



BENCHNOTES

JF506E





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Section One - Recommended Fluids & Capacities

Caution

You must use the correct fluid for each application. The friction material, accumulation, fluid type, vehicle weight, engine size, and transmission pressures all work together with the computer to insure a proper feel to each shift. Changing any of these can cause objectionable shifts or even damage to the transmission.

Land Rover Freelander



Recommended Fluid	LRN402 or Texaco N402
Capacity (Dry Fill)	9.1 Quarts (4.5 Quarts Refill)
Check Fluid Temperature	95°F to 113°F with engine running in Park
Transaxle Fills	Top of the Side Pan

Refer to TOT Sensor values and connector pinouts on page 24.

Jaguar X-Type



Recommended Fluid	WWS-M2C92-A1
Capacity (Dry Fill)	9.3 Quarts
Check Fluid Temperature	86°F to 104°F with enging running in Park
Transaxle Fills	Top of the Side Pan

Refer to TOT Sensor values and connector pinouts on page 21.

NOTE

Jaguar X Type uses an oil to air cooler on some models. The cooler bypasses the ATF back to the transmission until the fluid temperature reaches 176°F.

Checking the ATF level before this temperature has been reached will result in a false reading, leaving the transmission ½ qt. low on fluid.



Section One - Recommended Fluids & Capacities

Caution You must use the correct fluid for each application. The friction material, accumulation, fluid type, vehicle weight, engine size, and transmission pressures all work together with the computer to insure a proper feel to each shift. Changing any of these can cause objectionable shifts or even damage to the transmission.

Mazda 6 and MPV



Recommended Fluid	6 - Dexron III (up to including 2003) Mercon V (2004 and up) MPV - Dexron III for all years
Capacity Dry Fill	6 - 9.7 Quarts MPV - 10.3 Quarts
Check Fluid Level Temperature	140°F to 158°F (MP6 & MPV) with engine running in Park
Transaxle Fills	Most use dipstick tube some fill at top of pan

Refer to TOT Sensor values and connector pinouts on page 13.

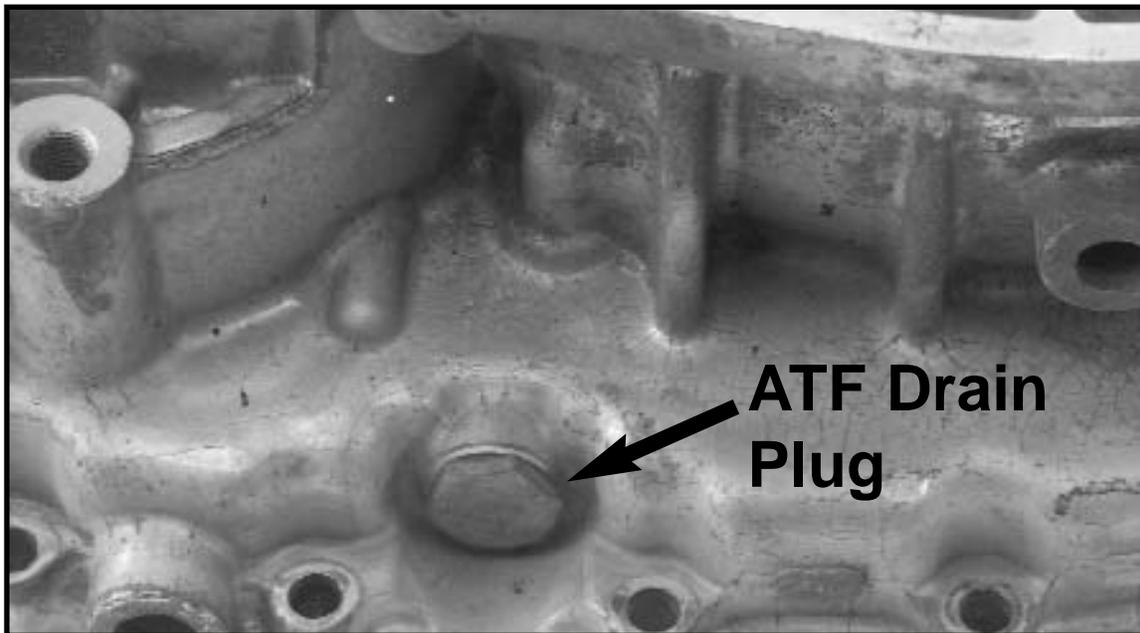
Volkswagen



Recommended Fluid	G052990A2
Capacity Dry Fill	7.4 Quarts
Check Fluid Level Temperature	95°F to 113°F with engine running in Park
Transaxle Fill	Top of side pan

Refer to TOT Sensor values and connector pinouts on page 17.

Section One - Recommended Fluids & Capacities



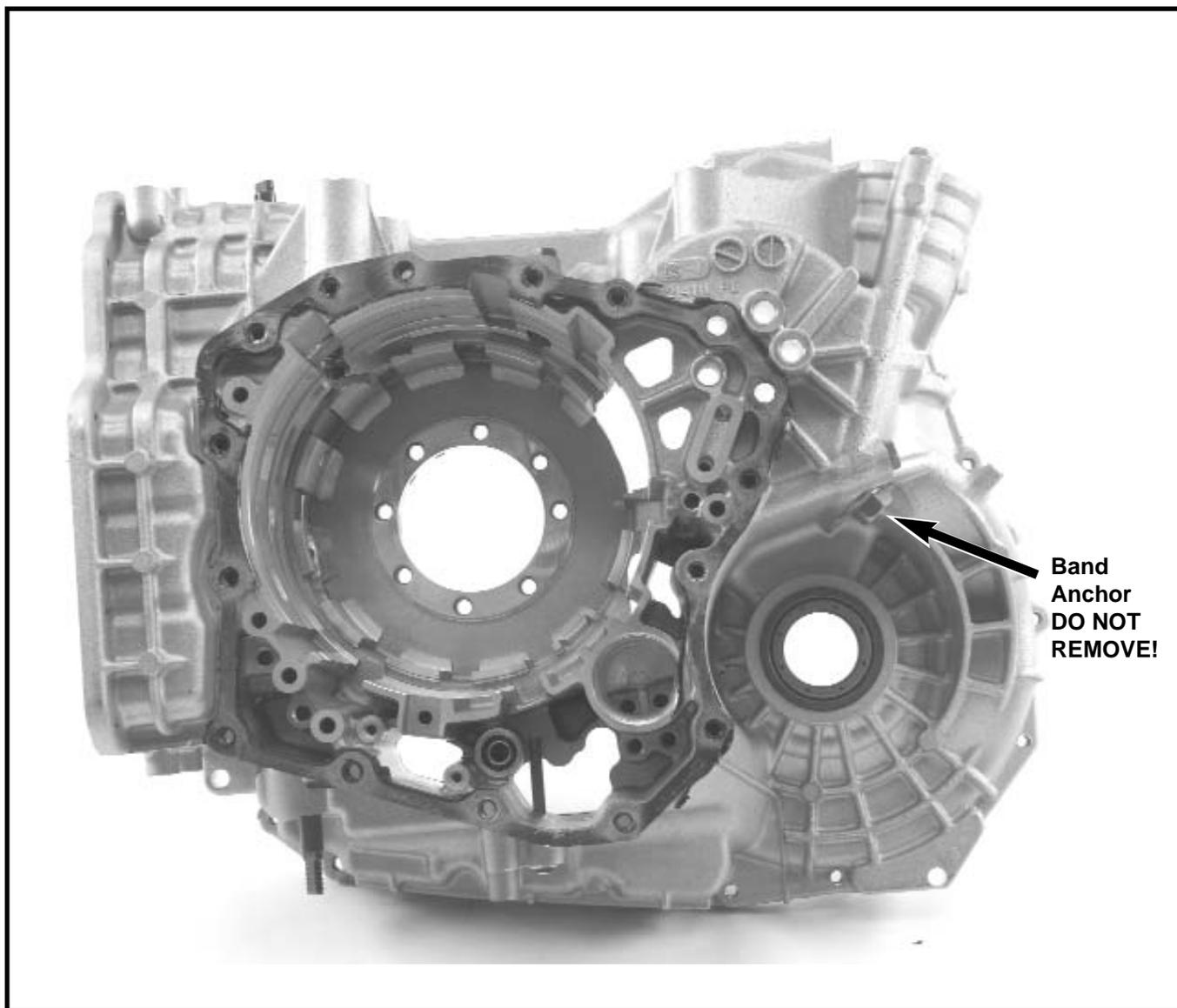
CAUTION

Removing the wrong bolt to check the fluid level or fill the transmission can cause internal damage. Be careful that you know what bolt you are removing. Most JF506E transmissions have a large drain plug at the bottom of the bell housing side of the case. (See above picture) Just below the band servo is a large bolt that anchors the band in place. **DO NOT REMOVE THIS BOLT.** This is not a place to fill the transaxle, see illustration on page 4.

JF506E
Transaxle

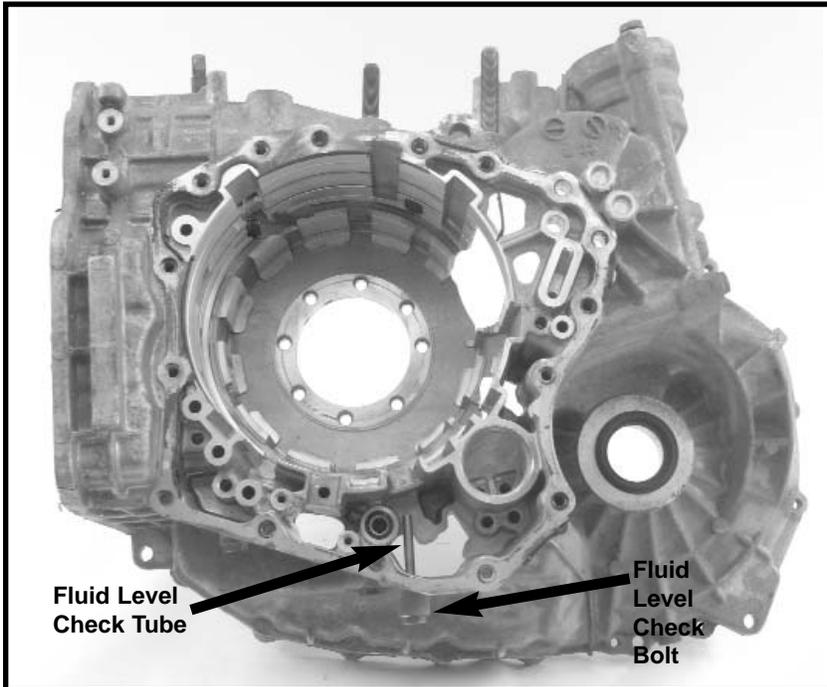


Section One - Recommended Fluids & Capacities



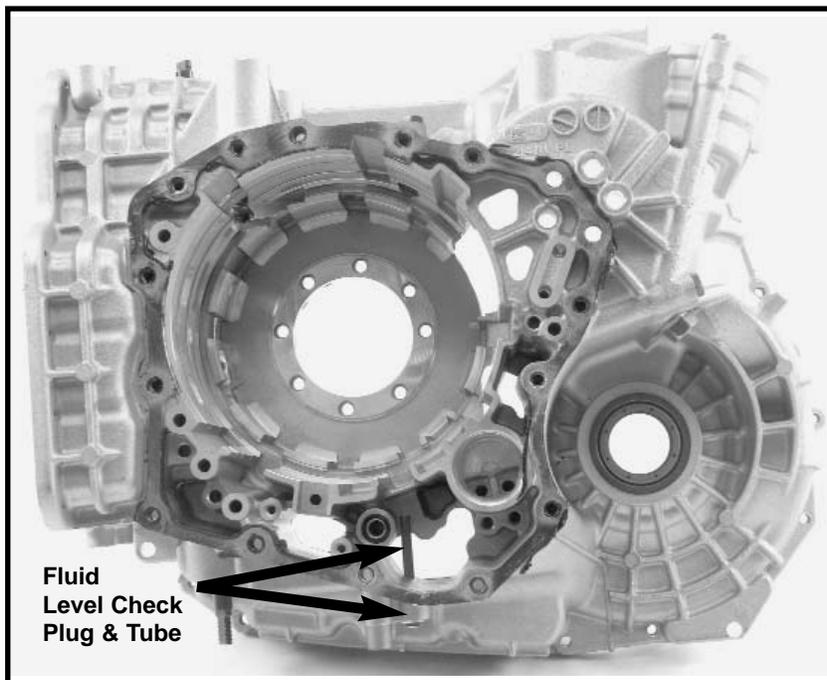
Section One - Recommended Fluids & Capacities

Mazda (JA5A-EL)



Some Mazda's have a Dipstick & Tube, others fill at top of pan

Jaguar



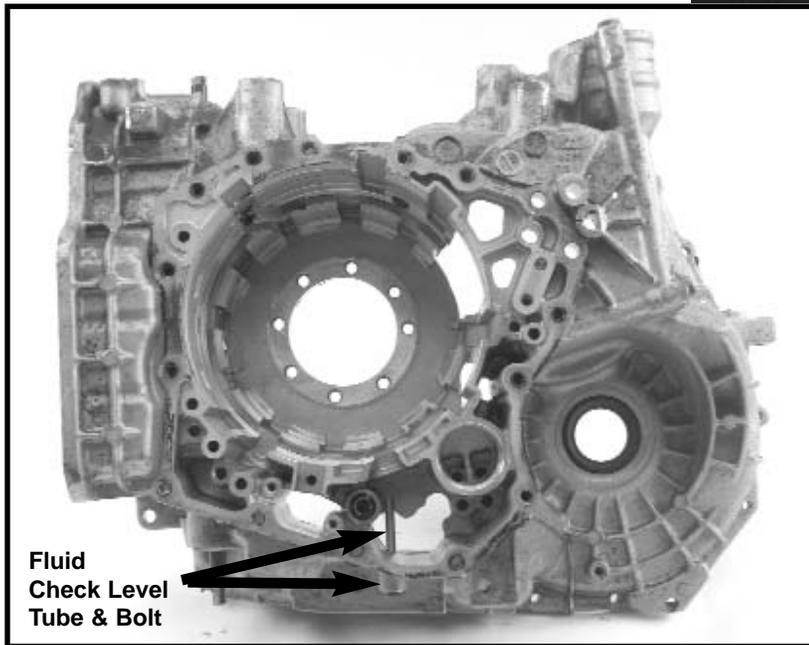
Fill at Top of Pan

JF506E Transaxle



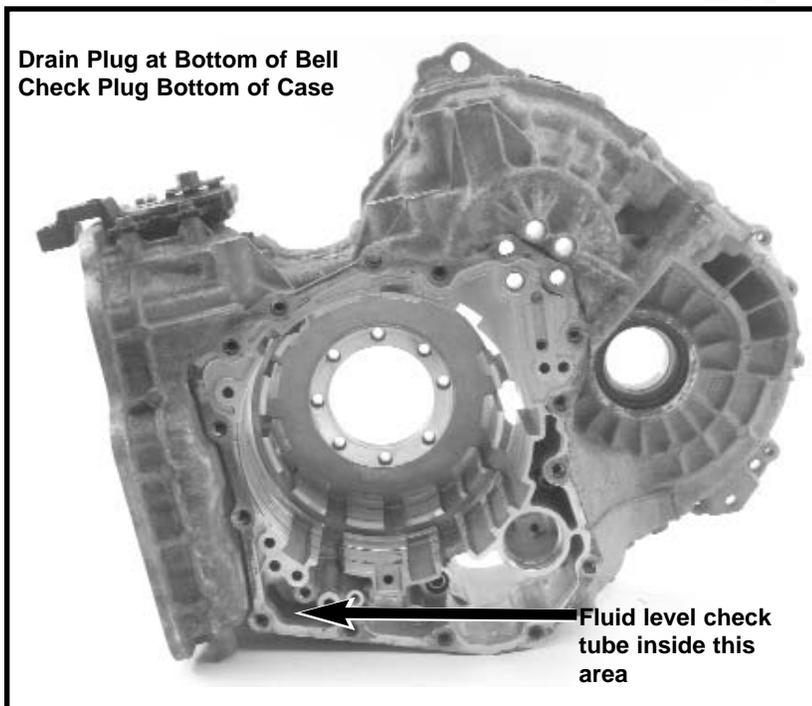
Section One - Recommended Fluids & Capacities

Land Rover



Fill at Top of Pan

Volkswagen



Fill at Top of Pan

Section One - Recommended Fluids & Capacities

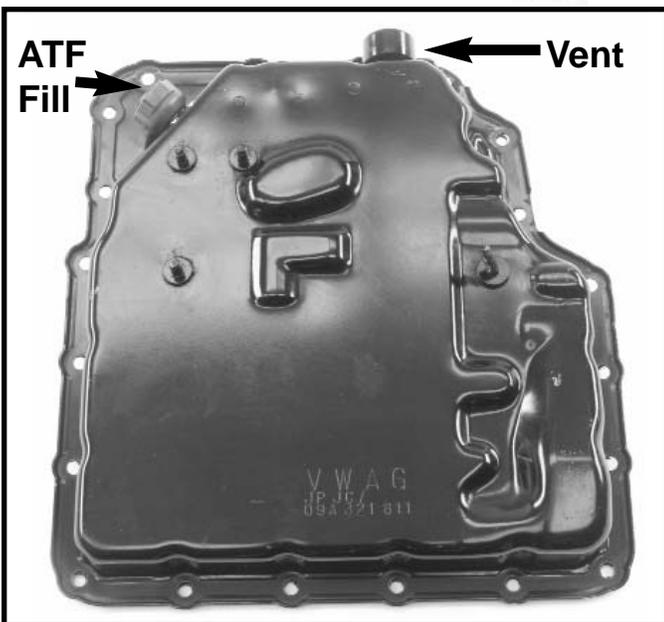
Freelander



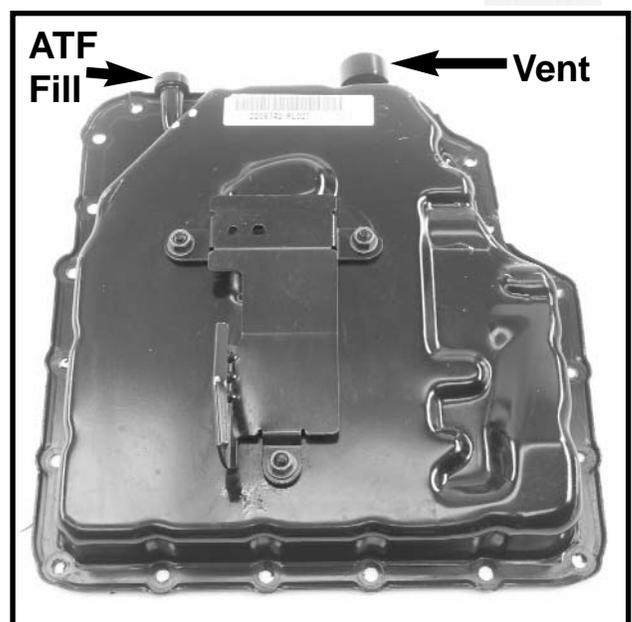
Mazda



Volkswagen



Jaguar





Section Two - Clutch & Band Application Charts

Clutch and Band Application Chart



Position/Range	Mode	Mode	Gear position	Engine braking effect	Low Clutch	2-4 Brake	High Clutch	Reverse Clutch	Low and Reverse Brake	Reduction Brake	Direct Clutch	Low One-Way Clutch	Reduction One-Way Clutch	
P	----		----	----										
R	----		Reverse	Yes				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				
			Reverse inhibition control	No				<input type="radio"/>		<input type="radio"/>	<input type="radio"/>			
N	----		----	----						<input type="radio"/>				
D	O/D OFF switch /OFF	Normal/Slope	1 GR	No	<input type="radio"/>							<input checked="" type="radio"/>	<input checked="" type="radio"/>	
			2 GR	No	<input type="radio"/>	<input type="radio"/>						<input checked="" type="radio"/>	<input checked="" type="radio"/>	
			3 GR	No	<input type="radio"/>	<input type="radio"/>							<input checked="" type="radio"/>	<input checked="" type="radio"/>
			4 GR	No		<input type="radio"/>	<input type="radio"/>							<input checked="" type="radio"/>
			5 GR	Yes		<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			<input checked="" type="radio"/>
	O/D OFF switch ON	----		1 GR	No	<input type="radio"/>							<input checked="" type="radio"/>	<input checked="" type="radio"/>
				2 GR	No	<input type="radio"/>	<input type="radio"/>						<input checked="" type="radio"/>	<input checked="" type="radio"/>
				3 GR	No	<input type="radio"/>	<input type="radio"/>							<input checked="" type="radio"/>
				4 GR	Yes		<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			<input checked="" type="radio"/>
				5 GR*	Yes		<input type="radio"/>	<input type="radio"/>				<input type="radio"/>		<input checked="" type="radio"/>
3	----	----	2 GR	No	<input type="radio"/>	<input type="radio"/>						<input checked="" type="radio"/>		
			3 GR	Yes	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>		<input checked="" type="radio"/>		
			4 GR*	Yes		<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input checked="" type="radio"/>		
			5 GR*	Yes		<input type="radio"/>	<input type="radio"/>				<input type="radio"/>	<input checked="" type="radio"/>		
2			2 GR	Yes	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>				
			3 GR*	Yes	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>				
			4 GR*	Yes		<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				
			5 GR*	Yes		<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			

Operating

Transmits the torque only when driving

* To prevent engine overspeed, inhibits downshift until the engine speed is reduced to the preset speed

NOTE

See pages 35 and 36 for exploded view of transaxle



Section Two - Clutch & Band Application Charts

Clutch and Band Application Chart



	Low Clutch	2-4 Clutch	High Clutch	Rev. Clutch	L/R Clutch	Direct Clutch	Reduction Band	Low Roller Clutch	Reduction Sprag
R				On	On		On		
1	On						On	On	On
2	On	On					On		On
3	On		On				On		On
4		On	On				On		On
5		On	On			On			

NOTE See pages 35 and 36 for exploded view of transaxle



Section Three - Solenoid & Harness Information

Solenoid Firing Order



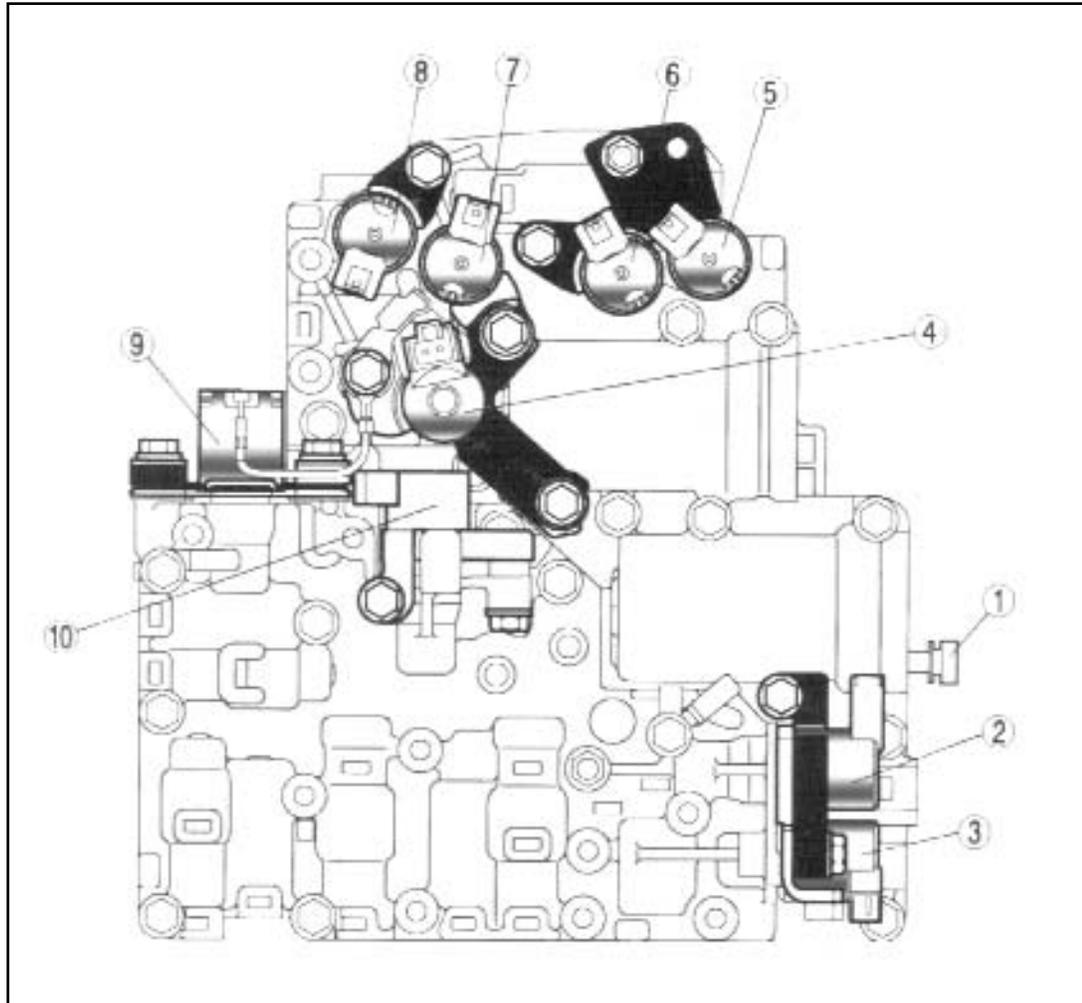
Position/Range	Mode	Mode	Gear Position	Solenoid valve				
				Shift Solenoid A	Shift Solenoid B	Shift Solenoid C	Reduction timing solenoid	Neutral shift solenoid
P	----		----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
R	----		Reverse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
			Reverse inhibition control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>
N	----		----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
D	O/D OFF switch/OFF	Normal/Slope	1 GR	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
			2 GR	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	
			3 GR		<input type="radio"/>		<input type="radio"/>	
			4 GR			<input type="radio"/>	<input type="radio"/>	
			5 GR	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	
	O/D OFF switch ON	----	1 GR	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
			2 GR	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	
			3 GR		<input type="radio"/>		<input type="radio"/>	
			4 GR			<input type="radio"/>		
			5 GR*	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	
3	----	----	2 GR	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	
			3 GR		<input type="radio"/>			
			4 GR*			<input type="radio"/>		
			5 GR*	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	
2			2 GR	<input type="radio"/>	<input type="radio"/>			
			3 GR*		<input type="radio"/>			
			4 GR*			<input type="radio"/>		
			5 GR*	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	

Operating

* To prevent engine overspeed, inhibits downshift until the engine speed is reduced to the preset speed

Section Three - Solenoid & Harness Information

Solenoid Identification



1	Manual valve
2	2-4 brake solenoid valve
3	Neutral shift solenoid valve
4	TCC solenoid valve
5	Shift solenoid C

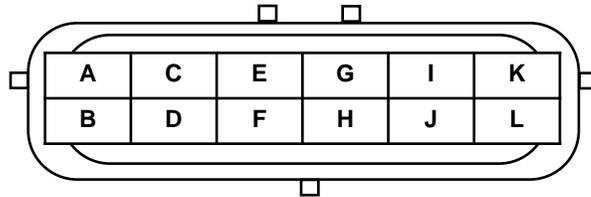
6	Shift solenoid B
7	Reduction timing solenoid valve
8	Shift solenoid A
9	Pressure control solenoid
10	High clutch solenoid valve

Section Three - Solenoid & Harness Information

MPV



Transaxle Case Side Connector (View From Terminal Side)



Yellow Connector

MPV



Description	Resistance	Terminals
2-4 brake solenoid valve	2.6 to 3.2 ohms	A and J
TCC solenoid valve	12.0 to 13.2 ohms	B and J
High clutch solenoid valve	2.6 to 3.2 ohms	C and J
Pressure control solenoid	2.6 to 3.2 ohms	D and J
Reduction timing solenoid valve	14 to 18 ohms	E and J
Shift solenoid C	14 to 18 ohms	F and J
Shift solenoid B	14 to 18 ohms	G and J
Neutral shift solenoid valve	14 to 18 ohms	H and J
Shift solenoid A	14 to 18 ohms	I and J

J = Common ground
Solenoids are powered by TCM



Section Three - Solenoid & Harness Information

MPV



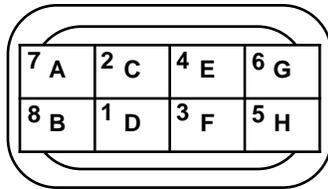
TOT Sensor Chart

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

ATF Check Temp

TERMINAL COMPONENT NO. 2

Transaxle side



TRANSAXLE CASE SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)



Orange Connector

Description	Resistance	Terminals
TFT	See Chart Above	7 and 8 or A and B
VSS	513 to 627 Ohms	5 and 6 or G and H
TSS	513 to 627 Ohms	1 and 2 or C and D
ISS	513 to 627 Ohms	3 and 4 or E and F

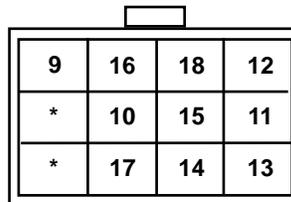


Section Three - Solenoid & Harness Information

Mazda 6



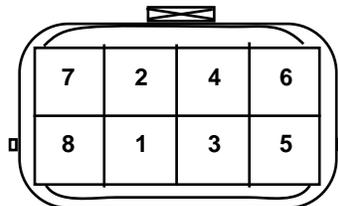
External Transmission Harness Connector



Terminal 9 is ground. All Solenoids are powered by TCM.

Description	Resistance	Terminals
Neutral shift solenoid	14 to 18 ohms	9 and 10
TCC solenoid	12 to 13.2 ohms	9 and 11
2-4 brake solenoid	2.6 to 3.2 ohms	9 and 12
High-clutch solenoid	2.6 to 3.2 ohms	9 and 13
Shift solenoid C	14 to 18 ohms	9 and 14
Reduction timing solenoid	14 to 18 ohms	9 and 15
Shift solenoid B	14 to 18 ohms	9 and 16
Shift solenoid A	14 to 18 ohms	9 and 17
Pressure-control solenoid	2.6 to 3.2 ohms	9 and 18

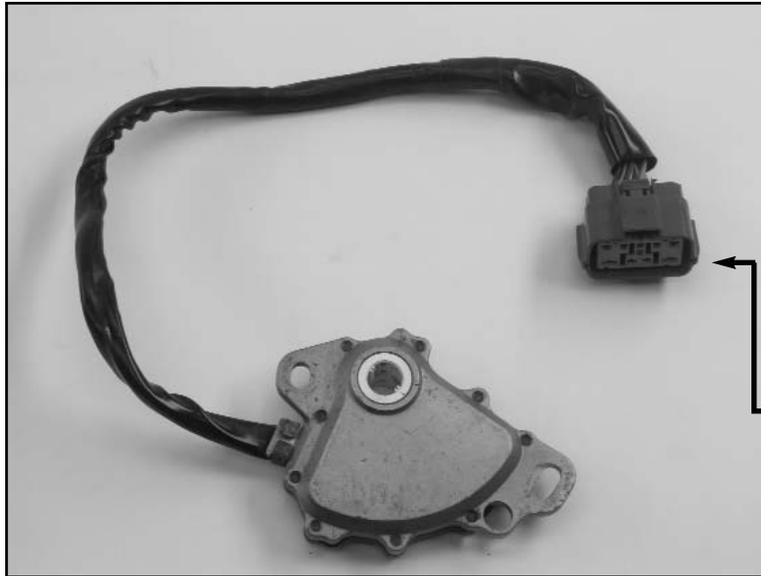
External Transmission Harness Connector



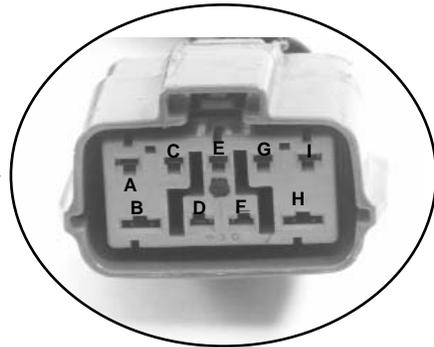
Description	Resistance	Terminals
Turbine-shaft speed sensor	513 to 627 ohms	1 and 2
Intermediate shaft speed sensor	513 to 627 ohms	3 and 4
Output-shaft speed sensor	513 to 627 ohms	5 and 6
Temperature sensor	Refer to TOT Sensor Chart on previous page	7 and 8

Section Three - Solenoid & Harness Information

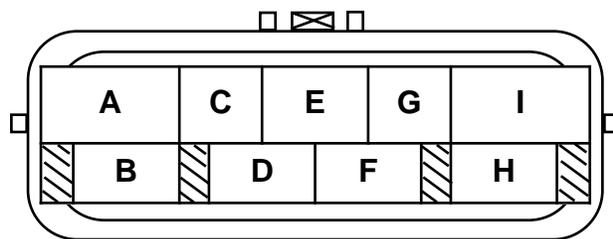
MLPS **MAZDA**



Connector **MAZDA**



MLPS Connector **MAZDA**



MLPS Continuity Test : **Continuity** **MAZDA**

Position/ Range	Connector Terminal								
	H	B	C	A	E	D	G	I	F
P	○—○		○—○						
R			○—○		○				
N	○—○		○			○			
D			○					○	



Section Three - Solenoid & Harness Information

Volkswagen Operation Information.



- The VW designation for this transmission is 09A.
- The 09A is capable of lock-up in 2nd, 3rd, 4th, and 5th gears. The computer uses load and speed to determine when the lock-up clutch operates.
- Turbine speed sensor -- VW designation is G182.
- Intermediate speed sensor -- VW designation is G265.
- Vehicle speed sensor -- VW designation is G68.
- Transmission oil temperature sensor, VW designation is G93.

NOTE

After overhaul or transaxle replacement, it is important to clear the codes and perform the “return to basics procedure” with a VAG scanner. At this time there is not a manual way to perform the return to basics procedure.

Solenoid Firing Order



Shift Solenoid	1st	2nd	3rd	4th	5th
A		On			On
B	On	On	On		
C	On			On	On

Section Three - Solenoid & Harness Information

Solenoid Information



Description	Resistance	Terminals
Solenoid 1 (N88) SSA	9 to 24 Ohms	9 and 18
Solenoid 2 (N89) SSB	9 to 24 Ohms	10 and 18
Solenoid 3 (N90) Low Clutch Timing	9 to 24 Ohms	12 and 18
Solenoid 4 (N91) TCC	9 to 24 Ohms	17 and 18
Solenoid 5 (N92) SSC	9 to 24 Ohms	11 and 18
Solenoid 6 (N93) EPC	1 to 5 Ohms	15 and 18
Solenoid 8 (N281) Reduction Timing Sol.	9 to 24 Ohms	14 and 18
Solenoid 9 (N282) 2/4 Brake Timing	9 to 24 Ohms	13 and 18
Solenoid 10 (N283) 2/4 Brake Duty	1 to 5 Ohms	16 and 18
Input Speed Sensor (G182)		
Input Speed Sensor (G182)	400 to 600 Ohms	1 and 2
Intermediate Speed Sensor (G265)		
Intermediate Speed Sensor (G265)	400 to 600 Ohms	3 and 4
Vehicle Speed Sensor (G68)		
Vehicle Speed Sensor (G68)	400 to 600 Ohms	5 and 6
TOT Sensor		
TOT Sensor	20C/68F = 2.5k Ohms	7 and 8
TOT Sensor	70C/158F = 500 Ohms	7 and 8
TOT Sensor (G-93)	80C/176F = 300 Ohms	7 and 8
TOT Sensor	110C/230F = 200 Ohms	7 and 8
ATF Check Temp	95F/113F = 1.16 KOHMS	7 and 8
Pin # 18 is ground, all solenoids are powered by the TCM		

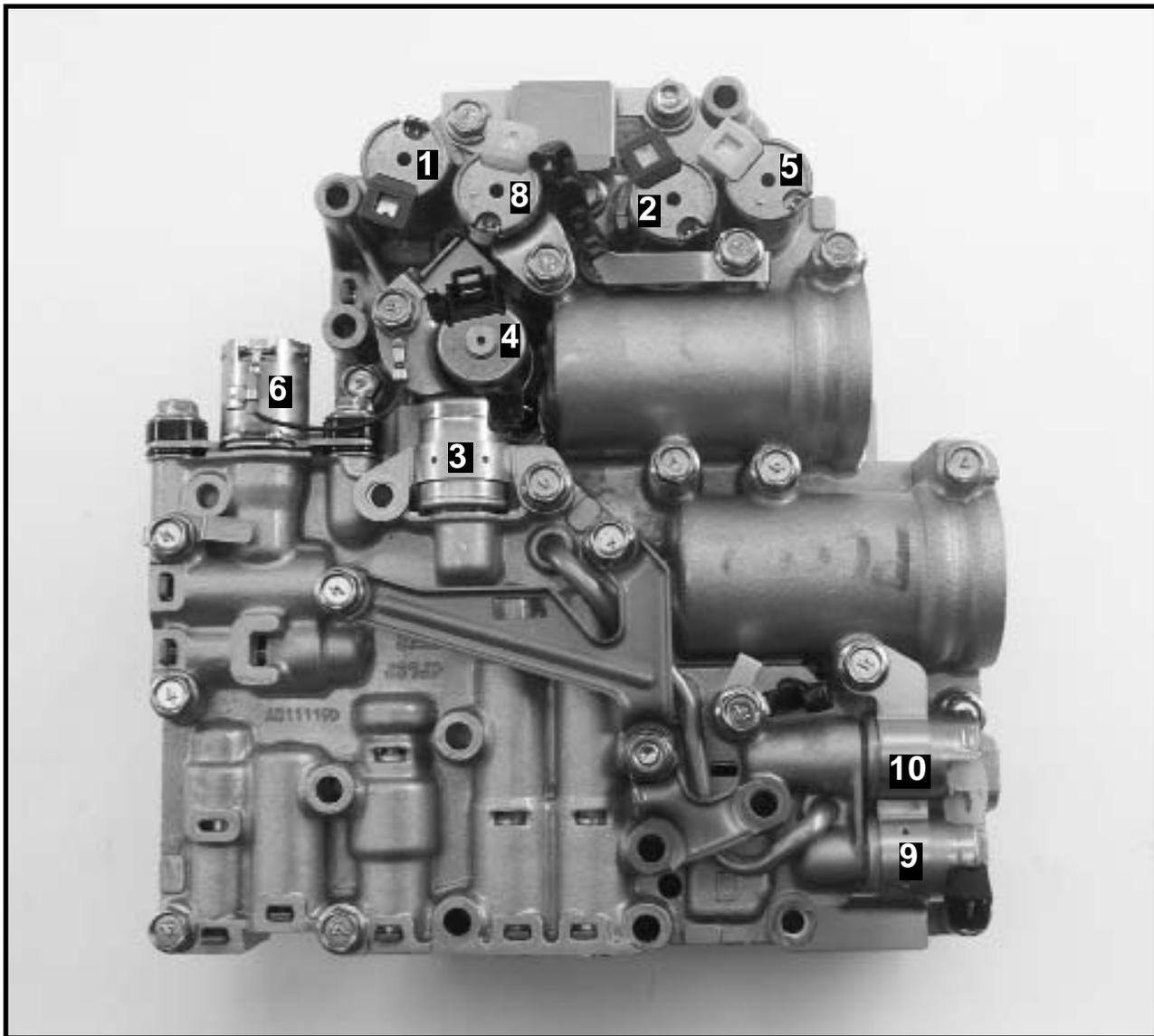
All TOT Sensors are the same

External Solenoid Connector



Section Three - Solenoid & Harness Information

Solenoid Identification



1	SSA
2	SSB
3	Low Clutch Timing
4	TCC
5	SSC

6	EPC
7	----
8	Reduction Timing
9	2/4 Brake Timing
10	2/4 Brake Duty



Section Three - Solenoid & Harness Information

Jaguar Operation Information



On/OFF Solenoids:

- Shift solenoids A, B, and C.
- Low clutch solenoid, reduction timing solenoid, and 2/4 brake timing solenoid.
- The on/off solenoids are normally open. When the internal coil is energized, the needle valve closes the fluid pressure circuit.

Duty Solenoids:

- Line pressure solenoid, lock-up solenoid, and 2/4 brake duty solenoid.
- The duty solenoids are operated at 50 Hz.
- The lock-up solenoid normally operates in 4th and 5th gears, but can come on in manual 3 and 2 positions.

Speed Sensors:

- There are three speed sensors, the turbine or input speed sensor, intermediate speed sensor, and the vehicle speed sensor. All three speed sensors are the same. Different brackets are used to mount them in their proper locations
- The turbine speed sensor (TSS), detects high/reverse drum rotation speed. The high/reverse clutch drum is splined to the input shaft.
- The intermediate speed sensor (ISS), detects transfer gear rotation speed.
- The vehicle speed sensor (VSS), detects parking gear and output shaft rotation speed.

Transmission Fluid Temperature Sensor:

- The TFT is located in the transmission sump area and is on the speed sensor wiring harness.
- The TFT is used for shift scheduling, pressure control and lock-up scheduling.

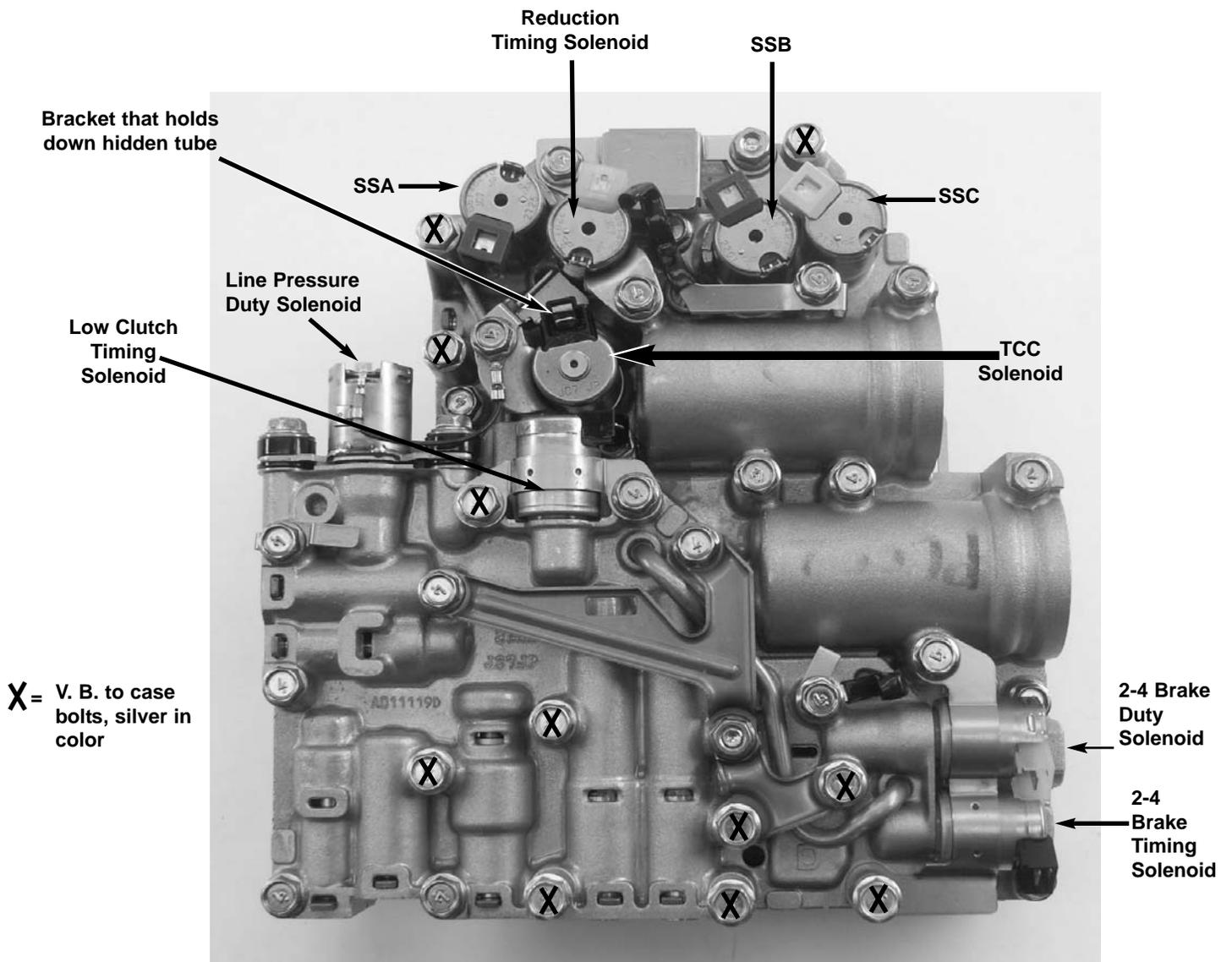
Solenoid Firing Order



Shift Solenoid	1st	2nd	3rd	4th	5th
A		On			On
B	On	On	On		
C	On			On	On

Section Three - Solenoid & Harness Information

Solenoid Identification



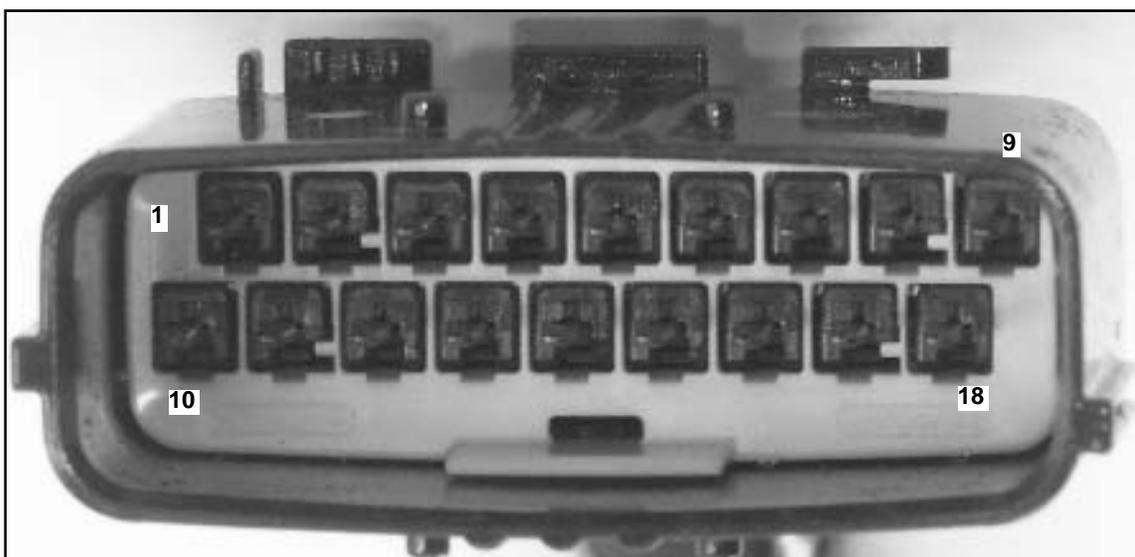
Section Three - Solenoid & Harness Information

Solenoid Information



Description	Resistance	Terminals
Shift Solenoid A	14 to 18 Ohms	9 and 18
Shift Solenoid B	14 to 18 Ohms	10 and 18
Shift Solenoid C	14 to 18 Ohms	11 and 18
Low Clutch Timing Solenoid	14 to 18 Ohms	12 and 18
2/4 Clutch Timing Solenoid	14 to 18 Ohms	13 and 18
Reduction Timing Solenoid	14 to 18 Ohms	14 and 18
Pressure Control Solenoid	2.6 to 3.2 Ohms	15 and 18
2/4 Duty Solenoid	2.6 to 3.2 Ohms	16 and 18
TCC Solenoid	12 to 13.2 Ohms	17 and 18
Turbine Speed Sensor	513 to 627 Ohms	1 and 2
Intermediate Speed Sensor	513 to 627 Ohms	3 and 4
Vehicle Speed Sensor	513 to 627 Ohms	5 and 6
Transmission Oil Temperature Sensor		7 and 8
ATF Check Temp	1.10 Kohms	7 and 8
Pin # 18 is ground, all solenoids are powered by the TCM		

External Solenoid/Sensor Connector





Section Three - Solenoid & Harness Information

Freelander Operation Information



The following is Land Rover information on solenoids, shifting strategy, and high temperature operation. This information does not apply to other car manufacturers.

Lock-Up

To help warm up the engine, the TCM will inhibit lock-up if the transmission temperature is below 40C or 104F. Normally the TCM will only allow lock-up in 4th and 5th. If the transmission temperature reaches 260F, the TCM will employ a cooling strategy that will allow lock-up in 2nd, 3rd, 4th, and 5th. When the transmission temperature cools to 248F or less the TCM resumes normal operation. The TCM will also request that the ECM turn on the electric radiator fan if the fluid temperature exceeds 230F. When the transmission fluid temperature cools to 212F the fan request is cancelled.

The lock-up solenoid is a PWM duty solenoid that operates at 50 hz and the TCM uses VSS and TPS to determine the appropriate speed for lock-up.

Pressure control solenoid

The pressure control solenoid is a duty solenoid. The TCM uses inputs from the engine sensors, speed sensor, vehicle speed sensor, and throttle position sensor to calculate line pressure.

Reverse Inhibit

Reverse will be electrically inhibited if a forward speed of 6 mph or greater is detected. The TCM will turn on the low clutch timing solenoid, this drains the pressure from the reverse clutch.

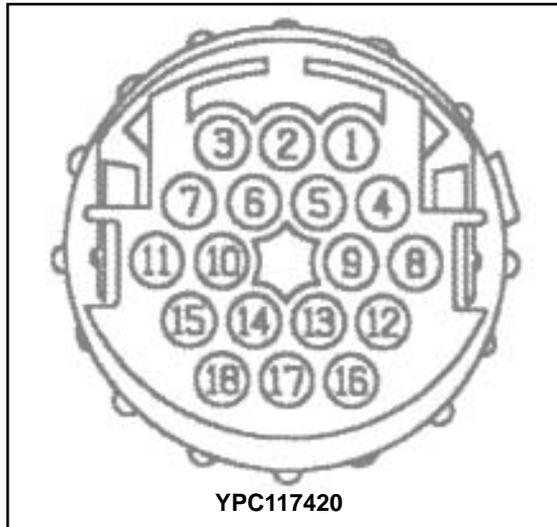
Solenoid Firing Order



Shift Solenoid	1st	2nd	3rd	4th	5th
A		On			On
B	On	On	On		
C	On			On	On

Section Three - Solenoid & Application Information

Solenoid - Gearbox



Location:
Front LH side of engine
compartment

Color: Black
Gender: Female



Section Three - Solenoid & Harness Information

Solenoid Information



Description	Resistance	Terminals
Shift Solenoid A	14 to 18 Ohms	9 and 18
Shift Solenoid B	14 to 18 Ohms	10 and 18
Shift Solenoid C	14 to 18 Ohms	11 and 18
Low Clutch Timing	14 to 18 Ohms	12 and 18
2/4 Timing Solenoid	14 to 18 Ohms	13 and 18
Reduction Timing	14 to 18 Ohms	14 and 18
Pressure Control	2.6 to 3.2 Ohms	15 and 18
2/4 Duty Solenoid	2.6 to 3.2 Ohms	16 and 18
TCC Solenoid	12 to 13.2 Ohms	17 and 18
Turbine Speed Sensor	513 to 627 Ohms	1 and 2
Intermediate Speed Sensor	513 to 627 Ohms	3 and 4
Vehicle Speed Sensor	513 to 627 Ohms	5 and 6
Transmission Temperature Sensor	See Chart Below	7 and 8

Pin # 18 is ground, all solenoids are powered by the TCM

TOT Values

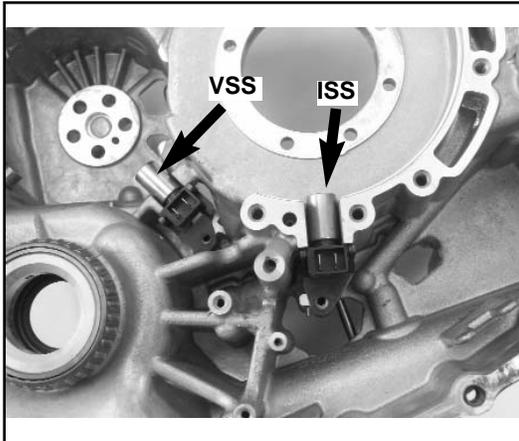
Temperature °C (°F)	Resistance k Ohms
-40 (-40)	54.90
-20 (-4)	16.70
0 (32)	6.02
20 (68)	2.50
40 (104)	1.16
60 (140)	0.59
80 (176)	0.33
100 (212)	0.19
120 (248)	0.12
140 (284)	0.08

ATF Check Temp.

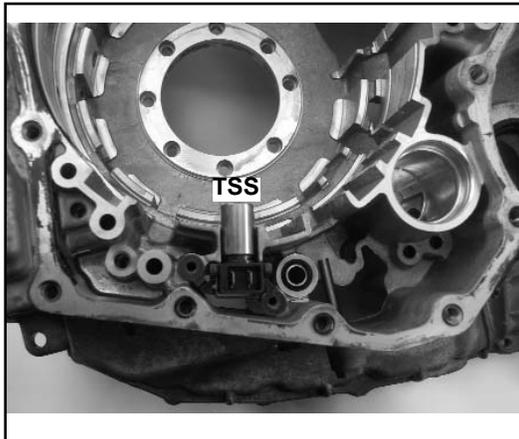
Section Three - Solenoid & Harness Information



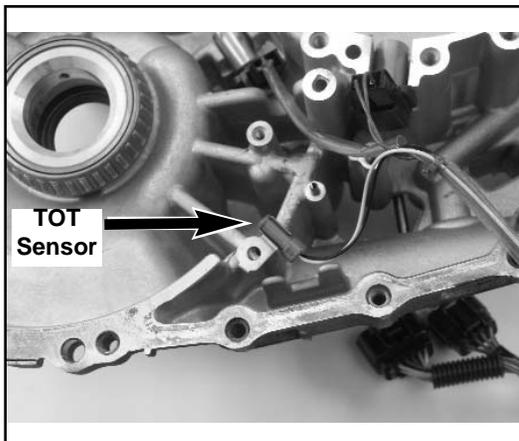
MAZDA



Intermediate speed sensor, (ISS), and vehicle speed sensor, (VSS), both use a single bolt holddown bolt.



Turbine speed sensor, (TSS), with two bolt holddown bracket.



The transmission oil temperature, (TOT), sensor is located in the case sump area below the vehicle speed sensor. The TOT sensor is held in place by one bolt.

NOTE

All speed sensors and TOT sensors are located in exactly the same place on all brand transmissions.

Section Three - Solenoid & Harness Information

The JF506E transaxle uses three speed sensors as inputs to the computer. All three speed sensors are the same, further more Land Rover, Jaguar, Mazda, and VW are using the same speed sensor. The speed sensors are AC generators.

- Turbine speed sensor, or TSS, uses the High/Reverse drum to generate a turbine speed signal. The TSS is used to monitor gear ratio.
- Intermediate speed signal, or ISS, uses the Transfer gear to generate its speed signal. The ISS is used to monitor gear ratio.
- Vehicle speed sensor, or VSS uses the parking gear to generate its signal. The VSS is used to monitor output shaft speed.

Speed Sensor

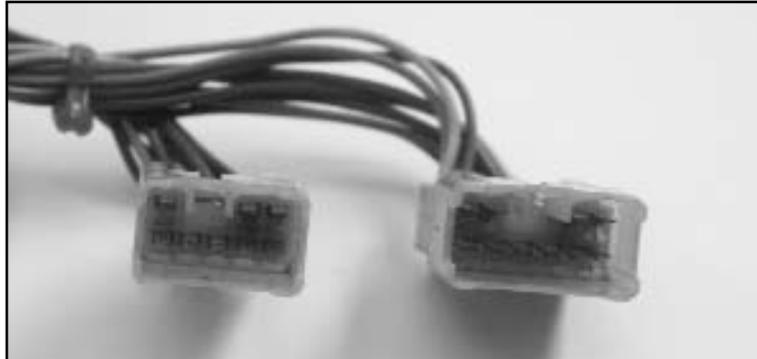


Section Three - Solenoid & Harness Information

Internal Harness Connector

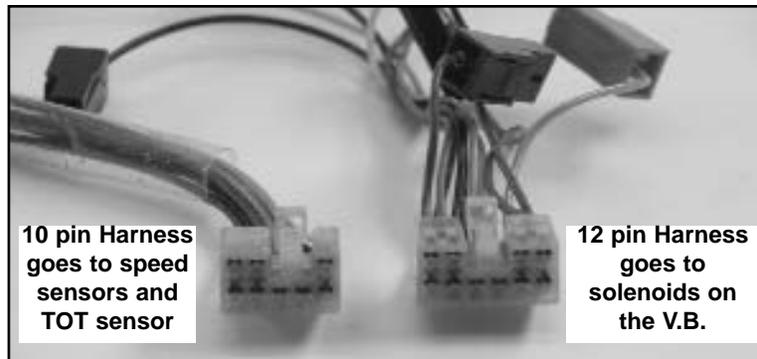


MAZDA



This short harness connects the solenoid harness and the sensor harness to the external connector.

Internal Harness Connector

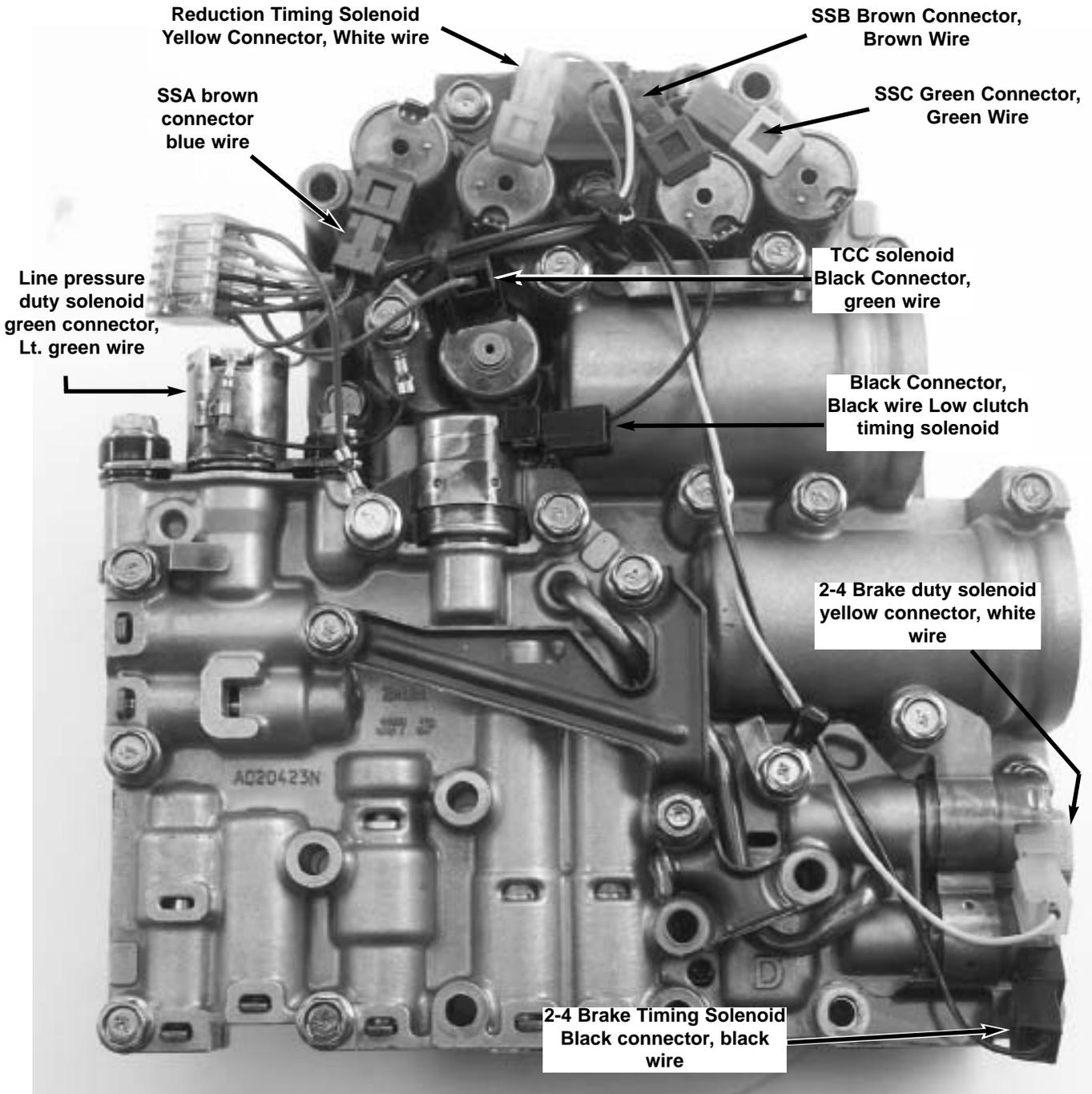


There are two harnesses in the transmission, one for the speed sensors and one for the solenoids. The Jaguar, Mazda, and VW speed sensors, TOT sensor, speed sensor wiring harness, and connectors are all the same. Even the wire colors are the same. The turbine speed sensor has blue wires, the intermediate speed sensor has pink wires, and the vehicle speed sensor has orange wires. The TOT wire color is white.

The solenoid harness is the same for the Jaguar and VW, but the Mazda solenoid harness is different and cannot be interchanged with the VW or the Jaguar. The single ground wire that goes to one of the valve body bolts can identify the Jaguar/VW solenoid harness. The Mazda solenoid harness has multiple wires going to a grounding bolt.

Section Three - Solenoid & Harness Information

Valve Body and Solenoid Wire/Connector Id



Section Four - Case & Bell Housing I.D.

Bell Housing

Jaguar X-Type



Volkswagen



Land Rover - Freelander



Mazda



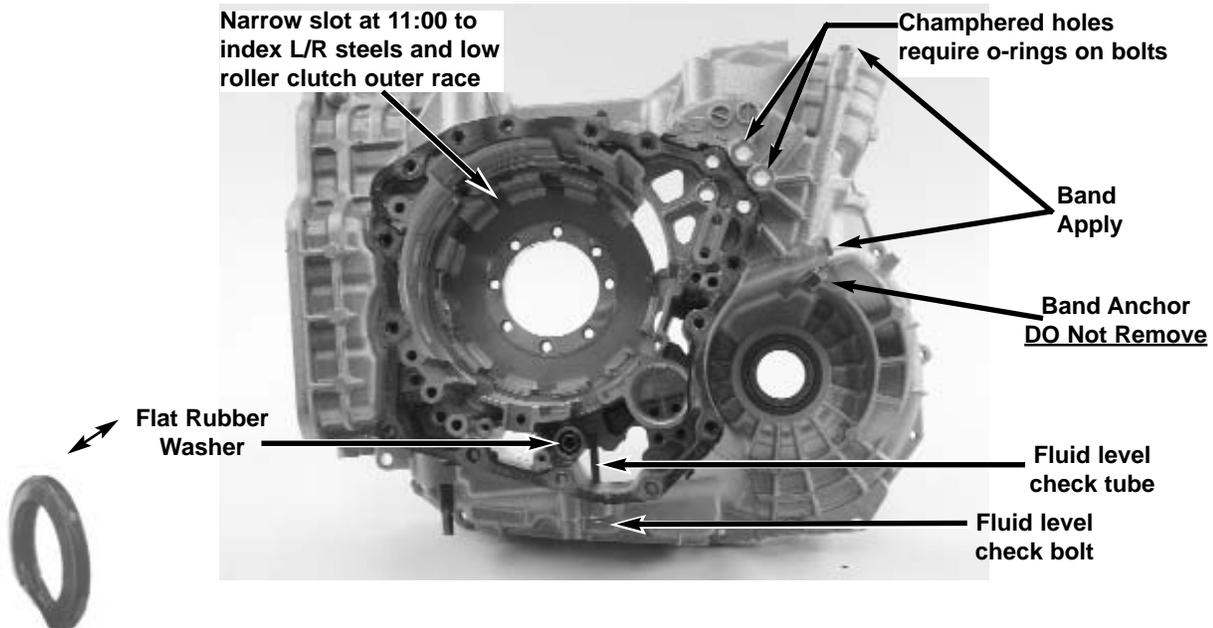
NOTE JF506E Units can be identified by the shape of their bell housings.

Section Four - Case & Bell Housing I.D.

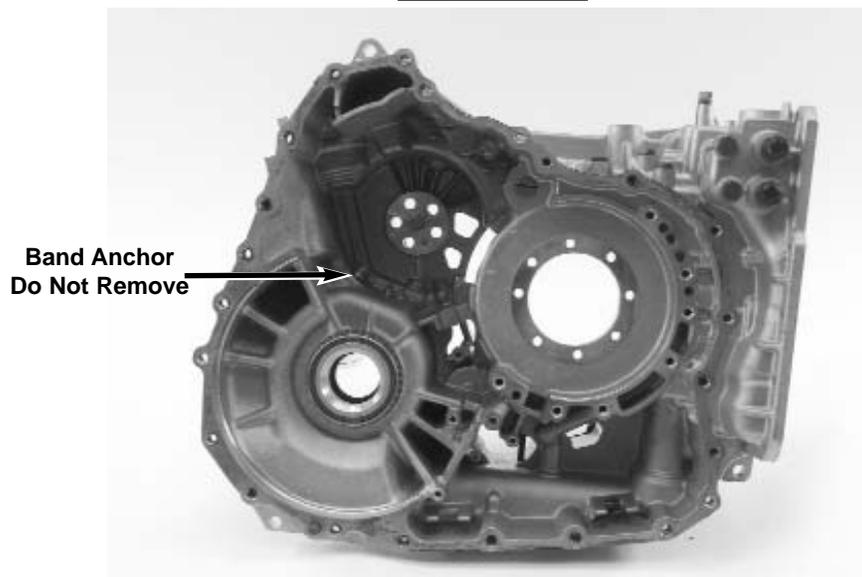
Jaguar Case



Rear View



Front View



Section Four - Case & Bell Housing I.D.

Land Rover



Rear View



Front View



Section Four - Case & Bell Housing I.D.

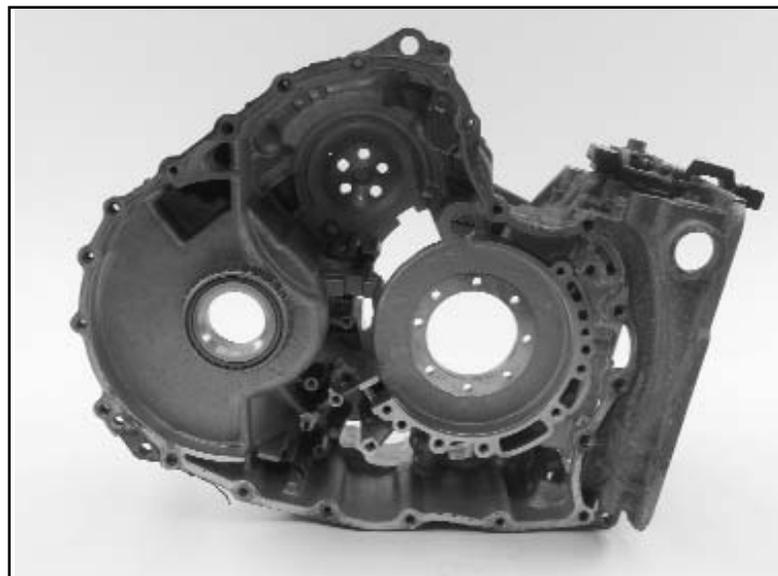
Volkswagen



Rear View



Front View



Section Four - Case & Bell Housing I.D.

Mazda



Rear View



Front View



JF506E Transaxle



Section Five - Disassembly & Overhaul Tips

Specs and Observations

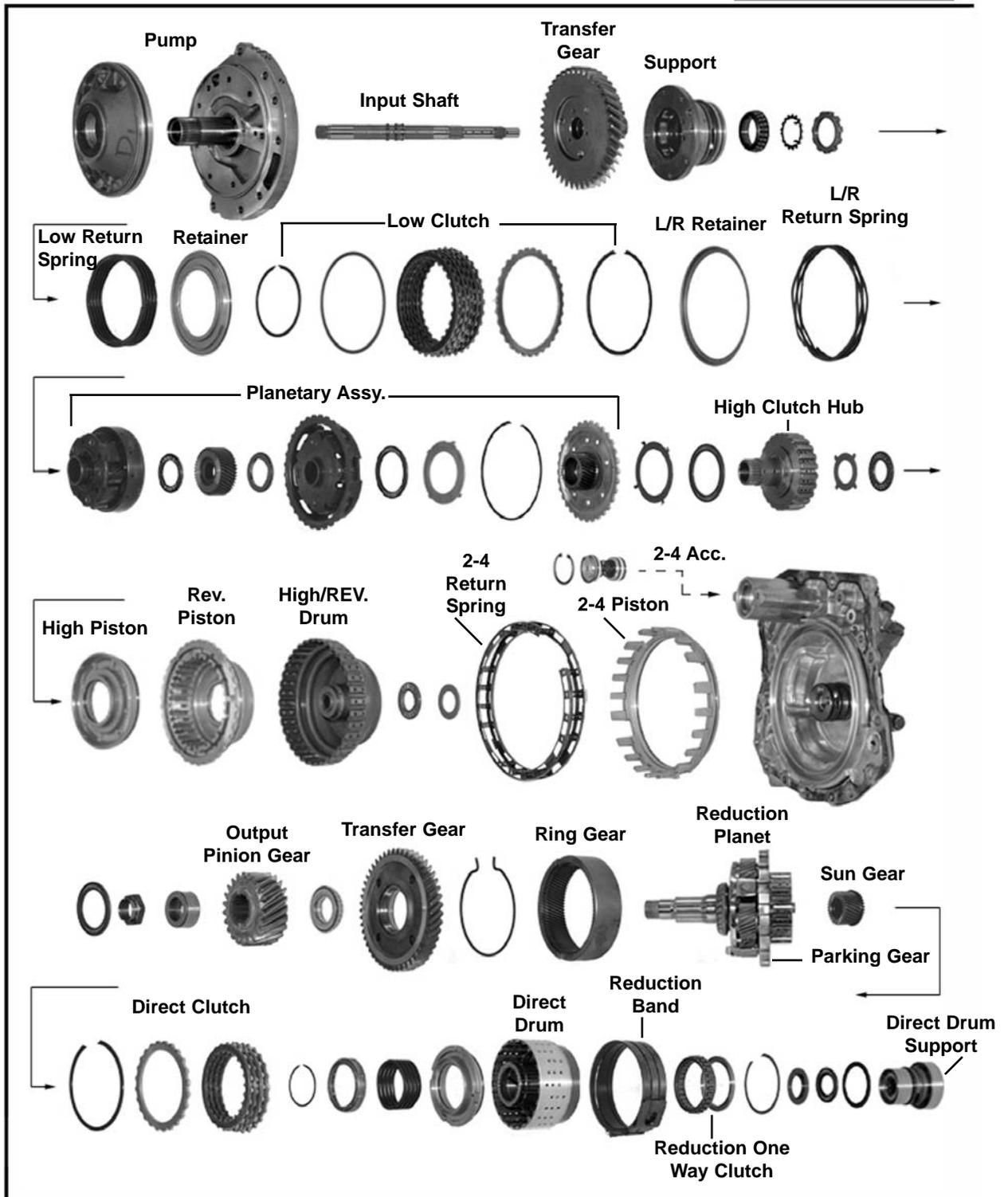


Remove the pan on the side of the transmission. Disconnect the speed sensor connector and the solenoid connector from the main internal harness. Remove the **silver bolts** that hold the valve body to the case. Remove valve body assembly. All other bolts on the valve body are **gold in color**. Between the valve body and the case are two rubber seals. One resembles a top hat and seals oil pressure to the low/reverse clutch in the case. The other rubber seal resembles a 5/16" flat washer with the inner diameter on each side puffed out a little. This flat washer seals oil pressure to the band apply oil circuit. Remove the wire retaining clip from the main harness and push the harness up and out of the case. Remove the manual lever position switch.

Next, remove the bolts that hold the two case halves and tap on the bell housing with a soft face hammer to split the case.

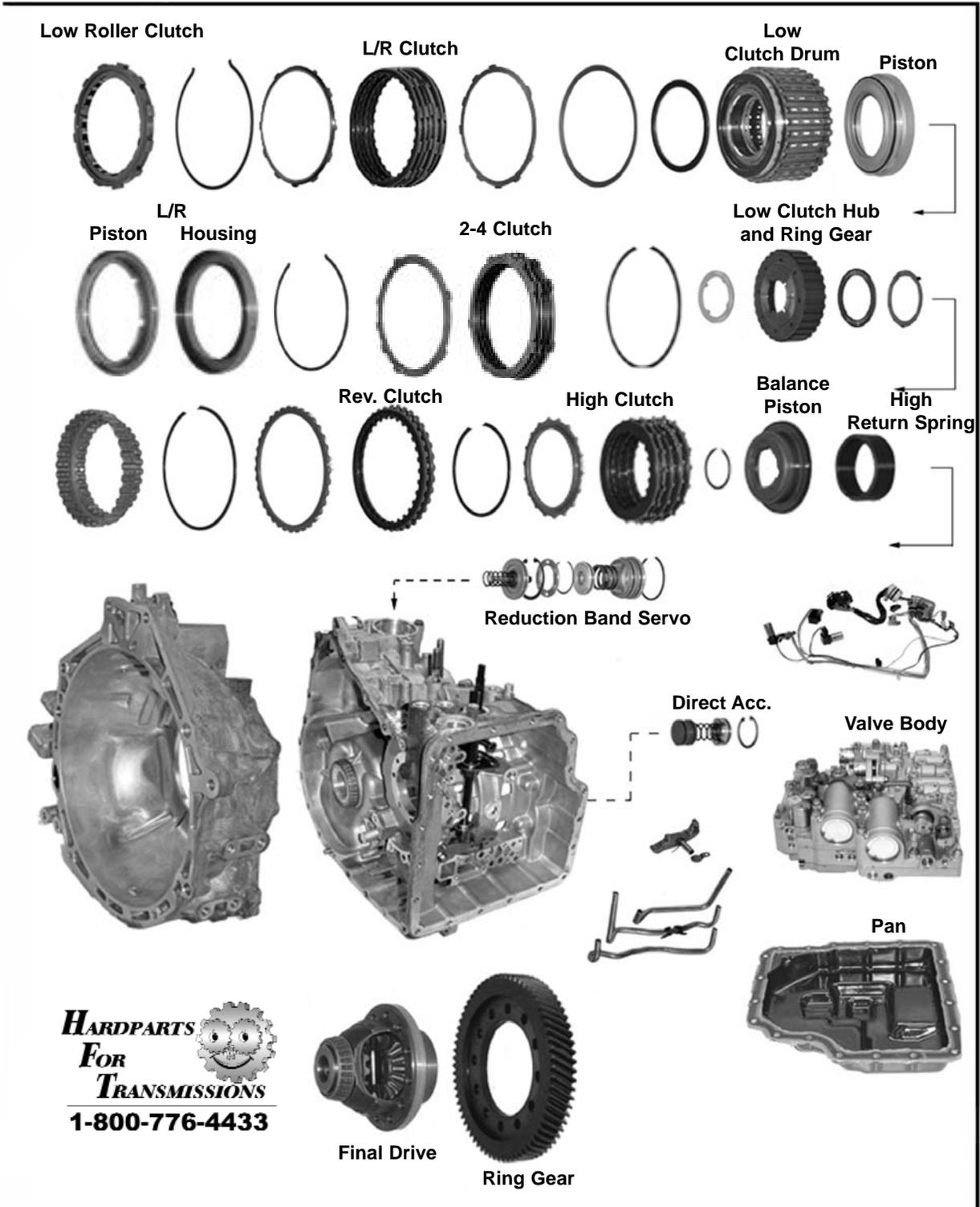
Section Five - Disassembly & Overhaul Tips

JF506E



Section Five - Disassembly & Overhaul Tips

JF506E



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TRANSMISSIONS
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Section Five - Disassembly & Overhaul Tips

Final Drive Identification

The final drive lifts out. The final drives and transfer gears come in different ratios and are all unique looking.

Land Rover



Jaguar



Mazda



Volkswagen



Section Five - Disassembly & Overhaul Tips

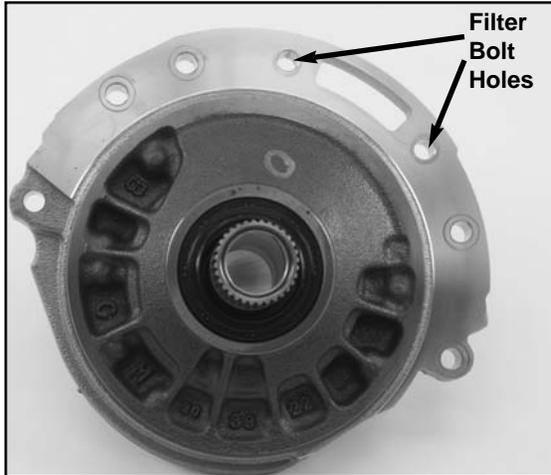
Pump



NOTE The pump gears are rounded and there is no crescent, like the Torqueflite pump

Section Five - Disassembly & Overhaul Tips

Pump Front



Pump Back



Filter



Filter



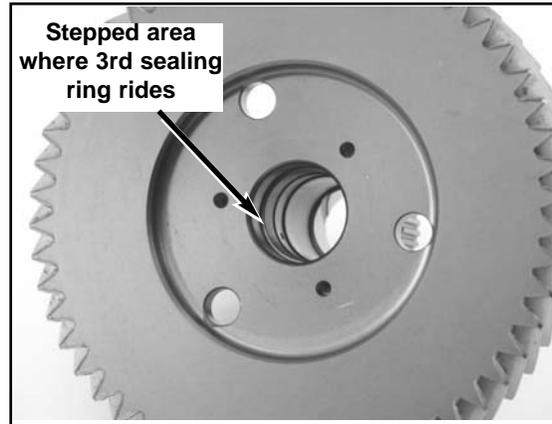
Remove the two pump bolts that hold the filter on. Pull the filter off of the pump and roll pin in the case. Currently there are only two filters for all the carmakers. VW has one design, it has a square intake and a VW insignia on it. All others use a filter that is smaller, slightly shorter with an oval oil inlet. Remove the rest of the pump bolts and remove the pump and input shaft.

Section Five - Disassembly & Overhaul Tips

3 Ring Input Shaft



Transfer Gear



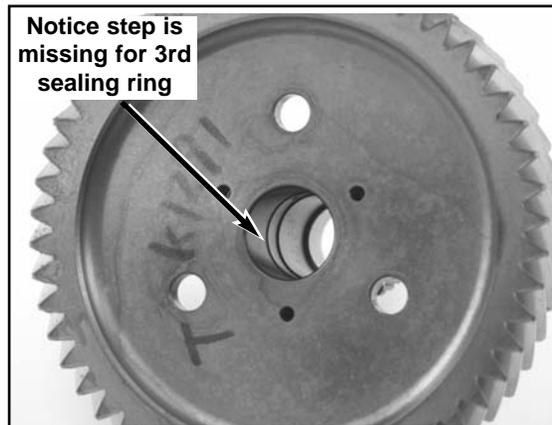
NOTE The above transfer gear uses the THREE sealing ring input shaft. Transfer gears come in many tooth counts, be sure to use exactly what came out, if replacement is needed.

The input shaft will usually come out with the pump. There are currently two different input shafts, one has three sealing rings and the other has two sealing rings depending on vehicle application. The 3rd sealing ring goes into the transfer gear that is situated directly behind the pump. The transfer gears vary in tooth count and some have accommodations for the third sealing ring and some do not. **Rule of Thumb - Replace what you take out with the same.**

2 Ring Input Shaft



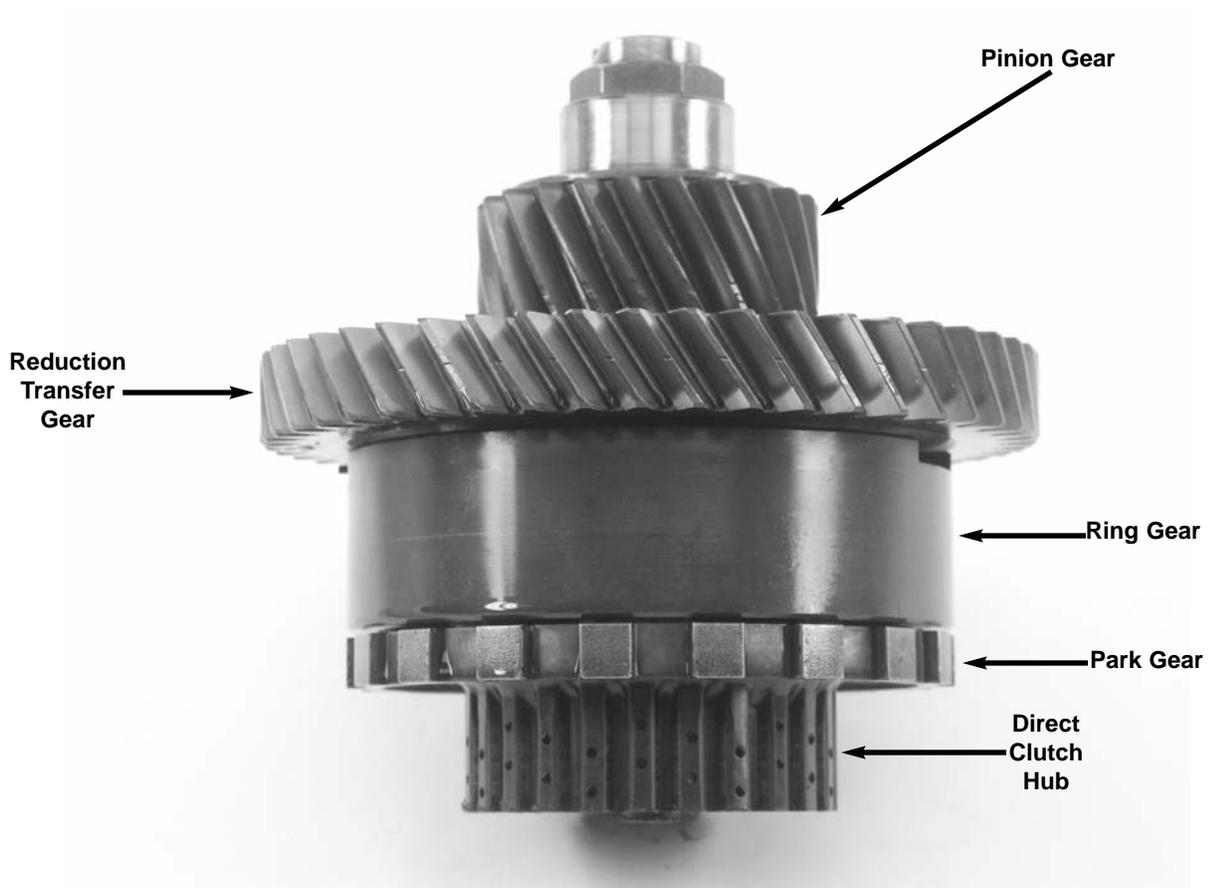
Transfer Gear



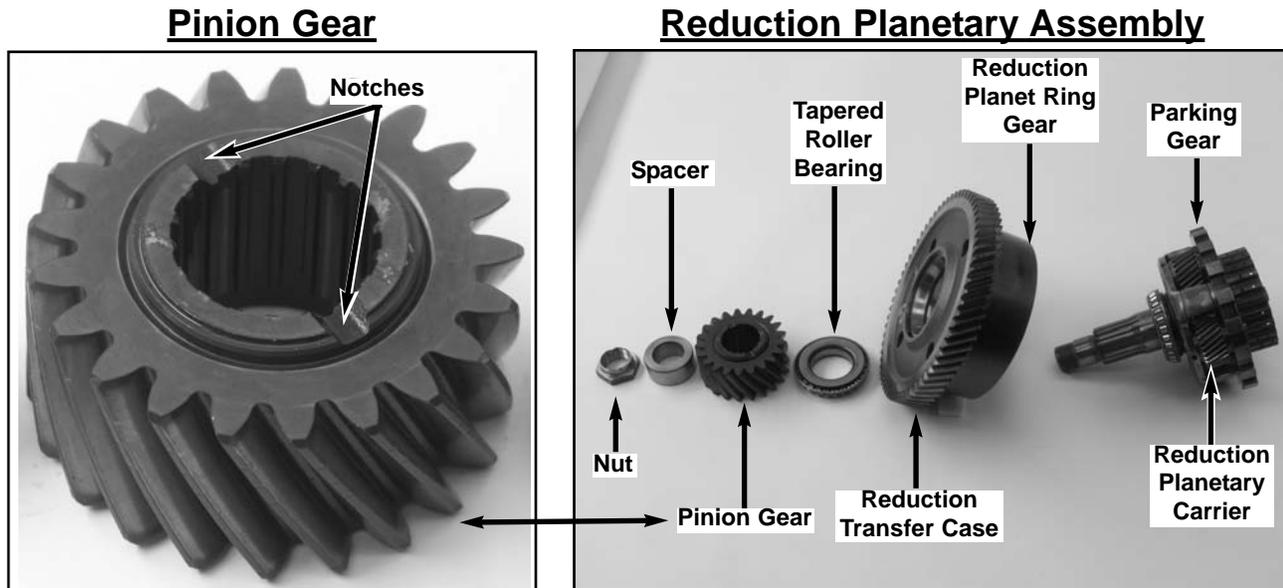
NOTE The above transfer gear uses the TWO sealing ring input shaft. If replacing gear, you will need the exact same tooth count and if it is used with a 2 or 3 ring input shaft.

Section Five - Disassembly & Overhaul Tips

Next, pull on the pinion gear/transfer gear/planet assembly and support with the other hand. It will pull straight out, leaving the direct drum and band.



Section Five - Disassembly & Overhaul Tips

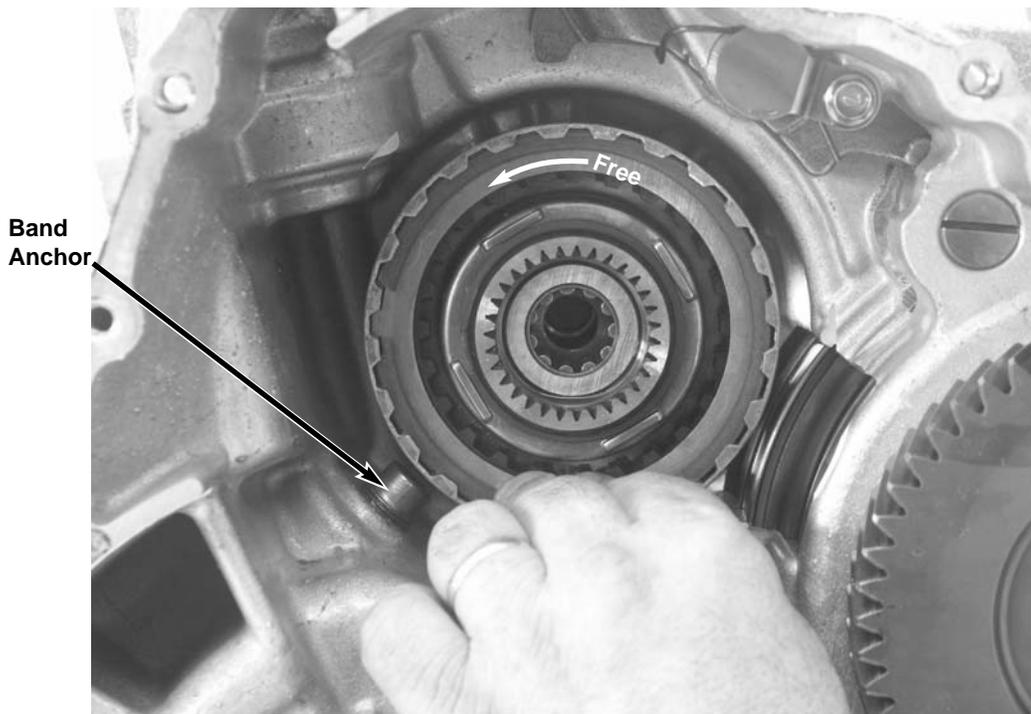


The reduction planetary assembly consists of the reduction planetary carrier with parking gear, the reduction ring gear, the reduction transfer gear, two tapered roller bearings with races, the pinion gear, a spacer, and a nut. This assembly must be disassembled, cleaned, and inspected for wear. To disassemble, the nut must be removed and the pinion gear pressed off of the shaft. The pinion gear has two notches on one side of the gear and they should face the spacer.

When reassembling, keep in mind that the tapered roller bearings require a preload of 5.3 to 15.5 inch pounds. Once the preload is set, stake the top of the nut to the slots in the shaft.

Section Five - Disassembly & Overhaul Tips

The sun gear may pull out with the planetary assembly or it may stay with the direct drum. The sun gear splines into the direct drum so that it can be held or driven. The sun gear comes in different tooth counts which means the direct drum must match the sun gear. Turn the direct drum counterclockwise as you remove it from the case. Remove the band. It is not necessary to remove the band anchor bolt.

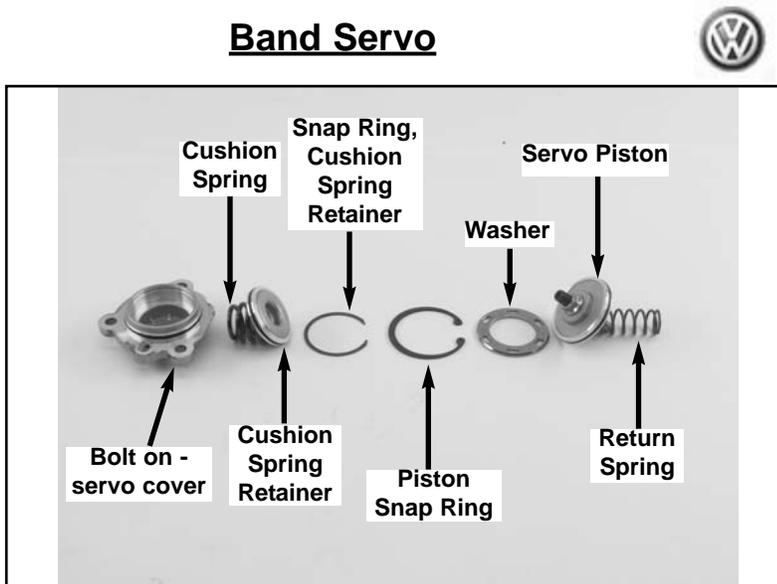
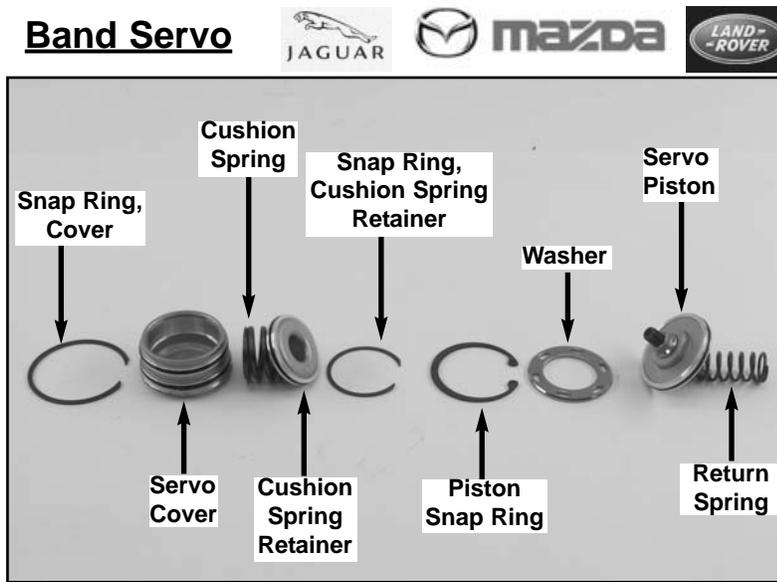


JF506E direct drum with reduction sprag at rear of direct drum. Sprag/Drum freewheels counterclockwise.

Section Five - Disassembly & Overhaul Tips

Remove snap ring holding the servo cover in place. On VW remove the bolts holding the servo cover to the case. The servo cover has a snap ring on the bottom side that retains a cushion spring and plate. Remove the servo cover and remove the snap ring and washer holding the servo apply piston in the bore. Extract the servo piston and return spring.

NOTE Tag servo return spring for identification, as it is very similar to an accumulator spring.



Section Five - Disassembly & Overhaul Tips

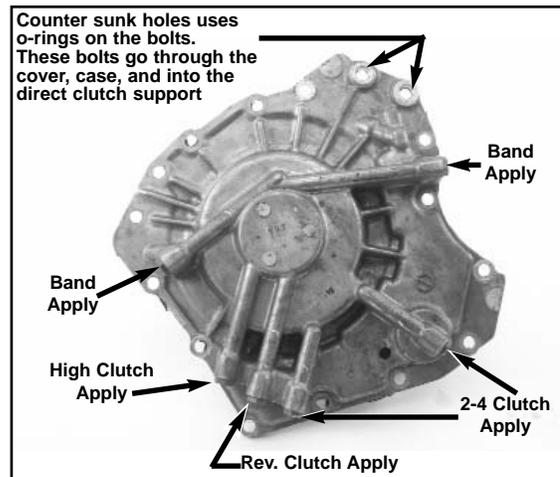
Spin the transmission around and remove the end cover. The high reverse drum may come off with the cover. The cover does not use a gasket, it uses RTV sealer. There are a couple of spots that have been provided to insert a large straight blade screw driver to gently pry and break the RTV free. Once the cover is off you will notice that there is another rubber flat washer between the case and the 2-4 accumulator. Notice that two of the bolts for the end cover have larger heads and o-ring seals and the cover holes are tapered to accept the o-rings. These two bolts go through the cover and case to thread into the inner race for the sprag in the direct clutch. **(continued on page 49)**

2-4 Accumulator



Exploded View

End Cover with Pressure Taps

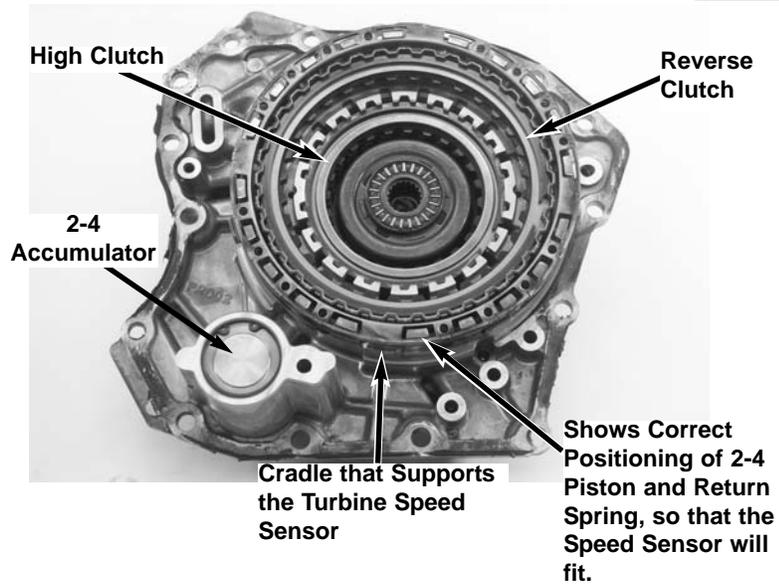


Section Five - Disassembly & Overhaul Tips

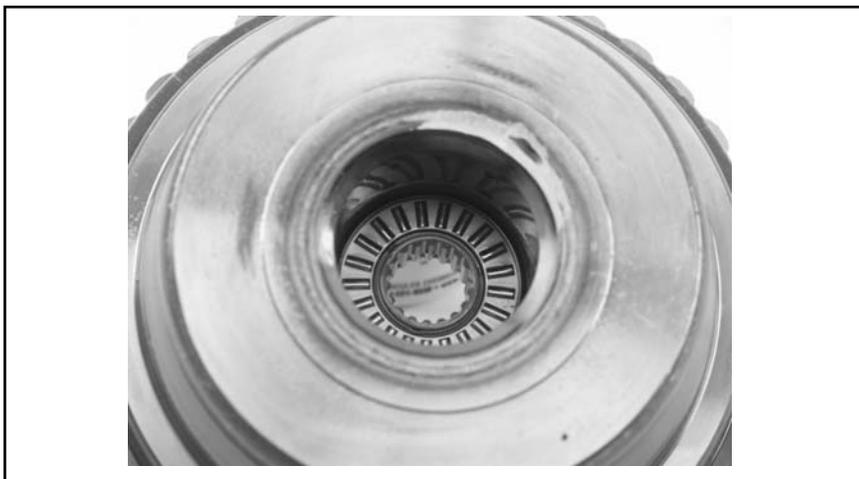
End Cover and High/Rev Drum



MAZDA



Cover Side of High/Rev. Drum Showing Thrust Bearing

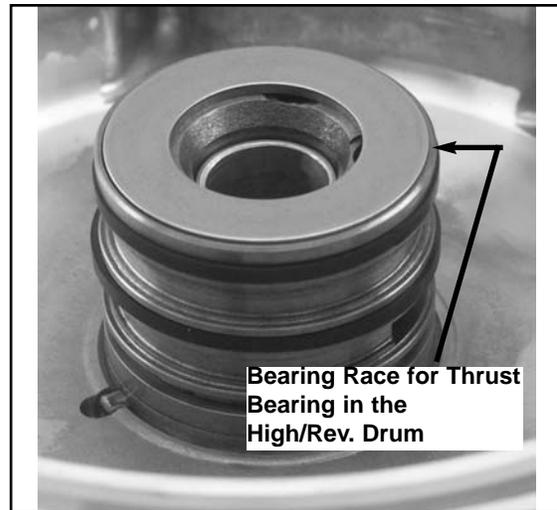


Section Five - Disassembly & Overhaul Tips

V-Cut Sealing Ring



End Cover Sealing Ring Location

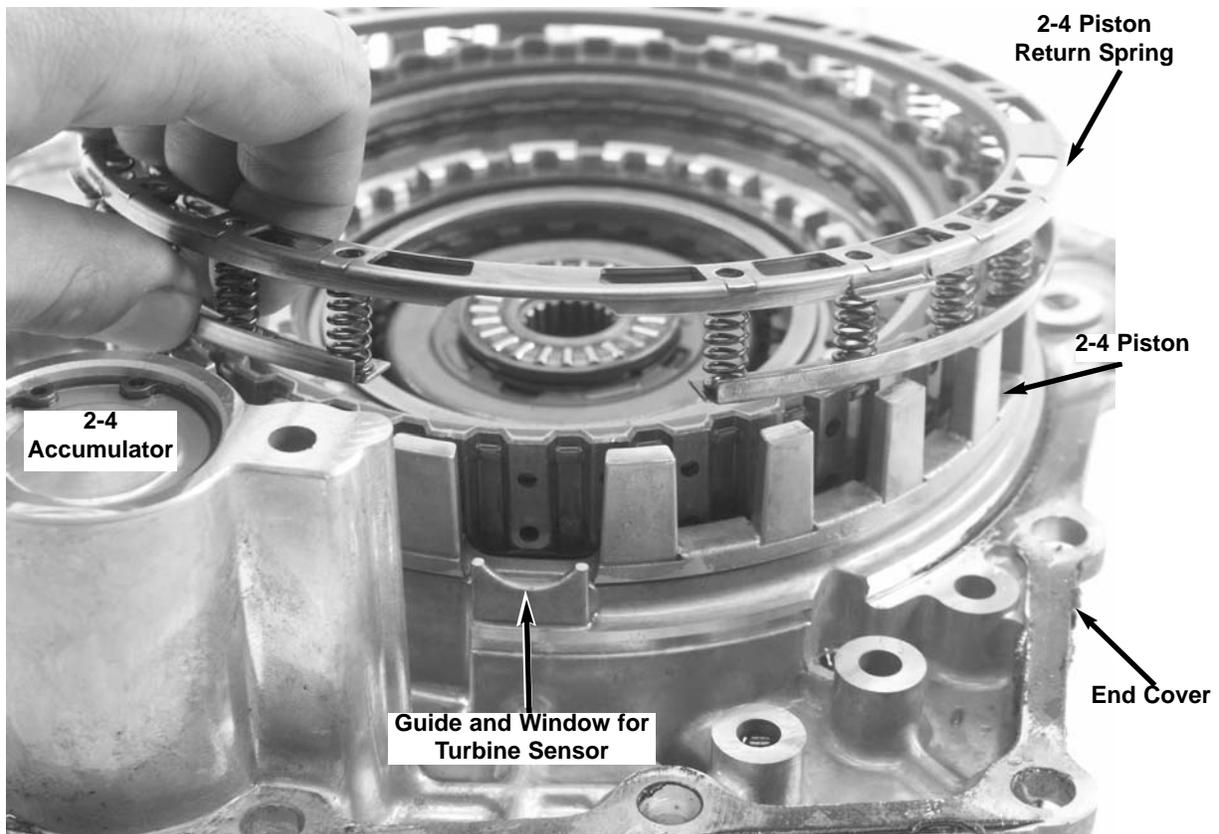


NOTE End cover sealing rings are directional, install as shown above

Oil is fed through case to the end cover to apply the reverse clutch and the high clutch. The sealing rings for the high/reverse drum are Teflon and one end has a point, like an arrow, and the other end is cut out the inverse of an arrow, like a V. These sealing rings are directional, when installed correctly the point of the arrow is to the right and the V is on the left.

Section Five - Disassembly & Overhaul Tips

End Cover



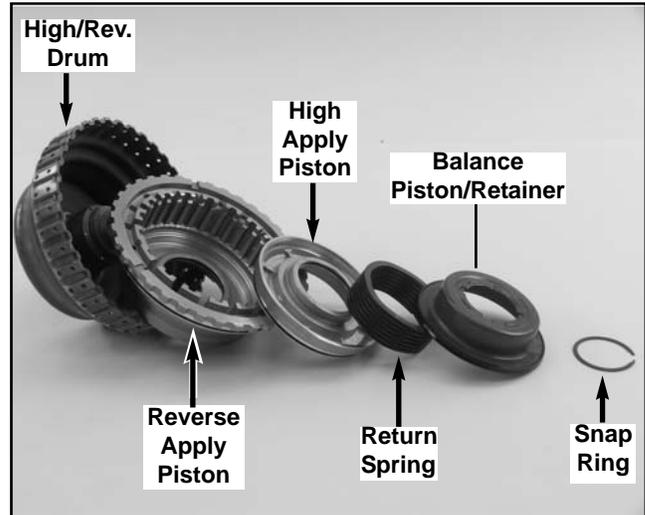
NOTE Notice position of 2-4 piston and return spring. This provides a window for the Turbine Speed Sensor to get to the High/Rev. drum.

Section Five - Disassembly & Overhaul Tips

Rev. Piston Inspect for Cracks



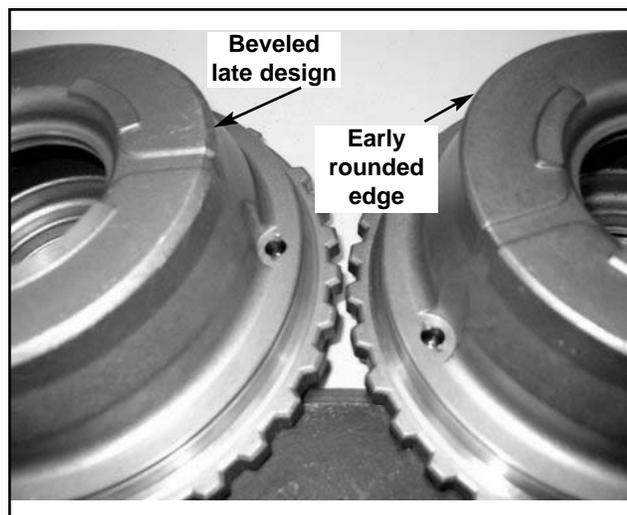
High/Reverse Drum



NOTE Mazda Part # FPO3-19-480 for 2nd design reverse apply piston. This part should fit all makes.

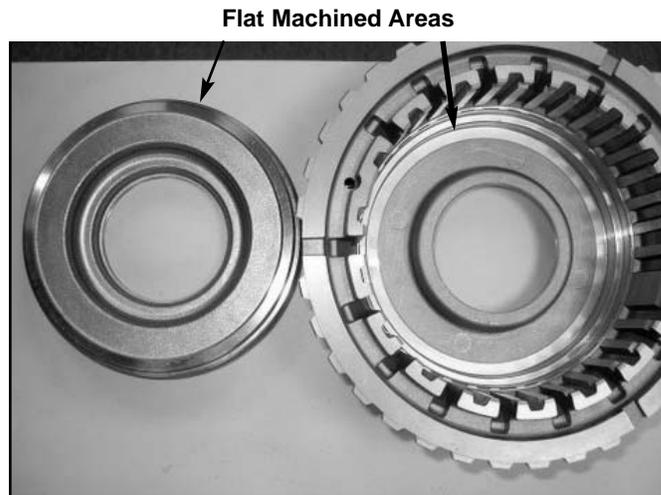


The JF605E used a reverse piston that would crack and it was upgraded in mid 2003. The piston was made .034" thicker in the area where it was known to crack and should be used in place of the early piston whenever the transaxle is disassembled for service. When you purchase a new reverse piston from Mazda you get both the high and the reverse pistons. Do not mix early and late pistons, always install both late pistons. Below are some pictures to help decide if your pistons are early or late design.



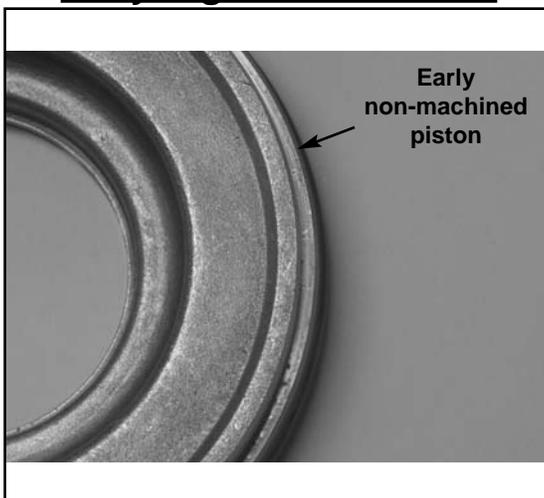
The left reverse piston is the late, updated version. Notice the beveled bottom edge on the late piston and the slight rounded edge on the early piston

Section Five - Disassembly & Overhaul Tips



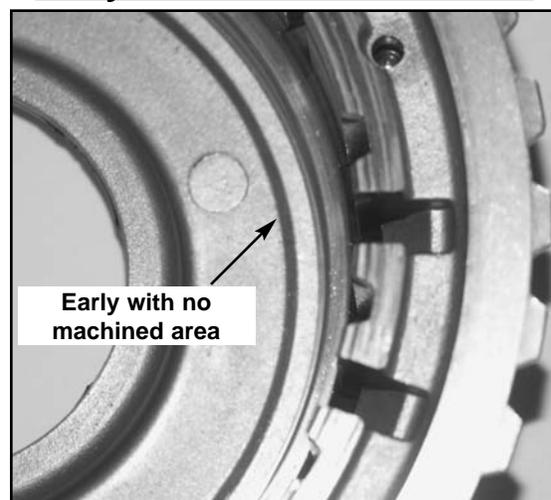
These are late, updated high and reverse pistons. Notice the flat machined edge on the bottom outside diameter of the high clutch piston and the corresponding machined inside area of the reverse clutch piston.

Early High Clutch Piston



This is the early high clutch piston. Notice the outer edge is not machined, it has a cast rib instead.

Early Reverse Clutch Piston

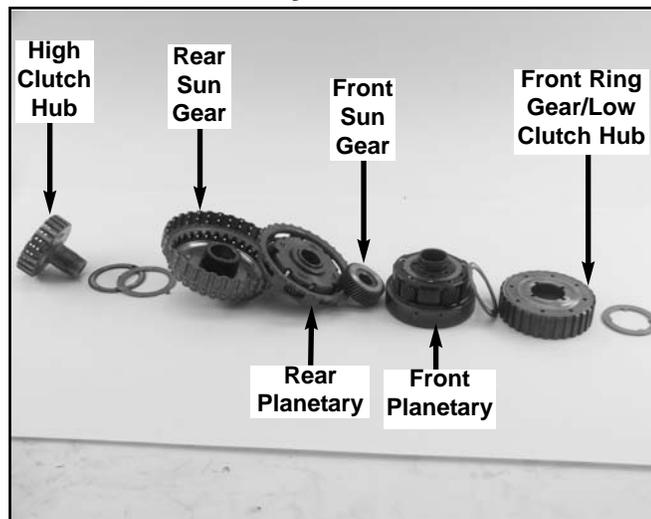


This is the inside of the early reverse clutch piston. Notice that the bottom area is not machined like the late piston

Section Five - Disassembly & Overhaul Tips

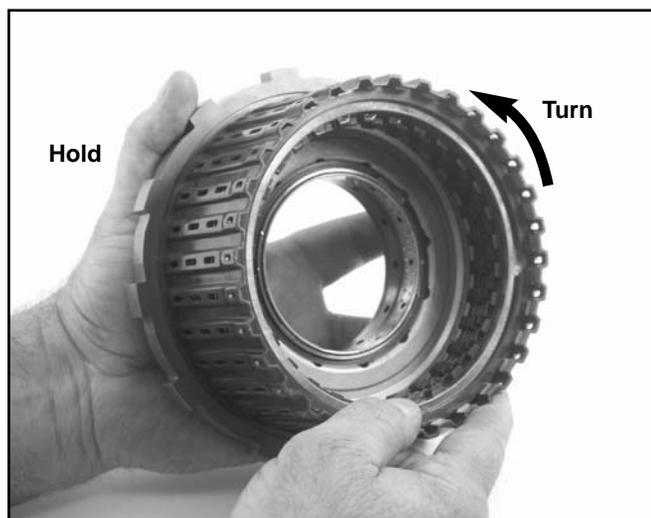
(Continued from page 45) Next, remove the high clutch hub, both planets and sun gears, and the low clutch hub.

Planetary Assemblies



Try to turn the low clutch drum both directions, it should turn counterclockwise and lock clockwise. Turn the low drum counterclockwise and lift out of low roller and case.

Low Clutch Rotation



NOTE Low clutch drum should freewheel counterclockwise when holding the low roller

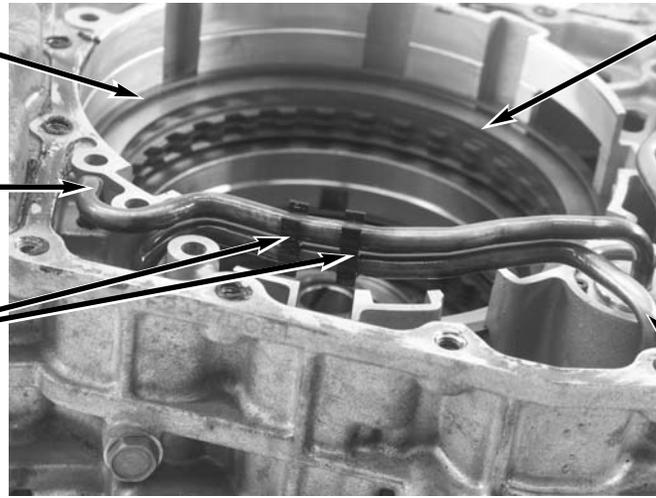
Section Five - Disassembly & Overhaul Tips

Tube Clips

2-4 Clutch Snap Ring is
.079" thick, the Snap
Ring ends are positioned
at 9:00

Top Tube is Direct
Accumulator Back
Pressure

Plastic Tube Clips



2-4 Clutch Pack

This Tube is
Direct Clutch
Apply Also.

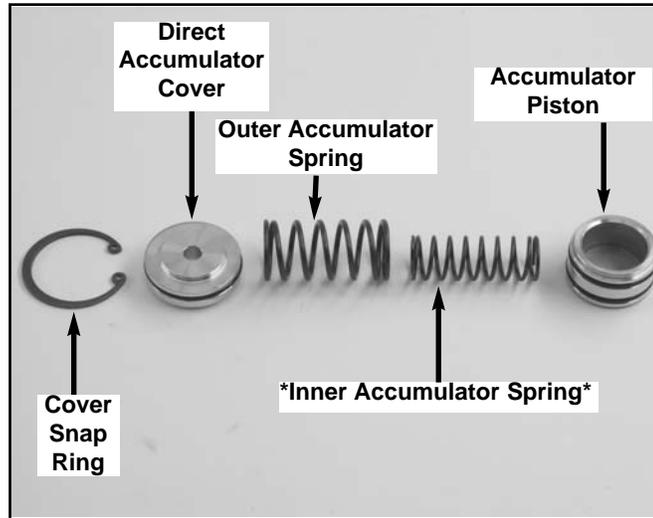
Direct
Accumulator

Bottom Tube
is Direct
Clutch Apply

To remove the 2-4 clutches from the case, remove the .079" thick snap ring. Notice that the ends of the snap ring are at the 9:00 position in the case. Lift out the two top pressure plates, together they measure .302" thick, and lift out the frictions, steels, and bottom pressure plate. There are three 2-4 frictions that are .079" thick. There are two 2-4 steel plates that are .118" thick. The bottom pressure plate is .163" thick.

Section Five - Disassembly & Overhaul Tips

Direct Accumulator



*See Spring Specification Table below

NOTE The direct inner accumulator spring is very similar to the band servo return spring.

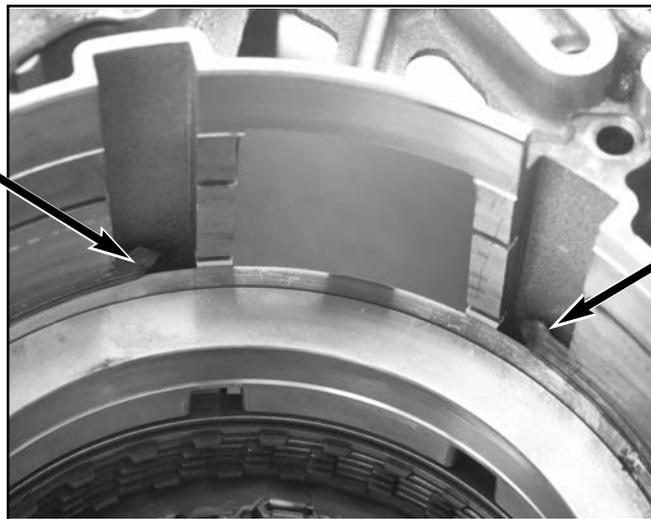
Spring Name	Free Length	Outside Diameter	Wire Diameter
Direct Outer Accumulator	2.113"	1.065"	0.098"
Direct Inner Accumulator	2.141"	0.790"	0.074"
Band Servo Return	2.017"	0.855"	0.095"
2-4 Accumulator	2.812"	1.064"	0.102"
VB Accumulator - "A"	2.95"	1.06"	0.090"
VB Accumulator - "B"	3.08"	1.06"	0.090"

Section Five - Disassembly & Overhaul Tips

To remove the low/reverse clutch housing it is best to compress the return spring by pressing on the low/reverse housing and removing the snap ring. The snap ring ends are curled out and go into slots in the case at the 1:30 and 3:00 positions. **See illustration for correct positioning of the snap ring.** The snap ring that retains the low/reverse clutch drum is .085" thick. Lift the low/reverse clutch housing out of case without cocking it.

Low/Rev. Clutch Housing (Correct Snap Ring Placement)

Snap Ring End
at 1:30 Position



Snap Ring End
at 3:00 Position

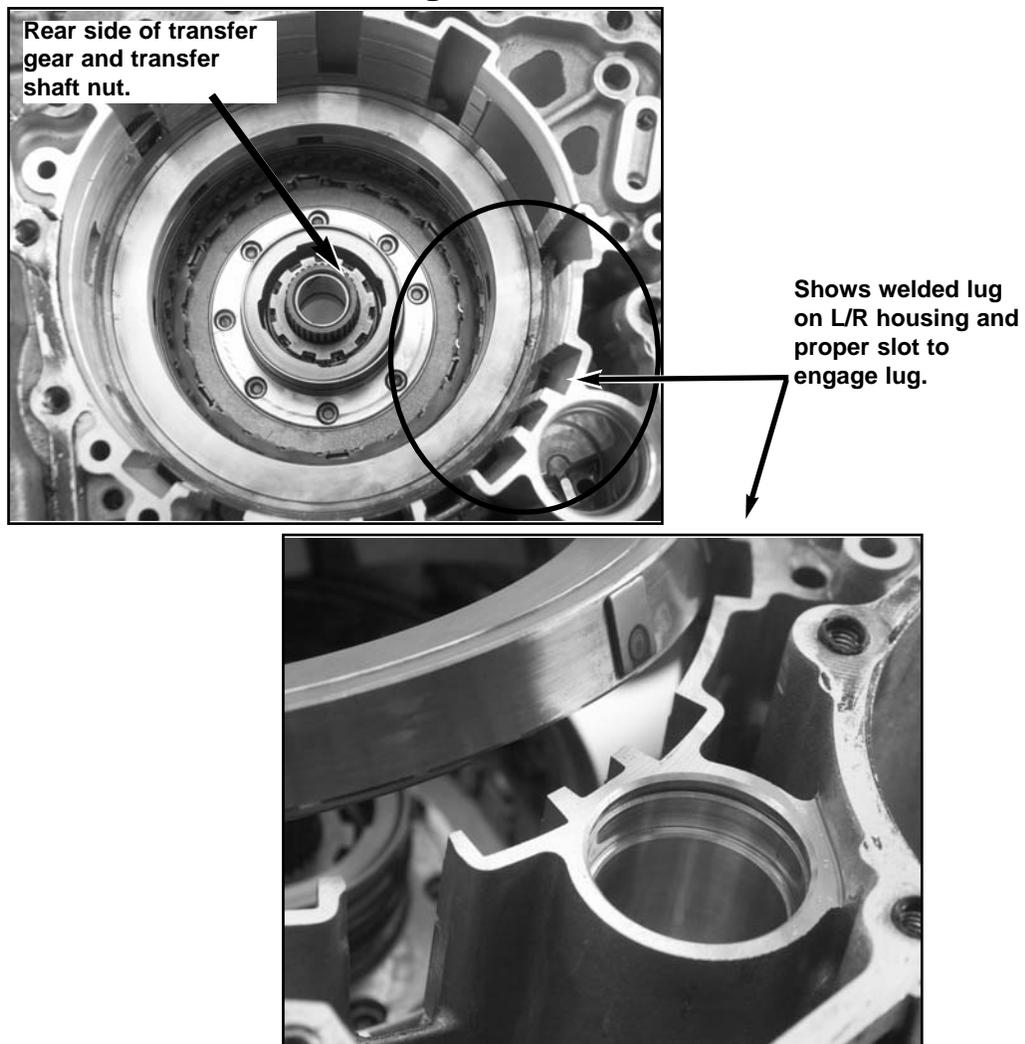
Section Five - Disassembly & Overhaul Tips

Notice the locating lug welded on the outside of the housing that slides into a slot at the 4:00 position. Remove the L/R release spring and retainer. **(see illustration for proper assembly into case)**. Next, lift out the concave cushion spring.

NOTE The outside edge of the cushion spring goes against the top steel and the inner edge of the cushion spring goes against the L/R piston

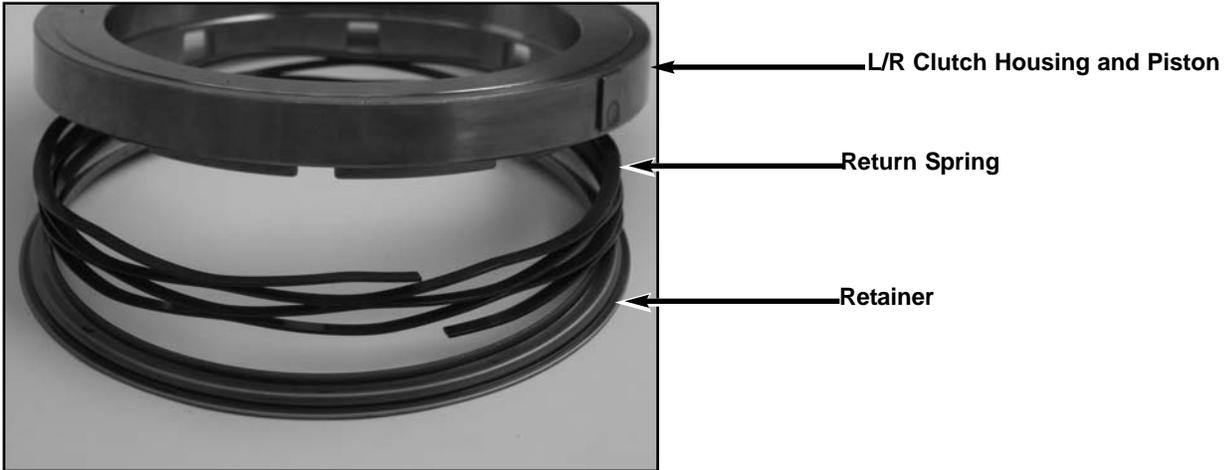
Lift out the L/R clutch plates. Notice that the L/R steels and pressure plate have one outer lug that is smaller than all of the others, it goes in the 11:00 slot in the case. The top steel is .094" thick, the five frictions are each .069" thick, the four steels are each .054" thick, and the bottom pressure plate is stepped, with the flat side up and an overall thickness of .147".

L/R Housing



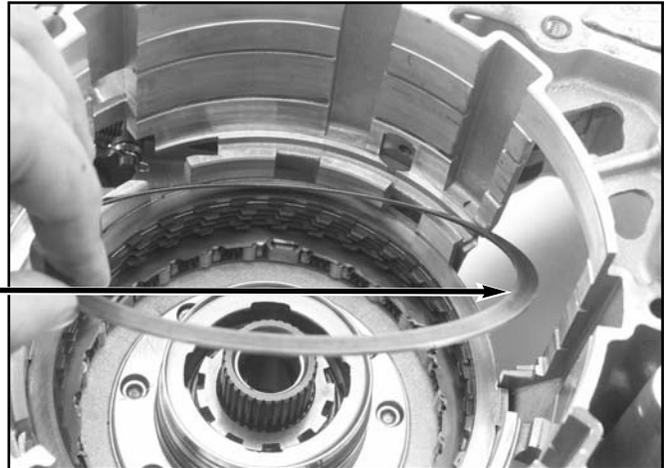
Section Five - Disassembly & Overhaul Tips

Proper placement of L/R Return Spring

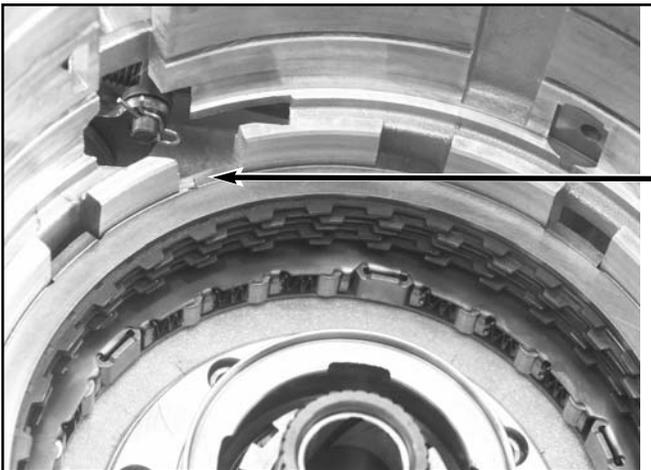


Proper placement of L/R Clutch Cushion Spring

Correct Positioning of Concave Cushion Spring



Small lug on steels at 11:00

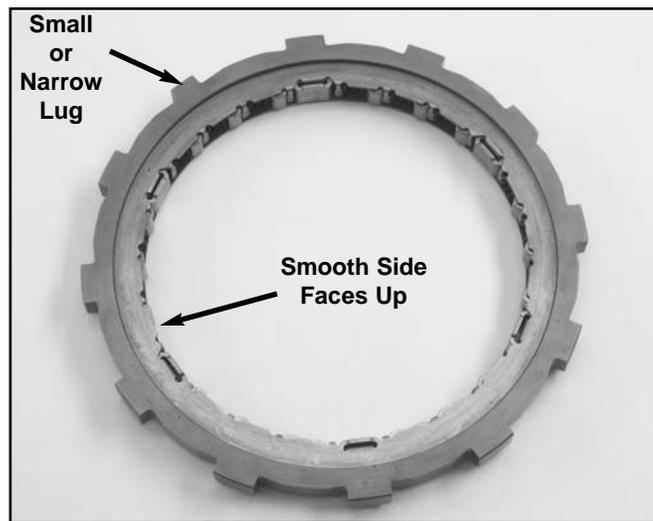


All L/R steels and pressure plates and the outer race of the low roller clutch have one small lug. The small lug is located in the slot that is at the 11:00 position.

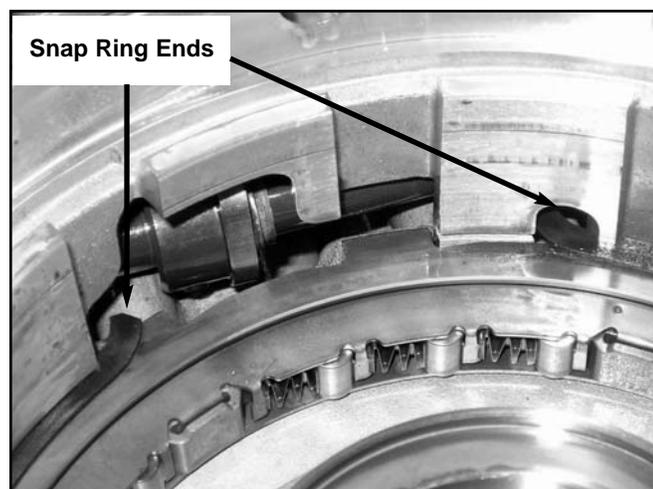
Section Five - Disassembly & Overhaul Tips

The low roller clutch is held in by a .048" thick snap ring. The snap ring has the ends curled out. When holding the snap ring with the gap facing up, the left curled end goes into an oval hole in the case at the 9:30 position on assembly. The smooth side of the low roller clutch faces up, or away from the bell housing. The low roller clutch also has one small locating lug that goes into the 11:00 slot in the case.

Low Roller Clutch



Low Roller Snap Ring End in Oval Hole



NOTE Notice that the gap between the snap ring ends allows room for the rooster comb to operate. The snap ring must be installed correctly and seated completely or the bottom pressure plate for the low/reverse clutch will not seat correctly. The step on the bottom of the pressure plate fits inside the inner edge of the snap ring.

Section Five - Disassembly & Overhaul Tips

The transfer shaft and bearings should be removed to inspect and clean the bearings and races. The transfer bearings need to have the proper preload to live a long life. The correct preload is 5.6 to 11.5 inch pounds of torque.

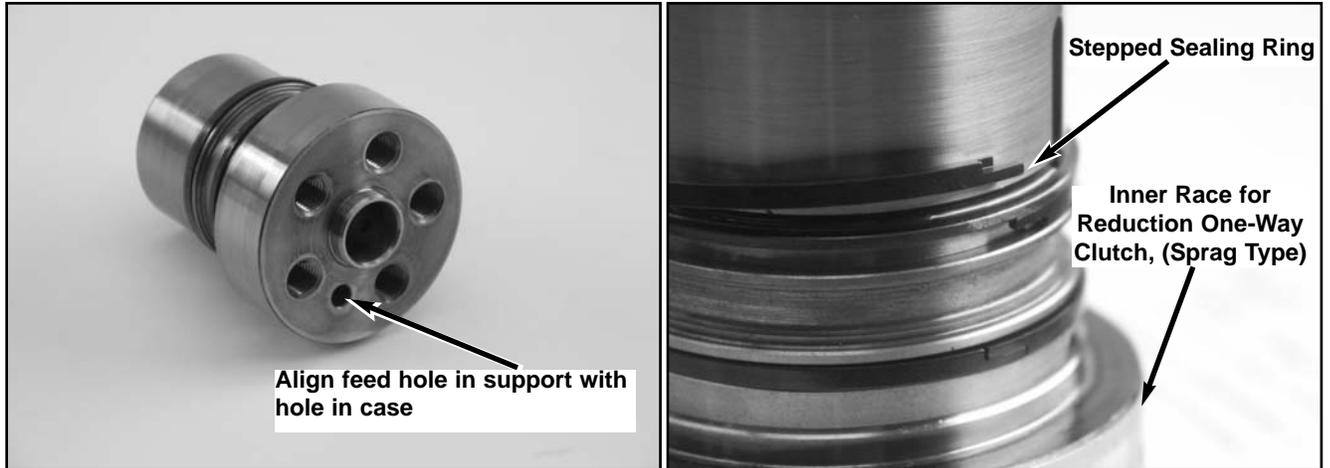
NOTE The bearing area is a perfect place for dirt and debris to hide, which could cause valves to stick after overhaul.

Exploded View of Transfer Gear

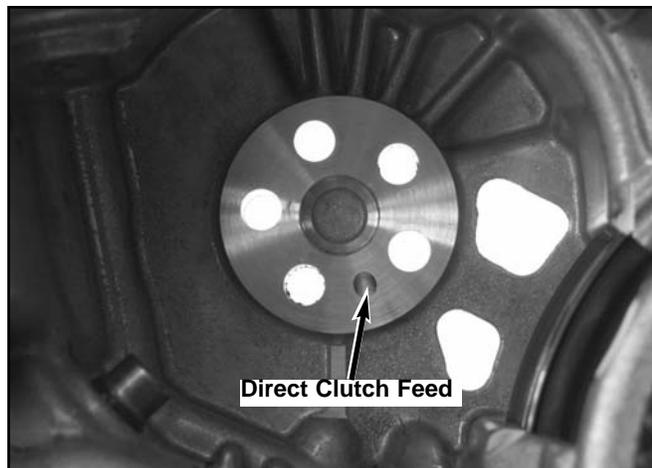


Section Five - Disassembly & Overhaul Tips

Direct Drum Support and Inner Sprag Race



The support and feed for the low clutch uses stepped sealing rings, similar to the vespel rings that GM uses on the 4T60E.



Section Five - Disassembly & Overhaul Tips



Reduction Band

NOTE Band Adjustment - Tighten Servo Pin until Snug and Back Off 5 Turns. Tighten Lock Nut



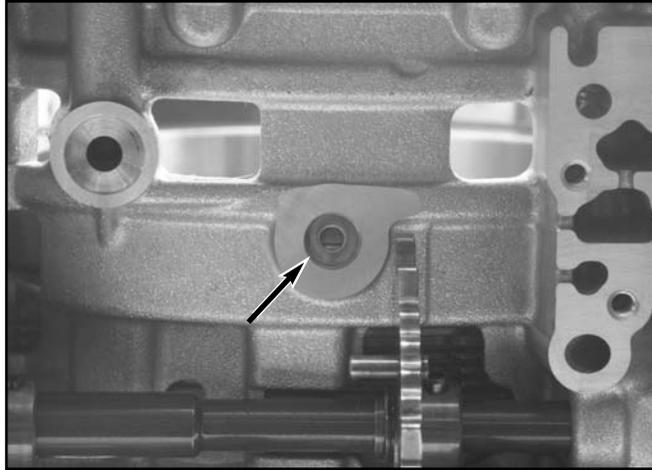
Direct drum showing the thrust bearing that is hidden under the sprag



Direct drum showing proper installation of the sprag. Notice that the lip on the sprag cage faces away from the pocket

Section Five - Disassembly & Overhaul Tips

L/R Clutch Housing



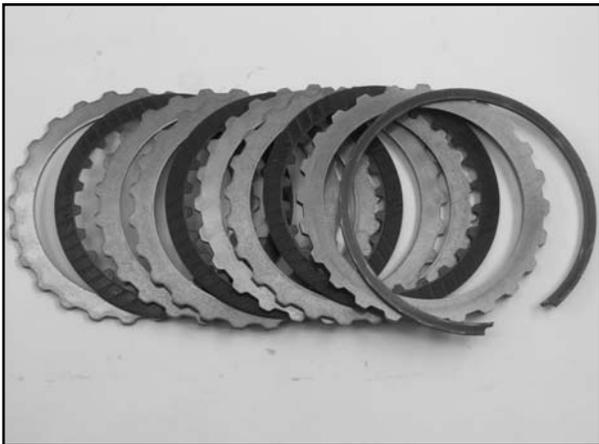
NOTE After installing the L/R clutch housing, always check the feed hole to be sure that it is in the correct location.



ASSEMBLY TIP: Install all components of the L/R clutch into the case, including the correctly positioned snap ring. Using 2 plastic hammer handles, Simultaneously drive the handles down against the L/R housing and snap ring. The snap ring will pop into the groove. Check to be sure that the snap ring is completely seated in the groove.

Section Five - Disassembly & Overhaul Tips

Direct Clutch 3-Pack



Direct Clutch Drum, 3-Friction

Top Snap Ring	.080"
Top Pressure Plate	.170"
3 Friction Plates, each plate	.068"
5 Steel Plates, each plate	.078"

Direct Clutch 4-Pack

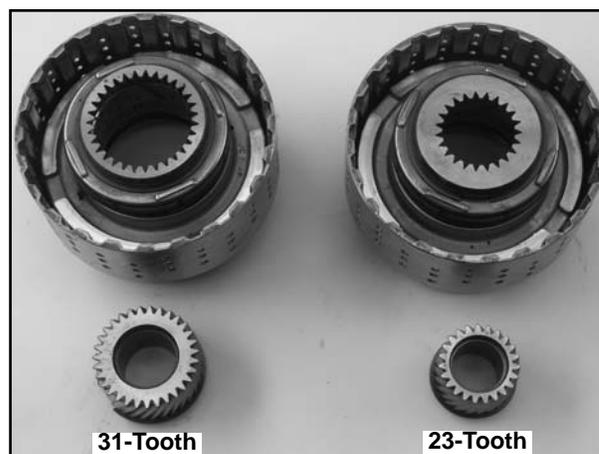


Direct Clutch Drum, 4-Friction

Top Snap Ring	.080"
Top Pressure Plate	.170"
4 Friction Plates, each plate	.068"
4 Steel Plates, each plate	.078"

4-Friction Drum

3-Friction Drum



Section Five - Disassembly & Overhaul Tips

Low Clutch 7-Pack



Low Clutch Breakdown

Snap Ring	.063"
Top Pressure Plate	.159"
6/7 Friction Plates, each plate	.069"
6/7 Steel Plates, each plate	.055"
1 Dished Cushion Plate, OD Toward Steel, ID Toward Piston	∖ /

Low Clutch Drum



L/R Clutch Pack



Low/Rev. Clutch, at Front of Case

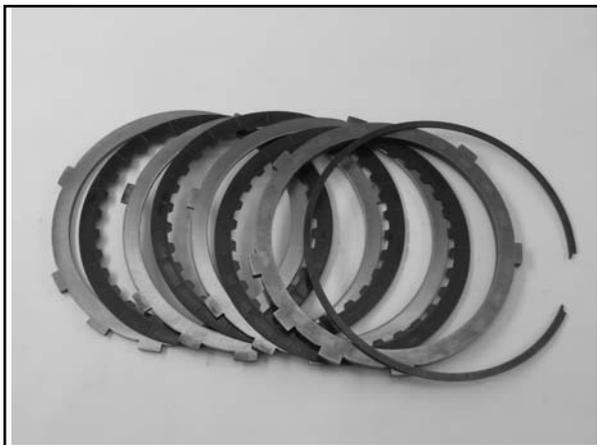
Snap Ring, holds L/R housing	.085"
Concave cushion spring, ID towards piston, OD to steel	∖ /
Top Steel	.094"
5 Friction Plates, each plate	.069"
4 Steel Plates, each plate	.054"
Bottom Pressure Plate, Stepped	.147"

Section Five - Disassembly & Overhaul Tips

2-4 Clutch, (at rear of case)

Snap Ring	.079"
Top Pressure Plates, both add to	.302"
3 Friction Plates, each plate	.063"
2 Steel Plates, each plate	.118"
Bottom Pressure Plate	.163"

2-4 Clutch Pack w/1-Thick Pressure Plates



Single thick pressure plate is .302" thick, the same as the two thin pressure plate style.

2-4 Clutch Pack w/2-Thin Pressure Plates



Section Five - Disassembly & Overhaul Tips

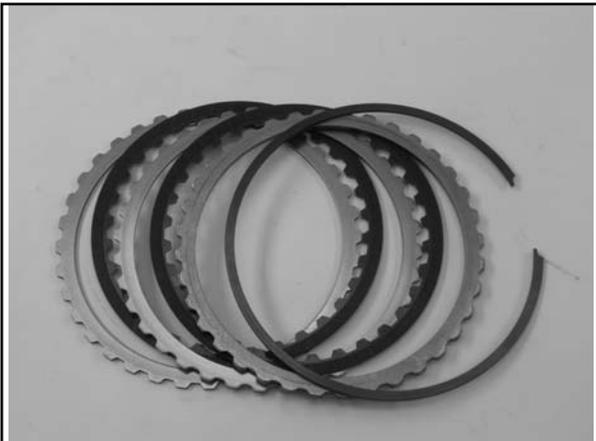
High Clutch Pack



High Clutch (drum w/2 clutch packs in it)

Snap Ring	.078"
Top Pressure Plate	.125"
5 Friction Plates, each plate	.063"
4 Steel Plates, each plate	.094"
Bottom Steel plate	.063"

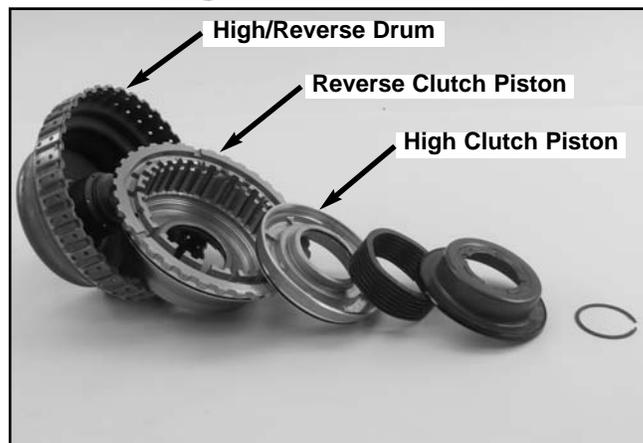
Reverse Clutch



Reverse Clutch (large clutches in drum w/high)

Snap Ring	.078"
Top Pressure Plate	.146"
2 Friction Plates, each plate	.061"
2 Steel Plates, each plate	.079"

High/Reverse Drum





Section Six - Valve Body

JF506E Valve Body

The JF506E valve body is not difficult, but there are a few things to keep in mind that will make this go a little easier.

- The accumulators on this valve body have springs that are very similar. The spring measurements are on the spring chart. Accumulator “A” has a shim that goes between the spring and the bottom of the accumulator piston.
- There are two sleeves with valves inside that are right next to each other in one of the valve body sections. The sleeves are different size inside, as are the valves. Be careful not to mix them up. The sleeves can be put into their bores backward. The sleeves have four equally spaced slots in each end. The end of the sleeve with the longer slots goes toward the outer edge of the valve body.
- On final assembly, make sure that all the bolts are in the valve body before tightening any bolts. The tolerances are so close that you may have to loosen all the bolts if you forgot to put one in earlier. One of the bolts that hold the valve body together is under the low clutch timing solenoid. The TCC solenoid must be removed to remove or install the low clutch timing solenoid, so don't put these solenoids on until some of the center bolts are torqued to spec. After tightening a few bolts in the center of the valve body, the VB to case bolts can be removed and all of the solenoids can be installed.
- As always use a torque wrench and tighten the valve body bolts starting in the center and working your way to the outside.
- All the valve body to case bolts are silver and all the same length.
- All of the bolts that hold the valve body together are gold.
- Jaguar, Land Rover, and Volkswagen use a manual valve that is 4½” long.
- Mazda uses a manual valve that is 4 13/16” long.
- Note that the large separator plate does not use gaskets, but the two smaller separator plates do use gaskets.
- All of the brackets are important and serve a purpose. **Do not install a valve body without all of its brackets.** There is a small bracket that is easy to overlook that mounts onto same bolt that holds down the TCC solenoid. This bracket holds down a hidden tube. The valve body pictures show the location of all the brackets.



Section Six - Valve Body

Interchange and Valve Body I.D. Information

As of December 2005, there are four car manufacturers that use the JF506E transaxle. There are two Valve Body designs. The differences are minor. The Mazda valve body and the Jaguar, Land Rover, and VW valve body. Even though they look alike, at this time there is not enough information to know if the Jaguar, Land Rover, and VW can be interchanged. The Mazda can only be used on a Mazda vehicle.

Do Not Interchange Valvebodies

There are some obvious differences between the two types.

Mazda



- Uses 10 valve body to case bolts.
- Has gold color solenoid hold down straps on some solenoids.
- No tube or “T” shaped bracket on the solenoid side of the valve body.
- The manual valve is 4 13/16” long.

VW, Land Rover, and Jaguar



- Uses 11 valve body to case bolts.
- All solenoids and brackets are silver.
- Has an external oil tube and “T” shaped hold down bracket on the solenoid side of the valve body.
- The manual valve is 4 ½” long.

The VW and Jaguar valve bodies appear to be the same except that VW uses one more plastic checkball than Jaguar. The steel checkballs have a diameter of 0.218 and the plastic checkballs are 0.214 in diameter.

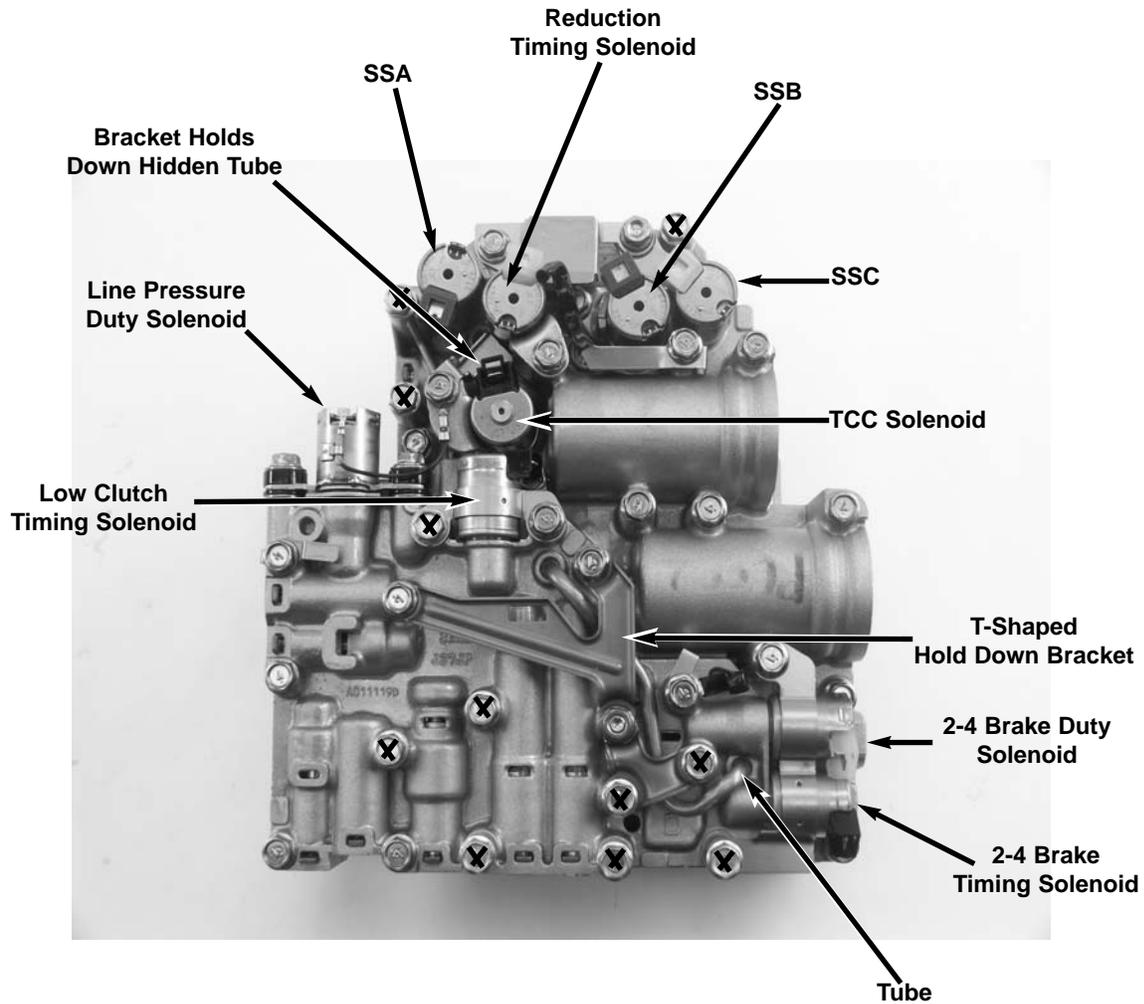
Do Not Interchange Valvebodies

JF506E Transaxle



Section Six - Valve Body

VW/Land Rover/Jaguar Valve Body



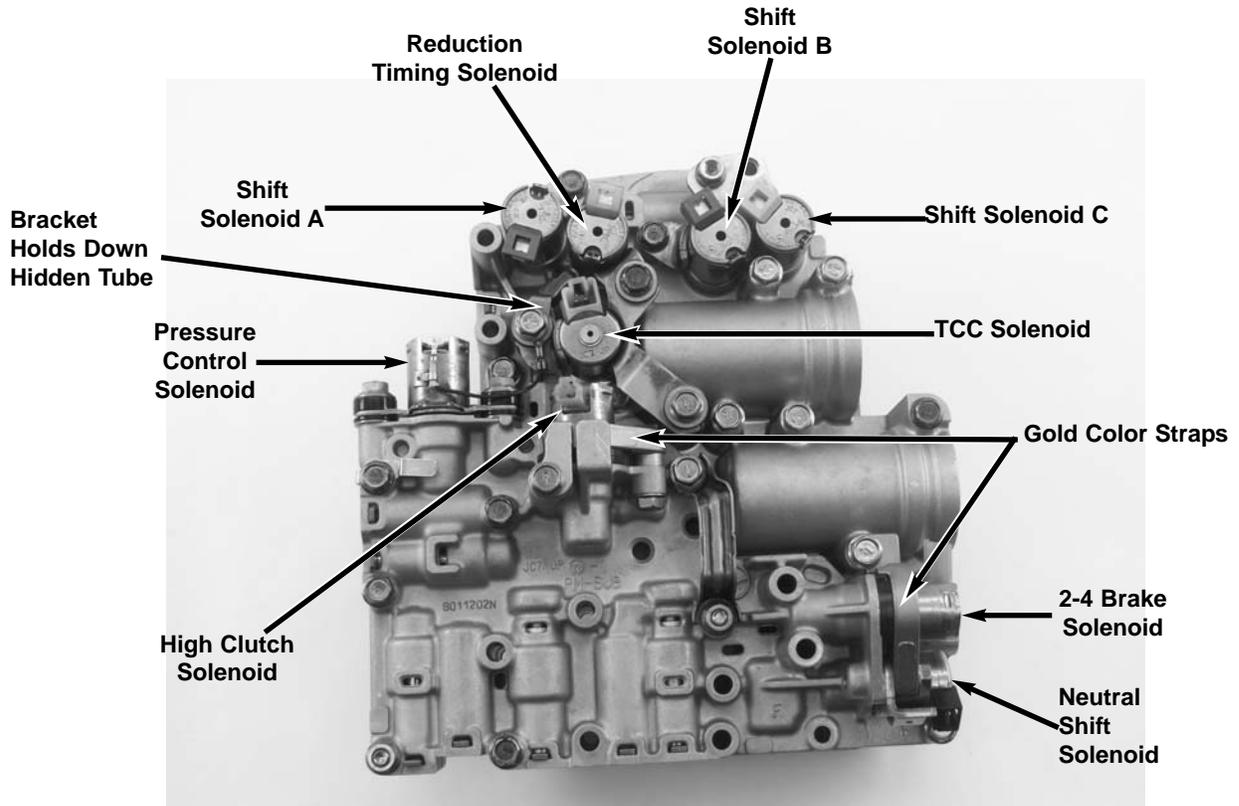
x = Silver Holddown Bolt

Quick ID Info

- Tube and T Shaped Holddown Bracket.
- All Solenoids and Brackets are Silver.
- 11 Valve Body to Case, Silver Bolts.

Section Six - Valve Body

Mazda Valve Body



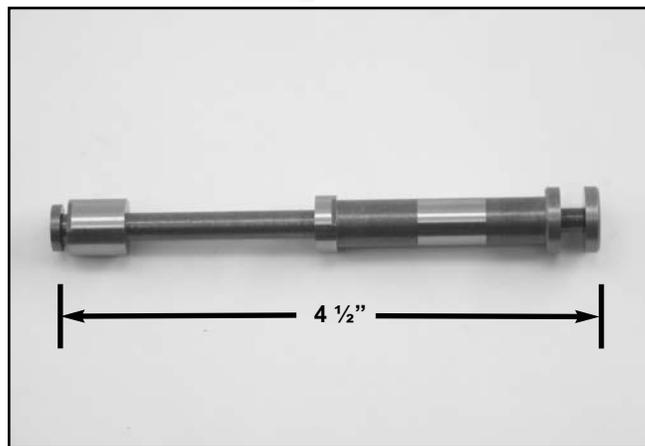
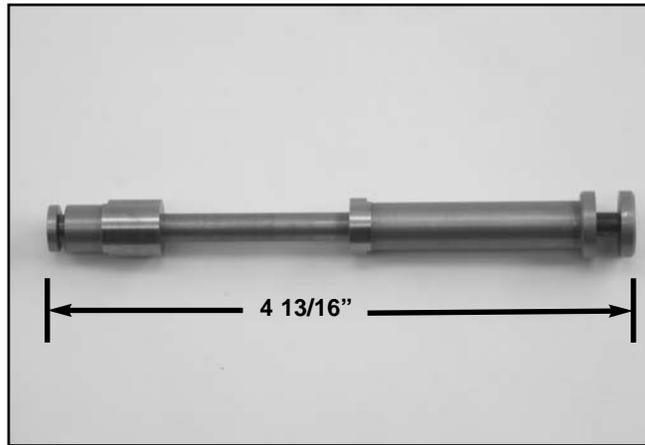
<u>Quick ID Info</u>
<ul style="list-style-type: none"> • 10 Silver Holddown Bolts • Gold Straps used for securing some solenoids • No tubes on top of VB.

JF506E
Transaxle



Section Six - Valve Body

Manual Valve I.D.

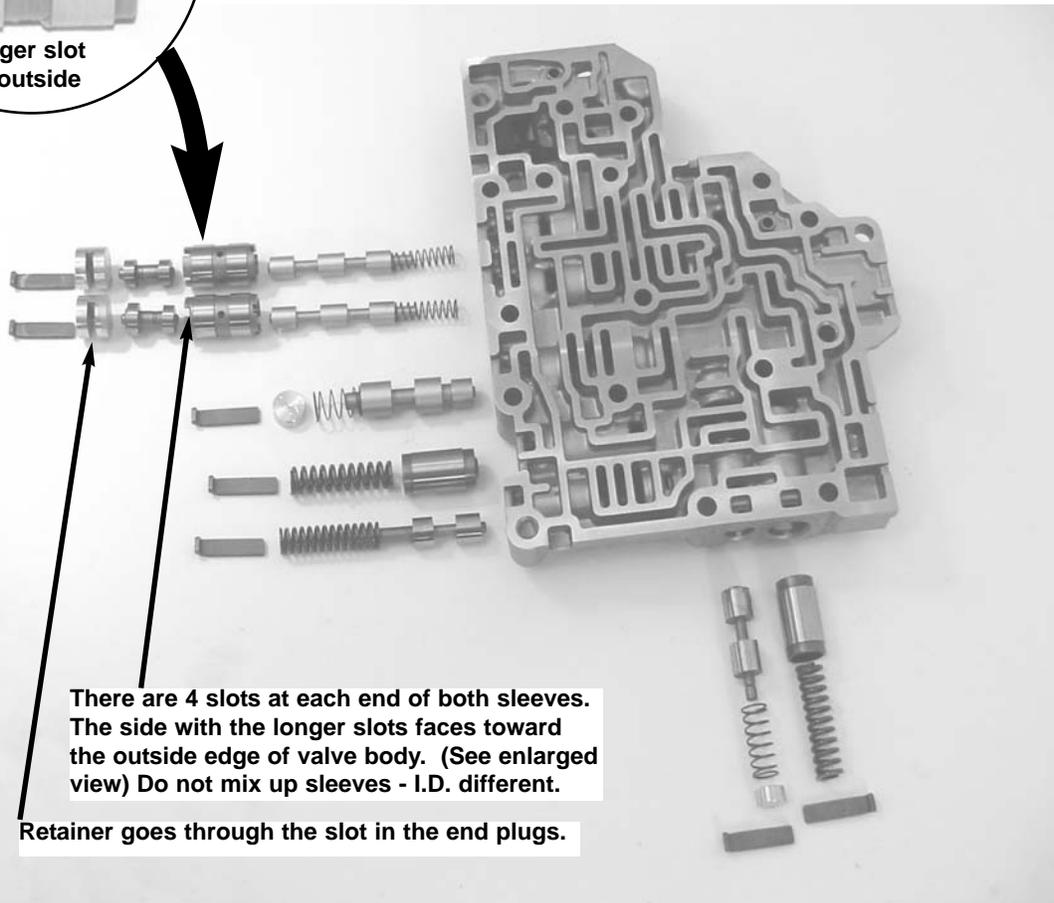


Section Six - Valve Body

Exploded View of VB



Larger slot
to outside



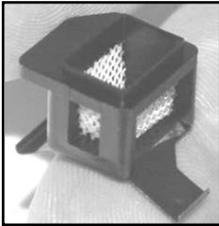
There are 4 slots at each end of both sleeves.
The side with the longer slots faces toward
the outside edge of valve body. (See enlarged
view) Do not mix up sleeves - I.D. different.

Retainer goes through the slot in the end plugs.

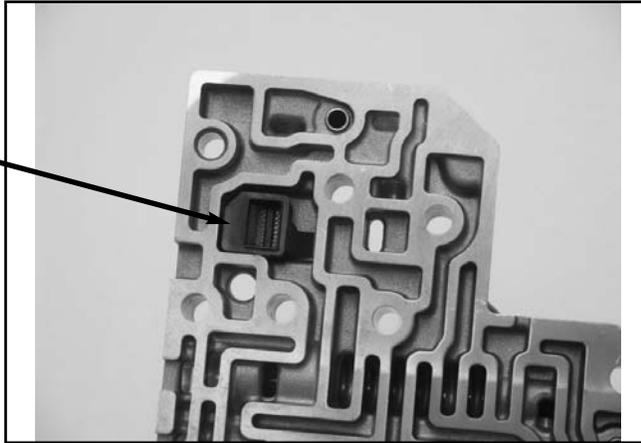
Jaguar shown, others similar

Section Six - Valve Body

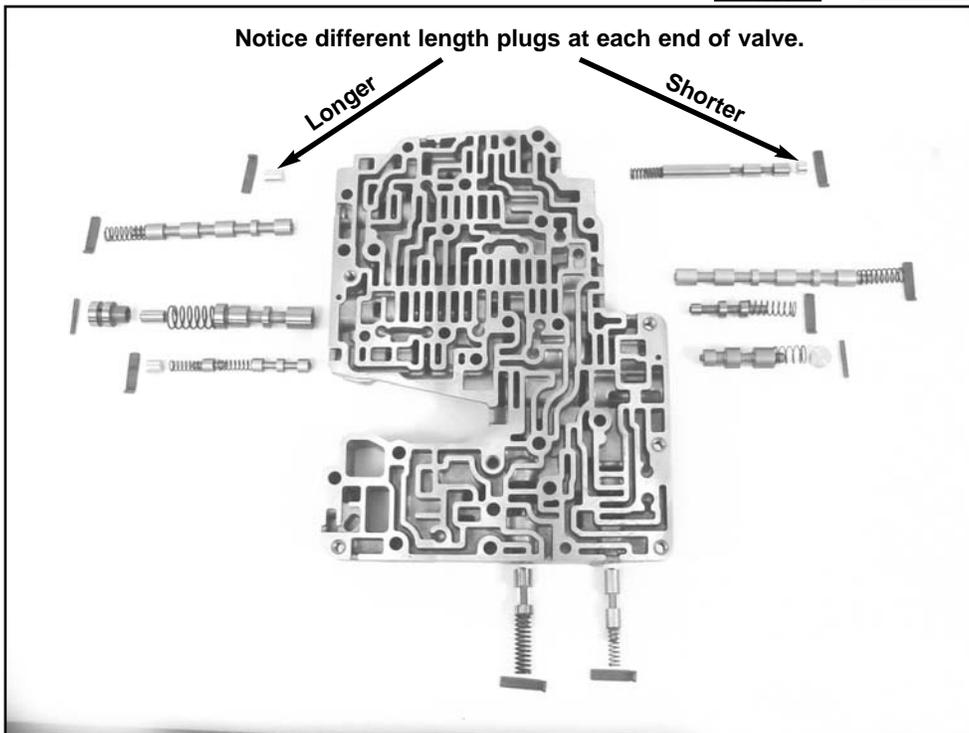
Valve Body Filter



Valve Body Filter Location



Valve Body Exploded View

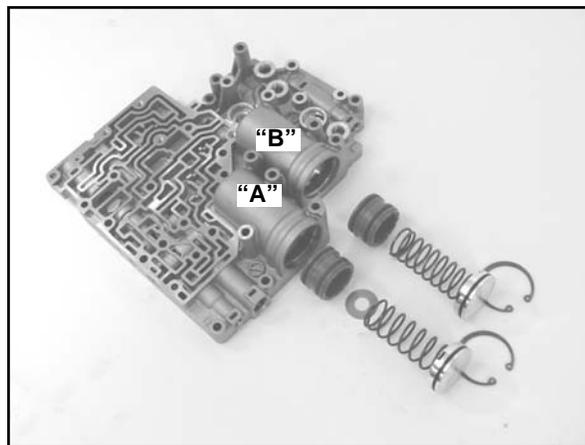


Section Six - Valve Body

There are several springs that are virtually identical in this transmission. To add to the confusion, all of the springs in the transmission are the same color, steel, or no color at all. To help with identification, the springs that can be confused have been measured for free length, outside diameter, and wire diameter.

Spring Name	Free Length	Outside Diameter	Wire Diameter
Direct Outer Accumulator	2.113"	1.065"	0.098"
Direct Inner Accumulator	2.141"	0.790"	0.074"
Band Servo Return	2.017"	0.855"	0.095"
2/4 Accumulator	2.812"	1.064"	0.102"
VB Accumulator - "A"	2.95"	1.06"	0.090"
VB Accumulator - "B"	3.08"	1.06"	0.090"

None of the vehicle manufacturers that use the JF506E have published an exploded view of the valve body with the parts named. For our use I have taken the liberty of naming the two accumulators in the valve body, A and B. The "A" accumulator is next to the 2/4 duty solenoid and uses the shorter spring. The "A" accumulator uses a thin washer or shim that goes between the spring and the piston. The "B" accumulator has the longer spring with no shim.



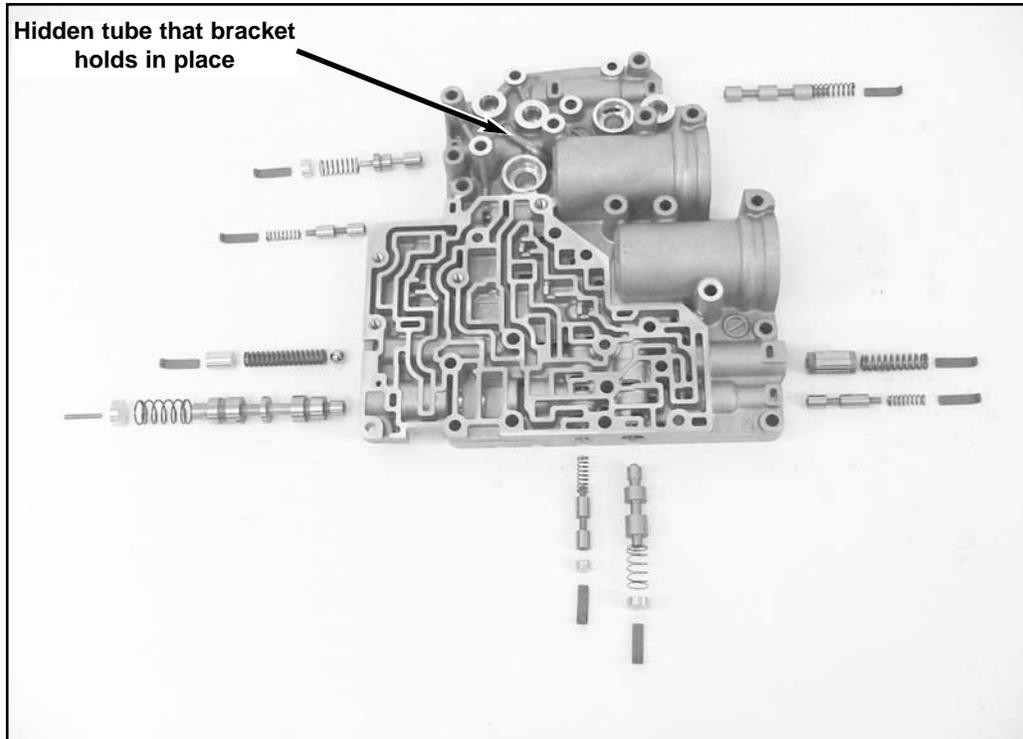
- "A" Accumulator piston has a thin shim between spring and piston.
- "A" Accumulator spring is 2.95" long and is shorter than "B" spring.
- "B" Accumulator has no shim.
- "B" Accumulator spring is 3.08" long and is longer than "A" spring.
- Both** accumulator pistons use scarf cut teflon rings.

JF506E Transaxle

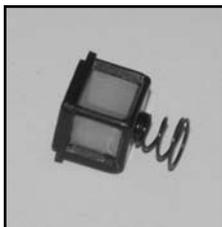


Section Six - Valve Body

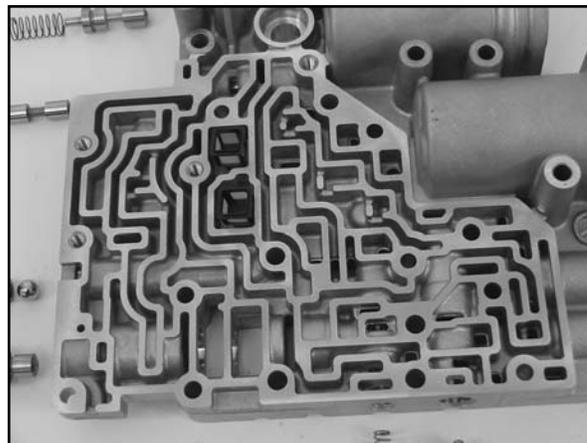
Exploded View of Valve Body



Screen



Accumulator Body

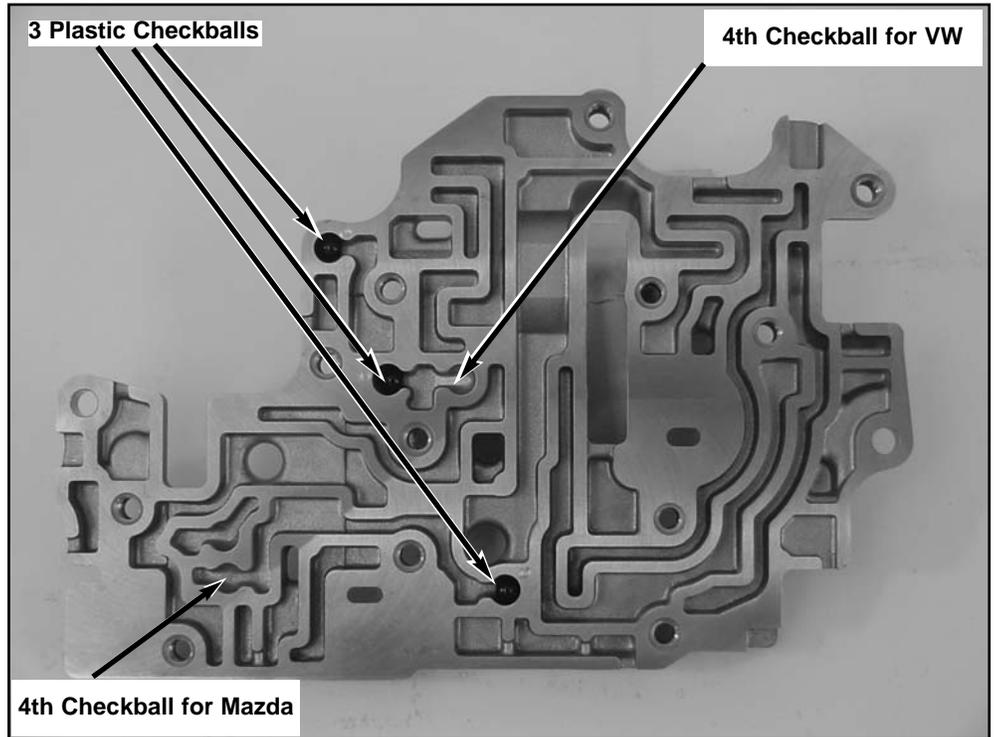


Place screens in valve body with spring down and opening toward separator plate.

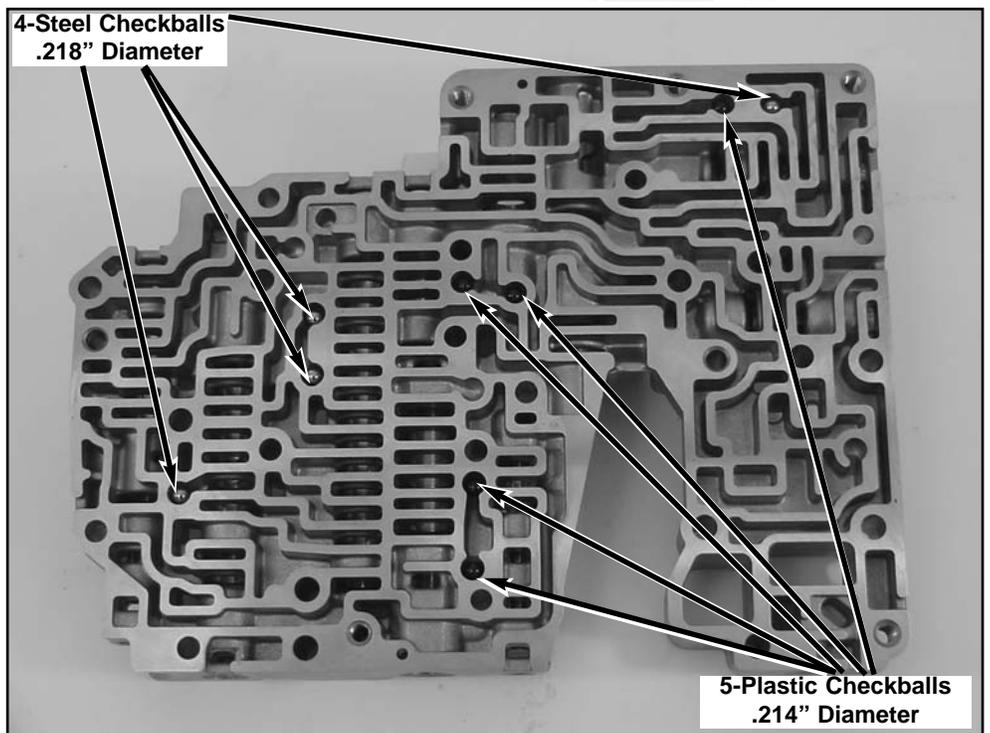
Section Six - Valve Body

NOTE
Jaguar only uses 3
check balls in this
section

Checkball Location - Plate

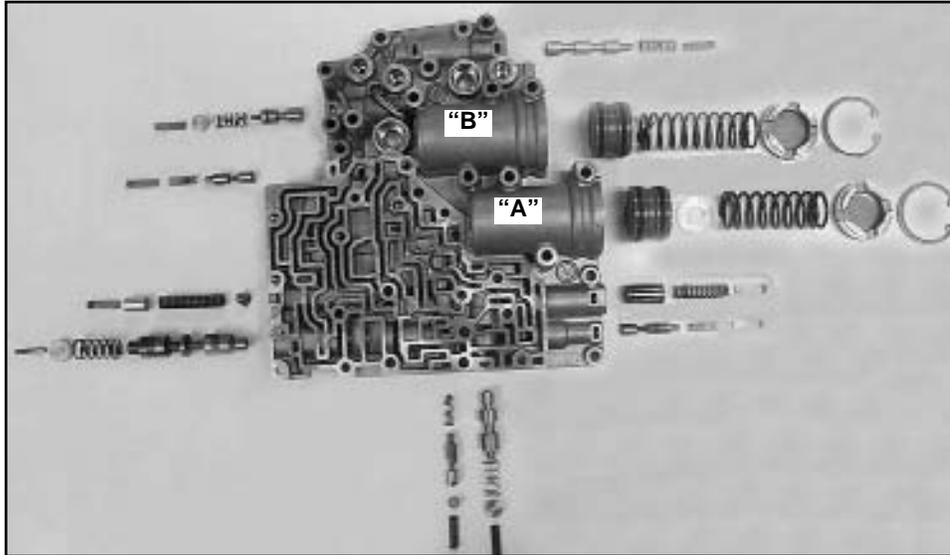


Checkball Locations
Main Valve Body



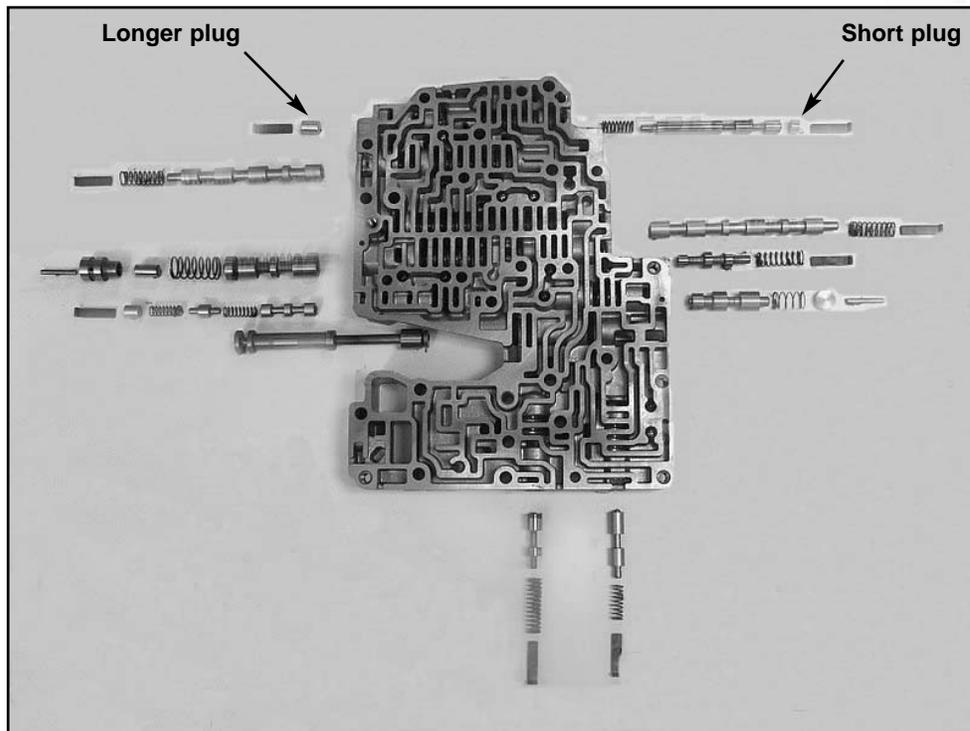
Section Six - Valve Body

VW Accumulator Body Exploded View



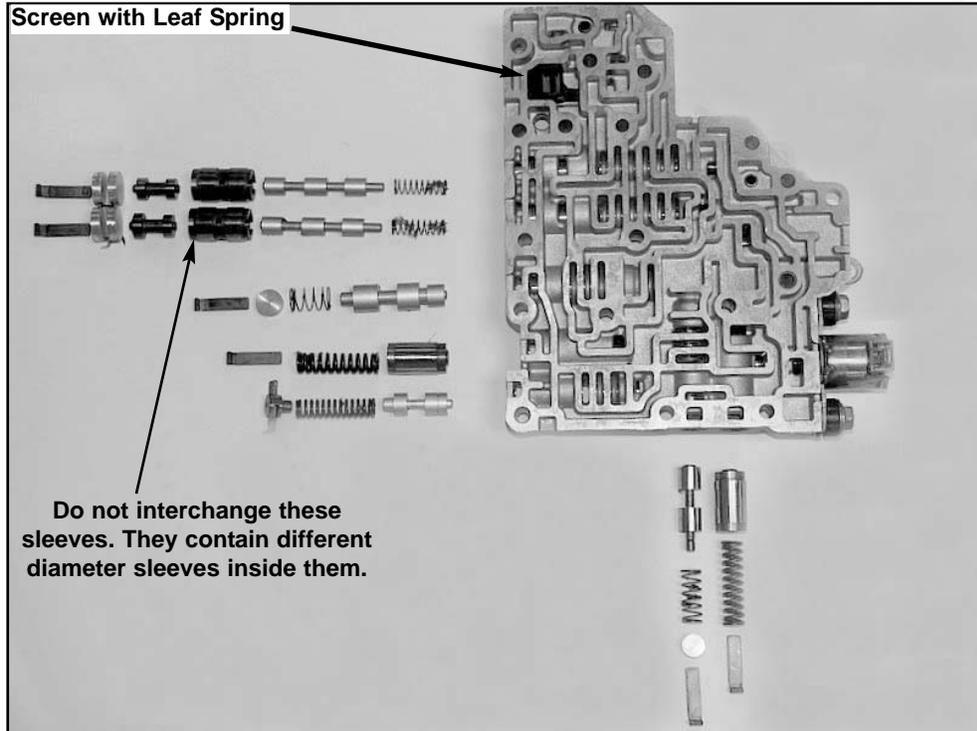
"A" accumulator spring uses a shim, is 2.763" long and has 7 coils.
"B" accumulator spring uses NO SHIM, is 3.05" long and has 9 coils.

VW Valve Body Exploded View

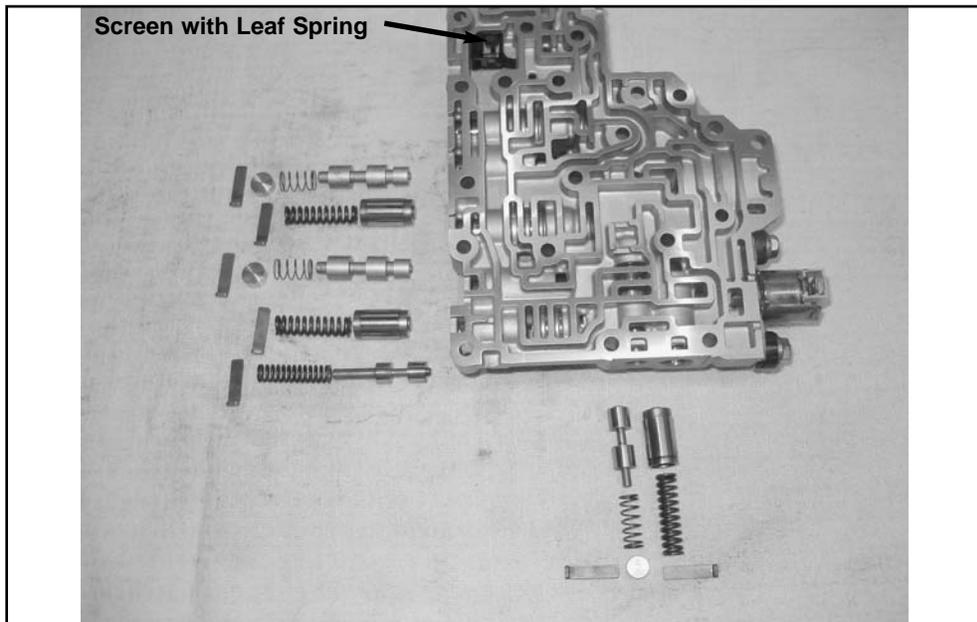


Section Six - Valve Body

VW - Exploded View of Valve Body



Mazda - Exploded View of Valve Body

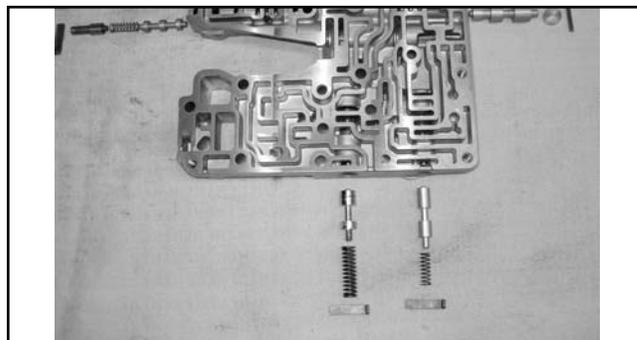
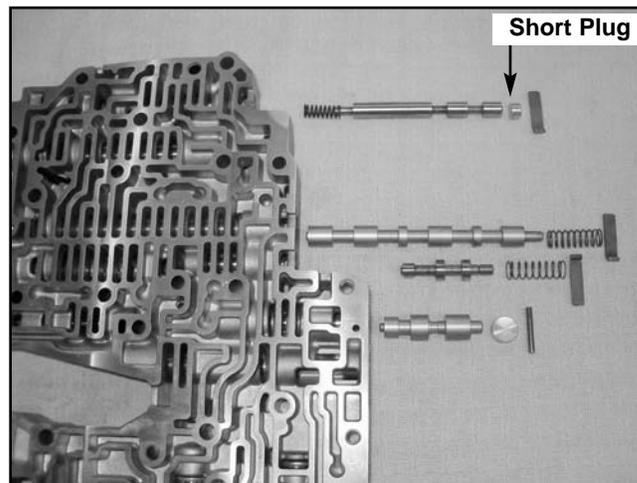
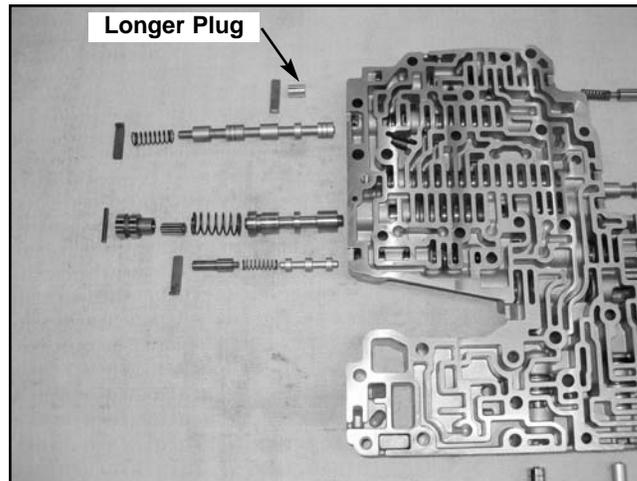


JF506E Transaxle



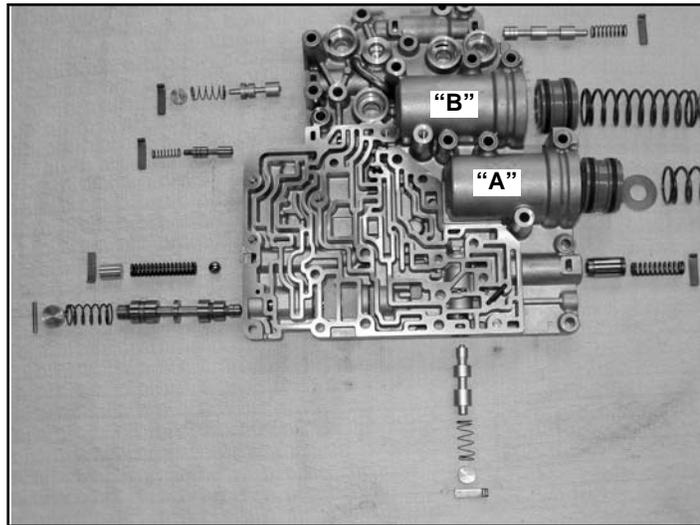
Section Six - Valve Body

Three Views of VB

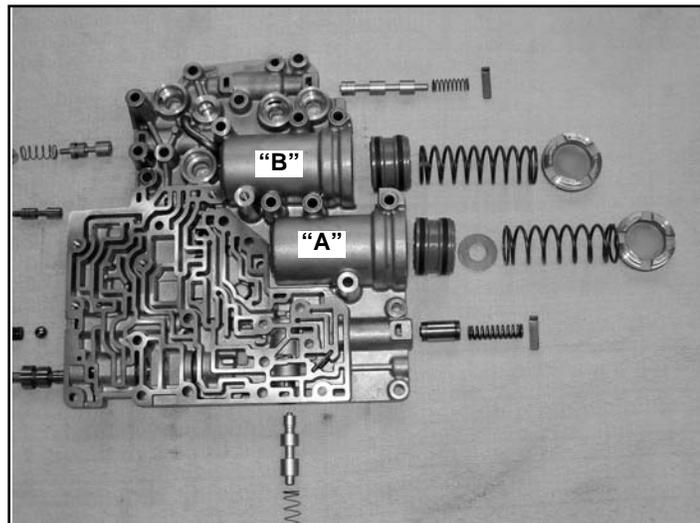


Section Six - Valve Body

Two Views of Accumulator



“A” accumulator spring uses a shim, is 2.93” long and has 7 coils.
“B” accumulator spring uses NO SHIM, is 3.095” long and has 9 coils.





Section Seven - Specifications, Pressure Testing and Air Checks

Pressure Specifications

Mazda



Pressure		Selector Position	PSI
Use Low Clutch Tap at Top of Case	At Idle	D, 3	42-71
		2	80-109
	At Stall	D, 3	186-215
		2	225-254
Use Reverse Clutch Tap on End Cover	At Idle	R	80-109
	At Stall	R	225-254

See page 76 and 77 for
Pressure Tap Pictures

Volkswagen



Pressure		Selector Position	PSI
Low Clutch	At Idle	D	49-55
	At Stall *	D	180-191
Reverse Clutch	At Idle	R	72.5-87
	At Stall *	R	334-348

See page 76 and 77 for
Pressure Tap Pictures

* If possible, main line pressure should be performed on the road while rolling or disconnect the pressure control solenoid and raise the engine RPM to 2000. Disconnecting the solenoids will set codes.

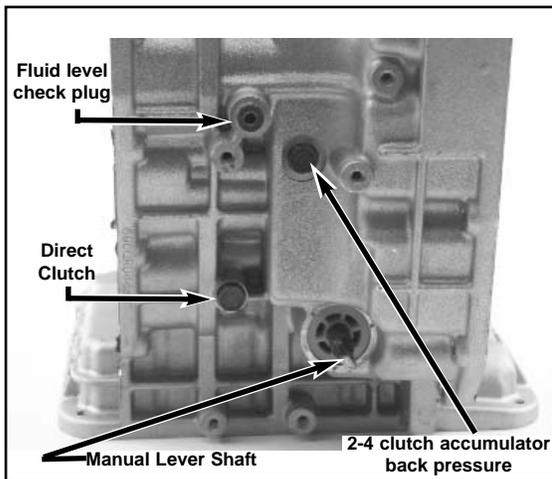
NOTE Jaguar and Land Rover specs are not published.

Section Seven - Specifications, Pressure Testing and Air Checks

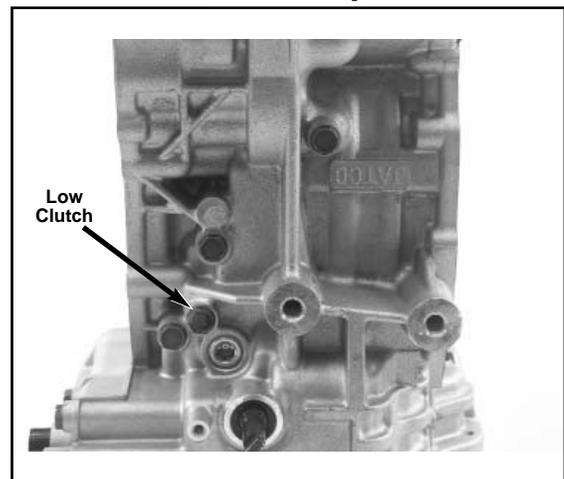
Jaguar



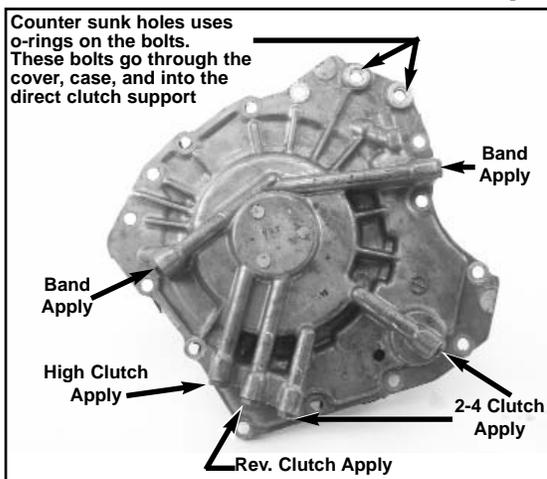
Case Bottom



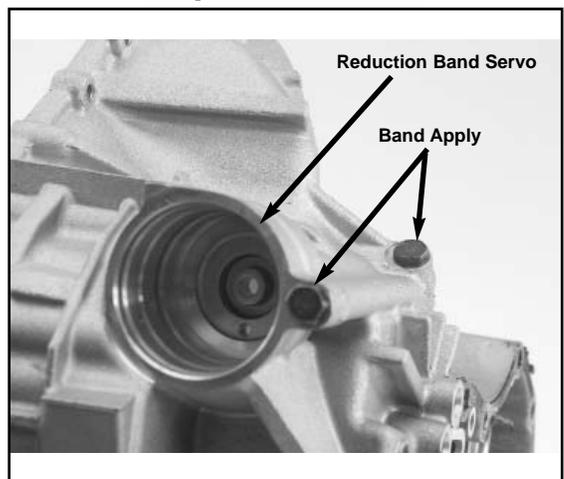
Case Top



End Cover with Pressure Taps



Top Servo Area

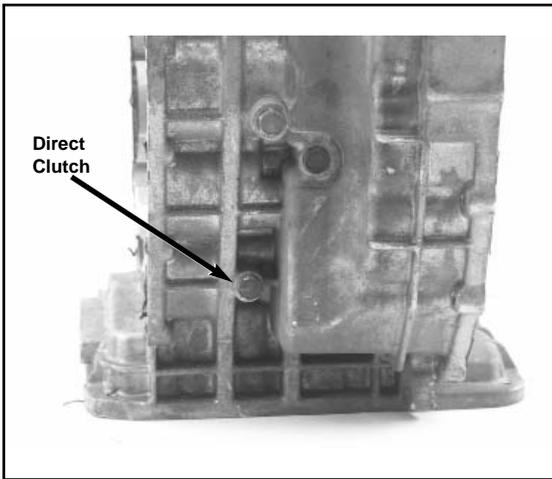


JF506E Transaxle

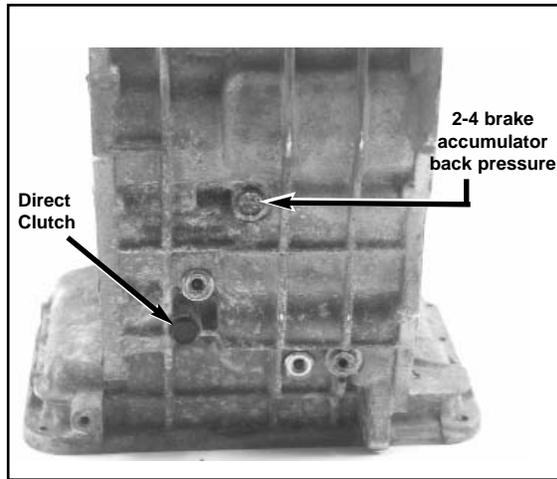


Section Seven - Specifications, Pressure Testing and Air Checks

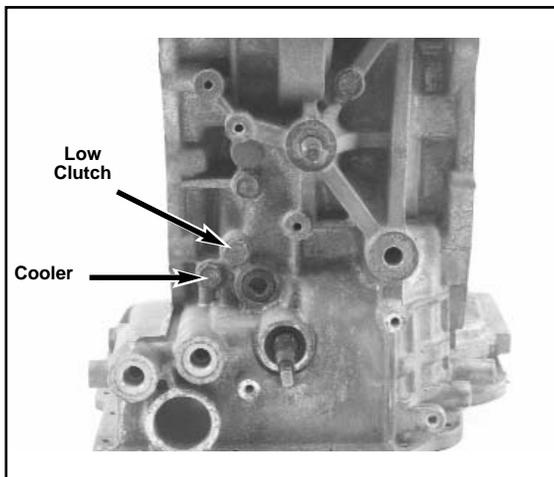
Case Bottom  **MAZDA**



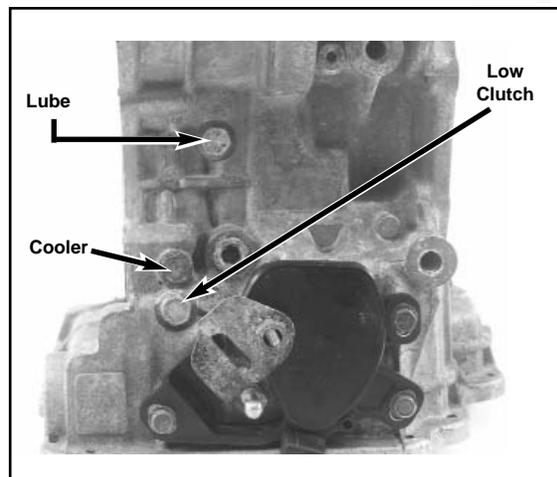
Case Bottom 



Case Top  **MAZDA**

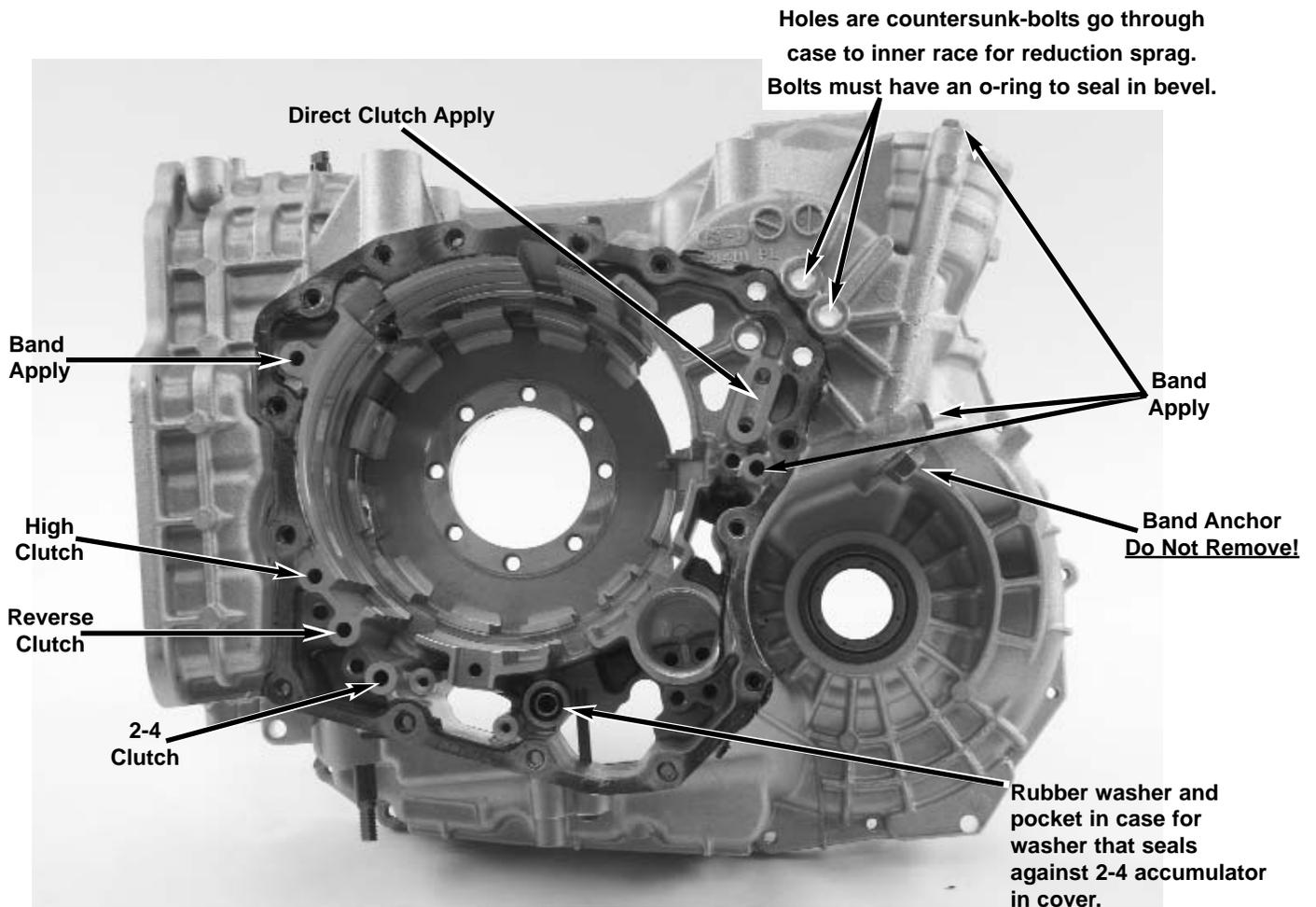


Case Top 



Section Seven - Specifications, Pressure Testing and Air Checks

Jaguar Rear Case



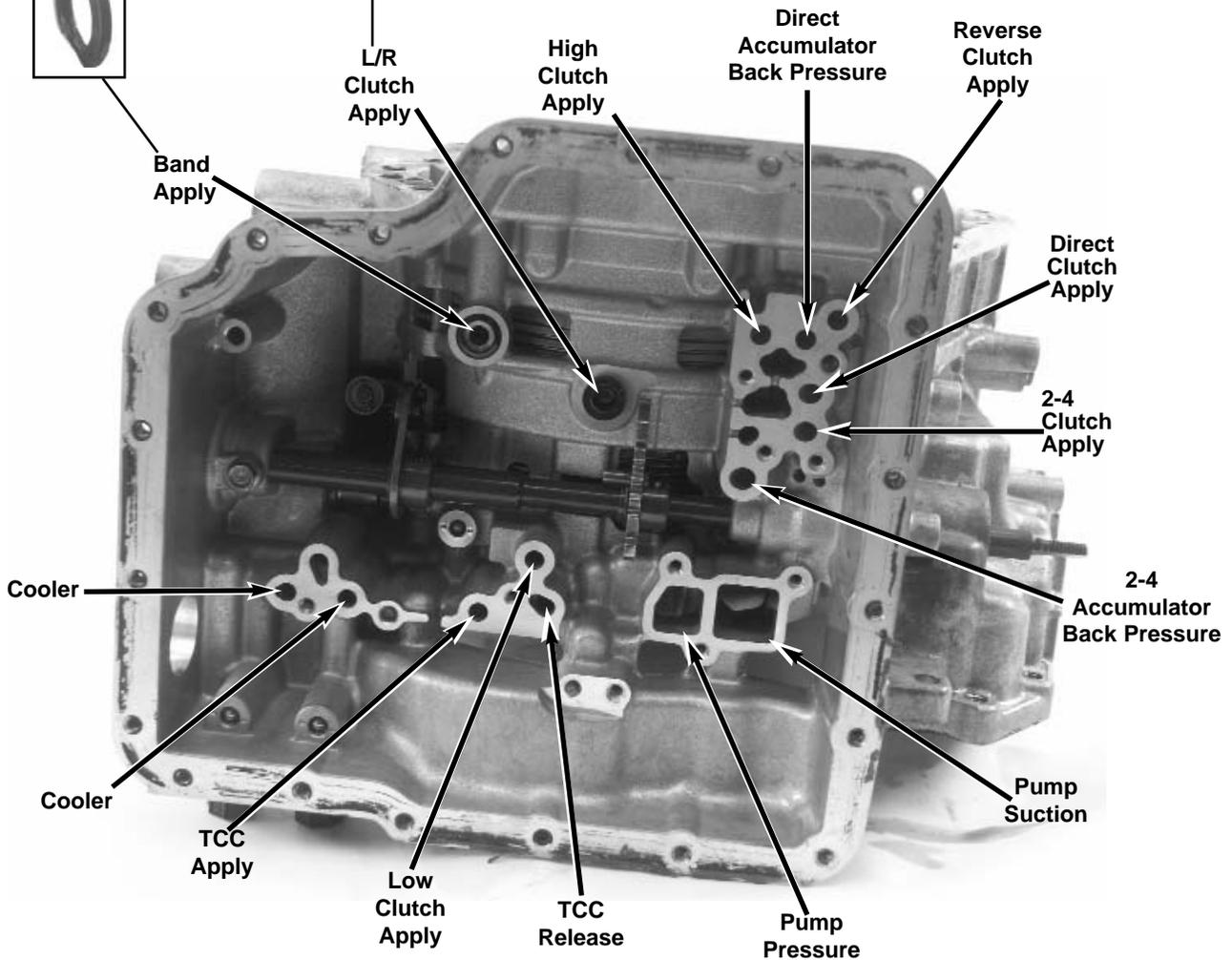
Section Seven - Specifications, Pressure Testing and Air Checks

Valve Body to Case Seals

L/R Case to Valve Body Seal



Rubber seal used between case and valve body





Section Seven - Specifications, Pressure Testing and Air Checks

Torque Specifications



MAZDA

Application	Specification
Solenoid Retaining Bolts	71 lb-in.
Transmission Fluid Drain Plug	33 lb-ft.
Pan Bolts	62 lb-in.
Fluid Level Check Plug	120 lb-in.
Transfer Drive Gear Support to Case Allen Head Bolts	96 lb-in.
Nut-Transfer Shaft	30 lb-ft.
Pinion Gear Nut	30 lb-ft.
Direct Drum Support Bolts	16 lb-ft.
End Cover Bolts	16 lb-ft.
Pump to Case	16 lb-ft.
Bell Housing to Case Bolts	22 lb-ft.
Valve Body to Case Bolts	71-78 lb-in.
Valve Body Bolts	71-78 lb-in.
MLPS	53 lb-in (8 mm bolts only)



Section Seven - Specifications, Pressure Testing and Air Checks

Misc. Specifications

Application	Specification
Input Shaft End Play	0.010" to 0.020"
Transfer Gear Bearing Preload	5.6 to 11.5 in.-lbs.
Reduction Gear Bearing Preload	5.3 to 15.5 in.-lbs.
Differential Bearing Preload	6.9 to 16.5 in.-lbs.

Clutch Clearances

Application	Specification
Reverse Clutch Clearance	0.020" to 0.031"
High Clutch Clearance	0.031" to 0.043"
Low Clutch Clearance	0.044" to 0.051"
Direct Clutch Clearance	0.071" to 0.087"
Low/Reverse Brake Clearance	0.031" to 0.043"
2/4 Brake Clearance	0.024" to 0.035"

Band Adjustment

With the servo piston, spacer, return spring and snap ring mounted in the case, turn the servo pin clockwise until snug. The band should be seated on the direct drum. Back off the servo pin **5** turns and tighten the lock nut.



Section Eight - Factory Bulletins

A/T Scraping Noise at 1,600/1,800 - 2,500 Rpm's



XT307-03 X-Type Date: 01/04

Model: 2002 MY-ON X-Type Vin: C00001-ON

Scraping Noise - 1600 RPM, 1800 - 2500 RPM - Install Modified Flexplate

Issue:

Some X-Type vehicles may exhibit a scraping noise from the automatic transmission at approximately 1600 RPM, 1800 to 2500 RPM and at 2500 RPM when driving.

A modified flexplate is available to resolve this issue.

Parts Information

Description	Part Number	QTY
Engine Flexplate	C2S 36487	1



Section Eight - Factory Bulletins

A/T - Difficulty Selecting Range



XT307-01 X-Type Date: 08/01 Amended 08/02

Model: 2002 MY-ON X-Type Vin: C00001-ON

Difficulty Selecting Transmission Ranges - GEARBOX FAULT Message - Reset J-Gate

Remove and destroy bulletin XT307-01, dated 08/01. Replace with this bulletin. The adjustment procedure has been revised.

Issue:

Some 2002 MY X-TYPE vehicles with automatic transmissions may experience customer complaints of being unable to select a transmission range, or the message 'GEARBOX FAULT' flashing on the message center (or the powertrain malfunction lamp [MIL] illuminating) causing the vehicle to run in limp-home mode.

Action:

Possible DTC's:

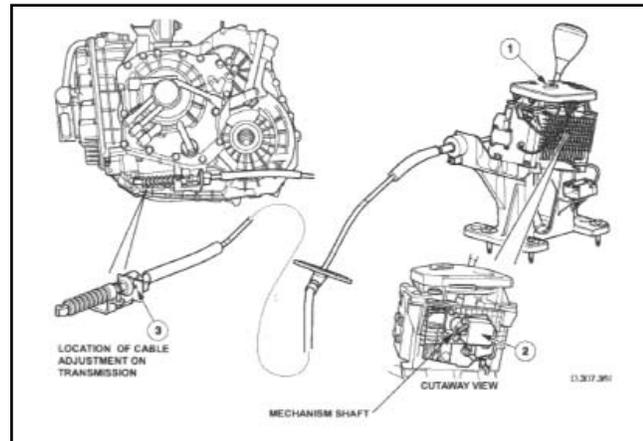
Condition	DTCs
Can cause the vehicle to run in limp-home mode	P1780 and/or P0706
Difficulty selecting a range or drive	P0731, P0732, P0733, P0734, P0735, P0740

Using WDS, check for any diagnostic trouble codes (DTCs) stored. If any DTC is stored (see table above), the J-gate assembly is functioning incorrectly and needs resetting. In order to do this, follow the workshop procedure outlined below.

NOTE Before starting the J-gate setting procedure, ensure the vehicle is cold, or has been left to cool for at least 2 hours.

Section Eight - Factory Bulletins

Transmission External Controls



NOTE If the selector lever cannot be moved from the Park position, remove the trim on the left side of the console. Release the lever by turning the end of the mechanism shaft to a vertical position (See Figure above).

FUNCTION CHECK

1. Apply hand brake
2. Apply foot brake
3. Start vehicle engine
4. Starting in P, slowly, move the selector lever around the J-gate and stop in each range position to check that all ranges can be selected. From 2, stop in each range position on the way back to P
5. Move selector lever from P to R
6. Holding selector lever tight to outside edge of J-gate, slowly move selector lever from R to N two or three times to ensure N illuminates.
7. Applying minimal force, slowly move the selector lever from N to D two or three times to ensure D does engage and illuminate.

NOTE If illumination is not apparent, proceed to setting procedure A.

NOTE To verify that D is engaged, check the tachometer for a drop in RPM.

8. Move selector lever to 3.
9. Holding selector lever to inside edge of J-gate, slowly move selector lever from 3 to D two or three times.



Section Eight - Factory Bulletins

NOTE When moving selector from 3 to D, ensure selector lever passes around the corner of D.

NOTE If after moving the selector lever to D at step 9, illumination is lost in all gear positions and cannot be recovered (even by shifting to N), then proceed to setting procedure A outlined below. If at step 9 illumination is still apparent or can be recovered, no further action is required.

Setting Procedure A

1. Switch ignition OFF.
2. Move selector lever to N.
3. Raise vehicle on a drive-on lift.
4. Remove transmission selector cover plate and place aside.
5. Loosen, but do not fully remove transmission selector cable adjusting bolt **(3, See Transmission External Controls picture)**.
6. Inside the vehicle, hold selector lever tight to position N.
7. Using corner of the gray feature line (that follows the J-gate) as a reference mark, use a ruler and move selector lever back 2 mm and hold.
8. Using an assistant under the vehicle, wiggle selector cable at transmission end.
9. Fully tighten transmission selector cable adjusting bolt **(3, See Transmission External Controls picture)**.
10. Start vehicle engine and repeat fault identification procedure to check if fault has been rectified. Check that ignition key can be removed easily.

Setting Procedure A (with J-Gate Tool)

1. Switch ignition OFF.
2. Move selector lever to N.
3. Raise vehicle on lift.
4. Remove transmission selector cover plate and place aside.
5. Loosen, but do not fully remove transmission selector cable adjusting bolt **(3, See Transmission External Controls picture)**.
6. Inside the vehicle, insert the red J-Gate setting tool into the cover plate to lock the lever in the N position.
7. Using an assistant under the vehicle, wiggle selector cable at transmission end.
8. Fully tighten transmission selector cable adjusting bolt **(3, See Transmission External Controls picture)**. Remove red tool.
9. Start vehicle engine and repeat fault identification procedure to check if fault has been rectified. Check that ignition key can be removed easily.

Section Eight - Factory Bulletins

NOTE If illumination is not apparent at any point, proceed to setting procedure B.

Setting Procedure B

1. Move selector lever to N.
2. Loosen, but do not fully remove transmission selector cable adjusting bolt (3, See Transmission External Control picture).

ADJUSTMENT TABLE	
Failure Position	Action
N or D	Set selector lever closer to N position in 1 mm increments to a maximum of 1 mm in front of N.
4	Set selector lever away from N position in 1 mm increments to a maximum of 4 mm behind N.

3. Using a steel ruler, adjust selector lever (see above table) either towards or away from N position and hold.
4. Using an assistant, wiggle selector cable at transmission end.
5. Fully tighten transmission selector cable adjusting bolt (3, See Transmission External Control picture).
6. Repeat fault identification procedure to check if fault has been rectified.

NOTE If illumination is still not apparent, further setting procedures may be necessary. (See table for adjustment limit).

7. Reinstall transmission selector cover plate.
8. Fit and fully tighten cover plate fixing bolts (10 Nm).
9. Lower vehicle. Check that ignition key can be removed easily.



Section Eight - Factory Bulletins

J-Gate Replacement

If problems with key removal persist, replace the J-gate as follows:

1. Open door.
2. Switch ON ignition.
3. Depress brake pedal.
4. Reposition selector lever to N position.
5. Release brake pedal.
6. Switch OFF ignition.
7. Open hood and install fender protector covers.
8. Disconnect vehicle battery.
9. Remove J-gate surround.
10. Remove console assembly.
11. Disconnect J-gate electrical connector.
12. Undo and remove center console bracket securing screws.

NOTE Center console bracket is removed with J-gate.

13. Release and remove selector cable locking pin.
14. Release selector cable retaining clip from J-gate.
15. Remove ashtray securing screws.
16. Displace and reposition ashtray.
17. Disconnect cigar lighter connector.
18. Remove ashtray.
19. Remove J-gate securing screws.
20. Displace and remove J-gate.
21. Remove center console bracket from J-gate.
22. Position new J-gate in the vehicle.
23. Position J-gate selector lever to N position.
24. Install center console bracket.
25. Install and fully seat new J-gate.
26. Install and tighten J-gate securing screws.
27. Connect ashtray cigar lighter connector.
28. Install and fully seat ashtray.
29. Install and tighten ashtray securing screws.
30. Connect selector cable to J-gate.
31. Secure selector cable locking pin.
32. Install and tighten center console mounting bracket securing screws.
33. Connect J-gate electrical connector.
34. Install center console.
35. Install J-gate surround.



Section Eight - Factory Bulletins

J-Gate Replacement Con'td

36. Connect vehicle battery.
37. Switch ignition ON.
38. Depress brake pedal.
39. Position selector lever to P position.
40. Release brake pedal.
41. Switch ignition OFF.
42. Remove fender protector covers and close hood. Check that ignition key can be removed easily.

Parts Information

Description	Part Number	QTY
J-Gate assembly	C2S 20251	1

Description	Time	Causal Part Number	Causal Part Description
J-Gate check/adjustment	0.3 hrs.	C2S 20251	J-Gate
J-Gate renew	0.9 hrs.	C2S 20251	J-Gate



Section Eight - Factory Bulletins

Jaguar X-Type V6-2.5L



XT303-S937 X-Type Date: 03/03

Model: 2002-03 MY X-Type Vin: C00294-D17471

Enhancements to vehicle operation - Reprogram ECM/TCM - Service Action S937

This service action supersedes Service Actions S926 and S931.
(Technical bulletins XT307-S926 and XT412-S931.)

Issue:

A significant change has been introduced in production to the programming of the Engine Control Module (ECM) and for automatic transmission vehicles, the Transmission Control Module (TCM) that provides a perceptible enhancement to the vehicle's operation.

On manual transmission vehicles, the ECM should be reprogrammed to the latest condition using Worldwide Diagnostic System (WDS) release JTP 759/23A or later. On automatic transmission vehicles, the ECM and TCM should be reprogrammed to the latest condition using Worldwide Diagnostic System (WDS) release JTP 759/23A or later.

It is intended that this Service Action be carried out in conjunction with Recall Action R935 Direction Indicator Tell Tale Operation.

This Service Action supersedes the following campaigns:

XT307-S926 Degradation of Shift Quality

XT412-S931 A/C System failure due to incorrect engine management software

Action:

Perform these reprogramming procedures on any 2002-03 MY X-Type vehicle, within the above VIN range, on which they have not already been carried out.

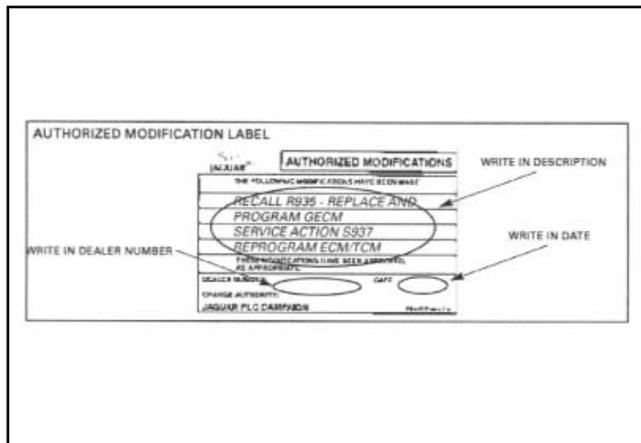
Section Eight - Factory Bulletins

Reprogramming procedure

NOTE Ensure WDS is loaded with software release JTP 759/23A or later.

1. Position WDS alongside vehicle, switch Portable Test Unit (PTU) 'ON' and allow software to load.
2. Connect PTU to vehicle DLC using diagnostic cable.
3. Enter VIN and navigate to configuration main menu.
4. Select and run 're-configure existing ECM' application.
5. After reconfiguration of ECM is complete, return to configuration main menu.
6. On automatic transmission vehicles, select and run 're-configure existing TCM' application.
7. On all vehicles, after reconfiguration of ECM/TCM is complete, switch 'OFF' PTU, disconnect from vehicle, and return WDS to original location.

Authorized Modification Label



The image shows a form titled "AUTHORIZED MODIFICATION LABEL". The form contains the following text and annotations:

- INCLUDE:** (circled)
- AUTHORIZED MODIFICATIONS:** (circled)
- WRITE IN DESCRIPTION:** (arrow pointing to the right)
- THE FOLLOWING MODIFICATIONS HAVE BEEN MADE:** (circled)
- RECALL R935 - REPLACE AND PROGRAM GECM** (circled)
- SERVICE ACTION S937** (circled)
- REPROGRAM ECM/TCM** (circled)
- WRITE IN DATE:** (arrow pointing to the right)
- FOR MODIFICATIONS TO BE APPROVED, PL APPROVE:** (circled)
- DEALER NUMBER:** (circled)
- DATE:** (circled)
- CHARGE AUTHORITY:** (circled)
- JAGUAR PLC CARPANEL:** (circled)
- WRITE IN DEALER NUMBER:** (arrow pointing to the left)

8. Fill out an authorized modification label (**See Above**) and apply it to the underside of the hood. This information can be written on the same label being used for R935.



Section Eight - Factory Bulletins

Land Rover Freelander V6-2.5L



A/T - Harsh Shifts/DTC's P0715/P0720/P1715/MIL ON

No: 44/01/05/NAS FGN LN307 Ref: SB125

Issue: 1 Date: March 07, 2005

Verification of Transmission Sensor Faults

Affected Vehicle Range:

Freelander (LN)
Transmission serial number 0600001 - 1812986

Situation:

Shift quality concerns from sensor deterioration

A condition can develop which results in harsh transmission shifts, the possibility of the transmission defaulting to limp-home mode/restricted performance mode and a MIL illumination with logged fault codes P0715, P0720 or P1715.

The likely reason for this type of event is that during the manufacture of the speed sensor the soldering process may have burned off the enamel protective coating on the wire, leaving the copper cable core exposed. Automatic Transmission Fluid (ATF) seeps past the connector blades through capillary action and enter the sensor body, coating the wire. The hot ATF chemical attack of the exposed cable causes resistance to increase, followed by sensor failure. The corrosion accelerates as the ATF temperature increases.

Resolution:

Identify affected sensor

An effective containment action has been introduced to address the sensor contamination issue both in production and through Service Action B125. This Technical Information Bulletin provides guidance to identify a faulty Output (Vehicle) speed sensor on an individual transmission within the specified Serial Number range that may exhibit the described symptoms.

Section Eight - Factory Bulletins

Parts Information

Information Only

NOTE The diagnostic process outlined as guidance in this TIB will lead to performance of either Option A or Option C of Service Action B125 if the Service Action remains OPEN on the vehicle being diagnosed.

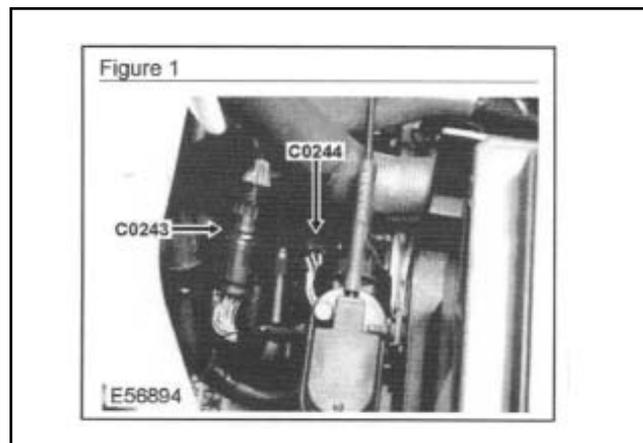
The inspection steps could also lead to a transmission replacement following normal warranty procedures. In addition, Option A of B125 will be claimed if Service Action B125 remains OPEN on the vehicle being diagnosed.

Normal warranty policy and procedures apply. Material allowance is included in labor operation.

Repair Procedure

Investigate Sensor Resistance

1. Confirm transmission serial number is within applicable range (0600001 to 1812986).

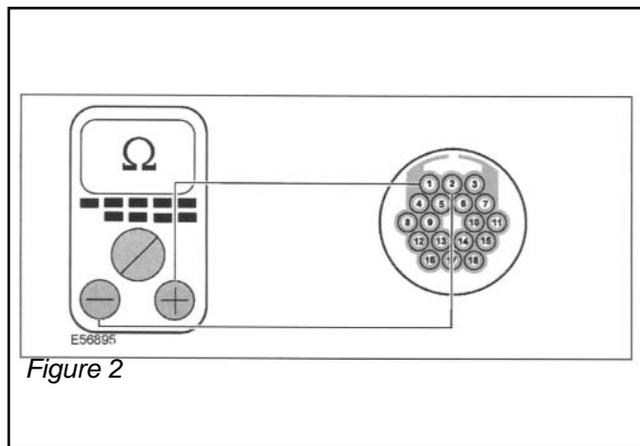


2. Locate connector C0243 (Solenoid-Gearbox Connector), located front left-hand side of engine compartment. **(See Above)**

Section Eight - Factory Bulletins

Pins	Parts Name
1 to 2	Turbine speed sensor
3 to 4	Intermediate speed sensor
5 to 6	Output (Vehicle) speed sensor

Pin Identification



- Refer to pin identification table and Figure 2. Perform resistance checks to identify possible 'open circuit' states.

CAUTION

The Output (Vehicle) speed sensor is not serviceable. Service Action B125 only addresses issues with the Turbine and Intermediate speed sensors.

- If either the Intermediate or Turbine speed sensors is identified as "open circuit," perform the Service Action B125.

NOTE

GTR lookup sequence is as follows: GTR Home > NAS > Service Information/LN Freelander 2002 > Workshop Manuals > Service Procedures > Bookmark "AUTOMATIC GEARBOX - JATCO 44-1" > TOC "REPAIR/Gearbox - KV6" link.



Section Eight - Factory Bulletins

5. If the Output (Vehicle) speed sensor is identified as an “open circuit,” refer to GTR section 44.20.02.99 and install a new Automatic Transmission.
6. Claim the correct Option for Service Action B125 if that Service Action remains open on the vehicle:
 - Option A if inspection leads to transmission replacement. This clears the Warranty Record. Option C if inspection leads to performance of the Service Action B125 procedure.



Section Eight - Factory Bulletins

A/T - OD Light Flashing/MIL ON/DTC P0706 Stored

05-001/05

2002-2005 MPV - O/D OFF Indicator Light Flashing/ MIL with DTC P0706

NOTE This bulletin supersedes the following TSB(s): 5-006/03. Please update your records accordingly.

Bulletin Note This bulletin supersedes the previous bulletins 05-006/03 issued on 12/18/06, and 05-001/05 issued on 01/07/05. The REPAIR PROCEDURE, PARTS(S) and WARRANTY INFORMATION have been revised.

Applicable Model(s)/Vins

2002-2005 MPV vehicles with VINS of JM3LW28**50539650 or lower (produced before Nov. 5, 2004)

Description

On some vehicles, the O/D OFF indicator may be flashing and/or the MIL is ON with DTC P0706 stored.

The Transaxle Range (TR) Switch electrical contact area for the D and 3 ranges may not be large enough. This may cause the Transaxle Control Module (TCM) to misjudge the position of the gear shift lever, and set the DTC.

To prevent this concern, the electrical contact area in the Transaxle Range (TR) Switch has been increased to allow detection of the D range signal in a wider range.

Customers having this concern should have their vehicle repaired using the following repair procedure.

Repair Procedure

1. Verify customer concern.
2. Replace Transaxle Range (TR) Switch according to the workshop manual (Section 05-17 Transaxle Range (TR) Switch Removal/Installation).
3. Verify repair.



Section Eight - Factory Bulletins

Part(s) Information

Part Number	Description	Qty.
FP01-19-444B	Transaxle Range (TR) Switch	1

- NOTE**
- This warranty information applies only to verified customer complaints on vehicles eligible for warranty repair. Refer to the SRT microfiche for warranty term information.
 - Additional diagnostic time cannot be claimed for this repair.

Disclaimer

Consumer Notice: The information and instructions in this bulletin are intended for use by skilled technicians. Mazda technicians utilize the proper tools/equipment and take training to correctly and safely maintain Mazda vehicles. These instructions should not be performed by “do-it-yourselfers.” Consumers should not assume this bulletin applies to their vehicle or that their vehicle will develop the described concern. To determine the information applies, consumers should contact their nearest authorized Mazda dealership.



Section Eight - Factory Bulletins

Mazda 6 V6-3.0L DOHC



After Repair Procedure [JA5A-EL]

Caution

- After repairing a malfunction, perform this procedure to verify that the malfunction has been corrected.
- When this procedure is carried out, be sure to drive the vehicle at lawful speed and pay attention to the other vehicles.

1. Connect the WDS or equivalent to the DLC-2.
2. Turn the ignition switch to ON (engine off).
3. Select the clear code function and clear the DTC.
4. Perform the following trouble code inspections to ensure that the DTC has been resolved:

- P0705

- i. Start the engine.
 - ii. Warm up the engine to normal operating temperature.
 - iii. Depress the brake pedal, and shift the selector lever from P to D for **5 seconds or more**.
 - iv. Gradually slow down and stop the vehicle.
 - v. Turn the IG switch to OFF.
 - vi. Repeat from step i to step iii again.
 - vii. Go to Step 5.

- For P0706

- i. Start the engine.
 - ii. Warm up the engine to normal operating temperature.
 - iii. Depress the brake pedal, and shift the selector lever from P to D for **100 seconds or more**.
 - iv. Gradually slow down and stop the vehicle.
 - v. Turn the IG switch to OFF.



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- vi. Repeat from step i to step iii again.
- vii. Go to Step 5.

- For P0711

- i. Decrease ATF temperature to **20°C (68°F) or below**.
 - ii. Start the engine.
 - iii. Drive the vehicle in D range for **330 seconds or more**.
 - iv. Gradually slow down and stop the vehicle.
 - v. Turn the IG switch to OFF.
 - vi. Repeat from step ii to step iii again.
 - vii. Go to Step 5

- For P0712

- i. Start the engine.
 - ii. Warm up the engine to normal operating temperature.
 - iii. Drive the vehicle in D range for **150 seconds or more**.
 - iv. Gradually slow down and stop the vehicle.
 - v. Turn the IG switch to OFF.
 - vi. Repeat from step i to step iii again.
 - vii. Go to Step 5.

- For P0713

- i. Start the engine.
 - ii. Warm up the engine to normal operating temperature.
 - iii. Drive the vehicle, two separate times, in D range at **20 km/h (12 mph) or above for 150 seconds or more**.
 - iv. Gradually slow down and stop the vehicle.
 - v. Turn the IG switch to OFF.



Section Eight - Factory Bulletins

- vi. Repeat from step i to step iii again.
- vii. Go to Step 5.

- For P0715, P0791

i. Start the engine.

ii. Drive the vehicle under the following conditions for **2 seconds or more**.

- Vehicle speed (VSS PID): **40 km/h (25 mph) or above**.
- Engine speed (RPM PID): **1,500 rpm or above**.
- Selector lever position: D range

iii. Gradually slow down and stop the vehicle.

iv. Turn the IG switch to OFF.

v. Repeat from step ii again.

vi. Go to Step 5.

- For P0720

i. Start the engine.

ii. Warm up the engine and ATX.

iii. Drive the vehicle, two separate times, under the following conditions for **2 seconds or more**.

- Selector lever position: D range
- Vehicle speed (VSS PID): **40 km/h (25 mph)**
- Engine speed (RPM PID): **1,400 rpm or above**

iv. Gradually slow down and stop the vehicle.

v. Turn the IG switch to OFF.

vi. Repeat from step i to step iii again.

vii. Go to Step 5.

- For P0740



Section Eight - Factory Bulletins

- i. Start the engine.
 - ii. Warm up the engine and ATX
 - iii. Drive the vehicle under the following conditions for **10 seconds or more**.
 - Vehicle speed (VSS PID): **76 km/h (47 mph)**.
 - Selector lever position: D range
 - TCC operating
 - iv. Gradually slow down and stop the vehicle.
 - v. Turn the IG switch to OFF.
 - vi. Repeat from step i to step iii again.
 - vii. Go to step 5.
 - For P0743
- i. Start the engine.
 - ii. Warm up the engine and ATX.
 - iii. Drive the vehicle in D range and make sure that the gears shift smoothly from 1GR to 5GR and TCC is operated.
 - iv. Go to Step 5.
 - For P0748, P0751, P0752, P0756, P0757, P0761, P0762
- i. Start the engine.
 - ii. Warm up the engine and ATX.
 - iii. Drive the vehicle in D range and make sure that the gears shift smoothly from 1GR to 5GR.
 - iv. Gradually slow down and stop the vehicle
 - v. Turn the IG switch to OFF.
 - vi. Repeat from step i to step iii again.
 - vii. Go to Step 5.
 - For P0753, P0758, P0763, P0768, P0773, P0778, P0798, P1710



Section Eight - Factory Bulletins

- i. Start the engine.
 - ii. Warm up the engine and ATX
 - iii. Drive the vehicle in D range and make sure that the gears shift smoothly from 1GR to 5GR.
 - iv. Go to Step 5.
 5. Gradually slow down and stop the vehicle.
 6. Make sure that no DTCs occur.

Section Nine - Tools

The tools for this transaxle are not available to the new car dealer or the after market. Therefore, in an effort to make the rebuilding process on this transaxle a little easier, the technical department has come up with some ideas.

Compressing the low/reverse clutch housing to remove or install the snap ring can be accomplished this way. The tool consists of a 7" length of 3/8" allthread, large flat washers, 3/8" nuts and the plate used to compress the E4OD overdrive piston housing (**See Figure 1**). Place the plate on the low/reverse housing and compress it using the allthread, washers and nuts through the transfer drive gear.

The tools that are used to install the transfer drive gear into the support and set the preload on the bearings consist of a 9 1/2" length of 3/8" allthread, some large 3/8" flat washers, 3/8" nuts and a 6" long piece of 1 1/4" steel pipe. The steel pipe may have a welded seam on the inside diameter, this should be ground or filed smooth. Place the transfer drive gear and bearing into the support. Slide the 2nd bearing down the shaft of the transfer drive gear and then place the steel pipe over the shaft so it pushes on the inner race of the bearing. Now assemble the allthread, nuts and washers through the steel pipe and transfer drive gear. Tighten 3/8" nuts until the bearing is pushed onto the shaft and the correct bearing preload is achieved.

Caution: always pre-lube bearings before assembling!

In order to be able to tighten the multi-slotted transfer drive gear nut to the correct torque, we made a socket. First we removed the nut using a punch. Next, we purchased a short piece of 1 3/4" exhaust pipe and used the nut as a template to mark the end of the pipe. Notches were carefully cut in the pipe to match the nut (**See Figure 2**). A short piece of flat metal was welded to the end of the pipe and a large nut welded to it (**See Figure 3**). The overall length of the exhaust pipe with nut is 4 1/2".



Figure 1

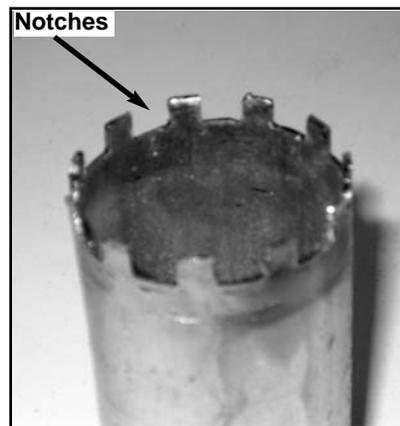


Figure 2



Figure 3



**A Special Thanks to
Hardparts for Transmissions
for their help with this manual.**

