Technical Seminar 2002

Automatic Transmission Rebuilders Association

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Program Contents

ATRA Technical Team

Dennis Madden
Chief Exsecutive Officer

Lance Wiggins
Technical Director

Creating a Great Seminar...
For most of you, a technical seminar is maybe half-a-dozen or so hours of intense technical information... and then, as quickly as it begins, it's over. But a lot of effort goes in ahead of time, researching, developing and designing a seminar, long before it's ready to play your town. Long days... late hours... frayed nerves... all part of the process to put a clean, carefully-choreographed presentation in front of a discriminating audience.
The folks involved in developing this year's seminar are the leaders in the transmission repair industry. With over 200 years of combined technical experience, they've poured their heart and soul into every page and slide in this program. Whether their contribution involved technical expertise or organizational skills, the culmination of their efforts was an extraordinary educational experience that we're proud to call the ATRA 2002 Technical Seminar.
We hope your experience is as rewarding as it was for us to develop it.

Evelyn Marlow
Technical Supervisor

Randall Schroeder
Senior Technical
Advisor and
Seminar Speaker

Steve Garrett
Technical Advisor and
Seminar Speaker

ATRA Technical Team(continued)

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ATRA Online

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Technical Advisor

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Seminar Speaker

Mike Baird
Technical Advisor and
Seminar Producer

Mike VanDyke
Technical Advisor

Mike Brown
Technical Advisor

Pete Huscher
Technical Advisor

On behalf of the entire ATRA Technical team and myself I would like you to sit back and enjoy the 2002 ATRA Technical Seminar.

ATRA Technical Team

ATRA Staff

It's difficult enough getting the seminar book researched, written, pictured, edited, and printed let alone getting it out to the seminar attendees. This is where the ATRA Staff comes in.

Cheif Executive Officer:	Dennis Madden
Executive Director:	Steve Gray
GEARS Publishing:	Rodger Bland
GEARS Magazine:	Frank Pasley
	Jeanette Troub
	Valerie Mitchell
	Paul Morton
Seminar and Trade Show :	Traci Mackey
Accounting :	Jody Wintermute
	Nancy Skora
	Amy Marsh
Bookstore:	Mike Helmuth
	Shaun Velasquez
Membership:	Vanessa Metzner
	Chris Klein
	Julia Garcia
	Robin Birdsong
	Joanna Book
	Jim Spitson

Without the ATRA team, it would be very hard to accomplish the task at hand. Please enjoy the seminar.

Lance Wiggins
ATRA, Technical Director

Ford

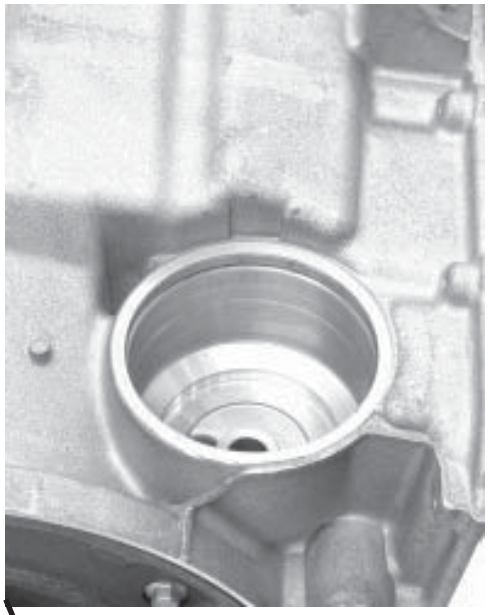
Contents

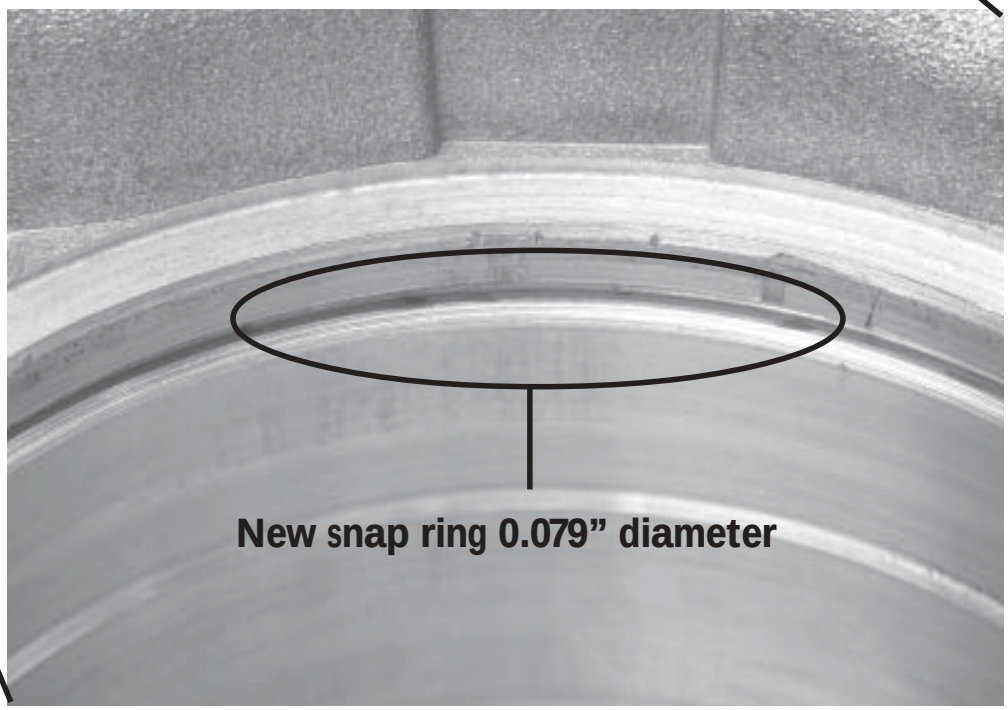
Notes:

CD4E

Case Damage from Servo Blowout

A case change was made to increase durability of the Intermediate/Overdrive servo. The new case has a wide groove and must have the correct snap ring installed.



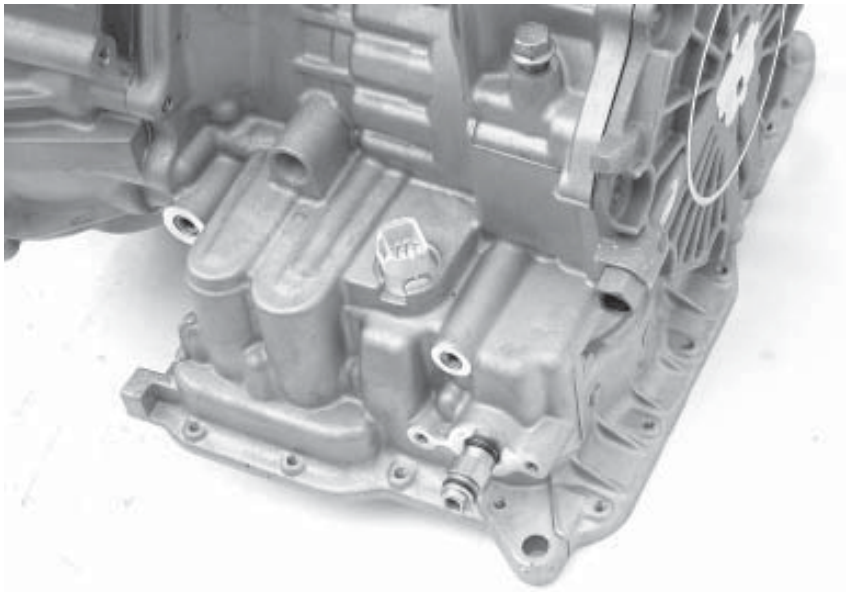


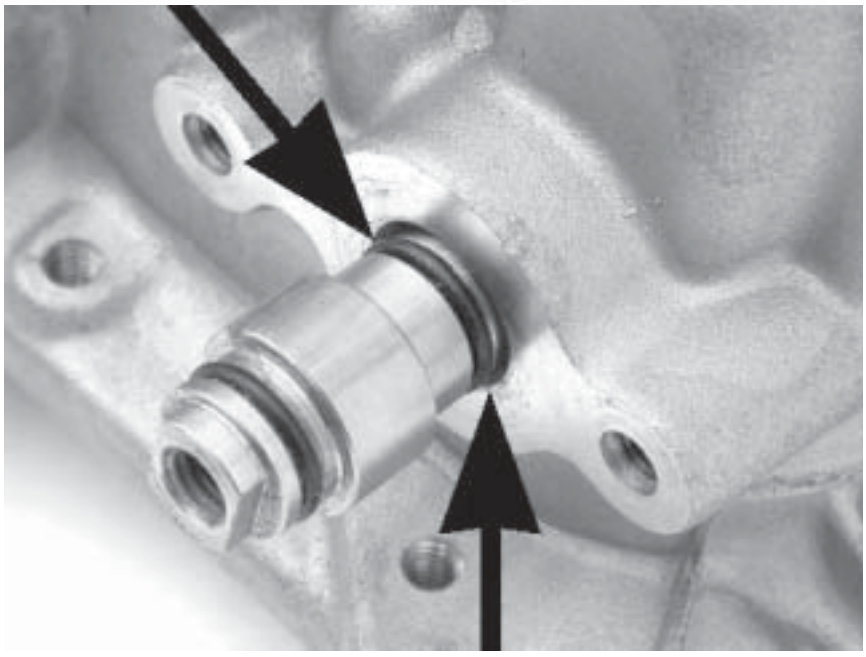
4F27E

Transmission Manual Shaft Leak

Common Cause: Manual shaft O-ring leaking, causing fluid to leak into the TRS. During early production a number of transaxles were assembled with a manual shaft O-ring that's diameter was too large. During installation these O-rings were cut or pinched causing them to leak.

Repair: Install new, smaller diameter O-ring-part # **XS4Z-7B498-AB**.





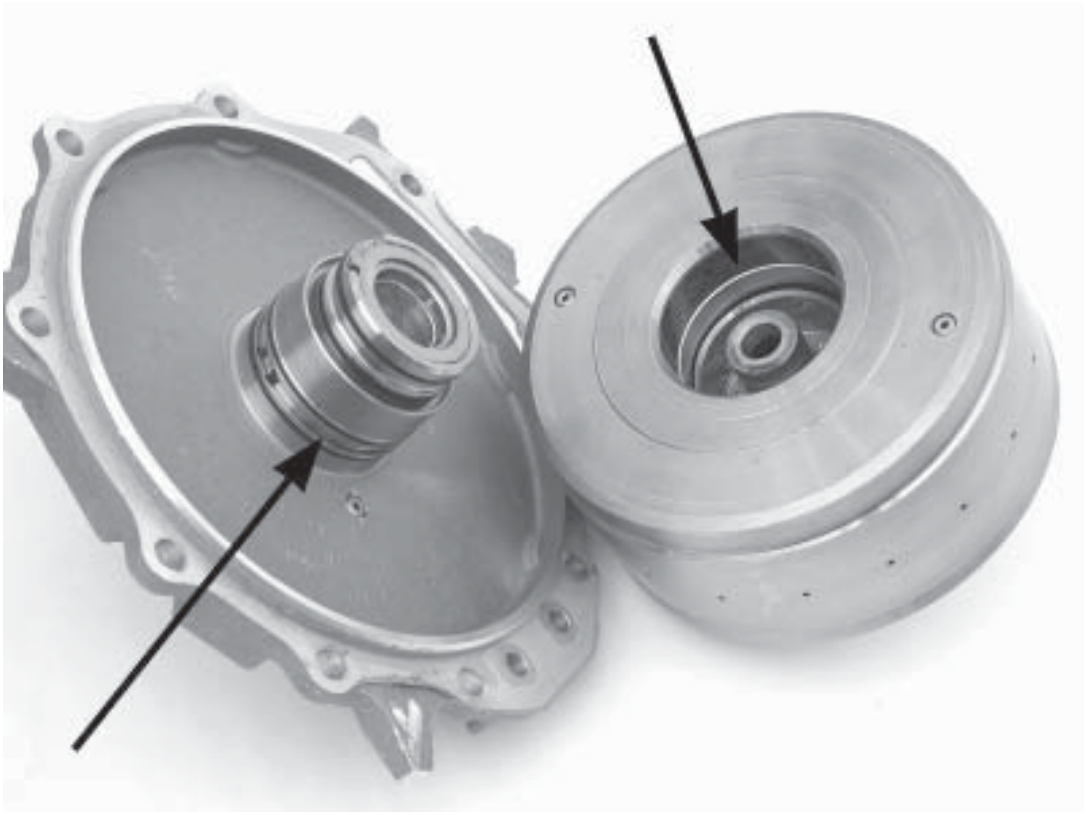
4F27E

Delay or No Reverse

Concern: Delayed or no reverse all other gears normal.

Common Cause: High pressure due to pressure regulator valve wear causing reverse clutch drum to side load on the rear support.

Repair: Replace drum, support assembly and valve body.



AX4S/AX4N

Redesigned Park System
2000 Taurus with Build Dates After 8/1999

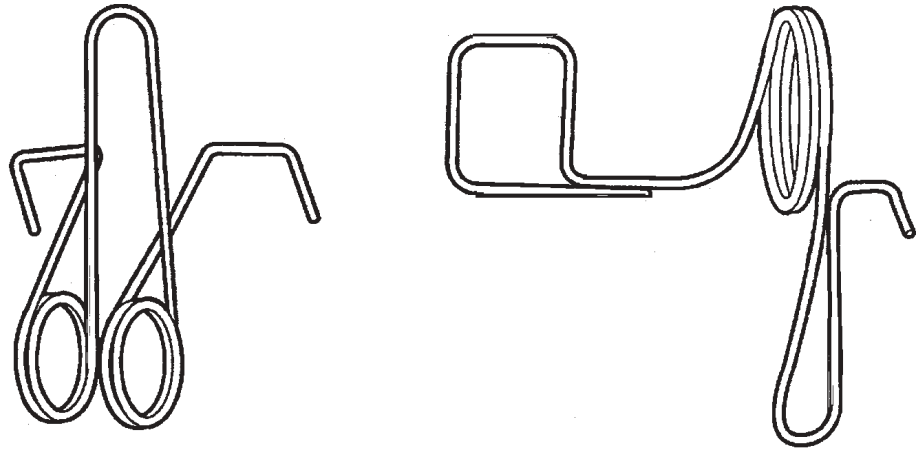
Parking System

1999 Taurus, Sable and Windstar vehicles with AX4S transaxles built August 1999 and beyond and all 2000 Taurus, Sable and Windstar vehicles with AX4S or AX4N transaxles and 2000 Continentals built 10/1999 or later have a redesigned park system.

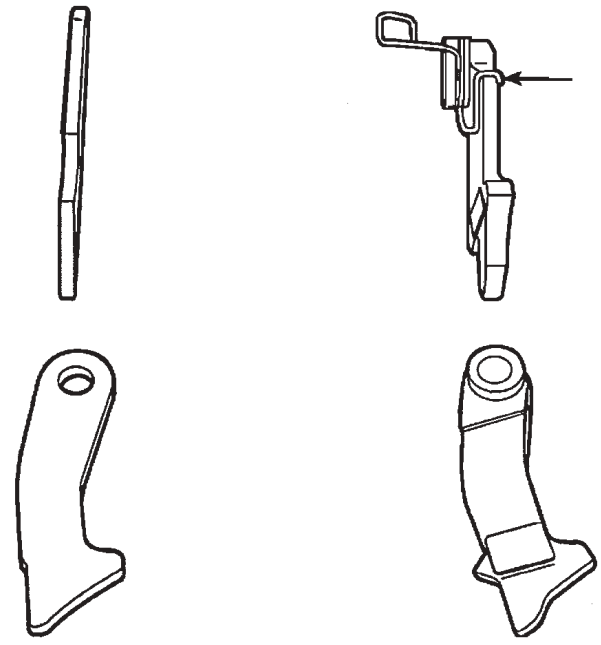
Part #	Description	Application
YF1Z-7A441-AA	Parking pawl	
YF1Z-7D070-A	Park spring	
YF1Z-7D071-A	Park shaft	
W706012-S300	Bolt	
YF1Z-7G101-A	Plate	
1F2Z-7D232-A	Rod	AX4S (only)
1F1Z-7D232-A	Rod	AX4N (only)
YF1Z-7A256-AA	Rod	
YF1Z-7A115-A	Lever	Model Dependent
YF1Z-7E332-AA	Spring	
YF1Z-7C493-A	Shaft	
1F1Z-7005-AA	Case	Model Dependent
1F1Z-7005-BA	Case	Model Dependent
-7G188-	Cover	Model Dependent
YF1Z-7G303-A	Gasket	
YF2Z-7A130-AA	Support	AX4S (only)
YF1Z-7A194-AA	Pan	AX4N (only)
YF1Z-7G084-A	Tube	AX4N (only)
N803202S		

AX4S/AX4N

Redesigned Park System (continued)
2000 Taurus with Build Date After 8/1999



YF1Z-7D070-A



YF1Z-7A441-AA

Old **New**

AX4S/AX4N

Redesigned Park System (continued)
2000 Taurus with Build Date After 8/1999

AX4N →

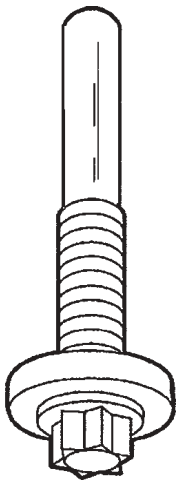
Old

AX4S →

Both AX4S and AX4N

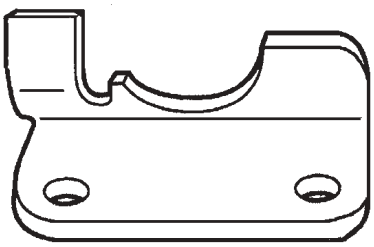
YF1Z-7D071-A

New

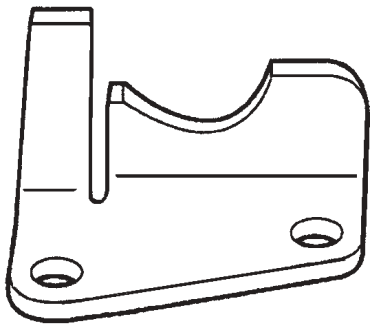


W706012-S300
(AX4S only)

New



Old



YF1Z-7G101-A

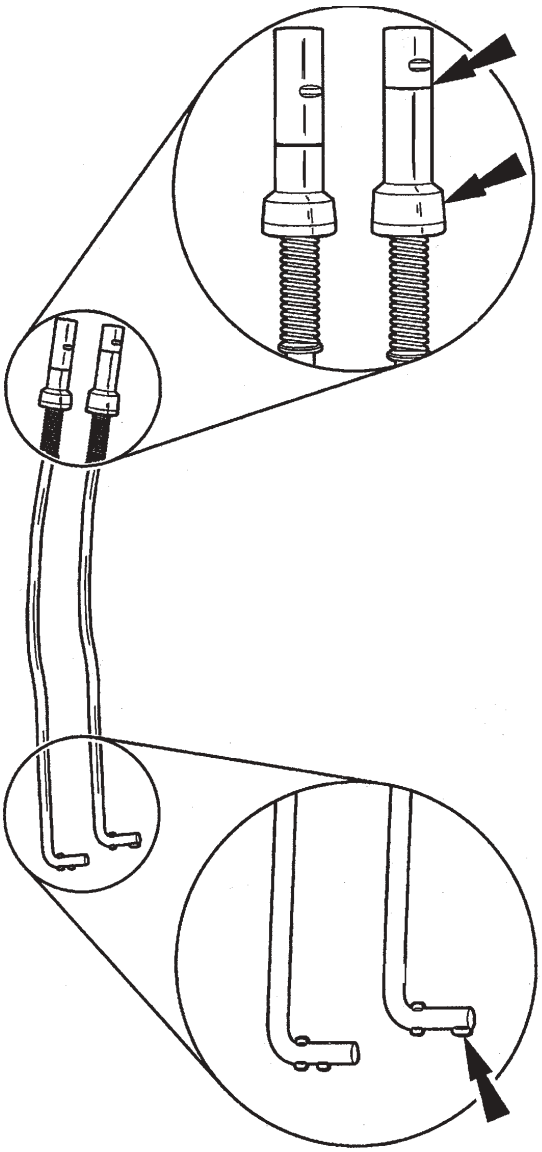
New

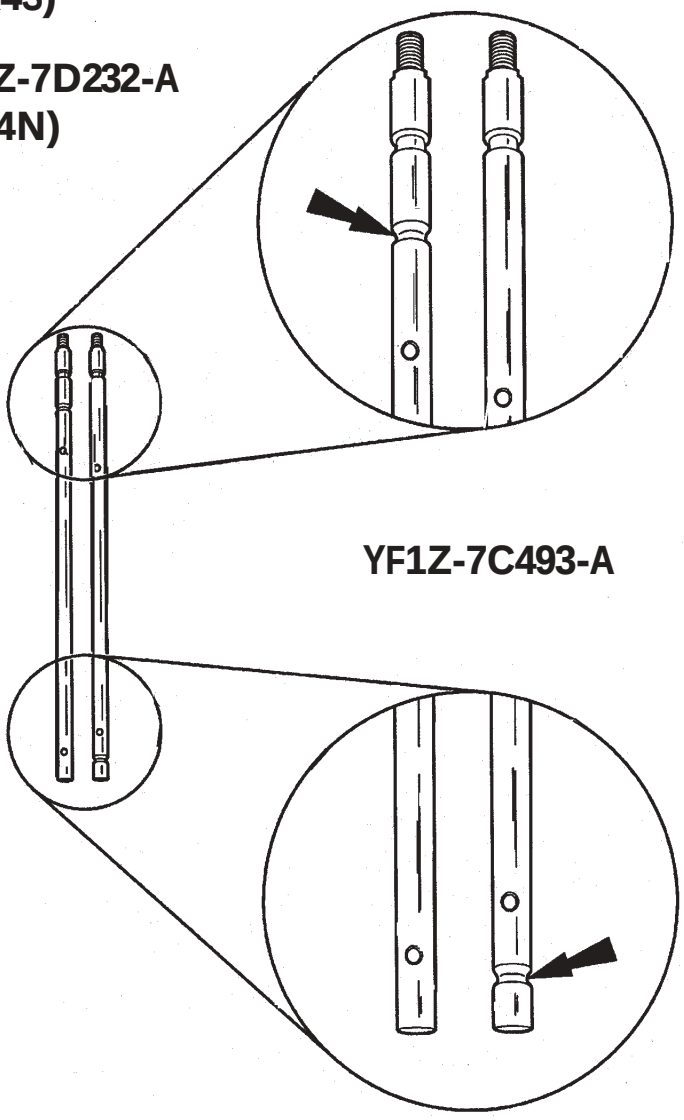
AX4S/AX4N

Redesigned Park System (continued)
2000 Taurus with Build Date After 8/1999

1F2Z-7D232-A
(AX4S)

1F1Z-7D232-A
(AX4N)

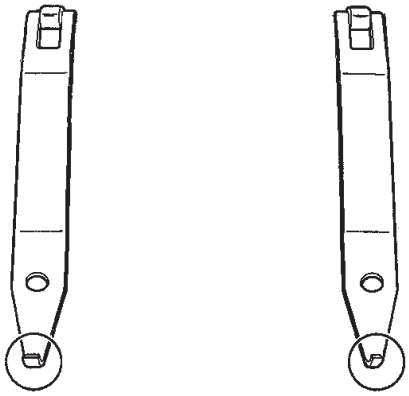




YF1Z-7C493-A

AX4S/AX4N

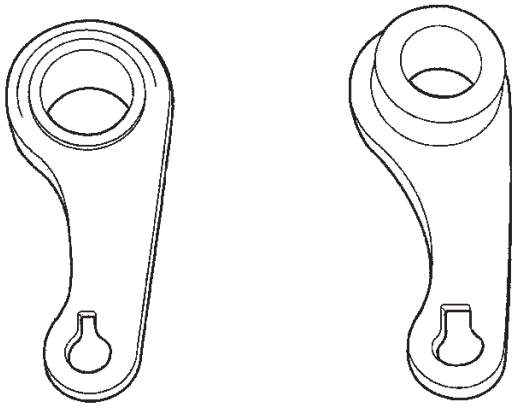
Redesigned Park System (continued)
2000 Taurus with Build Date After 8/1999



YF1Z-7E332-AA

New

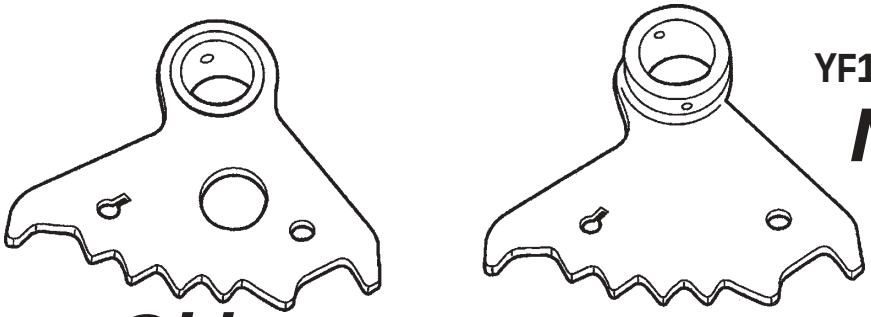
Old



YF1Z-7A256-AA

New

Old



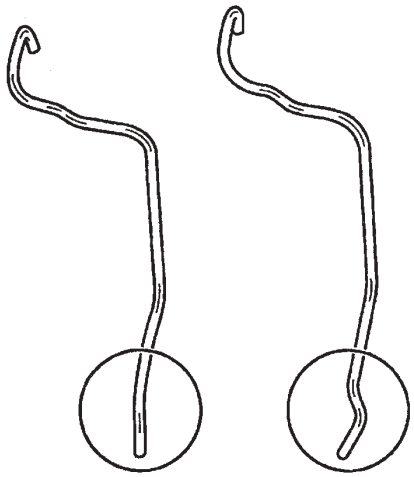
YF1Z-7A115-A

New

Old

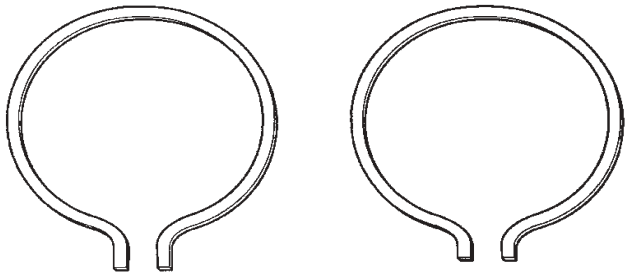
AX4S/AX4N

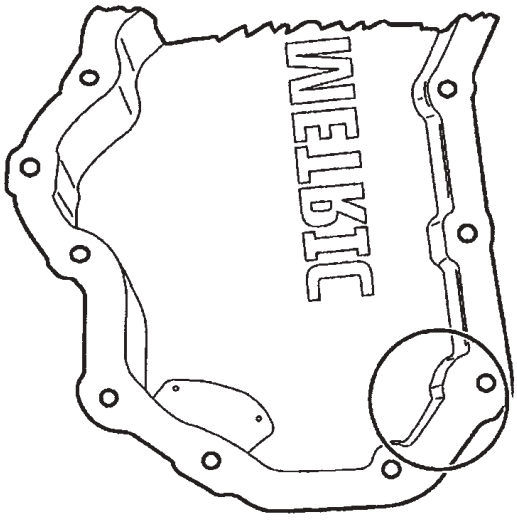
Redesigned Park System (continued)
2000 Taurus with Build Date After 8/1999

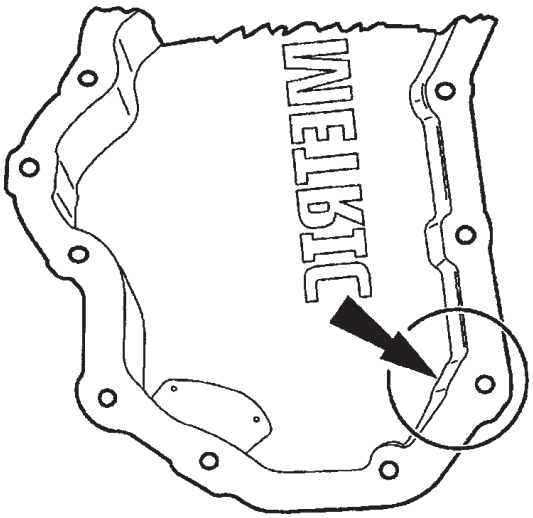


Lube Tube (AX4N only)
YF1Z-7G084-A

N803202S







YF1Z-7A194-AA
(AX4N)

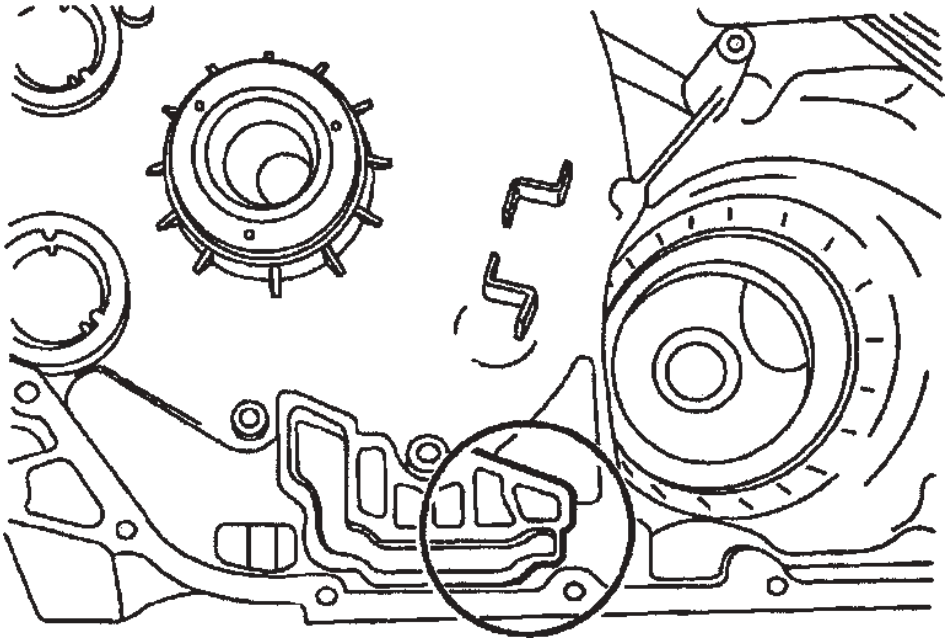
Old

New

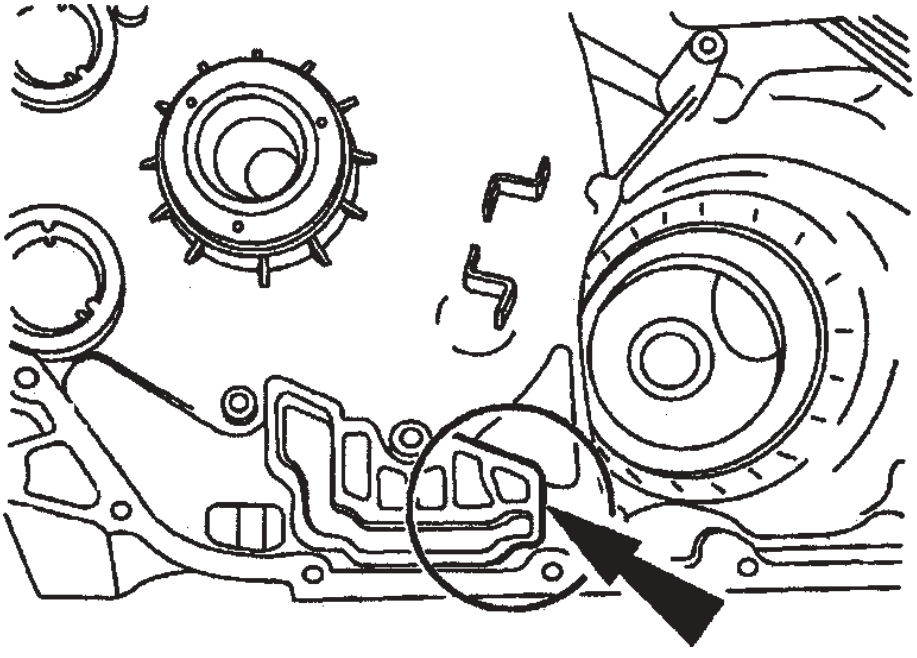
AX4S/AX4N

Redesigned Park System (continued)
2000 Taurus with Build Date After 8/1999

Case Assembly



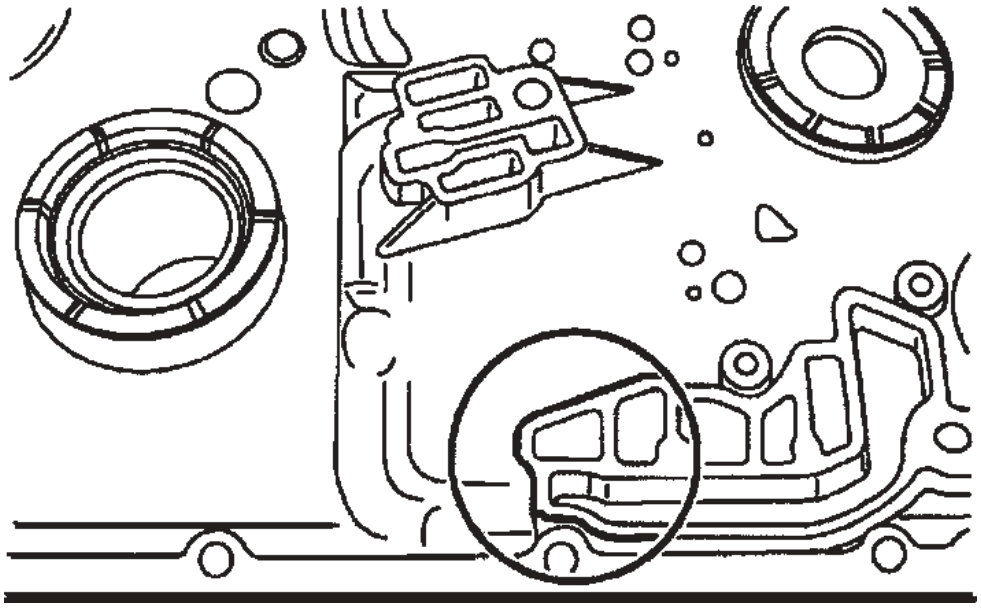
-7005-
(Model Dependant)



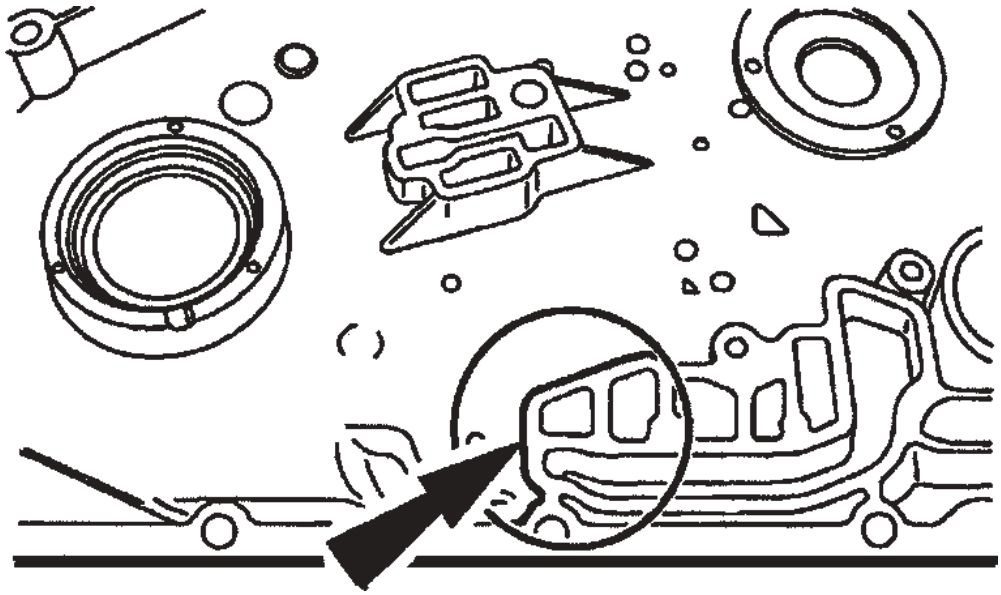
AX4S/AX4N

Redesigned Park System (continued)
2000 Taurus with Build Date After 8/1999

Channel Casting

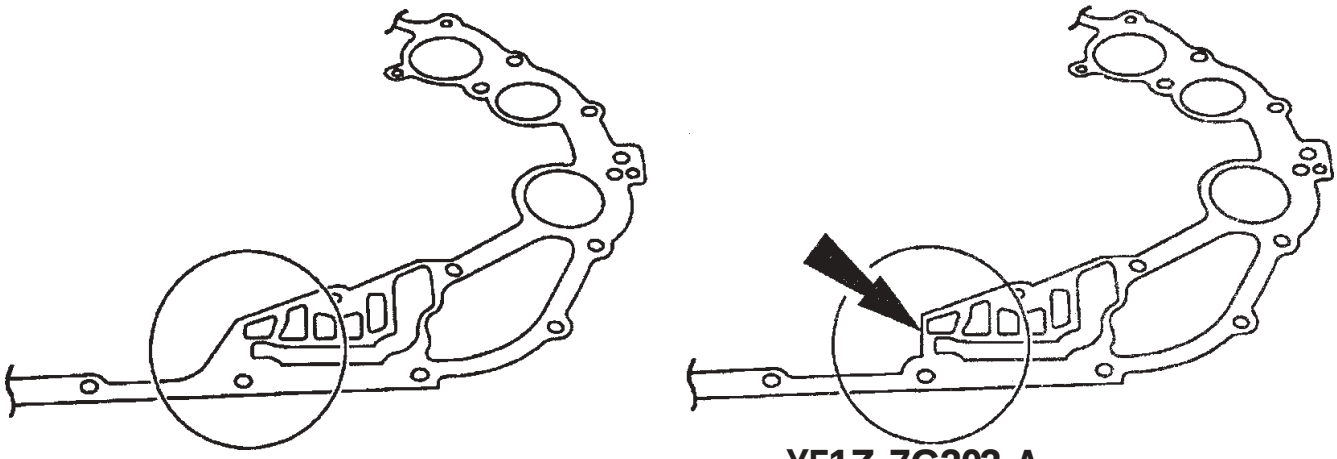


7G188
(Model Dependant)



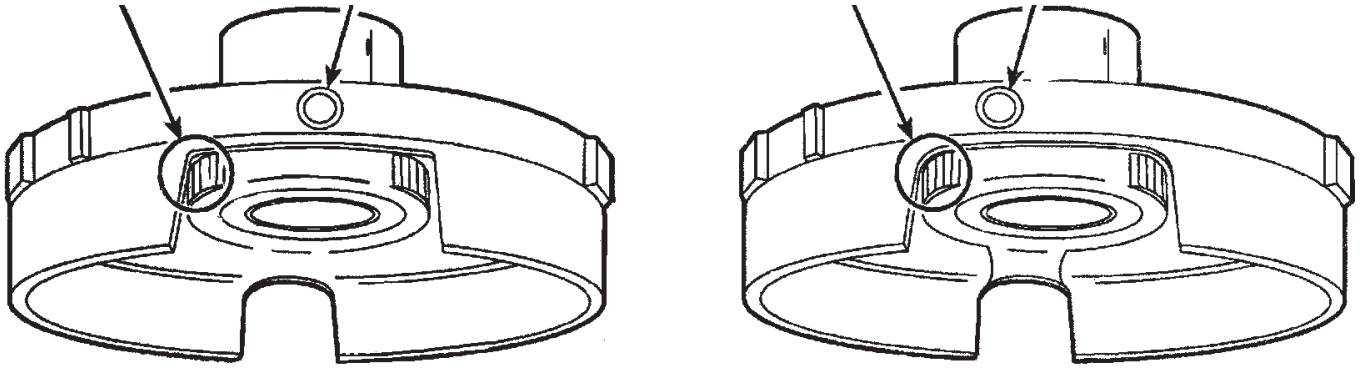
AX4S/AX4N

Redesigned Park System (continued)
2000 Taurus with Build Date After 8/1999



YF1Z-7G303-A

Note: Match channel plate and gasket to avoid reverse clutch oil lose.

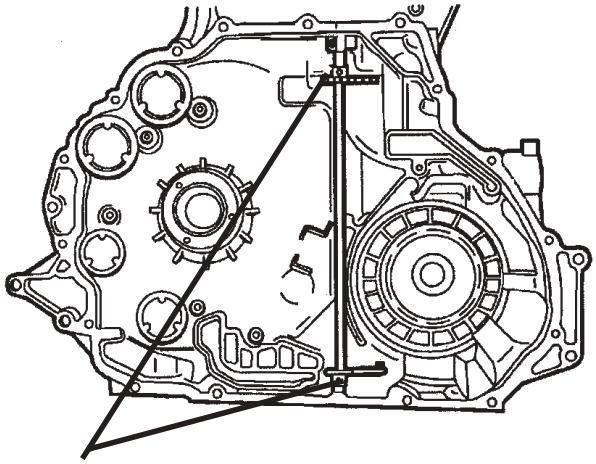


YF2Z-7A130-AA
(AX4S)

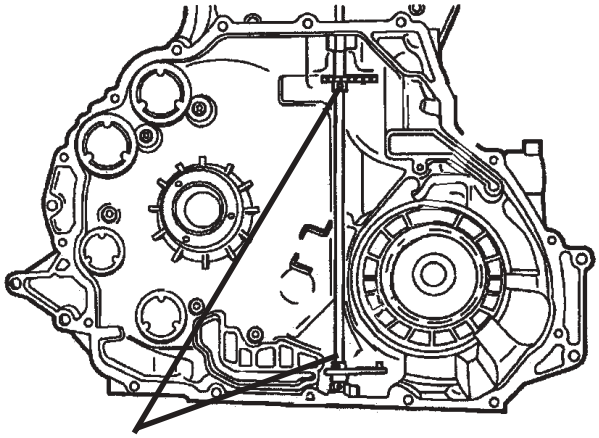
AX4S/AX4N

Redesigned Park System (continued)
2000 Taurus with Build Date After 8/1999

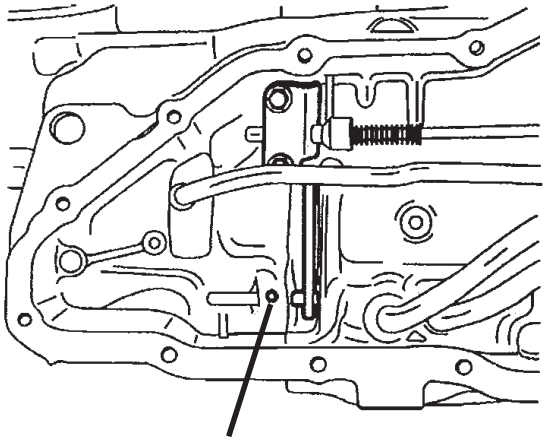
Old



New



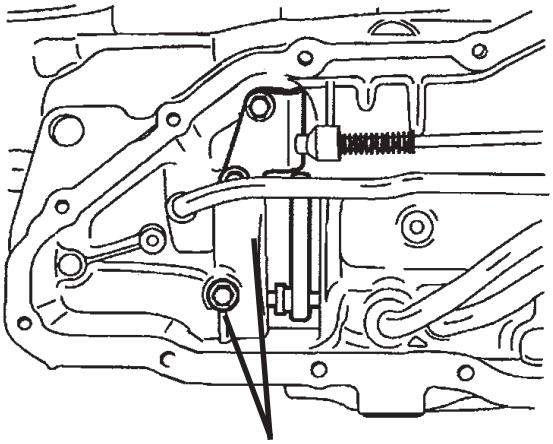
The positions of the roll pins changed



Roll pin.

Old

Redesigned plate uses an additional bolt.



Bolt and Plate assembly.

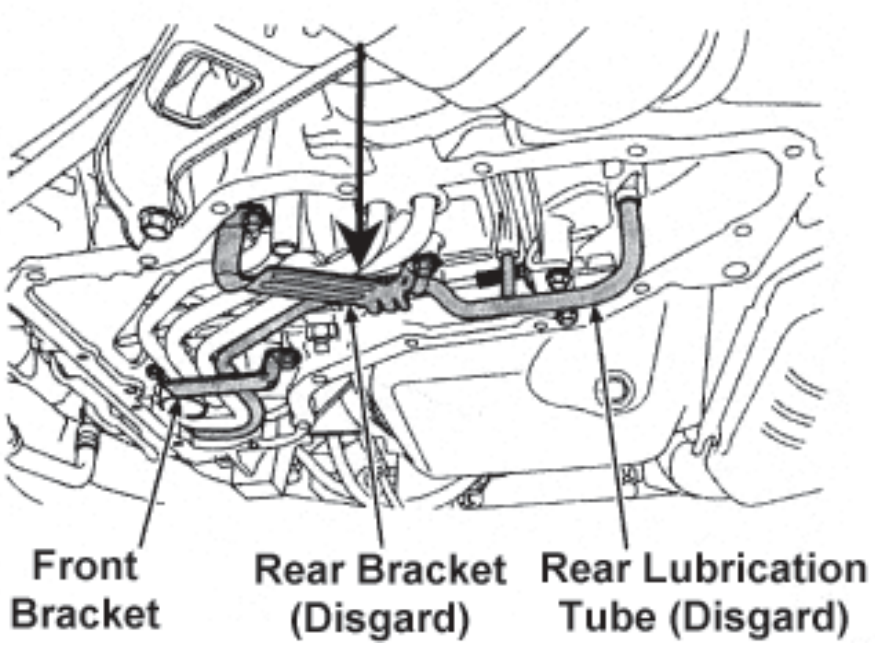
New

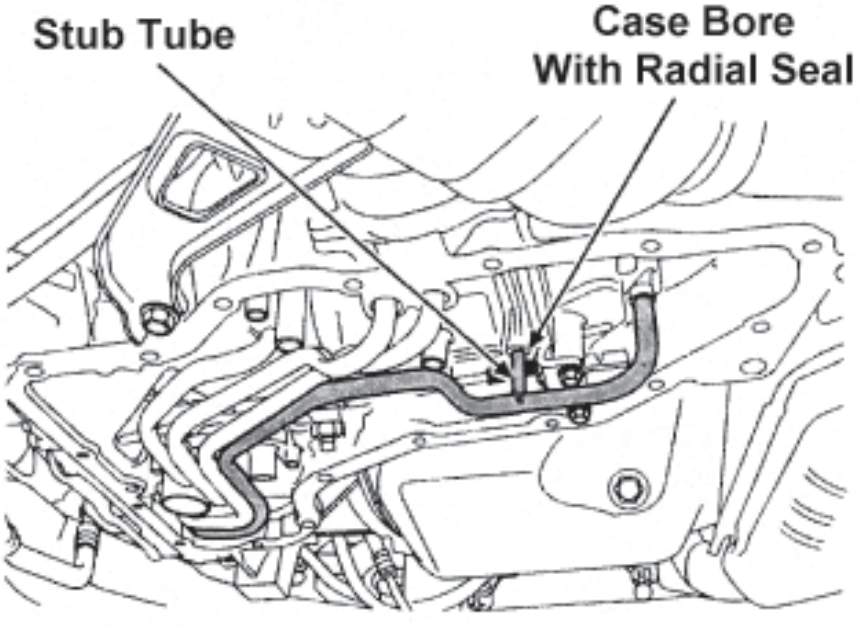
AX4S

Rear Lube Tube Cracking

Cause: A loose fit of the tube to the case assembly allowed the tube to vibrate and move, causing it to crack at the stub area.

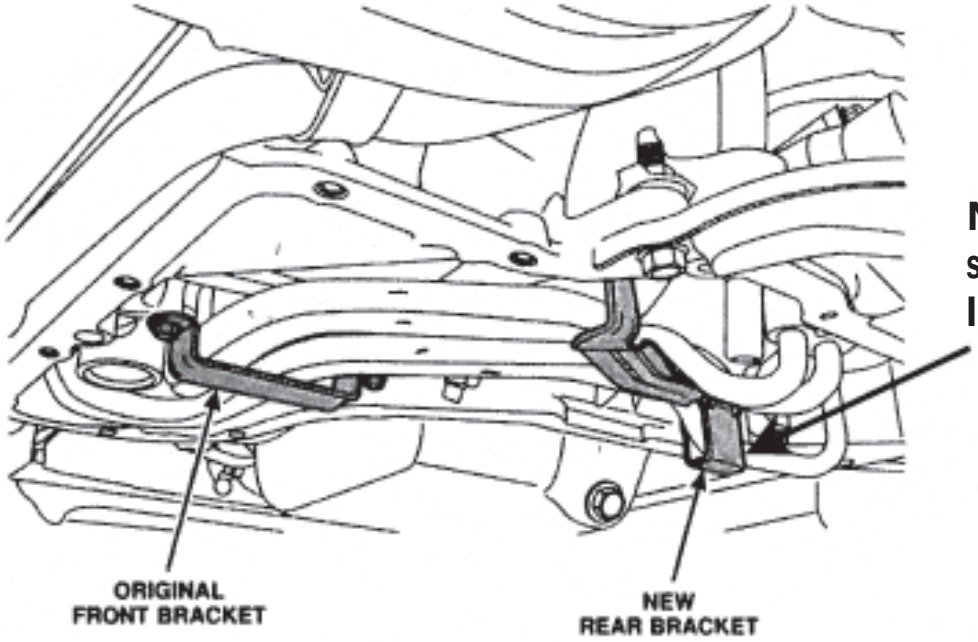
Repair: Replace with redesigned tube and rear bracket. FORD part number 1F1Z-7G353-AA





AX4S

Rear Lube Tube Cracking

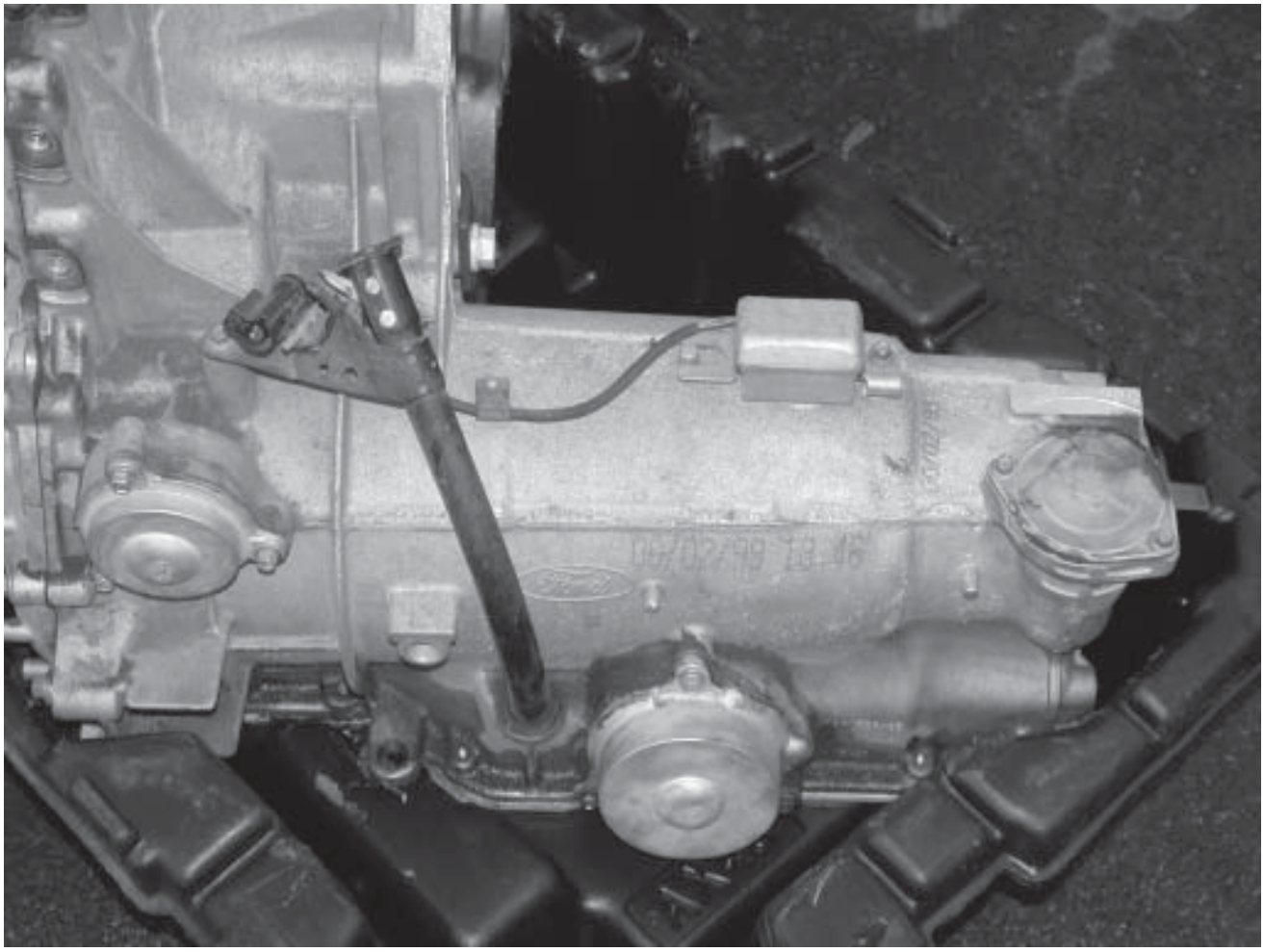


New bracket support for the lube tube

AX4S/AX4N

Service Case to Replace Past Models

The case on 2000 and later units with the park upgrade will service past models as complete assemblies.

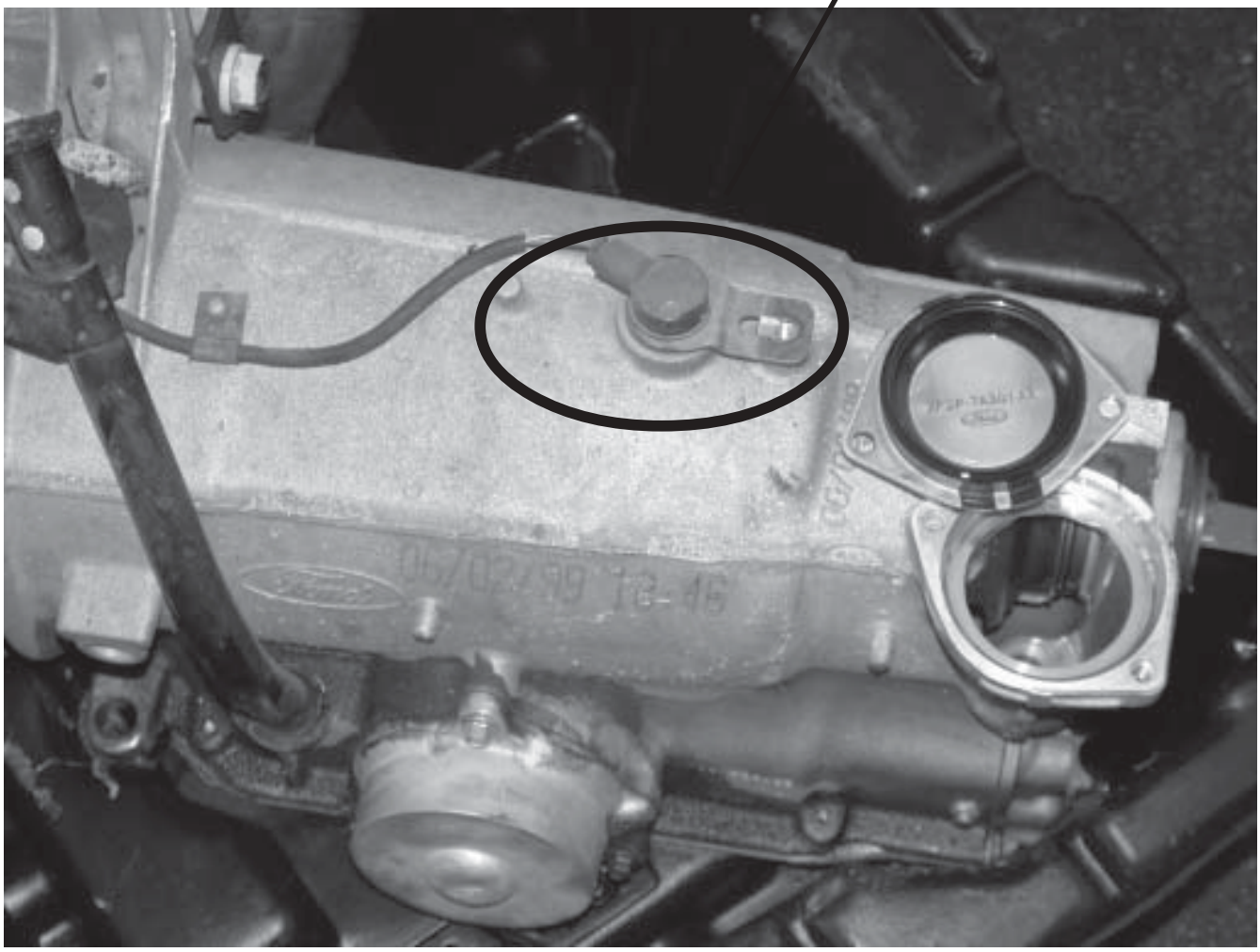


AX4S/AX4N

Service Case to Replace Past Models (continued)

AX4S 1991-1999 also needs plug for speed sensor

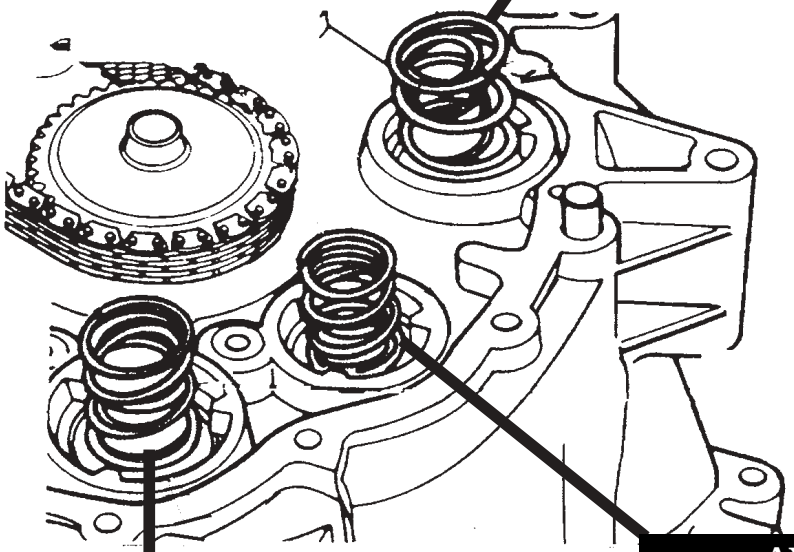
XF2Z-7H398-AB



AX4S

Accumulator Spring Changes

AX4S ACCUMULATOR SPRINGS		
VEHICLE	**N-D ACCUMULATOR**	**COLOR**
ALL MODELS	E6DZ-7G300-A	BLUE
98-02	F8DZ-7G300-BA	GREEN



AX4S ACCUMULATOR SPRINGS		
VEHICLE	**3-4 ACCUMULATOR**	**COLOR**
91-95	E9DZ-7G266-A	WHITE
95-97	F5DZ-7G266-A	YELLOW
98-02	F8DZ-7G266-AA	YELLOW

AX4S ACCUMULATOR SPRINGS		
VEHICLE	**1-2 ACCUMULATOR**	**COLOR**
91-95	E6DZ-7G267-A	BROWN
95-02	F58Z-7G326-A	PLAIN

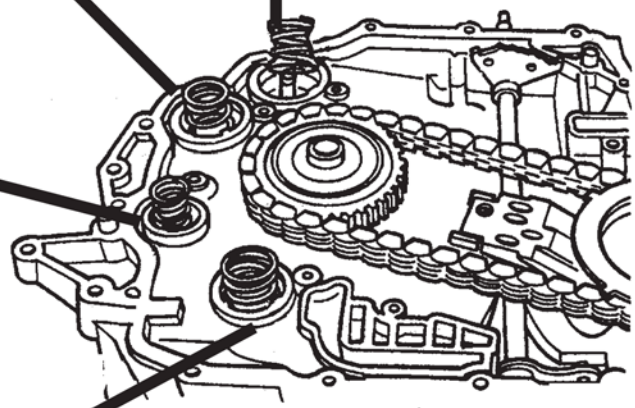
AX4N

Accumulator Spring Changes

AX4N ACCUMULATOR SPRINGS		
VEHICLE	**1-2 ACCUMULATOR**	**COLOR**
95-02	F5DZ-7G267-A	ORANGE
95-96 SHO ONLY	F6DZ-7G267-A	PURPLE
97-01 SHO ONLY	F7DZ-7D397-AA	PLAIN

AX4N ACCUMULATOR SPRINGS		
VEHICLE	**2-3 ACCUMULATOR**	**COLOR**
95-02	F5DZ-7F285-A	LT BLUE

AX4N ACCUMULATOR SPRINGS		
VEHICLE	**R ACCUMULATOR**	**COLOR**
95-97	F5DZ-7E485-A	GREEN
98-02	F8OZ-7E485-BA	YELLOW (INNER)



AX4N ACCUMULATOR SPRINGS		
VEHICLE	**3-4 ACCUMULATOR**	**COLOR**
95-02	F5DZ-7G266-A	BLUE

AX4N ACCUMULATOR SPRINGS		
VEHICLE	**N-D ACCUMULATOR**	**COLOR**
ALL EXCEPT 94 TAURUS	F5OZ-7G300-A	GREEN (OUTER)
94 TAURUS/SABLE	F4DZ-7G300-A	PLAIN (OUTER)
ALL EXCEPT 94 TAURUS	F5OZ-7G301-A	BROWN

AX4S/AX4N

Accumulator Spring Changes (continued)

AX4S ACCUMULATOR SPRING IDENTIFICATION				
PART NUMBER	**COLOR**	**O.D. DIAMETER**	**LENGTH**	**WIRE DIAMETER**
1-2 ACCUMULATOR				
E8DZ-7G358-A	PINK (Middle)	1.200"	1.460"	0.099"
E8DZ-7G326-A	PURPLE (Inner)	0.905"	1.620"	0.075"
E8DZ-7G267-A	BROWN (OUTER)	1.575"	1.435"	0.125"
F58Z-7G326-A	PLAIN	1.208"	1.480"	0.105"
3-4 ACCUMULATOR				
E9DZ-7G266-A	WHITE (Outer)	1.175"	1.760"	0.099"
E6DZ-7F288-A	GREEN/WHITE (Inner)	0.875"	1.450"	0.080"
F8DZ-7G266-AA	YELLOW	1.185"	1.770"	0.098"
N-D ACCUMULATOR				
E6DZ-7G301-A	BLUE (Outer)	1.485"	1.790"	0.135"
E6DZ-7D300-A	ORANGE (Inner)	1.020"	1.725"	0.099"
F8DZ-7G300-BA	GREEN	1.475"	1.218"	0.101"

AX4N ACCUMULATOR SPRING IDENTIFICATION				
PART NUMBER	**COLOR**	**OUTSIDE DIAMETER**	**LENGTH**	**WIRE DIAMETER**
1-2 ACCUMULATOR				
F5DZ-7G267-A	PLAIN	1.324"	1.540"	.112"
F6DZ-7G267-A	PURPLE (SHO ONLY)	1.510"	1.390"	.120"
2-3 ACCUMULATOR				
F5DZ-7F285-A	ORANGE/BLUE	1.300"	1.225"	.110"
3-4 ACCUMULATOR				
F5DZ-7G266-A	BLUE	1.312"	1.482"	.112"
REV. ACCUMULATOR				
F5DZ-7E485-A	GREEN	0.965"	1.405"	0.091"
F8OZ-7E485-BA	YELLOW	0.960"	1.405"	0.091"
N-D ACCUMULATOR				
F5OZ-7G300-A ALL EXCEPT 94 TAURUS/SABLE	GREEN (OUTER)	1.475"	1.218"	0.101"
F4DZ-7G300-A 94 TAURUS/SABLE	PLAIN (OUTER)	1.369"	1.218"	0.091"
F5OZ-7G301-A ALL EXCEPT 94 TAURUS/SABLE	BROWN (INNER)	1.172"	1.218"	0.083"

AX4S

3.8L Torque Converter Pilot Bushing Wear

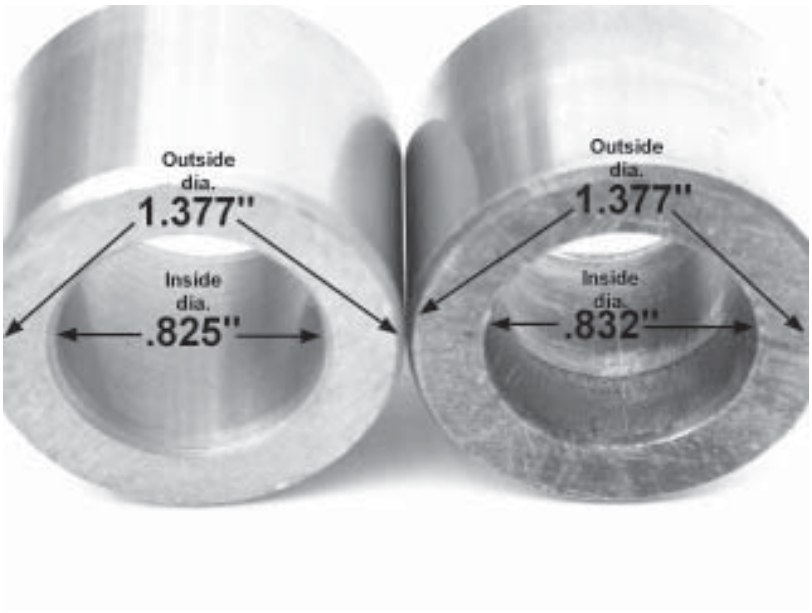
Concern: When a replacement transmission or engine is necessary make sure to visually check the torque converter pilot bushing in the crankshaft for excessive wear.

Note: All 3.8L require this bushing.

Cause: Pilot bushing in the crankshaft worn, allowing the torque converter to run off center.

Repair: Replace the bushing and check the run out.

New



Used .007" wear

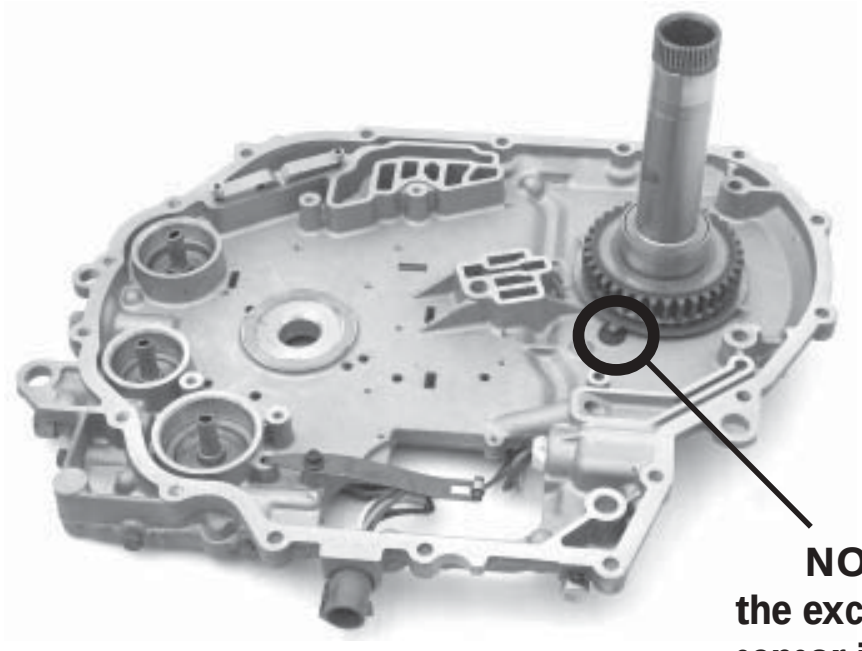
AX4S/AX4N

TSS Exciter Wheel Bent

Concern: Damage to the exciter ring on the driven sprocket, (primarily on 1996-1997 model years).

Common Cause: The exciter ring may cause the PCM to control line pressure higher then normal.

Repair: Straighten or replace sprocket.



NOTE: Measurement from the exciter ring to the tip of the sensor is .050”-.055”.

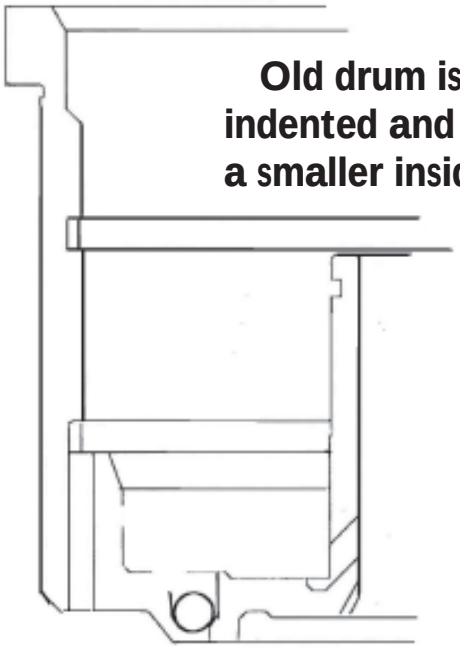
4R44E/5R55E

New Direct Drum

As of 1999 a new direct drum was available for the 4R44E/5R55E. This drum will interchange as an assembly. ***Do not MIX old parts and NEW parts! (Piston, Retainer, Etc.)***

Old Drum
97GT-7D044-A1E/A2E/A2F

Match with Case numbers
97GT-7D014-GA/HA/KA/LA

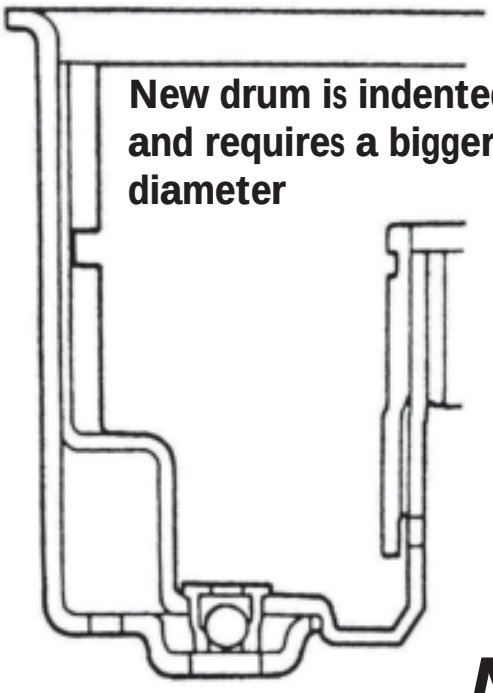


Old drum is not indented and requires a smaller inside diameter bearing

Old

New Drum
XL2P-7D044-AA/CB/DB

Match with Case numbers
XW4P-7F374-CA/DA/EA/FA



New drum is indented and requires a bigger inside diameter

New

4R44E/55E and 5R44E/55E

TCC Concerns
How to Test the system

The easiest way to test the TCC circuit is to know what's happening when the computer is ready to apply the TCC. Once all parameters are met, and the computer is ready to apply the TCC, the TCC solenoid is energized by the computer. Hydraulically, the line pressure is supplied to the coast clutch regulator valve. The coast clutch regulator valve charges the TCC solenoid and now the TCC solenoid pulses the TCC regulator valve to apply the torque converter clutch. To determine whether or not the converter, solenoid or both are causing the problem simply energize the TCC in the stall on the lift, or stationary. This test is simply checking the integrity of the converter and the circuit.

If the engine Stalls: The converter is capable of locking-up and the valves definitely moved and the problem may be in the regulation of the valves and the performance of the PWM circuit.

If the engine doesn't Stall: The first thing to check is the solenoid if the solenoid is working then the TCC charge has a leak in the system. This leak can be in a number of different areas.

Using your scan tool, locate the parameter that says TCC% and TCCAMACT or TCC RPM on your data screen. These parameters will give you a quick look at the system. TCC% is the amount of duty cycle the computer is commanding the TCC solenoid to pulse, usually this parameter runs between 90% and 100% on your scanner. TCCAMACT is the amount of slip RPM the computer is detecting.

GOOD Reading:

TCC %	Varying between 90% and 100%
TCCAMACT	Varying between 0-10 RPM

BAD Reading:

TCC %	Varying between 90% and 100%
TCCAMCAT	Varying higher then 10 RPM and as high as 200 RPM

4R44E/55E and 5R44E/55E

TCC Concerns (continued)

Torque converter concerns on 4R44E/4R55E/5R55E have been a constant concern. In recent years there have been a number of concerns related to torque converter apply as well as No cooler flow, Harsh TCC and Soft TCC engagement, No Lock-up or loss of TCC when hot. Diagnosing torque converter problems can be troublesome. The following pages have tips you can use to determine the fix.

Here are the common codes you will get:

Codes	Discriptions
628:	Torque Converter Clutch Slip or Error
P0740:	Torque Converter Clutch System Problem
P0741:	Torque Converter Clutch System Performance or Stuck Off
P0742:	Torque Converter Clutch System Stuck Off
P0743:	Torque Converter Clutch System Electrical
P1740:	Torque Converter Clutch Malfunction
P1741:	Torque Converter Clutch Control Error
P1742:	Torque Converter Clutch Solenoid Failed On, MIL Lamp On
P1743:	Torque Converter Clutch Solenoid Failed On, TCIL Lamp ON
P1744:	Torque Converter Clutch Mechanical Noise or Stuck in Off Position

4R44E/55E and 5R44E/55E

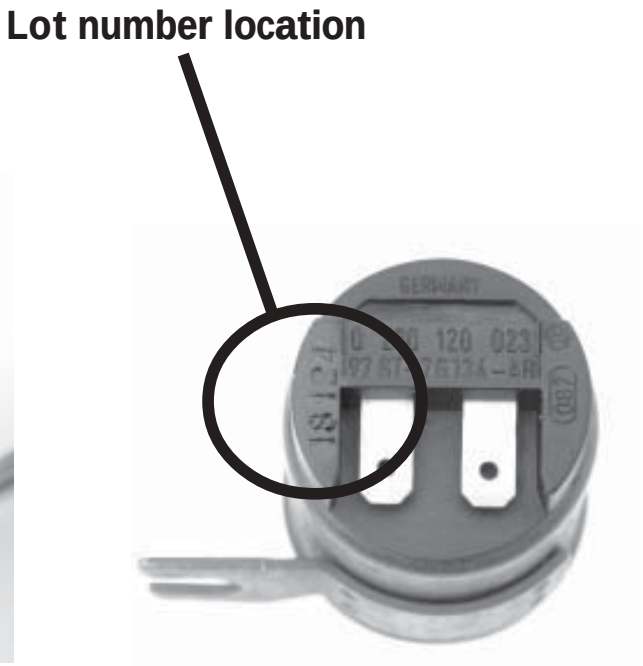
TCC Concerns (continued)
Damaged TCC Solenoid

Concern: A no TCC apply on 1995 trough 1998 with a flashing overdrive light, DTC 628, P0741, P1740 or P1744.

Common Cause: TCC solenoid (there were certain TCC solenoid's that were poorly designed and the result was the tip blowing out and the brackets were cracking.

Repair: Replace solenoid.

Note: ***Make sure not to reuse lot numbers between 769 and 771, these solenoids are defective.***



4R44E/55E and 5R44E/55E

TCC Concerns (continued)

Torque Converter Clutch Failure

Slip codes are very common. Make sure to diagnose converter codes correctly before replacing converter.

Concern: No converter clutch apply.

Common Cause: Torque converter lining burnt or flaked off.

Repair: Replace converter.

4R44E/55E and 5R44E/55E

TCC Concerns (continued)

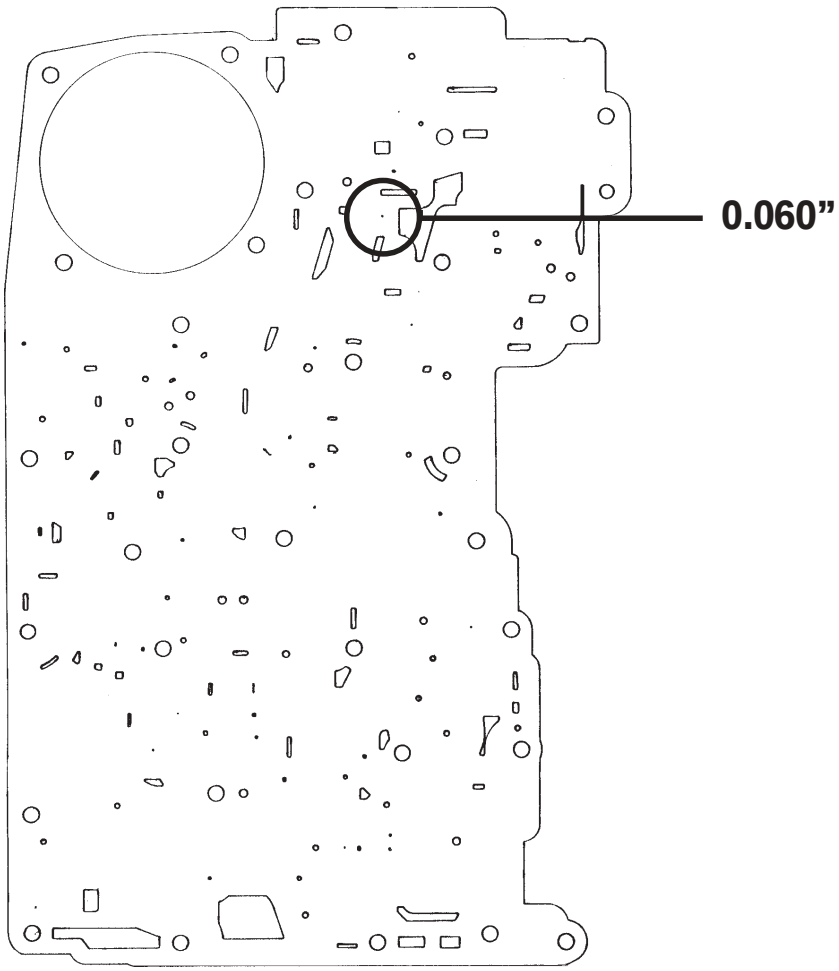
Separator Plate Feed Hole Modification

Modify the Separator plate to increase cooler flow. Cooler flow should be a minimum of 1 quart in 20 seconds. Make sure line pressure is within specification, high line pressures can cause low cooler flow.

Concern: TCC slip, or insufficient cooler flow.

Common Cause: The separator plate may have the wrong size feed holes. The converter feed holes are normally between 0.032″ and 0.048″.

Repair: Drill the converter feed hole in the separator plate to 0.060″ for increased cooler flow.



4R44E/55E and 5R44E/55E

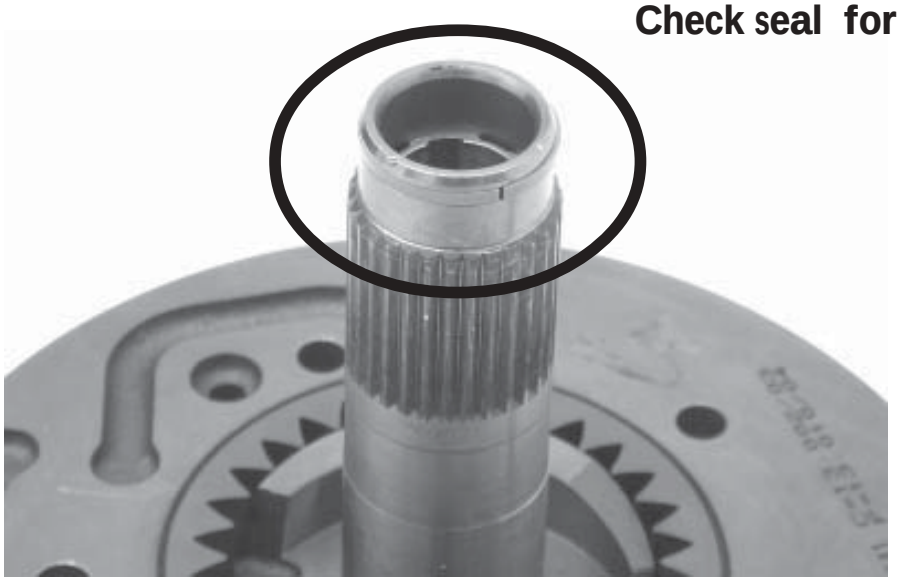
TCC Concerns (continued)

Butt-cut Seal Damaged

Concern: Slip or no TCC apply.

Common Cause: Seal broken or stator shaft worn or cracked.

Repair: Replace seal and check stator support for shaft wear or cracking around the seal area. If crack is evident replace stator.



4R44E/55E and 5R44E/55E

TCC Concerns (continued)

Inner Pump Gear Seal Damaged

Concern: TCC slip

Common Cause: Installing A4LD pump gears that don't have an O-ring, or correct pump gear inner O-ring damaged or missing. This will allow converter charge oil to leak into the converter bushing lube or drain back passage creating low converter charge.

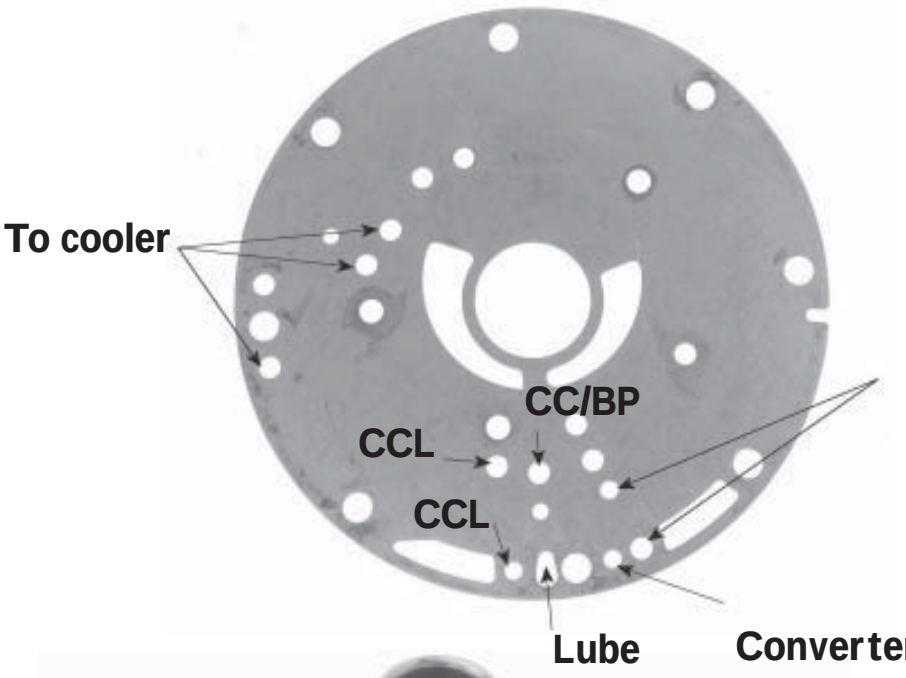
Repair: Install correct pump gears and O-ring. Inspect converter hub and lubricate prior to installation.

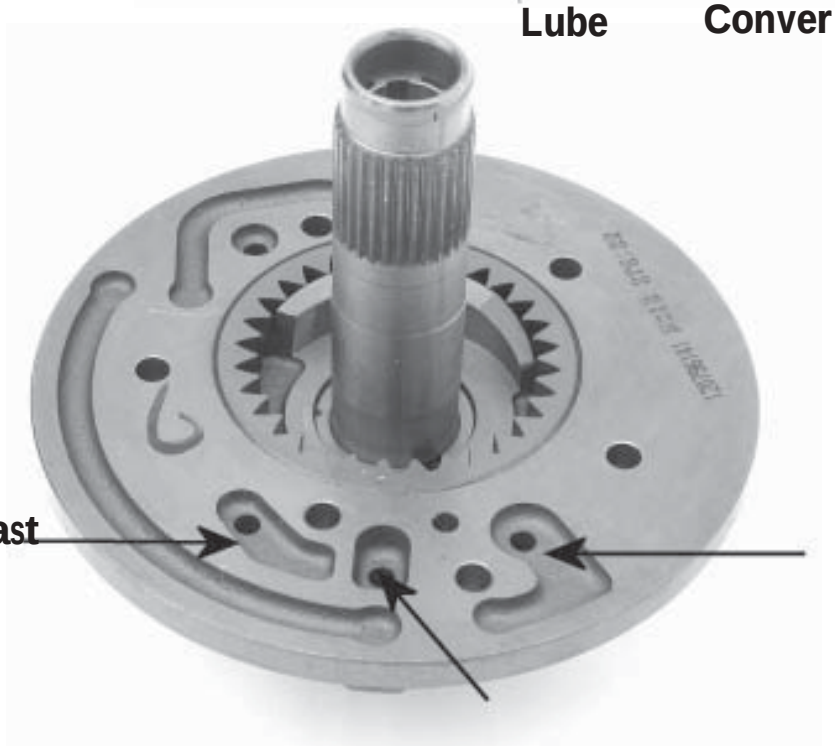
NOTE: Must have gear with o-ring.

4R44E/55E and 5R44E/55E

TCC Concerns (continued)
Pump and Spacer Plate Damage

Always inspect Pump assembly for damage, note any wear marks or warping and replace if necessary.





4R44E/55E and 5R44E/55E

TCC Concerns (continued)

Valve Body Damage

The valve body can cause many different TCC related problems. There are a number of valves involved:

- Torque Converter Regulator Valve
- Torque Converter Modulator Valve
- Coast Clutch Shift Valve
- Thermostatic Bypass Valve
- Converter Relief Valve

Anyone of these valves can cause a TCC failure.

Concern: Slip or No TCC apply.

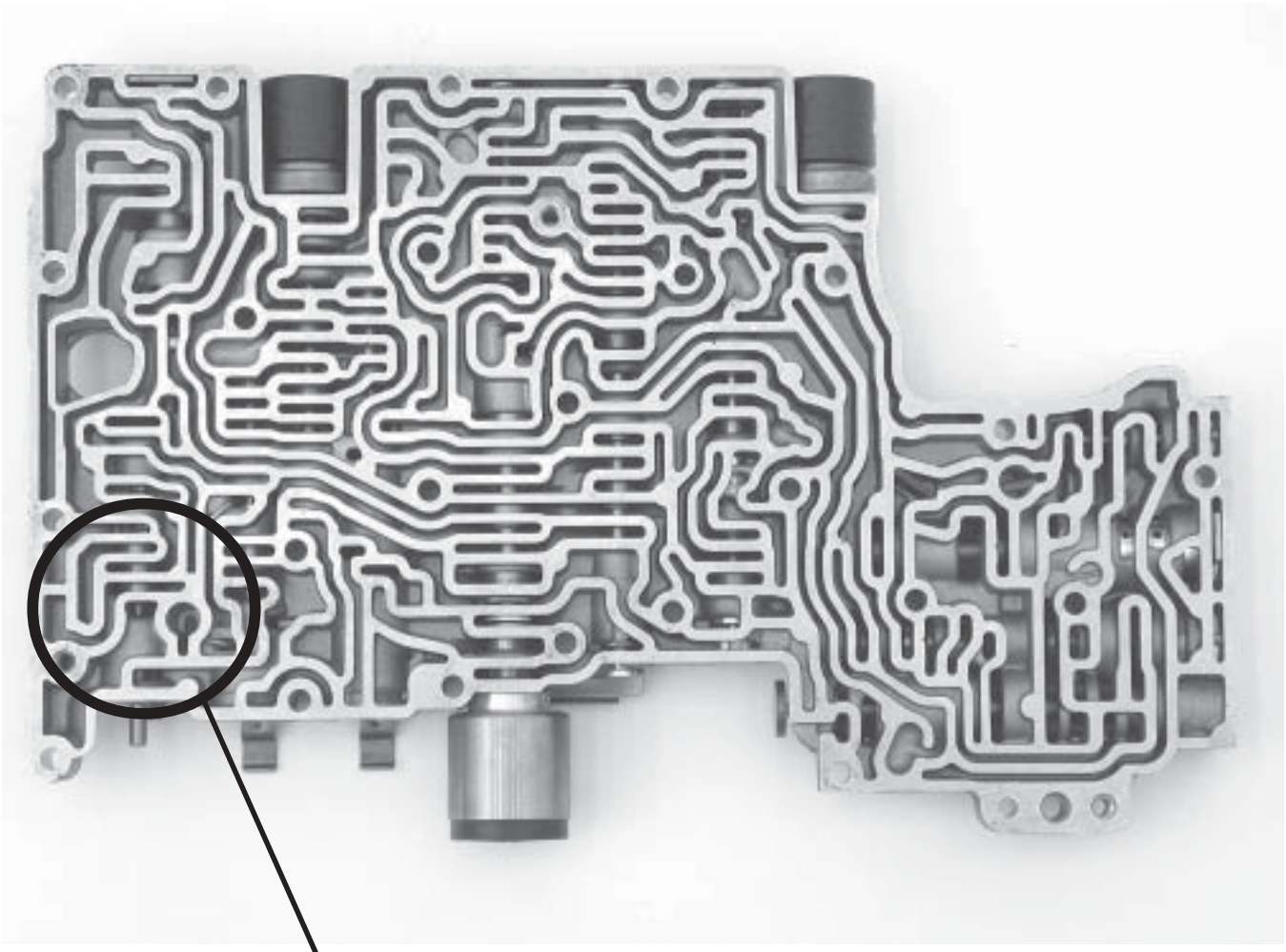
Common Cause: Wear in the Valve Body.

Repair: Repair or Replace Valve Body.

4R44E/55E and 5R44E/55E

TCC Concerns (continued)

Valve Body Damage

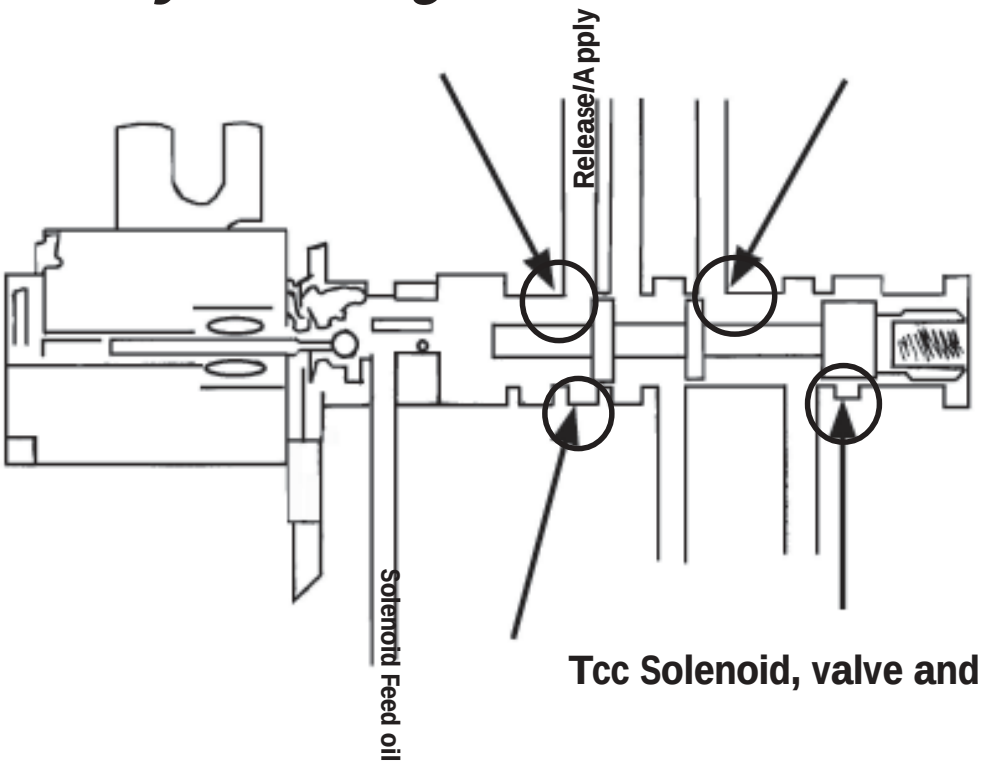


Always check valve body surface for warping

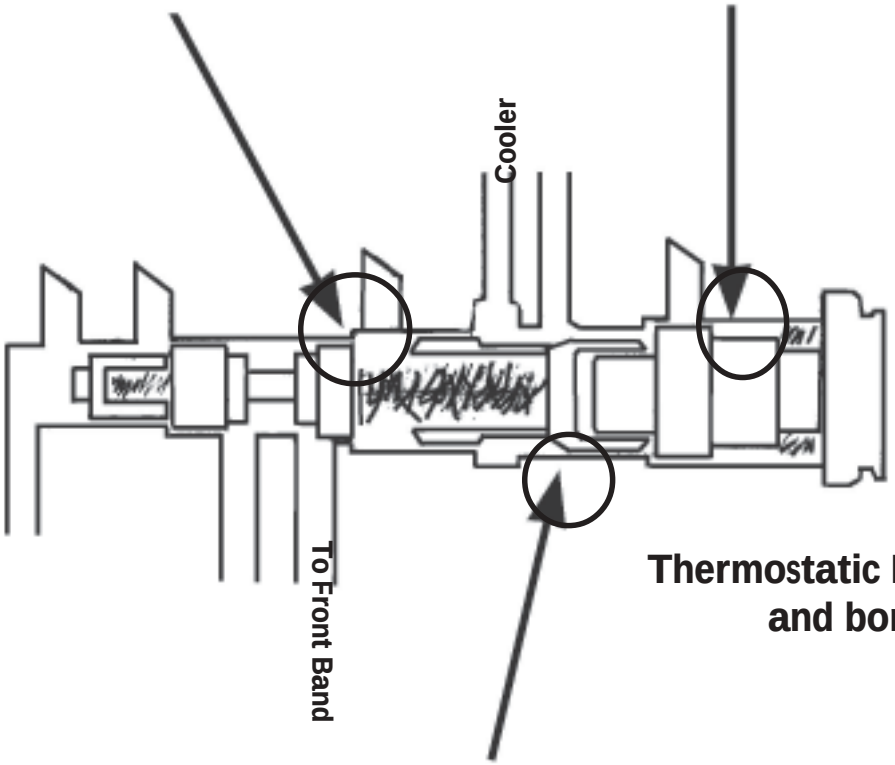
4R44E/55E and 5R44E/55E

TCC Concerns (continued)

Valve Body Damage



Tcc Solenoid, valve and bore



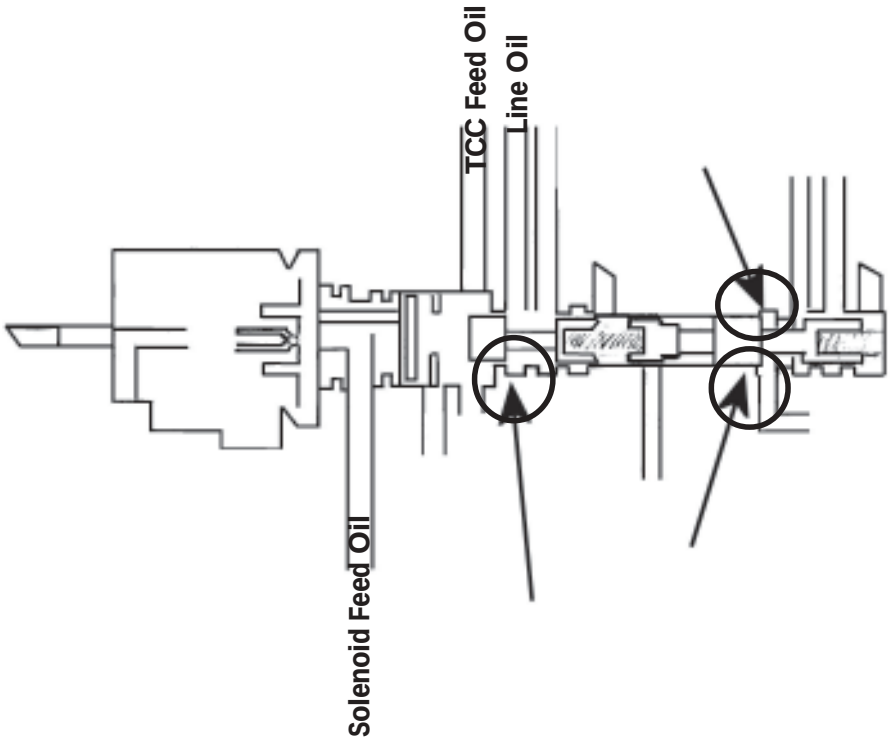
Thermostatic Bypass valve and bore

4R44E/55E and 5R44E/55E

TCC Concerns (continued)

Valve Body Damage

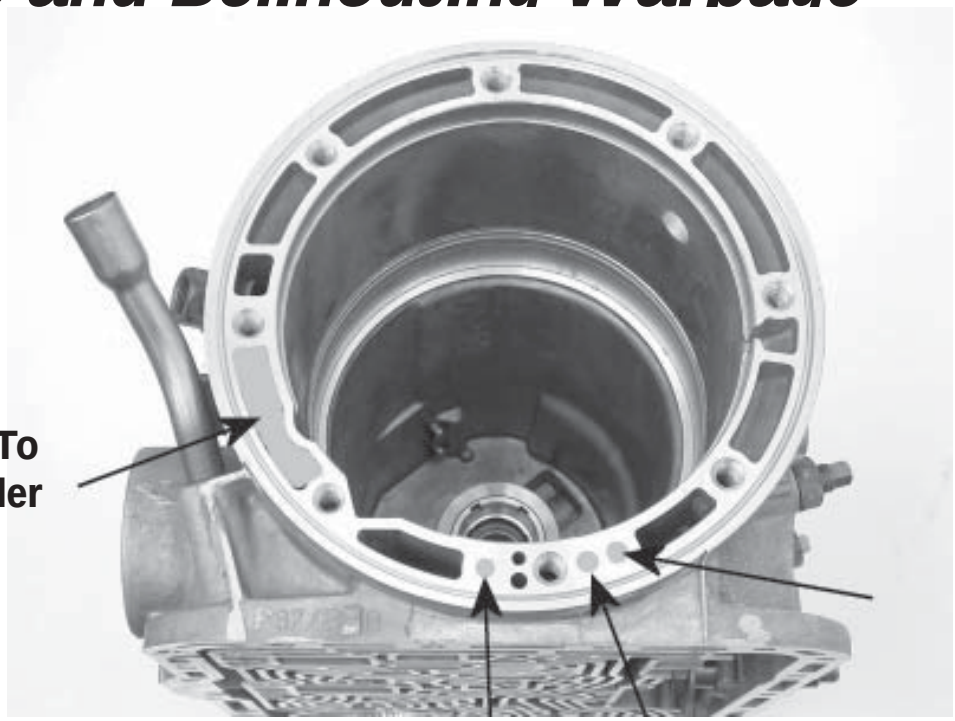
Coast Clutch Regulator Valve and Bore

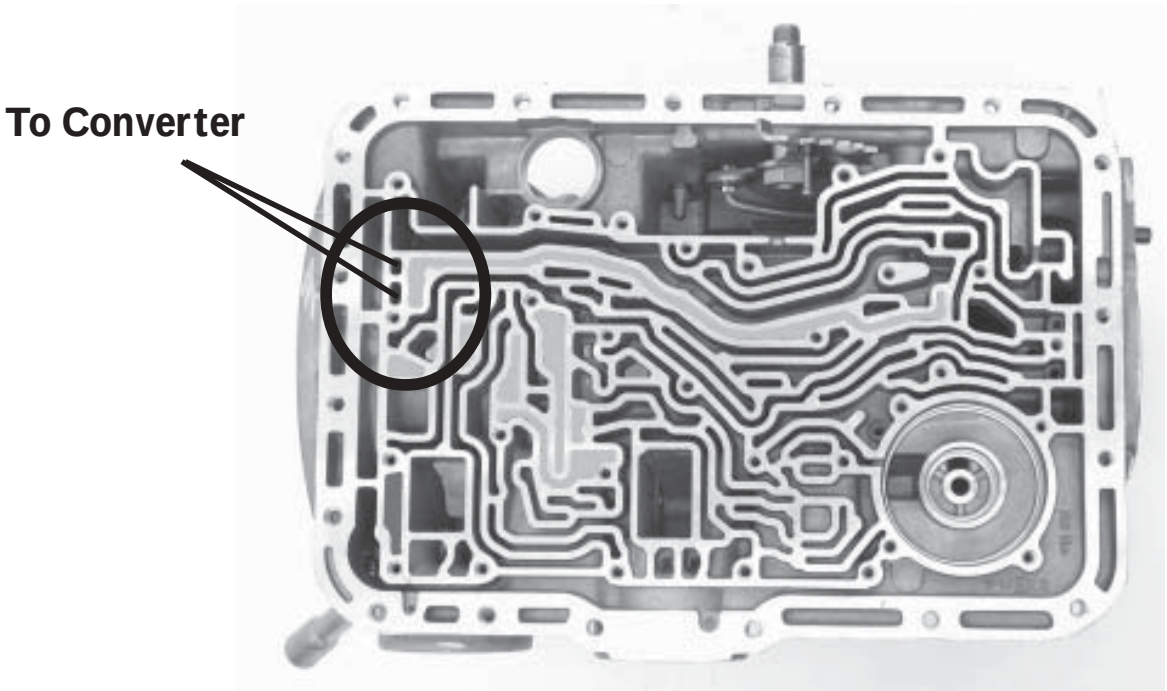


4R44E/55E and 5R44E/55E

TCC Concerns (continued)

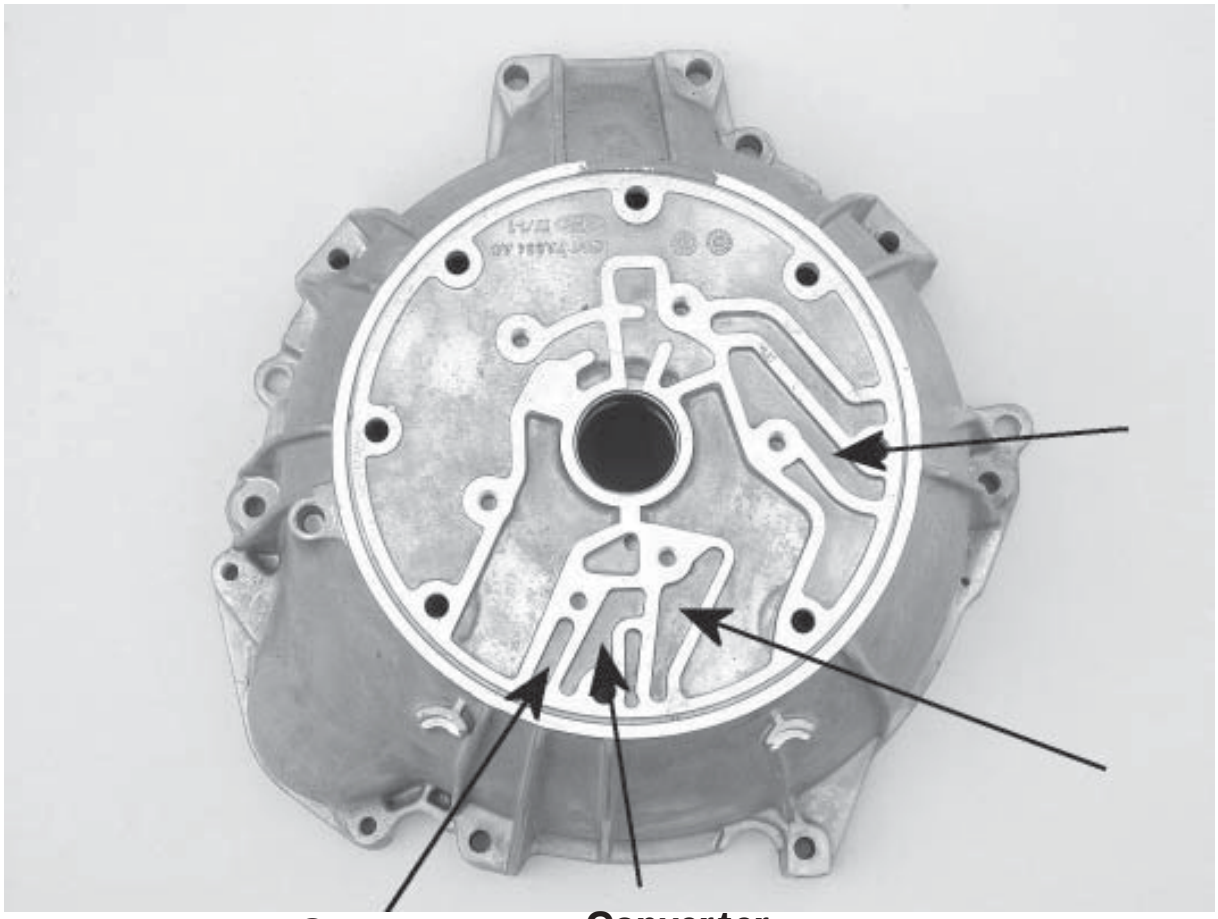
Case and Bellhousing Warpage





4R44E/55E and 5R44E/55E

TCC Concerns (continued)
Case and Bellhousing Warpage



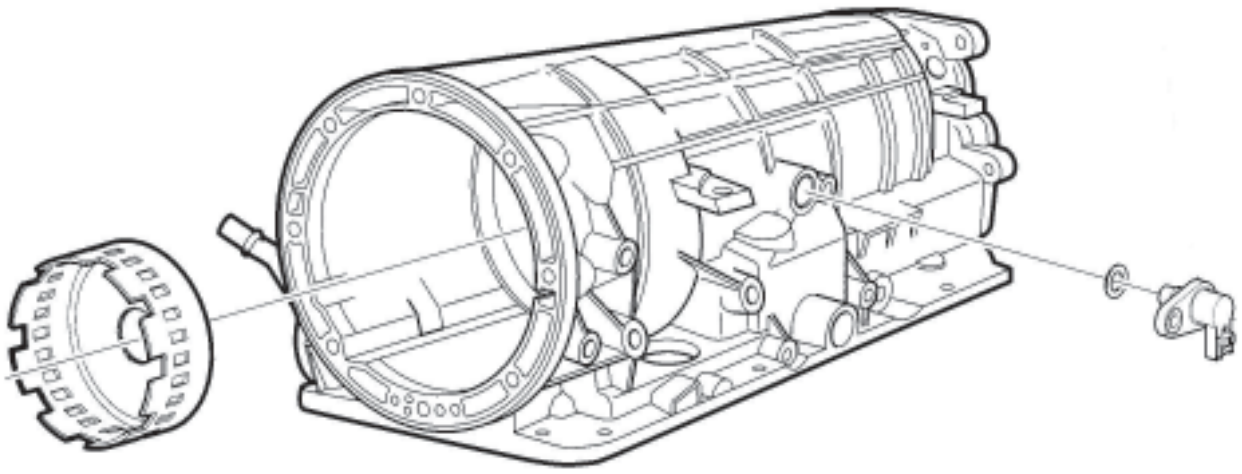
5R44E/ 5R55E

New Upgrades for 2001-On

The 5R44E is a new transmission that will replace the 4R44E. Some of the parts upgrades consist of:

- New Intermediate Shaft Speed (ISS) sensor for 5R44E/5R55E
- New Case, to accept the ISS Sensor
- New input shell trigger point for the ISS Sensor.

Note: New Input Shell may be use to service 97-On



5R44E/ 5R55E

Shift and Stall Speed chart for 2001

Shifts @ Vehicle Speed (MPH)*
5R44E/5R55E (2001 Only)

Position	OD Position, Shift	Vehicle Speed
Closed	5-4 4-3 3-2 2-1	34 to 50 mph - - 10 to 13 mph
Minium TP Voltage = 1.25V	1-2 2-3 3-4 4-5 5-4 4-3 3-2 2-1	10 to 22 mph 13 to 24 mph 18 to 28 mph 28 to 60 mph 25 to 36 mph 10 to 20 mph - 9 to 12 mph
Wide Open	1-2 2-3 3-4 4-5 5-4 4-3 3-2 2-1	37 to 46 mph 55 to 69 mph 69 to 82 mph 95 to 116 mph 85 to 114 mph 64 to 78 mph 45 to 61 mph 30 to 37 mph

* Range covers all OEM axle ratios and tire sizes. Alwalys drive vehicle safely according to traffic conditions and obey all traffic laws.

Stall Speed Specifications
5R44E/5R55E (2001 Only)

Trans.	Vehicle	Engine	RPM Range
5R44E	Ranger	2.3L	2621-3050
	Ranger	3.0L	2833-3384
5R55E	Ranger	4.0L SOHC	2557-3032
	Explorer Sport	4.0L SOHC	2557-3036
	Explorer Sport Trac	4.0L SOHC	2557-3036

5R44E/ 5R55E

Pressure Specification for 2001

Trans.	Application	Range	Idle@ 1000 rpm Pressures, psi		WOT Stall Pressures, psi	
			EPC	Line	EPC	Line
5R44E	2.3L Ranger 4x2	R	40-50	145-190	112-134	282-350
		N	20-40	75-120		
		OD, 2, 1	20-40	75-120	112-134	228-263
	3.0L Ranger	R	45-55	150-195	112-134	282-350
		N	20-40	75-120		
		OD, 2, 1	20-40	75-120	112-134	228-263
5R55E	4.0L SOHC Ranger	R	65-75	215-235	112-134	282-350
	4.0L SOHC Explorer Sport	N	20-40	75-120		
	4.0L SOHC Explorer Sport Trac	OD, 2, 1	35-50	110-145	112-134	228-263

5R44E/55E, 5R55N/55W

Shift Concerns With Adaptive Shift Strategy

Adaptive shift strategy, although fairly new to Ford, has been around for quite sometime now. The new 2001 5R44E/55E and 5R55N/55W are equipped with the adaptive strategy and it is important to understand the conditions needed for proper shift timing. The Adaptive Strategy is also used for adjusting the pressure control system. When power is lost to the Powertrain Control Module (PCM) the transmission shifts are affected, and may cause damage if precautions are not taken.

The reasons for shift adaptive electronic pressure control strategy:

- Better control over shift events.
- Maintain high mileage durability.
- Reduce unit variation from vehicle to vehicle.
- Provide consistent shift feel over the life of the vehicle.

Reasons for loss of power to the PCM:

- Vehicle battery disconnected or battery drain.
- An updated calibration installed to the Powertrain Control Module.
- Keep Alive Power lost to the Powertrain Control Module while the battery is still connected. (Bad Relay, Fuse, Wiring, PCM)

5R44E/55E, 5R55N/55W

Shift Concerns With Adaptive Shift Strategy (continued)

The inputs that directly affect the transmissions capability to shift correctly and maintain smooth shifting sequences are:

Inputs:

- Mass air flow sensor (MAF)
- Engine speed (RPM)
- Turbine speed (TSS)
- Intermediate speed (ISS)
- Vehicle speed/output speed (VSS/OSS)

Conditions needed to adapt:

- Calibrated minimum throttle level and minimum change in throttle.
- Calibrated operating temperature.
- Upshifts.
- Closed throttle, manual downshifts.
- Engagements.

Normal conditions for Adaptive Shift Control:

- New vehicle/transmission with abrupt shift feel or slip.
- Shifts only adapt at operating temperature.
- May take several shifts under same operating conditions to adapt.
- Information gets stored in Keep Alive Memory (KAM) power.
- Power loss to KAM, transmission shifts in its pre-adapted level.
- Adaptive process will, over time, fully update KAM.
- Depending on driving style, it may take longer to complete the adaptive strategy.

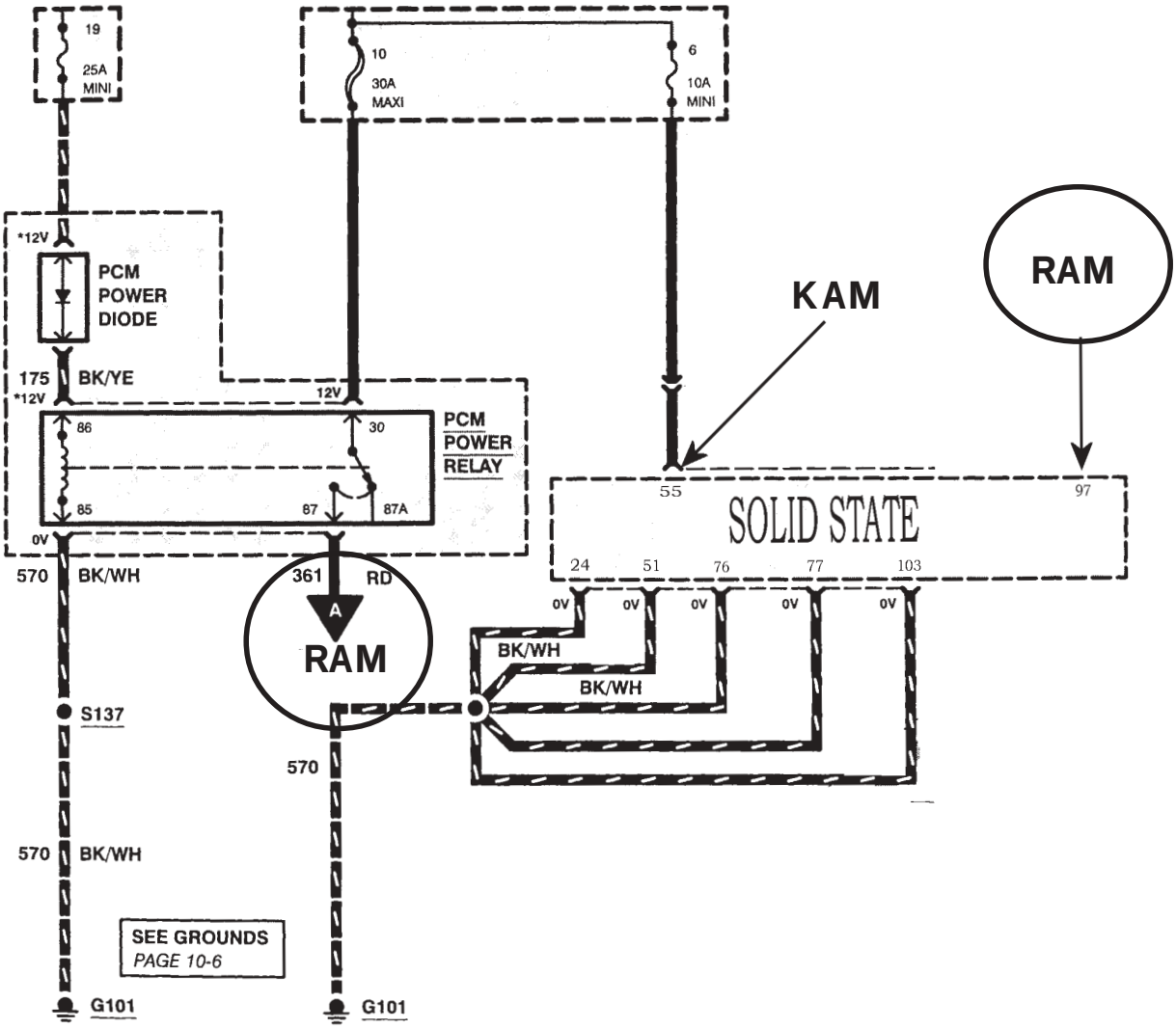
All Ford Vehicles

P0603 (KAM Test Code)
P0605 (RAM Test Code)

Any Ford with codes P0603 or P0605 may have an aftermarket chip installed on at or near the PCM.

- P0603 indicates **KEEP ALIVE MEMORY** at the PCM is or has been interrupted.
- P0605 indicates **RANDOM ACCESS MEMORY** at the PCM is or has been interrupted.

Check wiring for aftermarket installation or ask customer if they have had any performance modifications done to the vehicle.

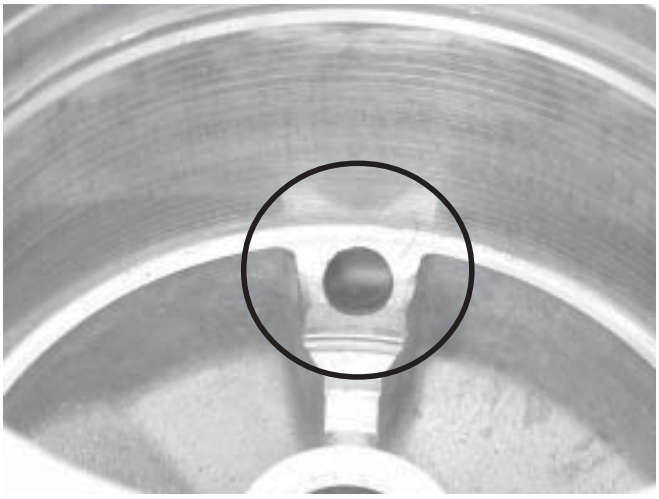


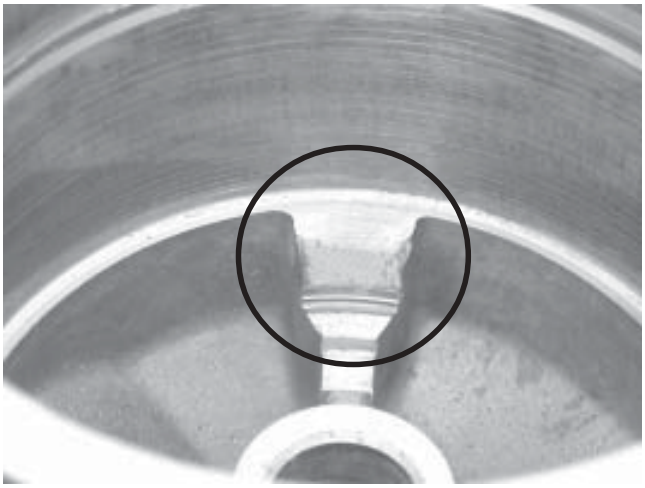
4R70W

Case Changes and Updates (Truck only)

In 2001, 4R70W cases changed for the truck lines only. These changes include:

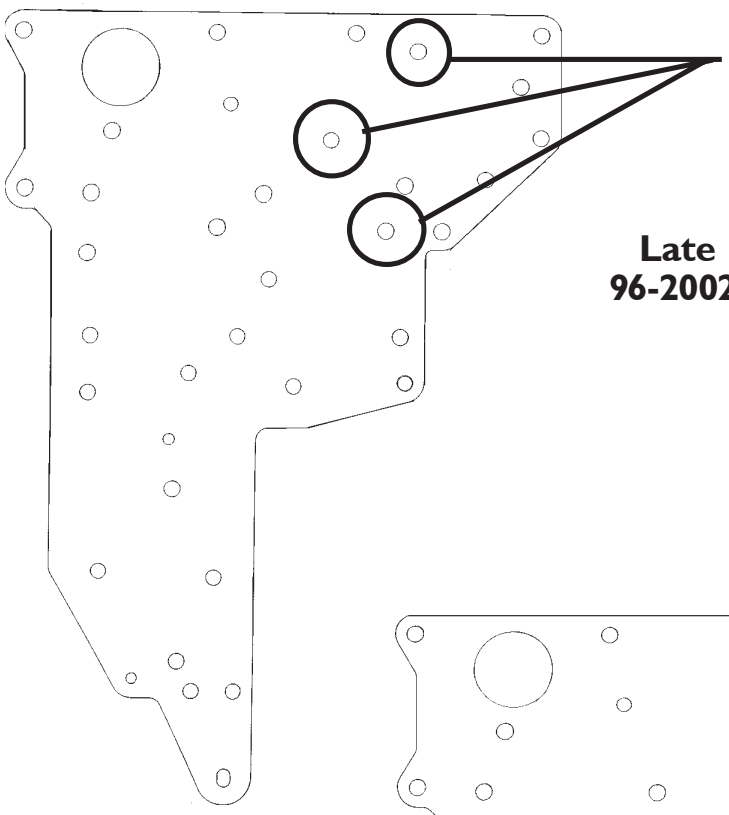
- Overdrive Servo bleed hole **"DELETED"**
- Unique Valve body for trucks only
- New case **WILL NOT** service earlier models, due to calibration changes.





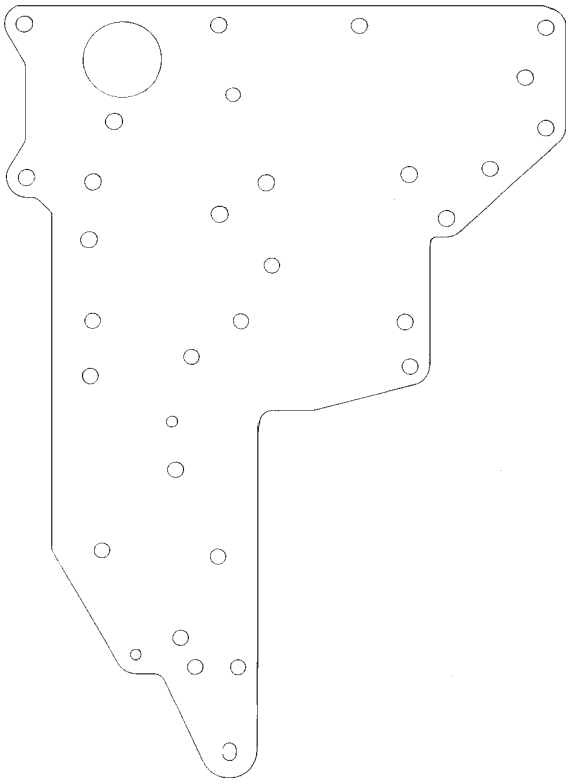
4R70W

Valve Body Lower Separator Plate/Gasket Changes



These holes were added in 1999 and on transmissions

Late 96-2002



Early 92-95

4R70W

Valve Body Separator Plate Changes (continued)

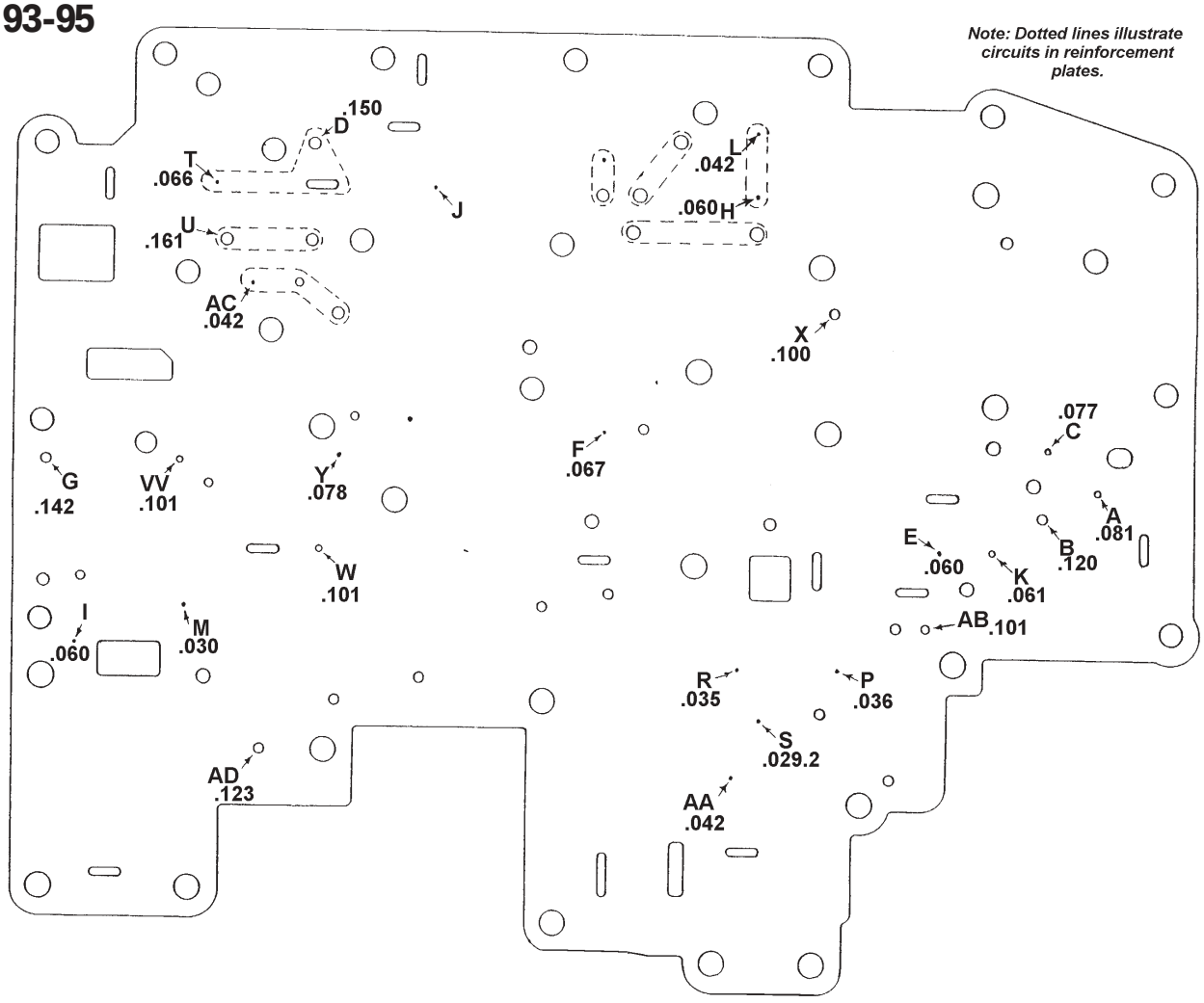
These are the orifice names you will see on the separator plate.

A= Forward Clutch Feed
AA= TCC Feed
AB= Rear Lube
AC= Converter Clutch Apply
AD= By-Pass Clutch control plunger
B= 2-3 Shift valve
C= 2-3 Accumulator
D= O/D Servo regulator
F= Low-Reverse Servo Release
G= Intermediate Clutch Feed
H= 3-4 Shift valve to O/D regulator valve
I= Reverse Clutch
K= Direct Clutch
L= O/D Servo Regulator Valve side
M= Main Regulator valve
P= SS1 Feed
R= SS2 Feed
S= Solenoid Main Feed
T= Intermediate Clutch from the 1-2 shift valve
U= B8 Intermediate Apply
VV= Converter Drain/Lube
W= Converter charge
Y= By-Pass Clutch control

4R70W/AODE

Valve Body Separator Plate Changes (continued)

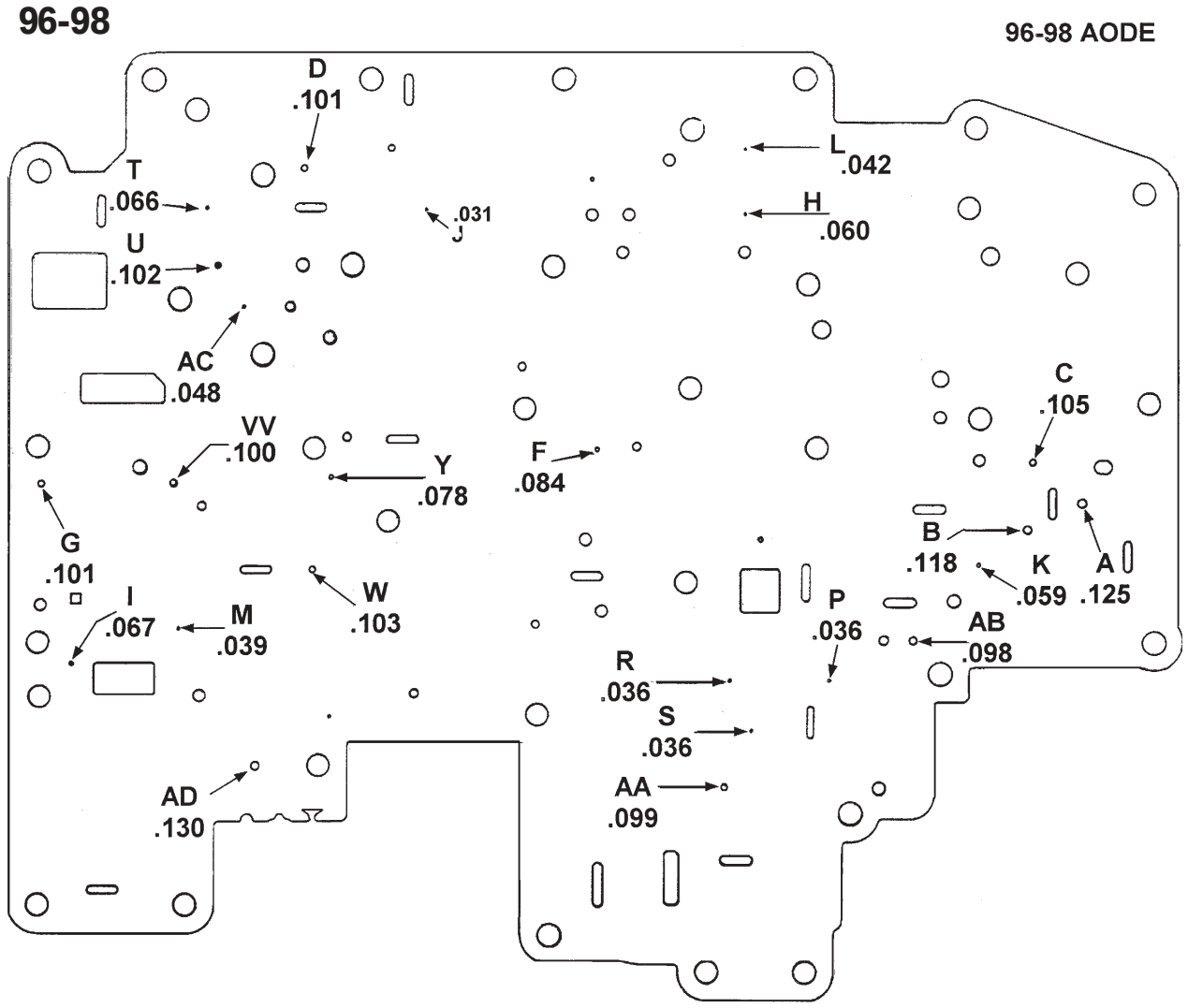
93-95



4R70W/AODE

Valve Body Separator Plate Changes (continued)

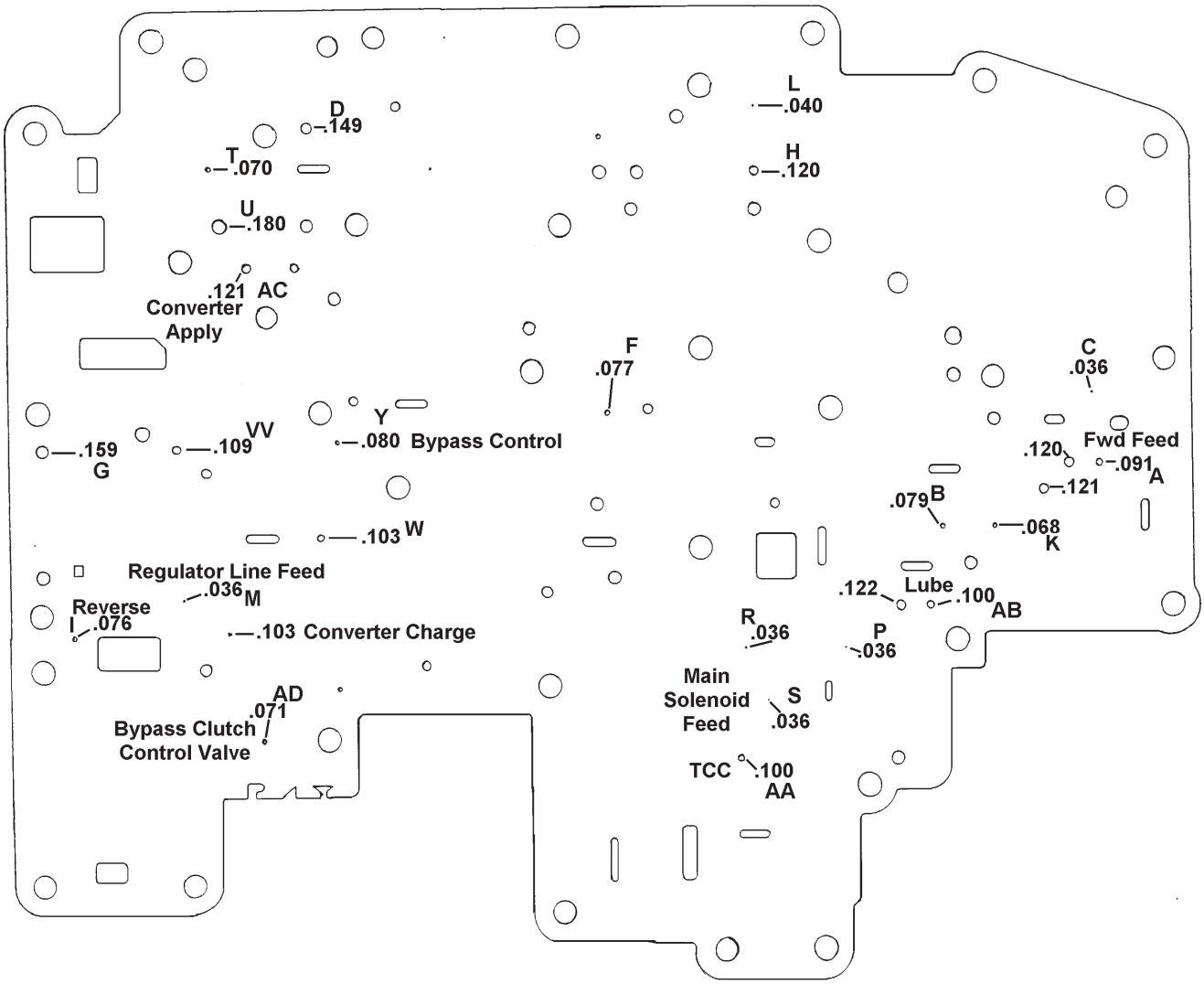
96-98



4R70W/AODE

Valve Body Separator Plate Changes (continued)

99-on



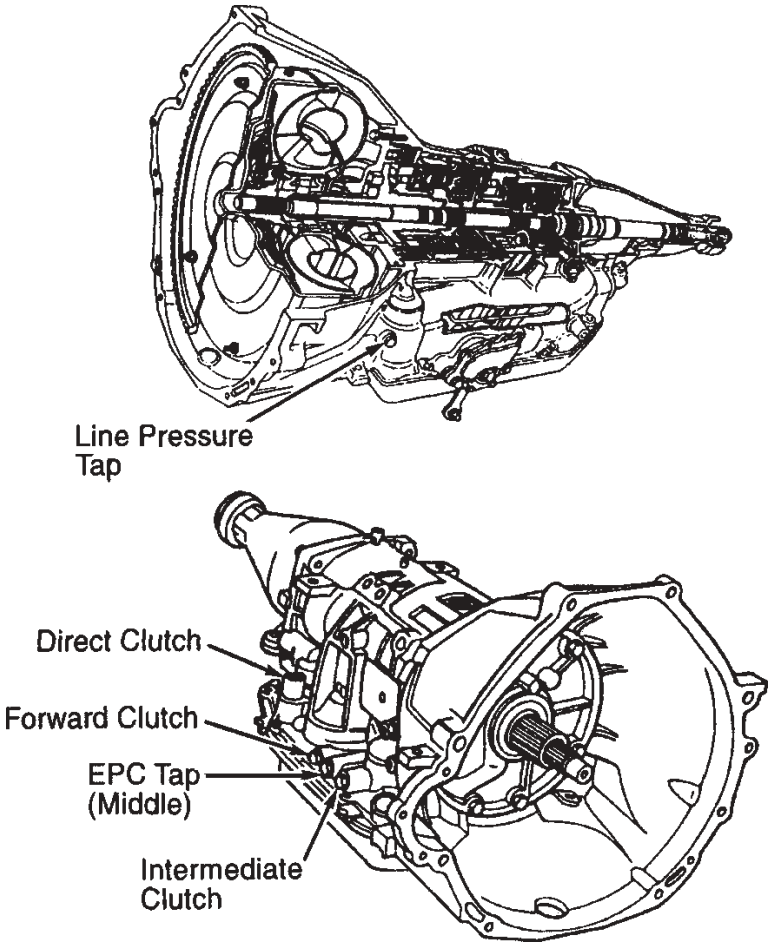
AODE/4R70W

Neutrals While Taking Off From a Stop

Concern: Typically described as during heavy acceleration from a stop the transmission neutralizes, but additional symptoms may be present. In 1st, 2nd or 3rd gear in the O/D position during heavy acceleration the transmission neutralizing may also accompany this concern.

Common Cause: The 3/4 shift valve strokes cutting off the forward clutch. Restricted solenoids being the most common concern are the focus of our attention, but keep in mind that it is the flooding of the solenoids that causes the neutralization so anything that can cause a solenoid to flood is also of concern.

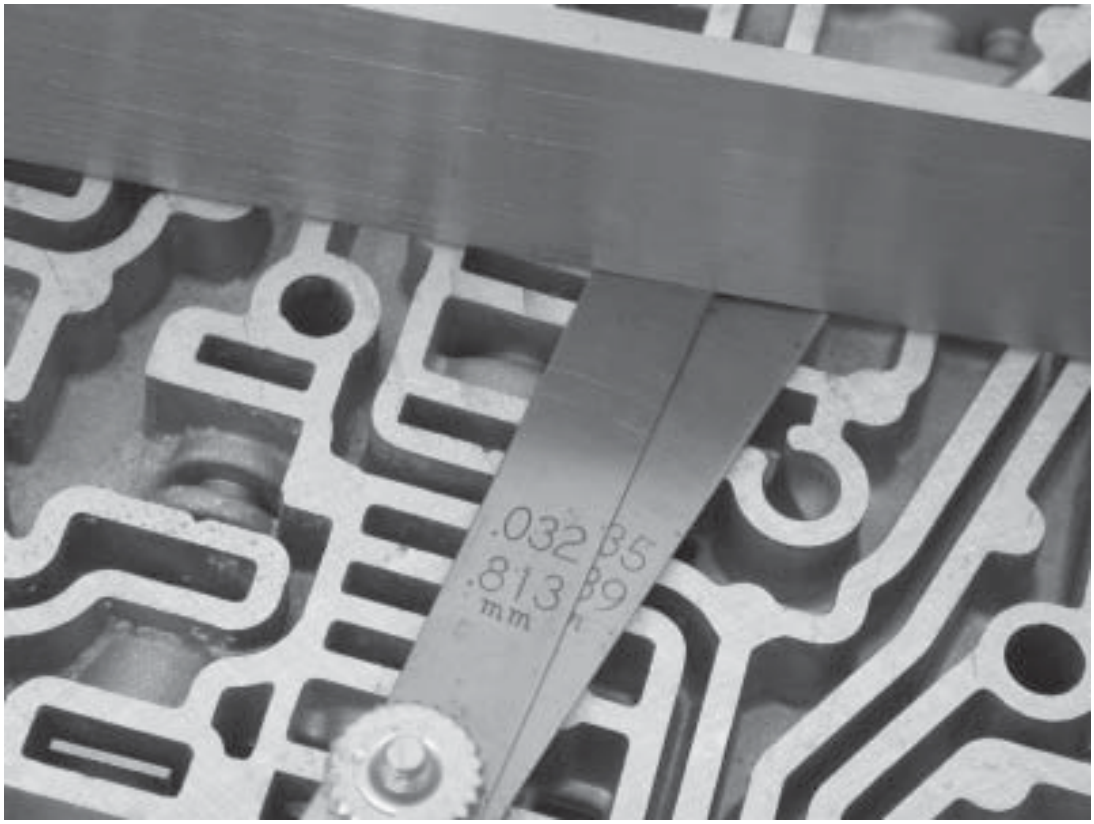
Testing & Repair: Install a gauge on the forward clutch pressure tap. When the neutralization occurs, if the gauge reads at or near 0psi, replace the shift solenoids and inspect the solenoid pressure regulator valve and bore for wear.



AODE/4R70W

Neutrals Taking Off From a Stop (continued)

Valve Body Warping



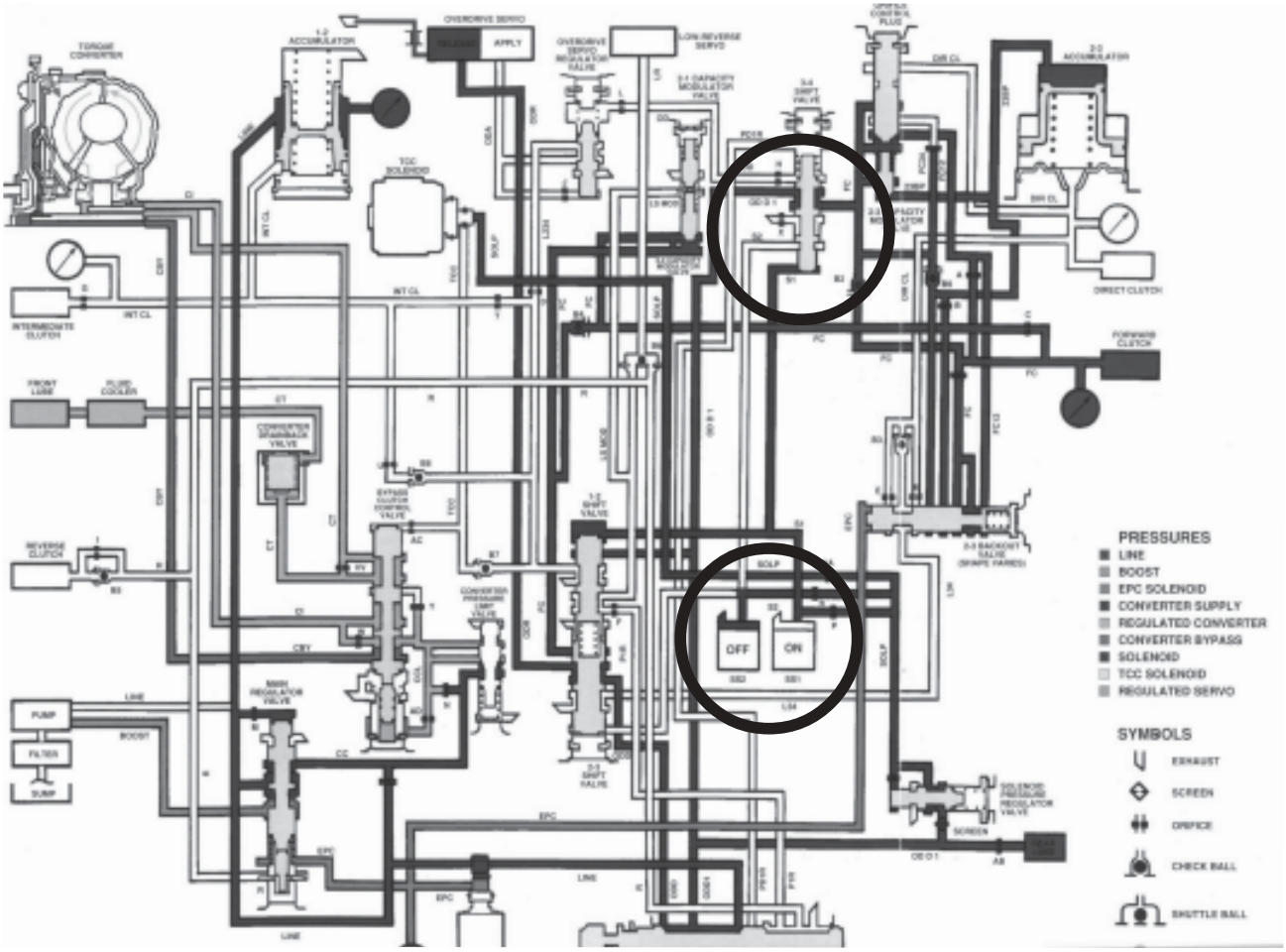
Note: Measurements should not exceed more than .005" clearance.

AODE/4R70W

Neutrals Taking Off From a Stop (continued)

Electrical Components

There is no direct command for a neutral condition with the manual valve in the drive position. However incorrect inputs to the processor may cause high pressure concerns that will in turn flood the shift solenoids circuit causing a neutral condition.

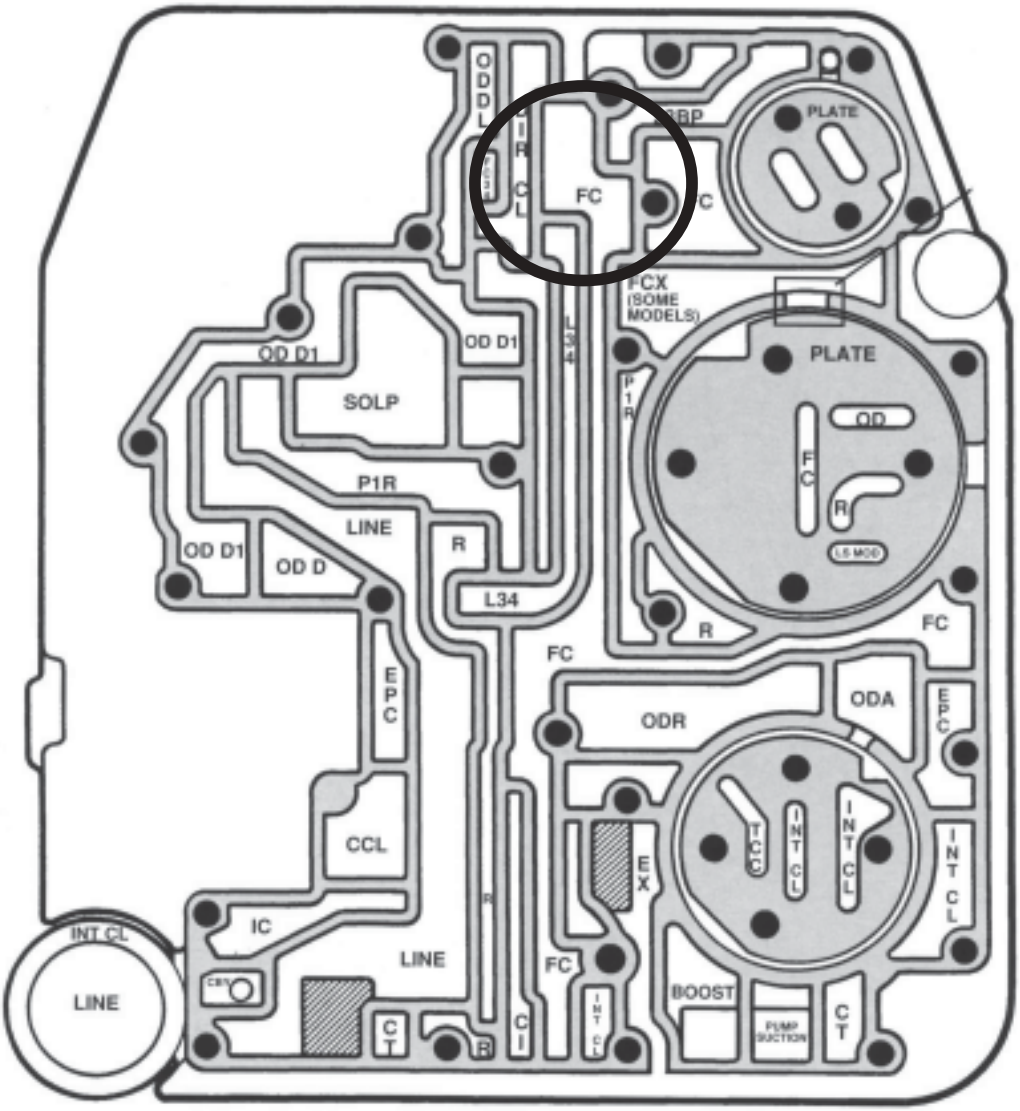


AODE/4R70W

Neutrals Taking Off From a Stop (continued)

Case Warping

Note: FC = Forward Clutch

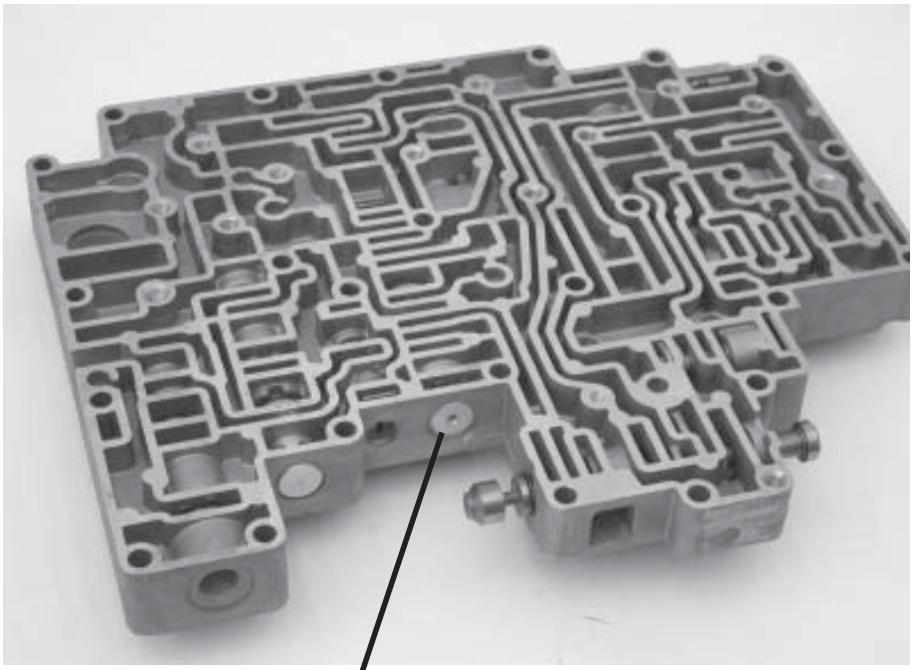


AODE/4R70W

Neutrals during the 3/4 shift

Concern: During a 3/4 shift or just accelerating in 4th the transmission neutralizes. No codes present and the correct commands are being sent to the transmission.

Common Cause: 2/3 shift valve end plug leaking. This leak causes the direct clutch to be cut off due to the amount of solenoid oil pressure required to keep both the 3/4 shift valve and the 2/3 shift valve in the stroked position. Because the 2/3 shift valve has only one area for solenoid pressure to pin the valve verses two for the 3/4 shift valve it is more likely to be susceptible to the leak.



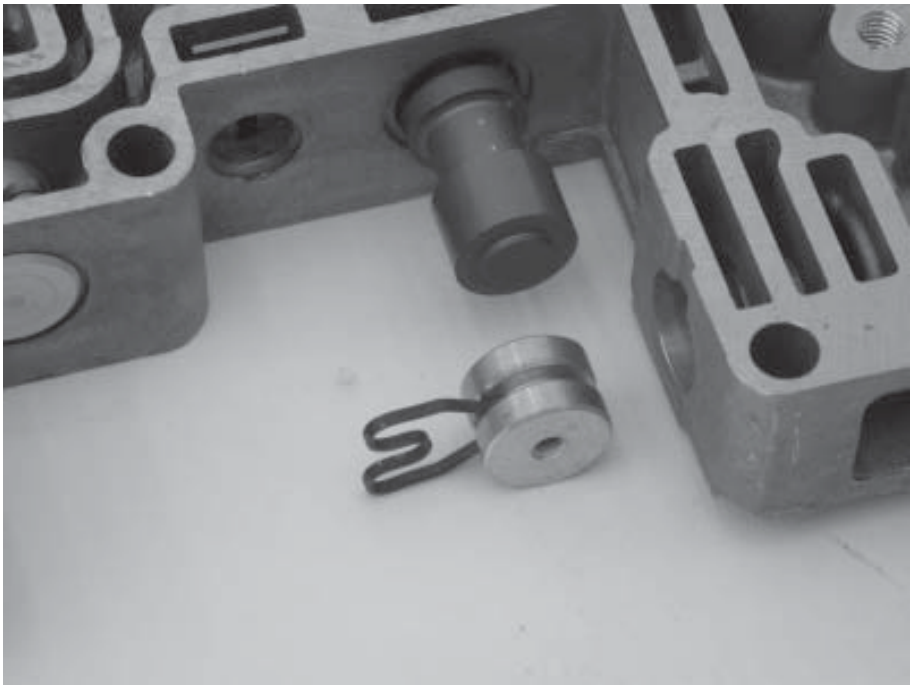
2-3 shift valve end plug

4R70W

Neutrals on the 3-4 Shift (continued)

Testing & Repair: Install a pressure gauge on the direct clutch tap. When the transmission neutralizes if the gauge shows little or no pressure, then remove the 2/3 shift valve end plug and run a tubing cutter around the outside diameter to seal the leak.

NOTE: While performing this repair also check the 2/3 shift and solenoid pressure regulator valves and bores for wear.



E4OD/4R100

Separator Plate and Valve Body Matching

Between 1989 and 2002 there have been a number of different changes in separator plates, gaskets and valve bodies. The chart indicates the relationship between separator plates and valve bodies.

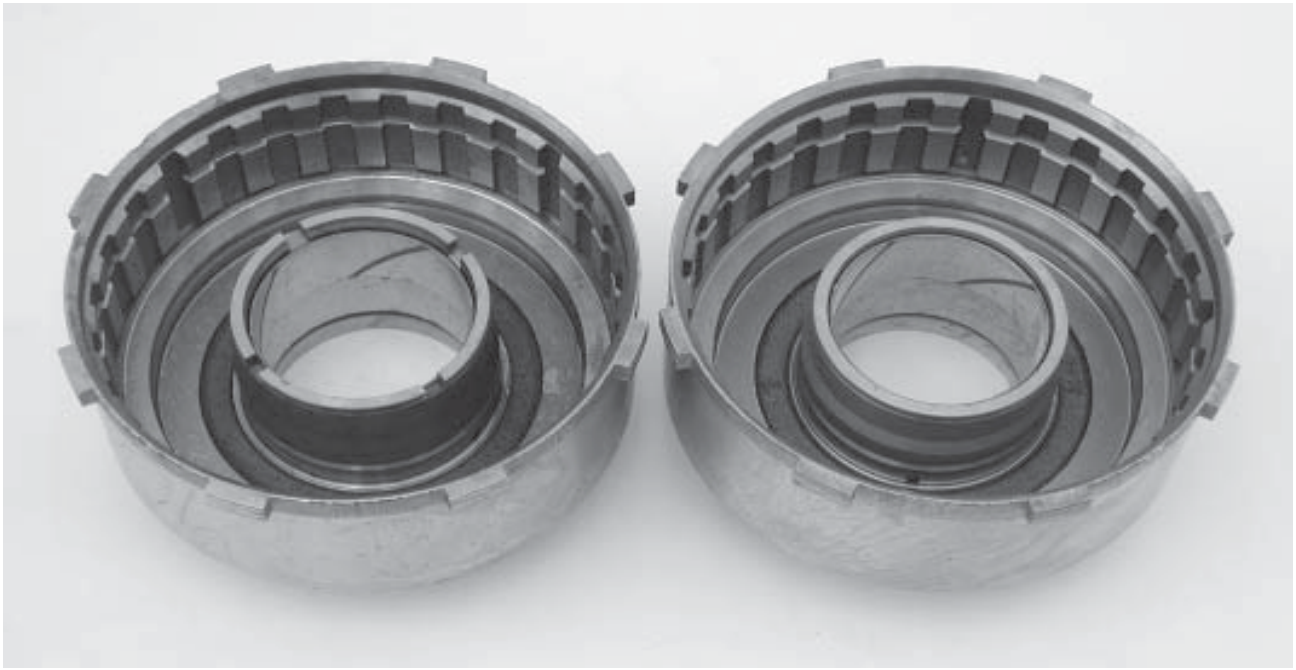
YEAR	ENGINE	V/B	SEP PLATE
1989	7.3/7.5/5.8	E9TZ-A E9TZ-B	E9TZ-A
1990-95	4.9/5.0/5.8/7.3/7.5	F0TZ-J F3TZ-G	F4TZ-A
1990-95	4.9/5.0/5.8/7.3/7.5	F5TZ-A F3TZ-G	F5TZ-A
1990-95	4.9/5.0/5.8/7.3/7.5	F6TZ-D F6TZ-A*	F6TZ-B*
1990-95	4.9/5.0/5.8/7.3/7.5	F6TZ-B F6TZ-A*	F5TZ-B*
1996	4.9/5.0/5.8/7.3/7.5	F6TZ-D F6TZ-A	F6TZ-B
		F6TZ-C	F7TZ-AA
1997	6.8	F6TZ-C	F7UZ-AA
		F6TC-C	F8UZ-CA
		F6TC-C	F81Z-EA
	4.2/4.6/5.4/7.3	F6TZ-C	F7TZ-AA
1998	6.8/7.3 4R100	F81Z-AA NON-PTO	F8UZ-AA
E4OD	6.8	F81Z-AA	F8UZ-BA
1998-2000	4.2/4.6/5.4	F6TZ-C	F7TZ-AA
2000-2001	H/J/L/M/K	F81Z-BA PTO	F81Z-BA
1999-2001	A/B/C/D/E/F	F81Z-AA NON-PTO	F81Z-DA

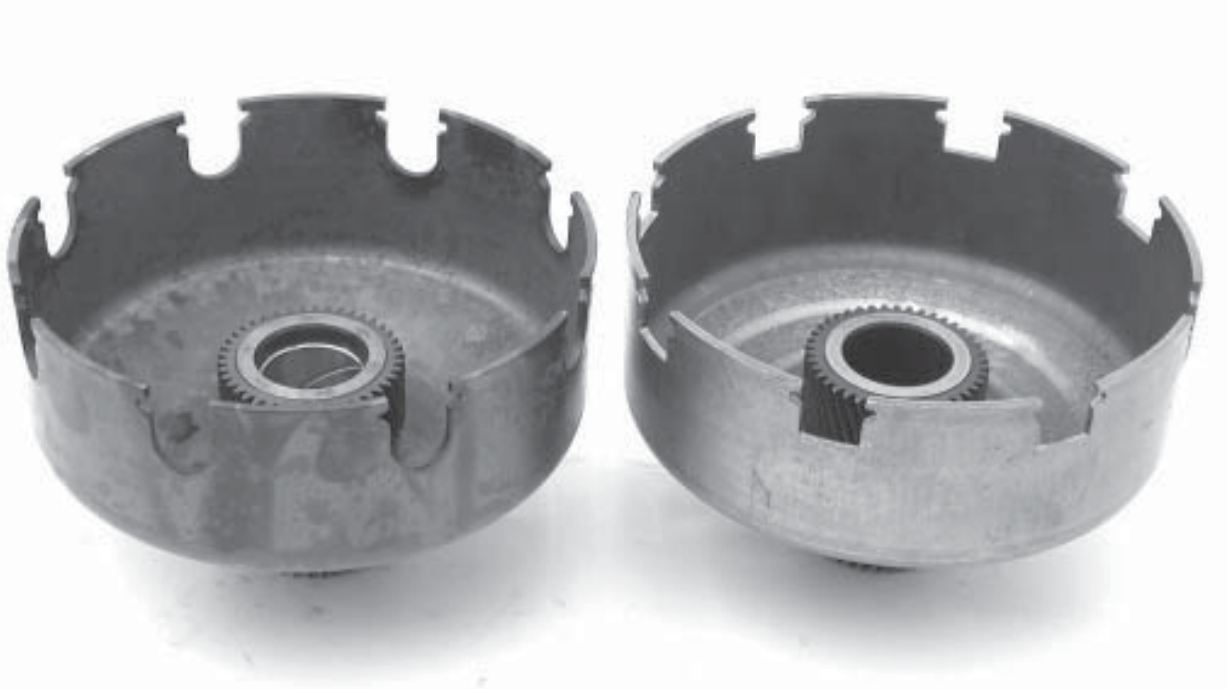
***Replacement valve body as an assembly only**

4R100

#8 Thrust Washer Removed

The new designed Direct Drum does not use the #8 thrust washer. There is no longer a loading of the forward clutch drum on the direct clutch drum. The Sun Shell was also replaced to accommodate this change. It now the supporting element for the Direct Drum.





4R100

Squawking Noise in Reverse, While Backing up a Hill

Concern: 1999 F250 Heavy Duty and Super Duty F-series trucks with 5.4L or 6.8L gas engines.

Common Cause: This condition is often due to low line rise. The computer command for line rise isn't adequate for the conditions.

Repair: Ford has issued an update computer calibration. Use the transmission tag number and calibration number to determine whether the truck requires this update.

Notice the drum flared at the top.

Ford Computer Calibration Update		
Application	**Transmission ID Tag**	**Calibration Number**
5.4L 49 State	MER	9 VZA-AF
5.4L CA	NUY	9 VZA-BJ
6.8L 49 State	YHH	9 WAA-AA
	AEO	9 WAA-AC
	BIH	9 WAA-AF
	DOZ	9 WAA-AH
	MCM	9 WAA-AI
6.8L CA	EAP	9 WAA-BC
	FOT	9 WAA-BD
	JUR	9 WAA-BL
	JTY	9 WAA-BV
	MFG	9 WAA-BY
	NRR	9 WAA-BZ

4R100

Squawking Noise in Reverse, While Backing up a Hill (continued)

The Low/Reverse clutch assembly can be replaced with E4OD parts. These parts include:

- Low one-way roller clutch.
- Reverse hub assembly.
- Inner race assembly.
- Low/Reverse clutch return spring.
- Reverse ring gear and hub.
- Reverse Planetary assembly.
- Clutches and steel plates

4R100

Solenoid Pack Update

In January 1998 diesel applications were changed to Pulse Width Modulated (PWM) Torque Converter Clutches from On/Off operation. The remaining Gas applications with 4R100 became modulated in the 1999 new model introduction.

A filter was added to the Solenoid bodies with PWM. These filters were installed to help keep the TCC solenoid from being contaminated.

Identifying Solenoid Bodies:

First Design

- The first design PWM solenoid body has a NATURAL top cover.
  Note: This solenoid body does not have a TCC screen!

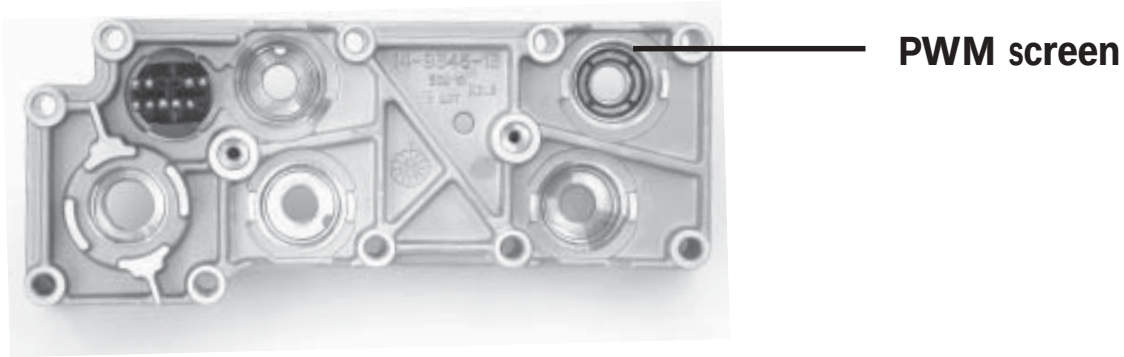
Second Design

- The second design PWM solenoid body has a GREEN top cover and a screen for the PWM circuit. However, this solenoid body caused a 2-3 and 3-4 shift flare with marginal fluid capacity at the PWM solenoid. The PWM solenoid and PCM calibration had to be updated.
  Note: This change resulted in the third design replacement solenoid body! (Do not use the second design solenoid body)

Third Design

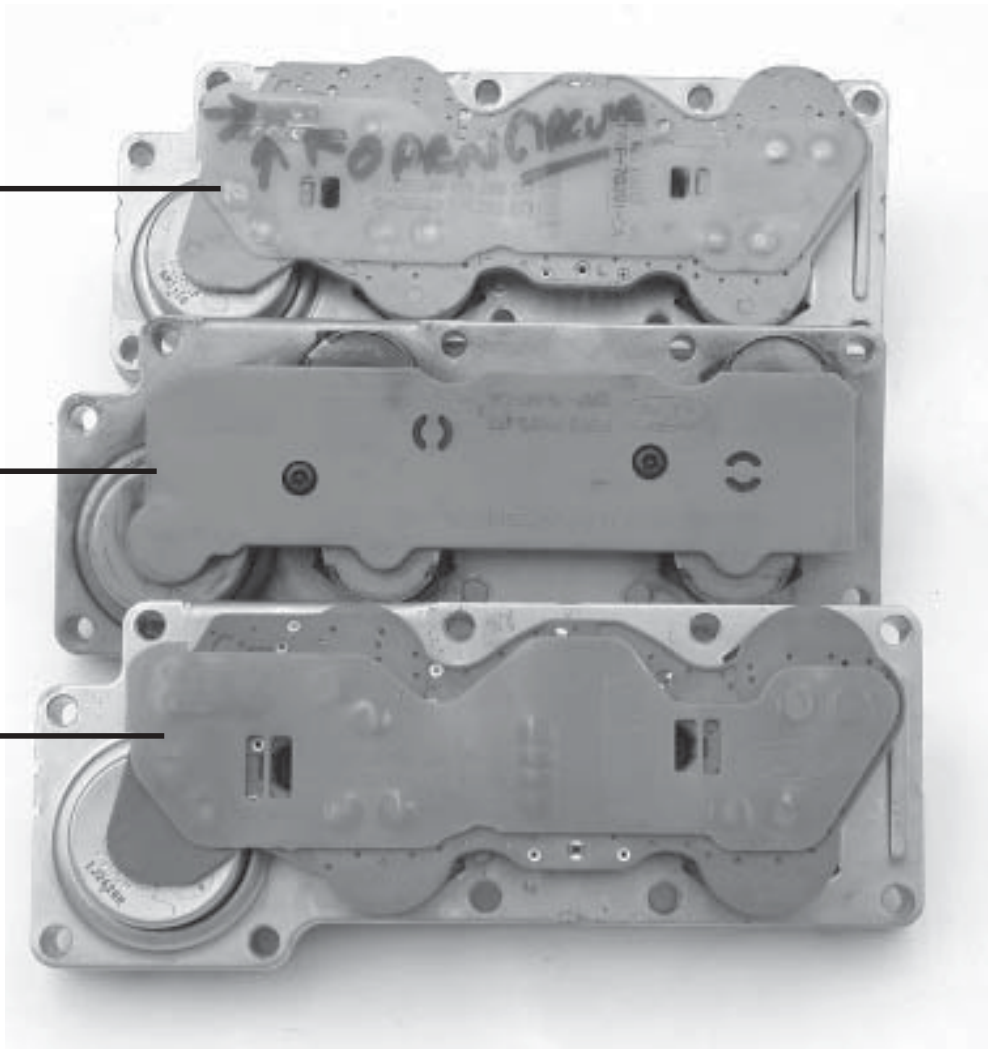
- The third design replacement solenoid body has an Orange top cover.
  Note: This solenoid body has a screen!

This screen is not serviceable. When replacements are necessary it will be necessary to replace the solenoid body assembly.



4R100

Solenoid Pack Update (continued)



4R100

Rattle Noise from Converter Area

1998-2000 Econoline
1999-2000 Superduty F-Series
7.3L engine and 4R100 transmission
PWM (Only)

Concern: Rattle noise coming from the converter area when the converter is ***not*** engaged.

Common Cause: The impact between the outer lugs at the converter piston and the cover. To confirm this problem you can command the torque converter on from the computer or test it at the transmission.

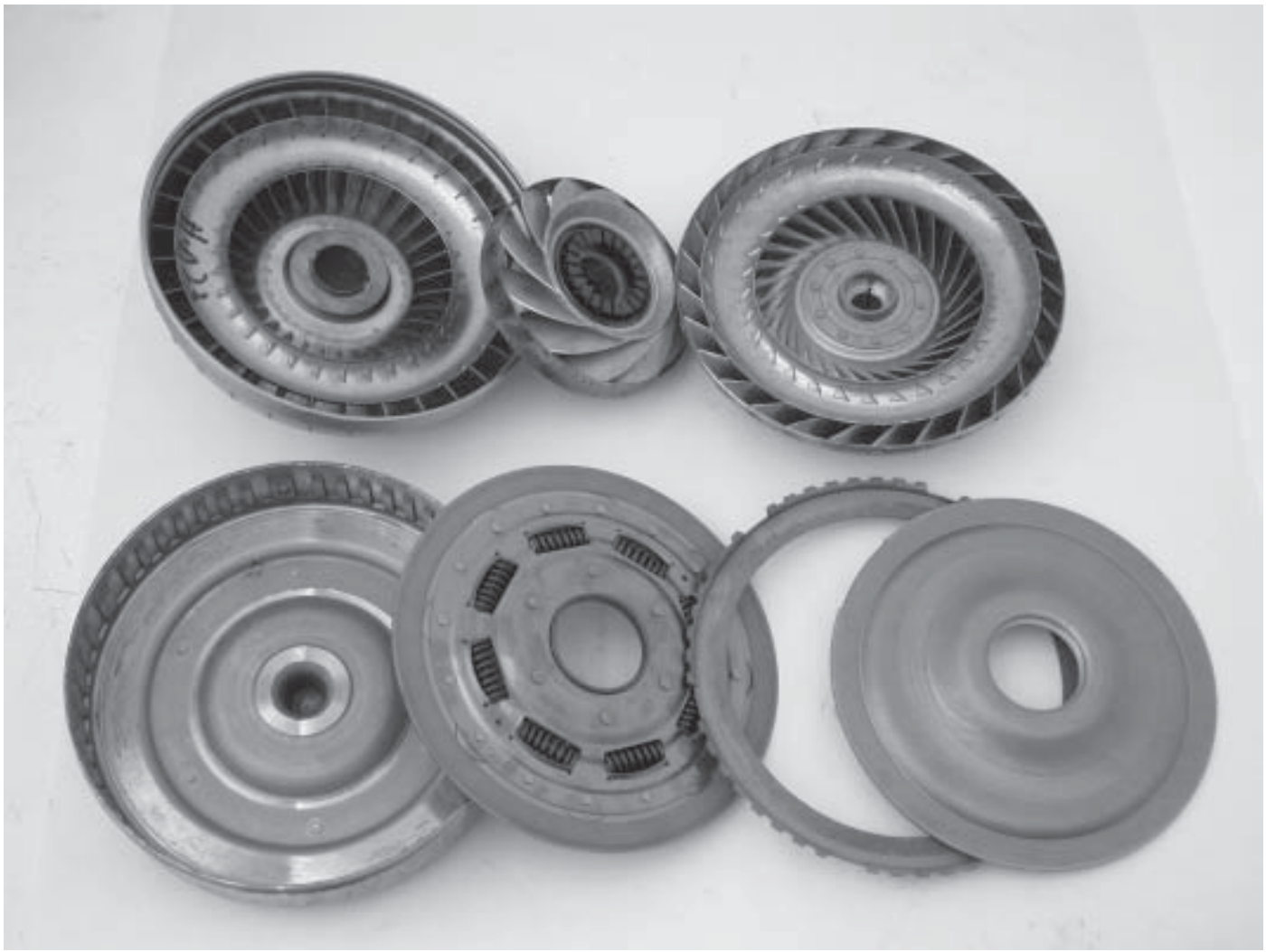
1. Ground PIN #54 at the computer to fully apply the converter clutch.
2. Cycle the converter ON and OFF a few times by applying and removing the ground from pin #54.
3. If the noise goes away when the converter is applied, replace the torque converter.

4R100

Rattle Noise from Converter Area (continued)

Repair: Replace Torque Converter with Part# XL3Z-7902-DARM

New Converter

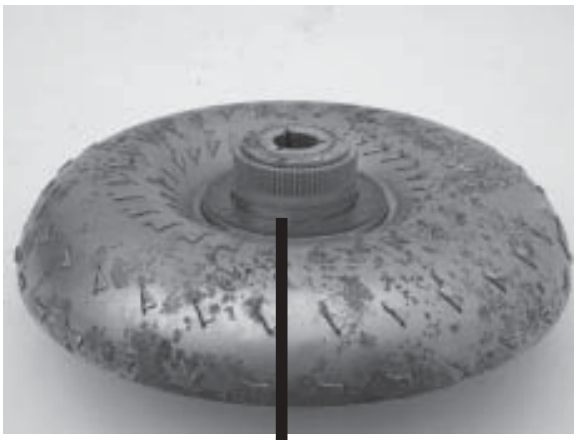


NOTE: Replacement converter comes with a two piece apply piston

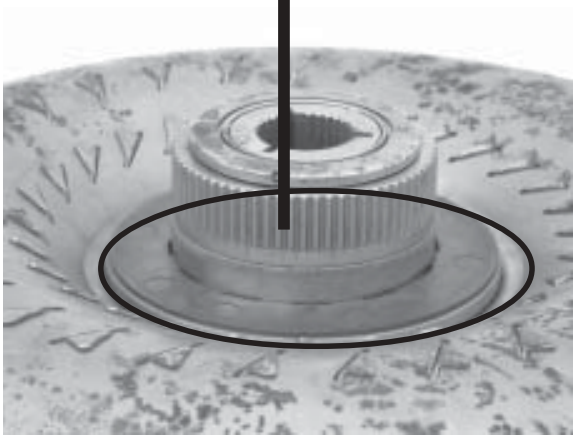
4R100

Rattle Noise from Converter Area (continued)

Old

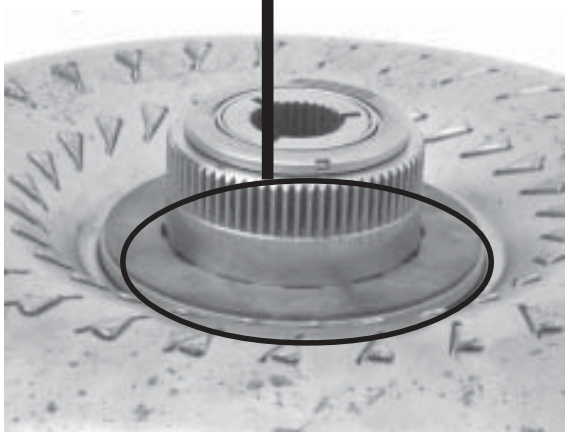


With sealing ring on turbine hub



New

Without sealing ring on turbine hub



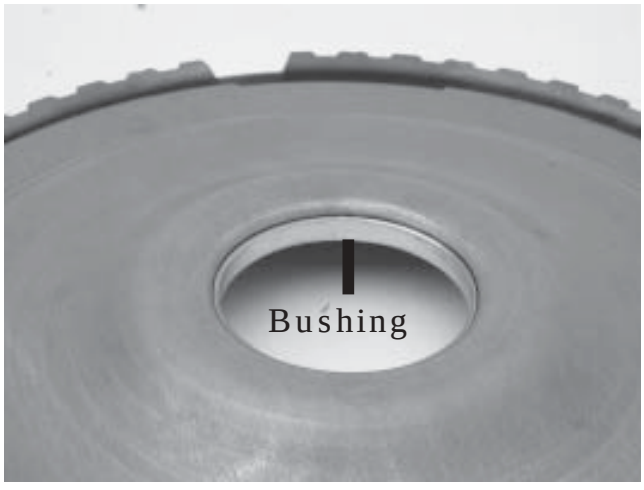
4R100

Rattle Noise from Converter Area (continued)

New converter has a two piece apply piston.

Old

New



4R100

Shift Solenoid Failures

Solenoid Operation and Failure Charts

Shift solenoid operation is the first step in diagnosing shift timing concerns. The following shift solenoid operation and failure charts will help to quickly diagnose common problems such as wrong gear starts, skipping gears and irregular shift patterns.

Operation of the Power Take Off PTO will be affected by shift solenoid B (SSB) failure. If the vehicle is equipped with a PTO it must be turned off during diagnosis. On-Board Diagnostic is not accessible when the PTO unit is in operation. SSB must be on and working correctly for the PTO to operate properly.

SOLENOID OPERATION CHART

TRANSMISSION RANGE SELECTOR LEVER POSITION	PCM COMMAND GEAR	SSA	SSB	TCC	CCS
P/R/N	1	ON	OFF	OFF	OFF
D	1	ON	OFF	*	*
D	2	ON	ON	*	*
D	3	OFF	ON	*	*
D	4	OFF	OFF	*	OFF
D	FIRST THROUGH THIRD GEAR ONLY, SSA, SSB, TCC, SAME AS OVERDRIVE, CCS ALWAYS ON				
CANCEL					
MANUAL 2	2	*	*	*	ON
MANUAL 1	2	OFF	OFF	OFF	ON
MANUAL 1	1	ON	OFF	OFF	ON
* PCM Controlled					

4R100

Shift Solenoid Failures (continued)

Solenoid Operation and Failure Charts

SSA ALWAYS OFF			
PCM GEAR COMMANDE	GEAR LEVER POSITION		
	D	2	1
	ACTUAL GEAR OBTAINED		
1	4	2	1
2	3	2	2
3	3	2	2
4	4	2	2

SSA ALWAYS ON			
PCM GEAR COMMANDE	GEAR LEVER POSITION		
	D	2	1
	ACTUAL GEAR OBTAINED		
1	1	2	1
2	2	2	1
3	2	2	1
4	1	2	1

SSB ALWAYS OFF			
PCM GEAR COMMANDE	GEAR LEVER POSITION		
	D	2	1
	ACTUAL GEAR OBTAINED		
1	1	2	1
2	1	2	1
3	4	2	2
4	4	2	2

SSB ALWAYS ON			
PCM GEAR COMMANDE	GEAR LEVER POSITION		
	D	2	1
	ACTUAL GEAR OBTAINED		
1	2	2	1
2	2	2	1
3	3	2	2
4	3	2	2