

# 4L80E *2nd Printing*

## ***Before & After Service Complaints***

The goal is to furnish hard and soft data [parts and info] to assure a quality repair by preventing after service hard parts breakage, direct and forward clutch failure, and various aggravating shift complaints.

Subjects are in a sequence that prevents rework and expensive parts breakage after your repair. We hope this repair data will allow the shop technician and the parts distributor to act with confidence.

15 Dec 94: Talked with a shop that had blew the passages out of four different cases, due to high line, in a period of two weeks—after repair.

21 Dec 94: Received report of case passage blowout at 13,000 miles.

Unless you prevent it: Sooner or later high pressure problems develop that breaks expensive hard parts. We thought this was a high miles problem, but find that it can happen in really hard hot service at any milage. We are confident the SK® relief valve intersecting the boost system will prevent the problem.

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## Shifts: Complaints/Corrections

COMPLAINT: 3rd gear starts. Tie up in manual "1". Code 86.  
CAUSE #1: Stuck solenoid "B".  
CAUSE #2: Broken direct clutch cushion spring or burned clutches.  
**QUICK TEST:** Remove solenoid "B", reinstall pan. If trans still has 3rd gear start and bind in "1" clutch pack is the problem. If it does not have 3rd start and bindup the solenoid was the problem.

COMPLAINT: No Lockup.  
CAUSE: Stop light switch.

COMPLAINT: No 3rd and or no Reverse. Solenoid OK. Code 87  
CAUSE: Burned 3rd clutches. Broken drum/piston.  
SOLUTION: Correct excess pressure, with SK® Kit. Replace burned or broken parts, check pressure rise in rev when hot.

COMPLAINT: No up shifts and low idle line pressure.  
2nd only when HOT and low pressure rise.  
CAUSE: Bottom broken out of actuator filter  
Or, O'ring not installed on filter.  
SOLUTION: Tapered plug in SK® Kit prevents actuator pressure loss. Spring prevents harmonic frequency breakup.

COMPLAINT: No up shifts. Or, quits shifting when hot.  
CAUSE: Speed sensor or speed sensor connector.  
SOLUTION: Replace input sensor. If still no shifts install the old input sensor into output sensor position.

COMPLAINT: Direct clutch failure due to case wear at support.  
SOLUTION: Install rubber bushing seals into case against support.  
[Seals are furnished in SK® kit.]

COMPLAINT: Long soft 2-3 shift or loses 2-3 hot.  
Repeating direct clutch burnup.  
CAUSE: #1 Direct clutch circuit leak between case and support.  
Support does not fit case snugly allowing movement that wears support lugs in the case and wears case at the center bolt.  
SOLUTION: SK® kit has hardened washer to stop wear under bolt and bushing type seals to prevent case to support leak.

COMPLAINT: Long soft 2-3 apply when hot.  
CAUSE #2: Restricted or sticking solenoid "B".  
SOLUTION: Replace solenoid.

## Shift Complaints [Continued]

COMPLAINT: Rough 1-2 shift and rough backout shifts.  
CAUSE: Excessive accumulator pressure at light throttle.  
SOLUTION: SK<sup>®</sup> kit has accumulator valve spring selection.

COMPLAINT: Soft 2-3 apply, slips with more throttle.  
CAUSE #3: Worn or undersize solid rings on center support.  
SOLUTION: Install metal rings or scarf cut rings GM 8626356.  
**COMMENT: Don't use the solid type ring.**

COMPLAINT: Tail bump 2-3 when very warm. OK cold.  
CAUSE: Converter stays locked during 2-3 shift.  
COMMENT: This is normal.

COMPLAINT: Skips gears, crazy downshifts, code 81-82-87-85.  
CAUSE: Solenoids or wires [81 is Sol "B"—82 is Sol "A"]  
SOLUTION: Replace Sol, then wires if necessary.

COMPLAINT: Falls out of 4th when warm, no 3rd or 4th.  
CAUSE: Solenoids or wires. Look for codes  
SOLUTION: Replace Sol, then wires if necessary.

COMPLAINT: Goes to fail safe [2nd only and high line]  
when hot or going over bump.  
CAUSE: Wires or bad ground. Look for codes.  
SOLUTION: Check ground strap, replace shift Solenoids,  
then wires if necessary.

COMPLAINT: Goes to fail safe with codes 73-81-82-83  
CAUSE: **Ignition switch.** Does not connect computer.  
COMMENT: Restart and turn switch backwards slightly.

COMPLAINT: Loses 4th when hot. Produces code 68 without 39.  
CAUSE: Slipping lockup or 4th.  
SOLUTION: Stator bushings, input shaft rings or converter.  
Install 48-HTRK Rings & Bushing  
COMMENT: See code 68 on page 11.

COMPLAINT: No 4th when very hot no codes.  
CAUSE: Trans temperature over 275 F.  
SOLUTION: This is normal to prevent hot overload.

COMPLAINT: Falls in and out of lockup [GAS only] NO CODES.  
CAUSE: Worn distributor bushing. Pull cap look for bronze flakes.  
Wiggle the shaft to see if it's loose.  
SOLUTION: Replace distributor

# Shift Solenoid Complaints

Solenoid “A” complaints: Starts in 2nd. No 4th [May have code 82]

Solenoid “B” complaints: [May have code 81 and also 68]

Starts in 3rd, bindup in “1”. Fail safe mode. 2nd only and high line. Might be OK cold. Falls out of 4th—No 4th when warm—No 3rd or 4th—No lockup. 2-3 slide or cutloose feel at hard throttle [light throttle OK]. These complaints can also be caused by defective wire harness.

Code 81 or 82 indicates solenoid or connections to the solenoid.

## Solenoids, Shift [Valve Assembly]

Always replace early type with later type. With Screen in snout

**Must have screen in snout.**

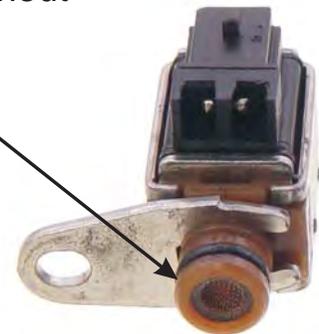
Late type 1-2: Valve assm-Solenoid “A” #10478147

Normally Open: 12V shuts off flow.

Late type 2-3: Valve assm-Solenoid “B” #10478148

Normally Open: 12V shuts off flow.

Electrical check: 20 to 30 ohms pin to pin.



## Pressure Control Solenoid Complaints

Very rough shifts at 1/4 throttle [high line pressure 140 to 170]

Shifts get noticeably softer at 5/8 throttle [low line pressure 40 to 82].

### Checking function with line pressure gauge

At idle in “D”, line pressure should be under 85 psi.

With foot on brake, line pressure should increase **smoothly** as throttle is added and should return **smoothly** as throttle is gradually released.

If pressure tends to stick and then jumps up or sticks and jumps down, it could be the force motor or the throttle position sensor. If the pressure tends to stick and/or jumps repeatedly the same, up or down, each time you move the throttle, suspect the TPS. If it tends to stick or jump differently going up or down, from one try to the next, suspect the solenoid.

1st type: SHINY can—GERMANY



info1

## EPC Solenoid

If trans has 1st type, replace it with 2nd type. 1st type has SHINY can and “GERMANY”.

2nd type has BLACK can #24203101

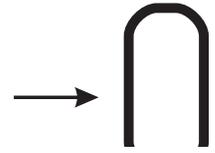
[Electrical check: Pin to pin 3.5 to 5.5 ohms].

2nd type has BLACK can

## Locating Problems—Pull trouble codes fast

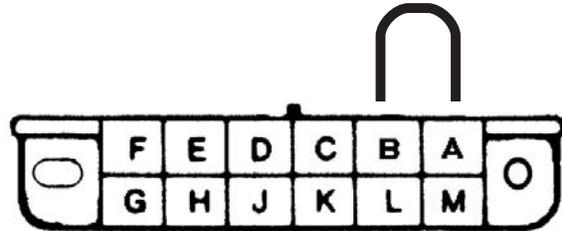
When chasing a problem it is easy to read the self diagnosis trouble codes. This can get you looking in the right direction.

Cut off a paper clip or bend a piece of safety wire like this, and get a pencil and paper for recording trouble codes.



With key off connect "A" & "B" with the wire. Turn key "ON".

The check engine light will flash 12 [one dash and two dots] three times and then will flash available codes.



### Probable problem indicated by codes

81 = Sol "B" or wires

82 = Sol "A" or wires

86 = Direct clutch stuck "ON": Plates welded or broken cushion.  
Or Solenoid "B" stuck closed.

87 = Direct clutch does not hold: Broken drum/piston, leaks,  
burned out clutch plates. Sol "B" stuck open.

87 = Actuator filter end broken or seal leaking.

85 = And has no 4th and Lockup: Treat as code 68

68 or 68 & 39 = 4th clutch or converter slipping or no 4th warm.

Check like this: Clear code. Drive in "3" till hot and give hard throttle many times. If code 39 appears converter slip is problem. If no code appears in "3" but 68 appears when 4th is used the problem is slipping 4th clutch.

39 = Converter clutch. Drive in "3" to verify.

### Fast sensor checkout and swap for a no upshift complaint:

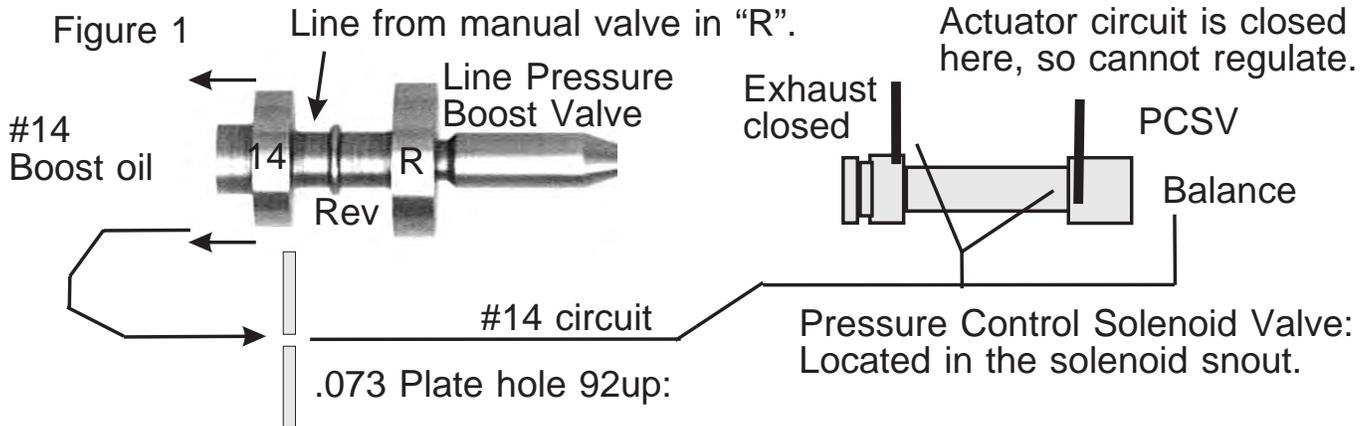
Replace input sensor. Still no shift. Install old input sensor at output sensor location. New speed sensor part # 24203876

# Cause & Correction of High Pressure Parts Breakage

**Fig 1.** Stuck pressure control solenoid valve [located in solenoid]. In forward ranges low pressure results. **In reverse 600-800 psi is common.** Immediate failure due to case, direct clutch drum or piston breakage.

a. In reverse line pressure goes to the rev land of the pressure boost valve. Line flows past the clearance of #14 land into the #14 circuit, through #14 orifice in plate [92up] and is then regulated by the EPC. When EPC is **stuck** in position shown it is **unable** to regulate or exhaust #14 circuit.

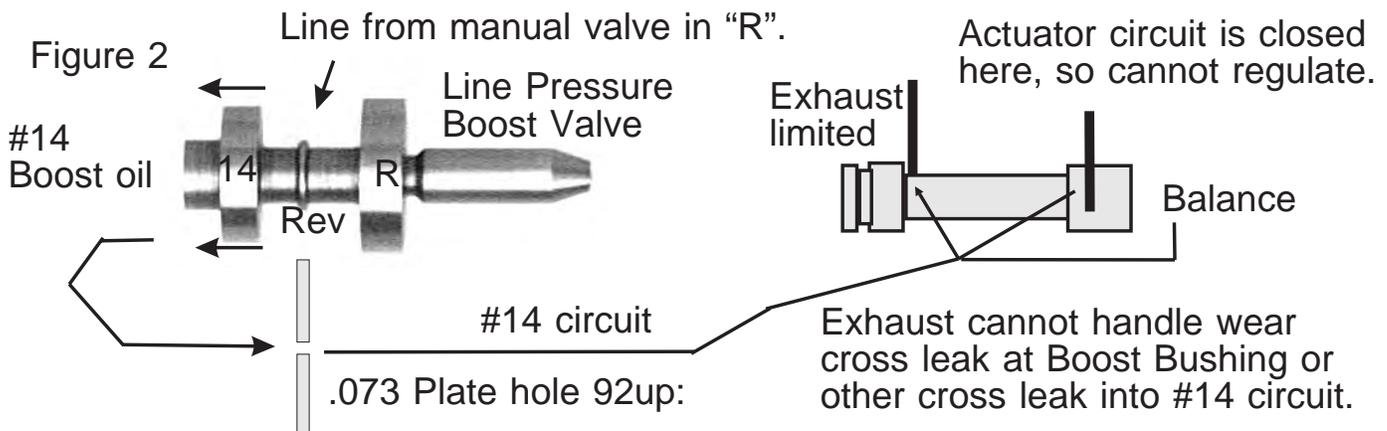
This problem can happen at low or high mileage. It is aggravated by the disintegration of solenoid filter and/or metal particle contamination.



**Fig 2.** In reverse oil leaks into the line boost circuit [#14] in excess of the exhaust capability of the Pressure Control Solenoid Valve Assembly.

In reverse, pressure goes to rev land of the pressure boost valve and flows past clearance of #14 land to #14 circuit, thru #14 orifice in plate [92up] and SHOULD then be regulated by the EPC. The EPC is barely able to exhaust cross flow leaks **without** any boost bushing **wear**, and is **unable** to exhaust or **regulate** excess flow caused by boost bushing wear and/or cross leaks—ANYWHERE—into the #14 circuit. **600-800 psi is not uncommon.**

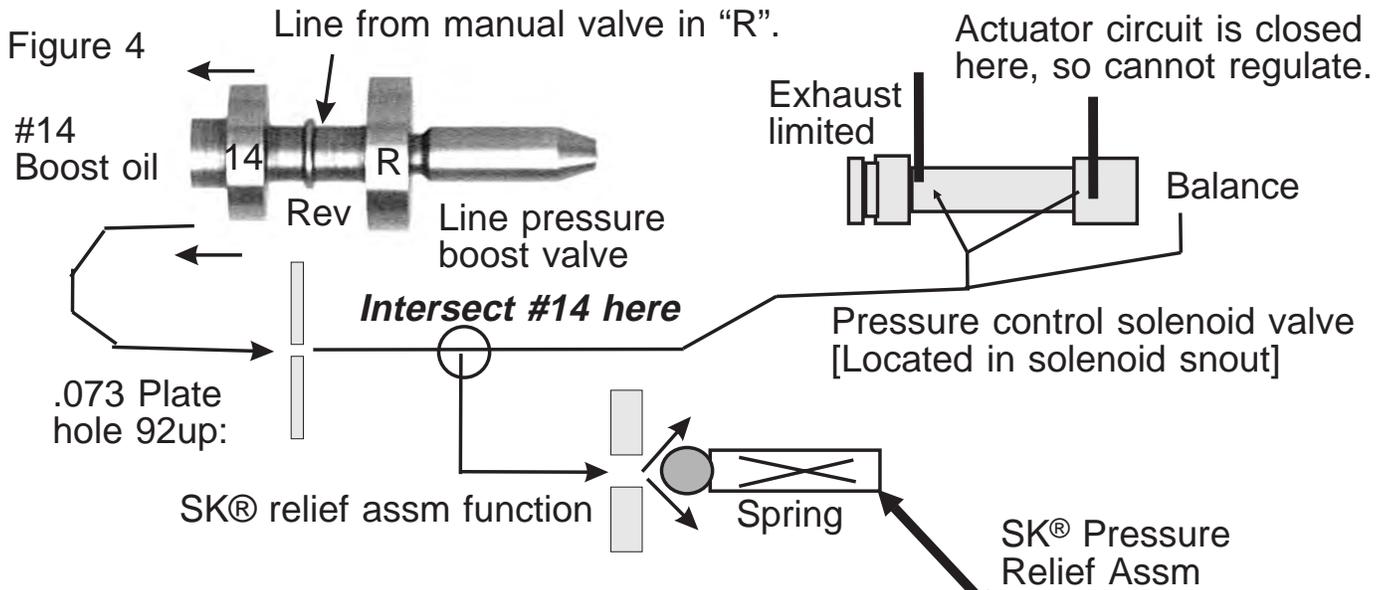
Replacing the boost valve and bushing or grinding boost valve stem shorter to allow valve to function in new area of bushing may reduce high pressure danger short, but not long term and doesn't correct #1 cause above.



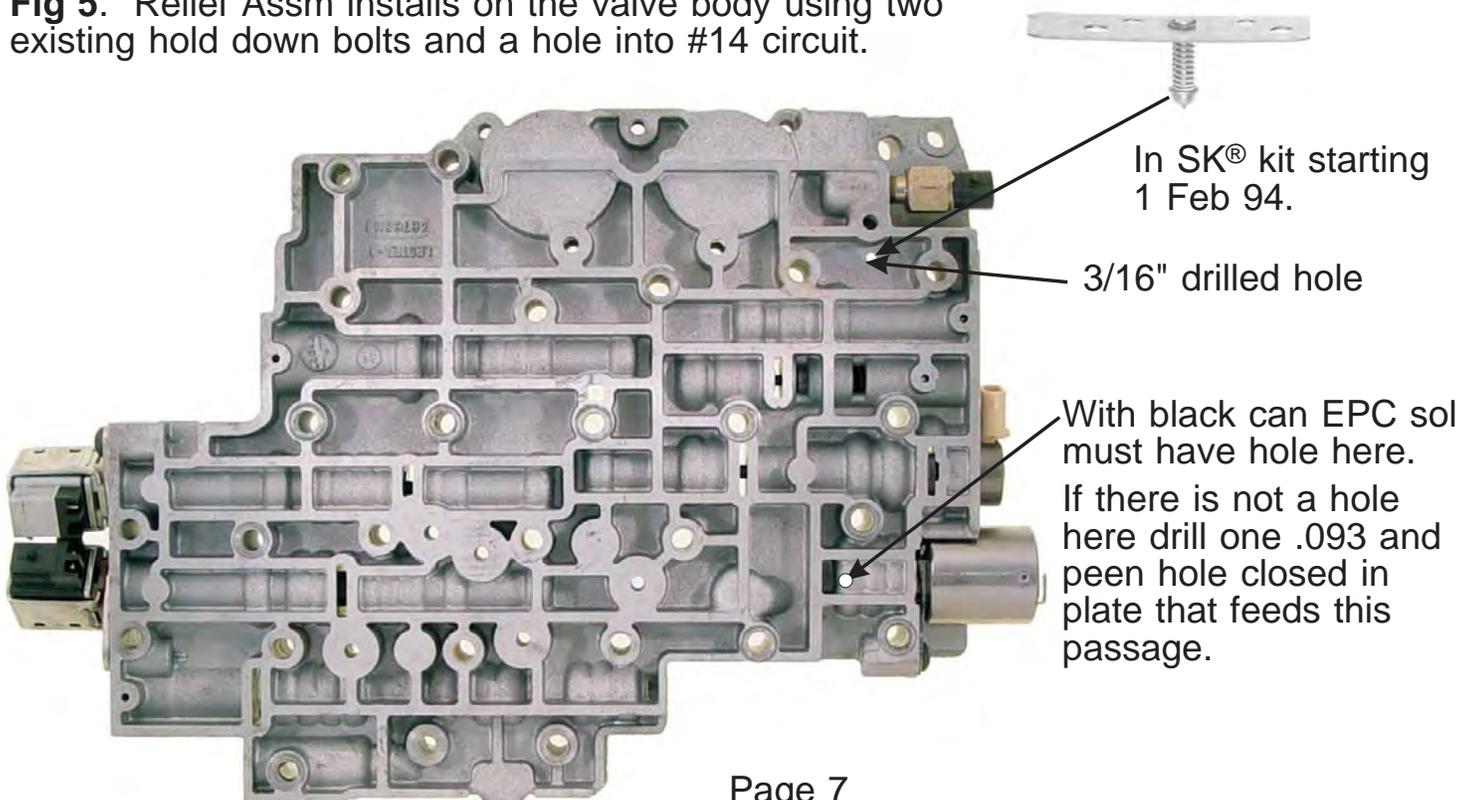
**Fig 3.** Since the diameter of the boost valve [.736] is larger than the balance end of PR valve [.625], a lack of #14 oil regulation results in unlimited pressure and case, direct drum, direct piston or valve body breakage.



**4. A practical solution:** Install TransGo relief assembly intersecting #14 oil circuit that would only operate during a high line pressure malfunction.

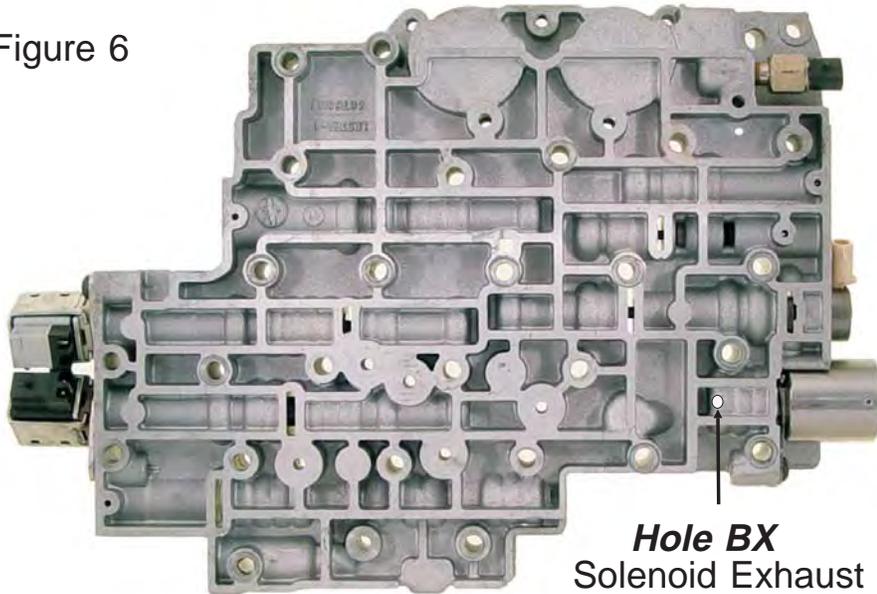


**Fig 5.** Relief Assm installs on the valve body using two existing hold down bolts and a hole into #14 circuit.



**Fig 6.** There are several case, gasket, solenoid and plate combinations that will cause no line rise in forward ranges and/or max line in forward, and unlimited pressure in reverse.

Figure 6



2nd type: VB-Plate-Sol

1. VB has hole BX.
2. Separator plate does not have hole SB.
3. Must use 2nd design [Black] solenoid.

1st design sol will cause all time high line and breakage.

1st type: VB-Plate-Sol

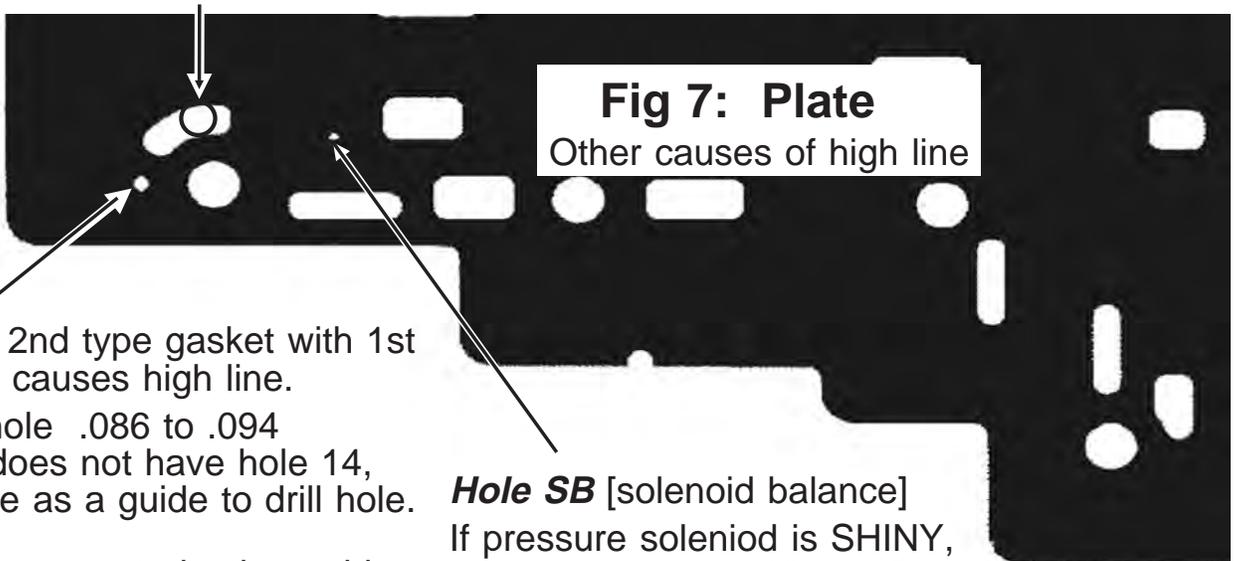
1. VB has no hole BX.
2. Plate has hole SB.
3. OK with any solenoid.

Problem here occurs when plate or VB is swapped or replacement plate installed.

With 1st design solenoid: VB must not have hole BX—Plate must have hole SB.  
 With 2nd design solenoid: Any VB or plate works OK.

**The bottom line is this: Never re-install 1st design [shiny] solenoid.**

Gaskets and Plate may have round hole here.



**Hole 14:** 2nd type gasket with 1st type plate causes high line.

Drill this hole .086 to .094

If plate does not have hole 14, use picture as a guide to drill hole.

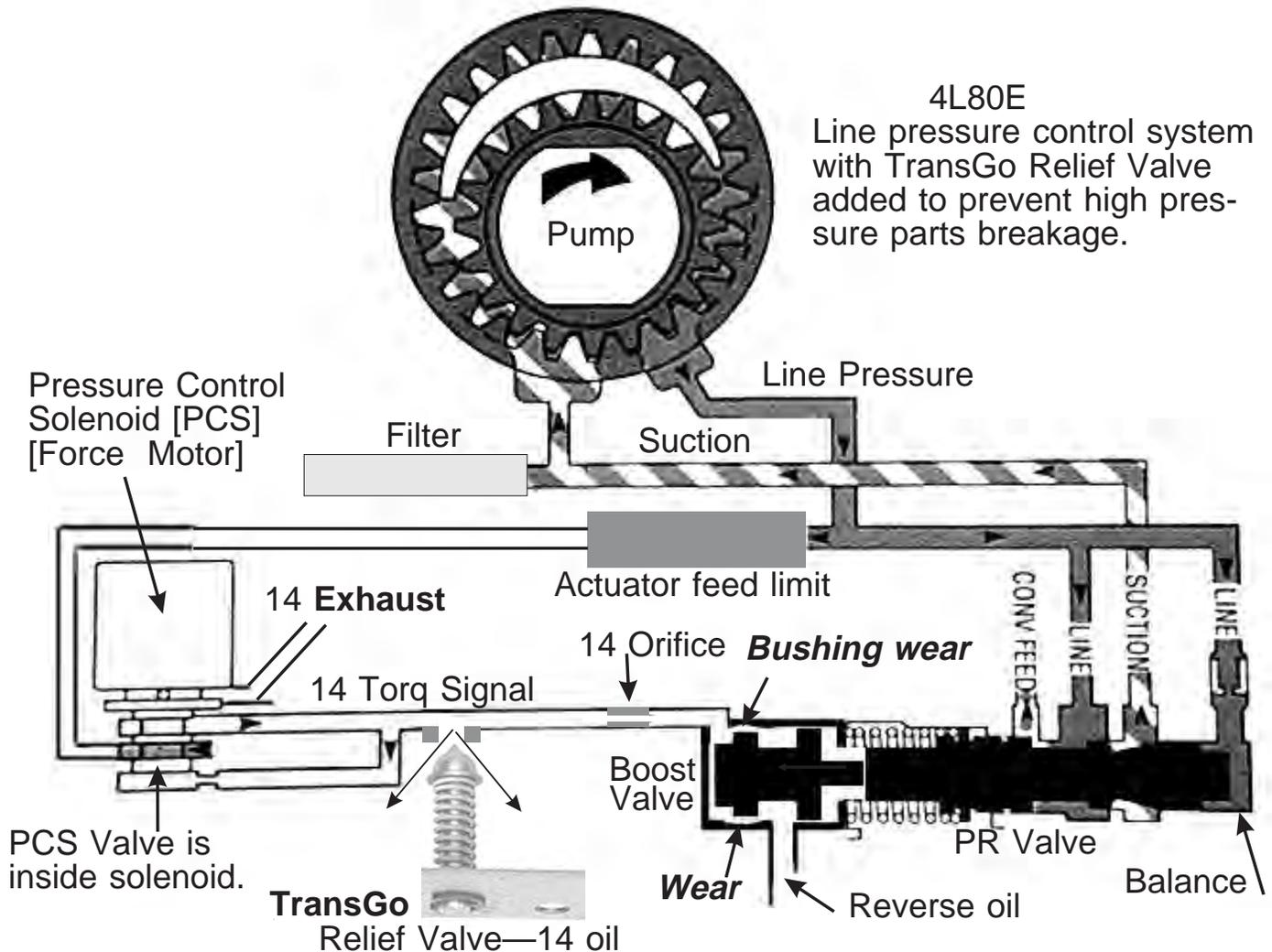
Both gaskets must also have this hole, cut hole in gaskets with razor blade if necessary.

**Hole SB** [solenoid balance]

If pressure solenoid is SHINY, plate must have .038 to .051 hole here. Hole not required but OK with BLACK solenoid.

## SUMMARY: Pressure rise & hard parts breakage.

1. Install relief valve in line boost circuit 14.
2. Install new TransGo double land boost valve.
3. To avoid crossmix, plate and gaskets must have hole #14.
4. Do not reuse 1st design [Shiny] Pressure control solenoid.



4L80E  
Line pressure control system  
with TransGo Relief Valve  
added to prevent high pressure  
parts breakage.

Reverse oil [which is line pressure] enters boost valve between the lands. The inboard land is larger, so the boost valve moves to the right against the PR valve to increase pressure. Rev pressure cross leaks leftward past the clearance in left land of boost valve and enters 14 circuit which forces the boost valve rightward causing pressure to skyrocket in the following situations:

- Volume of cross leak exceeds 14 orifice in separator plate. [Uh oh]
- Cross leak exceeds PCS valve exhaust. [Even slight wear/leak causes this.]
- Valve in solenoid sticks closed or midway. [Very common occurrence.]
- Valve in solenoid sticks open. [Rev is then 450psi instead of 270 to 370]
- No current to solenoid even momentarily for any reason. [450psi plus Rev.]

***In all of above conditions the added TransGo relief valve opens, and limits reverse pressure to prox 370 psi, which prevents parts breakage.***

[Correct rev pressure: Idle 80 to 120—Max 265-370]

This same cross leak causes low line in forward ranges. [see next page]

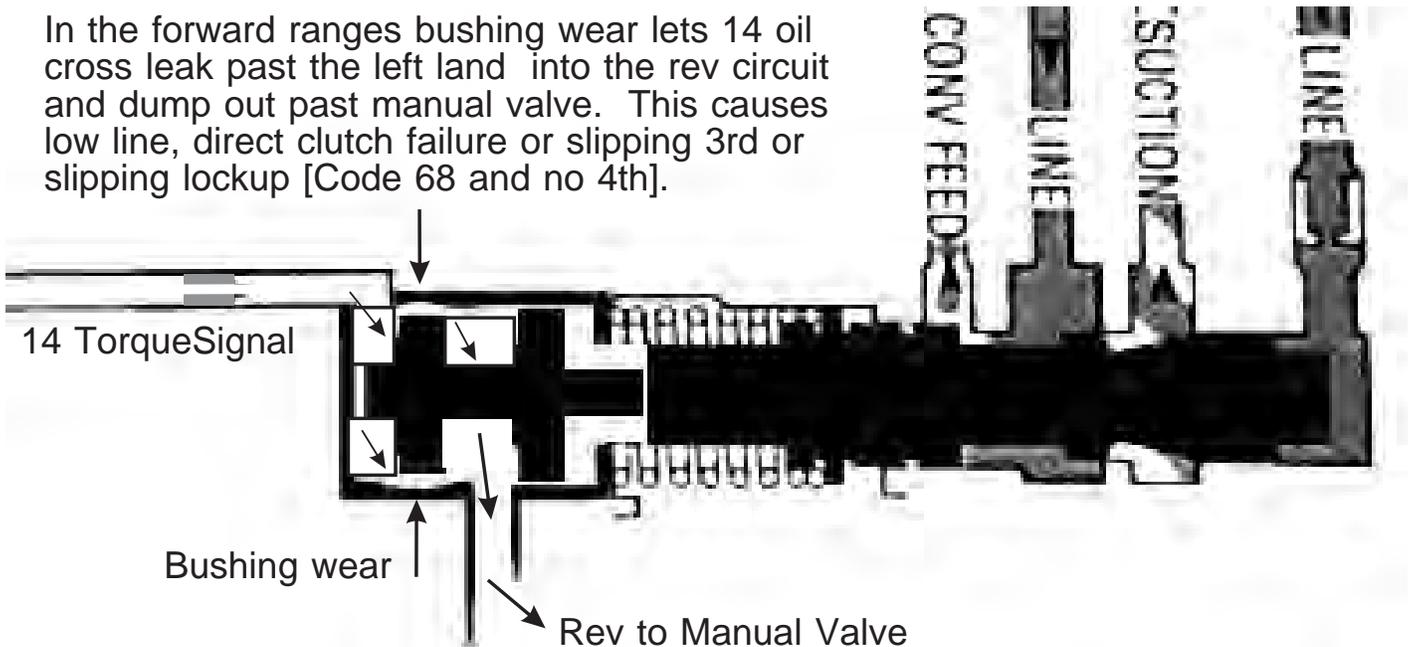
# Low Pressure in Forward Gears

Pressure at stall in "OD" or "D" must be at least 140 when HOT.

When bushing is worn pressure may be OK cold and the drop when hot.

A temporary solution is to replace the bushing. The lasting solution is to install the the boost valve furnished in the Shift Kit®.

In the forward ranges bushing wear lets 14 oil cross leak past the left land into the rev circuit and dump out past manual valve. This causes low line, direct clutch failure or slipping 3rd or slipping lockup [Code 68 and no 4th].



Original boost valve tilts and the sharp narrow lands wears the boost bushing.



Original Boost Valve

New wide double land valve will prevent wear and works in a new area to save worn bushing.



TransGo Wide double land valve.

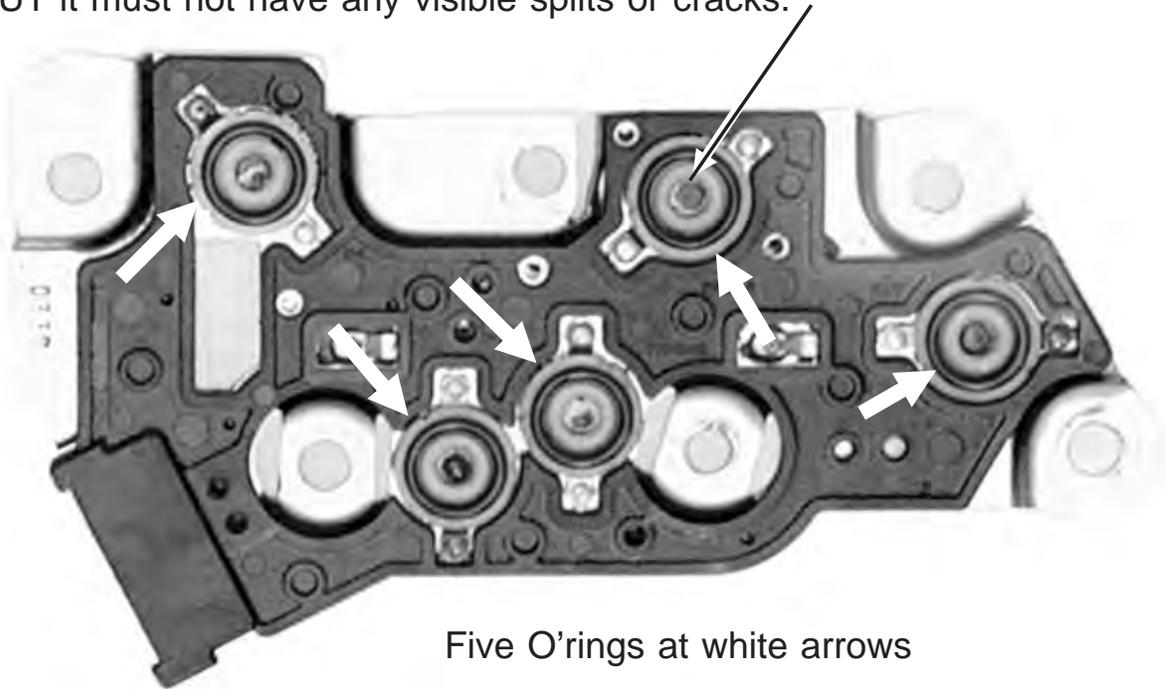
## REVIEW: Pressure rise & hard parts breakage.

1. Install relief valve in line boost circuit 14.
2. Install new TransGo Double Land Boost Valve
2. To avoid crossmix, plate and gaskets must have hole #14.
3. Do not reuse 1st design [Shiny] Pressure Control Solenoid.
4. When changing EPC ALWAYS check VB exhaust page 7

## Switch-Manifold Pressure

This tells the computer what position has been selected with manual lever.  
If scanner reads wrong shift lever position check connector and wires.  
If connector and wires are OK replace the manifold assm. # 24200695

Look at plastic in the middle of each switch. It is OK for it to be wrinkled or look ugly, BUT it must not have any visible splits or cracks.



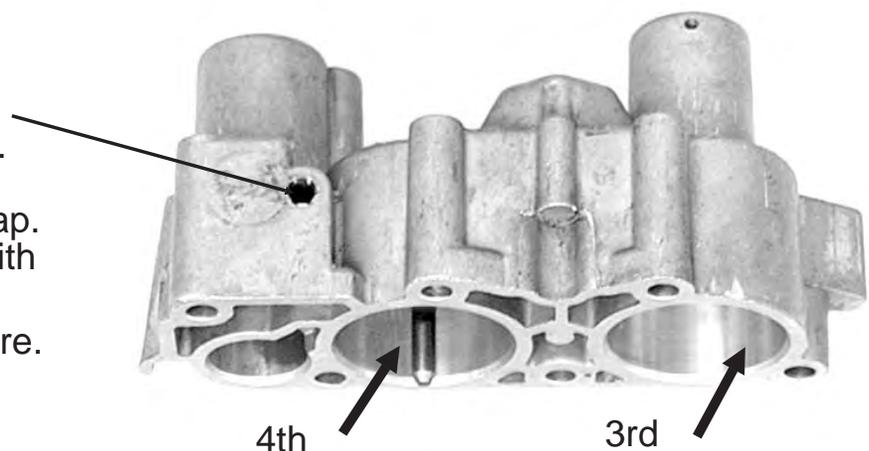
Five O'rings at white arrows

## Accumulator Housing 8677450

Plug 8611710 goes here.

Be sure this hole is plugged.  
If hole is open tap it 3 to 4  
threads deep with 5/16-20 tap.  
Screw 350 pan bolt into it with  
sealer and cut it off flush.

Open hole = low line pressure.



Some scratches in 4th and 3rd accm bores is normal. But if the piston has dug into the side of bore more than a couple thousandths, replace the housing. **Remember: Plug hole in new body.**

## Commonly needed Part numbers

### Solenoids, Shift [Valve Assembly]

Valve assm-Solenoid "A" #10478147

Valve assm-Solenoid "B" #10478148

Normally Open: Screen in snout.

Electrical check: 20 to 30 ohms pin to pin.



1st type: SHINY can—GERMANY



### Solenoid, Control Pressure

If trans has 1st type, replace it with 2nd type.  
1st type has SHINY can and says, "GERMANY"

2nd type: BLACK can #24203101

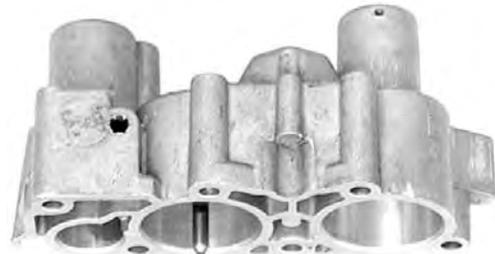
[Electrical check: Pin to pin 3.5 to 5.5 ohms].

2nd type has BLACK can

Switch, Manifold 24200695



8689993 Housing, accumulator  
Get Cup plug 8611710



**24200161 Harness,**  
wire loom upgrade [94 type].

**Shifts and solenoid electrical function can be checked and operated at the trans connector.**

**Remember:** An electrical check that is OK doesn't mean the solenoid is OK. It can check OK electrically and still be NG for lack of flow or mechanical sticking.

**Resistance pin to pin:**

"A" Sol = A to C 20 to 30 ohms

"B" Sol = B to C 20 to 30 ohms

TCC Sol = J to K 9 to 11 ohms

**To shift trans**

1st = 12V to C and grnd A. [Sol "A"]

2nd = no connections

3rd = 12V to C, grnd B [Sol "B"]

4th = 12V to C, grnd AB [Sol "AB"]

Lockup = 12V to K, grnd J [PWM]

When shifting the trans in this manner, shifts should be short and hard because line pressure is at max [145 to 168 psi]. When checking shifts on the lift it is OK to reduce line pressure to min [39 to 52 psi] by connecting 12V to pin L and grnd M.

**Line Pressure Checks:**

At idle in "N" and "D": 52 to 85 psi

At stall in "D": 145 to 168 psi

At stall in "R": 265 to 370 psi

If line pressure matches above, the pressure control solenoid is functioning properly.

If line pressure does not check as above then it is necessary to check the sol separately at the case connector.

**Disconnect the harness at the trans:**

At prox 1500 rpm pressure should be 145 to 168 psi in all forward and 265 to 370 psi in reverse.

Connect 12V to L and grnd M while reading pressure gauge in "N" at prox 1500 RPM.

All Forward gears = 38 to 52 psi

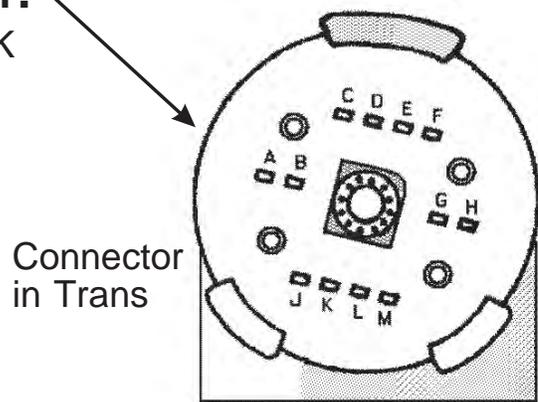
Reverse = 75 to 120 psi.

If pressure is OK when checking from the case connector the sol is OK.

If pressure is not OK with harness connected suspect external controls and wiring—not trans.

**1st design connector**

Has center attaching screw



**Fast Shift test—Wheels in Air**

Connect 12V to K&C, Grnd AB&J

Selector in "1" should be 1st

Selector in "2" should be 2nd

Selector in "D" should be 3rd

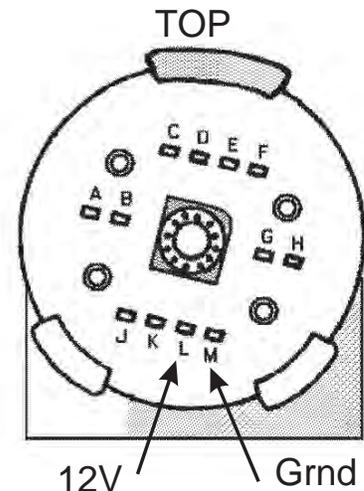
Selector in "OD" should be 4th

Selector in "D" or "OD":

Hard braking should kill engine.

Disconnect pin "B": Trans should now shift 1-2-3 as you move the selector and stay in 3rd when lever is moved to OD.

To check shifts on a road test disconnect pin J, [lockup]



Connect 12V here to record minimum pressures in both forward and reverse.

## Shifts and solenoid electrical function can be checked and operated at the trans connector.

**Remember:** An electrical check that is OK doesn't mean the solenoid is OK. It can check OK electrically and still be NG for lack of flow or mechanical sticking.

### Resistance pin to pin:

"A" Sol = A to E 20 to 30 ohms

"B" Sol = B to E 20 to 30 ohms

TCC Sol = S to E 9 to 11 ohms

### To shift trans

1st = 12V to E and grnd A. [Sol "A"]

2nd = no connections

3rd = 12V to E, grnd B [Sol "B"]

4th = 12V to E, grnd AB [Sol "AB"]

Lockup = 12V to E, grnd S [PWM]

When shifting the trans in this manner, shifts should be short and hard because line pressure is at max [145 to 168 psi]. When checking shifts on the lift it is OK to reduce line pressure to min [39 to 52 psi] by connecting 12V to pin C and grnd D.

### Line Pressure Checks:

At idle in "N" and "D": 52 to 85 psi

At stall in "D": 145 to 168 psi

At stall in "R": 265 to 370 psi

If line pressure matches above, the pressure control solenoid is functioning properly.

If line pressure does not check as above then it is necessary to check the sol separately at the case connector.

### Disconnect the harness at the trans:

At prox 1500 rpm pressure should be 145 to 168 psi in all forward ranges and 265 to 370 psi in reverse.

Connect 12V to C and grnd D while reading pressure gauge in "N" at prox 1500 RPM.

All Forward gears = 36 to 48 psi

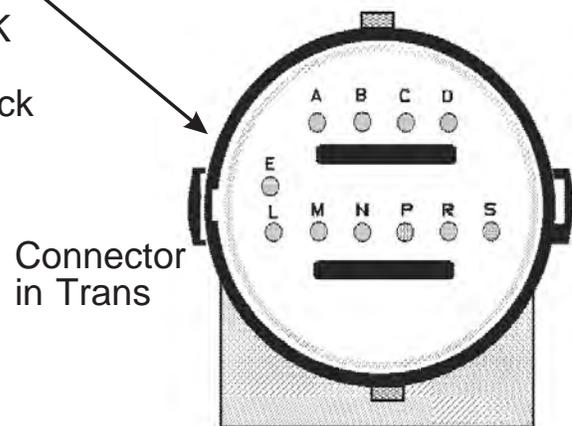
Reverse = 75 to 120 psi.

If pressure is OK when checking from the case connector the sol is OK.

If pressure is not OK with harness connected suspect external controls and wiring—not trans.

## 2nd design connector

Snaps on, has no screw.



## Fast Shift test—Wheels in Air

Connect 12V to E, Grnd AB&S

Selector in "1" should 1st

Selector in "2" should be 2nd

Selector in "D" should be 3rd

Selector in "OD" should be 4th

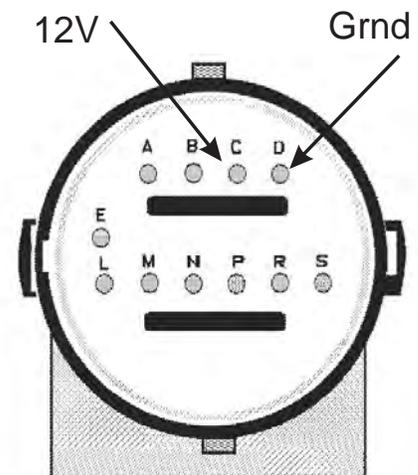
Selector in "D" or "OD":

Hard braking should kill engine.

Disconnect pin "B": Trans should now shift 1-2-3 as you move the selector and stay in 3rd when lever is moved to OD.

To check shifts on a road test disconnect pin S, [lockup]

To check min pressures in forward and reverse Connect 12V to "C" and grnd "D".

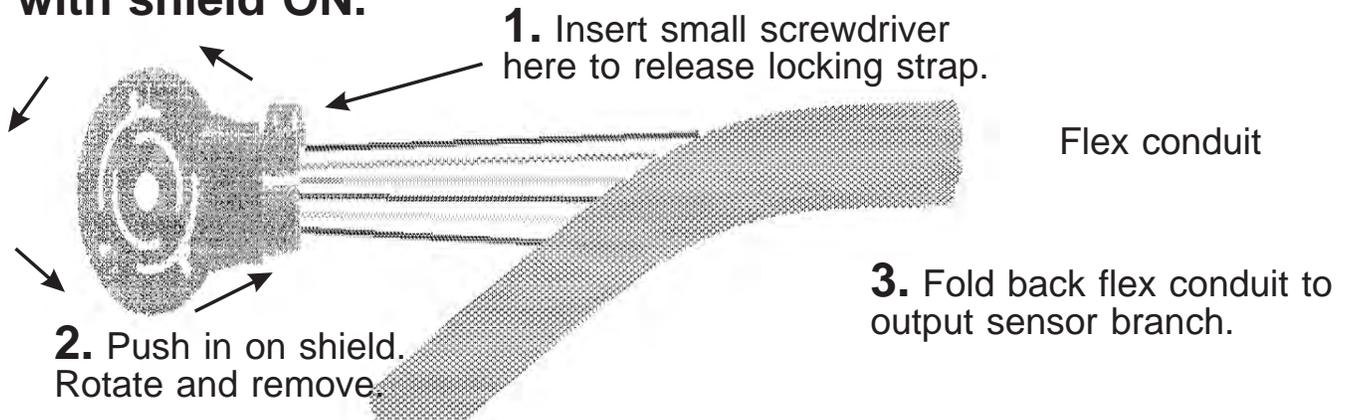


info2

# 4L80E: Instruction for installing #24200161 wire loom upgrade [94 type] onto earlier model vehicle.

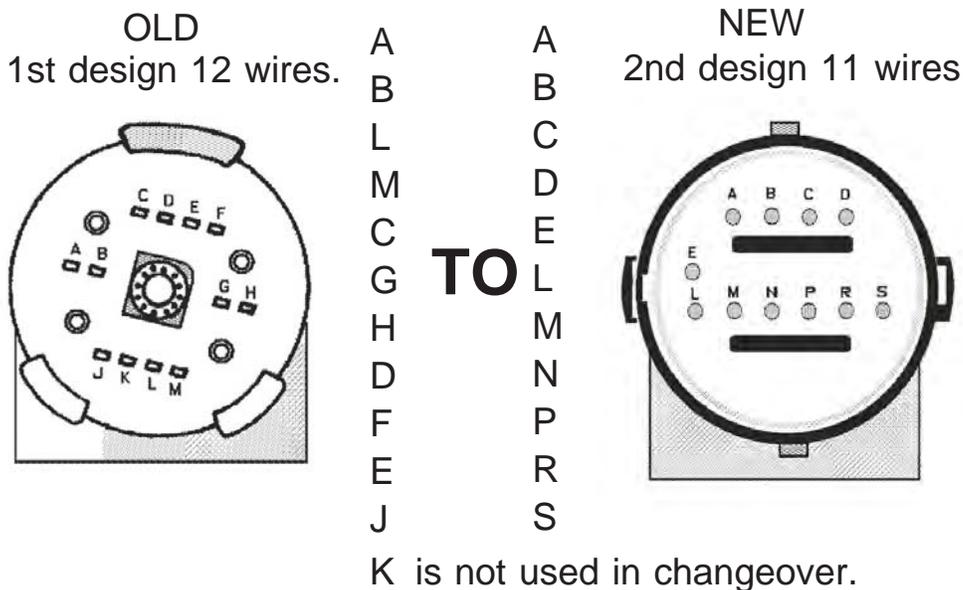
**Complaints:** Oil leak to outside connector—2nd gear only and high line [Fail Safe Mode]—Lock tabs or wires broken to the solenoids and switches. Crazy, shifts—neutral and

## 1st type connector with shield ON.



**Disregard wire colors: Use pin location for installation.**  
Wire color may not be original, or faded, or different than colors listed.

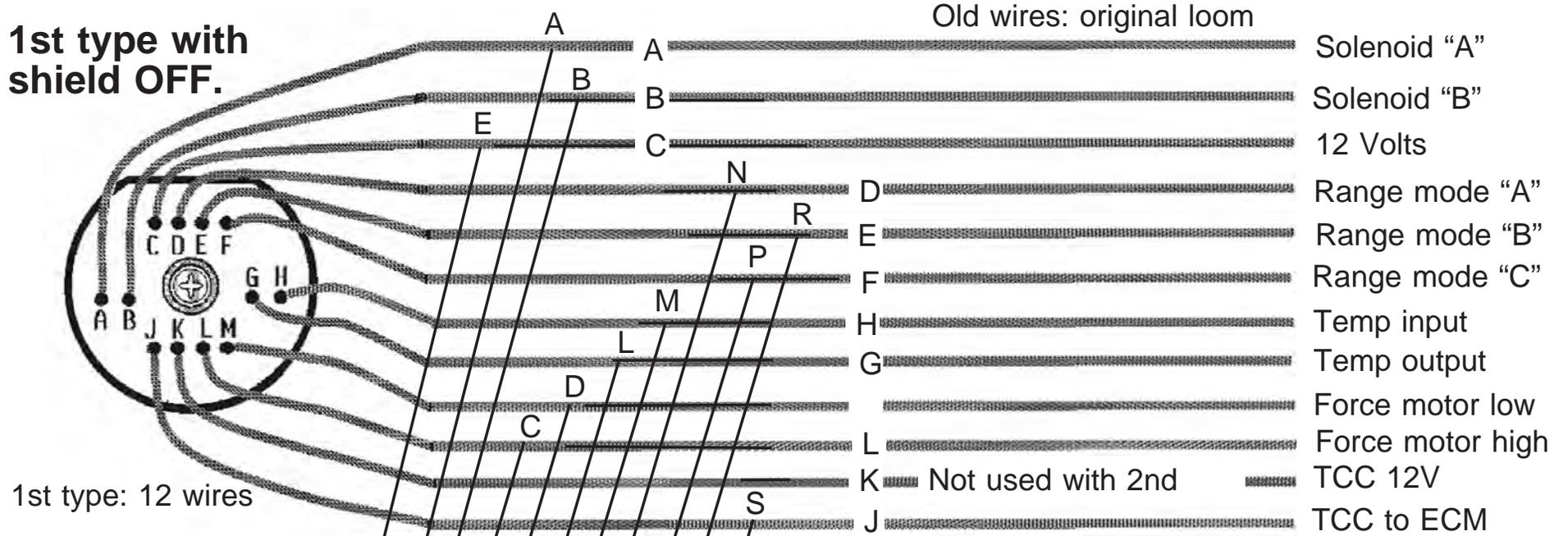
Connect Old outside wires to New outside wires.



See next page for outside wire diagram and pin function.

1st type has 12 wires. 2nd type uses eleven of them. One is left over.

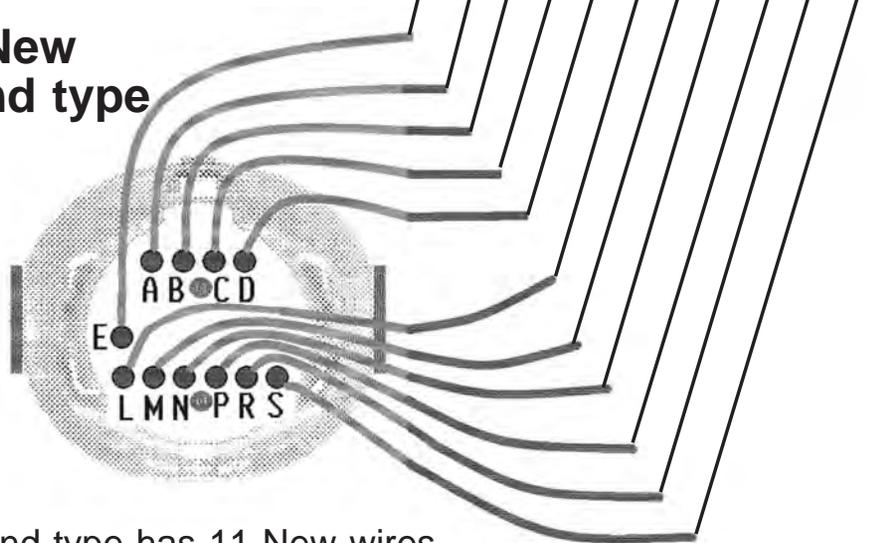
**1st type with shield OFF.**



1st type: 12 wires

New wire to old:

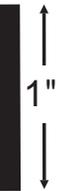
**New 2nd type**



2nd type has 11 New wires

**Save yourself a HUGE headache. Cut and connect one wire at a time:**

1. Find new wire "E": Cut it about 8" shorter, strip the end 1/4" and crimp a connector to it. Find old wire "C". Cut it back about 17". Strip end 1/4" and crimp it in connector against new wire "E".
2. Find new wire "A" and cut it about 1" shorter than "E". Strip the end 1/4" and crimp a connector onto it. Find old wire "A". Cut it, strip the end 1/4" and crimp it in connector against new wire "A".
3. Follow new wire chart downward, cutting each new wire about 1" shorter than the last one.



# Questions and Answers

(Chris Prescott)

**What is the resulting complaint after the installation of the pressure relief valve assembly when the line pressure boost bushing is worn or the force motor has an exhaust problem. What can we expect to see as a new result?**

With the relief valve installed rev pressure will be normal instead of sky-rocketing. Since July 95 the SK® 4L80 kit includes wide land boost valve that works just fine in a worn bushing. So any irregularity in line pressure would then have to be caused electrically or by a sticking PCS valve.

UpDate 1998: the longer style valve and bushing is in TransGo Kits

(Clay Sikes)

**How does fluid leakage at case connector cause bad connections, when all internal connections are totally submersed in fluid?**

Trans fluid does not conduct electricity but when it gets external in the connector it collects moisture and road particles that could cause cross circuit. It is not a very common concern. There is more trouble with the inside wires than the outside stuff.

(Pete Smith)

**When in reverse, does line pressure move the boost valve to uncover a port to #14 circuit or just leak past clearance in bushing to #14 land?**

Reverse oil, which is line, leaks past any excess clearance in the boost bushing and over pressures the #14 circuit.

**Other than metal particles and disintegrating solenoid filter, what causes EPC valve to stick?**

Great question Pete, 1st type solenoid has a very small diameter valve, so very little area for return balance force. 2nd type EPC has larger diameter valve with more return/balance force, which means less sticking. Area X pressure = force. 1st type PCS valve: Diam is .167 Area=.0219 x 90psi TV=1.97 lbs return/balance force. 2nd type EPC has .330 valve =.0855 area X 90psi TV=7.69 lbs return/balance force.

Almost 4 times as much area.

4L6-SOL EPC Solenoid Repair Kit has new valves that resist sticking. Kit fixes 4 solenoids better than new.

(Dwight L. Armstrong)

**On sealing rings for this unit, do I use only metal or scarf-cut rings, or are the solid rings okay if sized correctly? I just bought the sizing tools for this unit (\$260). Ouch!**

Sorry Dwight, we just don't like the solid rings in this application; they shrink with time and temp. For hard working rigs OE scarf cut rings are preferred, but metal will work fine.

**I've only built one of these units so far and it was a comeback from another shop in the company I work for. I replaced the harness inside and out and was happy to find that a 400 direct 5 plate sprag type drum and race would work just fine. Could I use a 400 5 or 6 plate roller type clutch drum in place of 4L80 drum assembly or is this too weak?**

In a pinch a five plate 400 drum and either type of one way sprag/roller will work, but it is not a step forward.

**Will the 4-plate setup for 2nd from a 4L80E fit in the 400) with 6-plate sprag type drum for HD duty with .088 TF snap ring: It's a neat thought.**

4 frictions in second on a 400? We don't see the need, but guys have been doing this for at least 15 years. 6 plate sprag type drum was common in early 400's and 425's and used by racers ever since.

(Thomas Copeland)

**On page 11, under "probable problem indicated by codes", one part reads 68 or 68 & 39. Please explain. Other than that I understand everything. I have seen the parts breakage and use the SK® 4L80 in every one I do.**

Codes 68 & 39 the controller has seen slippage in 4th/lockup. The road test on page 9 lesson #1 will determine if the lockup plate or the 4th clutch is slipping. The 4th clutch can't slip in D3 because its not on.

(Tim Moyer)

**Would you advise replacing the 2nd type pressure solenoid, also? Especially on a trans with a lot of metal in it? Or high mileage?**

Yes, Otherwise you can reuse it if you are willing to spend 5 minutes watching a line gage with the trans in gear and going from idle to prox 1800 slowly and back to idle slowly. The line pressure must go up and down smoothly. If it jumps or skips, replace PCS and/or check TPS for smooth voltage gradient.

**Would you advise replacing A and B solenoids on high mileage or metal contaminated units?**

All early solenoids should be replaced when trans is on the bench. Late solenoids with high mileage or metal contamination should also be replaced.

**(Thanks for the wiring information it was great.) Should all 1st type wire looms on 91-93 models be upgraded to 2nd type?**

If the harness looks OK inside and out it probably is. But if you have installed new solenoids and are chasing some mysterious shift complaint then check the wires under the loop bracket on the bell housing to make sure none are rubbed thru the insulation. If that's OK, time for new loom.

**Is there any company making individual wire connectors to fit the pins in connector to make solenoid testing easier? If so, what is their name?**

Not that we know of.

**When changing wire loom; is it necessary to solder the wires together or does crimping connectors work?**

It all depends on your climate. In Southern Cal rust and corrosion are not a concern. But, in humid areas soldering is, for sure, the way to go.

(Ivan Blacka)

**The bottom line is to replace shift solenoids and pressure control solenoid and manifold pressure switch with 2nd type harness on every rebuild, along with an SK 4L80. Also check plates, VB, accumulator housing, etc.**

With high miles, we can't argue with that Ivan, but not everybody agrees that every job needs all of of it.

**Rebuilt 4L80. It came back one week later with no 4th. Found a faulty shift solenoid. Now I will replace all on every job. They're cheap enough and will stop comebacks.**

**I noticed Borg Warner 400 intermediate clutches are waved. Is there any benefit in interchanging them? (Installing waved plates in 4L80 or flat plates in 400?)**

We just love waved plates. Shift feel is much easier to calibrate, and don't worry, more firmness can always be obtained, if desired.

**I understand the 4L80 uses a double stator in the torque converter. Please explain how this convertor works. What is its' torque ratio?**

The ratio of a dual stator convertor can be a high as 3.5 to 1. As far as, how it works Hydra-matic 4L80-E Technicians Guide pages 12, 13, and 14 gives a good explanation.

**When is the coast clutch applied?**

Any time selector is in 3, 2 or 1.  
It is not on in reverse.

**Which cooler line is return lube?**

The front fitting on the trans is cooler return and lube.

**In your opinion is this a good transmission (with SK installed)?**

Yes, this is most likely the strongest 4-speed that we have had the pleasure of working on.

**Do you know a source of colored oil circuit charts? If so who?**

HYDRA-MATIC 4L80E Technician's Guide, also Mitchell & Motor.

**Have you experienced complaints of erratic shift patterns caused by external wiring harness? When wires are removed from the conduit and separated the problem goes away. What's happening?**

An open circuit must be closing when the wires are moved, or there is a short in the wires at bell bracket.

**Page 5: Complaint: Long soft 2-3 apply when hot. Cause #2 restricted or sticking solenoid B. How does a shift solenoid cause a long apply? My understanding is that the solenoid controls a shift valve which determines when the shift happens not how it applies. Explain.**

To obtain a quick clean shift on any trans, the first thing that must happen is the shift valve must snap over quickly to direct oil to the clutch or band. If the solenoid is slow to close or slow to exhaust it will move the valve slowly and orifice the apply oil, causing a long soft shift.

**Can 2nd design gaskets be used on 1st type plate after drilling hole "14"?**

Yes.

(Joe Logan)

**Are T'Go gauges equipped with hoses? Sounds like it's time to buy gauges with higher readings.**

Yes, we have hoses and yes, we all need gauges for higher pressures.

**Is 600 - 800 psi normal?**

It is not uncommon to see. But it definitely is not normal.

**It is most improbable, but has anyone heard of any successful way of fixing a blown out passage in the case?**

Several shops claim an expert welder can fix them. It all depends on who is doing the welding.

**Multiple codes stored (3 to 4 or more) no lockup, intermittent limp, colleagues and competitors have had great "luck" (not necessarily success) with replacing harness and connector BEFORE replacing any solenoid/sensor/internal repair. Based on fluid contaminating connector and moisture disrupting processor reference voltages/resistance. You are recommending component repair replacement before most harness suspicions. Am I being misled by info on another "authorized complaint", or could this harness be causing a great deal of the lockup shudder/slip? Limp-in? No 4th, Intermittent?**

Shift solenoids and EPC gives much more trouble than other electrical components. New EPC and shift sols sure makes diagnosis easier.

**Lesson 1, Page 3, figure 4 shows the SK relief valve intersects between EPC valve and the .073 plate orifice. With bad bush wear, it seems the .073 hole may not have the capacity to bleed off the rev crossleak into the #14 circuit. This could allow it to build pressure against the #14 side of boost valve and sky rocket line pressure in reverse.**

You are exactly right. Yes #14 pressure will build against the #14 .073 hole. It is essential to increase it to .093 or larger. In the event of bushing wear there is no limit to reverse pressure. It will keep going up until something breaks.

Page 6: You mention three times to replace solenoids then wires if necessary. **What solenoids? What wires? (Internal or External wire?) I'm confused.**

Shift solenoids A & B. Harness assembly inside and out #24200161.

**Page 10, shows connector at lower right for minimum pressure readings. Although, reading the tech gives 100% correct (I hope) information, picture shows 12V to M, ground nowhere (or case????) And another unlabeled arrow to pin "A". I see the illustration to be troublesome, especially referenced to trans in vehicle where connector is less visible. (1st design connector). The same is true for page 11, 2nd design connector. Tech states "min pressures 12V to pin "C", ground pin "D". Illustration clearly shows 12V to "B" and ground "C". (Very unsure about results.)**

**This may sound “old hat” but I didn’t see anything about input shaft breakage. I also know that hardened input was redesigned. I guess my question is: Was this upgrade needed? Is the “real” cause stator lube to converter, or bushing size/wearout at stator or truly a design fudge in metal engineering.**

The new shaft is a real beauty the only concern at this time is that it may still be too hard and may still be a little too thick between the front splines and the first ring. Remember hard/stiff shafts break and shafts that are designed to flex will flex w/o breaking. At this time we see no other reason for shaft breakage than the shaft itself.

**(Sam Adams)**

**Is fail safe always just 2nd and high line or is there other modes of fail safe or limp?**

We have experienced high line with late 1-2 and 2-3 also no 4th and no lockup. High line with 4th and lockup, high line with only 2nd gear and HOT MODE locked in 3rd, no lockup and no 4th.

**I see that installing the relief assembly will prevent hard parts breakage, but wouldn’t the actual causes of high or low line problem also have to be addressed?**

The main cause of both high and low line problem is history. Starting in July 95 a new boost valve is included in the Shift Kit® which fixes high line in reverse and low forward line pressure, even with a worn boost valve bushing.

(George)

**The lesson seemed very confusing, even chaotic, until I used it to fix a problem. Then it became very understandable and appreciated. Why is this so?**

A young man who is trying to make kids is not able to absorb a ten page essay on contraceptives. However, after the 3rd child arrives he finds that very same information very interesting.

Gil constantly reminds us of these simple truths.

1. All data is information, but only data that expands perception is knowledge. Everything else is noise.
2. Misunderstood data and extra data is worse than no data.
3. A man with a problem is ready for data that fits the problem. He will reject other data as unneeded clutter.
4. In order for data to be useful it must arrive [be available] at the same time the problem is occurring.

**(V. Baldwin)**

**Should PWM solenoid be replaced on every overhaul, or just high mileage?**

Have not seen much trouble out of these. But with serious metal contamination be watchful.

**What is stop light switch and where is it located? (Is it the brake light switch at brake pedal ?)**

It is a two circuit switch mounted on brake pedal bracket for the release of lockup when depressing the brake and for turning on the stop lights.

**Page 10, checking pressure with harness disconnected. Wouldn't a leaking boost valve cause extreme high pressure in rev and possible misdiagnosis of EPC or are these pressures with SK® already installed with pressure relief valve?**

We do not recommend running any unrepaired 4L80E without the harness hooked up. If you must, then increase RPM very slowly in reverse with your eye ball on the gauge. If it exceeds 400 it is time to stop.

**Page 14: When cutting old harness should each wire be cut in 1" increments from 17" down to 7" at old wire "J"?**

Yes, it makes for a much cleaner looking repair. Its a lot faster too. BUT—remember to cut them one at time as each new wire is installed.

(Al Andani)

**The "Fast Shift Test Wheels in Air" (page 10). Please clarify.**

Fast shift test, wheels in the air is just a fast way to separate the problem between trans or electrical.

**Brake light switch faulty - no lockup!!?? Any codes in this mode? What goes wrong with the brake switch?**

Possible code 37 brake switch stuck ON or code 38 stuck OFF.

Jeff Wall

**Does high line pressure actually break the transmission case and you have to replace case?**

Yes. It will usually break out a piece of the case under the manual valve. It can also break a partition in the valve body.

**If everything is original and you have a shiny 1st design pressure control solenoid, and solenoid is working, should you still replace it when overhauling tranny?**

Yes, Not worth taking the risk. Replace it with 2nd design black type.

**The information in this lesson will be very helpful for me to diagnose problems. I was wondering if it is necessary to have the angled cushion in direct drum to get the right clearance?**

The 400 waved plate works just fine. BUT NOT IN THE FORWARD. More or less clearance can be obtained by mixing thick and thin steel plates.

(Jerry Beals)

**Is hole #14 the only hole in gasket and plate we need to watch for?**

No, page 4 figure 7 shows solenoid balance hole when using 1st type solenoid. Plate must have this hole if using 1st type solenoid. With 2nd type solenoid VB Must have exhaust hole, Page 7.

**Do tow truck 4L80's give this trans a problem when extra lights are wired into the truck's electrical system?**

No more than any other trans. When adding Tow or trailer wiring there is no reason to alter the trans wiring.

Is there a need for good rubber on accumulator pistons?

The 91 models had a teflon ring problem on the 1-2 accumulator piston, which caused bindup in manual "1" and soft 1-2 shift. New piston with rubber seal #8668929. We have not seen any ring shrinkage or problem with the 2-3 and 3-4 accms. In 1994 OE switched to a plastic pistons in the accm housing. Time will tell if this is a fix or reduces scratching.

**What does the convertor limit valve do?**

It limits convertor pressure to about 100 psi.

**How does TCC enable valve work in conjunction with TCC and converter limit valves?**

TCC enable valve is a safety valve that will not allow the TCC shift valve to move unless TCC solenoid is closed, there may have been some worry about cross leaks to the circuit.

**My first 4L80 completely smoked all the friction packs. The trans only had 40 PSI in the forward gears. Is the force motor causing all this damage?**

Installing a pressure gauge and checking voltage to EPC before disassembly would be the only way to know for sure. About 40 psi is what you get if the force motor [PCS] valve is stuck in the exhaust position.

**The 4L80 we worked on had a broken angled plate in direct clutch. What causes that problem? The Plate or high pressures?**

Late 400s have the same problem. Early angled plates break through the scallops. Always update to late plates #8680816 or 400 wave in **(DI-RECT ONLY NOT IN FORWARD)**.

**In my overhaul sets, I have a large cup plug with a hole about .050, where does it go?**

In the back of the case to lube the extension housing bushing.

**COMMENT: On 4L80 cases the case bushing is narrow. THM 400 case bushing works great along with 35400C Torrington Bearing which sits over the bushing that sticks out. On direct clutch spring retainer some snap ring grooves are cut too deep.**

**A 1-3/4" eyelet type snap ring works great just grind it flat on sides so it locks in place.**

(Tony Bigot)

**Does the convertor lockup in 2nd gear or 3rd gear? If it has lockup in 2nd gear, can it be changed to lockup in 3rd gear?**

The computer can lock this trans up in 2nd, 3rd and 4th. Why change it ?

**What is PWM?**

Pulse Width Modulated - It cycles on and off rapidly to control lockup feel.

(Donnie Larkin)

**Code 87 = Actuator filter end broken or seal leaking. Is that GM's explanation of this code or something you have learned and added to it?**

GM has it listed in their codes & possible causes booklet.

**How good are the solid type ring on center support?**

In hot service they shrink and cause loss of 3rd. Metal rings work great on center support.

**What is a backout shift?**

With substantial throttle applied, lift throttle quickly just before trans shifts. This is called a "Backout".

**Complaint: Tail bump 2-3 when very warm. OK cold.**

**Cause: Converter stays locked during 2-3 shift.**

**Question: Are you saying the converter unlocks for 2-3 shift when cold or that the heat enhances the bump?**

This trans normally locks up *after* 3rd, but when trans temp reaches 275F the convertor locks up right on top of 2nd and and stays locked up during

2-3 shift. This is done to help cool the trans. That's when you get a 2-3 tail bump.

**You would think the computer would look at the temp sensor and run a program to unlock before 2-3 ?**

Then it would feel like an E4OD and relock on top of 2-3 which feels really crummy.

**What is an actuator circuit and what does it do?**

Actuator feed limit valve regulates to a max of about 113 psi. This circuit feeds both shift solenoids and the EPC [force motor].

(Mark Klein)

**Do you think the 200-4R was helpful in GM's design of the 4L80 clutch application-wise.**

We have been told it is the other way around. This trans has been on the shelf since the late 60's

**Is the 400 early design fwd and direct clutch piston superior to those used in the 4L80?**

We have never put 800 psi line pressure to the 400 pistons to see if they would break, but we assume they would. With SK® installed there will be no more extreme pressure parts breakage unless the PR valve sticks, which happens rarely.

**Anyone have plans for stand-alone computer for hot rod?**

We are now releasing performance kits for this trans including a stick shift and internal brake. That does not use a computer. The kit comes with a vacuum pressure control system that matches engine torque.

**Note: Could you please, whenever possible include electrical pin locations, like you did in this lesson. It's really helpful to have all the essential data in one document and not having to look thru four books while chasing a complaint.**

Duly noted. We will probably do more of this because we also want the data in one place when we are helping on the phone.

(Gary Steffl)

**I've been waiting for an opportunity to work on this trans but I have not had one yet. So based on lesson only: Are there any complaints or problems which the kit and this data does not fix?**

At the trans itself, the problems are pretty much covered. But they are many other things that cause complaints that are not covered.

(Lou Engels)

**I have a Snap-on scanner, but have not purchased the trans cartridge yet. What advantages does it have other than to read codes? I can't imagine after working on cars for many years that the trans connector plug would be totally accessible, so do you recommend making your connectors to shift the trans or is there some particularly good unit available that does this job for you. With one of the testers is it possible to regulate the trans pressure by changing the voltage or duty cycle during a road test?**

The Shaffer Shifter will shift trans and raise and lower pressures.

**Is the 4L80E input sensor the same as the output sensor?**

Yes, it is.

**I like the method of code comparison to check for slipping 4th gear or slipping lockup converter. Is the wiring plug in connector a fairly common source of trouble.**

Not very common.

**Should some special type grease or silicone grease be applied to the connector?**

Great idea - Motorcraft #D7AZ-19A331-A.

**No 4th when very hot. Does this happen when hauling or towing a heavy load? Will a cooler help?**

It certainly won't hurt, in extreme conditions. Loss of 4th and lockup when hot is not considered a malfunction. It is a signal to pull over and let things cool off.

**Is a scan tool needed for these newer transmissions? Or will a paperclip do?**

A sharpened paperclip and a multi-meter are still nice tools. But a scanner makes the job easier and faster. You don't have to start over each time to read the codes.

(Ole Ringstad)

**Is the pressure control solenoid valve located inside the EPC?**

Yes, it is located in the snout of the EPC that insert into the VB.

**I have been driving with the pressure gauge on and have seen what a sticking force motor does Hot trans at 50 mph 39 lbs of line. I was shocked.**

We were also shocked. In the HD and performance kits min line will be around 70 psi which will hold quite a bit of throttle even with a malfunctioning EPC.

(Bob Perry)

**On page 4 you say a 94 separator does not have SB hole. Does this hole feed oil to the screen side of the solenoid? i.e. to be used as PCS Valve balance oil?**

Yes, it is balance oil for 1st type solenoid. 2nd type [Black PCS] does not need SB hole, its balanced internally.

**I understand that they are changing the shift solenoids again.**

So far there is 4 upgrades.

**I attended a seminar put on by the Florida boys. They had nothing but praise and highly recommended using the Shift Kit® in both 4L80's and AODE's.**

We appreciate that.

(Kenneth Scamp)

**Page 3: Wouldn't it be more prudent to fix the sticking EPC by replacing the solenoid, than to compensate for it's lack with the pressure relief assembly?**

There is no safety in that. Trans with 2nd type solenoid just stick a little less often, but they still stick. One time sticking and high line pressure breaks hard parts.

(Tony Selva)

**Have noticed that some jobs**

**come in with the forward clutches worn out. The rings on the input shaft that feed the forward clutch don't always hold and will unseat when pressure drops under 55 psi. You can see the slip with a scanner by watching the input sensor, which should stay at zero if vehicle is not moving. Replacing the rings seems to fix it for awhile but not forever. The original rings have obviously shrunk and have no outward tension. Some replacement rings seem to shrink soon.**

See page 29

# 4L80E-HTRK™

## Hi-Temp Ring & Endplay Upgrade

### Corrects/Prevents/Reduces

No Lockup and 4th hot—Codes 68—39—85  
 Hard shifts and no 4th—Direct Clutch Slippage  
 Prevents Metal Particles by Separating Shafts  
 Hot Idle Forward Clutch Slip, Aborts LU & 4th.  
 Reverse Delay—Bindup in reverse when hot.

**TransGo®**

Product Support: [626] 443-7451  
 Book/Tech sales: [626] 443-0991

**Shop Owner & Technician :** Most often no lockup and no 4th and codes 68, 39, 85 are caused by rings that have shrunk, or hardened, and not usually caused by bad friction or converter.

**A&B:** This prevents Lube Oil cross-leak from applying Coast clutch by accident, which causes coast & 4th clutch burnup.

**C. Bushing:** Reduces lockup leak into lockup release circuit.

**D&E:** Self expanding Hi-temp rings prevents hot forward clutch slip which causes hard shifts, no lockup and 4th. Prevents/Cures hot bindup in reverse.

**A.** Install the two Big wires into ring grooves.

**B.** Install the two Big rings into ring grooves gently with Jel.

### Stator Support

**C.** Install new stator bushing.

Coast Clutch

Patent #6,340,160 B1

### Input Shaft

**D.** Install the wires that match grooves.

**E.** Install rings with Jel.

Forward

Forward Clutch

Lockup Release

**Technical Stuff**  
 These complaints usually occur HOT. When they occur there is no LU and no 4th. But even more important is — **line pressure goes MAX which reduces or cuts off LUBE.**

In a working truck, the driver is not going to stop cause he has no 4th. He just keeps right on and overheats to total burnup. One big rework will buy about 30 of these kits.

**Fix it while you are here.**