UPDATE HANDBOOK
JF506E

INDEX

AUTOMATIC TRANSMISSION SERVICE GROUP
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INTRODUCTION
JATCO JF506E
"UPDATE HANDBOOK"

1st Printing
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FOUND IN:	MANUFACTURERS I.D.
Mazda "MPV" beginning in 2002 (3.0L V6)	JA5A-EL
Mazda "6" beginning in 2003 (3.0L V6)	JA5A-EL
Land Rover "Freelander" beginning in 2002 (2.5L V6)	JF506E
Jaguar "X" Type beginning in 2002 (2.5L/3.0L V6)	JF506E
VW "Jetta" beginning in 2002 (1.8L Gas/1.9L Diesel)	09A
VW "GTI" beginning in 2002 (1.8L Engine)	09A
VW "Golf" beginning in 2004 (1.9L Diesel)	09A

As you can see from above, with different manufacturers comes different identifications. These transaxles are all similar in the teardown and assembly process, but the internal and external parts are different in the design and engineering area. This manual is designed to identify the engineering differences between the current models available at this time.

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

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BELL HOUSING IDENTIFICATION

The JF506E transaxle is manufactured in Japan by JATCO and is used in the USA in the Land Rover Freelander, Jaguar X Type, Mazda "6" and "MPV" and the Volkswagen Golf, GTI and Jetta.

The JF506E transaxles can be identified very easily between the different users by the shape of the bell housings, as shown in Figure 1.

INTERNAL COMPONENT LOCATION

Internal component locations are shown in the cut-away in Figure 2 and the application chart is shown in Figure 4. Gear ratios vary between the car manufacturers as well as within the same user. There are also different final drive ratios so care must be used should replacement be necessary. We have provided you with a ratio chart in Figure 3.

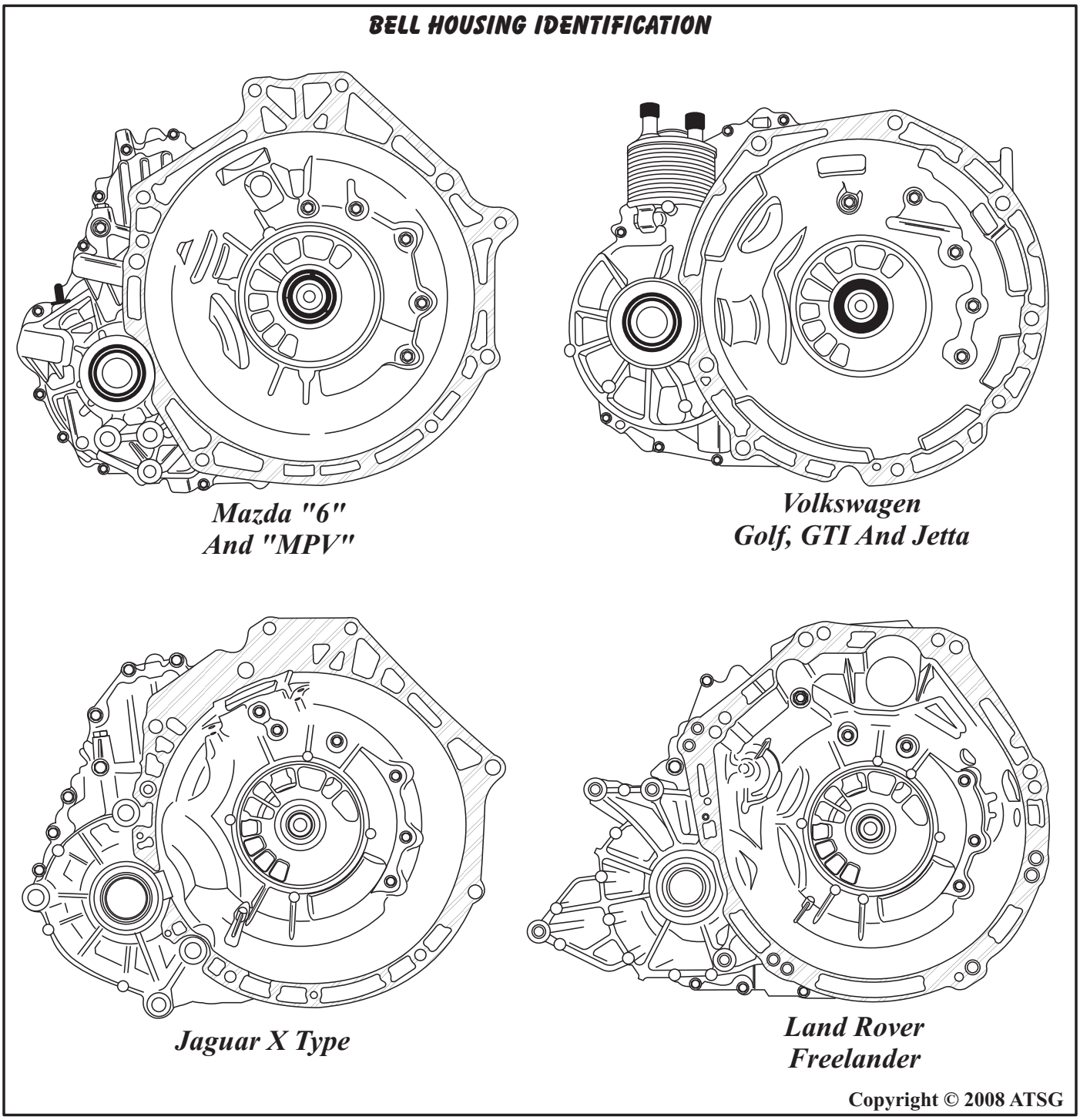


Figure 1

MAZDA JF506E COMPONENT LOCATIONS

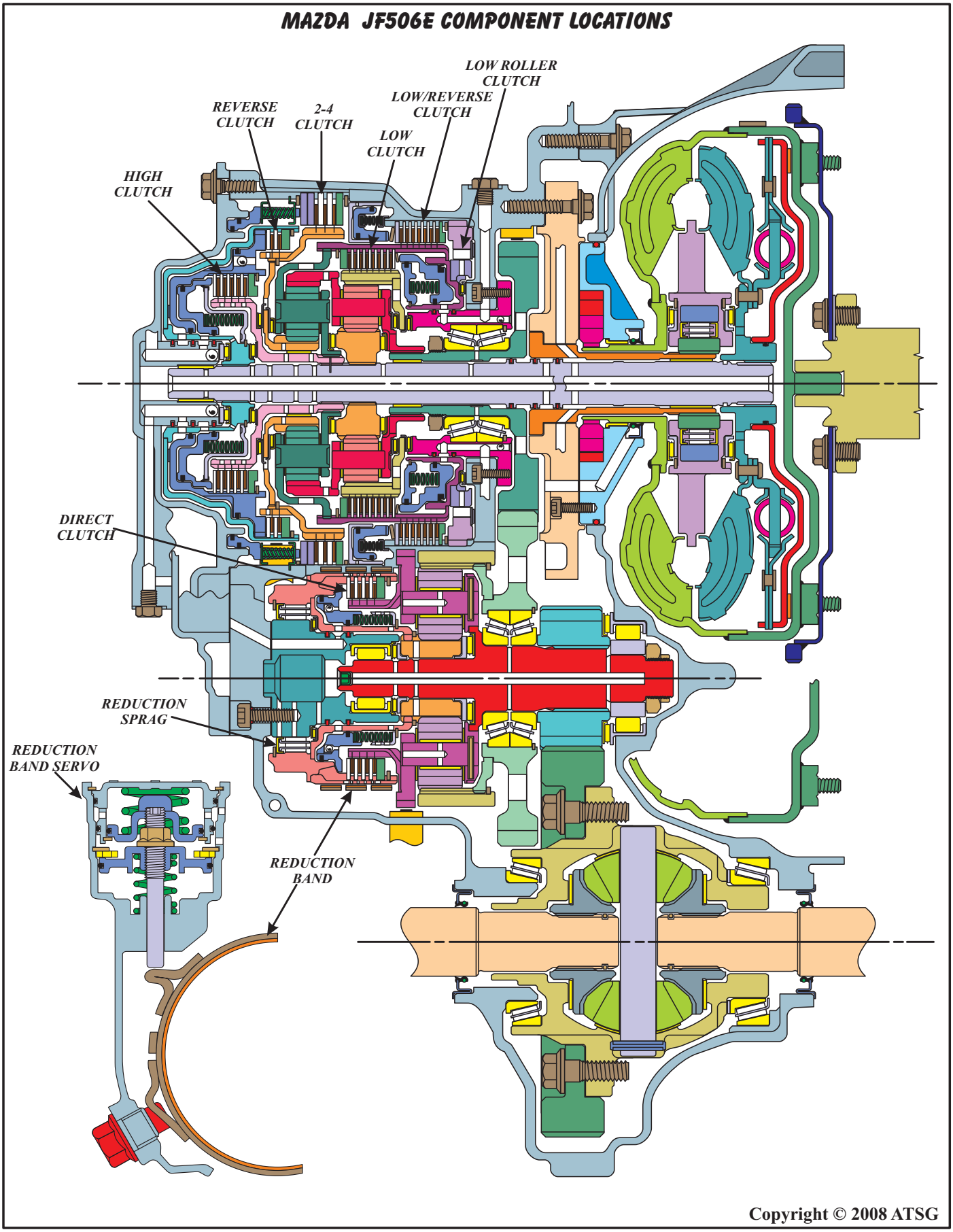


Figure 2

JF506E PLANETARY GEAR RATIOS

	Maxda 6 3.0L V6	Maxda MPV 3.0L V6	Land Rover Freelander 2.5L V6	Land Rover Freelander Turbo Diesel	Jaguar X Type 2.0L/2.5L/3.0L	VW Golf 1.9L Diesel	VW Jetta 1.8L/2.8L	VW GTI 1.8L
1st Gear	3.801	3.801	3.474	3.801	3.801	3.801	3.801	3.801
2nd Gear	2.131	2.131	1.948	2.131	2.131	2.131	2.131	2.131
3rd Gear	1.364	1.364	1.247	1.364	1.364	1.364	1.364	1.364
4th Gear	0.935	0.935	0.854	0.935	0.935	0.935	0.935	0.935
5th Gear	0.685	0.685	0.685	0.685	0.685	0.685	0.685	0.685
Reverse	2.970	2.970	2.714	2.970	2.970	2.970	2.970	2.970
Differential Ratio	3.23	3.04	3.04	2.87	3.23	Transaxle Code "EEB" = 3.45 Transaxle Code "EYN" = 3.45 Transaxle Code "EEF" = 2.70		

Figure 3

COMPONENT APPLICATION CHARTS

JF506E COMPONENT APPLICATION CHART

Mazda MPV RANGE	GEAR	Low Clutch	2-4 Clutch	High Clutch	Reverse Clutch	Low/ Reverse Clutch	Reduction Band	Direct Clutch	Low Roller Clutch	Reduction Sprag	Shift Solenoids		
											SSA	SSB	SSC
Park/Neutral							On						
Reverse	R				On	On	On						
"D" OD Cancel "OFF"	1st	On					On		Hold	Hold		On	On
	2nd	On	On				On			Hold	On	On	
	3rd	On		On			On			Hold		On	
	4th		On	On			On			Hold			On
	5th		On	On				On			On		On
"D" OD Cancel "ON"	1st	On							Hold	Hold		On	On
	2nd	On	On							Hold	On	On	
	3rd	On		On						Hold		On	
	4th		On	On									On
"3"	1st	On							Hold	Hold		On	On
	2nd	On	On							Hold	On	On	
	3rd	On		On									On
"2"	1st	On							Hold	Hold		On	On
	2nd	On	On								On	On	

Transaxle Range Selector Indicators vary in the number of range positions between vehicle users. There are 4, 6, and 7 position indicators. The example shown above is for the Mazda MPV, 6 position indicator.

Mazda "6" Indicator
P R N D

Mazda "MPV" Indicator
P R N D 3 2

Freelander Indicator
P R N D 4 2 1

Jaguar "X" Indicator
P R N D 4 3 2

Volkswagen Indicator
P R N D 4 3 2

Figure 4

RANGE SELECTOR SWITCH IDENTIFICATION

All models of the JF506E transaxle, regardless of the manufacturer, use an external mounted Range Selector Switch. They are all typical range selector switches, commonly referred to in the past as an Inhibitor Switch. The detent positions vary and may have four, six or seven positions, depending on model useage. We are covering 5 different versions of the JF506E transaxle in this manual, and there are five different range switch electrical connectors which we will identify for you, one at a time. This will make the diagnosis process much easier. Pay close attention to the wire schematics provided, as some models are equipped with a steptronic feature or a manual mode, that allows a "Slap-Stick" for Up and Down shift control, and some models are equipped with an overdrive cancel switch.

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

Transaxle Range Selector Switch MAZDA "6"

The Mazda "6" will have four positions (P R N D), and has a nine pin electrical connector, as shown in Figure 5. Two of the pin and cavities are not used on the Mazda "6". The electrical connector is hard wired to, and part of, the Transaxle Range Selector Switch. Connector terminal identification is shown in Figure 7. The Mazda "6" shift quadrant is shown in Figure 10.

MAZDA "MPV"

The Mazda "MPV" will have six detent positions (P-R-N-D-3-2), and also has a nine pin electrical connector, but is different than the Mazda "6", as shown in Figure 6. All of the pins and cavities are used on the Mazda "MPV". The electrical connector is hard wired to, and part of, the Transaxle Range Selector Switch. Connector terminal identification is shown in Figure 8. The Mazda "MPV" shift quadrant is shown in Figure 9.

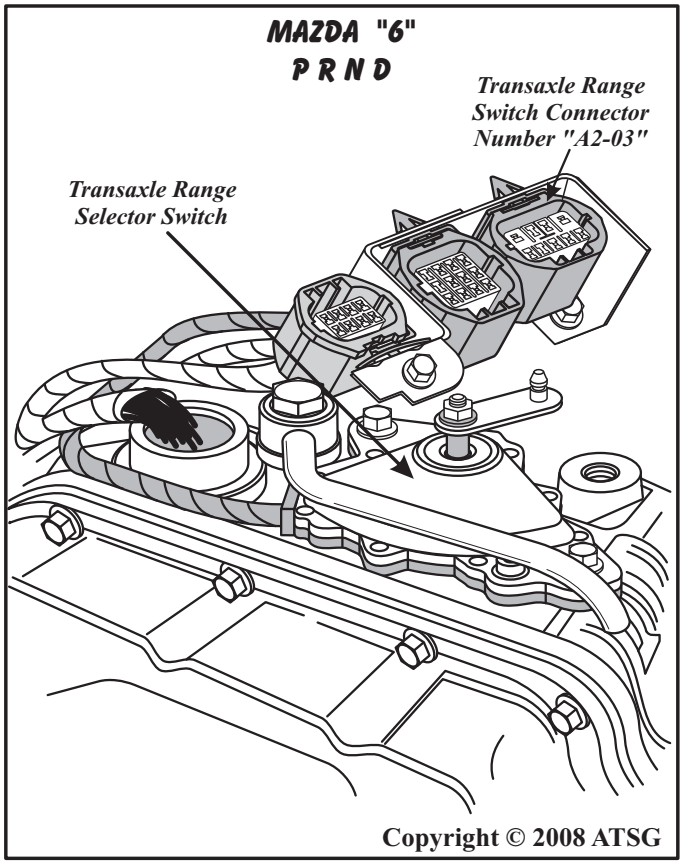


Figure 5

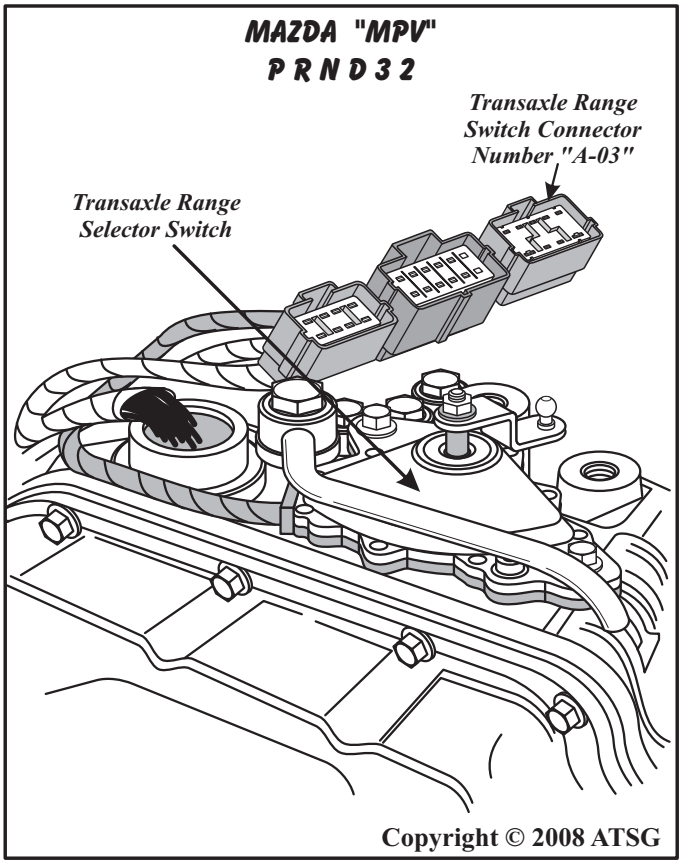


Figure 6

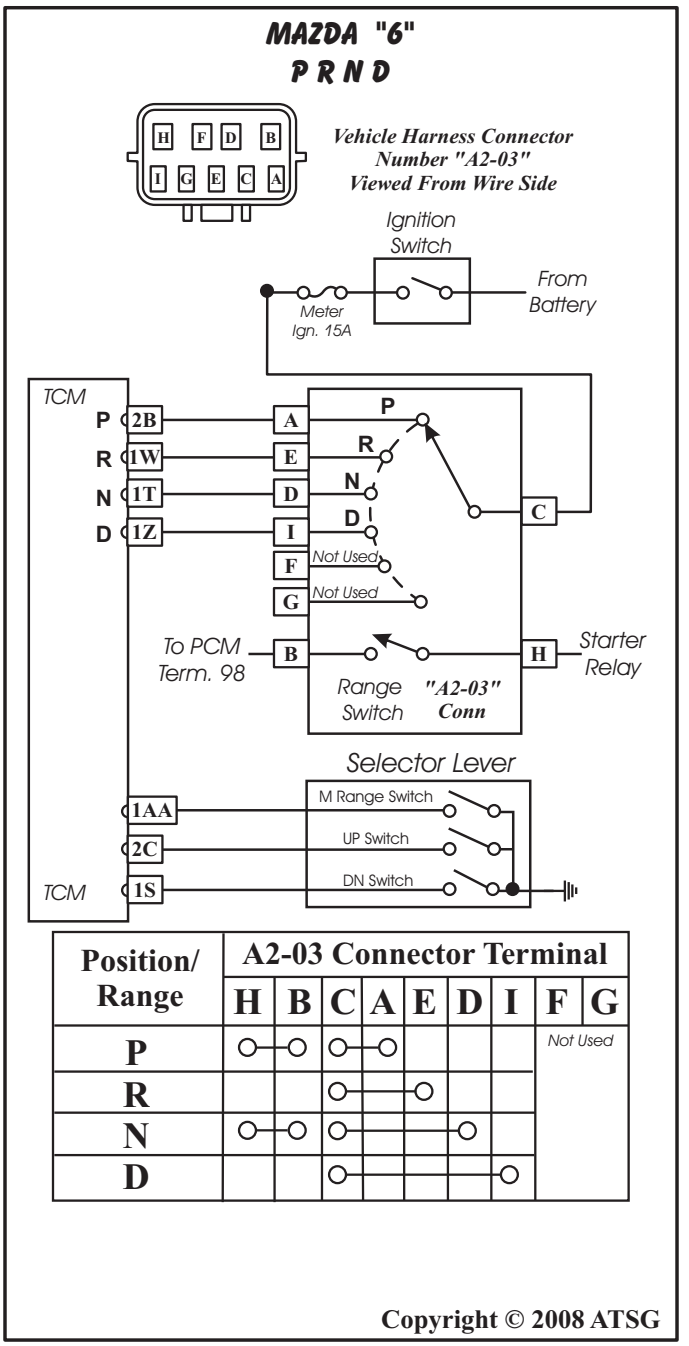
Mazda 6 and MPV Range Selector Switch (Cont'd)

We have provided you with individual connector views, wire schematic and continuity chart for both the Mazda "6" and "MPV" in Figure 7 and 8. Although the charts in Figure 7 and 8 are used to check the integrity of the switch's range selection, using an Ohmmeter, the best method, is to check the range switch in the vehicle with a Volt meter.

By looking at the charts in Figure 7 and 8, it can be seen that terminal "C" is the common terminal for all range selections. This is the voltage supply into the switch. Terminals "H" and "B" are used for starting purposes only. With the ignition switch "ON", there must battery voltage at terminal "C". If there is not, this must be repaired first. If voltage is present, it should exit the assigned terminal in each range selection.

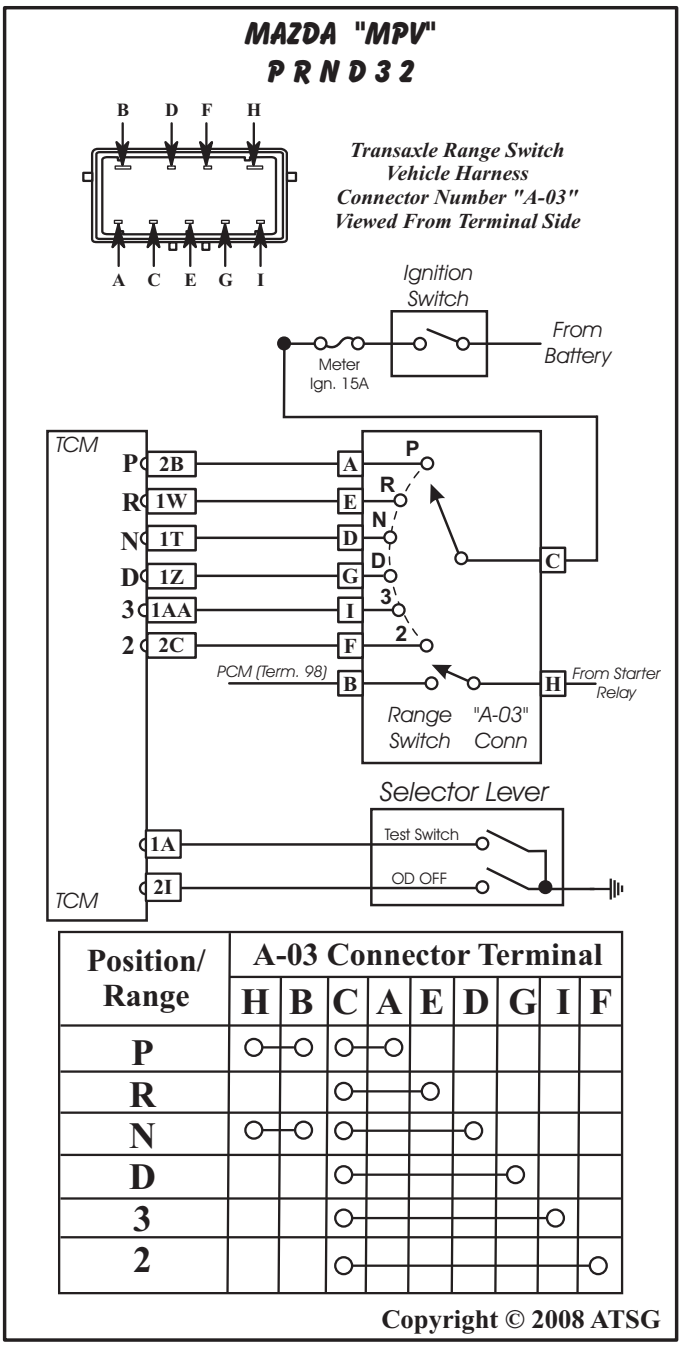
Notice also the Mazda "6" has a manual switch in the selector lever that allows manual shifting up and down (See Figure 10). The Mazda "MPV" is not equipped with the manual mode, but is equipped with an overdrive cancel button (See Figure 9).

Transaxle Range Switches
Continued on next Page



Position/ Range	A2-03 Connector Terminal								
	H	B	C	A	E	D	I	F	G
P	○	○	○	○				Not Used	
R			○		○				
N	○	○	○			○			
D			○				○		

Figure 7



Position/ Range	A-03 Connector Terminal								
	H	B	C	A	E	D	G	I	F
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○				○		
3			○					○	
2			○						○

Figure 8

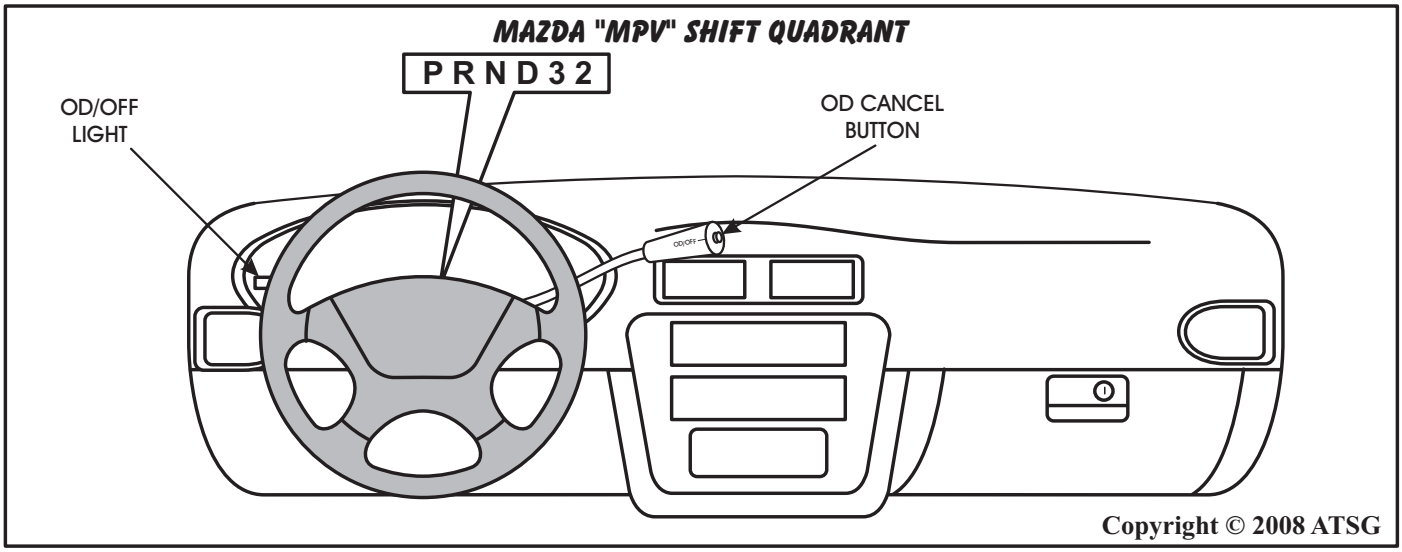


Figure 9

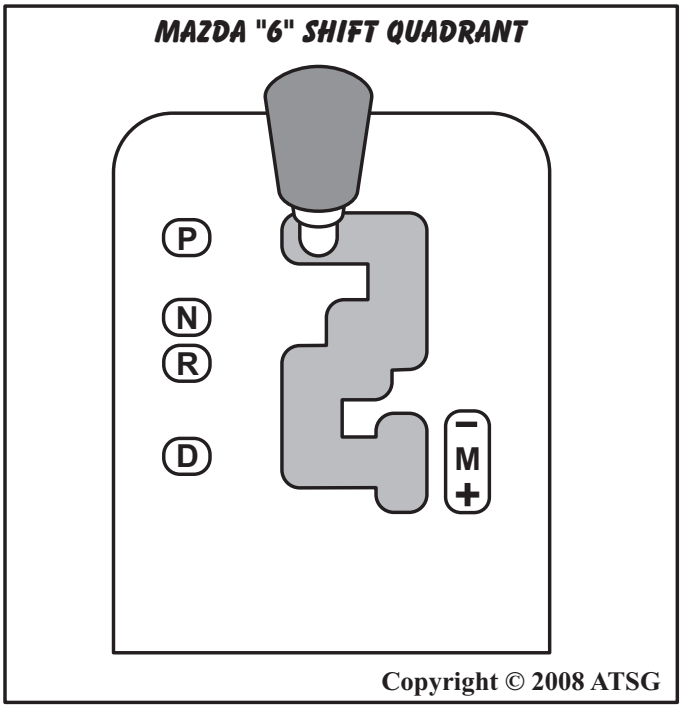


Figure 10

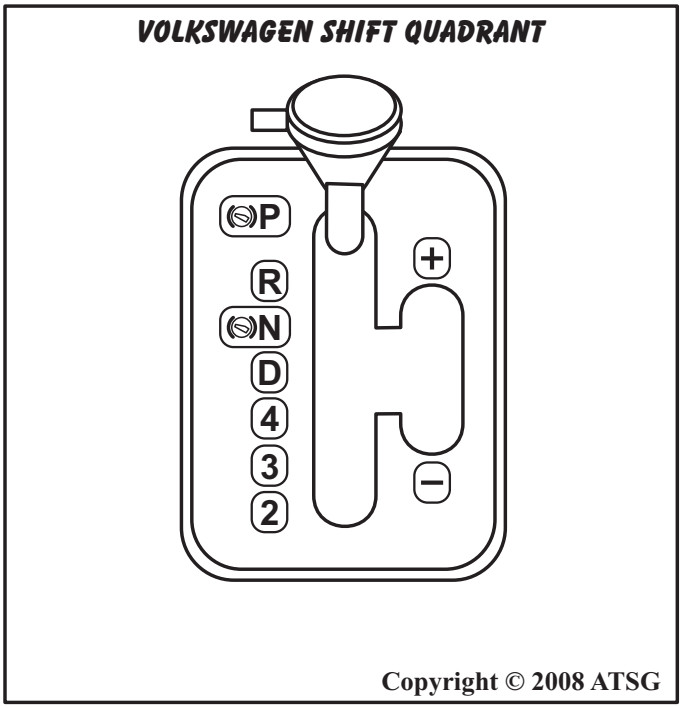


Figure 11

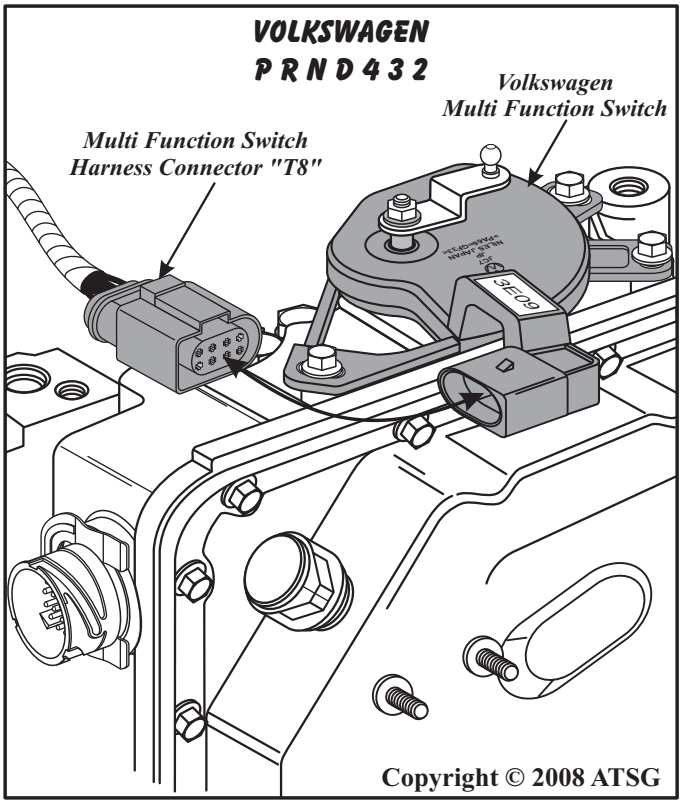


Figure 12

RANGE SELECTOR SWITCH IDENTIFICATION

Volkswagen Range Selector Switch

Volkswagen refers to their range selector switch as a "Multi-Function" Switch, and it is illustrated in Figure 12. The multi-function switch detects the position of the selector lever and transmits this information to the Transaxle Control Module (TCM). The TCM then initiates the gear selections made by the operator. The TCM also activates the starter inhibitor relay, if the selector lever is placed in the "P" or "N" position. Notice also a "Tiptronic" feature is available that when selected, allows the driver to to upshift or downshift by moving the selector lever towards "+" or "-", as shown in Figure 11.

In previous VW transaxles, mechanical circuits were used in the Multi-function switch. In this unit the mechanical circuits have been replaced by Hall senders. These non-contact switches are wear free.

At present there is no "manual" test procedure available for this type of switch with Hall senders. The appropriate Volkswagen scanner must be used. For inspection and repair, refer to the appropriate vehicle workshop manual.

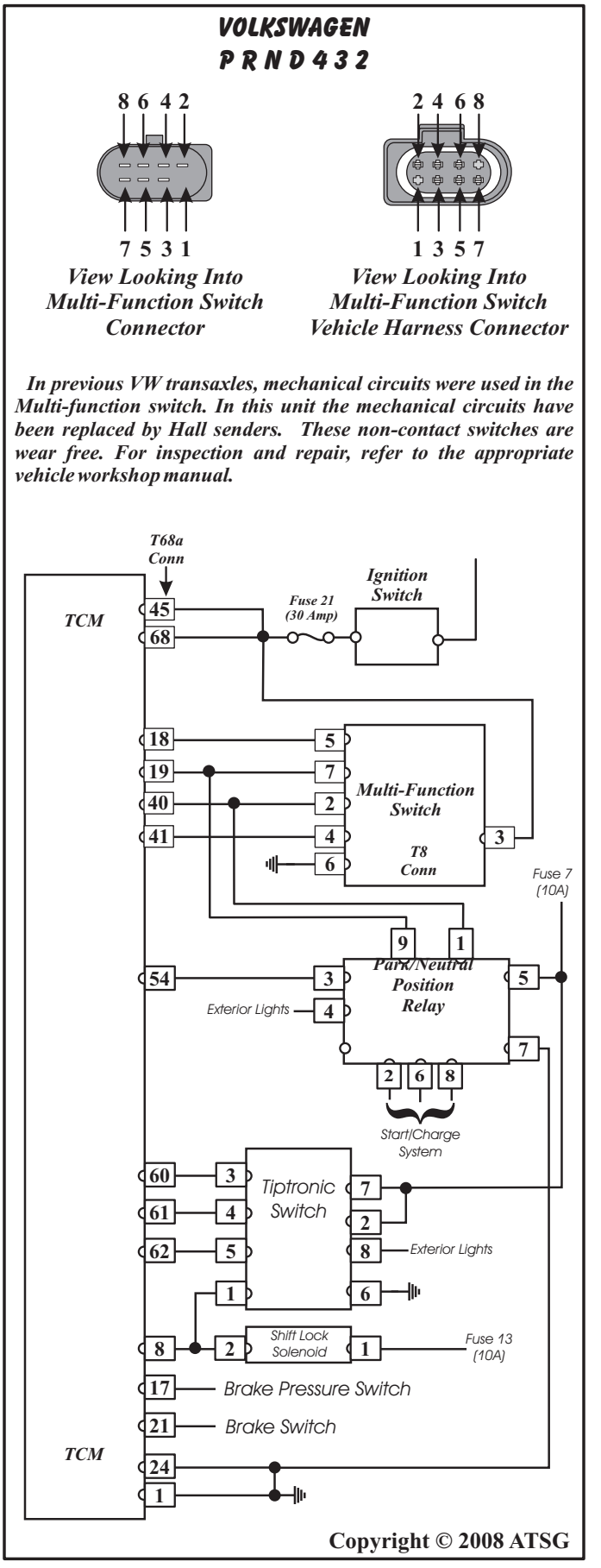


Figure 13

RANGE SELECTOR SWITCH IDENTIFICATION

Jaguar Range Selector Switch

The Jaguar Range Selector Switch is shown in Figure 15. Notice there is not a manual shift lever on top like all the others, as the shaft goes all the way through the case and out the bottom, which is where the manual lever is located, and operated with a cable. Jaguar also uses a "J-Gate" system for the shift quadrant and it is shown in Figure 14.

Jaguar uses two different types of Transaxle Control Module (TCM), a "16-bit" TCM and a "32-bit" TCM. In addition there is an "Early" style "16-bit" version, and a "Late" style "16-bit" version, that are different electronically. The early style 16-bit uses the J-gate with an overdrive cancel switch in the J-gate, and the range selector switch sends the signal for P, R, N, D, 3, 2. The late style does away with the overdrive cancel switch and includes 4, 3, and 2 in the wire harness from the J-gate to the TCM, while the range selector switch sends the signal for P, R, N, D. The 32-bit version was used in all models from mid 2003-up, and also does not have the overdrive cancel switch.

We have provided you with individual connector views, wire schematics and continuity charts for all three versions, in Figure 16, 17, and 18, to check the integrity of the switch's range selection.

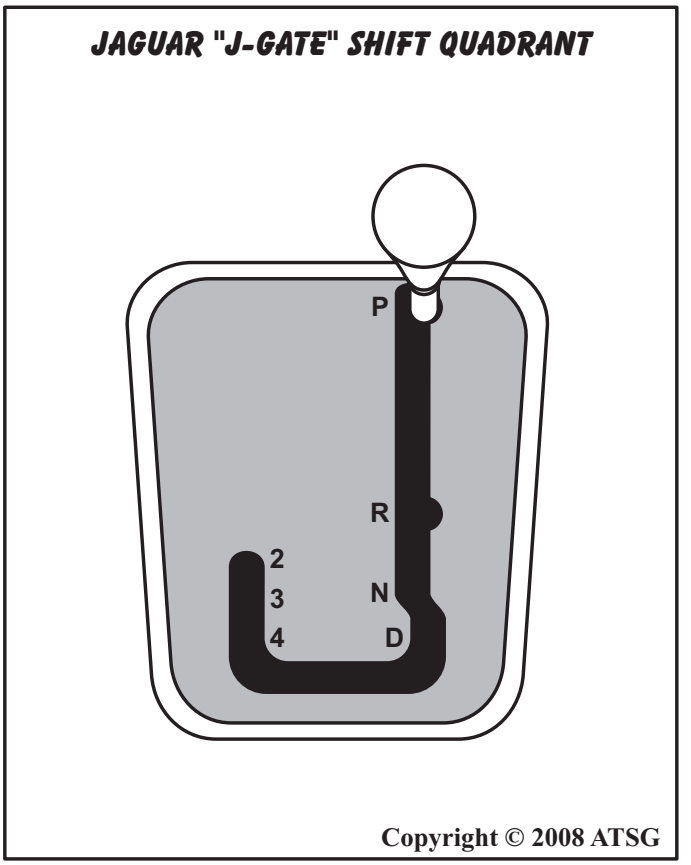


Figure 14

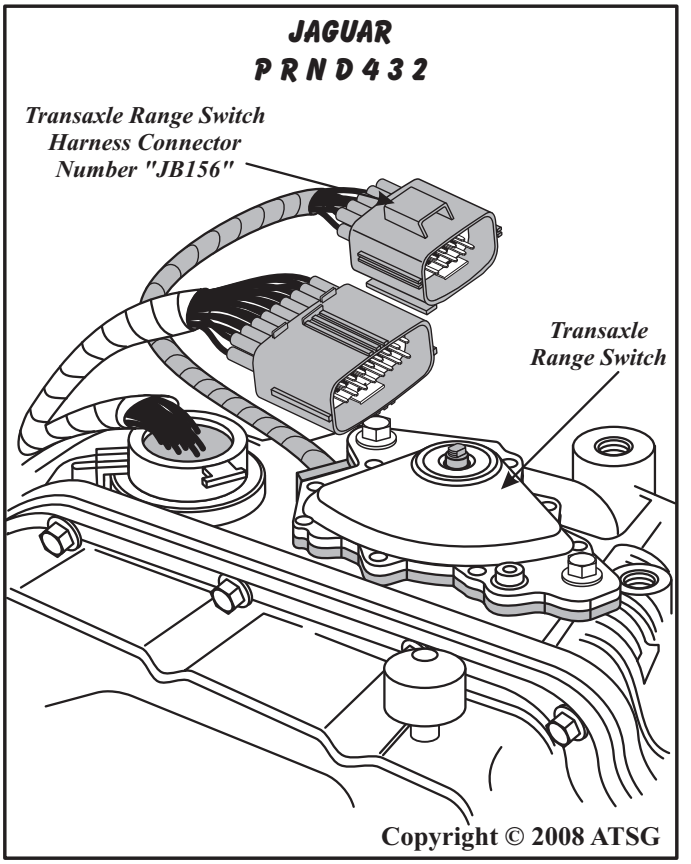
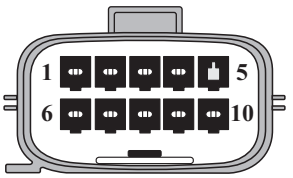
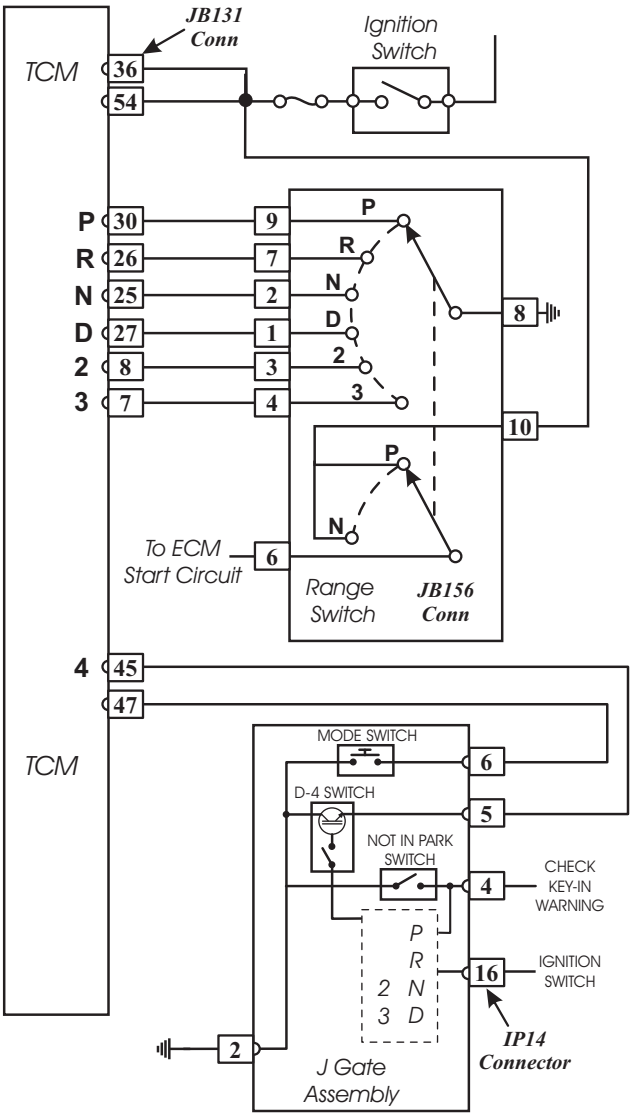


Figure 15

2002 JAGUAR (EARLY) "16 BIT" TCM
P R N D 4 3 2



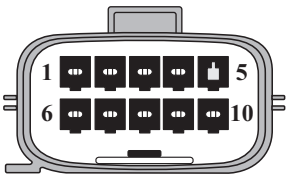
View Looking Into JB156 Connector



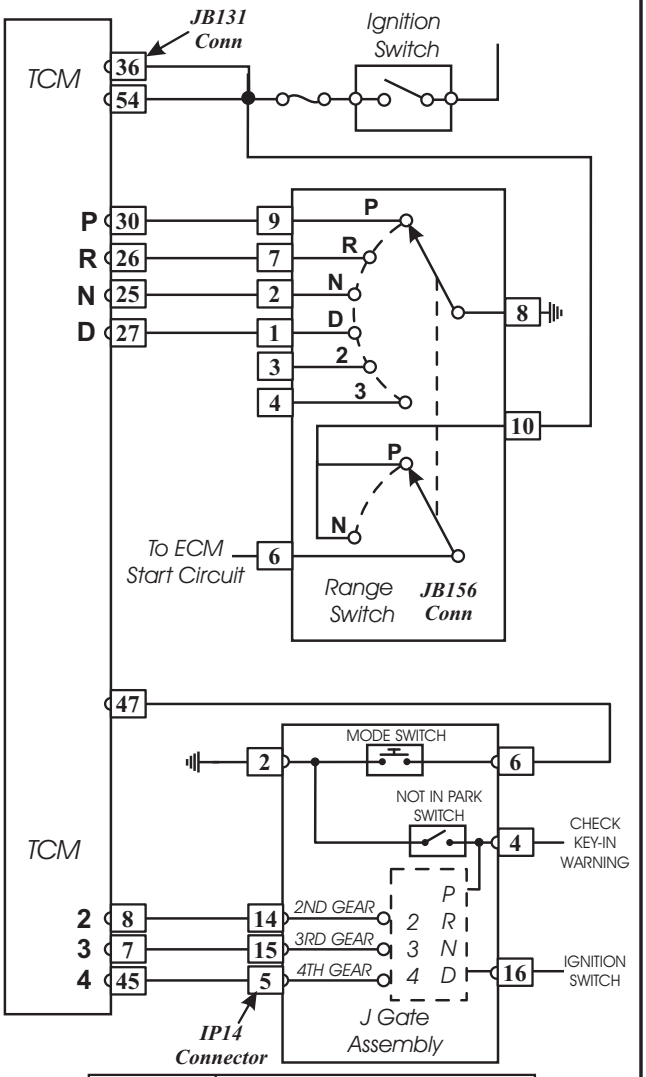
Position/ Range	JB156 Connector Terminal									
	6	10	8	9	7	2	1	4	3	5
P	○	○	○	○						
R			○		○					
N	○	○	○			○				
D			○				○			
2			○					○		
3			○						○	
4	*D-4 Switch on Shift Console*									

Figure 16

2002 JAGUAR (LATE) "16 BIT" TCM
P R N D 4 3 2



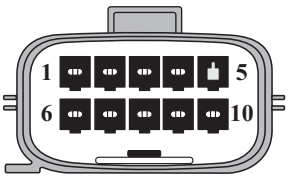
View Looking Into JB156 Connector



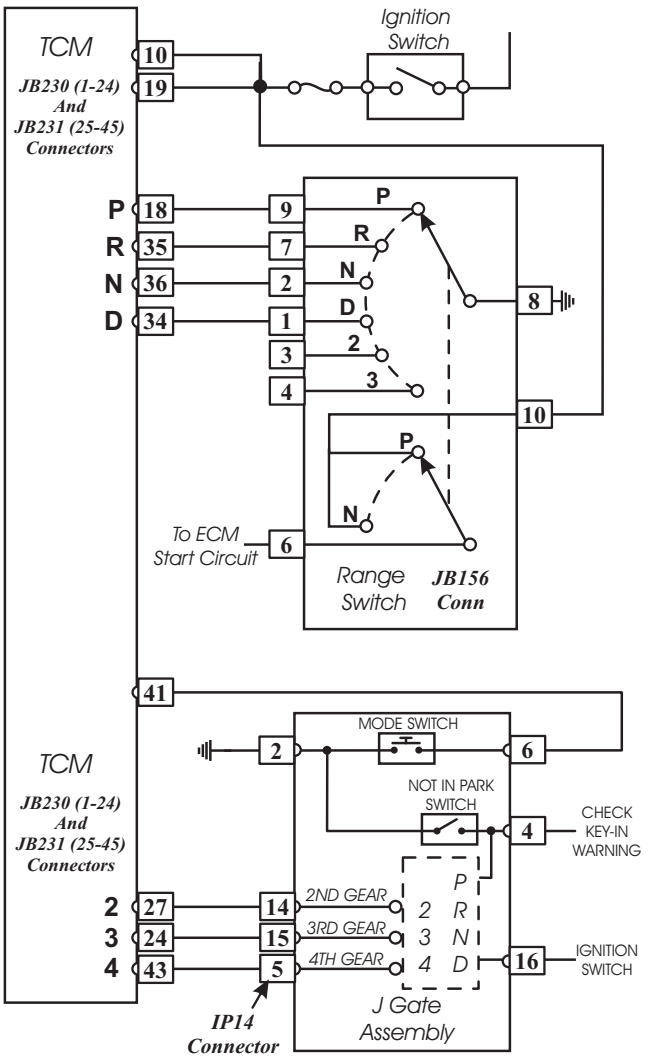
Range	JB156 Connector Terminals									
	6	10	8	9	7	2	1	4	3	5
P	○	○	○	○						
R			○		○					
N	○	○	○			○				
D			○				○			
Range	**IP14 Connector Terminals**									
			2				5	15	14	
2			○						○	
3			○					○		
4			○				○			

Figure 17

2004 JAGUAR "32 BIT" TCM
P R N D 4 3 2



View Looking Into JB156 Connector



Range	JB156 Connector Terminals									
	6	10	8	9	7	2	1	4	3	5
P	○	○	○	○						
R			○	○						
N	○	○	○			○				
D			○				○			
Range	**IP14 Connector Terminals**									
			2				5	15	14	
2			○						○	
3			○					○		
4			○				○			

Figure 18

FREELANDER SHIFT QUADRANT

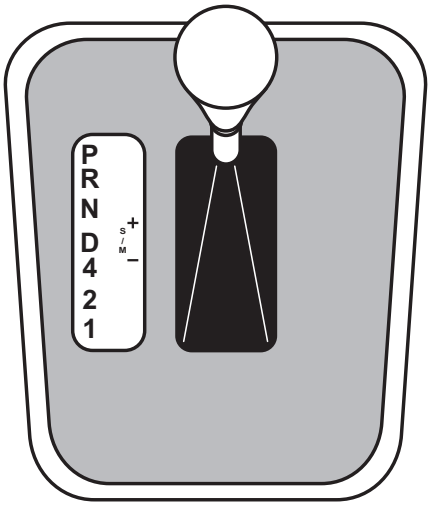


Figure 19

FREELANDER
P R N D 4 2 1

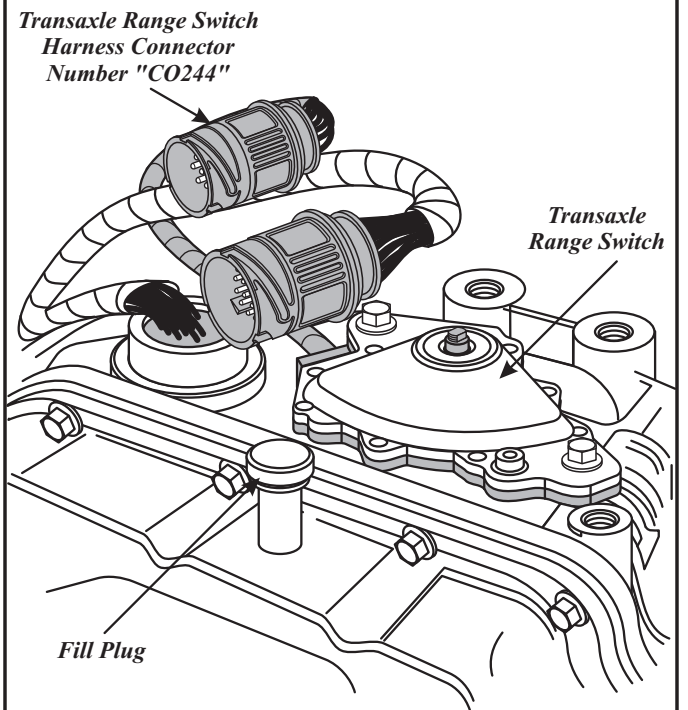


Figure 20

RANGE SELECTOR SWITCH IDENTIFICATION

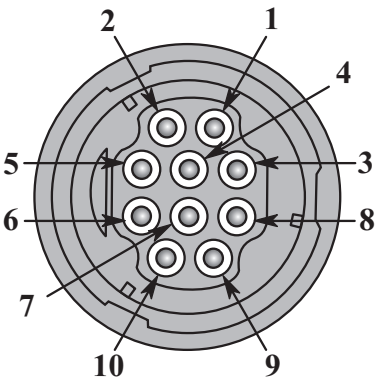
Freelaander Range Selector Switch

The Range Selector Switch for the Freelander is located on the selector shaft on top of the transaxle and is connected to the main harness with a 10 pin connector, as shown in Figure 20. Notice there is no manual lever on top, as the selector shaft goes through the transaxle with the manual lever on the bottom and is operated with a cable. The selector lever position is displayed on the LED module in the center console, shown in Figure 19, and in the instrument cluster just left of the odometer and is determined by the selector lever position and range selector switch. The selector lever is attached to a gimbal mounting, which allows a selection of PRND421 in a forward and rearward direction and selection between automatic and sport/manual (S/M) mode in a left and right transverse direction, as shown in Figure 19. When the "D" position is selected, the TCM receives a signal that "D" is selected. When the selector lever is moved to the S/M position (to the right), and the TCM does not receive a signal from either the 4 or N sensors, it determines that sport mode has been selected. If the selector lever is not moved to the "+" or "-" positions, the TCM keeps the transaxle in sport mode for higher and harsher automatic shifts. If the TCM senses a signal from either the "+" or "-" sensor, it initates manual mode and selects the manual gear selection requested. Manual mode will be maintained until the TCM again senses a signal from the "D" sensor.

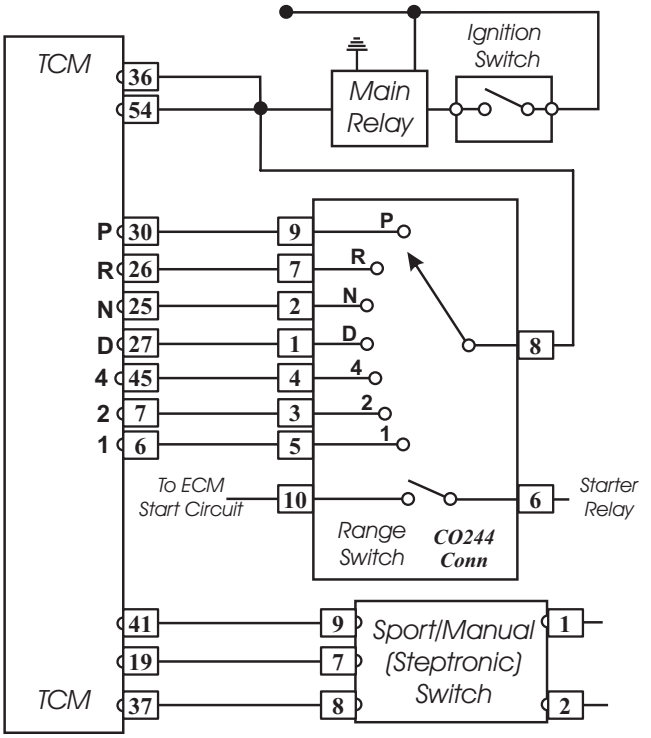
We have provided you with individual connector views, wire schematic and continuity chart for the Freelander in Figure 21. Although the charts in Figure 21 are used to check the integrity of the switch's range selection, using an Ohmmeter, the best method, is to check the range switch in the vehicle with a Volt meter.

By looking at the charts in Figure 21, it can be seen that terminal "8" is the common terminal for all range selections. This is the voltage supply into the switch. Terminals "6" and "10" are used for starting purposes only. With the ignition switch "ON", there must battery voltage at terminal "8". If there is not, this must be repaired first. If voltage is present, it should exit the assigned terminal in each range selection, as shown in the chart.

FREELANDER
P R N D 4 2 1



External Transaxle Harness Connector CO244



Position/ Range	CO244 Connector Terminal									
	6	10	8	9	7	2	1	4	3	5
P	○	○	○	○						
R			○		○					
N	○	○	○			○				
D			○				○			
4			○					○		
2			○						○	
1			○							○

Figure 21

OIL PAN IDENTIFICATION

Each of the oil pans are also different, as shown in Figure 22. The Volkswagen, Jaguar, and Freelander all have studs on the oil pan, in different locations, for various shaped brackets for the individual applications. Notice also that those three have a fill pipe and plug on the top of the pans, and the Volkswagen and Jaguar vent through the pan, where the others do not. The Mazda pan has zero studs and no fill plug on the pan, as it fills through the dipstick tube in the case, near the final drive.

These pans will not interchange.

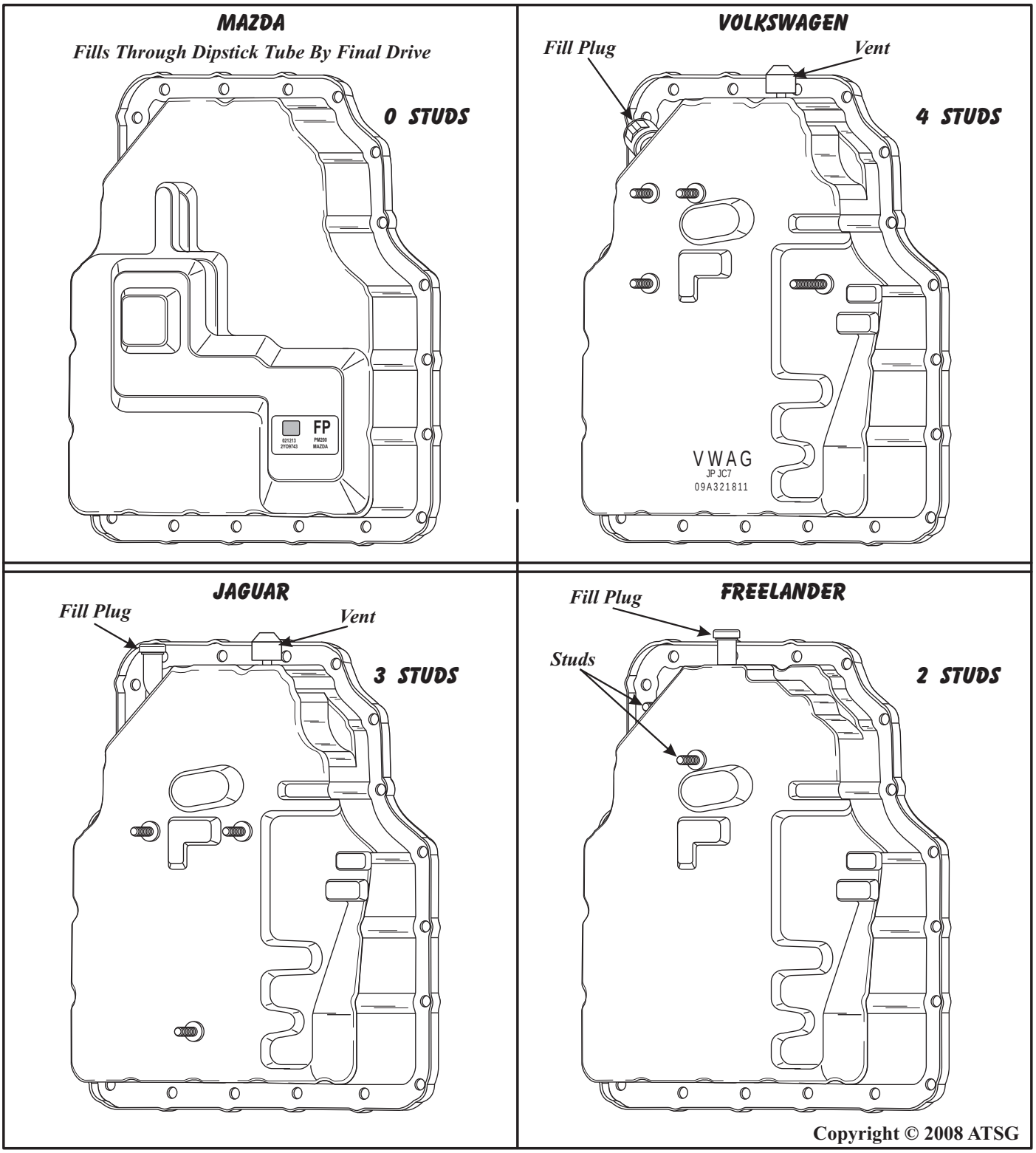


Figure 22

ELECTRONIC COMPONENTS

Electrical Connectors and Wire Harness For Mazda "6" And Mazda "MPV"

The JF506E transaxles ***all*** have a complex wire harness set-up, compared to previous units. On the Mazda units there are two ***external*** case connectors, as shown in Figure 23 and 24. One connector that provides voltage for all of the 9 solenoids, and one connector that provides a path for the three speed sensors and the TFT sensor. Both of these connectors merge into one harness, goes through a "Pass-thru" case connector, and once again splits into two more connectors ***internally***. One connector with eight terminals for the three speed sensors and the TFT sensor, and one connector with ten terminals for the 9 solenoids and a ground. Refer to Figure 23 for the Mazda "6" version and Figure 24 for the Mazda "MPV" version. If any of these connectors are damaged, a complete wiring harness is required (See Figure 33).

There is an internal wire harness that plugs into the 10-way internal connector and runs to each of the 9 solenoids and provides an internal ground. There is also an internal harness that plugs into the 8-way internal connector that provides a path for all three speed sensors and the Transaxle Fluid Temp (TFT) sensor. Of course then there are connectors at each of the 9 solenoids, and more connectors at each of the 3 speed sensors and the TFT sensor. These internal harness' can also be seen in Figure 23 and 24. The internal harness' are the same on both the Mazda "6" and the Mazda "MPV".

This makes the electronic diagnostic process a challenge, to say the very least, with a variety of connectors that may have corrosion or damage. We have provided you with individual terminal identification for the external and the internal connectors, and a resistance chart in Figure 25 for the Mazda "6", and Figure 26 for the "MPV".

Terminal identification for the TCM is found in Figure 29, and is the same for both models. Wire schematics from transaxle to TCM are shown in Figure 27 for the Mazda "6" and Figure 28 for the Mazda "MPV".

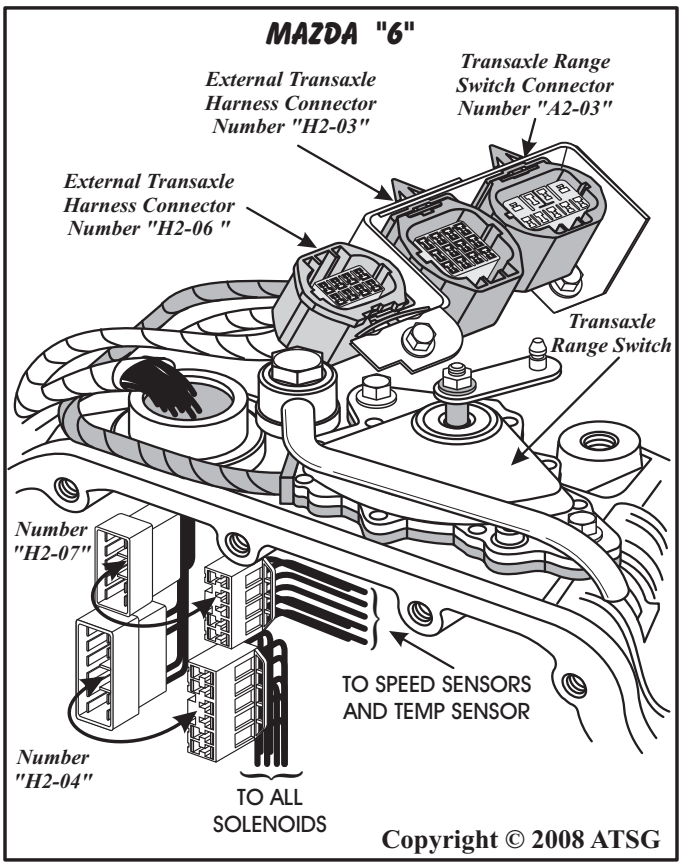


Figure 23

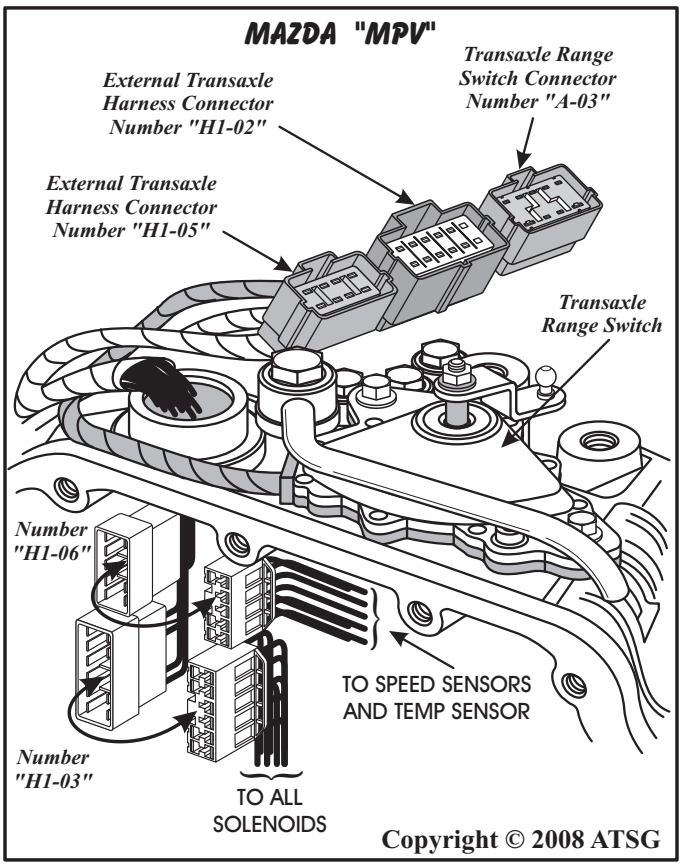
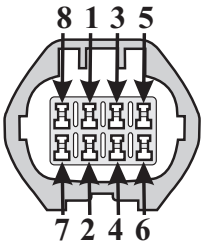


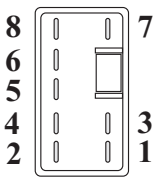
Figure 24

2004 MAZDA "6" TRANSAXLE TERMINAL I.D. AND RESISTANCE CHART

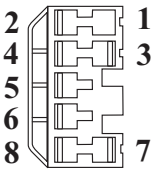


External Transaxle Harness Connector Number "H2-06"

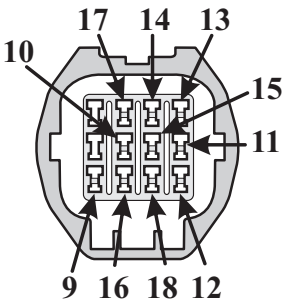
1 & 2 = Turbine Shaft Speed Senor	*(513 to 627 ohms)*
3 & 4 = Intermediate Shaft Speed Sensor	*(513 to 627 ohms)*
5 & 6 = Output Shaft Speed Senor	*(513 to 627 ohms)*
7 & 8 = Temperature Sensor	*(Refer to Page 33)*



Internal Transaxle Harness "Male" Coupler Connector Number "H2-07"

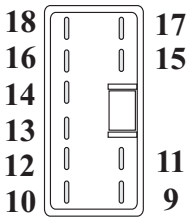


Internal Transaxle Harness "Female" Coupler Connector Number "H2-07"

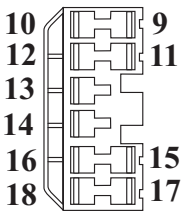


External Transaxle Harness Connector Number "H2-03"

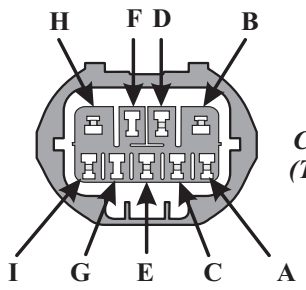
9 & 10 = Neutral Shift Solenoid	*(14 to 18 ohms)*
9 & 11 = TCC Solenoid	*(12 to 13.2 ohms)*
9 & 12 = 2/4 Brake Timing Solenoid	*(2.6 to 3.2 ohms)*
9 & 13 = High Clutch Timing Solenoid	*(2.6 to 3.2 ohms)*
9 & 14 = Shift Solenoid C	*(14 to 18 ohms)*
9 & 15 = Reduction Timing Solenoid	*(14 to 18 ohms)*
9 & 16 = Shift Solenoid B	*(14 to 18 ohms)*
9 & 17 = Shift Solenoid A	*(14 to 18 ohms)*
9 & 18 = Pressure Control Solenoid	*(2.6 to 3.2 ohms)*



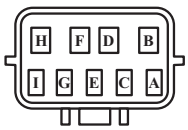
Internal Transaxle Harness "Male" Coupler Connector Number "H2-04"



Internal Transaxle Harness "Female" Coupler Connector Number "H2-04"



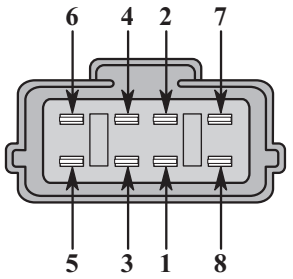
Transaxle Range Switch Connector Number "A2-03" (Terminal F and G Not Used)



Transaxle Range Switch Vehicle Harness (Wire Side) Connector Number "A2-03" (Terminal F and G Not Used)

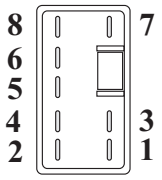
Figure 25

2004 MAZDA "MPV" TRANSAXLE TERMINAL I.D. AND RESISTANCE CHART

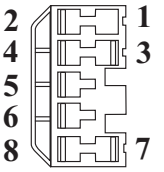


External Transaxle Connector Number "H1-05"

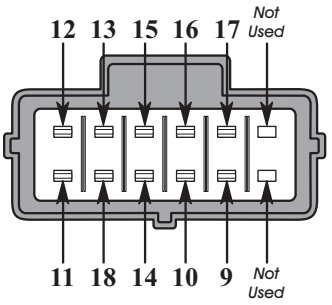
1 & 2 = Turbine Shaft Speed Senor (513 to 627 ohms)
3 & 4 = Intermediate Shaft Speed Sensor (513 to 627 ohms)
5 & 6 = Output Shaft Speed Senor (513 to 627 ohms)
7 & 8 = Temperature Sensor (Refer to Page 33)



Internal Transaxle Harness "Male" Coupler Connector Number "H1-06"



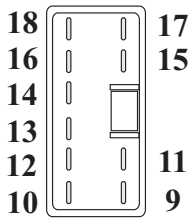
Internal Transaxle Harness "Female" Coupler Connector Number "H1-06"



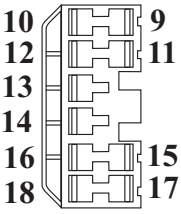
External Transaxle Connector Number "H1-02"

9 & 10 = Neutral Shift Solenoid (14 to 18 ohms)
9 & 11 = TCC Solenoid (12 to 13.2 ohms)
9 & 12 = 2/4 Brake Timing Solenoid (2.6 to 3.2 ohms)
9 & 13 = High Clutch Timing Solenoid (2.6 to 3.2 ohms)
9 & 14 = Shift Solenoid C (14 to 18 ohms)
9 & 15 = Reduction Timing Solenoid (14 to 18 ohms)
9 & 16 = Shift Solenoid B (14 to 18 ohms)
9 & 17 = Shift Solenoid A (14 to 18 ohms)
9 & 18 = Pressure Control Solenoid (2.6 to 3.2 ohms)

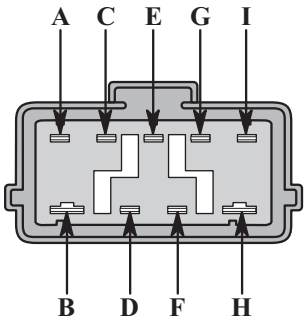
CAUTION: Even though there are two blank terminals in the external transaxle connector "H1-02" as shown here, the mating connector from the TCM has two wires in these locations that are not used.



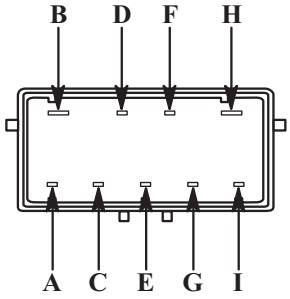
Internal Transaxle Harness "Male" Coupler Connector Number "H1-03"



Internal Transaxle Harness "Female" Coupler Connector Number "H1-03"



Transaxle Range Switch Connector Number "A-03"



Transaxle Range Switch Vehicle Harness (Pin Side) Connector Number "A-03"

Figure 26

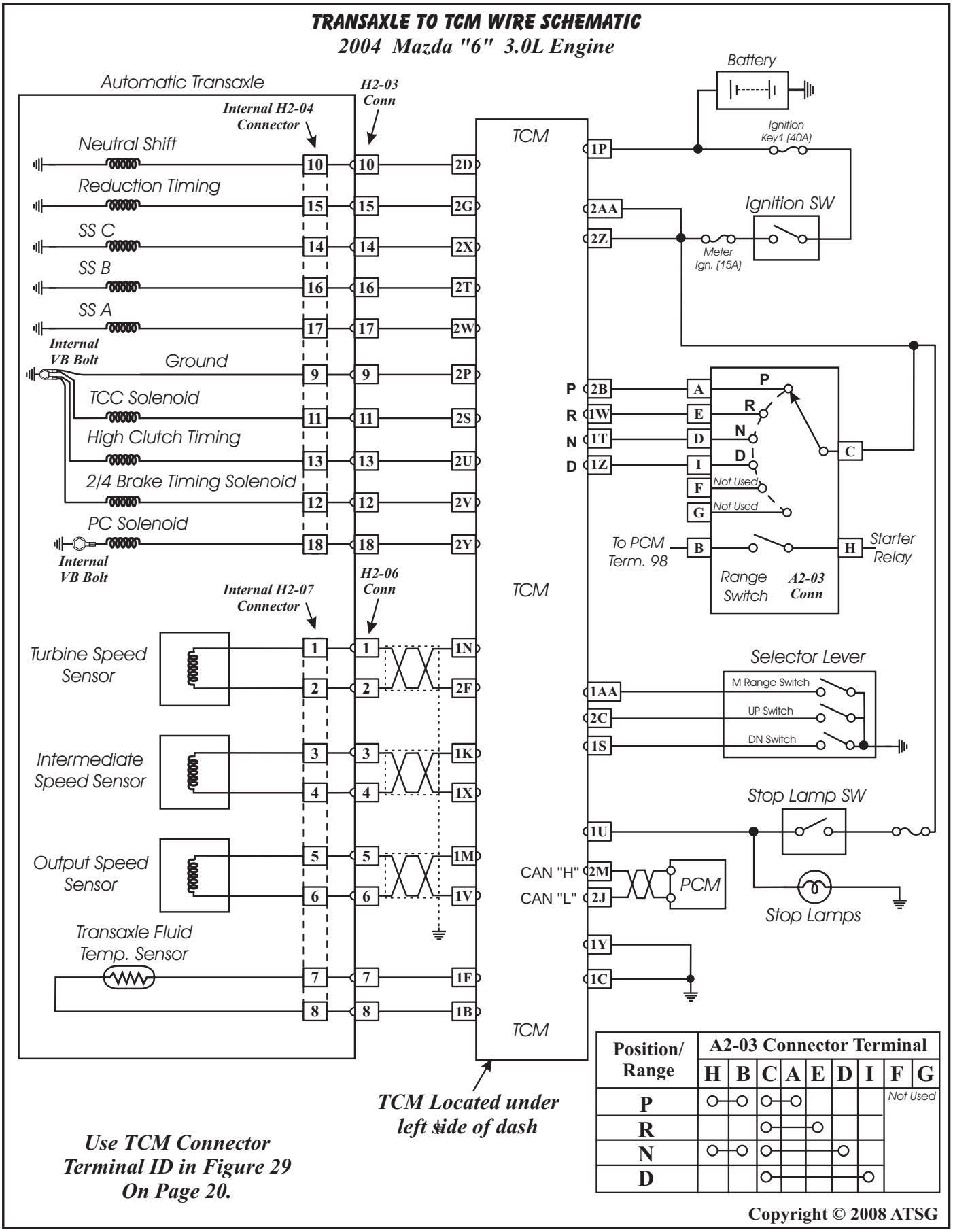
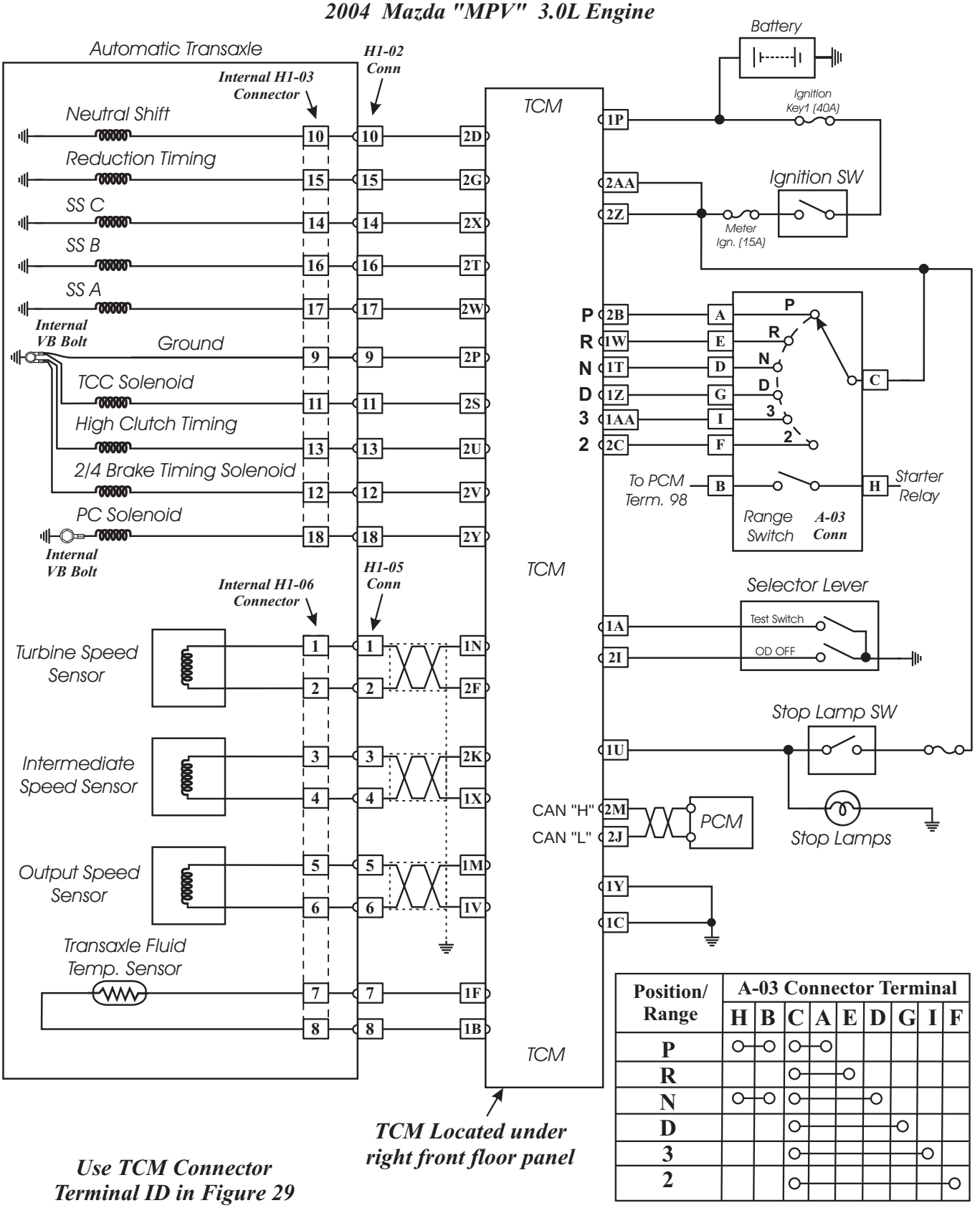

TRANSAXLE TO TCM WIRE SCHEMATIC
2004 Mazda "6" 3.0L Engine
Automatic Transaxle
H2-03 Conn
Internal H2-04 Connector
Neutral Shift
Reduction Timing
SS C
SS B
SS A
Internal VB Bolt
Ground
TCC Solenoid
High Clutch Timing
2/4 Brake Timing Solenoid
PC Solenoid
Internal VB Bolt
Internal H2-07 Connector
H2-06 Conn
Turbine Speed Sensor
Intermediate Speed Sensor
Output Speed Sensor
Transaxle Fluid Temp. Sensor
TCM
Battery
Ignition Key1 (40A)
Ignition SW
Meter Ign. (15A)
P
R
N
D
Not Used
Not Used
To PCM Term. 98
Starter Relay
Range Switch
A2-03 Conn
Selector Lever
M Range Switch
UP Switch
DN Switch
Stop Lamp SW
Stop Lamps
CAN "H"
CAN "L"
PCM
TCM Located under left side of dash
Use TCM Connector Terminal ID in Figure 29 On Page 20.
Position/ Range
A2-03 Connector Terminal
H B C A E D I F G
Not Used
Copyright © 2008 ATSG

Figure 27

TRANSAXLE TO TCM WIRE SCHEMATIC

2004 Mazda "MPV" 3.0L Engine



Position/ Range	A-03 Connector Terminal								
	H	B	C	A	E	D	G	I	F
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○				○		
3			○					○	
2			○						○

Use TCM Connector Terminal ID in Figure 29 On Page 20.

Figure 28

TCM TERMINAL IDENTIFICATION
WIRE SIDE HARNESS CONNECTOR VIEW
2004 "Mazda 6" 3.0L And 2004 "Mazda MPV", 3.0L

Connector "One"

Y	V	S	P	M	J	G	D	A
Z	W	T	Q	N	K	H	E	B
AA	X	U				I	F	C

Connector "Two"

Y	V	S	P	M	J	G	D	A
Z	W	T	Q	N	K	H	E	B
AA	X	U				I	F	C

Figure 29

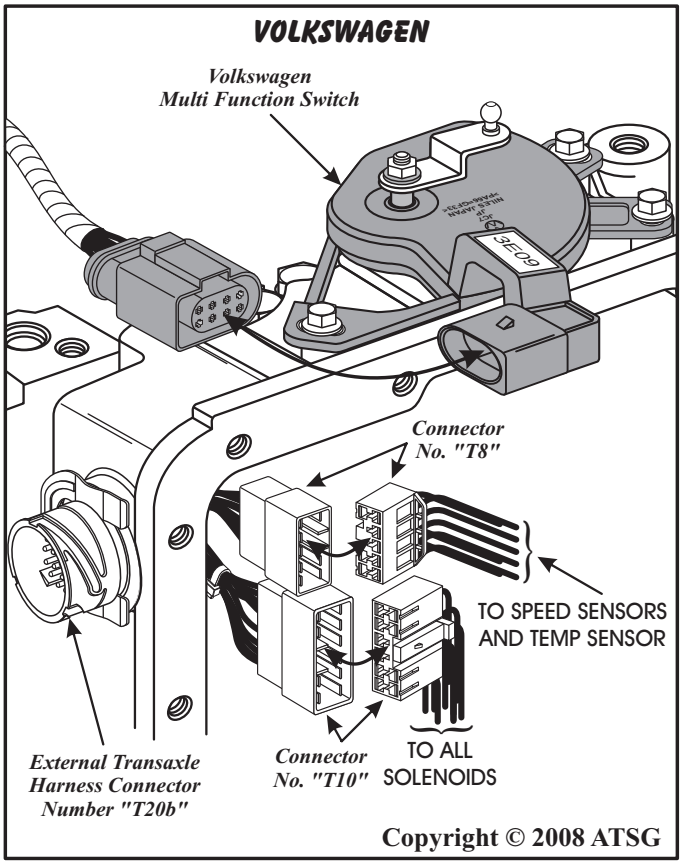


Figure 30

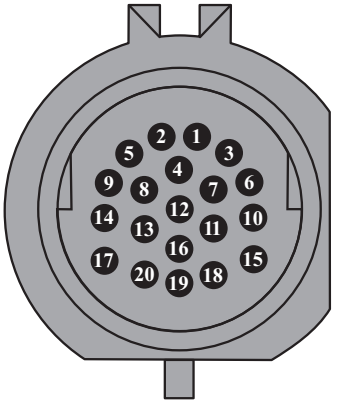
Electrical Connectors and Wire Harness For Volkswagen Golf, Jetta, GTI

The JF506E transaxles all have a complex wire harness set-up, compared to previous units. On the Volkswagen units there is one, 20 pin, ZF style, ***external*** case connector, as shown in Figure 30. These wires from the external case connector split into two more connectors ***internally***. One connector with eight terminals for the three speed sensors and the TFT sensor, and one connector with ten terminals for the 9 solenoids and a ground. Refer to Figure 30 for the internal connectors. If any of these connectors are damaged, a complete wiring harness is required (See Figure 33).

There is an internal wire harness that plugs into the 10-way internal connector and runs to each of the 9 solenoids and provides an internal ground. There is also an internal harness that plugs into the 8-way internal connector that provides a path for all three speed sensors and the Transaxle Fluid Temp (TFT) sensor. Of course then there are connectors at each of the 9 solenoids, and more connectors at each of the 3 speed sensors and the TFT sensor. These internal harness' can be seen in Figure 30. The internal solenoid harness for the Volkswagen is unique to the VW and will not fit any other vehicle. This complex wiring system makes the electronic diagnostic process a challenge, to say the very least, with a variety of connectors that may have corrosion or damage. We have provided you with individual terminal identification for the external and the internal connectors, and a resistance chart in Figure 31 for the VW family.

Terminal identification for the TCM is found in Figure 32, and is the same for all VW models. Wire schematic from transaxle to TCM is also shown in Figure 32, and is the same for all VW models.

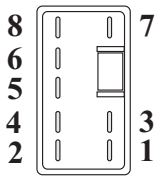
VOLKSWAGEN TRANSAXLE TERMINAL I.D. AND RESISTANCE CHART



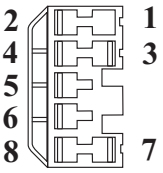
View Looking Into The External Transaxle Harness Connector Number "T20b"

1 & 2 = G182 Turbine Shaft Speed Senor, (400 to 600 Ohms)
3 & 4 = G265 Intermediate Shaft Speed Sensor, (400 to 600 Ohms)
5 & 6 = G68 Output Shaft Speed Senor, (400 to 600 Ohms)
7 & 8 = G93 Transaxle Fluid Temp Sensor, (Refer to Page 33)

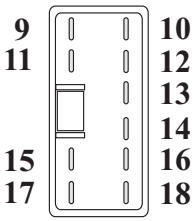
18 & 9 = N88 Shift Solenoid A,	*(9 to 24 Ohms)*
18 & 10 = N89 Shift Solenoid B,	*(9 to 24 Ohms)*
18 & 11 = N92 Shift Solenoid C,	*(9 to 24 Ohms)*
18 & 12 = N90 Low Clutch Timing Solenoid ,	*(9 to 24 Ohms)*
18 & 13 = N283 2-4 Brake Solenoid ,	*(9 to 24 Ohms)*
18 & 14 = N281 Reduction Timing Solenoid ,	*(9 to 24 Ohms)*
18 & 15 = N93 Pressure Control Solenoid ,	*(1 to 5 Ohms)*
18 & 16 = N282 2-4 Brake Timing Solenoid ,	*(1 to 5 Ohms)*
18 & 17 = N91 TCC Solenoid ,	*(9 to 24 Ohms)*



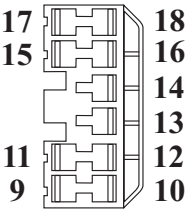
View Looking Into The Internal Transaxle Harness "Male" Coupler Connector Number "T8"



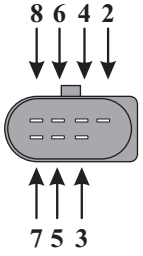
View Looking Into The Internal Transaxle Harness "Female" Coupler Connector Number "T8"



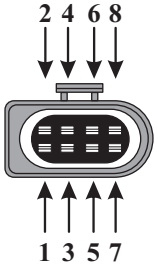
View Looking Into The Internal Transaxle Harness "Male" Coupler Connector Number "T10"



View Looking Into The Internal Transaxle Harness "Female" Coupler Connector Number "T10"



View Looking Into The Multi-Function Switch Connector



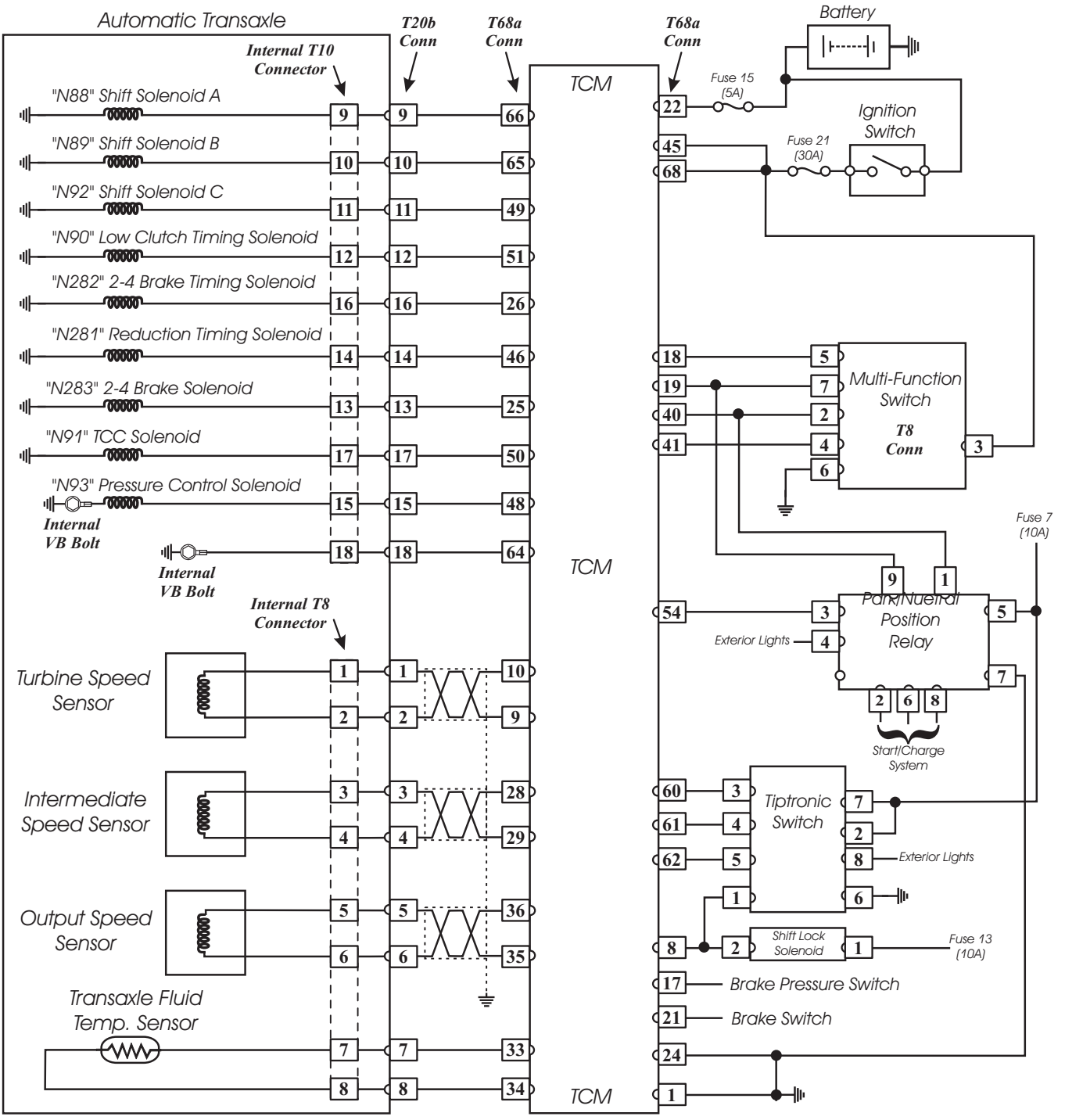
View Looking Into The Multi-Function Switch Harness Connector "MS8"

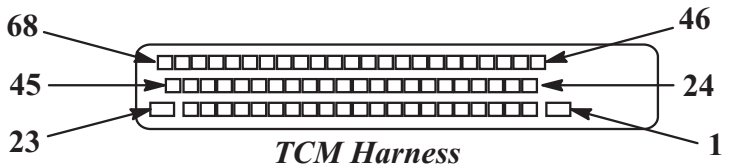
Numbers are stamped into connector on the wire side.

Figure 31

TRANSAXLE TO TCM WIRE SCHEMATIC

2002 Volkswagen "GTI", "Golf", "Jetta"





TCM Harness Connector T68a

TCM Located in the passenger (Right) side Firewall

Figure 32

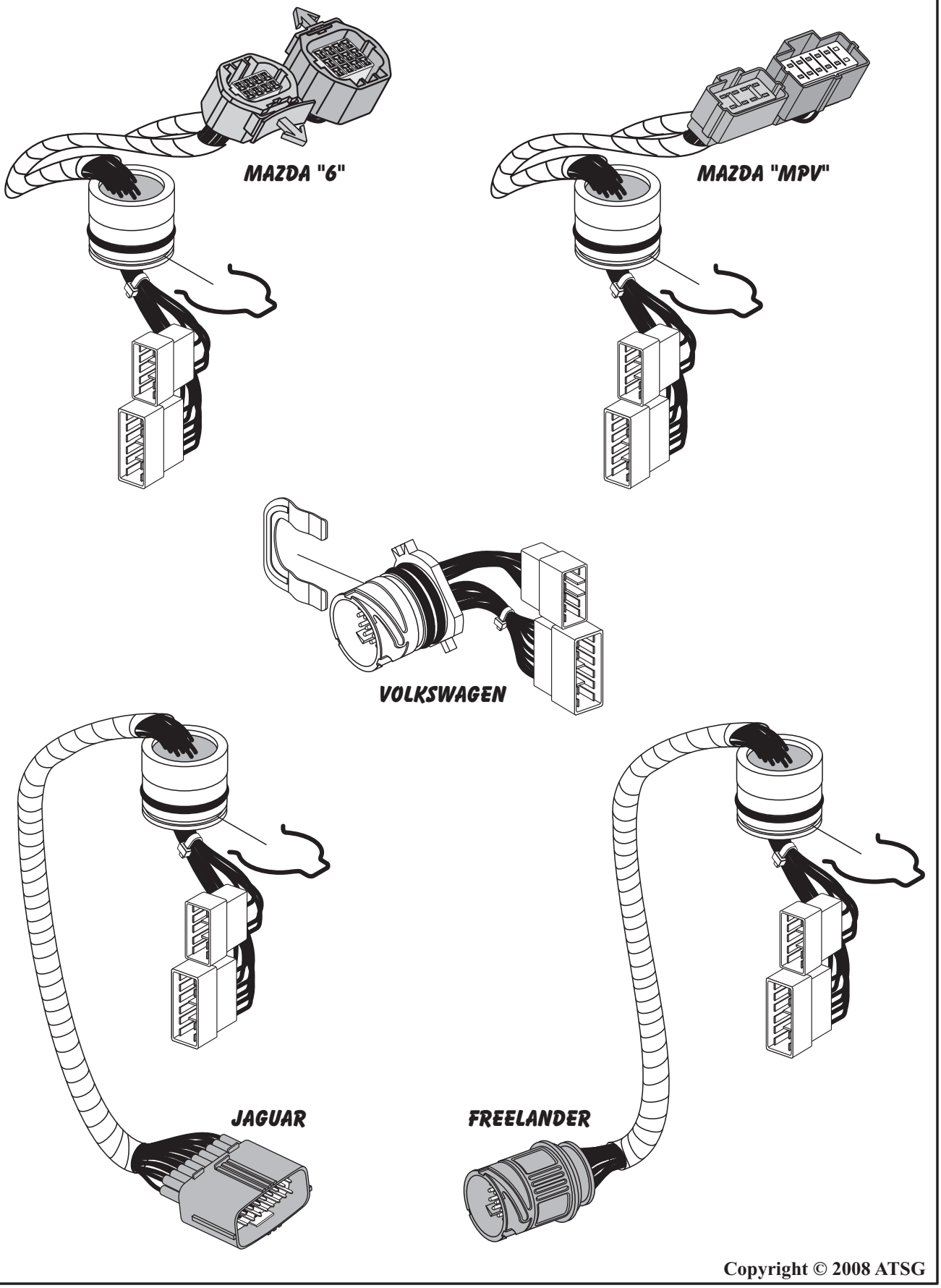


Figure 33

Electrical Connectors and Wire Harness For Jaguar "X" Type

The JF506E transaxles all have a complex wire harness set-up, compared to previous units. On the Jaguar units there is one, 18 pin, ***external*** case connector, as shown in Figure 34. These wires from the external case connector go through a "Pass-thru" case connector and then split into two more connectors ***internally***. One connector with eight terminals for the three speed sensors and the TFT sensor, and one connector with ten terminals for the 9 solenoids and a ground. See Figure 34 for the Jaguar "X" Type version. If any of these connectors are damaged, a complete wiring harness is required (See Figure 33).

There is an internal wire harness that plugs into the 10-way internal connector and runs to each of the 9 solenoids and provides an internal ground. There is also an internal harness that plugs into the 8-way internal connector that provides a path for all three speed sensors and the Transaxle Fluid Temp (TFT) sensor. Of course then there are connectors at each of the 9 solenoids, and more connectors at each of the 3 speed sensors and the TFT sensor.

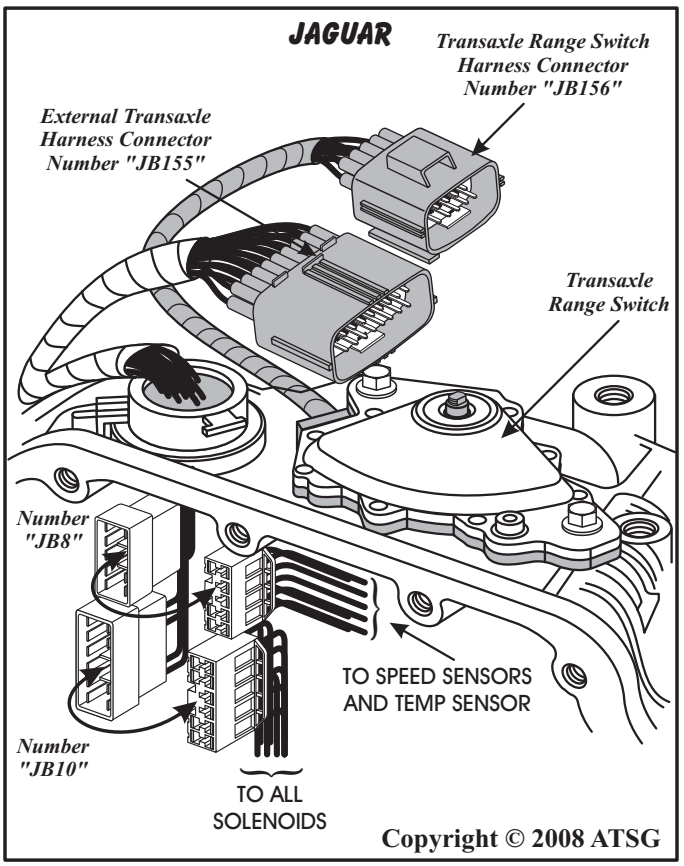


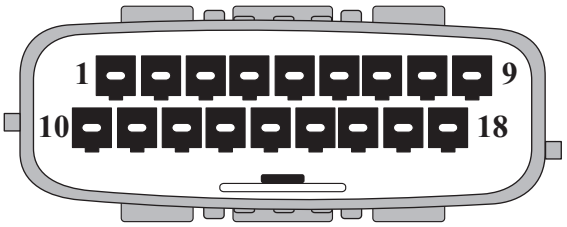
Figure 34

These internal harness' can be seen in Figure 34. The internal solenoid harness for the Jaguar is unique to the Jaguar and will not fit any other vehicles. This complex wiring system makes the electronic diagnostic process a challenge, to say the very least, with a variety of connectors that may have corrosion or damage. We have provided you with individual terminal identification for the external and the internal connectors, and a resistance chart in Figure 35 for the Jaguar family.

The Jaguar uses two different types of Transaxle Control Module (TCM), a "16-bit" TCM and a "32-bit" TCM. In addition there is an "Early" style "16-bit" version, and a "Late" style "16-bit" version, that are different electronically. The early style 16-bit uses the J-gate with and overdrive cancel switch in the J-gate, and the range selector switch sends the signal for P, R, N, D, 3, 2. The late style does away with the overdrive cancel switch and includes 4, 3, and 2 in the wire harness from the J-gate to the TCM, while the range selector switch sends the signal for P, R, N, D. The 32-bit version was used in all models from mid 2003-up, and also does not have the overdrive cancel switch. TCM connector identification is shown in Figure 39, for both the "16-bit" and "32-bit" versions.

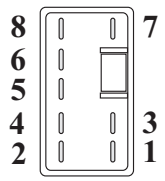
We have provided you with TCM to transaxle wire schematics for all three versions in the Jaguar family, in Figures 36, 37, and 38.

JAGUAR X TYPE TRANSAXLE TERMINAL I.D. AND RESISTANCE CHART

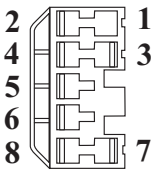


View Looking Into The Jaguar X Type Transaxle Harness Connector JB155 (Face Side)

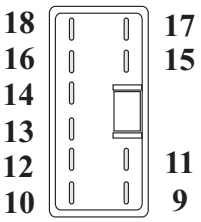
1 & 2 = Turbine Shaft Speed Senor	*(513 to 627 ohms)*
3 & 4 = Intermediate Shaft Speed Sensor	*(513 to 627 ohms)*
5 & 6 = Output Shaft Speed Senor	*(513 to 627 ohms)*
7 & 8 = Temperature Sensor	*(Refer to page 33)*
18 & 9 = Shift Solenoid A	*(14 to 18 ohms)*
18 & 10 = Shift Solenoid B	*(14 to 18 ohms)*
18 & 11 = Shift Solenoid C	*(14 to 18 ohms)*
18 & 12 = Low Clutch Timing Solenoid	*(14 to 18 ohms)*
18 & 13 = 2/4 Timing Solenoid	*(14 to 18 ohms)*
18 & 14 = Reduction Timing Solenoid	*(14 to 18 ohms)*
18 & 15 = Pressure Control Solenoid	*(2.6 to 3.2 ohms)*
18 & 16 = 2/4 Duty Solenoid	*(2.6 to 3.2 ohms)*
18 & 17 = TCC Solenoid	*(12 to 13.2 ohms)*



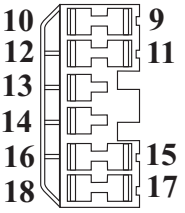
Internal Transmission Harness "Male" Coupler Connector Number "JB8"



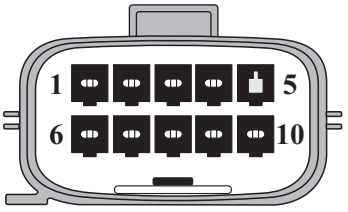
Internal Transmission Harness "Female" Coupler Connector Number "JB8a"



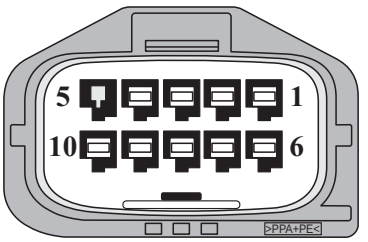
Internal Transmission Harness "Male" Coupler Connector Number "JB10"



Internal Transmission Harness "Female" Coupler Connector Number "JB10a"



View Looking Into Transaxle Range Sensor Connector JB156

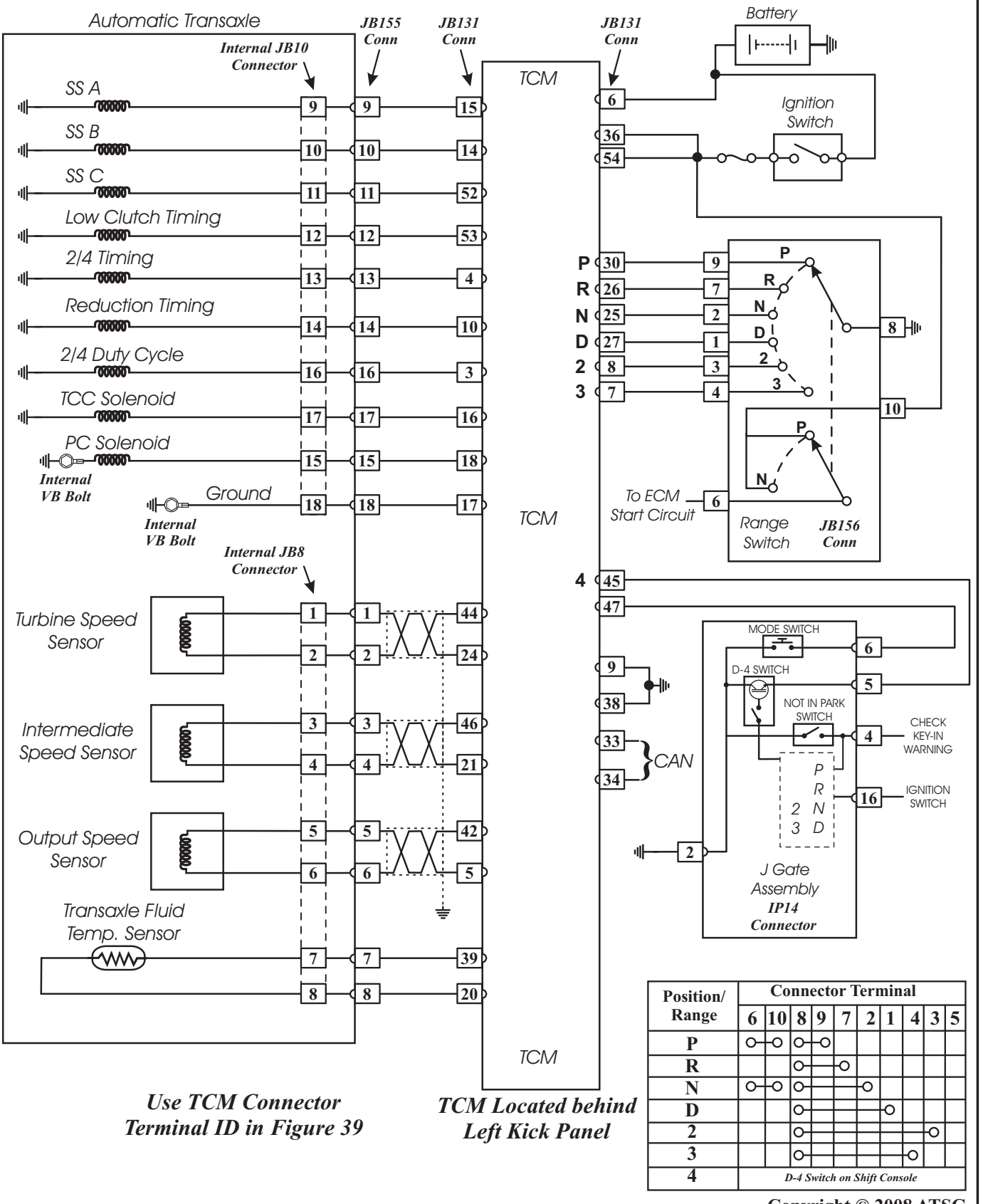


View Looking Into Vehicle Harness Connector JB156

Figure 35

TRANSAXLE TO TCM WIRE SCHEMATIC

2002 (Early Style) Jaguar X Type "16 Bit" TCM



Position/ Range	Connector Terminal									
	6	10	8	9	7	2	1	4	3	5
P	○	○		○						
R			○		○					
N	○	○	○			○				
D			○				○			
2			○						○	
3			○					○		
4	D-4 Switch on Shift Console									

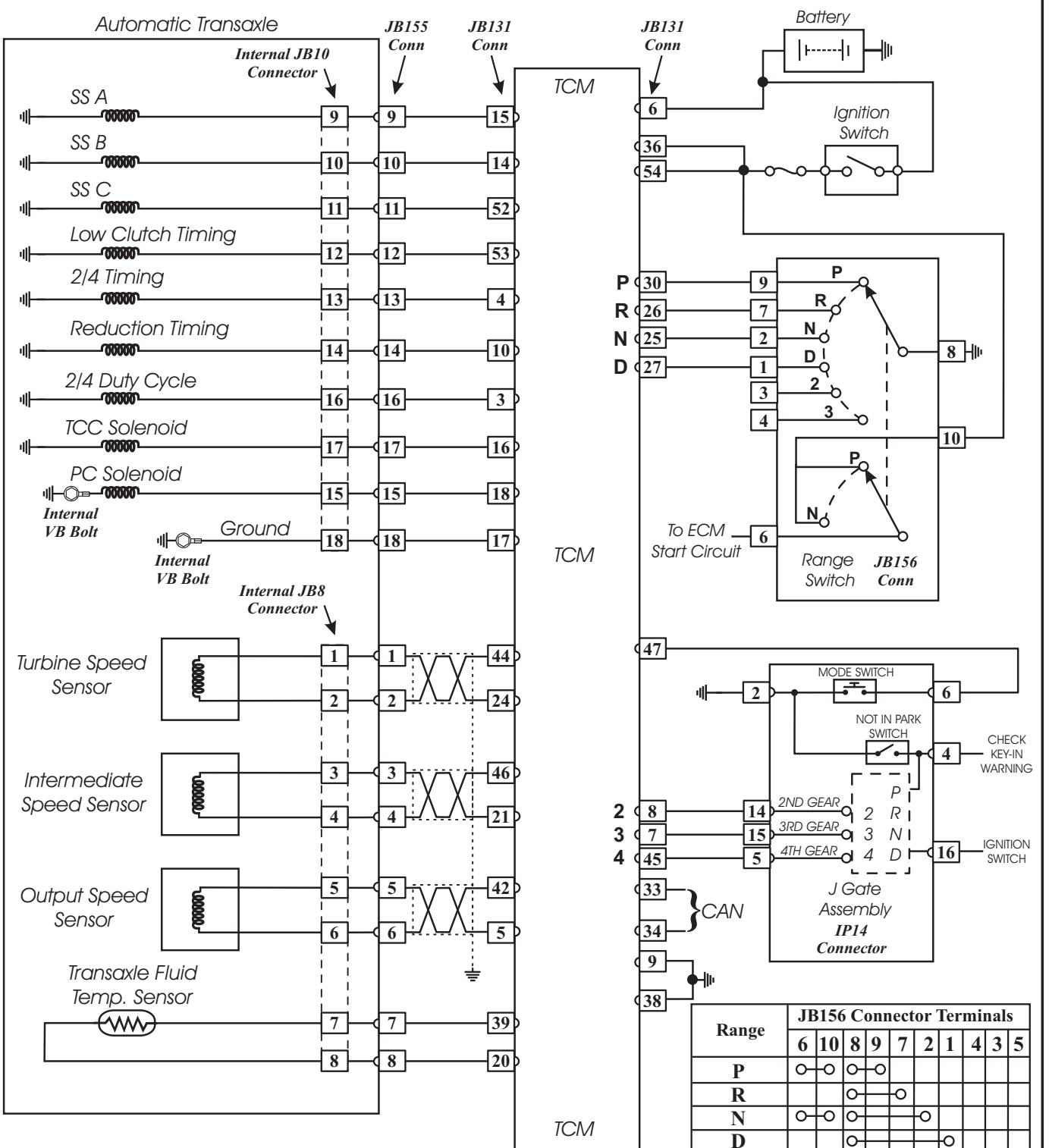
Use TCM Connector Terminal ID in Figure 39

TCM Located behind Left Kick Panel

Figure 36

TRANSAXLE TO TCM WIRE SCHEMATIC

2002 (Late Style) Jaguar X Type "16 Bit" TCM



Range	JB156 Connector Terminals									
	6	10	8	9	7	2	1	4	3	5
P	○	○	○	○						
R			○	○						
N	○	○	○			○				
D			○				○			

Range	IP14 Connector Terminals									
			2				5	15	14	
2			○						○	
3			○					○		
4			○				○			

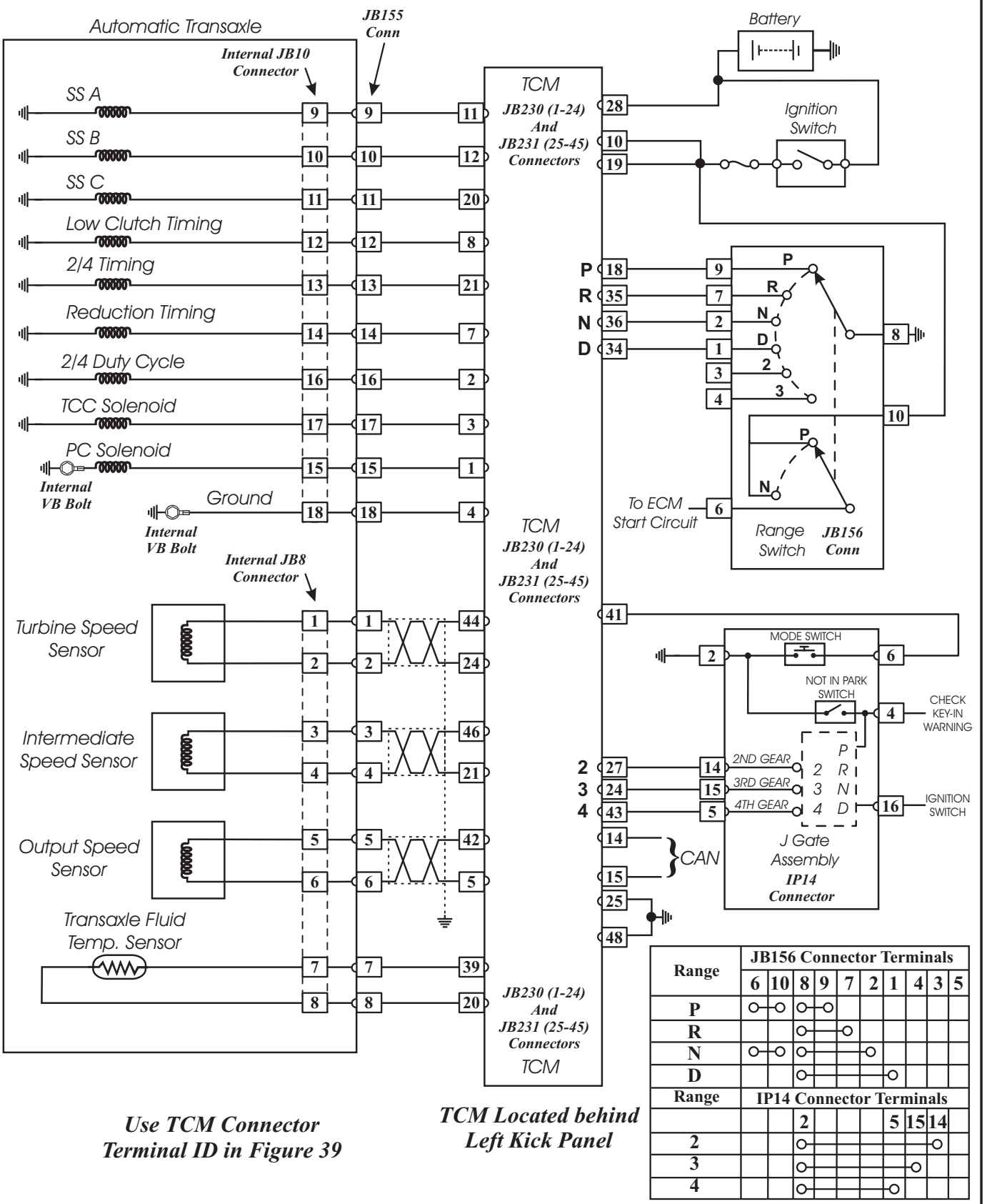
Use TCM Connector Terminal ID in Figure 39

TCM Located behind Left Kick Panel

Figure 37

TRANSAXLE TO TCM WIRE SCHEMATIC

2004 Jaguar X Type "32 Bit" TCM



Range	JB156 Connector Terminals									
	6	10	8	9	7	2	1	4	3	5
P	○	○	○	○						
R			○		○					
N	○	○	○			○				
D			○				○			

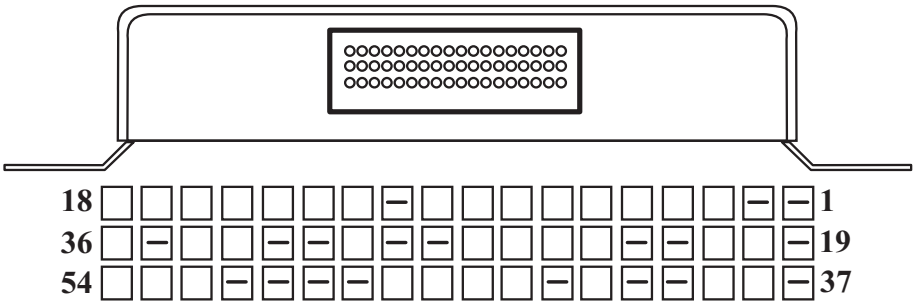
Range	IP14 Connector Terminals									
			2				5	15	14	
2			○						○	
3			○					○		
4			○				○			

Use TCM Connector Terminal ID in Figure 39

TCM Located behind Left Kick Panel

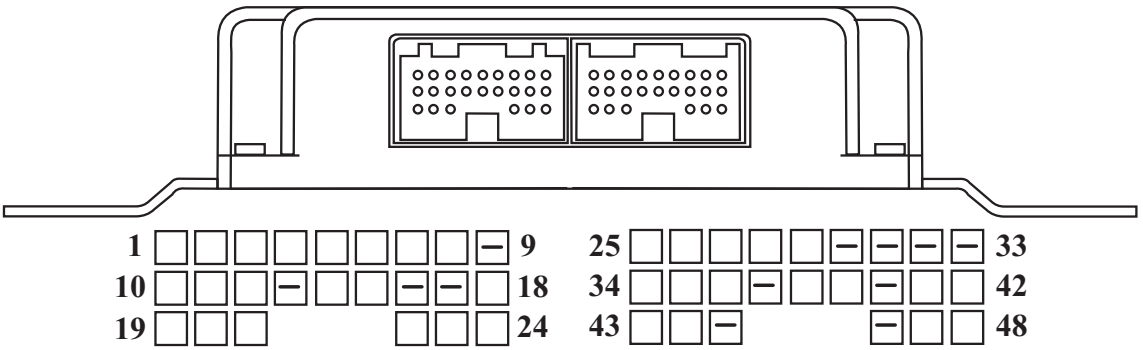
Figure 38

2004 JAGUAR "X" TYPE
"16-BIT" TCM



JB131
Blue Connector

2004 JAGUAR "X" TYPE
"32-BIT" TCM



JB230 (1-24)
White Connector

JB231 (25-48)
Grey Connector

Comprehensive Component Monitor Transmission Drive Cycle

The Comprehensive Component Monitor Transmission Drive Cycle will "Check" all transmission components.

1. *Engine and transmission at normal operating temperature. Ignition OFF; ensure that SPORT mode is NOT selected.*
2. *With gear select in P and the ignition ON. Check gearshift interlock by attempting to move the selector without pressing the brake pedal. Verify P state illumination.*
3. *Press and hold the brake pedal. Move the gear select to R. Verify R state illumination.*
4. *Set the parking brake. Press and hold the brake pedal. Attempt o start the engine. The engine should not start.*
5. *Move the gear select to N. Verify N state illumination. Start the engine.*
6. *With the hand brake set and the brake pedal pressed, move the gear select to the remaining positions in the J gate (D, 4, 3, 2) for five seconds. Verify the state illumination in each position.*
7. *Move the gear select switch back to 4. Verify 4 state illumination.*
8. *Move the gear select switch back to D. Verify D state illumination.*
9. *Move the gear select switch back to N. Verify N state illumination.*
10. *Select R, release the brake and drive the vehicle in reverse for a short distance and stop the vehicle.*
11. *Select 2 and drive the vehicle up to 40 mph (65 km/h) and hold for a minimum of 5 seconds.*
12. *Select 3 and hold 40 mph (65 km/h) for a minimum of 5 seconds.*
13. *Select 4 and hold 40 mph (65 km/h) for a minimum of 5 seconds.*
14. *Select D and accelerate to a minimum speed of 50 mph (80 km/h). Hold 50-80 mph (80-129 km/h) for a minimum of 1 mile (1.7 Kilometers).*
15. *Stop the vehicle; do NOT shut OFF the engine. Check for diagnostic codes.*

Figure 39

Electrical Connectors and Wire Harness For Land Rover Freelander

The JF506E transaxles all have a complex wire harness set-up, compared to previous units. On the Freelander units there is one, 18 pin, ZF style ***external*** case connector, as shown in Figure 40. These wires from the external case connector go through a "Pass-thru" case connector and then split into two more connectors ***internally***. One connector with eight terminals for the three speed sensors and the TFT sensor, and one connector with ten terminals for the 9 solenoids and a ground. See Figure 40 for the Freelander version. If any of these connectors are damaged, a complete wiring harness is required (See Figure 33).

There is an internal wire harness that plugs into the 10-way internal connector and runs to each of the 9 solenoids and provides an internal ground. There is also an internal harness that plugs into the 8-way internal connector that provides a path for all three speed sensors and the Transaxle Fluid Temp (TFT) sensor. Of course then there are connectors at each of the 9 solenoids, and more connectors at each of the 3 speed sensors and the TFT sensor.

These internal harness' can be seen in Figure 40. The internal solenoid harness for the Freelander is unique to the Freelander and will not fit any other vehicle. Figure 41 illustrates an example of the internal solenoid harness. Example shown is for Mazda, but the others are similar. This complex wiring system makes the electronic diagnostic process a challenge, to say the very least, with a variety of connectors that may have corrosion or damage.

We have provided you with individual terminal identification for the external and the internal connectors, and a resistance chart in Figure 42 for the Freelander.

Terminal identification for the TCM is found in Figure 43, along with a TCM to transaxle wiring schematic for the Freelander.

ELECTRONIC COMPONENTS
Continued on Page 33

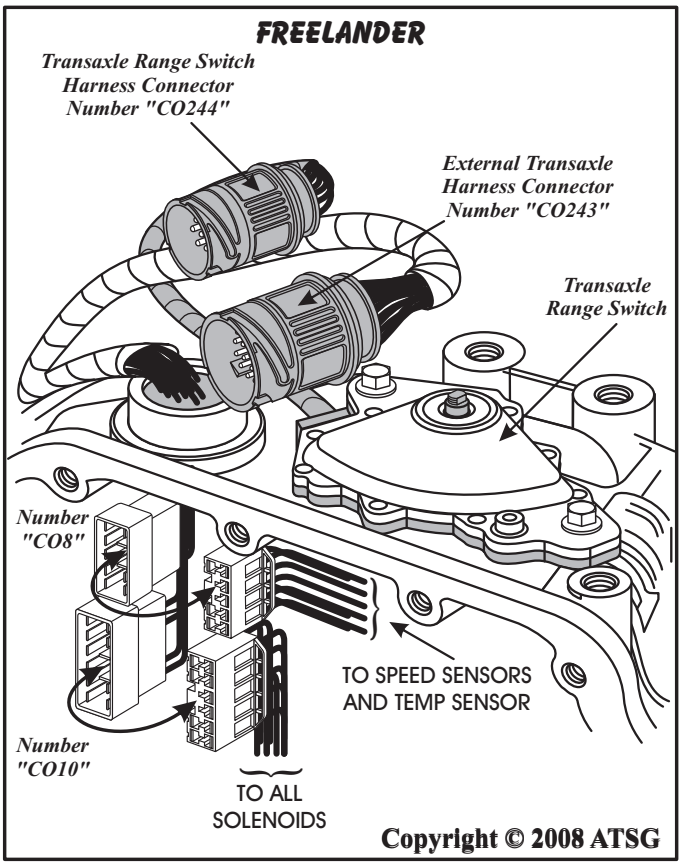


Figure 40

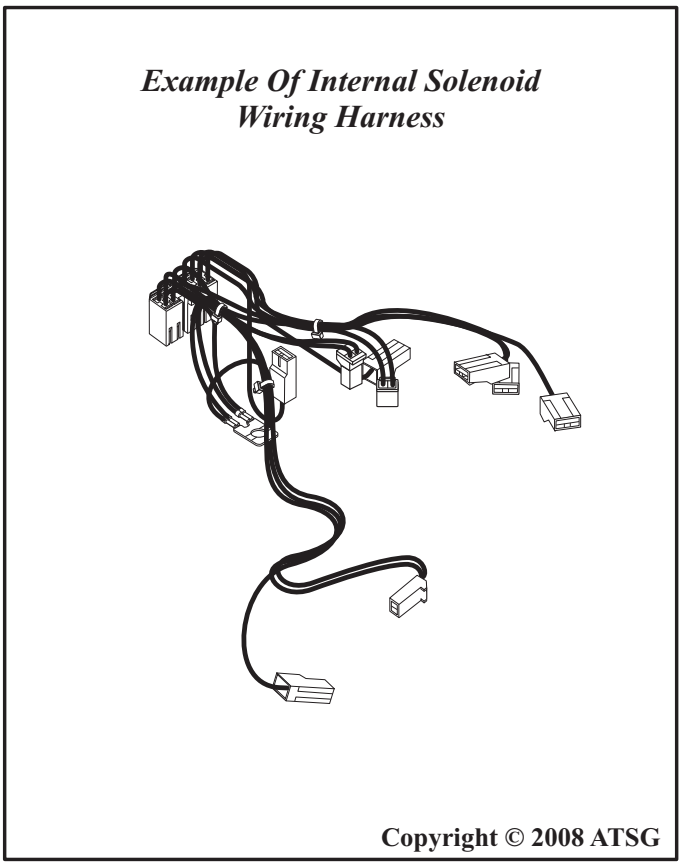
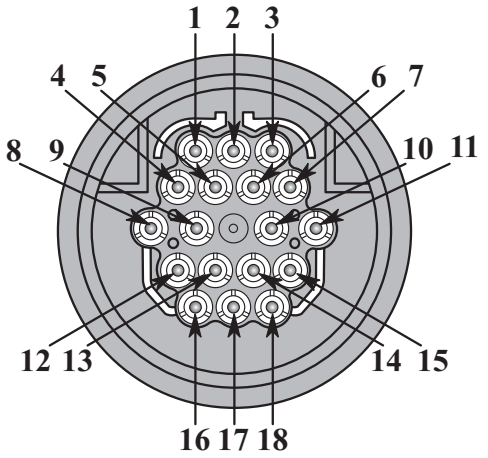


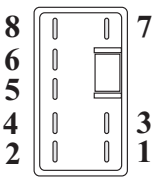
Figure 41

2004 LAND ROVER FREELANDER TRANSAXLE TERMINAL I.D. AND RESISTANCE CHART

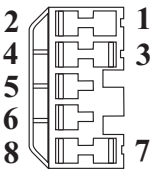


View Looking Into Transaxle Harness Connector CO243

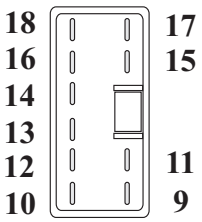
1 & 2 = Turbine Shaft Speed Senor	*(513 to 627 ohms)*
3 & 4 = Intermediate Shaft Speed Sensor	*(513 to 627 ohms)*
5 & 6 = Output Shaft Speed Senor	*(513 to 627 ohms)*
7 & 8 = Temperature Sensor	*(Refer to page 33)*
18 & 9 = Shift Solenoid A	*(14 to 18 ohms)*
18 & 10 = Shift Solenoid B	*(14 to 18 ohms)*
18 & 11 = Shift Solenoid C	*(14 to 18 ohms)*
18 & 12 = Low Clutch Timing Solenoid	*(14 to 18 ohms)*
18 & 13 = 2/4 Timing Solenoid	*(14 to 18 ohms)*
18 & 14 = Reduction Timing Solenoid	*(14 to 18 ohms)*
18 & 15 = Pressure Control Solenoid	*(2.6 to 3.2 ohms)*
18 & 16 = 2/4 Duty Solenoid	*(2.6 to 3.2 ohms)*
18 & 17 = TCC Solenoid	*(12 to 13.2 ohms)*



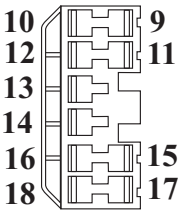
Internal Transaxle Harness "Male" Coupler Connector Number "CO8"



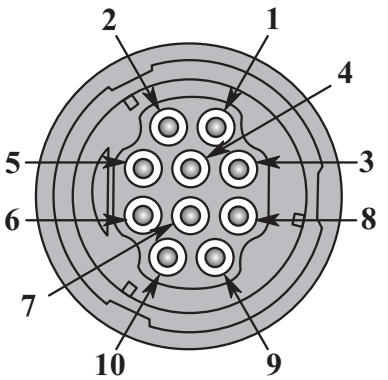
Internal Transaxle Harness "Female" Coupler Connector Number "CO8"



Internal Transaxle Harness "Male" Coupler Connector Number "CO10"



Internal Transaxle Harness "Female" Coupler Connector Number "CO10"



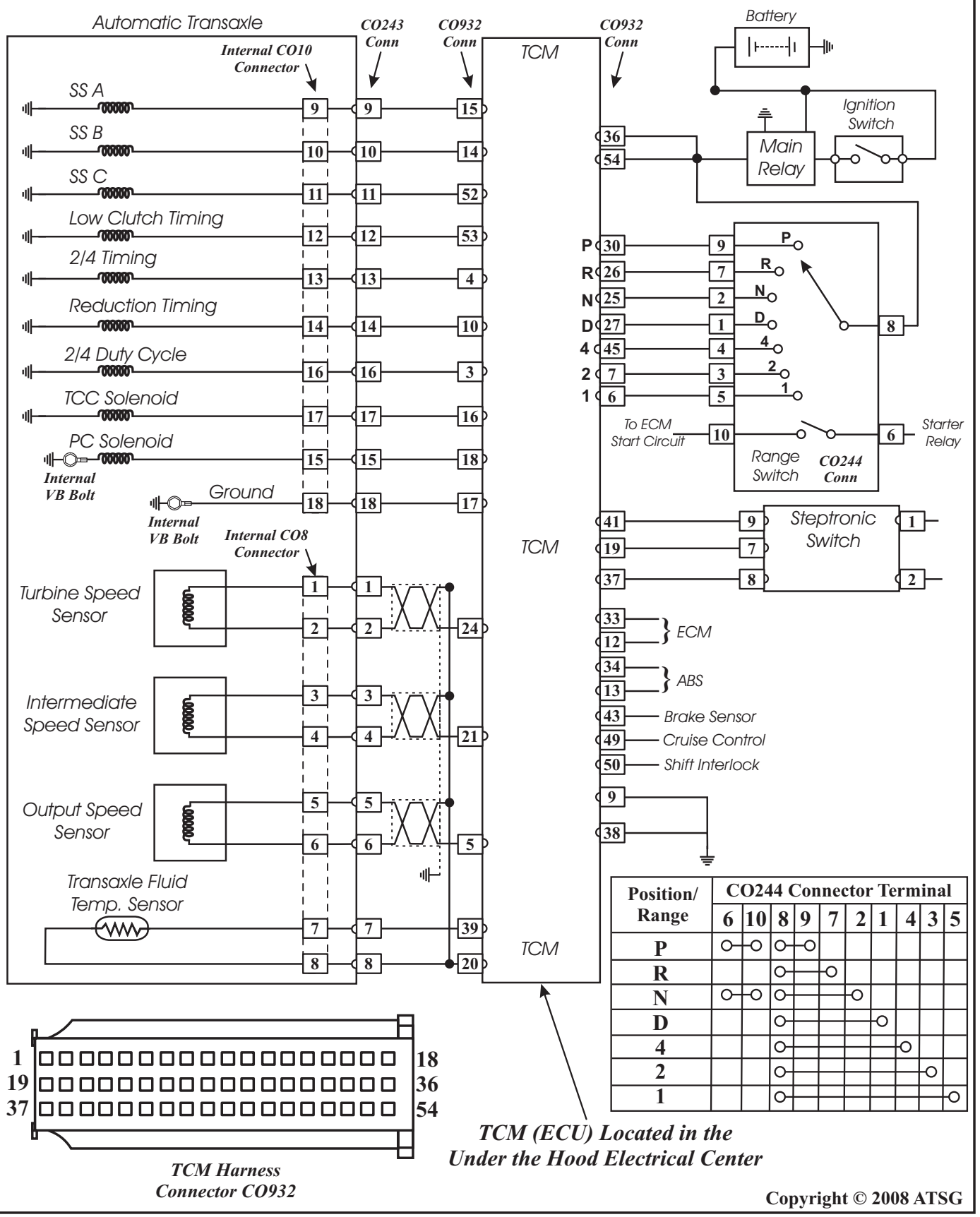
View Looking Into Transaxle Range Sensor Connector CO244

Position/ Range	Connector Terminal									
	6	10	8	9	7	2	1	4	3	5
P	○	○	○	○						
R			○		○					
N	○	○	○			○				
D			○				○			
4			○					○		
2			○						○	
1			○							○

Figure 42

TRANSAXLE TO TCM WIRE SCHEMATIC

2004 Freelander 2.5L Engine



Position/ Range	CO244 Connector Terminal									
	6	10	8	9	7	2	1	4	3	5
P	○	○	○	○						
R			○		○					
N	○	○	○			○				
D			○				○			
4			○					○		
2			○						○	
1			○							○

Figure 43

ELECTRONIC COMPONENTS (CONT'D)

Transaxle Fluid Temperature (TFT) Sensor

The Transaxle Fluid Temp (TFT) Sensor is located inside of the transaxle case housing, as shown in Figure 45, and requires disassembly if replacement becomes necessary. Resistance of the TFT sensor decreases as the fluid temperature increases, as shown in the chart in Figure 44.

Input from the TFT is used by the TCM for converter clutch apply, torque reduction and fifth gear operation. To promote engine warm up during cold weather operation, the TCM may inhibit TCC apply until transaxle fluid temperature has reached approximately 104°F (40°C). Fifth gear may also be prohibited during cold weather operation, or when the TFT malfunctions. Torque reduction may also be inhibited when the TFT malfunctions. Use the charts for terminal identification specific to the vehicle you are working on, to check the TFT sensor, and the resistance chart in Figure 44 to verify proper reading.

The TFT sensor may produce a Diagnostic Trouble Code (DTC) and the DTC numbers vary between the manufacturers. Check the vehicle specific DTC number and description in the DTC list in this manual.

ATF Temperature C° {F°}	Resistance (kilohm)
-20 {-4}	15.87-17.54
0 {32}	5.73-6.33
20 {68}	2.38-2.63
40 {104}	1.10-1.22
60 {140}	0.56-0.62
80 {176}	0.31-0.34
100 {212}	0.18-0.20
120 {248}	0.11-0.12
130 {266}	0.09-0.10

Figure 44

TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR

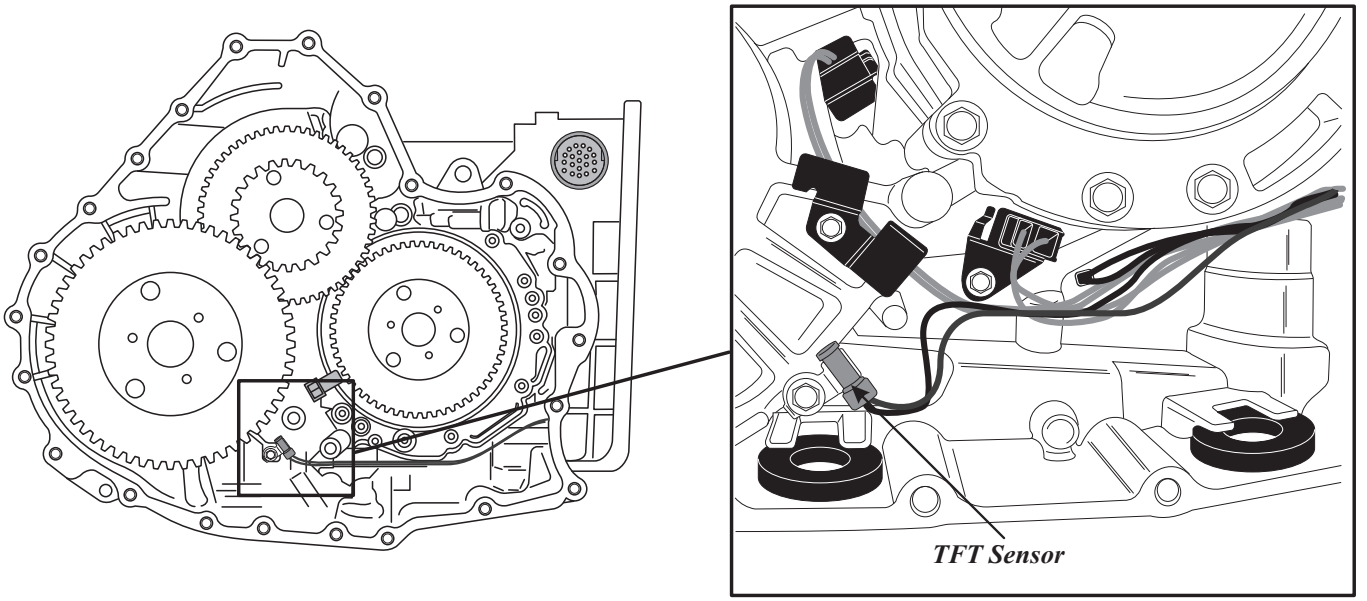
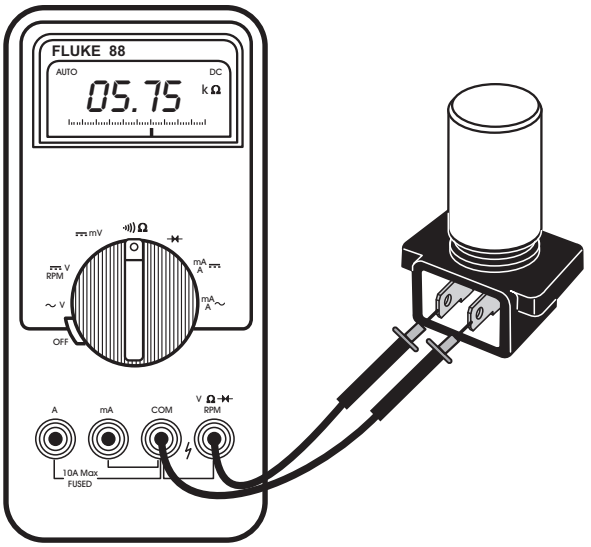


Figure 45

All Three Speed Sensors Should Measure As Follows:
Mazda, Jaguar, Freelander = 513-627 Ohms
Volkswagen = 400-600 Ohms



Volkswagen Part Number = 09A 927 321
Mazda Part Number = FP21-21-2550

Figure 46

ELECTRONIC COMPONENTS (CONT'D)

SPEED SENSORS

There are three inductive type speed sensors located inside of the transaxle case housing and are not accessible from outside. Disassembly is required, if replacement becomes necessary. The Turbine Shaft Speed sensor is the only one that can be accessed in the vehicle, by removing the rear cover, as shown in Figure 47. The other two speed sensors require transaxle removal, and splitting the case. The speed sensors are, Turbine Shaft Speed Sensor, Intermediate Shaft Speed Sensor and the Output Shaft Speed Sensor. Electrical connections to all of the speed sensors and TFT sensor come through the external connector and the 8-way internal connector to reach these components.

All three speed sensors are the same, but different brackets are used to mount them in their proper locations. Amazingly Mazda, Jaguar, and Freelander are all using the same speed sensor. All 3 speed sensors should measure the same resistance at 68°F (20°C), as shown in Figure 46, and can also be checked through the appropriate terminals on the external case connector.

Continued on Page 35

TURBINE SHAFT SPEED SENSOR

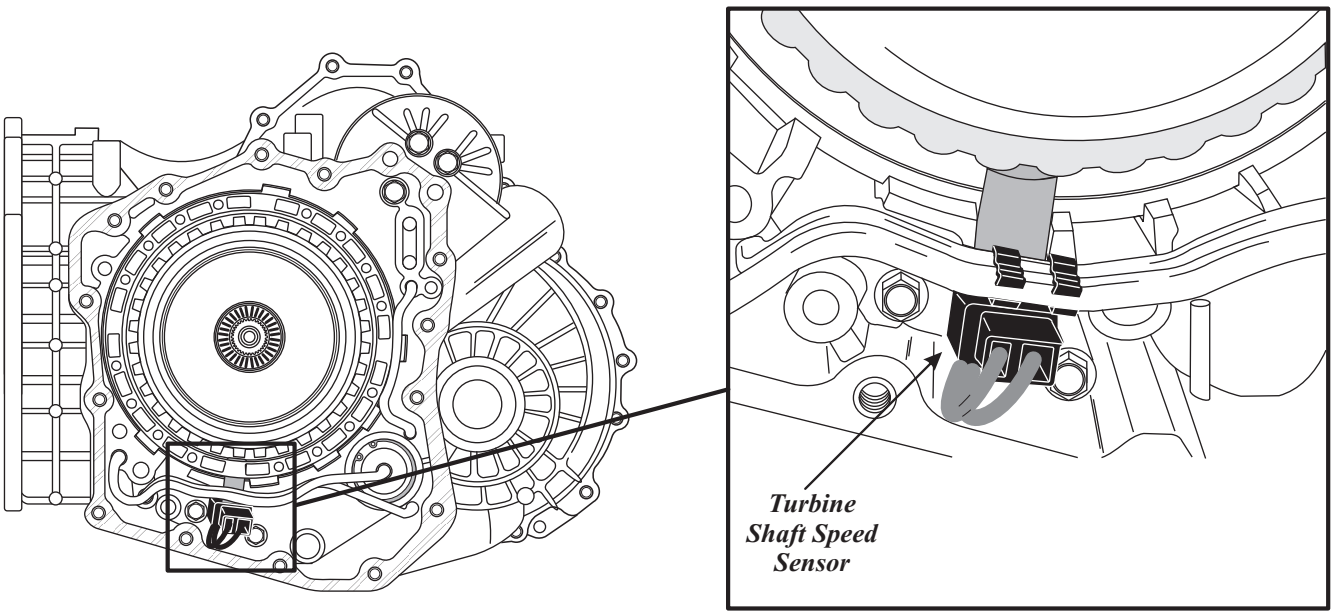


Figure 47

SPEED SENSORS (CONT'D)

Turbine Shaft Speed Sensor

The Turbine Shaft Speed sensor is positioned, as shown in Figure 47, to read the high/reverse clutch housing which is splined to the turbine shaft. The TSS sensor detects a pulse signal from the projections on the outside of the high/reverse clutch housing. The speed sensors can be checked externally, as shown in Figure 46. The Turbine Shaft Speed sensor is the only one that can be accessed in the vehicle, by removing the rear cover, as shown in Figure 47.

The information from the TSS sensor is used by the TCM to monitor gear ratio, line pressure control and to monitor and control TCC apply. This sensor may produce a Diagnostic Trouble Code (DTC), but the code numbers vary between manufacturers. Check the DTC list in this manual for code numbers and description.

Intermediate Shaft Speed Sensor

The Intermediate Shaft Speed sensor is positioned, as shown in Figure 48, to read the transfer "Drive" gear, which is driven by the 1st and 2nd planetary gearset. The sensor detects a pulse signal according to the teeth on the transfer drive gear. Since there are various ratios, the tooth count will vary.

The input of the intermediate shaft speed sensor is used by the TCM to calculate the timing of engagements and disengagements of the brake clutches, and to monitor gear ratio. This sensor may produce a Diagnostic Trouble Code (DTC), but the code numbers vary between manufacturers. Check the DTC list in this manual for code numbers and description.

Output Shaft Speed Sensor

The Output Shaft Speed sensor is positioned, as shown in Figure 48, to read the "Park Gear", which is driven by the output shaft. The sensor detects a pulse signal according to the teeth on the park gear.

The input of the output shaft speed sensor is used by the TCM to provide a vehicle speed signal, calulate shift timing, line pressure control, and to monitor gear ratio. This sensor may produce a Diagnostic Trouble Code (DTC), but the code numbers vary between manufacturers. Check the DTC list in this manual for code numbers and description.

INTERMEDIATE SHAFT AND OUTPUT SHAFT SPEED SENSORS

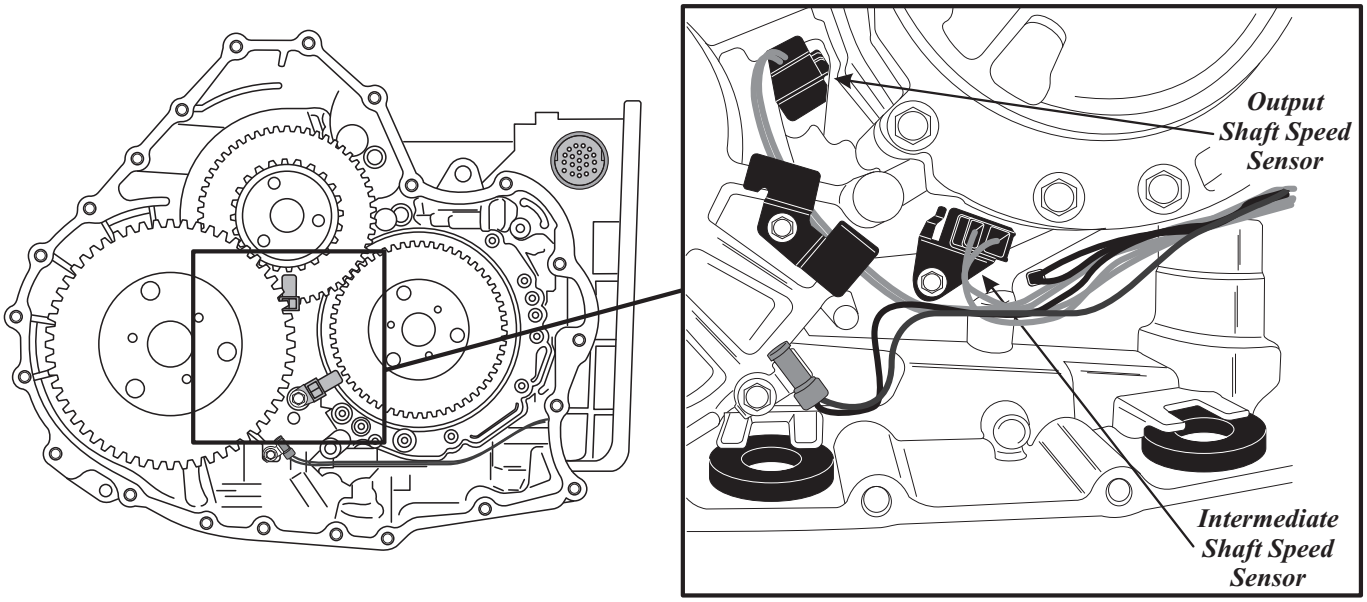


Figure 48

SOLENOID IDENTIFICATION AND LOCATIONS

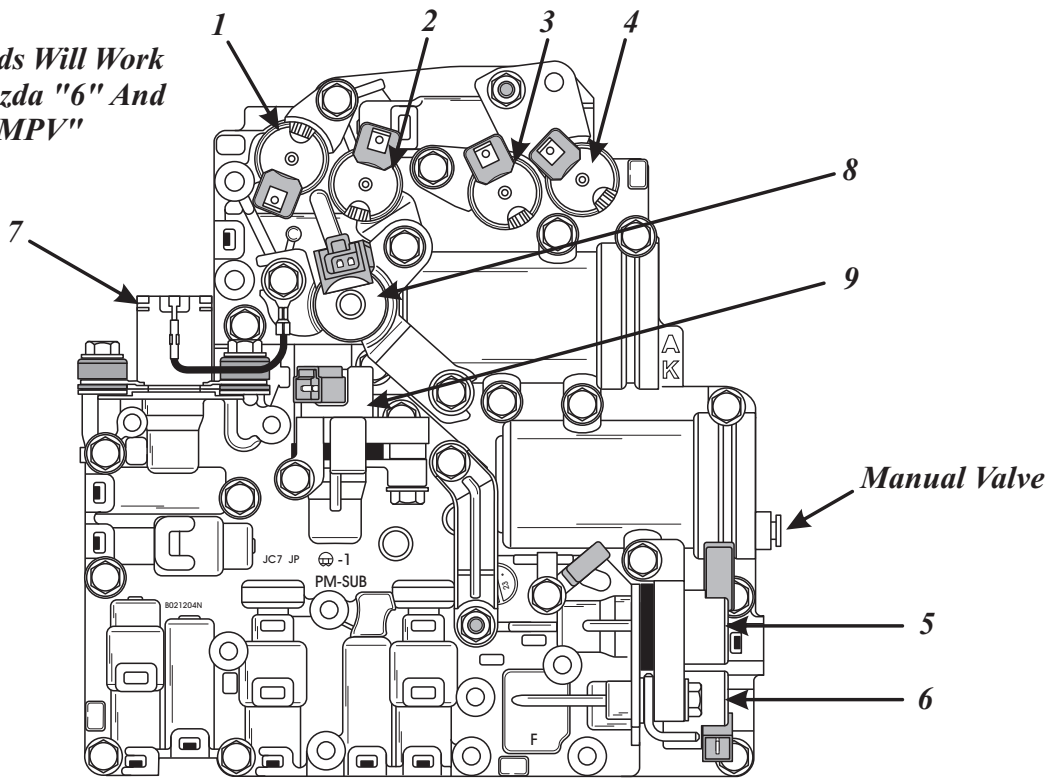
There are a total of nine (9) solenoids used on all models, which can be classified as two different types, because of the way in which they operate. Three of them are duty cycle solenoids, the other six are On/Off solenoids. Solenoid names and functions are different between the manufacturers. All solenoids in all models are actuated (energized) by a voltage feed from the TCM.

Mazda Solenoids

The Mazda solenoid locations and names are identified for you in Figure 49, and are the same for both Mazda "6" and Mazda "MPV". The shift solenoid firing sequence is the same on all models, and is also shown in Figure 49.

MAZDA SOLENOID IDENTIFICATION AND LOCATIONS

Mazda Solenoids Will Work "Only" On Mazda "6" And Mazda "MPV"



Shift Solenoid Application Chart					
Solenoid	***1st***	***2nd***	***3rd***	***4th***	***5th***
SSA		***ON***			***ON***
SSB	***ON***	***ON***	***ON***		
SSC	***ON***			***ON***	***ON***

Manufacturer	Mazda Solenoid Identification And Location								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Mazda "6" And Mazda "MPV"	Shift Solenoid "A"	Reduction Timing Solenoid	Shift Solenoid "B"	Shift Solenoid "C"	2/4 Brake Timing Solenoid	Neutral Shift Solenoid	Line Pressure Solenoid	TCC Solenoid	High Clutch Timing Solenoid

Figure 49

SOLENOID IDENTIFICATION (CONT'D)

Mazda ON/OFF Solenoids

On/Off Solenoids are as follows:
Shift Solenoids A, B, C, High Clutch Timing Solenoid, Reduction Timing Solenoid and the 2/4 Brake Timing Solenoid, as shown in Figure 50 and 51. These On/Off solenoids close the pressure circuit in response to current flow from the TCM. Each solenoid has an internal coil. Current passes through the coil and actuates the needle valve. The needle valve then opens or closes the fluid pressure circuit.

Mazda Duty Cycle Solenoids

Duty Cycle Solenoids are as follows:
Line Pressure Solenoid, TCC Solenoid and the Neutral Shift Solenoid, as shown in Figure 52. The duty cycle solenoids repeatedly turn On/Off in 50Hz cycles. This opens or closes the fluid pressure circuit rapidly and allows fluid pressure into the circuit, dependant upon vehicle speed, throttle opening, engine load, and transaxle temperature, among other things.

Use the terminal identification and resistance charts on Page 16 for Mazda "6", and Page 17 for Mazda "MPV" to check the solenoids while still in the transaxle.

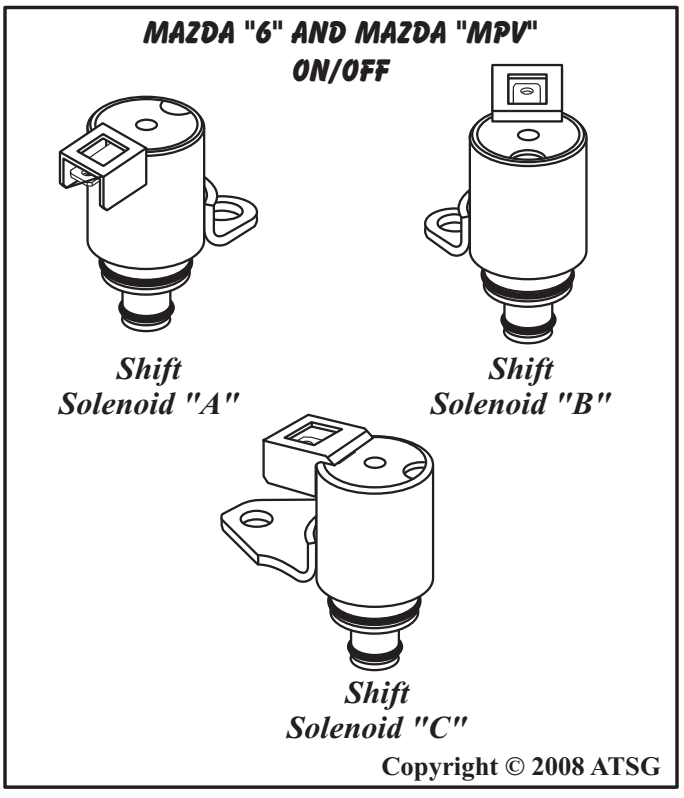


Figure 50

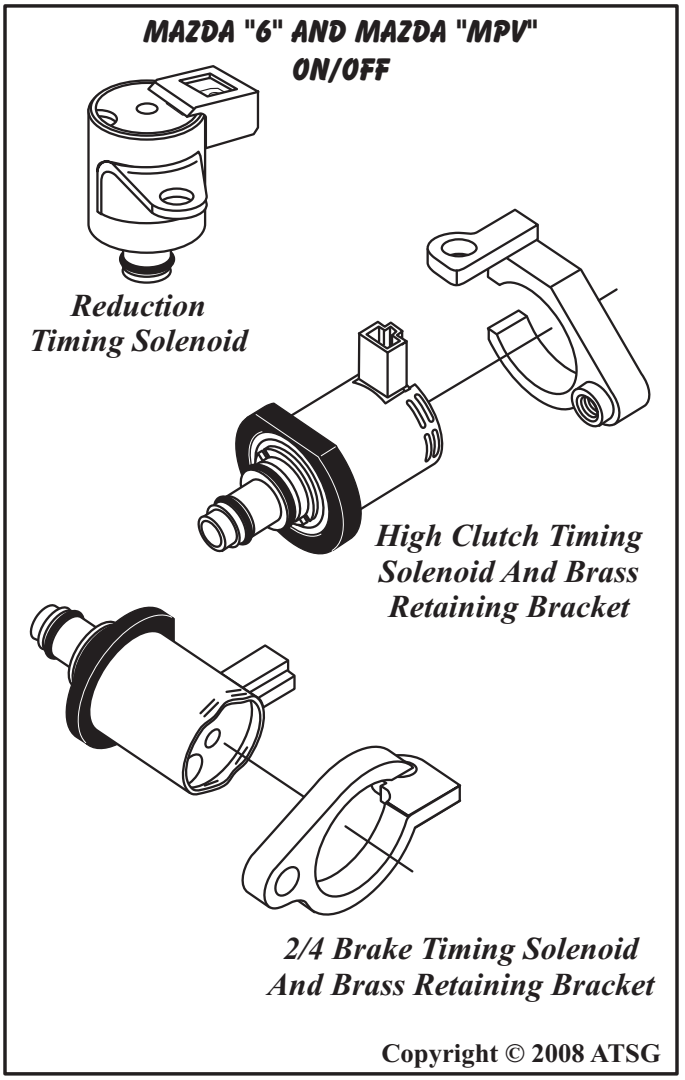


Figure 51

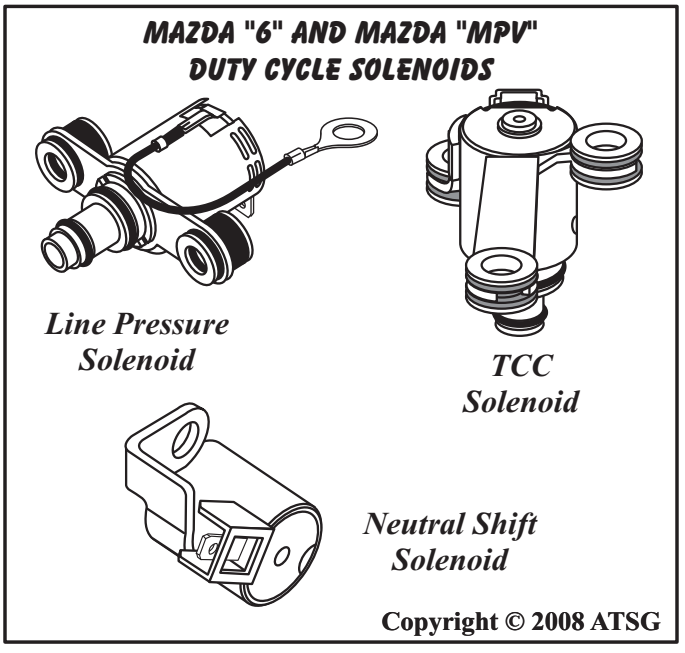


Figure 52

SOLENOID IDENTIFICATION AND LOCATIONS (CONT'D)

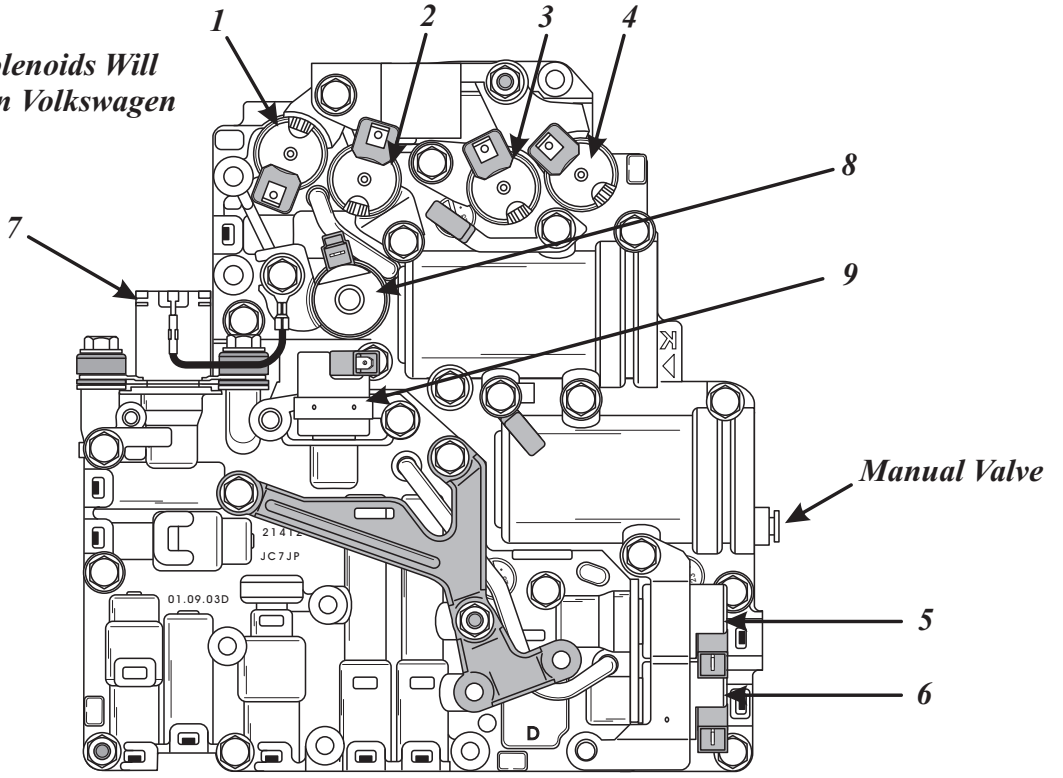
Volkswagen Solenoids

The Volkswagen solenoid locations and names are identified for you in Figure 53. Notice the familiar "N" numbering on the solenoids instead of names. We have also provided description of solenoid functions in Figure 53.

There are a total of nine (9) solenoids, which can be classified as two different types, because of the way in which they operate. Three of them are duty cycle solenoids, the other six are On/Off solenoids. All solenoids are actuated (energized) by a voltage feed from the TCM/ECU.

VOLKSWAGEN SOLENOID IDENTIFICATION AND LOCATIONS

Volkswagen Solenoids Will Work "Only" On Volkswagen



Shift Solenoid Application Chart					
Solenoid	*1st*	*2nd*	*3rd*	*4th*	*5th*
N88 = SSA		*ON*			*ON*
N89 = SSB	*ON*	*ON*	*ON*		
N92 = SSC	*ON*			*ON*	*ON*

Manufacturer	Volkswagen Solenoid Identification And Location								
	1	2	3	4	5	6	7	8	9
VW Golf, GTI and Jetta	N88 - SV1	N281-SV8	N89-SV2	N92-SV5	N283-SV10	N282-SV9	N93-SV6	N91-SV4	N90-SV3
Description	Shift Solenoid "A"	Reduction Timing Solenoid	Shift Solenoid "B"	Shift Solenoid "C"	2-4 Brake Solenoid	2-4 Brake Timing Solenoid	Line Pressure Solenoid	TCC Solenoid	Low Clutch Timing Solenoid

Figure 53

SOLENOID IDENTIFICATION (CONT'D)

Volkswagen ON/OFF Solenoids

On/Off Solenoids are as follows:
Shift Solenoids A, B, C, ("N88", "N89", "N92"), the "N90" Solenoid, the "N281" Reduction Timing Solenoid and the "N282 Solenoid, as shown in Figure 54 and 55 These On/Off solenoids close the pressure circuit in response to current flow from the TCM/ECU. Each solenoid has an internal coil. Current passes through the coil and actuates the needle valve. The needle valve then opens and/or closes the fluid pressure circuit.

Volkswagen Duty Cycle Solenoids

Duty Cycle Solenoids are as follows:
The "N93" Line Pressure Solenoid, the "N91" TCC Solenoid and the "N283" Solenoid, as shown in Figure 56. The duty cycle solenoids repeatedly turn On/Off in 50Hz cycles. This opens and closes the fluid pressure circuit rapidly and meters the fluid pressure into the circuit, dependant upon vehicle speed, throttle opening, engine load, and transaxle fluid temperature, among other things.

Use the terminal identification and resistance charts on Page 21 for Volkswagen, to check the solenoids while still in the transaxle.

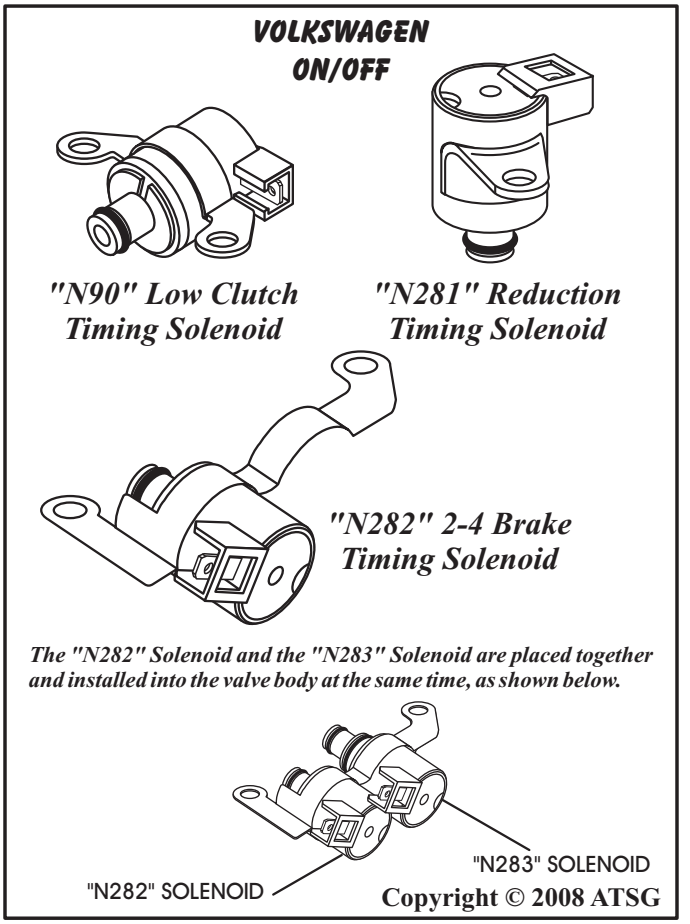


Figure 55

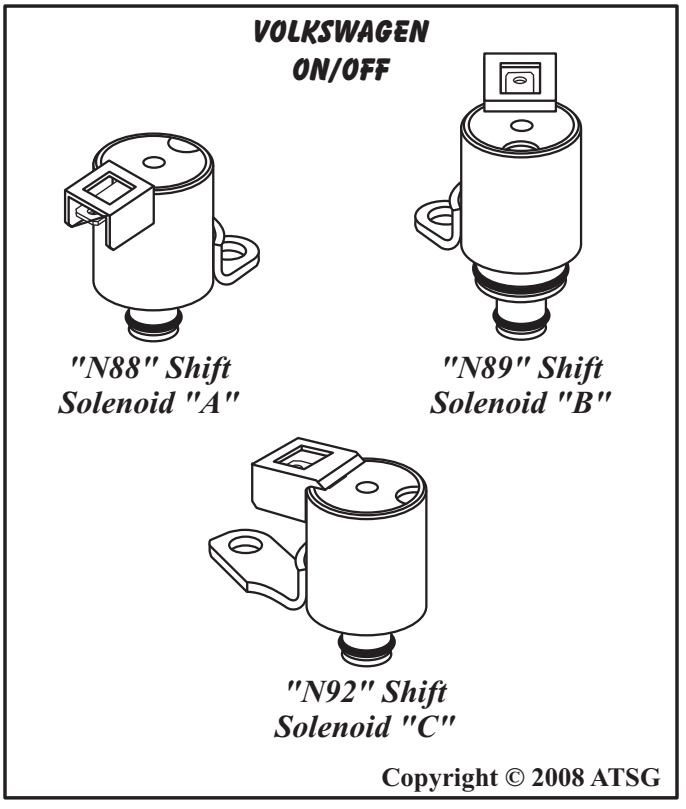


Figure 54

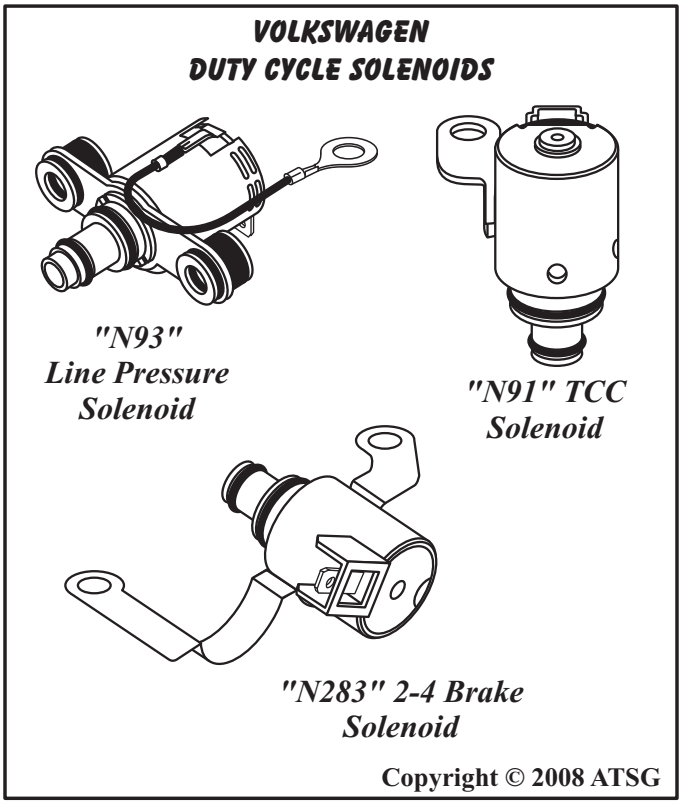


Figure 56

SOLENOID IDENTIFICATION AND LOCATIONS (CONT'D)

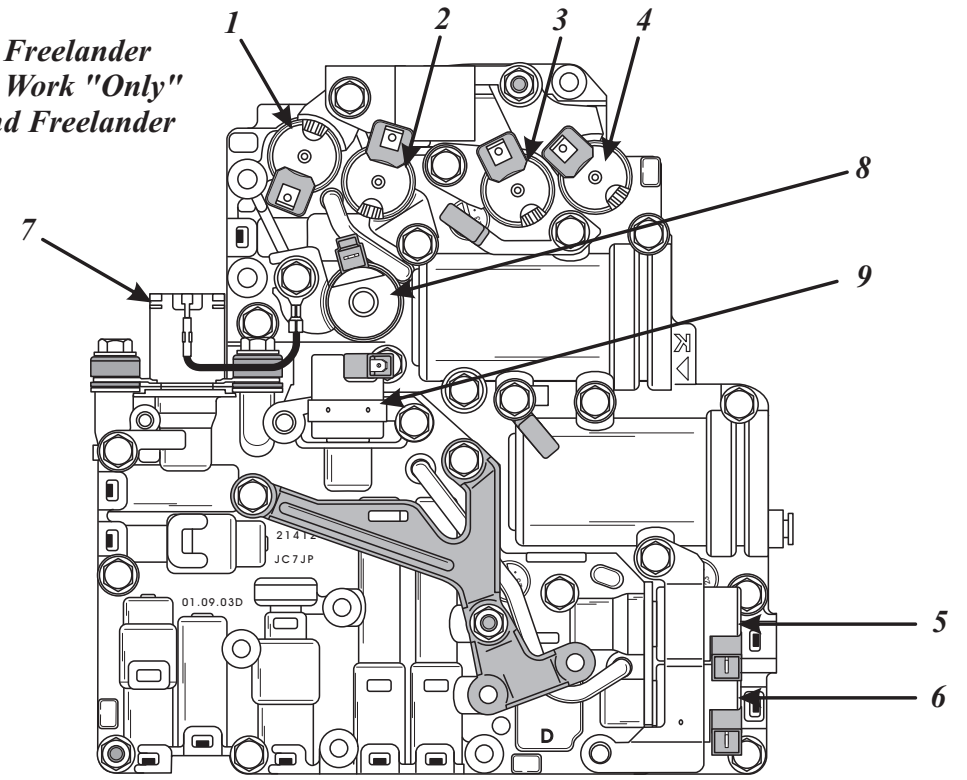
Jaguar/Freelander Solenoids

The Jaguar and Freelander solenoid locations and names are identified for you in Figure 57. The Jaguar and Freelander are the only two units where the solenoids will interchange. Again, the shift solenoid firing sequence is the same on all JF506E transaxles, and is also shown in Figure 57.

There are a total of nine (9) solenoids, which can be classified as two different types, because of the way in which they operate. Three of them are duty cycle solenoids, the other six are On/Off solenoids. All solenoids are actuated (energized) by a voltage feed from the TCM/ECU.

JAGUAR/FREELANDER SOLENOID IDENTIFICATION AND LOCATIONS

Jaguar And Freelander Solenoids Will Work "Only" On Jaguar And Freelander



Shift Solenoid Application Chart					
Solenoid	***1st***	***2nd***	***3rd***	***4th***	***5th***
SSA		***ON***			***ON***
SSB	***ON***	***ON***	***ON***		
SSC	***ON***			***ON***	***ON***

Manufacturer	Jaguar/Freelander Solenoid Identification And Location								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Jaguar, X Type And Land Rover, Freelander	**Shift Solenoid "A"**	**Reduction Timing Solenoid**	**Shift Solenoid "B"**	**Shift Solenoid "C"**	**2/4 Brake Timing Solenoid**	**2/4 Brake Duty Solenoid**	**Line Pressure Solenoid**	**TCC Solenoid**	**Low Clutch Timing Solenoid**

Figure 57

SOLENOID IDENTIFICATION (CONT'D)

Jaguar/Freelander ON/OFF Solenoids

On/Off Solenoids are as follows:
Shift Solenoids A, B, C, Low Clutch Timing Solenoid, Reduction Timing Solenoid and the 2/4 Brake Timing Solenoid, as shown in Figure 58 and 59. These On/Off solenoids close the pressure circuit in response to current flow from the TCM/ECU. Each solenoid has an internal coil. Current passes through the coil and actuates the needle valve. The needle valve then opens and/or closes the fluid pressure circuit.

Jaguar/Freelander Duty Cycle Solenoids

Duty Cycle Solenoids are as follows:
Line Pressure Solenoid, the TCC Solenoid, and the 2-4 Brake Duty Solenoid, as shown in Figure 60. The duty cycle solenoids repeatedly turn On/Off in 50Hz cycles. This opens and closes the fluid pressure circuit rapidly and meters fluid pressure into the circuit, dependant upon vehicle speed, throttle opening, engine load, and transaxle temperature, among other things.

Use the terminal identification and resistance charts on Page 25 for the Jaguar, and Page 31 for the Freelander to check the solenoids while still in the transaxle.

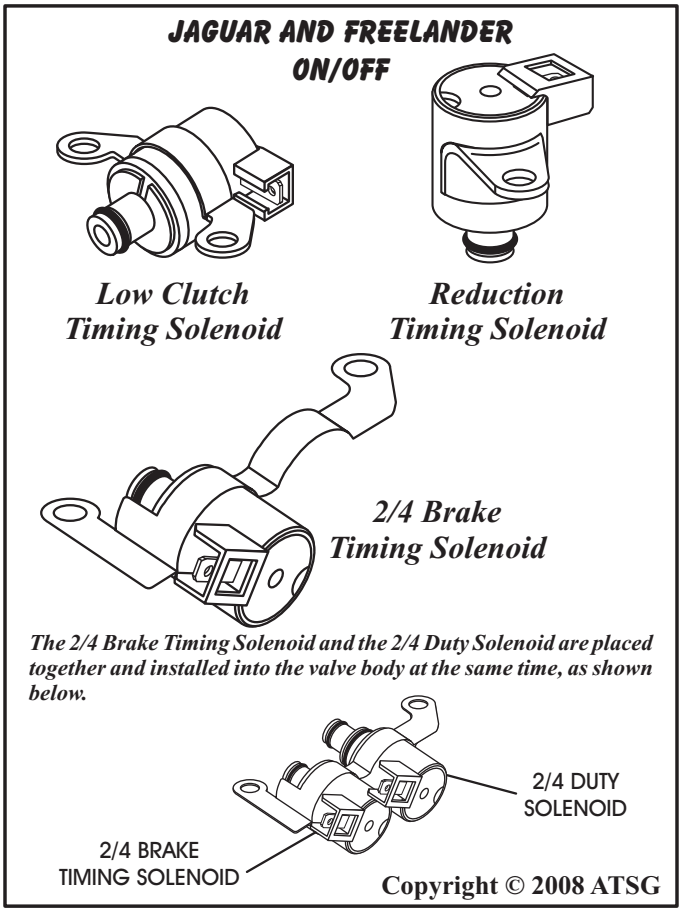


Figure 59

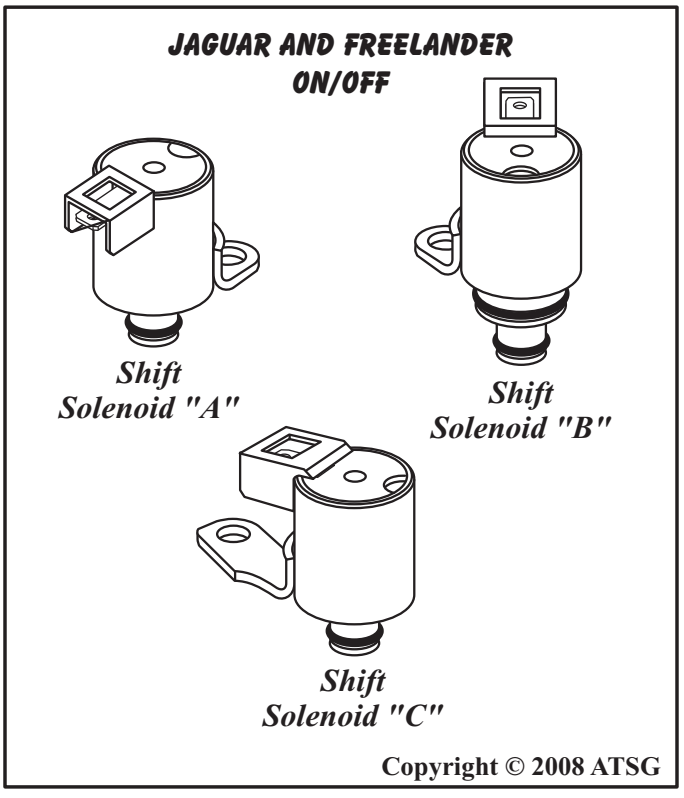


Figure 58

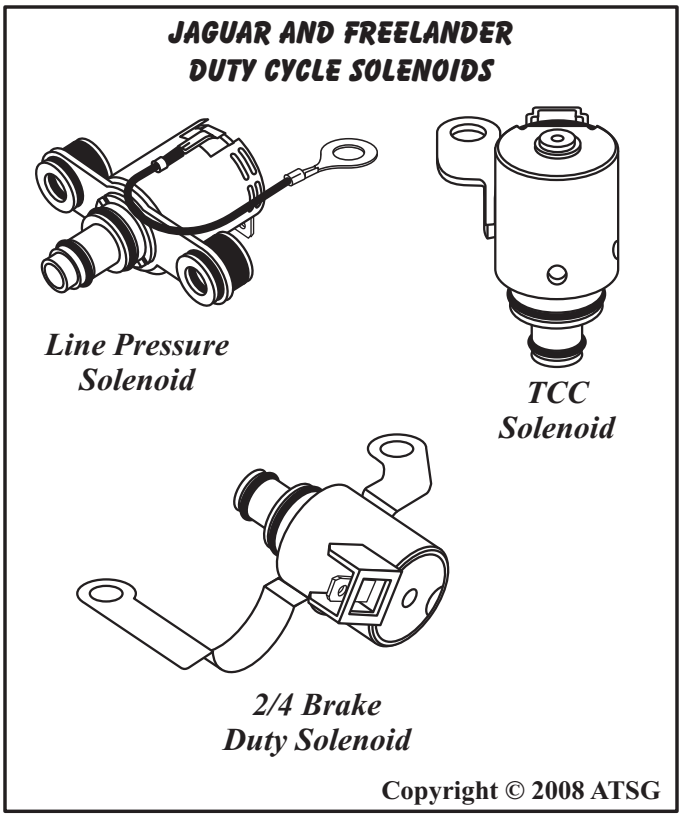


Figure 60

MAZDA DIAGNOSTIC TROUBLE CODES		BOTH	MAZDA 6	MAZDA MPV
DTC	DESCRIPTION	MIL ON	AT WARNING LAMP	OD/OFF FLASHING
P0116	Engine Coolant Temperature (ECT) performance problem	Yes	No	No
P0117	Engine Coolant Temperature (ECT) circuit, low input	Yes	No	No
P0118	Engine Coolant Temperature (ECT) circuit, high input	Yes	No	No
P0121	Throttle Position (TP) stuck closed	Yes	No	No
P0122	Throttle Position (TP) circuit, low input	Yes	No	No
P0123	Throttle Position (TP) circuit, high input	Yes	No	No
P0705	Transaxle Range (TR) switch, circuit malfunction (Short to power)	Yes	Yes	Yes
P0706	Transaxle Range (TR) switch, circuit malfunction (Open or short)	Yes	Yes	Yes
P0711	Transaxle Fluid Temp (TFT) sensor malfunction (Stuck)	Yes	No	No
P0712	Transaxle Fluid Temp (TFT) sensor malfunction (Short circuit)	Yes	Yes	Yes
P0713	Transaxle Fluid Temp (TFT) sensor malfunction (Open circuit)	Yes	Yes	Yes
P0715	Turbine Shaft Speed (TSS) circuit malfunction	Yes	Yes	Yes
P0720	Vehicle Speed Sensor (VSS) circuit malfunction	Yes	Yes	Yes
P0740	Torque Converter Clutch (TCC) system malfunction	Yes	No	No
P0743	Torque Converter Clutch (TCC) solenoid malfunction	Yes	Yes	Yes
P0748	Pressure Control Solenoid, circuit malfunction	No	Yes	Yes
P0751	Shift Solenoid "A" malfunction (Stuck Off)	Yes	No	No
P0752	Shift Solenoid "A" malfunction (Stuck On)	Yes	No	No
P0753	Shift Solenoid "A" malfunction (Open or Short circuit)	Yes	Yes	Yes
P0756	Shift Solenoid "B" malfunction (Stuck Off)	Yes	No	No
P0757	Shift Solenoid "B" malfunction (Stuck On)	Yes	No	No
P0758	Shift Solenoid "B" malfunction (Open or Short circuit)	Yes	Yes	Yes
P0761	Shift Solenoid "C" malfunction (Stuck Off)	Yes	No	No
P0762	Shift Solenoid "C" malfunction (Stuck On)	Yes	No	No
P0763	Shift Solenoid "C" malfunction (Open or Short circuit)	Yes	Yes	Yes
P0768	Reduction Timing Solenoid circuit malfunction (Open or Short)	No	Yes	Yes
P0773	Neutral Shift Solenoid circuit malfunction (Open or Short)	No	Yes	Yes
P0778	2-4 Brake Timing Solenoid circuit malfunction (Open or Short)	No	Yes	Yes
P0791	Intermediate Speed Sensor (ISS) circuit malfunction (Open or Short)	Yes	Yes	Yes
P0798	High Clutch Timing Solenoid circuit malfunction (Open or Short)	No	Yes	Yes
P1710	Ground Return circuit malfunction	No	No	No
U0073	CAN BUS OFF	Yes	Yes	Yes
U0100	TCM cannot receive signals from PCM	Yes	Yes	Yes

Figure 61

VOLKSWAGEN "VAG" DIAGNOSTIC TROUBLE CODES	
DTC	**DESCRIPTION**
00258	*N88-SV1 Shift Solenoid A, Circuit Error (Open or Short)*
00260	*N89-SV2 Shift Solenoid B, Circuit Error (Open or Short)*
00262	*N90-SV3 Low Clutch Timing Solenoid, Circuit Error (Open or Short)*
00264	*N91-SV4 Torque Converter Clutch (TCC) Solenoid, Circuit Error (Open or Short)*
00266	*N92-SV5 Shift Solenoid C, Circuit Error (Open or Short)*
00268	*N93-SV6 Pressure Control Solenoid, Circuit Error (Open or Short)*
00281	*G68 Output Speed Sensor (OSS), Vehicle Speed Sensor (VSS), Circuit Fault*
00293	*Transaxle Range (TR) switch, circuit malfunction (Open or Short circuit)*
00296	*Kickdown Switch Fault, Wide Open Throttle Signal During Idle*
00300	*Transaxle Fluid Temperature (TFT) Sensor, Circuit Error (Open or Short Circuit)*
00347	*N281-SV8 Reduction Timing Solenoid, Circuit Error (Open or Short)*
00348	*N282-SV9 2-4 Brake Timing Solenoid, Circuit Error (Open or Short)*
00349	*N283-SV10 2-4 Brake Solenoid, Circuit Error (Open or Short)*
00350	*Ground Return, Circuit Error (Open or Short)*
00351	*G265 Intermediate Shaft Speed Sensor, Circuit Fault*
00529	*TCM to ECM Error, No Speed Signal*
00532	*Power Supply Voltage Out Of Range*
00652	*Gear Ratio Error, Mechanical or Electrical*
00777	*Throttle Position Sensor, No Signal*
01166	*Engine Torque Signal, No Signal or Outside Of Tolerance*
01192	*Torque Converter Clutch, Lock-Up Slip, Mechanical or Hydraulic*
01236	*Selector Lever Lock Solenoid, Circuit Error (Open or Short)*
01312	*Drive Train Data Bus Fault, No Communication*
01314	*Engine Control Module, No Comunication or Wrong Equipment*
01316	*ABS Module, No Communication*
018108	*Brake Pressure Switch, Implausible Signal*
17101	*G182 Turbine Shaft Speed Sensor, Circuit Fault*
65535	*Control Module Faulty, (TCM)*
SPECIAL NOTE: No OBDII correlation available at time of this printing.	

Figure 62

JAGUAR "X" TYPE DIAGNOSTIC TROUBLE CODES	
DTC	**DESCRIPTION**
P0116	Engine Coolant Temperature (ECT) Performance Problem
P0117	Engine Coolant Temperature (ECT) Circuit, Low Input
P0118	Engine Coolant Temperature (ECT) Circuit, High Input
P0121	Throttle Position (TP), Performance (TP-1 Compared To TP-2)
P0122	Throttle Position (TP) Circuit 1, Low Voltage
P0123	Throttle Position (TP) Circuit 1, High Voltage
P0706	Transaxle Range (TR) Switch, Circuit Malfunction (Open or short circuit)
P0710	Transaxle Fluid Temperature (TFT) Circuit Malfunction
P0715	Turbine Shaft Speed (TSS), Circuit Malfunction
P0720	Output Speed Sensor (OSS), Circuit Malfunction
P0731	1st Gear Ratio Out Of Range
P0732	2nd Gear Ratio Out Of Range
P0733	3rd Gear Ratio Out Of Range
P0734	4th Gear Ratio Out Of Range
P0735	5th Gear Ratio Out Of Range
P0736	Reverse Gear Ratio Out Of Range
P0740	Torque Converter Clutch (TCC), System Malfunction
P0743	Torque Converter Clutch (TCC), Solenoid Malfunction
P0748	Pressure Control Solenoid, Circuit Malfunction (Open or Short)
P0753	Shift Solenoid "A" Malfunction (Open or Short Circuit)
P0758	Shift Solenoid "B" Malfunction (Open or Short Circuit)
P0763	Shift Solenoid "C" Malfunction (Open or Short Circuit)
P0778	2-4 Brake Solenoid circuit malfunction (Open or Short circuit)
P0791	(TCM Side) Intermediate Speed Sensor (ISS) Circuit Malfunction (Open or Short Circuit)
P0791	(ECM Side) Output Speed Sensor (OSS) circuit Malfunction (Open or Short Circuit)
P0860	J-Gate CAN Network, Circuit Malfunction (Open or Short Circuit)
P0915	J-Gate Signal Failure
P1573	CAN Throttle Angle Error
P1601	Incorrect ECM or TCM Installed In Vehicle
P1603	TCM EEPROM Failure
P1710	Solenoid Ground Return, Circuit Malfunction
P1745	Low Clutch Timing Solenoid, Circuit Error (Open or Short)
P1746	Reduction Timing Solenoid, Circuit Error (Open or Short)
P1747	2-4 Brake Timing Solenoid, Circuit Error (Open or Short)
P1777	CAN Torque Reduction Error
P1780	D-4 Switch, Circuit Error (Open or Short)

Figure 63

LAND ROVER FREELANDER DIAGNOSTIC TROUBLE CODES	
DTC	**DESCRIPTION**
P0116	Engine Coolant Temperature (ECT) Performance Problem
P0117	Engine Coolant Temperature (ECT) Circuit, Short To Ground
P0118	Engine Coolant Temperature (ECT) Circuit, Open or Short To Battery
P0122	Throttle Position (TP) Circuit 1, Low Voltage
P0123	Throttle Position (TP) Circuit 1, High Voltage
P0702	Ground Return (Sensor Earth), Short Circuit To Battery
P0710	Transaxle Fluid Temperature (TFT) Sensor, Out Of Range
P0715	Turbine Shaft Speed (TSS), Circuit Malfunction
P0720	Output Speed Sensor (OSS), Circuit Malfunction
P0731	1st Gear Ratio Out Of Range
P0732	2nd Gear Ratio Out Of Range
P0733	3rd Gear Ratio Out Of Range
P0734	4th Gear Ratio Out Of Range
P0735	5th Gear Ratio Out Of Range
P0736	Reverse Gear Ratio Out Of Range
P0740	Torque Converter Clutch (TCC) Solenoid, Out Of Range
P0743	Torque Converter Clutch (TCC) Solenoid, Short To Ground or Power
P0748	Pressure Control Solenoid, Circuit Malfunction (Open or Short)
P0753	Shift Solenoid "A" Malfunction (Open or Short Circuit)
P0758	Shift Solenoid "B" Malfunction (Open or Short Circuit)
P0763	Shift Solenoid "C" Malfunction (Open or Short Circuit)
P0790	Mode Switch Input, Multiple Signals
P1562	Battery Voltage, Out Of Range
P1605	EAT ECU EEPROM Error, Flag Set
P1715	Intermediate Shaft Speed Sensor, Circuit Malfunction
P1748	2-4 Brake Timing Solenoid, Circuit Error (Open or Short)
P1785	Low Clutch Timing Solenoid, Circuit Error (Open or Short)
P1786	Reduction Timing Solenoid, Circuit Error (Open or Short)
P1815	Steptronic (Manual) +/- Switch, Multiple Input Signals or No Signals
P1825	Shift Interlock, ECU Shift Interlock Failure
P1840	CAN BUS Malfunction
P1841	BUS Monitoring Off
P1842	Level Monitoring Incompatable
P1843	Timeout Monitoring, Missing Nodes Detected
P1844	Flag Error Set For RPM, ECT, TPS, Virtual Throttle Angle or; Torque Reduction Volume Not Achieved

Figure 64

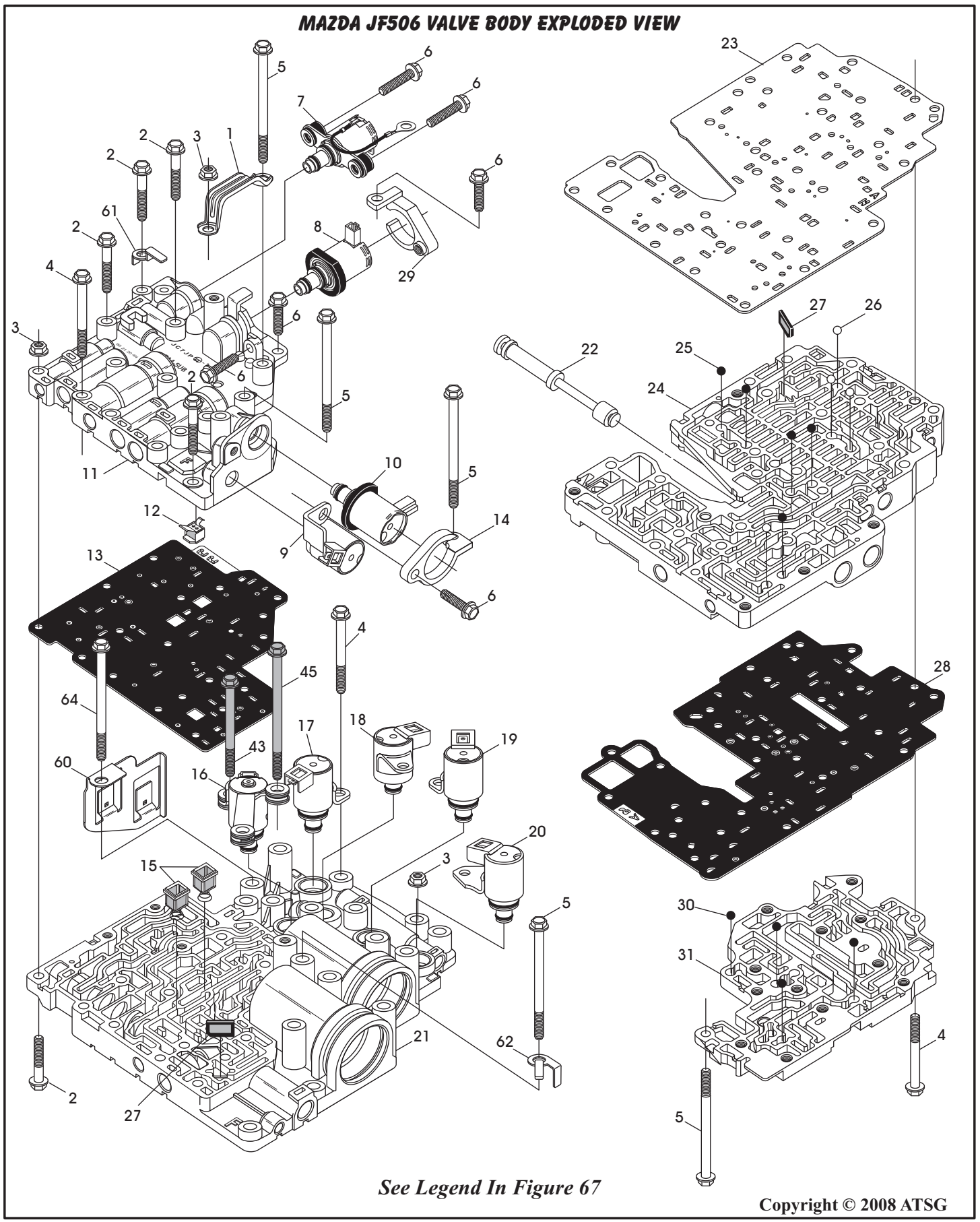
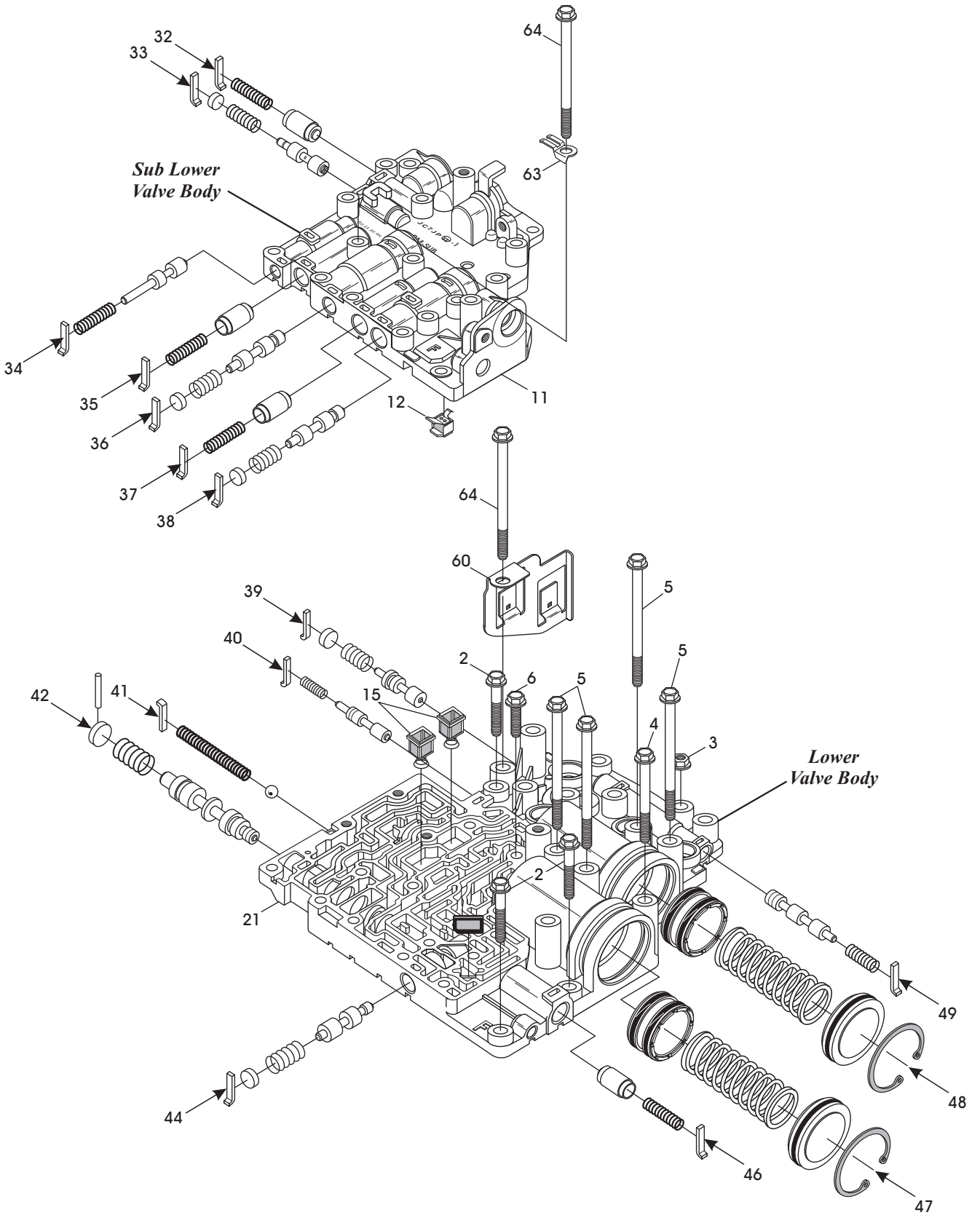

MAZDA JF506 VALVE BODY EXPLODED VIEW
See Legend In Figure 67
Copyright © 2008 ATSG

Figure 65

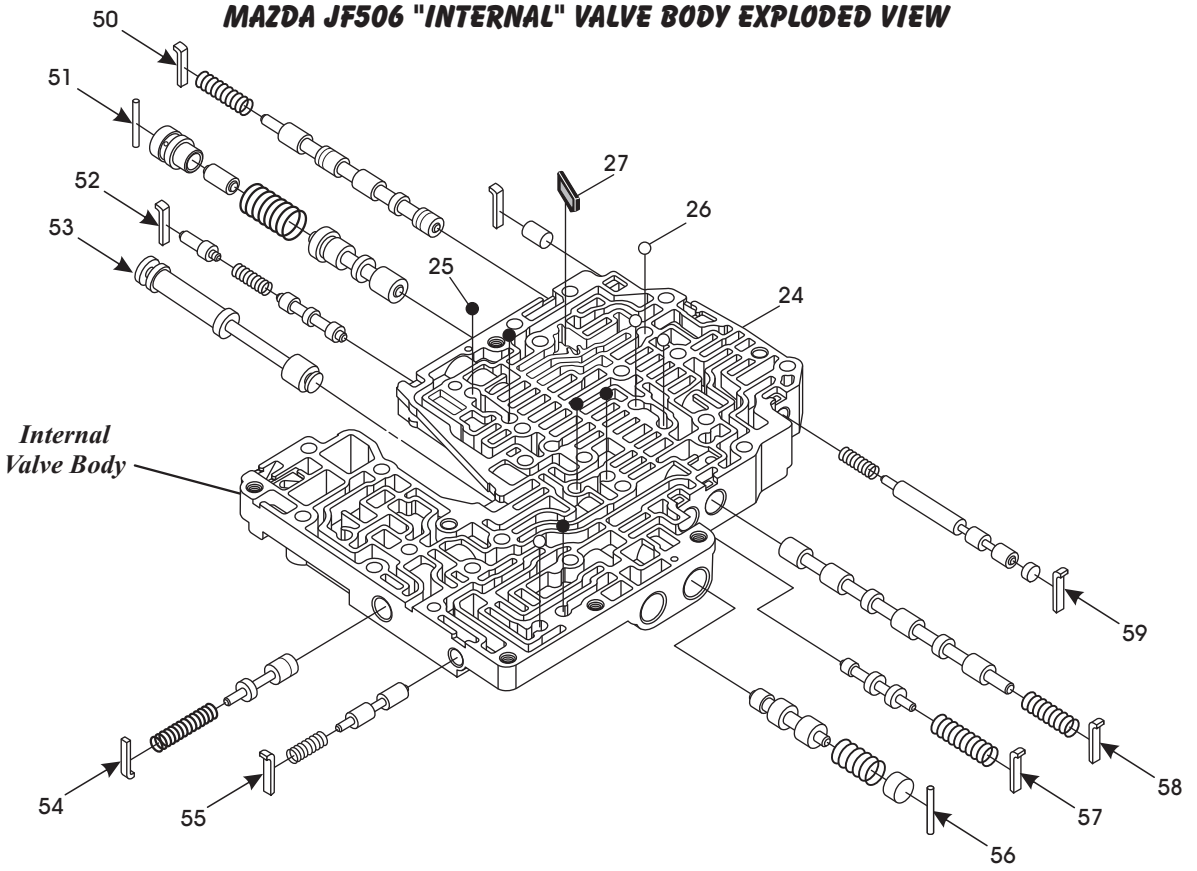
MAZDA JF506 "SUB LOWER" AND "LOWER" VALVE BODY EXPLODED VIEW



See Legend In Figure 67

Figure 66

MAZDA JF506 "INTERNAL" VALVE BODY EXPLODED VIEW



1 VALVE BODY BRACKET
2 VALVE BODY BOLT, 37MM LENGTH
3 NUT FOR VALVE BODY BOLT FROM BOTTOM
4 VALVE BODY BOLT, 67MM LENGTH
5 VALVE BODY BOLT, 90MM LENGTH
6 VALVE BODY BOLT, 24MM LENGTH
7 LINE PRESSURE SOLENOID (DUTY CYCLE)
8 HIGH CLUTCH TIMING SOLENOID (ON/OFF)
9 NEUTRAL SHIFT SOLENOID (DUTY CYCLE)
10 2/4 BRAKE TIMING SOLENOID (ON/OFF)
11 SUB LOWER VALVE BODY CASTING
12 PILOT FILTER WITH "LEAF" SPRING
13 SPACER PLATE "A" WITH GASKETS
14 2/4 BRAKE TIMING SOLENOID BRASS RETAINING BRACKET
15 COIL SPRING LOADED FILTERS (2 REQUIRED)
16 TCC SOLENOID (DUTY CYCLE)
17 SHIFT SOLENOID "A" (ON/OFF)
18 REDUCTION TIMING SOLENOID (ON/OFF)
19 SHIFT SOLENOID "B" (ON/OFF)
20 SHIFT SOLENOID "C" (ON/OFF)
21 LOWER VALVE BODY CASTING
22 MANUAL SHIFT VALVE
23 SPACER PLATE "B" (NO GASKETS USED)
24 INTERNAL VALVE BODY CASTING
25 PLASTIC CHECK BALL (.218" DIAMETER, 5 REQUIRED)
26 STEEL CHECK BALL (.218" DIAMETER, 4 REQUIRED)
27 INTERNAL VALVE BODY FLAT SCREEN (2 REQUIRED)
28 SPACER PLATE "C" WITH BONDED GASKETS
29 HIGH CLUTCH TIMING SOLENOID BRASS RETAINING BRACKET
30 PLASTIC CHECK BALL (.218" DIAMETER, 4 REQUIRED)
31 UPPER VALVE BODY CASTING
32 MODIFIER ACCUMULATOR VALVE TRAIN
33 PRESSURE MODIFIER VALVE TRAIN
34 TORQUE CONVERTER PRESSURE REGULATOR VALVE TRAIN
35 THROTTLE ACCUMULATOR "A" VALVE TRAIN
36 ACCUMULATOR CONTROL VALVE "A" VALVE TRAIN
37 THROTTLE ACCUMULATOR "C" VALVE TRAIN
38 ACCUMULATOR CONTROL VALVE "C" VALVE TRAIN
39 REDUCTION REDUCING VALVE TRAIN
40 REDUCTION TIMING VALVE TRAIN
41 LINE PRESSURE RELIEF BALL AND SPRING
42 PRESSURE REGULATOR VALVE TRAIN
43 VALVE BODY BOLT, 75MM LENGTH (BLACK IN COLOR)
44 ACCUMULATOR CONTROL VALVE "B" VALVE TRAIN
45 VALVE BODY BOLT, 105.5MM LENGTH (BLACK IN COLOR)
46 THROTTLE ACCUMULATOR "B" VALVE TRAIN
47 HIGH CLUTCH ACCUMULATOR PISTON AND SPRING
48 LOW CLUTCH ACCUMULATOR PISTON AND SPRING
49 SHIFT VALVE "C" VALVE TRAIN
50 SHIFT VALVE "A" VALVE TRAIN
51 TCC CONTROL VALVE TRAIN
52 NEUTRAL SHIFT VALVE TRAIN
53 MANUAL SHIFT VALVE
54 PILOT VALVE TRAIN
55 ACCUMULATOR SWITCH VALVE TRAIN
56 NEUTRAL CONTROL VALVE TRAIN
57 REVERSE INHIBIT VALVE TRAIN
58 SHIFT VALVE "B" VALVE TRAIN
59 FAILSAFE VALVE TRAIN
60 INTERNAL CONNECTOR RETAINING BRACKET
61 INTERNAL SOLENOID WIRE HARNESS CLIP
62 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
63 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
64 VALVE BODY TO CASE BOLT, 90MM LONG *(SILVER IN COLOR)*

Figure 67

MAZDA SMALL PARTS AND CHECKBALL LOCATIONS

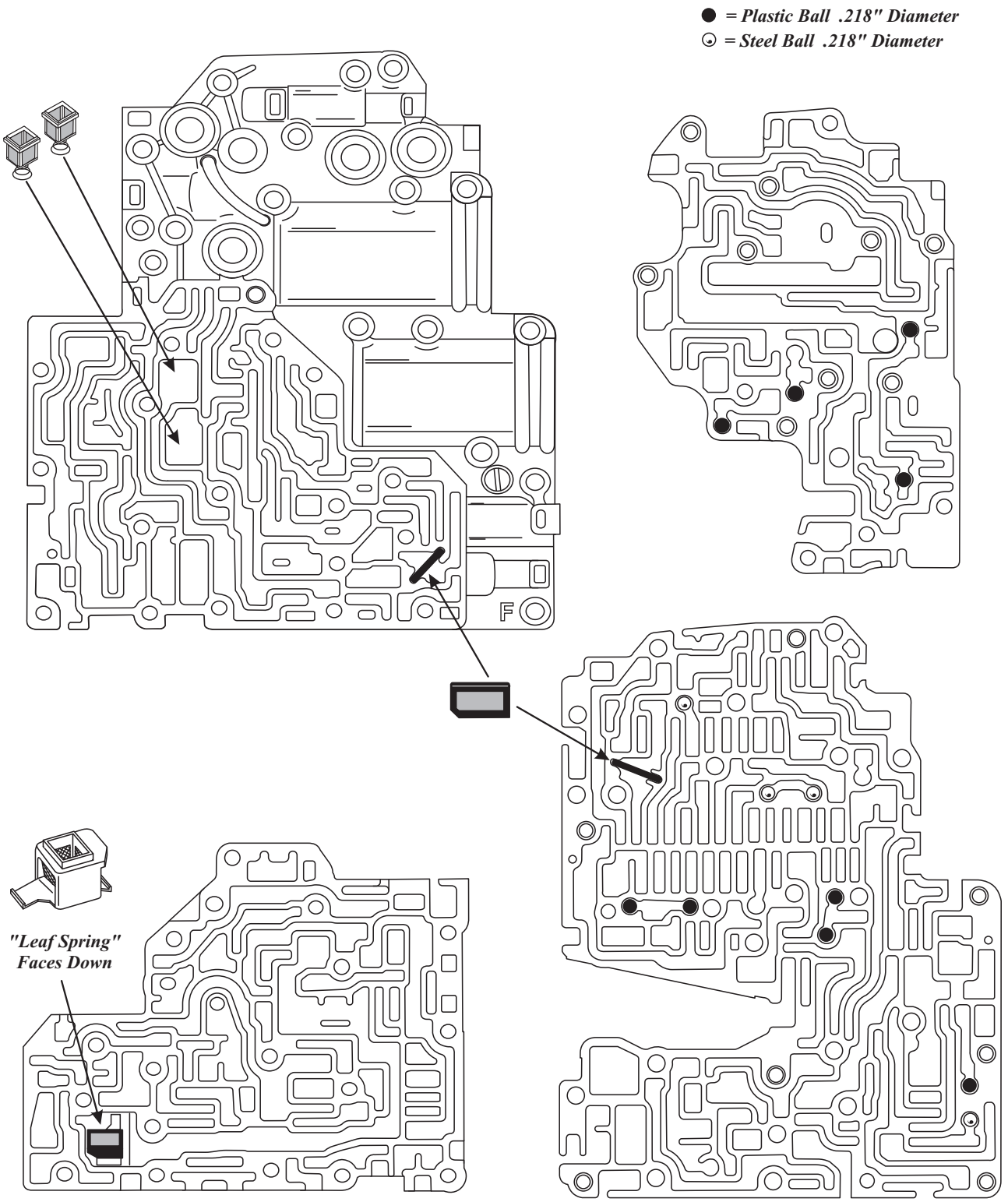
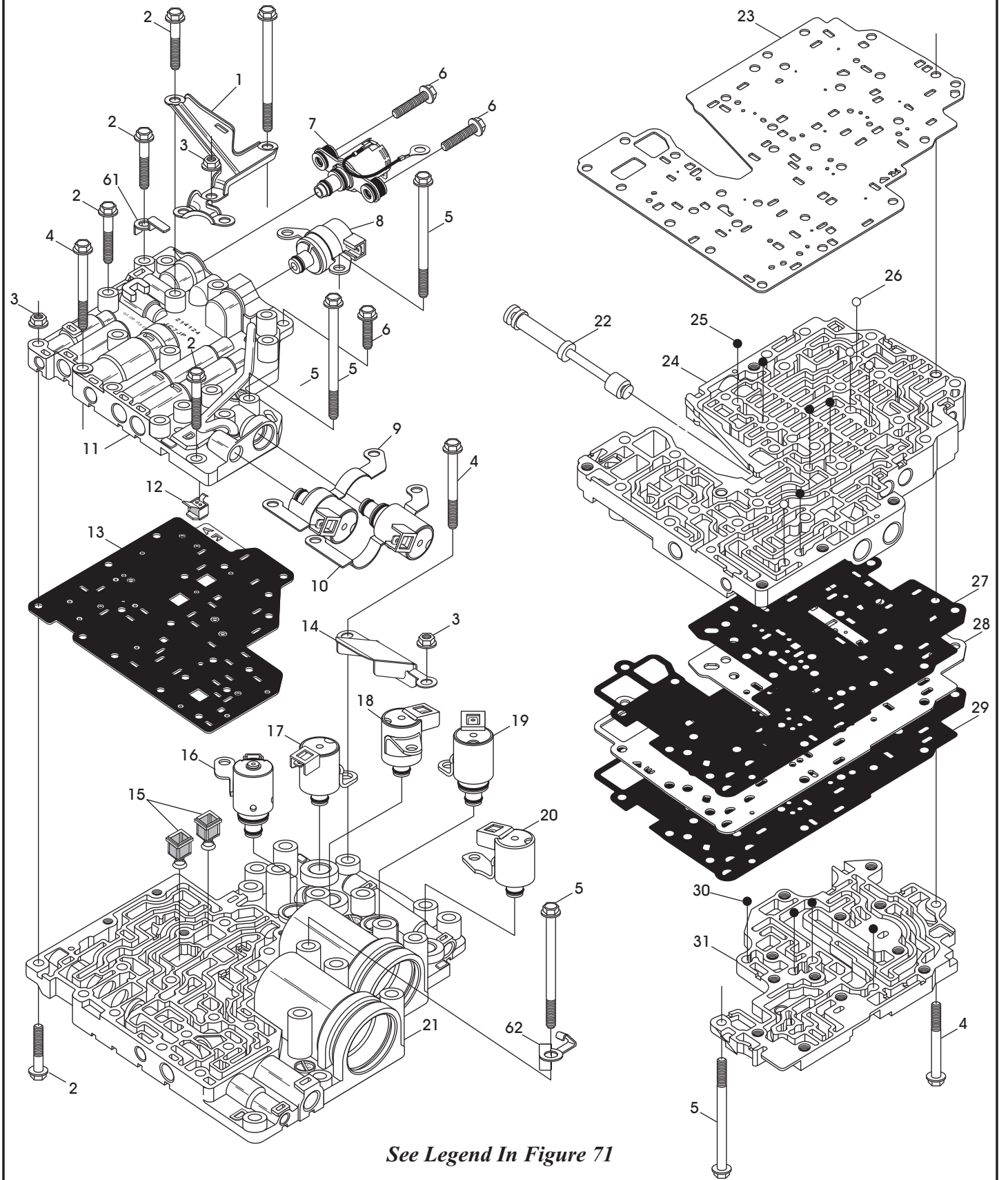


Figure 68

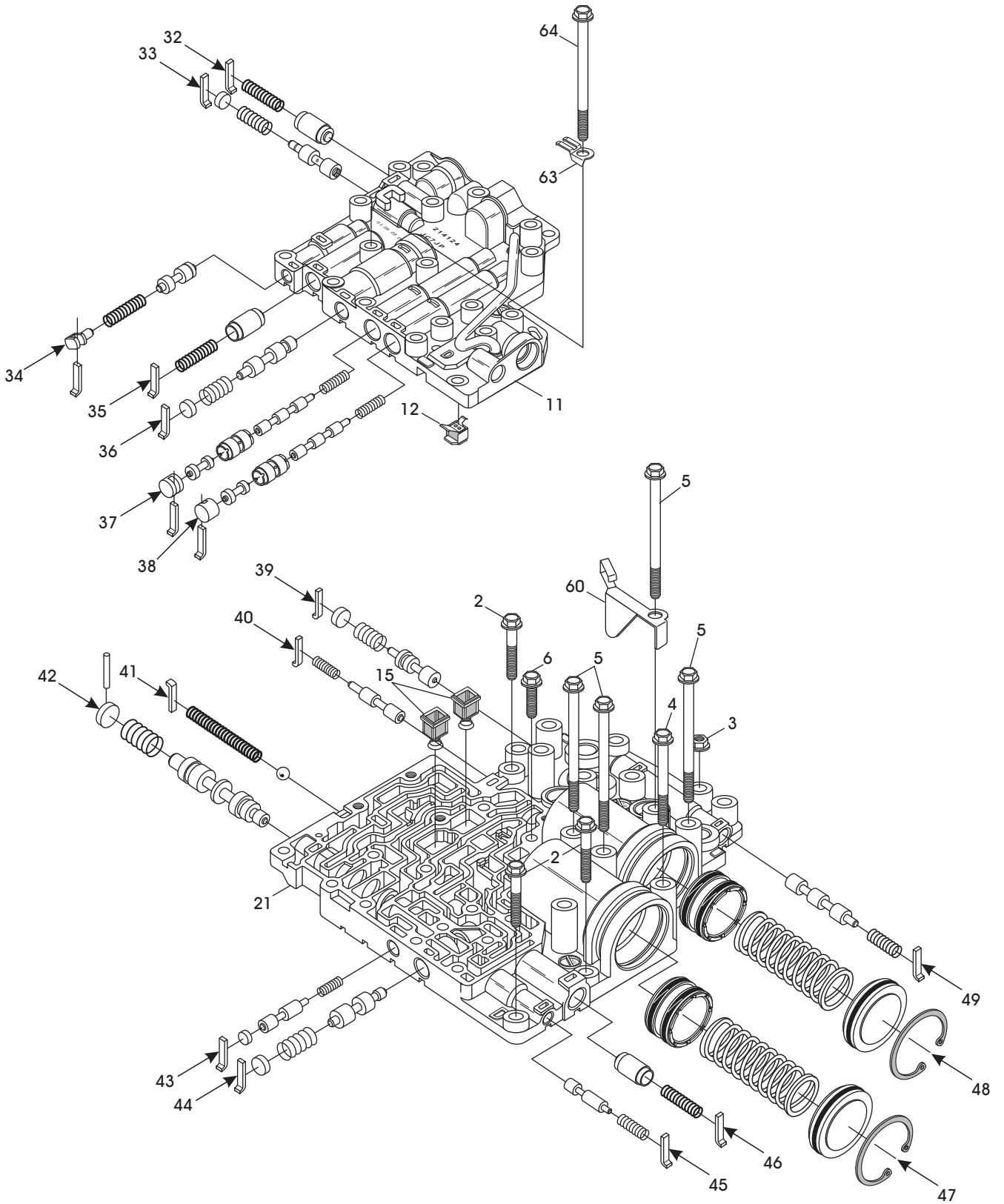
VOLKSWAGEN JF506 VALVE BODY EXPLODED VIEW



See Legend In Figure 71

Figure 69

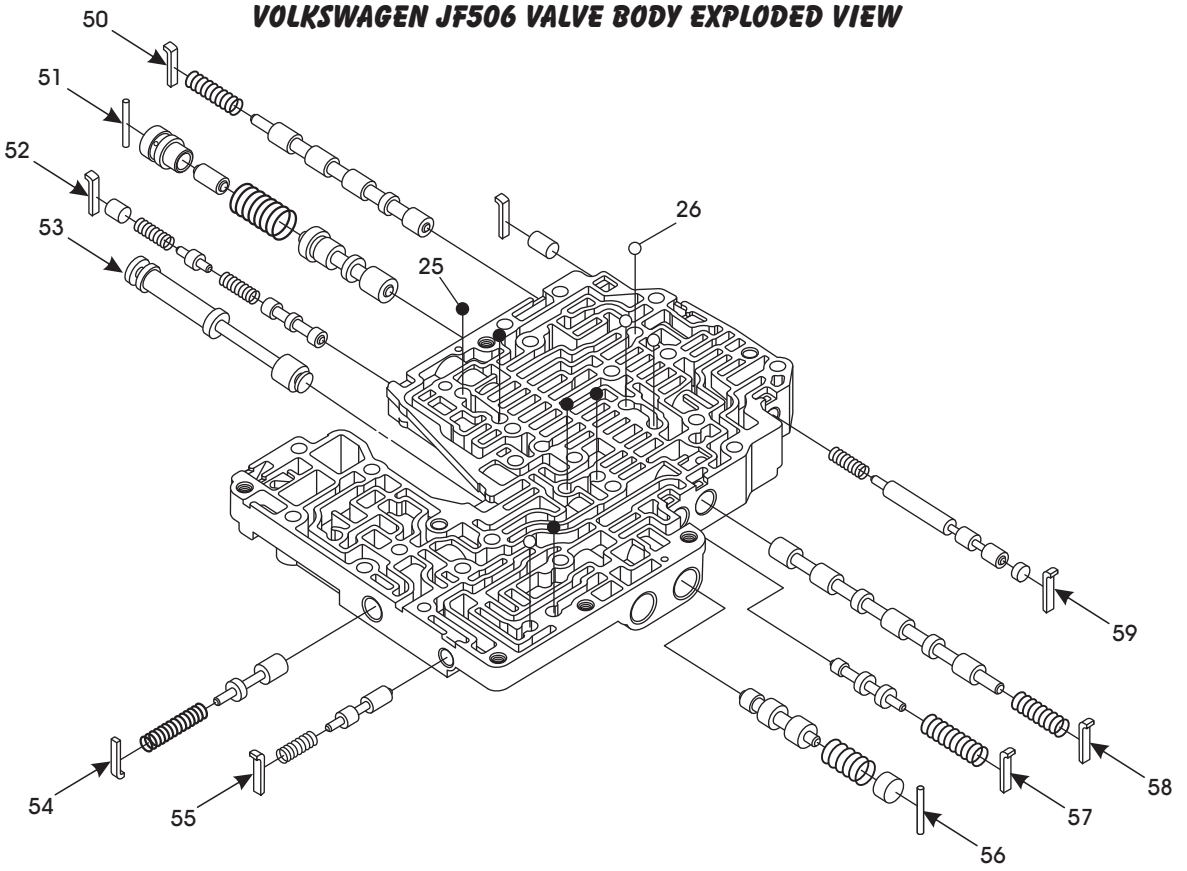
VOLKSWAGEN JF506 VALVE BODY EXPLODED VIEW



See Legend In Figure 71

Figure 70

VOLKSWAGEN JF506 VALVE BODY EXPLODED VIEW



1 VALVE BODY BRACKET
2 VALVE BODY BOLT, 37MM LENGTH
3 NUT FOR VALVE BODY BOLT FROM BOTTOM
4 VALVE BODY BOLT, 67MM LENGTH
5 VALVE BODY BOLT, 90MM LENGTH
6 VALVE BODY BOLT, 22MM LENGTH
7 LINE PRESSURE SOLENOID (N93-SV6)
8 LOW CLUTCH TIMING SOLENOID (N90-SV3)
9 2-4 BRAKE TIMING SOLENOID (N282-SV9)
10 2-4 BRAKE DUTY SOLENOID (N283-SV10)
11 SUB LOWER VALVE BODY CASTING
12 PILOT FILTER WITH "LEAF" SPRING
13 SPACER PLATE "A" WITH GASKETS
14 OIL BAFFLE
15 COIL SPRING LOADED FILTERS (2 REQUIRED)
16 TCC SOLENOID (N91-SV4)
17 SHIFT SOLENOID "A" (N88-SV1)
18 REDUCTION TIMING SOLENOID (N281-SV8)
19 SHIFT SOLENOID "B" (N89-SV2)
20 SHIFT SOLENOID "C" (N92-SV5)
21 LOWER VALVE BODY CASTING
22 MANUAL SHIFT VALVE
23 SPACER PLATE "B" (NO GASKETS)
24 INTERNAL VALVE BODY CASTING
25 PLASTIC CHECK BALL (.218" DIAMETER, 5 REQUIRED)
26 STEEL CHECK BALL (.218" DIAMETER, 4 REQUIRED)
27 SPACER PLATE "C" UPPER GASKET (MAY BE BONDED)
28 SPACER PLATE "C"
29 SPACER PLATE "C" LOWER GASKET (MAY BE BONDED)
30 PLASTIC CHECK BALL (.218" DIAMETER, 4 REQUIRED)
31 UPPER VALVE BODY CASTING
32 MODIFIER ACCUMULATOR VALVE TRAIN
33 PRESSURE MODIFIER VALVE TRAIN
34 TORQUE CONVERTER PRESSURE REGULATOR VALVE TRAIN
35 THROTTLE ACCUMULATOR VALVE "A" VALVE TRAIN
36 ACCUMULATOR CONTROL VALVE "A" VALVE TRAIN
37 HIGH CLUTCH ACCUMULATOR REGULATOR VALVE TRAIN
38 2-4 BRAKE CLUTCH ACCUMULATOR REGULATOR VALVE TRAIN
39 REDUCTION REDUCING VALVE TRAIN
40 REDUCTION TIMING VALVE TRAIN
41 LINE PRESSURE RELIEF BALL AND SPRING
42 PRESSURE REGULATOR VALVE TRAIN
43 2-4 CLUTCH ACCUMULATOR REGULATOR SWITCH VALVE TRAIN
44 ACCUMULATOR CONTROL VALVE "B" VALVE TRAIN
45 HIGH CLUTCH ACCUMULATOR REGULATOR SWITCH VALVE
46 THROTTLE ACCUMULATOR "B" VALVE TRAIN
47 HIGH CLUTCH ACCUMULATOR PISTON AND SPRING
48 LOW CLUTCH ACCUMULATOR PISTON AND SPRING
49 SHIFT VALVE "C" VALVE TRAIN
50 SHIFT VALVE "A" VALVE TRAIN
51 TCC CONTROL VALVE TRAIN
52 NEUTRAL SHIFT VALVE TRAIN
53 MANUAL SHIFT VALVE
54 PILOT VALVE TRAIN
55 ACCUMULATOR SWITCH VALVE TRAIN
56 NEUTRAL CONTROL VALVE TRAIN
57 REVERSE INHIBIT VALVE TRAIN
58 SHIFT VALVE "B" VALVE TRAIN
59 FAILSAFE VALVE TRAIN
60 INTERNAL SOLENOID WIRE HARNESS CLIP
61 INTERNAL SOLENOID WIRE HARNESS CLIP
62 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
63 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
64 VALVE BODY TO CASE BOLT, 90MM LONG *(SILVER IN COLOR)*

Figure 71

VOLKSWAGEN SMALL PARTS AND CHECKBALL LOCATIONS

● = Plastic Ball .218" Diameter
⊙ = Steel Ball .218" Diameter

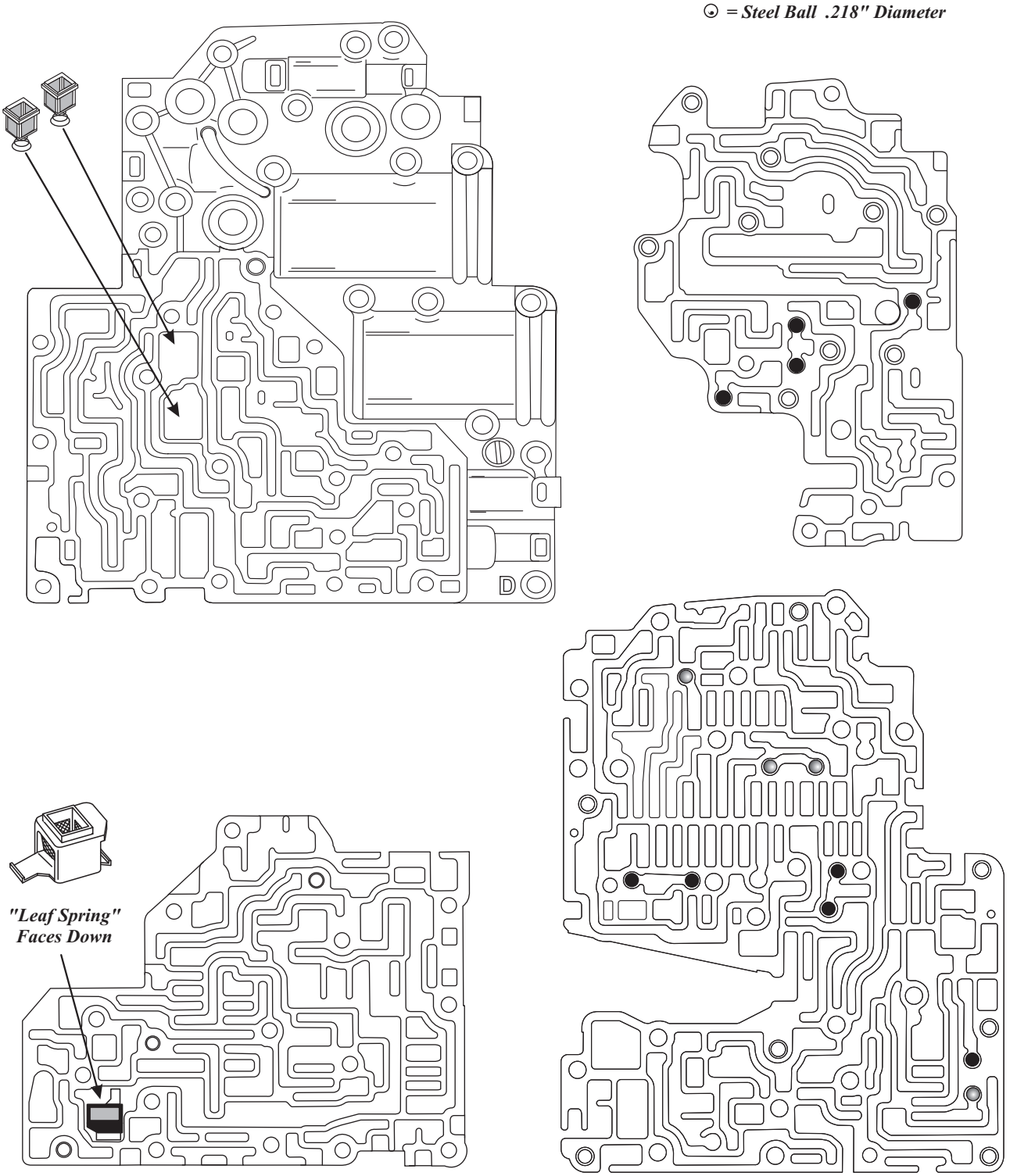
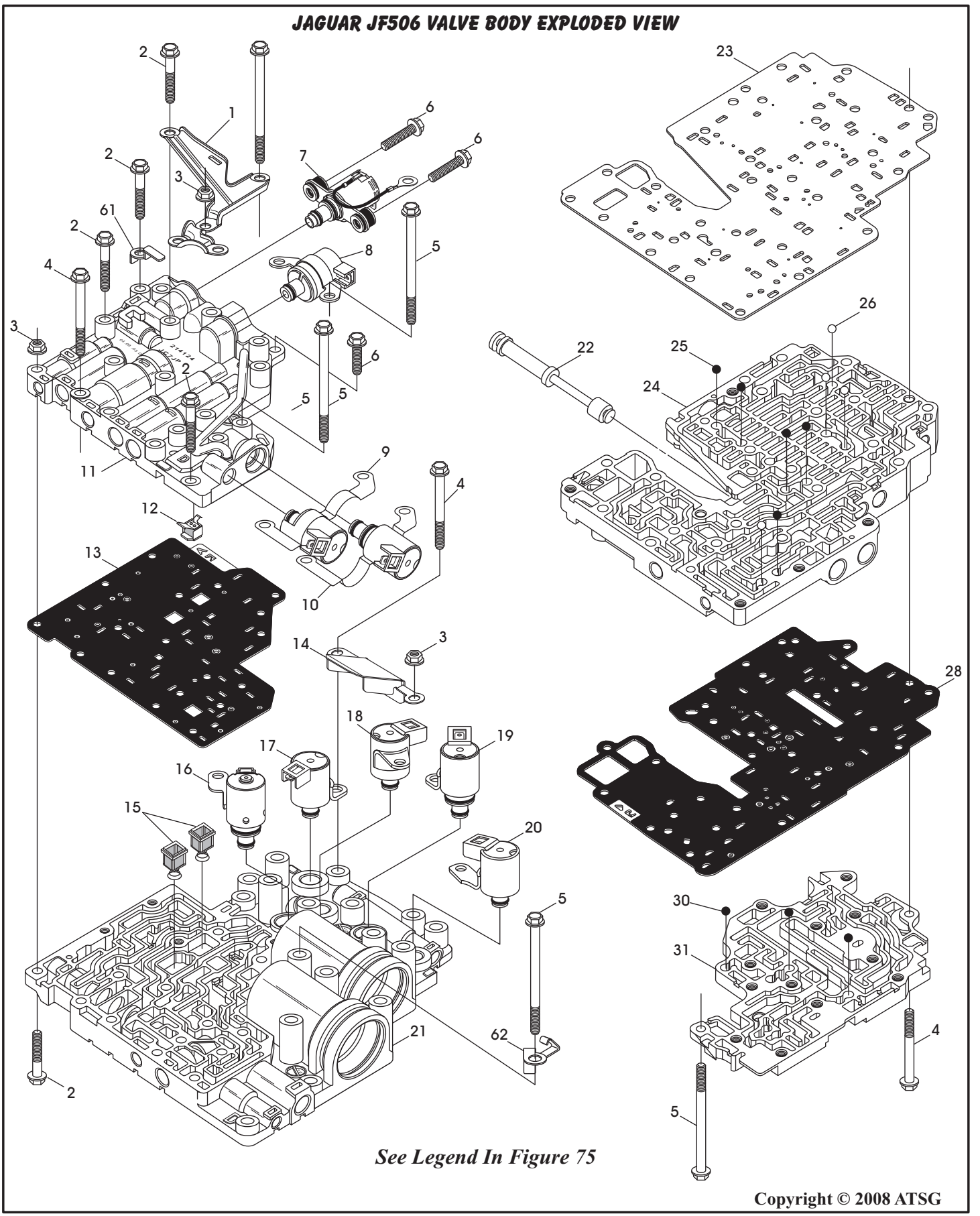


Figure 72

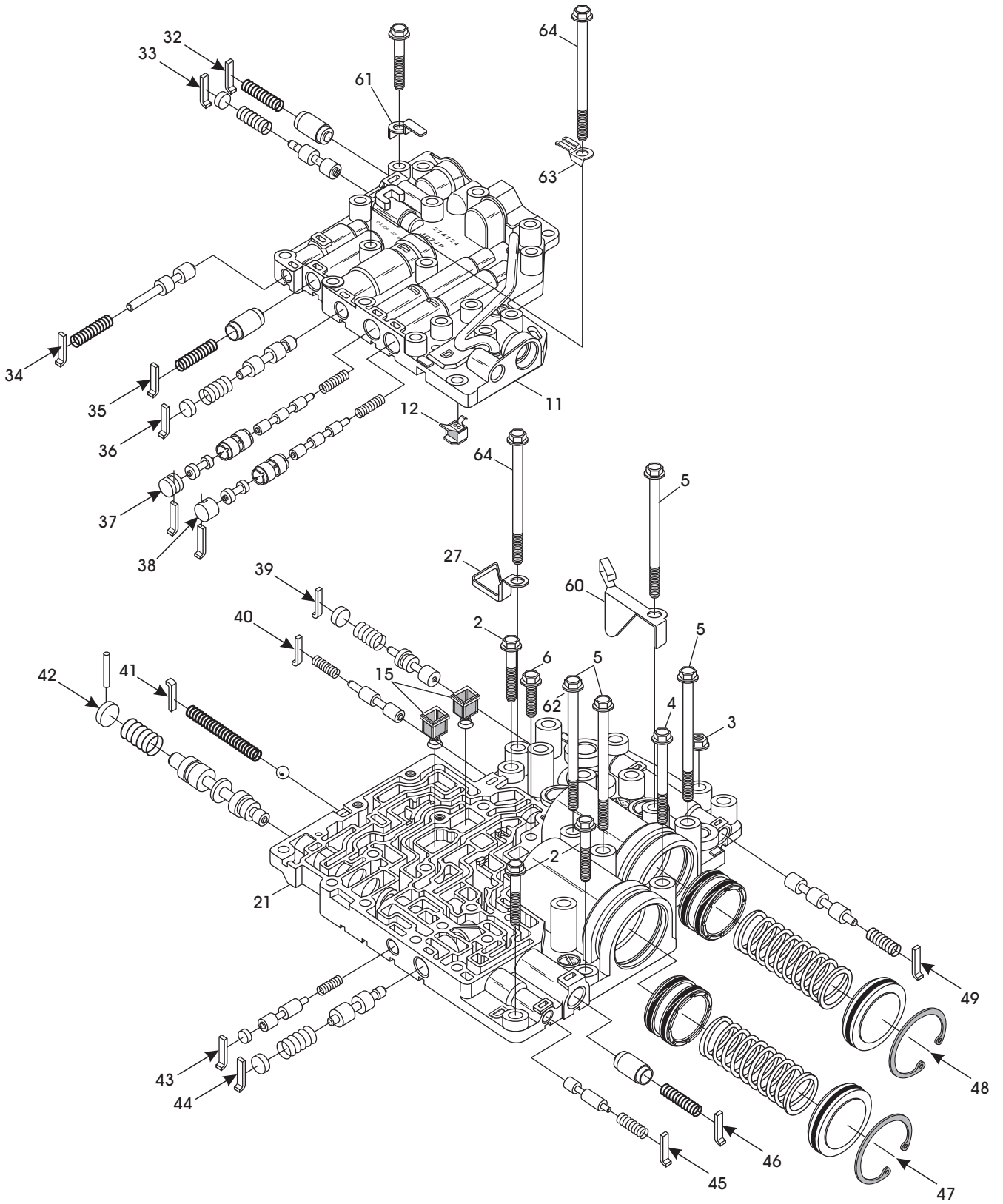
JAGUAR JF506 VALVE BODY EXPLODED VIEW



See Legend In Figure 75

Figure 73

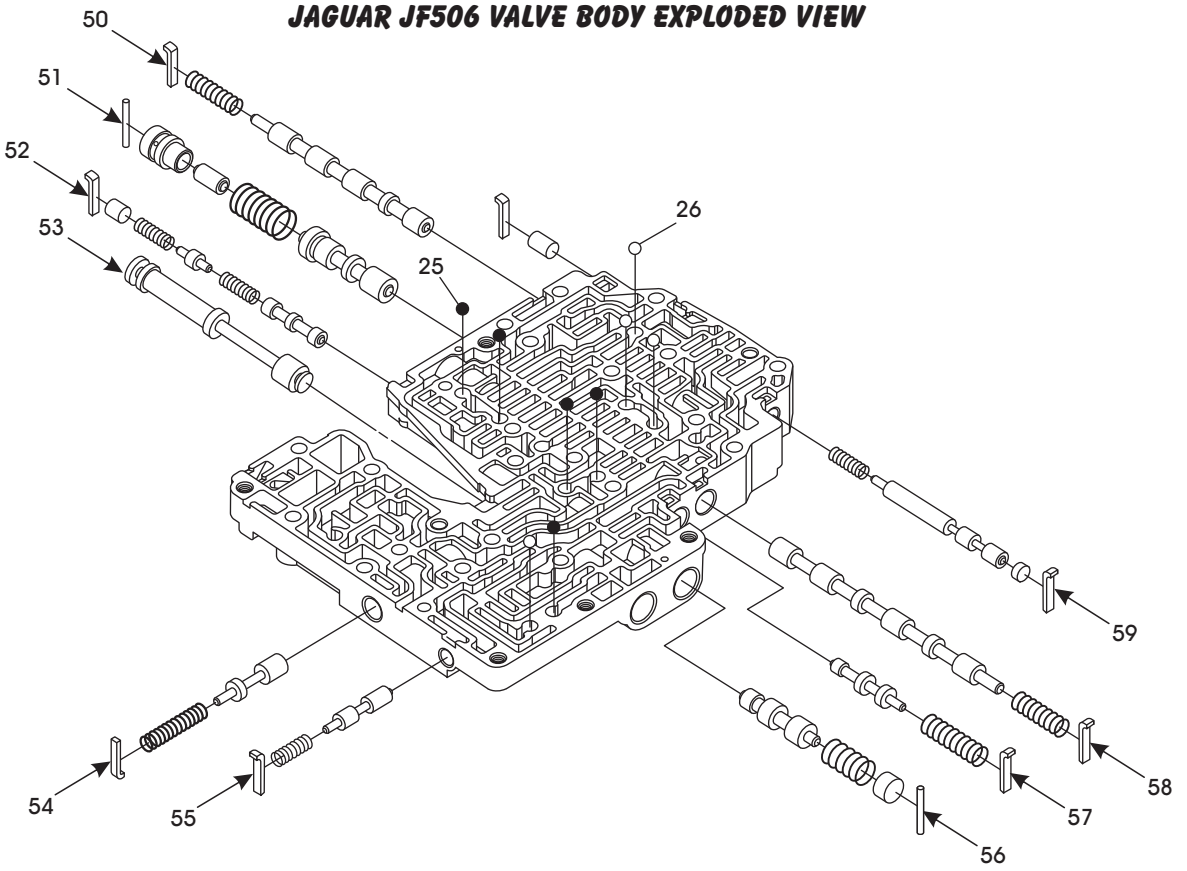
JAGUAR JF506 VALVE BODY EXPLODED VIEW



See Legend In Figure 75

Figure 74

JAGUAR JF506 VALVE BODY EXPLODED VIEW



1 VALVE BODY BRACKET
2 VALVE BODY BOLT, 37MM LENGTH
3 NUT FOR VALVE BODY BOLT FROM BOTTOM
4 VALVE BODY BOLT, 67MM LENGTH
5 VALVE BODY BOLT, 90MM LENGTH
6 VALVE BODY BOLT, 22MM LENGTH
7 LINE PRESSURE SOLENOID (DUTY CYCLE)
8 LOW CLUTCH TIMING SOLENOID (ON/OFF)
9 2-4 BRAKE TIMING SOLENOID (ON/OFF)
10 2-4 BRAKE DUTY SOLENOID (DUTY CYCLE)
11 SUB LOWER VALVE BODY CASTING
12 PILOT FILTER WITH "LEAF" SPRING
13 SPACER PLATE "A" WITH GASKETS
14 OIL BAFFLE
15 COIL SPRING LOADED FILTERS (2 REQUIRED)
16 TCC SOLENOID (DUTY CYCLE)
17 SHIFT SOLENOID "A" (ON/OFF)
18 REDUCTION TIMING SOLENOID (ON/OFF)
19 SHIFT SOLENOID "B" (ON/OFF)
20 SHIFT SOLENOID "C" (ON/OFF)
21 LOWER VALVE BODY CASTING
22 MANUAL SHIFT VALVE
23 SPACER PLATE "B" (NO GASKETS)
24 INTERNAL VALVE BODY CASTING
25 PLASTIC CHECK BALL (.218" DIAMETER, 5 REQUIRED)
26 STEEL CHECK BALL (.218" DIAMETER, 4 REQUIRED)
27 HARNESS CONNECTOR SUPPORT BRACKET.
28 SPACER PLATE "C" WITH BONDED GASKETS
30 PLASTIC CHECK BALL (.218" DIAMETER, 3 REQUIRED)
31 UPPER VALVE BODY CASTING
32 MODIFIER ACCUMULATOR VALVE TRAIN
33 PRESSURE MODIFIER VALVE TRAIN
34 TCC PRESSURE REGULATOR VALVE TRAIN
35 THROTTLE ACCUMULATOR VALVE "A" VALVE TRAIN
36 ACCUMULATOR CONTROL VALVE "A" VALVE TRAIN
37 HIGH CLUTCH ACCUMULATOR REGULATOR VALVE TRAIN
38 2-4 BRAKE CLUTCH ACCUMULATOR REGULATOR VALVE TRAIN
39 REDUCTION REDUCING VALVE TRAIN
40 REDUCTION TIMING VALVE TRAIN
41 LINE PRESSURE RELIEF BALL AND SPRING
42 PRESSURE REGULATOR VALVE TRAIN
43 2-4 CLUTCH ACCUMULATOR REGULATOR SWITCH VALVE TRAIN
44 ACCUMULATOR CONTROL VALVE "B" VALVE TRAIN
45 HIGH CLUTCH ACCUMULATOR REGULATOR SWITCH VALVE
46 THROTTLE ACCUMULATOR "B" VALVE TRAIN
47 HIGH CLUTCH ACCUMULATOR PISTON AND SPRING
48 LOW CLUTCH ACCUMULATOR PISTON AND SPRING
49 SHIFT VALVE "C" VALVE TRAIN
50 SHIFT VALVE "A" VALVE TRAIN
51 TCC CONTROL VALVE TRAIN
52 NEUTRAL SHIFT VALVE TRAIN
53 MANUAL SHIFT VALVE
54 PILOT VALVE TRAIN
55 ACCUMULATOR SWITCH VALVE TRAIN
56 NEUTRAL CONTROL VALVE TRAIN
57 REVERSE INHIBIT VALVE TRAIN
58 SHIFT VALVE "B" VALVE TRAIN
59 FAILSAFE VALVE TRAIN
60 INTERNAL SOLENOID WIRE HARNESS CLIP
61 INTERNAL SOLENOID WIRE HARNESS CLIP
62 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
63 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
64 VALVE BODY TO CASE BOLT, 90MM LONG *(SILVER IN COLOR)*

Figure 75

JAGUAR SMALL PARTS AND CHECKBALL LOCATIONS

● = Plastic Ball .218" Diameter
⊙ = Steel Ball .218" Diameter

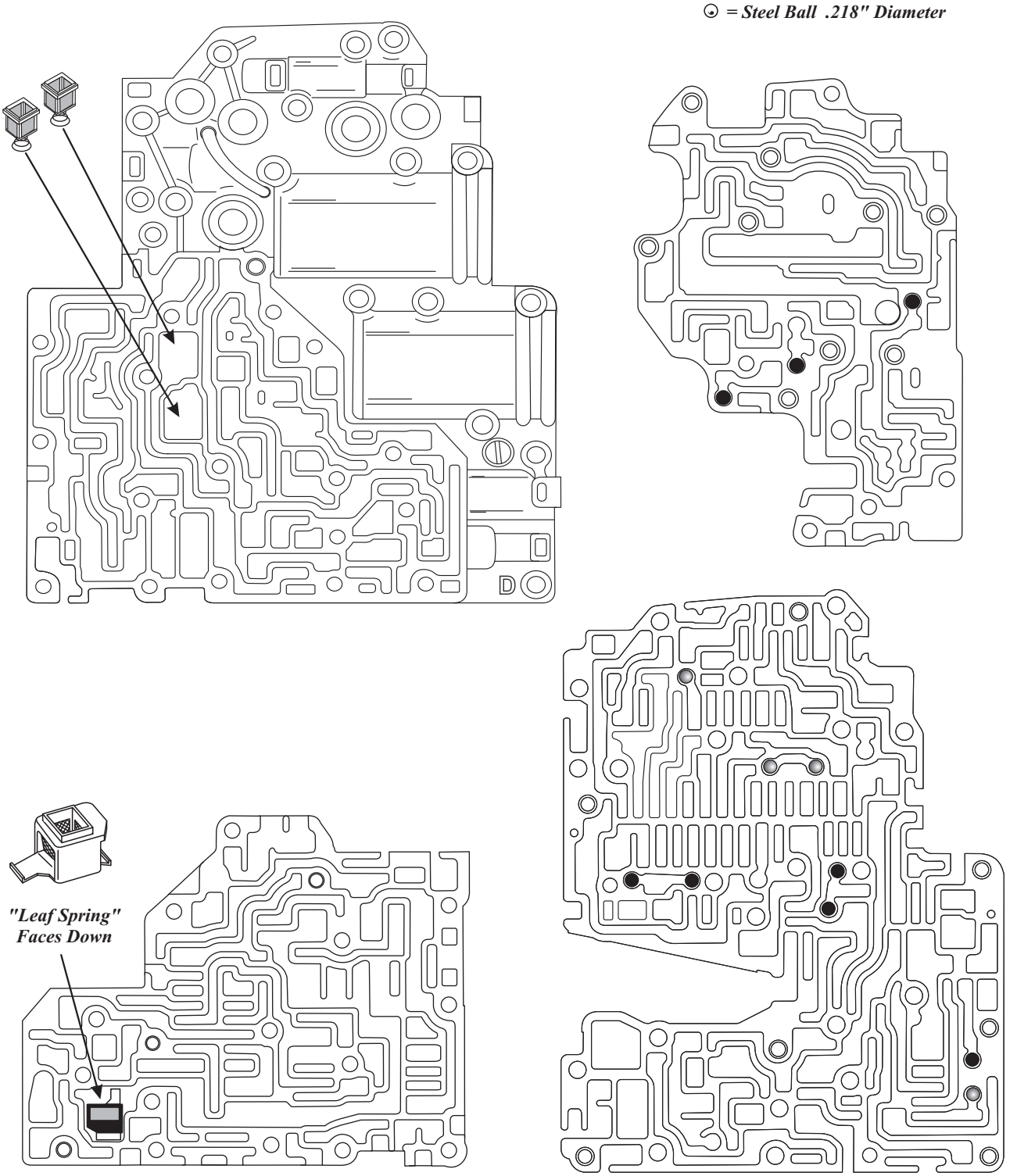
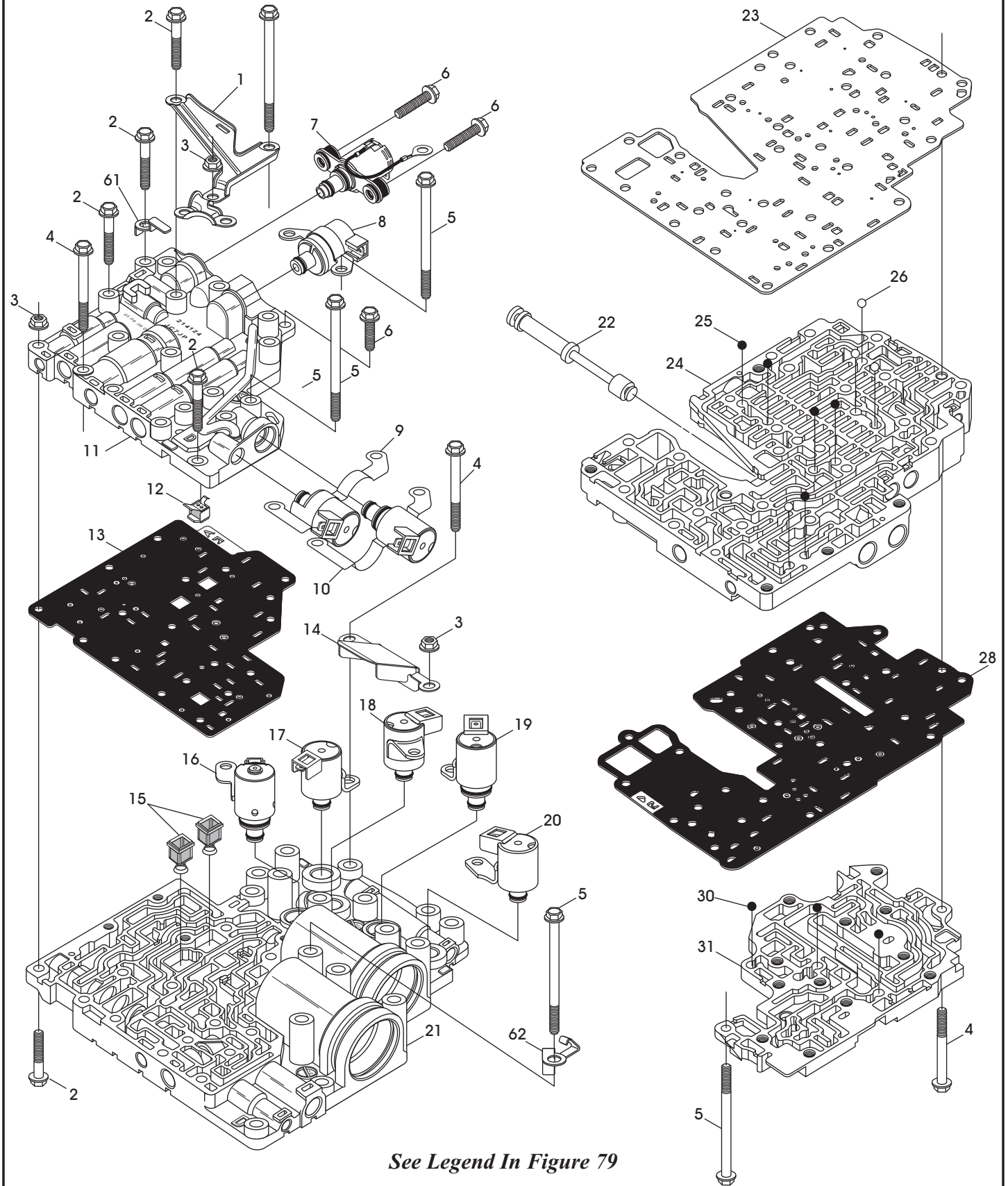


Figure 76

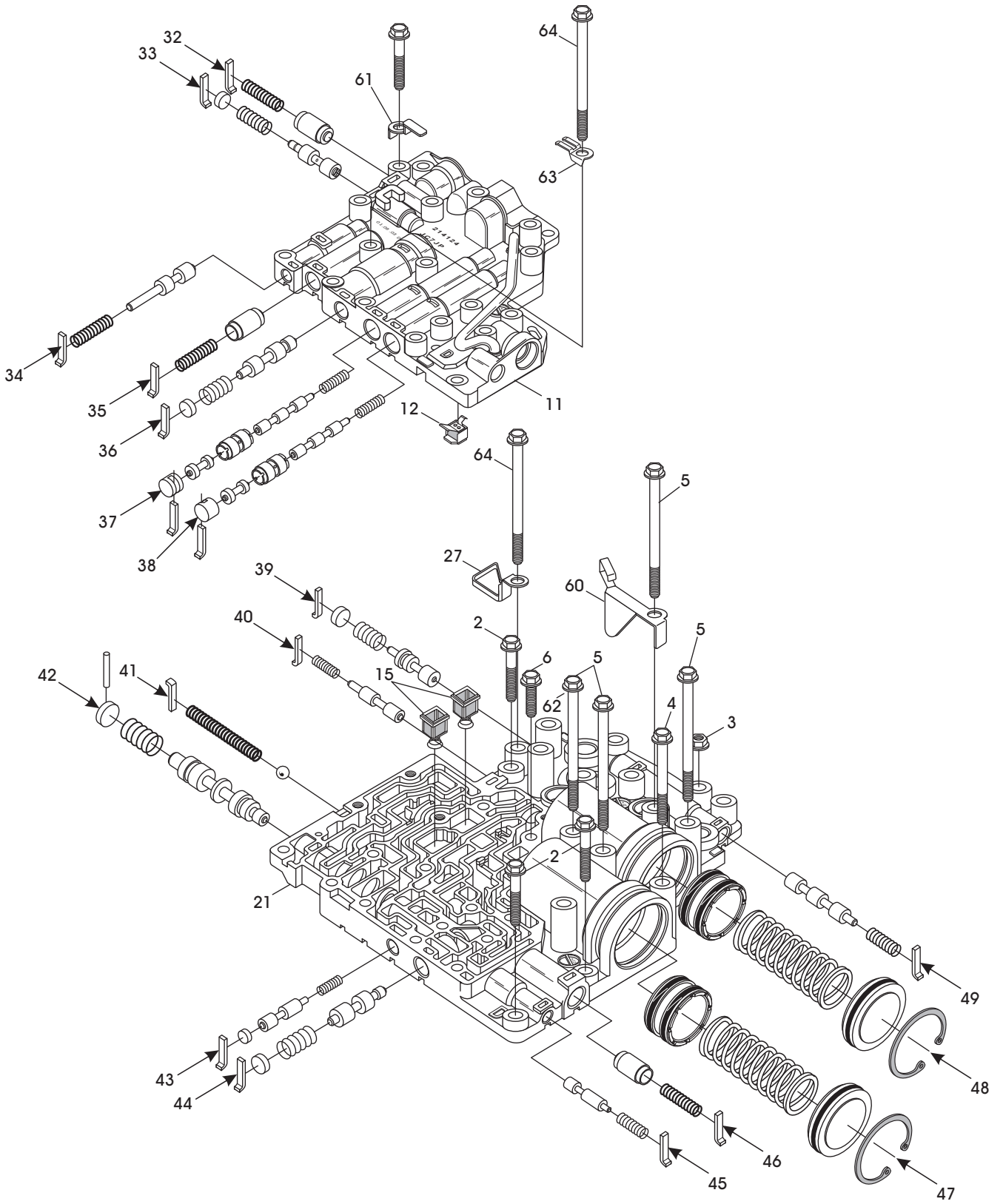
FREELANDER JF506 VALVE BODY EXPLODED VIEW



See Legend In Figure 79

Figure 77

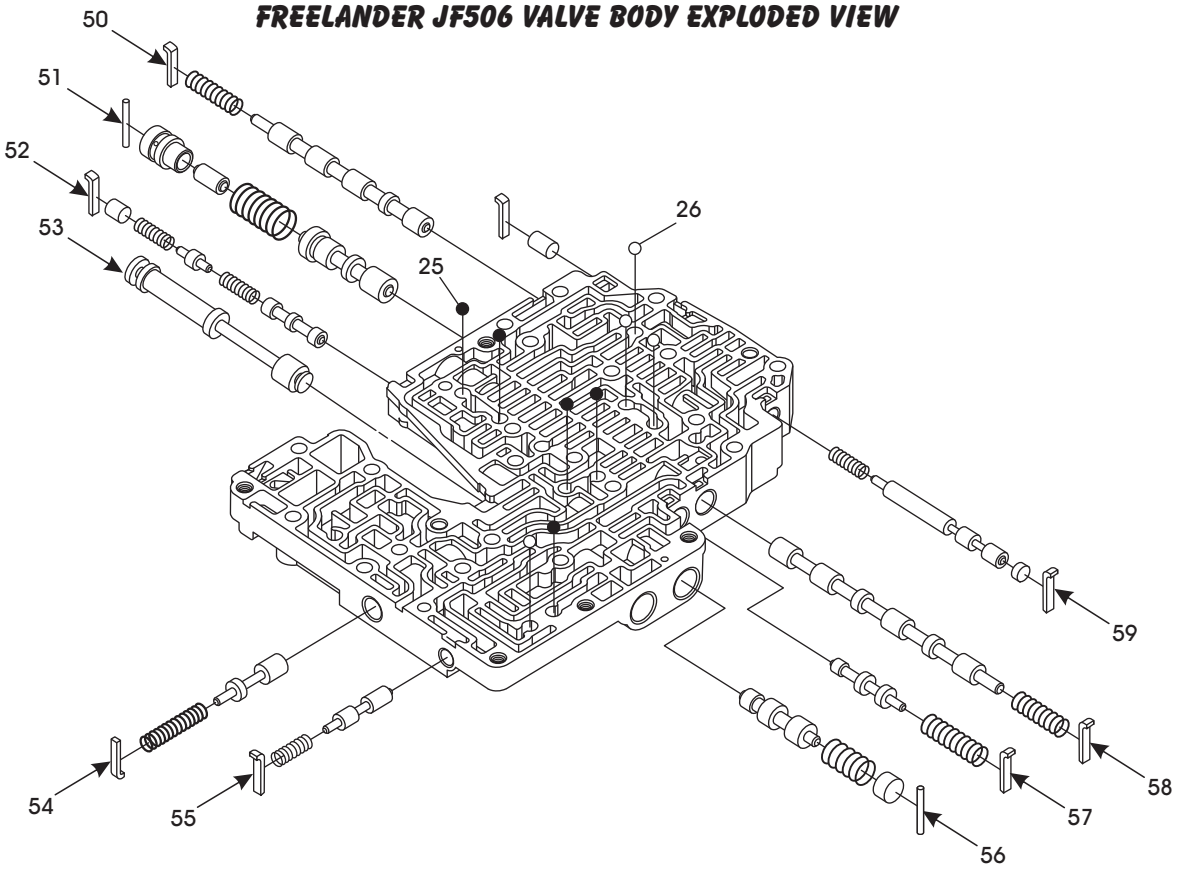
FREELANDER JF506 VALVE BODY EXPLODED VIEW



See Legend In Figure 79

Figure 78

FREELANDER JF506 VALVE BODY EXPLODED VIEW



1 VALVE BODY BRACKET
2 VALVE BODY BOLT, 37MM LENGTH
3 NUT FOR VALVE BODY BOLT FROM BOTTOM
4 VALVE BODY BOLT, 67MM LENGTH
5 VALVE BODY BOLT, 90MM LENGTH
6 VALVE BODY BOLT, 22MM LENGTH
7 LINE PRESSURE SOLENOID (DUTY CYCLE)
8 LOW CLUTCH TIMING SOLENOID (ON/OFF)
9 2-4 BRAKE TIMING SOLENOID (ON/OFF)
10 2-4 BRAKE DUTY SOLENOID (DUTY CYCLE)
11 SUB LOWER VALVE BODY CASTING
12 PILOT FILTER WITH "LEAF" SPRING
13 SPACER PLATE "A" WITH GASKETS
14 OIL BAFFLE
15 COIL SPRING LOADED FILTERS (2 REQUIRED)
16 TCC SOLENOID (DUTY CYCLE)
17 SHIFT SOLENOID "A" (ON/OFF)
18 REDUCTION TIMING SOLENOID (ON/OFF)
19 SHIFT SOLENOID "B" (ON/OFF)
20 SHIFT SOLENOID "C" (ON/OFF)
21 LOWER VALVE BODY CASTING
22 MANUAL SHIFT VALVE
23 SPACER PLATE "B" (NO GASKETS)
24 INTERNAL VALVE BODY CASTING
25 PLASTIC CHECK BALL (.218" DIAMETER, 5 REQUIRED)
26 STEEL CHECK BALL (.218" DIAMETER, 4 REQUIRED)
27 HARNESS CONNECTOR SUPPORT BRACKET.
28 SPACER PLATE "C" WITH BONDED GASKETS
30 PLASTIC CHECK BALL (.218" DIAMETER, 3 REQUIRED)
31 UPPER VALVE BODY CASTING
32 MODIFIER ACCUMULATOR VALVE TRAIN
33 PRESSURE MODIFIER VALVE TRAIN
34 TCC PRESSURE REGULATOR VALVE TRAIN
35 THROTTLE ACCUMULATOR VALVE "A" VALVE TRAIN
36 ACCUMULATOR CONTROL VALVE "A" VALVE TRAIN
37 HIGH CLUTCH ACCUMULATOR REGULATOR VALVE TRAIN
38 2-4 BRAKE CLUTCH ACCUMULATOR REGULATOR VALVE TRAIN
39 REDUCTION REDUCING VALVE TRAIN
40 REDUCTION TIMING VALVE TRAIN
41 LINE PRESSURE RELIEF BALL AND SPRING
42 PRESSURE REGULATOR VALVE TRAIN
43 2-4 CLUTCH ACCUMULATOR REGULATOR SWITCH VALVE TRAIN
44 ACCUMULATOR CONTROL VALVE "B" VALVE TRAIN
45 HIGH CLUTCH ACCUMULATOR REGULATOR SWITCH VALVE
46 THROTTLE ACCUMULATOR "B" VALVE TRAIN
47 HIGH CLUTCH ACCUMULATOR PISTON AND SPRING
48 LOW CLUTCH ACCUMULATOR PISTON AND SPRING
49 SHIFT VALVE "C" VALVE TRAIN
50 SHIFT VALVE "A" VALVE TRAIN
51 TCC CONTROL VALVE TRAIN
52 NEUTRAL SHIFT VALVE TRAIN
53 MANUAL SHIFT VALVE
54 PILOT VALVE TRAIN
55 ACCUMULATOR SWITCH VALVE TRAIN
56 NEUTRAL CONTROL VALVE TRAIN
57 REVERSE INHIBIT VALVE TRAIN
58 SHIFT VALVE "B" VALVE TRAIN
59 FAILSAFE VALVE TRAIN
60 INTERNAL SOLENOID WIRE HARNESS CLIP
61 INTERNAL SOLENOID WIRE HARNESS CLIP
62 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
63 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
64 VALVE BODY TO CASE BOLT, 90MM LONG *(SILVER IN COLOR)*

Figure 79

FREELANDER SMALL PARTS AND CHECKBALL LOCATIONS

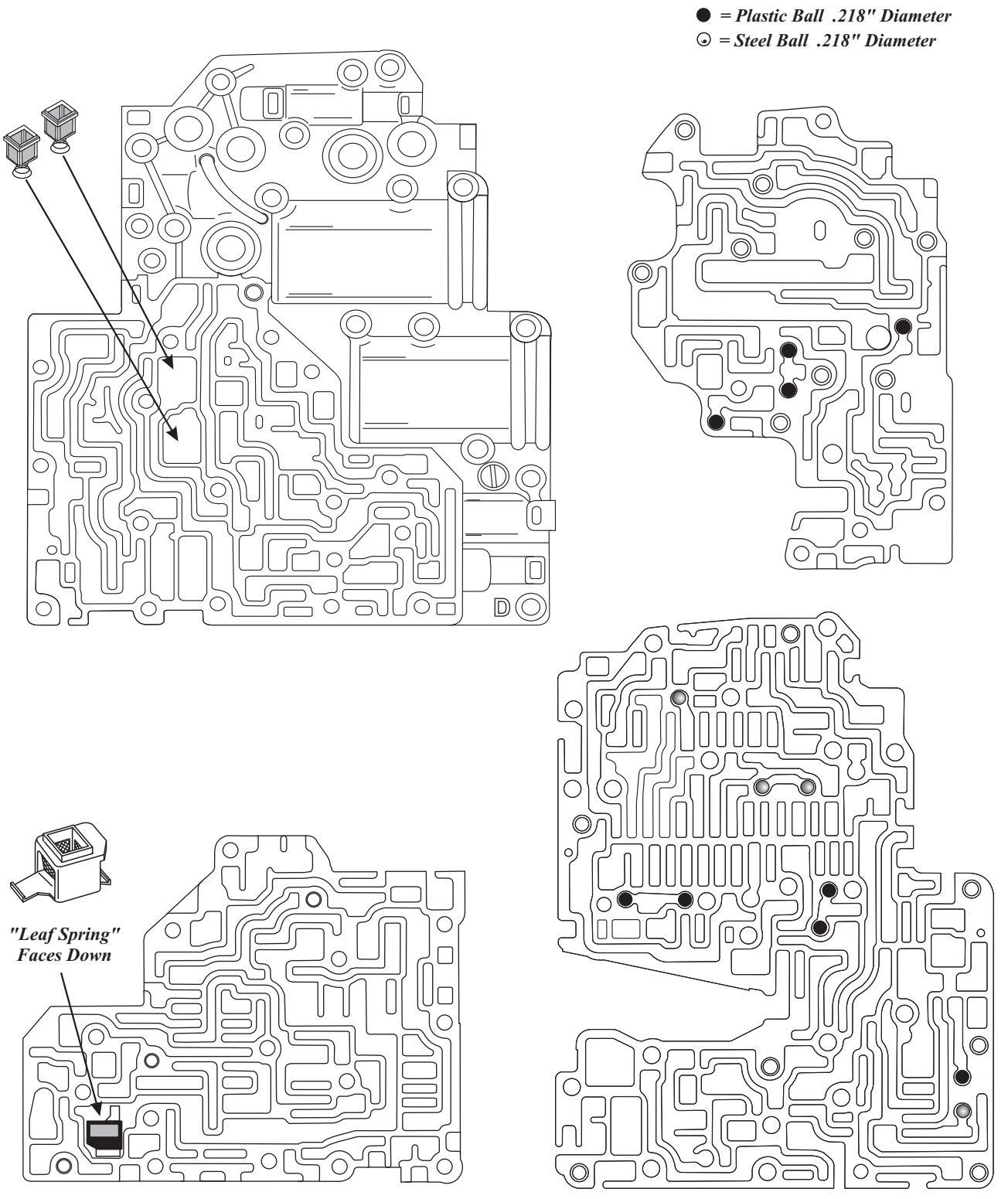


Figure 80

SPACER PLATE DIFFERENCES

The spacer plates in the JF506E units are very similar, but they will not ***all*** interchange. You ***must*** pay attention to the codes that are stamped into the spacer plates. Some are enough different that they would only affect calibration concerns, but others would affect transaxle operation.

Spacer Plate "A"

Spacer Plate "A" is the smallest of the three, uses bonded gaskets, and is illustrated in Figure 81. Spacer Plate "A" goes between the lower valve body and the sub lower valve body. Volkswagen, Jaguar and Freelander all use the same plate, as shown in Figure 81. The Mazda plate is different and will work only with Mazda valve bodies. Pay close attention to the codes that are stamped into the plates, as shown in Figure 81, as they ***will not*** interchange.

Spacer Plate "B"

Spacer Plate "B" is the largest of the three, uses no gaskets, and is illustrated in Figure 82. Spacer plate "B" goes between the lower valve body and the internal valve body, and is the one that can get you in the most trouble. The manufacturer has made them very easy to identify, as shown in Figure 82. The Mazda uses the "A" plate, Volkswagen uses the "K" plate, Jaguar uses the "J" plate, and Freelander uses the "F" plate. Pay attention to the codes, as these spacer plates ***will not*** interchange between the models.

Spacer Plate "C"

Spacer Plate "C" is the mid-size of the three, uses bonded gaskets, and is illustrated in Figure 83. Spacer plate "C" goes between the upper valve body and the internal valve body. The manufacturer has made them very easy to identify, as shown in Figure 83, with the codes stamped into the plates. These spacer plates ***will not*** interchange between the models, with the exception of the Jaguar and Freelander.

SPACER PLATE "A" IDENTIFICATION

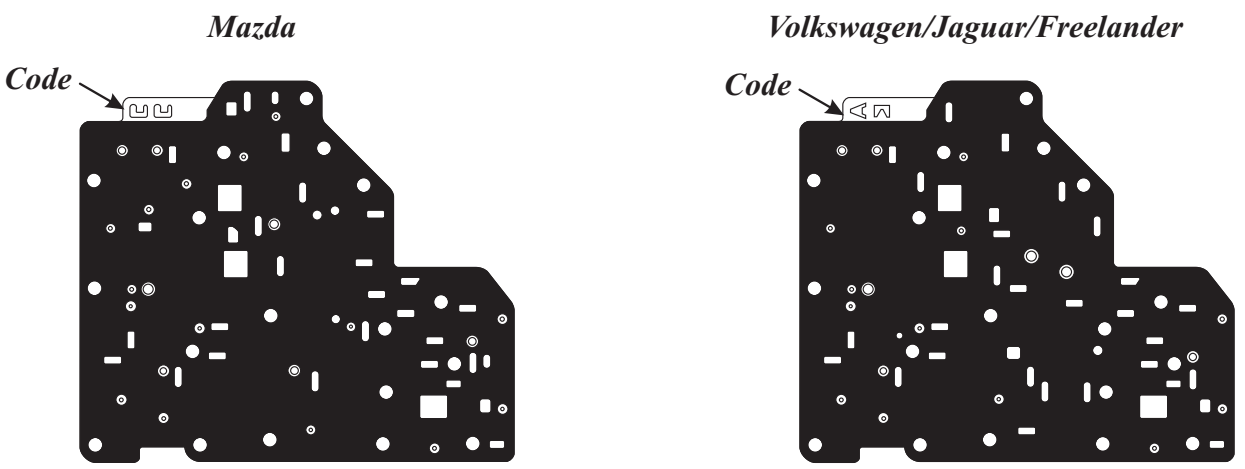


Figure 81

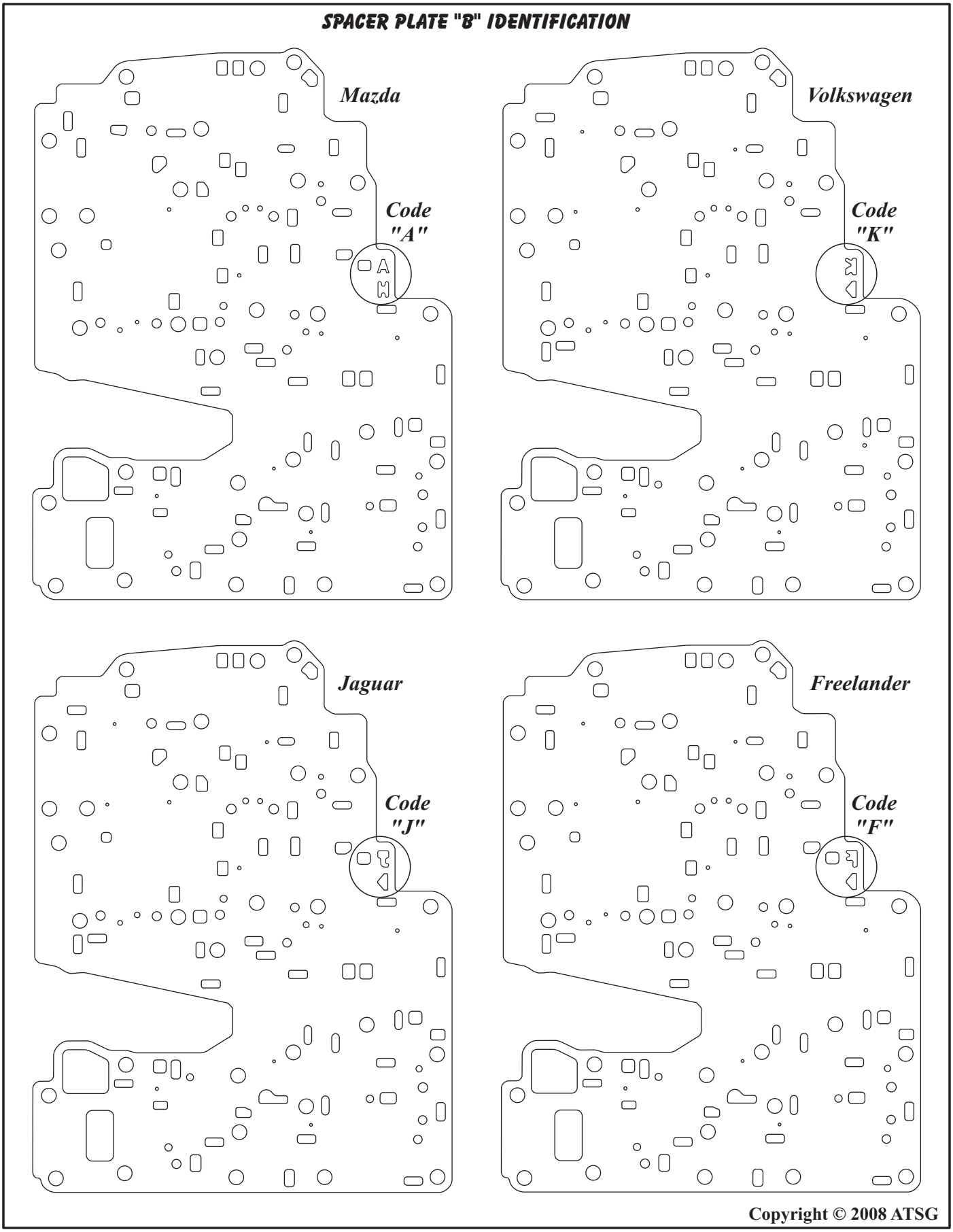

SPACER PLATE "B" IDENTIFICATION
Mazda
Code "A"
A M
Volkswagen
Code "K"
Jaguar
Code "J"
Freelander
Code "F"
Copyright © 2008 ATSG

Figure 82

SPACER PLATE "C" IDENTIFICATION

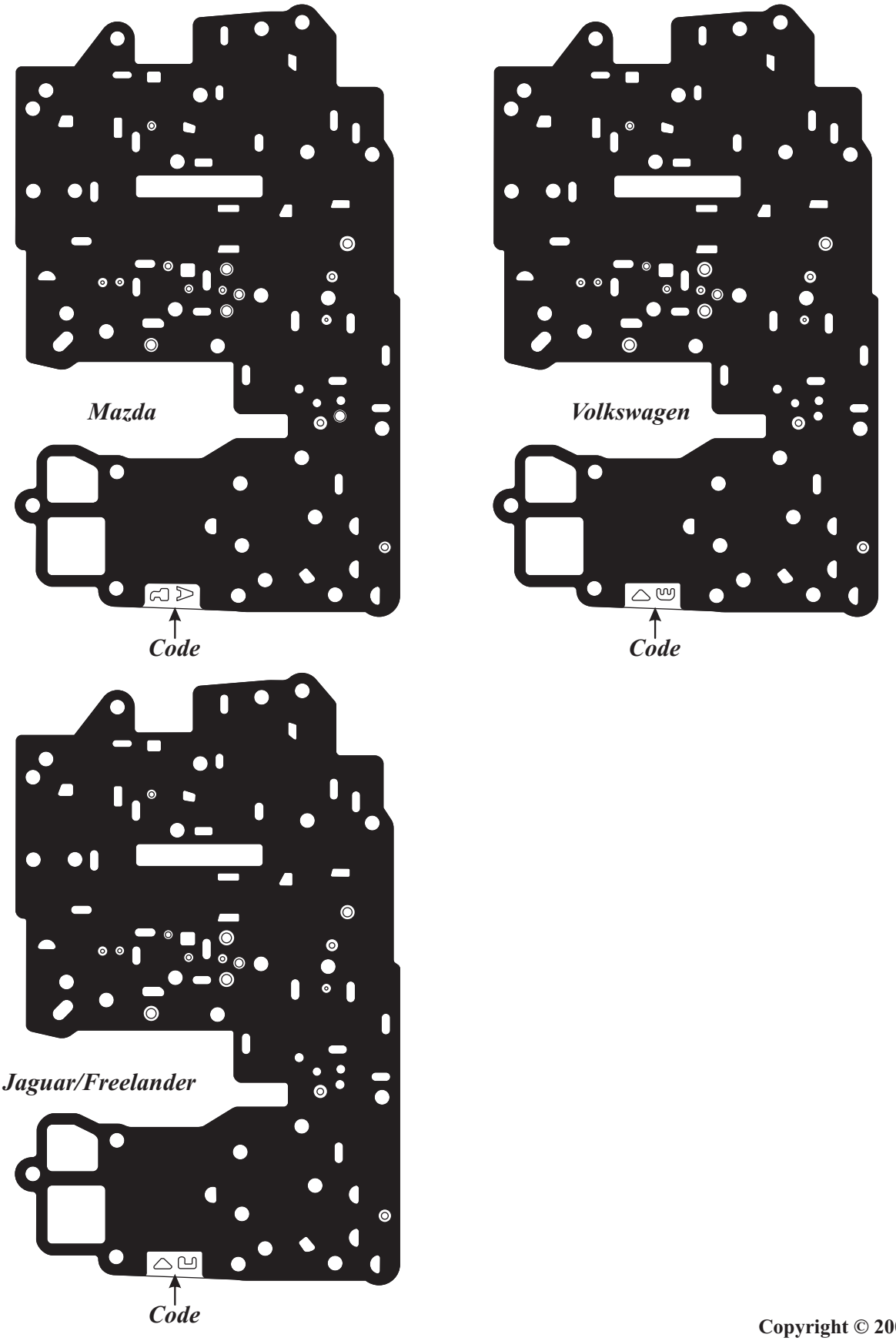


Figure 83

VALVE BODY CASTING IDENTIFICATION

Sub Lower Valve Body

The Sub Lower Valve Body has different worm tracks, one uses a tube and one does not, and the mount for the solenoids is different, as shown in Figure 84. The easiest identification is the "F" cast into the Mazda valve body, and the "D" cast into the Volkswagen, Jaguar and Freelander valve body, as shown in Figure 84.

Lower Valve Body

The Lower Valve Body has different worm tracks, one uses a flat screen and one does not, as shown in Figure 84. The easiest identification is the "F" cast into the Mazda valve body, and the "D" cast into the Volkswagen, Jaguar and Freelander valve body, as shown in Figure 84.

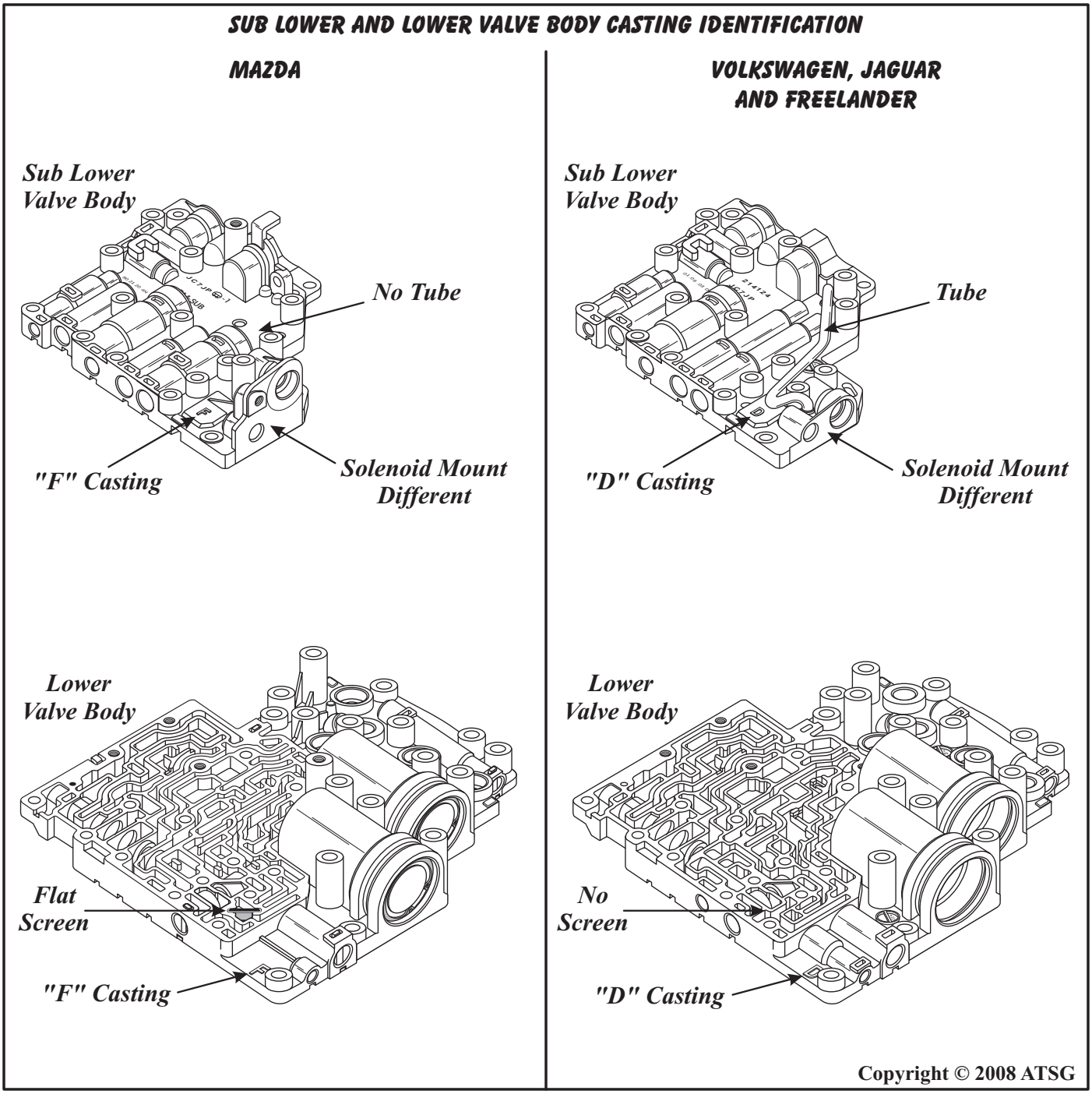


Figure 84

VALVE BODY CASTING IDENTIFICATION (CONT'D)

Internal Valve Body

The Internal Valve Body has different worm tracks, one uses a flat screen and one does not, as shown in Figure 85. We have also high-lighted for you, the worm tracks that are different, also shown in Figure 85.

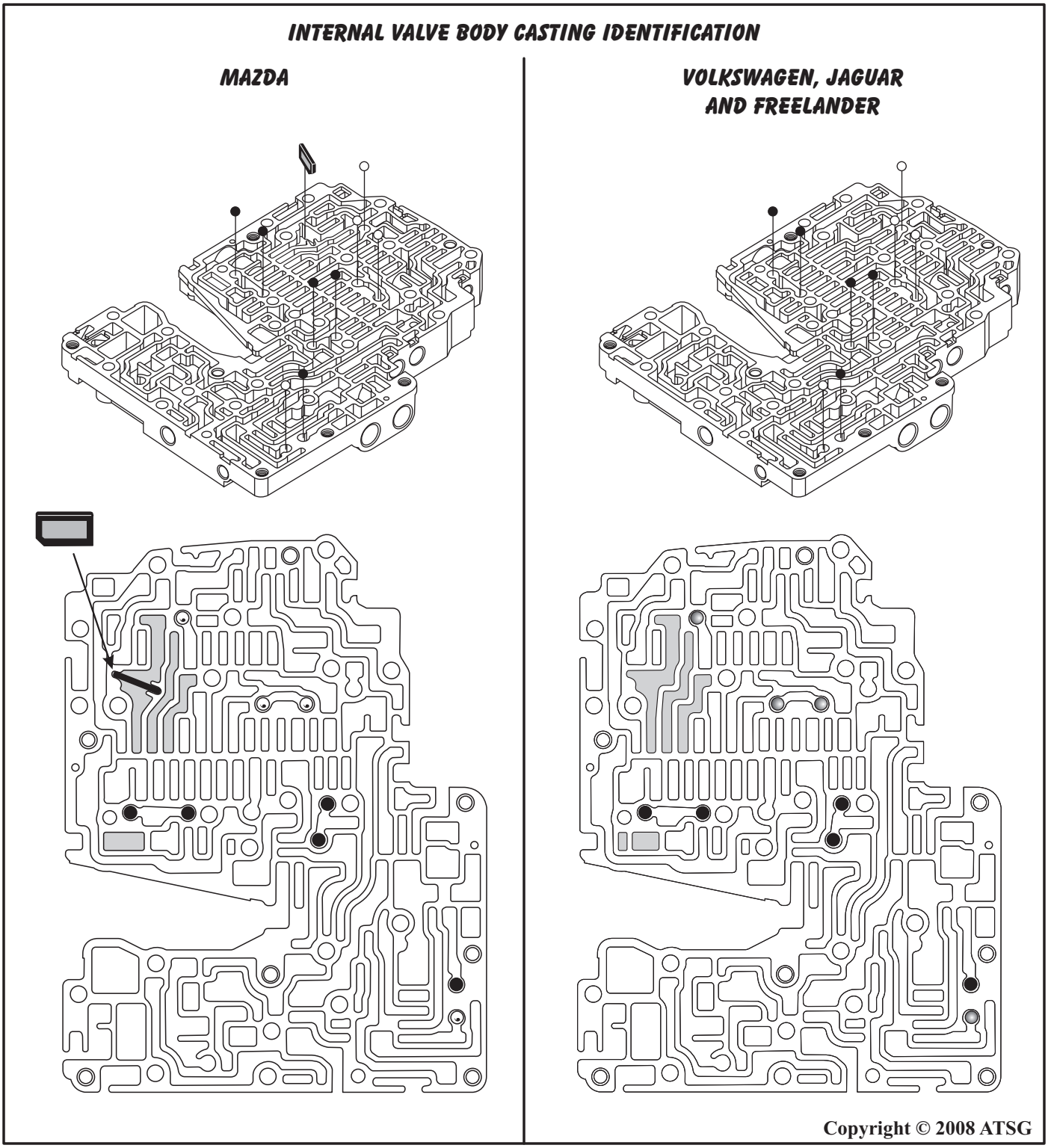


Figure 85

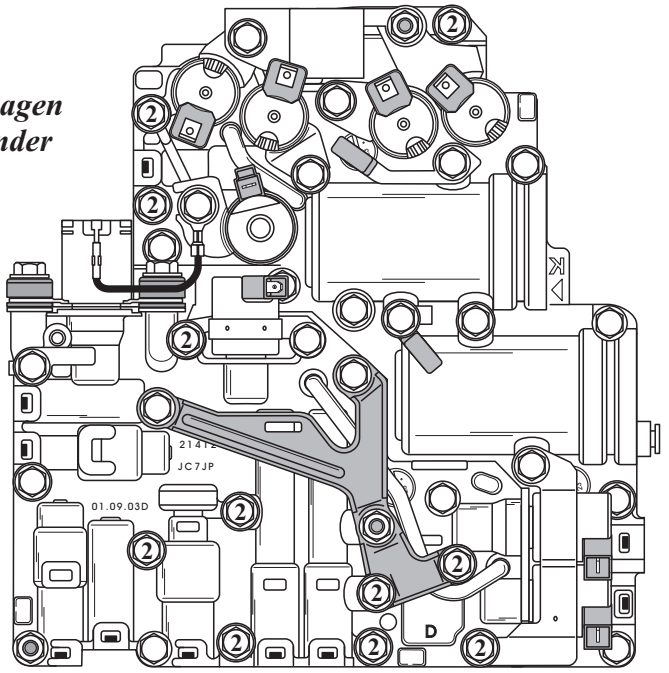
VALVE BODY TO CASE BOLT LOCATIONS

Valve body to case retaining bolt locations are shown in Figure 86, for all models. The valve body to case bolts are Silver in color, all others are Gold.

FREELANDER VALVE BODY ASSEMBLY

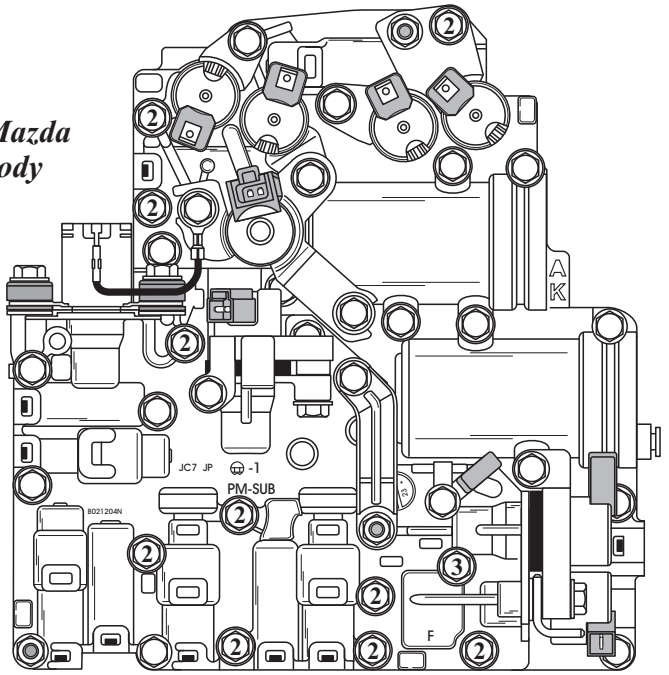
The following Pages will begin the valve body assembly process for the Freelander. All others are very similar.

JF506E Volkswagen
Jaguar, Freelander
Valve Body



2. VALVE BODY TO CASE BOLT, 90MM LONG (SILVER IN COLOR)
ELEVEN 90MM LONG BOLTS REQUIRED

JF506E Mazda
Valve Body



2. VALVE BODY TO CASE BOLT, 90MM LONG (SILVER IN COLOR)
TEN 90MM LONG BOLTS REQUIRED
3. VALVE BODY TO CASE BOLT, 106MM LONG (SILVER IN COLOR)
ONE 106MM LONG BOLT REQUIRED

Figure 86

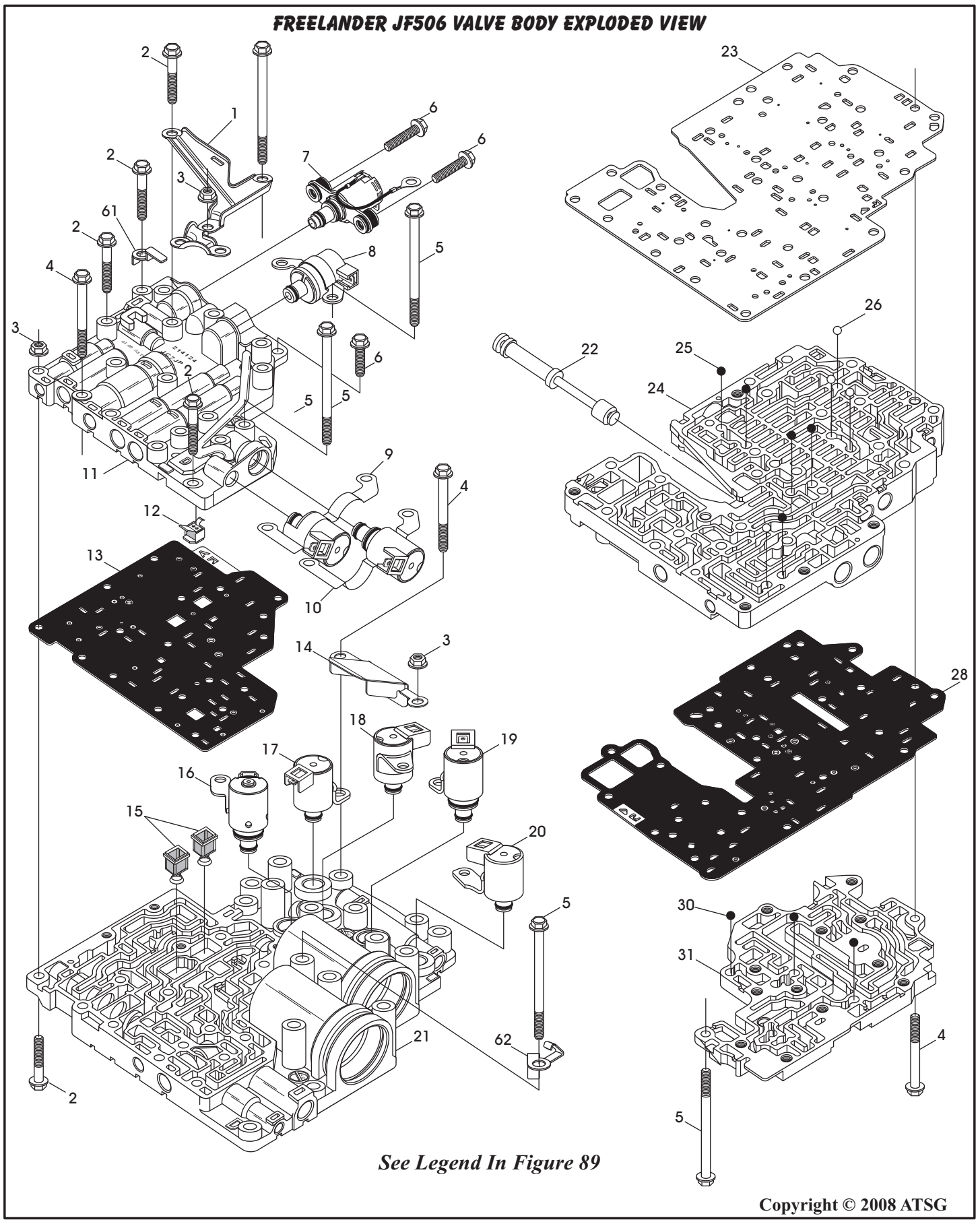

FREELANDER JF506 VALVE BODY EXPLODED VIEW
See Legend In Figure 89
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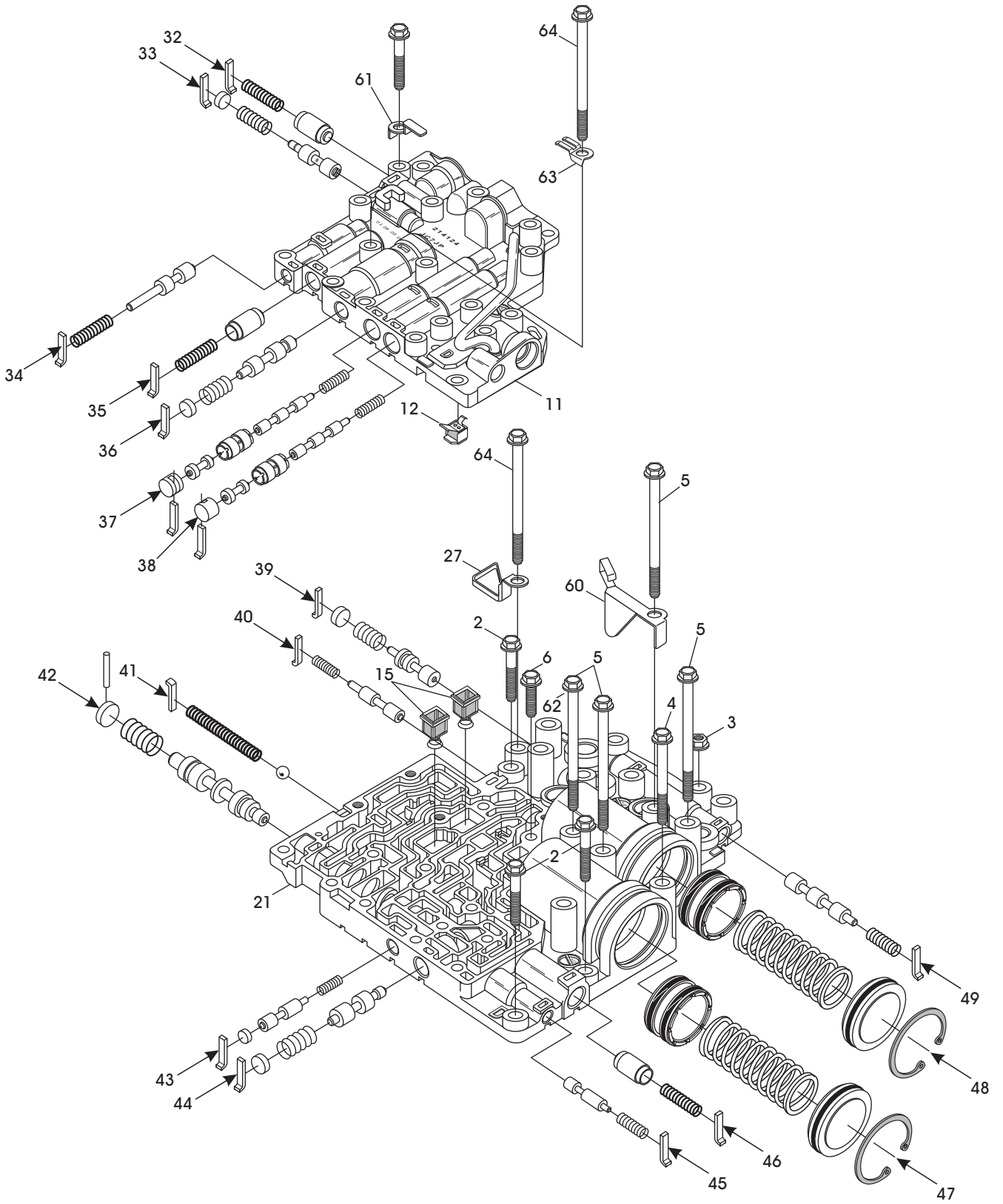
Figure 87

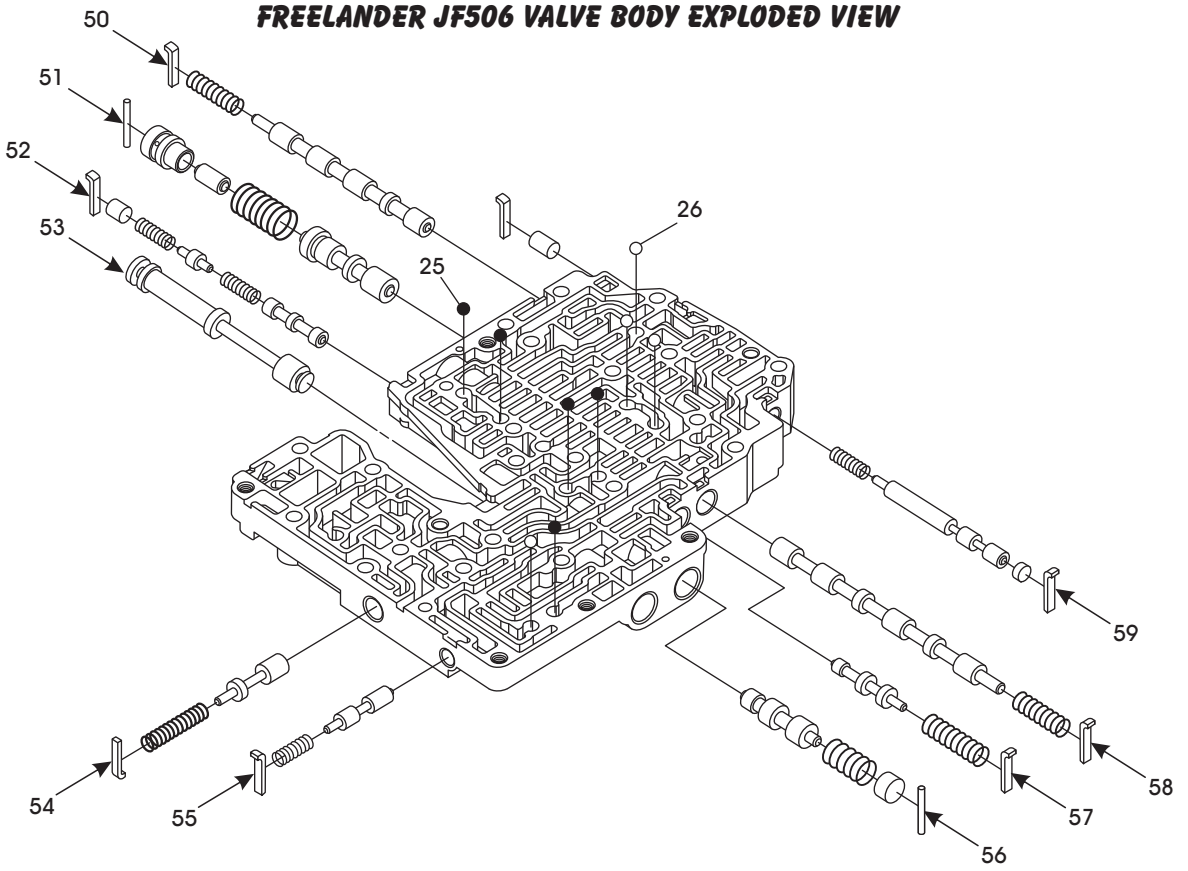
FREELANDER JF506 VALVE BODY EXPLODED VIEW



See Legend In Figure 89

Figure 88

FREELANDER JF506 VALVE BODY EXPLODED VIEW



1 VALVE BODY BRACKET
2 VALVE BODY BOLT, 37MM LENGTH
3 NUT FOR VALVE BODY BOLT FROM BOTTOM
4 VALVE BODY BOLT, 67MM LENGTH
5 VALVE BODY BOLT, 90MM LENGTH
6 VALVE BODY BOLT, 22MM LENGTH
7 LINE PRESSURE SOLENOID (DUTY CYCLE)
8 LOW CLUTCH TIMING SOLENOID (ON/OFF)
9 2-4 BRAKE TIMING SOLENOID (ON/OFF)
10 2-4 BRAKE DUTY SOLENOID (DUTY CYCLE)
11 SUB LOWER VALVE BODY CASTING
12 PILOT FILTER WITH "LEAF" SPRING
13 SPACER PLATE "A" WITH GASKETS
14 OIL BAFFLE
15 COIL SPRING LOADED FILTERS (2 REQUIRED)
16 TCC SOLENOID (DUTY CYCLE)
17 SHIFT SOLENOID "A" (ON/OFF)
18 REDUCTION TIMING SOLENOID (ON/OFF)
19 SHIFT SOLENOID "B" (ON/OFF)
20 SHIFT SOLENOID "C" (ON/OFF)
21 LOWER VALVE BODY CASTING
22 MANUAL SHIFT VALVE
23 SPACER PLATE "B" (NO GASKETS)
24 INTERNAL VALVE BODY CASTING
25 PLASTIC CHECK BALL (.218" DIAMETER, 5 REQUIRED)
26 STEEL CHECK BALL (.218" DIAMETER, 4 REQUIRED)
27 HARNESS CONNECTOR SUPPORT BRACKET.
28 SPACER PLATE "C" WITH BONDED GASKETS
30 PLASTIC CHECK BALL (.218" DIAMETER, 3 REQUIRED)
31 UPPER VALVE BODY CASTING
32 MODIFIER ACCUMULATOR VALVE TRAIN
33 PRESSURE MODIFIER VALVE TRAIN
34 TCC PRESSURE REGULATOR VALVE TRAIN
35 THROTTLE ACCUMULATOR VALVE "A" VALVE TRAIN
36 ACCUMULATOR CONTROL VALVE "A" VALVE TRAIN
37 HIGH CLUTCH ACCUMULATOR REGULATOR VALVE TRAIN
38 2-4 BRAKE CLUTCH ACCUMULATOR REGULATOR VALVE TRAIN
39 REDUCTION REDUCING VALVE TRAIN
40 REDUCTION TIMING VALVE TRAIN
41 LINE PRESSURE RELIEF BALL AND SPRING
42 PRESSURE REGULATOR VALVE TRAIN
43 2-4 CLUTCH ACCUMULATOR REGULATOR SWITCH VALVE TRAIN
44 ACCUMULATOR CONTROL VALVE "B" VALVE TRAIN
45 HIGH CLUTCH ACCUMULATOR REGULATOR SWITCH VALVE
46 THROTTLE ACCUMULATOR "B" VALVE TRAIN
47 HIGH CLUTCH ACCUMULATOR PISTON AND SPRING
48 LOW CLUTCH ACCUMULATOR PISTON AND SPRING
49 SHIFT VALVE "C" VALVE TRAIN
50 SHIFT VALVE "A" VALVE TRAIN
51 TCC CONTROL VALVE TRAIN
52 NEUTRAL SHIFT VALVE TRAIN
53 MANUAL SHIFT VALVE
54 PILOT VALVE TRAIN
55 ACCUMULATOR SWITCH VALVE TRAIN
56 NEUTRAL CONTROL VALVE TRAIN
57 REVERSE INHIBIT VALVE TRAIN
58 SHIFT VALVE "B" VALVE TRAIN
59 FAILSAFE VALVE TRAIN
60 INTERNAL SOLENOID WIRE HARNESS CLIP
61 INTERNAL SOLENOID WIRE HARNESS CLIP
62 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
63 INTERNAL SPEED SENSOR WIRE HARNESS CLIP
64 VALVE BODY TO CASE BOLT, 90MM LONG *(SILVER IN COLOR)*

Figure 89

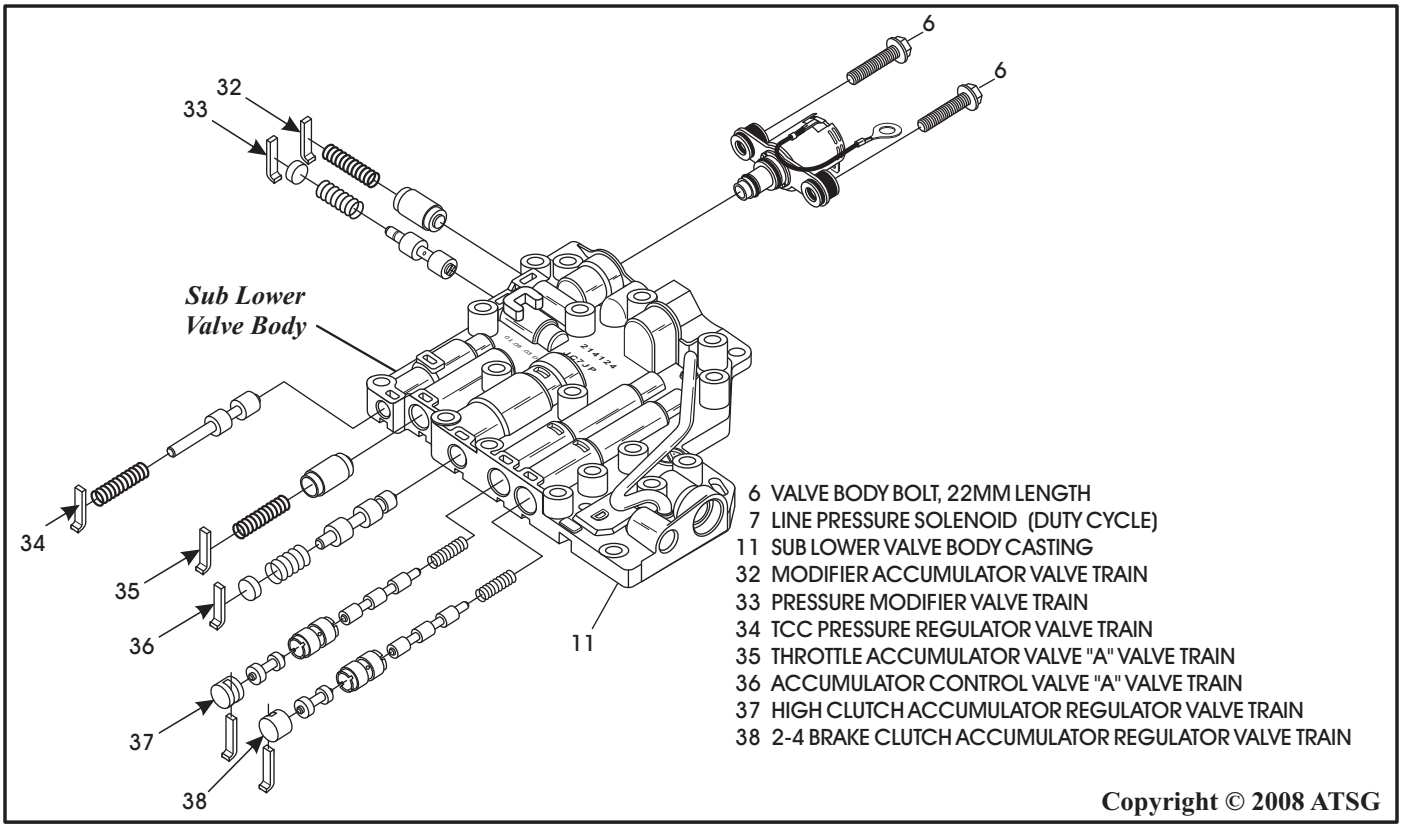


Figure 90

FREELANDER VALVE BODY ASSEMBLY

The following procedure is dedicated to the Land Rover, Freelander valve body, but all other valve bodies are very similar and the same procedure can be used, as long as correct spacer plates are used.

There are two different colors of valve body bolts, Silver and Gold. Silver in color bolts are the valve body to case bolts. Gold in color, all other locations.

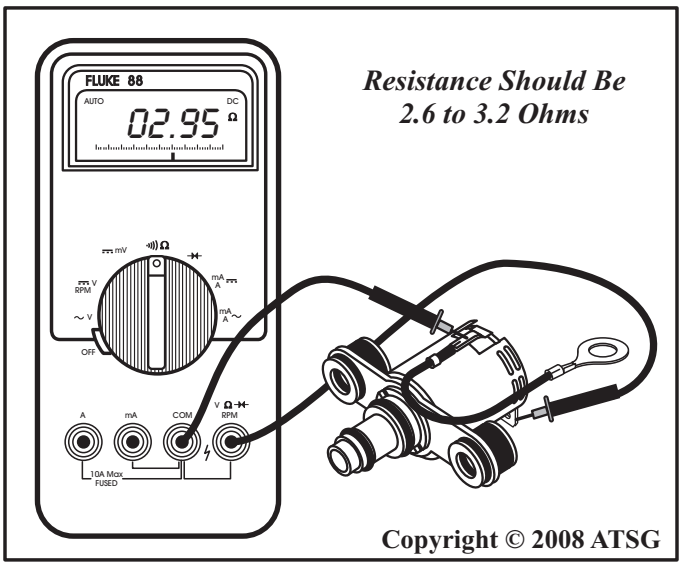


Figure 91

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

1. Disassemble the valve body assembly using Figure 87 as a guide.
   Note: Tag the High and Low Accumulator piston springs as you remove them, as there are different calibrations, and no information available for identification.
2. Clean valve body component parts thoroughly and dry with compressed air.
3. Starting with the sub lower valve body, shown in Figure 90, disassemble and place the valves, springs, bore plugs and retainers in appropriate trays exactly as they were removed.
4. Clean sub lower valve body parts thoroughly and dry with compressed air.
5. Assemble sub lower valve body parts ***exactly*** as shown in Figure 90, and lube with ATF as they are installed.
   Note: Install the retainers exactly as shown in Figure 90, as they install in different directions through out the valve body.

Continued on Page 72

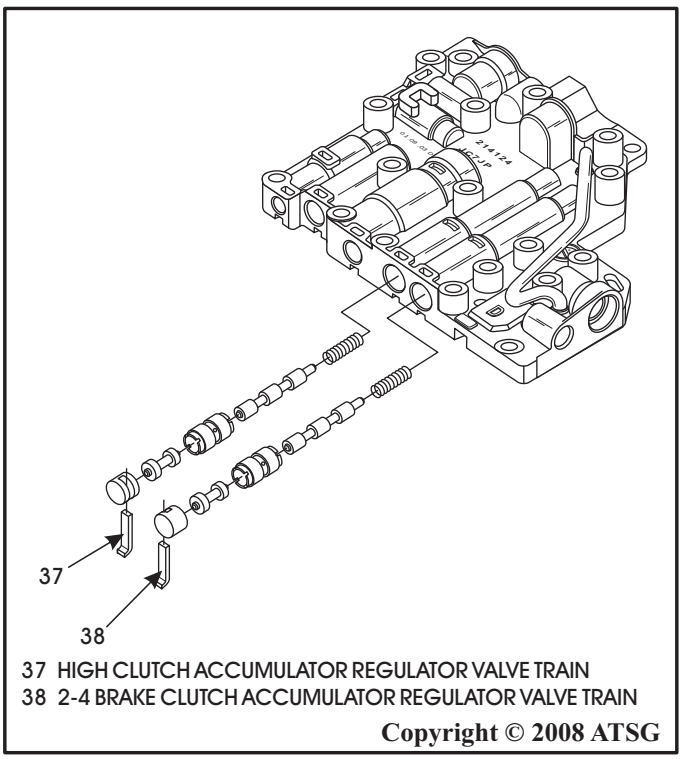


Figure 92

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

Special Caution:

6. Bore numbers 37 and 38, shown in Figure 92, are ***almost*** identical, when inspecting visually, but the diameter of the valves inside of the sleeves are different. The valve lands are also different diameters on the same valve. Refer to Figure 93 and 94 for the valve diameters and identification grooves.
7. The sleeves both have the same O.D. which means they will not interchange, even though they fit in the bore. The sleeve from bore No. 37 has I.D. groove in the outside diameter of lugs, as shown in Figure 93, and this sleeve along with the proper valve must go in bore number 37, and the same for bore number 38.
8. The valve can also be installed into the sleeve backwards. It goes into the sleeve small end first, and then the assembly gets installed with the I.D. groove on sleeve facing out.
9. Refer to Figure 93 and 94, and use extra care when installing the valve trains into bore No. 37 and 38.

Note: These two valve trains are identical on the VW, Jaguar, and Freelander transaxles. All 3 have the same I.D. grooves as shown.

Continued on Page 73

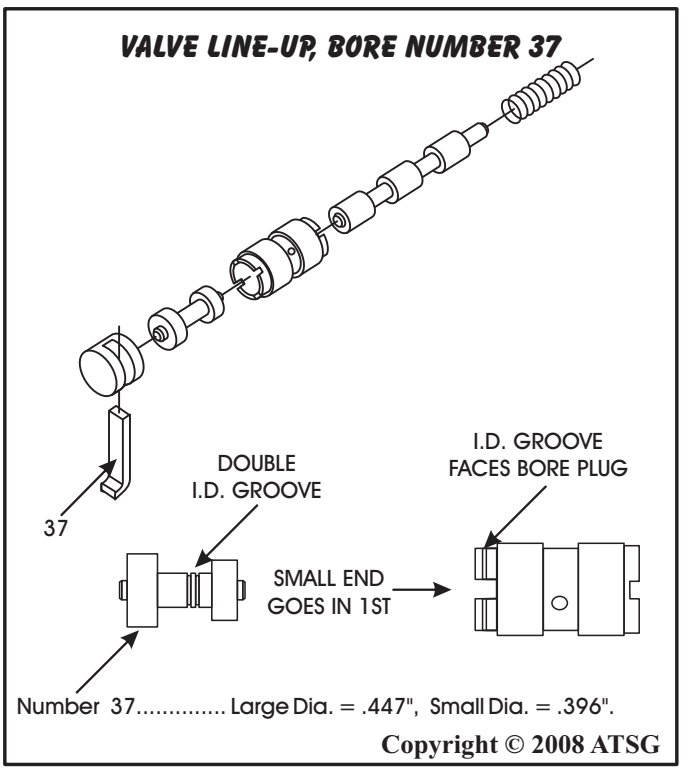


Figure 93

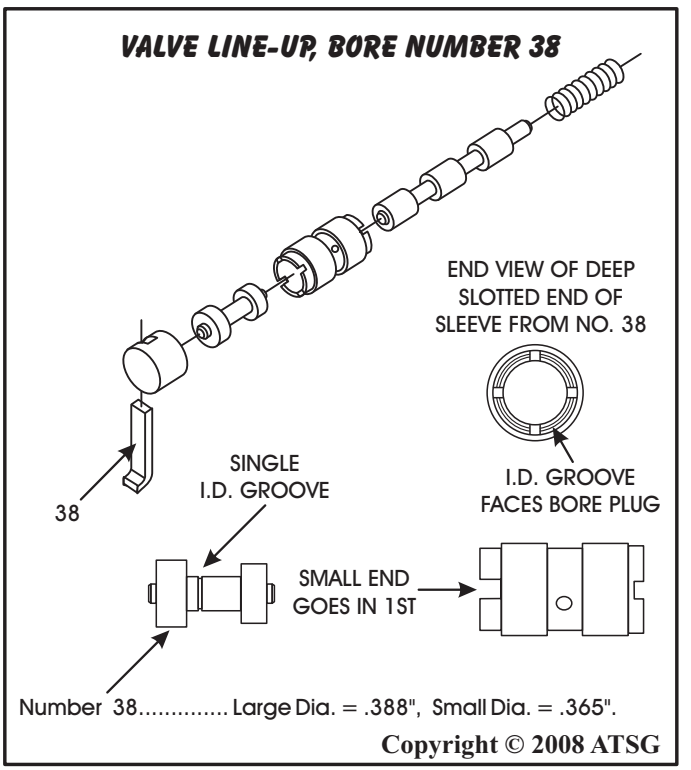


Figure 94

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

10. Check the line pressure solenoid for the proper resistance, as shown in Figure 91.
11. Install new "O" rings, lube with ATF and install ***only*** the pressure control solenoid, as shown in Figure 90. Torque bolts to 10 N·m (88 in.lb).

COMPLETED SUB LOWER VALVE BODY ASSEMBLY

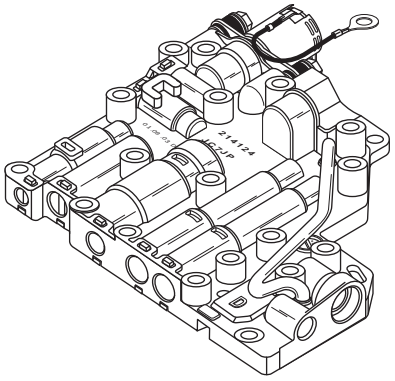


Figure 95

12. Set completed sub lower valve body assembly aside for final valve body assembly, as shown in Figure 95.
13. Disassemble the lower valve body, as shown in Figure 96, and place the valves, bore plugs and retainers in appropriate trays exactly as they were removed.
14. Clean lower valve body parts thoroughly and dry with compressed air.
15. Assemble lower valve body parts ***exactly*** as they are shown in Figure 96, and lube with ATF as they are installed.
    Note: Install the retainers exactly as shown in Figure 96, as they install in different directions through out the valve body.

Continued on Page 74

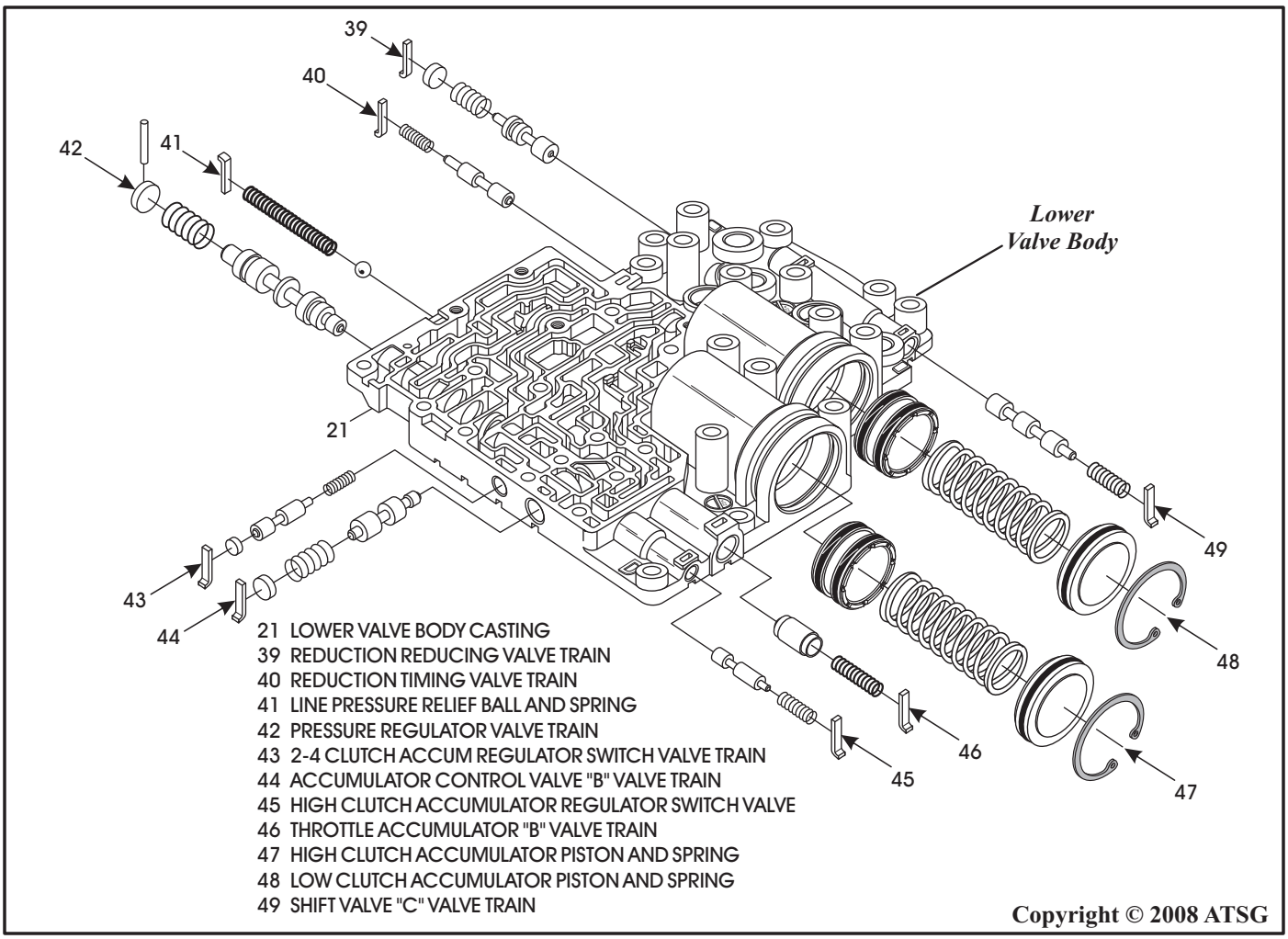


Figure 96

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

16. Install two new scarf-cut seal rings on both the high and the low clutch accumulator pistons, as shown in Figure 97, and ensure the scarf-cut is configured properly.
17. Lubricate both pistons and seals with a small amount of ATF and install them into the bores, as shown in Figure 96.
18. Install new "O" ring on both the high and the low clutch accumulator covers, as shown in Figure 97, and lube with small amount of ATF.
19. Install both high and low clutch accumulator springs, that were previously labeled, in their proper positions as shown in Figure 96.
20. Install high clutch accumulator cover, using care so as not to damage the "O" ring.
21. Compress the cover and install the snap ring shown in Figure 96.
22. Install low clutch accumulator cover, using care so as not to damage the "O" ring.
23. Compress the cover and install the snap ring shown in Figure 96.
24. Set the completed lower valve body aside for the final valve body assembly process.

Continued on Page 75

COMPLETED LOWER VALVE BODY ASSEMBLY

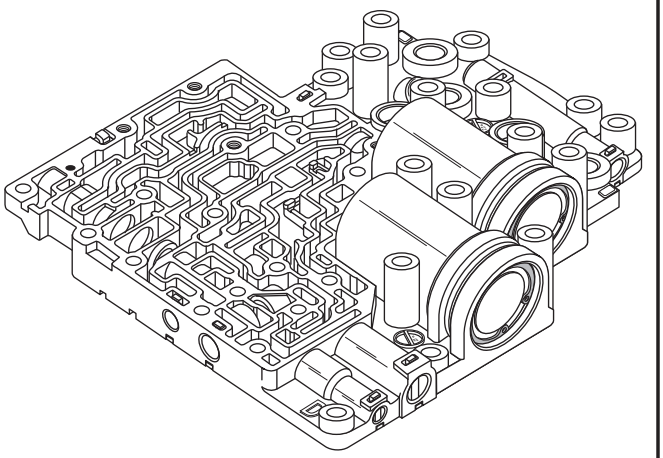


Figure 98

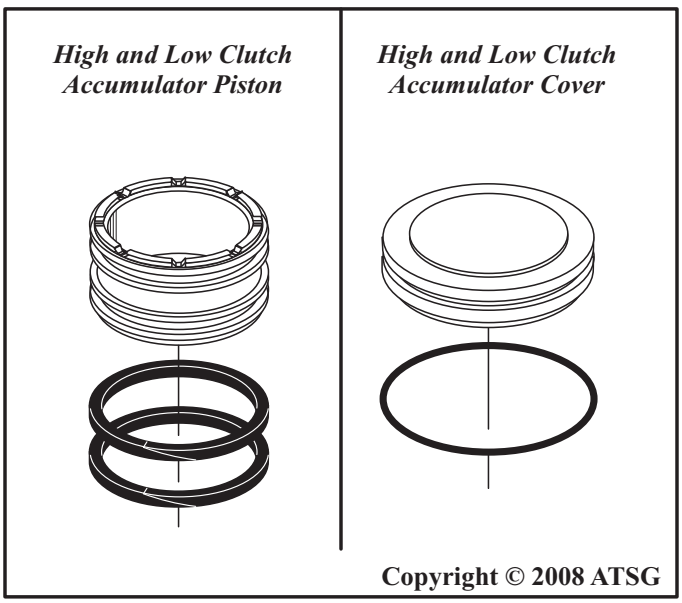


Figure 97

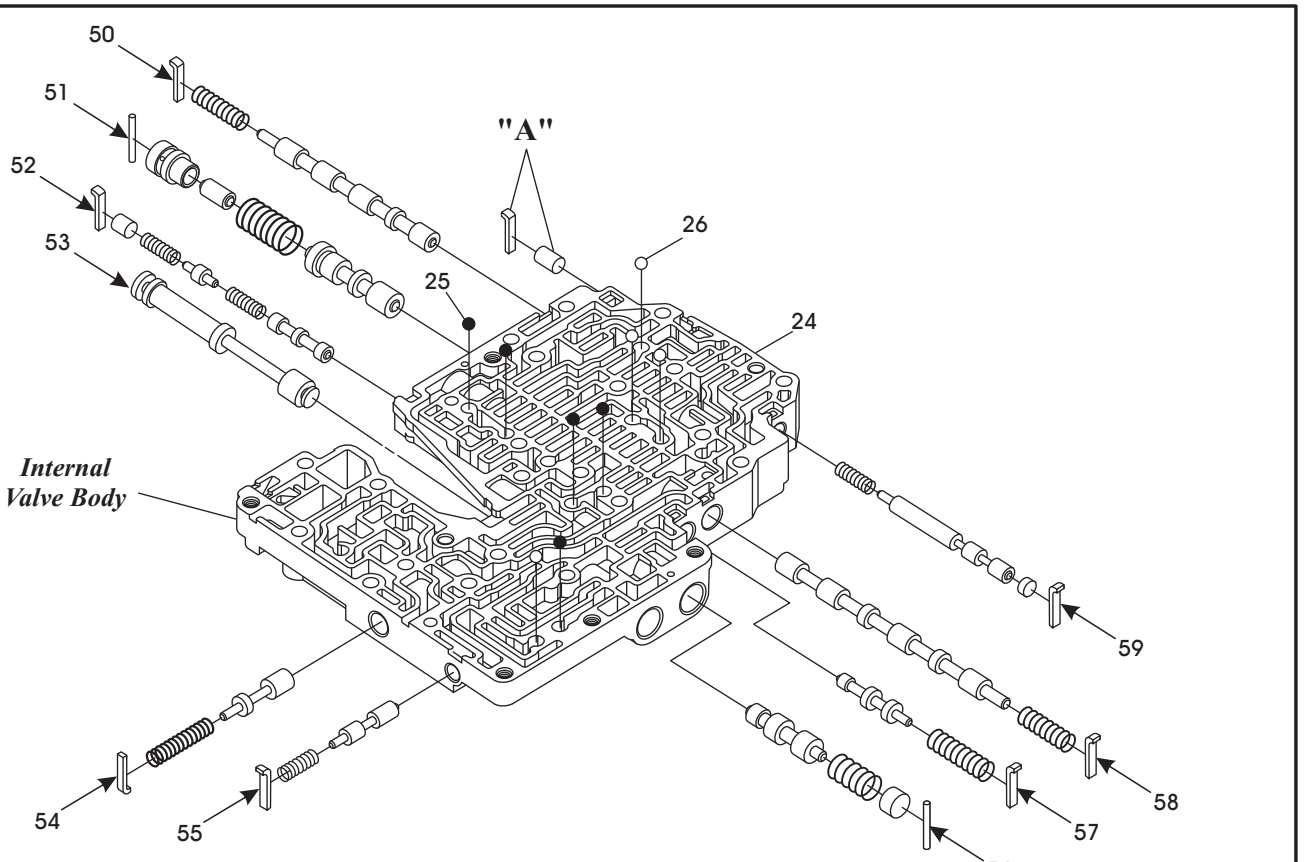


Figure 99

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

25. Disassemble the internal valve body, as shown in Figure 99, and place the valves, bore plugs and retainers in appropriate trays exactly as they were removed from casting.
Note: There is no need to remove the bore plug and retainer identified with an "A" in Figure 99, as the valve is removed from opposite side.
26. Clean all internal valve body parts thoroughly and dry with compressed air.
27. Assemble internal valve body parts ***exactly*** as they are shown in Figure 99, and lube with ATF as they are installed.
Note: Install the retainers exactly as shown in Figure 99, as they install in different directions through out the valve body.
28. Install the manual valve into the internal valve body in the direction shown in Figure 99.
29. Install an appropriate size clevis pin clip into groove in the exposed end of manual valve, as shown in Figure 100.
Note: This is a temporary measure that will assist in installing the completed valve body on the unit, as it is a "blind" process. This pin clip must be removed before the oil pan is installed. This will also keep you from losing the manual valve.
This clevis pin clip can be found at most auto supply stores or farm supply stores.

Continued on Page 76

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

30. Install the four steel check balls in their proper positions, as shown in Figure 101.
31. Install the five plastic check balls in their proper positions, as shown in Figure 101.
32. Set the completed internal valve body aside for final valve body assembly (See Figure 102). ***Note: Set aside with the check ball side facing up so as not to lose the check balls.***

Continued on Page 77

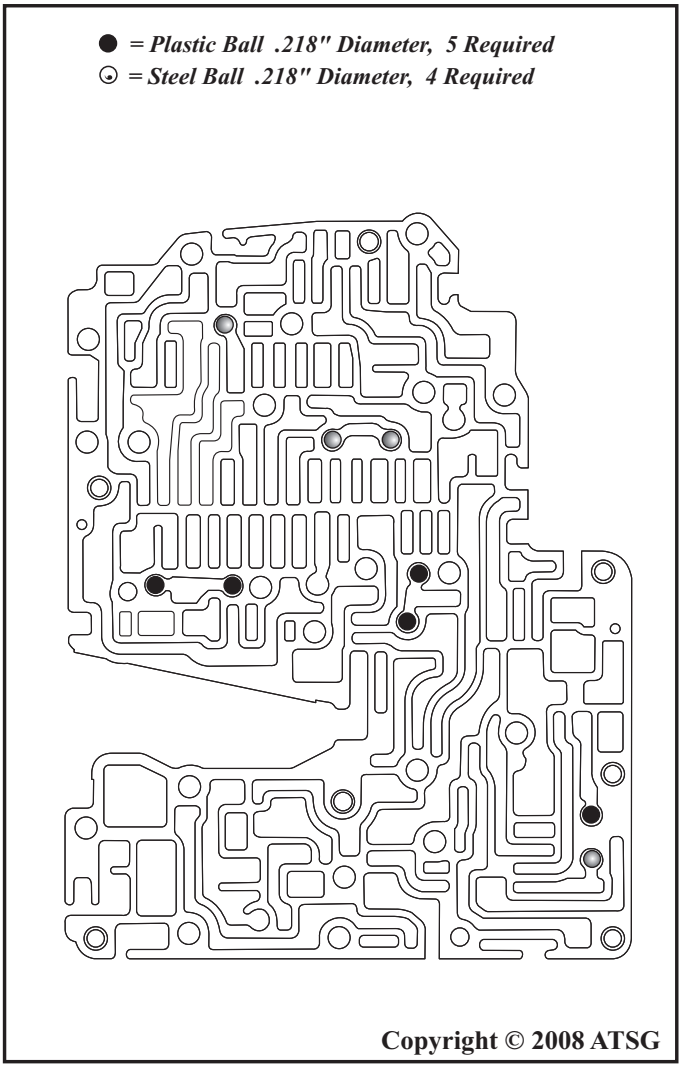


Figure 101

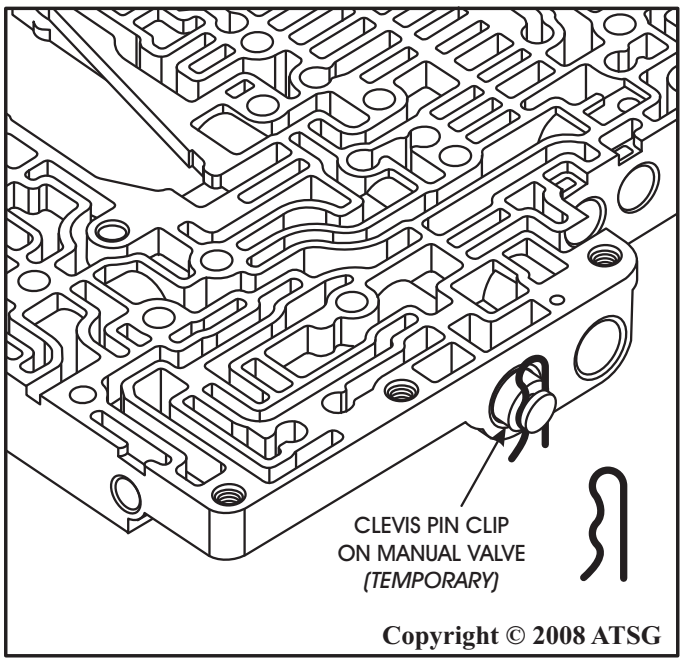


Figure 100

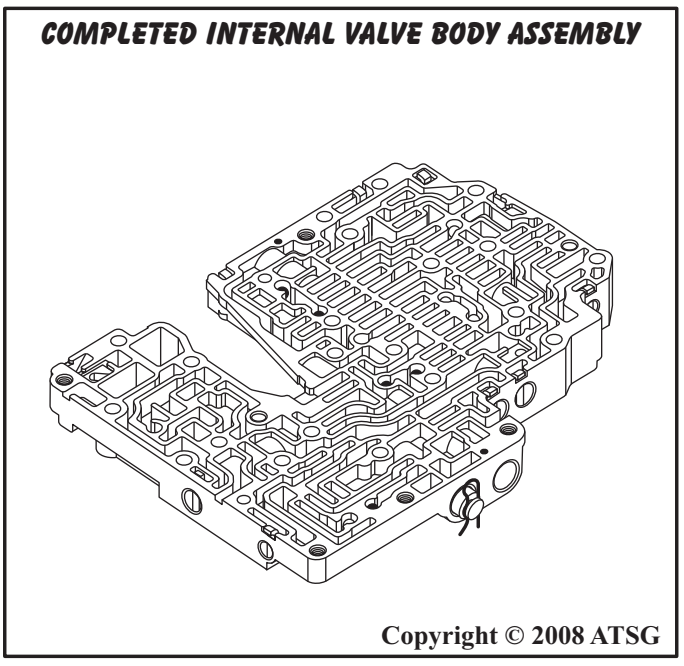


Figure 102

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

33. Install one 67mm bolt and one 90mm valve body bolt through the upper valve body casting as shown in Figure 104.
    Note: The holes in components that these bolts go through have a very close tolerance and act much like alignment dowels.
34. Lay the assembly on a flat work surface with the worm track side facing up, as shown in Figure 104.
35. Install four plastic check balls in their proper locations, as shown in Figure 103.
36. Install spacer plate "C" with bonded gaskets over the two bolts and onto the upper valve body, as shown in Figure 104, ensuring that you have the proper spacer plate for the Freelander ("Triangle C").
37. Install the completed internal valve body over the two bolts and onto spacer plate "C", as shown in Figure 104, and ensure check balls are still in position.
    Note: Do not remove the clevis pin clip from the manual valve at this time.

Continued on Page 78

● = *Plastic Ball .218" Diameter, 4 Required*

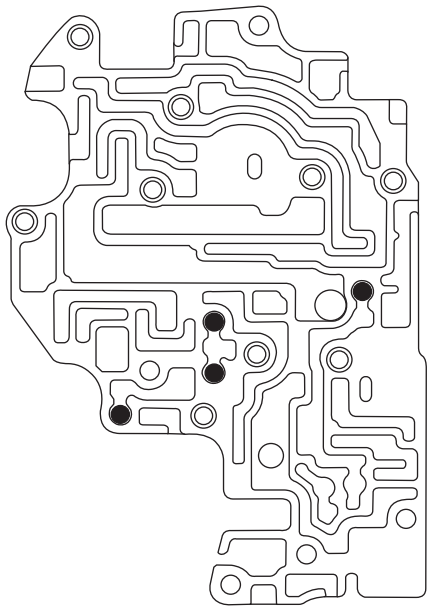
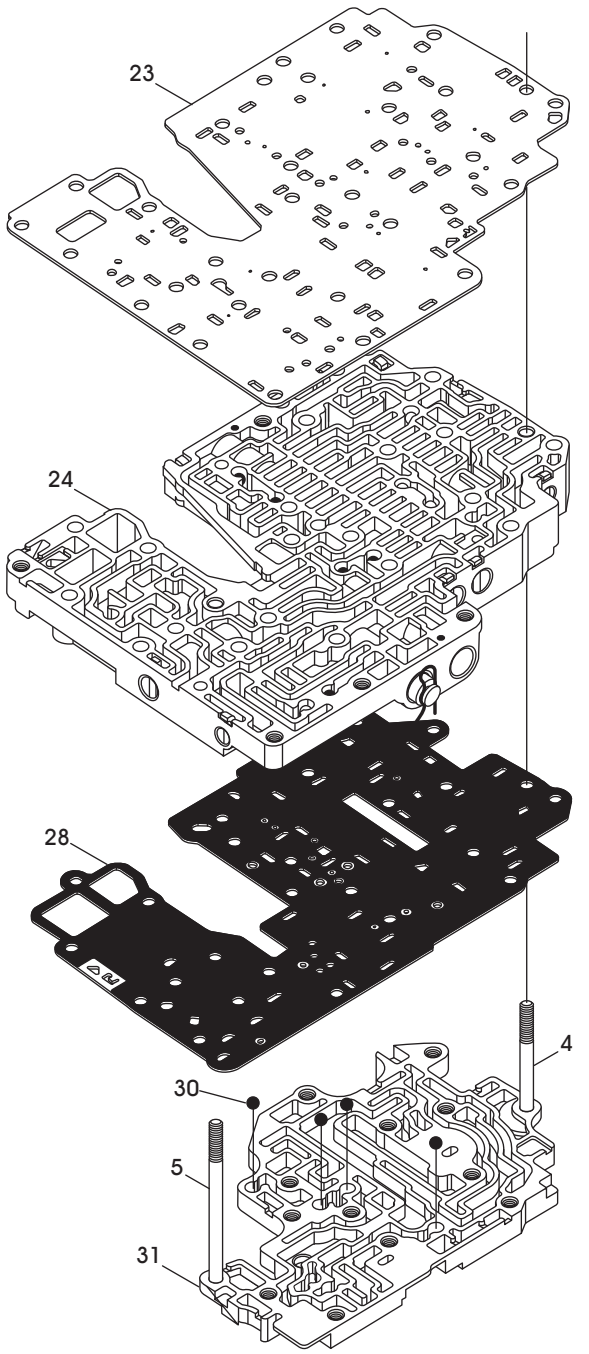


Figure 103



4 VALVE BODY BOLT, 67MM LENGTH
5 VALVE BODY BOLT, 90MM LENGTH
23 SPACER PLATE "B" (NO GASKETS USED)
24 INTERNAL VALVE BODY CASTING
28 SPACER PLATE "C" WITH BONDED GASKETS
30 PLASTIC CHECK BALL (.218" DIAMETER, 4 REQUIRED)
31 UPPER VALVE BODY CASTING

Figure 104

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

38. Install spacer plate "B" over the two bolts, as shown in Figure 104, ensuring that you have the proper spacer plate with the "F" for the Freelander.
    Note: There are "No" gaskets used with spacer plate "B".
39. Install completed lower valve body assembly over the two bolts, on top of spacer plate "B", as shown in Figure 105.
40. Install the two tapered coil spring loaded filters into their pockets in the lower valve body, with the spring side down, as shown in Figure 106.
41. Install spacer plate "A" with bonded gaskets over one bolt onto the lower valve body, as shown in Figure 106, ensuring you have the proper spacer plate for Freelander ("A" "E").
    Note: Ensure that the two spring loaded filters engage into the square holes in spacer plate "A" as it is lowered into place.
42. Install the pilot filter with the "leaf spring" facing up, and the wide leg of the "leaf spring" facing the bottom of valve body, as shown in Figure 106.
    Note: This filter must also engage into square hole in spacer plate "A".

Continued on Page 79

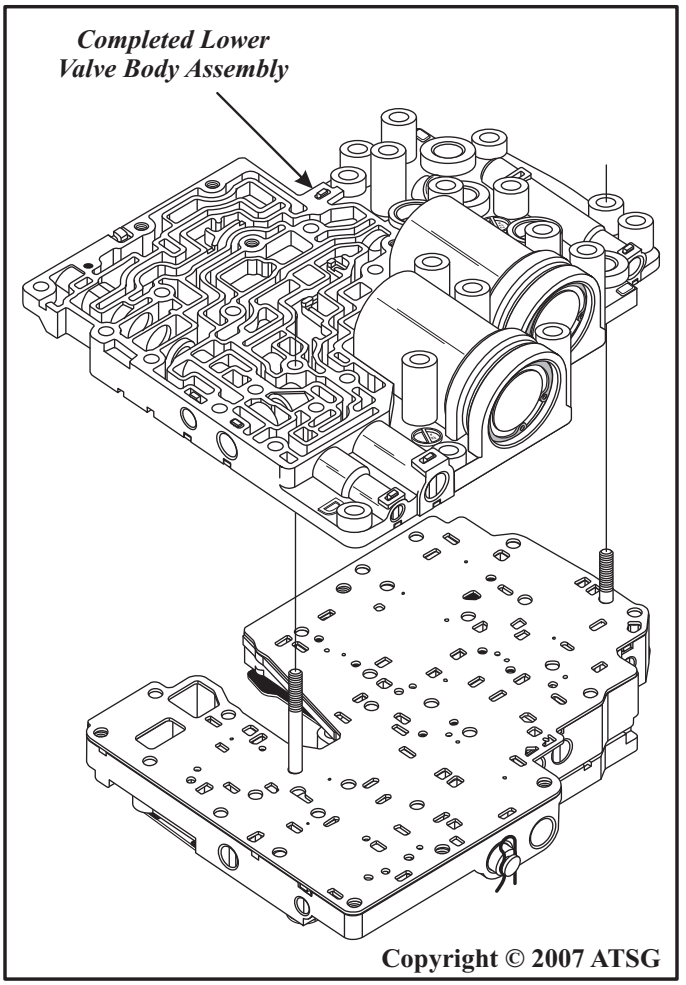


Figure 105

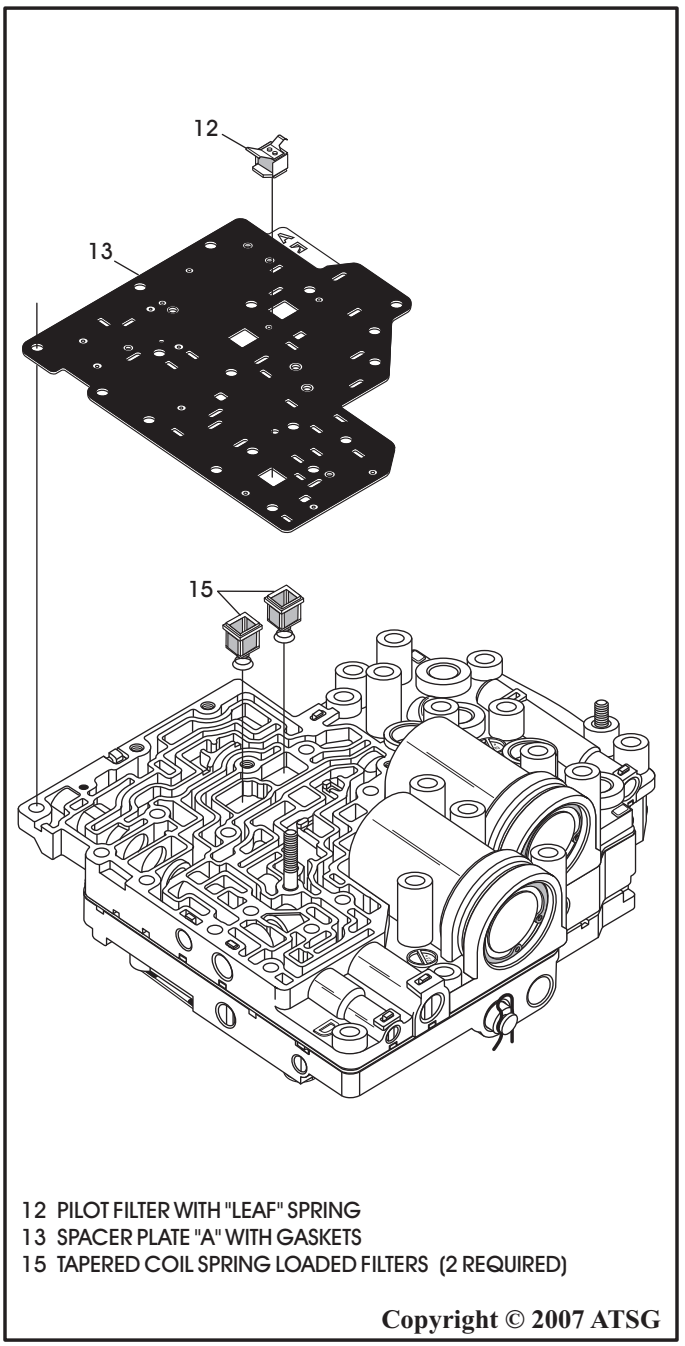
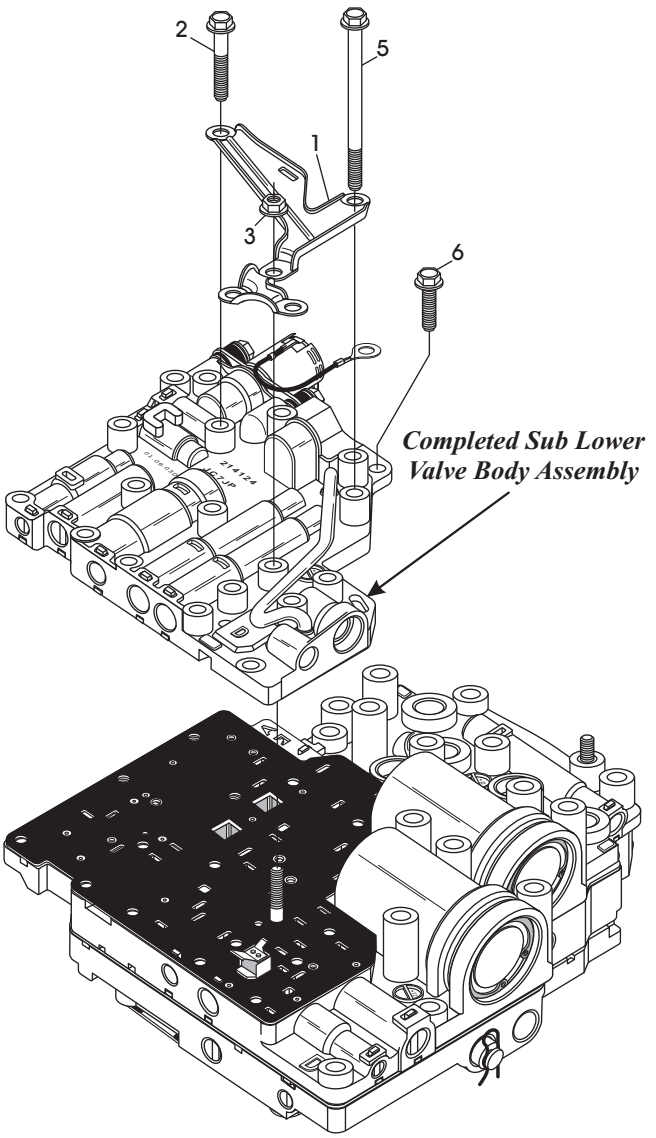


Figure 106

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

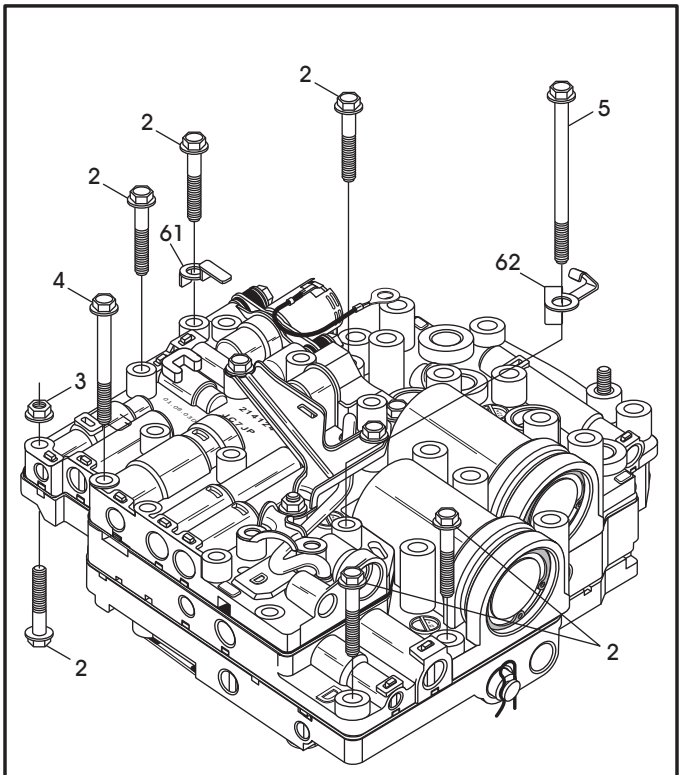
43. Install the completed sub lower valve body over the bolt and on top of spacer plate "A", as shown in Figure 107.
    Note: Check once again that all three filters are engaged in spacer plate holes.
44. Install the valve body bracket over bolt and on top of the sub lower valve body, as shown in Figure 107.
45. Install 90mm (5) and 37mm (2) bolts through the bracket, as shown in Figure 107, and hand tighten only at this time.
46. Install nut (3) on 90mm bolt coming through from the bottom, as shown in Figure 107, and hand tighten only at this time.
47. Install one 24mm bolt (6), in location shown in Figure 107, and hand tighten only.
48. Install a 37mm bolt (2), from the bottom, in the lower left side of the valve body, as shown in Figure 108, install nut (3), hand tighten only.
49. Install five 37mm bolts (2), in locations shown in Figure 108, and hand tighten only.
    Note: One of these bolts has a internal wire harness retainer (61).
50. Install one 67mm bolt (4), in location shown Figure 108, and hand tighten only.
51. Install one 90mm bolt (5), along with the wire harness retainer (62), in the location shown in Figure 108, and hand tighten only.

Continued on Page 80



1 VALVE BODY BRACKET
2 VALVE BODY BOLT, 37MM LENGTH
3 NUT FOR VALVE BODY BOLT FROM BOTTOM
5 VALVE BODY BOLT, 90MM LENGTH
6 VALVE BODY BOLT, 24MM LENGTH

Figure 107

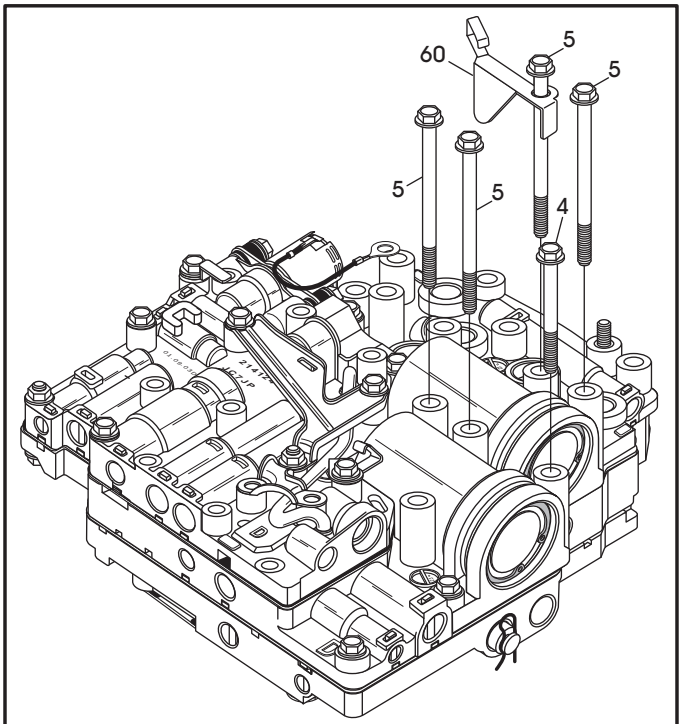


2 VALVE BODY BOLT, 37MM LENGTH
3 NUT FOR VALVE BODY BOLT FROM BOTTOM
4 VALVE BODY BOLT, 67MM LENGTH
5 VALVE BODY BOLT, 90MM LENGTH
6 VALVE BODY BOLT, 24MM LENGTH
61 INTERNAL SOLENOID WIRE HARNESS CLIP
62 INTERNAL SPEED SENSOR WIRE HARNESS CLIP

Figure 108

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

52. Install 67mm (4) bolt in the location shown in Figure 109, and hand tighten only.
53. Install four 90mm (5) bolts in locations shown in Figure 109, and hand tighten only. Notice that one has a wire harness bracket (60).



4 VALVE BODY BOLT, 67MM LENGTH
5 VALVE BODY BOLT, 90MM LENGTH
60 INTERNAL SOLENOID HARNESS BRACKET

Figure 109

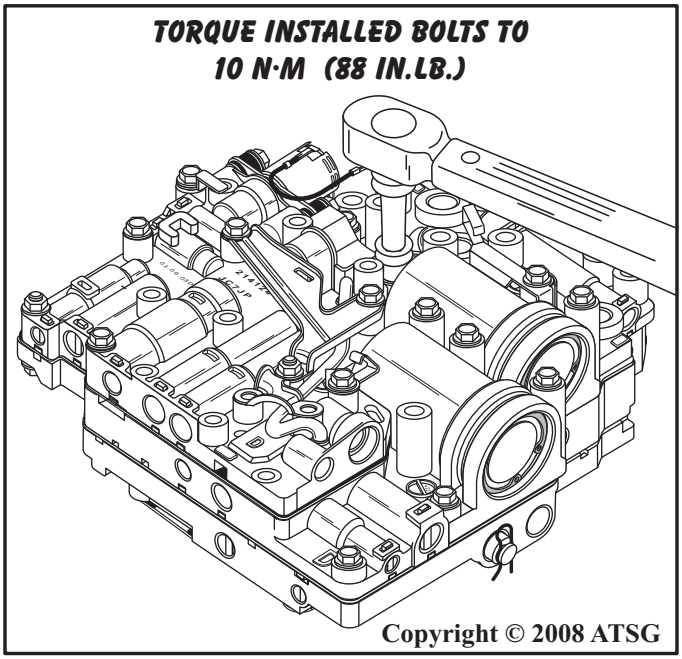
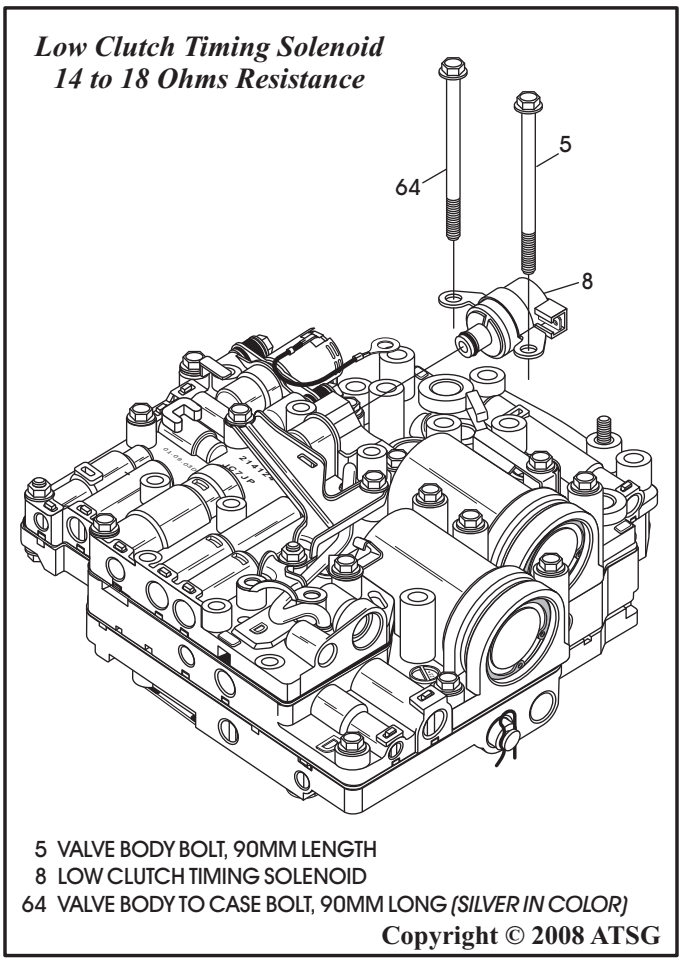


Figure 110

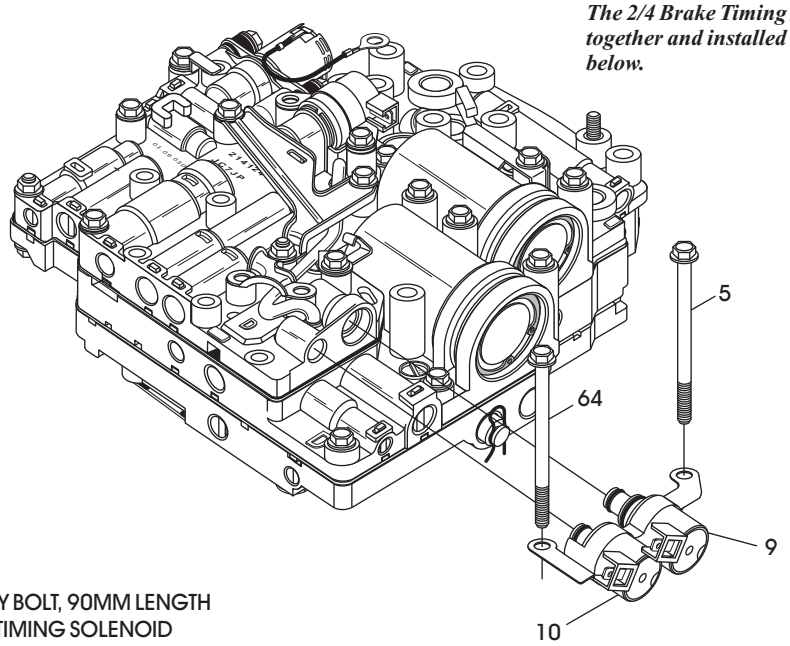
54. Install the eleven valve body to case bolts in their proper holes for alignment purposes. ***Note: These are the silver bolts.***
55. Beginning in the center and working your way outward, torque all installed valve body bolts to 10 N·m (88 in.lb.), as shown in Figure 110. ***Note: On the two nuts, you may have to hold bolt from the back side with a wrench.***
56. Now you can remove the eleven silver valve body to case bolts.
57. Install new "O" ring, lube with ATF and install the low clutch timing solenoid, using one 90mm (5) bolt, as shown in Figure 111. ***Note: Low Clutch Timing Solenoid should check at 14 to 18 Ohms resistance.***
58. Install one silver valve body to case bolt (64), for alignment purposes, as shown in Figure 111 and torque the gold retaining bracket bolt to, 10 N·m (88 in.lb.), and remove the silver valve body to case bolt.

Continued on Page 81



5 VALVE BODY BOLT, 90MM LENGTH
8 LOW CLUTCH TIMING SOLENOID
64 VALVE BODY TO CASE BOLT, 90MM LONG *(SILVER IN COLOR)*

Figure 111



The 2/4 Brake Timing Solenoid and the 2/4 Duty Solenoid are placed together and installed into the valve body at the same time, as shown below.

2-4 Brake Timing Solenoid
14 to 18 Ohms Resistance

2/4 Brake Duty Solenoid
2.6 to 3.2 Ohms Resistance

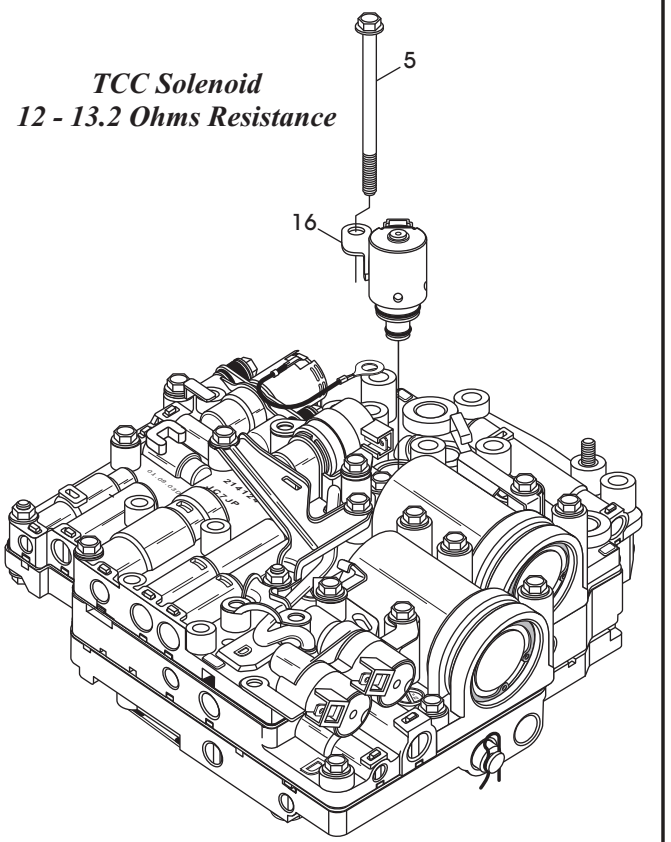
5 VALVE BODY BOLT, 90MM LENGTH
9 2-4 BRAKE TIMING SOLENOID
10 2-4 BRAKE DUTY SOLENOID
64 VALVE BODY TO CASE BOLT, 90MM LONG *(SILVER IN COLOR)*

Figure 112

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

59. Install new "O" ring on 2-4 brake duty solenoid and lube with ATF (See Figure 112).
Note: 2-4 Brake Duty Solenoid should check at 2.6 to 3.2 Ohms resistance.
60. Install 2 new "O" rings on the 2-4 brake timing solenoid and lube with ATF (See Figure 112).
Note: 2-4 Brake Timing Solenoid should check at 14 to 18 Ohms resistance.
61. Assemble the 2-4 brake duty solenoid onto the 2-4 brake timing solenoid, and install both pieces as an assembly into the valve body, as shown in Figure 112.
62. Install one 90mm gold bolt (5), and one 90mm silver bolt (64) for alignment purposes only, as shown in Figure 112, and torque the gold bolt to 10 N·m (88 in.lb.).
63. Install new "O" rings, lube with small amount of ATF, and install TCC solenoid in the valve body, with 90mm bolt, as shown in Figure 113.
Note: TCC Solenoid should check at 12 to 13.2 Ohms resistance.
64. Hand tighten only the 90 mm bolt at this time.
Note: The ground wire from line pressure solenoid goes under this bolt.

Continued on Page 82



TCC Solenoid
12 - 13.2 Ohms Resistance

5 VALVE BODY BOLT, 90MM LENGTH
16 TORQUE CONVERTER CLUTCH SOLENOID

Figure 113

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

65. Install new "O" ring, lube with ATF, and install shift solenoid "A" into valve body, as shown in Figure 114.
Note: Shift Solenoid "A" should check at 14 to 18 Ohms resistance.
66. Install 67mm (4) bolt, and finger tighten only by just a thread or two, as it must come back out to install oil baffle underneath the bolt.
66. Install new "O" ring, lube with ATF, and install reduction timing solenoid into the valve body, using a 90mm bolt, as shown in Figure 115.
Note: Reduction Timing Solenoid should check at 14 to 18 Ohms resistance.
67. Hand tighten only, the 90mm bolt at this time.
68. Install new "O" rings, lube with small amount of ATF, and install shift solenoid "B" into the valve body, using a 67mm bolt, as shown in Figure 115.
Note: Shift Solenoid "B" should check at 14 to 18 Ohms resistance.
69. Hand tighten only the 67mm bolt at this time.

Continued on Page 83

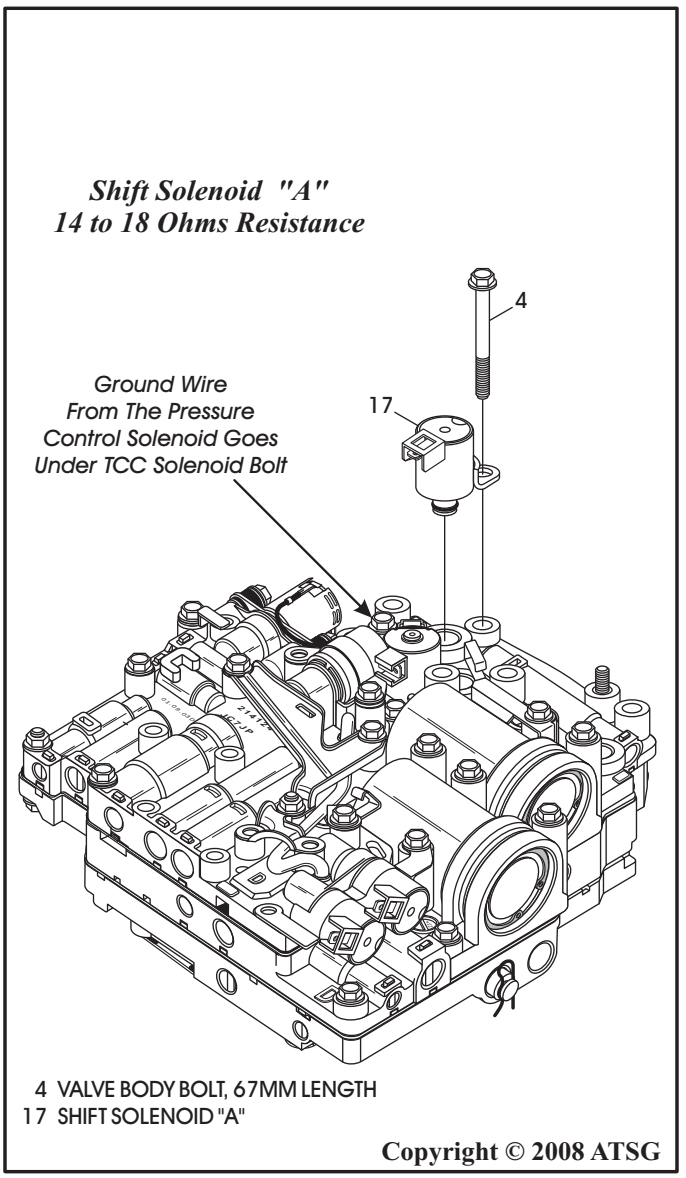


Figure 114

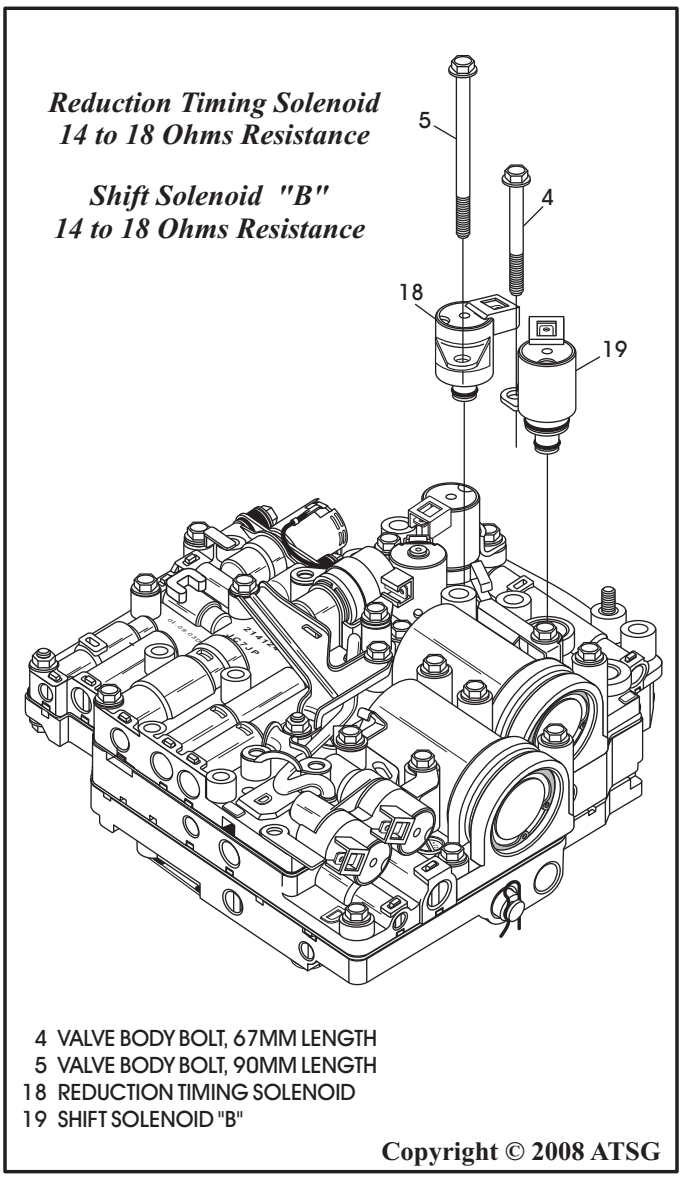


Figure 115

FREELANDER VALVE BODY ASSEMBLY (CONT'D)

70. Install new "O" rings, lube with small amount of ATF, and install shift solenoid "C" into the valve body, as shown in Figure 116.
Note: Shift Solenoid "C" should check at 14 to 18 Ohms resistance.
71. Shift solenoid "C" is bolted in the valve body using a nut on the 67mm bolt from the bottom, as shown in Figure 116.
72. Remove previously installed shift solenoid "A" bolt and install oil baffle under the nut and the previously installed bolt (See Figure 116).
73. Now, you can torque the remaining solenoid retaining bolts to 10 N·m (88 in.lb.), as shown in Figure 117.
74. Set the completed valve body assembly aside, for the final transaxle assembly process.
Note: Notice in Figure 118, clevis pin clip is still in place and must remain there until the valve body is installed onto the case, plus you haven't lost the manual valve yet.

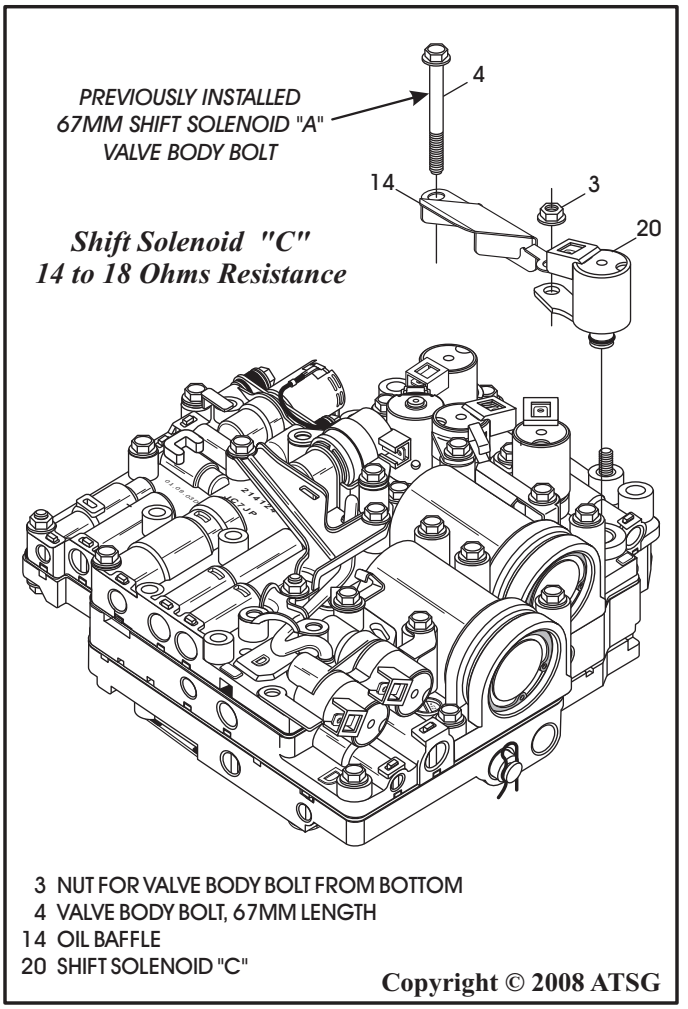


Figure 116

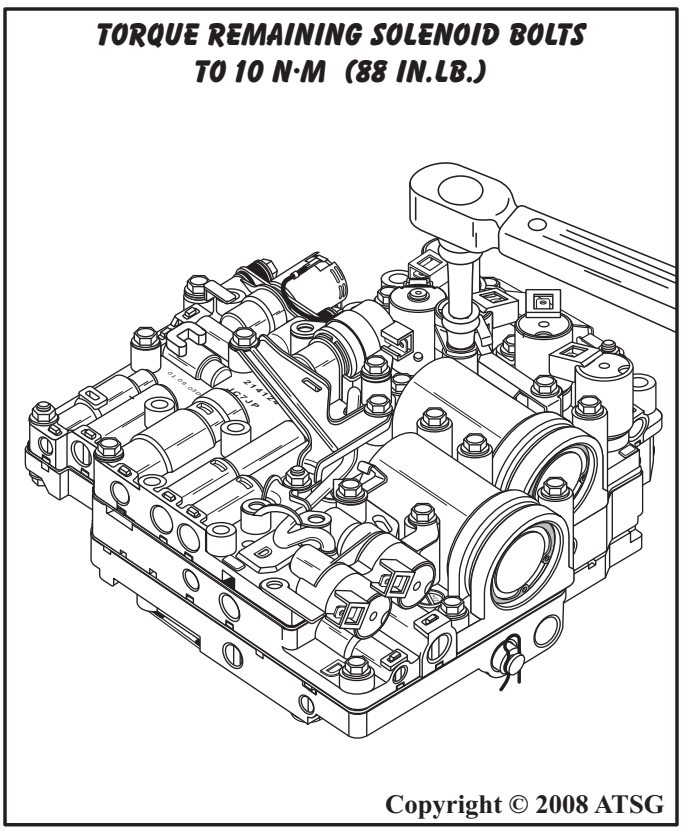


Figure 117

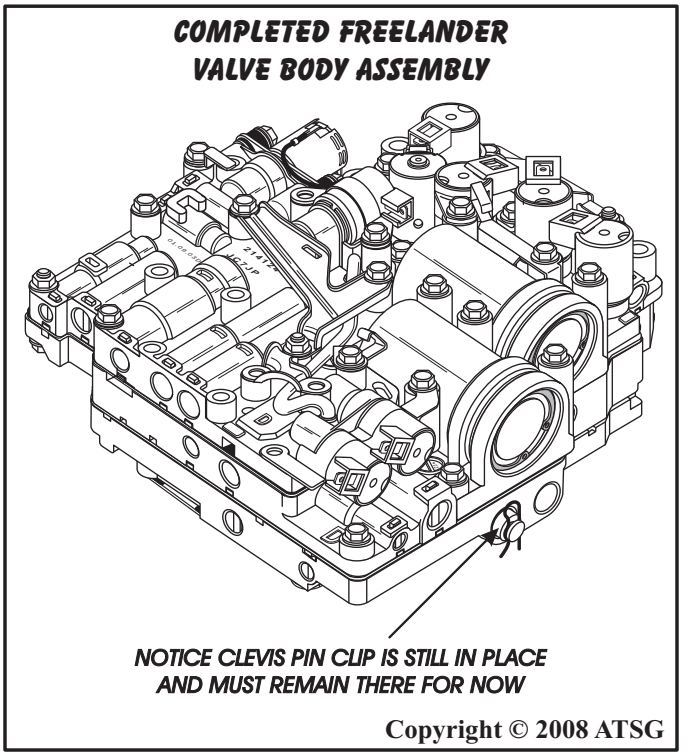


Figure 118

FLUID REQUIREMENTS

You ***must*** use the recommended fluid for each of the individual applications. The friction material, fluid type, engine size, vehicle weight and transaxle fluid operating pressures, are all engineered to be compatable with the electronic calibrations to ensure proper shift feel and durability. The factory recommended fluid requirements are as shown in Figure 119.

MAZDA "6" AND MAZDA "MPV"	
Fluid Requirements	*Mercon "V"®*
Approximate Dry Fill Capacity	*Mazda "6" 9.7 Qts. Mazda "MPV" 10.3 Qts*
Transaxle Fills	*Fills Through Dipstick Tube, Close To Final Drive*
VOLKSWAGEN	
Fluid Requirements	*G052990A2*
Approximate Dry Fill Capacity	*Golf, Jetta, GTI 7.4 Qts*
Transaxle Fills	*Fills Through Fill Plug On Top Of Side Pan*
JAGUAR "X" TYPE	
Fluid Requirements	*IDEMITSUK K-17 (JATCO 3100 PL085)*
Approximate Dry Fill Capacity	*9.3 Qts*
Transaxle Fills	*Fills Through Fill Plug On Top Of Side Pan*
FREELANDER	
Fluid Requirements	*Texaco N402*
Approximate Dry Fill Capacity	*9.1 Qts*
Transaxle Fills	*Fills Through Fill Plug On Top Of Side Pan*

Figure 119

CHECKING FLUID AND FILLING PROCEDURES

Mazda "6" And Mazda "MPV"

Fluid requirements are the same for the Mazda "6" and the Mazda "MPV". Both units are filled through the dipstick tube, located close to the final drive. The fluid should be checked while hot at 60-70°C (149-158°F) and should be at the level on dipstick, as shown in Figure 120. The drain plug is located on the bottom of the converter housing part of the case, just in front of where the two case pieces split.

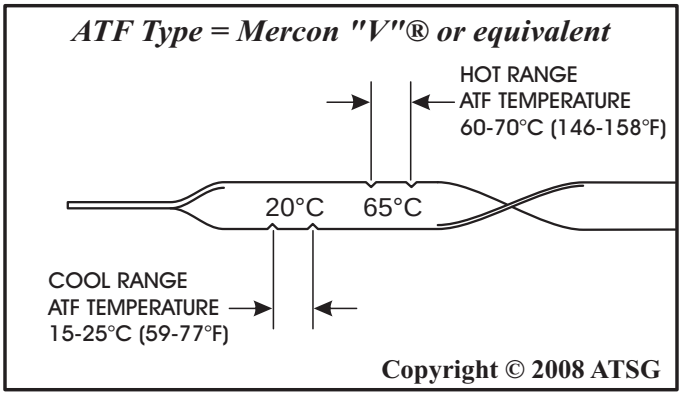


Figure 120

Volkswagen, Jaguar, And Freelander

The Volkswagen, Jaguar, and Freelander have the fluid level check plug installed vertically into the bottom side of the transaxle case, as shown in Figure 121. The fluid level check plug all have a 5mm Allen Head, and closes the lower end of an internal fluid level tube, as shown in Figure 121. Only the excess fluid will be expelled when the check plug is removed. The Jaguar and Freelander check plug is located along side of the selector cable bracket, as shown in Figure 122. The Volkswagen check plug is located about 4 inches behind the pan rail on the bottom of the transaxle case. All three have 5mm allen head, as shown in Figure 122.

CAUTION:

Because of the similarity to other plugs and fasteners on the transaxle case, there is great potential for loosening an incorrect fastener, instead of the fluid level check plug. If the wrong plug is removed, there is a hugh risk of internal transaxle damage. The check plug is the one with the 5mm Allen Head. Refer to Page 87 for the most common mistake when removing plugs.

Continued on Page 85

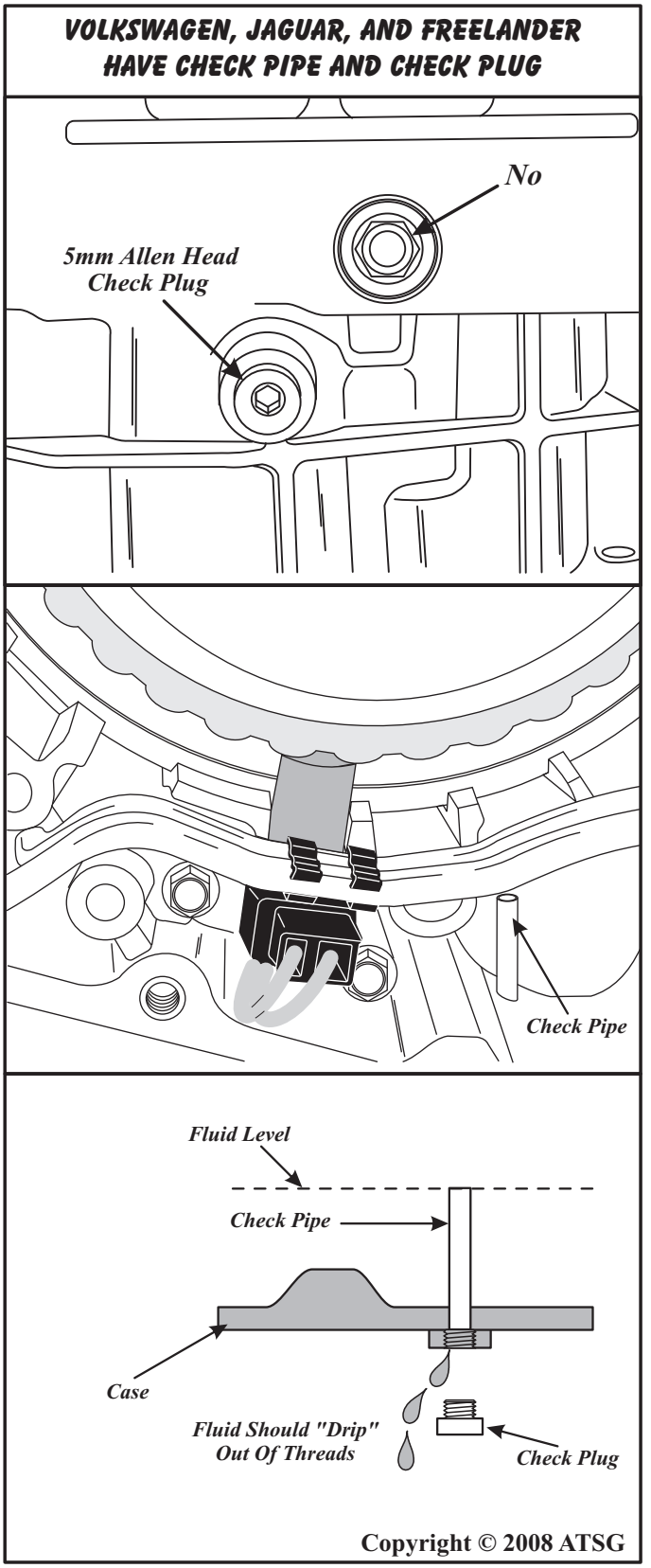


Figure 121

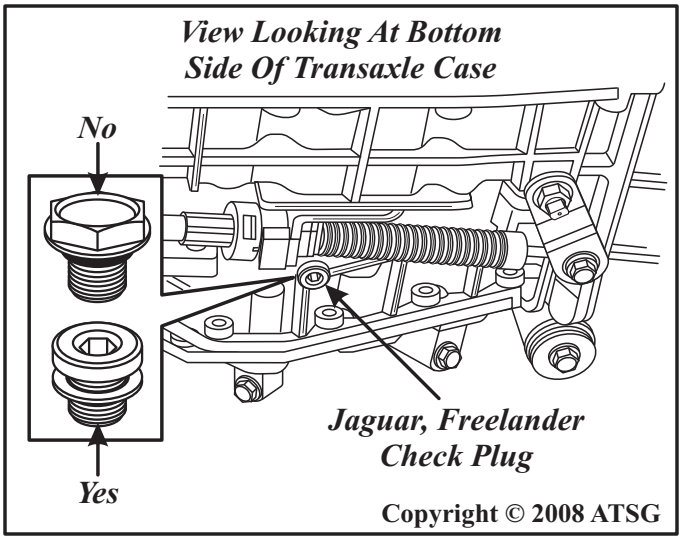


Figure 122

CHECKING AND FILLING PROCEDURES (CONT'D)

Volkswagen, Jaguar, And Freelander (Cont'd)

1. Vehicle must be parked on a level surface.
2. Remove the fill plug from the top of side cover, as shown in Figure 123.
3. If after rebuild, add 5 quarts of appropriate fluid for the vehicle, as shown in Figure 119
4. Start the engine and allow engine to idle in the "Park" position, and immediately add 3 more quarts of fluid.
5. Shift the vehicle with the manual shift lever through each position, pausing in each position for about 3 seconds.
6. Shift back to the "Park" position and allow the engine to idle to raise the fluid temperature to rise above 40°C (104°F).
7. Remove the ***"5mm Allen Head"*** fluid check plug from the bottom of the transaxle case, and allow to drain into a clean container.
   Caution: Care MUST be exercised when you remove the fluid check plug, as the fluid is very HOT.
8. Allow fluid to drain until it drips intermittently.
9. If no fluid comes out, add the appropriate ATF until it drips intermittently (See Figure 121).
10. Install a new washer on the fluid check plug, and tighten to 16.5 N·m (10 ft.lb.).

OIL PAN FILL PLUG LOCATIONS

Each of the oil pans are also different, as shown in Figure 123. The Volkswagen, Jaguar and Freelander all have studs on the oil pan, in different locations, for various shaped brackets for the individual applications. Notice also that those three have a fill pipe and plug on the top of the pans, and the Volkswagen and Jaguar vent through the pan, where the others do not. The Mazda pan has zero studs and no fill plug on the pan, as it fills through the dipstick tube in the case, near the final drive.

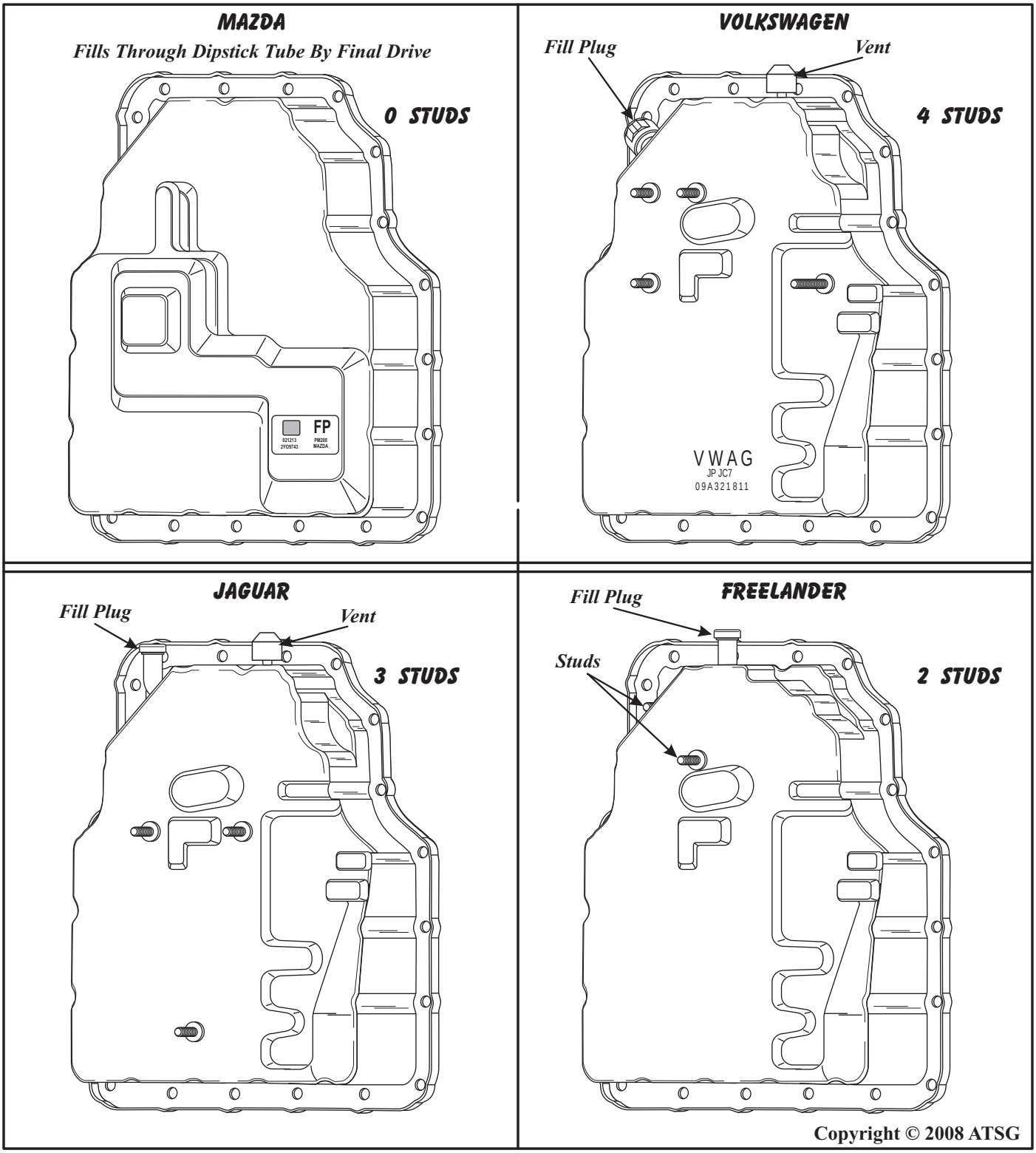


Figure 123

VOLKSWAGEN, JAGUAR, AND FREELANDER JF506E TRANSAXLE

NO REVERSE AND SLIPS FORWARD, AFTER REBUILD OR FLUID CHANGE

COMPLAINT: Volkswagen, Jaguar, and Freelander vehicles equipped with the JF506E transaxle may exhibit a no reverse condition and barely moves forward, after a rebuild, or after a fluid change.

CAUSE: The cause may be, the reduction band anchor bolt was accidently mistaken for a fluid fill plug. When the plug was removed to fill the unit with fluid, the band dropped out of position. Refer to Figure 124.

CORRECTION: Some technicians have said they were able to lift the band back into position through the servo bore. If this cannot be achieved, the transaxle must be removed and disassembled to gain access to the band to place it back into proper position.
When filling the unit, remove the fluid check plug from the bottom of the case, as shown in Figure 121 and 122, and fill the unit through the fill pipe located on top of the side of the pan, as shown in Figure 123.

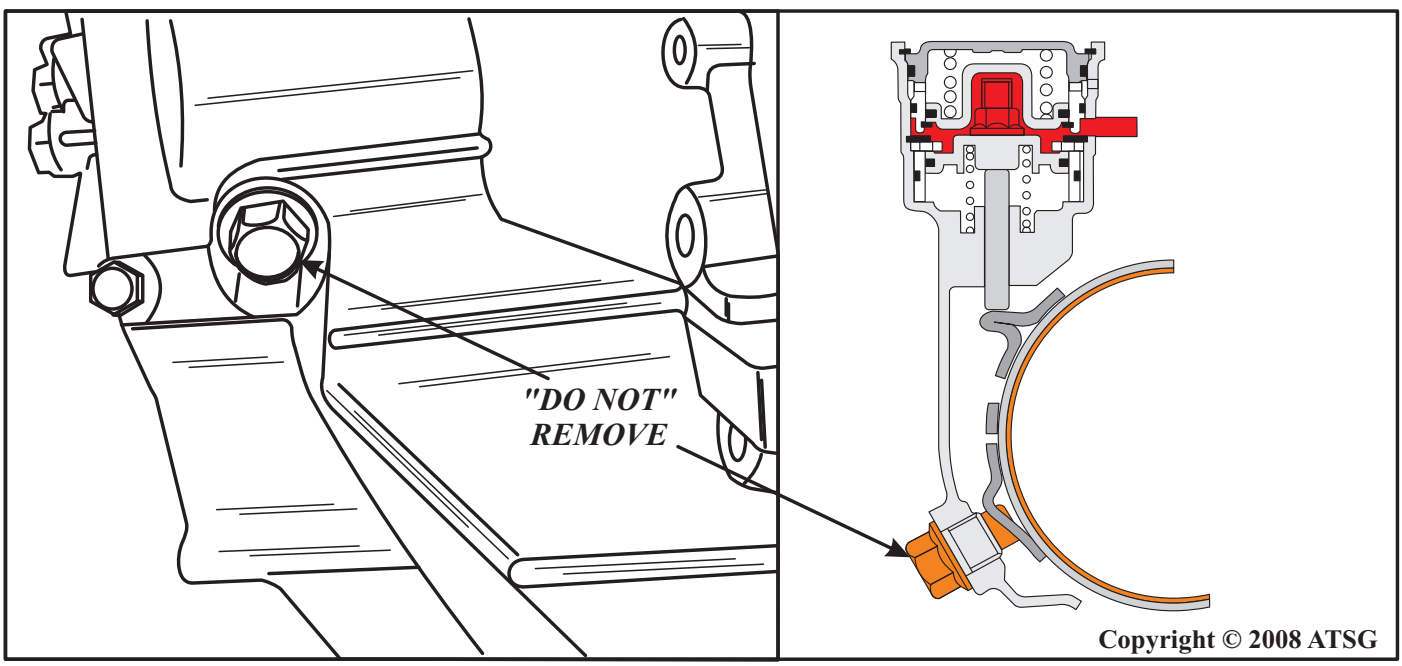


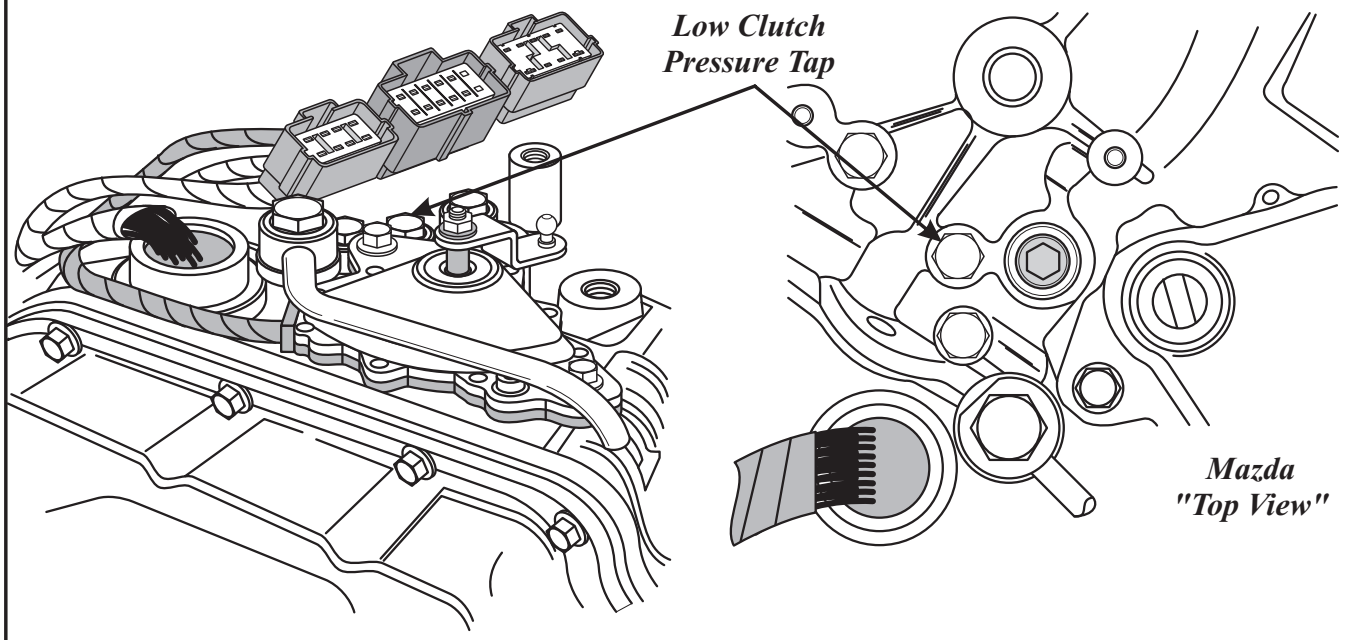
Figure 124

LINE PRESSURE TEST

Special Note:

Line pressure cannot be measured on the JF506E transaxle. Use the "Low Clutch" tap when testing in "D", "4", "3", and "2" range positions. Use the "Reverse Clutch" tap when testing in the "R" range position. Pressure specifications shown on Page 91.

MAZDA LOW PRESSURE TAP LOCATION



VOLKSWAGEN LOW PRESSURE TAP LOCATION

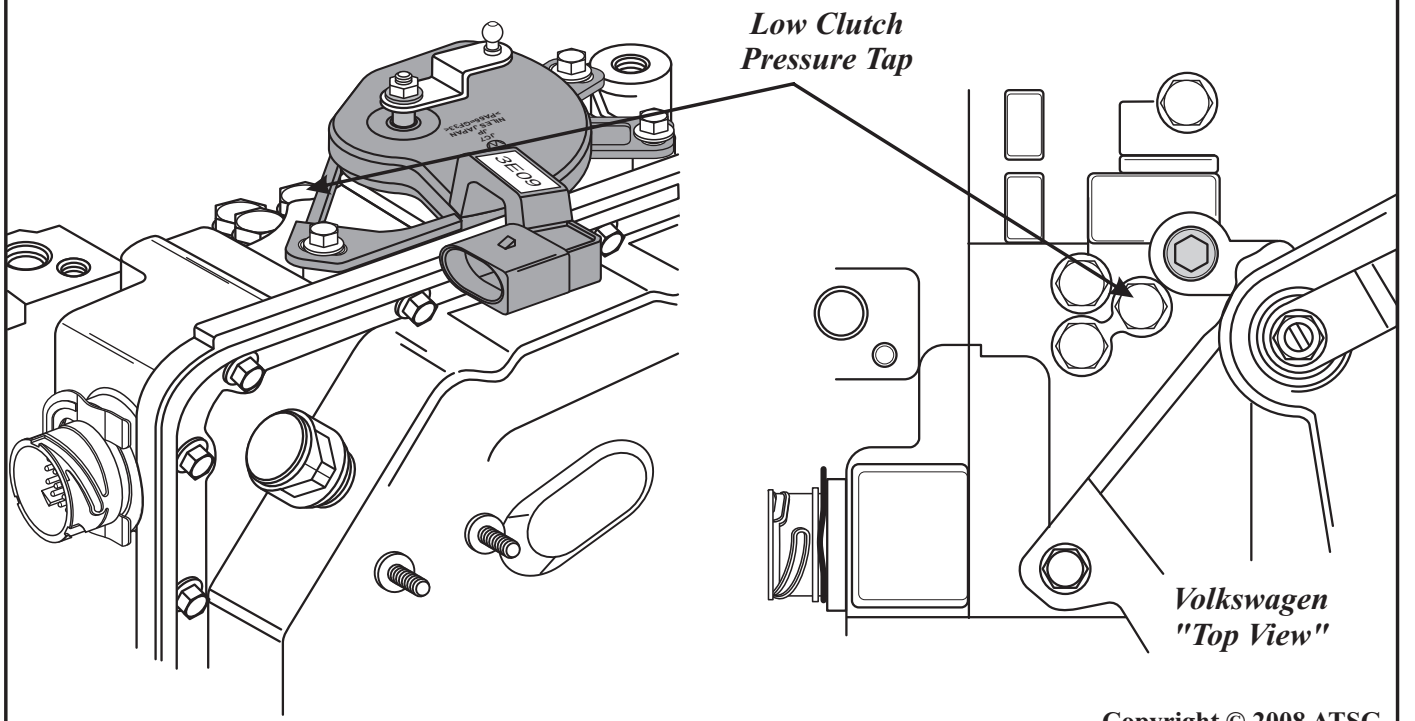


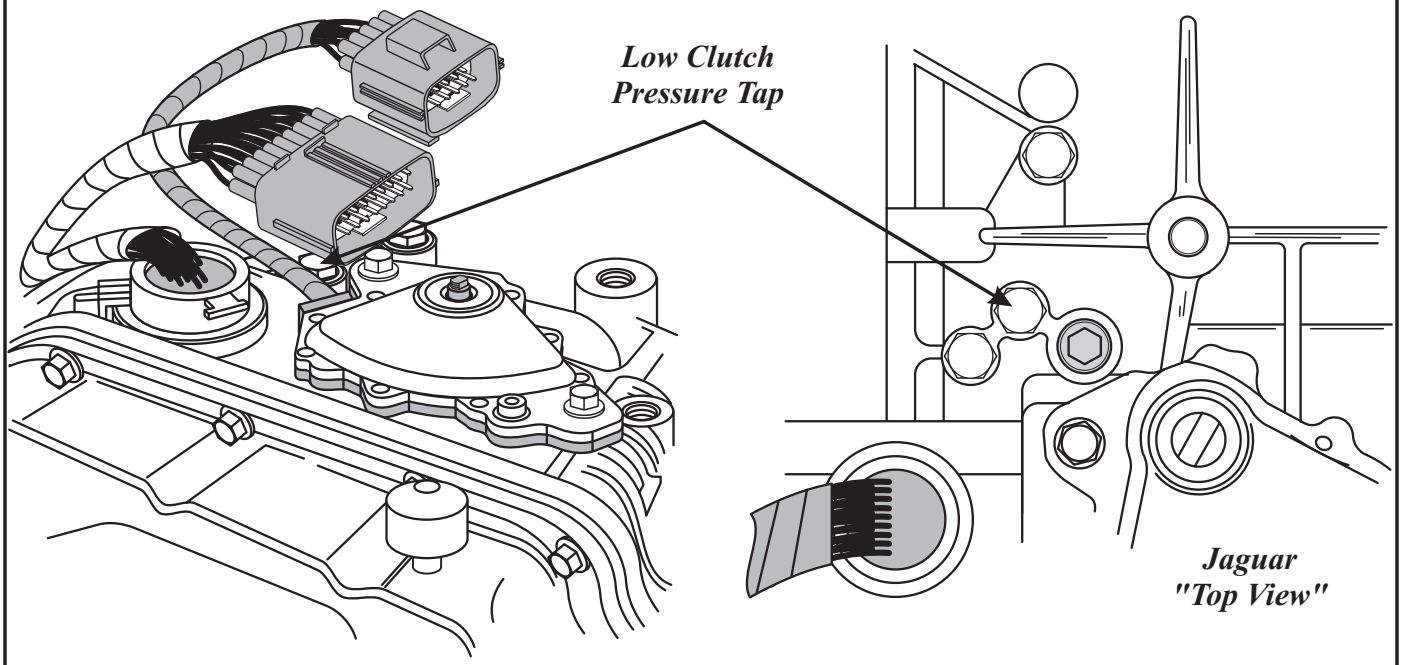
Figure 125

LINE PRESSURE TEST

Special Note:

Line pressure cannot be measured on the JF506E transaxle. Use the "Low Clutch" tap when testing in "D", "4", "3", and "2" range positions. Use the "Reverse Clutch" tap when testing in the "R" range position. Pressure specifications shown on Page 91.

JAGUAR LOW PRESSURE TAP LOCATION



FREELANDER LOW PRESSURE TAP LOCATION

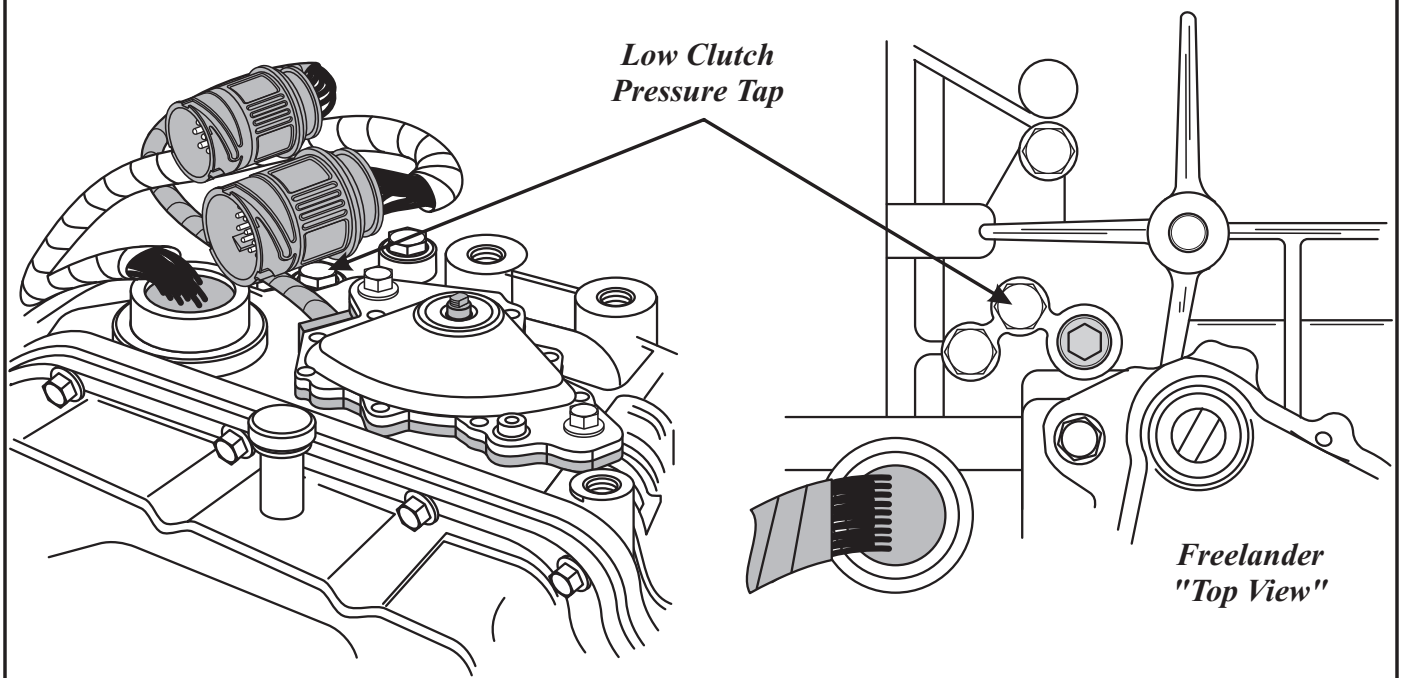


Figure 126

LINE PRESSURE TEST

Special Note:

Line pressure cannot be measured on the JF506E transaxle. Use the "Low Clutch" tap when testing in "D", "4", "3", and "2" range positions. Use the "Reverse Clutch" tap when testing in the "R" range position. Pressure specifications shown on Page 91.

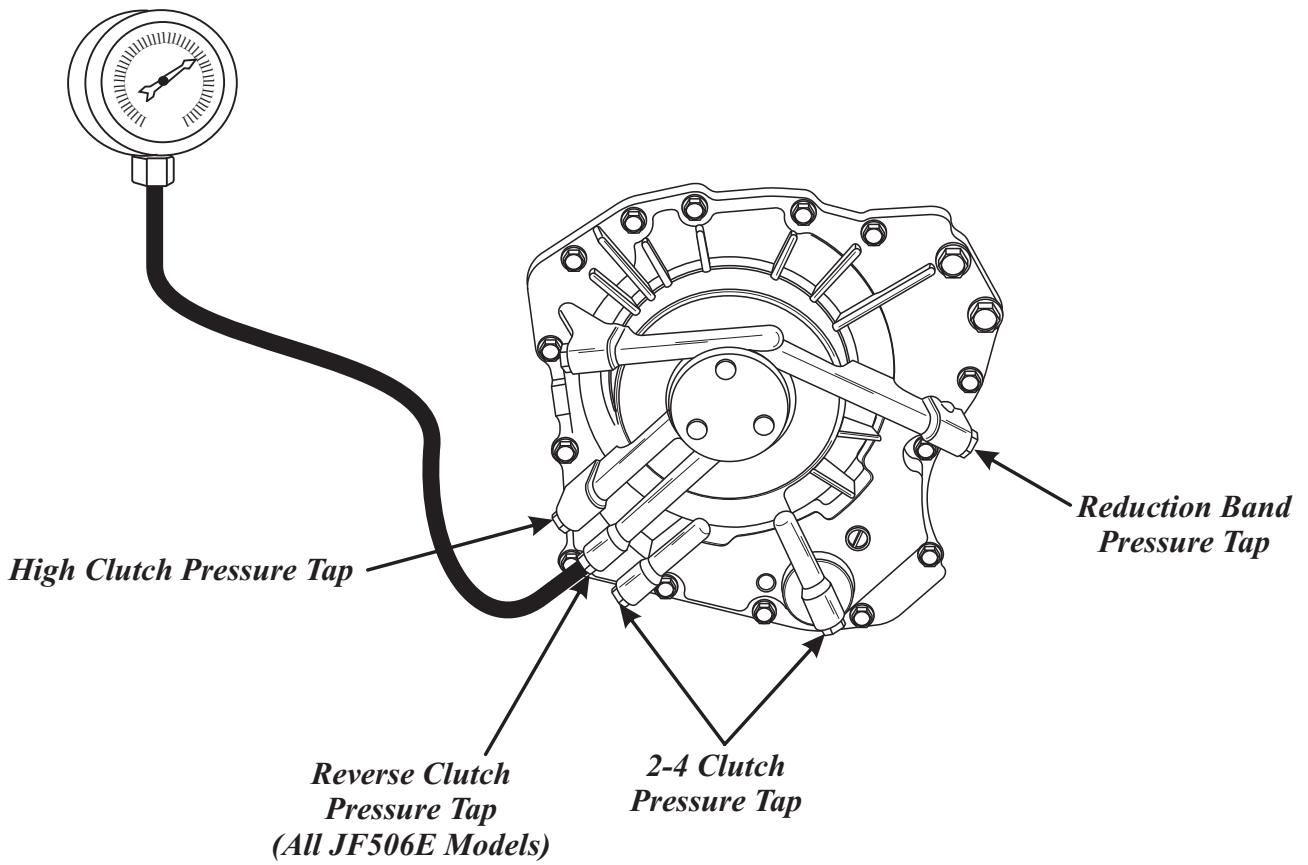


Figure 127

LINE PRESSURE TEST

Special Note:

Line pressure cannot be measured on the JF506E transaxle. Use the "Low Clutch" tap when testing in "D", "4", "3", and "2" range positions. Use the "Reverse Clutch" tap when testing in the "R" range position. Pressure specifications have been published only for the Mazda, but all models should check very close to the same pressures, as the calibrations are very close, and those pressures are all shown below by model.

MAZDA "6"

RANGE	PRESSURE TAP	IDLE	STALL
"D",	Low Clutch	42-71 psi	186-215 psi
"R",	Reverse Clutch	80-109 psi	225-254 psi

MAZDA "MPV"

RANGE	PRESSURE TAP	IDLE	STALL
"D", "3",	Low Clutch	42-71 psi	186-215 psi
"2",	Low Clutch	80-109 psi	225-254 psi
"R",	Reverse Clutch	80-109 psi	225-254 psi

VOLKSWAGEN

RANGE	PRESSURE TAP	IDLE	STALL
"D", "4", "3"	Low Clutch	49-55 psi	179-195 psi
"2",	Low Clutch	73-88 psi	220-290 psi
"R",	Reverse Clutch	73-88 psi	220-290 psi

JAGUAR X TYPE

RANGE	PRESSURE TAP	IDLE	STALL
"D", "4", "3"	Low Clutch	42-71 psi	186-215 psi
"2",	Low Clutch	80-109 psi	225-254 psi
"R",	Reverse Clutch	80-109 psi	225-254 psi

FREELANDER

RANGE	PRESSURE TAP	IDLE	STALL
"D", "4",	Low Clutch	42-71 psi	186-215 psi
"2", "1",	Low Clutch	80-109 psi	225-254 psi
"R",	Reverse Clutch	80-109 psi	225-254 psi

Figure 128

OIL PUMP ASSEMBLY

The Oil Pump Assembly has the Gerotor style pump gears, without a pump cresent, as shown in Figure 130. The converter hub bushing in the oil pump also has a step in it, that gets installed facing the pump gears, as shown in Figure 129. Oil Pump specifications are also shown in Figure 129.

Oil Pump Specifications	
COMPONENT	*SPECIFICATION*
INNER GEAR TO FACE	.0008" - .0015"
OUTER GEAR TO FACE	.0008" - .002"
OUTER GEAR TO BODY	.004" - .006"

OIL PUMP BUSHING INSTALLATION

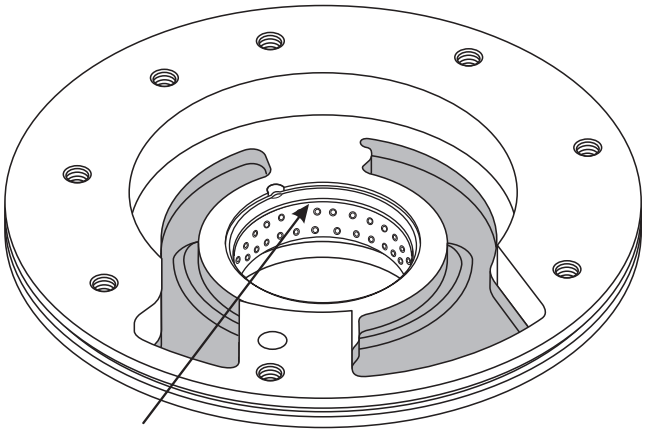
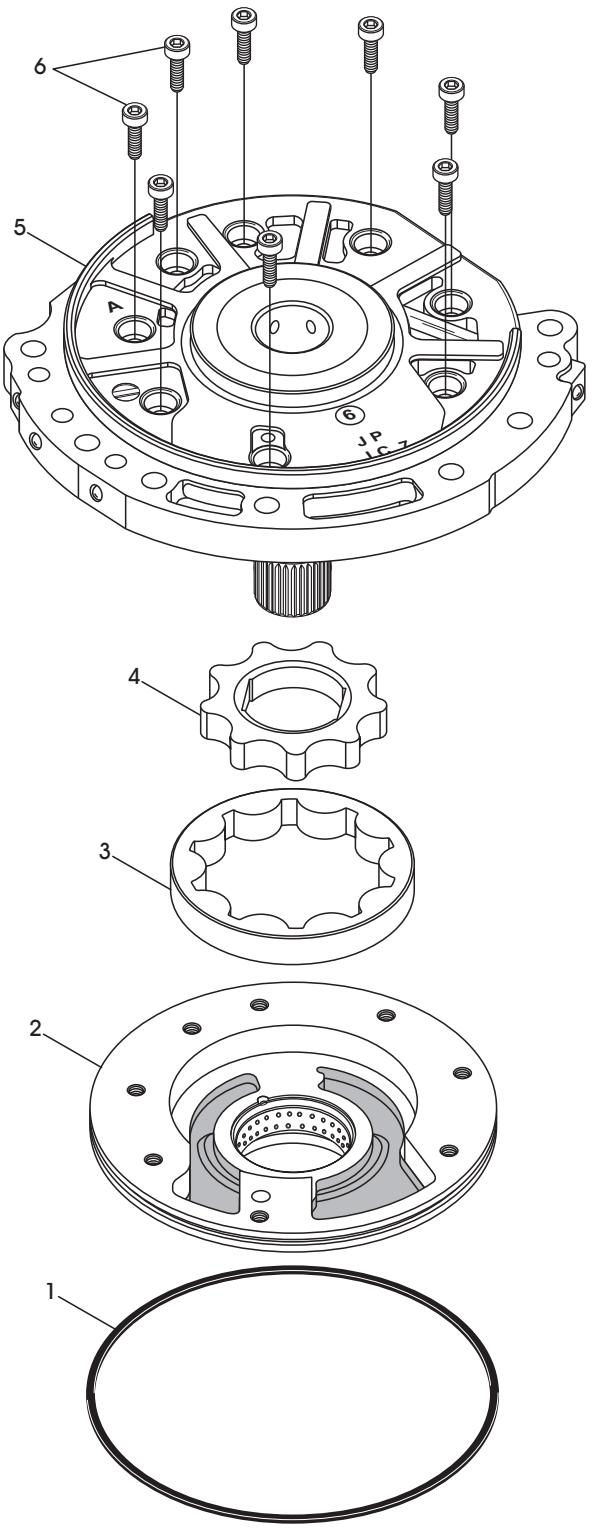


Figure 129



1 PUMP TO CONVERTER HOUSING "D" RING
2 OIL PUMP HOUSING
3 OUTER GEROTOR
4 INNER GEROTOR
5 OIL PUMP COVER
6 PUMP COVER TO OIL PUMP BOLTS (8 REQUIRED)

Figure 130

REDUCTION BAND ADJUSTMENT

The reduction band adjustment in the factory manuals, backing off adjusting screw 5 turns, does not always produce satisfactory transaxle operation. This adjustment could create a "Chatter" condition in forward or reverse and possibly store gear ratio codes. ATSG recommends adjusting the reduction band using the following procedure.

Reduction Band Adjusting Procedure

1. Install the reduction servo return spring, apply piston with new "O" ring.
2. Compress the reduction servo piston assembly and install retaining snap ring with flat side facing down, as shown in Figure 132.
3. Remove the pressure plug and "O" ring from transaxle case, as shown in Figure 132.
4. Install the factory servo piston holding tool, as shown in Figure 132.
   Note: This is a mandatory tool to get the adjusting screw locking nut torqued properly. We have provided the Mazda part number, as shown in Figure 131 and 132.
5. Install 14 mm deep socket over the adjusting screw locking nut and loosen the nut.
6. Using a dial caliper measure from the top of the 14 mm deep socket, down to a straight edge placed on machined surface of transaxle case, as shown in Figure 133.
7. Record this measurement as "Dimension A".
8. Fully compress the servo piston and the 14mm socket, using a large screwdriver, as shown in Figure 135.
9. With piston fully compressed, measure again from the top of socket down to straight edge, and record the measurement as "Dimension B".
10. Subtract "Dimension B" from "Dimension A".
11. Turn adjusting screw as necessary to achieve, a minimum of 3.175mm (0.125") to a maximum of 4.75mm (0.187").
12. Torque the adjusting screw locking nut down to 39-50 N·m (30-35 ft.lb.).
    Caution: Do not allow the band to become dislodged from the band anchor, as indexing the band back into the proper position will require splitting the case halves.

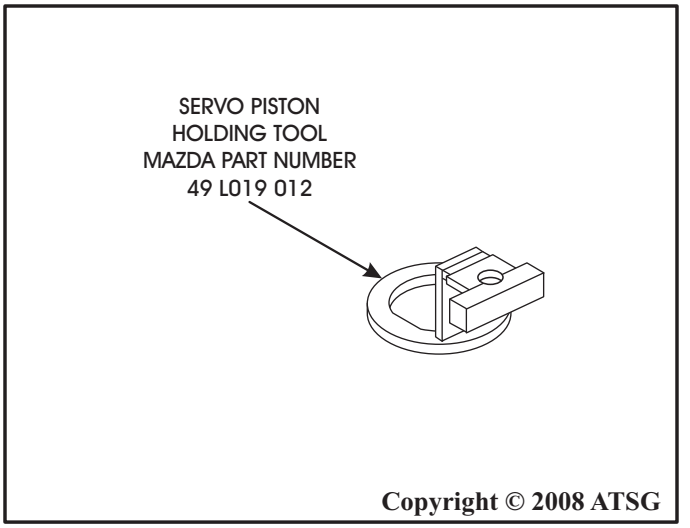


Figure 131

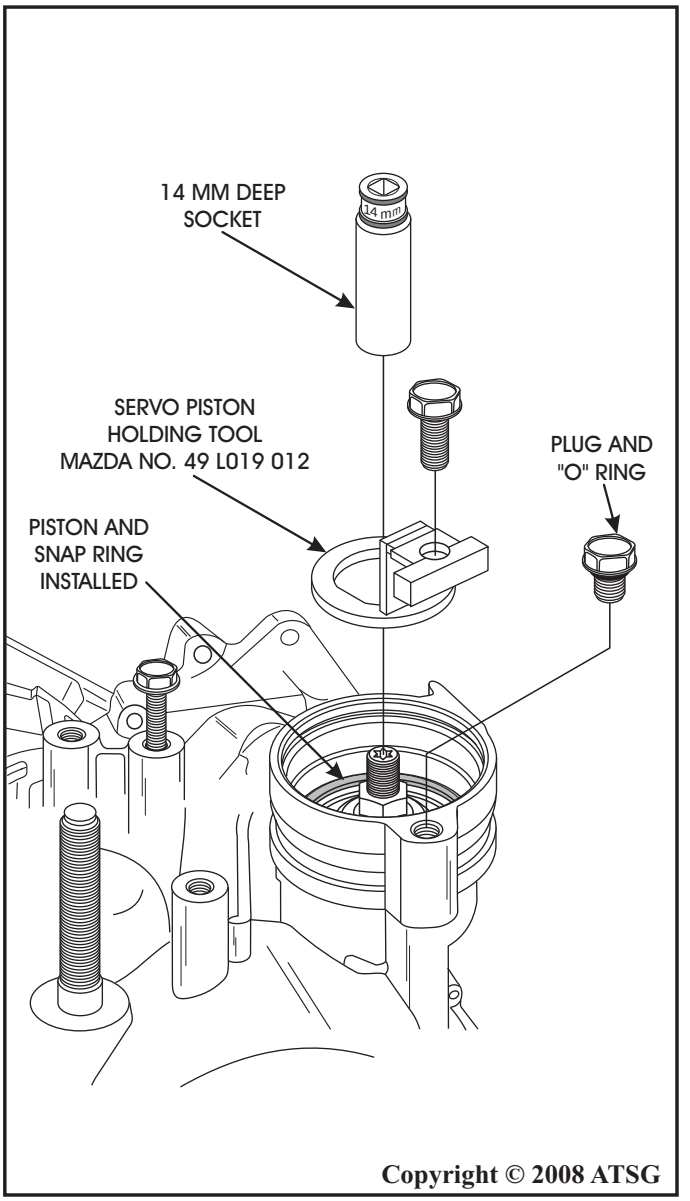


Figure 132

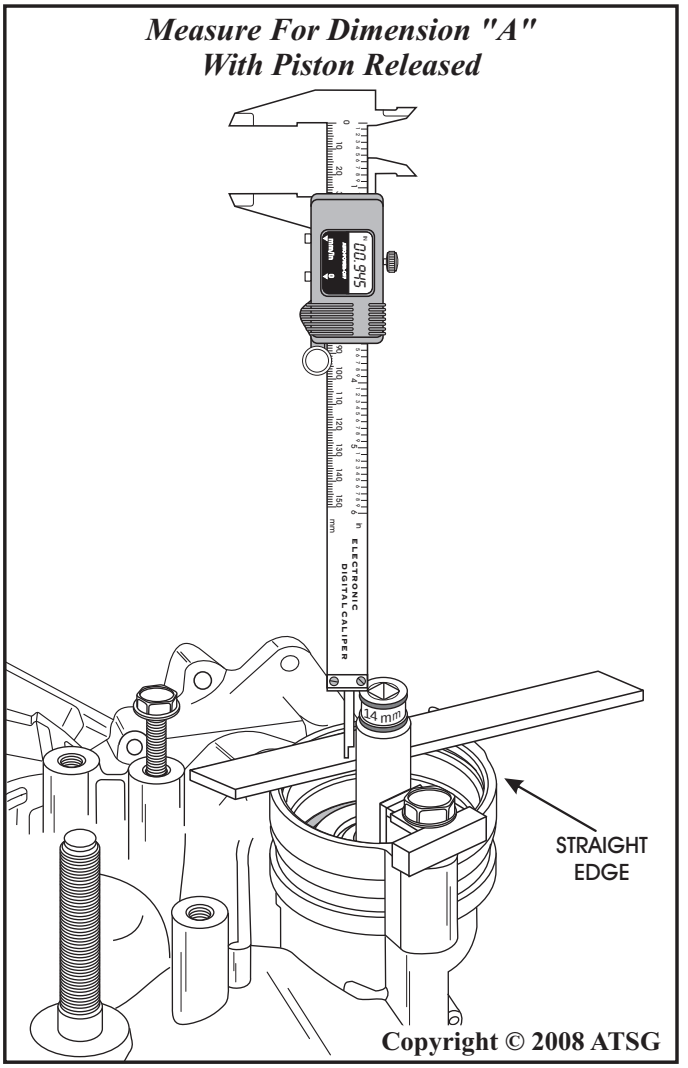


Figure 133

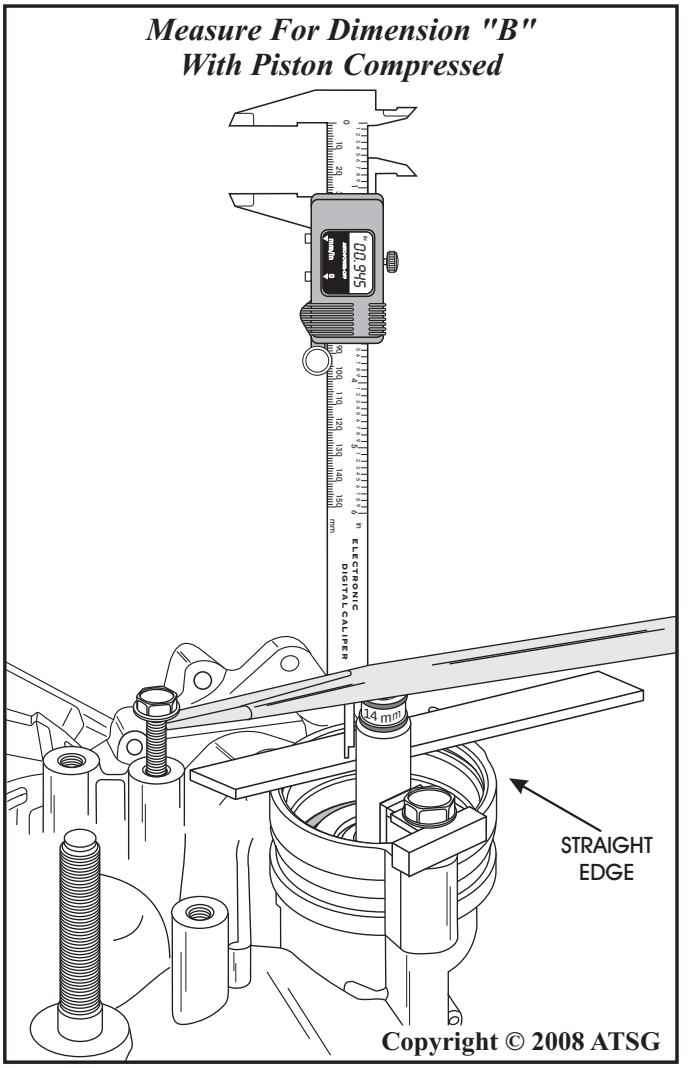


Figure 135

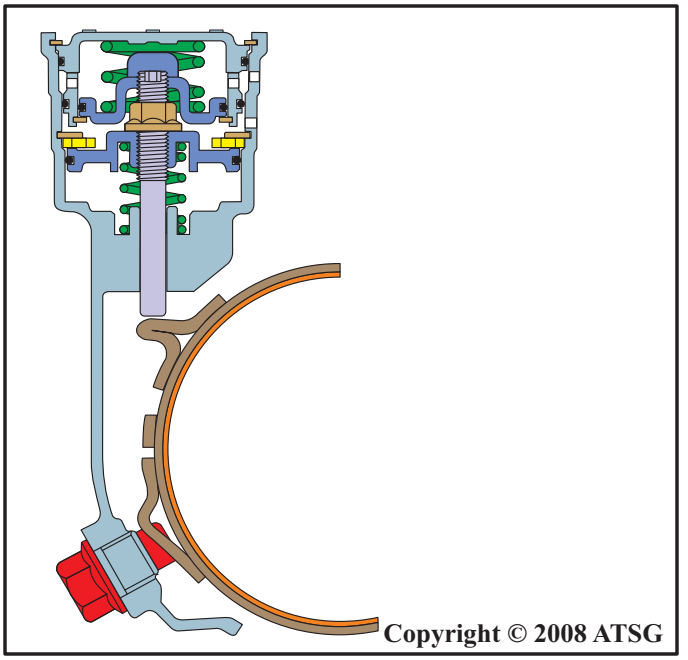
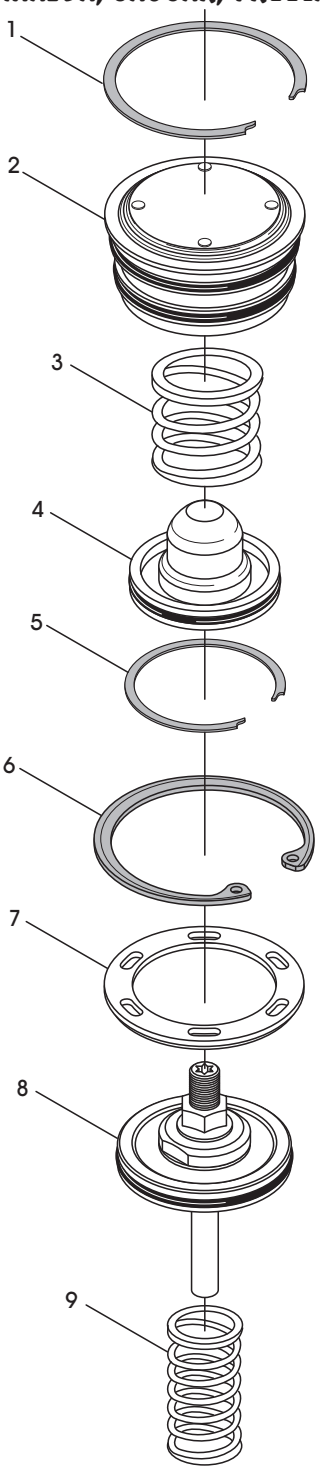


Figure 134

REDUCTION SERVO DIFFERENCES

The Reduction Servo internal components are all the same with the exception of the servo cover. The Volkswagen models use a bolt on cover and all the others use a snap ring to retain the servo cover in the case, as shown in Figure 136 and 137. The cut-away view shown in Figure 134 is the snap ring cover version but Volkswagen is set up exactly the same, except for the bolt on cover. When removing servo apply piston, tag the servo apply piston return spring for identification, as it is very similar to one of the accumulators.

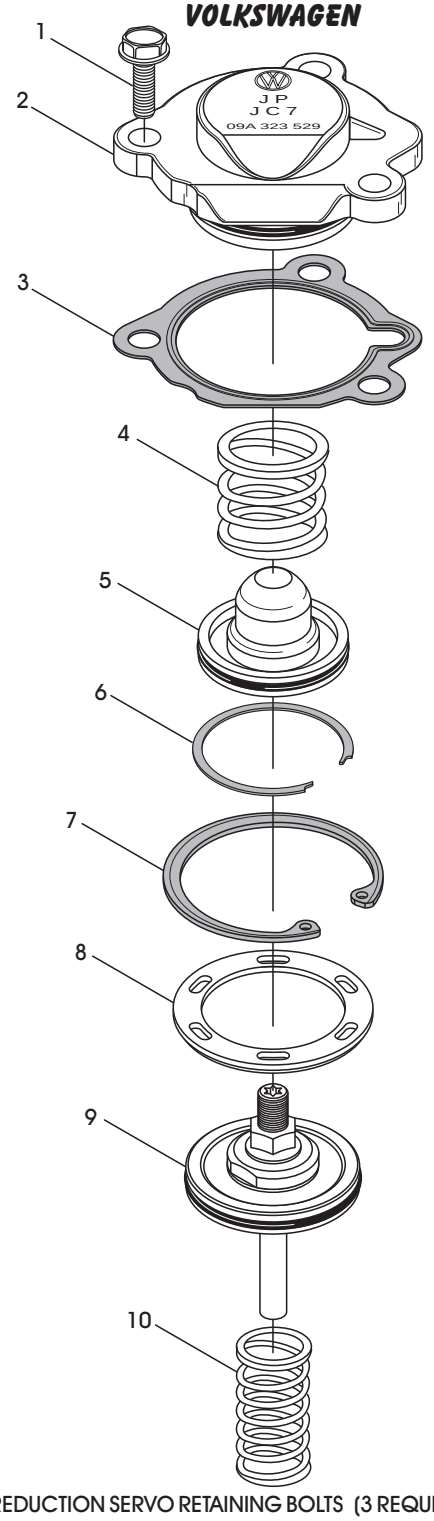
MAZDA, JAGUAR, FREELANDER



1 REDUCTION SERVO COVER RETAINING SNAP RING
2 REDUCTION SERVO COVER AND "O" RINGS ASSEMBLY
3 REDUCTION SERVO CUSHION SPRING
4 REDUCTION SERVO CUSHION SPRING RETAINER AND "O" RING
5 CUSHION SPRING RETAINER SNAP RING
6 REDUCTION SERVO PISTON SNAP RING
7 REDUCTION SERVO SPACER
8 REDUCTION SERVO APPLY PISTON ASSEMBLY
9 REDUCTION SERVO RETURN SPRING

Figure 136

VOLKSWAGEN



1 REDUCTION SERVO RETAINING BOLTS (3 REQUIRED)
2 REDUCTION SERVO COVER AND "O" RING, (BOLT ON)
3 REDUCTION SERVO COVER GASKET (RIBBED STEEL)
4 REDUCTION SERVO CUSHION SPRING
5 SERVO CUSHION SPRING RETAINER AND "O" RING
6 SERVO CUSHION SPRING RETAINER SNAP RING
7 REDUCTION SERVO PISTON SNAP RING
8 REDUCTION SERVO SPACER
9 REDUCTION SERVO APPLY PISTON ASSEMBLY
10 REDUCTION SERVO RETURN SPRING

Figure 137

FLUID FILTER DIFFERENCES

The main fluid filter mounts with two of the oil pump retaining bolts and also goes over a roll pin located in transaxle case, as shown in Figure 138 and Figure 139.

Currently there are only three filters in production that cover all applications, as shown in Figure 139. The Volkswagen filters are thinner, slightly longer and have a square oil inlet pipe. The other one is thicker, shorter, has a round oil inlet pipe and fits the Mazda, Jaguar and Freelander models. The transaxle case halves must be split to replace this filter.

The oil pump to case gasket is a stamped steel gasket, which would normally be "Ribbed" around all oil passage holes. This gasket however, is "Ribbed" only around the pump suction port, as shown in Figure 138. Make sure this gasket is replaced on any service to the transaxle. There have been many reports of valve buzz after rebuild and this gasket has been identified as part of this concern. This gasket is not serviced by any of the car companys except Mazda, and is available under OEM part number FP01-19-221, as shown in Figure 138.

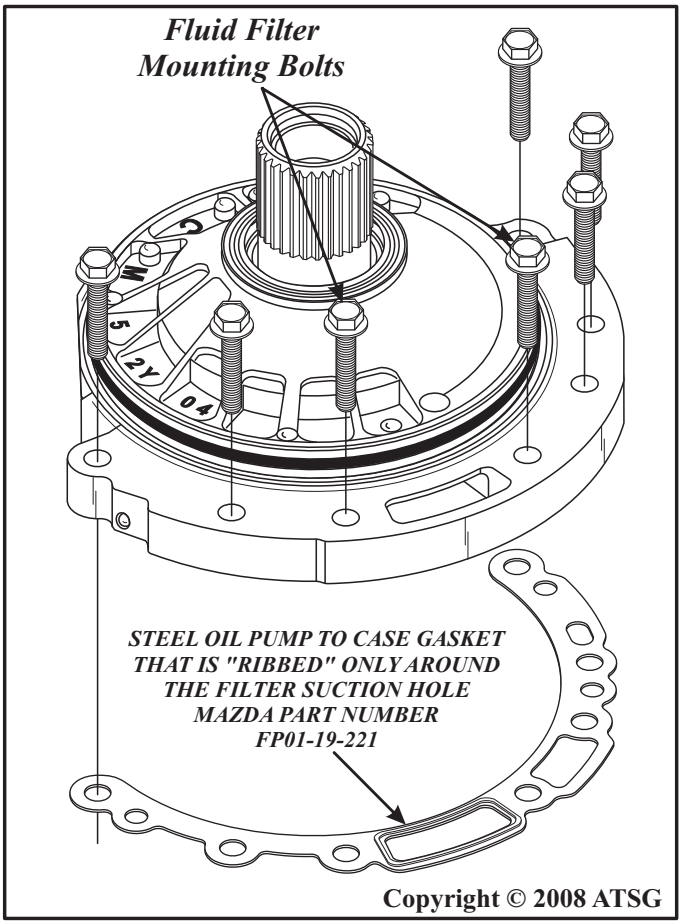


Figure 138

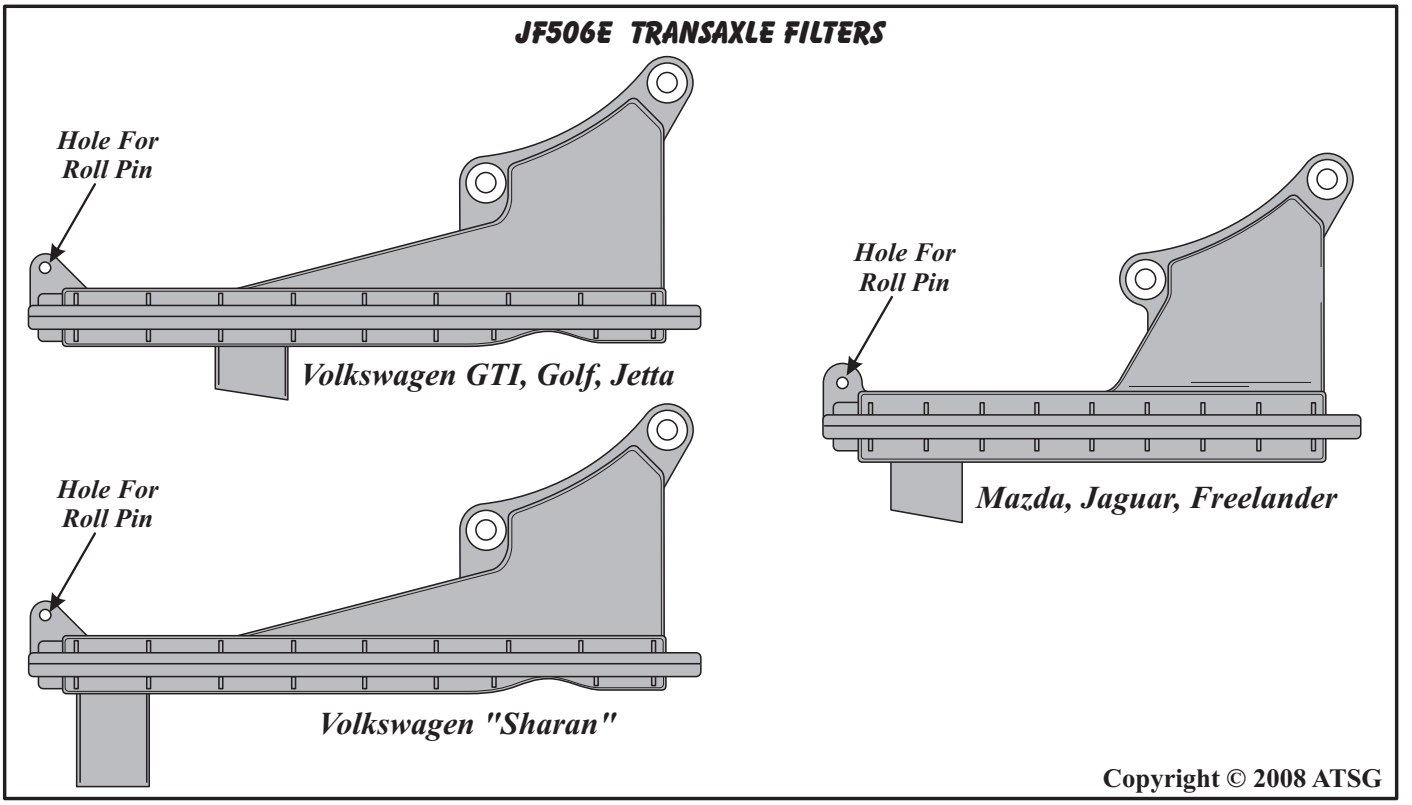


Figure 139

INPUT SHAFT AND TRANSFER GEAR

There are currently two different input shafts, one with three sealing rings and one with two sealing rings, as shown in Figure 141. The third sealing ring goes into Transfer Gear "A", located directly behind the oil pump assembly and seals lube oil from escaping, which of course changes the inside diameter of the transfer gear. ATSG feels that this 3rd sealing ring may be an upgrade, as we have seen one shaft that was just not yet machined, as shown in Figure 141. Some transfer gears are bored to accept the third sealing ring, as shown in Figure 140, and some are not. You must measure the inside diameter, as shown in Figure 140, to determine whether it is used with a 2 ring input shaft, or a 3 ring input shaft. The transfer gears also vary in tooth count between the various models, as shown in the chart in Figure 142.

Be very careful with the selection process, if replacement parts are necessary.

Special Note:
The three ring input shaft and transfer sprocket is definitely the better design and will make a much more durable transaxle.

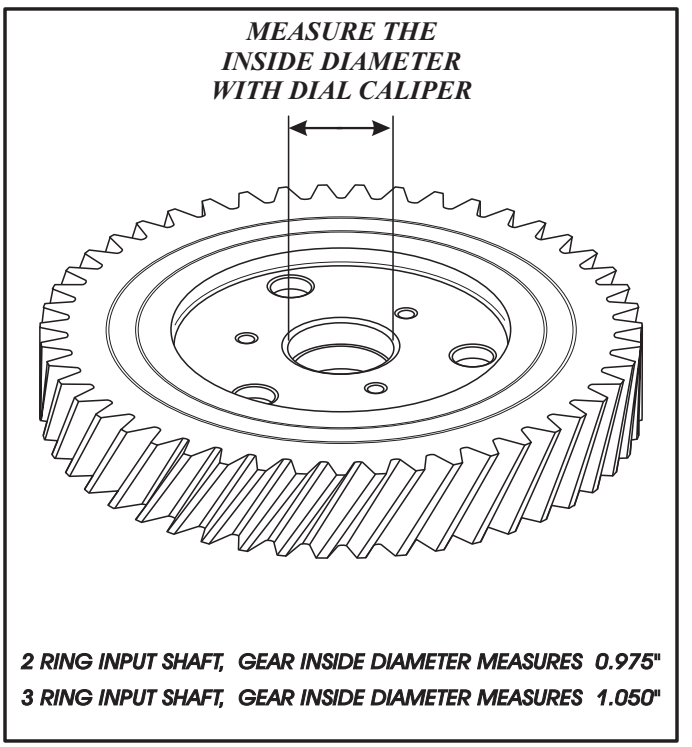


Figure 140

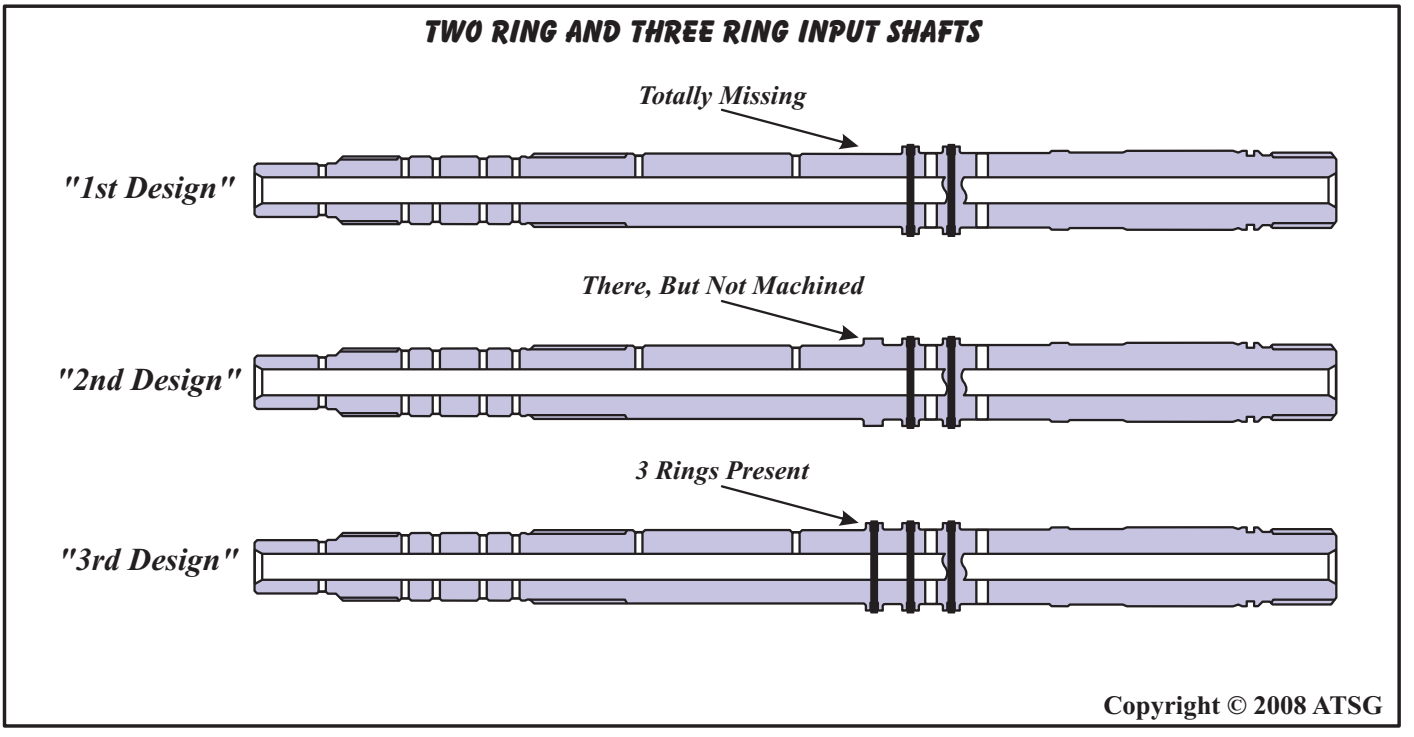


Figure 141

JF506E PLANETARY, DIFFERENTIAL, TRANSFER GEAR RATIO CHART

	Maxda 6 3.0L V6	Maxda MPV 3.0L V6	Land Rover Freelander 2.5L V6	Land Rover Freelander Turbo Diesel	Jaguar X Type 2.0L/2.5L/3.0L	VW Golf 1.9L Diesel	VW Jetta 1.8L/2.8L	VW GTI 1.8L
1st Gear	3.801	3.801	3.474	3.801	3.801	3.801	3.801	3.801
2nd Gear	2.131	2.131	1.948	2.131	2.131	2.131	2.131	2.131
3rd Gear	1.364	1.364	1.247	1.364	1.364	1.364	1.364	1.364
4th Gear	0.935	0.935	0.854	0.935	0.935	0.935	0.935	0.935
5th Gear	0.685	0.685	0.685	0.685	0.685	0.685	0.685	0.685
Reverse	2.970	2.970	2.714	2.970	2.970	2.970	2.970	2.970
Differential Ratio	3.23	3.04	3.04	2.87 (2.42) Codes Unknown	3.23	Transaxle Code "EEB" = 3.45 Transaxle Code "EYN" = 3.45 Transaxle Code "EEF" = 2.82		
Transfer Gear "A"	41 Teeth 2 Ring ID	41 Teeth 2 Ring ID	54 Teeth 0 Ring ID	54 Teeth (58 Teeth)	54 Teeth 0 Ring ID	52 Teeth 0 Ring ID	52 Teeth 0 Ring ID	52 Teeth 0 Ring ID
Transfer Gear "B"	47 Teeth 1 Ring ID	47 Teeth 1 Ring ID	65 Teeth 0 Ring ID	65 Teeth (65 Teeth)	65 Teeth 0 Ring ID	67 Teeth 0 Ring ID	67 Teeth 0 Ring ID	67 Teeth 0 Ring ID
Differential Pinion Gear	21 Teeth 3 Ring ID	22 Teeth 2 Ring ID	22 Teeth 2 Ring ID	23 Teeth (26 Teeth)	21 Teeth 3 Ring ID	20 Teeth 3 Ring ID	20 Teeth 3 Ring ID	23 Teeth 3 Ring ID
Differential Ring Gear	68 Teeth 3 Ring ID	67 Teeth 2 Ring ID	67 Teeth 2 Ring ID	66 Teeth (63 Teeth)	68 Teeth 3 Ring ID	69 Teeth 3 Ring ID	69 Teeth 3 Ring ID	65 Teeth 3 Ring ID

Special Note: The above tooth counts were "Observed" counts, from units that we seen during teardown. Notice also that the rings that are normally used for identification, are the same count on many of the ring gears. Use "ONLY" the tooth count for positive identification, and in the case of Transfer Gear "A", you must also measure the inside diameter of the gear, to determine if it is used for 2 ring input shaft or 3 ring input shaft.

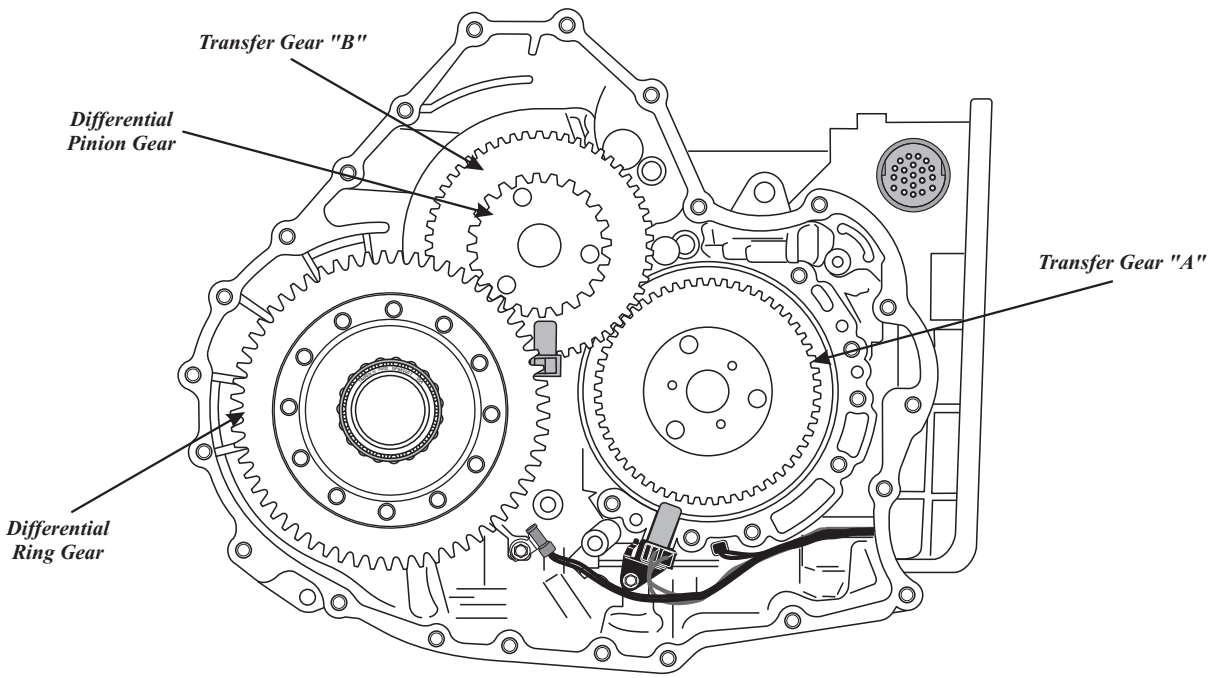


Figure 142

FINAL DRIVE IDENTIFICATION

The Final Drive assembly can be lifted out, after the converter housing is removed from the case. The differentials, shown in Figure 143, and the pinion gears come in various ratios and all are unique to the individual manufacturer.

Refer to the gear ratio chart in Figure 142, on Page 98, for the differential ratios that have been published. These final drive assemblies obviously will not interchange between the manufacturers.

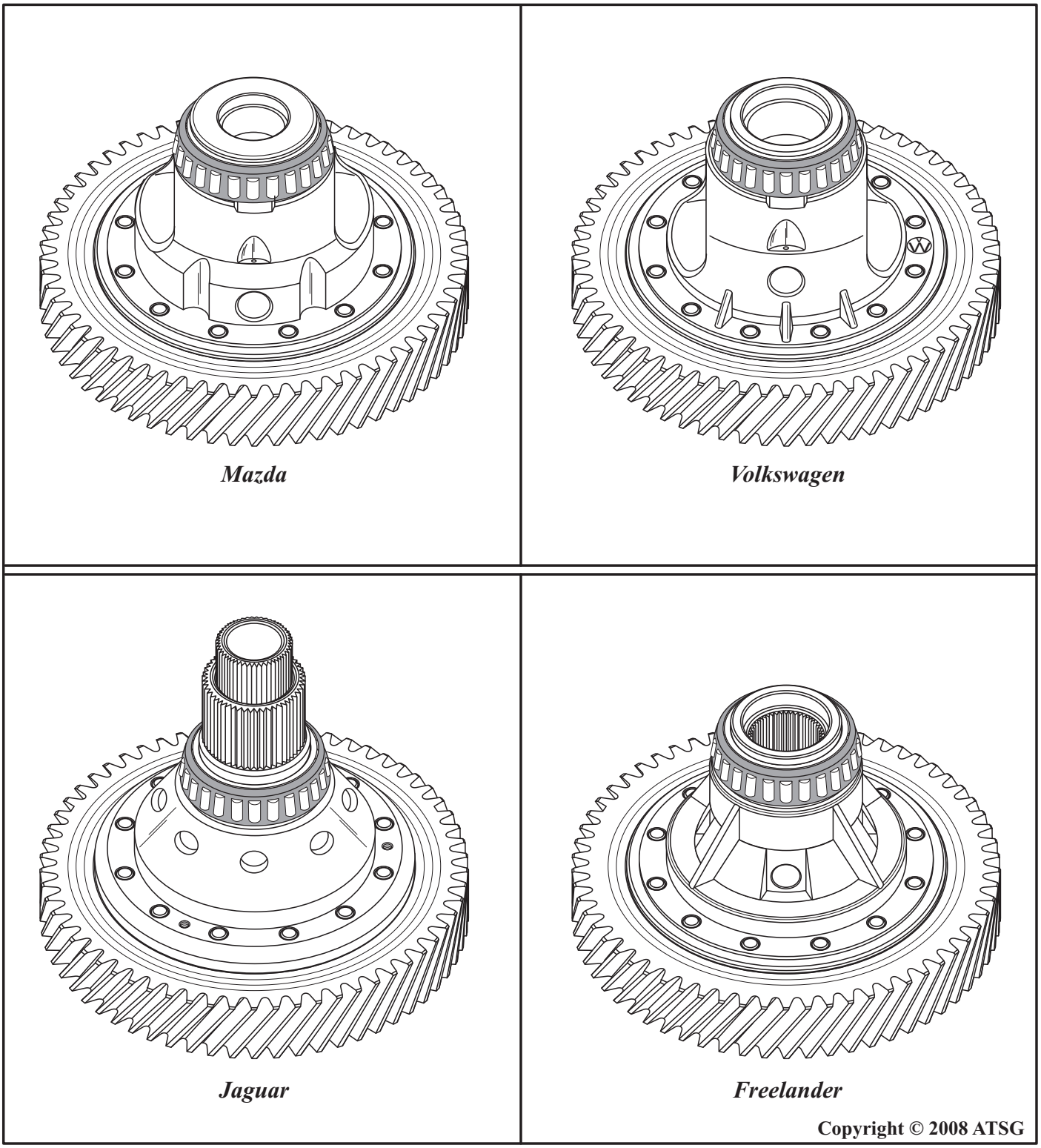


Figure 143

JF506E TRANSAXLE (ALL MODELS)
2-3 FLARE OR SLIPS IN 3RD, 4TH AND 5TH

COMPLAINT: Mazda, Volkswagen, Jaguar or Freelander vehicles, equipped with the JF506E transaxle, may exhibit a flare on the 2-3 upshift, and/or slips in 3rd, 4th and 5th gear.

CAUSE: The cause may be, a cracked High Clutch Housing/Reverse Piston (See Figure 144). This crack is extremely difficult to see, and if missed during rebuild will cause premature high clutch failure. When this piston is cracked, it allows high clutch fluid to bleed into the reverse clutch circuit when the unit is in 3rd, 4th and 5th gear. The reverse clutch circuit is open to exhaust, when the unit is in these gears.

CORRECTION: Replace the High Clutch Housing/Reverse Piston assembly, as shown in Figure 144. Refer to Figure 145 for an exploded view of the high and reverse clutch housing for the piston location.

SERVICE INFORMATION:

High Clutch Piston Housing/Reverse Piston (Mazda Part No.) FP03-19-480
Special Note:
This piston is only available individually from Mazda, but works just fine in the other units. All others it is not sold seperately.

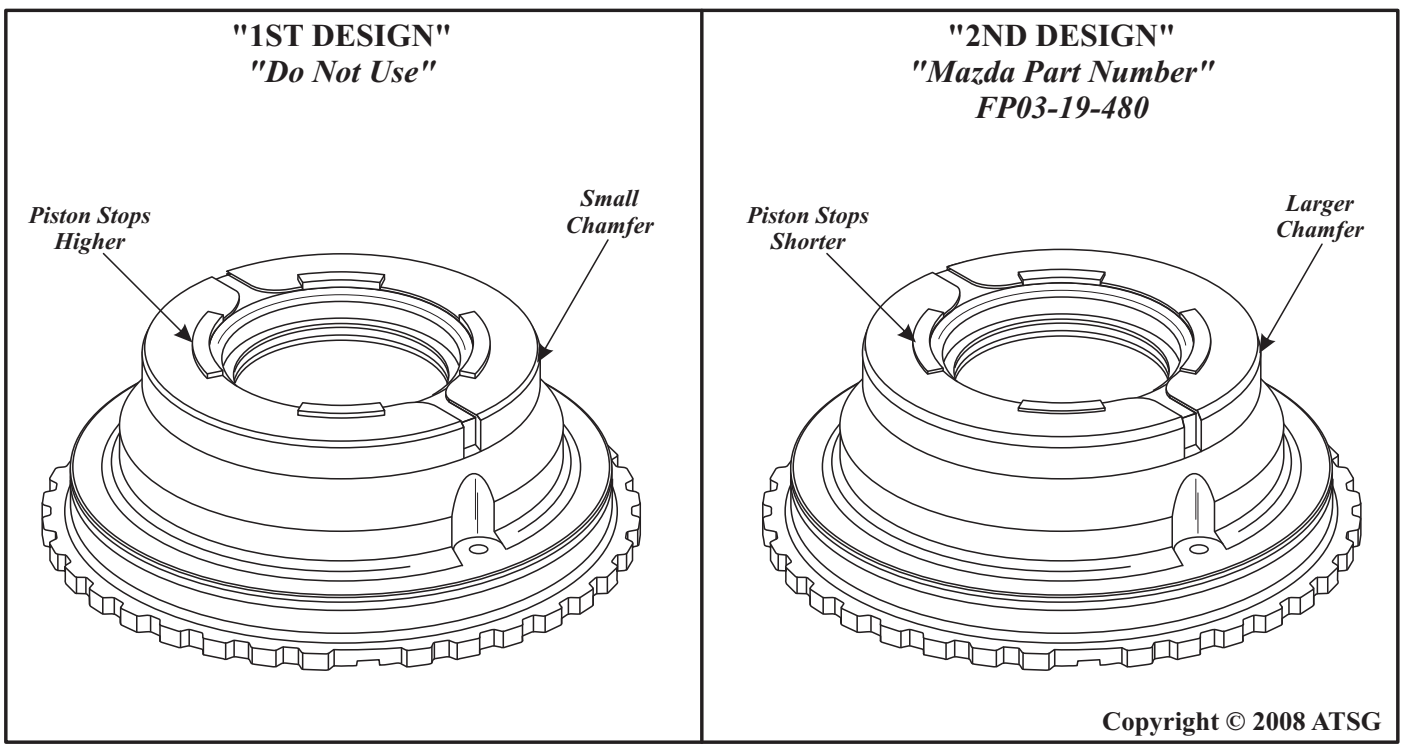
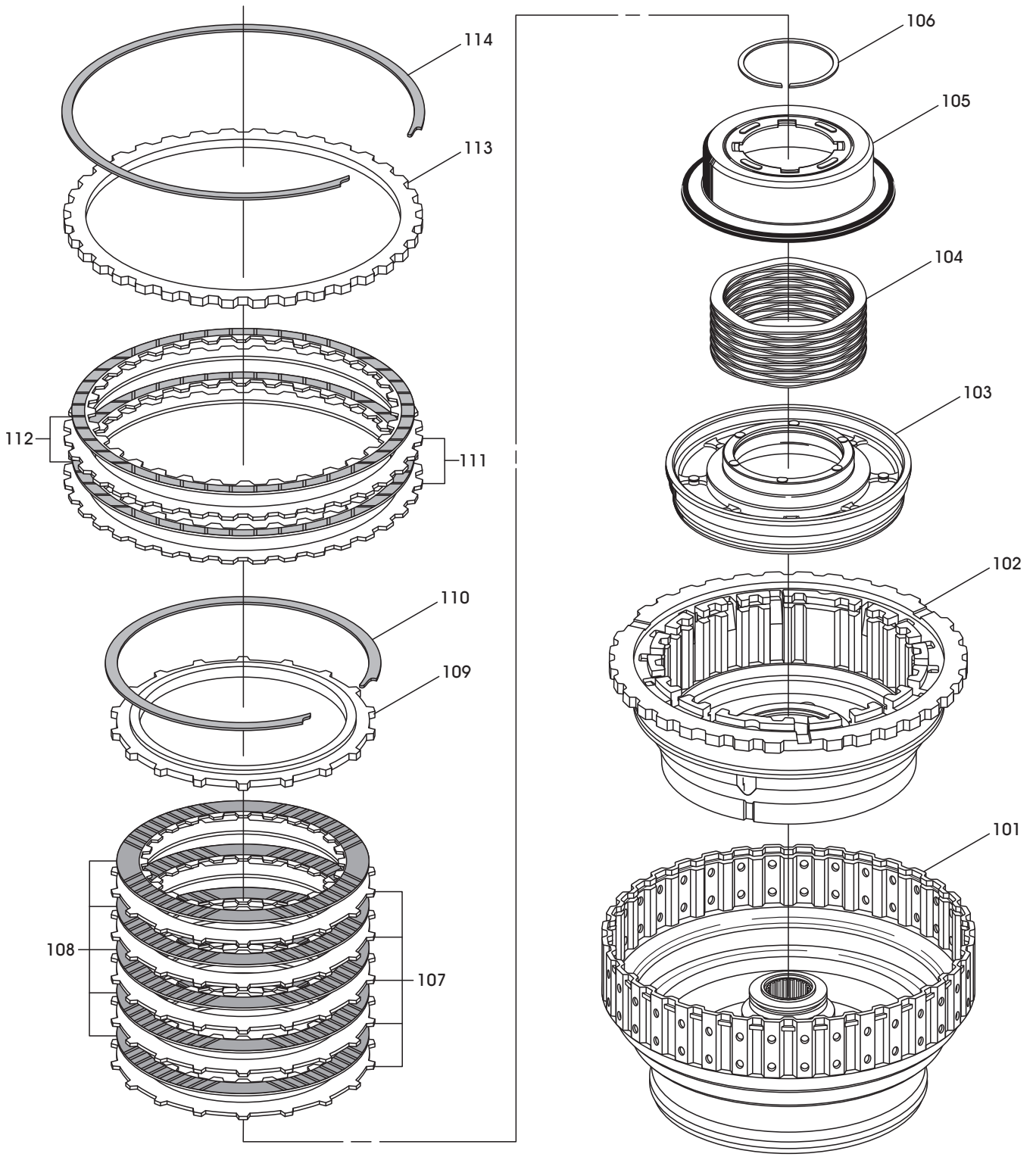


Figure 144



101 REVERSE CLUTCH HOUSING ASSEMBLY
102 HIGH CLUTCH HOUSING/REVERSE PISTON ASSEMBLY
103 HIGH CLUTCH PISTON
104 HIGH CLUTCH PISTON RETURN SPRING
105 HIGH CLUTCH BALANCE PISTON
106 HIGH CLUTCH BALANCE PISTON SNAP RING
107 HIGH CLUTCH STEEL PLATES
109 HIGH CLUTCH BACKING PLATE
110 HIGH CLUTCH BACKING PLATE SNAP RING
111 REVERSE CLUTCH STEEL PLATES
112 REVERSE CLUTCH FRICTION PLATES
113 REVERSE CLUTCH BACKING PLATE
114 REVERSE CLUTCH BACKING PLATE SNAP RING

Figure 145

VOLKSWAGEN JF506E
REPEATED LUBE FAILURE

COMPLAINT: Repeated planetary failure, from lack of lubrication, on any Volkswagen equipped with the JF506E transaxle. Has normally been occurring after rebuild.

CAUSE: The cause may be, ***not*** installing the "beaded" gasket between the case and the converter housing, or installing the ***wrong*** "beaded" gasket, as shown in Figure 146. Jatco changed this gasket during the 2003 model year because of a change in the case pocket depth. This gasket is in the Volkswagen aftermarket kits only, as Volkswagen is the only manufacturer that uses the cooler mounted externally on the transaxle case, as shown in Figure 148. There are tubes that run from the back side of the converter housing, internally over to the cooler.

CORRECTION: Now there will be two different thickness gaskets included in your kits, and this will require you to measure the thickness of the original gasket metal core, before discarding, as shown in Figure 147. The 1st design gasket (1999-Some 2003) has a metal core thickness of .203mm (.008"). The 2nd design gasket (Some 2003-Up) has a metal core thickness of .610mm (.024"). Install the correct "beaded" gasket between the case and the converter housing, as shown in Figure 146.

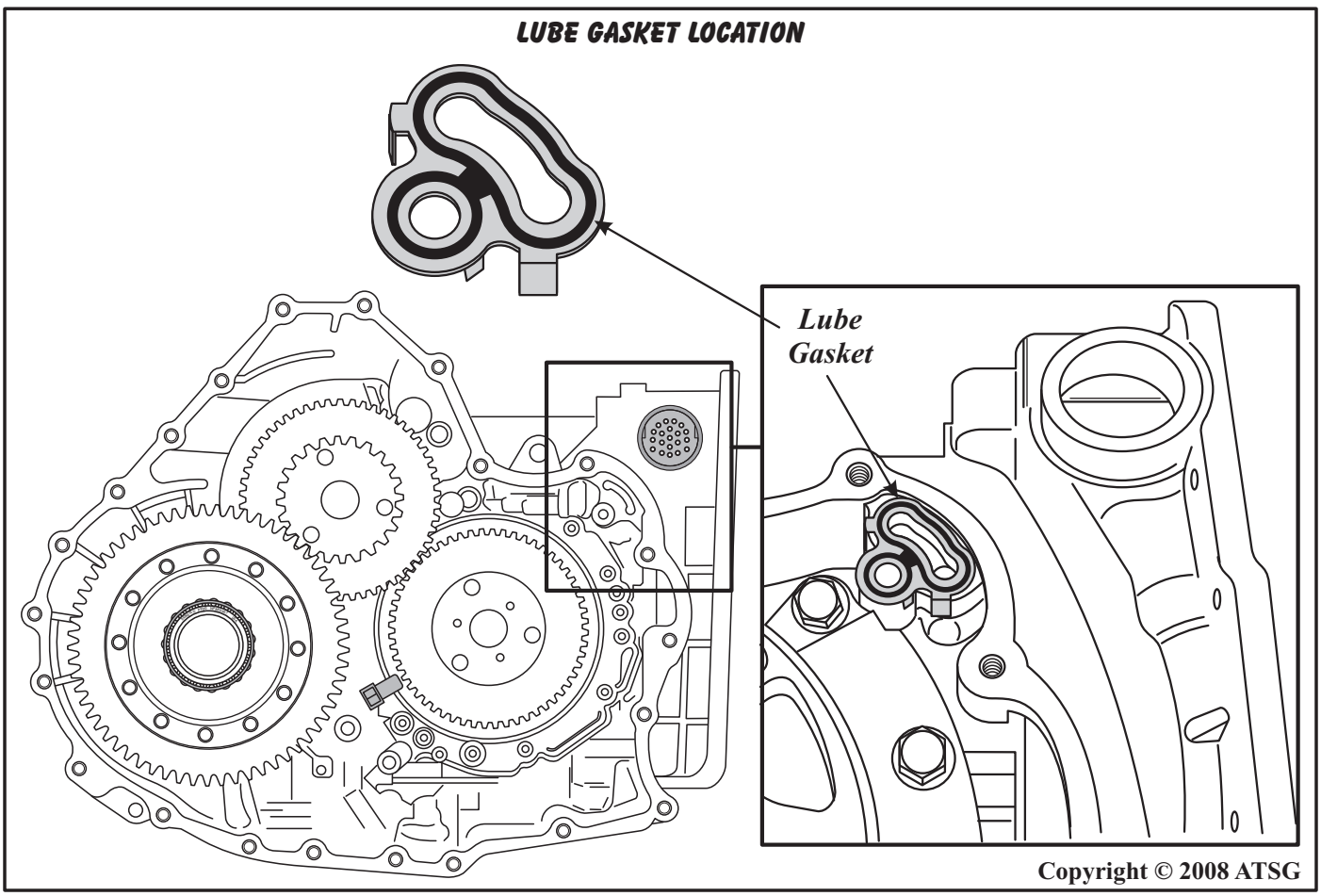
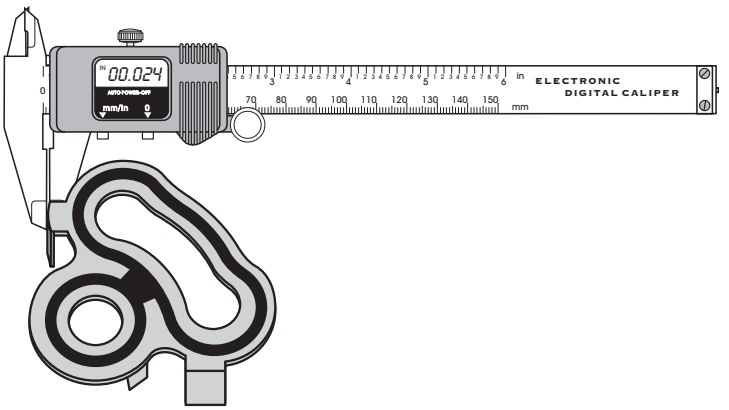


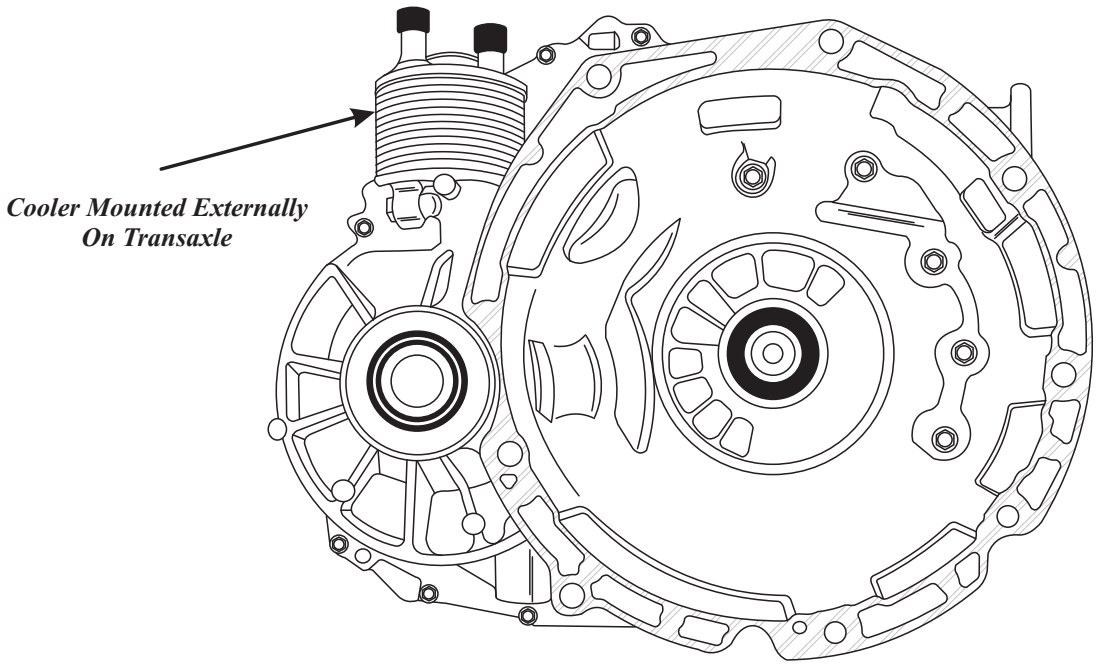
Figure 146

MEASURING GASKET METAL CORE THICKNESS



1999 Models Through Some 2003 = .203mm (.008") Thickness
Some 2003 Through Current Models = .610mm (.024") Thickness

Figure 147



Volkswagen
Golf, GTI And Jetta

Figure 148

DIRECT CLUTCH DIFFERENCES

Direct Clutch Housing

The Direct Clutch Housing is different, depending on the planetary gear ratio of your unit, because the reduction sun gear "splines" into the direct clutch housing, as shown in Figure 149. The Freelander uses a 23 Tooth sun gear, while all others use a 31 Tooth sun gear, as shown in Figure 149. Since the reduction sun gear is a different diameter, it also changes the "hub" of the selective thrust bearing race, as shown in Figure 149. The thrust bearing assembly for this area is the same on all models. The direct clutch stack-up is also different between the 4 clutch and the 3 clutch direct clutch housings. Refer to Page 106.

Reduction Planetary Carrier

The Reduction Planetary Carrier is going to have different size pinion gears in the carrier obviously because of the ratio difference. The pilot that goes into the direct clutch housing has a diameter on it that is compatable with the 23 Tooth sun gear, as shown in Figure 150, only on the area down between the pinion gears where the sun gear rotates. The reduction sprag parts are the same on all models, also shown in Figure 150.

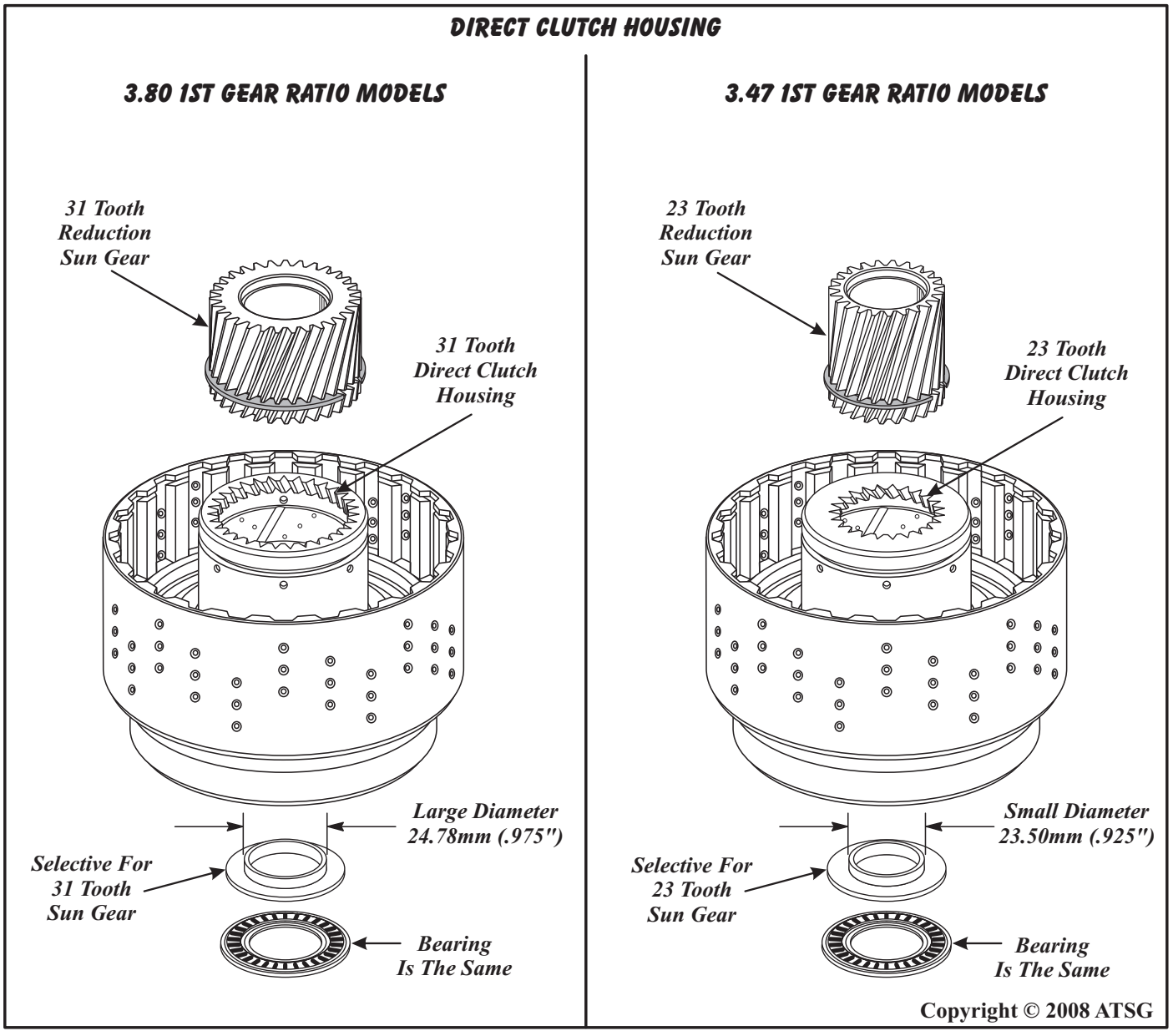


Figure 149

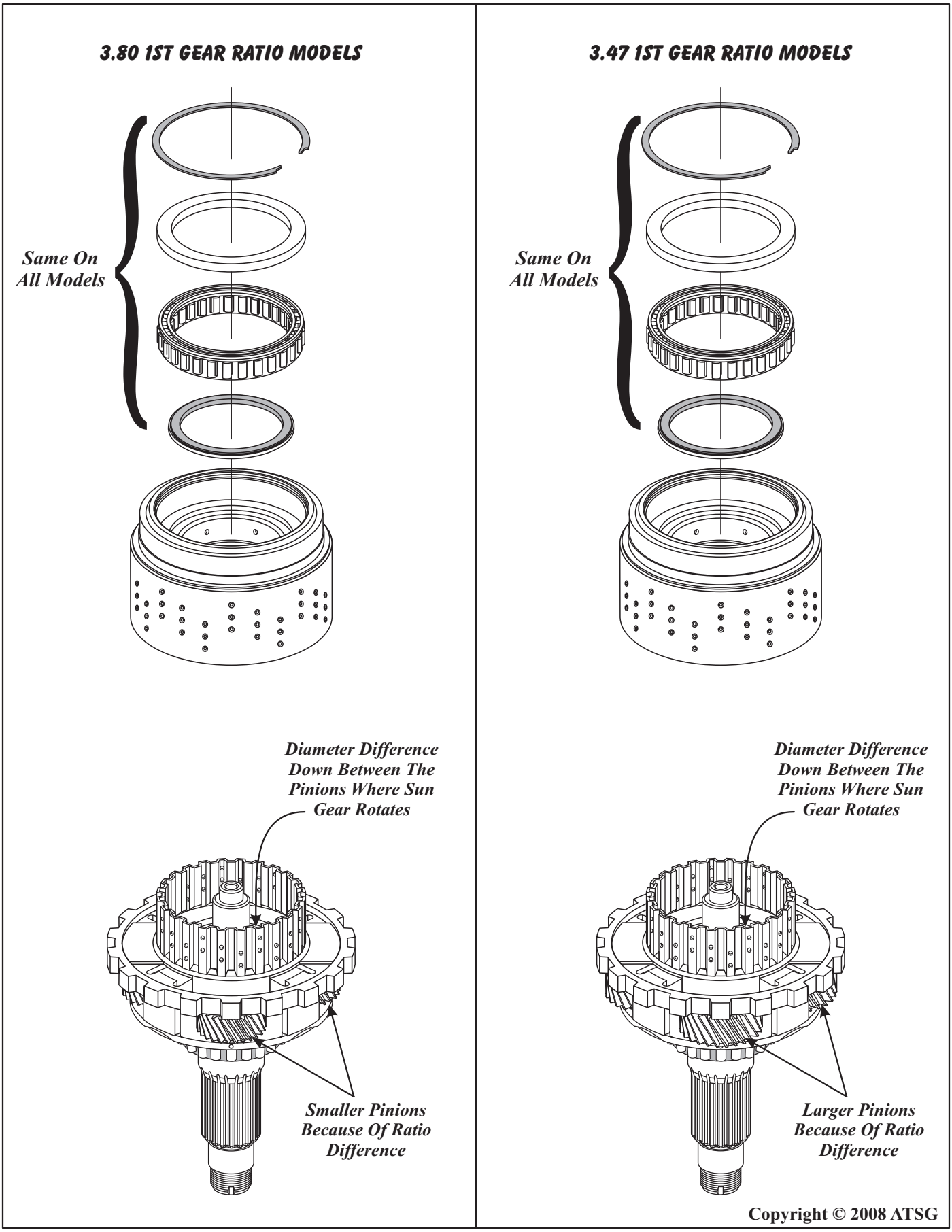

3.80 1ST GEAR RATIO MODELS
Same On All Models
Diameter Difference Down Between The Pinions Where Sun Gear Rotates
Smaller Pinions Because Of Ratio Difference
3.47 1ST GEAR RATIO MODELS
Same On All Models
Diameter Difference Down Between The Pinions Where Sun Gear Rotates
Larger Pinions Because Of Ratio Difference
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Figure 150

DIRECT CLUTCH DIFFERENCES (CONT'D)

Direct Clutch Stack-Up

The direct clutch friction and steel plates also stack differently, as shown in Figure 151. There is a 4 friction and 4 steel stack, and a 3 friction and 5 steel stack, as shown in Figure 151. The direct clutch backing plate is the same on all models.

Direct Clutch Piston

The direct clutch apply piston also changes in height, in the area shown in Figure 151, to accommodate the different clutch stack-ups. Be very careful in choosing replacement parts for this area.

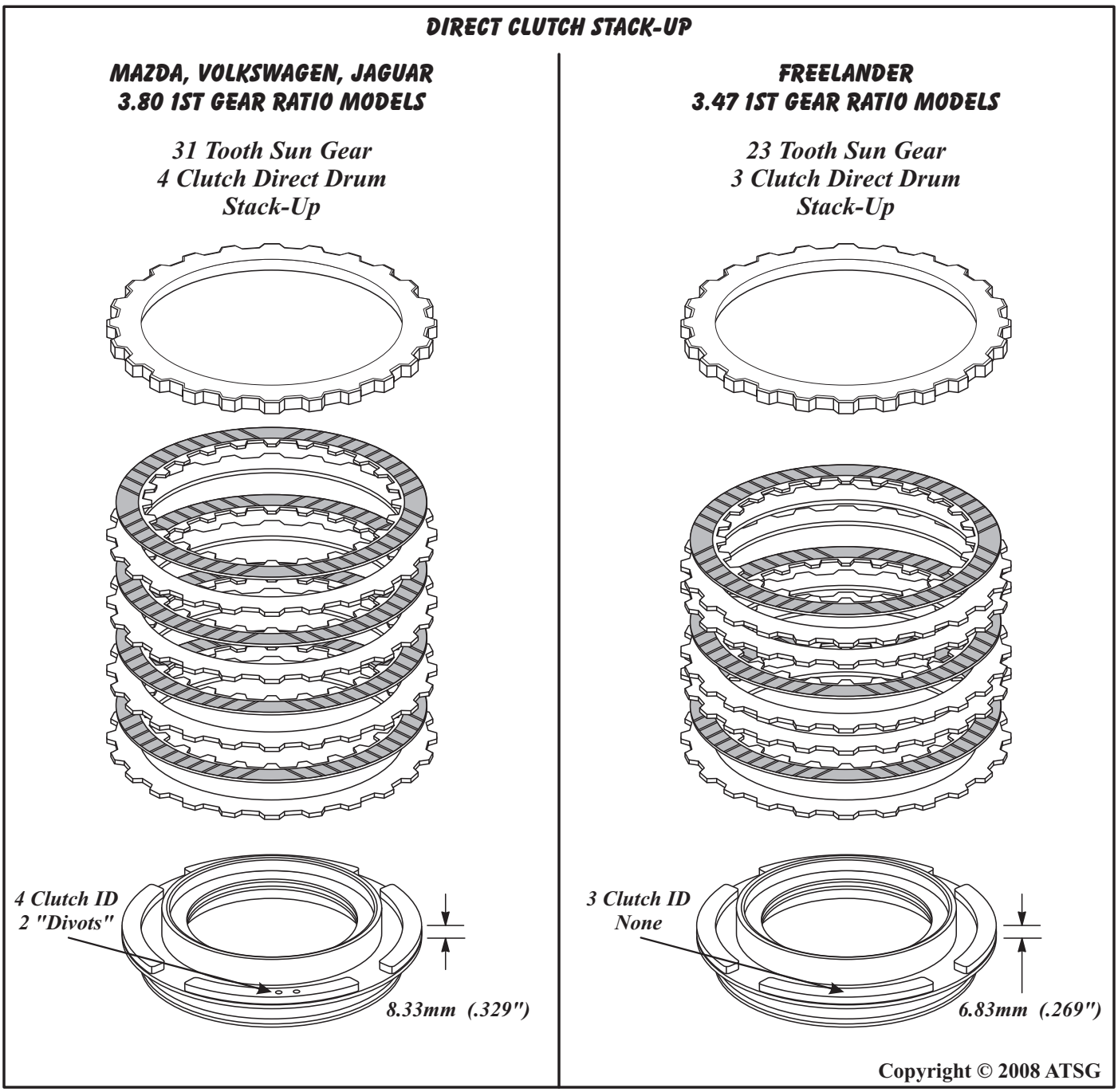


Figure 151

CASE PASSAGE IDENTIFICATION

Figure 152 identifies the case passages under the valve body for possible air checks, or for removing a particular component. Also shown are the location of the two seals between the valve body and the case.

CASE PASSAGE IDENTIFICATION

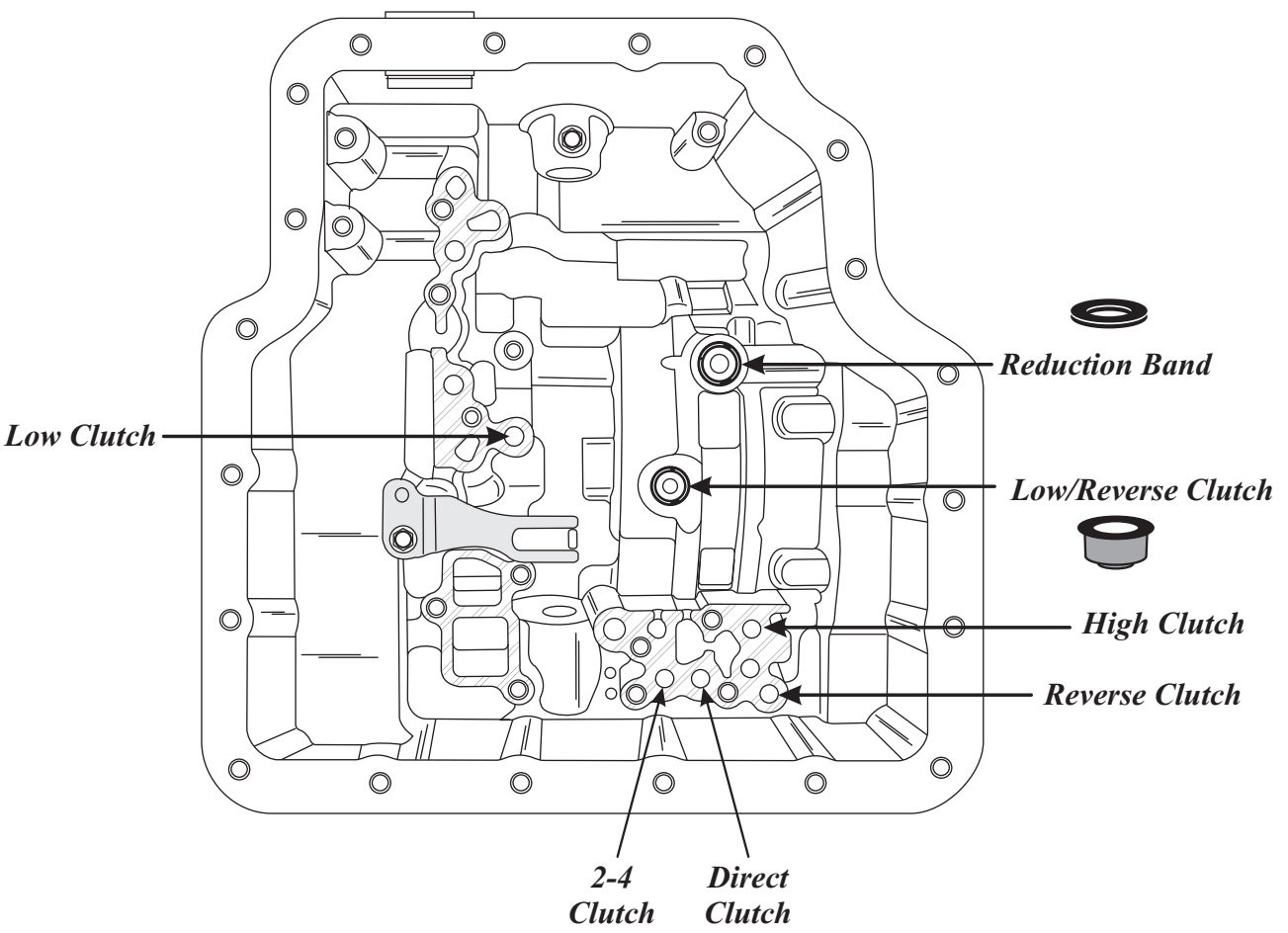
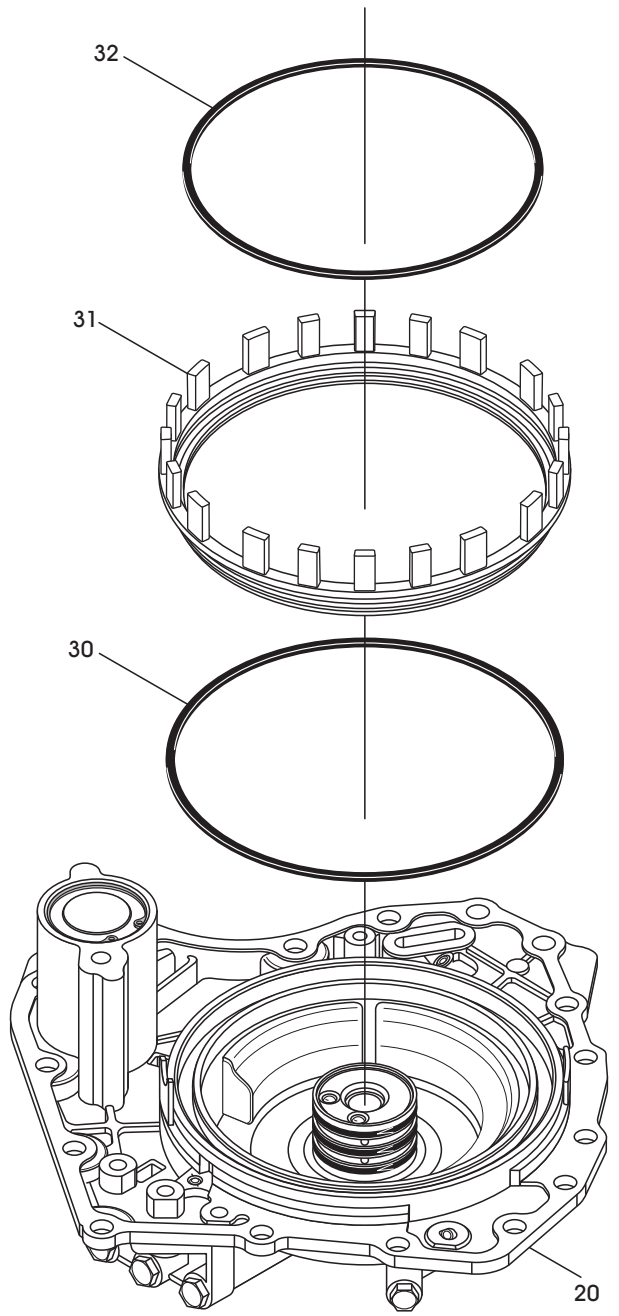


Figure 152

END COVER AND 2-4 CLUTCH PISTON DIFFERENCES

2-4 Brake Clutch Piston/End Cover

There are currently two different 2-4 Brake Clutch Pistons, that are different only on the inside diameter, as shown in Figure 154. You will need a dial caliper capable of measuring 6 plus inches.



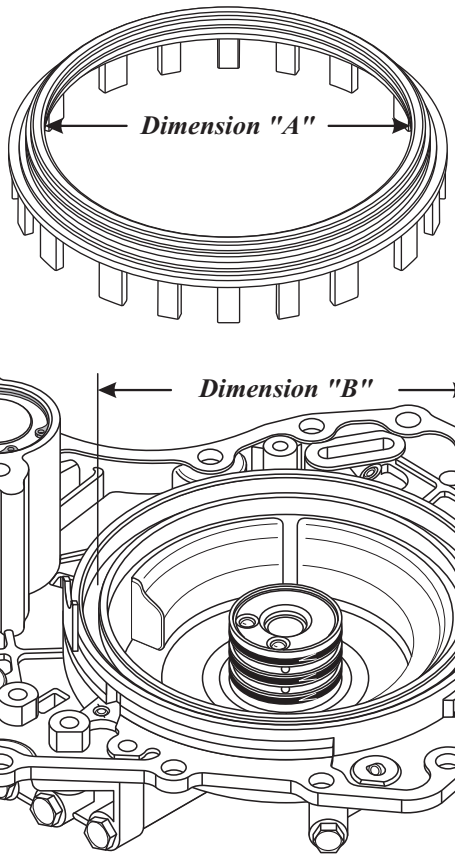
20 TRANSAXLE END COVER
30 2-4 BRAKE CLUTCH PISTON OUTER SEAL
31 2-4 BRAKE CLUTCH PISTON
32 2-4 BRAKE CLUTCH PISTON INNER SEAL

Figure 153

2-4 Brake Clutch Piston/End Cover (Cont'd)

Currently we have confirmed it only in the Volkswagen Sharan, but we have suspicion that it may be in other models as well. It is not known whether it is strictly model differences or a model year change, but we do know that it is out there. Obviously this would also affect the inside diameter of the piston area in the end cover, also shown in Figure 154. The smaller inside diameter piston would create a larger surface area for the 2-4 clutch apply fluid to work with. The smaller inside diameter piston cannot be installed in the cover for the larger diameter piston You can go the other way very easily, but you will not like the result. ***Ensure that you use extra care if replacement parts are needed for this area.***

PISTON DIMENSIONS
Dimension "A" Is 161.7mm (6.366") = Smaller Diameter
Dimension "A" Is 164.2 (6.465") = Larger Diameter



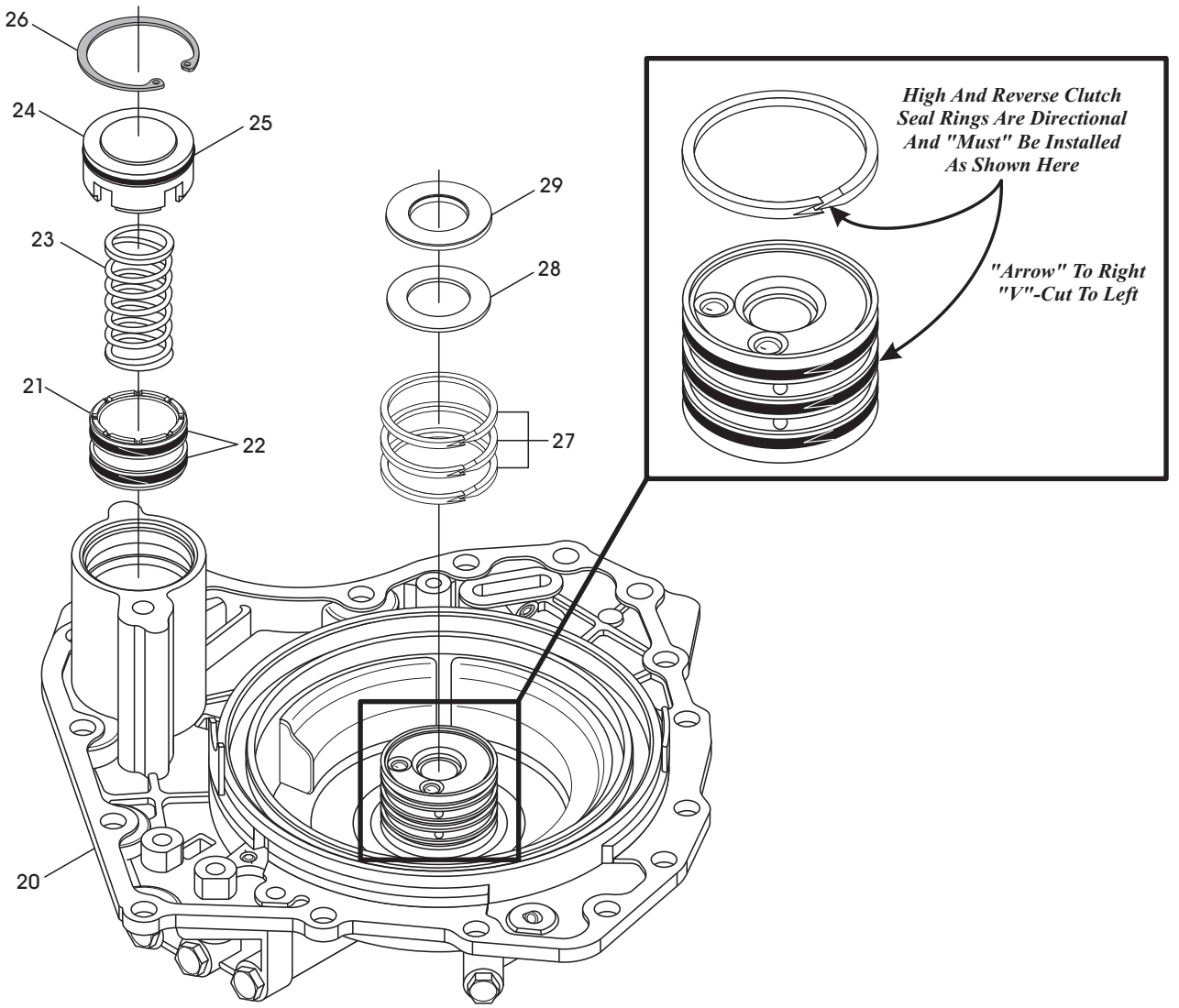
END COVER DIMENSIONS
Dimension "B" Is 161.2mm (6.346") = Smaller Diameter
Dimension "B" Is 163.7 (6.445") = Larger Diameter

Figure 154

REAR COVER "V"-CUT SEALING RINGS

Fluid is fed through the rear cover to apply the high clutch and the reverse clutch, which are both located in the reverse clutch housing. The sealing rings for the high and reverse clutch are Teflon® and one end has a point like an "arrow", and the other end is cut out the inverse of an arrow, or like a "V", as shown in Figure 155. These sealing rings are directional, and when installed correctly, the point of the "arrow" is to the right and the "V" is to the left as shown in Figure 155.

TRANSAXLE REAR COVER EXPLODED VIEW



20 TRANSAXLE REAR COVER
21 2-4 BRAKE ACCUMMULATOR PISTON
22 2-4 BRAKE ACCUMMULATOR PISTON SEALS (2 REQUIRED)
23 2-4 BRAKE ACCUMMULATOR PISTON RETURN SPRING
24 2-4 BRAKE ACCUMMULATOR COVER
25 2-4 BRAKE ACCUMMULATOR COVER "O" RING SEAL
26 2-4 BRAKE ACCUMMULATOR COVER SNAP RING
27 REAR END COVER SCARF-CUT SEALING RINGS (3 REQUIRED)
28 REAR COVER TO REAR BEARING "SELECTIVE" THRUST WASHER
29 REAR COVER TO REVERSE CLUTCH HOUSING THRUST BEARING

Figure 155

LOW ROLLER CLUTCH AND SNAP RING

Installation

The low roller clutch assembly (230) cannot be installed incorrectly, as the outer case lug configuration will allow for only one possibility. A quick method for installation is to first face the ledge side of the roller clutch housing down towards the case, and align the narrow lug of the housing to the narrow case groove as shown in Figure 156. The retaining low roller clutch snap ring (231) fits properly into the case as shown in Figure 156.

LOW/REVERSE CLUTCH PACK

Installation

The low/reverse clutch stepped backing plate (246) fits into the case with the step facing down and lugs into the case in the same fashion as the low roller clutch assembly, as well as the steel plates (248), as shown in Figure 157.

The low/reverse piston retainer's (256) outer tab must key into the case as shown in the lower right corner, as shown in Figure 156, so as to properly align the feed hole to the valve body side of the case.

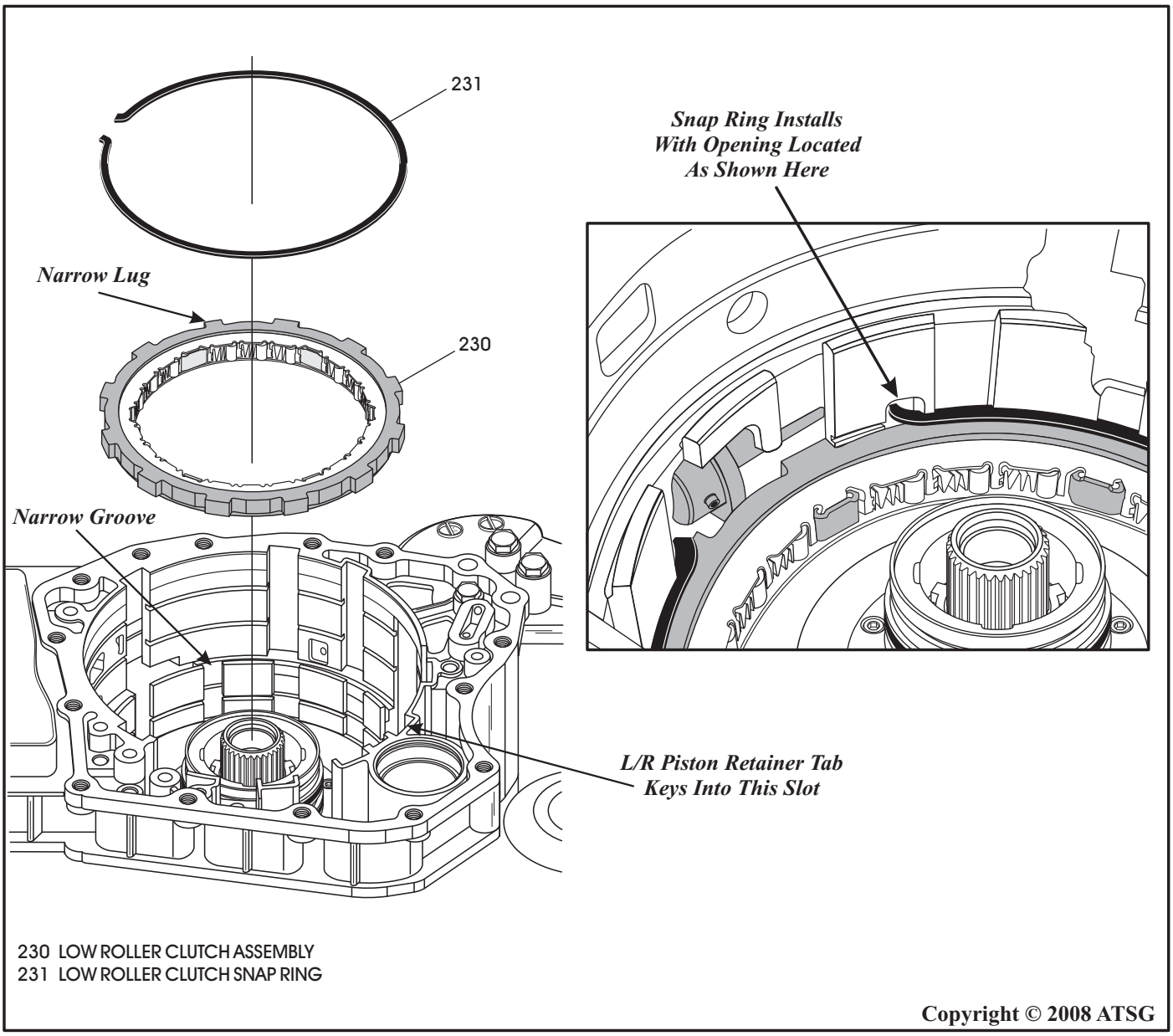
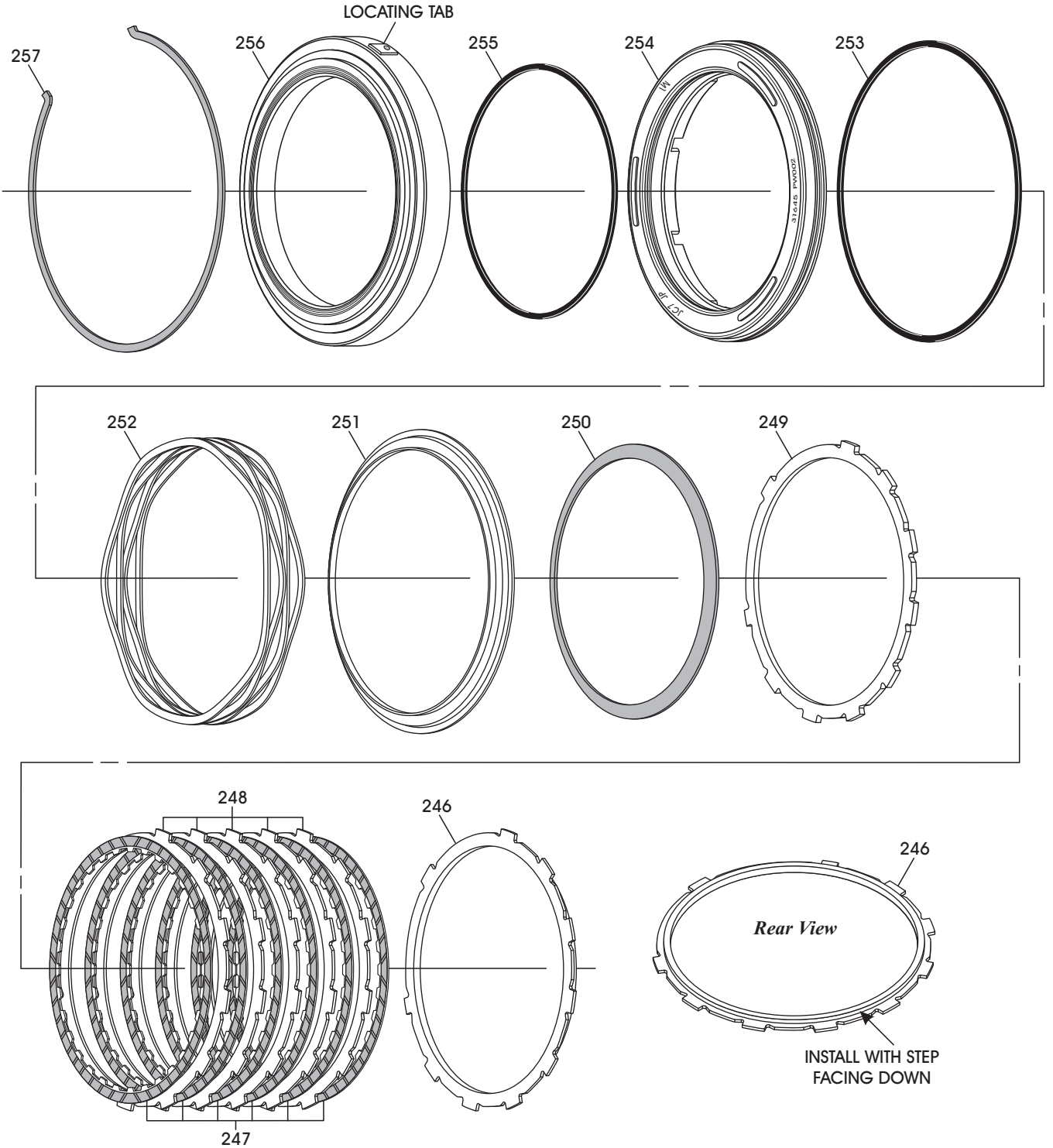


Figure 156

LOW/REVERSE CLUTCH EXPLODED VIEW



246 LOW/REVERSE CLUTCH BACKING PLATE
247 LOW/REVERSE FRICTION PLATES
248 LOW/REVERSE STEEL PLATES
249 LOW/REVERSE "SELECTIVE" PRESSURE PLATE
250 LOW.REVERSE "CONE" CUSHION PLATE
251 LOW/REVERSE PISTON RETURN SPRING SEAT
252 LOW/REVERSE PISTON RETURN SPRING
253 LOW/REVERSE APPLY PISTON OUTER "D" RING SEAL
254 LOW/REVERSE CLUTCH APPLY PISTON
255 LOW/REVERSE APPLY PISTON INNER "D" RING SEAL
256 LOW/REVERSE CLUTCH PISTON RETAINER
257 LOW/REVERSE PISTON RETAINER SNAP RING

Figure 157

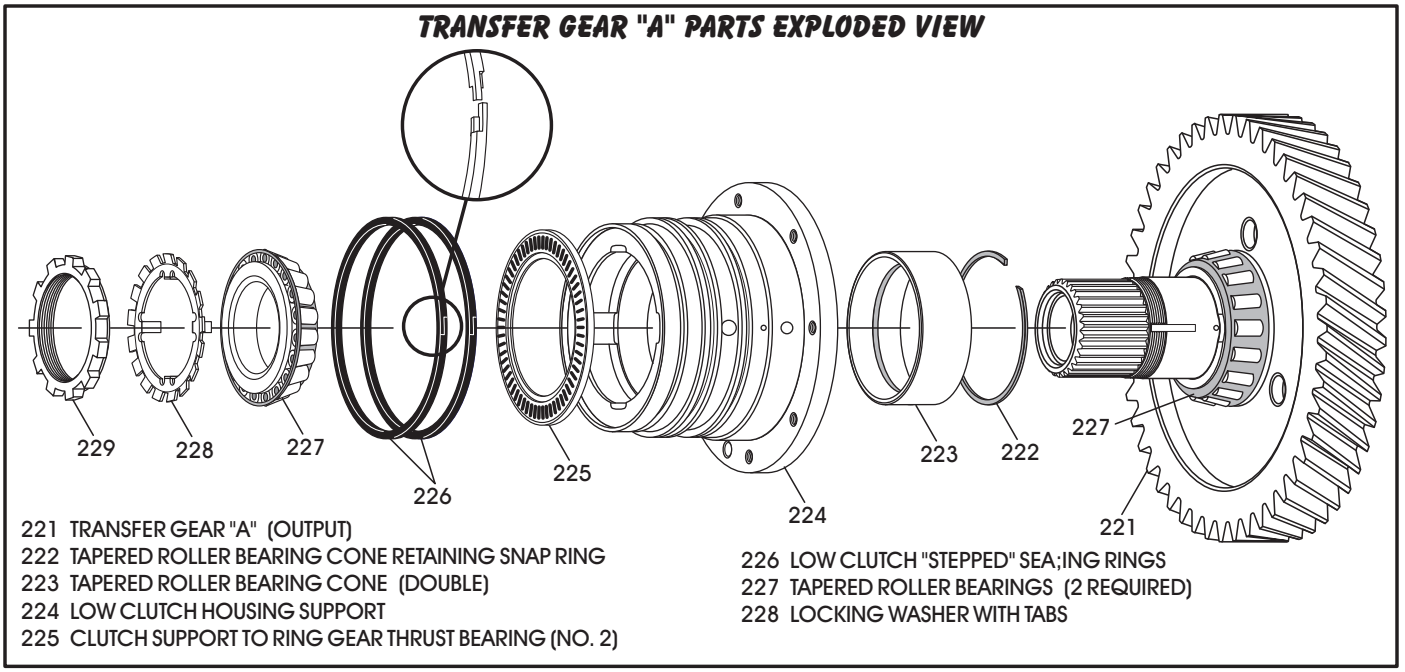


Figure 158

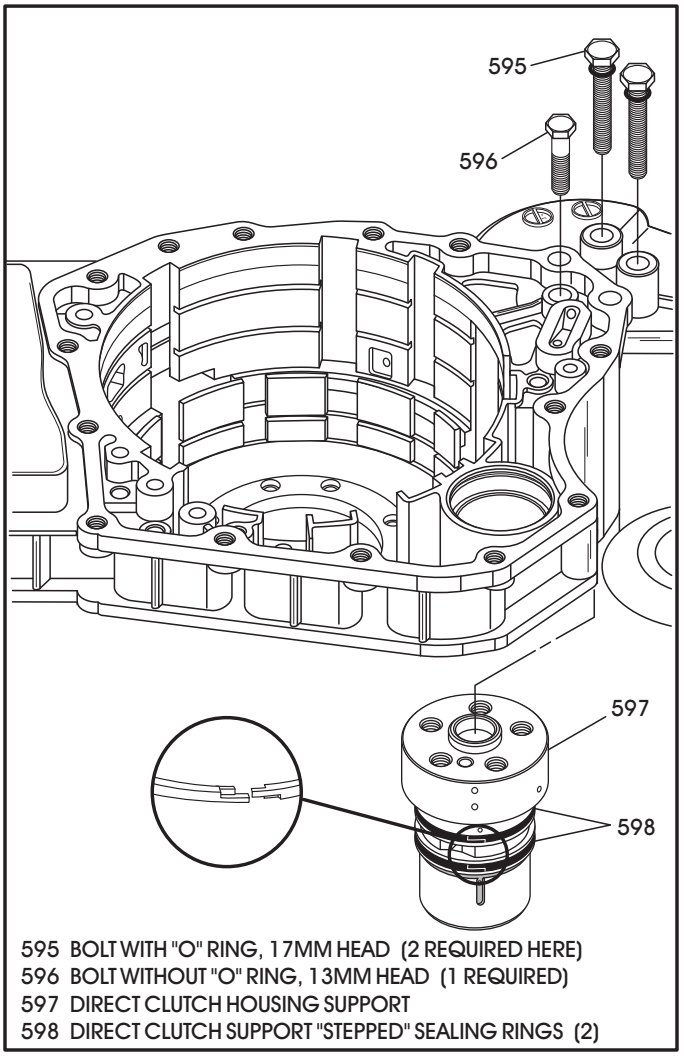


Figure 159

LOW CLUTCH "STEPPED" SEAL RINGS

The low clutch support and feed for the low clutch uses a "stepped" sealing ring with a unique step configuration, as shown in Figure 158.

DIRECT CLUTCH "STEPPED" SEAL RINGS

The direct clutch support and feed for the direct clutch also uses the "stepped" sealing rings with the unique step configuration, except they are a different size, as shown in Figure 159.

A VERY HEARTY "THANK YOU" TO FRANK KUPERMAN OF PHOENIX REMENUFACTURED TRANSMISSIONS FOR SUPPLYING US WITH THE TRANSMISSIONS THAT MADE THE ILLUSTRATIONS IN THIS BOOKLET POSSIBLE.

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