Welcome To Today's Presentation

Sponsored By:

A6LF1 Introduction

Presented by:
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Vehicle Application

Hyundai
2009-14 Avante/HD/MD FWD L4 1.6L/1.8L (A6GF1)
2010-14 Avante/MD F/AWD L4 2.0L (A6MF1)
2011-13 Azera FWD V6 3.3L (A6LF1) V6 3.8L (A6FL2)
2014 B-Suv FWD L4 1.6L /2.0L (A6GF1)
2012-14 Elantra FWD L4 1.6L/1.8L (A6GF1) F/AWD L4 2.0L (A6MF1)
2009-14 Grandeur FWD L4 2.4L V6 2.7L (A6MF1/2) V6 3.0L/3.3L/3.5L/3.8L (A6LF1/2/3)
2011-14 i30 FWD L4 1.2L/1.6L/1.8L/2.0L (A6GF1) (A6MF1)
2012-14 i40 FWD L4 1.7L/2.0L (A6MF1)
2010-14 ix35 FWD L4 2.0L/2.4L (A6MF1) (A6LF1/2)
2013-14 Maxcruz FWD L4 2.2L V6 3.0L/3.3L (A6LF1/2/3)
2014 Mistra FWD L4 1.8L (A6GF1) L4 2.0L (A6MF1)
2009-14 Santa Fe F/4X4 L4 2.0L V6 3.3L/3.5L (A6LF2/3) L4 2.4L/2.7L (A6MF1/2)
2009-14 Sonata FWD L4 2.0LV6 3.5L (A6LF2) F/AWD L4 2.0l/2.4L (A6MF1/2)
2009-14 Tucson ix F/4X4 L4 2.0L (A6FL1/2) L4 2.0L/2.4L (A6MF1)
2012-14 Veloster FWD L4 1.6L (A6GF1)
2011-14 Veracruz F/4X4 V6 3.0L (A6FL3)
2011-13 Verna FWD L4 1.6L (A6MF1)
Kia
2011-14 Carens FWD L4 1.7L/2.0L (A6MF1/2) L4 1.6L (A6GF1)
2012-14 Cee'D/Pro FWD L4 1.2L/1.6L (A6GF1) (A6MF1)
2012-14 Cerato FWD L4 1.6L (A6GF1) L4 1.8L/2.0L (A6MF1)
2011-13 Forte FWD L4 1.6L (A6GF1) L4 1.8L/2.0L/2.4L (A6MF1/2)
2009-14 Grand Carnival FWD L4 2.2L V6 3.5L (A6LF1/2/3)
2010-12 K3/K5/K7 FWD L4 2.0L/2.4L V6 2.7L (A6MF1/2)
2010 Lotze FWD L4 2.0L/2.4L (A6MF1/2) V6 3.5L (A6LF2)
2009-11 Opirus (Amanti) FWD V6 2.7L (A6MF2) V6 3.3L/3.8L (A6LF1/2)
2010-14 Optima F/AWD L4 2.0L/2.4L (A6LF1/2) (A6MF1/2) (A6GF1)
2014 Pride FWD L4 1.6L (A6GF1)
2009-14 Sorento F/4X4 L4 2.0L/2.2L V6 3.3L/3.5L (A6LF1/2/3) L4 2.4L V6 2.7L (A6MF2)
2011-14 Soul FWD L4 1.6L/2.0L (A6MF1) or (A6GF1)
2010-14 Sportage F/4X4 L4 2.0L/2.4L (A6MF1) (A6GF1) L4 2.0L (A6LF1/2)

Gear Box Comparisons

A6LF1/2/3
Stall Speed: 2200 =/- 100 RPM

	3.5/3.8/4.0L	3.3L
Gear Ratio:	Wide	Close
1st:	4.651	4.252
2nd:	2.831	2.654
3rd:	1.842	1.804
4th:	1.386	1.386
5th:	1.000	1.000
6th:	0.772	0.772
R:	3.393	3.393

3 Balance Pistons
Engine Size:

A6LF1	3.3L
A6LF2	3.5L / 3.8L
A6LF3	4.0L

Length (mm) 386 / 389 / 402 (front to rear)
Torque: (kg.m) 33.5 / 36.5 / 40.0

A6MF1/2
Stall Speed: 2400 =/- 100 RPM

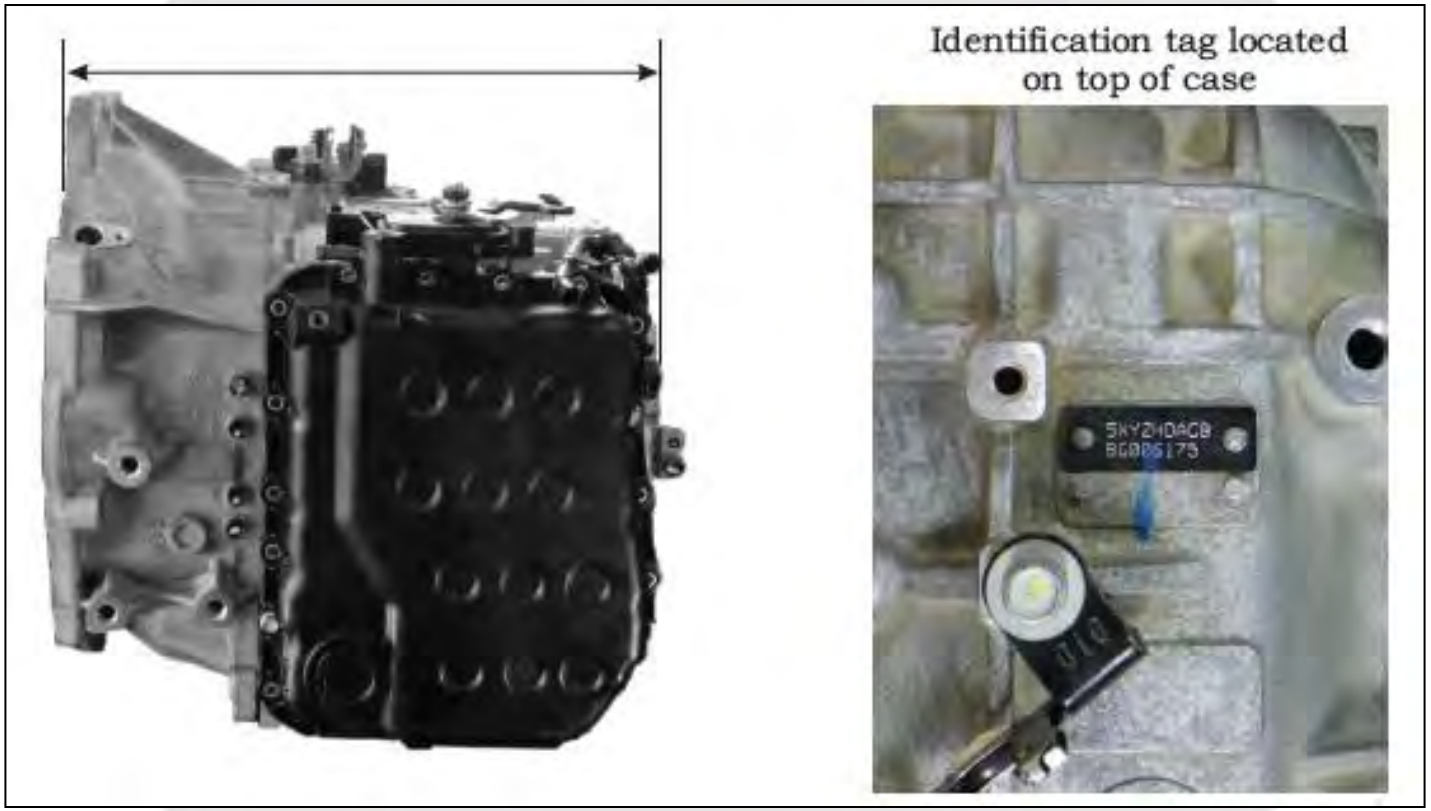
	2.7L	2.0L
Gear Ratio:	Wide	Close
1st:	4.639	4.162
2nd:	2.826	2.575
3rd:	1.841	1.772
4th:	1.386	1.369
5th:	1.000	1.000
6th:	0.772	0.778
R:	3.385	3.500

2 Balance Pistons
Engine Size:

A6MF1	2.0L / 2.4L
A6MF2	2.4L / 2.7L

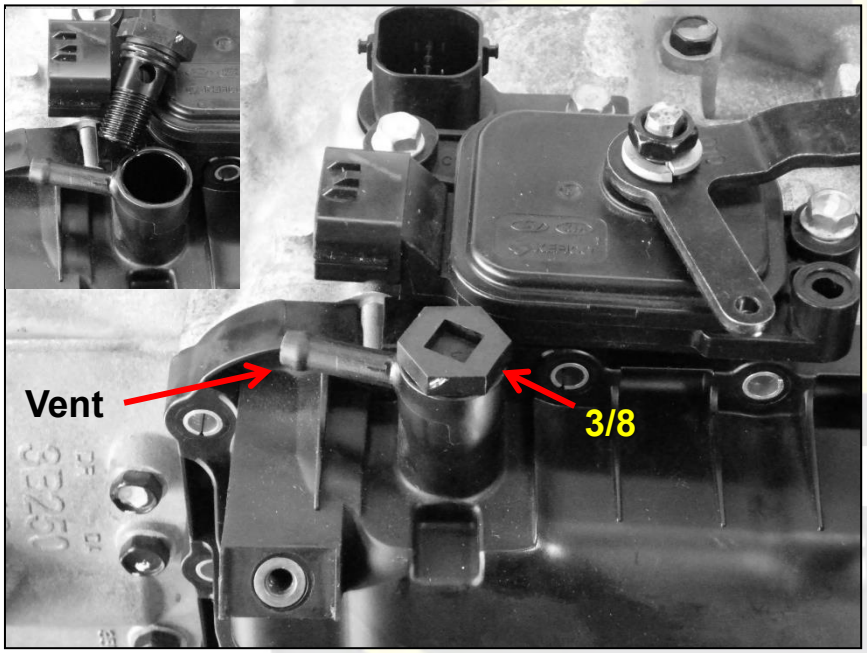
Length (mm) 376.4 / 386.4 (front to rear)
Torque: (kg.m) 23.5 / 28.5

Identification Tag Location

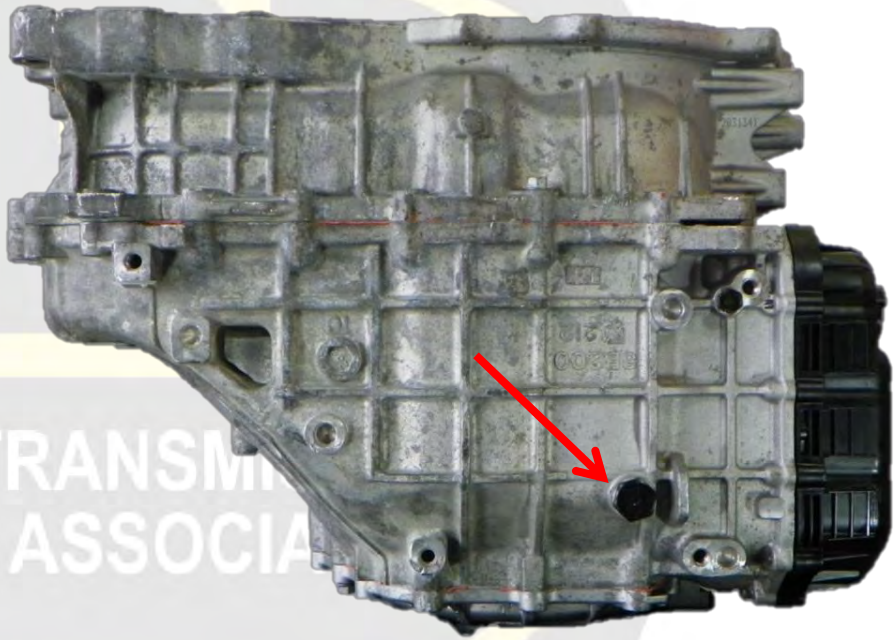


Fluid Drain & Fill

Fill Plug

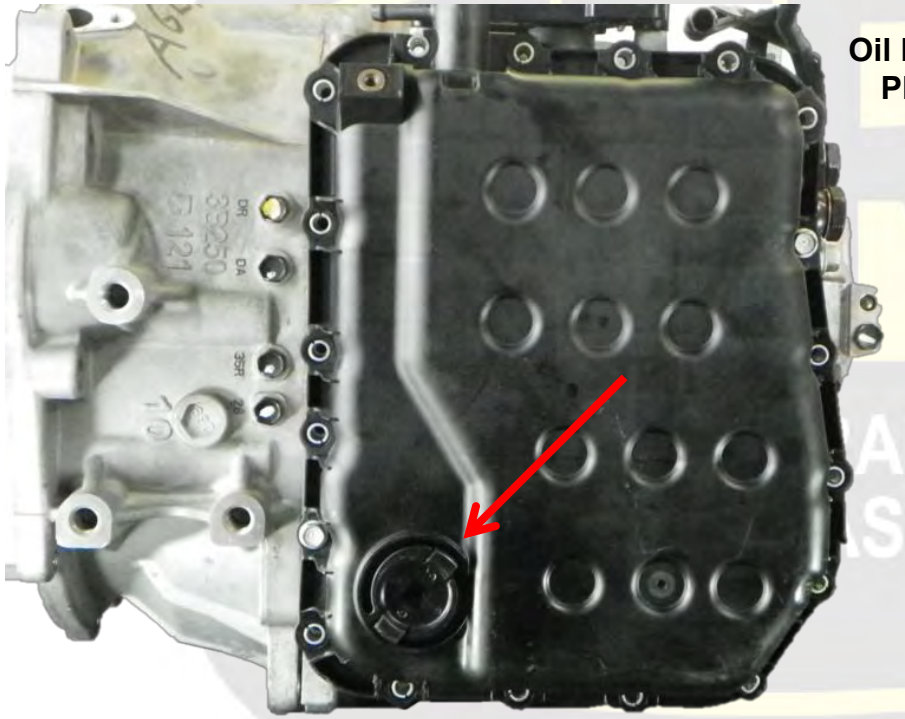


Drain Plug

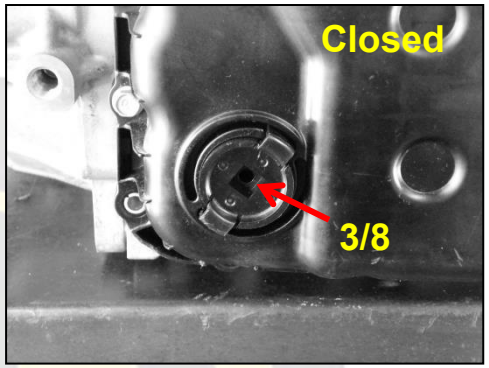


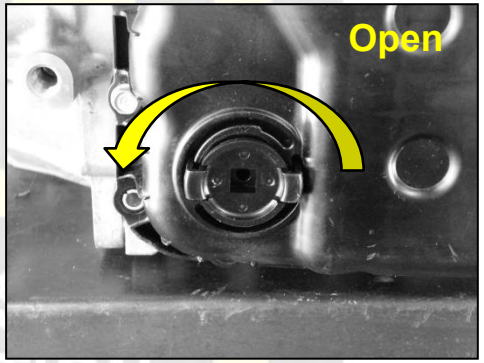
Fluid Level Check

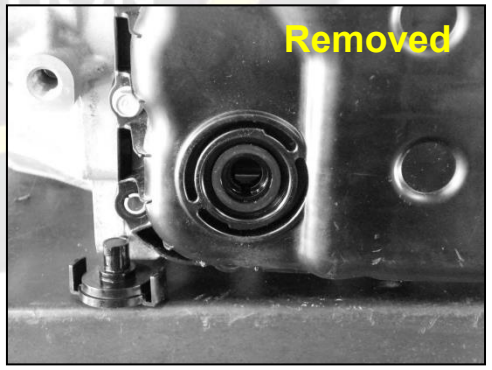
Confirm that the transmission fluid temperature is 50-60 C (122-140 F) with a capable scan tool.



Oil Level Plug





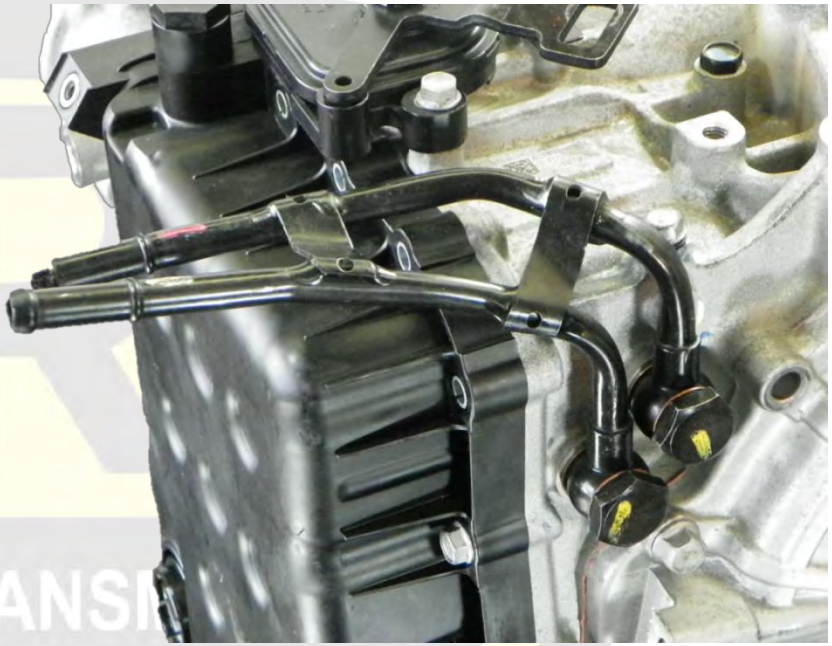


Capacity:

A6LF1/2/3	**7.8L**
A6MF1/2	**7.1L**

Fluid Contamination & Cooler Hoses Burst

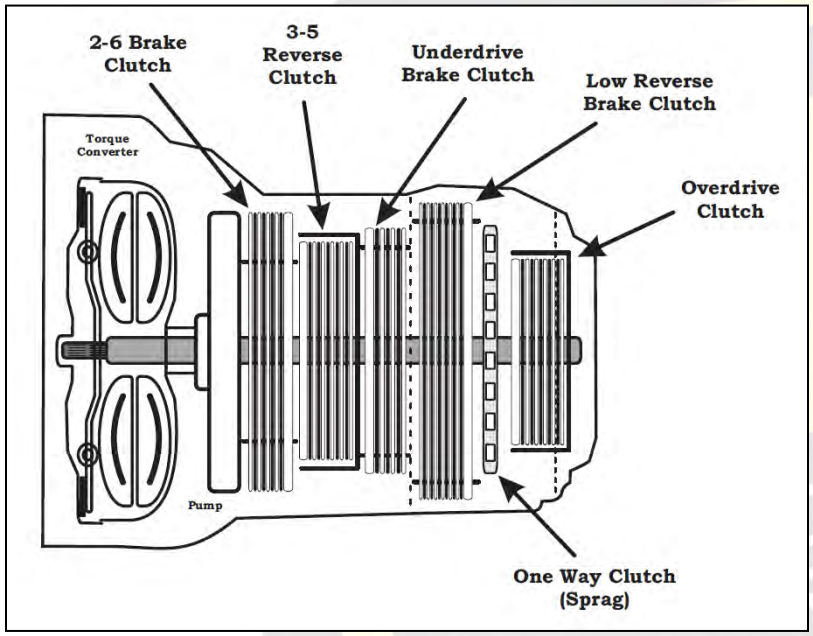
Known problems of Radiator contaminating transmission and Rubber cooler lines bursting



Side Cover Leaks

Later models with rubber molded valve body cover gasket. Problems leaking due to warping. Flat sand cover before re-using rubber molded gasket. Apply silicone.

Component Identification & Apply Chart

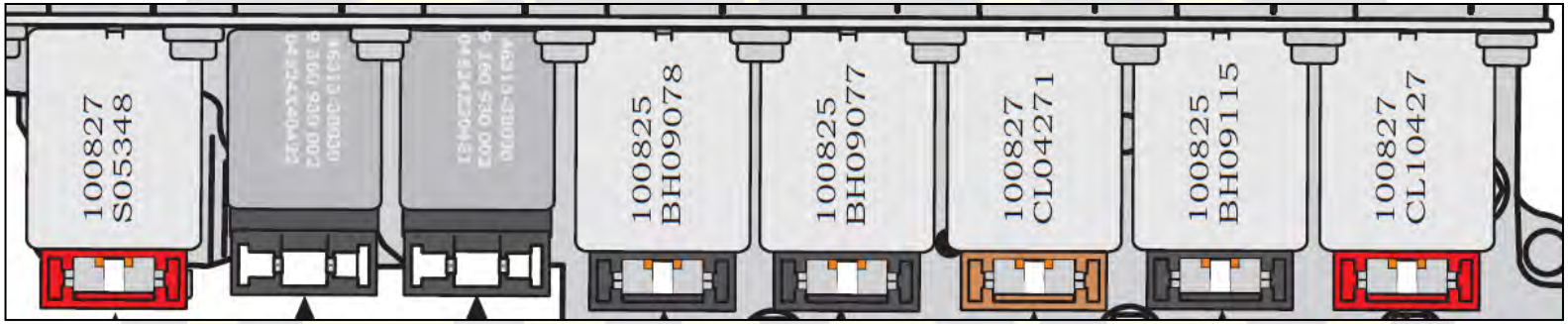


	Clutch		Brake			O.W.
Gear	35R	O/D	2-6	U/D	L/R	Low
P/N					X	
R	X				X	
D1				X	O	X
D2			X	X		
D3	X			X		
D4		X		X		
D5	X	X				
D6		X	X			

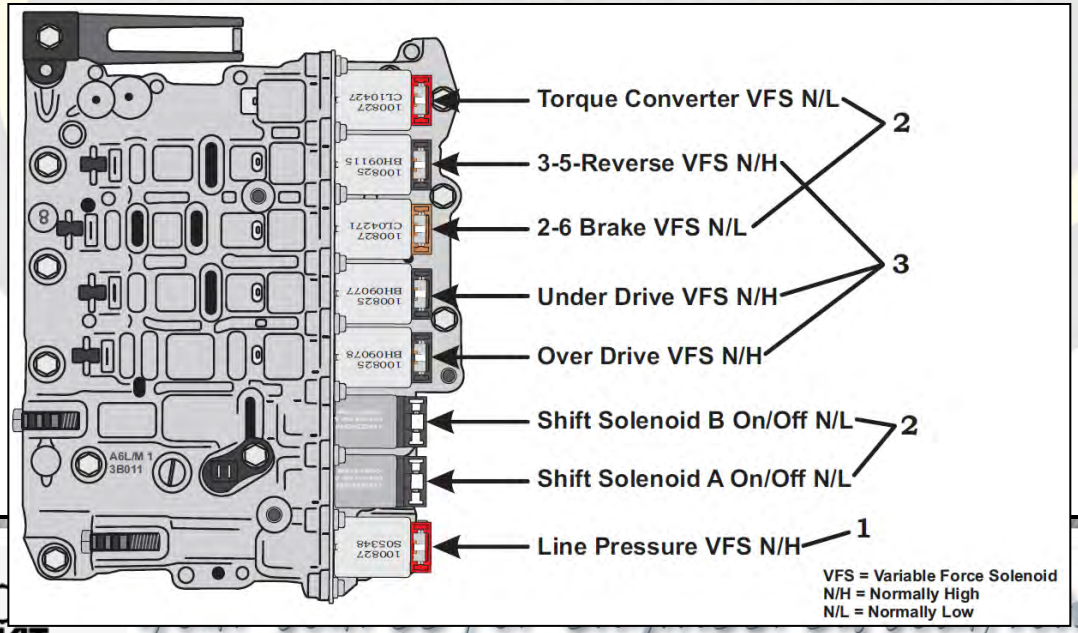
O = Speeds below 5 km/h (3 mph)

Solenoid Function

There are 8 solenoids used in the A6LF1 transmission. 2 normally low variable force solenoids, 4 normally high variable force solenoids and 2 on/off normally low type solenoids.



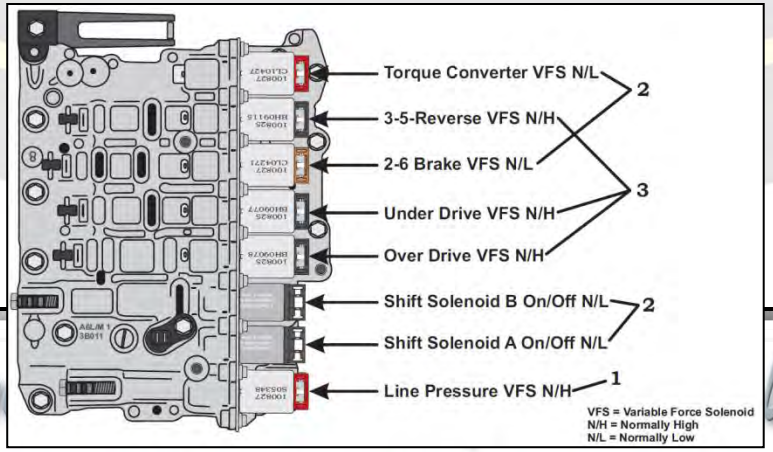
NH On/Off NH NH NL NH NL



Solenoid Apply Chart

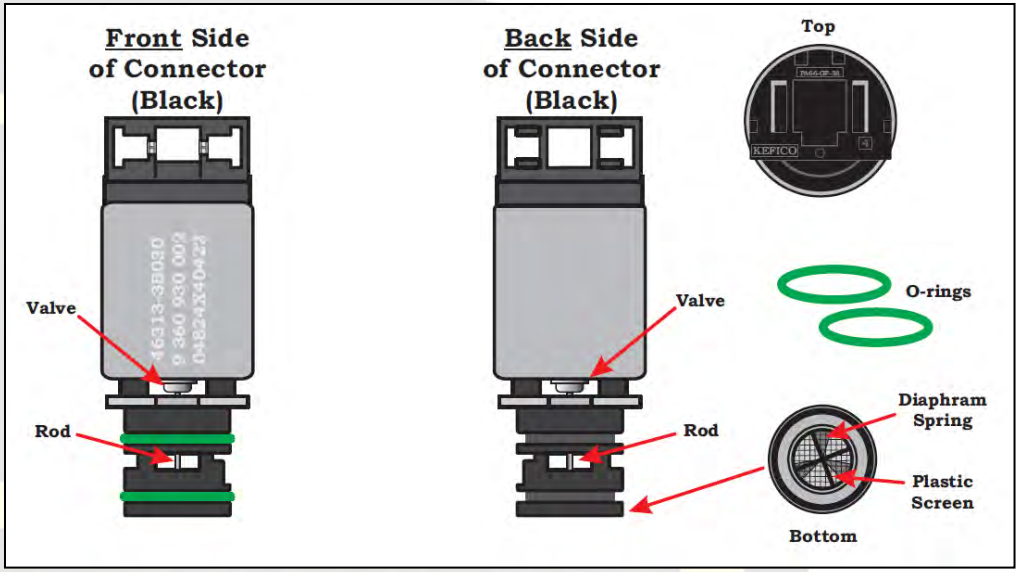
Solenoid / Gear	SS A On/Off	SS B On/Off	UD VFS N/H	OD VFS N/H	35R VFS N/H	2-6 VFS Brake N/L	Lockup N/L	Line Pressure N/H
N / P	X		X		X			Varying
1	O			O	X			Varying
2				X	X	X	X	Varying
3		X		X			X	Varying
4					X		X	Varying
5		X	X				X	Varying
6			X		X	X	X	Varying
L	X				X			Varying
R	X	X	X					Varying

O = Vehicle speeds above 8 km/h (5 mph) N/L = White N/H = Black

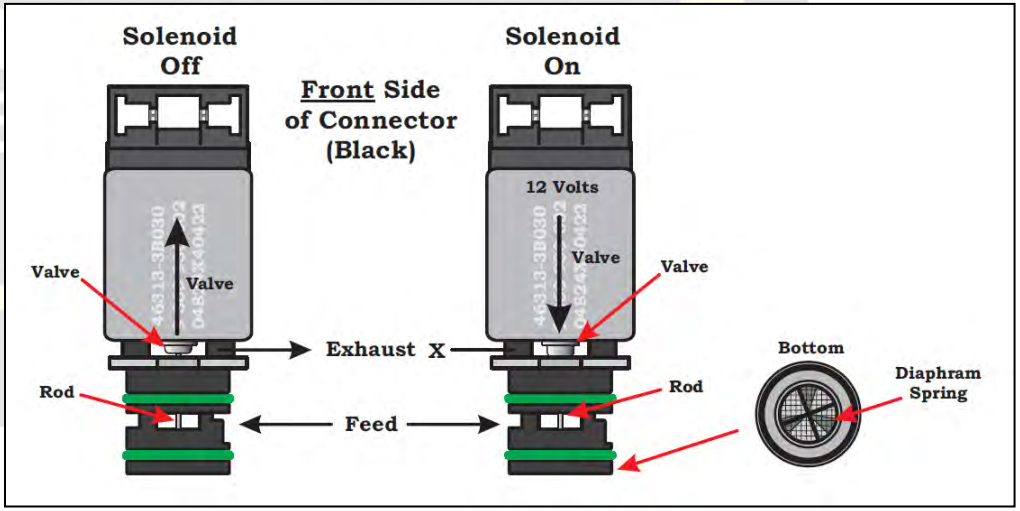


Solenoid Function

Shift Solenoid A (SSA) and Shift Solenoid B (SSB) On/Off Solenoids are Normally Low (N/L) type solenoids.

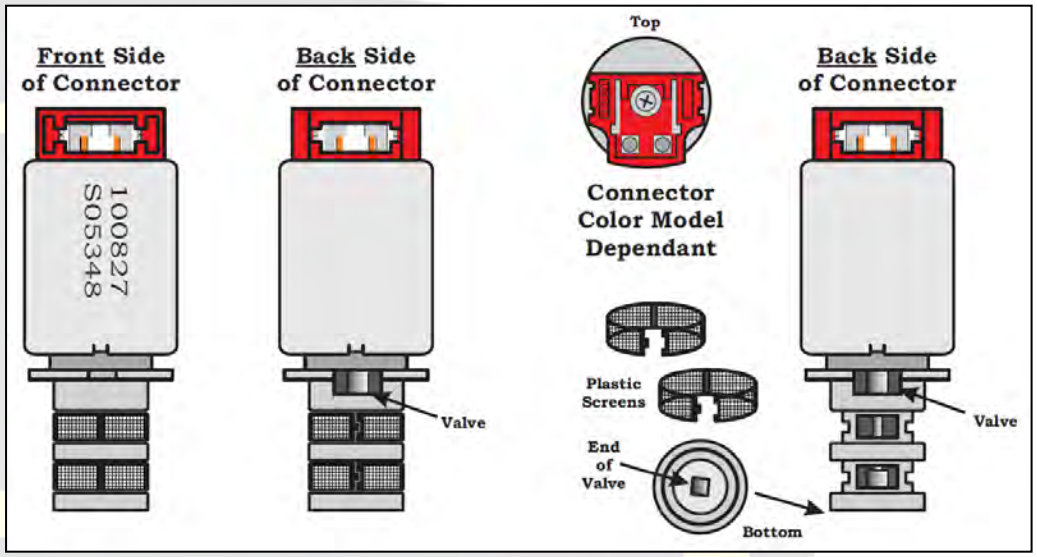


When the solenoid is turned off the pressure in the circuit is low. When the solenoid is energized (source voltage) the pressure in the circuit is high (71.12 psi.). The solenoid resistance is approximately 10-11 ohms.

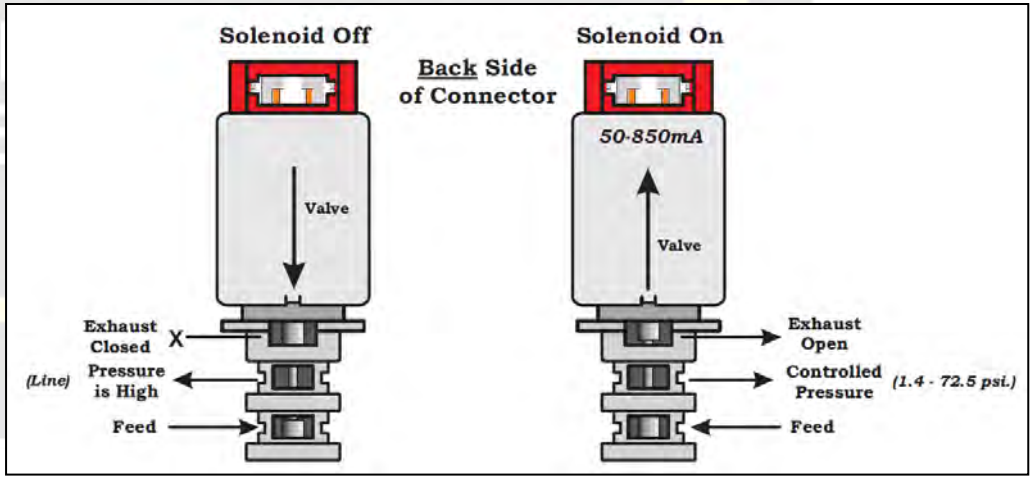


Solenoid Function

Line Pressure (LP) Variable Force Solenoid (VFS) is a Normally High (N/H) type solenoid. When the solenoid is turned off the pressure in the circuit is high.



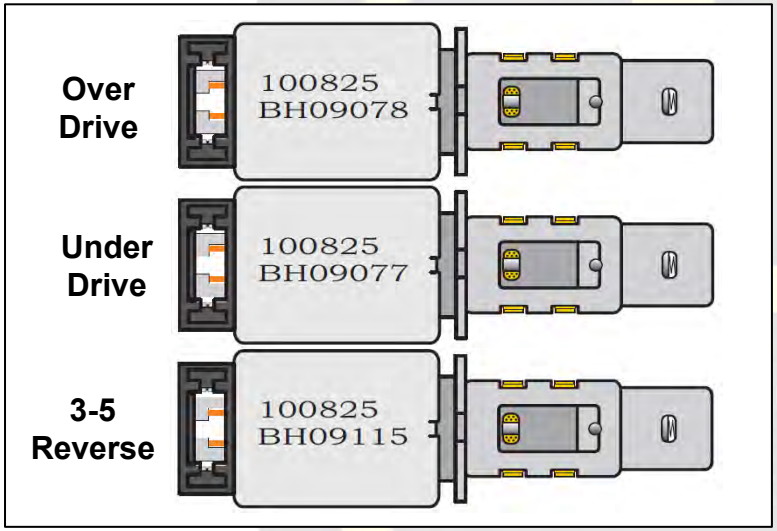
When the solenoid is energized (50 - 850 mA) the pressure in the circuit is varied (1.42 - 72.54 psi.). The solenoid resistance is approximately 5.1 ohms.



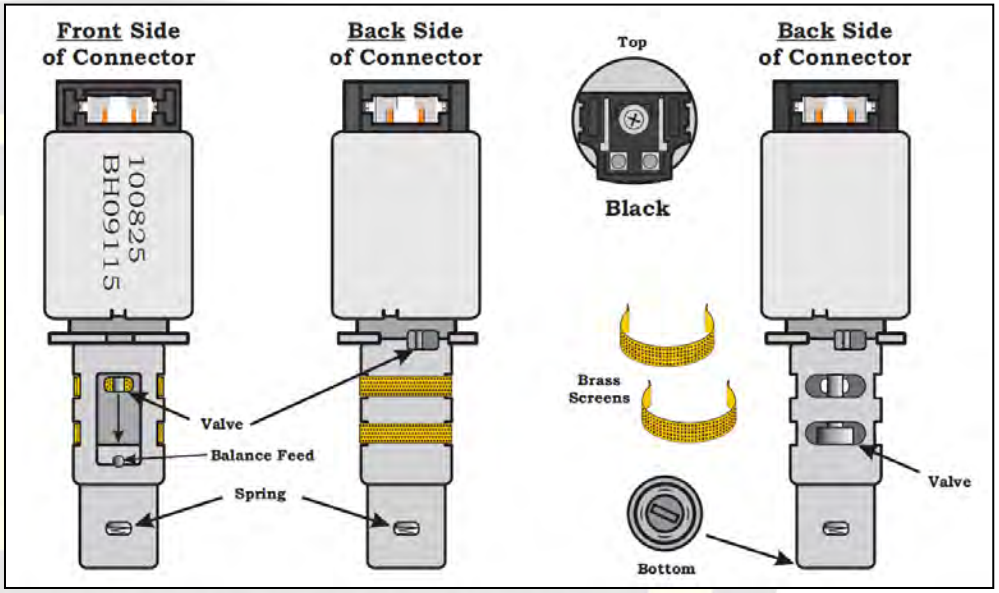
Note: Variable Force Solenoid Connector Colors are model dependent.

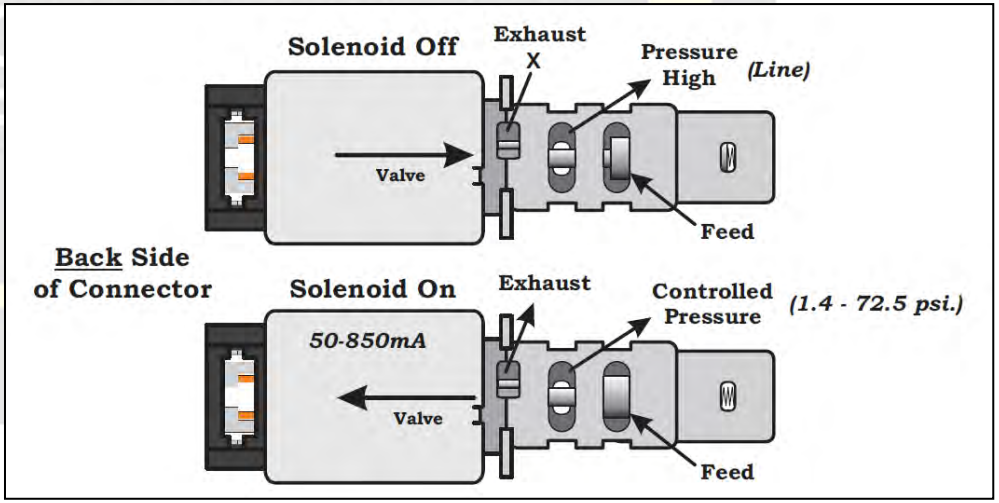
Solenoid Function

3-5-Reverse, Underdrive and Overdrive Variable Force Solenoid (VFS) are <u>Normally High</u> (N/H) type solenoids.



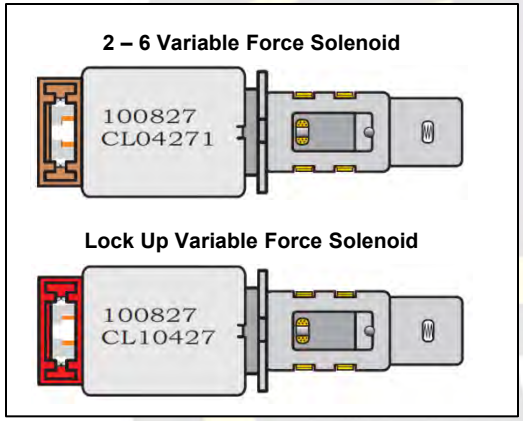
When the solenoid is turned off the pressure in the circuit is high. When the solenoid is energized (50 - 850 mA) the pressure in the circuit is low (1.42 - 72.54 psi.). The solenoid resistance is approximately 5.1 ohms.



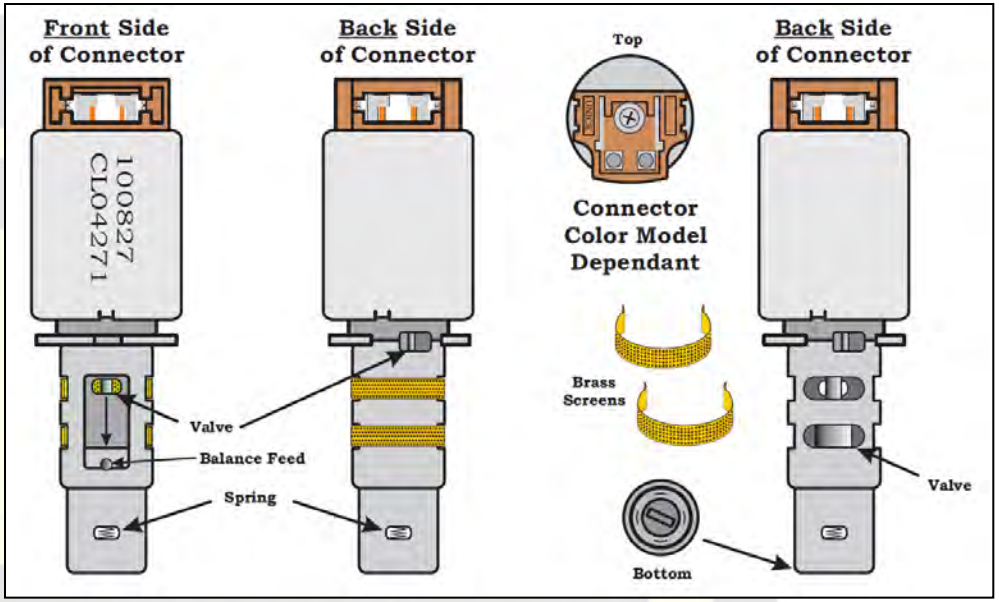


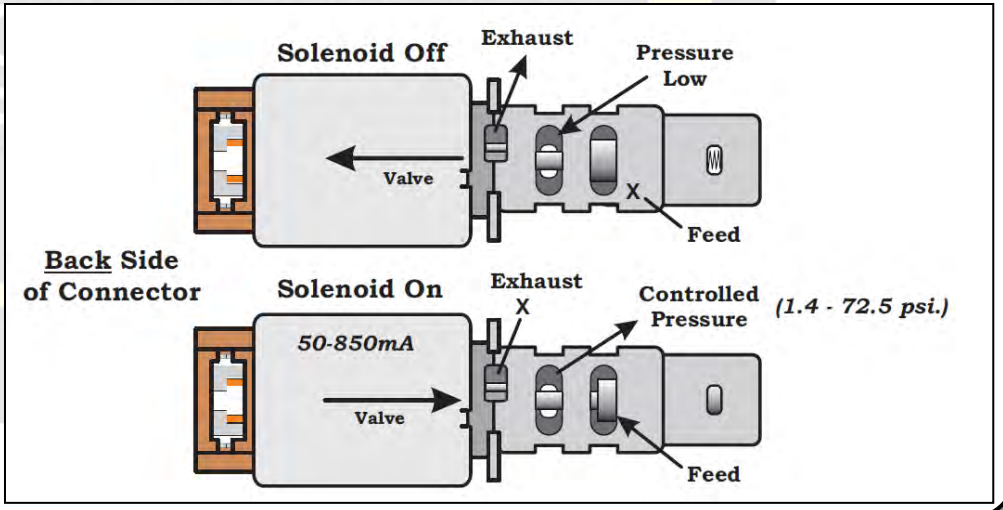
Solenoid Function

Torque Converter and 2-6 Brake Variable Force Solenoid (VFS) are <u>Normally Low</u> (N/L) type solenoids.



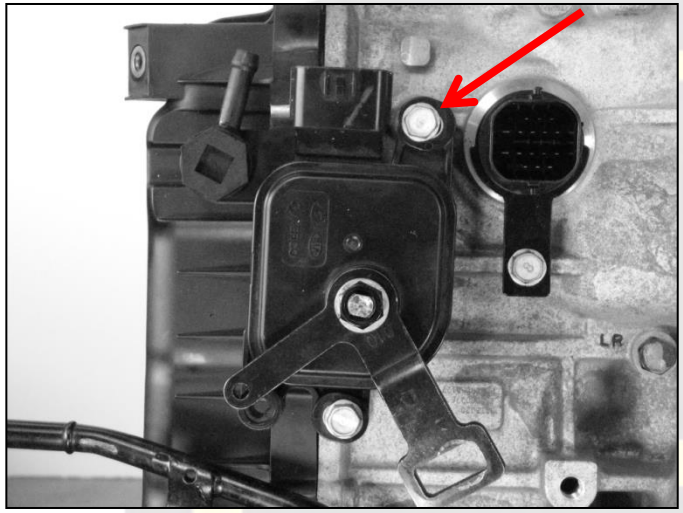
When the solenoid is turned off the pressure in the circuit is low. When the solenoid is energized (50 - 850 mA) the pressure in the circuit is high (1.42 - 72.54 psi.). The solenoid resistance is approximately 5.1 ohms.



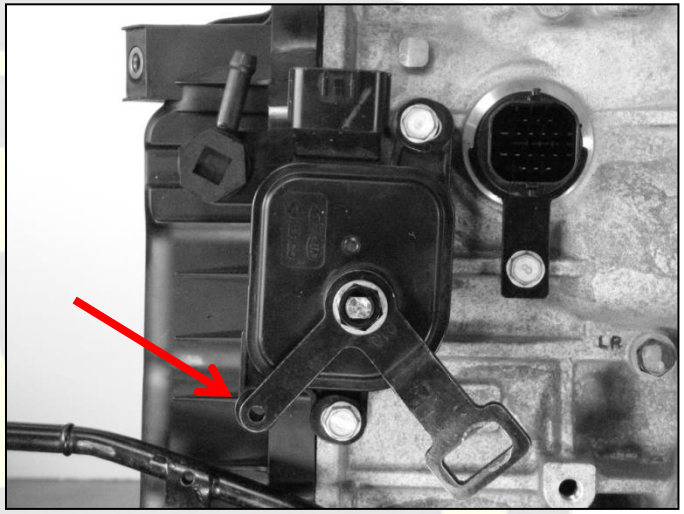


Inhibitor Switch

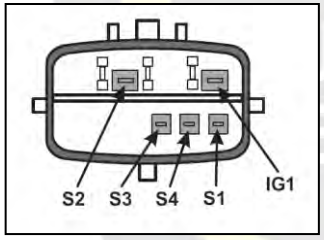
Adjustment Bolts



Neutral Alignment



Pin ID



Voltage Check

IG SW	POS	S1	S2	S3	S4
On	P	12V	0V	12V	12V
On	R	0V	0V	0V	12V
On	N	12V	12V	0V	12V
On	D	12V	0V	0V	0V

TCM Data
(may not be provided by scan tool)

	P	P-R	R	R-N	N	N-D	D	D-X	X	X-Y	Y	Y-Z	Z
S1	1	0	0	0	1	1	1	1	1	1	0	0	0
S2	0	0	0	1	1	0	0	1	1	0	0	1	1
S3	1	1	0	0	0	0	0	0	1	1	1	1	1
S4	1	1	1	1	1	1	0	0	0	0	0	0	1

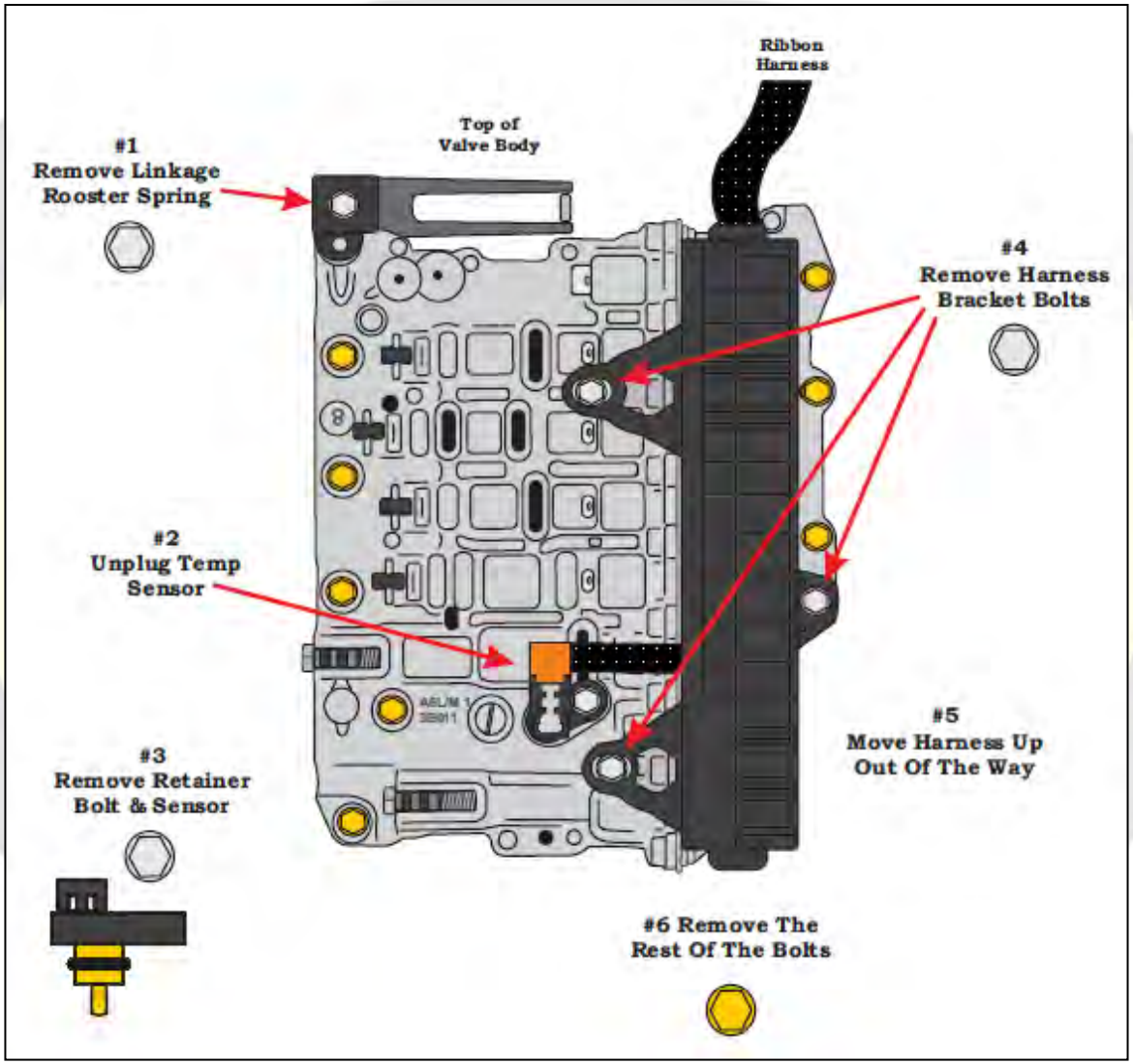
Internal Harness Removal & Connector ID

The retainer for the Internal Harness Connector must be removed prior to removing the harness. Once the retainer is remove from the connector the harness can be pushed down into the transmission and remove from the inside.

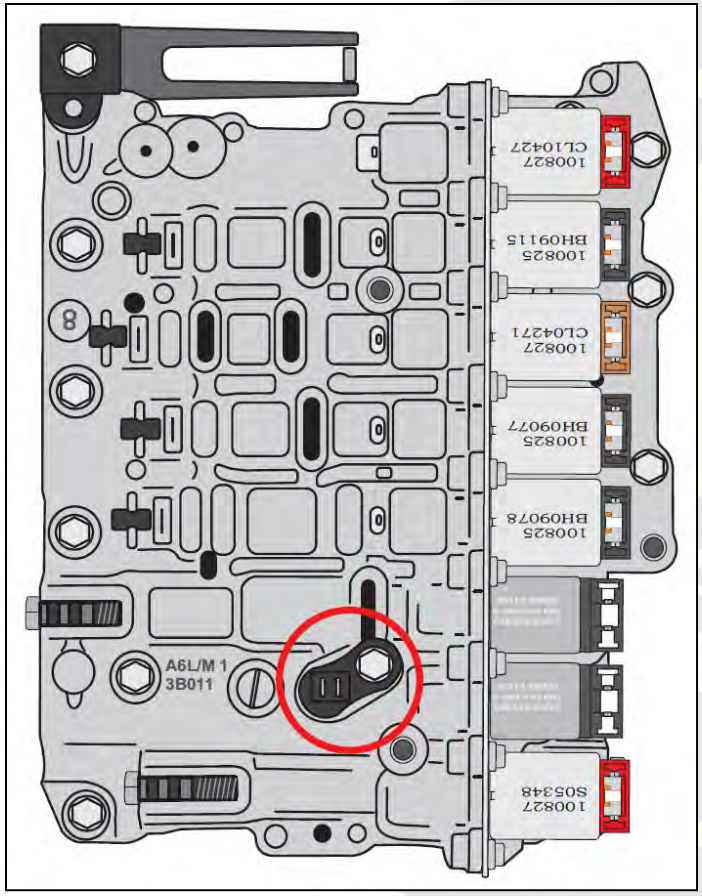
Solenoid & Sensor Resistance:
Oil Temperature:1.9k ohms @ 24.4 C (76 F)
Input Speed Sensor (ISS): 3.8m ohms
Output Speed Sensor (OSS): 5.8m ohms
Variable Force Solenoids VFS: 5.1 ohms
Shift Solenoids (on/off): 10-11 ohms

1: N/A
2: DC VFS (lockup)
3: OSS PWR
4: OSS SIG
5: Solenoid PWR 2
6: 3-5-R VFS
7: O/D VFS
8: ISS SIG
9: Oil Temp Sensor GND
10: Solenoid PWR 1
11: 2-6 VFS
12: SSB
13: Oil Temp Sensor PWR
14: ISS PWR
15: N/A
16: U/D VFS
17: LP VFS (line)
18: SSA

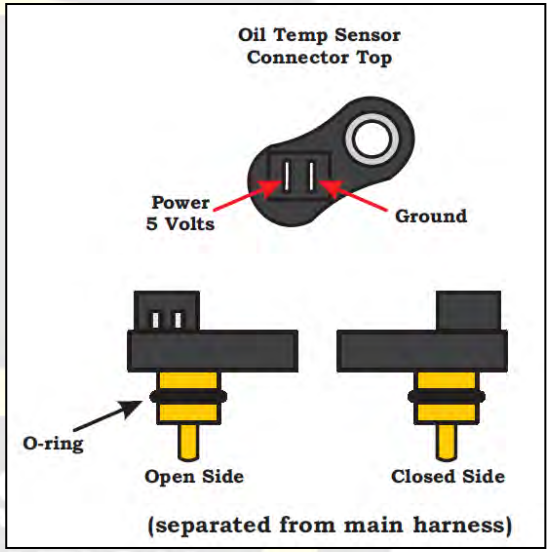
Valve Body Removal



Fluid Temperature Sensor

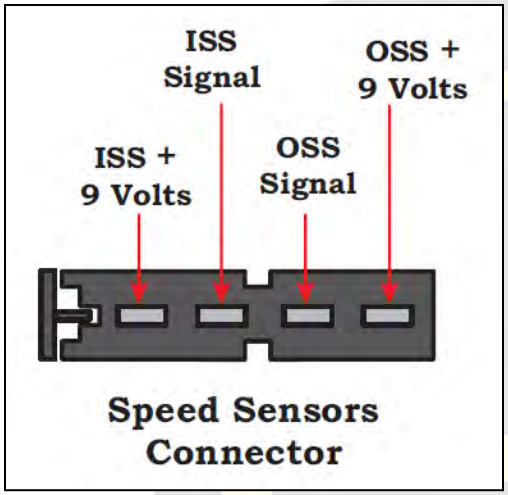


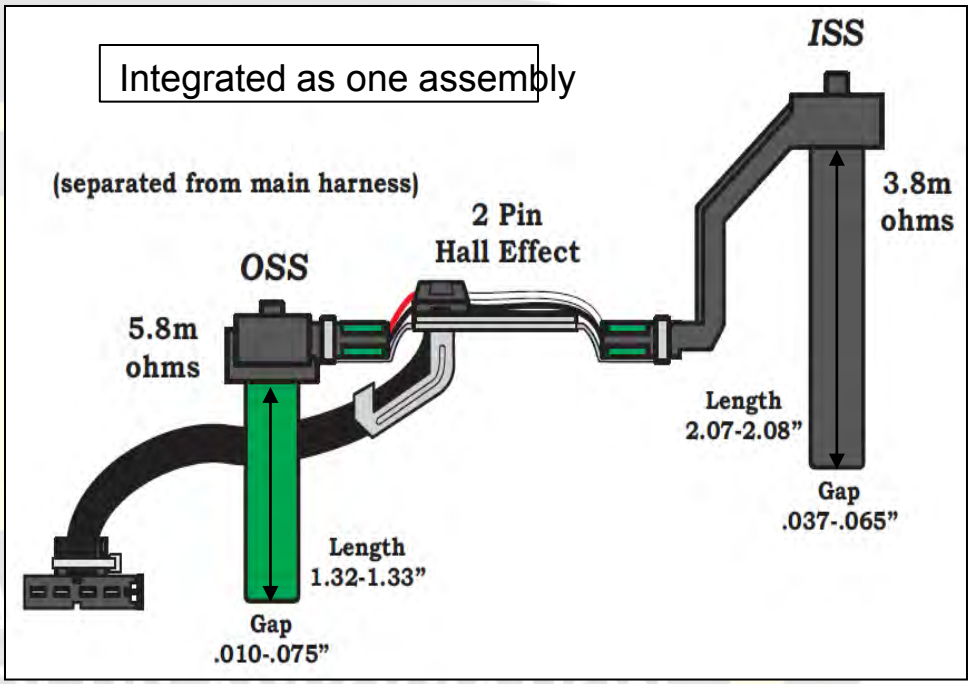
Temp C (F)	Resistance (k ohms)
-40 C (-40 F)	48.1k ohms
-20 C (-4.0 F)	15.6k ohms
0 C (32 F)	5.88k ohms
20 C (68.1 F)	2.51k ohms
40 C (104 F)	1.11k ohms
60 C (140 F)	0.61k ohms
80 C (176 F)	0.32k ohms
100 C (212 F)	0.18k ohms
120 C (248 F)	0.10k ohms
140 C (284 F)	0.06k ohms
150 C (302 F)	0.05k ohms



Voltage: Max. 3.26V @ - 40 C (104 F)
Voltage: Min. 0.29V @ 150 C (302 F)
Sensor Failsafe;
Fixed to 4th Gear
1st & 2nd will be Prohibited
Default Value 80 C (176 F)
May Not Turn On MIL

Input & Output Speed Sensors

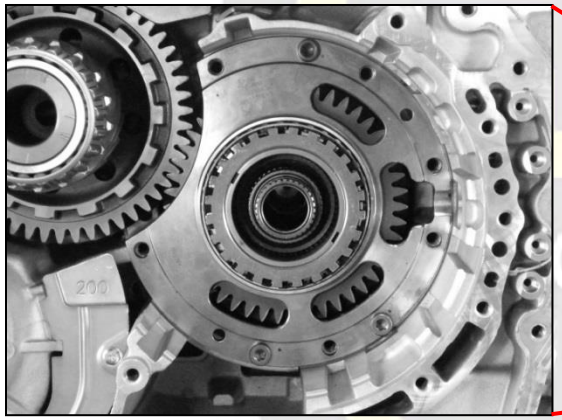


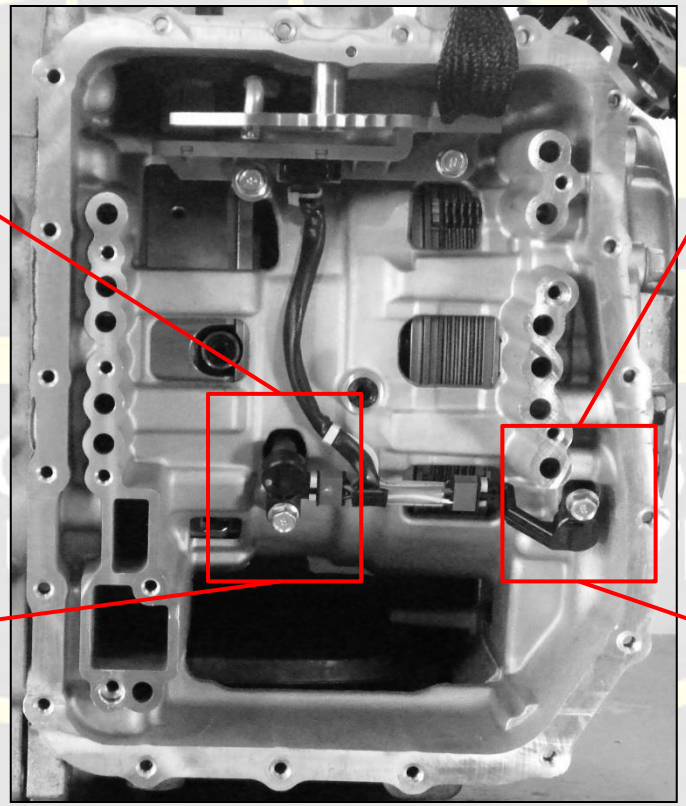


Voltage: Input 1.62-0.79V Output 1.63-0.78V
Current Type: Low 7 mA to High 14 mA
Type: Hall Effect 2 pin 9 Volt Power Signal
Length: Input 52.7-52.9 mm (2.07-2.08" in.) Output 33.6-33.8 mm (1.32-1.33")
Air Gap: Input 0.95-1.65 mm (0.037-0.065" in.) Output 0.25-1.9 mm (.010-.075")
Input Speed Sensor Resistance: 3.8m ohms
Output Speed Sensor Resistance: 5.8m ohms
Input / Output Sensor Failsafe: 4th Gear Hold in Drive, 2nd - 4th Manual Shift (Sport)

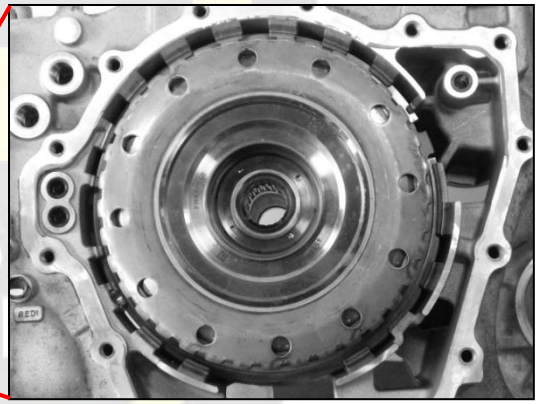
Input & Output Speed Sensors

Output
Speed Sensor (OSS)
Monitors Transfer
Drive Gear

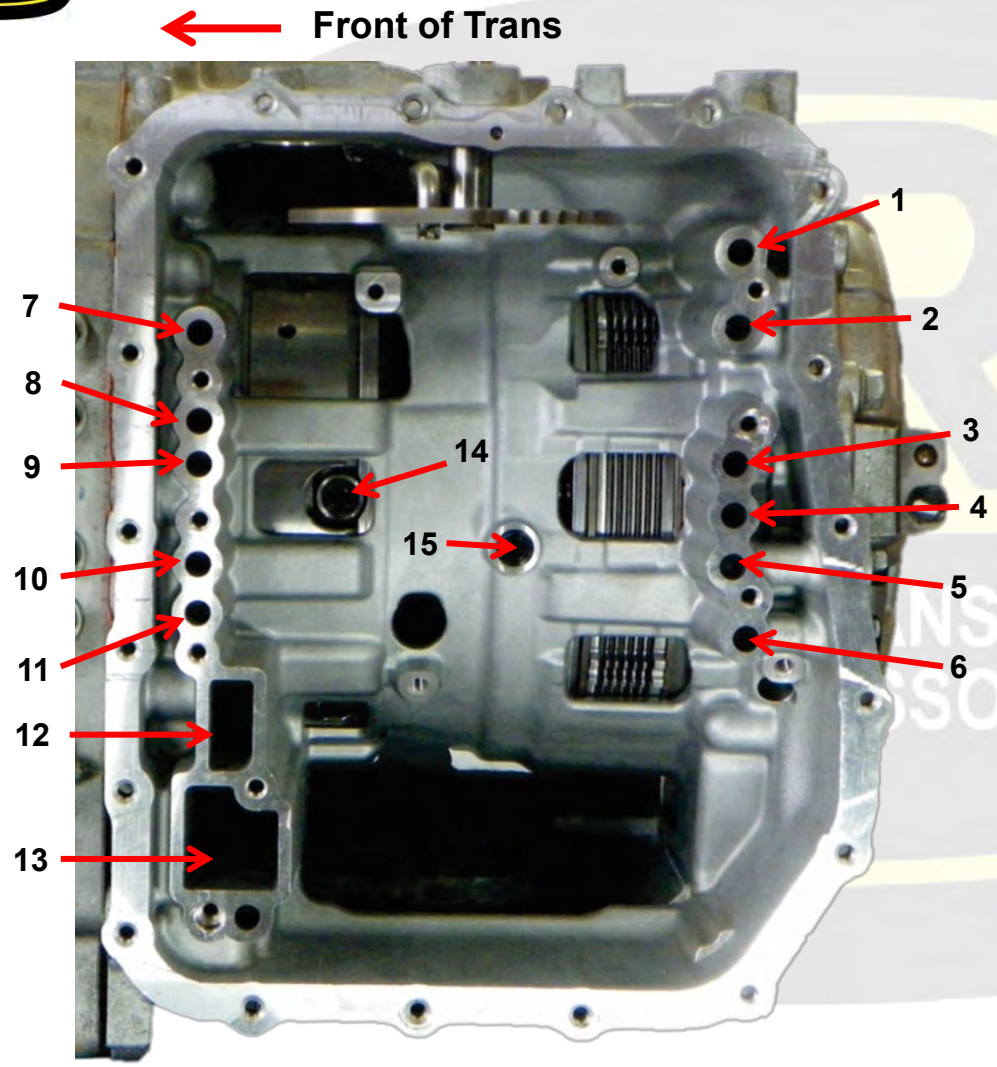




Input
Speed Sensor (ISS)
Monitors Overdrive
Clutch Drum

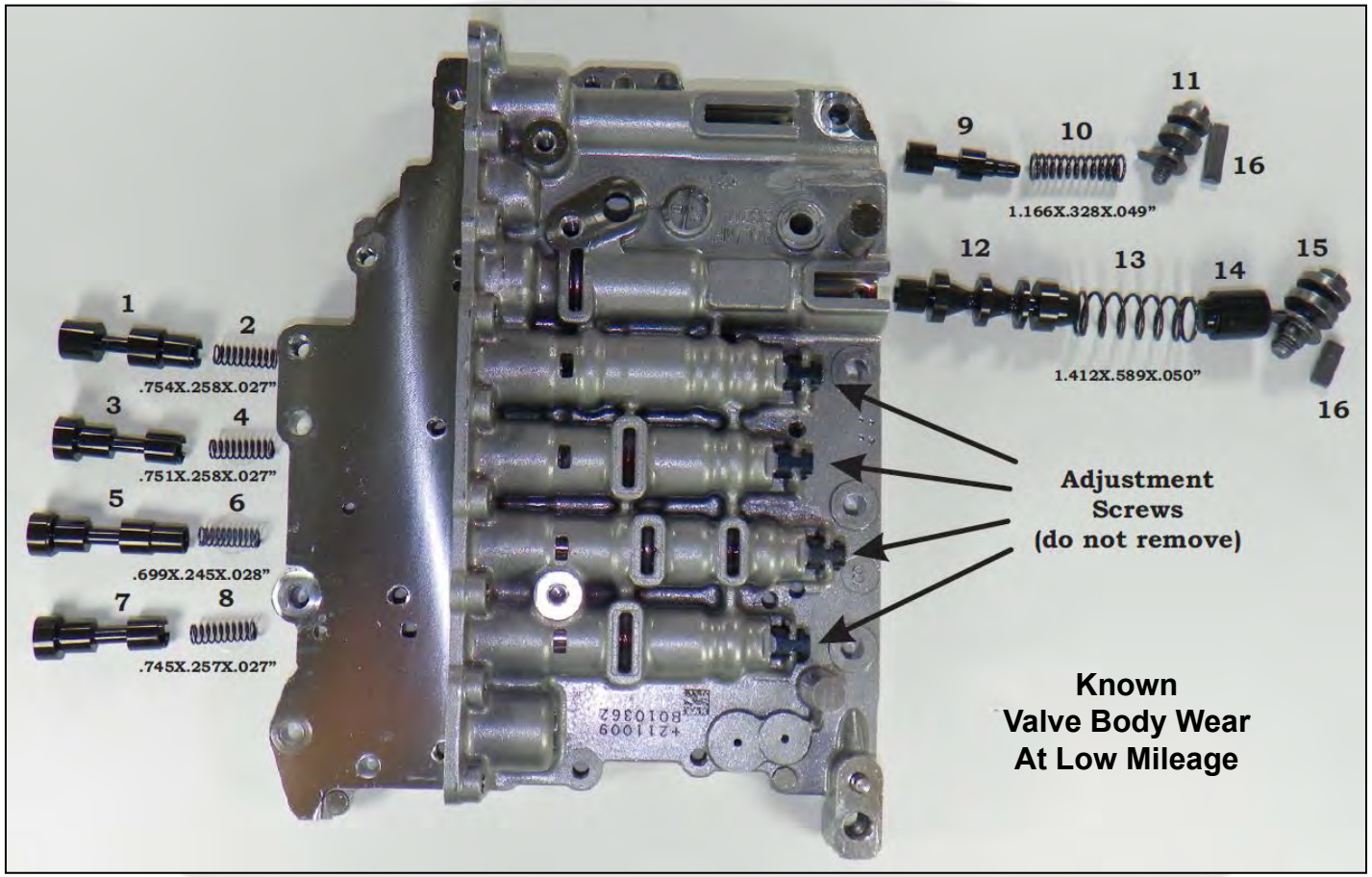


Case Air Checks



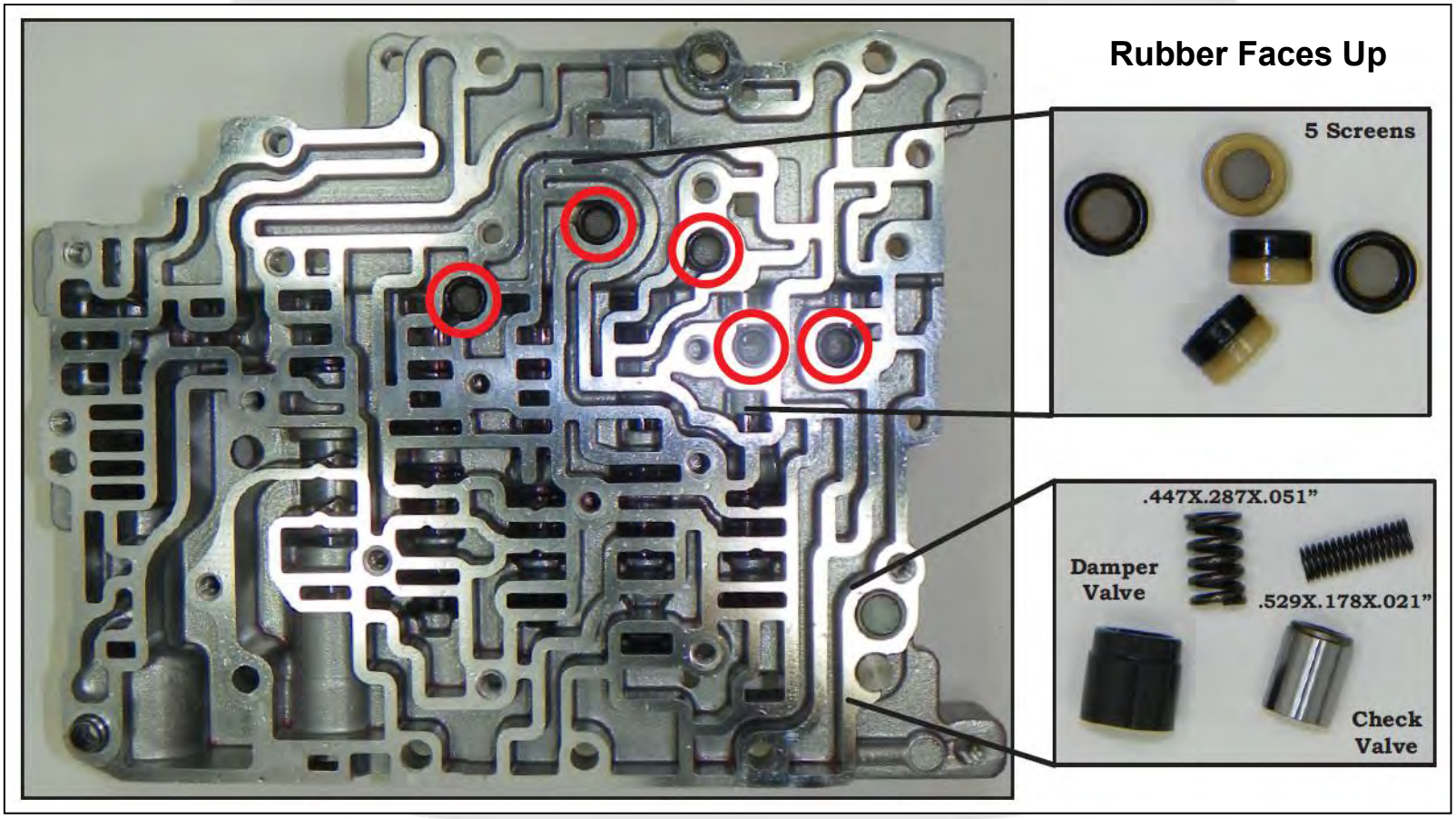
1. To Cooler
2. From Cooler
3. Lubrication (rear)
4. Overdrive Pressure
5. Reducing Pressure (Red 2)
6. Reducing Pressure (Red 1)
7. From Damper Pressure
8. To Damper Pressure
9. Lubrication (front)
10. 3-5-R Clutch Pressure
11. 2-6 Brake
12. From Oil Pump
13. To Oil Pump
14. Under-drive Pressure
15. Low & Reverse Pressure

Outer Valve Body Assembly

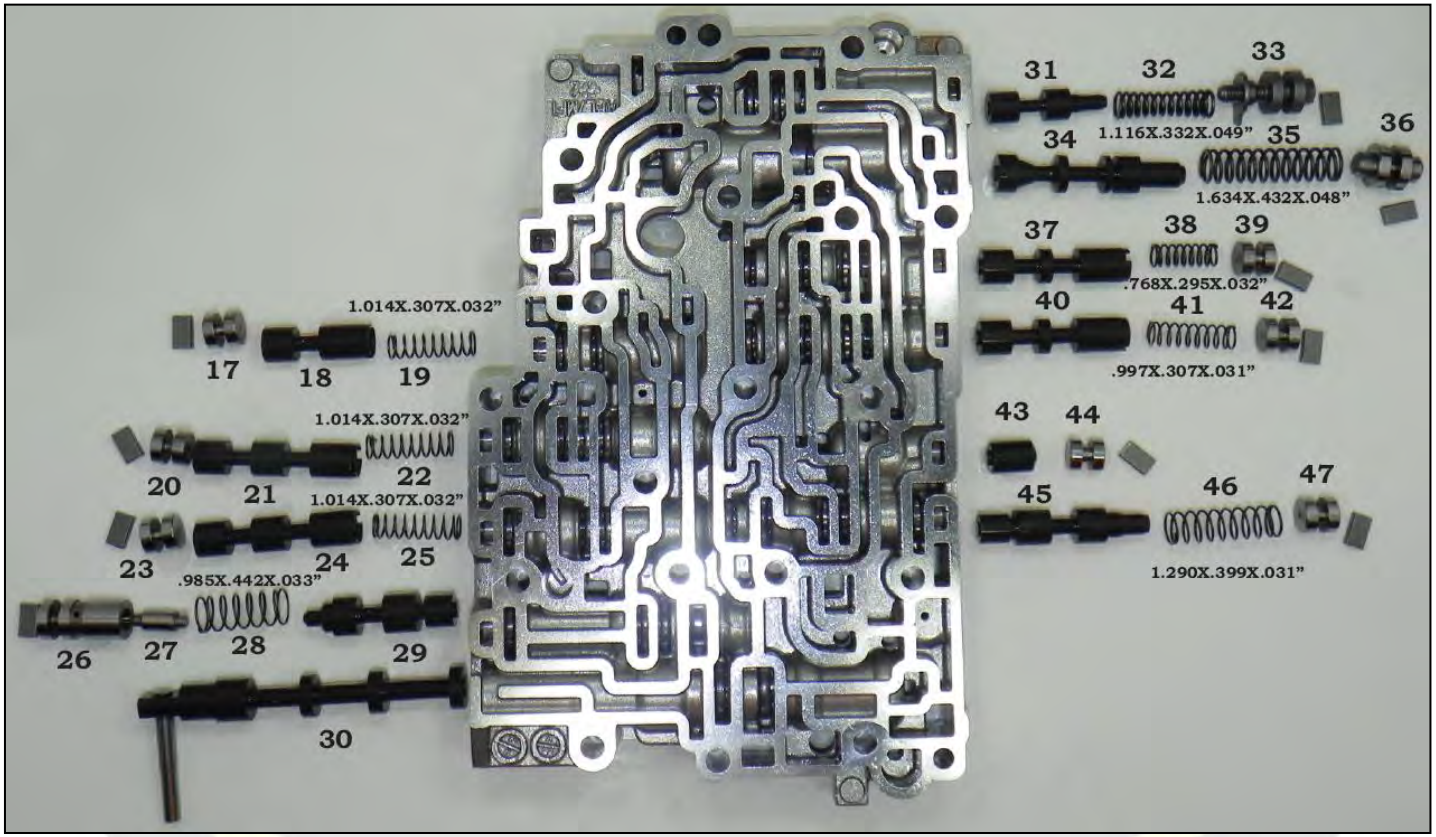


1: Over drive pressure control valve
2: Over drive pressure control valve spring
3: Under drive pressure control valve
4: Under drive pressure control valve spring
5: 2/6 Brake pressure control valve
6: 2/6 Brake pressure control valve spring
7: 3/5/Reverse pressure control valve
8: 3/5/Reverse pressure control valve spring
9: Reducing valve 1
10: Reducing valve 1 spring
11: Adjustment screw
12: Regulator valve
13: Regulator valve spring
14: Regulator sleeve
15: Adjustment screw
16: Retainer

Outer Valve Body Assembly

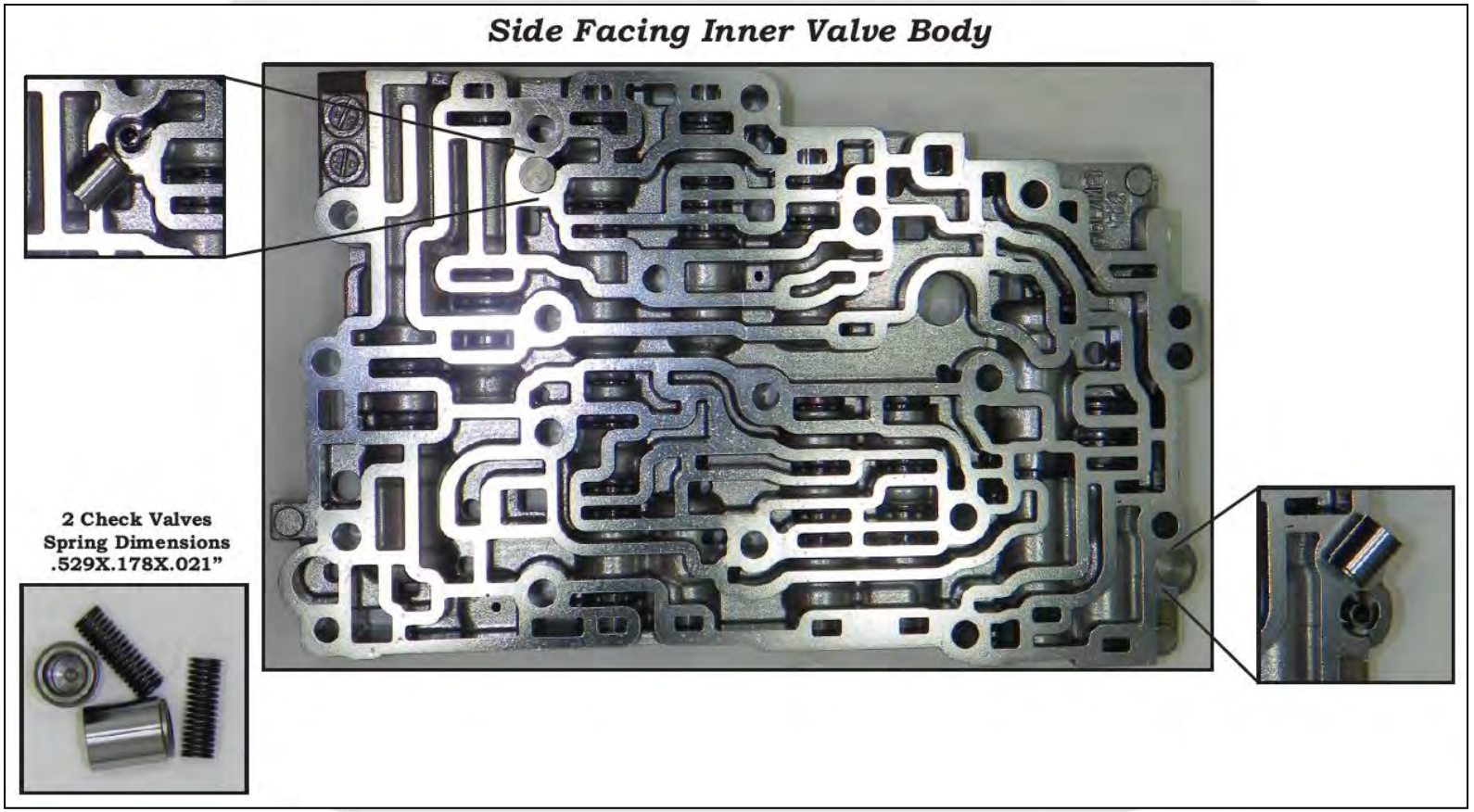


Center Valve Body Assembly

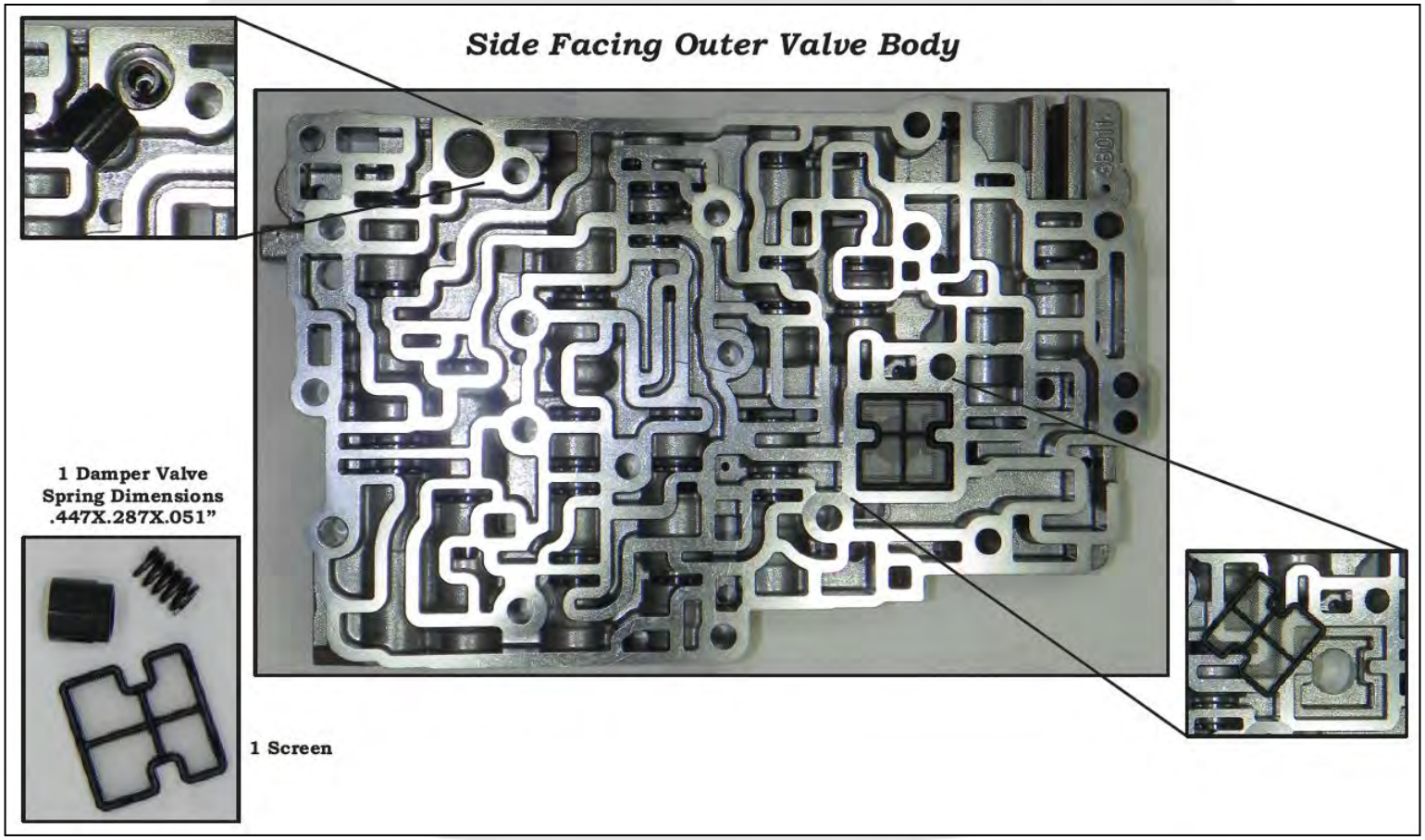


17: Stopper plug
18: Under drive pressure switch valve
19: Under drive pressure switch valve spring
20: Stopper plug
21: 2/6 Brake pressure switch valve
22: 2/6 Brake pressure switch valve spring
23: Stopper plug
24: 3/5/Reverse pressure switch valve
25: 3/5/Reverse pressure switch valve spring
26: TCC pressure control sleeve
27: TCC pressure control plug
28: TCC pressure control valve spring
29: TCC pressure control valve
30: Manual valve
31: Reducing valve 2
32: Reducing valve 2 spring
33: Adjustment screw
34: TCC control valve
35: TCC control valve spring
36: Stopper plug
37: Over drive & low reverse switch valve
38: Over drive & low reverse switch valve spring
39: Stopper plug
40: Over drive pressure switch valve
41: Over drive pressure switch valve spring
42: Stopper plug
43: 3/5/R & 2/6 brake check valve
44: Stopper plug
45: Low & reverse switch valve
46: Low & reverse switch valve spring
47: Stopper plug

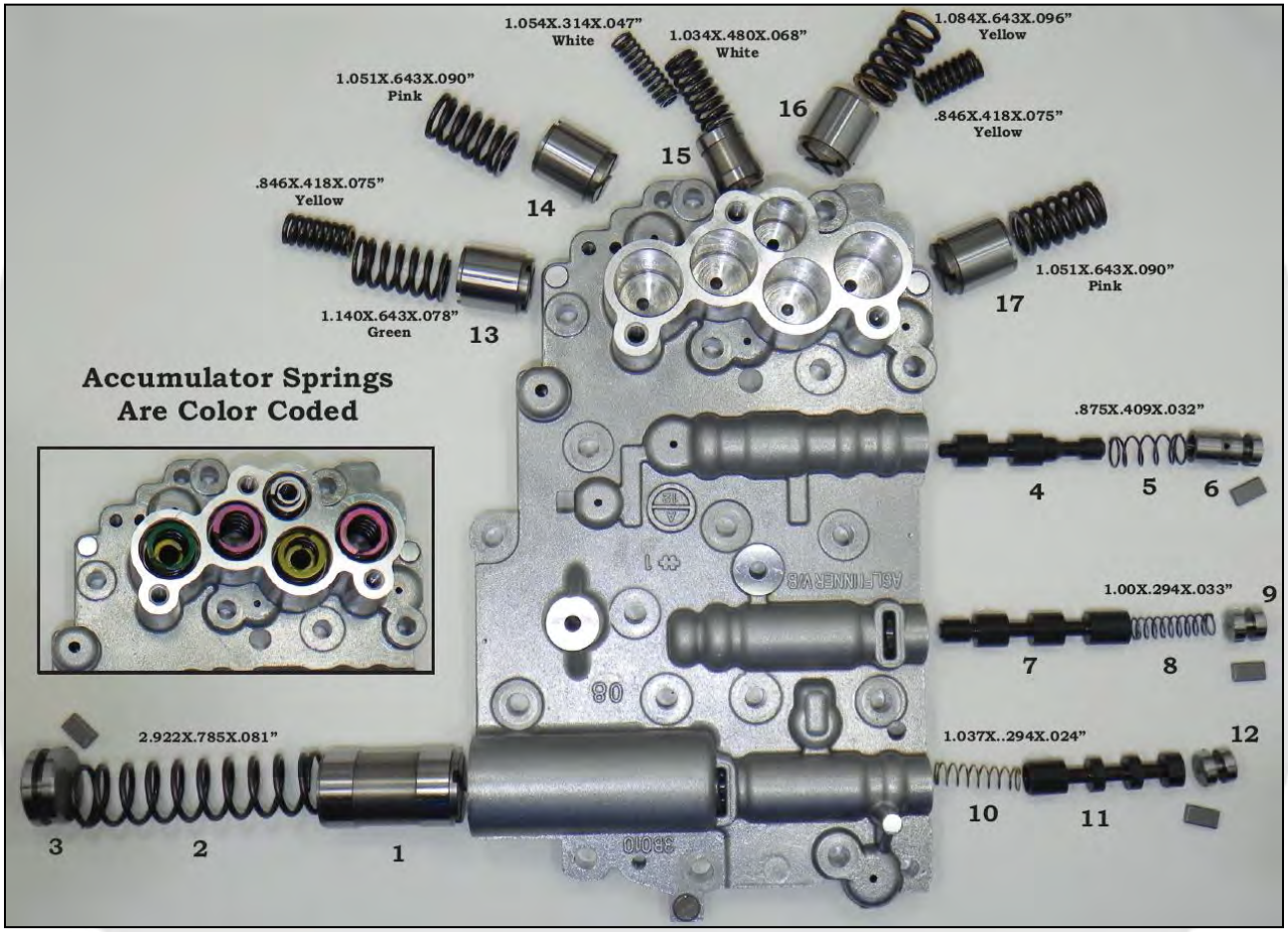
Center Valve Body Assembly



Center Valve Body Assembly



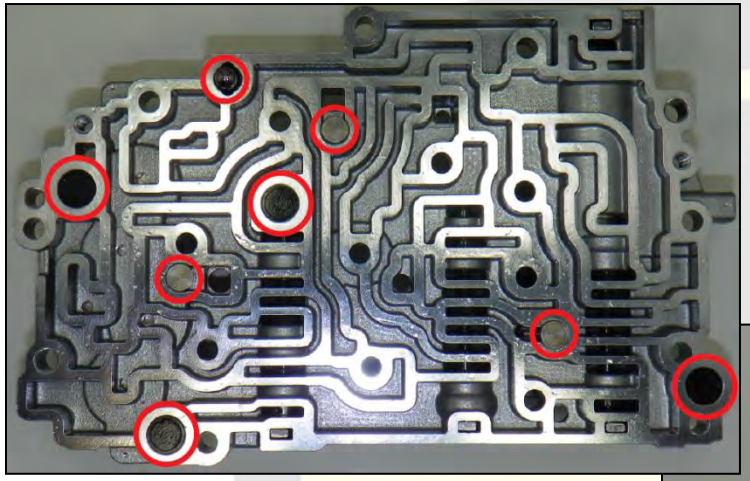
Inner Valve Body Assembly

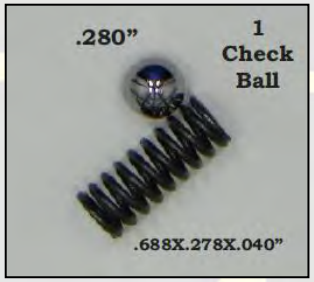


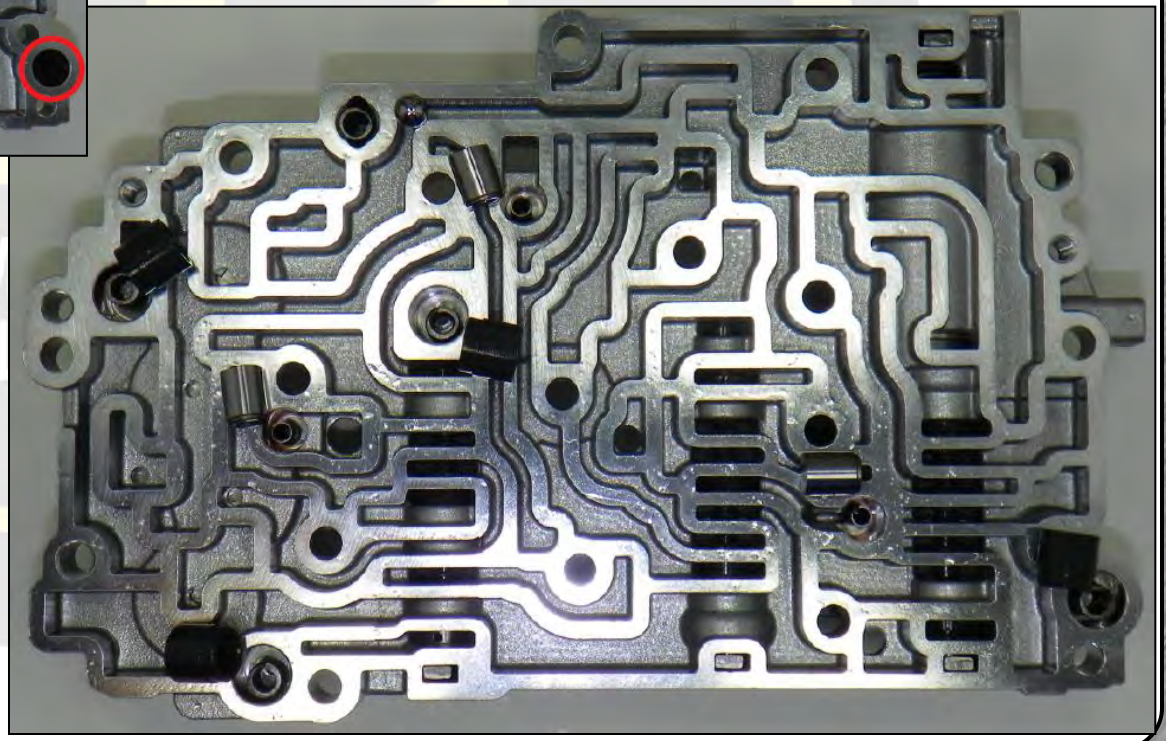
1: Accumulator piston (DN)
2: Accumulator spring
3: Stopper plug
4: Failsafe valve O/D
5: Failsafe valve spring
6: Failsafe valve O/D sleeve
7: 3/5/Reverse switch valve
8: 3/5/Reverse switch valve spring
9: Stopper plug
10: L/U switch valve spring
11: L/U switch valve
12: Stopper plug
13: Accumulator piston 2
14: Accumulator piston 1
15: Damping valve (RED2)
16: Accumulator piston 4
17: Accumulator piston 3

Lockup Valve 11 shown backwards in some factory manuals correct assembly shown here

Inner Valve Body Assembly





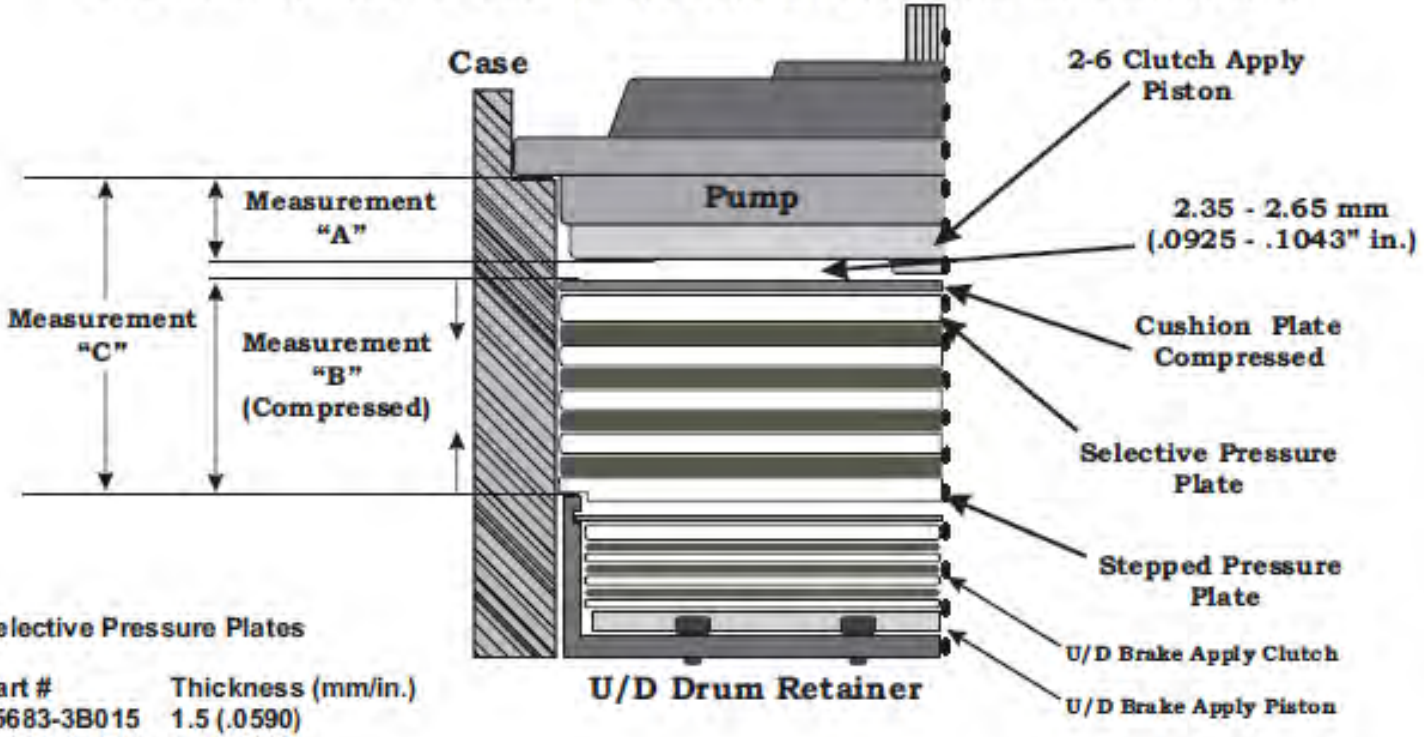


Valve Body Wear As
Low As 35,000 K
No Repair Available

Clutch End Play Checks

2-6 Brake Clutch

Add measurement "A" and "B" subtract the total from measurement "C"

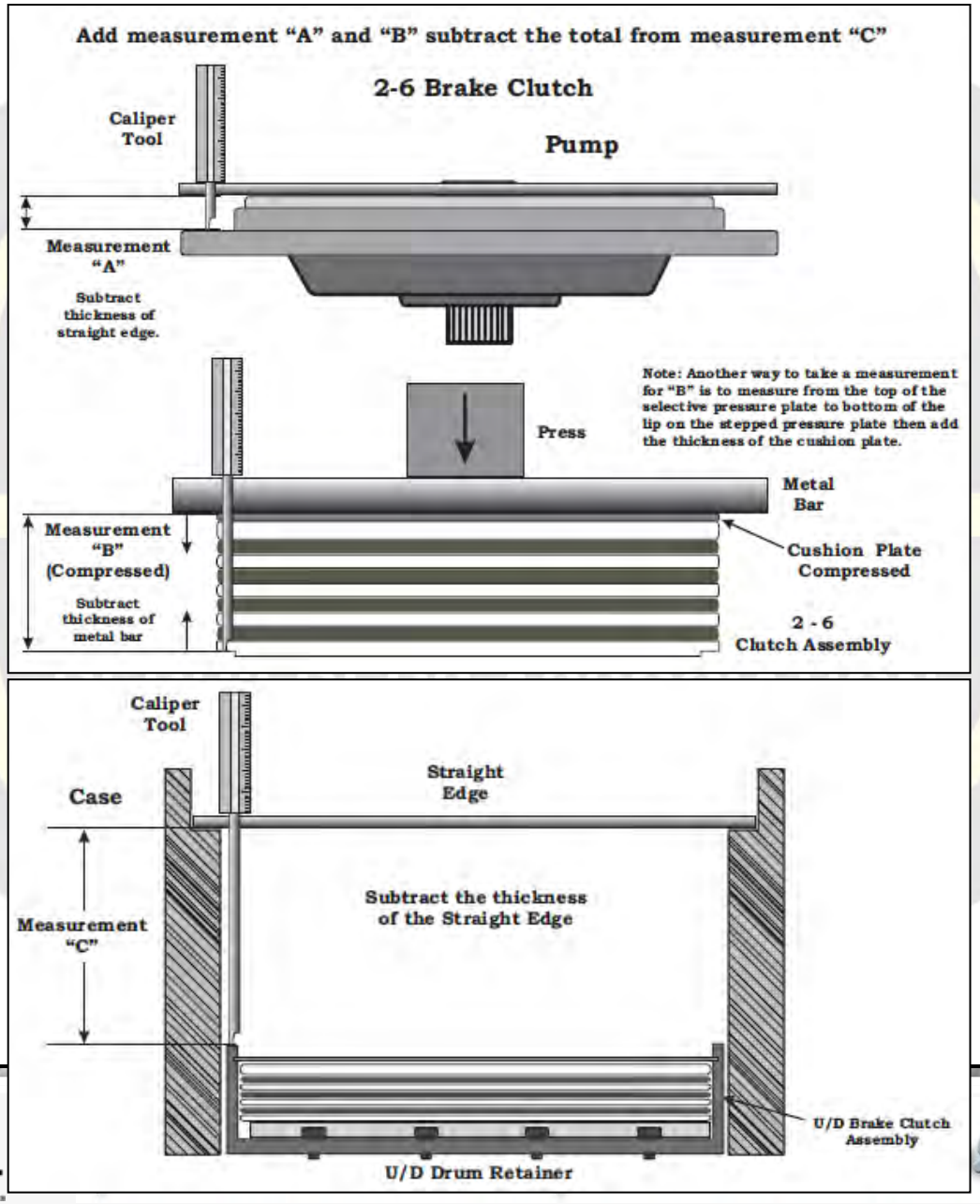


Selective Pressure Plates

Part #	Thickness (mm/in.)
45683-3B015	1.5 (.0590)
45683-3B017	1.7 (.0669)
45683-3B019	1.9 (.0748)
45683-3B021	2.1 (.0826)
45683-3B023	2.3 (.0905)
45683-3B025	2.5 (.0984)
45683-3B027	2.7 (.1062)
45683-3B029	2.9 (.1141)
45683-3B031	3.1 (.1220)

Note: Another way to take a measurement for "B" is to measure from the top of the selective pressure plate to bottom of the lip on the stepped pressure plate then add the thickness of the cushion plate.

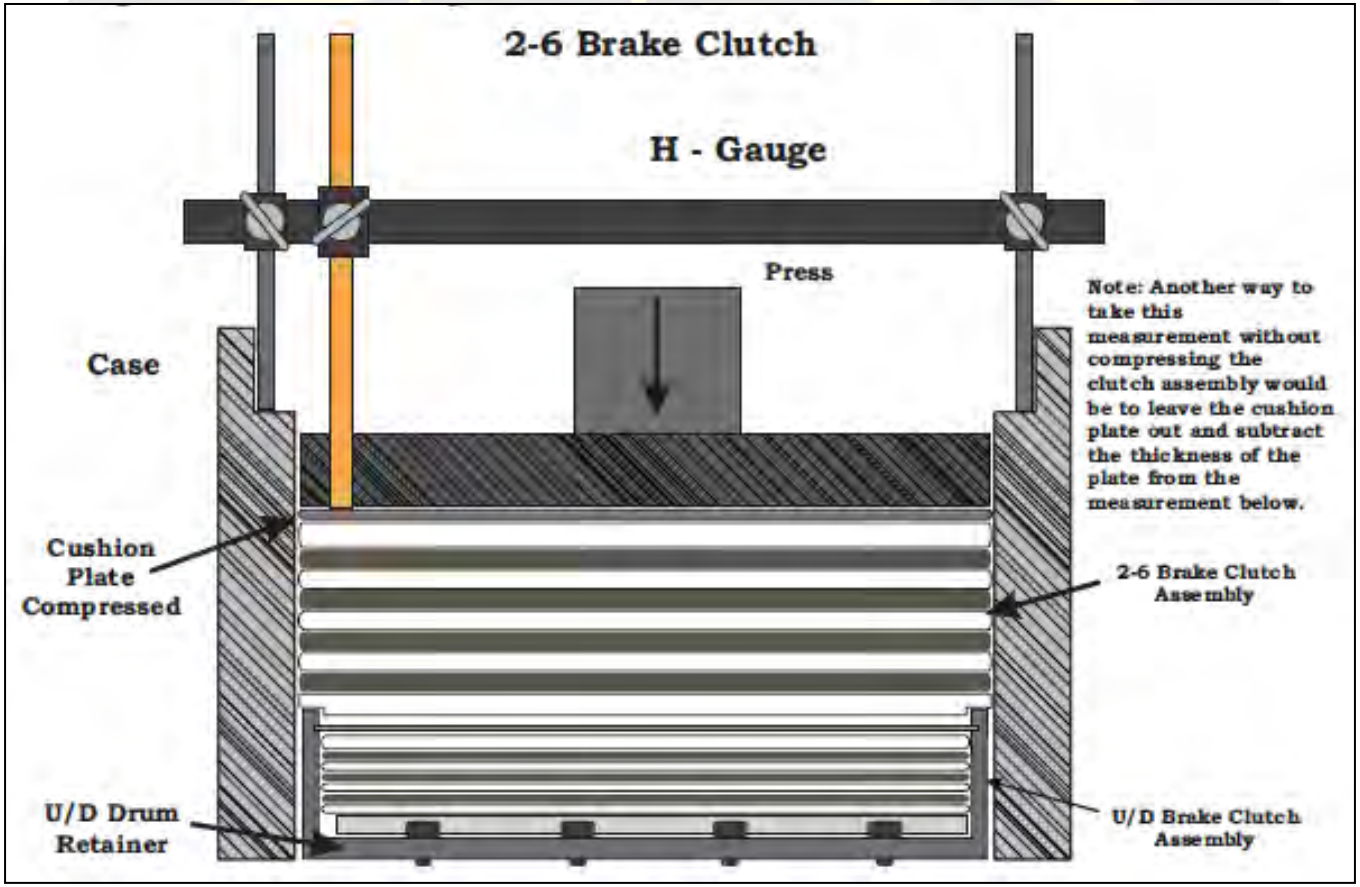
Clutch End Play Checks



Clutch End Play Checks

"Alternative Procedure"

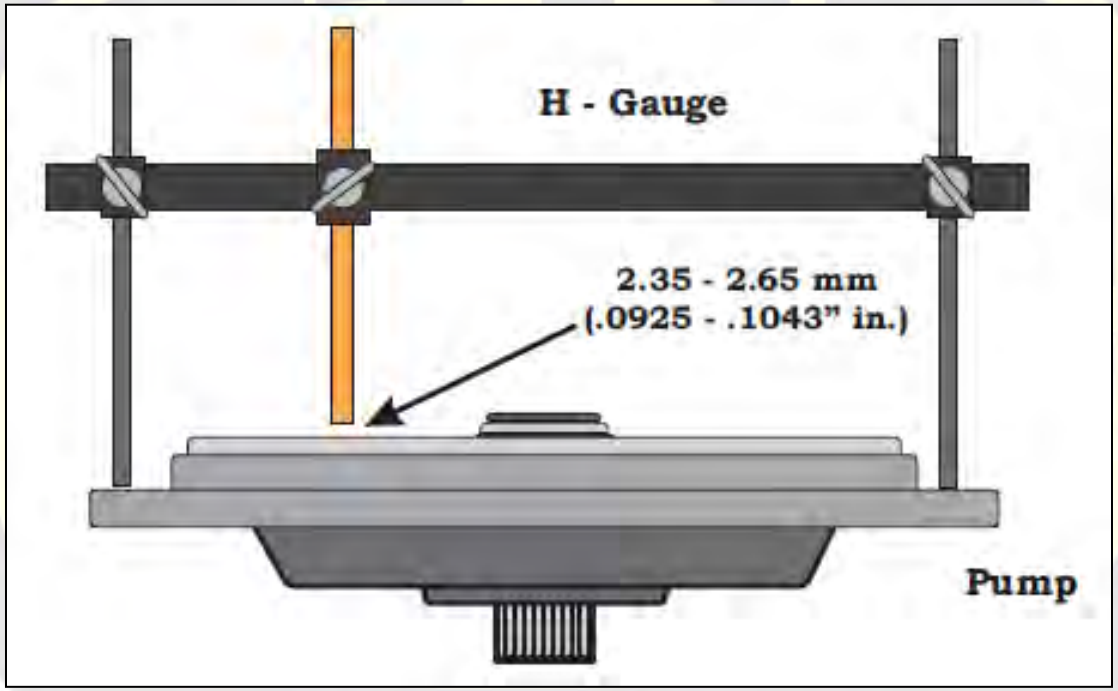
Place the legs of the H-Gauge on the case at the pump to case mating area. Slide the measuring bar down to the compressed 2-6 Brake Clutch Cushion Plate.



Clutch End Play Checks

"Alternative Procedure"

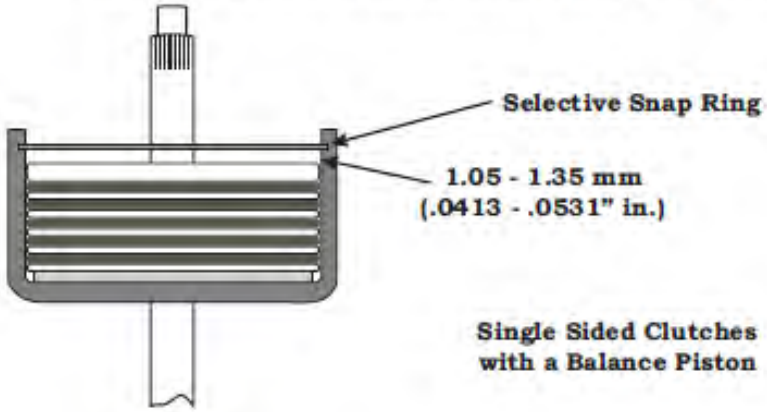
Then flip the H-Gauge over and place onto the pump at the to case mating area. Measure the clearance at the apply piston.



Clutch End Play Checks

3-5- Reverse Clutch

Measure between the selective snap ring and the top pressure plate.

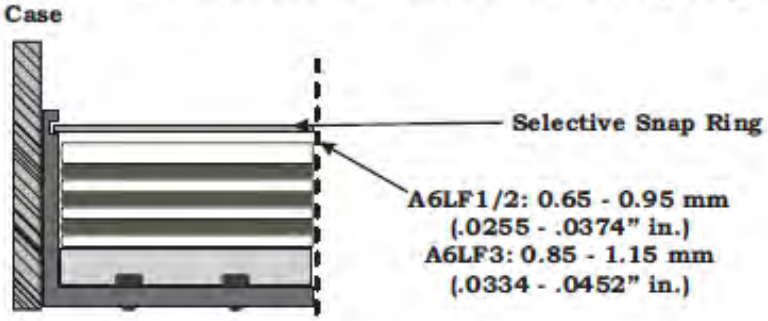


Selective Snap Rings

Part #	Thickness (mm/in.)
45452-3B016	1.6 (.0629)
45452-3B018	1.8 (.0708)
45452-3B020	2.0 (.0787)
45452-3B022	2.2 (.0866)
45452-3B024	2.4 (.0944)
45452-3B026	2.6 (.1023)
45452-3B028	2.8 (.1102)

Under Drive Brake Clutch

Measure between the selective snap ring and the top pressure plate.



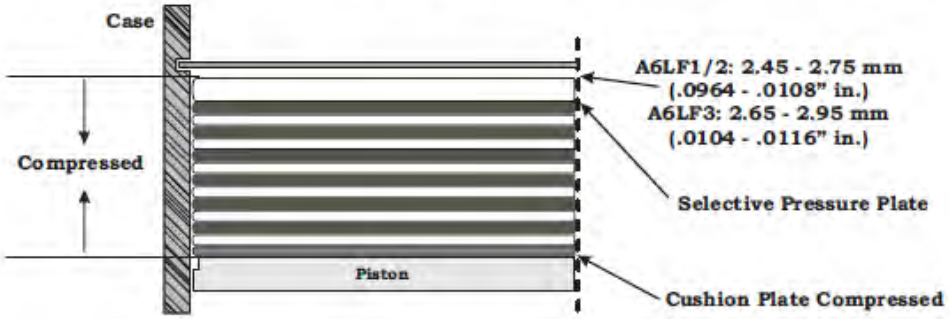
Selective Snap Rings

Part #	Thickness (mm/in.)
45619-3B017	1.7 (.0669)
45619-3B019	1.9 (.0748)
45619-3B021	2.1 (.0826)
45619-3B023	2.3 (.0905)
45619-3B025	2.5 (.0984)
45619-3B027	2.7 (.1062)
45619-3B029	2.9 (.1141)

Clutch End Play Checks

Low Reverse Brake Clutch

Measure between the snap ring and the top selective pressure plate.



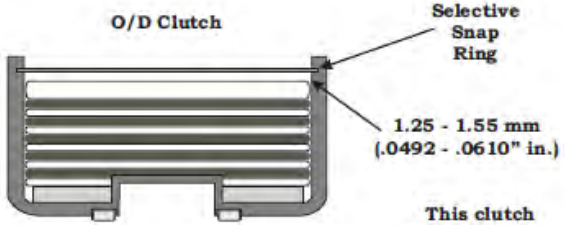
Selective Pressure Plates

Part #	Thickness (mm/in.)
45649-3B015	1.5 (.0590)
45649-3B017	1.7 (.0669)
45649-3B019	1.9 (.0748)
45649-3B021	2.1 (.0826)
45649-3B023	2.3 (.0905)
45649-3B025	2.5 (.0984)
45649-3B027	2.7 (.1062)
45649-3B029	2.9 (.1141)
45649-3B031	3.1 (.1220)
45649-3B033	3.3 (.1299)
45649-3B035	3.5 (.1377)

Note: Another way to take a measurement is to leave out the cushion plate. Measure between the selective pressure plate and the snap ring. Then subtract the thickness of the cushion plate.

Overdrive Brake Clutch

Measure between the selective snap ring and the top pressure plate.



Selective Snap Rings

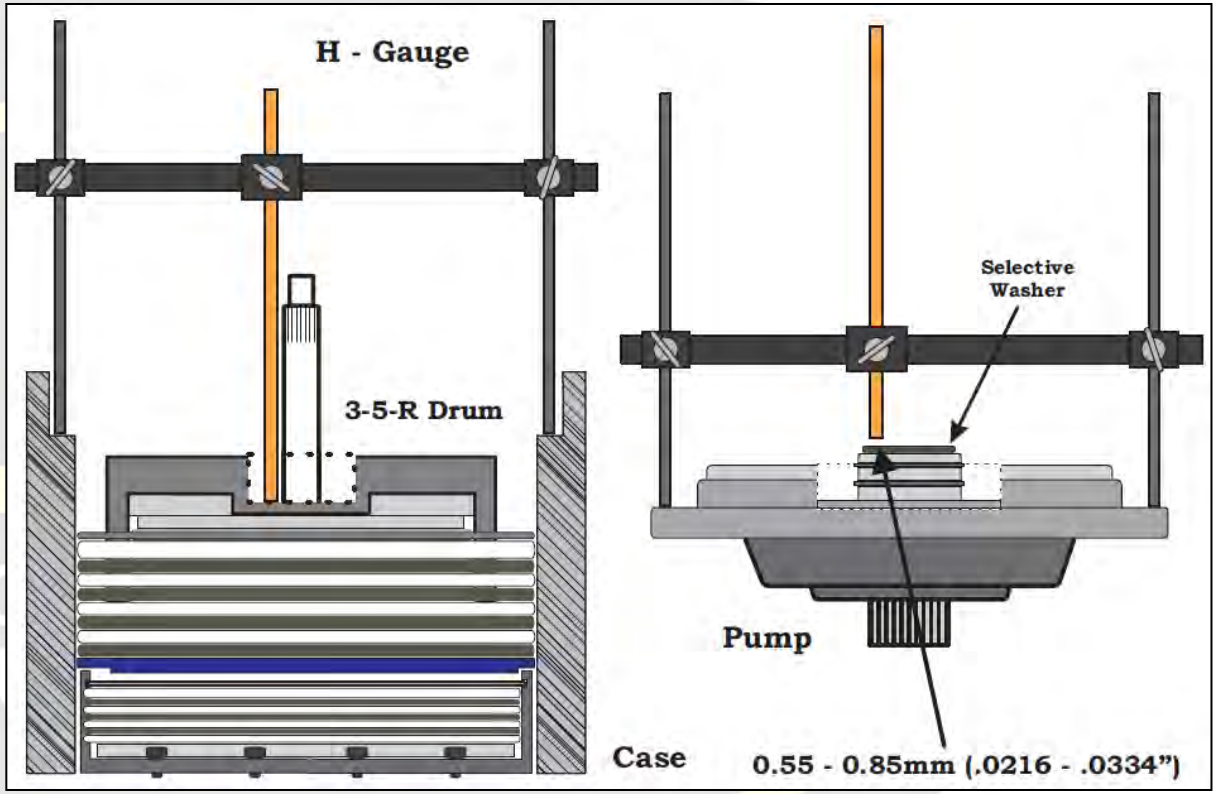
Part #	Thickness (mm/in.)
45552-3B017	1.7 (.0669)
45552-3B019	1.9 (.0748)
45552-3B021	2.1 (.0826)
45552-3B023	2.3 (.0905)
45552-3B025	2.5 (.0984)
45552-3B027	2.7 (.1062)
45552-3B029	2.9 (.1141)

Unit End Play Specifications (Front)

Place the legs of the H-Gauge on the case at the pump to case mating area. Slide the measuring bar down to the bottom of the 3-5-R drum where the thrust washer would make contact.

Then flip the H-Gauge over and place onto the pump at the to case mating area.

With the selective thrust washer in place measure the amount of end play present.



Unit end play (front)
0.55 - 0.85mm (.0216 - .0334")
Selective Thrust Washers

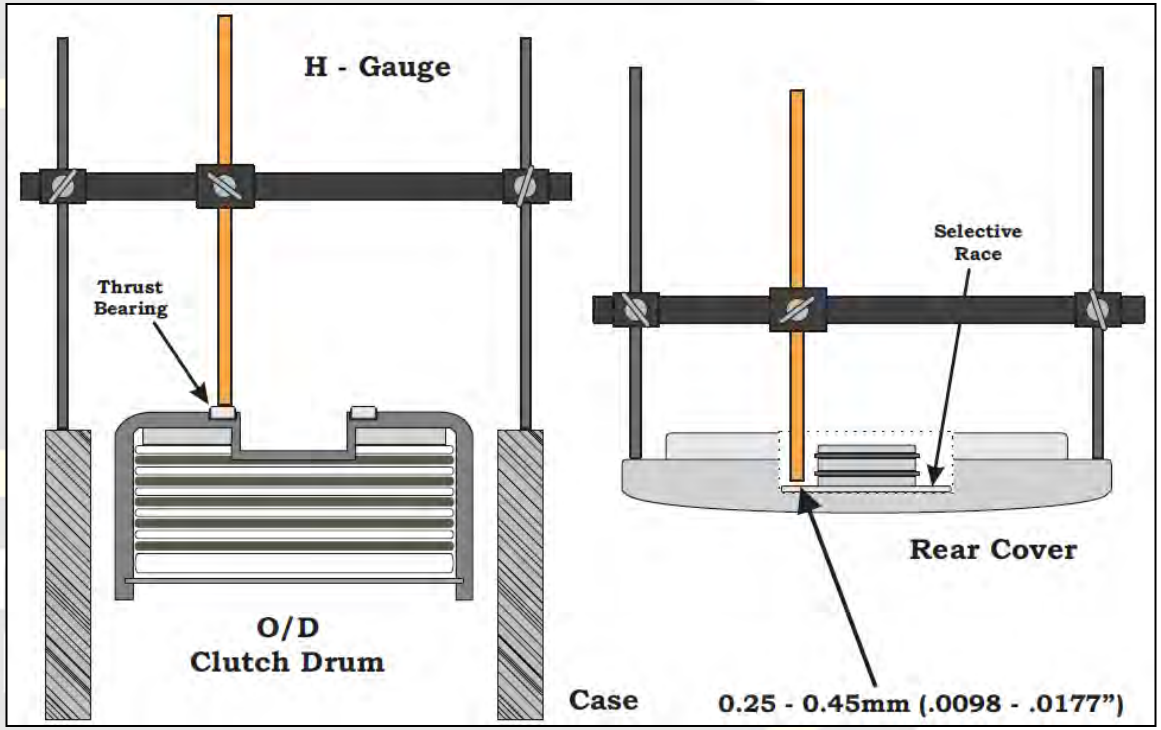
Part #	Thickness (mm/in.)
45472-3B018	1.8 (.0708)
45472-3B020	2.0 (.0787)
45472-3B022	2.2 (.0866)
45472-3B024	2.4 (.0944)
45472-3B026	2.6 (.1023)
45472-3B028	2.8 (.1102)

Unit End Play Specifications (Rear)

Place the legs of the H-Gauge on the case at the rear cover to case mating area. Slide the measuring bar down until it makes contact with the thrust bearing on the bottom of the O/D drum.

Then flip the H-Gauge over and place onto the rear cover at the case to cover mating area.

With the selective race in place measure the amount of end play present.

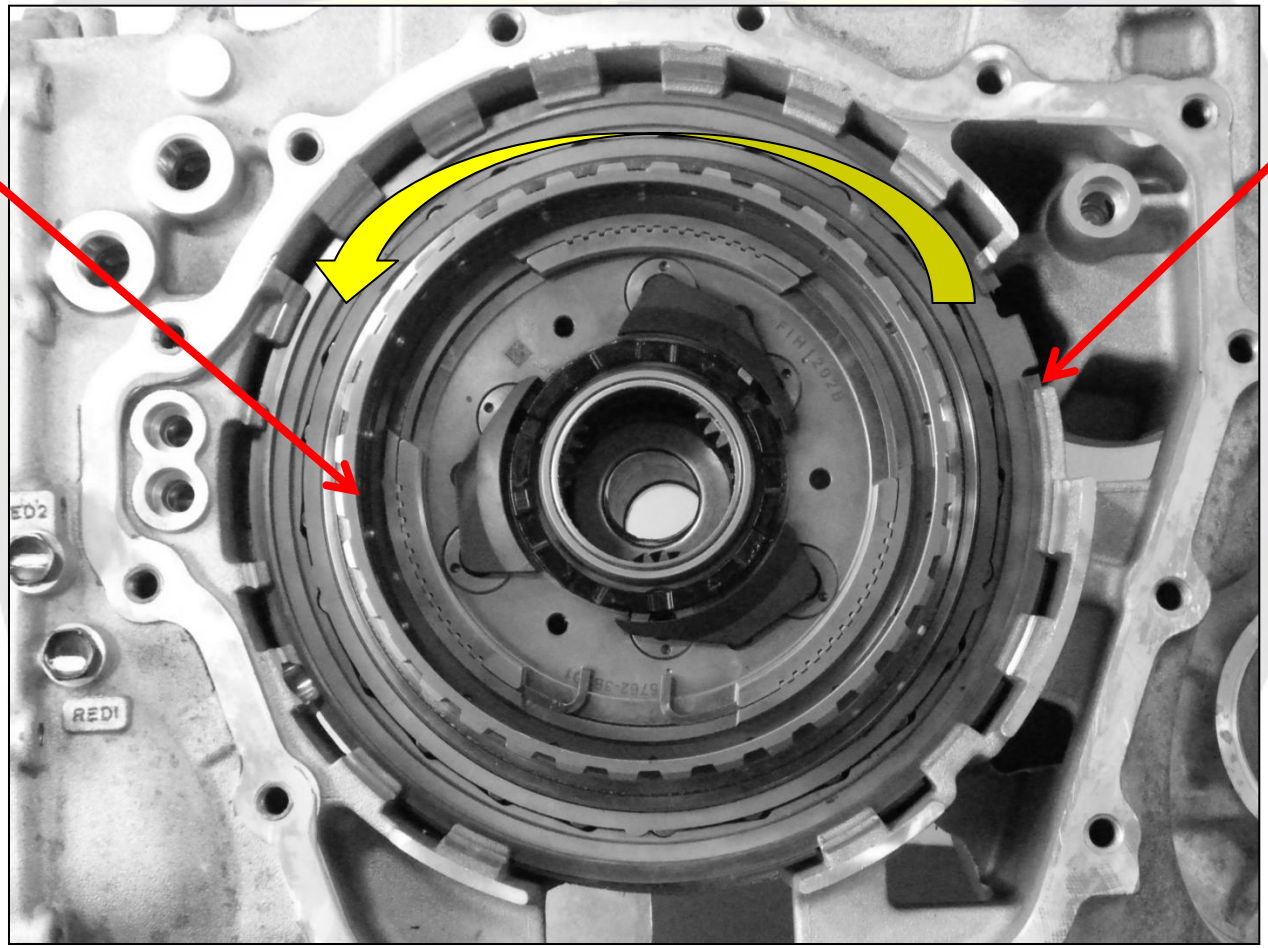


Unit end play (rear)
0.25 - 0.45mm (.0098 - .0177")
Selective Thrust Races

Part #	Thickness (mm/in.)
45853-3B014	1.4 (.0551)
45853-3B015	1.5 (.0590)
45853-3B016	1.6 (.0629)
45853-3B017	1.7 (.0669)
45853-3B018	1.8 (.0708)
45853-3B019	1.9 (.0748)
45853-3B020	2.0 (.0787)
45853-3B021	2.1 (.0826)
45853-3B022	2.2 (.0866)
45853-3B023	2.3 (.0905)

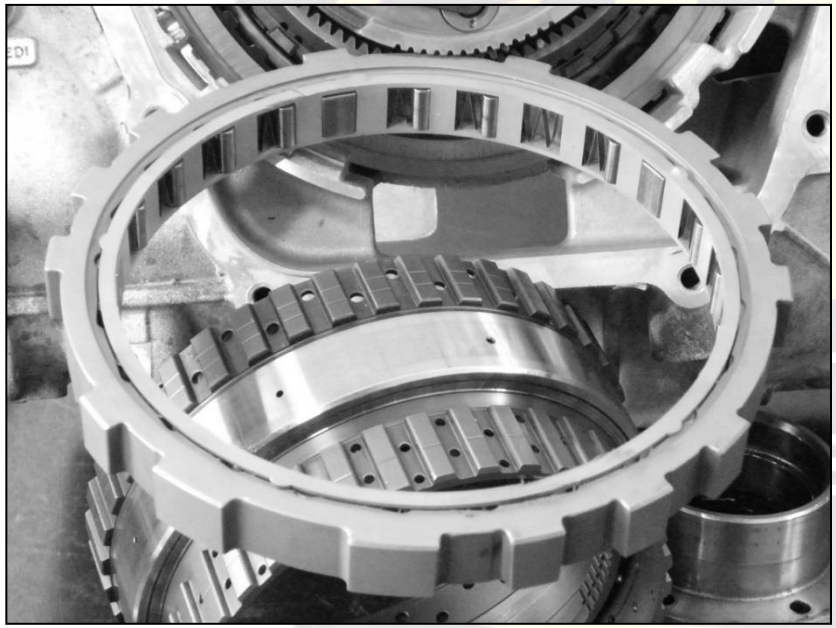
Low/Reverse One Way Clutch (sprag) Rotation

Planet Turns (Freewheels) Counter Clockwise
When Viewed From Back Of Case

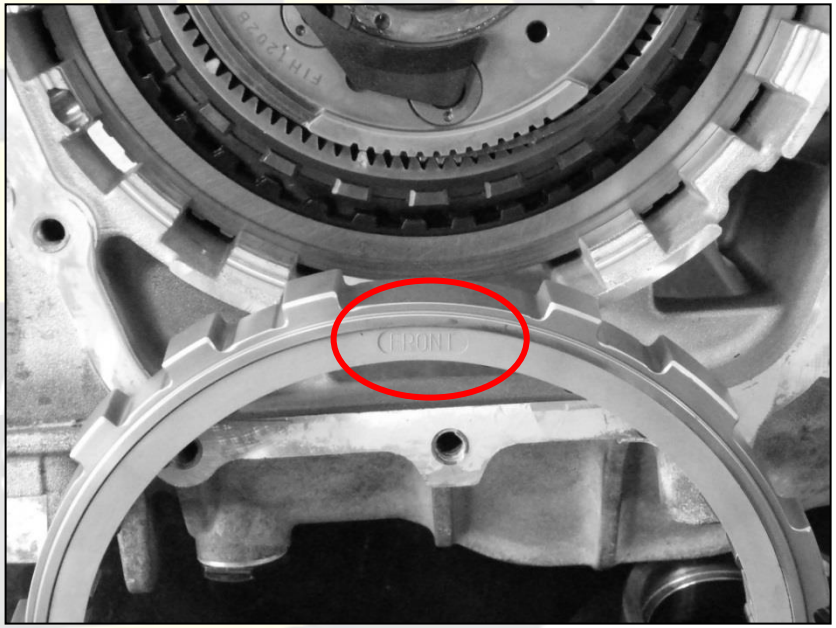


Low/Reverse One Way Clutch (sprag) Rotation

There are no identification marks
On the side that faces out.



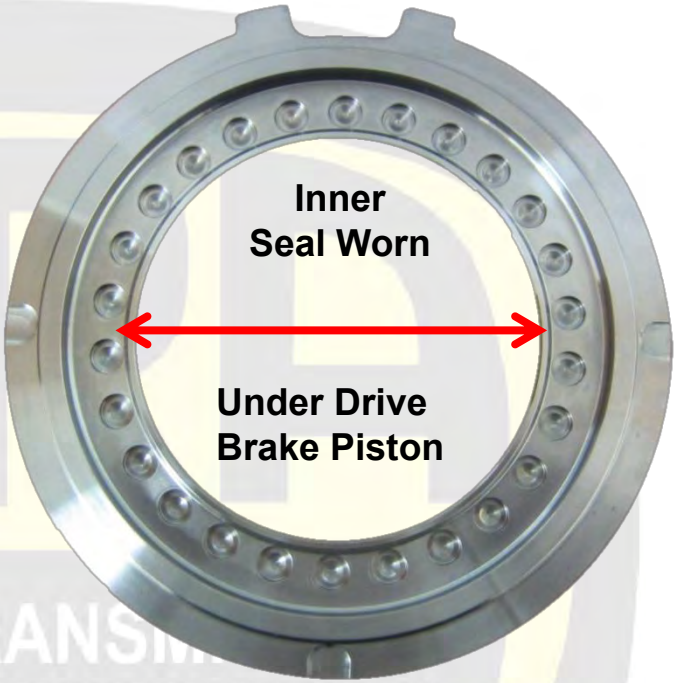
The word “Front” is marked on the
side that faces towards the pump.



“Front”

Under Drive Brake Piston Inner Seal Failure

There is a problem with inner under drive lip seal prematurely wearing. This may cause a delay or slip in drive. This similar to the clutch seal wear found in the early 1999 Subaru 4EAT Phase II transmission.

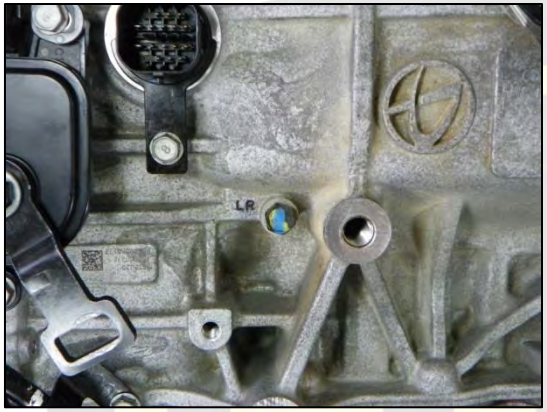


Under Drive Brake Drum

The only difference with this drum is it may be too rough to sand down smooth. the drum will have to be replaced.

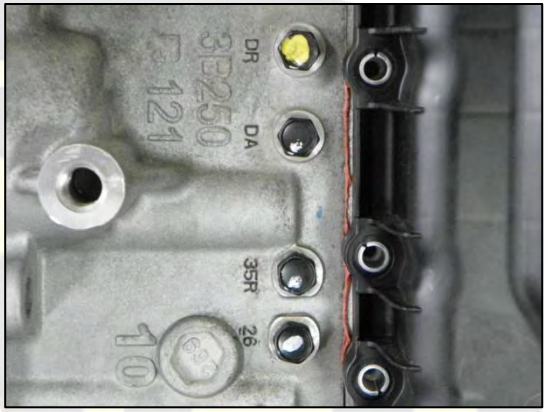
Pressure Tap Identification

Top of Case



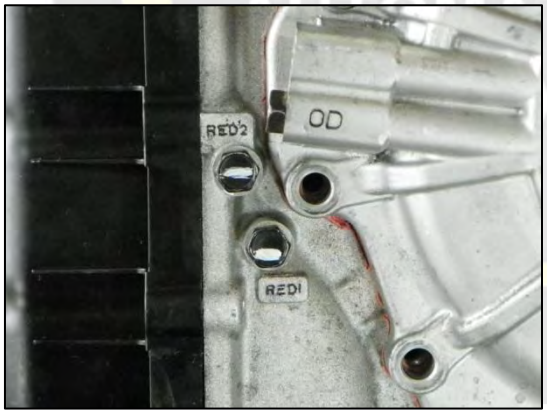
Low Reverse Brake Clutch

Front Side of Case



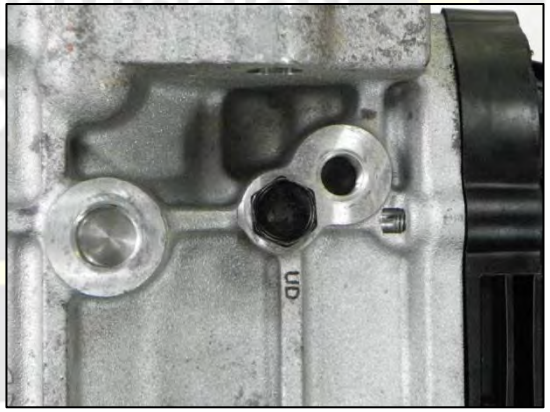
Damper Release/Apply 3-5-Reverse Clutch /2-6 Brake Clutch

Back of Case



Overdrive Clutch / Reducing Pressure 1 / Reducing Pressure 2

Bottom of Case



Under Drive Brake Clutch

Pressure Testing

Shifter Position	RPM	Solenoid Current (mA)						ON/OFF		Solenoid Pressure (psi)								
		UD/B	OD/C	26/B	35R/C	LP	TCC	SSA	SSB	UD/C +/-	OD/C +/-	26/C +/-	35R/C +/-	LR/B +/-	RED1 +/-	RED2 +/-	DR +/-	DA +/-
D1	2500	0	852	0	852	0	0	OFF	OFF	230		1.4 UNDER			71-3	71-3	104-109	62
	▲	700	▲	▲	▲	▲	▲	▲	▲	9-20								
		600								38-44								
		500								65-77								
D2		0	852	852	852	0	0	OFF	OFF	213-249		230	0-6		71-3	71-3		
		▲	▲	352	▲	▲	▲	▲	▲			13-24						
				452								40-74						
				652								65-77						
D3		0	852	0	0	0	0	OFF	ON	213-249	5		230	0-6	71-3	71-3		
		▲	▲	▲	700	▲	▲	▲	▲				6-17					
					600								36-27					
D4		0	0	0	500 852	0	0	OFF	OFF	213-249	213-249		61-72		71-3	71-3		
		▲	700	▲	▲	▲	▲	▲	▲		20							
			652								31				71-3			
D5		852	0	0	0	0	0	OFF	ON	4-6	230		213-249		71-3	71-3		
D6		852	0	852	852	0	852	OFF	OFF		213-249	213-249				71-3	0-3	109-119
		▲	▲	▲	▲	400	▲	▲	▲		35-192							
						600					115-129							
						852					57-71							
						0	562	OFF	OFF								DA 45	DR 60
	0					▲	452	▲	▲								DA 18	DR 33
L	▲	0	0	0	852	0	0	ON	OFF	213-249				230				
D1	600	0	852	0	852	0	0	OFF	OFF	ABOVE 7 (1)					71-3 71-3			
N	▲	852	0	0	852	0	0	ON	OFF					ABOVE 7		71-3		
R	2500	852	852	0	0	0	0	OFF	ON				213-249	230		71-3		

(1) A6LF1/2/3 above 11.2 kph (7 mph)

(2) A6MF1/2 above 9.6 kph (6 mph)

DR = Damper Release (lockup)

DA = Damper Apply (lockup)

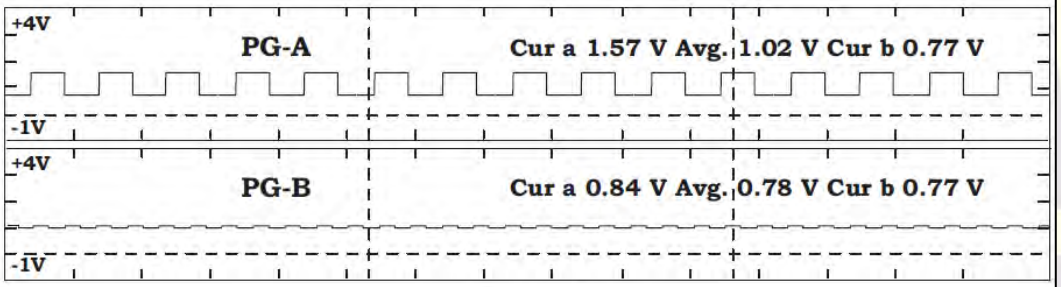
Solenoid Function

Item	Function	Pieces	Specificaions
VFS	2-6/B T/Con	2	Control pressure 9.81-500kps (0.1-5.1kgf/cm2, 1.42-7254psi) Curren value: 50-850mA Low Type 5.1 ohh
	Line pressure Control	1	Control pressure00.14 9.81kpa (5.1-0.1kgf/cm2, 72.54-1.42psi) Curren value: 50-850mA High Type 5.1 ohm
	35R U/D O/D	3	Control pressure00.14 9.81kpa (5.1-0.1kgf/cm2, 72.54-1.42psi) Curren value: 50-850mA High Type 5.1 ohm
On/Off	SS-A SS-B	2	Control pressure 490.33kpa (5.0kgf/cm2 71.12psi) Curreent value 10-110mA On/Off Type 10-11 ohm

Scan Tool & Oscilloscope Data

Current Data: Park

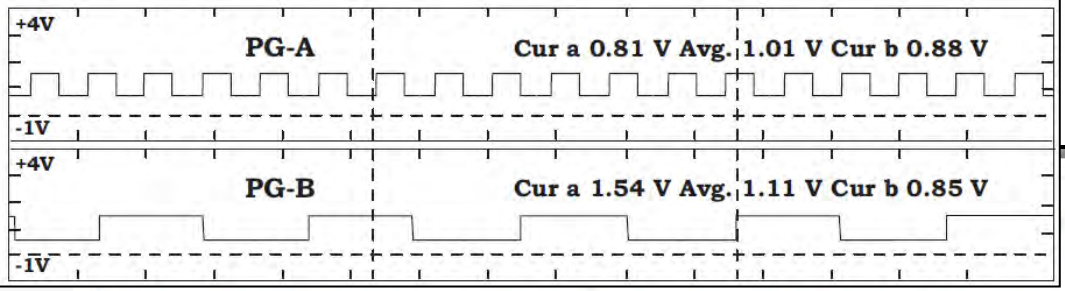
Input Speed (PG-A)	762 RPM
Output Speed (PG-B)	0 RPM
Shift Lever Switch	Park
Current Gear	P/N/R
Engine RPM	792 RPM
Vehicle Speed	0 km/h (0 mp/h)
Gear Ratio	0.0:1
Shift Control Solenoid Valve A	850mA
Shift Control Solenoid Valve B	850mA



Reverse

Current Data: Reverse

Input Speed (PG-A)	745 RPM
Output Speed (PG-B)	219 RPM
Shift Lever Switch	Revers
Current Gear	R
Engine RPM	791 RPM
Vehicle Speed	9 km/h (5.59 mp/h)
Gear Ratio	3.4:1
Shift Control Solenoid Valve A	850mA
Shift Control Solenoid Valve B	850mA

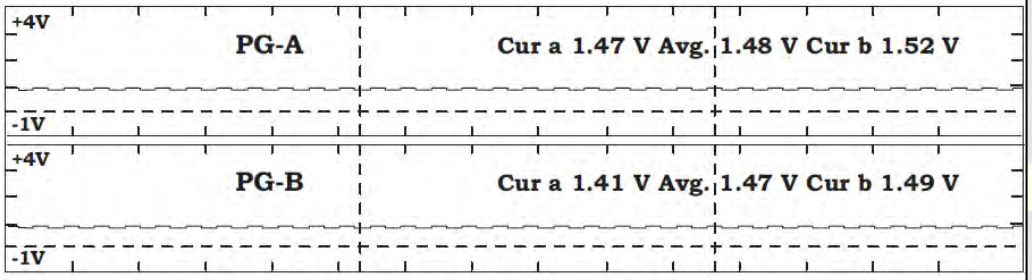


Scan Tool & Oscilloscope Data

Drive 1st Gear Below 6 km/h (3.72 mp/h)

Current Data: Drive

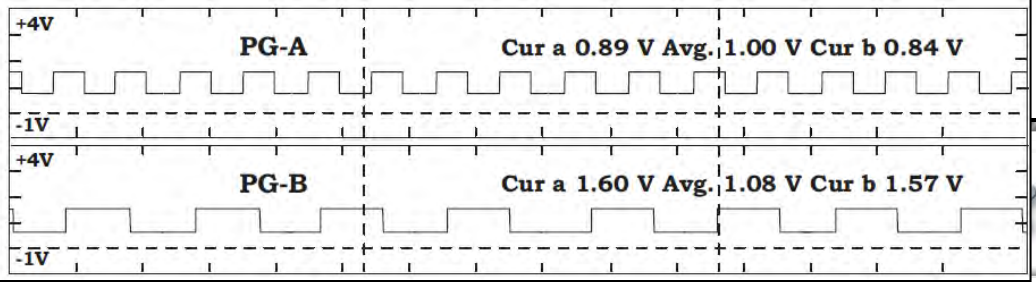
Input Speed (PG-A)	0 RPM
Output Speed (PG-B)	0 RPM
Shift Lever Switch	Drive
Current Gear	1
Engine RPM	788 RPM
Vehicle Speed	0 km/h (0 mp/h)
Gear Ratio	4.7:1
Shift Control Solenoid Valve A	50mA
Shift Control Solenoid Valve B	50mA



Drive 1st Gear Above 6 km/h (3.72 mp/h)

Current Data: Drive

Input Speed (PG-A)	748 RPM
Output Speed (PG-B)	160 RPM
Shift Lever Switch	Drive
Current Gear	1
Engine RPM	791 RPM
Vehicle Speed	6 km/h (3.72 mp/h)
Gear Ratio	4.7:1
Shift Control Solenoid Valve A	850mA
Shift Control Solenoid Valve B	50mA

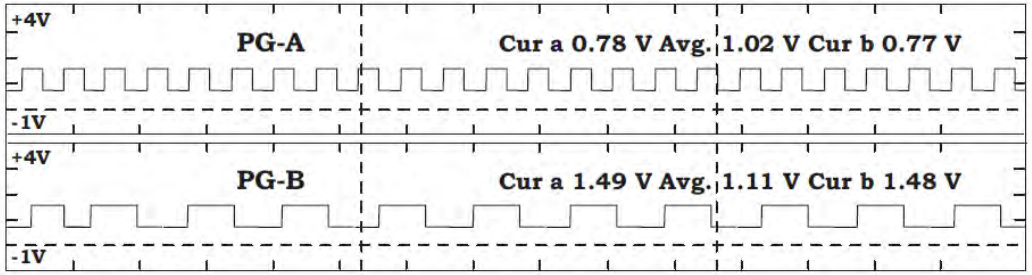


Scan Tool & Oscilloscope Data

Drive 2nd Gear

Current Data: Drive

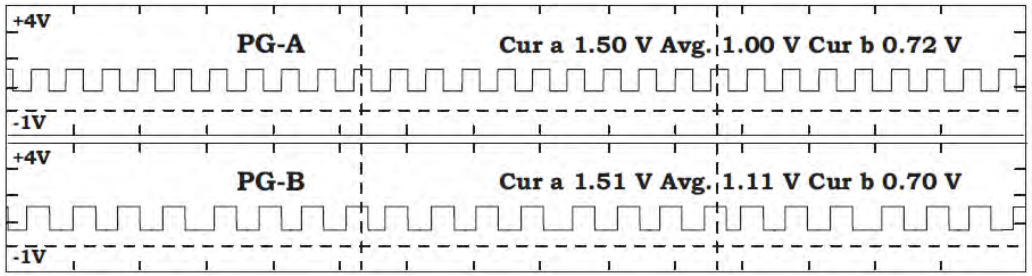
Input Speed (PG-A)	1756 RPM
Output Speed (PG-B)	619 RPM
Shift Lever Switch	Drive
Current Gear	2
Engine RPM	1787 RPM
Vehicle Speed	24 km/h (14.9 mp/h)
Gear Ratio	2.8:1
Shift Control Solenoid Valve A	50mA
Shift Control Solenoid Valve B	50mA



Drive 3rd Gear

Current Data: Drive

Input Speed (PG-A)	1522 RPM
Output Speed (PG-B)	825 RPM
Shift Lever Switch	Drive
Current Gear	3
Engine RPM	1558 RPM
Vehicle Speed	34 km/h (21.1 mp/h)
Gear Ratio	1.8:1
Shift Control Solenoid Valve A	50mA
Shift Control Solenoid Valve B	850mA

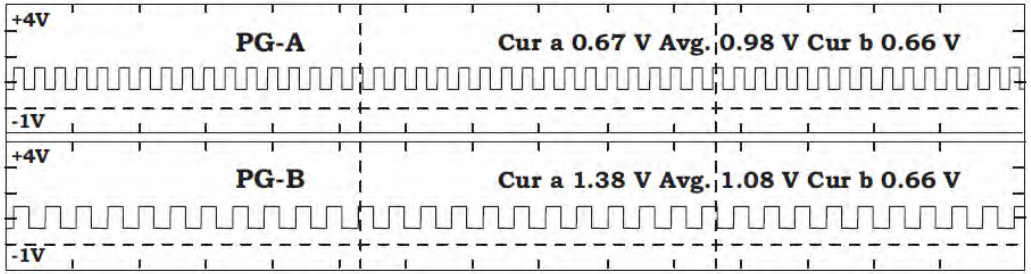


Scan Tool & Oscilloscope Data

Drive 4th Gear

Current Data: Drive

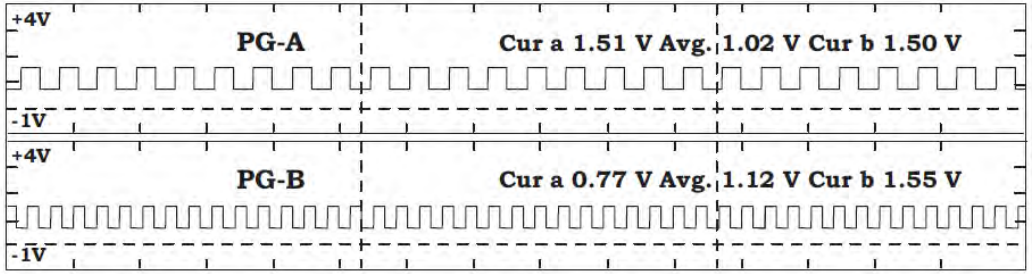
Input Speed (PG-A)	1797 RPM
Output Speed (PG-B)	1296 RPM
Shift Lever Switch	Drive
Current Gear	4
Engine RPM	1863 RPM
Vehicle Speed	50 km/h (31 mp/h)
Gear Ratio	1.4:1
Shift Control Solenoid Valve A	50mA
Shift Control Solenoid Valve B	50mA



Drive 5th Gear

Current Data: Drive

Input Speed (PG-A)	1397 RPM
Output Speed (PG-B)	1810 RPM
Shift Lever Switch	Drive
Current Gear	5
Engine RPM	1497 RPM
Vehicle Speed	71 km/h (44.1 mp/h)
Gear Ratio	1.0:1
Shift Control Solenoid Valve A	50mA
Shift Control Solenoid Valve B	850mA

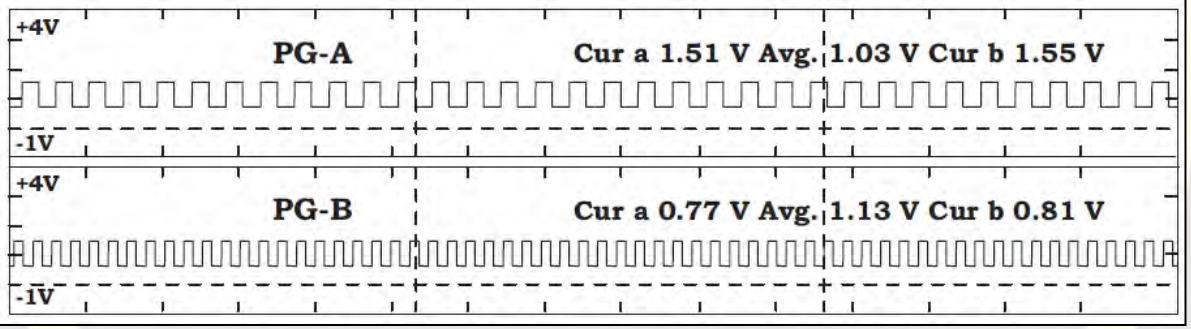


Scan Tool & Oscilloscope Data

Drive 6th Gear

Current Data: Drive

Input Speed (PG-A)	1822 RPM
Output Speed (PG-B)	1360 RPM
Shift Lever Switch	Drive
Current Gear	6
Engine RPM	1823 RPM
Vehicle Speed	92 km/h (57.1 mp/h)
Gear Ratio	0.8:1
Shift Control Solenoid Valve A	50mA
Shift Control Solenoid Valve B	50mA



TCM Learning Procedure

When harsh shifts have occurred or parts related with the transaxle are replaced. TCM learning should be performed.

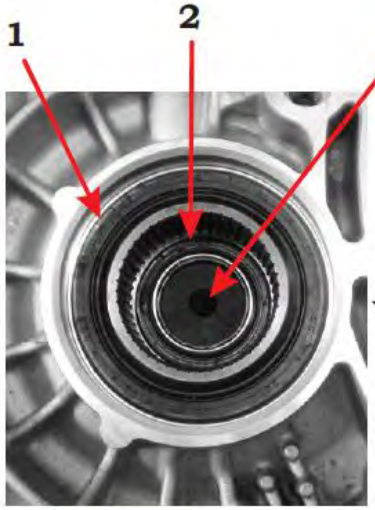
TCM learning is required when;
Transaxle assembly is replaced
TCM is replaced
TCM is updated

Note: ATF temperature must be: 60-115 C (140-239 F)

TCM relearn procedure;
A: Stop learning. (engagements)
1. Shift from Neutral to Park 4 times or more while depressing brake.

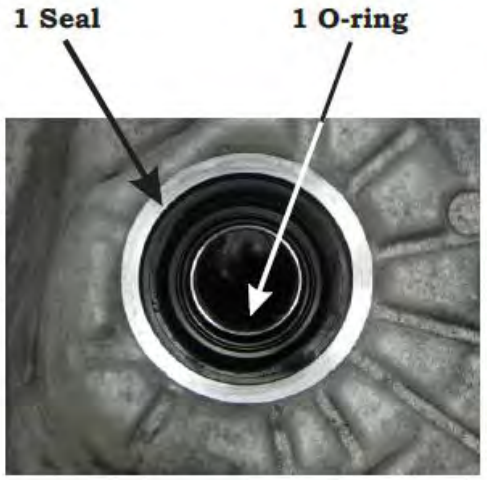
B: Driving learning.
1. Drive through all gears in D range from a stop at a fixed 15-30% throttle opening.
2. Down shift from 6th to 5th, 5th to 4th, 4th to 3rd, 3rd to 2nd, 2nd to 1st.
3. Repeat 4 times or more.

All Wheel Drive



1 Large Seal
2 Small Seal
3 Rubber Coated Metal Plug

All - Wheel Drive Case

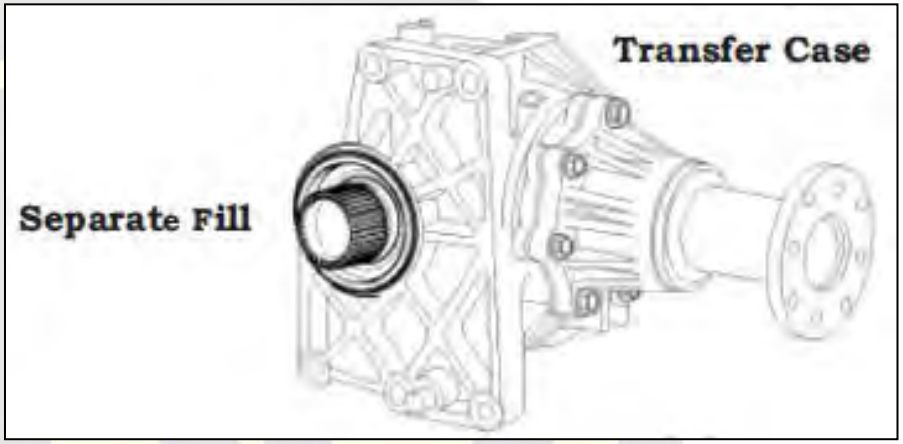


All Wheel Drive

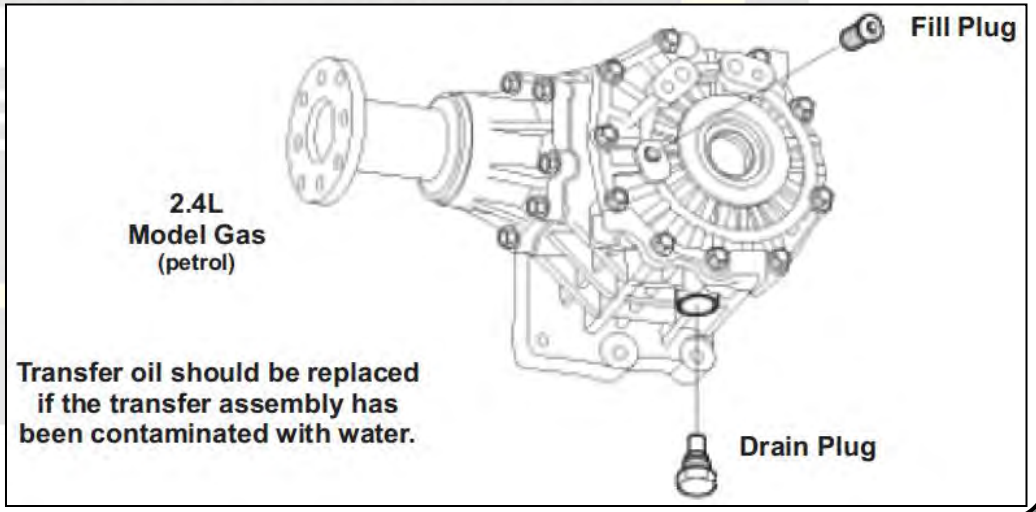
Transfer oil should be checked and refilled if needed every 30 months or 59,500 Km (37,500 miles).

Tightening torque Oil drain plug: 39.2~58.8N.m (4.0~6.0kgf.m, 28.9~43.4lb-ft)
Tightening torque Filler plug: 39.2~58.8N.m (4.0~6.0kgf.m, 28.9~43.4lb-ft)

Transfer Oil Replacement; Transfer oil is not replaced under normal conditions. But it should be replaced every 75,000 miles in severe driving conditions.



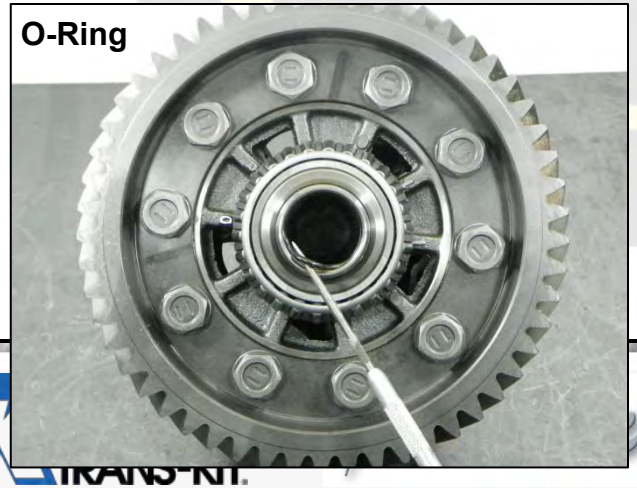
Oil Type:
Hypoid gear oil, SAE 75w/90, AOI GL-2.4L 0.6L (0.16 U.S. gal, 0.63 U.S. qt. 0.53 Imp. qt. 3.5L 0.7L (0.19 U.S. gal, 0.74 U.S. qt. 0.62 Imp. qt.



4 Pinion Differential Gear Set

The differential has a 4 pinion gear set up to handle high torque levels in a compact designed transmission.

- **This creates 50% more capacity than other differentials of the same size.**
- **Differential side gears & pinion gear backlash .025 - .150mm (.0009 - .0059”).**

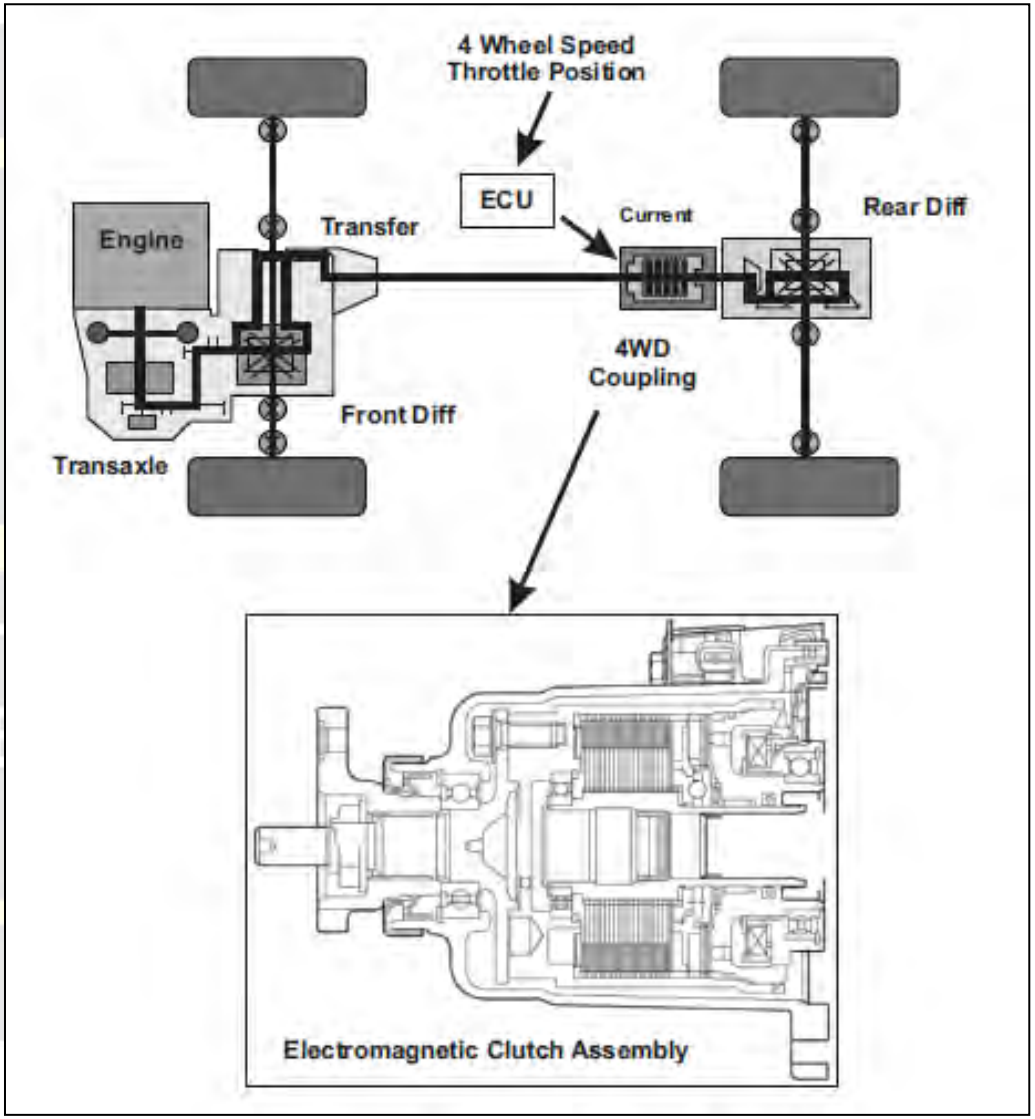


4WD System Power Flow

Auto Mode:
While driving in the 4WD AUTO mode, the vehicle operates similar to conventional 2WD vehicle under normal driving conditions.

If the system determines a need for the 4WD mode, the engine's driving torque is distributed to all four wheels automatically without driver control.

While driving on normal roads and pavement, the vehicle reacts similar to conventional 2WD vehicle.

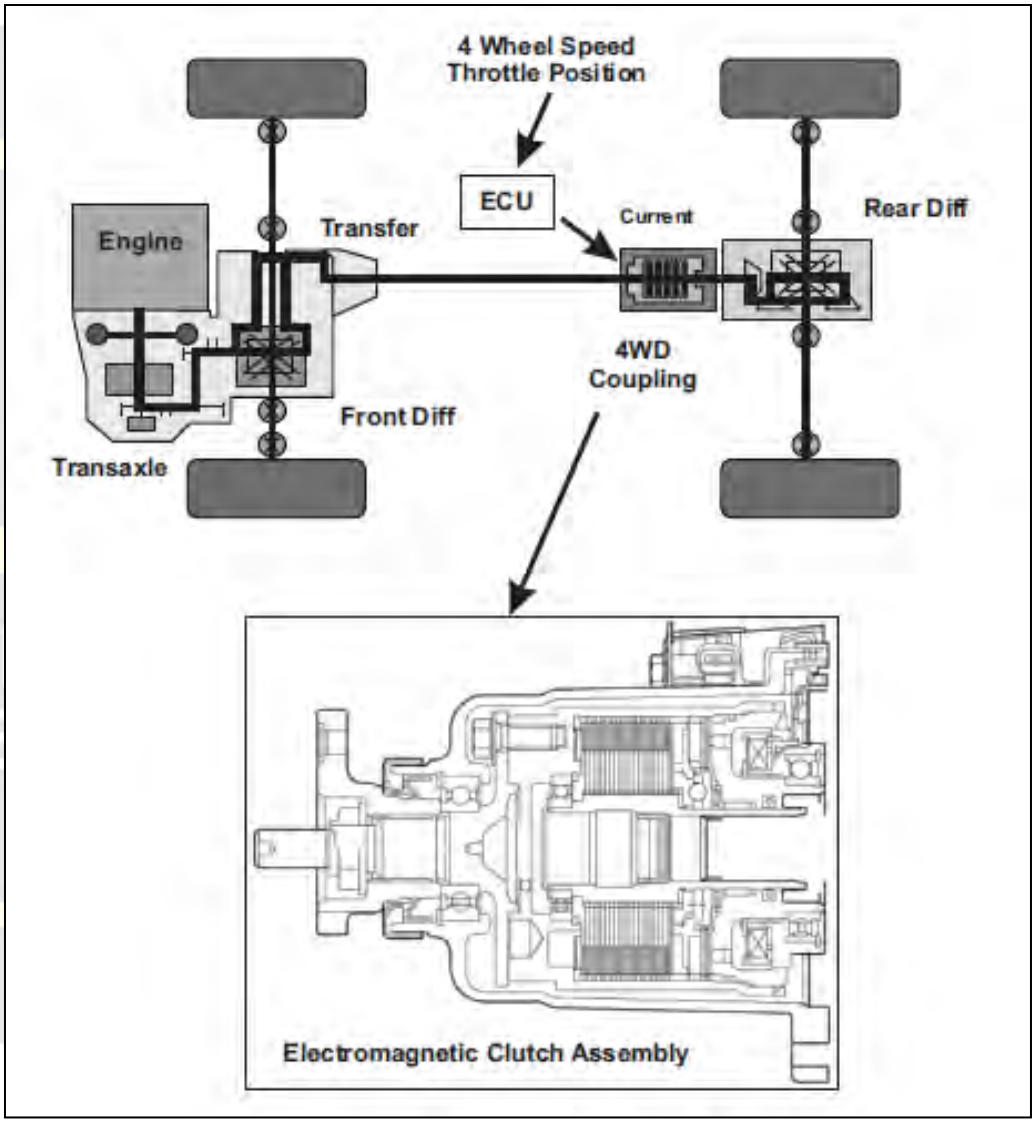


4WD System Power Flow

Lock Mode:
4WD lock mode is used for climbing or descending sharp grades, off-road driving, driving on sandy and muddy roads, etc., for maximize traction.

This mode will automatically begin to deactivate at speeds above 30 km/h (19 mph) and shifts to 4WD AUTO mode at speed above 40 km/h (25 mph).

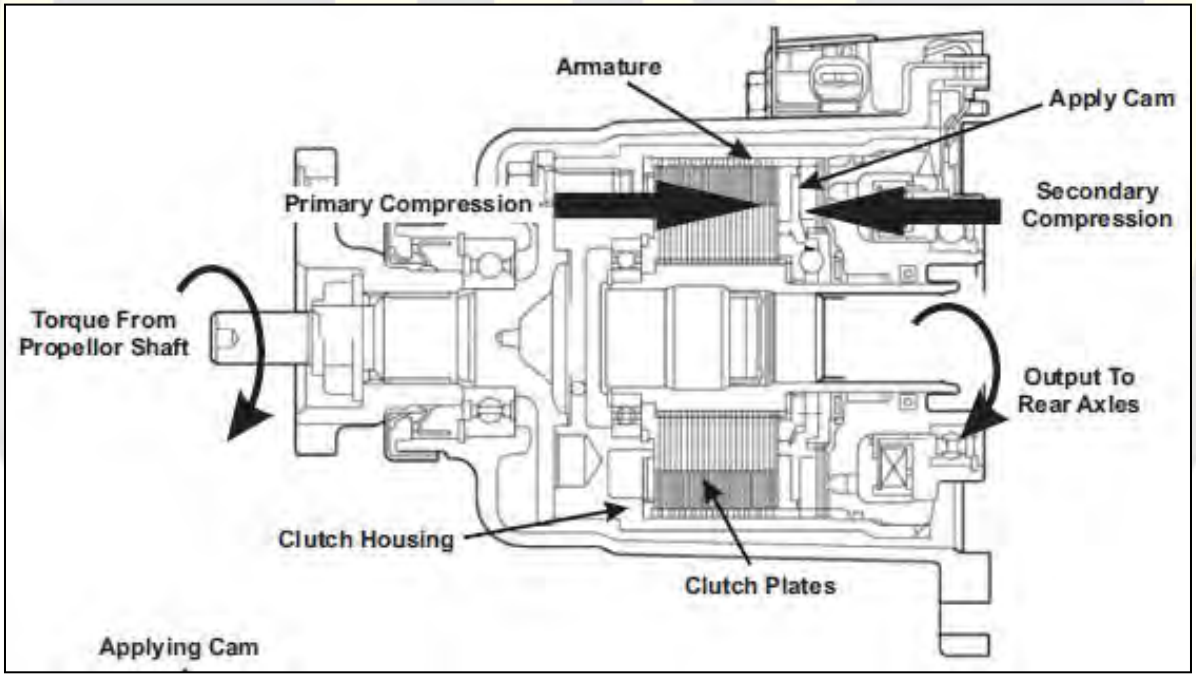
If the vehicle decelerates below 30 km/h (19 mph), the transfer mode is shifted into 4WD LOCK mode again.



4WD System Power Flow

The Electronic Control Unit (ECU) use inputs (listed below) to control the amount of current needed to apply the electromagnetic clutch assembly located in the 4 wheel drive couple mounted onto the rear differential.

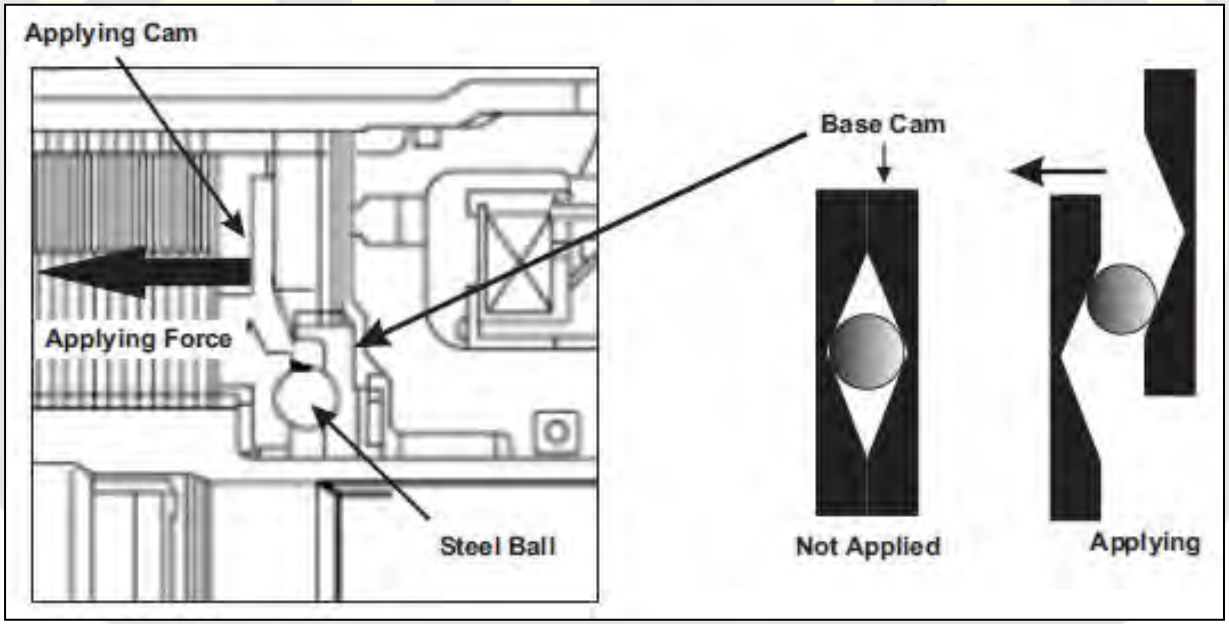
- **Input torque (Throttle position sensor)**
- **Cornering situation (Steering angle sensor)**
- **Vehicle speed and different wheel speed front & rear (Wheel speed sensor)**
- **Braking situation (Brake signal and ABS signal)**



4WD System Power Flow

The EMC (Electric Magnetic Clutch) operates the primary clutch controlling the cam's opening gap.

This Controls the slip of inner & outer plate to optimize front & rear driving force.



Transfer Gear Preload

Note: Transfer gear preload is known to be too tight from factory, this must be checked during rebuild.

Torque Specifications		
Item	**N.m**	**lb.ft**
Transfer drive gear	30.4 - 35.3	22.4 - 26.0
Rear cover	27.5 - 34.3	20.3 - 25.3
Under drive brake retainer	30.4 - 35.3	22.4 - 26.0
Under drive brake chamber	4.9 - 9.8	3.6 - 7.2
Park rod guide	9.8 - 11.8	7.2 - 8.7
Oil pump pipe	9.8 - 11.8	7.2 - 8.7
Oil pump	19.6 - 25.5	14.5 - 15.9
Oil filter	9.8 - 11.8	7.2 - 8.7
Torque converter housing	27.5 - 34.3	20.3 - 25.3
Valve body cover	9.8 - 11.8	7.2 - 8.7
Inhibitor switch	9.8 - 11.8	7.2 - 8.7
Manual control lever	17.7 - 24.5	13.0 - 18.1

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