GENERAL DESCRIPTION

The AODE transmission is a four speed, rear wheel drive, automatic overdrive, which is totally electronic controlled and was first introduced in model year 1992. This unit also has the standard four-element lock-up torque converter. It contains the standard three elements (impeller, turbine and stator) for transmitting and multiplication of engine torque, plus a torque converter clutch for increased fuel economy in 3rd and 4th gears.

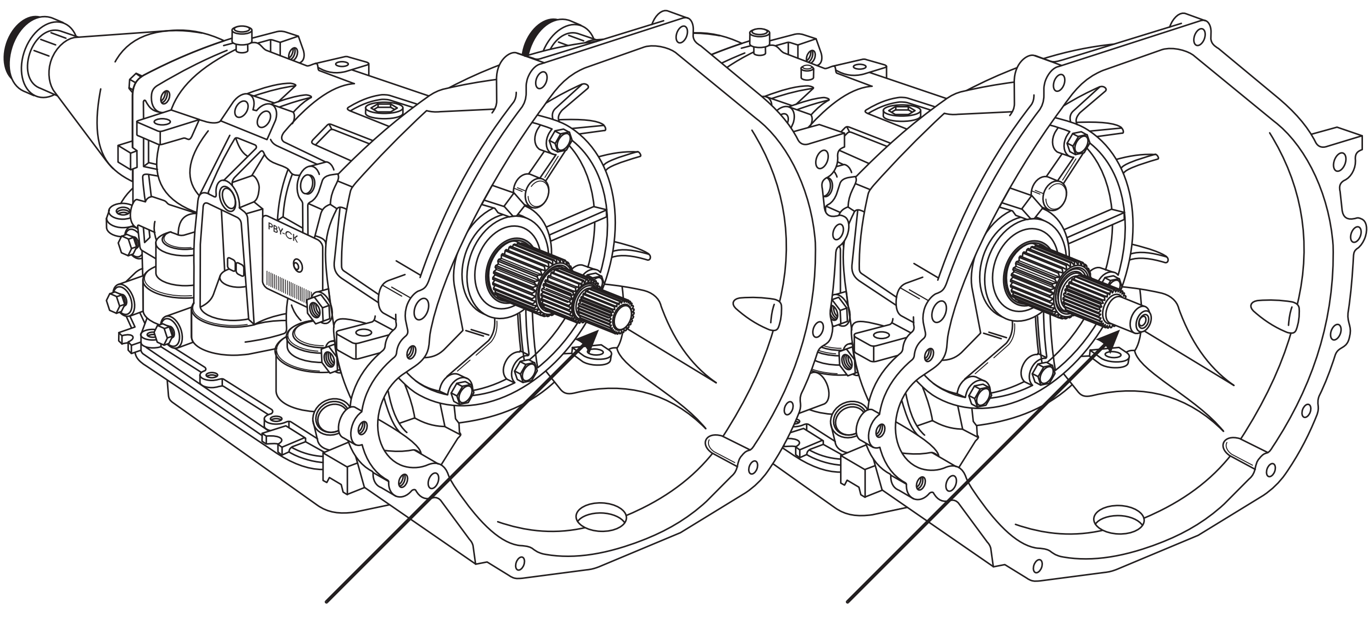
In its general appearance, the AODE transmission very closely resembles the hydraulically controlled AOD unit. However, the AODE is equipped with two splined shafts at the front of the unit, where the AOD is equipped with three, as shown in Figure 1. This would be a quick way to identify these units.

ELECTRONIC COMPONENTS

Shift timing, shift feel (line pressure) and converter clutch control in the AODE transmission are all controlled electronically by the EEC-IV processor and its input/output network. Transmission control is seperate from the engine control strategy in the EEC-IV processor, although some of the input signals are shared.

Some input signals come from engine related sensors such as, the mass air-flow (MAF) sensor, engine coolant temp (ECT) sensor that gives the processor information about engine load and climate the engine is operating under. Some other inputs are based on operator inputs, such as accelerator pedal position which is relayed to the processor by the throttle position sensor (TPS). The manual lever position sensor (MLPS) tells the processor which position has been selected by the operator with the manual shift lever. Still other inputs are relayed from the transmission, such as the output speed sensor (OSS) and the transmission oil temperature (TOT) sensor.

Using all of these input signals the processor can determine when the proper time and conditions are right for a shift or TCC application. The processor can also determine line pressure needed to optimize shift feel. To accomplish these functions, the processor controls 4 electronic solenoids, two ON/OFF solenoids for shifting, one PWM solenoid for TCC control, and one electronic pressure control (EPC) solenoid for line pressure control.



The AOD transmission has three splined shafts with 1 removeable.

The AODE transmission has two splined shafts with 0 removeable.

Figure 1

FORD AODE

NO UPSHIFT

COMPLAINT: Since the hydraulically controlled AOD transmission and the electronically controlled AODE transmission planetary gears were the same ratios, the first thing to happen was interchange of parts which is okay to do, ***except*** for the internal ring gear. The internal ring gear for the AODE transmission ***must*** have the holes in the ring gear, to trigger the output shaft speed sensor, as shown in Figure 8.

CAUSE: The cause may be, AOD internal ring gear that has no holes to trigger the output speed sensor has been installed by mistake.

CORRECTION: Install the AODE internal ring gear with the holes to trigger the output speed sensor, as shown in Figure 8.

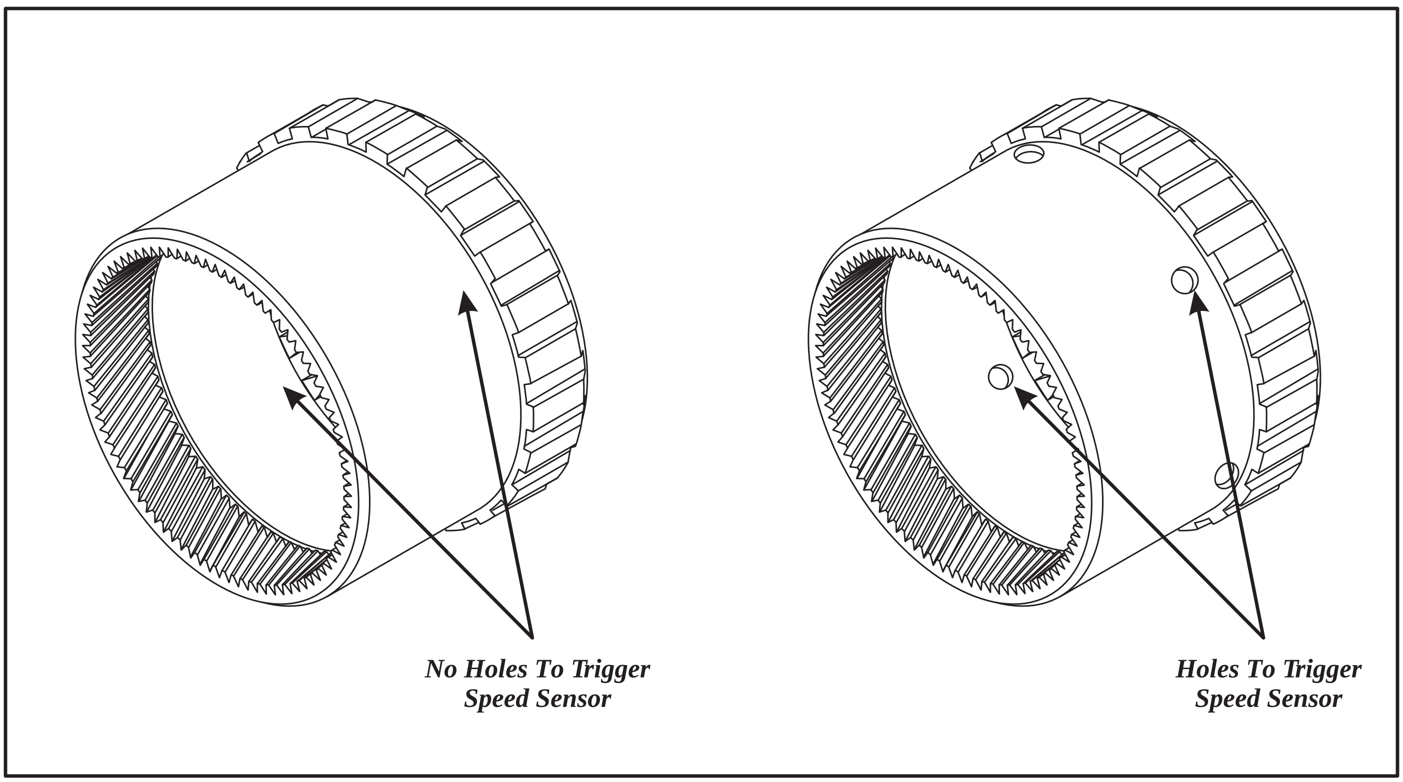
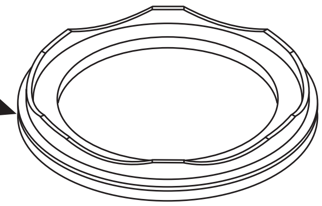


Figure 8

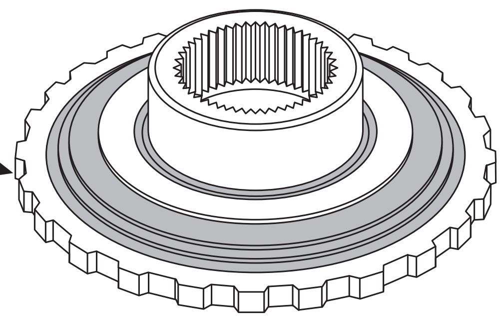
FORD AOD-E
OUTPUT SHAFT RING GEAR SUPPORT AND
REAR CASE BEARING IDENTIFICATION

TWO PIECE "OPEN"
REAR CASE BEARING
.113" THICKNESS
PART NO, EOAZ-7F242-A



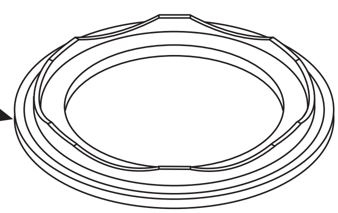
DIFFERENT PROFILE ON SUPPORT
AND WILL NOT INTERCHANGE

RING GEAR SUPPORT
PART NO. F4AZ-7D164-A



FORD 4R70W
OUTPUT SHAFT RING GEAR SUPPORT AND
REAR CASE BEARING IDENTIFICATION

THREE PIECE "CLOSED"
REAR CASE BEARING
.144" THICKNESS
PART NO, F3LY-7F242-A



DIFFERENT PROFILE ON SUPPORT
AND WILL NOT INTERCHANGE

RING GEAR SUPPORT
PART NO. F3LY-7D164-B

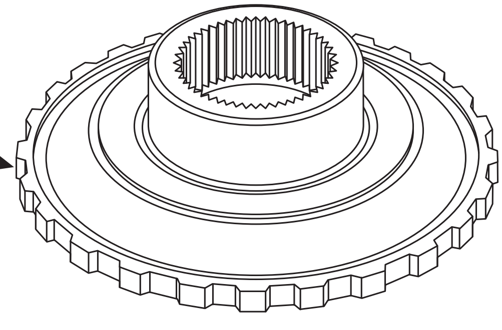


Figure 9

FORD 4R70W

3-NEUTRAL SHIFT AND FORWARD CLUTCHES BURNT

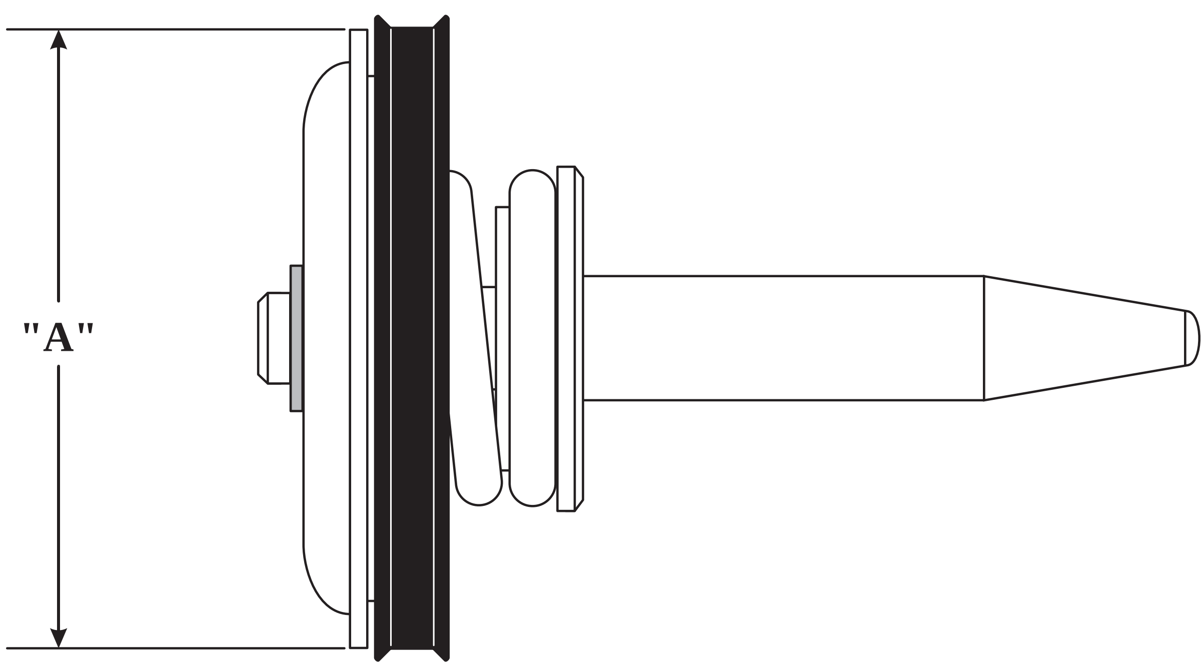
COMPLAINT: After overhaul, the 4R70W transmission displays a 3-neutral upshift and when the unit is disassembled, you find the forward clutches burnt.

CAUSE: The cause may be, a mis-assembled Overdrive Servo Assembly, with the "Rubber Coated Sleeve" omitted. The 4R70W transmission is calabrated with a smaller diameter overdrive servo piston than is the AOD-E transmission. To retain a common case between the two transmissions, an additional "Rubber Coated Sleeve" is required on the 4R70W Overdrive Servo Assembly, as shown in Figure 19.

CORRECTION: Install the "Rubber Coated Sleeve" in the Overdrive Servo Assembly case bore, as shown in Figure 19. If your rubber coated sleeve is missing or lost, you ***must*** purchase the complete Overdrive Servo Assembly, available under part number F3LY-7H188-A. It is not available individually.
Overdrive servo piston dimensions are shown in Figure 18, to identify the two different overdrive servo pistons.

SERVICE INFORMATION:

4R70W Overdrive Servo Piston Assembly (Includes Sleeve) F3LY-7H188-A
AOD-E Overdrive Servo Piston Assembly F2VY-7H188-A



4R70W PISTON, DIMENSION "A" = 2.470"
AOD-E PISTON, DIMENSION "A" = 2.680"

Figure 18

FORD AOD-E/4R70W
EPC SOLENOID AND RETAINER CHANGES

CHANGE: The Electronic Pressure Control (EPC) solenoid changed at the start of production for all 1993 models of the AOD-E/4R70W transmissions, and care must be taken to use the proper EPC solenoid retainer (See Figure 26).

REASON: Improved line pressure control.

PARTS AFFECTED:

(1) EPC SOLENOID - The external dimensions on the solenoid changed in the area where the retainer goes over the solenoid to hold it into the case, in addition to internal changes to improve durability. The previous design solenoid is no longer available. Refer to Figure 26, which shows you the current EPC Solenoid F3AZ-7G383-A, which comes with the retainer for 1992-1995 model transmissions.

(2) EPC SOLENOID RETAINER - Changed in 1993 to accommodate the new design solenoid, and must be used with the new design solenoid on 1992 models (See Figure 26).
The EPC Solenoid retainer changed again in 1996, and was made 1/16" ***shorter,*** to accommodate a thinner valve body plate, and must be used on 96 models with the thinner plate (See Figure 26).

INTERCHANGEABILITY:

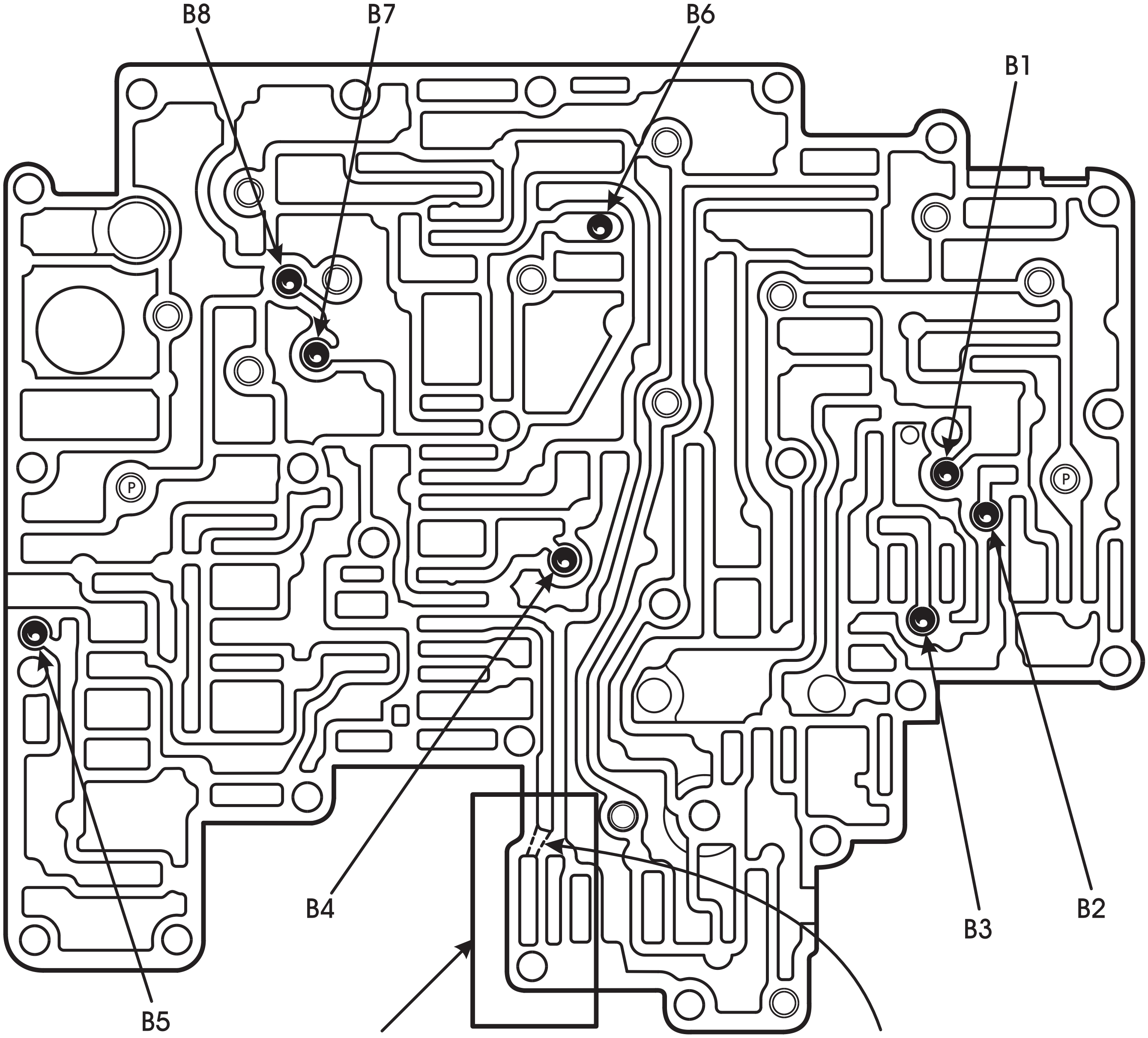
(1) When the EPC Solenoid is replaced, the 2nd design solenoid is the ***only*** one available, and comes with the proper retainer which ***must*** be used on 1992-1995 models (See Figure 26). The new design solenoid will retro-fit to 1992 models.

(2) The only retainer that can be used on 1996 models is the one that is 1/16" shorter to accommodate the thinner valve body plate that was used in 1996 (See Figure 26).

SERVICE INFORMATION:

EPC Solenoid, 2nd Design (Includes F3AZ-7H111-A Retainer) F3AZ-7G383-A
EPC Solenoid Retainer (1st Design) F2VY-7H111-A
EPC Solenoid Retainer (2nd Design) F3AZ-7H111-A
EPC Solenoid Retainer (3rd Design) F6AZ-7H111-A

1992-1995 AODE/4R70W CHECKBALL LOCATIONS



Passages In This Area May Vary In Shape On 1992-1995 Models

Some Models Have The OD D and OD Circuits Connected To Form One OD Circuit As Shown With The Dotted Lines.

B1 - Between the Forward Clutch circuit and the 23BP circuit (92-95 Only).
B2 - In the Forward Clutch circuit near the 3-4 shift valve.
B3 - In the Direct Clutch circuit near the 2-3 backout valve.
B4 - In the Overdrive and Forward Clutch circuits near the 1-2 shift valve.
B5 - In the Reverse circuit near orifice number one.
B6 - Shuttle ball between the Low and Reverse circuits.
B7 - Between the L234 and Torque Converter Clutch circuits.
B8 - Between the L234 and Intermediate Clutch circuits.

Figure 34

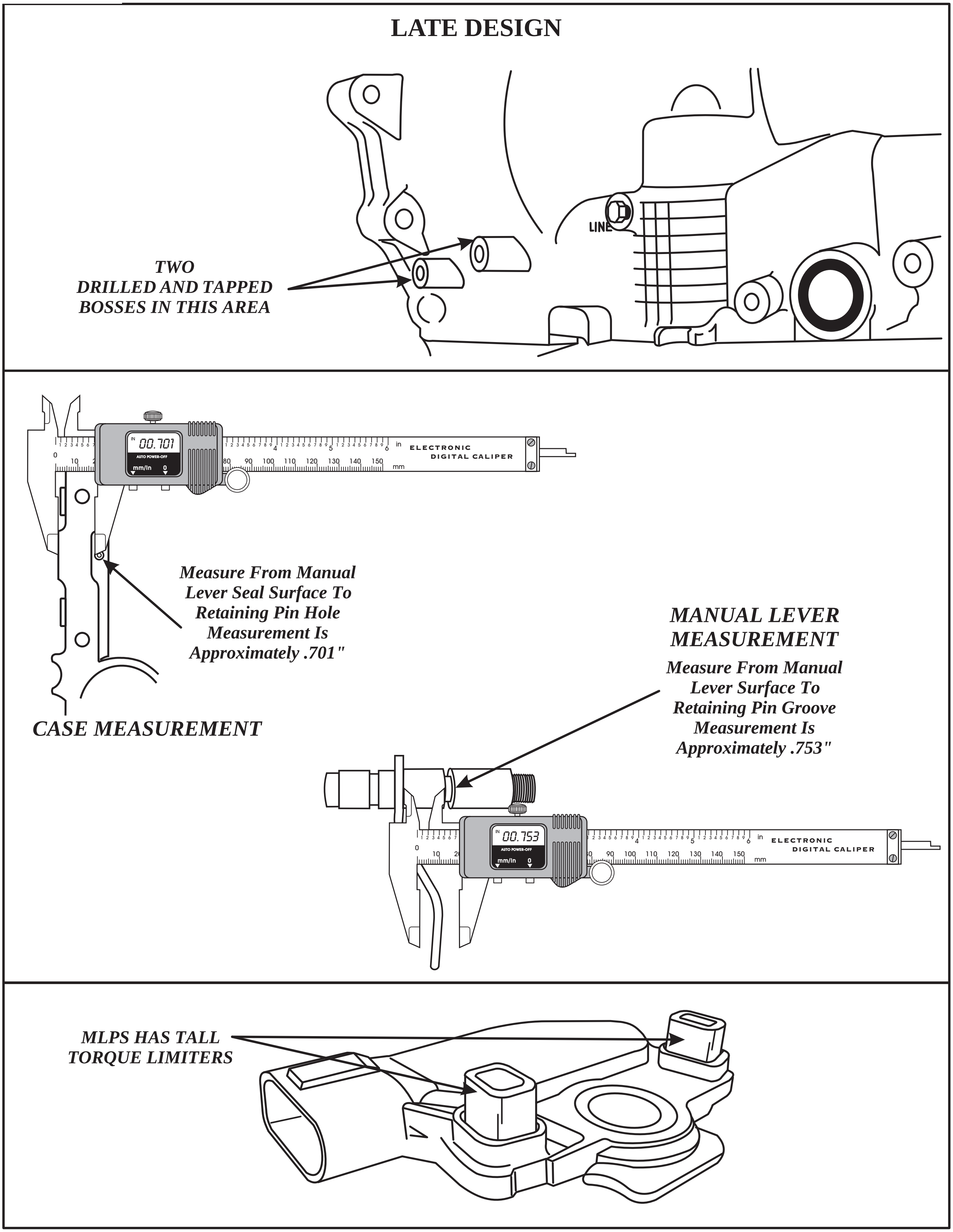
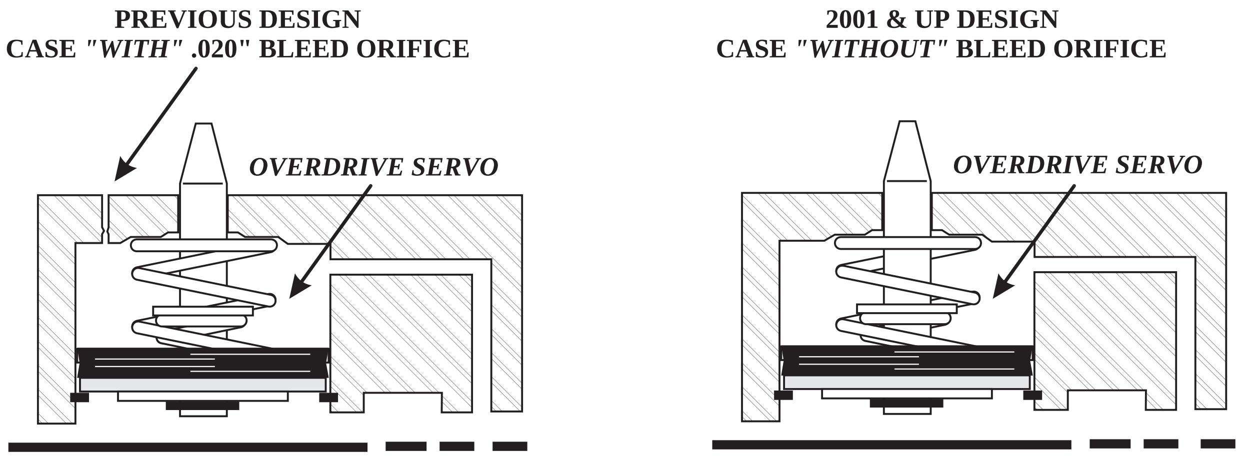

LATE DESIGN
TWO
DRILLED AND TAPPED
BOSSES IN THIS AREA
LINE
00.701
ELECTRONIC
DIGITAL CALIPER
Measure From Manual
Lever Seal Surface To
Retaining Pin Hole
Measurement Is
Approximately .701"
CASE MEASUREMENT
MANUAL LEVER
MEASUREMENT
Measure From Manual
Lever Surface To
Retaining Pin Groove
Measurement Is
Approximately .753"
00.753
ELECTRONIC
DIGITAL CALIPER
MLPS HAS TALL
TORQUE LIMITERS

Figure 45

CASE CHANGES



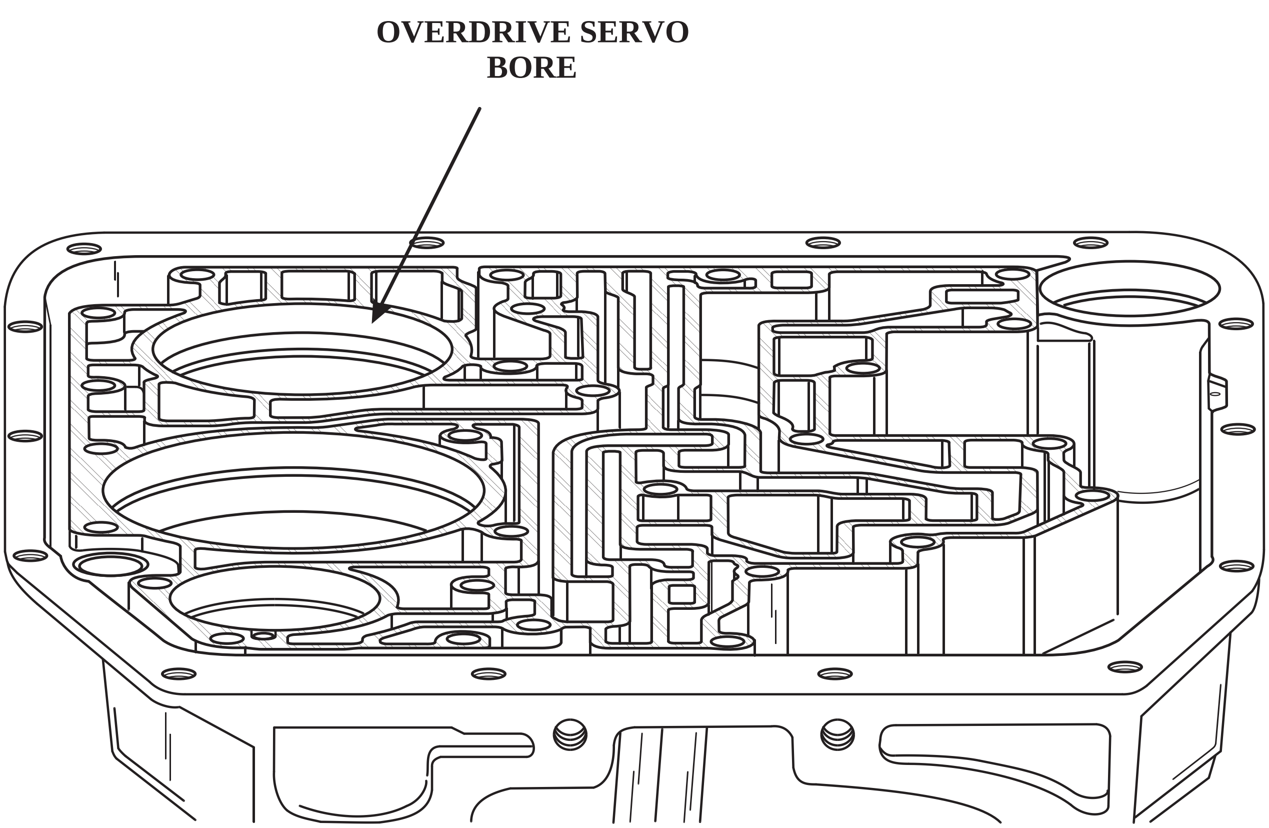


Figure 59

NEW DESIGN LEVEL RETURN SPRING AND INTERMEDIATE CLUTCH ASSEMBLY

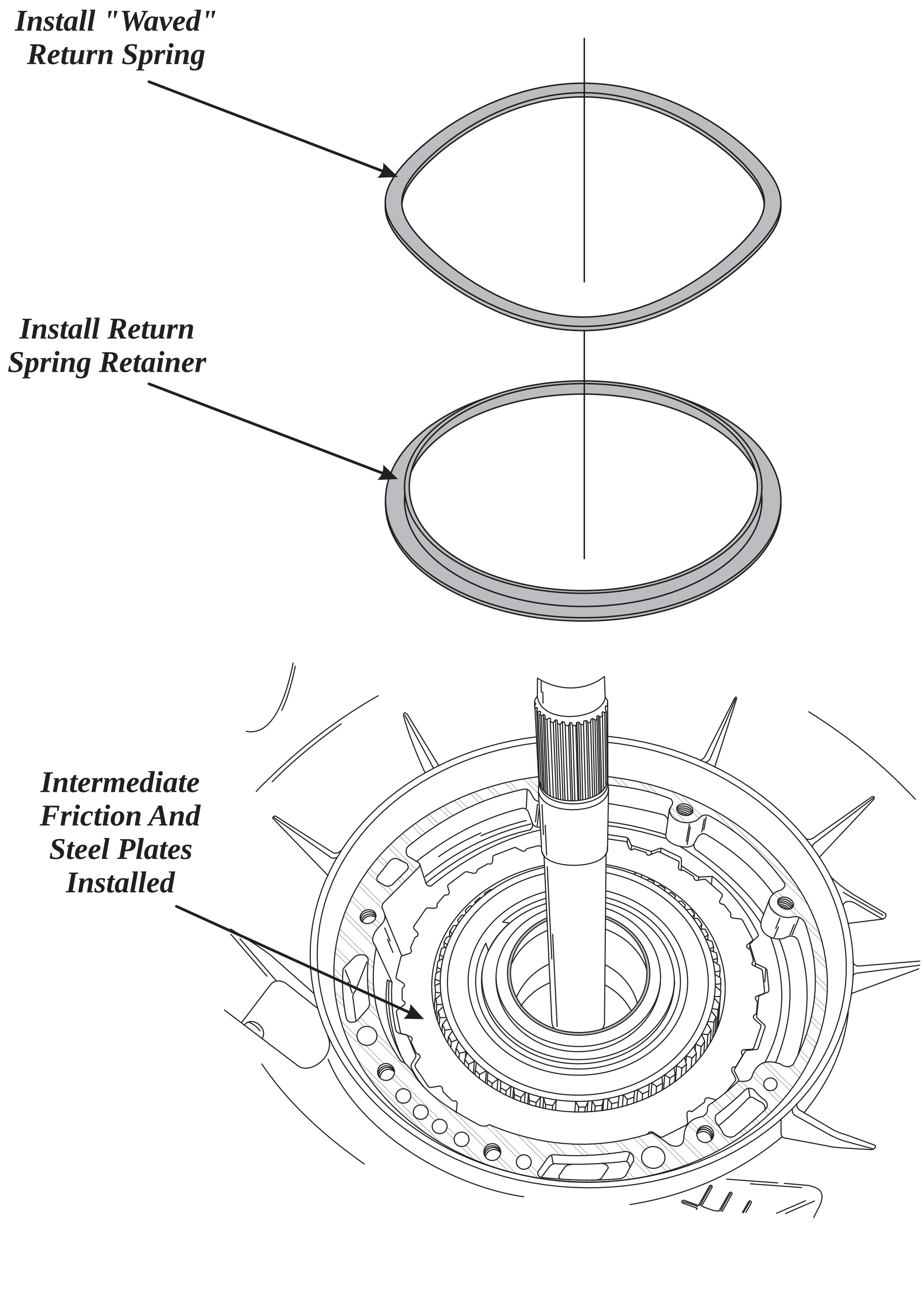


Figure 62

FORD AODE/4R70W/4R75E

LOSS OF EPC PRESSURE

COMPLAINT: The transmission is slipping in all gears as well as during shifts. When line pressure is checked, the gauge indicates little or no line rise. A check of EPC pressure reveals a near zero reading. EPC solenoid amperage is correct and replacement of the EPC solenoid did not cure the complaint.

The long term complaint may be premature failure of the forward clutch, if the loss of pressure was minimal at the time of overhaul. This would result in a small, but steady loss, of EPC pressure, and eventual failure.

CAUSE: EPC pressure is routed to the Pressure Regulator Valve along side of a circuit that Ford identifies as the Boost Circuit. These oil passages can be identified in both the valve body and the case as seen in Figure 75 and 76. This is illustrated by the hydraulic schematic shown in Figure 77. This circuit is routed back to the inlet side of the pump. When the Pressure Regulator Valve or its bore is worn, (See Figure 78), EPC pressure is allowed to be sucked away by pump suction, (See Figure 79 and 80), preventing any line pressure rise from occurring when the throttle is opened.

A quick test can be performed to verify if this condition exists. Remove the pan and filter. Blow compressed air into the TV pressure port in the case. It is normal to see some leakage around the EPC solenoid, but if you see ***any*** oil forced out of the filter neck bore by the air pressure, (Refer to Figure 81), ***PR valve and/or bore wear is the reason.***

CORRECTION: Always check the Pressure Regulator Valve and its bore for wear during the repair process. If it is worn use one of the repair kits that are available from Sonnax® to repair this condition, or, you must replace the valve body.

It is always a good idea to also check the revere boost valve sleeve for wear, as this is also a common wear item.

SERVICE INFORMATION:

Check with your local transmission supplier for the Sonnax® repair kit part numbers, as there are several different numbers, depending on model, make and year.

FORD 4R70W
2001-UP MAIN VALVE BODY EXPLODED VIEW

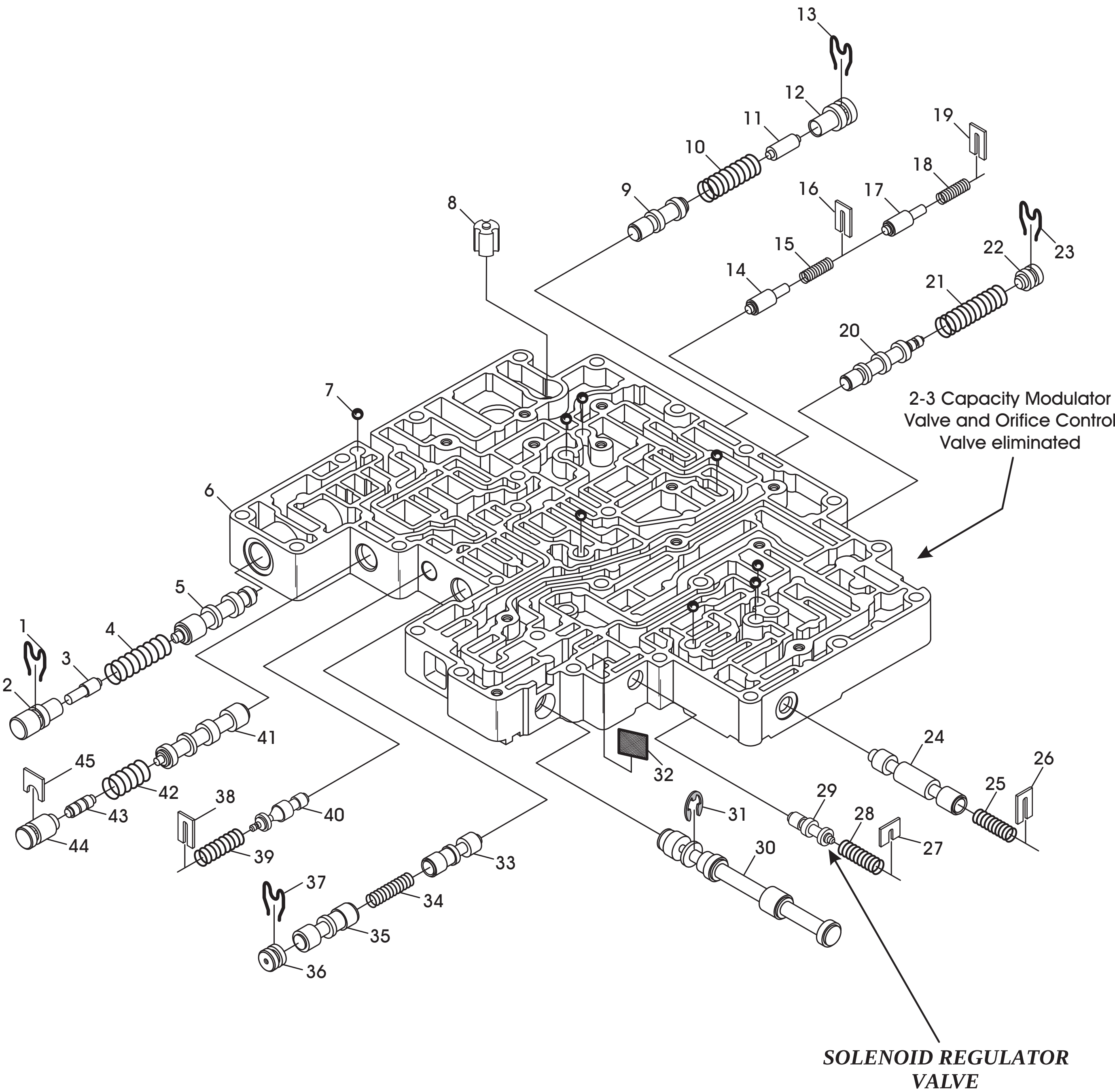
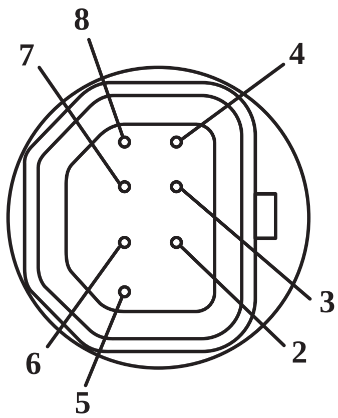


Figure 88

FORD 4R70W WIRE SCHEMATIC



1998-UP MODELS

PIN	FUNCTION
1	*Not Used*
2	*TOT Sensor (Minus)*
3	*TCC Solenoid Ground*
4	*12 Volt Power In*
5	*TOT Sensor (Plus)*
6	*EPC Solenoid Ground*
7	*Shift Solenoid 1 Ground*
8	*Shift Solenoid 2 Ground*
9	*Not Used*
10	*Not Used*

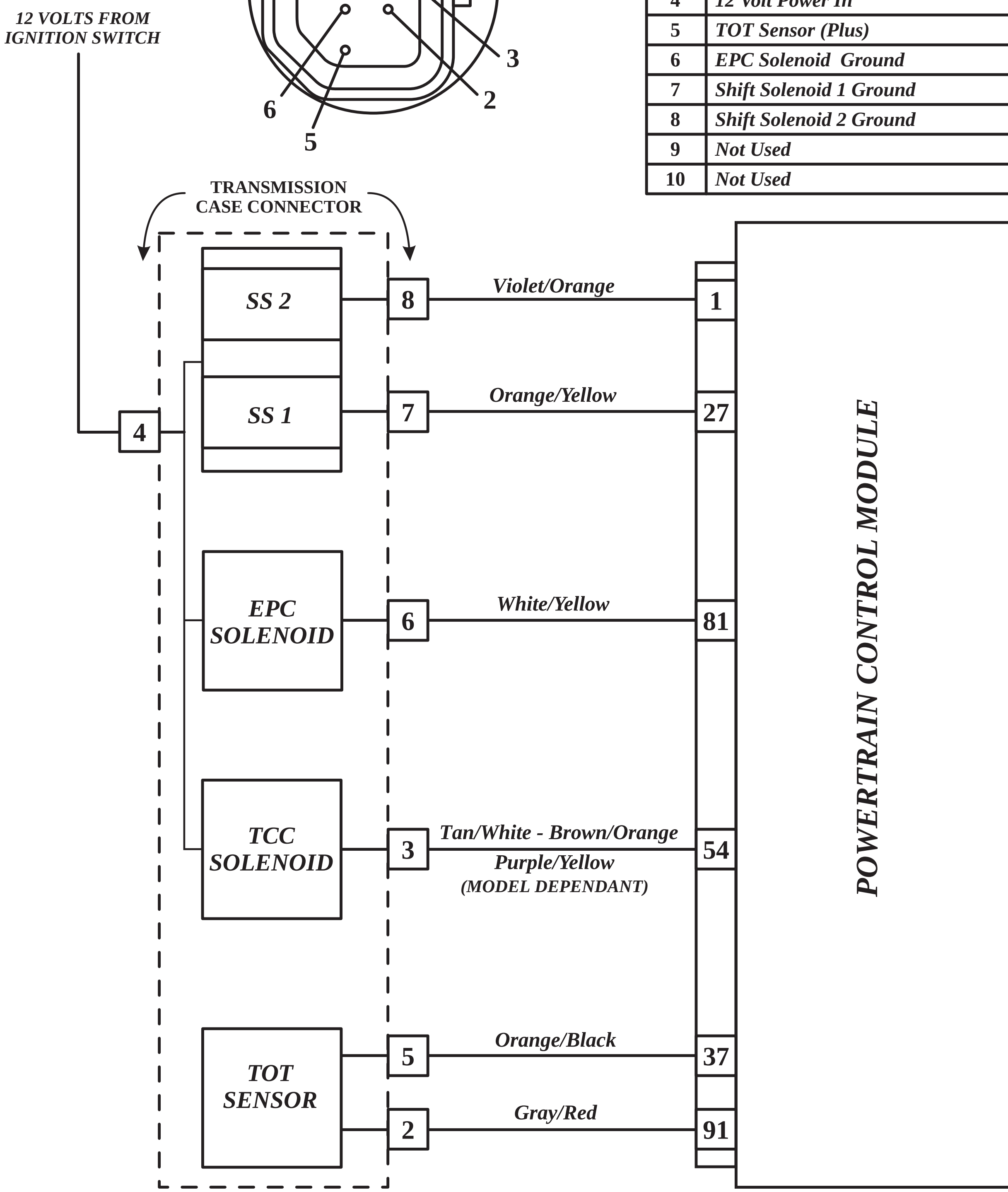


Figure 95

RE-CALIBRATING THE PSOM: (Cont'd)

STEP 6 - THE "WHAT IF" PROCEDURE

There may be times where one might say, "What if the differential was changed and now we don't know what the axle capacity or ratio is, what do we do now?" ***Or,*** "What if the tires have been changed and the dimensions of the tire do not match up with the vehicles door jam sticker, what do we do now?" These are ***very*** difficult problems with ***very*** involved procedures to remedy them. The easiest remedy is to get the factory specified tires and/or axle ratio required. However, if there are brave technicians who want to go, where few technicians have gone before, here might be some helpful methods.

For the unknown axle capacity, one method that may be employed is to see how many turns of the drive shaft it takes to make the rear tire rotate one complete turn. If it takes slightly more that 4 turns of the drive shaft to make the rear wheel rotate one complete revolution, you would have a 4.1 axle ratio. When comparing the charts in Figure 107 and 108, this ratio applies to many different axle capacities. The breakdown would be like this:

For Bronco and "F" Series Trucks with a 4.1 axle ratio, the rear could have a 3800, a 5300, a 6250, a 7400 or a 8250 axle capacity. "E" Series Vans would have a 6340, a 7800,or an 8000 axle capacity.

Looking now at the axle capacities for both F and E series vehicles found in the Figure 109 charts, only a 3800 axle capacity vehicle would have an exciter ring tooth count of 108. All others would have 120. If the cover on the differential is removed and the exciter ring has 108 teeth, this was an easy find. Now all one would have to do is match the appropriate tire size from the left side column and intersect it with the top 3800/108 column to obtain the conversion constant number. Once the conversion constant number is acquired, the PSOM can now be re-calibrated.

But what if the exciter ring has 120 teeth? Now it becomes necessary to obtain the tire size. Let's say you have an E series van with a LT225/75R16E/A/S...689 tire size. You can find this tire size looking at the bottom chart in Figure 107. There you will notice that all of the 120 teeth exciter ring axle capacities with this tire size has the same 10.34 conversion constant number. You are now ready to re-calibrate the PSOM.

But what if the vehicle tire size is other than OE specified? This situation will require an involved mathematical procedure of which there are four to choose from. Choose which ever one you are most comfortable with.

Formula 1 in Figure 114 uses the entire equation because overall tire height is not known.

Formula 2 in Figure 115 uses the tire inches above and below the rim is known.

Formula 3 in Figure 116 uses overall tire height.

Formula 4 in Figures 117 and 118 are used when tire size or gear ratios are questionable.

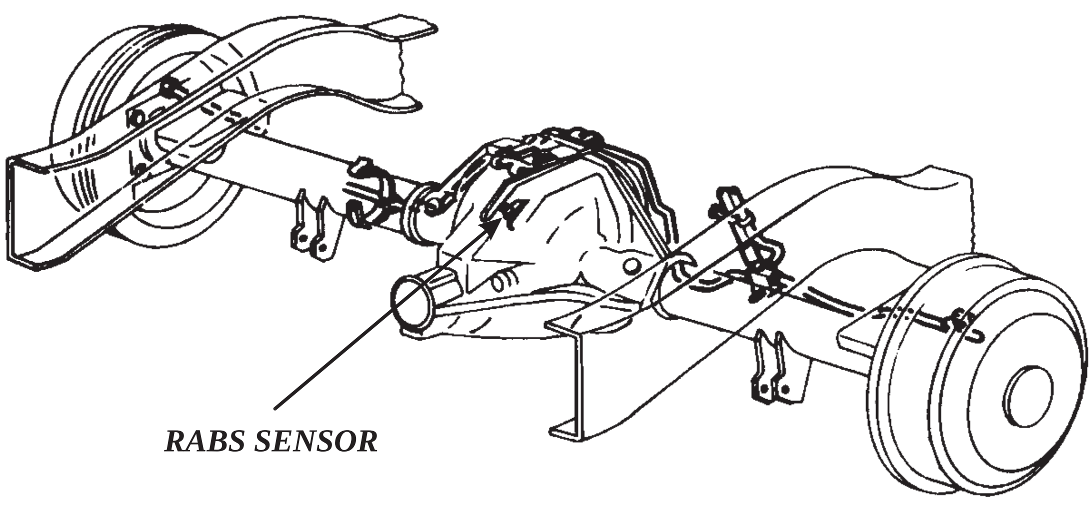


Figure 99

"E" SERIES VANS

E150-250-350 REGULAR REAR AXLE

CODE	CAPACITY	RATIO
12	3800	2.73
18	3800	3.08
19	3800	3.55
23	5400	3.54
24	5400	3.73
33	6340	3.54
52	7800	4.10
32	6340	4.10
62	8000	4.10
17	3800	3.31
35	6340	4.09
34	6340	3.73
56	7800	4.10

E150-250-350 LIMITED SLIP REAR AXLE

CODE	CAPACITY	RATIO
H8	3800	3.08
H9	3800	3.08
B4	5400	3.73
C2	6340	4.10
C3	6340	3.54
E2	7800	4.10
F2	8000	4.10
H7	3800	3.31
C5	6340	4.09
C4	6340	3.73
E6	7800	4.10

Figure 108

Formula #4 uses the following procedure and equation when tire size or gear ratios are questionable:

When gear ratio and/or tire size are questionable, one final method which will determine a conversion constant would be as follows:

1. Mark the tire at the 6 o'clock position and the floor at the same time so as to have both marks lined up with each other.
2. Roll the vehicle so the marked tire has made one complete revolution. At this time, make another mark on the floor so that it lines up with the mark on the tire which should be, once again, at the 6 o'clock position.
3. Now measure the distance between the two marks on the floor (See Figure 20). For this example, the measurement between the two marks was 39¼" which in decimal equals 39.25"

The Formula:

Floor measurement / Multiply by / 2.54 / Equals / Centimeters / Overall Tire Circumference / Divided by
39.25 x 2.54 = 99.69 99.69 ÷
Pi / Equals / Tire Diameter
3.14 = 31.74

The next step is to calculate tire revolutions per mile as follows:

Tire Diameter / Multiplied by / 28 / equals / _____ / 1528 / Minus / _____ / equals / Revolutions per Mile
31.74 x 28 = 888.72 / 1528 - 888.72 = 639.28

With the revolutions per mile, use this following equation to determine the conversion constant:

Revolutions per Mile / Multiplied by / RABS Sensor Exciter Ring Tooth Count / equals / _______
639.28 x 120 = 76713.6

/ Divided by / PSOM Pulses per Mile / equals / **Conversion Constant**
÷ 8000 = **9.59**

Once a numerical conversion constant has been established, the re-calibration process of the PSOM can begin.
Special note: If the arrived numerical conversion constant is not one listed in the PSOM, then the tire size or differential gear ratio far exceeds OE tolerances prohibiting PSOM re-calibration.

Figure 117

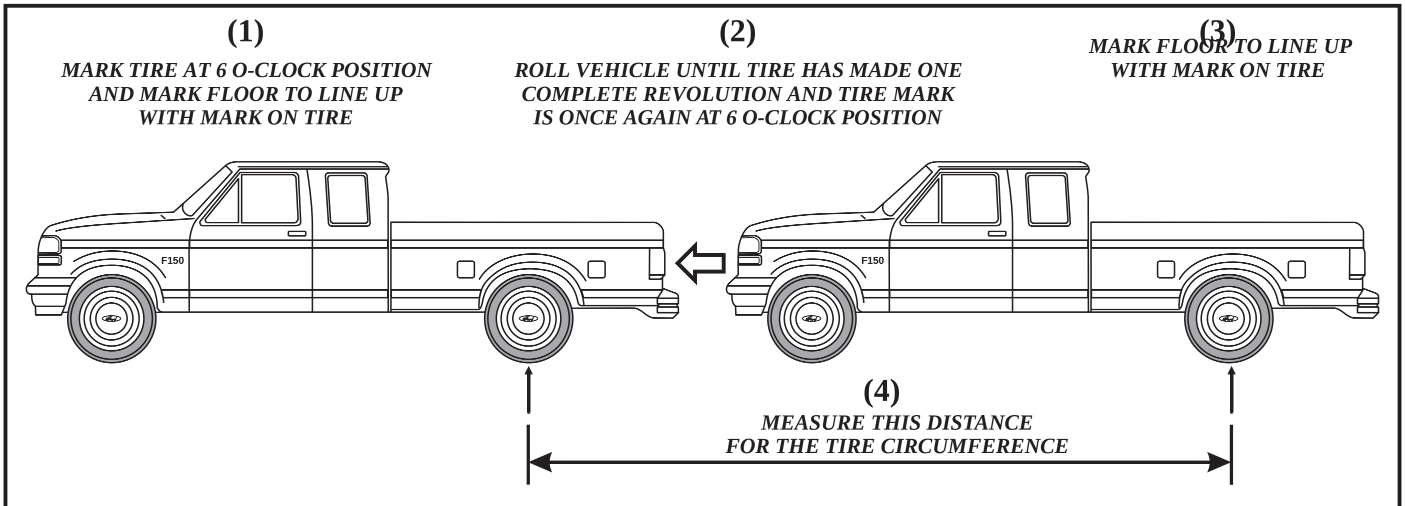


Figure 118