GM 4L80-E, 4L85-E PERFORMANCE PACK

PART NUMBER HP-4L80E-01 **INSTRUCTION BOOKLET**

Pump Parts

- Line Pressure Booster Kit
- Lube Regulated Pressure Regulator Valve

Valve Body Parts

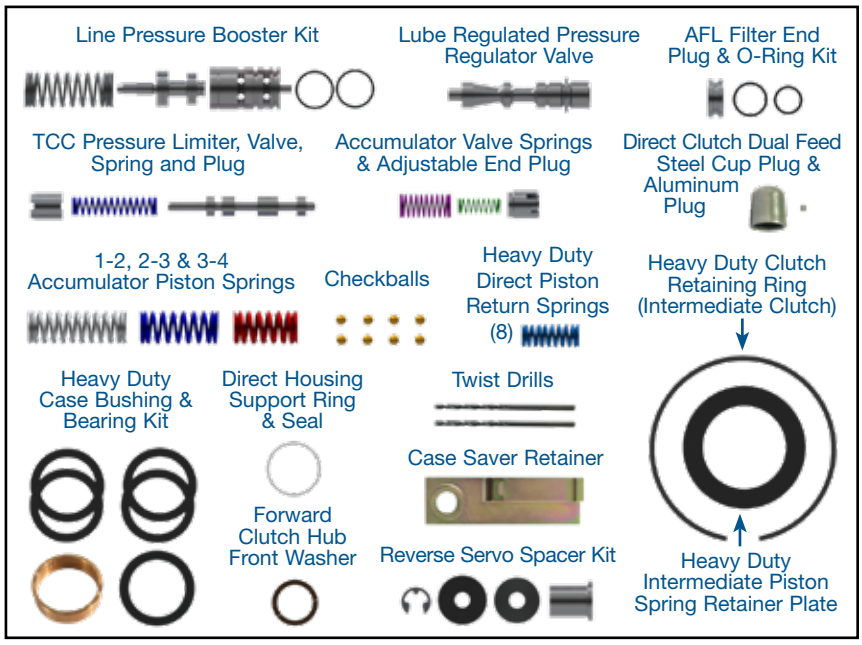
- TCC Pressure Limiter, Valve, Spring & Plug
- Accumulator Valve Springs & Adjustable End Plug — 2 Springs
- AFL Filter End Plug & O-Ring Kit
- Direct Clutch Dual Feed Steel Cup Plug
- Direct Clutch Dual Feed Aluminum Plugs (3) — 2 Extra
- 1-2, 2-3 & 3-4 Accumulator Piston Springs (3)
- Checkballs (8)
- Twist Drill — .062"
- Twist Drill — .086"

Internal Parts

- Heavy Duty Case Bushing & Bearing Kit
- Direct Housing Support Ring and Seal
- Heavy Duty Intermediate Piston Spring Retainer Plate
- Heavy Duty Clutch Retaining Ring — Intermediate Clutch
- Case Saver Retainer
- Heavy Duty Direct Piston Return Springs (8)
- Forward Clutch Hub Front Washer

Servo Part

Reverse Servo Spacer Kit



Before You Begin

What to know about torque converter pressure, transmission pump wear and other issues.

The torque converter operates in two basic modes. The first mode is "TCC released" where converter oil pressure is regulated by the converter limit valve in the pump. This valve restricts pressure in the torque converter to about 110 psi regardless of how high line pressure rises. The second mode is when "TCC is applied" where TCC oil pressure comes from the TCC regulator valve in the valve body. Normal TCC apply pressure varies between 30 psi–80 psi by controlling PWM TCC solenoid duty cycle.

Common modifications to the converter limit valve spring, TCC regulator valve or when the TCC solenoid is operated at 100% duty cycle with aftermarket programming, aftermarket controllers or on-off type switching will cause converter pressure to far exceed intended values.

When converter pressure is increased beyond intended limits, it puts increased load on the crank shaft thrust bearing and contributes to extra in and out movement of the torque converter. Excessive in and out movement of the torque converter is related to damaged transmission pumps as the inner gear gets pulled back and forth by the converter drive hub. Additionally, there is no performance benefit in either TCC released or TCC applied modes from increased pressure.

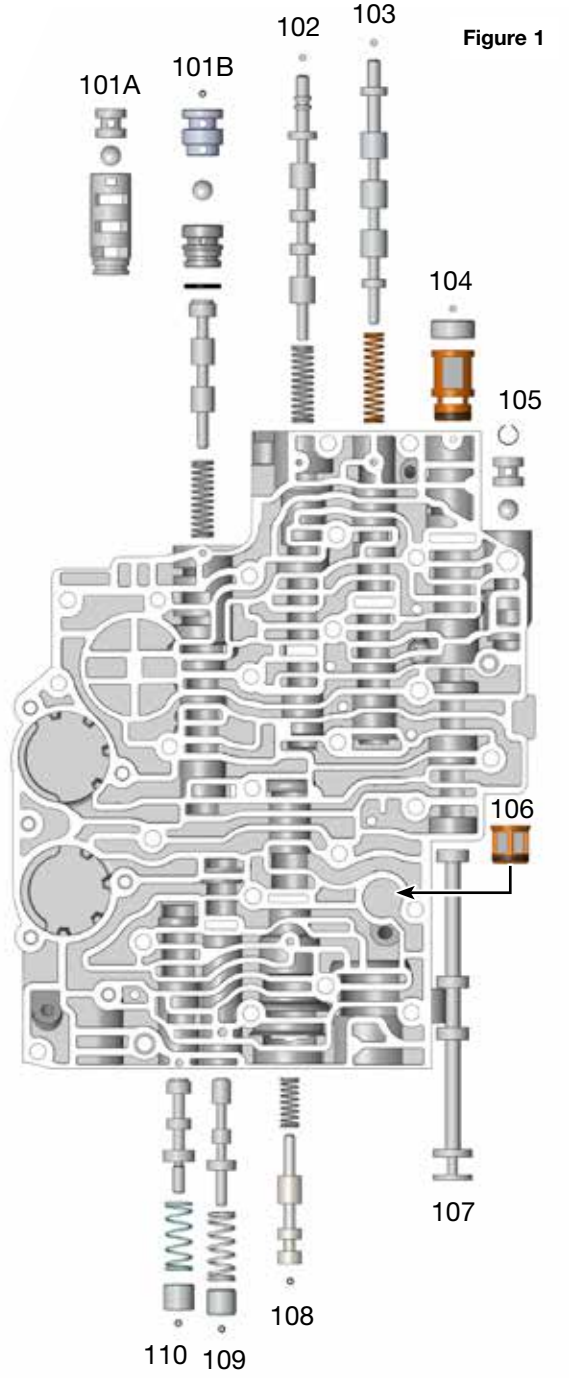
This kit includes a Sonnax TCC pressure limit valve located in the valve body that converts the PWM variable pressure TCC regulator valve to on-off non-PWM system that always limits TCC apply pressure to a safe 100 psi.

At the converter limit valve in pump (**Figure 2**), do not block this valve or install stronger spring. This eliminates the valves ability to regulate pressure leading to excess converter pressure.

OE Exploded View

Valve Body • 4L80-E Shown

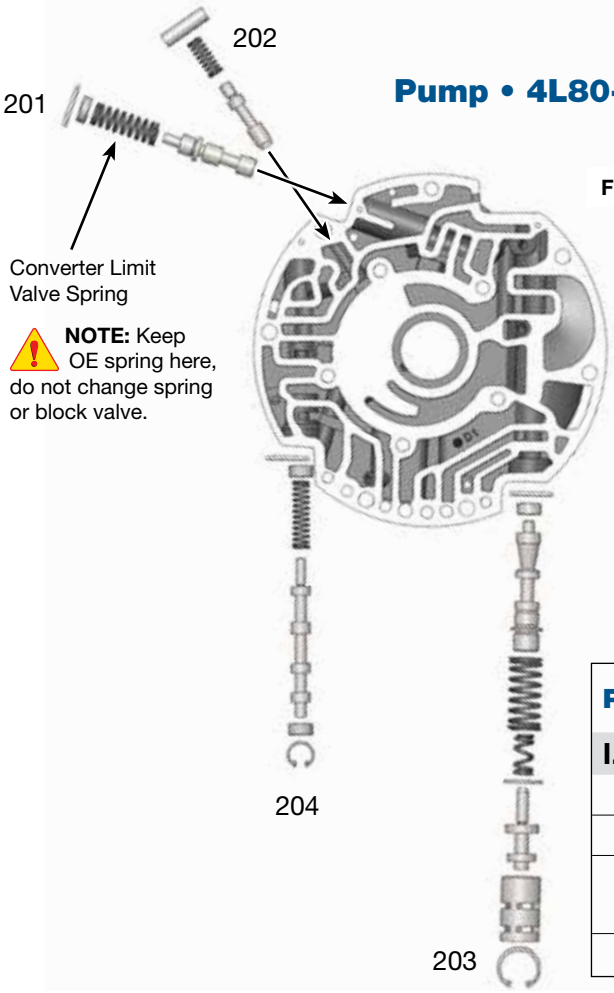
Figure 1



Valve Body Descriptions	Figure 1
I.D. No.	**Description**
101A	3rd/Reverse Checkball & Sleeve (Outboard, Early Style) 3-4 Shift Valve (Inboard)
101B	Reverse Checkball Sleeve (Outboard), 3rd Checkball Sleeve (Center), 3-4 Shift Valve (Inboard)
102	2-3 Shift Valve
103	1-2 Shift Valve
104	Actuator Feed Limit Solenoid Filter & End Plug
105	Checkball
106	Force Motor Feed Filter
107	Manual Valve
108	TCC Regulator Valve
109	Actuator Feed Limit Valve
110	Accumulator Control Valve

Pump • 4L80-E Shown

Figure 2



NOTE: Keep OE spring here, do not change spring or block valve.

Pump Descriptions	Figure 2
I.D. No.	**Description**
201	Converter Limit Valve
202	TCC Enable Valve
203	Pressure Regulator Valve (Inboard) Boost Valve Assembly (Outboard)
204	TCC Valve

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Pump Parts (Figure 3)

1. Lube Regulated Pressure Regulator Valve & Line Pressure Booster Kit Installation

NOTE: Sonnax lube regulated pressure regulator valve provides a significant increase in cooler flow under low RPM and high pressure conditions and includes an internal check valve to prevent converter drain back.

Disassembly

Remove and discard OE boost valve, sleeve, large diameter pressure regulator spring and main pressure regulator valve. Retain OE bumper spring, spring seat, end plug, and retaining clip.

Bore Preparation

NOTE: O-Rings included in this kit provide extra insurance for preventing cross-leaks and should always be installed.

a. Carefully inspect snap ring grooves, feed holes or bore edges and deburr if necessary to reduce possibility of cutting O-rings during installation. A non-abrasive tool such as a radial wire brush (**Figure 4**) works best. The bore should always be thoroughly cleaned after any deburring.

b. Place O-rings into grooves on boost sleeve, roll sleeve over bench to resize O-rings, then pre-lube O-rings. Sonnax Slippery Stick (**O-LUBE**) or Door Ease® are ideal for this purpose.

Installation

a. Install Sonnax line-to-lube regulated pressure regulator valve, Sonnax pressure regulator spring, OE small bumper spring (used '92-later) and OE spring seat into pump cover (**Figure 3**).

b. Carefully push Sonnax large ratio boost assembly into pump body, just deep enough to reinstall retaining ring.

c. Install retaining ring into pump cover.

4L80-E Pump with Sonnax & OE Components **Figure 3**

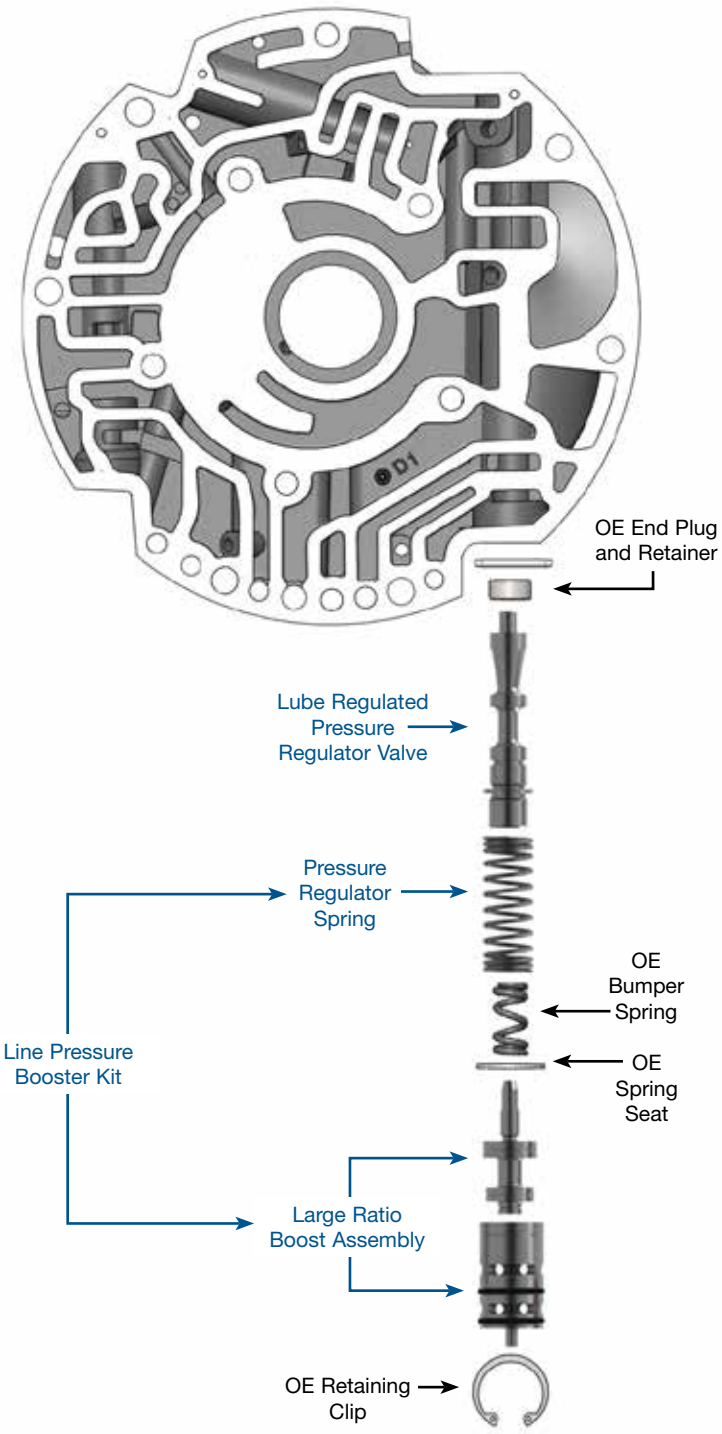
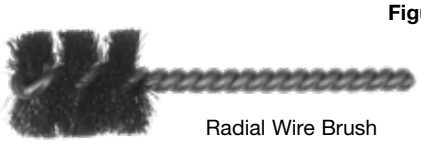


Figure 4



Valve Body Parts

2. TCC Pressure Limiter Valve & Spring Installation

Disassembly & Drilling

a. Remove TCC solenoid retaining clip and solenoid.

b. Remove and discard roll pin, valve and spring.

c. Create vent hole with included .086" drill by drilling down though roll pin hole and out bottom of valve body casting (**Figures 5 and 6**).

Installation

a. Install Sonnax TCC limit valve with long stem outwards (**Figure 6**).

b. Install Sonnax spring, followed by Sonnax plug.

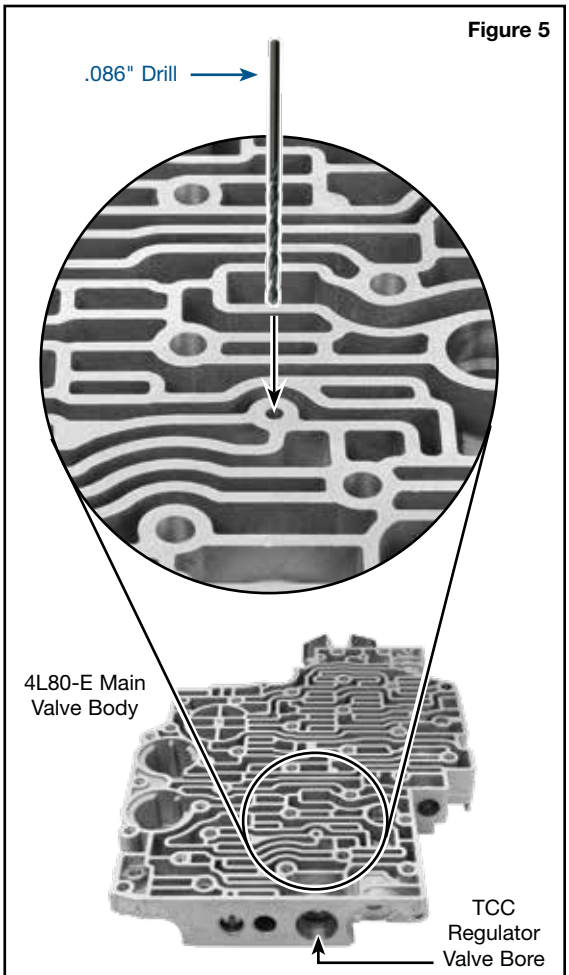
c. Install solenoid.

d. Install retaining clip from separator plate side (**Figure 8**).

CAUTION: Orient solenoid as shown (**Figure 7**). Carefully position retaining clip as shown (**Figure 8 and 9**).

e. Make sure retaining clip is evenly/squarely seated against valve body casting wall.

Figure 5



Sonnax TCC Pressure Limiter Valve & Spring **Figure 6**

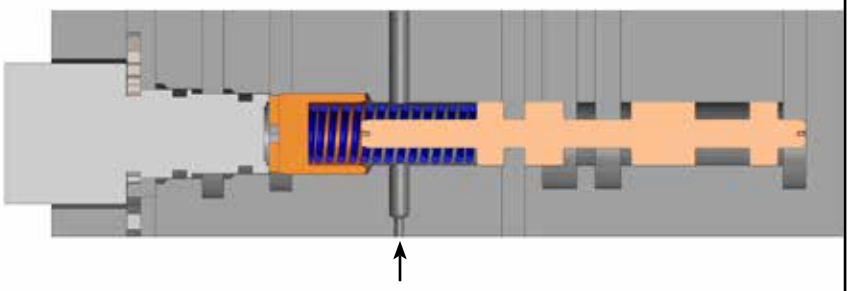
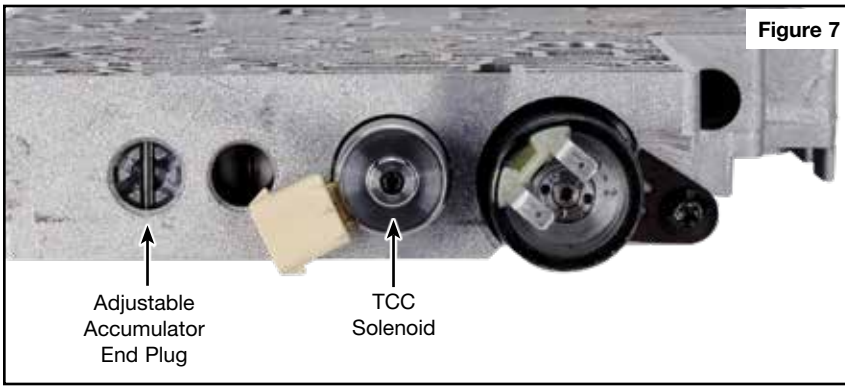
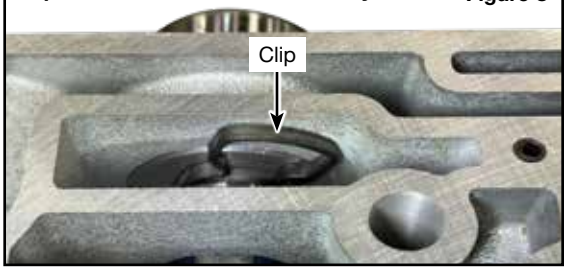


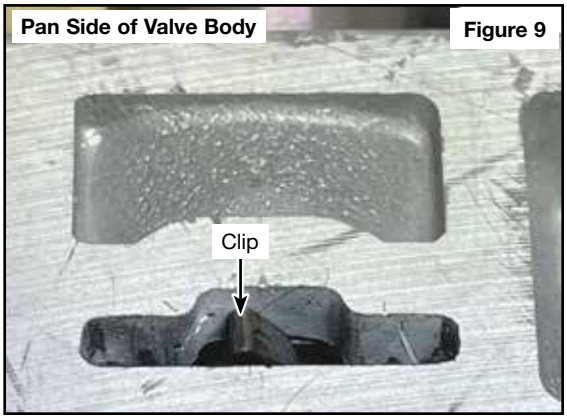
Figure 7



Separator Plate Side of Valve Body **Figure 8**



Pan Side of Valve Body **Figure 9**



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3. Accumulator Valve Springs & Adjustable End Plug Installation

NOTE: The Sonnax adjustable accumulator regulator valve end plug has three positions that allows for adjustment of accumulator pressure and shift feel of 1-2, 2-3 and 3-4 upshifts without removing the valve body.

Disassembly & Preparation

a. Remove accumulator regulator valve roll pin (**Figure 11**).

b. Remove and discard OE end plug and springs.

c. Remove and inspect OE accumulator valve.

Assembly

a. Install OE accumulator valve (**Figure 11**).

b. Install Sonnax inner and outer springs.

c. Install Sonnax adjustable end plug.

d. Install OE roll pin, position end plug at middle step of three available adjustment positions (**Figure 10**).

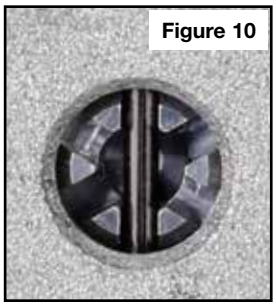


Figure 10

In-Vehicle Adjustment

Using small pick, push end plug into valve body and rotate to desired position (**Figure 10**).

- **Shallow step = Softer shifts**
  Plug positioned deepest into valve body.
- **Deepest step = Firmer shift**
  Plug positioned furthest outwards.

4. AFL Plug Installation

CAUTION: Always replace AFL filter, early years were known crack and fail.

NOTE: AFL fluid feeds the solenoids, including main pressure EPC solenoid and in '97-later, it feeds part of the lubrication circuit. Preventing leaks in the AFL circuit is critical for maintaining shift solenoid function, max line pressure and lubrication. Always replace the 3rd/Reverse checkball sleeve inner O-ring (**101A and B, Figure 1, Page 2**) and inspect AFL valve bore (**108, Figure 1, Page 2**) in valve body.

Disassembly & Preparation

a. Remove AFL plug roll pin.

b. Remove AFL plug and filter.

Assembly

a. Install O-ring on AFL aluminum plug.

b. Install O-ring on AFL filter.

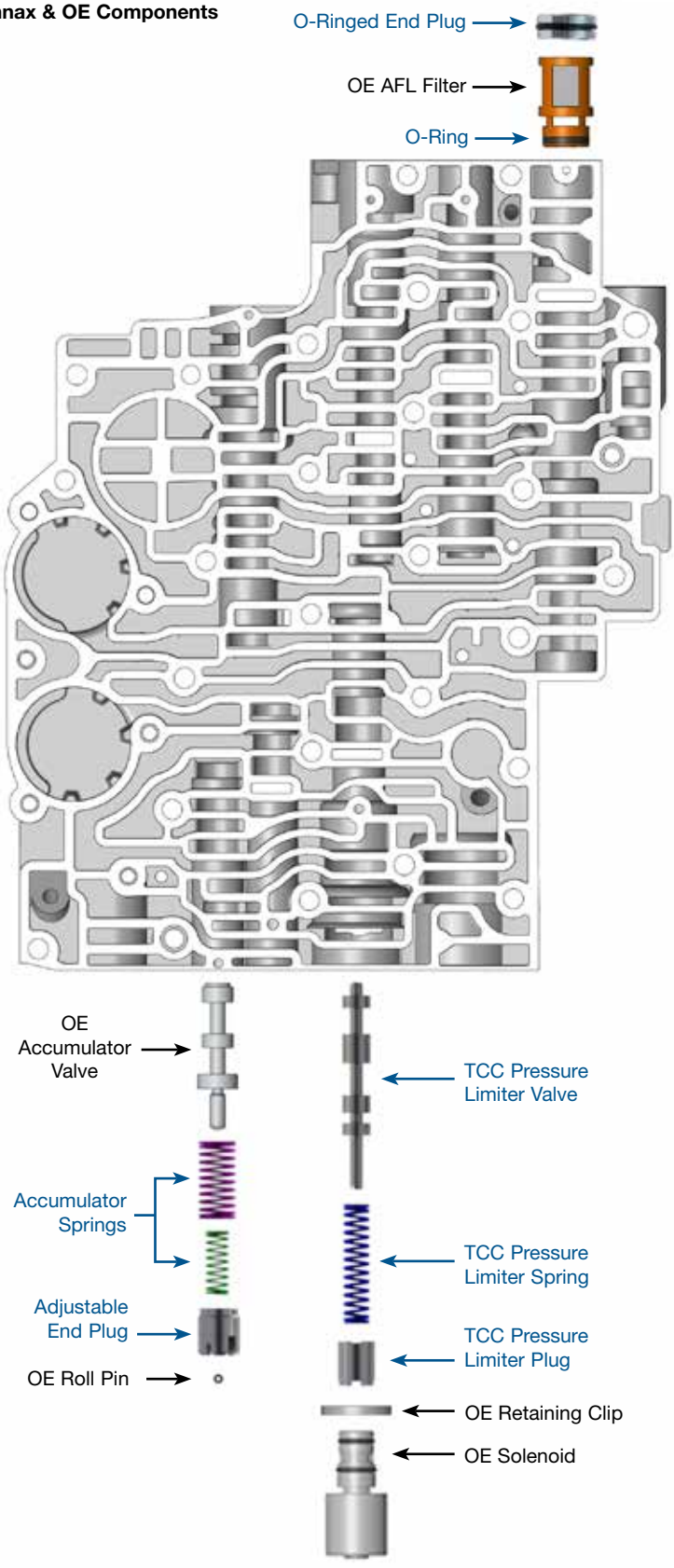
c. Install AFL filter into valve body (**Figure 11**).

d. Install aluminum plug with O-ring.

e. Install OE roll pin.

4L80-E Valve Body with Sonnax & OE Components

Figure 11



5. Separator Plate Adjustments

Drill 1-2, 2-3, 3-4 and Reverse holes with Sonnax provided .086" drill bit (**Figure 12**).

6. Direct Clutch Dual Feed Modifications

Do NOT install second sealing ring on center support, (**Figure 26, page 9**).

NOTE: Blocking feed to the reverse side of direct piston can be done at either of two locations depending on builder preference.

- **OPTION 1:** Use Sonnax small aluminum plug in the separator plate (**Figure 12**).
- **OPTION 2:** Use Sonnax steel cup plug in the center support (**Figure 26, page 9**).

Option 1 (**Figure 12**)

a. Drill feed hole with Sonnax provided .062" drill bit.

b. With Sonnax provided .086" drill bit create a very slight chamfer on both sides of plate.

c. Insert Sonnax aluminum plug into hole and with a hammer lightly peen on both sides to secure plug in place.

Option 2 (**Figure 26, Page 9**)

Install Sonnax cup plug center support feed passage.

7. Accumulator Piston Spring Installation

a. Install blue 3-4 and white 2-3 accumulator springs into accumulator body (**Figure 13**).

b. Install red 1-2 accumulator spring into reverse servo and 1-2 accumulator assembly (**Figure 17**).

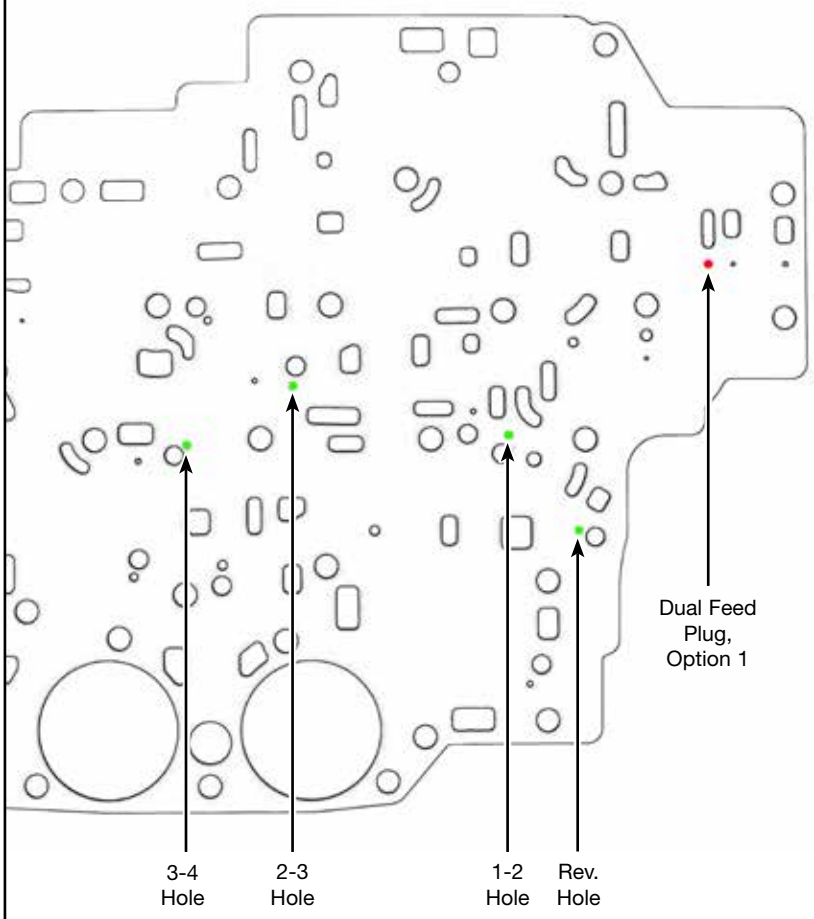
8. Checkball Installation (**Figure 14**)

Insert Sonnax checkballs in the 8 locations shown.

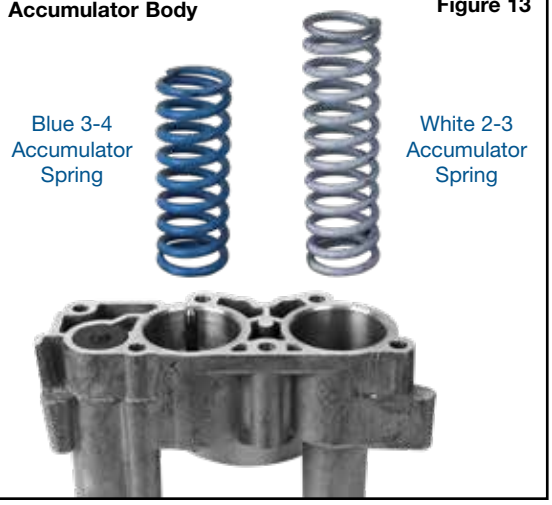
Separator Plate Holes **Figure 12**

● = Drill Feed Holes

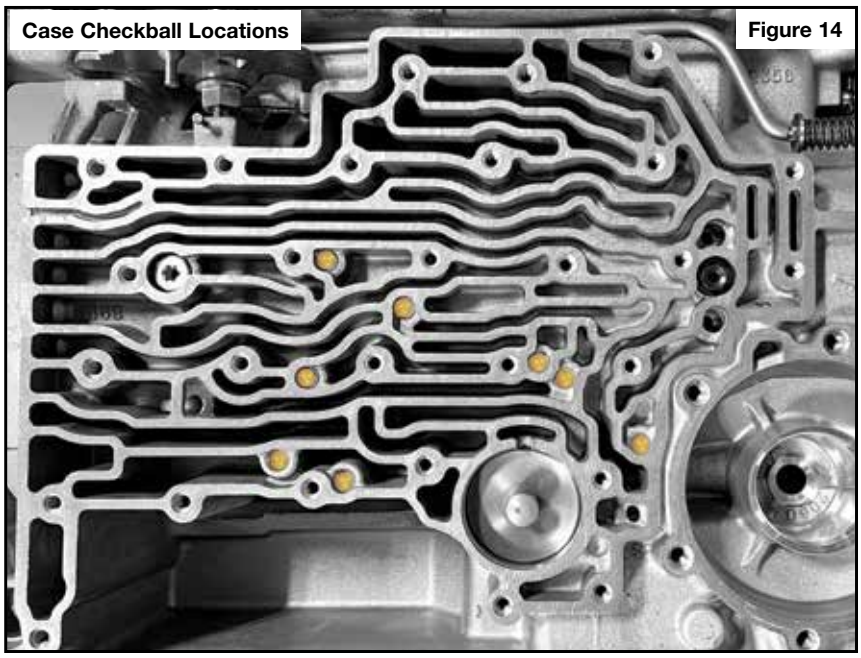
● = Dual Feed Plug, Option 1



Accumulator Body **Figure 13**



Case Checkball Locations **Figure 14**



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9. Reverse Servo Spacer Kit Installation

WARNING: For use with '96-later reverse servo ONLY.
Do not use these parts with earlier style piston (**Figure 15**).

NOTE: Reverse servo spacer kit prevents breakage of '96-later servo pistons (**Figures 16** & **18**).

Diassembly

a. Disassemble OE Low/Reverse servo assembly.

b. Discard OE spacer and E-clip.

c. Inspect reverse piston for cracks and replace if necessary.

NOTE: Do not reuse a cracked piston.

Installation & Assembly

a. Reassemble the Low/Reverse servo with Sonnax components (**Figure 17**).

b. Sonnax flat washer is installed with rounded edge against reverse piston.

c. Sonnax Belleville spring washer is placed on top of flat washer with open-dish side towards flat washer.

d. Sonnax short spacer is installed through OE short bumper spring assembly. The small OD of Sonnax spacer goes against the Belleville spring washer.

e. Install Sonnax E-clip to retain the reverse piston on the apply pin.

Reverse Servo Identification **Figure 15**

'91-'95 '96-Later

Figure 16

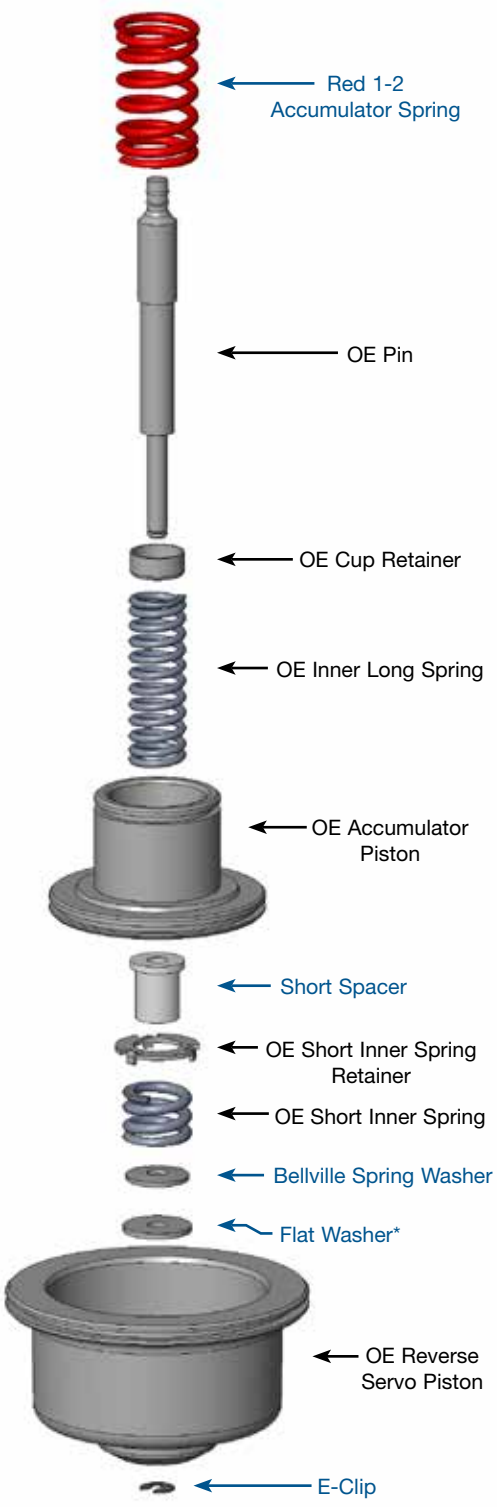
Prevents piston breaking of '96-Later.

Figure 18

Wider contact with the Sonnax kit prevents piston breaking.

Figure 17

Reverse Servo & 1-2 Accumulator Assembly



*Install rounded edge of flat washer towards piston.

Internal Parts

10. Heavy Duty Case Bushing Kit with Bearing Installation (Figure 19)

Disassembly

Remove OE case bushing from transmission case. Check the case bore for burrs, deburr the leading (inward) edge as needed.

NOTE: If the OE bushing has spun, measure the case bore. For an ideal fit, the bore should not measure more than 2.1285" in diameter.

Assembly

a. Press Sonnax no-walk bushing into the case bore from inside the transmission so bushing flange is seated on the transmission case.

b. Discard OE 3-tab selective washer and 4-tab thrust washer.

c. Two .010" and two .015" Sonnax shims are included to set the rear unit endplay in accordance with OE specifications. These shims allow adjustment in .005" increments, covering the common range of OE selective washers. Install the required combination of selective shims around the bushing's flange and against the face of the case.

- 4L80-E Rear End Play Specifications: .005–.025"

d. Install Sonnax thrust bearing around the bushing's flange and against the shims in proper orientation (**Figure 20**).

NOTE: On some applications, the output shaft may be snug during reassembly. Tap on the shaft at spline area to reform the bushing high spots.

11. Optional Direct Drum Support Seal Modification

Note: This modification improves long term durability by adding support to the direct drum and preventing wear from contact with the center support. Installation is a bit tedious the first time but the results are worth the effort.

Trim Flat Steel Insert to Size (Figure 21)

a. Temporarily install sealing ring into direct housing bore.

b. Carefully place flat steel insert inside seal ring.

c. Mark point where flat steel insert over laps itself.

d. Carefully trim flat steel insert so there is a small gap of 1mm or less (**Figure 22**).

Figure 19

Figure 20

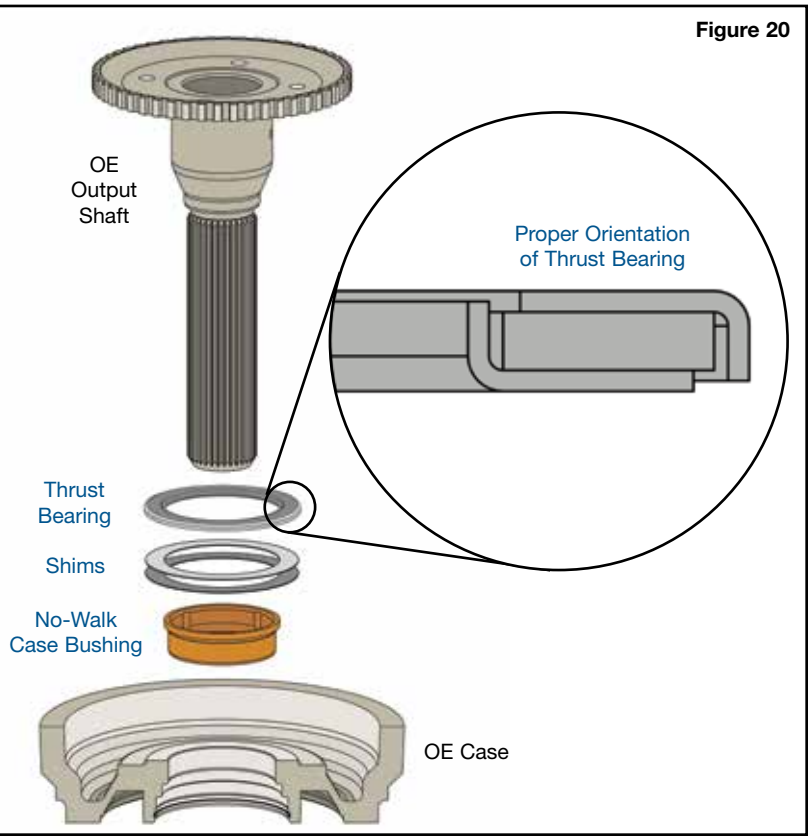
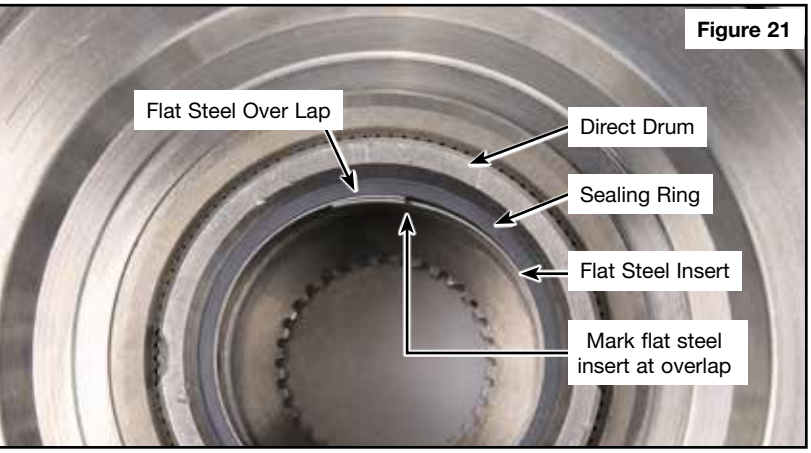


Figure 21



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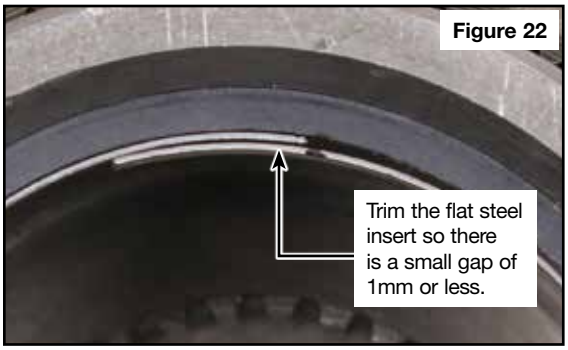


11. Optional Direct Drum Support Seal Modification (continued)

Installation

a. Install trimmed flat steel insert into lower seal ring groove of center support (**Figure 23**).

b. Install solid PTFE seal ring over flat steel insert (**Figure 24**).

c. If appropriate sizing tool is not available, wrap tightly with vinyl electrical tape and let sit for 15 minutes.

d. Ensure drum slides easily over sealing ring before final assembly.

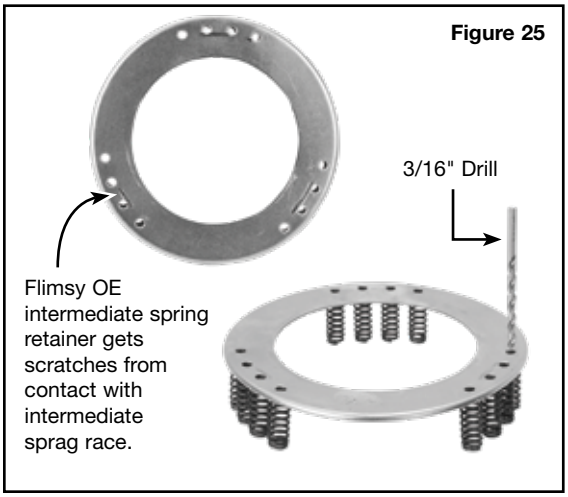
12. Heavy Duty Intermediate Piston, Spring Retainer Plate Installation

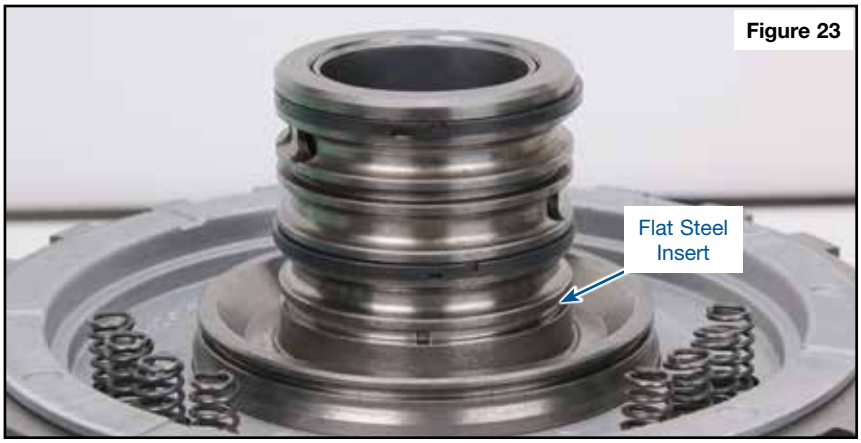
a. Use 3/16" drill to remove crimps holding springs to retainer. Ensure not to damage or distort springs (**Figure 25**).

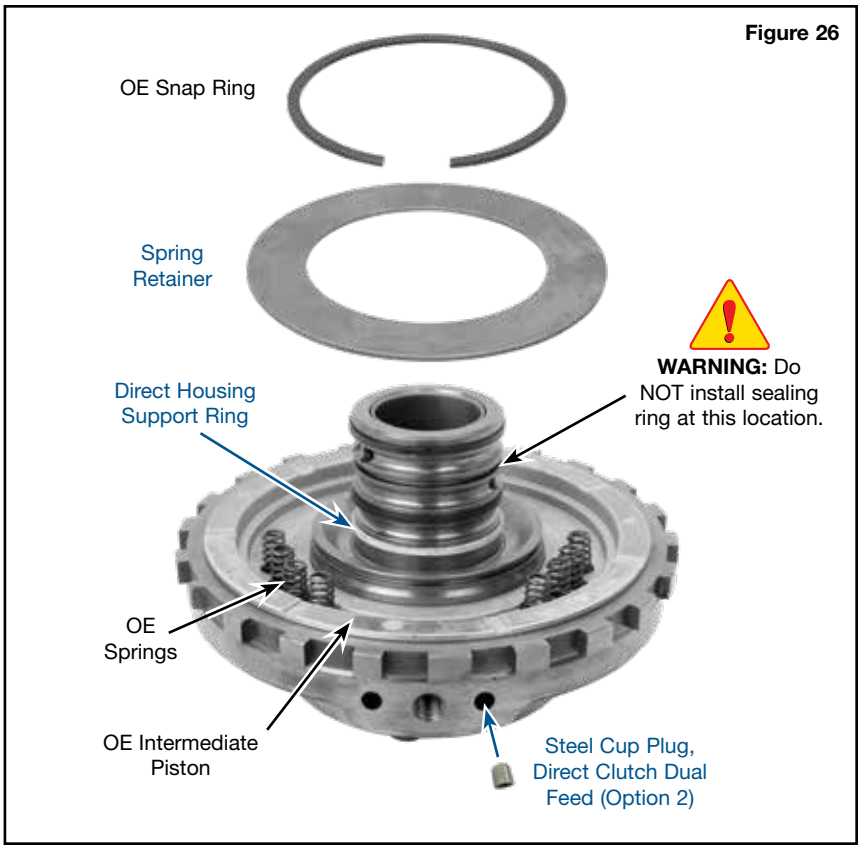
b. Install springs into intermediate piston (**Figure 26**).

c. Install Sonnax heavy duty intermediate piston and spring retainer.

d. Install OE intermediate spring retainer snap ring.







13. Heavy Duty Direct Piston Return Spring Installation

Disassembly

a. Carefully pry off OE retainer from spring assembly (**Figure 27**).

b. Remove every other OE spring (**Figure 27**).

Assembly

a. Install 8 blue Sonnax springs making sure they fit over OE crimps (**Figure 28**)

b. Reinstall OE retainer onto spring assembly (**Figure 29**)

c. Verify individual springs are straight and top and bottom retainers are flat and parallel.

d. Install spring assembly onto direct piston (**Figure 30**).

Figure 27

Figure 28


Spring Assembly with Sonnax & OE Components

Figure 29

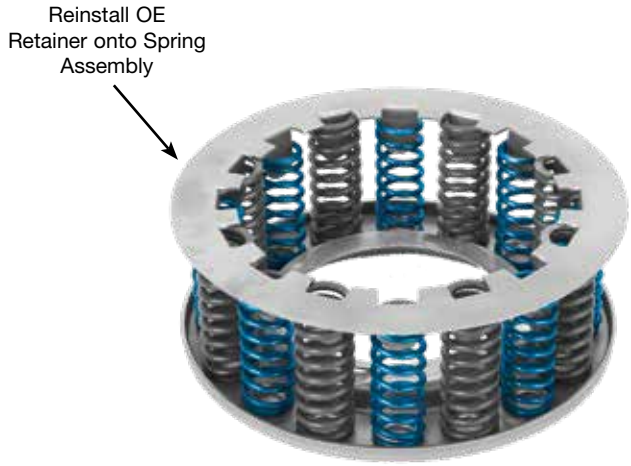
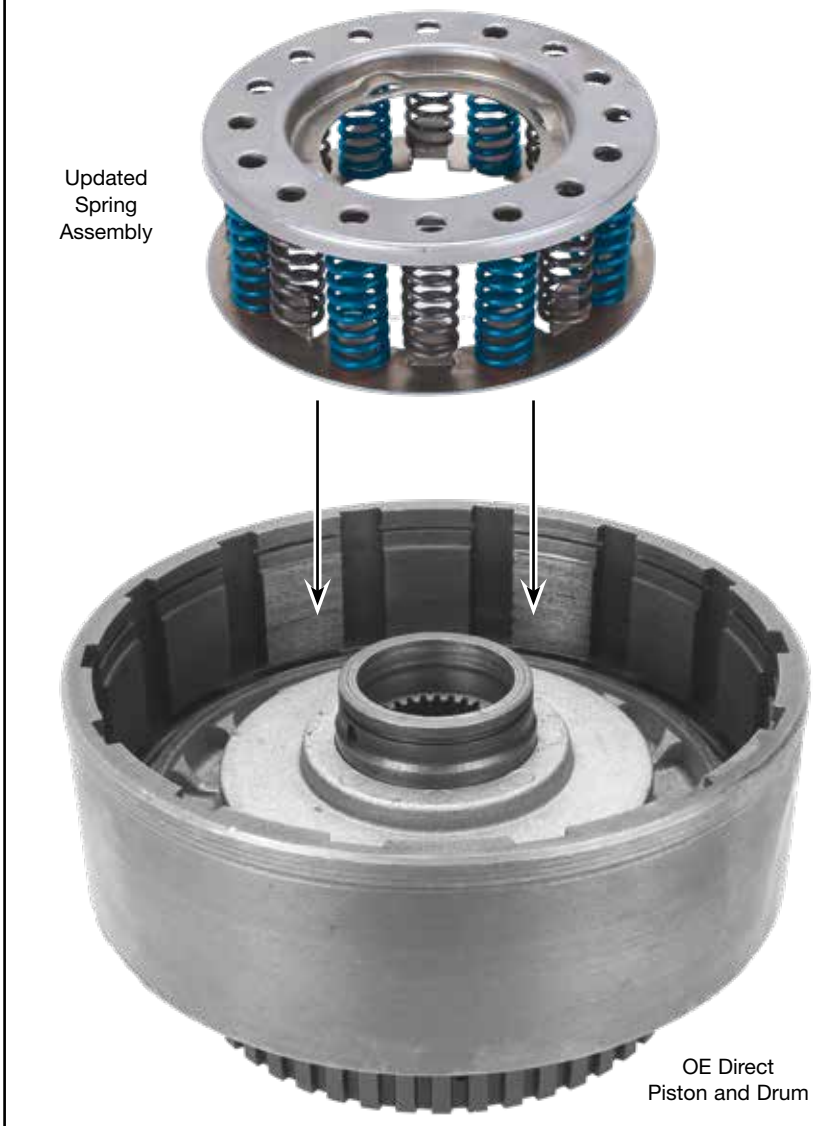


Figure 30



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14. Universal Case Saver Retainer Installation

NOTE: Sonnax case saver retainer is the only intermediate clutch retaining ring case saver that allows the intermediate band to be retained. This universal version can be used in both '99-later 4L80-E and modified '98-earlier applications.

Verify Year & Case Version

The distance between the front band anchor pin inside the case and the intermediate clutch backing plate retainer ring varies depending on year of the case.

- **'99-Later** units have wider (1.250") intermediate band, .041" shim under rear sun gear bearing and 'flat' .275" thick intermediate backing plate. If your unit is '99-later, no case saver modification is needed.
- **'98-Earlier** units, the retainer must be modified by removing two tips explained below.

Modify Case Saver ('98–Earlier Only)

Using a cut off wheel or file (**Figure 31**), carefully remove the two tips from the case saver (**Figures 32**).

Modify Backing Plate with Additional Notch (All Years) (**Figure 33**)

a. Apply machinist layout fluid, a black marking pen or other marking material to both sides of the intermediate backing plate (**Figure 34**).

b. Lay an intermediate steel plate over the friction face of the backing plate and align the lugs as accurately as possible.

c. Scribe the new lug notch (**Figure 34**).

d. Repeat on other side of backing plate.

e. With a fine tooth hacksaw, cut up to the scribed lines on the pressure plate with a series of cuts (**Figure 35**).

f. Break out the sections between cuts.

g. Use a file to clean up the added notch. Recheck with steel plate, filing as necessary (**Figure 33**).

Figure 31

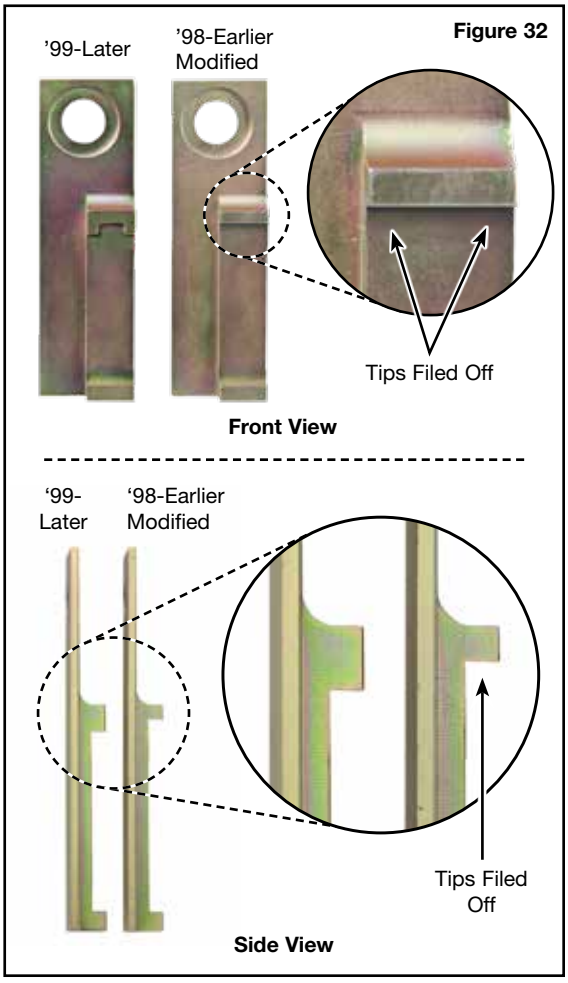

Figure 32

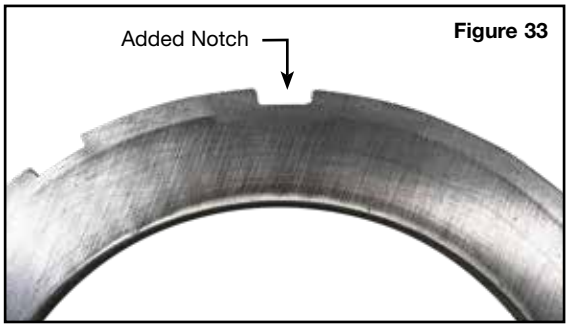

Figure 33

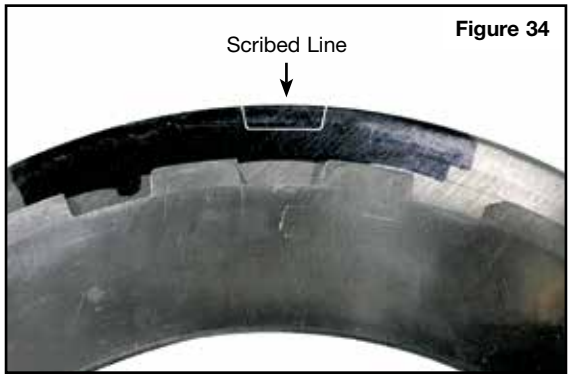

Figure 34

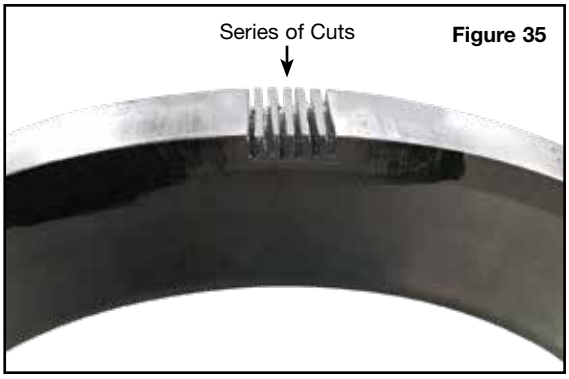

Figure 35

14. Universal Case Saver Retainer Installation (continued)

Installation (Figure 36)

a. Before installing the beveled center support retaining ring, place the Sonnax case saver over front band anchor pin and between exposed center support lugs.

b. Install the beveled center support retaining ring with the opening at the 9 o'clock position and so one end of the retaining ring holds the case saver against the inside of the case.

c. Install intermediate clutches and modified backing plate.

d. Install the Sonnax heavy duty intermediate clutch retaining ring with open end at 12 o'clock position.

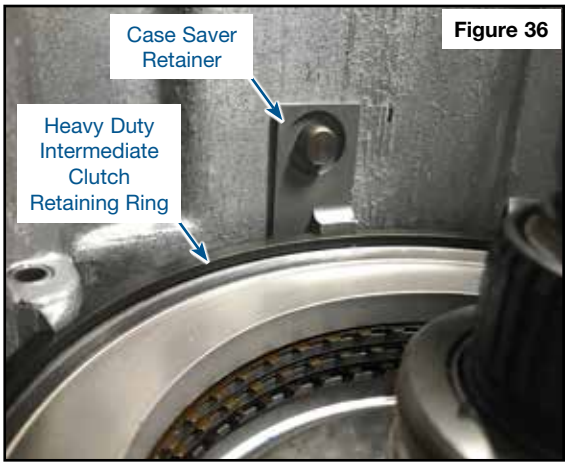

Figure 36

Check Intermediate Band-to-Drum Clearance

a. Install intermediate band.

b. Install direct drum.

c. Partially apply and release band by inserting screwdriver through band servo pin hole in case.

d. Check band anchor end to ensure there is some clearance between band friction lining and drum. Ensure band is not dragging on direct drum (**Figure 37**).

e. If additional band-to-drum clearance is needed, a small amount of material can be removed from back of band anchor lug (**Figure 38**).

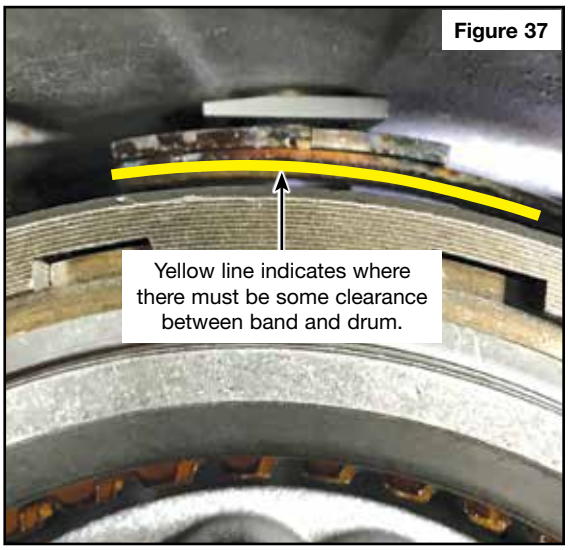

Figure 37

15. Forward Clutch Hub Front Washer

a. Install Sonnax washer between forward clutch drum and forward clutch hub (**Figure 39**).

b. Push up on rear output shaft to take up rear endplay.

c. Check front unit endplay and verify .005–.025" travel.

d. Further adjustments can be done in combination with selective OE pump washers (**see chart**).

Front Unit Endplay	
Selective OE Pump Washer Thickness	**Color**
.057–.061"	Blue
.073–.077"	Red
.089–.093"	Brown
.105–.109"	Green
.121–.125"	Plain

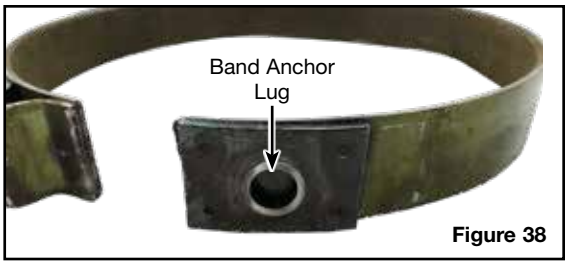

Figure 38

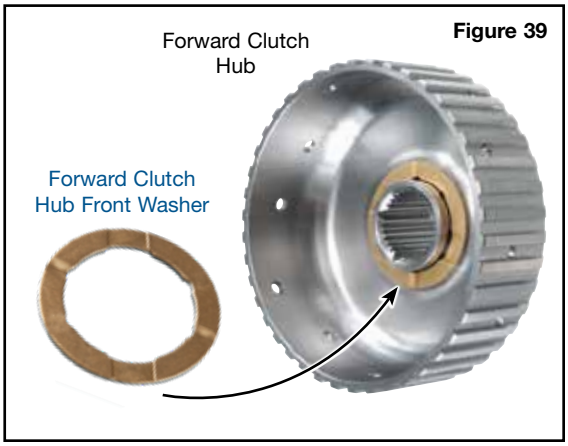

Figure 39

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