



AW55-50SN

B E N C H M A R K S

V o l u m e 2 1





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Section One: Unit ID

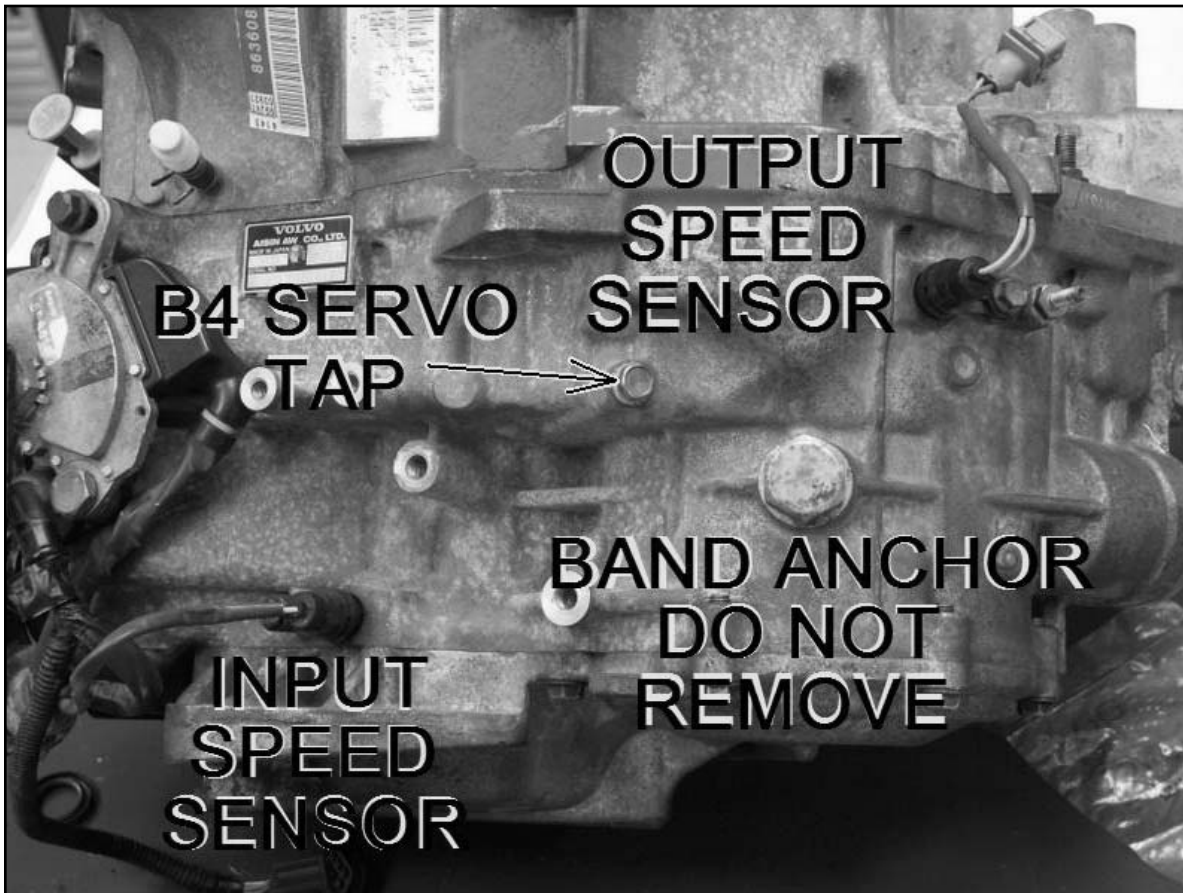
Below is a list of vehicles the AW55-50SN is found in. Both Volvo and Saab use the Asian Warner designation, while Nissan calls this unit an RE5F22A, and GM calls it the AF23-5 or AF33-5, depending on application.

Volvo (AW55-50SN) '02-'07 40 series, '05-'07 50 series; '01-'08 60 series (except R); '01-'07 70 series (except R); '04-'06 80 series, '03-'06 90 series; '02 Cross Country

Saab (AW55-50SN) '03-'07 9'3; '02-'07 9'5

Nissan (RE5F22A) '05-'06 Altima; '04-'06 Maxima (except SL); '04-'06 Quest (except S)

GM (AF23-5, AF33-5) '05-'08 Chevrolet Equinox; '06-'08 Pontiac Torrent; '02-'03 Saturn VUE; '03-'04 Saturn Ion.

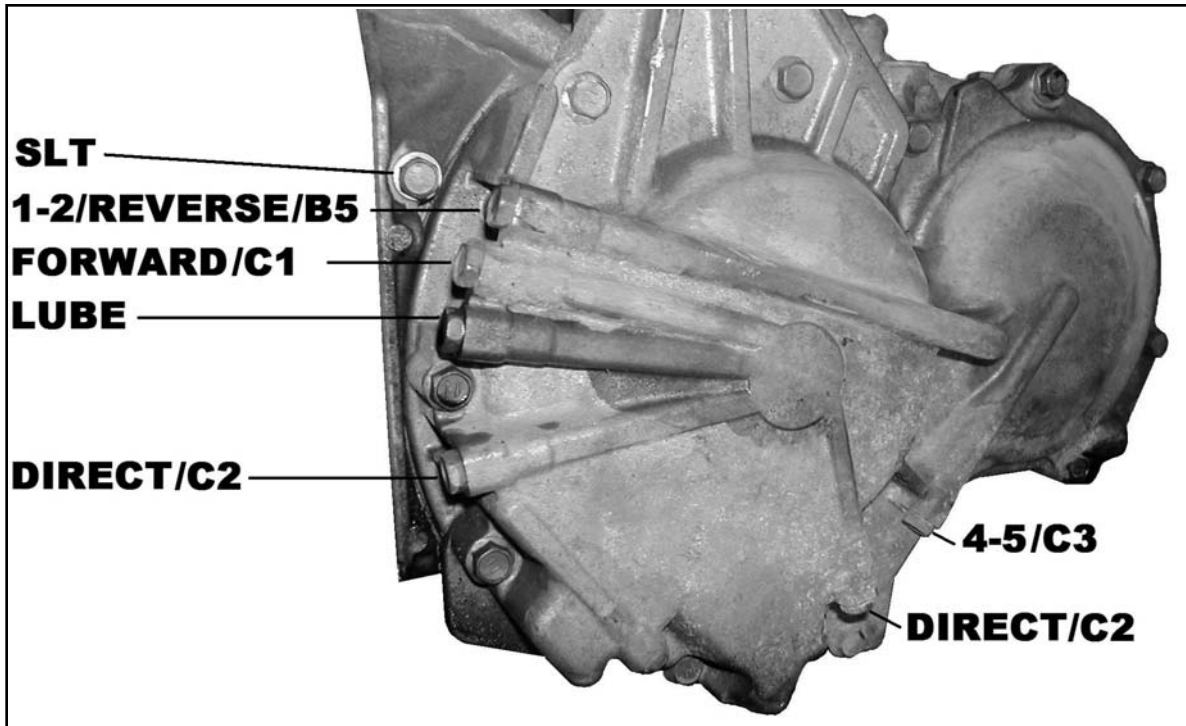


Notice ID tag next to vent in upper left-hand corner, near MLP sensor.



Section One: Unit ID

Pressure Tap Locations



Critical pressure tests must be performed to ascertain the overall health of the valve body and unit. These are:

- 1-2/Reverse Pressure - Drive 48-56 @ idle, 185-205 @ stall.
Reverse 72-88 @ idle, 248-287 @ stall.
- Lube Pressure - 30 PSI cold, 5 PSI in D, 8 PSI in R hot.
- SLT Pressure - 5 @ idle, 80 @ stall.
- C1 clutch pressure - 25 on initial engagement, quickly to 50 @ idle, 185 @ stall.
- B4 pressure - Must follow C1 clutch pressure on apply. If not within 10 PSI, suspect SLT/SLS or control issues.

NOTE EXCEPT LUBE, PERFORM ALL PRESSURE TESTS WITH TRANSMISSION TEMPERATURE @ APPROXIMATELY 150° F.



Section Two: Clutch/Band and Solenoid Application

Gear	Second Clutch	Second Coast Clutch	Second Sprag	Low Sprag	Low/Rev Clutch	Forward Clutch	Direct Clutch	4-5 Clutch	3rd Gear Band	1-2 Reverse Clutch
	B2	B1	F1	F2	B3	C1	C2	C3	B4	B5
Park										APPLIED
Reverse					APPLIED		APPLIED			APPLIED
Neutral										APPLIED
D	1			HOLDING		APPLIED				APPLIED
	2	APPLIED	APPLIED	HOLDING		APPLIED				APPLIED
	3	APPLIED	APPLIED	HOLDING		APPLIED			APPLIED	
	4	APPLIED	APPLIED	HOLDING		APPLIED		APPLIED		
	5	APPLIED				APPLIED	APPLIED	APPLIED		
I	1			HOLDING		APPLIED				APPLIED
	2	APPLIED	APPLIED	HOLDING		APPLIED				APPLIED
	3	APPLIED	APPLIED	HOLDING		APPLIED			APPLIED	
L	1 E/B			HOLDING	APPLIED	APPLIED				APPLIED
	2	APPLIED	APPLIED	HOLDING		APPLIED				APPLIED



Section Two: Clutch/Band and Solenoid Application

Saturn, GM, and Saab Solenoid Apply Chart

Gear	SLU	SS1	SS2	SS3	SS4	SS5
Park		X		X		
Reverse			X	X		X
Reverse Inhibit		X	X			
Neutral		X		X		
1st		X		X		
1st -2nd			X	X		
2nd	•		X	X		
2nd - 3rd		X	X	X		X
3rd	•	X	X	X		
3rd - 4th		X		X	X	X
4th	•	X		X	X	
4th - 5th				X	X	
5th	•			X	X	
Manual Low		X		X		X
Manual 2nd			X	X		
Manual 3rd			X	X	X	

X = Applied

• = Conditional

SLT Solenoid controls line pressure

SLS Solenoid controls shift feel

SLU Solenoid controls TCC apply



Section Two: Clutch/Band and Solenoid Application

Volvo and Nissan Solenoid Apply Chart

Gear	SLU	SS1	SS2	SS3	SS4	SS5
Park		X	X	X		
Reverse				X		X
Reverse Inhibit		X				
Neutral		X	X	X		
1st		X	X	X		
1st - 2nd				X		
2nd	•			X		
2nd - 3rd		X		X		X
3rd	•	X		X		
3rd - 4th		X	X	X	X	X
4th	•	X	X	X	X	
4th - 5th			X	X	X	
5th	•		X	X	X	
Manual Low		X	X	X		X
Manual 2nd				X		
Manual 3rd				X	X	

X = Applied

• = Conditional

SLT Solenoid controls line pressure

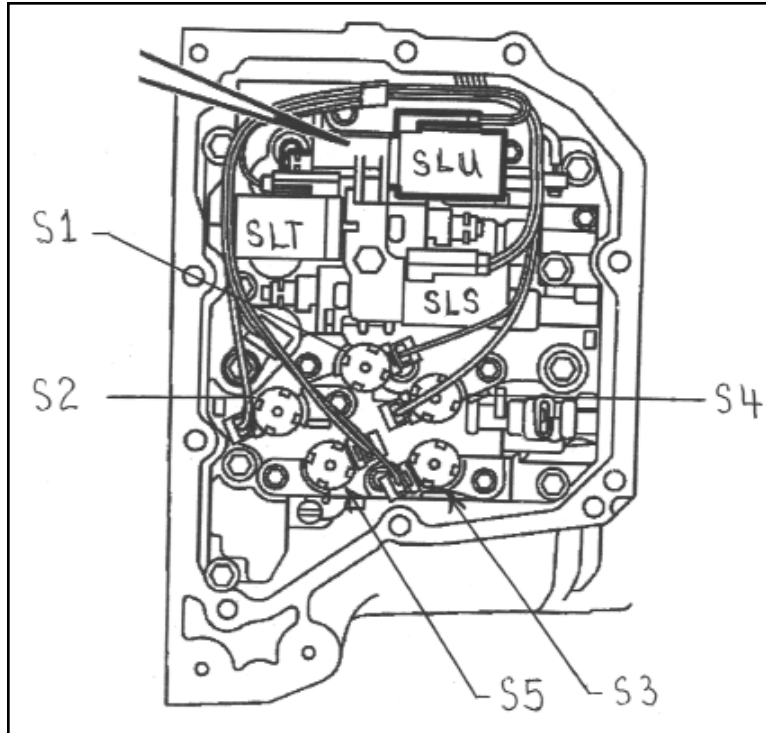
SLS Solenoid controls shift feel

SLU Solenoid controls TCC apply

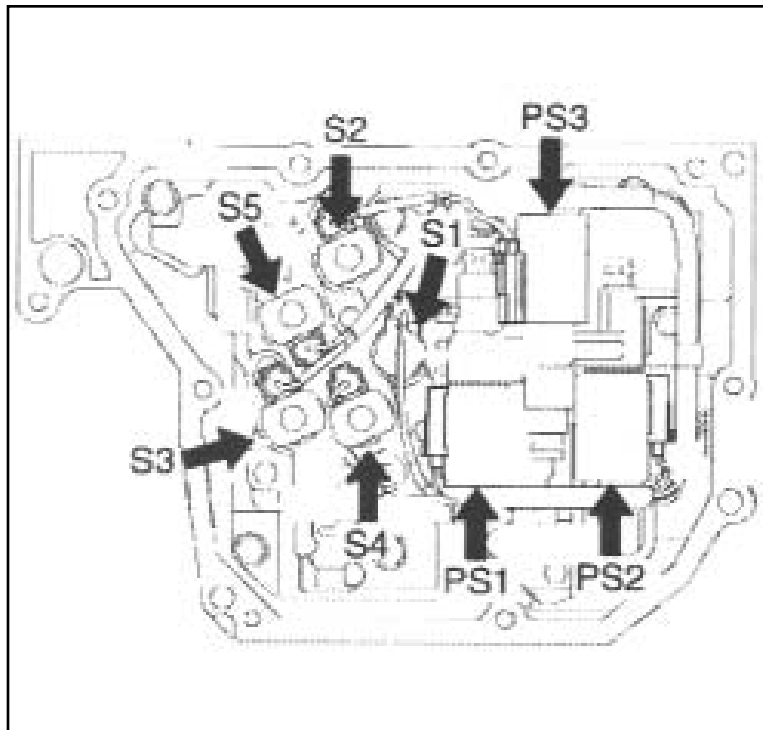
Section Two: Clutch/Band and Solenoid Application

Solenoid ID

GM, Saturn, Volvo, Saab

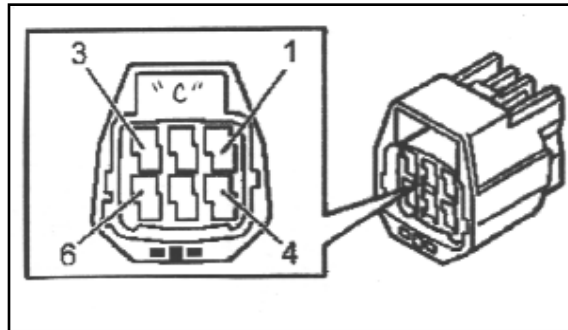


Nissan

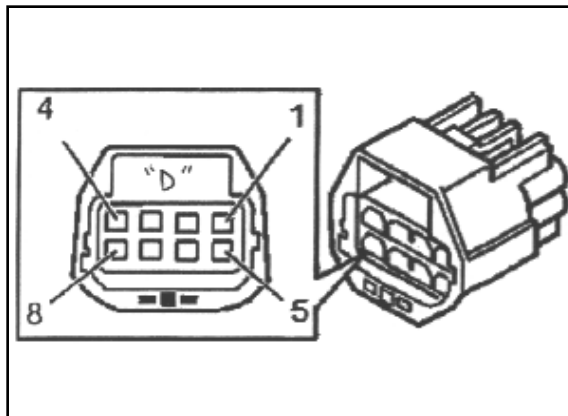


Section Two: Clutch/Band and Solenoid Application

Solenoid and Harness Information - Volvo



Solenoid	Case Connector Pin Numbers	Resistance
S1	1	12 - 16 Ohms
S2	2	11 - 15 Ohms
S3	3	11 - 15 Ohms
S4	4	11 - 15 Ohms
S5	5	11 - 15 Ohms

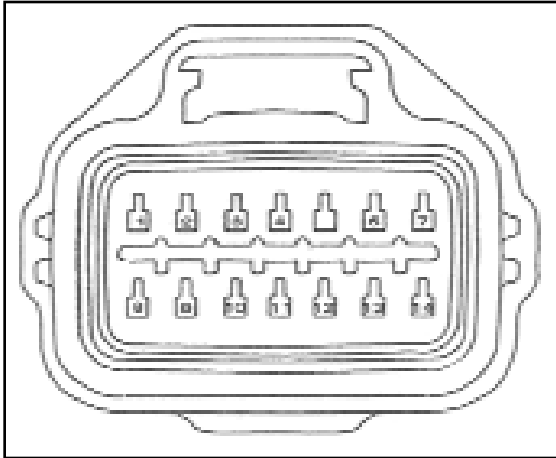


Solenoid	Case Connector Pin Numbers	Resistance
TOT	7 and 8	4.0 - 4.5 K Ohms
SLT	3 and 4	5.0 - 5.6 Ohms
SLU	1 and 2	5.0 - 5.6 Ohms
SLS	5 and 6	5.0 - 5.6 Ohms

Section Two: Clutch/Band and Solenoid Application

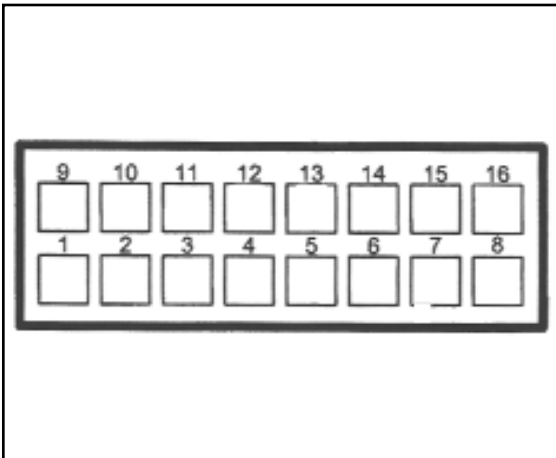
Solenoid and Harness Information - Saturn and Saab

Saturn



<i>Solenoid</i>	<i>Case Connector Pin Numbers</i>	<i>Resistance</i>
<i>TOT</i>	<i>1 and 8</i>	<i>4.0 - 4.5 K Ohms</i>
<i>SLT</i>	<i>4 and 11</i>	<i>5.0 - 5.6 Ohms</i>
<i>SLU</i>	<i>3 and 10</i>	<i>5.0 - 5.6 Ohms</i>
<i>SLS</i>	<i>2 and 9</i>	<i>5.0 - 5.6 Ohms</i>
<i>S1</i>	<i>14</i>	<i>11 - 16 Ohms</i>
<i>S2</i>	<i>7</i>	<i>11 - 16 Ohms</i>
<i>S3</i>	<i>13</i>	<i>11 - 16 Ohms</i>
<i>S4</i>	<i>6</i>	<i>11 - 16 Ohms</i>
<i>S5</i>	<i>12</i>	<i>11 - 16 Ohms</i>

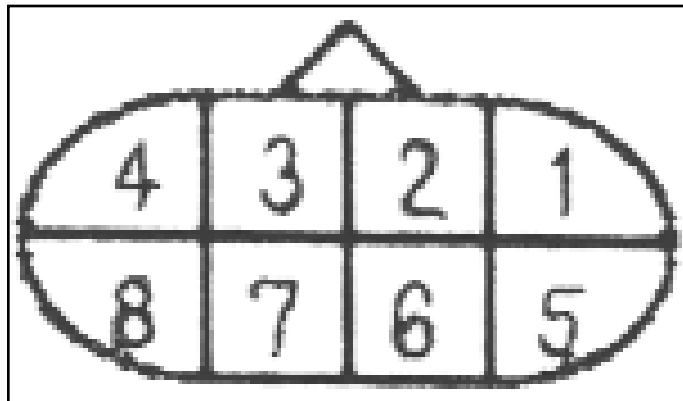
Saab



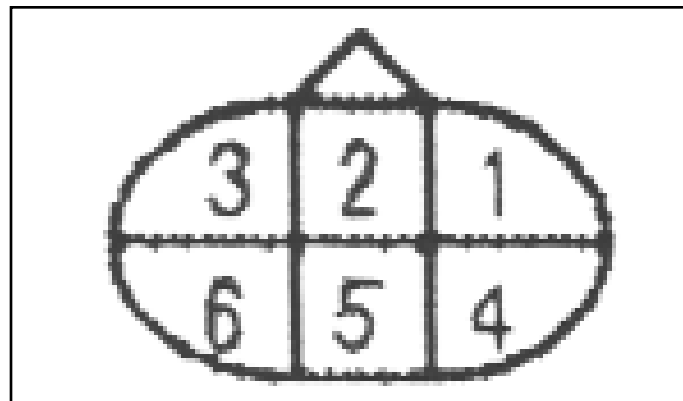
<i>Solenoid</i>	<i>Case Connector Pin Numbers</i>	<i>Resistance</i>
<i>TOT</i>	<i>6 and 14</i>	<i>4.0 - 4.5 K Ohms</i>
<i>SLT</i>	<i>3 and 11</i>	<i>5.0 - 5.6 Ohms</i>
<i>SLU</i>	<i>4 and 12</i>	<i>5.0 - 5.6 Ohms</i>
<i>SLS</i>	<i>5 and 13</i>	<i>5.0 - 5.6 Ohms</i>
<i>S1</i>	<i>1</i>	<i>11 - 16 Ohms</i>
<i>S2</i>	<i>9</i>	<i>11 - 16 Ohms</i>
<i>S3</i>	<i>2</i>	<i>11 - 16 Ohms</i>
<i>S4</i>	<i>10</i>	<i>11 - 16 Ohms</i>
<i>S5</i>	<i>15</i>	<i>11 - 16 Ohms</i>

Section Two: Clutch/Band and Solenoid Application

Solenoid and Harness Information - Nissan



Solenoid	Case Connector Pin Numbers	Resistance
SS4	1	11 - 16 Ohms
SS1	2	11 - 16 Ohms
PS2	3 and 7	5.0 - 5.6 Ohms
TOT	4 and 8	4.2 K Ohms @ 68°F
SS5	5	11 - 16 Ohms

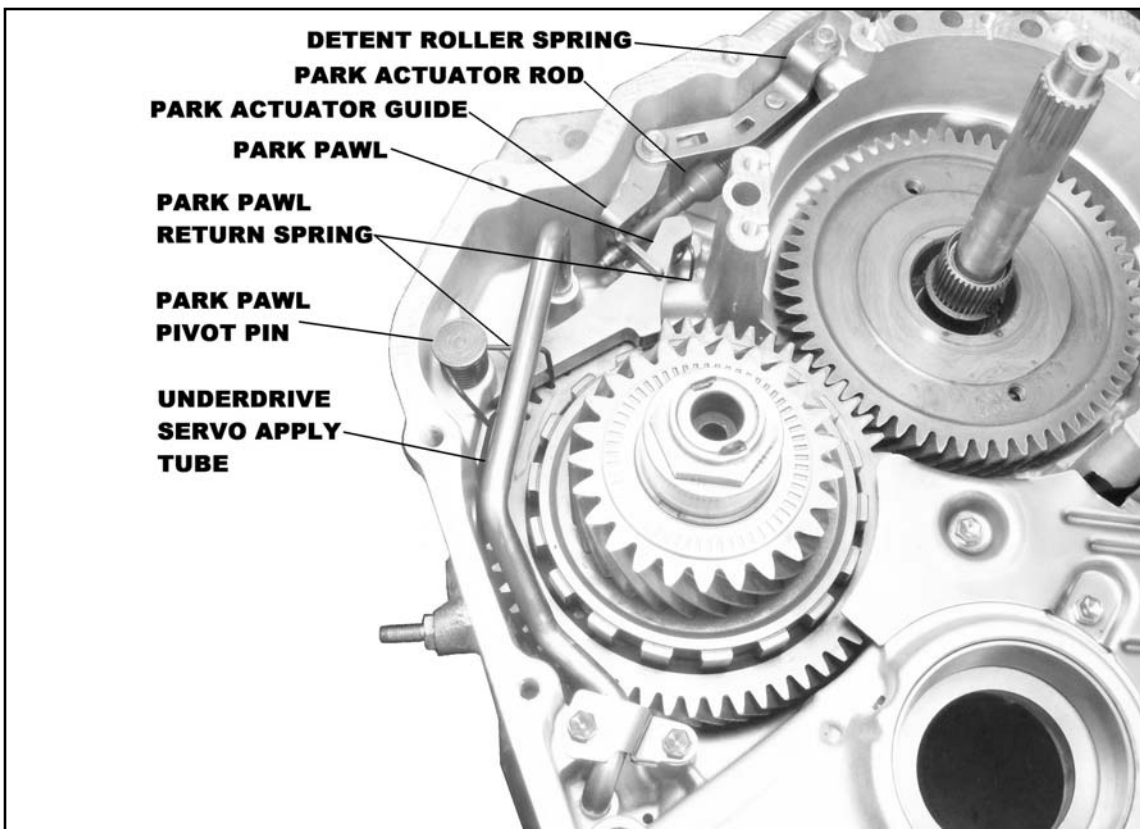


Solenoid	Case Connector Pin Numbers	Resistance
SS2	1	11 - 16 Ohms
PS3	2 and 5	5.0 - 5.6 Ohms
PS1	3 and 6	5.0 - 5.6 Ohms
SS3	4	11 - 16 Ohms

Section Three: Unit Breakdown

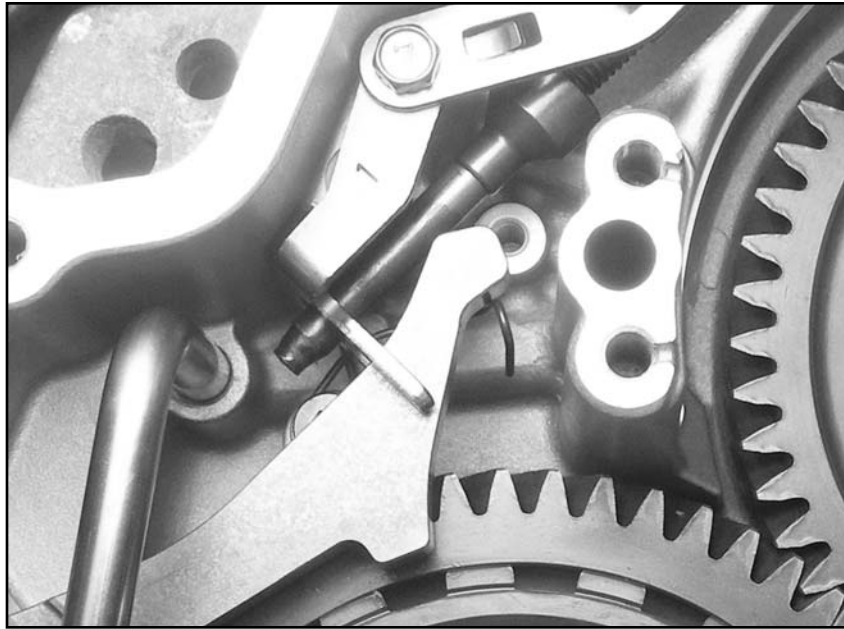
Disassembly

Remove Valve Body cover, disconnect harness from solenoids, and remove valve body. Remove pump, converter housing. Remove differential assembly. Remove fluid baffle, fluid filter, and case fluid passage cover. Remove Underdrive Servo Apply Tube. Rotate rooster comb from Park past Low and disengage detent spring and roller. Rotate rooster comb to align tabs on park actuator rod. Remove park actuator rod from rooster comb and withdraw from case. Remove park pawl pivot pin and spring. Remove park pawl. Remove Front Differential Transfer Gear assembly. Remove 4-5 Clutch drum. Remove Underdrive Band. Remove 1-2/Reverse Carrier and 1-2/Reverse Internal Gear. Remove rear cover. Remove Forward Clutch Housing, Rear Sun Gear, Rear Internal Gear, and Front Planetary and Front Sun Gear. Remove L/R Brake. Remove Rear Internal Gear and Low Sprag assembly. Remove retaining ring from Output Gear assembly and withdraw from case. Compress L/R piston return spring and remove retaining ring. Remove return spring and extract L/R piston from case.

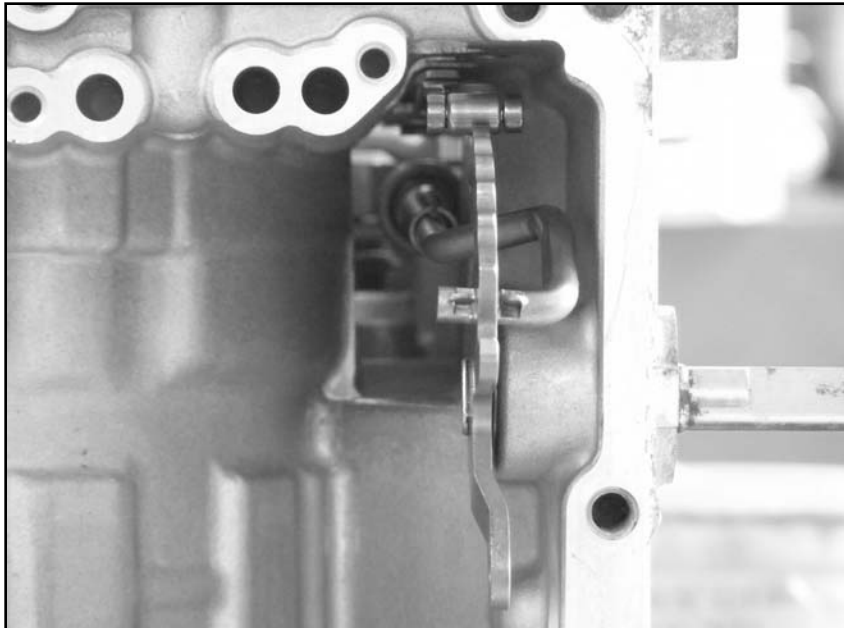


Section Three: Unit Breakdown

Park Pawl and Actuator Rod

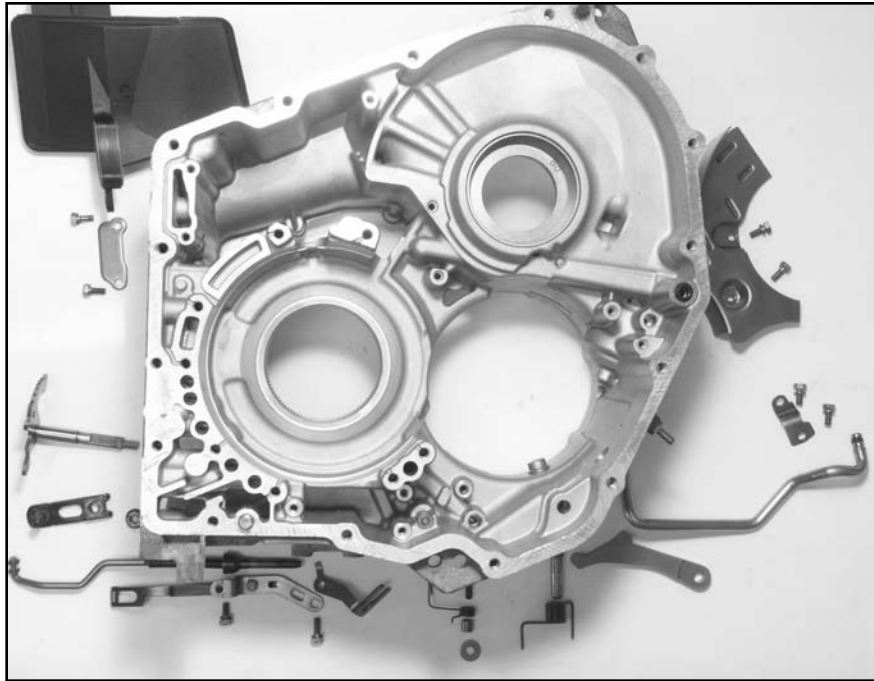


Rooster Comb

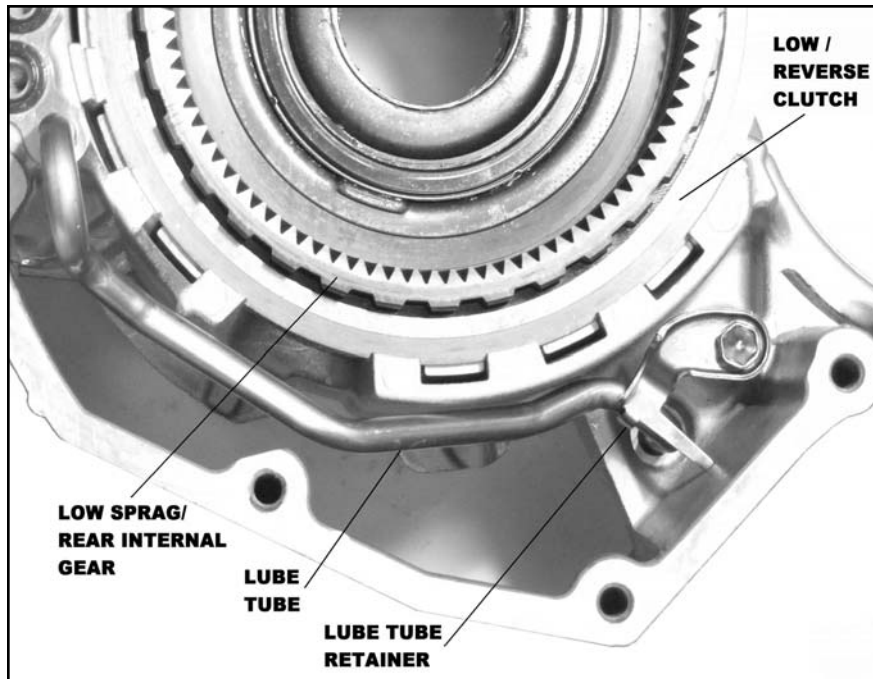


Section Three: Unit Breakdown

Main Case Small Parts

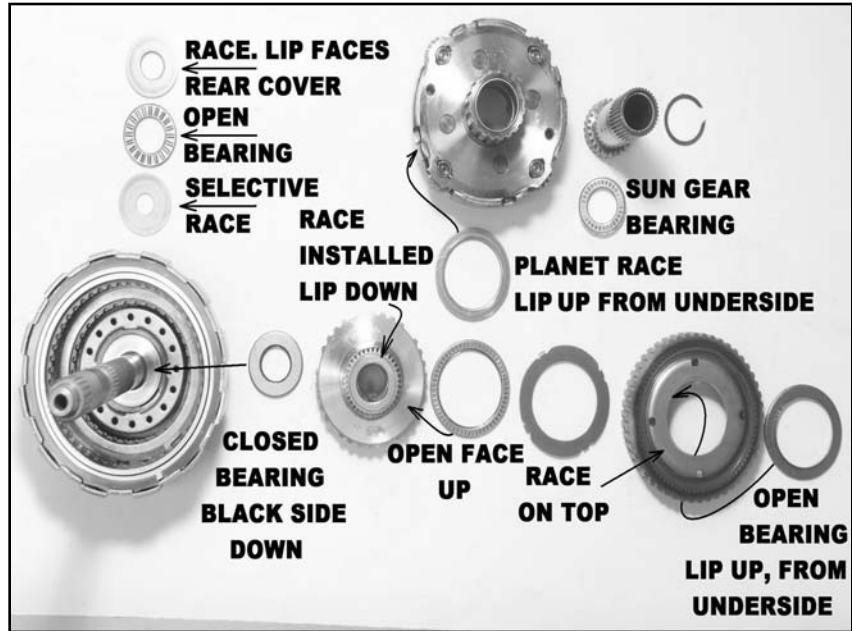


Lube Tube

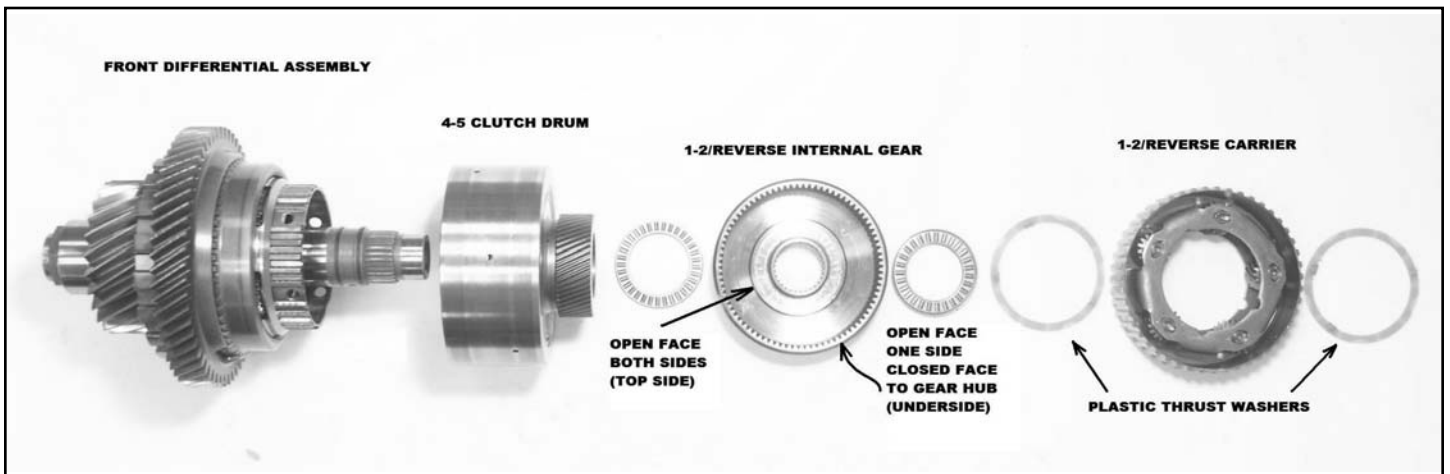


Section Three: Unit Breakdown

Rear Planet



Front Differential





Section Four: Overhaul

Inspection

Pump, 2nd Coast and 2nd Brake

Press down on 2nd Coast Brake backing plate and remove retaining ring from 2nd Coast Brake. Remove 2nd Coast Brake and inspect for worn or burnt friction or steel plates. Remove 2nd Brake retaining ring, remove 2nd Brake and 2nd Brake return spring. Inspect 2nd Brake for worn or burnt friction or steel plates. Remove retaining ring for 2nd Brake piston, then remove inner and outer pistons. Compress 2nd Coast Brake return spring and remove retaining ring. Remove 2nd Coast Brake return spring and 2nd Coast Brake piston. Disassemble pump, noting orientation of gear ID marks and record for re-assembly reference. Measure clearance between outer pump gear and pump body, between inner pump gear and crescent, and from top of gears to surface of pump body. Inspect converter bushing in pump body for scratches, pitting or burning. Check that bushing is not loose in pump body or has rotated. Inspect bushing in pump cover for scratches, pitting, or burning. Check that bushing is not loose in pump body or has rotated. Inspect castle-like tabs of 2nd Brake cylinder for signs of cracking or stress.

Forward, Direct, 4-5 Clutches and 1-2/Reverse Brake

(Disassembly and inspection of all clutches/brakes are similar except where noted)

Remove retaining ring and remove clutch/brake stack. Inspect for worn or burnt friction or steel plates. Note orientation of dish plate in Direct Clutch and 1-2/Reverse Brake for proper reinstallation. Note orientation of tab on 1-2/Reverse Brake retaining ring for proper reinstallation. On all brake assemblies, note orientation of ring end gap for proper reinstallation. Inspect 4-5 drum for scratched, worn or burnt bushing, inspect area where sealing rings ride for grooving, and inspect surface of drum where band rides for burnt or grooved surface. Inspect sun gears for pitting.

CAUTION Direct Clutch and 2nd Coast Brake friction plates are very similar. Do not mix.

Compress return springs and remove retaining ring, then remove return spring. Extract piston, using pliers to pull piston up evenly.

CAUTION Using compressed air to remove clutch pistons can cause the piston to lock and become jammed in case. Use pliers to grasp piston and pull up evenly to prevent jamming.

Differential Assembly

Remove 12 19mm ring gear to carrier bolts. Lift ring gear and upper carrier housing up from lower carrier housing. Turn lower carrier housing over to allow pin(s) to fall out of cross shaft(s) and lower carrier housing. Place lower carrier housing on suitable support to allow axle stub free movement. Extract cross shaft(s) from lower carrier housing. Remove spacer from center of spider gears, then remove spider gears and thrust washers. Inspect gear faces and thrust washers for signs of excessive wear.

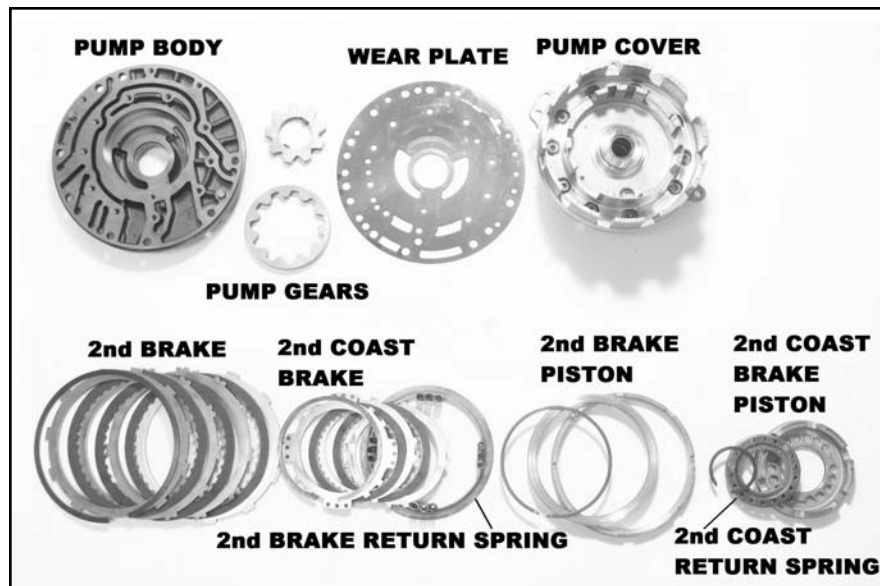
Section Four: Overhaul

Component Overhaul

Pump, 2nd Coast and 2nd Brake

Press new bushing in place and install new converter seal into pump body. Place pump gears into body with ID marks oriented correctly. Verify proper clearances according to table on page 55. Install new bushing into pump cover, align pump cover with pump body and install. Insert the 12 1.0 X 14.5mm Torx bolts, and 1 0.8 X 17mm Torx bolt. Torque the 1.0 X 14.5 to 86 - 121 in-lbs. in a crisscross pattern, and the 0.8 X 17mm to 54 - 65.5 in-lbs. Replace O-rings on inner and outer 2nd Brake pistons, and 2nd Coast Brake piston. Lube pistons and bores and install pistons. Install the second brake piston retaining ring. Install the second brake return spring onto the piston with the spring side up. Load the second brake stack beginning with the lower apply plate. Alternate friction and steel plates and end with the top backing plate. Install the retaining ring making sure the ends of the ring do not align with any cutouts of the cylinder, see photo on page 18. Load the 2nd coast brake beginning with a steel plate and ending with a friction plate. The 2nd coast brake may use 2 or 3 frictions and are smooth. Install the clutch backing plate/return spring assembly and compress to install the retaining ring. Verify proper clearance or piston travel according to chart on page 54. Install new pump O-ring.

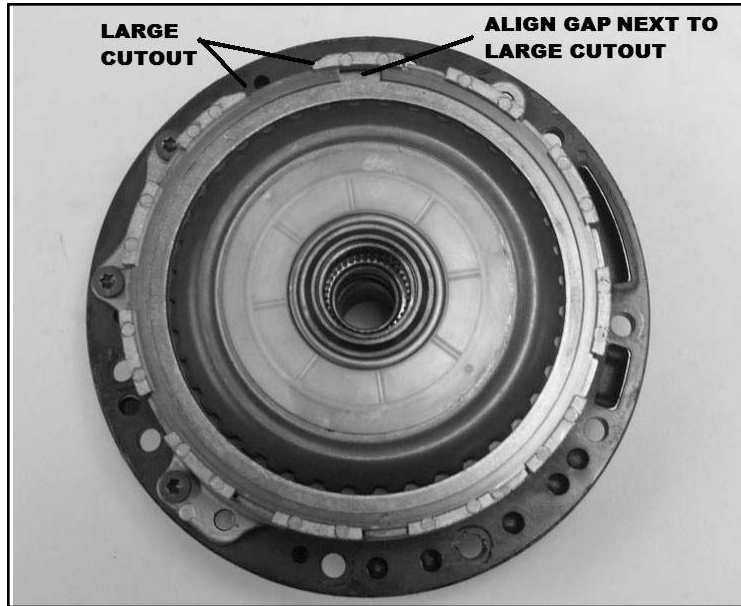
Pump



Section Four: Overhaul

Component Overhaul Continued

2nd Brake Retainer

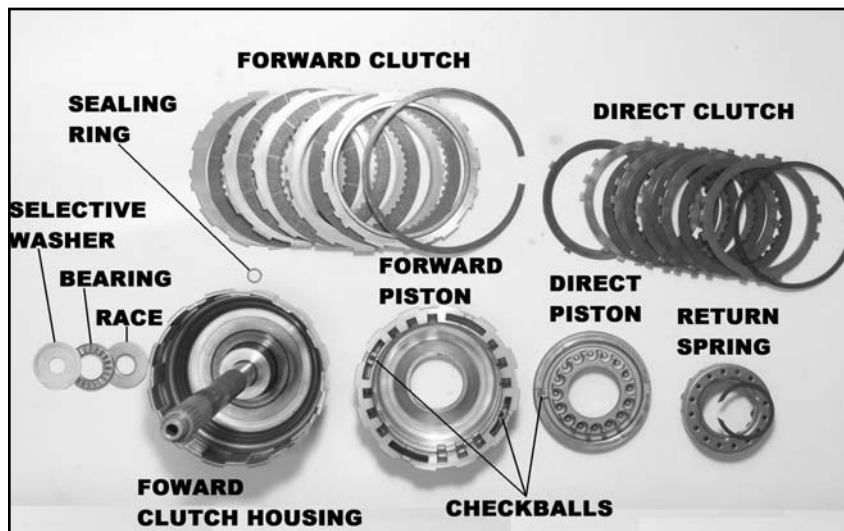


Forward, Direct, 4-5 Clutches and 1-2/Reverse Brake

(Assembly of all clutches/brakes is similar except where noted)

Ensure piston checkball is free and seals properly. Replace inner and outer piston O-rings, lube O-rings and drum and insert piston. Press piston down into drum and install return spring. Compress spring and retain with ring. **Install dish plate on Direct Clutch with dish facing up.** Direct frictions may be either 0.059" (stripe ID) or 0.067" (no stripe) and have radial grooves. Load clutch stacks, alternating friction and steel plates, ending with backing plate, then retain with ring. Verify correct clearance or piston travel according to chart on page 54.

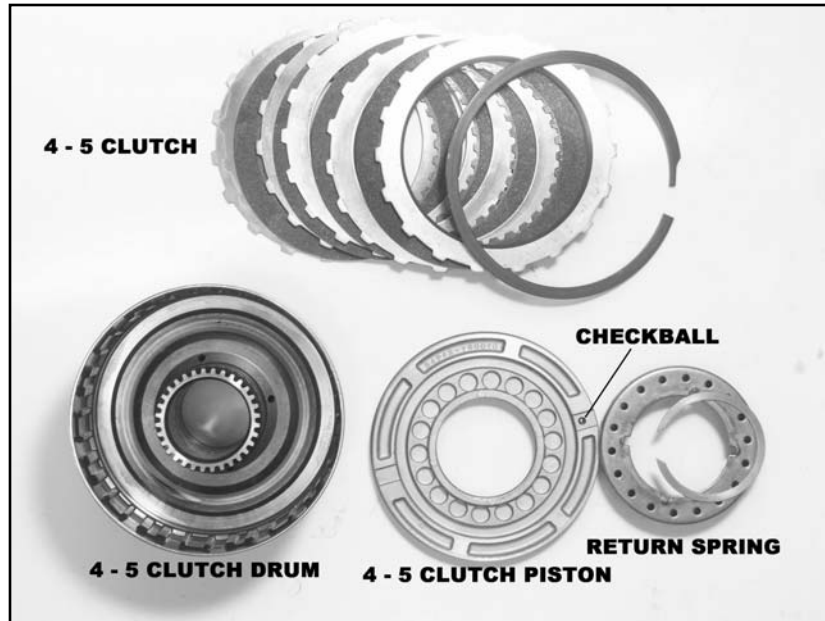
Forward/Direct Clutch



Section Four: Overhaul

Component Overhaul Continued

4-5 Clutch



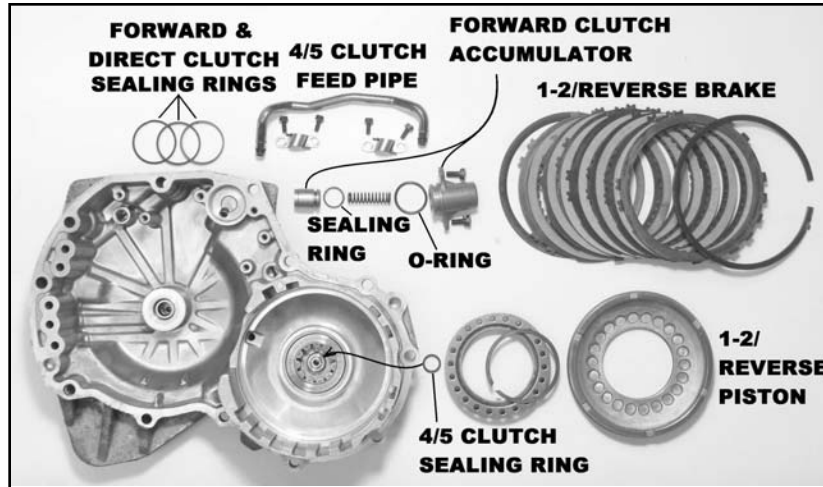
1-2/Reverse Brake

Replace inner and outer piston O-rings, lube O-rings and housing, and insert piston. Press piston down into housing, and install return spring. Compress spring and retain with ring. **Install dish plate with dish facing up.** Load brake stack, alternating friction and steel plates, ending with backing plate, then retain with ring. Ensure tab on retaining ring is oriented properly in correct notch in end cover. See illustrations on page 20. Verify correct clearance or piston travel according to chart on page 54. Replace O-ring on 4-5 clutch feed pipe and retain with 2 brackets and 4 bolts. Remove and check roller bearing and pre-lube. Replace sealing rings for Forward Clutch Housing and 4-5 Clutch. Verify clearance between ring and land is between 0.003" and 0.005". Reinstall roller bearing. Replace O-ring on Forward Clutch accumulator housing and sealing ring on Forward Clutch accumulator piston. Install piston as shown, spring first, then attach to rear cover with 2 bolts.

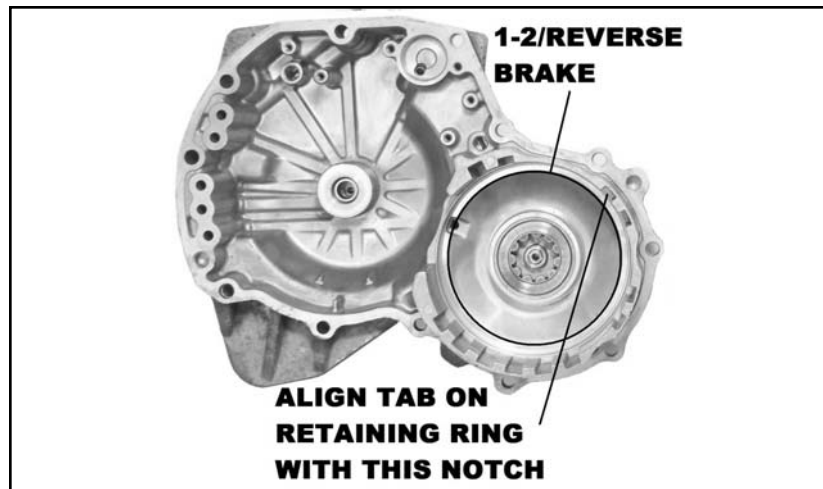
Section Four: Overhaul

Component Overhaul Continued

Rear Cover



Rear Cover



Proper installation of brake retaining ring.

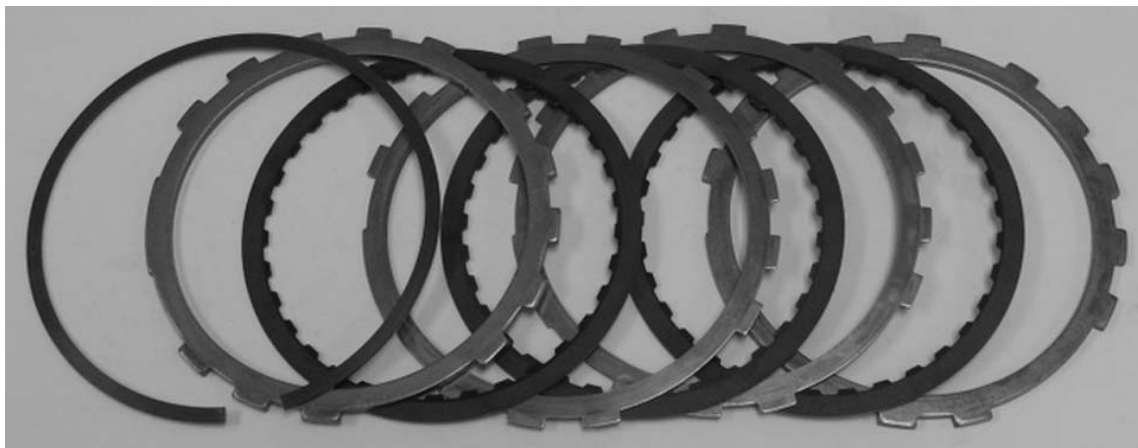
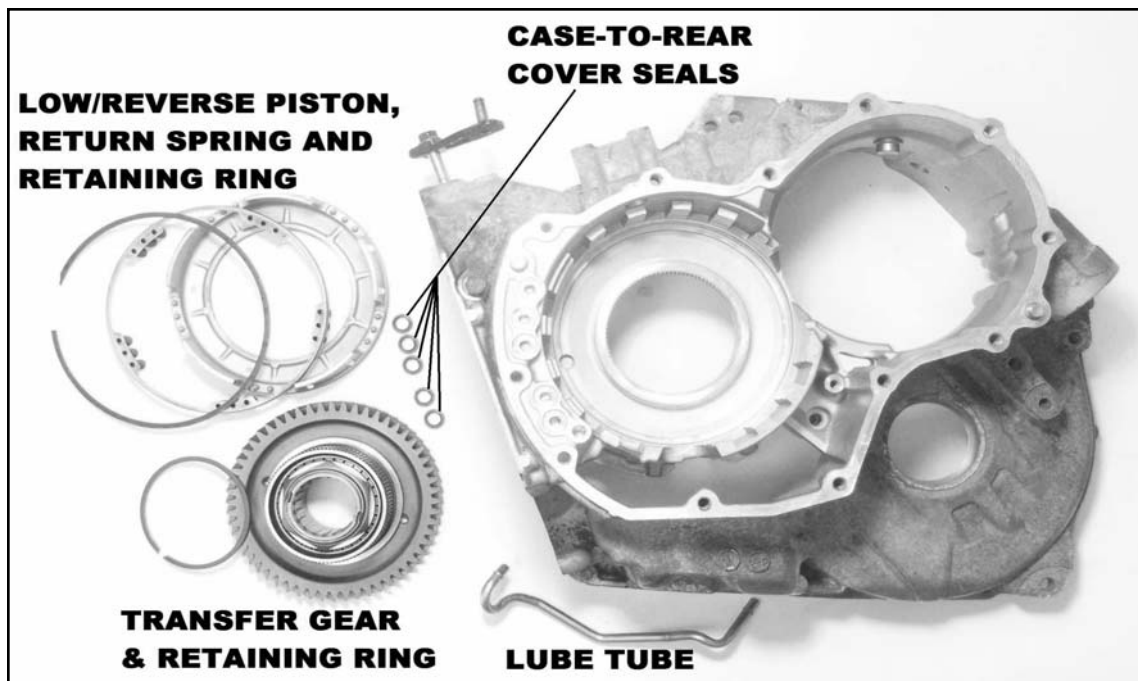
Section Four: Overhaul

Component Overhaul Continued

Low/Reverse Brake

Replace inner and outer O-rings on Low/Reverse piston, lubricate O-rings and case, and insert piston by pressing down. Install Low/Reverse return spring by compressing spring by hand and installing retaining ring. Load Low/Reverse stack, alternating friction and steel plates, ending with backing plate. Low/Reverse may have 3 or 4 frictions. Install retaining ring. Open end of retaining ring must align with dowel pin in case see photo on page 22. Verify correct clearance or piston travel according to chart on page 54. After verification, remove retaining ring and clutch stack and set aside to facilitate installation of Low Sprag assembly.

Low/Reverse Piston



Section Four: Overhaul

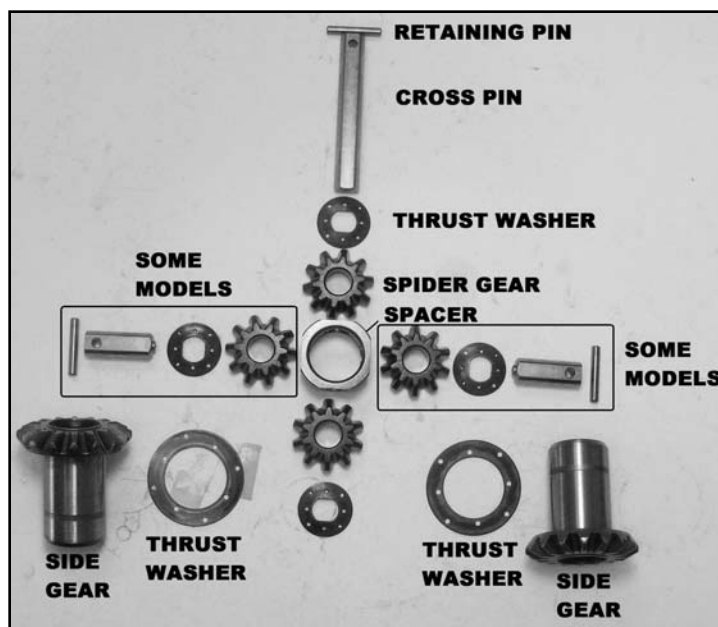
Component Overhaul Continued

Low/Reverse Brake Retainer



Differential Assembly

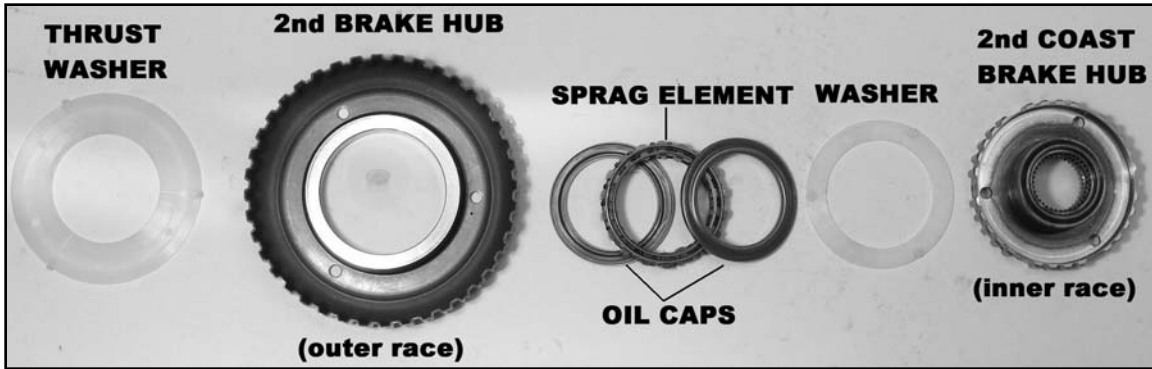
Remove both axle stubs from upper and lower differential carrier assembly. Each axle stub contains one metal clad seal and one O-ring. Drive or press metal clad seal from axle stub. Lightly lubricate seal and axle stub and press new metal clad seal into groove machined into axle stub. Install new O-ring into groove in splined end of axle stub and lubricate to facilitate axle shaft installation.



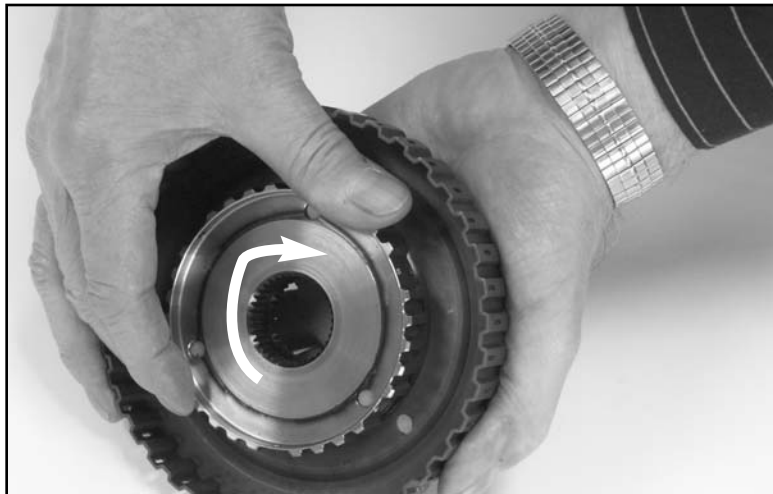
Section Four: Overhaul

Sprags

2nd Sprag



2nd Sprag



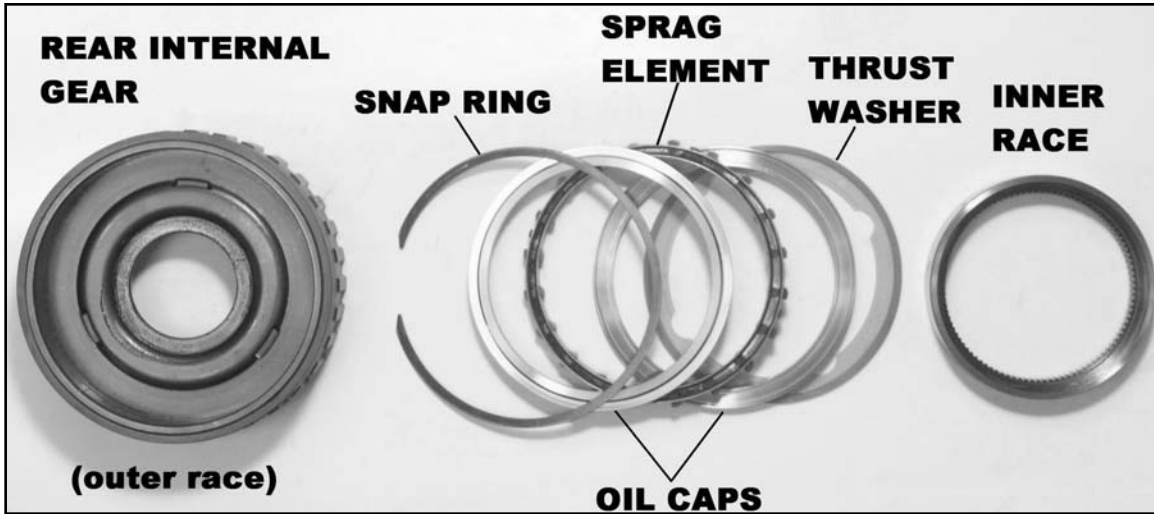
Inner hub freewheels clockwise.

Section Four: Overhaul

Component Overhaul Continued

Sprags Continued

Low Sprag



Low Sprag



Inner race freewheels in counter-clockwise direction.

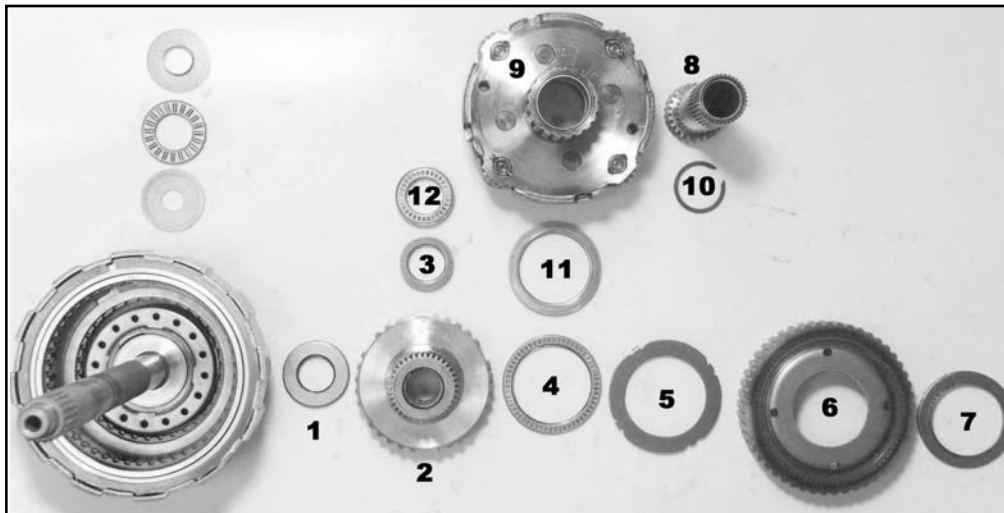
Section Four: Overhaul

Component Overhaul Continued

Sub-Assembly

Forward Clutch Housing and Front Planetary

Front Planet



Thrust Washer and Bearing Locations for Front Planetary

- a) Place bearing (#1) down over input shaft with black side down.
- b) Place Rear Sun Gear (#2) down over input shaft and engage into Direct Clutch discs.
- c) Place Bearing Race (#3) on Rear Sun Gear, lip facing down.
- d) Place Thrust Bearing (#4) on Rear Sun Gear, open face up.
- e) Place Bearing Race (#5) onto outside, or bottom of Rear Internal Gear (#6) hub.
- f) Place Bearing assembly (#7) into inside, or top of Rear Internal Gear (#6) hub.
- g) Engage Rear Internal Gear (#6) into Forward Clutch discs hub down.
- h) Insert Front Sun Gear (#8) into Front Planetary carrier (#9) and retain with ring (#10).
- i) Place Bearing Race (#11) onto Front Planetary (#9) with lip facing into carrier.
- j) Place Bearing Race (#12) onto Front Sun Gear (#8) with lip facing into gear.

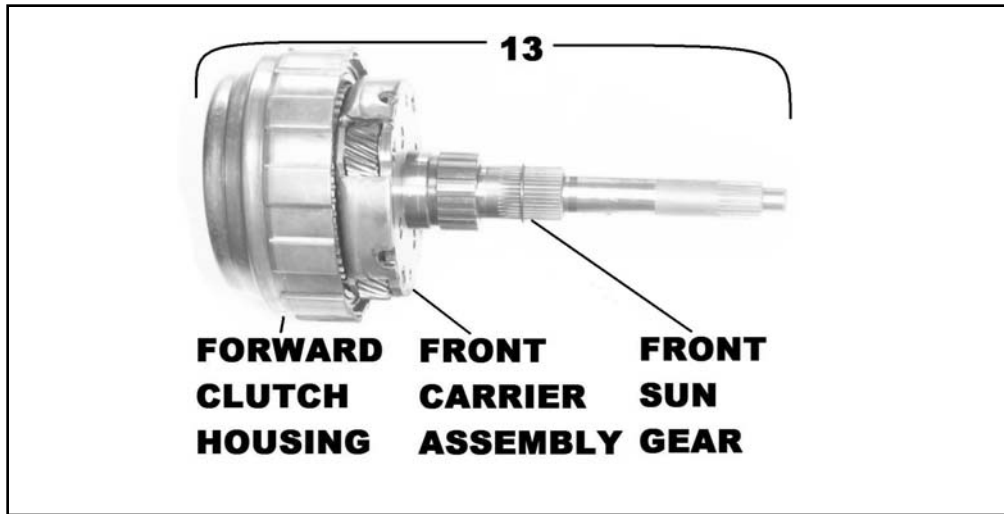
Section Four: Overhaul

Component Overhaul Continued

Sub-Assembly Continued

Forward Clutch Housing and Front Planetary

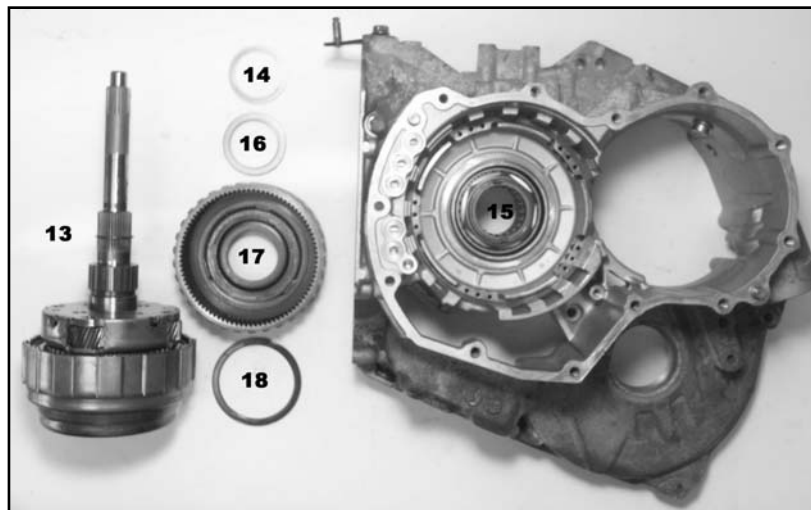
Forward Clutch Assembly



Assembled Forward Clutch Housing and Front Planetary

- k) Place assembled Front Planetary carrier down Forward Clutch Housing and engage Rear Sun Gear and Rear Internal Gear (#13).
- l) Place Race (#14) onto Output Gear assembly (#15), already installed into main case.
- m) Place Bearing (#16) into bottom of Front Internal Gear hub (#17).
- n) Place Bearing (#18) onto top of Front Internal Gear hub (#17), black side facing up.
- o) Place Front Internal Gear and Bearing onto Output Gear assembly.
- p) Stack entire Low/Reverse Brake into case and retain with ring.
- q) Insert complete Forward Clutch Housing (#13) assembly into Output Gear assembly.

Front Internal Gear and Bearings



Assembled Forward Clutch Housing and Rear Internal Gear, Washer, Bearings, and Case with Output Gear installed



Section Four: Overhaul

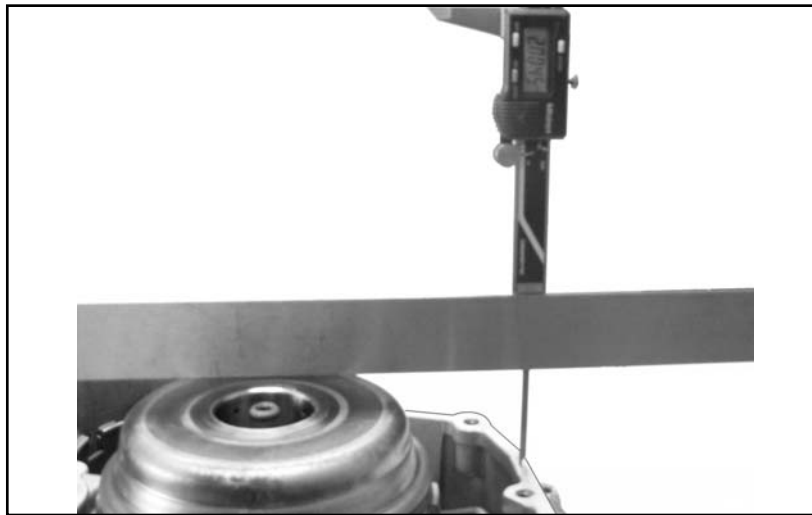
Component Overhaul Continued

Sub-Assembly Continued

Forward Clutch Housing

Install Forward Clutch Housing assembly into case, then check from back of Forward Clutch Housing down to Case. Measurement must be between 2.002" and 2.040". This is only an assembly check, as there are no shims to adjust this measurement.

Forward Drum to Case to Measurement



Measuring from the back of the Forward Clutch Housing to the case surface. Specification is 2.002" to 2.040".

Section Four: Overhaul

Component Overhaul Continued

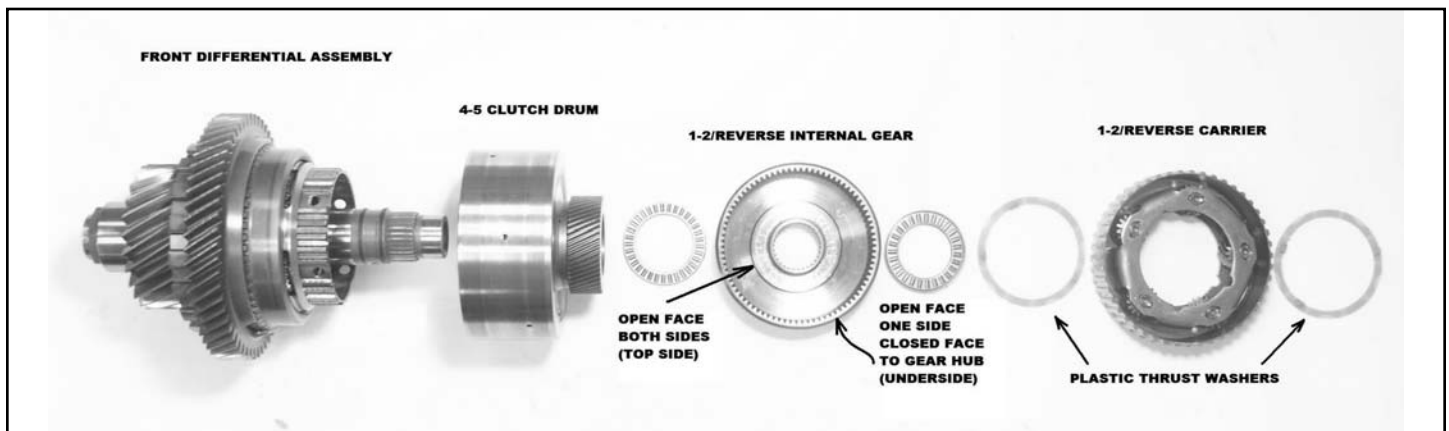
Sub-Assembly Continued

- a) Transmission end cover is installed at this point. Position case assembly upright with valve body area facing down on bench.
- b) Start with ring gear installed onto Front Differential assembly.
- c) Slide 4 - 5 Clutch drum over shaft and engage clutch discs onto hub. All friction discs are engaged when space between drum and gear is approximately 1/8th inch.
- d) Affix thrust washers to 1-2/Reverse Internal Gear and 1-2/Reverse Carrier.
- e) Insert 1-2/Reverse Carrier into 1-2/Reverse Internal Gear.
- f) Slide 1-2/Reverse Carrier and Internal Gear assembly into 1-2/Reverse Brake, fully engaging all friction discs.
- g) Grasp Front Differential assembly by Transfer Gear and slide assembled shaft into case, engaging 1-2/Reverse Sun Gear into 1-2/Reverse Carrier and Shaft splines into 1-2/Reverse Internal Gear.
- h) Continue pushing assembly into case to engage 4-5 Clutch sealing ring in end cover.
- i) Front Differential is fully engaged when Transfer Gear is flush with Output Gear.
- j) Check assembled height as shown on next page.
- k) If assembled height is not correct, change selective washer under top thrust bearing.

Front Differential Transfer Gear

NOTE

On some models, there is an additional selective washer between the 1-2/Reverse Internal Gear and rear case cover. If unable to achieve the correct assembled height by changing the top washer, change bottom washer in combination with top washer.

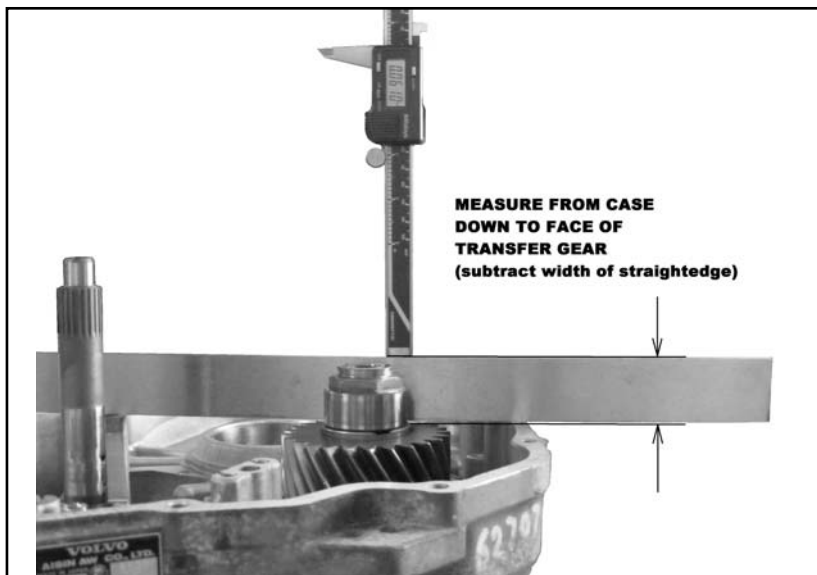
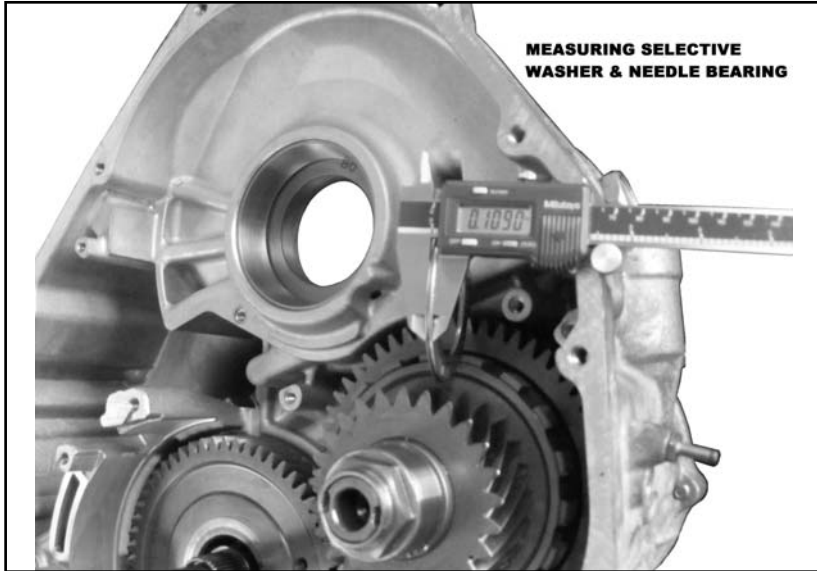


Section Four: Overhaul

Component Overhaul Continued

Sub-Assembly Continued

Front Differential Transfer Gear





Section Four: Overhaul

Checking Installed Height of Front Differential Assembly

- I. Measure the thickness of the thrust bearing and selective washer that sits on top of the Transfer Gear. Record this measurement.
- II. Measure from the case down to the Transfer Gear.
- III. Subtract Case - to - Transfer Gear measurement from the Thrust Bearing & Selective Washer measurement.

The resulting measurement must be between 0.050" and 0.065". If it is not, replace the selective washer with one of the appropriate thickness.

NOTE On some models, there is an additional selective washer under the 1-2/Reverse Internal gear.

If the appropriate clearance cannot be obtained by changing the washer on top of the Transfer Gear, replace the selective washer under the 1-2/Reverse Internal Gear. **THIS LOWER WASHER IS NOT ON ALL MODELS.**

GM Selective Shim Tables

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

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



Section Four: Overhaul

Updated Servo Cover

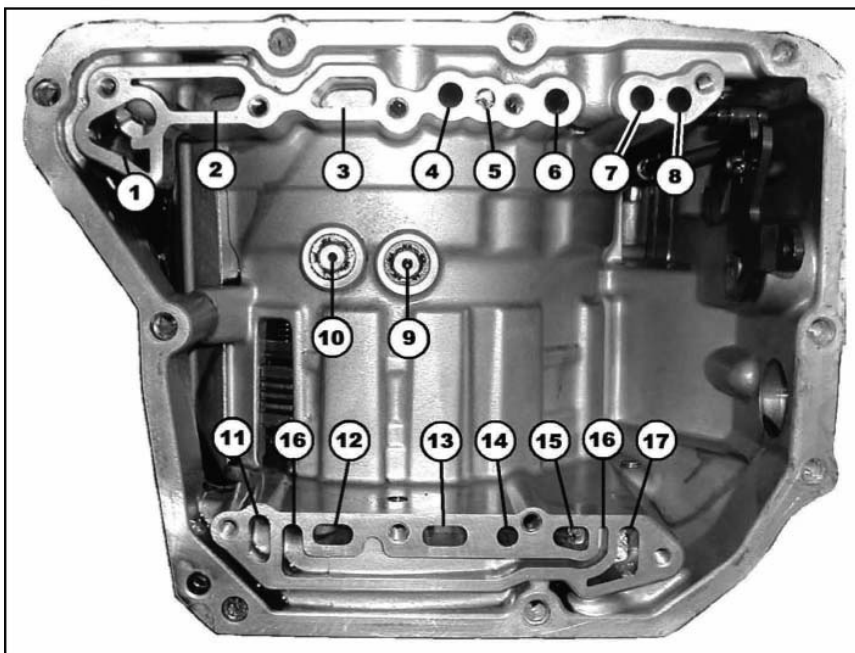


Volvo Part # 30751262

Servo Apply Pin Length

Servo Pin ID Ring	Length
0	3.000"
1	3.020"
2	3.040"
3	3.060"
4	3.080"

Air Test



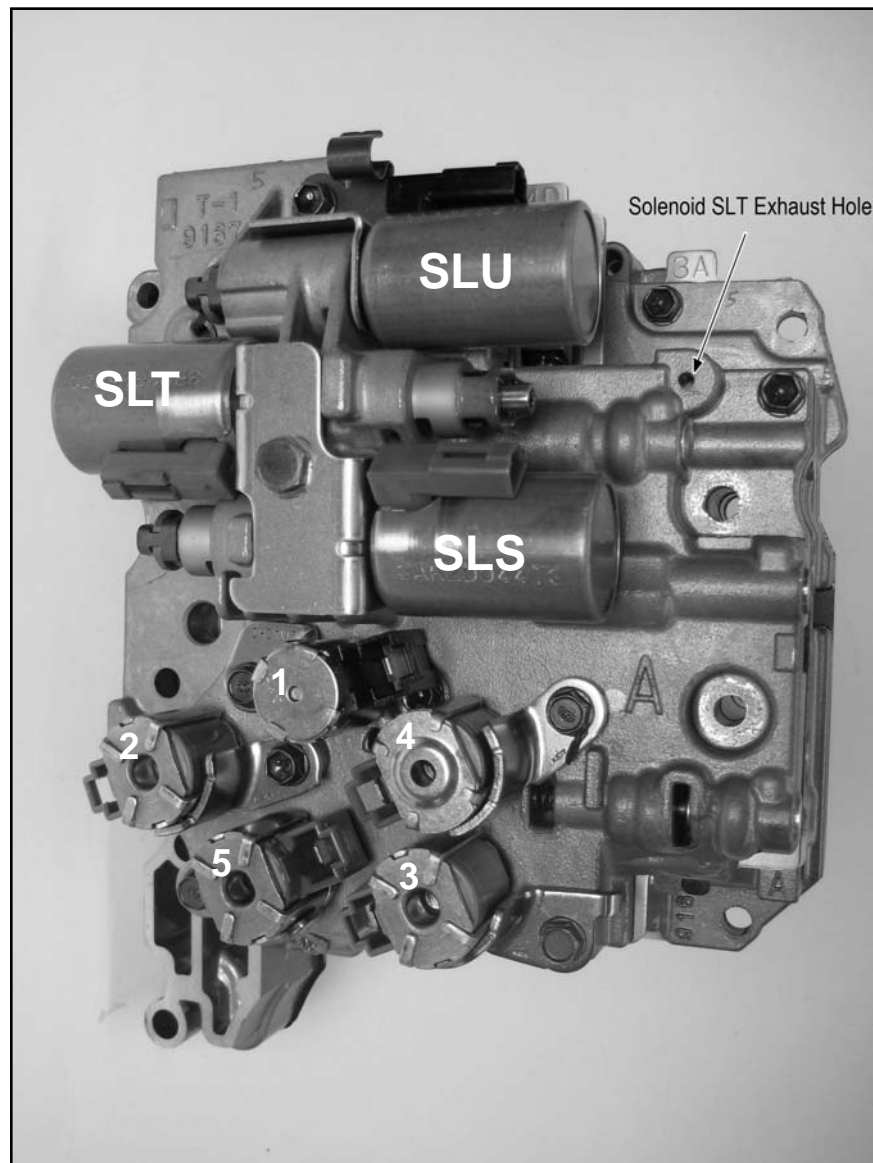
1. Cooler
2. Suction
3. Line
4. 2nd Brake
5. 2nd Coast Brake
6. TCC Release
7. TCC Apply
8. Underdrive Band
9. Center Lube
10. Low/Reverse
11. Lube
12. Direct Clutch
13. Lube
14. Forward Clutch
15. 1-2 Reverse Brake
16. 4-5 Clutch
17. SLT Pressure

Section Five: Valve Body

***Special Thanks to Bob Warnke
and Sonnax for their assistance
with the valve body
section of this manual and DVD.***

Solenoid ID/Resistance Tests

Solenoid Location





Section Five: Valve Body

Solenoid ID/Resistance Tests

Resistance Tests

Shift solenoids have a signal terminal. Check resistance by connecting one lead of meter to terminal while touching other lead to metal body of solenoid. PWM solenoids have two terminals. Check solenoid resistance by connecting meter leads to each terminal.

Solenoid Resistance and Internal Wire Harness Colors

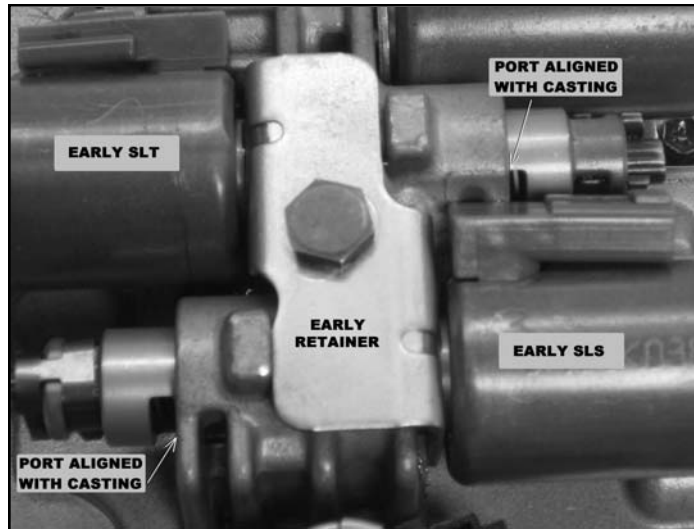
Solenoid	Resistance @ 68° F	Connector Color	Wire Color (from harness)	Flow
SLU	5.0 - 5.6 Ohms	Black	Green Brown	N.C.
SLT	5.0 - 5.6 Ohms	Blue	Green Grey	N.O.
SLS	5.0 - 5.6 Ohms	Green	Blue Red	N.O.
SS1	13.5 - 15.5 Ohms	Black	White	N.O.
SS2	13.5 - 15.5 Ohms	Black Grey	Black	N.O. GM, Saturn, Saab N.C. Volvo, Nissan
SS3	13.5 - 15.5 Ohms	Grey	Yellow	N.C.
SS4	13.5 - 15.5 Ohms	Blue Green	Purple Red	N.O.
SS5	13.5 - 15.5 Ohms	Green Red Grey	Blue Black	N.C.

Section Five: Valve Body

Interchange Issues

Front Valve Body casting ID 'No Letter' uses the SLT solenoid with the blue connector, and the SLS solenoid with the green connector 'facing up'. There are two different SLT / SLS solenoid retainers used with no letter ID valve bodies. See photos below and on next page for correct ID and usage.

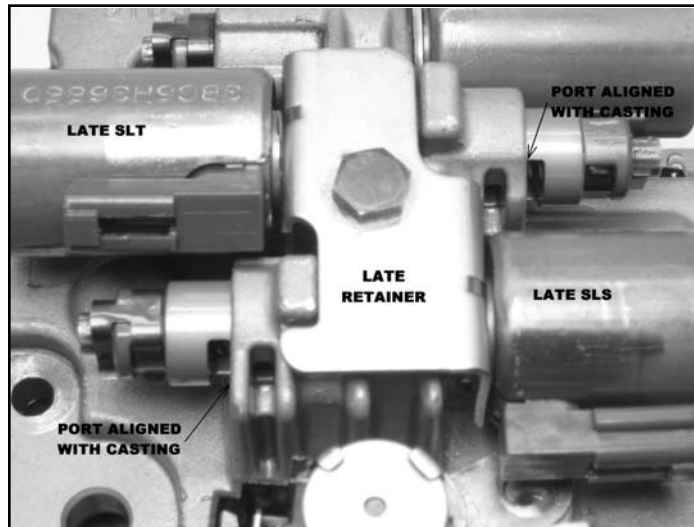
Early Bracket, Early SLT, SLS



Early SLT, SLS Solenoids w/Correct Retainer. Notice Alignment of Ports

Front Valve Body casting ID A, B, or C use the SLT solenoids with the blue connector, and the SLS solenoid with the green connector 'facing down'. See photo below and on next page for connector orientation and late SLT / SLS solenoid retainer used for A, B, or C letter code ID valve bodies.

Late Bracket, Late SLT, SLS

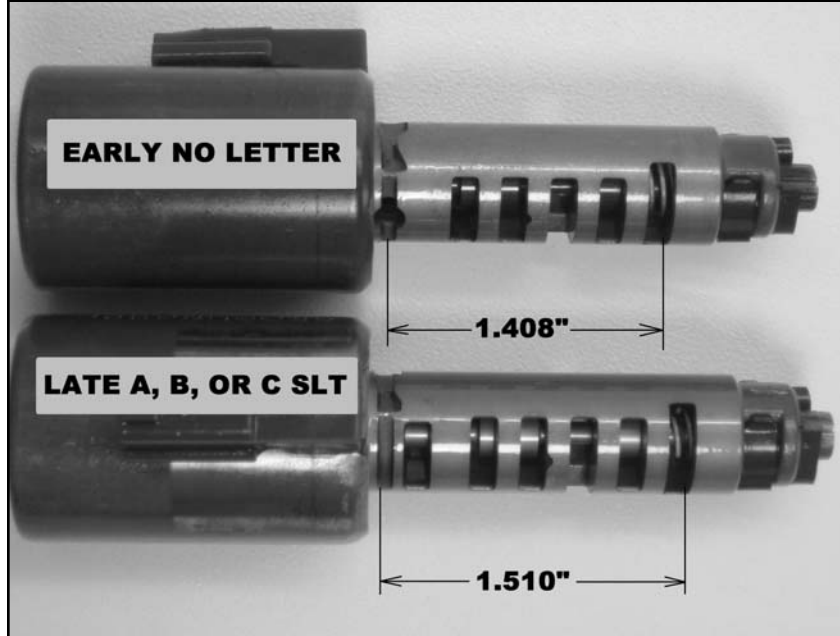


Late SLT, SLS Solenoids with Correct Retainer. Notice Alignment of Ports

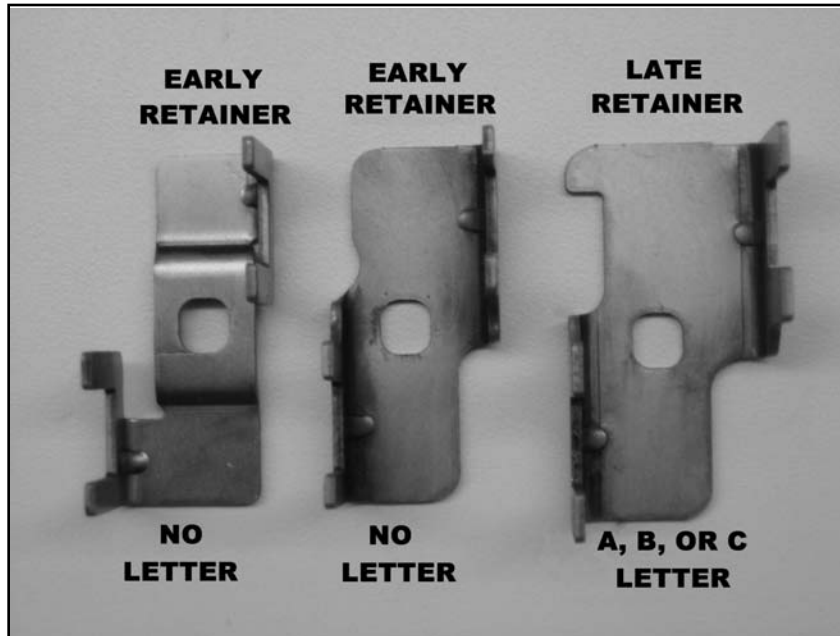
Section Five: Valve Body

Interchange Issues

Early & Late SLT Solenoids with Dimensions



Early and Late Versions of SLT, SLS Solenoid Retainers



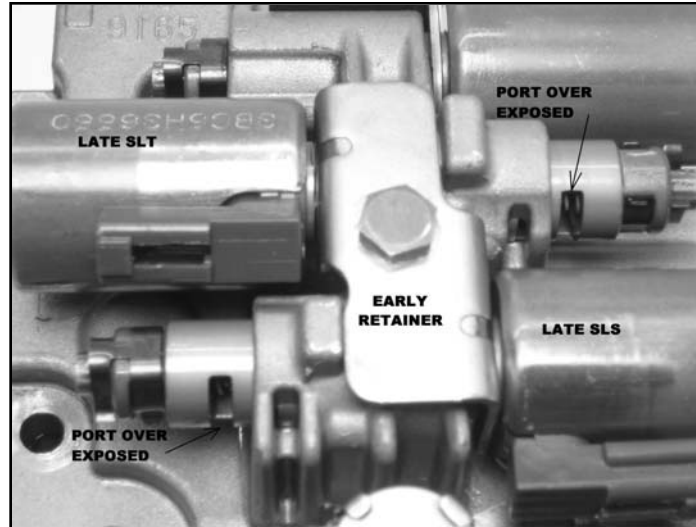
Retainers Bottom View

Section Five: Valve Body

Interchange Issues

Incorrect set-up using the early SLT, SLS retainer with late SLT, SLS linear solenoids. Notice the distance between the Front Valve Body casting and the last port in the solenoid manifold.

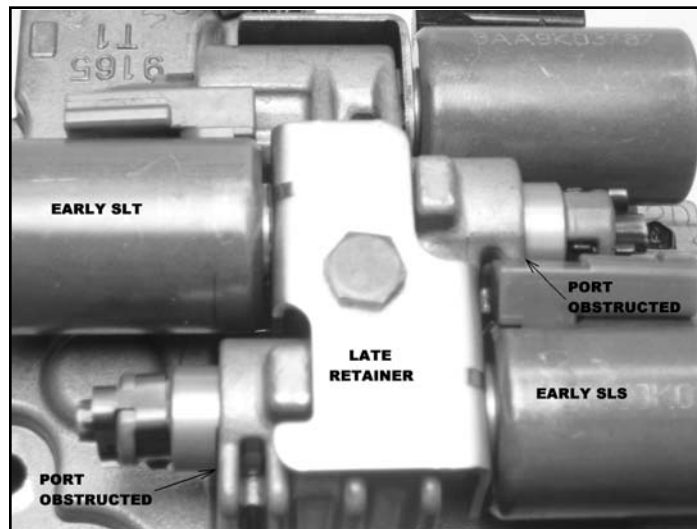
Early Bracket, Late SLT, SLS



Late SLT, SLS Solenoids w/Early Retainer. Notice how far port is away from Front Valve Body casting.

Incorrect set-up using the late SLT, SLS retainer with the early SLT, SLS linear solenoids. Notice that the Front Valve Body casting obstructs the last port in the solenoid manifold.

Late Bracket, Early SLT, SLS



Early SLT, SLS Solenoids w/Late Retainer. Notice that ports are obstructed by Front Valve Body casting.

CAUTION

The early SLT/SLS linear solenoids will work in the late Front Valve Body casting ID A, B, or C if the early retainer is used. However, because the connectors are oriented differently, the harness may not connect. The same is true of late SLT/SLS & retainer in the early casting.

Section Five: Valve Body

Interchange Issues

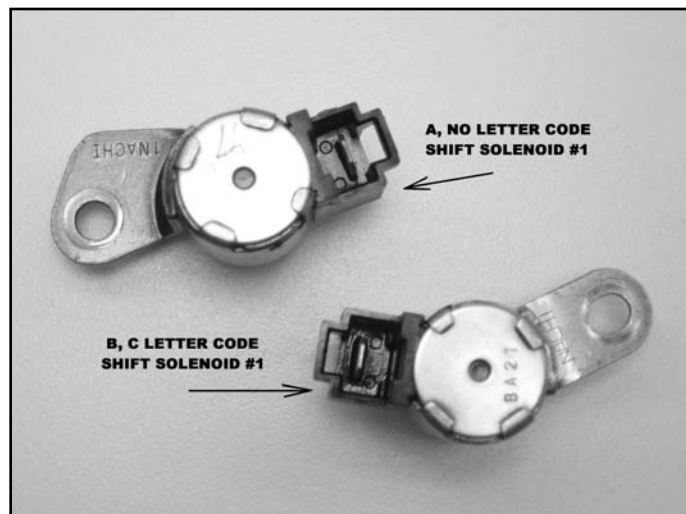
There are two different #1 shift solenoids.

The #1 shift solenoid shown in the upper left-hand area of the photo can only be used in the Front Valve Body casting ID 'No Letter', or letter 'A'.

The #1 shift solenoid shown in the lower right-hand area of the photo can only be used in the Front Valve Body casting ID 'B' or 'C'.

Both solenoids function and test the same way. See photo below for correct ID.

Shift Solenoid 1 Comparison Top View



Early Shift Solenoid #1 on left, Late Shift Solenoid #1 on right.

Section Five: Valve Body

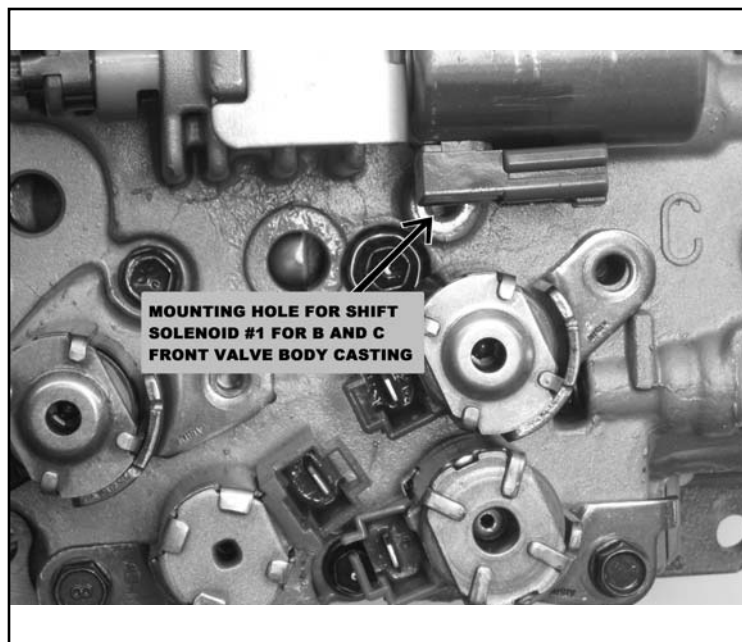
Interchange Issues

Casting differences for Shift Solenoid #1 location..

No Letter and Letter A Upper Valve Body Casting Solenoid 1 Installation



Letter B and C Upper Valve Body Casting Solenoid 1 Installation



Section Five: Valve Body

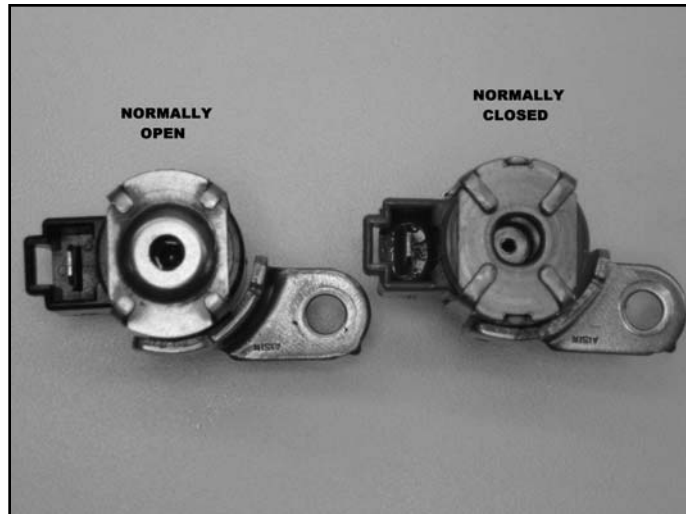
Interchange Issues

There are two different #2 shift solenoids.

- Normally Open (N.O.) #2 shift solenoids are used in GM, Saturn, and Saab vehicles. The raised top and gray snout can identify this N.O. #2 solenoid. See photos "Shift Solenoid #2 Comparison".
- Normally Closed (N.C.) #2 shift solenoids are used in Nissan and Volvo vehicles. The flat top and black snout can identify this N.C. #2 shift solenoid. See photos "Shift Solenoid #2 Comparison".

Although the hydraulic function of all the valve bodies is the same, the computer strategies differ for the various manufacturers. Installing the wrong #2 shift solenoid will result in erratic shifting.

Shift Solenoid 2 Comparison Top View



Shift Solenoid 2 Comparison Bottom View





Section Five: Valve Body

Interchange Issues

Valve Body Interchange Info

- Currently there are four different valve body variations. They are as follows:
 - No letter code
 - Letter code A
 - Letter code B
 - Letter code C
- Valve bodies with no casting ID letter code are the earliest design. Casting ID's A, B, & C are subsequent variations.
- Front Valve Body casting ID's A, B, and C are very similar. Certain components from valve bodies with no letter code ID will not interchange with valve bodies that have a letter code ID.
- Front Valve Body casting ID 'No Letter' and letter code C do not have a hole in the casting for SLT solenoid exhaust. The exhaust hole is located in the separator plate. See photos on pages 41, 42, and 43 for valve body casting ID. See photos on page 44 for separator plate ID.
- Front Valve Body letter codes A and B have two additional check valves compared to 'No Letter' and C. See photos on pages 45 for correct check valve configurations.

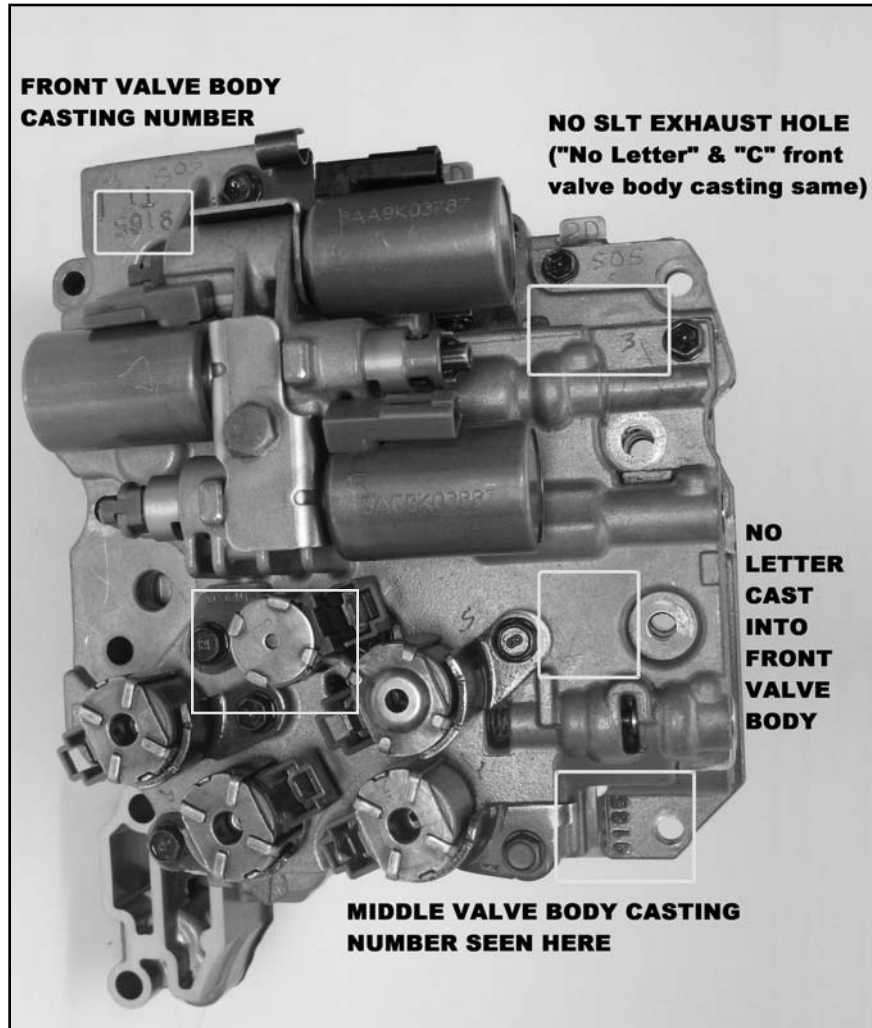
Match casting numbers from the Front Valve Body and Middle Valve Body using the table below.

	No Letter	A	B	C
Front Valve Body	9165	9167	9168	9165
Middle Valve Body	9165	9167	9167	9165



Section Five: Valve Body

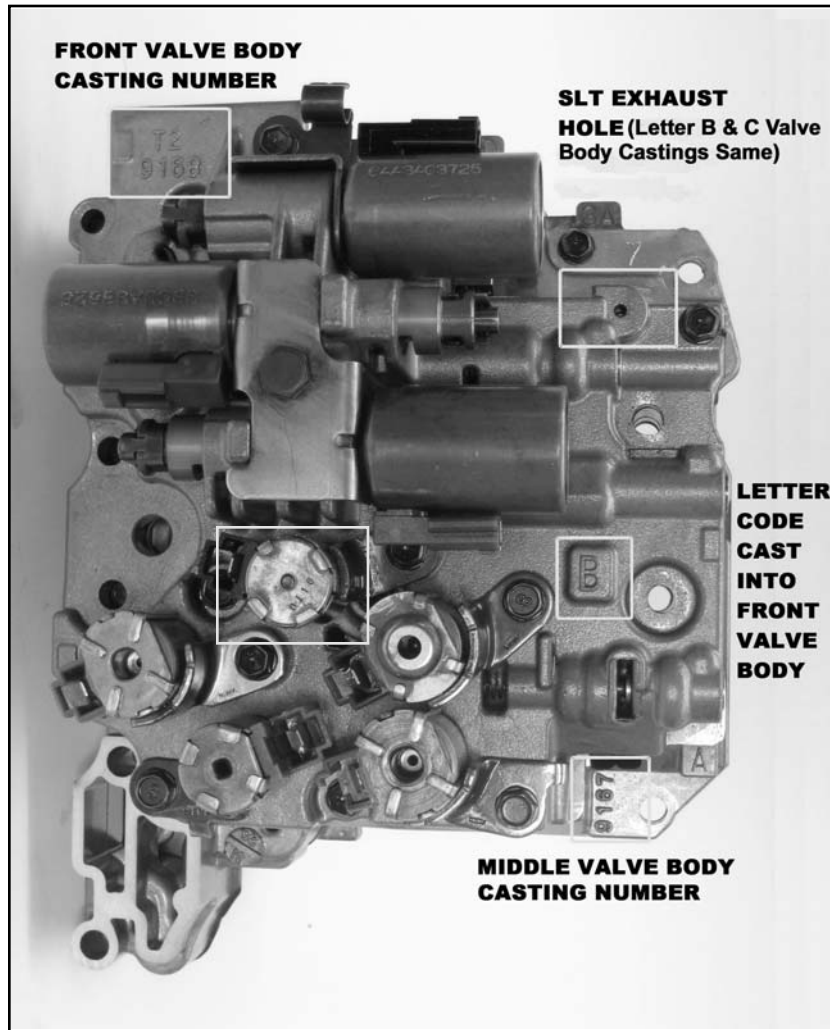
Interchange Issues



"No Letter" and "C" Front Valve Body Castings similar except Shift Solenoid #1 mounting orientation (see page 37).

Section Five: Valve Body

Interchange Issues

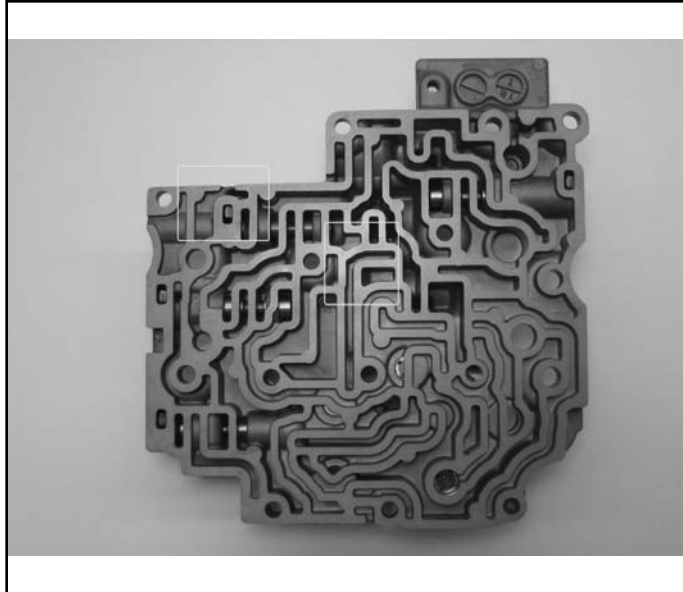


"A" and "B" Front Valve Body castings similar except Shift Solenoid #1 mounting orientation (see page 37).

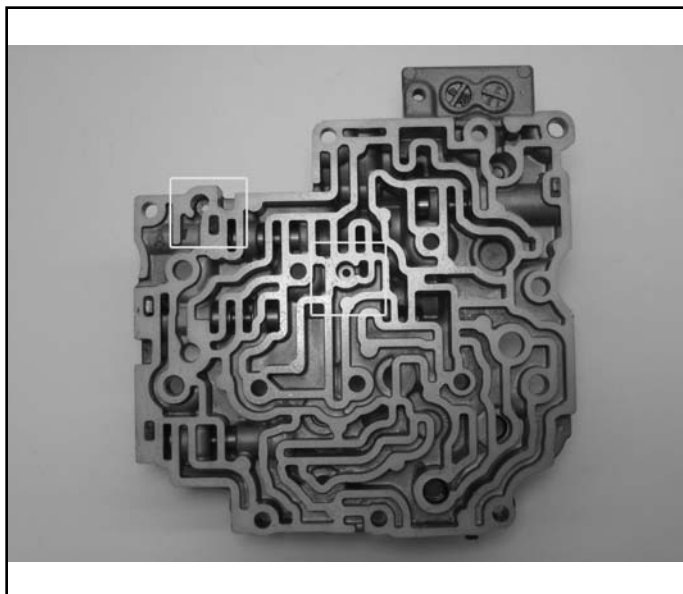


Section Five: Valve Body

Interchange Issues



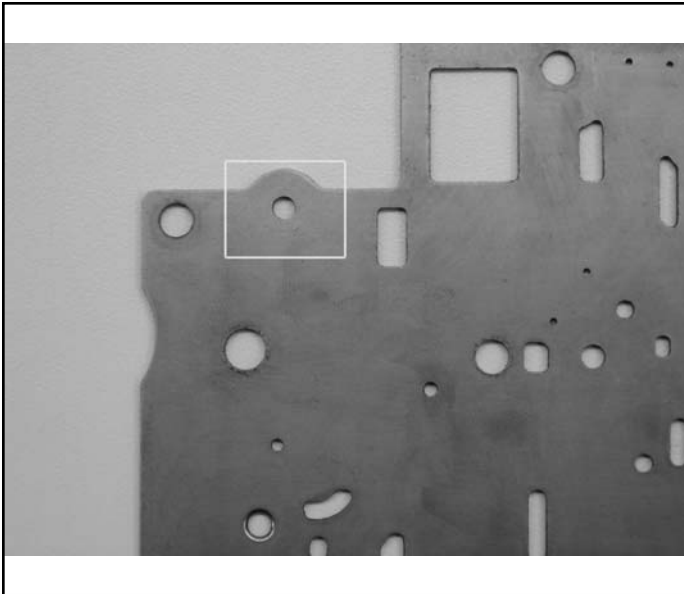
Front Valve Body casting "No Letter" or C



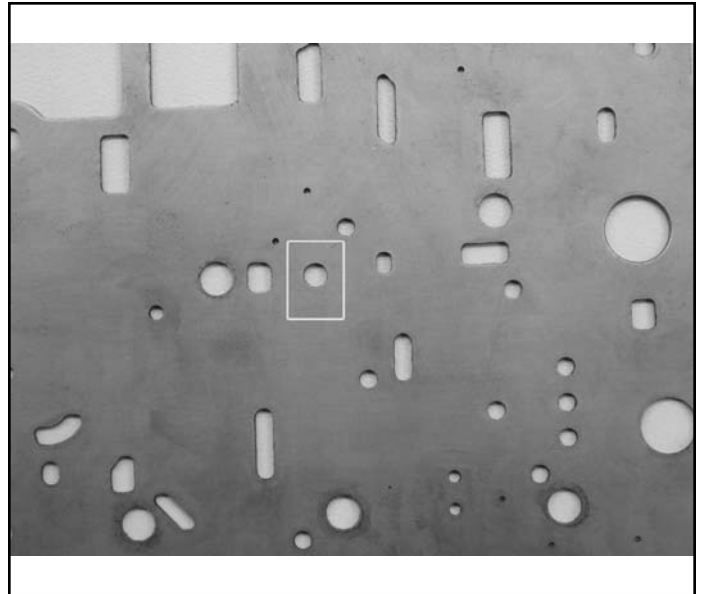
Front Valve Body casting ID A or B

Section Five: Valve Body

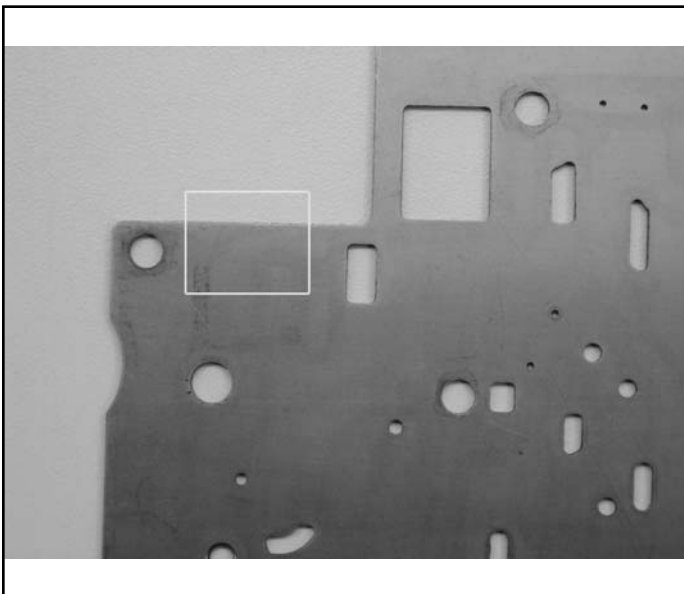
Interchange Issues



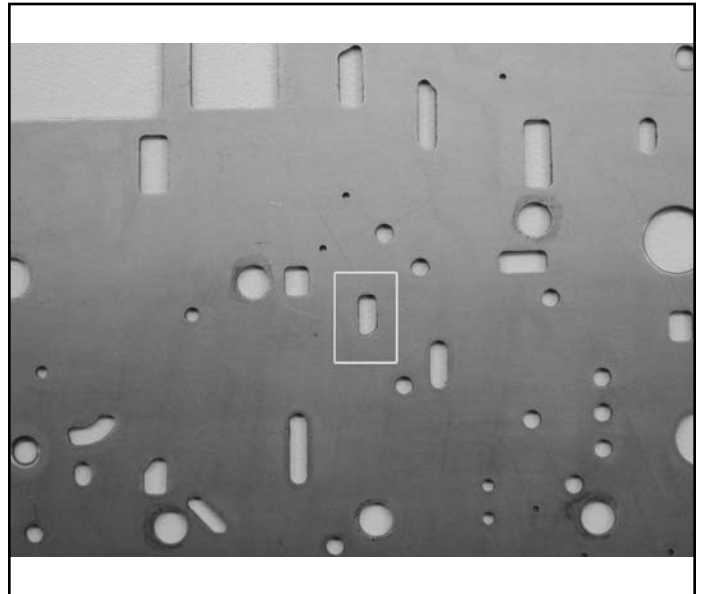
SLT Exhaust hole in plate for Front Valve Body casting ID A or B.



Round hole in middle of plate for Front Valve Body casting ID A or B.



No SLT exhaust hole in plate. Exhaust hole in Front Valve Body casting ID "No Letter" or C.

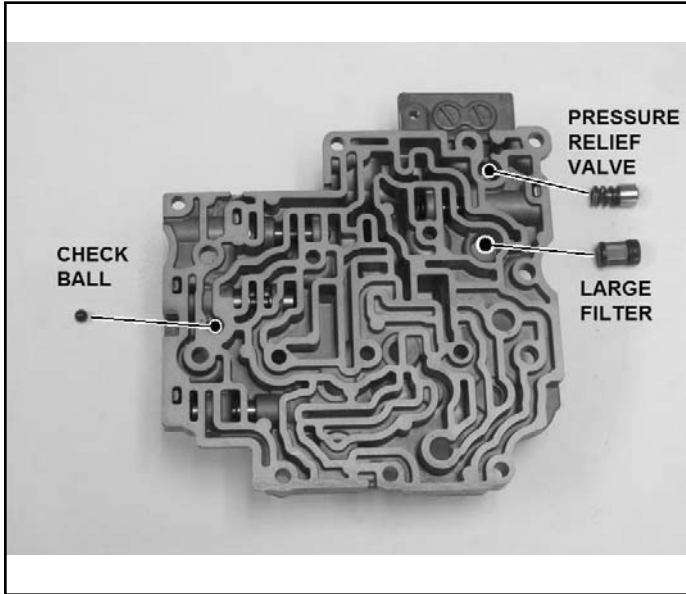


Elongated hole in middle of plate for Front Valve Body casting ID "No Letter" or C.

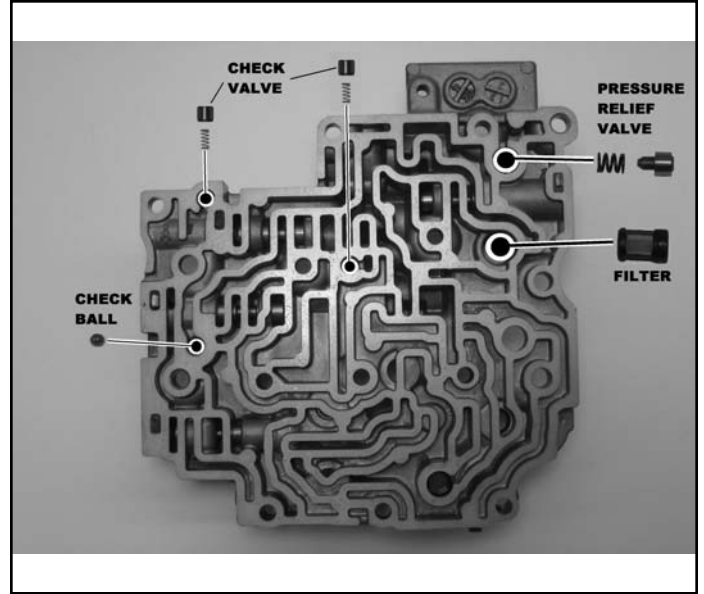
Section Five: Valve Body

Valve Body Breakdown

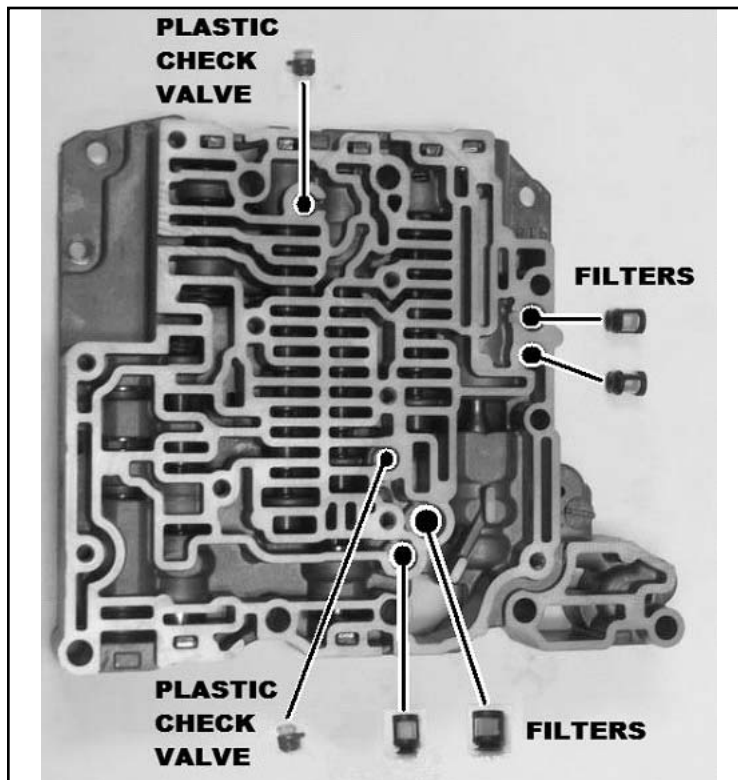
Check Ball/Check Valve Locations



Front Valve Body Casting "No Letter" or C



Front Valve Body Casting A or B

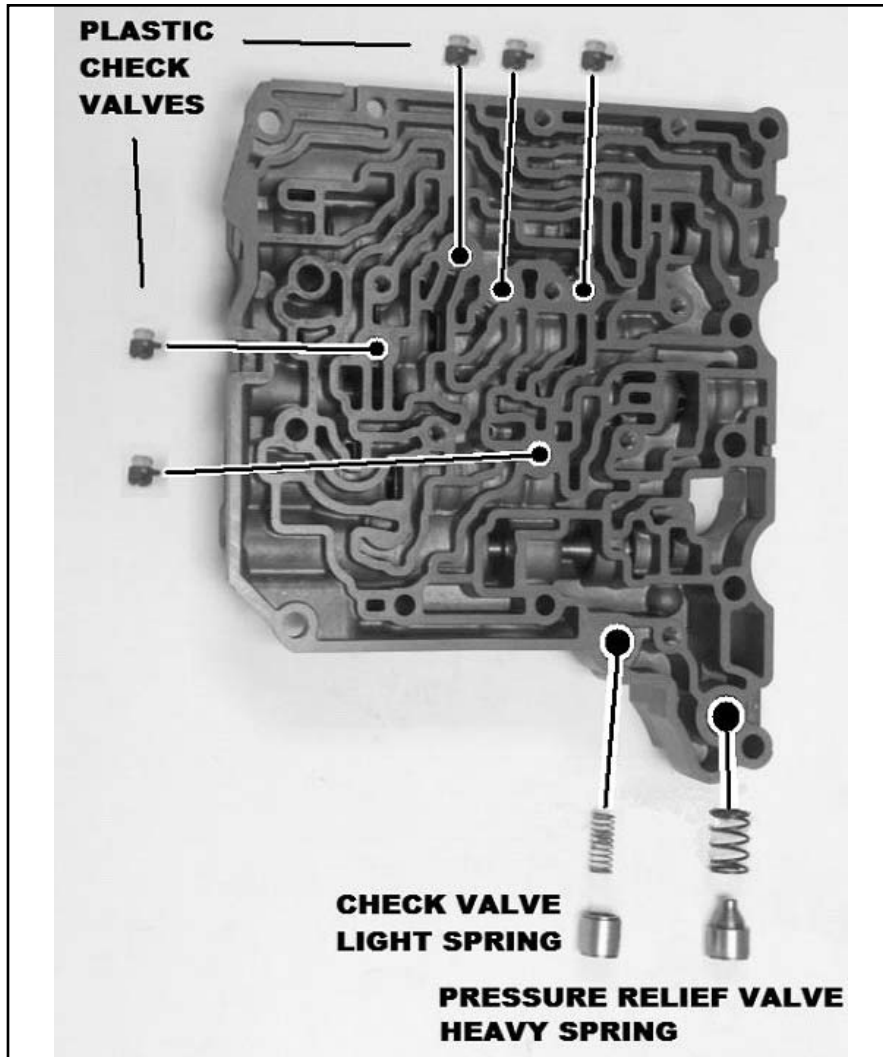


Middle Valve Body, Front Side

Section Five: Valve Body

Valve Body Breakdown

Check Ball/Check Valve Locations



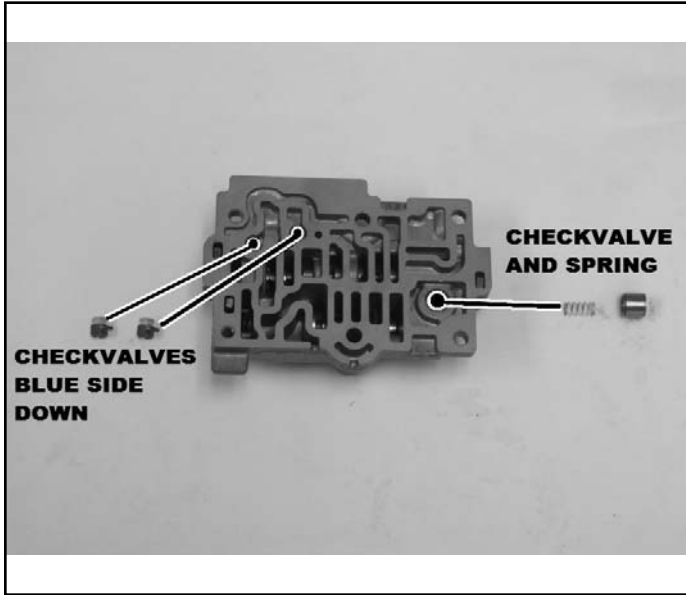
Middle Valve Body, Rear Side

Section Five: Valve Body

Valve Body Breakdown

Valve ID & Location

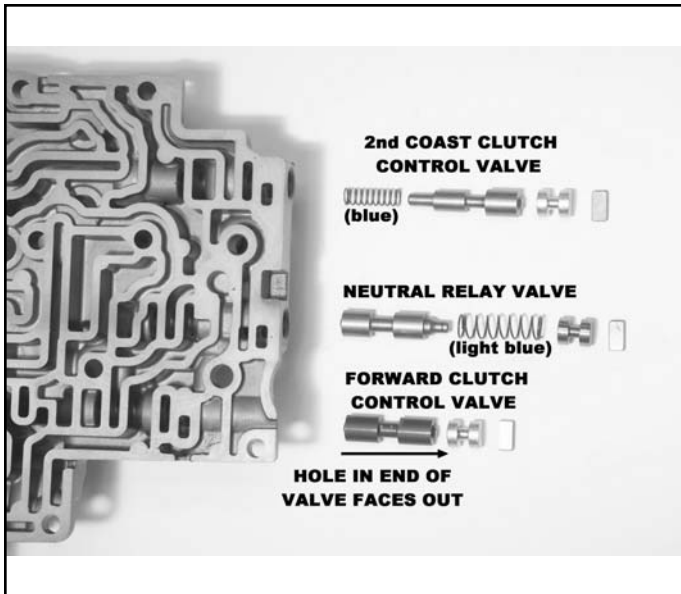
#2 Rear Valve Body



Front Valve Body Left Side



Front Valve Body Right Side



Forward Clutch Control Valve Detail

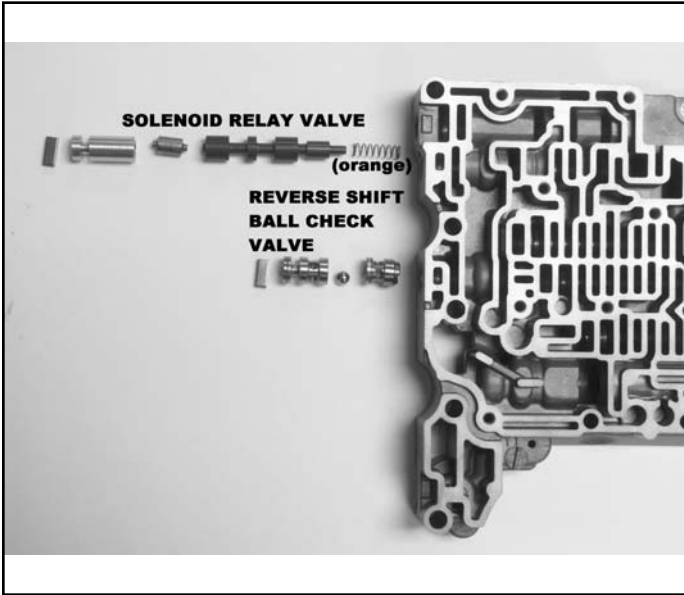


Section Five: Valve Body

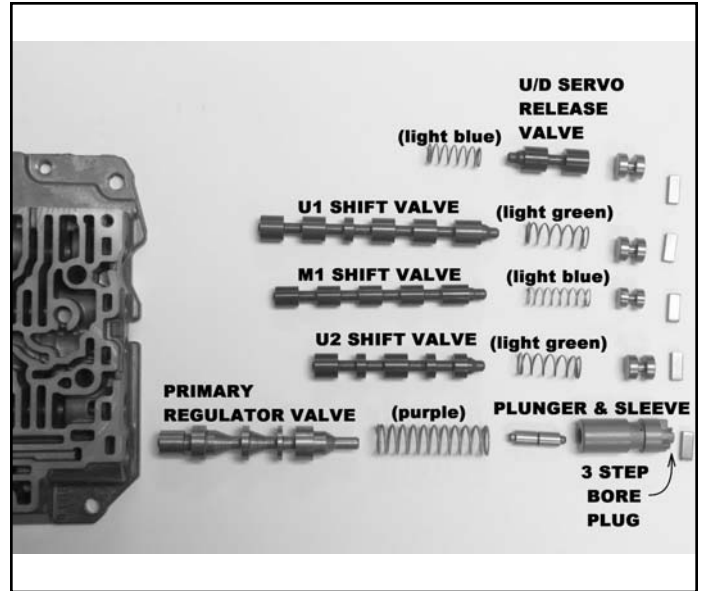
Valve Body Breakdown

Valve ID & Location

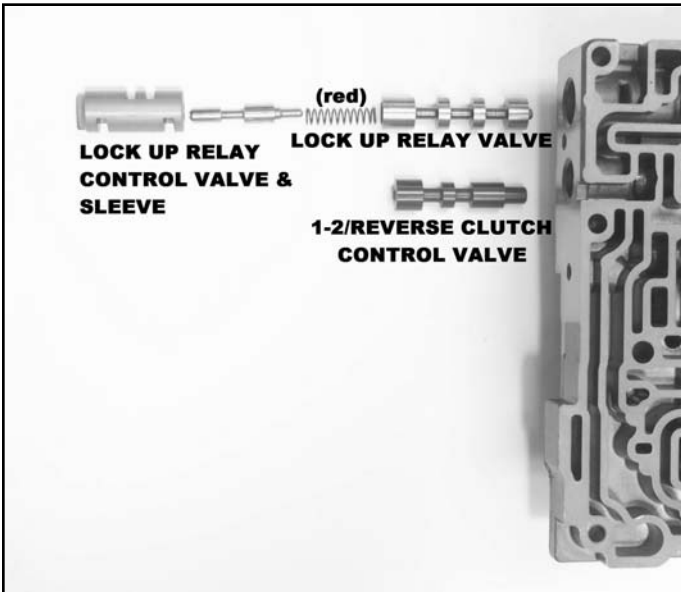
Middle Valve Body Left Side



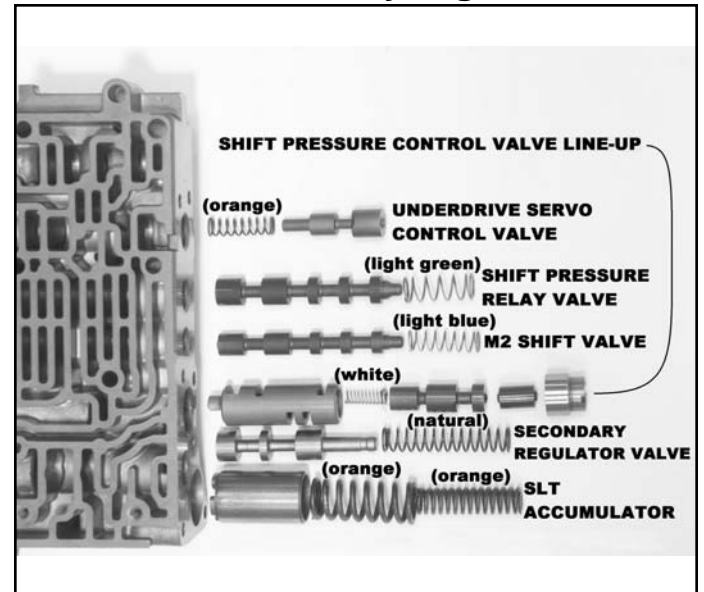
Middle Valve Body Right Side



Rear Valve Body Left Side



Rear Valve Body Right Side

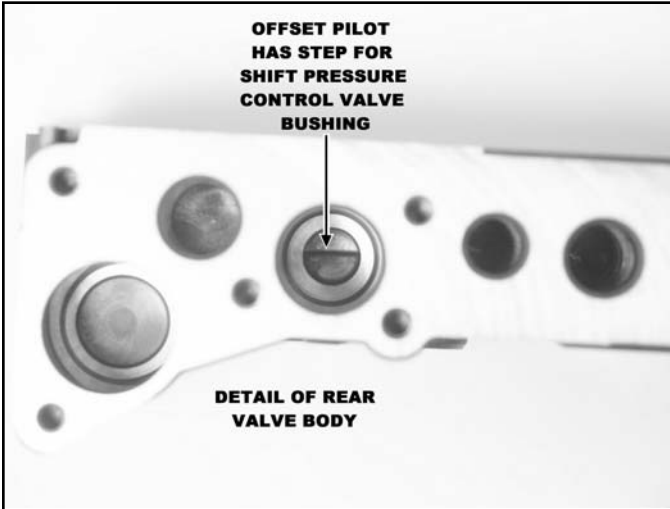


Section Five: Valve Body

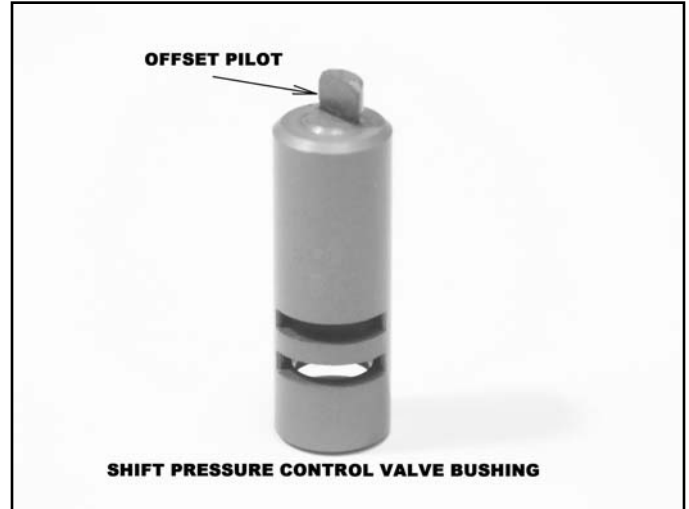
Valve Body Breakdown

Valve ID & Location

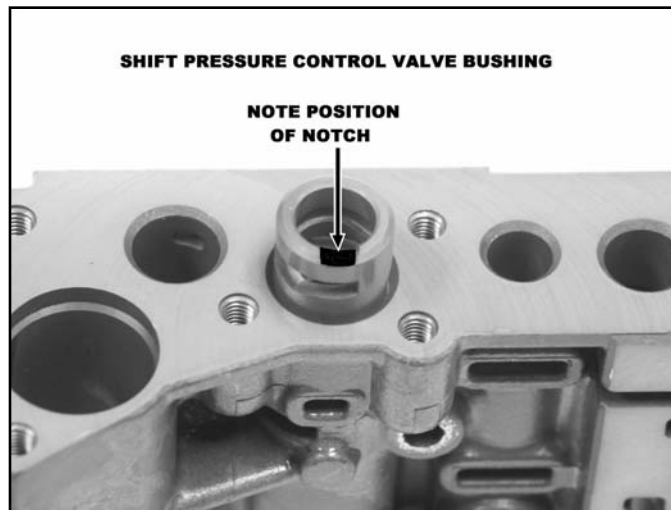
Shift Pressure Control Valve Bushing Detail



Step to locate pilot of Shift Pressure Control Valve Bushing



Detail of offset pilot on Shift Pressure Control Valve Bushing



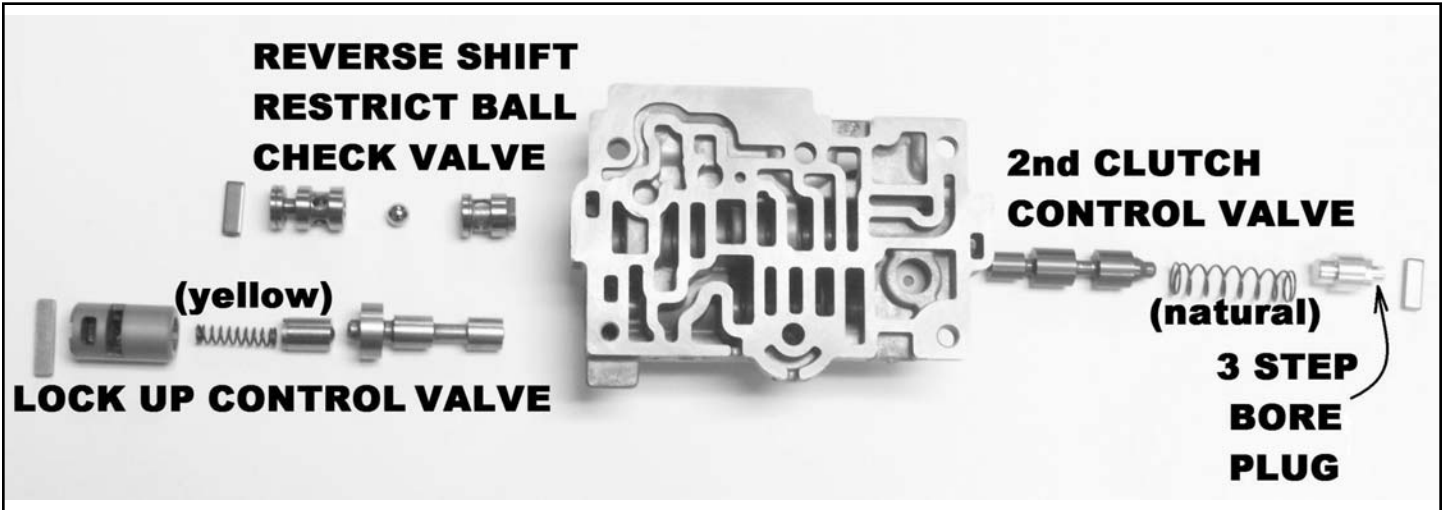
Orientation of Notch in Shift Pressure Control Valve Bushing

Section Five: Valve Body

Valve Body Breakdown

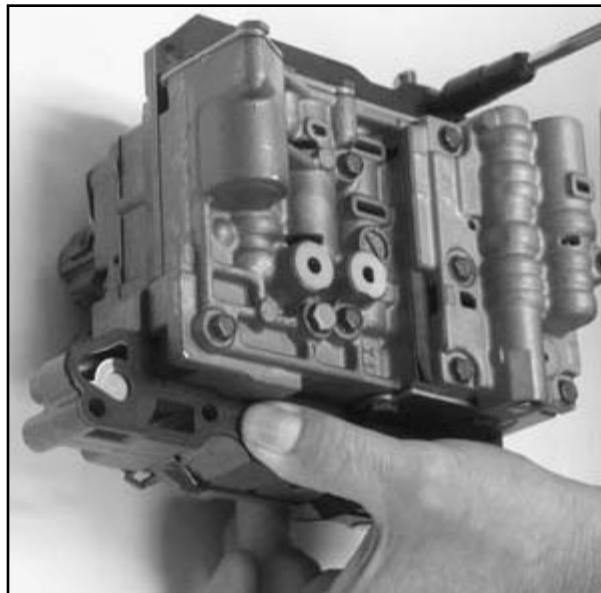
Valve ID & Location

#2 Rear Valve Body



Air Testing Valve Body

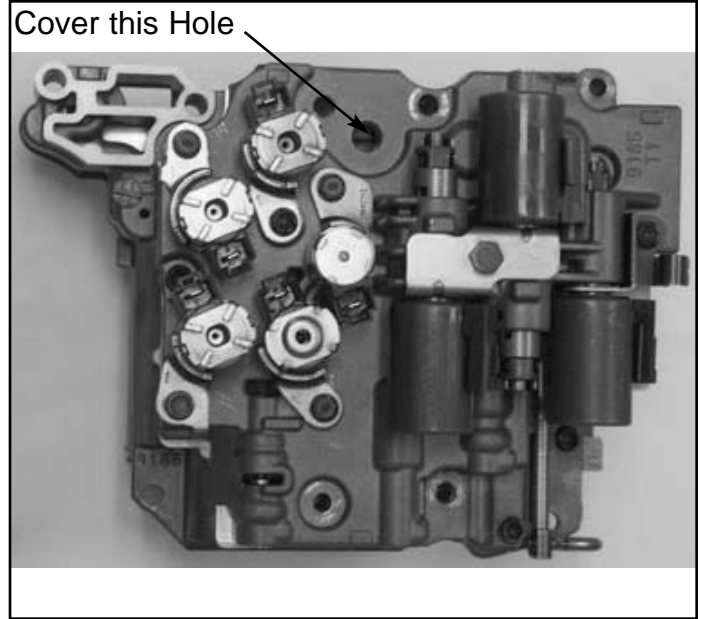
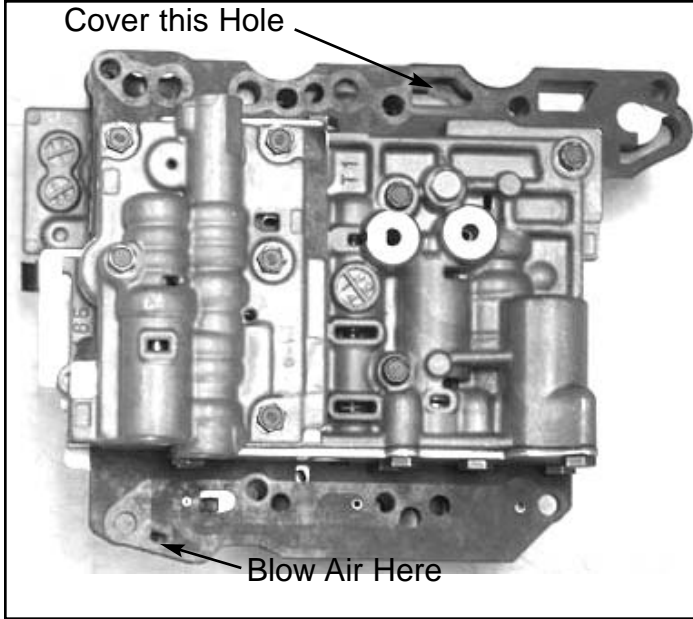
The valve body can be air tested to check for worn valves. See photos on page 51 for which holes to block and blow air. Valve Body should hold a small amount of air pressure. If you hear or see air/oil escaping from exhaust holes or end plugs you have a worn valve in that area.



NOTE Manual valve must be in valve body to perform test.

Section Five: Valve Body

Air Testing Valve Body



Problem Areas and Fixes

Middle Valve Body Right Side



Rear Valve Body Left Side



Section Five: Valve Body

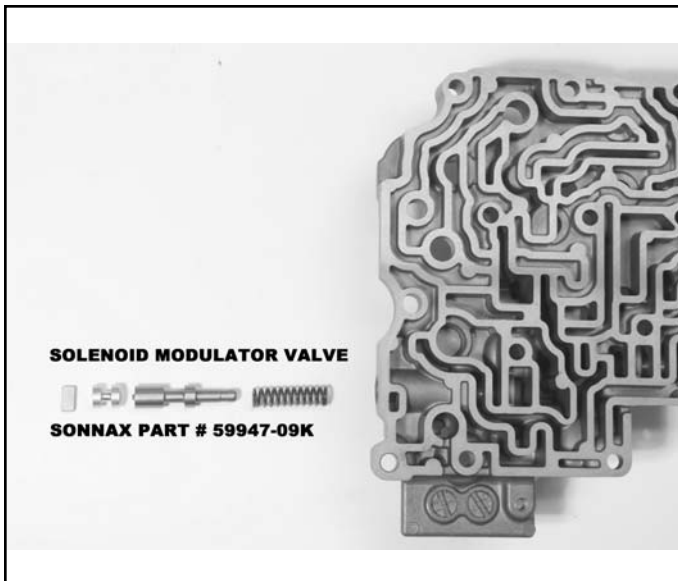
Valve Body Breakdown

Problem Areas and Fixes

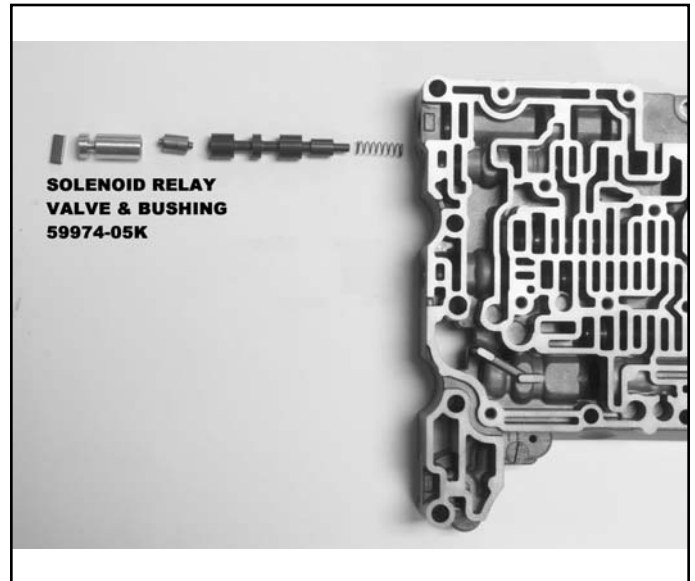
#2 Rear Valve Body



Front Valve Body Left Side



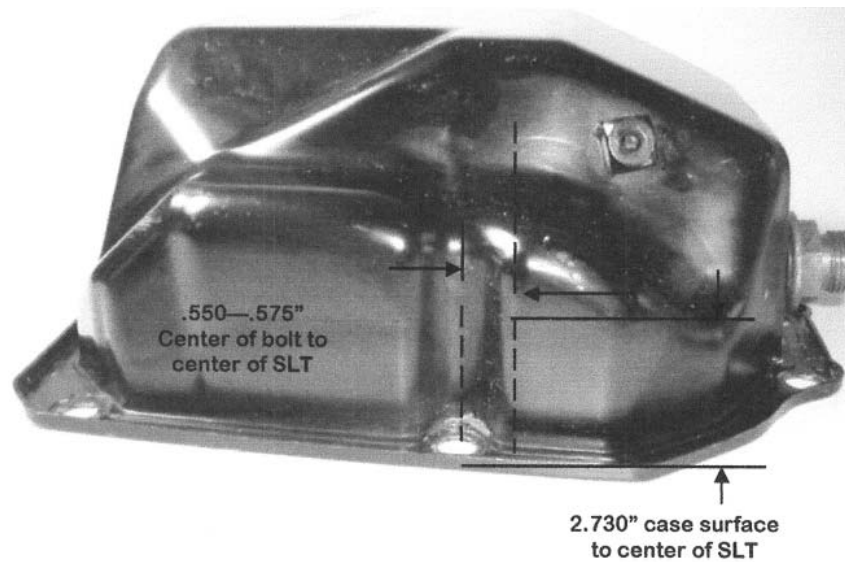
Middle Valve Body Left Side



Section Five: Valve Body

Setting SLT Pressure in Vehicle

- Drill 1/4 Hole in valve body cover at location shown.



- Use 3mm allen wrench through hole in cover to set SLT pressure to 5 @ idle, 80 @ WOT.
- When finished plug hole with 1/4 blind pop rivet.
- Perform pressure tests with transmission temperature @ approximately 150°F.
- See page 4 for Pressure Tap Locations.

**Section Six: Specifications****Clutch Clearances, Piston, Servo Travels, How to Adjust**

Clutch/Brake	Clearance	Piston Travel	Number of Frictions	Adjustment
Forward C1	0.029" - 0.042"	0.029" - 0.042"	5	Backing Plate
Direct/C2 (radial slots) (striped 0.059" thick) (plain 0.067" thick)	0.030" - 0.049"	0.059" - 0.075"	5	Backing Plate
4 -5 C3	0.024" - 0.054"	0.060" - 0.075"	5	Check Only
2nd Coast Brake B1 (smooth frictions)	0.020" - 0.038" 2 Frictions 0.030" - 0.057" 3 Frictions	0.042" - 0.055" 2 Frictions 0.051" - 0.064" 3 Frictions	2 or 3	Check Only
2nd Brake B2	0.017" - 0.040"	0.043" - 0.059"	4	Backing Plate
Low/Reverse Brake B3	0.042" - 0.063" 3 Frictions 0.055" - 0.087" 4 Frictions	0.032" - 0.056" 3 Frictions 0.043" - 0.075" 4 Frictions	3 or 4	Check Only
Underdrive Servo B4		0.227" - 0.266"	Band	Servo Pin 3.000", 3.020", 3.040", 3.060", 3.080"
1-2/Reverse Brake B5	0.033" - 0.064"	0.092" - 0.106"	6	Backing Plate



Section Six: Specifications

Pump Gear Clearances

Area to Measure	Specification
Outer Gear to Pump Body	0.002" - 0.007"
Inner Gear to Crescent	0.001" - 0.010"
Outer Gear to Crescent	0.001" - 0.018"
Gear Face to Pump Body	0.0012" - 0.003"

Endplay Specifications

Area to Measure	Specification	Selective
Case to Front Differential Gear	0.050" - 0.065"	Washer on Top of Front Differential Transfer Gear or Washer Under 4-5 Internal Gear (some models)
Forward Clutch Housing to Case	2.002" - 2.040"	Assembly Check Only
Input Shaft Endplay	0.007" - 0.022"	Washer Between Forward Clutch Housing and Rear Cover

Rotational Torque Specifications

Area to Measure	Specification	Selective
Differential Rotational Torque	6 - 11 in-lbs. Used 7 - 12 in-lbs. New	Shim Under Race in Main Case

**Section Six: Specifications*****Bolt Torque Specifications*****Fastener Tightening Specifications**

Description of Usage	Qty.	Size	Specification	
			Metric	English
Automatic Transmission Fluid Pump to Transmission Case Assembly	8	M8x1.25x28 mm	25 N.m	18 lb ft
Control Valve Body Cover to Transmission Case Assembly	9	M8x1.25x15.5mm	13 N.m	10 lb ft
Control Valve Body Fluid Passage Cover to Control Valve Body	2	M6x1.0x55 mm	10 N.m	89 lb in
Fluid Baffle to Torque Converter Housing Assembly	3	M6x1.0x14 mm	5 N.m	44 lb in
Fluid Baffle to Transmission Case Assembly	3	M6x1.0x14.7 mm	5 N.m	44 lb in
Fluid Filter to Transmission Case	1	M6x1.0x16.7 mm	5 N.m	44 lb in
Fluid Level Indicator Bolt	1	M8x1.25x25 mm	10 N.m	89 lb in
Fluid Pump Body to Fluid Pump Stator Shaft Assembly	13	M6x1.0x14.5 mm	12 N.m	106 lb in
Fluid Pump Body to Fluid Pump Stator Shaft Assembly	1	M5x0.8x17 mm	7 N.m	62 lb in
Fluid Temperature Sensor Clip to Control Valve Body	1	M6x1.0x50 mm	10 N.m	89 lb in
Forward Clutch Accumulator Cover to Case Cover	2	M6x1.0x14.5 mm	10 N.m	89 lb in
Input Speed Sensor to Transmission Case Assembly	1	M6x1.0x16 mm	5 N.m	44 lb in
Lube Fluid Pipe Retainer to Torque Converter Housing	1	M6x1.0x14 mm	5 N.m	44 lb in
Lube Fluid Pipe Retainer to Transmission Case Assembly	1	M6x1.0x14.5 mm	5 N.m	44 lb in
Manual Shift Detent Spring to Transmission Case	1	M6x1.0x14 mm	5 N.m	44 lb in
Output Speed Sensor to Transmission Case Assembly	1	M6x1.0x16 mm	5 N.m	44 lb in
Park/Neutral Position Switch Nut to Manual Shift Detent Lever	1	M16x1.5 mm	7 N.m	62 lb in
Park/Neutral Position Switch to Transmission Case Assembly	1	M8x1.25x22 mm	25 N.m	18 lb ft
Park/Neutral Position Switch to Transmission Case Assembly	1	M8x1.25x36 mm	25 N.m	18 lb ft
Park Pawl Actuator Bracket to Transmission Case Assembly	1	M6x1.0x16.7 mm	10 N.m	89 lb in
Park Pawl Bolt/Screw to Transmission Case Assembly	1	M6x1.0x25 mm	10 N.m	89 lb in
Rear Valve Body Cover Plate Bolt - Hexagon	2	M5x0.8x13 mm	7 N.m	62 lb in



Section Six: Specifications

Bolt Torque Specifications

Fastener Tightening Specifications

Description of Usage	Qty.	Size	Specification	
			Metric	English
Rear Valve Body Cover Plate Bolt - Hexagon	7	M5x0.8x13 mm	7 N.m	62 lb in
Torque Converter Housing to Transmission Case Assembly	2	M8x1.25x30 mm	29 N.m	21 lb ft
Torque Converter Housing to Transmission Case Assembly	11	M8x1.25x30 mm	29 N.m	21 lb ft
Torque Converter Housing to Transmission Case Assembly	2	M8x1.25x35 mm	29 N.m	21 lb ft
Torque Converter Housing to Transmission Case Assembly	1	M8x1.25x45 mm	29 N.m	21 lb ft
Torque Converter Housing to Transmission Case Assembly - TORX	1	M8x1.25x30 mm	29 N.m	21 lb ft
Torque Converter Housing to Transmission Case Assembly	9	M8x1.25x30 mm	25 N.m	18 lb ft
Torque Converter Housing to Transmission Case Assembly	2	M8x1.25x48 mm	25 N.m	18 lb ft
Torque Converter Housing to Transmission Case Assembly	1	M8x1.25x45 mm	25 N.m	18 lb ft
Transmission Case Fluid Passage Cover to Transmission Case Assembly	2	M6x1.0x14 mm	5 N.m	44 lb in
Transmission Fluid Drain Plug to Torque Converter Housing	1	M18x12 mm	39 N.m	29 lb ft
Transmission Fluid Pressure Test Hole Plug	9	—	7 N.m	62 lb in
3rd Gear Band Anchor Bolt to Transmission Case Assembly	1	M20x1.5x21 mm	167 N.m	123 lb ft
3rd Gear Band Apply Tube Retainer to Transmission Case Assembly	2	M6x1.0x14 mm	5 N.m	44 lb in
4-5 Clutch Apply Pipe Retainer to Transmission Case Cover	4	M5x08x12 mm	7 N.m	62 lb in
Valve Body				
• Control Valve Body to Transmission Case Assembly	2	M6x1.0x16 mm	10 N.m	89 lb in
• Control Valve Body to Transmission Case Assembly	2	M6x1.0x50 mm	10 N.m	89 lb in
• Control Valve Body to Transmission Case Assembly	2	M6x1.0x55 mm	7 N.m	62 lb in
• Control Solenoid Valve Retainer to Control Valve Body	1	M5x0.8x13 mm	7 N.m	62 lb in



Section Six: Specifications

Bolt Torque Specifications

Fastener Tightening Specifications

Description of Usage	Qty.	Size	Specification	
			Metric	English
Valve Body Continued				
• Front Control Valve Body to Middle Control Valve Body	4	M5x0.8x20 mm	7 N.m	62 lb in
• Front Control Valve Body to Middle Control Valve Body	2	M5x0.8x16 mm	7 N.m	62 lb in
• Front Control Valve Body to No. 2 Rear Control Valve Body	1	M5x0.8x76 mm	7 N.m	62 lb in
• Front Control Valve Body to No. 2 Rear Control Valve Body	4	M5x0.8x49.5 mm	7 N.m	62 lb in
• Lock Up Control Solenoid Valve to Front Control Valve Body	1	M5x0.8x10 mm	7 N.m	62 lb in
• Middle Control Valve Body Pressure Tap	1	M6x1.0x12 mm	7 N.m	62 lb in
• Middle Control Valve Body to No. 2 Rear Control Valve Body	1	M5x0.8x50 mm	7 N.m	62 lb in
• No. 2 Rear Control Valve Body to Front Control Valve Body	1	M5x0.8x50 mm	7 N.m	62 lb in
• Rear Control Valve Body to Middle Control Valve Body	1	M5x0.8x40 mm	7 N.m	62 lb in
• Rear Control Valve Body to Middle Control Valve Body	2	M5x0.8x35 mm	7 N.m	62 lb in
• Reverse, 1st Shift Solenoid Valve - S1 to Control Valve Body	1	M5x0.8x28 mm	7 N.m	62 lb in
• Reverse Shift Solenoid Valve - S5 to Control Valve Body	1	M5x0.8x28 mm	7 N.m	62 lb in
• 1-2, 2-3, Reverse, Shift Solenoid Valve - S3 to Control Valve Body	1	M5x0.8x50 mm	7 N.m	62 lb in
• 2-3, 3-4 Shift Solenoid Valve - S2 to Control Valve Body	1	M5x0.8x10 mm	7 N.m	62 lb in
• 3-4, 4-5 Shift Solenoid Valve - S4 to Control Valve Body	1	M5x0.8x28 mm	7 N.m	62 lb in



Section Six: Specifications

Gear Ratios

Gear	R	1st	2nd	3rd	4th	5th
Nissan	5.114	4.657	3.032	1.982	1.341	1.018
Volvo	*	*	*	*	*	*
Saab	5.144	4.655	3.032	1.979	1.340	1.016
Equinox	3.177	4.685	2.942	1.923	1.301	1.000
Saturn	3.12	4.60	2.89	1.89	1.28	0.98

* Not published

Final Drive Ratios

Make/Model	RPO or Transaxle Code	RPO or Transaxle Code
Nissan Maxima	9J500 2.269	8Y100 2.440
Nissan Altima	9J500 2.269	8Y100 2.440
Nissan Quest	CK710 2.269	
Chevy Equinox AWD/FWD	RPO Code F67 2.70	
Saturn Vue	RPO Code FH9 2.60	
Saturn ION	RPO Code FH9 2.60	
Pontiac Torrent AWD/FWD	RPO Code F67 2.70	
Saab	2.44	
Volvo	Not Published	



Section Six: Specifications

Fluid Type and Capacity

NOTE NO “DRAIN AND FILL” CAPACITIES PUBLISHED

CAUTION DO NOT SUBSTITUTE “MULTI-BRAND” OR SYNTHETIC FLUID FOR THE MANUFACTURER’S RECOMMENDED FLUID.

Manufacturer/Part Number	Dry Fill Capacity Liter, quart
Volvo JWS 3309 1161540 1 l., 1161640 4 l.	7.1 l., 7.25 qt.
Nissan Nissan Matic “K”	7.3 l., 7.7 qt.
Saab 3309	7.2 l., 7.6 qt.
GM T-IV P/N 88900925	7.8 l., 8.2 qt.



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