



FORD 4R44E, 4R55E, 5R44E, 5R55E ZIP KIT

PART NUMBER 4R44E-5R55E-ZIP

INSTALLATION & TESTING BOOKLET

Torque Specifications

Band Adjuster Lock Nut 35 to 45 ft-lb	Transmission Oil Pan Bolt 115 to 133 in-lb
Converter Housing-to-Case 27 to 39 ft-lb	Converter-to-Flywheel 22 to 30 ft-lb
Extension Housing-to-Case 27 to 39 ft-lb	Oil Pump-to-Cnvtr Housing 16 to 21 ft-lb
Manual Lever Inner Nut 30 to 40 ft-lb	Manual Lever Outer Nut 30 to 40 ft-lb
Oil Cooler Line-to-Connector Nut 18 to 23 ft-lb	Oil Cooler Line-to-Connector 5/16" Tube Nut 26 to 32 ft-lb
Transmission-to-Engine 28 to 38 ft-lb (Except 3.0L) 33 to 44 ft-lb (3.0L)	Low-Reverse Servo Cover Bolt 106 to 124 in-lb
Center Support-to-Case Bolt 80 to 115 in-lb	Separator Plate Bolt 53 to 71 in-lb
TR Sensor 71 to 98 in-lb	Valve Body-to-Case Bolt 71 to 98 in-lb

Recommended Fluid & Capacities

Mercon V (XT-5-QM) ATF

4R44E 2WD, 2.3L 9.9 Qts (9.4L)	4R44E 2WD, 3.0L 10.0 Qts (9.5L)
4R44E 4WD 10.4 Qts (9.8L)	
5R55E 2WD 10.0 Qts (9.5L)	5R55E 4WD 10.3 Qts (9.8L)

Valve Body Rebuild Tips & Techniques

Bore-by-bore tips for removal, installation, options and checks of valve body components. The detailed steps below correlate to the quick guide steps.

1. Replace OE Boost Assembly

This kit includes an increased ratio boost assembly and strong pressure regulator valve spring. These provide for firmer forward and reverse engagement and slightly firmer upshifts. These elevated versions should not be used if testing determines that the Sonnax EPC and engagement control kit 37947-11K (not included in this Zip Kit) is necessary and installed.

2. Replace OE Forward Modulator Valve

By positioning the manual valve furthest into the bore, air pressure can be used to blow the modulator valve out. If there is any visible wear or ridge in the bore, buff this area with Scotch-Brite™ placed on a twisted wire and inserted into drill. Install the PTFE seal onto the Sonnax valve. Invert the valve and push into the bore just far enough to size the PTFE seal. After sizing the seal, install the OE forward modulator spring into the end of the Sonnax valve and install into the bore (illustrated in Quick Guide).

3. Replace OE Solid Plug

If the OE end plug has a relief valve in it, do NOT install the Sonnax end plug or the spring. If the OE end plug was solid, replace with the Sonnax end plug and spring.

Optional Step: Seal the "L" pin circuits at the forward and reverse modulator valve bores (inboard at bores in steps 3 and 4). These locate and hold plugs which separate and seal oil circuits. As the valves toggle, the plugs become loose and allow fluid to pass around them. It is suggested to vacuum test the area for severe wear first (reference page 7) to determine if refurbishing the bore is a better option. The following sealant process requires cure time, so time must be allowed. Using Permatex® Surface Prep Activator #24163 or a similar product, clean the middle plug and "L" pin area from both sides and through the open bore. Air dry, then drip a small amount of Loctite® 609 or 3M #04732 sealant into the "L" pin opening. This must have a cure time to hold properly. Epoxy is not suggested, as it is permanent. Loctite can be heated to allow removal. To remove plugs once sealed, heat the area until the sealant melts, then air dry. Flat stone the valve body surface and clean well to remove surface imprints.

4. Replace OE End Plugs

- Most plugs require two O-rings and have a tapped hole to allow for easy removal in the future. To install, lube the plug, slip on the O-rings and roll the plug on a clean surface to seat the O-rings. Verify that the valves and springs are in their original positions and install the end plugs with the tapped hole facing out. Extra O-rings are supplied in case an O-ring is torn during installation.
- The OE "U"-shaped retainer is used to hold the plug into the casting, and should be inserted into the plug groove between the two O-rings. The outer plug groove will protrude from the bore and is used to help retain the OE solenoid bracket.

4. Replace OE End Plugs (continued)

- c. Remove the plug between the EPC solenoid and the 1-2/2-3 shift valve. The plug may not come out easily after removing the “U”-shaped retainer. A rod (.125" dia.) can be inserted into the opposite bore (113, page 7) to drive out the plug. After the plug is removed, push the shift valve to the bottom of the bore and retain it with a screwdriver. Install the small OE plunger valve into the Sonnax O-ringed plug before installing into the bore. The large OE “U”-shaped retainer should be installed with the longer leg closest to the manual valve.
- d. Pull out the “L” pin near the solenoid. The OE plug can be difficult to remove. With a strong needle-nose pliers, turn the plug and hit it with the tip of your pliers. Continue this until the spring drives out the plug. If the OE plug will not come out, you must also remove the inner “L” pin retainer. You will then have to drill an access hole to drive out the valves (**Figure 1**). A new spring is supplied for the inner coast clutch valve in case the OE is damaged during this process. Use the needle nose pliers to install the Sonnax end plug (O-ring only) by holding the small nub. Twist while inserting the plug until the O-ring is inboard of the “L” pin retainer port.
- e. These three plugs seal shift solenoid oil. The two smaller end plugs use four small O-rings. The larger end plug is .630" in diameter, and uses two large O-rings.



Figure 1

For bore 109 valve removal, drill .110" hole, entering at bolt and exiting into spring pocket of bore 109. This allows rod to drive out the valve.

5. Replace OE Checkballs, EPC Limit Valve & Lube Orifice Plug

Replace the four OE checkballs with the new Torlon® balls included, ensuring proper location. Replace the OE lube orifice. Replace the OE EPC relief valve with the Sonnax domed relief, reusing the OE spring. The TCC relief and the EPC relief springs are interchangeable. Two replacement “L” pins are included in case originals are lost or damaged.

6. Drill Separator Plates

- a. Drill the pressure regulator balance orifice to .055" dia. with included drill. To prevent flashing, start the drill on one side and then finish from the opposite. It's always best to taper the orifice holes when done with a larger drill.
- b. Drill the overdrive servo apply orifice to .072" dia. with included drill. This will supply firmer 4th in 4R units and firmer 5th and 2nd in 5R units. Later 5R55E units are already this size.
- c. Drill line pressure circuit to converter feed orifice in the plate to .062" dia. with included drill. Late-model 5R55E units are already this size. Drill the indicated converter clutch orifice to .062" dia., then insert the included .062" aluminum plug and peen in place to close off the hole.
- d. Drill the TCC exhaust hole to .110" dia. with included drill.

7. TCC Modification

Remove the smallest spring from the cooler bypass valve bore. This spring can be pulled out from the lower side of the casting, through the slot next to the filter inlet (**Figure 2**).

8. Replace OE Solenoid O-Rings

Replace small and large O-rings from the four indicated solenoids (see Quick Guide). Lube the O-ringed solenoid snout prior to bore installation.



Figure 2

Separator Plate & Relief Valve Information

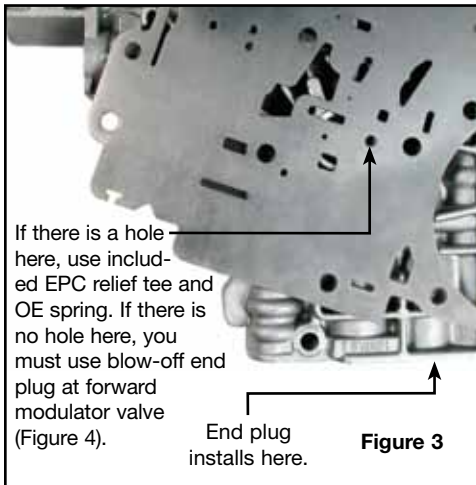


Figure 3



Figure 4

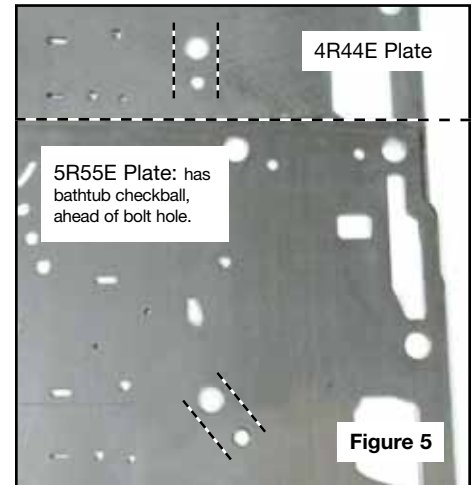


Figure 5

Rebuilding Cautions

- Do not combine aftermarket parts or procedures with this kit.
- Do not drill line-to-lube through the casting at the pressure regulator valve.
- Do not use a stronger pressure regulator valve spring or shim than the ones supplied.
- Do not remove springs or block reverse engagement control valve.

Troubleshooting Tips

These tips are not about common problems such as blown gaskets or dirty valve bodies. These only include valve body problems not visible during a rebuild.

No/Slow Reverse

- The SSA solenoid must be turned on, allowing flow through the solenoid, or direct clutch will not apply until EPC rises to 20 psi. The direct clutch psi will then slowly rise following EPC until clutch holds.
- Always install new servo pistons. Both servos are charged on the release side in reverse.
- Inspect the center support sleeve, sealing rings and direct drum sleeve for cracks.
- Ensure the vehicle has line rise, as reverse will not engage until line is 120 psi.

Delayed Reverse & Forward

The separator plate must be aligned with pins. If not, the bolt threads will separate the case from the plate, causing a line pressure leak.

Servo Covers Blown Out of Case

Inspect for causes of high line psi such as pressure regulator bore or boost sleeve wear, or line booster valve stuck inboard.

Servo Rubber Separated/Blown Off

This often occurs from pre-assembly damages, so inspect carefully before installing. The rubber lip separation occurs from heat and high pressure. Both servos are pushed toward the cover in reverse, so check for cause of high line pressure.

No 2nd, 1-2 Slide or Soft 2nd Gear Starts

- Air test the rectangular circuit five openings in from EPC solenoid. No cross leakage should be visible!
- Look for bore wear at the forward modulation valve (repaired by **37947-11K**, not included in this Zip Kit). This valve controls the servo apply rate.
- If the plug that lives in the middle of OE assembly (repaired by **37947-11K**, not included in this Zip Kit), is loose and bore leaks, a poor 1-2 and/or 2-3 results.

No 2nd or 4th, Erratic Direct Clutch, No Upshift

The solenoid regulator valve is likely out of position. With SSB solenoid removed, the end of the casting to edge of the long aluminum plug will measure 1.720" when "L" pin is installed properly.

No Coast Clutch Pressure

- Inspect the bore plug for wear at the TCC regulator valve. Sonnax TCC regulator sleeve kit **37947-09K** (not included in this Zip Kit) eliminates the leak and bore plug here.
- The bore for the coast clutch shift valve wears out. Insert the valve: no side-to-side movement should be visible.

Troubleshooting Tips (continued)

No Overdrive Servo Apply psi

- The coast clutch shift valve may be out of position, the bore worn severely or the dumbbell-shaped valve (opposite bore from the TCC modulator) is not being retained correctly.
- This “L” pin falls out of position easily.
- Timing valve may be stuck toward the end plug or the spring is not on center, which causes it to coil bind.
- Kickdown valve may be stuck or spring missing.

No OD Servo Release (No Overdriven 2nd in 5R & No 4th in 4R)

Mismatched separator plate at 5R/4R identification (**Figure 5**).

OD Band Failure, No Overdrive Release psi

The 3-4 shift valve may not be positioned due to a loose SSC solenoid. Bracket must hold it in flush.

Broken Bands, No EPC Blow-Off, EPC psi Too High

Relief Tee near the pressure regulator is not opening or mismatched plate without a hole here and no relief used at forward modulator end plug. The EPC spring bore is often tapered, which alters spring operation. The Sonnax EPC and engagement control kit **37947-11K** (not included in this Zip Kit) addresses this problem.

Low EPC, Soft Shifts, Slip in 3rd

Multiple EPC leakage points. Use the Sonnax EPC and engagement control kit **37947-11K** (not included in this Zip Kit), which address this entire circuit. Good maximum EPC is 125-130 psi in OD and maximum of 144 in reverse. EPC should not drop more than 15 psi during TCC apply.

Low EPC Pressure & No Lockup Control

If TCC modulator valve sticks, EPC will only obtain about 65 psi.

Flare on 2-3 Shift, 4R (3-4 on 5 Speed)

The servo pin bore is worn on the intermediate servo, or the spring on the piston is too strong.

No 3rd or 4th

The 2-3 shift valve spring is missing or installed wrong. Also, the 1-2 shift valve should stroke during wet air test (WAT) at the rectangular circuit five openings in from EPC solenoid.

TCC Applied Prematurely, Harsh Shifts

If the solenoid is restricted or grounded, the TCC valve can stroke and apply the converter clutch.

Poor Converter Charge, Delayed Engagements

The balance spool or innermost bore for the pressure regulator is worn out.

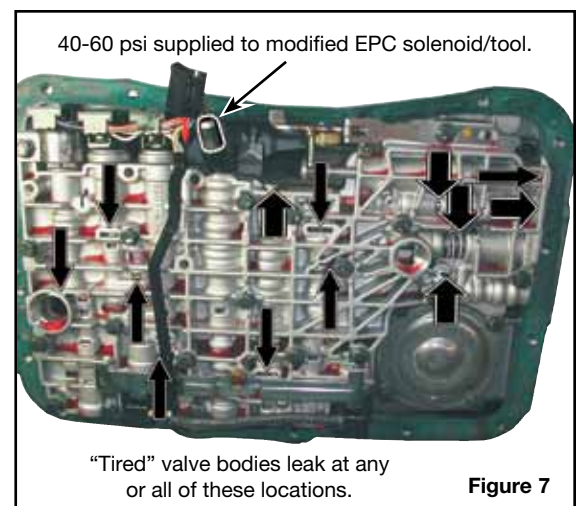
Shift Solenoids

It is very rare to have a shift solenoid problem on these units. It's more common to have a loss of solenoid oil psi due to loose end plugs.

EPC Circuit Testing

The most effective method to isolate the EPC circuit is to perform a wet air test with fluid while the body is still bolted to the case. This can be done in the vehicle or at the bench. A quick test adapter can be made from an old 4R/5R EPC solenoid. The coil housing and valve will be removed and a plug or epoxy used to seal the inboard circuit (**Figure 6**).

Supply 40-60 psi of air into the adapter. No leaks should be visible at the locations shown in **Figure 7**. Any leakage is reduction of EPC pressure and line rise while in operation. Remember, though, as operating temperature increases, valve clearance and the flow rate (viscosity) of ATF increase. You can duplicate hot fluid at the bench by filling the case and valve body with solvent, then bolt up and test with the adapter.



Apply Component Chart

GEAR		Shifter Position	Front Band	Intermediated Band	Reverse Band	Coast Clutch '95-'96	Coast Clutch '97-'00	Direct Clutch	Forward Clutch	Front One-Way Clutch		Reverse One-Way Clutch	
4R44E/ 4R55E	5R55E									Drive	Coast	Drive	Coast
Reverse	Reverse	Reverse			A	A*		A		H	OR†		
1st	1st	Overdrive				A*			A	H	OR†	H	OR
	2nd	Overdrive	A						A	OR	OR	H	OR
2nd	3rd	Overdrive		A		A*	A*		A	H	OR†	OR	OR
3rd	4th	Overdrive				A*	A*	A	A	H	OR†	OR	OR
4th	5th	Overdrive	A					A	A	OR	OR	OR	OR
Manual 2 Position	Manual 2 Position	2		A		A	A		A	H	OR	OR	OR
Manual 1 Position	Manual 1 Position	1			A	A	A		A	H	OR	H	OR
Planetary Component			FRS	FS	RP	FRS	FRS	FS	FR	FRS		RP	

Apply Component Chart Key:

A = Applied

* = Applied, TCS on

FS = Forward Sun Gear

H = Holding

[†] = Ineffective. TCS on

RP = Reverse Planet Assembly

OR = Overrunning

FRS = Front Sun Gear

FR = Forward Ring Gear

Figure 8

Solenoid Apply Chart

Transmission Range Selector Lever Position	Powertrain Control Module (PCM) Gear Commanded		Shift Solenoids			
	4R44E/4R55E	5R55E	SSA	SSB	SSC	SSD/CCS
Park/Neutral	Park/Neutral	Park/Neutral	On	Off	Off	Off
Reverse	Reverse	Reverse	On	Off	Off	Off
Overdrive (TCS Off)	1	1	On	Off	Off	Off
		2	On	Off	On	Off
	2	3	On	On	Off	Off
	3	4	Off	Off	Off	Off
	4	5	Off	Off	On	Off
Overdrive (TCS On)	1	1	On	Off	Off	Off
		2	On	Off	On	On*
	2	3	On	On	Off	On*
	3	4	Off	Off	Off	On
Manual 2nd	2	3	On	On	Off	On
	3 ^A	4 ^A	Off	Off	Off	On
Manual 1st	1	1	On	Off	Off	On
		2 ^A	On	Off	On	On
	2 ^{A*}		On	On	Off	On

Apply Component Chart Key:

A = When a manual pull-in occurs above calibrated speed, the transmission will not downshift until the vehicle speed drops below this calibrated speed.

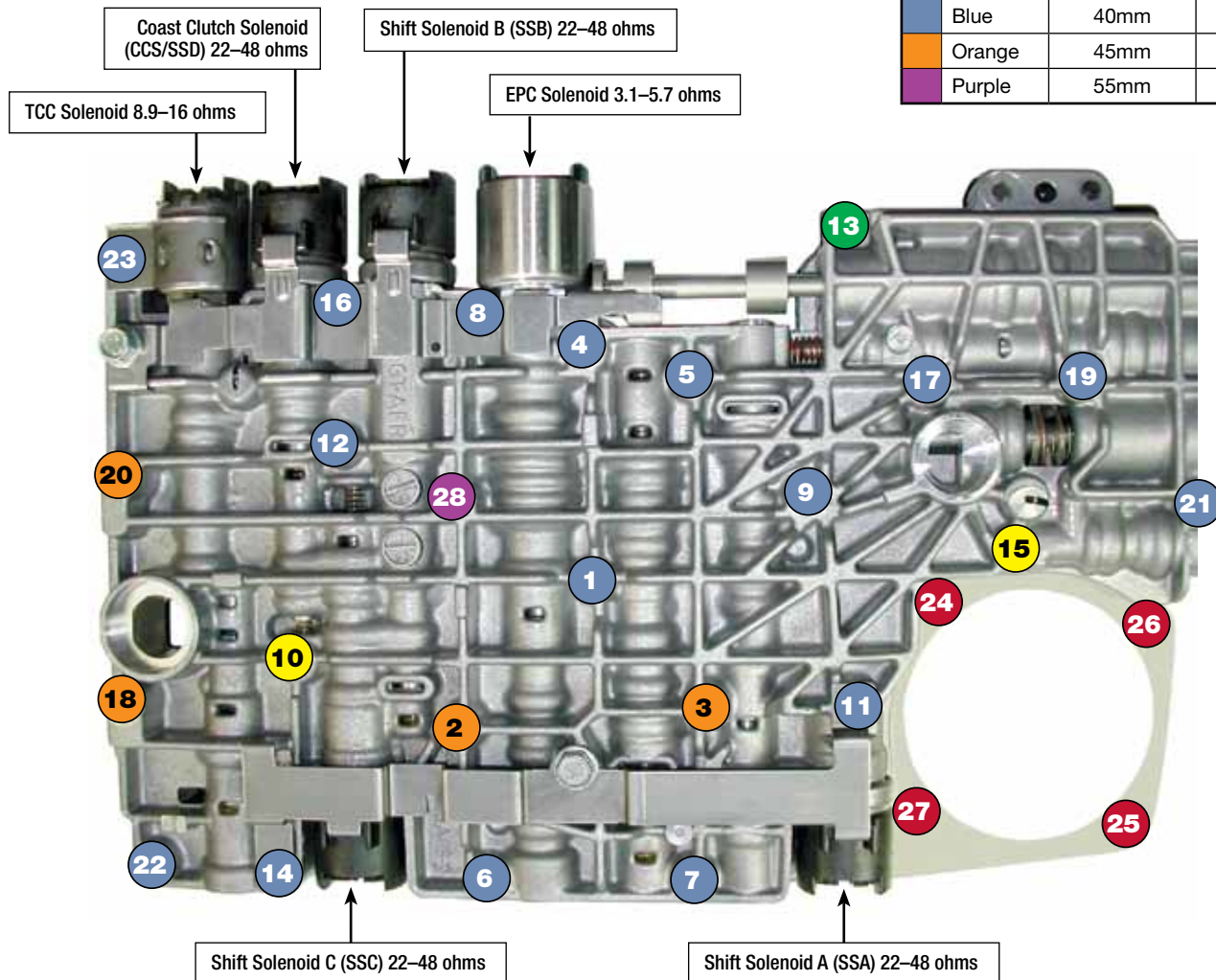
* = Model and calibration dependent.

Figure 9

Solenoid & Bolt Locations

Install bolts in sequence indicated by numbers. Colors indicate bolt lengths, see chart for details.

Bolt Color Code	Bolt Lengths	No. Bolts Required
Red	20mm	4
Green	30mm	1
Yellow	35mm	2
Blue	40mm	16
Orange	45mm	4
Purple	55mm	1



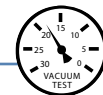
OE Spring Identification Chart

Bore	Valve Springs	O.D.	Wire Dia.	Free Length	Coils	Color
101	Forward Control	.338"	.032"	.665"-.775"	6.5	White
102	Pressure Regulator, Outer	.745"	.055"	1.065"	4	Plain/Lt. Purp.
102	Pressure Regulator, Inner	.412"	.032"	1.135"	9.5	Lt. Green
103	Forward Modulator	.236"	.026"	.738"	14	White
103	EPC Boost	.293"	.040"	1.210"	12	Orange
105	Reverse Modulator, Outer	.210"	.018"	1.080"	10.5	Plain
105	Reverse Modulator, Inner	.210"	.018"	1.080"	10.5	Plain
106	2-3/3-4 Shift	.275"	.030"	1.052"	13	Plain
107	1-2/2-3 Shift	.284"	.033"	.730"	7	Lt. Purple
108	Solenoid Regulator	.218"	.030"	.830"	8.5	Yellow
109	TCC Regulator, Inner	.187"	.028"	.720"	12	White

Bore	Valve Springs	O.D.	Wire Dia.	Free Length	Coils	Color
109	TCC Regulator, Outer	.285"	.040"	.787"	9.5	Orange
109	Coast Clutch. Bottom Bore	.222"	.023"	.840"	9.5	Red
110	TCC Modulator	.238"	.023"	1.230"	11.5	White/Yellow
111	Thermal Outer, Big	.575"	.042"	1.045"	4.5	White
111	Thermal, Middle	.264"	.026"	1.232"	13.5	Lt. Green
111	Inner Limit (smallest)	.200"	.018"	.840"	12	Blue
112	3-4/4-5 Shift	.280"	.032"	1.162"	12	Plain
113	Throttle Downshift	.263"	.028"	.700"	6.5	Orange
114	Manual Low	.320"	.032"	.985"	7.5	Yellow
115	Kickdown	.262"	.028"	.670"	7	Orange
N/A	Steel EPC Relief Tee	.292"	.040"	.982"	13.5	Plain
N/A	Plastic TCC Relief Tee	.292"	.040"	.982"	13.5	Plain

Critical Wear Areas & Vacuum Test Locations

NOTE: OE valves are shown in rest position and should be tested in rest position unless otherwise indicated. Test locations are pointed to with an arrow. Springs are not shown for visual clarity. Low vacuum reading indicates wear and Sonnax parts noted for replacement. For specific vacuum test information, refer to individual part instructions included in kits and available at www.sonnax.com.



Pressure Regulator Valve

- Delayed engagement due to poor converter fill
- High/Low line pressure
- Low cooler flow at idle
- Overheated converters

Replace with Sonnax Part No.
37947-05K

Boost Valve Assembly

- Soft shifts
- Delayed reverse
- Low line pressure
- Poor modulator control

Replace with Sonnax Part No.
37947-01K OE Ratio
37947-03K* Increased Ratio

EPC Boost Valve, Forward Modulator Valve & Reverse Modulator Valve

- Poor shift quality
- Delayed forward/no reverse
- 2nd Gear starts

Replace with Sonnax Part No.
37947-11K

TCC Regulator Valve

- Converter apply issues
- High TCC slip RPM
- Codes 628 and 1741
- TCC surge/cycle
- High fluid/converter temperatures

Replace with Sonnax Part No.
37947-09K
37947-38

Coast Clutch Valve

- No 4th gear (4R)
- No 2nd or 5th gear (5R)
- No engine braking in D3 to low
- No coast clutch apply

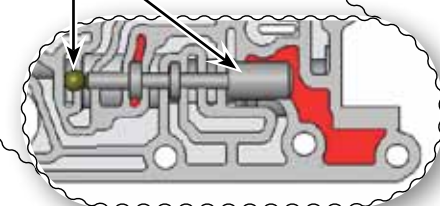
Replace with Sonnax Part No.
37947-33K

TCC Modulator Valve

- No TCC apply
- Code 1741
- Low cooler flow
- Poor converter fill & delayed engagements
- Engine stall on forward engagement

Replace with Sonnax Part No.
37947-07K

To vacuum test this port: invert valve and prop outboard with a Torlon checkball.



Part numbers with an asterisk () are included in this Zip Kit. Other part numbers are available separately.

OE Valve Body Exploded View

Valve Body Descriptions

I.D No.	Description
101	Forward Engagement Control Valve
102	Boost Valve Assembly & Pressure Regulator Valve
103	EPC Boost Valve & Forward Modulator Valve
104	Manual Valve
105	Reverse Modulation Valves
106	2-3 or 3-4 Shift Valve
107	1-2 or 2-3 Shift Valve
108	Solenoid Regulator Valve
109	Coast Clutch Valve & Converter Regulator Valve
110	Converter Clutch Modulator Valve
111	Cooler Limit Valve, Bypass Valve & Thermostat Bypass Valve
112	3-4 or 1-2 & 4-5 Shift Valve
113	Throttle Downshift Control Valve
114	Manual Low Valve
115	Kick Downshift Control Valve

