

# GM 4L60-E, 4L65-E, 4L70-E

## SURE CURE KIT

PART NUMBER **SC-4L60E**

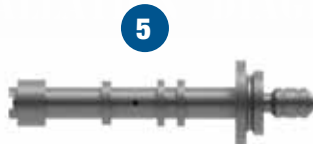
**INSTALLATION GUIDE**

*Parts are labeled here in order of installation. See page 2 for details on Sure Cure kit contents.*

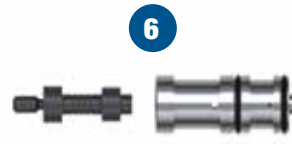
*See Sure Cure instruction booklet (pages 3-8) for detailed installation steps.*



Servo D-Ring Seals (6)



Oversized Pressure Regulator Valve



Oversized Boost Valve, Sleeve, O-rings (2) & Spacer (Spacer not shown)



Pump Bushing

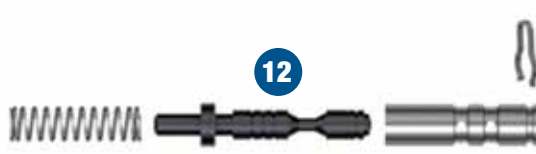
Pump Slide Pivot Pin



TCC Apply Valve Kit



Isolator Valve & Spring, TCC Regulator Valve & Sleeve, & Clip



Actuator Feed Limit Valve, Sleeve, Spring & Clip



Pinless Accumulator Piston Kits (2)

1-2 or 3-4 Accumulator Spring



Servo Release Check Valve Kit



FWD & REV Abuse Bore Plugs (2)



3-4 Relay Valve End Plug & O-ring



Checkballs (8)



Shims, Endplay .010" (2) & .015" (2)  
**NOTE:** See specifications on page 11.



**NOTE:** This kit is fully compatible with '95-later 4L60-E, 4L65-E & 4L70-E units with PWM/EC3 (electronically controlled capacity clutch) control. These can be identified by the 13-pin case connector, PWM/TCC solenoid and PWM pump (five solenoids). All components in this kit are compatible '93-'94 non-PWM units EXCEPT the TCC apply valve kit **77805E-K** installed in the pump. These units can be identified by the 12-pin case connector, only having a 3-2 solenoid in valve body (four solenoids).



**CAUTION:** This sheet is NOT intended to be a quick install guide. Not ALL steps/parts are shown here. See other side for details and use in conjunction with instruction booklet.

## Kit Contents & Installation Steps



**NOTE:** See technical booklet for additional repair information and specifications.

### Step 1 Bearing & Planetary Inspection

### Step 2 Case & Bore Prep

### Step 3 Install Servo D-ring Seals

Items Provided for This Step

Packaging Pocket 13

- Seals, Viton® (5)

### Step 4 Ream PR Valve Bore

**NOTE:** Requires Sonnax tool kit 77917-TL not included in this kit.

### Step 5 Install Oversized PR Valve

Items Provided for This Step

Packaging Pocket 1

- Valve

### Step 6 Install Oversized Boost Valve, Sleeve & Spacer

Items Provided for This Step

Packaging Pocket 2

- Valve (.490" dia.) • Sleeve • Spacer • O-Rings (3)

### Step 7 Install Pump Bushing & Pump Slide Pivot Pin

Items Provided for This Step

Packaging Pocket 3

- Bushing • Pin

### Step 8 Install TCC Apply Valve Kit

Items Provided for This Step

Packaging Pocket 4

- Valve • Seal • Spring

### Step 9 Ream TCC Reg. Valve Bore

**NOTE:** Requires Sonnax reamer 77754-R2 not included in this kit.

**NOTE:** For units with a .441" dia. isolator valve where the isolator bore is not worn. If the valve measures .473" dia., you have a GM serviced valve body and have two reaming options. In either case, you will need to install Sonnax isolator sleeve kit, 77754-ISO:

Ream bore using Sonnax tool kit 77754-SERV followed by Sonnax tool kit 77754-RM5.

Ream bore with Sonnax tool kit F-77754-SERV followed by F-77754-TL4 tool kit. This requires VB-FIX alignment fixture.



**WARNING:** Tool kit F-77754-SERV is no longer in production. Check with your distributor for availability.

### Step 10 Ream AFL Valve Bore

**NOTE:** Requires Sonnax tool kit 77754-TL not included in this kit. Tool kit 77754-TL also works for 4L80-E AFL valve repairs.

### Step 11 Install Isolator Valve, Spring, TCC Regulator Valve & Sleeve

Items Provided for This Step

Packaging Pocket 5

- Isolator Valve • Spring • Regulator Valve • Clip • Regulator Sleeve

### Step 12 Install AFL Valve, Sleeve, Spring & Retaining Clip

Items Provided for This Step

Packaging Pocket 6

- Valve • Sleeve • Spring • Retaining Clip

### Step 13 Install Pinless Accumulator Pistons & Spring

Items Provided for This Step

Packaging Pocket 7, 8 & 9

- D-Ring, Viton® (2) • Seal, PTFE (2) • Balls, Steel (2)
- Pinless Accum. Piston, Aluminum (2) • Accum. Spring

### Step 14 Install Servo Release Check Valve

Items Provided for This Step

Packaging Pocket 10

- Valve • O-Ring

### Step 15 Modify Separator Plate 3-4 Clutch Feed

**NOTE:** See technical booklet for detailed instructions.

### Step 16 Replace FWD Abuse Bore Plug & Reassemble FWD Accumulator

Items Provided for This Step

Packaging Pocket 10

- Plugs (2)

### Step 17 Replace 3-4 Relay Valve End Plug

Items Provided for This Step

Packaging Pocket 11

- End Plug • O-Ring

### Step 18 Remove 3-2 Downshift Assembly to Replace Inner Plug w/Abuse Plug

### Step 19 Install Checkballs

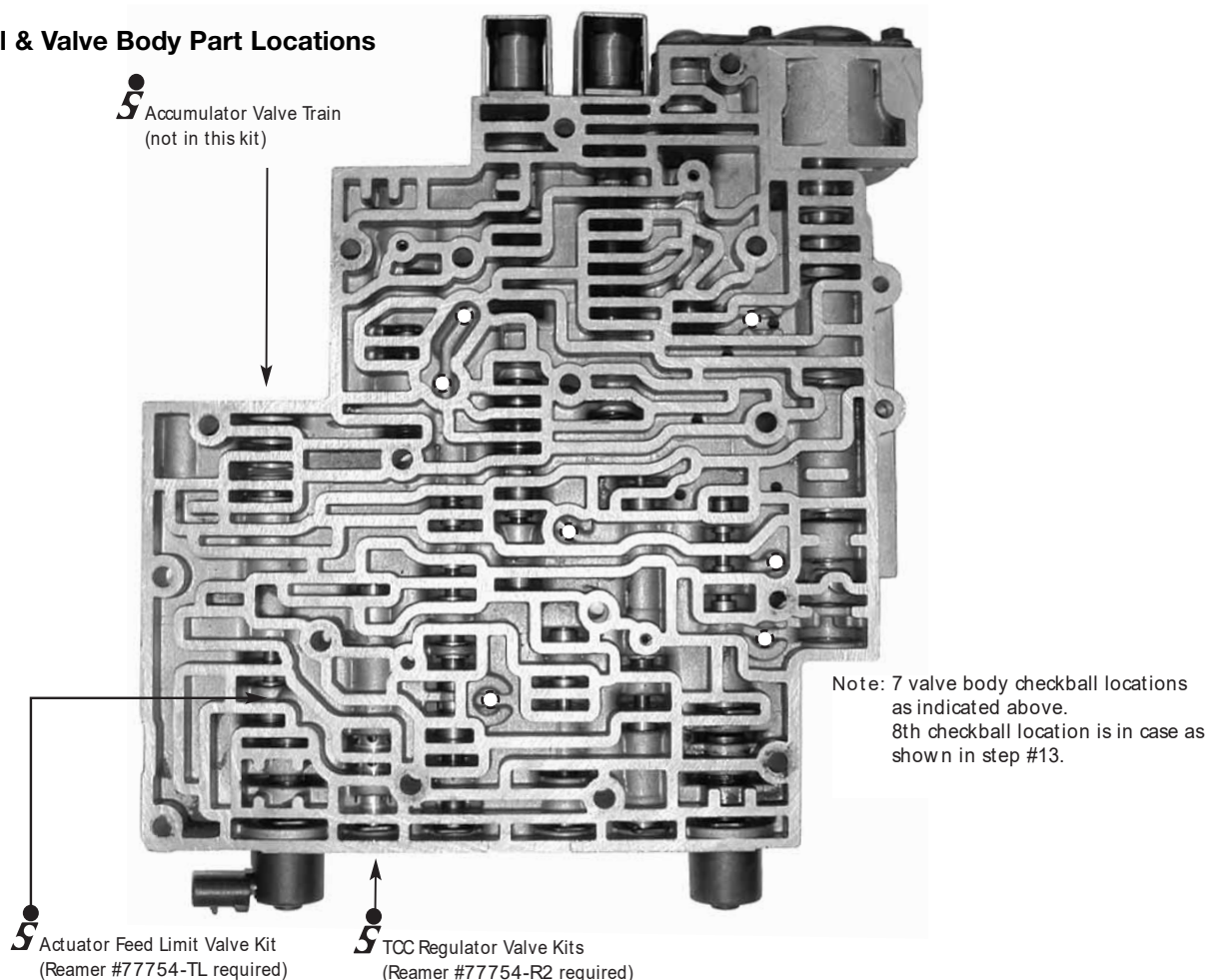
Items Provided for This Step

Packaging Pocket 12

- Checkballs (8)

The parts listed here may be protected by one of these patent numbers: 6,619,323, 6,634,377, 6,899,211, 6,990,996, 7,104,273.

### Checkball & Valve Body Part Locations

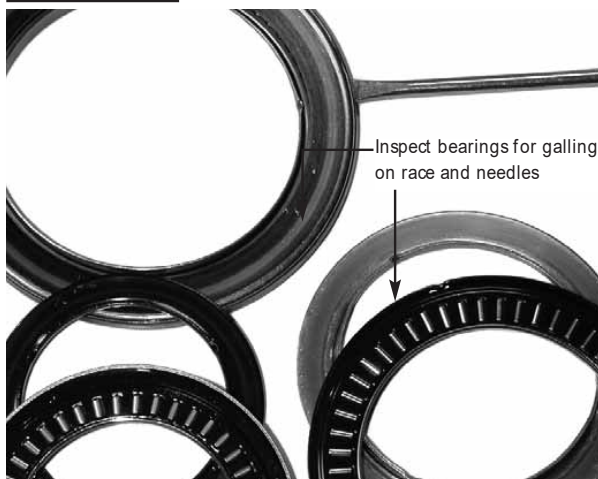


## Sure Cure Fast Version

If you need to get this job out the door in a hurry, then just follow **highlighted** steps below. The other steps are repair information (to help prevent NO GOs and CBs) & OEM part numbers that you can read at your convenience.

1. Bearing and planetary inspection
2. Case and bore prep
3. Servo seals
4. Pressure Regulator Valve
5. Boost Valve
6. Pump body
7. Pump cover
8. TCC apply valve inspection
9. TCC apply valve installation
10. Pinless accumulator pistons
11. Servo check valve

12. Separator plate modification
13. Checkball
14. Forward Abuse Bore Plug
17. AFL valve (tool required)
18. Separator plate modification
19. TCC regulator valve (tool required)
20. Reverse Servo Abuse Bore Plug
21. 3-4 Relay Valve End Plug
22. 3-2 Downshift Abuse Plug

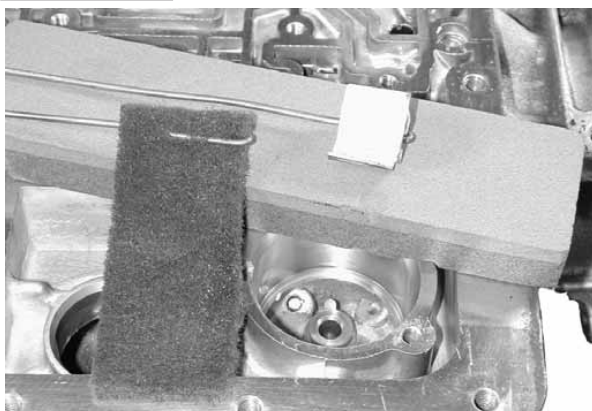
**STEP 1 BEARING & PLANETARY INSPECTION (REASSEMBLY PARTS)**

Inspect bearings for galling  
on race and needles

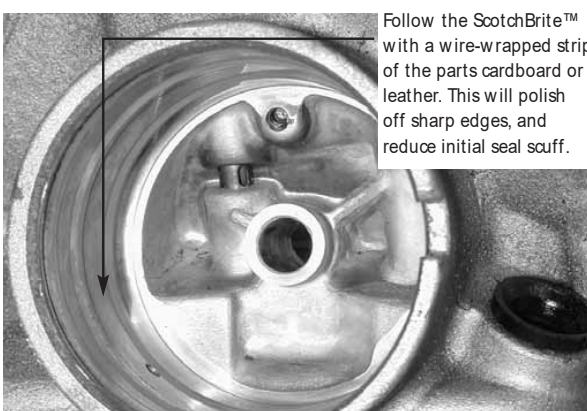
Note: Bearings can easily be pried open at the crimp.  
Ask for Torrington™ Bearing Kit SBK-G12.



Inspect planet pins and endplay.  
No side to side movement

**STEP 2 PREPARE CASE, SERVO AND ACCUMULATOR BORES**

Use a fine grit stone to remove high spots on case and valve body.  
Scuff the accumulator(s) and servo bore with Red ScotchBrite™.  
A stiff wire or rod wrapped with material can be spun in a drill.



Follow the ScotchBrite™  
with a wire-wrapped strip  
of the parts cardboard or  
leather. This will polish  
off sharp edges, and  
reduce initial seal scuff.

Note: Viton® seals require a surface that retains fluid to ensure  
long life.

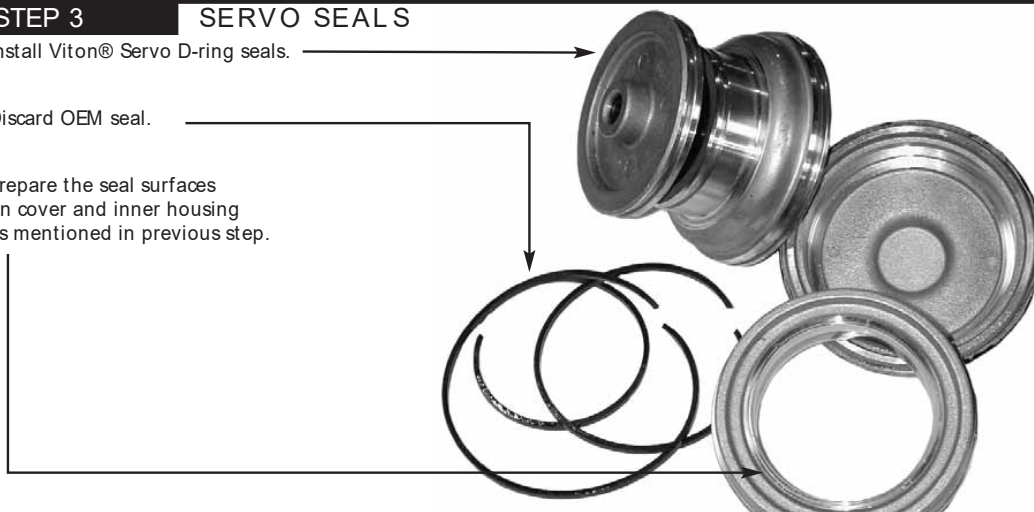
PREP SURFACES BEFORE CLEANING AND FINISH WITH SOLVENT.

**STEP 3 SERVO SEALS**

Install Viton® Servo D-ring seals.

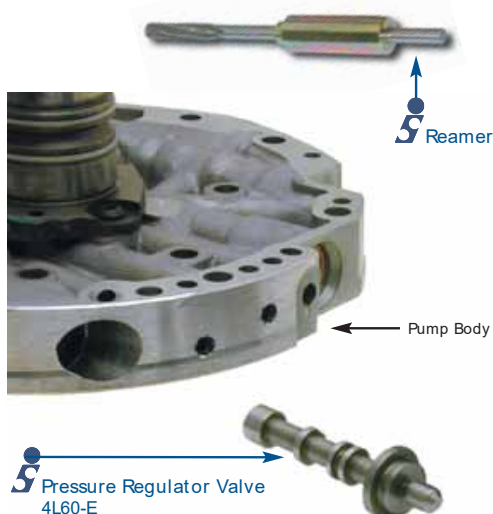
Discard OEM seal.

Prepare the seal surfaces  
on cover and inner housing  
as mentioned in previous step.





## STEP 4 REAM &amp; INSTALL PRESSURE REGULATOR VALVE



## Reaming Instructions

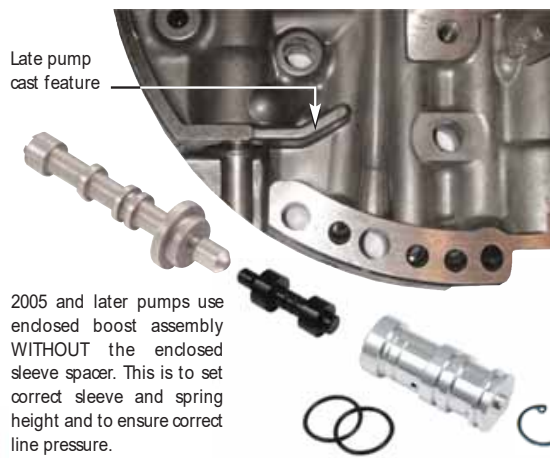
1. Remove and discard the OEM pressure regulator valve.
2. Clamp the pump housing securely to a bench.
3. Install the reamer and guide 77917-TL as shown in the figure above.
4. Flood the valve bore and reamer flutes with cutting fluid (Tap Magic™, kerosene, etc.).
5. Using a "low" RPM (500-600) drill, carefully ream the valve bore. Maintain a constant moderate clockwise rotation and apply steady forward pressure until the reamer reaches the bottom of the valve bore. The reamer should cut easily. Continue to turn the reamer clockwise as it is removed from the bore. Ream one pass only.
6. Remove any debris and burrs from the bore. Lubricate and install the Sonnax replacement valve.



## STEP 5 BOOST VALVE

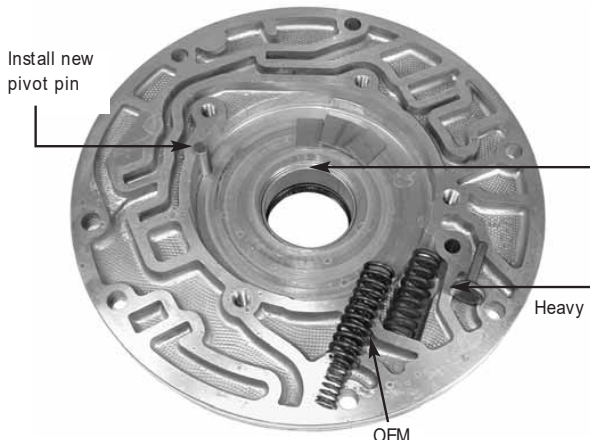


Pre-2005 pumps use enclosed boost assembly WITH the enclosed sleeve spacer. This is to set correct sleeve and spring height and to ensure correct line pressure.



2005 and later pumps use enclosed boost assembly WITHOUT the enclosed sleeve spacer. This is to set correct sleeve and spring height and to ensure correct line pressure.

## STEP 6 PUMP BODY PARTS INSTALLATION



Install new pivot pin

PTFE-coated pump bushing is inserted here as rebuild option. Butt gap bushing is not suggested unless the pump has anti-walk ridge. Surfaces must be prepared with #609 Loctite®. Butt gap should be placed at 12 o'clock position and installed using full end contact on arbor press.

Also available:  
Heavy Duty Slide Spring  
77722-01K

OEM

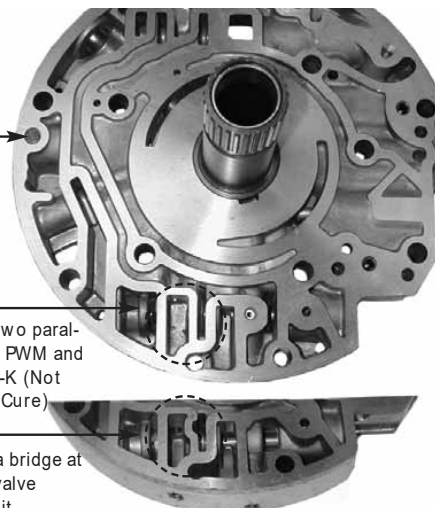
**STEP 7** PUMP COVER IDENTIFICATION

Remove the relief rivet and clean ball and seat. With severe contamination, reform the seat by tapping ball into it.

Note: Don't forget to replace filter o-ring.

**Non PWM**  
If the casting has two parallel webs, it is NON PWM and takes valve 77805-K (Not included in Sure Cure)

**PWM**  
If the casting has a bridge at this location, use valve 77805E-K in this kit (See also Step 13).

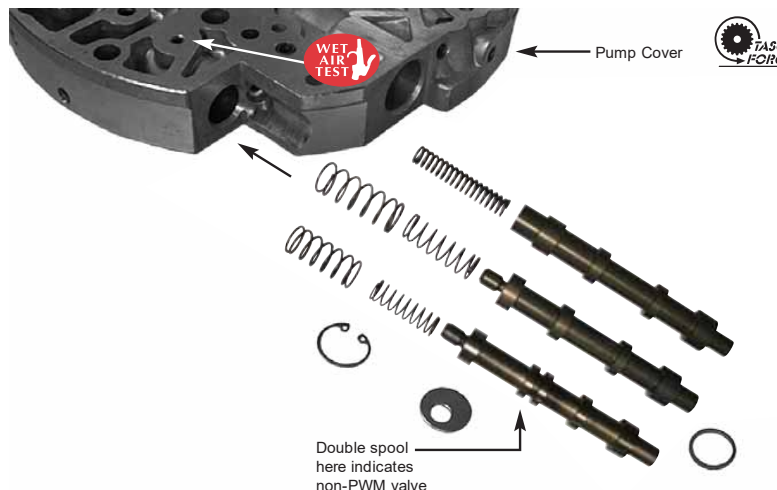
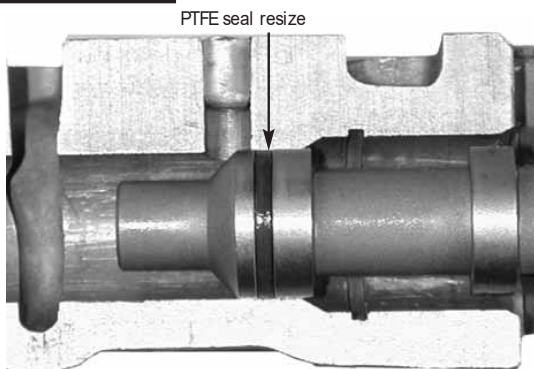


P/N 77805-K is not in this kit!

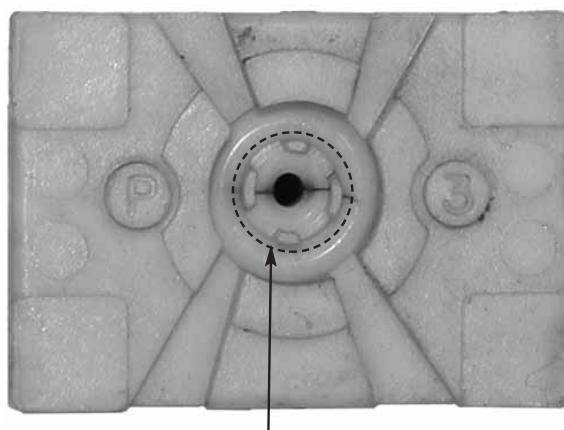
**STEP 8** TCC APPLY VALVE IDENTIFICATION

Photo at right shows the 3 different OEM 4L60 and 4L60-E TCC apply valves. Oil circuits differ, so it is critical NOT TO MISMATCH PWM versus non-PWM valves. OEM valve materials can be steel or aluminum, and should not be used for identification. A double spool at the indicated location can be used to determine PWM versus non-PWM valves.

Sonnax kit 77805E-K, included, can be used in both early and late PWM applications. Discard OEM valve and spring(s), and replace with complete valve and seal kit.

**STEP 9** TCC VALVE INSTALLATION

PTFE seal supplied must be stretched to install into valve groove. Resize with finger pressure, pre-lube, then resize by inverting into bore.



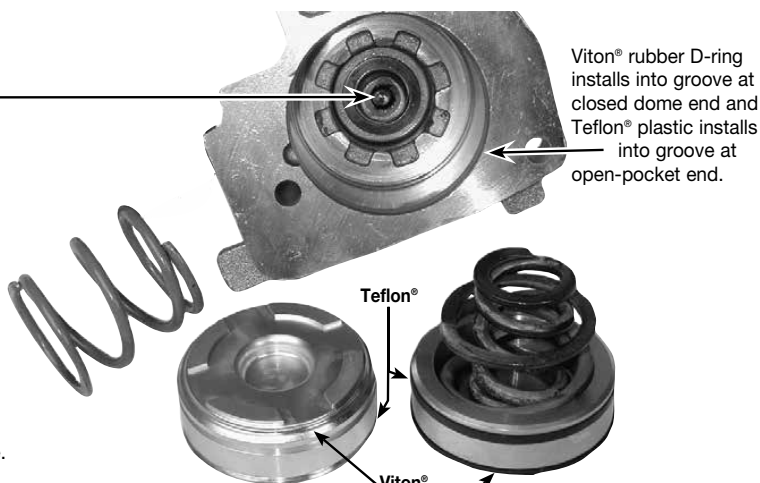
**STEP 10** PINLESS SONNAX ACCUMULATOR PISTONS

OEM pin must be driven from cover.

Plug pin holes by driving either the large or small steel checkballs into the hole. Lightly stake the pin bore after installing the ball.

**Reassembly:**

- Pre-1994 - 4th piston - Install dome into case with spring in pocket.
- 1-2 piston - Install dome into accumulator body followed by purple spring.
- 1994 later - 4th piston - Install dome into case. Some units do not have a spring for 4th accumulator. If OEM had a spring, install into piston pocket.
- 1-2 piston - Install spring(s) into accumulator body, set piston pocket opening onto spring, dome toward plate.  
(Patent Pending)

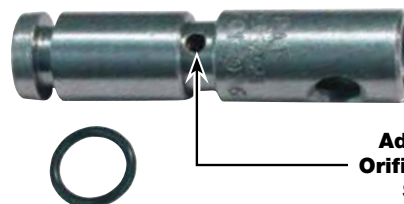
**STEP 11** SERVO RELEASE CHECK VALVE

**NOTE:** Before installing servo release check valve, make sure the 3rd accumulator checkball capsule is in the case and there are no leaks. Replace a leaking capsule with OE p/n 8634400.

- If necessary adjust orifice "A" in valve to match servo being used (see info to right).
- Tapered end goes in first. Valve must be driven flush with case surface and must be tight.
- Install into case without included O-ring. If fit is loose, install included O-ring on check valve and reinstall.
- Adjust separator plate orifice "C" to match vehicle (see step 19).



Some cases bores may be oversized. Use o-ring on check valve for these bores only. If valve goes into bore without resistance, install the o-ring.



- If the last three servo casting numbers are 553, 554 or 159, or any servo with 2.312" to 2.520" small diameter piston, Sonnax valve installs "as is".
- If the last three digits are 093, or the servo is a one-piece aftermarket; enlarge the orifice "A" (at center groove) to .120"-.125".

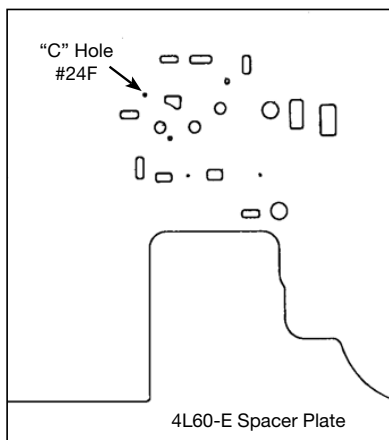
**STEP 12** SEPARATOR PLATE 3-4 CLUTCH FEED IMPROVEMENT

Set up the plate to match your vehicle needs: A larger separator plate feed hole-C- will result in a shorter 2-3 shift. Too large, and a bumpy 2-3 will result. Locate the 3-4 clutch feed -C- orifice in your plate.

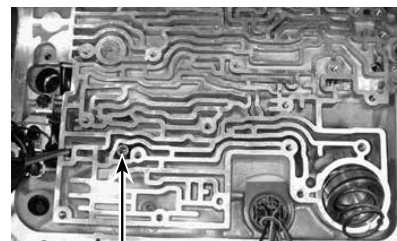
**"C" - Transmission 4L60-E**

| Application          | Orifice Dia.          |
|----------------------|-----------------------|
| Regular Duty         | No Plate Modification |
| Moderate Performance | .090"                 |
| Maximum Performance  | .100"                 |

Check valve can be removed by threading it (5/16" x 18") and using a bolt-on slide hammer or #5 easy out.



The Sonnax check valve will be installed with the OE 3rd accumulator check valve (OE part #8634400).



The check valve installs on top of the OE 3rd accumulator capsule.

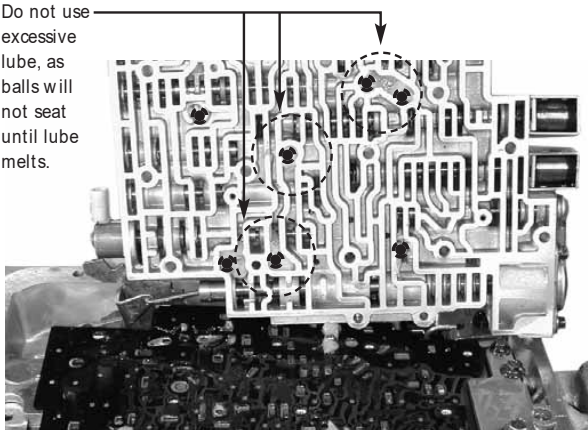


**STEP 13 CHECKBALLS AND ASSEMBLY TIPS**

If you are installing this kit in the vehicle, checkballs must be loaded into valve body.

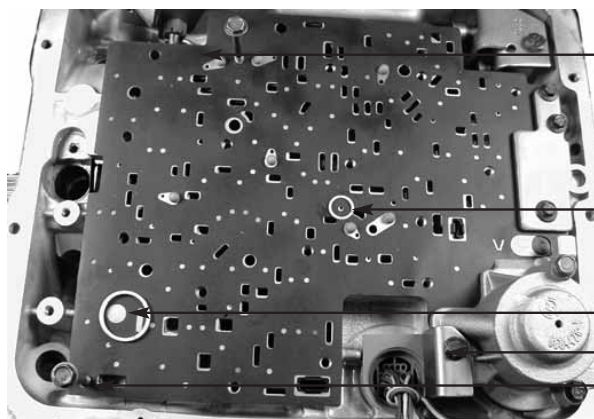
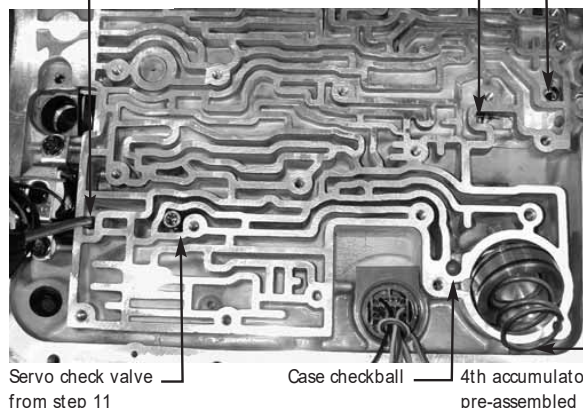
Valve body checkball locations shown here and picture of checkball and valve body part locations shown before Step 1.

Do not use excessive lube, as balls will not seat until lube melts.



Supply 12 volts to TCC solenoid and WAT here. TCC valve in pump will stroke.

Drill bit used to check low-reverse clutch clearance (clutch clearance on spec sheet).



Note checkball locations

Orifice "C" for check valve modification in step 20

Plate with holes is PWM

Plate without holes is not PWM

Case connector retainer #77980-01K

Note alignment holes in plate

**STEPS 14-22 STEPS 14 TO 22 INDICATED BY NUMBER ON VALVE BODY****STEP 14:**

With forward accumulator cover still off, remove low-overrun valve and roll pin.

Pull out the divider plug and replace with abuse bore plug in kit.

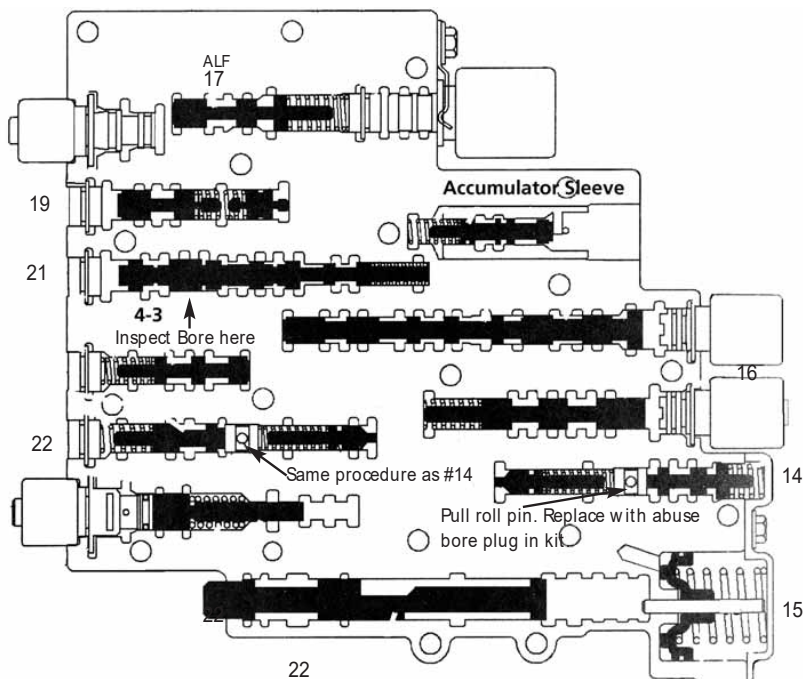
**STEP 15:**

Reassemble forward accumulator.

**STEP 16:**

Update shift solenoids, replace o-rings.

Solenoid information in specifications.

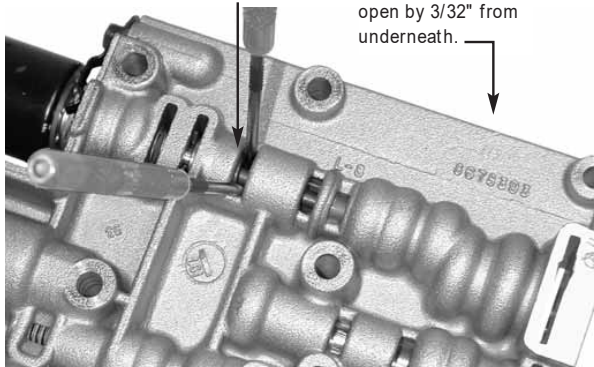




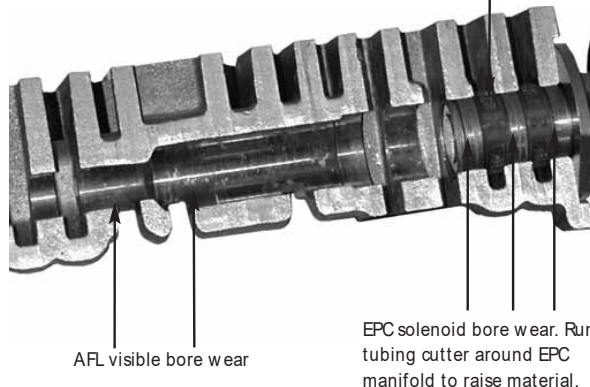
## STEP 17 AFL BORE INSPECTION AND REPAIR

AFL should not have movement

Prop the AFL valve open by 3/32" from underneath.

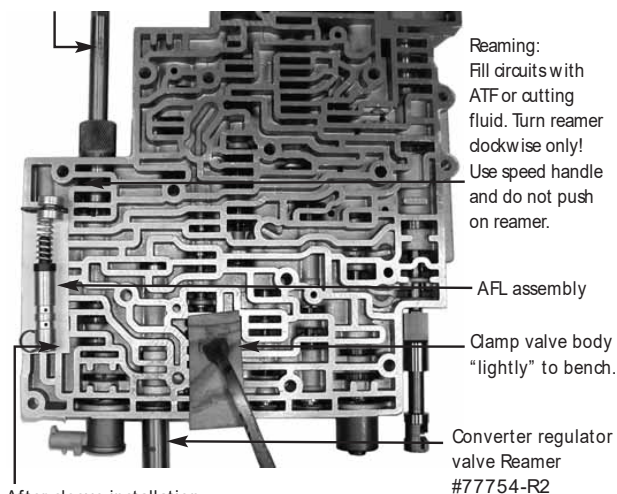


Remove EPC solenoid, clean the screen and replace filters in plate.

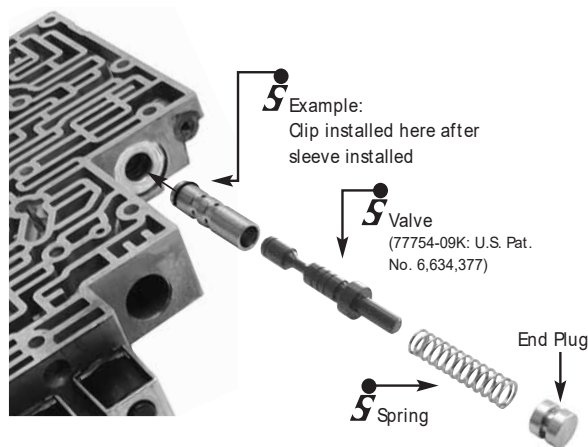


EPC solenoid bore wear. Run tubing cutter around EPC manifold to raise material.

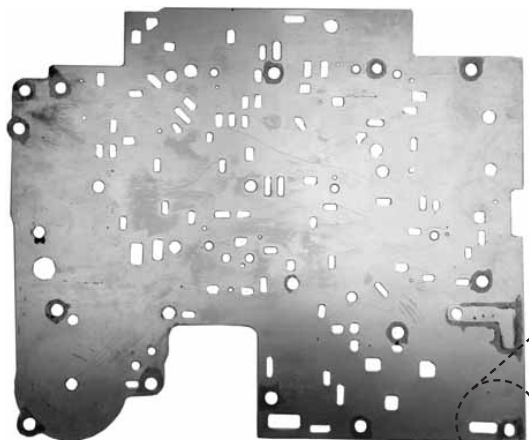
Note: Reamer kit 77754-TL required. Also works on 4L80-E  
4L60-E uses marked reamer and guide. No pre-drilling required.



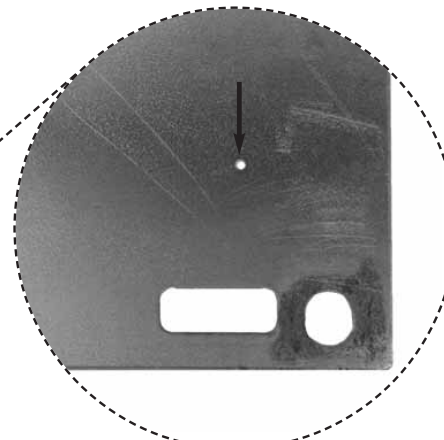
After sleeve installation  
"poodle clip" pushes into sleeve  
groove at channel indicated.



## STEP 18 AFL BALANCE HOLE MODIFICATION

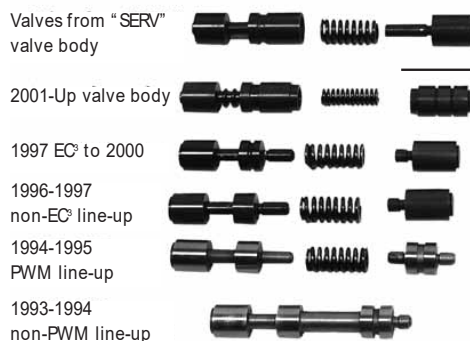
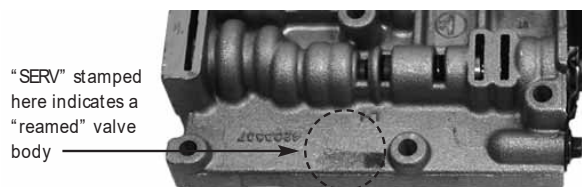
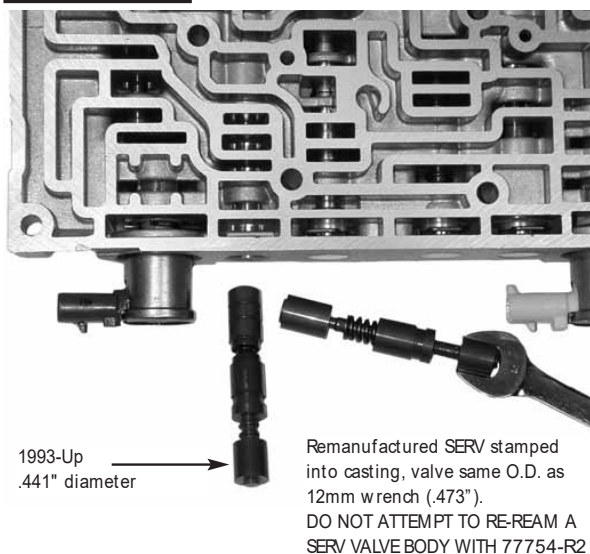


When AFL valve & sleeve are installed, the AFL balance hole in plate must be opened with drill supplied in reamer kit.

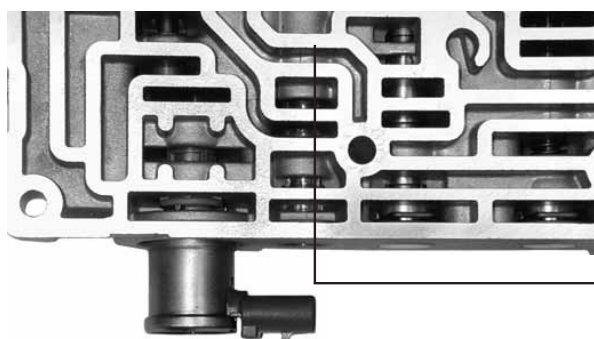
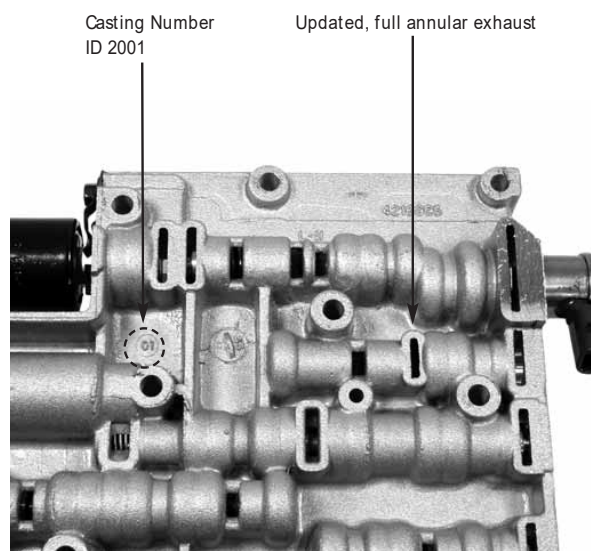
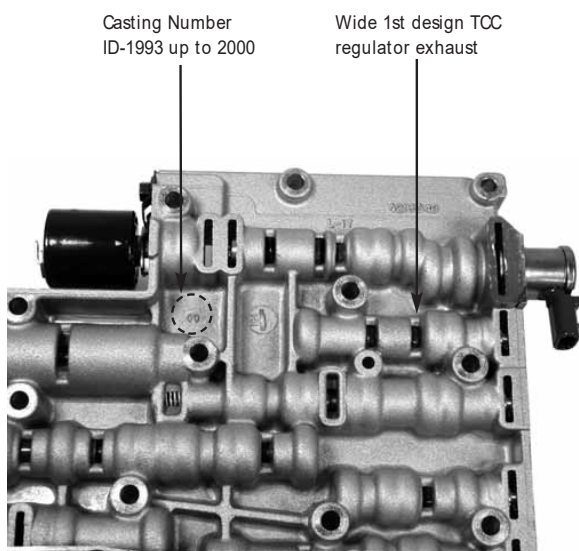


Enlarge the indicated balance AFL orifice to .052" with the drill bit supplied in reamer kit.

## STEP 19 CONVERTER REGULATOR VALVE DESIGN VARIATIONS:

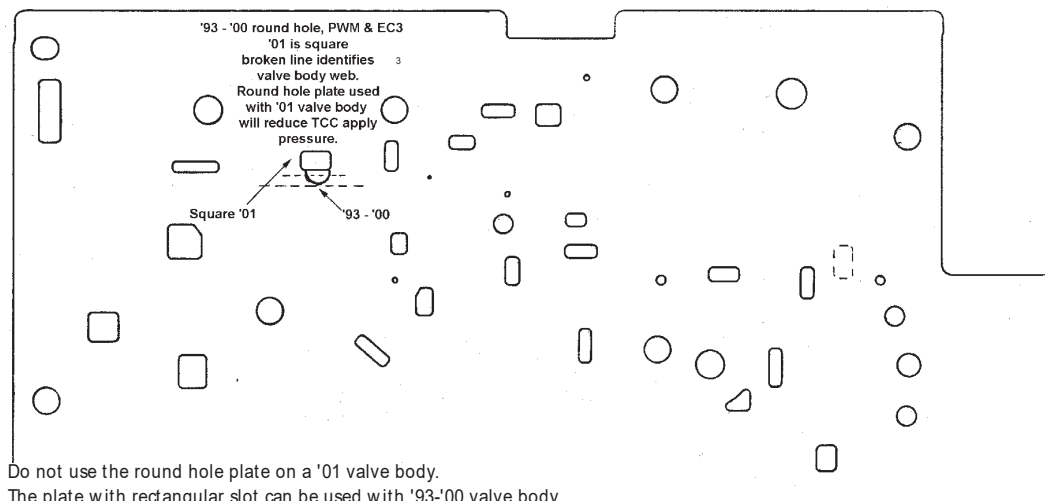


Sonnax valves repair these OEM designs

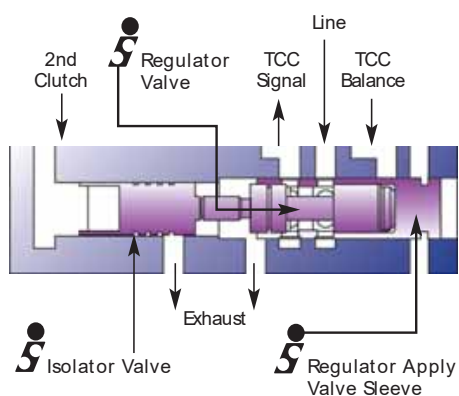


Remove OEM converter regulator valve  
Ream this bore with 77754-R2 (sold separately)  
Lightly clamp to bench, this side up.  
Fill circuits with ATF/ cutting fluid.  
Turn reamer with speed handle.  
Ream, turning clockwise only.  
Blow chips free before removal.  
Never turn counterclockwise!  
If tight assembly, repeat with 500 RPM drill.

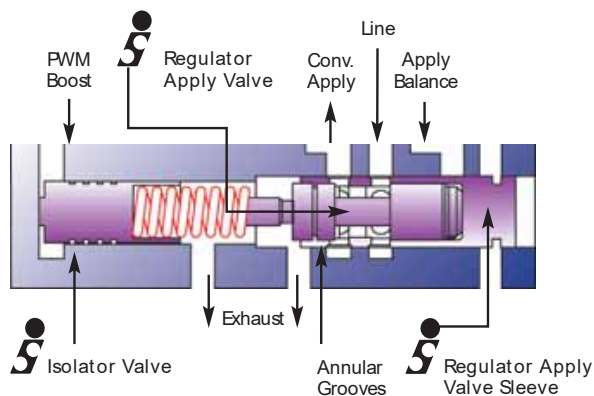
## STEP 20 NEW PLATE &amp; VALVE APPLICATION



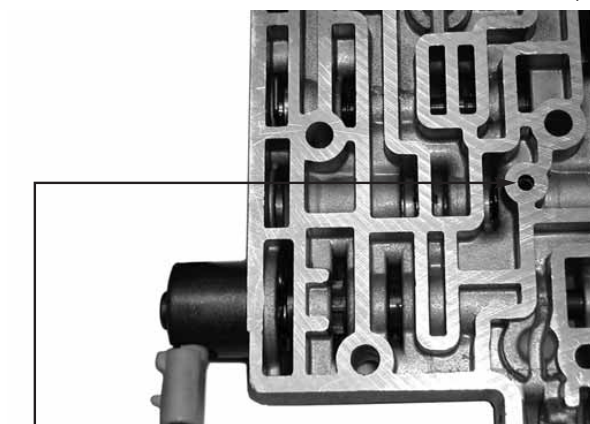
## Sonnax installed - Non-PWM



## Sonnax installed - PWM



## STEPS 21-22 BORE INSPECTION (LEFT: 3-4 RELAY, RIGHT: 3-2 DOWNSHIFT)



22. Remove 3-2 downshift assembly to remove the inner plug and replace with abuse plug provided.



## Specifications and Rebuild Information:

### R & R INFORMATION:

Cooler return line: Top line

Correct Sonnaxflow® readings: 1.5-1.7 GPM TCC off, 2.0-2.6 TCC applied

Fluid capacity: Pan removal 5 qts. overhaul 11 qts

Cold climate (-20f. or more) fluid suggestion: 100% synthetic ATF or blend 50%

Suggested system fluid change on all PWM controlled converters: 40,000 miles

Line pressure: P-N-OD idle 55      Max. EPC 190  
Ridle 64      Max EPC 320 (Average 270-300)

An effective line pressure and pump output test is:

Reverse 600-750 RPM, with maximum EPC

Line pressure should obtain 270 psi, and not drop more than 20 psi or create an unstable gauge.

### CONVERTER IDENTIFICATION:

Bolt-on bell housing height on large 300mm converter: 7"

298mm converter height: (hub set on bench to pad surface) 5.875"

300mm converter height: (hub set on bench to pad surface) 6.500"

| Year            | Converter control | OEM friction material | Converter Code |
|-----------------|-------------------|-----------------------|----------------|
| '93-'94         | on-off            | paper                 |                |
| '95-'96         | PWM               | composition carbon    | G,H,L          |
| '97 W cars 3.4  | EC <sup>3</sup>   | woven carbon          | N,P,F          |
| '97 298mm truck | PWM               | composition carbon    | G,H,L          |
| '98 all         | EC <sup>3</sup>   | woven carbon          | N,P,F          |
| '98-2000        | EC <sup>3</sup>   | woven carbon          | B,A            |

### CRITICAL TORQUE AND ASSEMBLY SPECIFICATIONS:

|                                    |                                             |
|------------------------------------|---------------------------------------------|
| Valve body and accumulator to case | 06-10 ft. lbs                               |
| Pump body                          | 15-20 ft. lbs                               |
| Pump to case                       | 15-20 ft. lbs.                              |
| Bell housing to case               | 48-55 ft. lbs. (Sonnax Torx bit #77000-HBK) |

### OEM CLUTCH/BAND CLEARANCE, ENDPLAY SPECIFICATIONS:

|                                                                                                                                                                                                        |                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Forward clutch                                                                                                                                                                                         | .030" - .063"                                                        |
| 3-4 clutch                                                                                                                                                                                             | .035" - .083"                                                        |
| Reverse input                                                                                                                                                                                          | .040" - .076"                                                        |
| Low-reverse clutch component stack on bench                                                                                                                                                            | 1.15" - 1.18"                                                        |
| "Rule of thumb for unspecified clutch" allow .010" clearance per friction<br>(Note: Picture 19 Drill bit inserted between clutches with separator plate off, is used to verify low-reverse clearance.) |                                                                      |
| Servo travel:                                                                                                                                                                                          | .075-.125" (band must freewheel over drum when turning output shaft) |
| Pump slide clearance                                                                                                                                                                                   | .0008"-.0020"                                                        |
| Pump vane clearance                                                                                                                                                                                    | .002" max.                                                           |
| 3rd accumulator check ball tube to case depth                                                                                                                                                          | 1.653"                                                               |
| Planet side gear clearance                                                                                                                                                                             | .024" max.                                                           |
| Endplay                                                                                                                                                                                                | .005" to .036" total unit (combined)                                 |

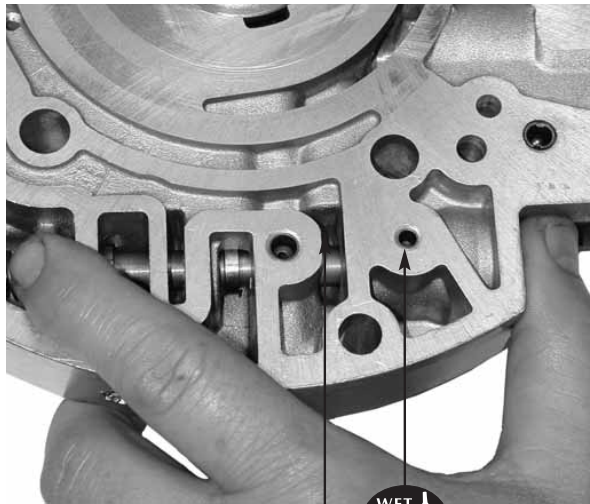
### ELECTRICAL:

|                         | OHM Readings | GM P/N's                          |
|-------------------------|--------------|-----------------------------------|
| Shift solenoid          | 20-40 ohms   | 10478131                          |
| TCC PWM solenoid        | 10-15 ohms   | 24212690                          |
| 3-2 downshift solenoid  | 20-31 ohms   | 24212327 ('96 on, 93-95 PWM 9-13) |
| EPC solenoid resistance | 3.5-8 ohms   | 24209276                          |
| TCC solenoid resistance | 20-40 ohms   | N/A                               |

Shift solenoid firing order: 1st gear both on , 2nd 2-3 on, 3rd both off, 4th 1-2 on

Transmission temperature sensor under approximately 100 ohms inhibits 4th, and brings TCC on after 1-2 shift.

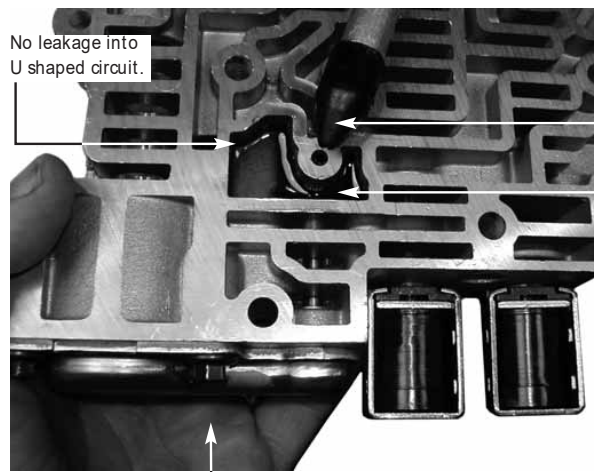
**WET AIR TESTS**



Use ATF here to identify leakage



Test at Orifice Plug



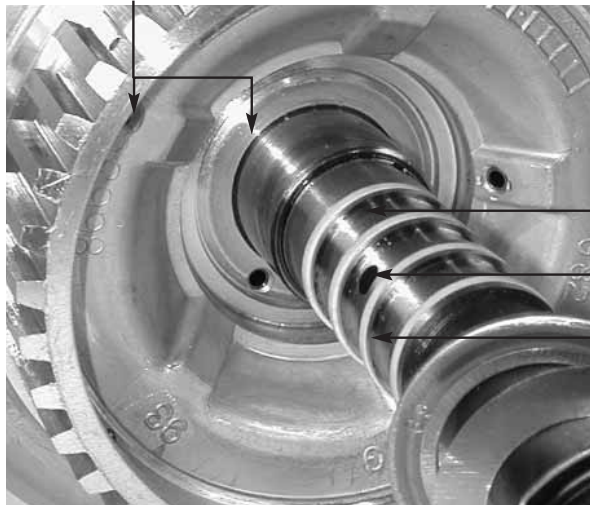
No leakage into U shaped circuit.

Pressurize roll pin from machined side.

Place fluid into the U-shaped cavity over lo-override valve.

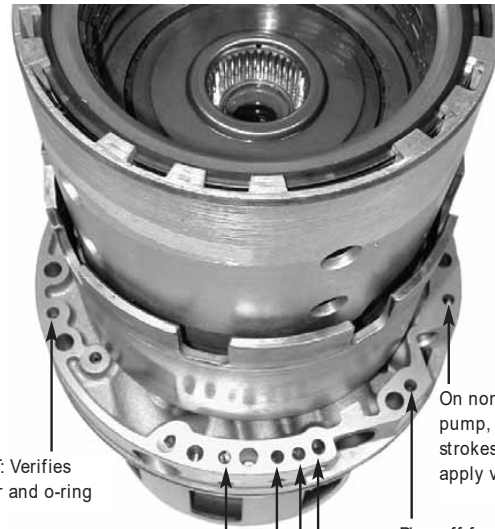
When WAT 3-4 clutch:  
No oil loss at checkball, or base of shaft.

Close off roll pin under the valve body w/finger.



3-4 Clutch  
Forward

Override Clutch



WAT: Verifies filter and o-ring

Reverse:  
No checkball leaks  
No leaks at torque signal

3-4 clutch: Overrun,  
no piston movement

Torque signal:  
No leakage from reverse

On non-PWM pump, air psi strokes TCC apply valve.

Plug off forward, WAT overruns, No 3-4 piston movement!

Forward clutch, No 3-4 apply!

**Stator Inspection:**

If you had an overheated converter or stator, inspect tube sleeves for cross leaks. These leaks can be identified by the WATs and testing the tube by itself.



Note: A 100% leak tested shaft, 77918S-K or 77918S-1K, are available from Sonnax.

2005 & later stator shafts are not interchangeable with 2004 & earlier shafts.

07/21/04

