



FORD 4R100 "UPDATE HANDBOOK"

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INTRODUCTION

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FORD 4R100 "UPDATE HANDBOOK"

Since the introduction of the 4R100 transmission in model year 1998, there have been many engineering changes to improve Easeability, Reliability and Durability concerns. These changes have affected most every part used in this transmission. This "Update Handbook" will explain each change, the reason for the change, and any parts interchangeability concerns created by the change, along with any part numbers needed to update your transmission.

*We wish to thank Ford Motor Company
for the information and some illustrations
that have made this booklet possible.*

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*The information and part numbers contained in this booklet have
been carefully compiled from industry sources known for their
reliability, but ATSG does not guarantee its accuracy.*

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Technical Service Information

FORD 4R100 PRELIMINARY INFORMATION

CHANGE: Beginning at the start of production for 1999 models, Ford Motor Company introduced a new transmission in some F250, F350, F450 and F550 Super Duty Trucks, equipped with the 5.4L, 6.8L and 7.3L engines. Basically the new 4R100 is a revised version of the previous E4OD transmission with a Power-Take-Off (PTO) window on the side of the case (See Figure 1). The revisions that have occurred however, have created many major engineering changes that have affected many internal and external parts that will affect service.

REASON: Provided a PTO option for Ford Motor Company.

PARTS AFFECTED:

- (1) TRANSMISSION CASE - Now has a PTO window added to the left side of the case directly behind the front pump area, and a Turbine Speed Sensor has been added at the top of the case and triggered by a revised coast clutch drum (See Figure 2). Another change to the rear of the case is the addition of a Lube Orifice Plug to the Rear of the case, as shown in Figure 4, which also changes the extension housings.
- (2) TURBINE SPEED SENSOR - Added to the top front of the case on some models, as shown in Figure 2. We have also provided you with the resistance readings and OEM part numbers on both Turbine Speed Sensors, as the PTO and Non-PTO models use different sensors. Refer to Figure 2 for turbine speed sensor information.
- (3) OUTPUT SHAFT SENSOR - Output Shaft Speed sensor was added to the top of the extension housing on some models, as shown in Figure 2. OSS is triggered by an added rotor pressed onto the output shaft, which requires a new tool to position the speed rotor properly *if* it is removed during overhaul, as shown in Figure 3. The park gear is also now pressed onto the output shaft, and the number 13 thrust washer has been changed to a thrust bearing as shown in Figure 3. We have provided you with the resistance reading and the OEM part number for the output shaft speed sensor. Refer to Figure 2 for output shaft speed sensor information.
- (4) LUBE ORIFICE PLUG - Added to the rear of the case in the lube circuit to provide added lubrication to the extension housing bushing on 2WD models. To retain common cases the 4WD models will also have the lube orifice plug installed, as well as E4OD cases produced after July 24, 1997. Lube Orifice Plug is available under OEM part number F81Z-7E380-AA, and should be replaced on rebuild. Refer to Figure 4.
- (5) EXTENSION HOUSING - Has an added boss or shoulder to retain the lube orifice plug in position in the transmission case, as shown in Figure 5. Notice that the 6.8L and 7.3L, 2 wheel drive extension housing has added a new passage to the extension housing bushing, much like the 4L80-E. All 4R100 and E4OD transmissions equipped with the lube orifice plug **must** use an extension housing with the shoulder or boss. Failure to do so could blow the lube orifice plug out and exhaust all lube oil, which would be catastrophic. Refer to Figure 5.

Continued on next Page.

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PARTS AFFECTED: (Continued)

- (6) **MANUAL SHIFT LEVER** - There are two different external shift levers for this unit, one for Non-PTO transmissions and one for transmissions with the PTO option, as shown in Figure 6. We have provided you with the "Stamping" number as well as the OEM part number for both, as shown in Figure 6.
- (7) **COOLER BYPASS VALVE** - Similar to the Cooler Bypass Valve on the E4OD that provides lubrication to the transmission in case of blocked or partially blocked coolers. We have given you OEM part numbers for both and both bypass valves are illustrated in Figure 7.
- (8) **TRANSMISSION COOLERS** - Most F-Series vehicles over 8500 GVW equipped with the 4R100 transmission have an external "Oil-To-Air" cooler **only**. Due to the internal design of the "Oil-To-Air" cooler, it cannot be adequately flushed to remove contaminants, and requires replacement during transmission rebuild. The only exception is that F-Series vehicles over 8500 GVW equipped with the 5.4L engine also uses a radiator "In-Tank" cooler in addition to the "Oil-To-Air" cooler. Refer to Figure 8 for transmission cooler information.
- (9) **FRONT PUMP COVER** - The pump cover is basically the same as the E4OD, but has a different valve line-up in the Converter Clutch Control Valve bore. The gasoline applications all have an "On-Off" lock-up solenoid and the 7.3L diesel applications all have a Pulse Width Modulated (PWM) lock-up solenoid. This changes the Converter Clutch Control Valve line-ups in the pump cover, as shown in Figure 9.
- (10) **FRONT PUMP STATOR SHAFT** - With the addition of the PTO gear on the front of the coast clutch drum, it was necessary to move the coast clutch sealing ring grooves up on the pump stator shaft to accommodate the coast clutch drum moving. There are currently three different Pump Stator Shafts used in production and all three are illustrated in Figure 10. One is the current E4OD shaft which is used with the "Cast Iron" coast clutch drum with 5.4L and 6.8L engines **without** the PTO option. Two is the shaft with the relocated sealing rings and a bushing in the pump tower, which is used with the "Stamped Steel" coast clutch drum with 5.4L and 6.8L engines **without** the PTO option. Third is the shaft with the relocated sealing rings and a caged needle bearing in the pump tower, which is used with the "Stamped Steel" coast clutch drum with 6.8L and 7.3L engines **with** the PTO option. Refer to Figure 10.
- (11) **COAST CLUTCH DRUM AND STEEL PLATES** - There is now a revised "Stamped Steel" coast clutch drum introduced with the 4R100 transmission. There are currently three different coast clutch drums used in production and all three are illustrated in Figure 11. One is the current E4OD coast clutch drum which is "Cast Iron" and uses the current steel plates. Two is the new design "Stamped Steel" coast clutch drum without the PTO gear pressed on it and uses a new design coast clutch steel plate to accommodate the new drum. Third is the new design "Stamped Steel" coast clutch drum with the PTO gear pressed on it and uses the new design coast clutch steel plates to accommodate the new drum. The new design "Stamped Steel" coast clutch drum now has the overdrive roller clutch inner cam made on the drum and the overdrive sun gear is pressed into the new design drum, which changes the assembly process of the overdrive roller clutch. Refer to Figure 11.
- (12) **COAST CLUTCH PISTON** - The coast clutch piston in the new design coast clutch drum is now a stamped steel, molded rubber seals assembly and is illustrated in Figure 12. The new design piston assembly requires a new seal protector tool, Rotunda No. 307-387, to install the piston and seal assembly into the new design stamped steel coast clutch drum (See Figure 12).

Continued on next Page.**Copyright © 2005 ATSG**



Technical Service Information

PARTS AFFECTED: (Continued)

- (13) OVERDRIVE ROLLER CLUTCH - The overdrive roller clutch inner cam is now made onto the new design coast clutch drum, instead of being splined like the previous models were, and is illustrated in Figure 13. The new design overdrive roller clutch assembly is now assembled onto the inner cam on the new design drum. The overdrive roller clutch outer race is still located in the overdrive ring gear next to the overdrive carrier and the number 13 thrust washer between the two is now plastic, but the cage and roller assembly are now assembled over the inner race on the new design coast clutch drum. Refer to Figure 13.
- (14) OVERDRIVE FRICTION PLATES - Now have wider teeth to accommodate the new design stamped steel coast clutch drum assembly when it is used, as illustrated in Figure 14.
- (15) VALVE BODY CHECKBALL LOCATIONS - Valve body checkball locations are illustrated in Figure 15 and now has two 1/4" checkballs and two 5/16" checkballs. This of course changes the lower valve body spacer plate as illustrated in Figure 16. The new design spacer plate has only one hole over the bathtub where the checkball was removed. The case checkball locations remain the same as the 1996-Up configuration, and this illustration is included for reference and shown in Figure 17.
- (16) VALVE LINE-UPS IN VALVE BODY - Have changed from the previous models and are illustrated in Figure 18, with a valve description and legend shown in Figure 19.
- (17) SOLENOID BODY - There are now two different Solenoid Bodies, depending on whether you have a gasoline or diesel model. Since the diesel models now have a Pulse Width Modulated (PWM) converter clutch application, the resistance on the converter clutch solenoid in the Solenoid Body is going to be different. We have included the OEM part numbers for both solenoid bodies and resistance charts for all solenoids in Figure 20, and you will find solenoid application and pin function charts in Figures 21 and 22.
- (18) TROUBLE CODES - Abbreviations are listed in Figure 23 and OBD II Trouble Codes are listed in numerical order in Figures 24 through 28.

INTERCHANGEABILITY:

All of the parts listed above are model sensitive, and some of the parts listed above cannot be intermixed with E4OD parts. With this unit you will have to be very carefull if replacement of the various components becomes necessary.

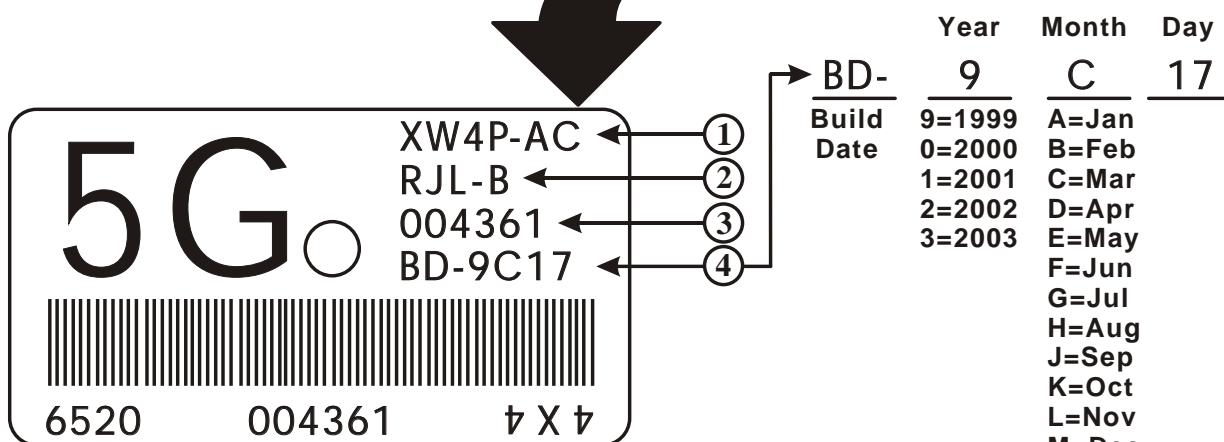
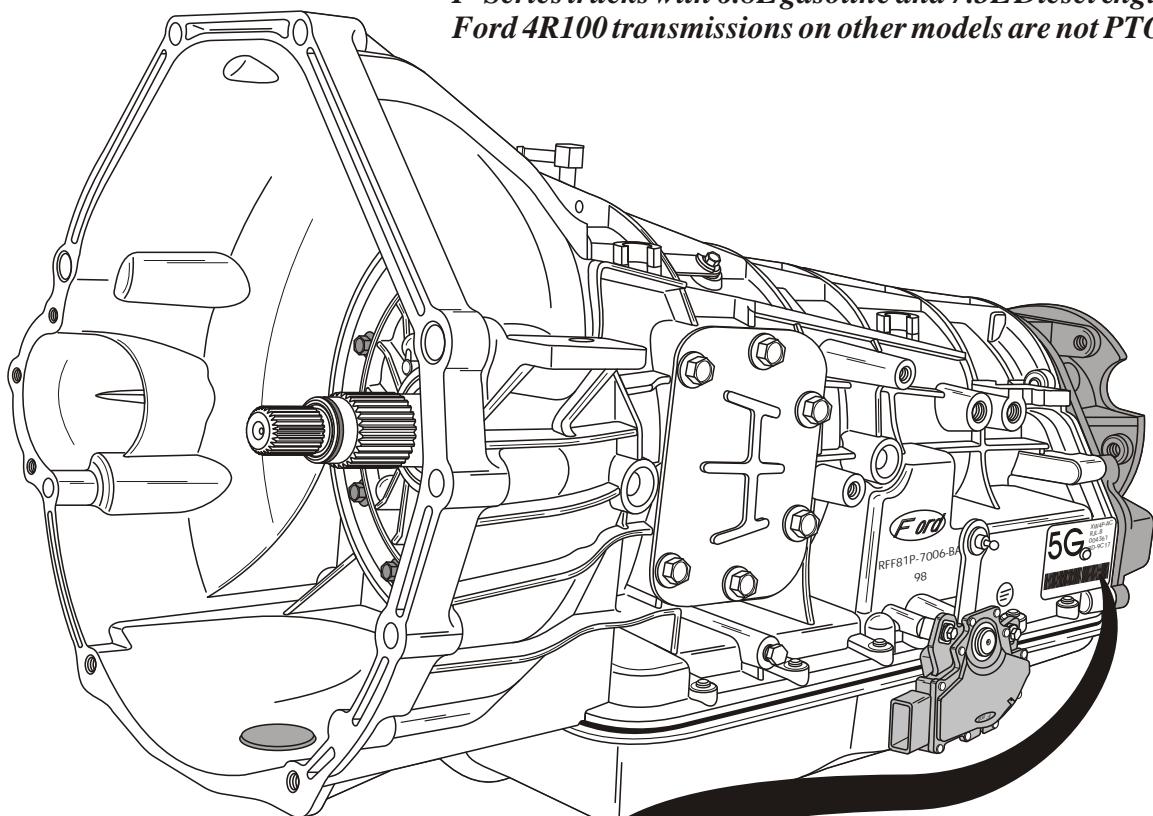
SERVICE INFORMATION:

Turbine Shaft Speed Sensor (PTO Models Only)	F81Z-7M101-BA
Turbine Shaft Speed Sensor (Non-PTO Models Only)	F81Z-7M101-AA
Output Shaft Speed Sensor (All Models)	F81Z-7M101-AA
Lube Orifice Plug (Plastic)	F81Z-7E380-AA
External Manual Shift Lever (With PTO Option)	F81Z-7A256-AA
External Manual Shift Lever (Without PTO Option)	F7UZ-7A256-BB
Cooler Bypass Valve Assembly	F81Z-7H322-AA
Coast Clutch Piston (New Design)	F81Z-7A262-AA
Solenoid Body Assembly (Gasoline Engine Only)	F81Z-7G391-BA
Solenoid Body Assembly (Diesel Engine Only)	F81Z-7G391-AB
Overdrive Roller Clutch And Cage Assembly	F81Z-7A089-AB

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FORD 4R100**WITH POWER TAKE OFF OPTION**

Note: PTO is available as an option on 8500 GVW or above, Super Duty F-Series trucks with 6.8L gasoline and 7.3L Diesel engines. Ford 4R100 transmissions on other models are not PTO capable.



1	Assembly Part Number, Prefix And Suffix
2	Transmission Model
3	Serial Number
4	Build Date (Year, Month, Day)

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Figure 1

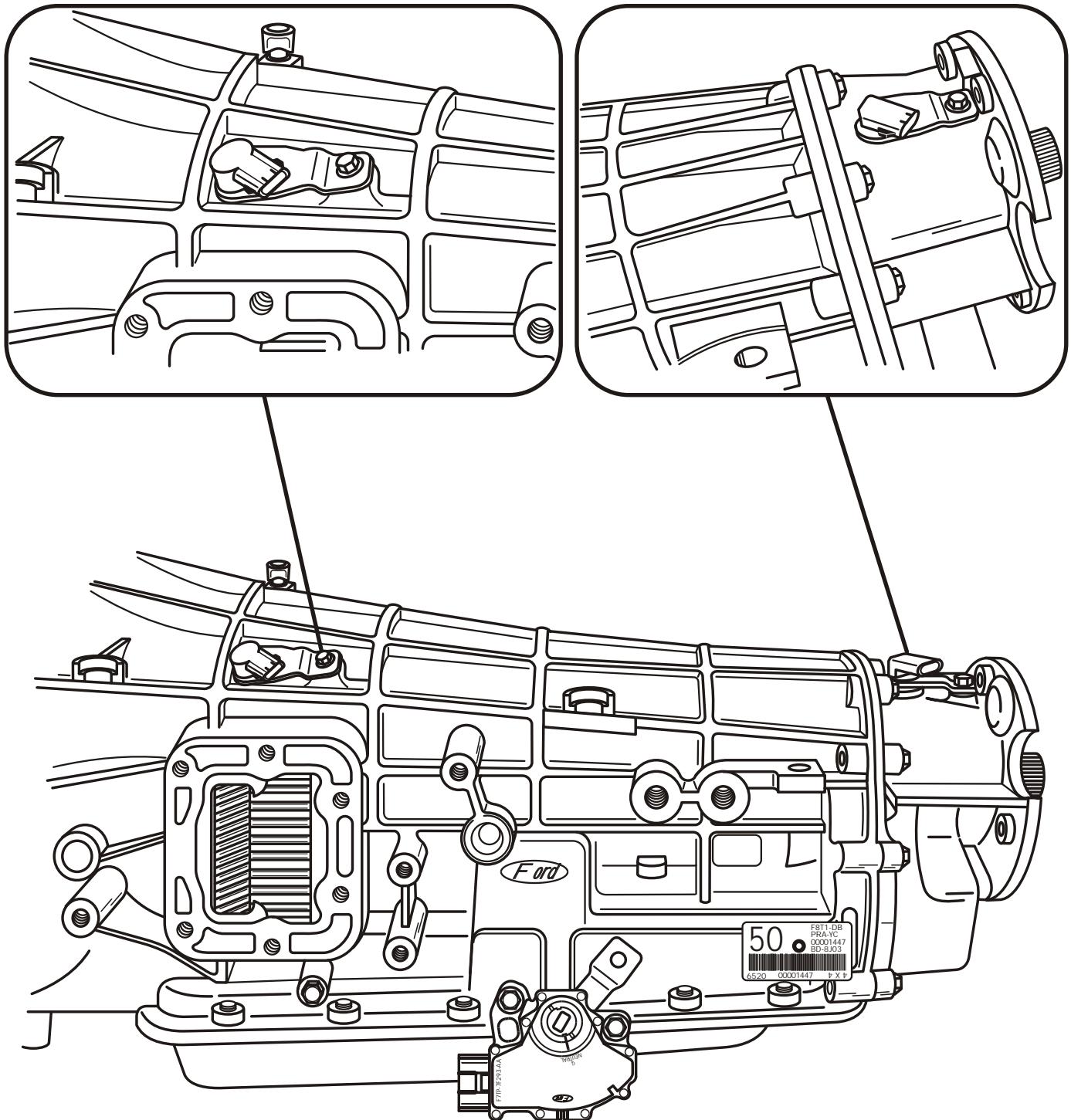
Turbine Shaft Speed Sensor

*PTO Models Only = 496-1244 Ohms Resistance
Part Number F81Z-7M101-BA*

*Non PTO Models Only = 781-1979 Ohms Resistance
Part Number F81Z-7M101-AA*

Output Shaft Speed Sensor

*All Models = 781-1979 Ohms Resistance
Part Number F81Z-7M101-AA*



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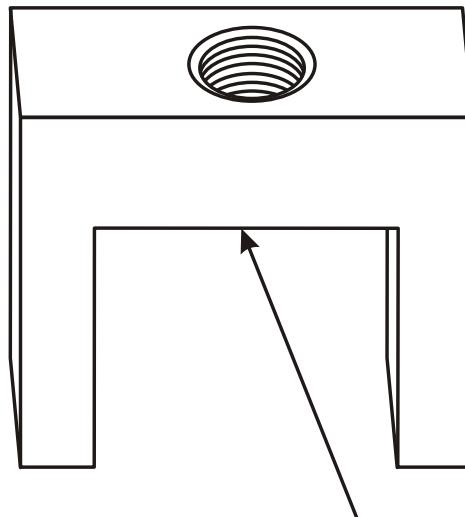
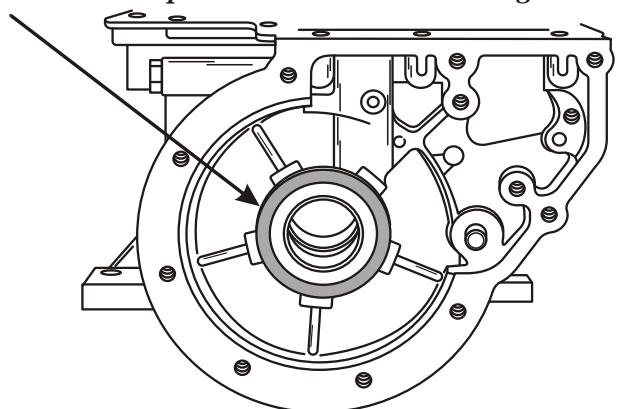
Figure 2

**FORD 4R100
OUTPUT SHAFT SPEED SENSOR ROTOR**

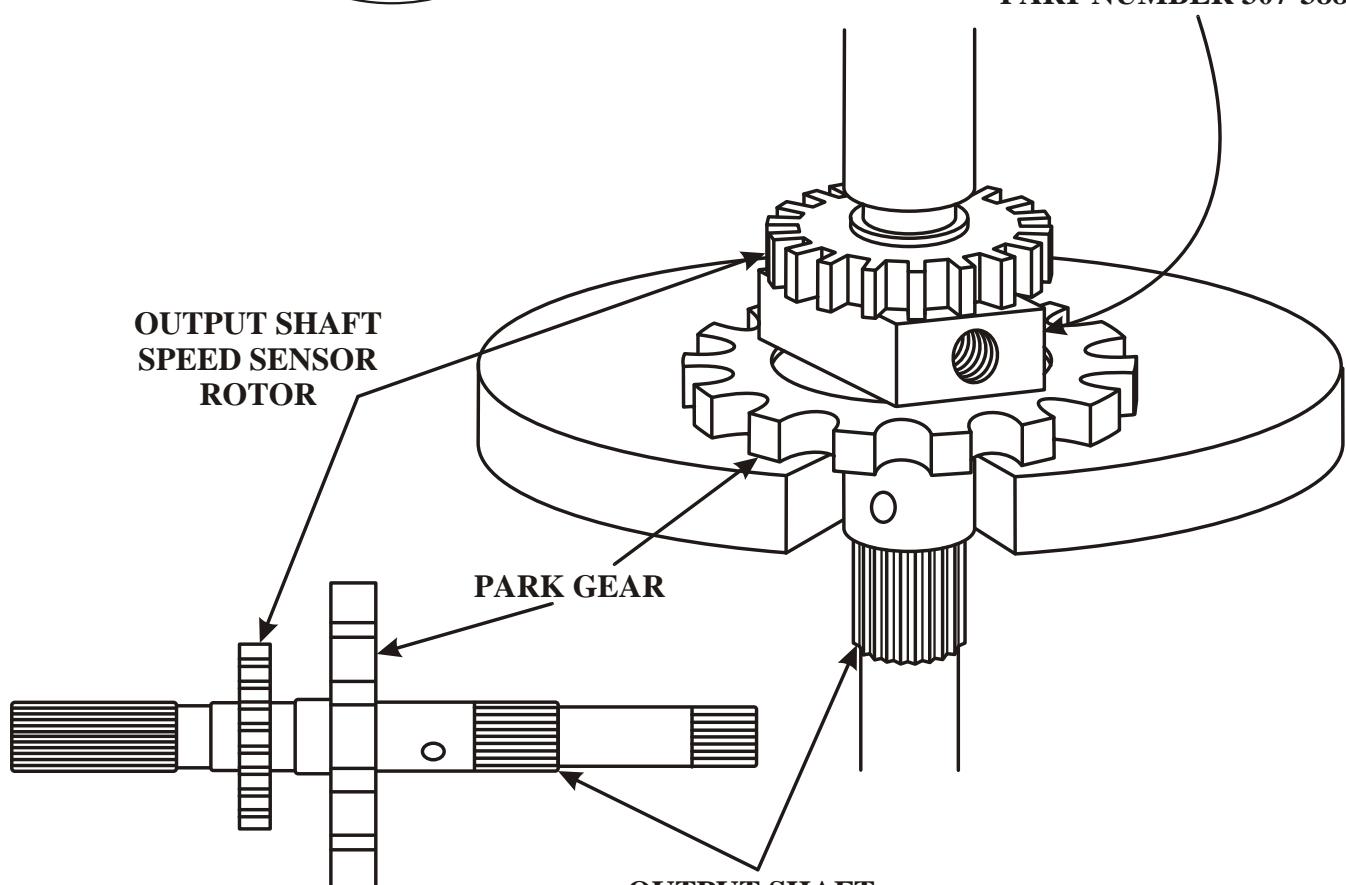
Output Shaft Speed Sensor Rotor is press fit to the output shaft and requires new Spacer Tool, Rotunda No. 307-388 for spacing the speed sensor rotor the proper distance from the park gear, if it was removed from the output shaft during service.

PARK GEAR

The Park Gear is also press fit to the output shaft, and the number 13 thrust washer, between the case and the park gear has been replaced with a needle bearing.

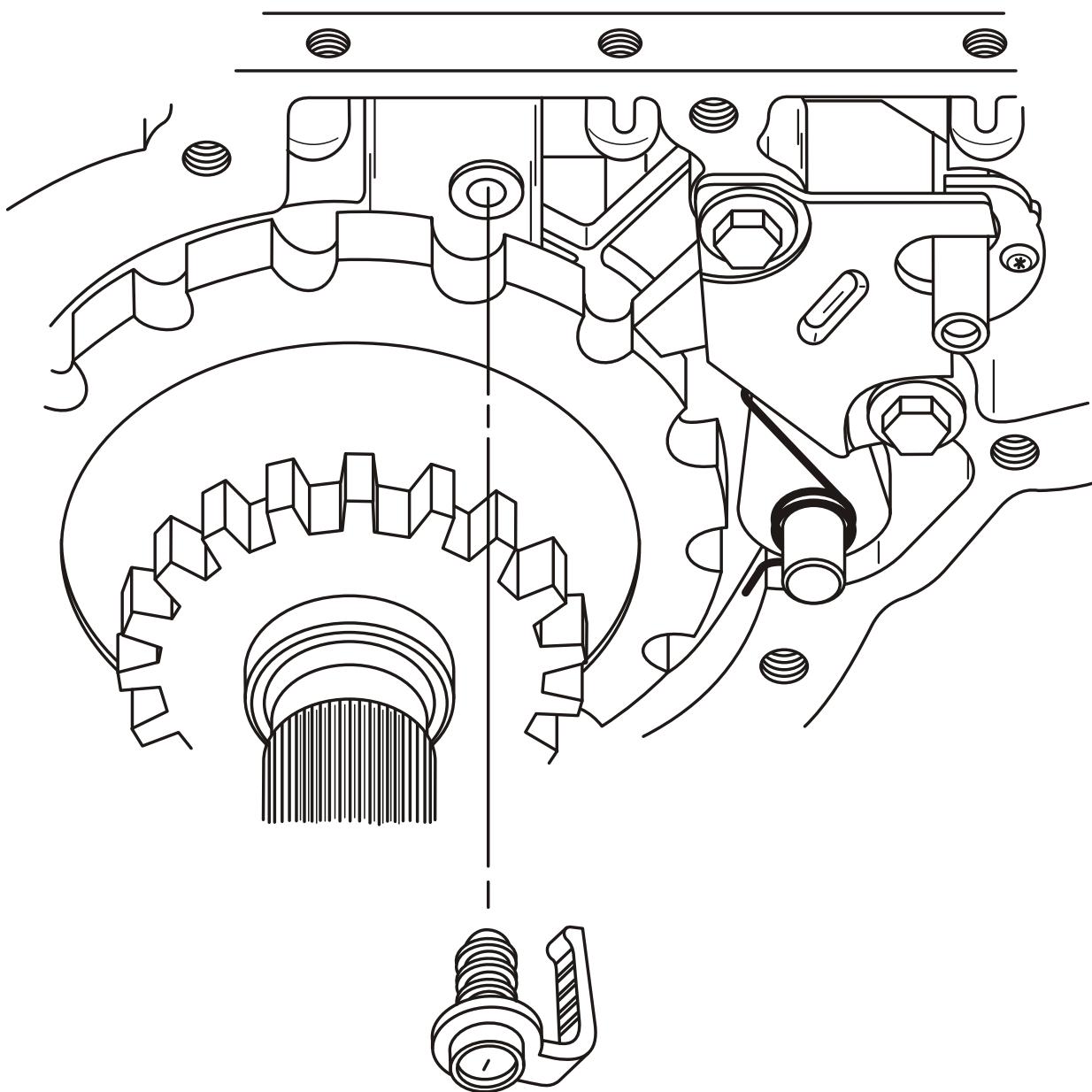


**SPACER, ROTUNDA
PART NUMBER 307-388**



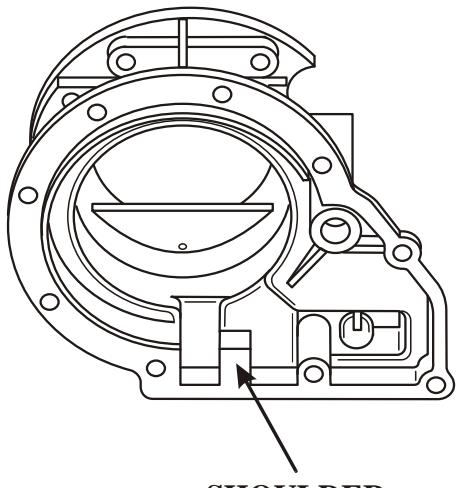
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Figure 3

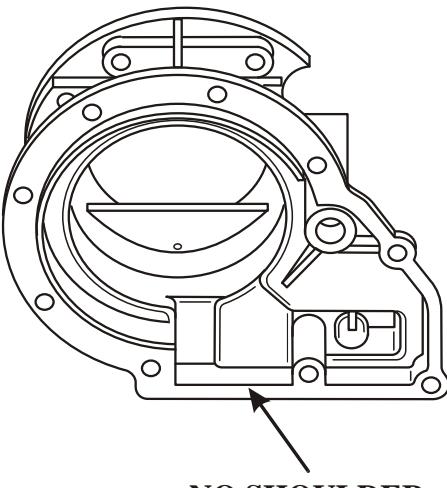
**FORD 4R100
LUBE ORIFICE LOCATION**

**LUBE ORIFICE PLUG
FORD PART NUMBER
F81Z-7E380-AA**

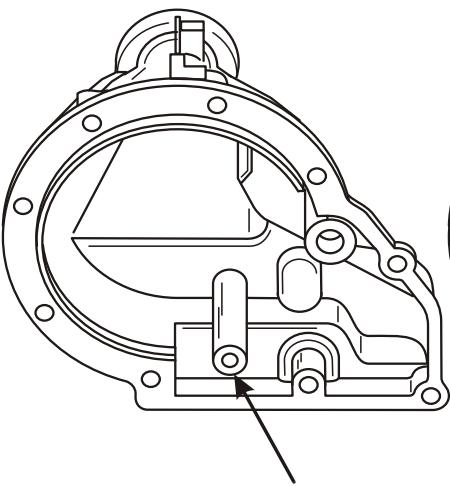
EXTENSION HOUSINGS

4R100 TYPICAL
4 WHEEL DRIVE

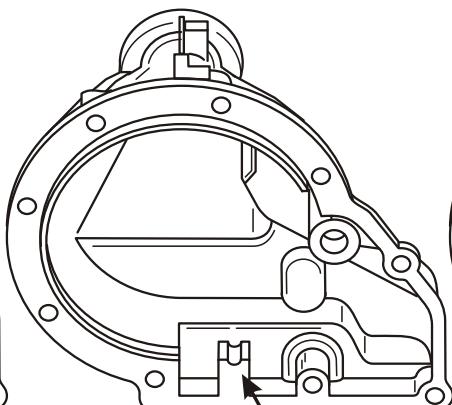
SHOULDER

E4OD 4X4 WITHOUT
LUBE PLUG

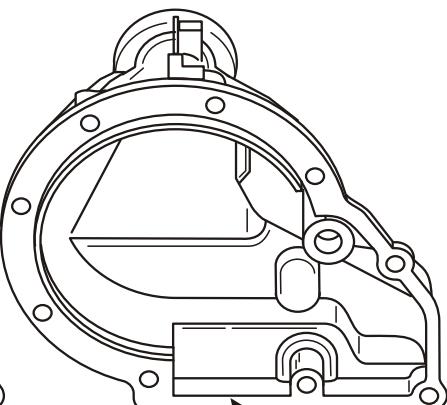
NO SHOULDER

FORD 4R100
6.8L AND 7.3L
2 WHEEL DRIVEALL OTHER
2 WHEEL DRIVE
APPLICATIONSE4OD WITHOUT
LUBE PLUG

ADDED BOSS



SHOULDER



NO SHOULDER

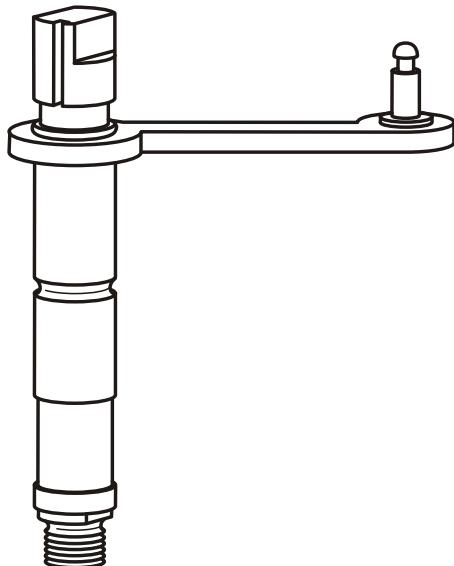
NOTE: Extension Housings are model sensitive. Refer to Ford Motor Co. parts list for proper part numbers.

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Figure 5

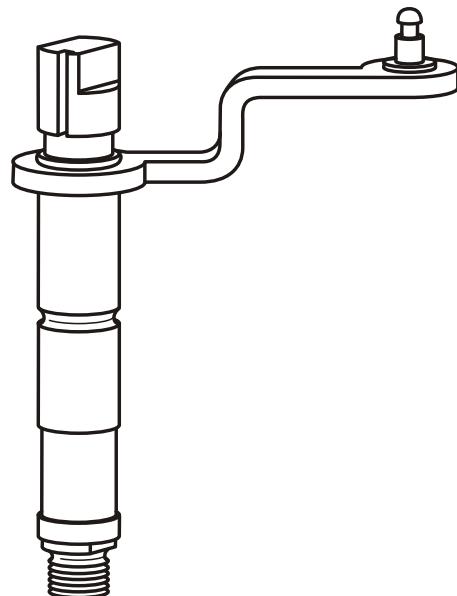
**FORD 4R100
MANUAL SHIFT LEVERS**

**"With" PTO OPTION
STAMPED F81P-AA**



**FORD PART NUMBER
F81Z-7A256-AA**

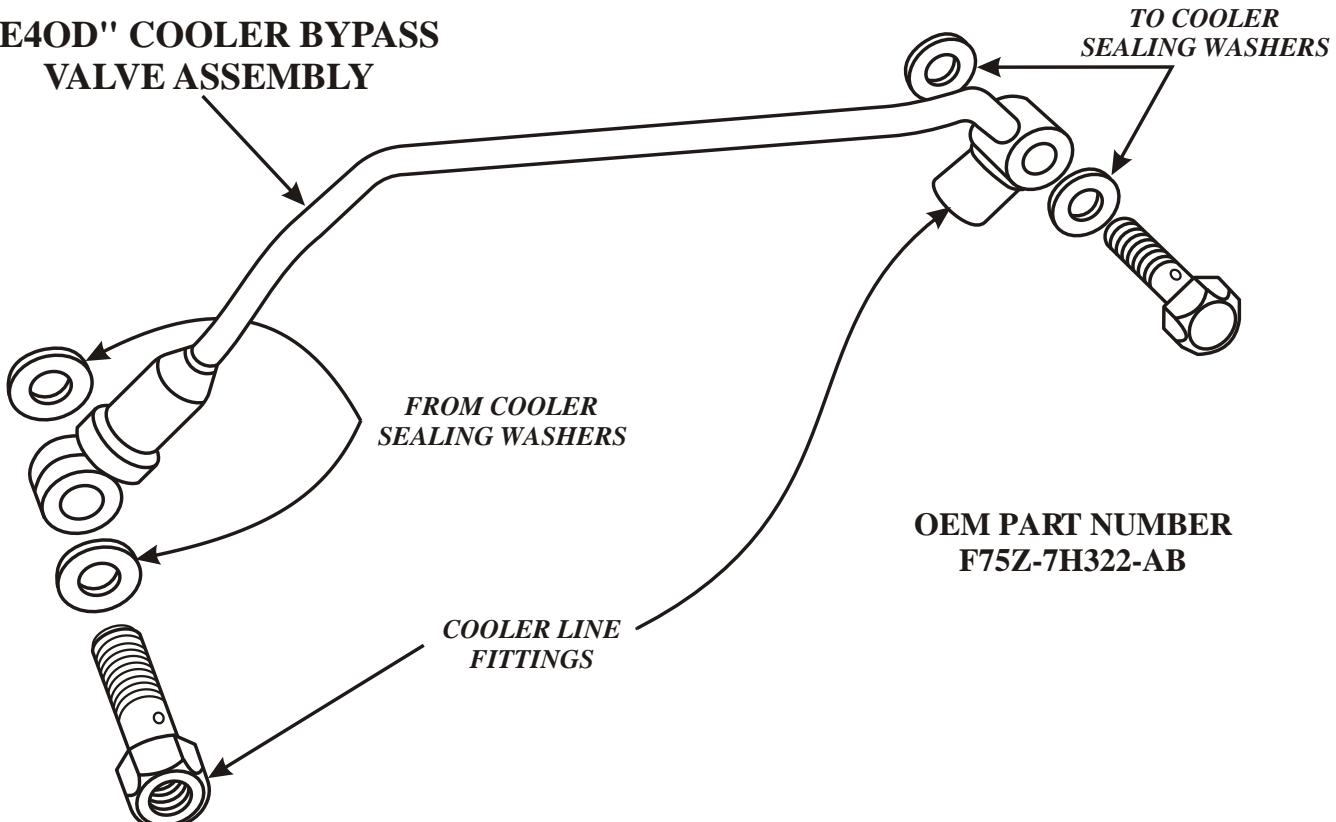
**"Without" PTO OPTION
STAMPED F75P-BB**



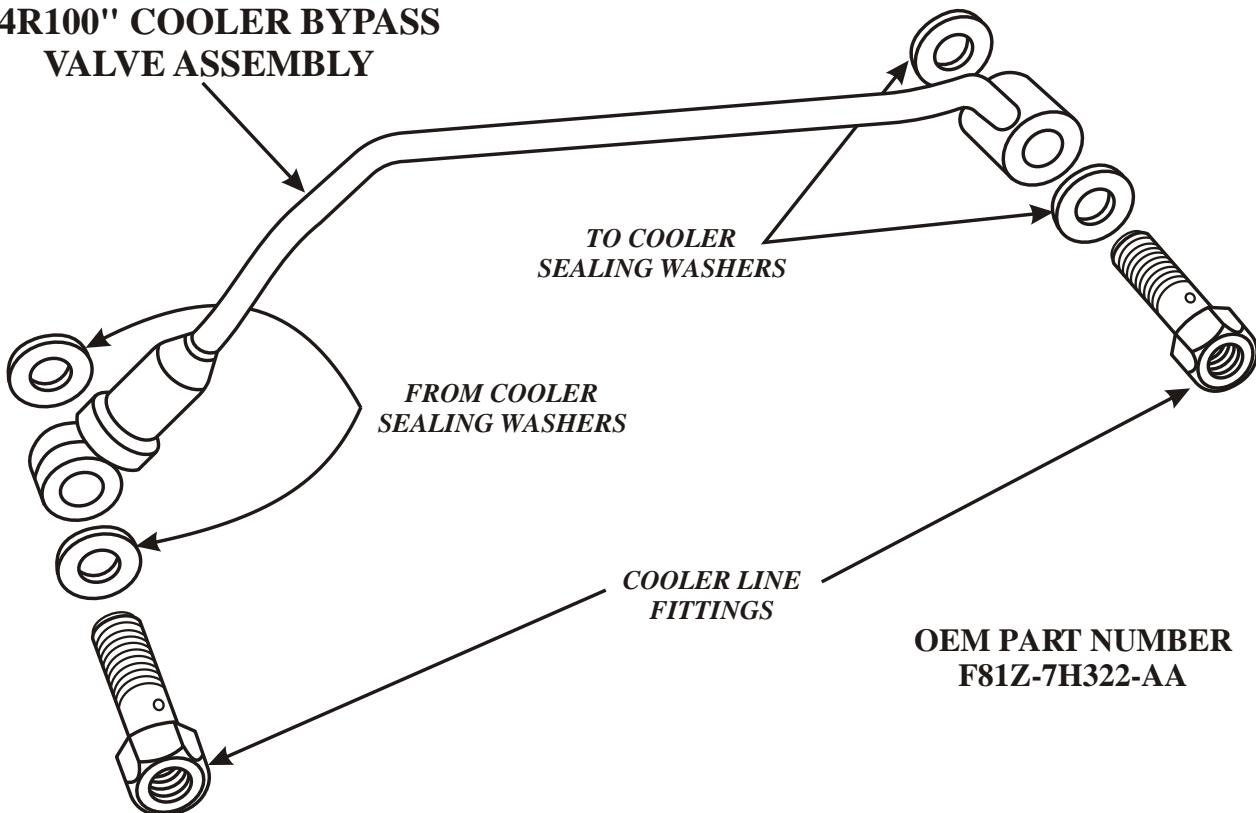
**FORD PART NUMBER
F7UZ-7A256-BB**

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Figure 6

**"E4OD" COOLER BYPASS
VALVE ASSEMBLY**

OEM PART NUMBER
F75Z-7H322-AB

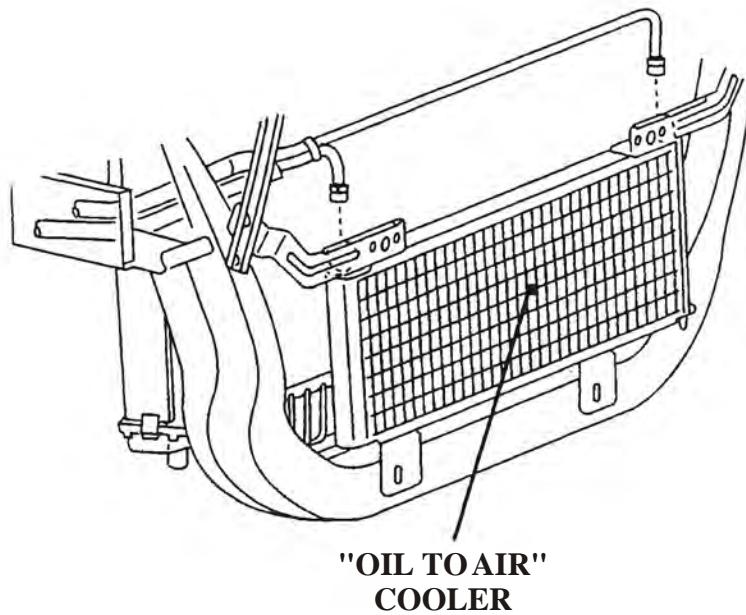
**"4R100" COOLER BYPASS
VALVE ASSEMBLY**

OEM PART NUMBER
F81Z-7H322-AA

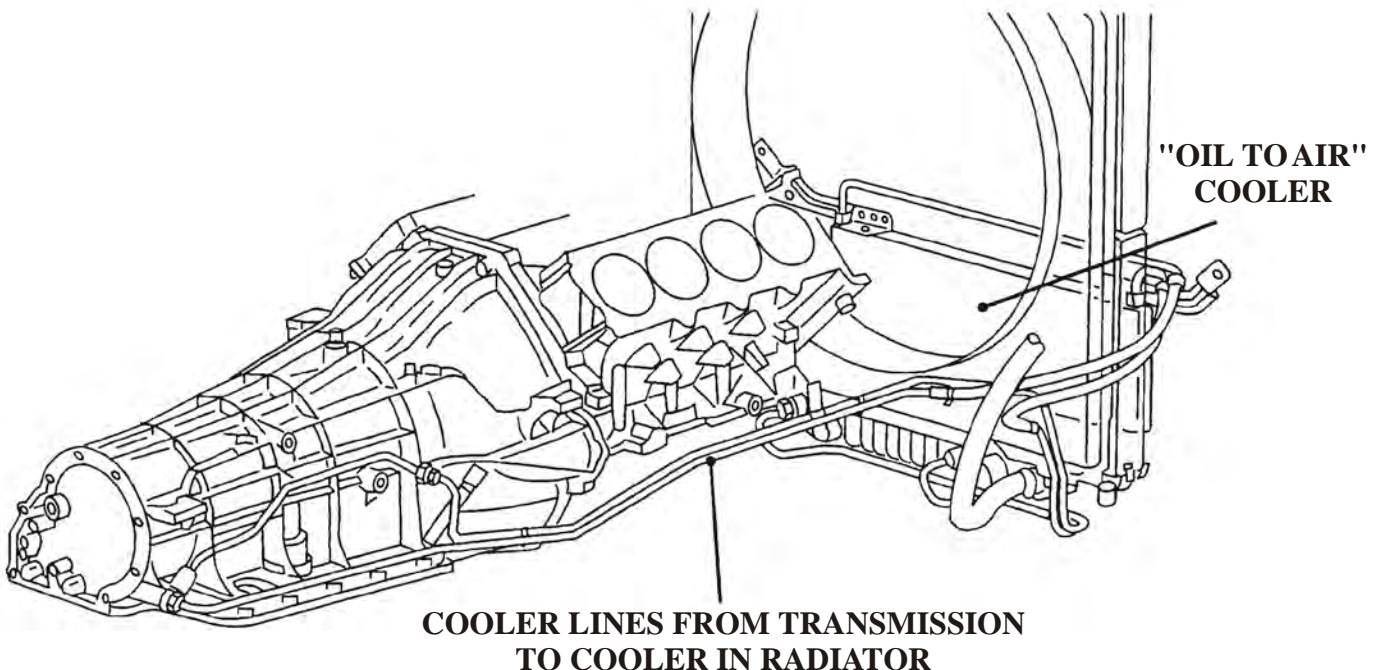
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Figure 7

Most F-Series vehicles over 8500 GVW equipped with the 4R100 transmission have an external "Oil-To-Air" cooler only. Due to the internal design the "Oil-To-Air" cooler cannot be adequately flushed to remove contaminants, and requires replacement during transmission rebuild.



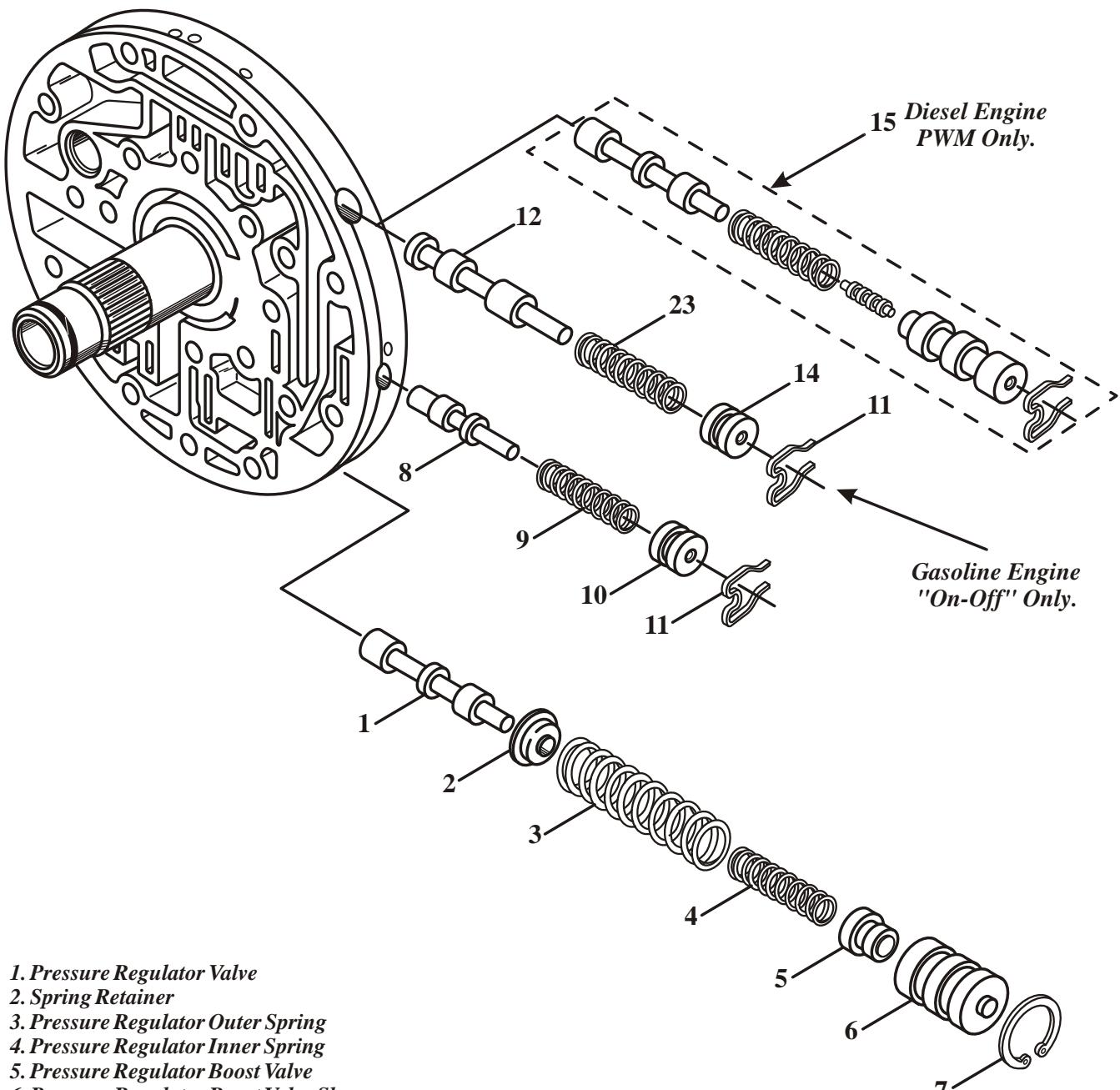
The only exception is that F-Series vehicles over 8500 GVW equipped with the 5.4L engine also uses a radiator "In-Tank" cooler in addition to the "Oil-To-Air" cooler.



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Figure 8

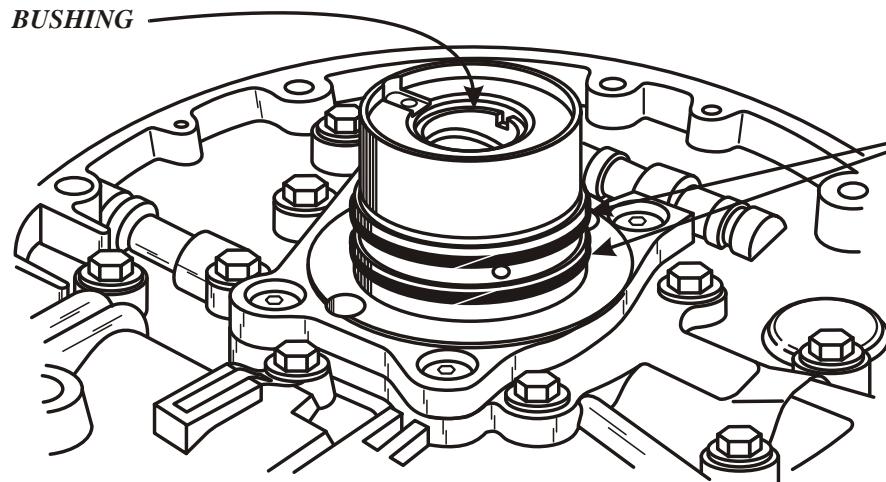
FORD 4R100
VALVE LINE-UPS IN PUMP ASSEMBLY



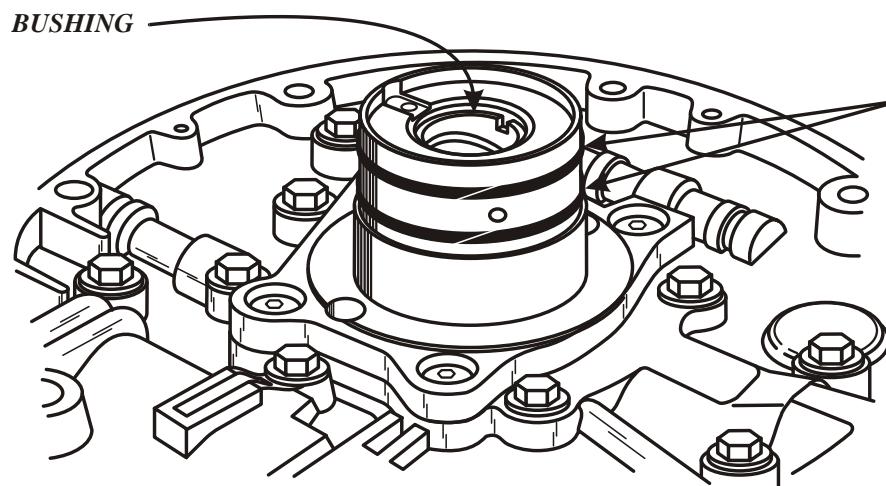
1. Pressure Regulator Valve
2. Spring Retainer
3. Pressure Regulator Outer Spring
4. Pressure Regulator Inner Spring
5. Pressure Regulator Boost Valve
6. Pressure Regulator Boost Valve Sleeve
7. Snap Ring
8. Converter Clutch Regulator Valve
9. Converter Clutch Regulator Spring
10. Converter Clutch Regulator Bore Plug
11. Bore Plug Retainer
12. Converter Clutch Control Valve (Gas "On-Off" Only)
13. Converter Clutch Control Spring (Gas "On-Off Only")
14. Converter Clutch Control Bore Plug
15. Converter Clutch Control Line-up (Diesel "PWM" Only)

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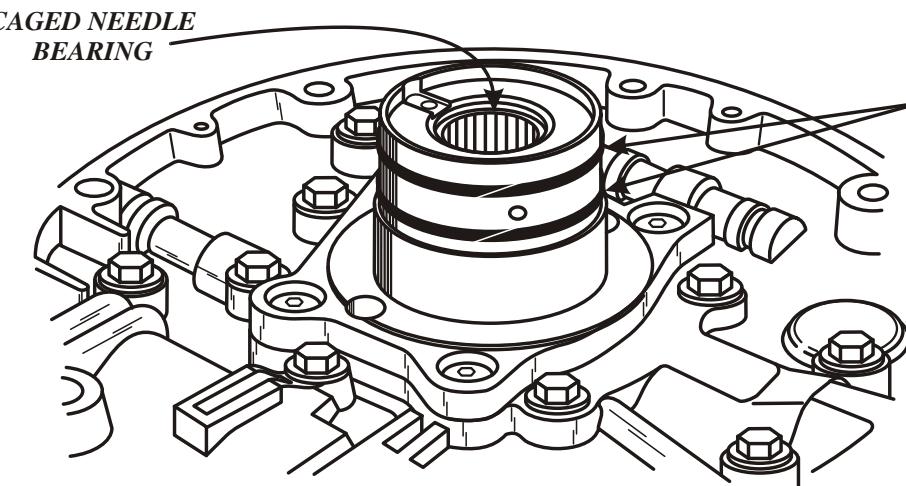
Figure 9



USED WITH THE "CAST IRON" COAST CLUTCH DRUM
WITH 5.4L AND 6.8L "WITHOUT" PTO OPTION



USED WITH THE "STAMPED STEEL" COAST CLUTCH DRUM
WITH 5.4L AND 6.8L "WITHOUT" PTO OPTION

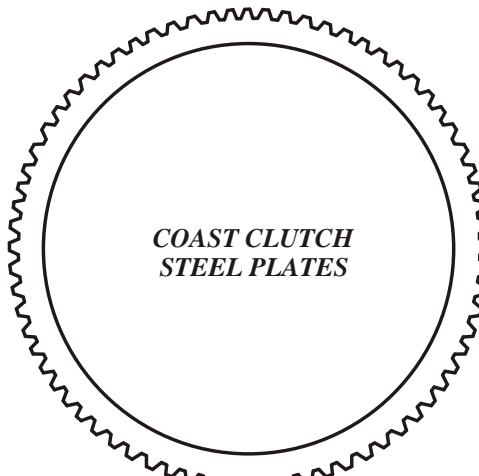
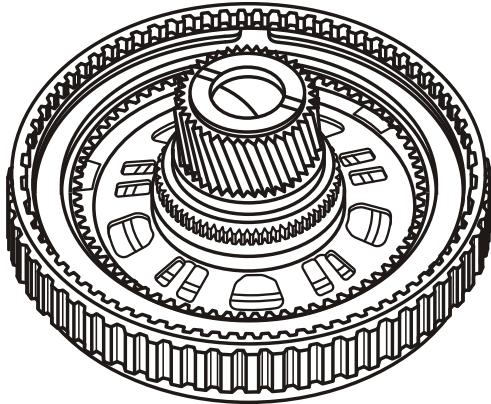


The Caged Needle Bearing shown here, allegedly never made it to production, but we have seen some out there.

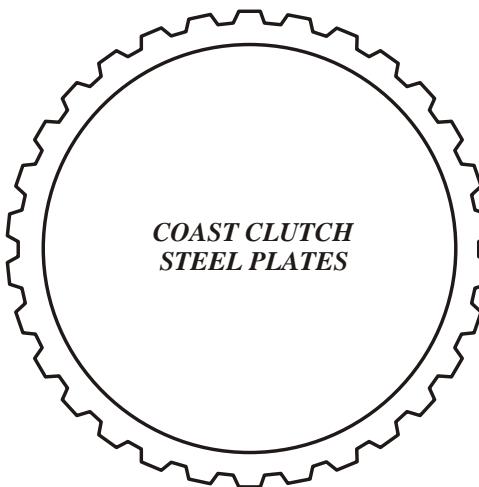
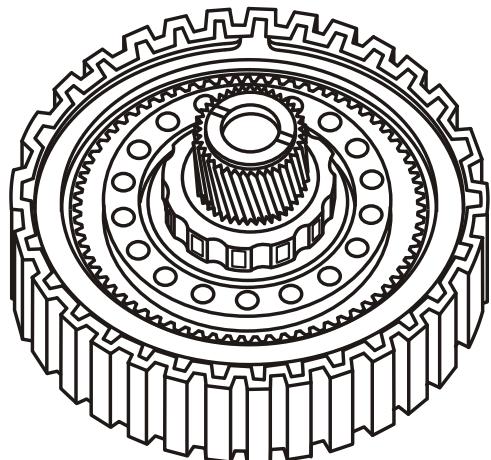
USED WITH THE "STAMPED STEEL" COAST CLUTCH DRUM
WITH 6.8L AND 7.3L "WITH" PTO OPTION

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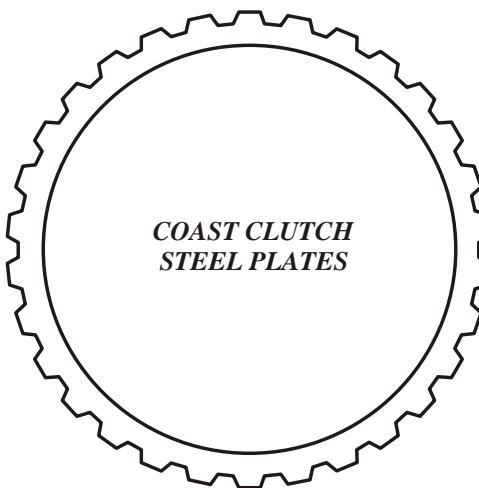
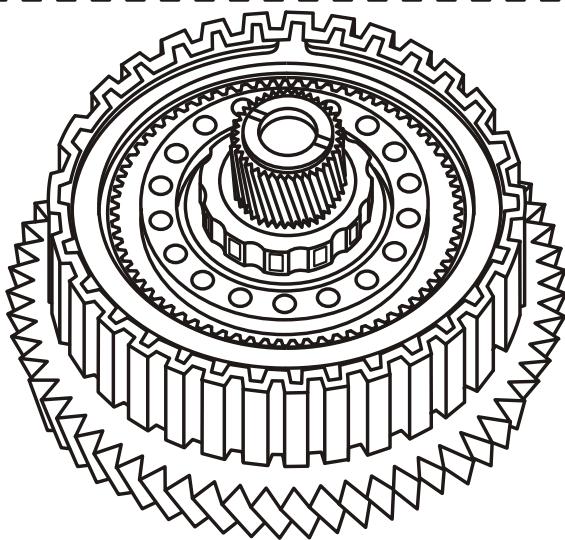
Figure 10



**"CAST IRON" COAST CLUTCH DRUM USED
WITH 5.4L AND 6.8L "WITHOUT" PTO OPTION**



**"STAMPED STEEL" COAST CLUTCH DRUM USED
WITH 5.4L AND 6.8L "WITHOUT" PTO OPTION**



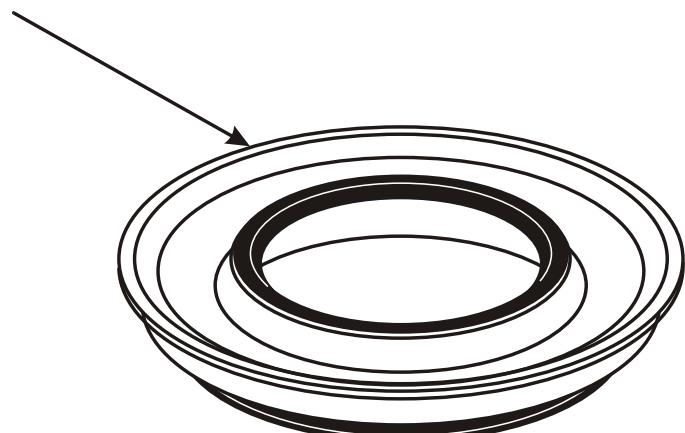
**"STAMPED STEEL" COAST CLUTCH DRUM USED
WITH 6.8L AND 7.3L "WITH" PTO OPTION**

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Figure 11

**STAMPED STEEL MOLDED RUBBER COAST CLUTCH PISTON
FOR NEW DESIGN COAST CLUTCH DRUM**

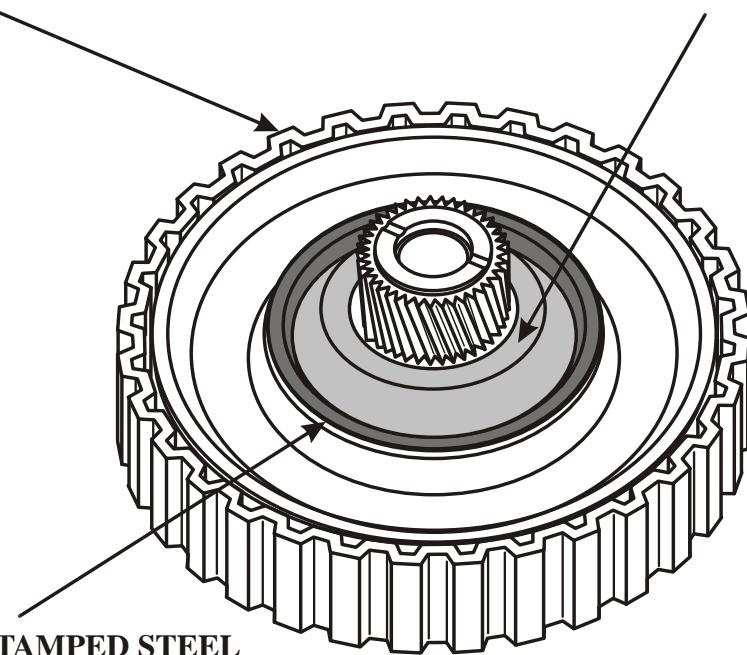
**NEW DESIGN STAMPED STEEL,
MOLDED RUBBER SEAL PISTON
OEM PART NUMBER F81Z-7A262-AA**



**NEW DESIGN STAMPED STEEL
COAST CLUTCH DRUM**

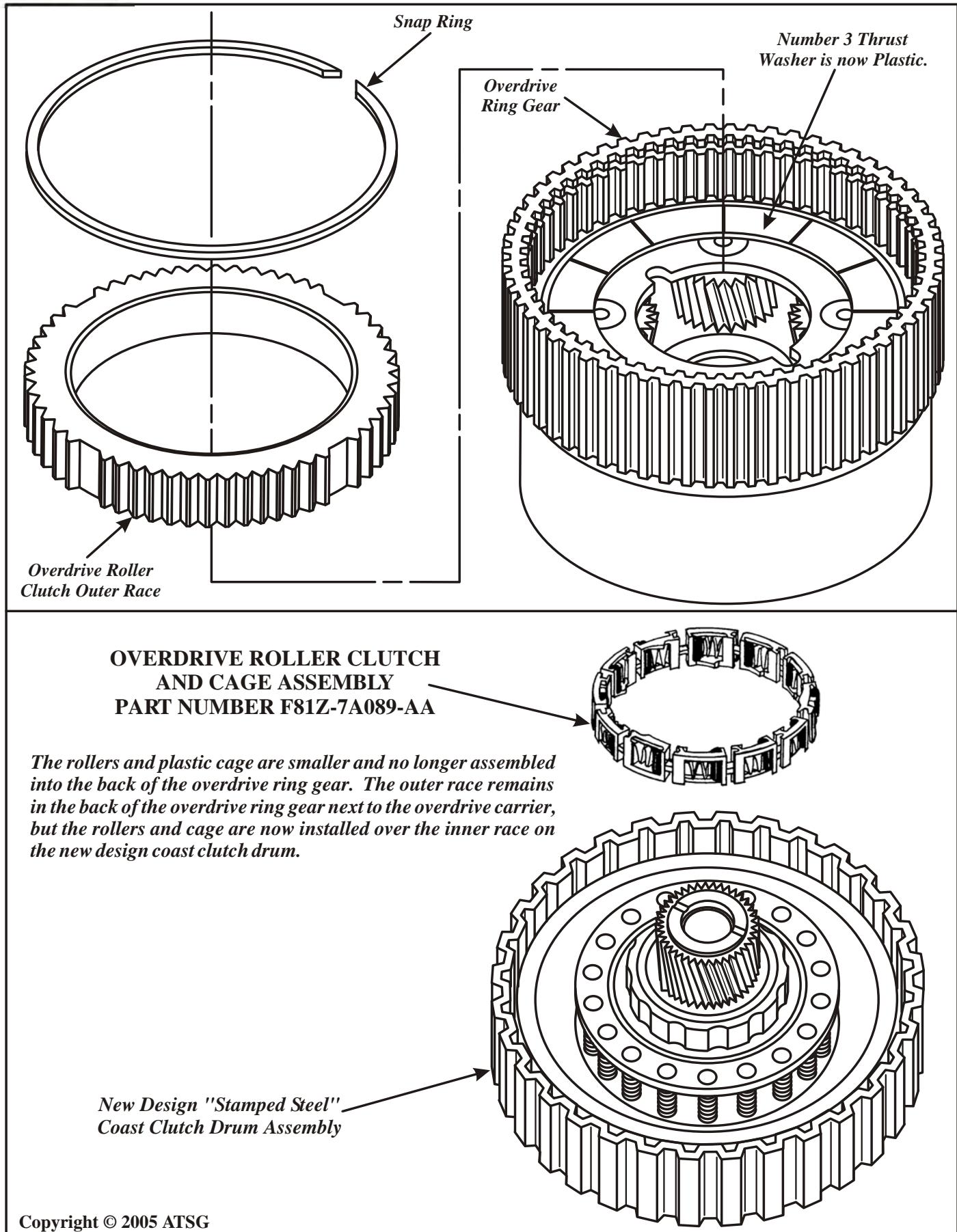
**LIP SEAL PROTECTOR
ROTUNDA NO. 307-387**

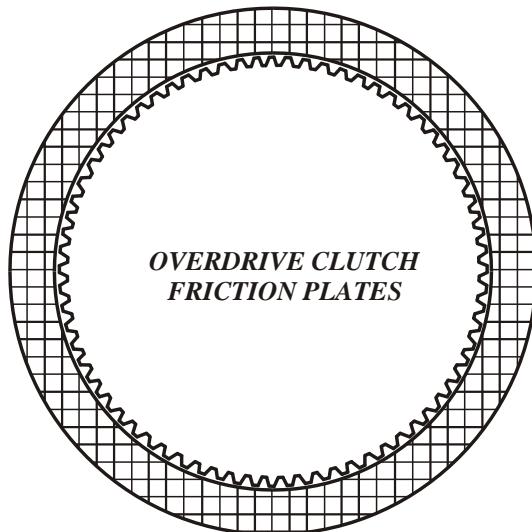
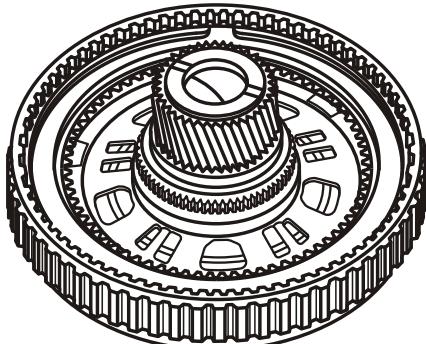
**NEW DESIGN STAMPED STEEL
MOLDED RUBBER PISTON**



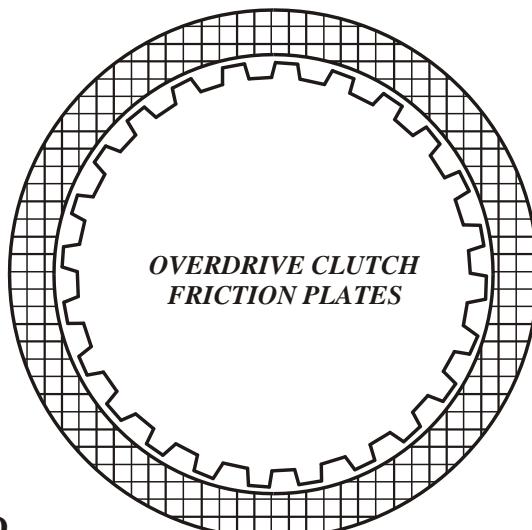
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Figure 12

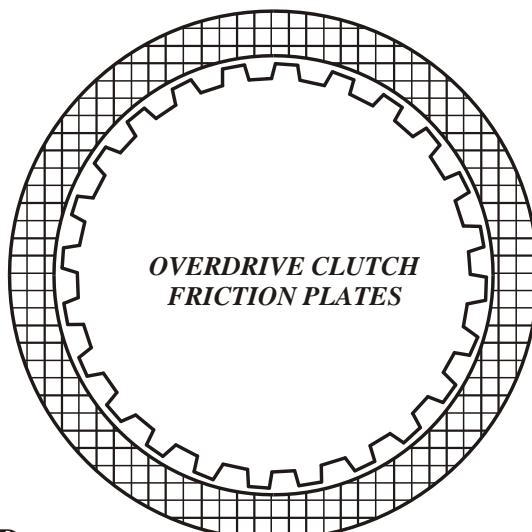
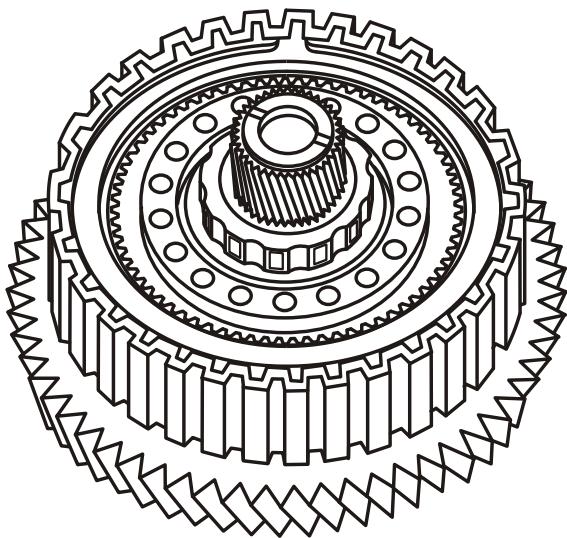




**"CAST IRON" COAST CLUTCH DRUM USED
WITH 5.4L AND 6.8L "WITHOUT" PTO OPTION**



**"STAMPED STEEL" COAST CLUTCH DRUM USED
WITH 5.4L AND 6.8L "WITHOUT" PTO OPTION**



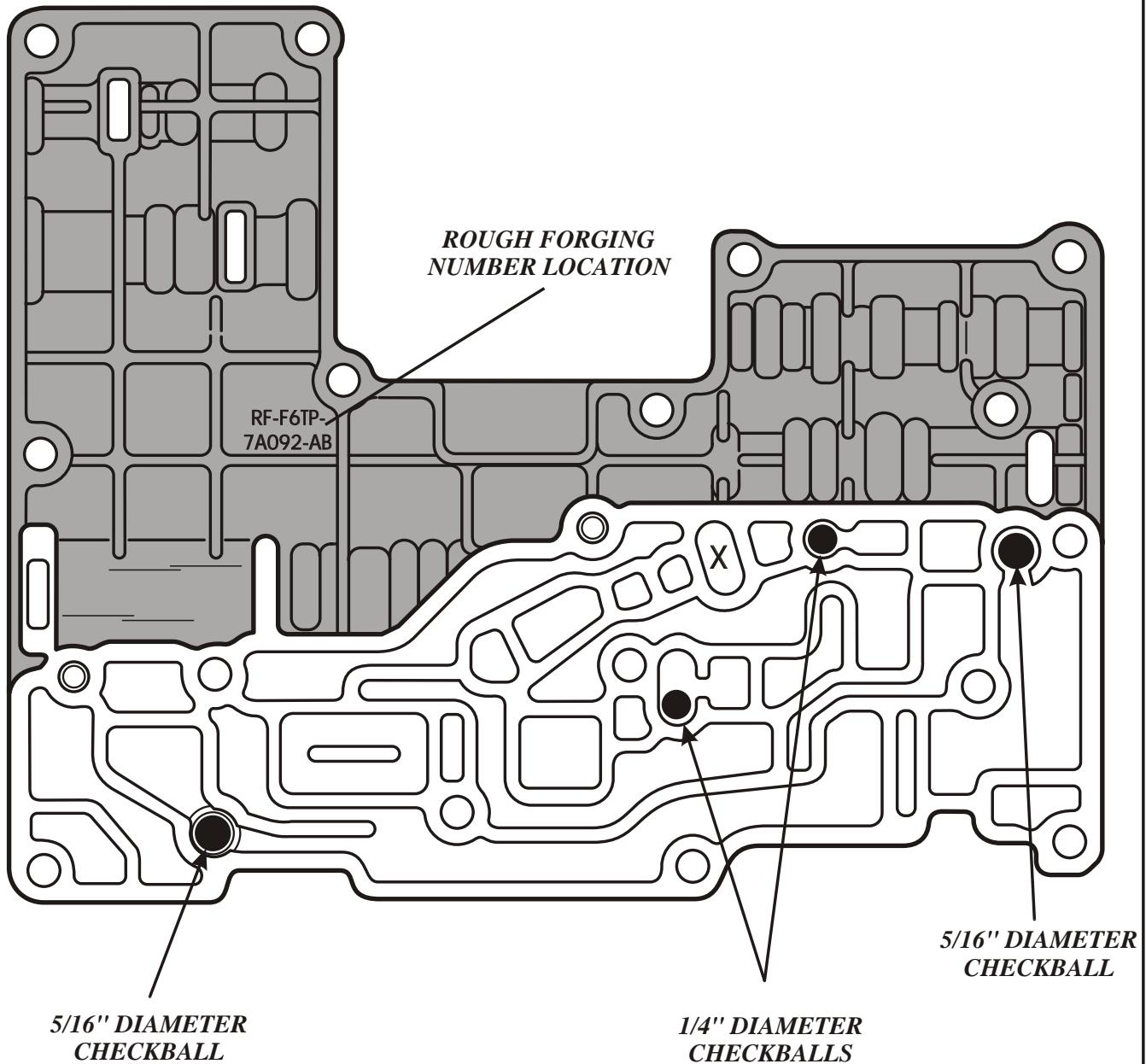
**"STAMPED STEEL" COAST CLUTCH DRUM USED
WITH 6.8L AND 7.3L "WITH" PTO OPTION**

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Figure 14

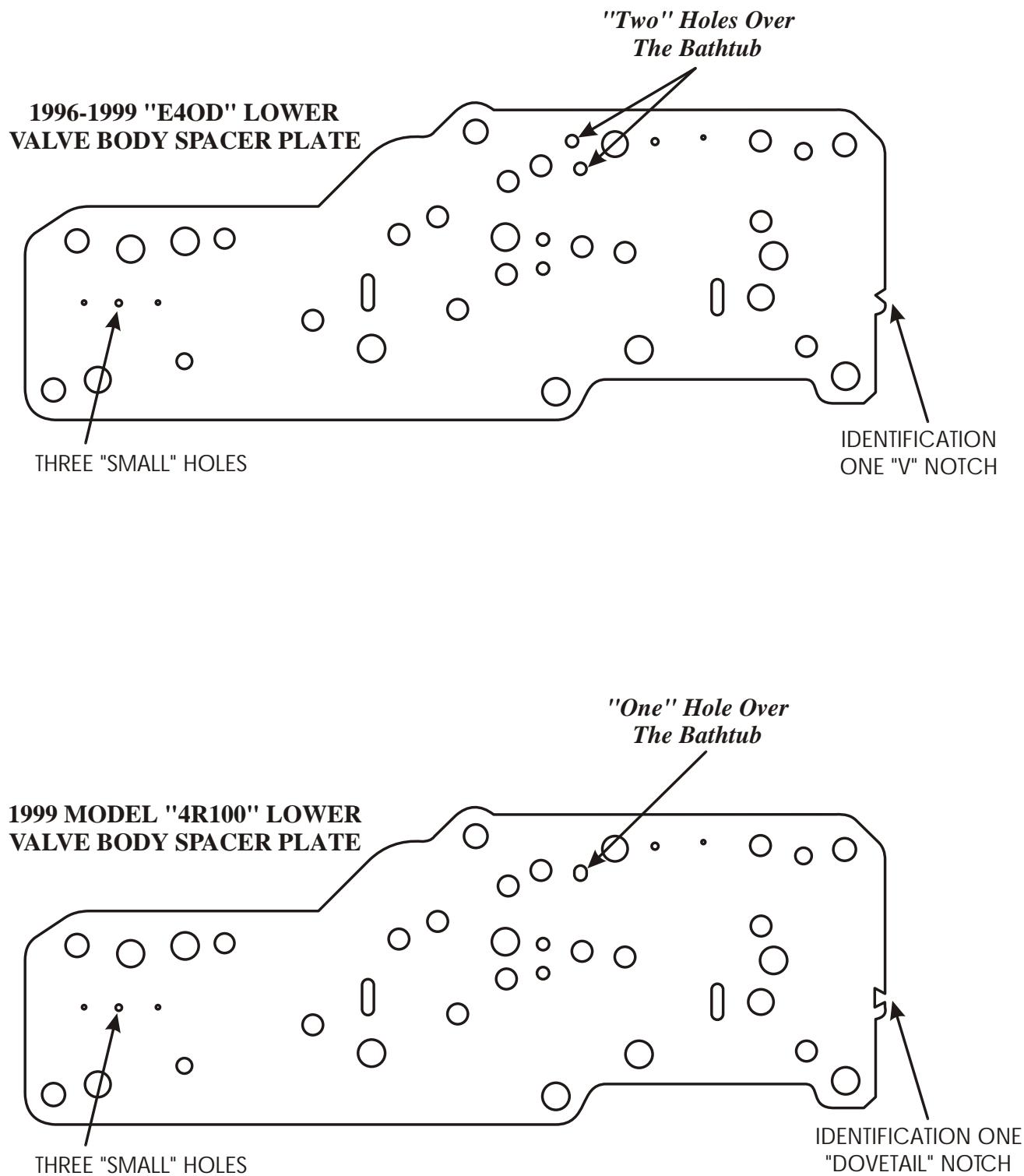
FORD 4R100

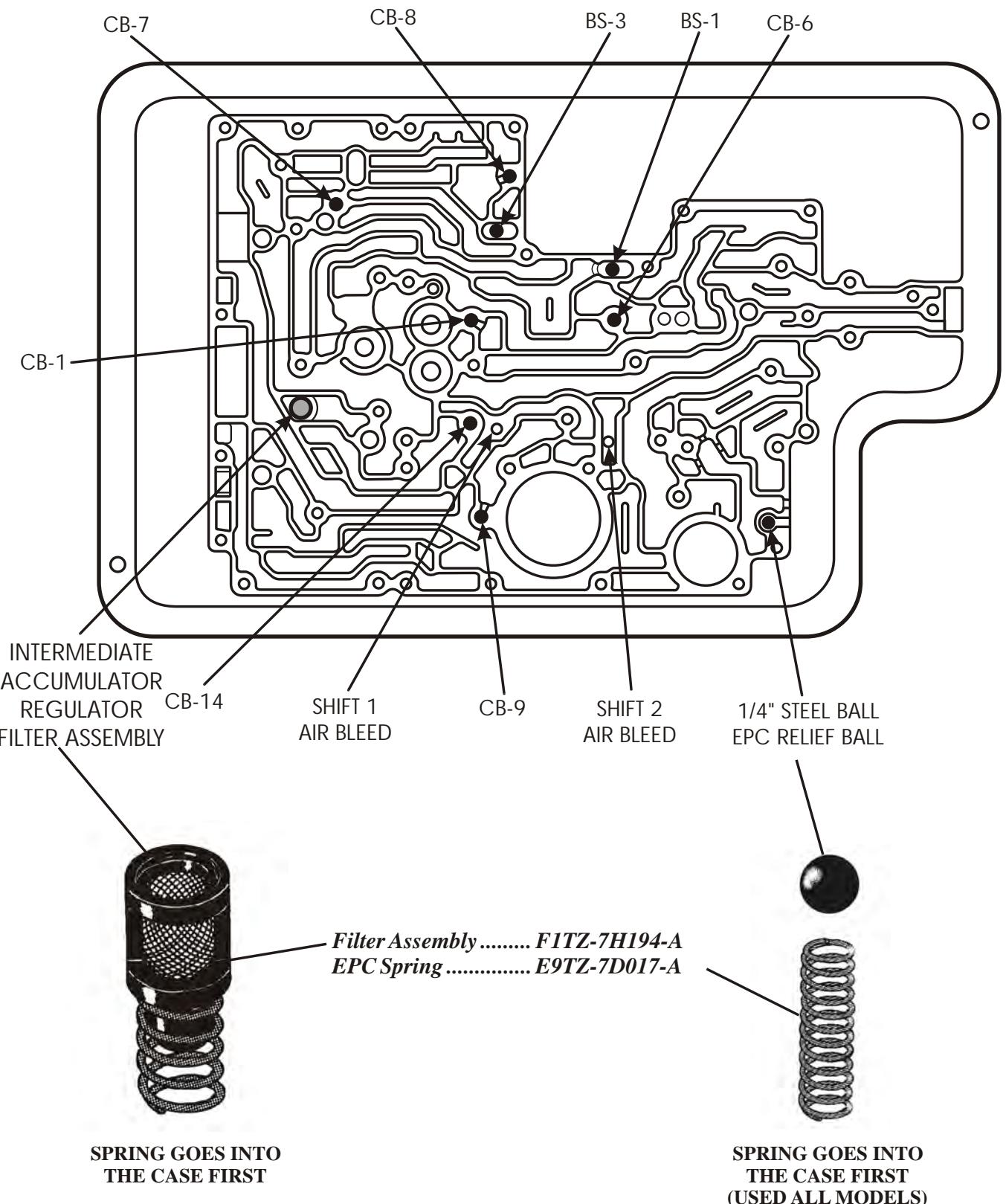
**4R100 VALVE BODY CHECKBALL LOCATIONS
REQUIRES TWO 1/4" RUBBER BALLS,
AND TWO 5/16" RUBBER BALLS**



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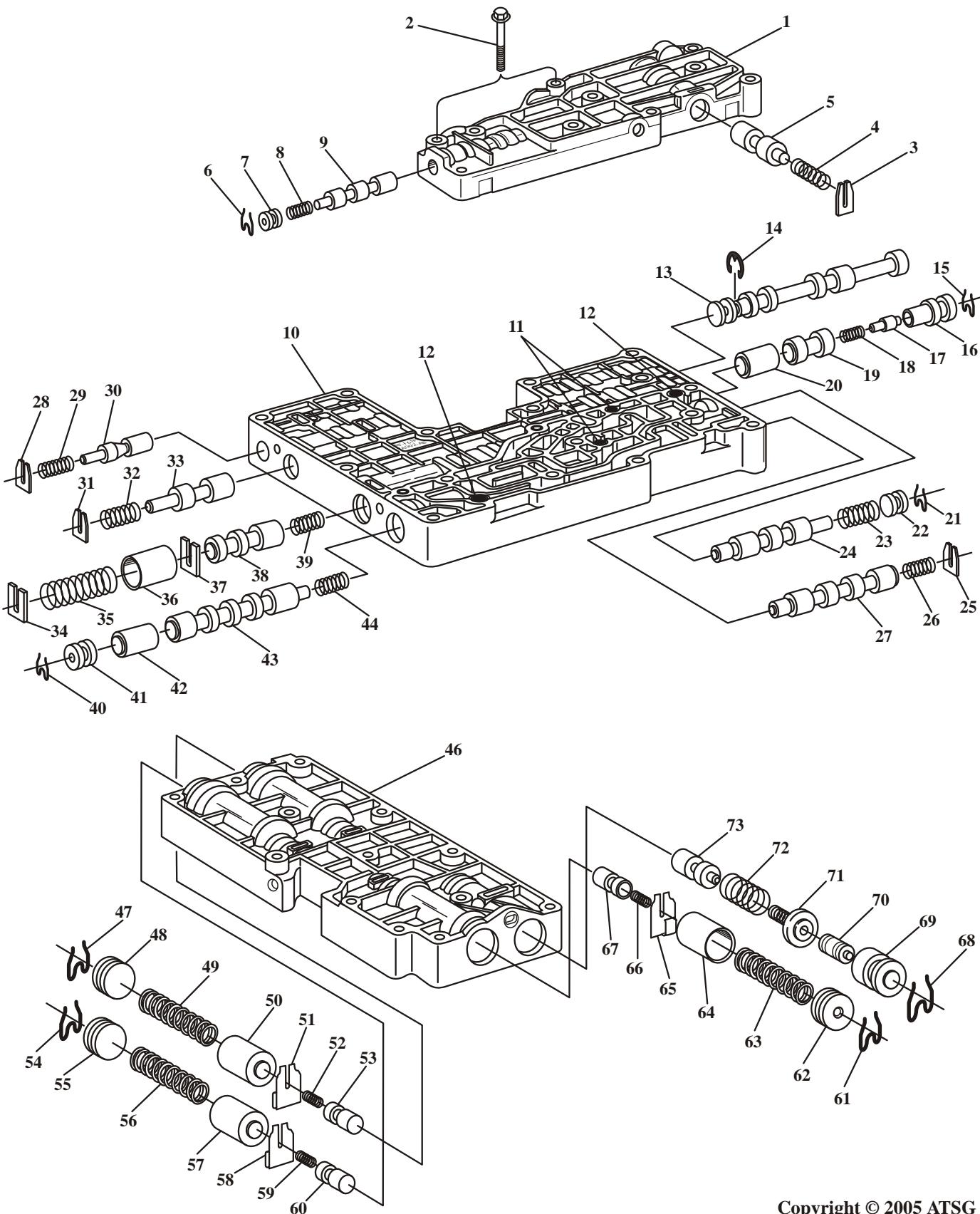
Figure 15



**1999 4R100 CASE CHECKBALL LOCATIONS
REQUIRES EIGHT (5/16") RUBBER BALLS**

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Figure 17

**FORD 4R100
MAIN, LOWER, AND ACCUMULATOR VALVE BODIES EXPLODED VIEW**

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Figure 18



Technical Service Information

FORD 4R100 MAIN, LOWER, AND ACCUMULATOR VALVE BODY LEGEND

Item	Description	Item	Description
1	Lower Valve Body	47	Spring Clip Bore Plug Retainer
2	Hex Head Bolt, M1 X 36 (2 Required)	48	Direct Clutch Accumulator Regulator Plunger Bore Plug
3	Retaining Plate	49	Direct Clutch Accumulator Regulator Plunger Spring
4	Manual 1-2 Transition Valve Spring	50	Direct Clutch Accumulator Regulator Plunger
5	Manual 1-2 Transition Valve	51	Direct Clutch Accumulator Regulator Valve Retainer
6	Spring Clip Bore Plug Retainer	52	Direct Clutch Accumulator Regulator Valve Spring
7	Engagement Valve Bore Plug	53	Direct Clutch Accumulator Regulator Valve
8	Engagement Valve Spring	54	Spring Clip Bore Plug Retainer
9	Engagement Valve	55	O.D. Clutch Accumulator Regulator Plunger Bore Plug
10	Main Valve Body	56	O.D. Clutch Accumulator Regulator Plunger Spring
11	Checkball 1/4", 2 Required (7E195)	57	O.D. Clutch Accumulator Regulator Plunger
12	Checkball 5/16", 2 Required (7E195)	58	O.D. Clutch Accumulator Regulator Valve Retainer
13	Manual Control Valve	59	O.D. Clutch Accumulator Regulator Valve Spring
14	Manual Valve "E" Clip	60	O.D. Clutch Accumulator Regulator Valve
15	Spring Clip Bore Plug Retainer	61	Spring Clip Bore Plug Retainer
16	Low Reverse Modulator Valve Sleeve	62	Int. Clutch Accumulator Regulator Plunger Bore Plug
17	Low Reverse Modulator Valve Plunger	63	Int. Clutch Accumulator Regulator Plunger Spring
18	Low Servo Modulator Valve Spring	64	Int. Clutch Accumulator Regulator Plunger
19	Low Servo Modulator Valve	65	Int. Clutch Accumulator Regulator Valve Retainer
20	Low Reverse Modulator Valve	66	Int. Clutch Accumulator Regulator Valve Spring
21	Spring Clip Bore Plug Retainer	67	Int. Clutch Accumulator Regulator Valve
22	3-4 Shift Valve Bore Plug	68	Spring Clip Bore Plug Retainer
23	3-4 Shift Valve Spring	69	Line Pressure Modulator Plunger Sleeve
24	3-4 Shift Valve	70	Line Pressure Modulator Plunger
25	Retaining Plate	71	Line Pressure Modulator Spring And Retainer Assembly
26	2-3 Shift Valve Spring	72	Line Pressure Modulator Valve Spring
27	2-3 Shift Valve	73	Line Pressure Modulator Valve
28	Retaining Plate		
29	Solenoid Regulator Valve Spring		
30	Solenoid Regulator Valve		
31	Retaining Plate		
32	Coast Clutch Shift Valve Spring		
33	Coast Clutch Shift Valve		
34	Retaining Plate		
35	4-3-2 Shift Timing Control Valve Plunger Spring		
36	4-3-2 Shift Timing Control Valve Plunger		
37	Retaining Plate		
38	4-3-2 Shift Timing Valve		
39	4-3-2 Shift Timing Valve Spring		
40	Spring Clip Bore Plug Retainer		
41	1-2 Shift Valve Bore Plug		
42	1-2 Shift Valve		
43	Drive 2 Valve		
44	1-2 Shift Valve Spring		
46	Accumulator Valve Body (7G422 Model Sensitive)		

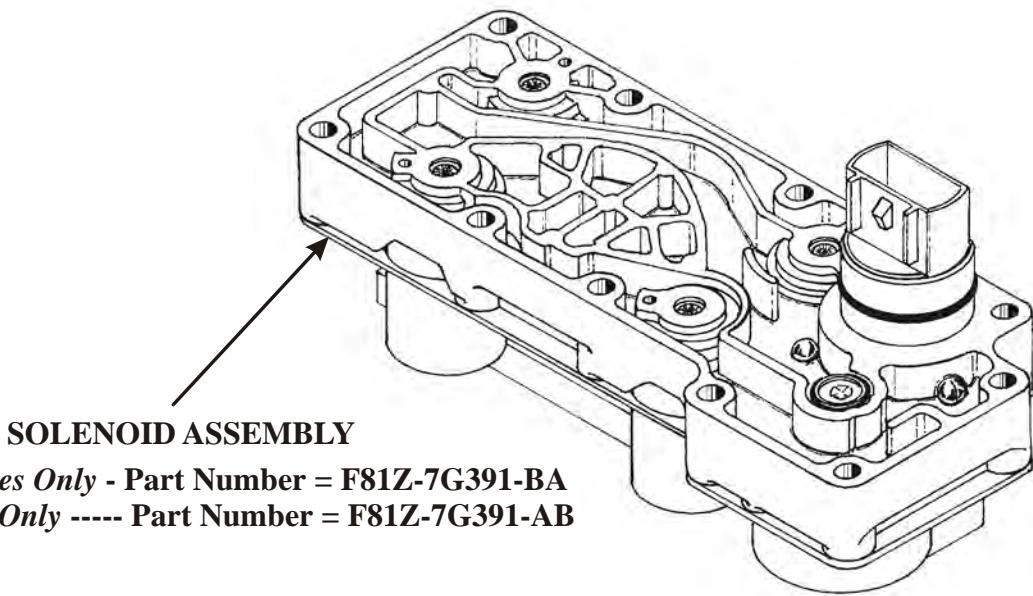
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Figure 19

FORD 4R100 SOLENOID RESISTANCE CHARTS

<i>Solenoid Resistance Chart</i>		
<i>Solenoid</i>	<i>Solenoid Body Pin Numbers</i>	<i>Resistance</i>
<i>Shift Solenoid "B" (2)</i>	<i>1 and 2</i>	<i>20-30 Ohms</i>
<i>Shift Solenoid "A" (1)</i>	<i>1 and 3</i>	<i>20-30 Ohms</i>
<i>TCC Solenoid, Gasoline (On-Off)</i>	<i>1 and 4</i>	<i>20-30 Ohms</i>
<i>TCC Solenoid, Diesel (PWM)</i>	<i>1 and 4</i>	<i>10-20 Ohms</i>
<i>Coast Clutch Solenoid</i>	<i>1 and 5</i>	<i>20-30 Ohms</i>
<i>Electronic Pressure Control Solenoid</i>	<i>11 and 12</i>	<i>3.0-5.0 Ohms</i>
<i>Transmission Fluid Temp Sensor</i>	<i>7 and 8</i>	<i>See Chart Below</i>

<i>Transmission Fluid Temperature</i>		
<i>•C</i>	<i>•F</i>	<i>Resistance</i>
<i>-40 to -20</i>	<i>-40 to -4</i>	<i>1062k - 284k W</i>
<i>-19 to -1</i>	<i>-3 to 31</i>	<i>284k - 100k W</i>
<i>0 - 20</i>	<i>32-68</i>	<i>100k - 37k W</i>
<i>21-40</i>	<i>69-104</i>	<i>37k - 16k W</i>
<i>41-70</i>	<i>105-158</i>	<i>16k - 5k W</i>
<i>71-90</i>	<i>159-194</i>	<i>5k - 2.7k W</i>
<i>91-110</i>	<i>195-230</i>	<i>2.7k - 1.5k W</i>
<i>111-130</i>	<i>231-266</i>	<i>1.5k - 0.8k W</i>
<i>131-150</i>	<i>267-302</i>	<i>0.8k - 0.54k W</i>



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Figure 20

<i>Shift Solenoid Application Chart</i>					
<i>Selector Lever Range</i>	<i>Commanded Gear</i>	<i>Shift Solenoid "A"</i>	<i>Shift Solenoid "B"</i>	<i>TCC Solenoid</i>	<i>Coast Clutch Solenoid</i>
P/R/N	1	ON	OFF	*	*
(D)	1	ON	OFF	*	*
(D)	2	ON	ON	*	*
(D)	3	OFF	ON	*	*
(D)	4	OFF	OFF	*	*
<i>(D) Cancel First Through 3rd Gear Only, SSA, SSB, TCC, Same as Overdrive, CCS Always On.</i>					
MANUAL 2	2	*	*	*	ON
MANUAL 1	2	OFF	OFF	OFF	ON
MANUAL 1	1	ON	OFF	OFF	ON

* Controlled by PCM

SHIFT SOLENOID "A" ALWAYS OFF

PCM Gear Commanded	<i>Selector Lever Position</i>		
	(D)	2	1
	<i>Actual Gear Obtained</i>		
1st	4	2	1
2nd	3	2	2
3rd	3	2	2
4th	4	2	2

SHIFT SOLENOID "B" ALWAYS OFF

PCM Gear Commanded	<i>Selector Lever Position</i>		
	(D)	2	1
	<i>Actual Gear Obtained</i>		
1st	1	2	1
2nd	1	2	1
3rd	4	2	2
4th	4	2	2

SHIFT SOLENOID "A" ALWAYS ON

PCM Gear Commanded	<i>Selector Lever Position</i>		
	(D)	2	1
	<i>Actual Gear Obtained</i>		
1st	1	2	1
2nd	2	2	1
3rd	2	2	1
4th	1	2	1

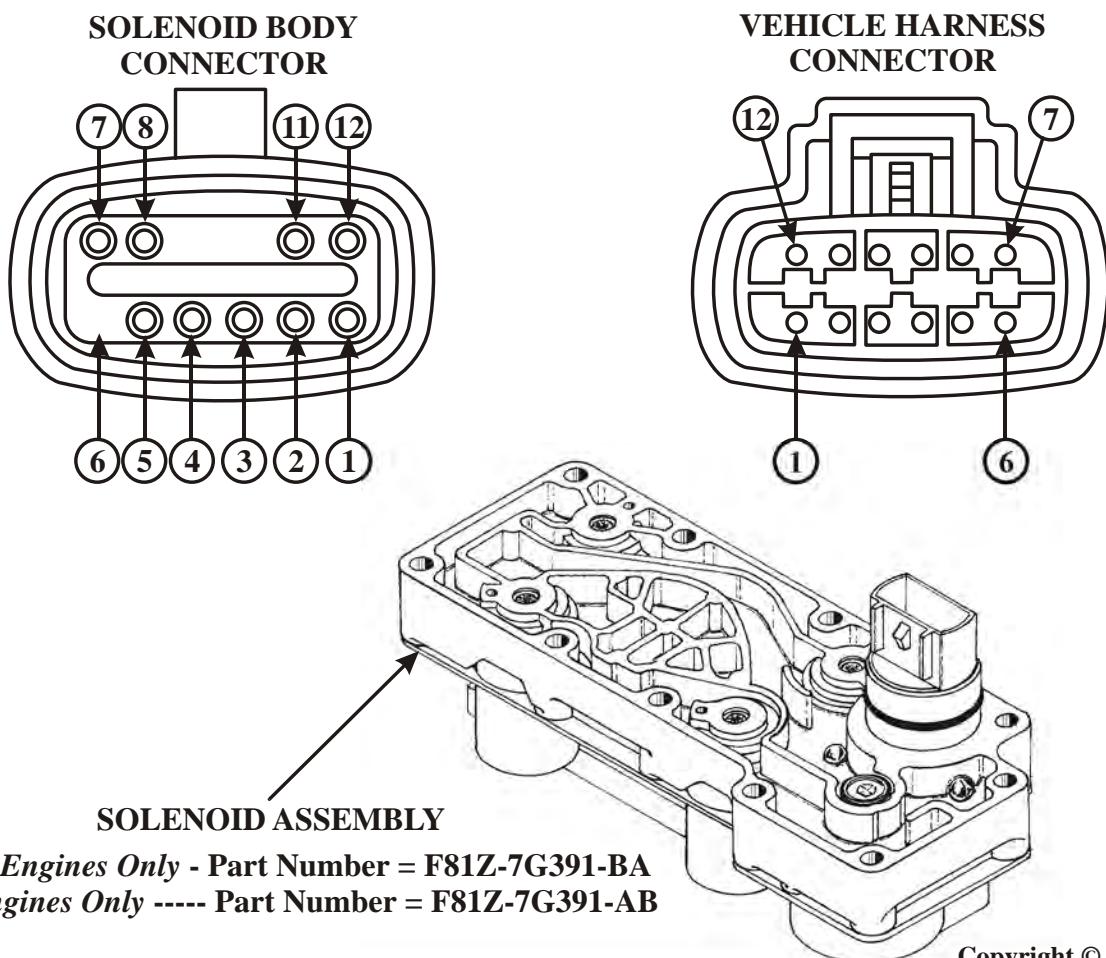
SHIFT SOLENOID "B" ALWAYS ON

PCM Gear Commanded	<i>Selector Lever Position</i>		
	(D)	2	1
	<i>Actual Gear Obtained</i>		
1st	2	2	1
2nd	2	2	1
3rd	3	2	2
4th	3	2	2

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Figure 21

FORD 4R100
SOLENOID BODY PIN IDENTIFICATION AND FUNCTION



*Gasoline Engines Only - Part Number = F81Z-7G391-BA
Diesel Engines Only ----- Part Number = F81Z-7G391-AB*

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Solenoid Connector Pin Identification and Function

Pin No.	Description	PCM Connector Pin	
		Gas & Diesel (Cal)	Diesel (49 State)
1	Vehicle Power In For Solenoids (VPWR)	71, 97	71, 97
2	Shift Solenoid "B" (2) Ground from PCM	11	1
3	Shift Solenoid "A" (1) Ground from PCM	6	27
4	Converter Clutch Solenoid Ground from PCM	54	28
5	Coast Clutch Solenoid Ground from PCM	20	53
6	Not Used		
7	Transmission Fluid Temp Sensor	37	37
8	Transmission Fluid Temp Sensor (Signal Return)	91	91
9	Not Used		
10	Not Used		
11	Electronic Pressure Control (EPC)	81	81
12	Vehicle Power In For EPC Solenoid (VPWR)	71, 97	71, 97

Figure 22



Technical Service Information

1999 FORD 4R100 <i>Abbreviation Description</i>			
<i>Abbreviation</i>	<i>Description</i>	<i>Abbreviation</i>	<i>Description</i>
4X4L	4X4 Low Switch	MIL	Malfunction Indicator Lamp
ABS	Antilock Brake System	OCT ADJ	Octane Adjust
A/C	Air Conditioning	OSS	Output Shaft Sensor
ACCS	Air Conditioning Clutch Status	PCM	Powertrain Control Module
AP	Accelerator Pedal Position Sensor	PIP	Profile Ignition Pickup
ARPMDES	Ancillary Engine Speed Desired	RPM	Engine Speed
BARO	Barometric Pressure Sensor	SCCS	Speed Control Command Switch
BOO	Brake ON/OFF Switch	SS1	Shift Solenoid "1"
BPA	Brake Pressure Applied	SS2	Shift Solenoid "2"
BPP	Brake Pedal Position	SSA	Shift Solenoid "A"
CCS	Coast Clutch Solenoid	SSB	Shift Solenoid "B"
CPP	Clutch Pedal Position	SPOUT	Spark Output
CRUISE	Cruise Control Mode (Driving)	TCC	Torque Converter Clutch
DLC	Data Link Connector	TCIL	Trans Control Indicator Lamp
DTC	Diagnostic Trouble Code	TCS	Transmission Control Switch
DTC CNT	Diagnostic Trouble Code Count	TFT	Transmission Fluid Temperature
DTR	Digital Transmission Range Sensor	TP	Throttle Position Sensor
EBP	Exhaust Back Pressure	TSS	Turbine Shaft Speed Sensor
ECT	Engine Coolant Temperature	VPWR	Vehicle Power Supply
EOT	Engine Oil Temperature	VREF	Vehicle Reference Voltage
EPC	Electronic Pressure Control	VSS	Vehicle Speed Sensor
EPR	Exhaust Pressure Regulator	WOT	Wide Open Throttle
FUEL PW	Fuel Pulse Width		
GPC	Glow Plug Control Duty Cycle		
IAT	Intake Air Temperature		
ICP	Injector Control Pressure Sensor		
IPR	Injector Pressure Regulator		
IVS	Idle Validation Switch		
KAM	Keep Alive Memory		
KAPWR	Keep Alive Power		
KOEO	Key On Engine Off		
KOEO	Key On Engine Running		
MAF	Mass Air Flow Sensor		
MAP	Manifold Absolute Pressure Sensor		Copyright © 2005 ATSG

Figure 23



Technical Service Information

1999 FORD 4R100 Diagnostic Trouble Code Chart		
Diagnostic Code	Description	Symptom
P0102	<i>MAF sensor system fails to operate in a normal manner, which may cause a transmission concern.</i>	<i>High EPC pressure. Firm shifts and engagements. May flash TCIL.</i>
P0103		
P0107	<i>BARO sensor circuit signal higher or lower than expected.</i>	<i>Firm shift feel, late shifts at higher altitudes.</i>
P0108		
P0122	<i>(TP) Throttle Position sensor or (AP) Accelerator Pedal Position sensor below specification during normal operation.</i>	<i>Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.</i>
P0123	<i>(TP) Throttle Position sensor or (AP) Accelerator Pedal Position sensor above or below normal specifications during normal operation.</i>	<i>Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.</i>
P0235	<i>MAP sensor or circuit open, shorted to ground or to 5V.</i>	<i>Firm shift feel, late shifts at higher altitudes.</i>
P0236	<i>MAP sensor signal higher or lower than expected or no response due to vacuum hose circuit damaged, disconnected or restricted.</i>	<i>Firm shift feel, late shifts at higher altitudes.</i>
P0237	<i>MAP sensor out of On-Board Diagnostics range. No response during Dynamic Response (Goose) test.</i>	<i>Rerun On-Board Diagnostics and perform "Goose" test when asked.</i>
P0340	<i>(DI) Distributor Ignition circuit concern or (CKP) Crankshaft Position sensor failure.</i>	<i>Engine will stall or will not run. May flash TCIL.</i>
P0341		
P0344		
P0500	<i>Insufficient or intermittent vehicle speed input from VSS/ABS.</i>	<i>Harsh engagements, firm shift feel, abnormal shift pattern, unexpected downshifts may occur at closed throttle, abnormal TCC operation or engages only at WOT. May flash TCIL.</i>
P0503		
P0571	<i>(BPP) Brake Pedal Position switch failure, or not connected.</i>	<i>Failed off. TCC will not disengage when brake is applied.</i>
P0703	<i>(BPP) Brake Pedal Position switch failure, or not connected.</i>	<i>Failed off. TCC will not disengage when brake is applied.</i>
P0705	<i>(DTR) Digital Transmission Range sensor circuit malfunction.</i>	<i>Harsh engagements, firm shift feel. May flash TCIL.</i>
P0708	<i>(DTR) Digital Transmission Range sensor circuit malfunction.</i>	<i>Slight increase in EPC pressure.</i>
P0712	<i>TFT sensor circuit grounded, exceeds scale set for temperature of 315°F.</i>	<i>Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.</i>

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Figure 24



Technical Service Information

1999 FORD 4R100 Diagnostic Trouble Code Chart		
Diagnostic Code	Description	Symptom
P0713	<i>TFT sensor circuit open, exceeds scale set for temperature of minus 40°F.</i>	<i>TCC and stabilized shift schedule may be enabled sooner after cold start. May flash TCIL.</i>
P0715	<i>Insufficient input from TSS sensor.</i>	<i>Set DTC, Flash TCIL and Flash MIL.</i>
P0717	<i>TSS sensor signal intermittent.</i>	<i>Set DTC, Flash TCIL.</i>
P0718	<i>TSS sensor signal noisy.</i>	<i>Set DTC.</i>
P0720	<i>Insufficient input from OSS sensor.</i>	<i>Set DTC, Flash TCIL and Flash MIL.</i>
P0721	<i>OSS sensor signal noisy.</i>	<i>Set DTC.</i>
P0722	<i>OSS sensor signal intermittent.</i>	<i>Set DTC, Flash TCIL.</i>
P0731	<i>1-2 shift error because of SSA, SSB, or internal transmission components.</i>	<i>Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.</i>
P0732	<i>2-3 shift error because of SSA, SSB, or internal transmission components.</i>	<i>Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.</i>
P0733	<i>3-4 shift error because of SSA, SSB, or internal transmission components.</i>	<i>Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.</i>
P0741	<i>The PCM picked up an excessive amount of TCC slippage during normal operation.</i>	<i>TCC slippage/erratic or no torque converter clutch operation. Flash TCIL.</i>
P0743	<i>TCC Solenoid circuit failure.</i>	<i>Short Circuit: Engine stalls in "D" or "2" at idle with brake applied. Open Circuit: TCC never engaged.</i>
P0750	<i>SSA circuit failure.</i>	<i>Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.</i>
P0755	<i>SSB circuit failure.</i>	<i>Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.</i>

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Figure 25



Technical Service Information

1999 FORD 4R100 Diagnostic Trouble Code Chart		
Diagnostic Code	Description	Symptom
P0781	<i>1-2 shift error because of SSA, SSB, or internal transmission components.</i>	<i>Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.</i>
P0782	<i>2-3 shift error because of SSA, SSB, or internal transmission components.</i>	<i>Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.</i>
P0783	<i>3-4 shift error because of SSA, SSB, or internal transmission components.</i>	<i>Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.</i>
P1100 P1101	<i>MAF sensor system fails to operate in a normal manner, which may cause a transmission concern.</i>	<i>High EPC pressure. Firm shifts and engagements. May flash TCIL.</i>
P1111	<i>System Pass.</i>	<i>No Codes Detected.</i>
P1120	<i>Throttle Position Sensor voltage lower than expected.</i>	<i>Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.</i>
P1124	<i>Throttle Position Sensor out of On-Board Diagnostics range during KOEO test.</i>	<i>TP sensor (Gas Engines) not at idle position during KOEO test.</i>
P1280	<i>Injection Control Pressure (ICP) sensor circuit failure (Diesel Engine), or out of range low.</i>	<i>May result in firm shifts.</i>
P1281	<i>Injection Control Pressure (ICP) sensor circuit failure (Diesel Engine), or out of range high.</i>	<i>May result in firm shifts.</i>
P1460 P1463 P1464	<i>A/C switch error.</i>	<i>Failed On: EPC pressure slightly low with A/C off. Failed Off: EPC pressure slightly low with A/C on.</i>
P1500	<i>Insufficient or intermittent vehicle speed input from VSS/ABS.</i>	<i>Harsh engagements, firm shift feel, abnormal shift pattern, unexpected downshifts may occur at closed throttle, abnormal TCC operation or engages only at WOT. May flash TCIL.</i>

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Figure 26

1999 FORD 4R100		
Diagnostic Trouble Code Chart		
Diagnostic Code	Description	Symptom
P1702	Digital Transmission Range (DTR) sensor signal intermittent.	Erratic harsh shift engagements.
P1703	(BPP) Brake Pedal Position switch not actuated during KOER test.	Failed on or not connected, TCC will not engage at less than one-third throttle opening.
P1704	Digital Transmission Range (DTR) sensor misaligned or failed electronically.	Increase in EPC pressure.
P1705	Digital Transmission Range (DTR) sensor not run in park or neutral during On-Board Diagnostics KOEO or KOER tests.	Rerun On-Board Diagnostics.
P1711	Transmission not at operating temperature during On-Board Diagnostics.	Warm vehicle to normal operating temperature and rerun On-Board Diagnostics.
P1713	No change in TFT sensor - Low range.	May flash TCIL.
P1714	SSA mechanical failure detected.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P1715	SSB mechanical failure detected.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P1718	No change in TFT sensor - High range.	May flash TCIL.
P1728	Excessive amount of transmission slippage has been detected.	Transmission slippage, erratic or no TCC operation. May flash TCIL.
P1729	4X4 Low switch circuit failure.	Early or delayed shift schedule.
P1740	TCC solenoid mechanical failure detected.	Harsh shift, may flash TCIL.
P1744	The PCM picked up an excessive amount of TCC slippage during normal operation.	TCC slippage/erratic or no torque converter clutch operation. Flash TCIL.
P1746	Failure of the EPC control pressure driver located inside the PCM.	Open circuit causes maximum EPC pressure, harsh engagements and shifts. May flash TCIL.
P1747	EPC shorted circuit failure, or PCM.	Shorted circuit causes minimum EPC pressure, limits engine torque with partial fuel shut off and heavy misfire. Flashing TCIL.

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Figure 27



Technical Service Information

1999 FORD 4R100 Diagnostic Trouble Code Chart		
Diagnostic Code	Description	Symptom
P1754	<i>CCS circuit failure.</i>	<i>Failed Off: No third gear engine braking in O.D. cancel. Failed On: Third gear engine braking in O.D. range. Coast clutch may be damaged causing eventual failure.</i>
P1760	<i>EPC signal intermittent short.</i>	<i>Short circuit causes minimum EPC pressure.</i>
P1780	<i>TCS not cycled during the On-Board Diagnostics or the circuit is open or shorted.</i>	<i>No overdrive cancel when switch is cycled.</i>
P1781	<i>4X4 Low switch circuit failure.</i>	<i>Early or delayed shift schedule.</i>
P1783	<i>Transmission Fluid Temperature has exceeded 270°F.</i>	<i>Slight increase in EPC pressure. May flash TCIL.</i>

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Figure 28



FORD 4R100 POWER-TAKE-OFF DESCRIPTION AND OPERATION

DESCRIPTION:

Beginning at the start of production for 1999 models, Ford Motor Company introduced a new 4R100 transmission in some F250, F350, F450 and F550 Super Duty Trucks, equipped with the 5.4L, 6.8L and 7.3L engines. Basically the new 4R100 is a revised version of the previous E4OD transmission with a Power-Take-Off (PTO) window on the left side of the transmission case, right behind the front pump. Refer to Figure 29. The revisions that have occurred have created many major engineering changes that have affected many internal and external parts that will create service concerns and diagnostic concerns.

PTO REQUIREMENTS:

- (1) Obviously the case must be PTO capable with the cast-in window in the transmission where the PTO unit mounts to the transmission, as shown in Figure 29.
- (2) Designed for use during Mobile (Some Models) or Stationary conditions.
- (3) PTO is available as an option **only** on 8500 GVW or above, Super Duty F-Series trucks with 6.8L Gasoline and 7.3L Diesel engines. Ford 4R100 transmissions on other models **are not** PTO capable.
- (4) Battery voltage **must** be supplied to the Electronic Engine Control (EEC) input pin 4 on gasoline models, or pin 66 on diesel models, **when PTO is engaged**. The processor uses this information to raise EPC pressure to approximately 55 PSI so that you do not smoke the coast clutch. **This voltage must be provided by the PTO installer.**

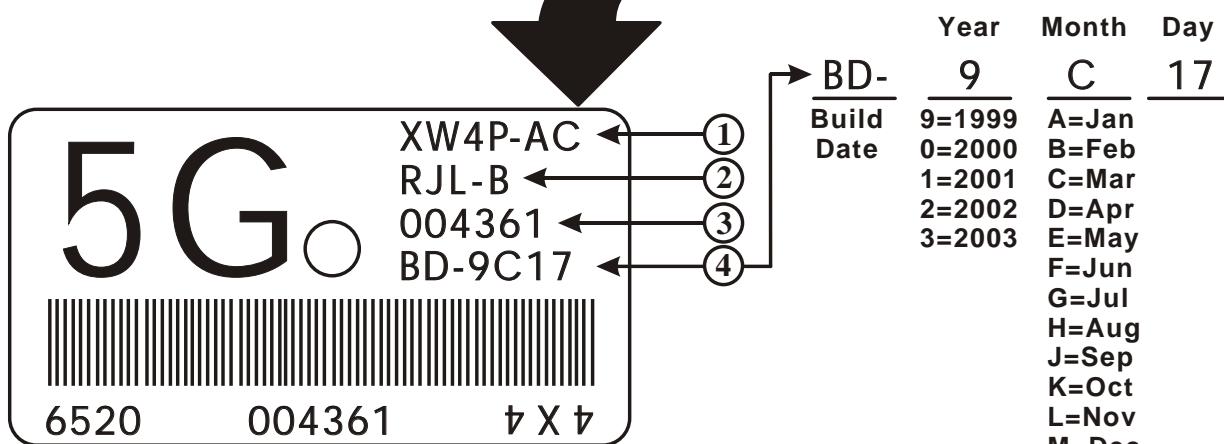
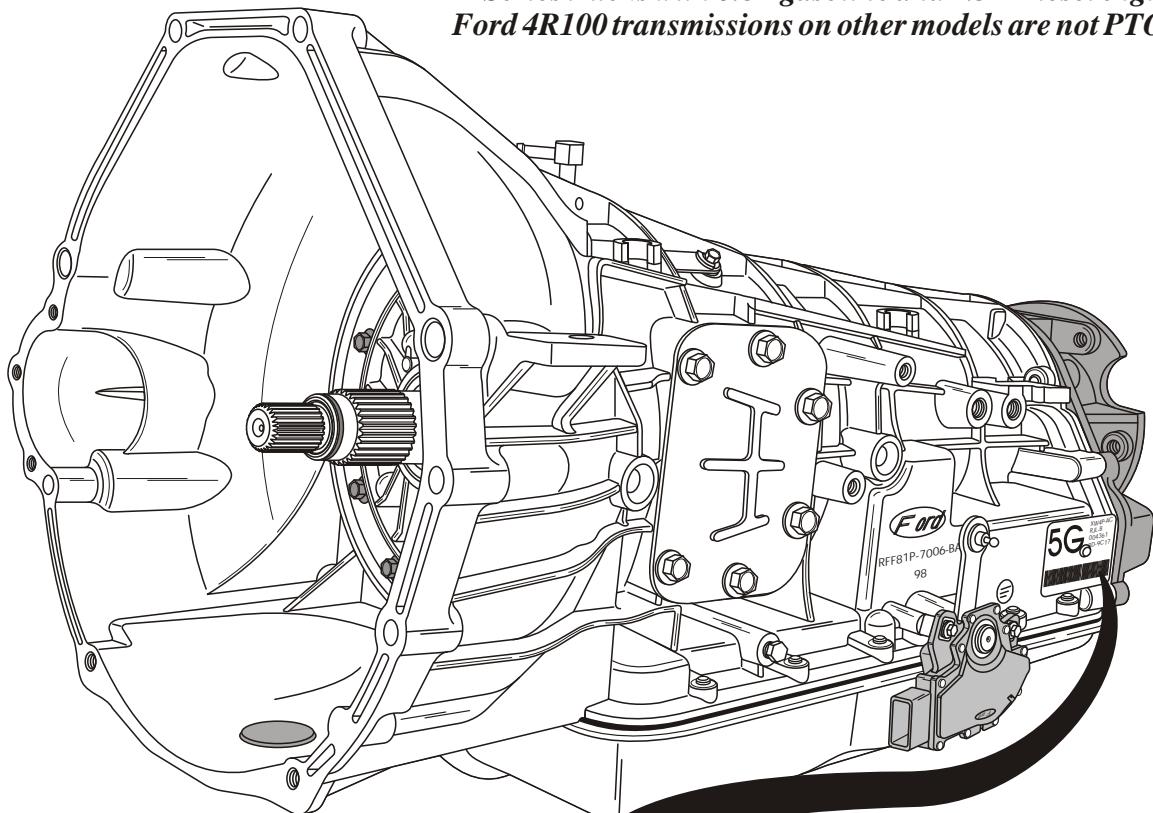
CONDITIONS FOR PTO OPERATION (General):

- (1) The vehicle is not in the crank or start mode.
- (2) The transmission range selector **must** be in P, R, O.D, 2 or 1 position. The PTO will not operate when selector is in the neutral position.
- (3) PTO operation is inhibited when in cranking mode, neutral, or 4th gear.
- (4) Transmission only operates 1st through 3rd gears. Computer strategy does not allow 4th gear to engage, even if selected.
- (5) Transmission Fluid Temperature Sensor reading is up to operating temperature.

Continued on Page 36

FORD 4R100
WITH POWER TAKE OFF OPTION

Note: PTO is available as an option on 8500 GVW or above, Super Duty F-Series trucks with 6.8L gasoline and 7.3L Diesel engines. Ford 4R100 transmissions on other models are not PTO capable.



1	<i>Assembly Part Number, Prefix And Suffix</i>
2	<i>Transmission Model</i>
3	<i>Serial Number</i>
4	<i>Build Date (Year, Month, Day)</i>

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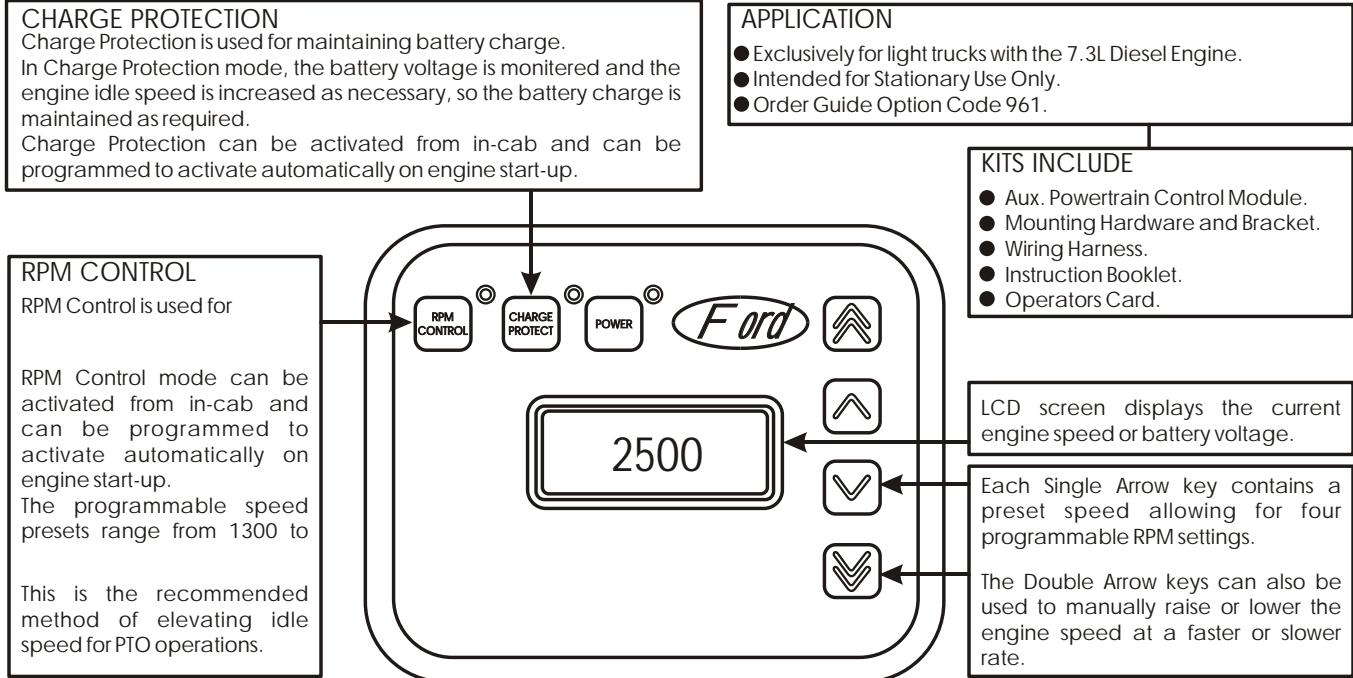
Figure 29

DIESEL ENGINE PTO OPERATION:

"AUXILIARY" POWERTRAIN CONTROL MODULE 7.3L DIESEL ENGINE (ONLY)

- The Auxiliary Powertrain Control Module (APCM) commands the Electronic Engine Control (EEC) module to increase the idle speed during PTO operation. The APCM controls engine speed from 1200 to 2500 RPM.
- The Auxiliary Powertrain Control Module is a separate option, *it does not come standard* with a PTO capable transmission, and is for 7.3L diesel applications only.
- Intended for stationary use only, and in stationary operation the PTO requires an engine idle speed of 1200 RPM. During stationary PTO operation on the 7.3L diesel, the EEC increases the idle to 1200 RPM automatically.
- During stationary PTO operation, the Torque Converter Clutch (TCC) engages once the RPM reaches 1200-1300 RPM.
- The following conditions **must** be met before the idle speed is increased:
 1. *Parking brake must be engaged for all applications.*
 2. *No hydraulic brake actuation.*
 3. *Accelerator pedal must be in the idle position.*
 4. *Vehicle speed must be zero MPH.*
 5. *Brake lights must be functional.*

Ford AUXILIARY POWERTRAIN CONTROL MODULE



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Continued on Page 37



Technical Service Information

GASOLINE ENGINE PTO OPERATION:

- (1) PTO installer must obtain a "High Idle Throttle Control" from an aftermarket source.
- (2) Auxiliary Powertrain Control Module seen on the previous page, ***does not*** work on the gasoline engine models. APCM module works ***only*** on the 7.3L diesel engine.
- (3) For stationary PTO operation, an engine idle speed of 1300 RPM is required.
- (4) The Torque Converter Clutch (TCC) engages once the engine reaches 1300 RPM.

TRANSMISSION FUNCTIONS DURING PTO OPERATION:

- (1) Shift Solenoid "B" (2) is turned on, the coast clutch activates and does not allow 4th gear operation during PTO operation.
- (2) The Electronic Pressure Control (EPC) pressure is raised to approximately 55 PSI. This is why the coast clutch will be smoked in a short period of time if the battery voltage wire is not applied to EEC input pin 4 (gasoline) or pin 66 (diesel) when the PTO is engaged.
- (3) The Transmission Control Indicator Lamp (TCIL) illuminates.
- (4) When the PTO is turned ON, the transmission operates only in 1st through 3rd gears. Overdrive 4th gear is not allowed by the strategy.
- (5) The transmission shift schedule is ***early*** and shift feel is ***very firm***.

DIAGNOSIS CONCERNS WITH PTO EQUIPPED VEHICLES:

- (1) ***Always*** ensure that PTO is turned OFF, before any diagnosis procedures begin.
- (2) ***Never*** perform any transmission special tests (i.e. pressure test, stall test etc.) when the PTO is turned ON.
- (3) If a transmission concern or symptom goes away with the PTO turned OFF, it is most likely ***not a transmission concern***.
- (4) On Board Diagnostics operate normally during PTO operation with the exception of the engine misfire moniter. The circuit checks made by the PCM and Failure Mode Effect Management (FMEM) capability will continue. The PTO ***must*** be turned OFF to access Diagnostic Trouble Codes (DTC's) and perform OBD tests.
- (5) ***No testing with the PTO turned ON.***

FORD 4R100

"NON-PTO" AND "PTO" HYDRAULIC DIFFERENCES

CHANGE: Beginning at the start of production for 1999 models, Ford Motor Company made available a "Power Take Off" option for some F250, F350, F450 and F550 Super Duty Trucks, equipped with 5.4L, 6.8L and 7.3L engines.

REASON: The "PTO" option addition, to the 4R100, required many changes to the transmission to make the "PTO" function. The "PTO" window, added to the case, the "PTO" drive gear and other cosmetic changes were previously covered in this manual. Hydraulic changes also had to be made to make the coast clutch operate in ranges other than the Drive ranges.

PARTS AFFECTED:

- (1) **TRANSMISSION CASE:** The transmission case was changed to accommodate the "PTO" window, as previously shown in this manual. All 4R100 Cases, "NON-PTO" and "PTO," also had a "Dam" added to separate "Rear Lube" and to incorporate "Central Lube" as shown in Figure 30.
- (2) **VALVE BODY TO CASE SPACER PLATE:** The Valve Body to Case Spacer plate on the "PTO" versions had a hole added, to supply the 3-4 Shift Valve with Line Pressure, as shown in Figure 32. A hole was also added to the Spacer Plate on "NON-PTO" and "PTO" versions to connect "Solenoid Regulator Valve" oil to supply "Central Lubrication." Refer to Figures 31 and 32 for identification of "NON-PTO" and "PTO" Valve Body To Case Spacer Plates.
- (3) **MAIN VALVE BODY:** A passage was added on the "Upper Side" of the Main Valve Body on "PTO" versions, as shown in Figure 34, to supply Line Pressure to the 3-4 Shift Valve. A passage was also added, on the "Lower Side" of the Main Valve Body, to connect the 3-4 Shift Valve (Coast Clutch Circuit) to an exhaust as shown in Figure 36. The spring side of the 3-4 Shift Valve was also separated from the Low/Reverse circuit as shown in Figure 36. Refer to Figures 33 thru 36 for identification of "NON-PTO" and "PTO" Main Valvebody's.
- (4) **LOWER VALVE BODY:** The Lower Valve Body had a passage added, as shown in Figure 38, to connect to the "*new*" exhaust passage in the Main Valve Body. Refer to Figures 37 and 38 for identification of "NON-PTO" and "PTO" Lower Valvebody's.
- (5) **LOWER VALVE BODY SPACER PLATE:** The Lower Valve Body Spacer Plate had a hole added to connect the "*new*" exhaust passage in the Main Valve Body to the "*new*" exhaust passage in the Lower Valve body, as shown in Figure 39. Refer to Figure 39 for "NON-PTO" and "PTO" Lower Valve Body Spacer Plate identification.

INTERCHANGEABILITY:

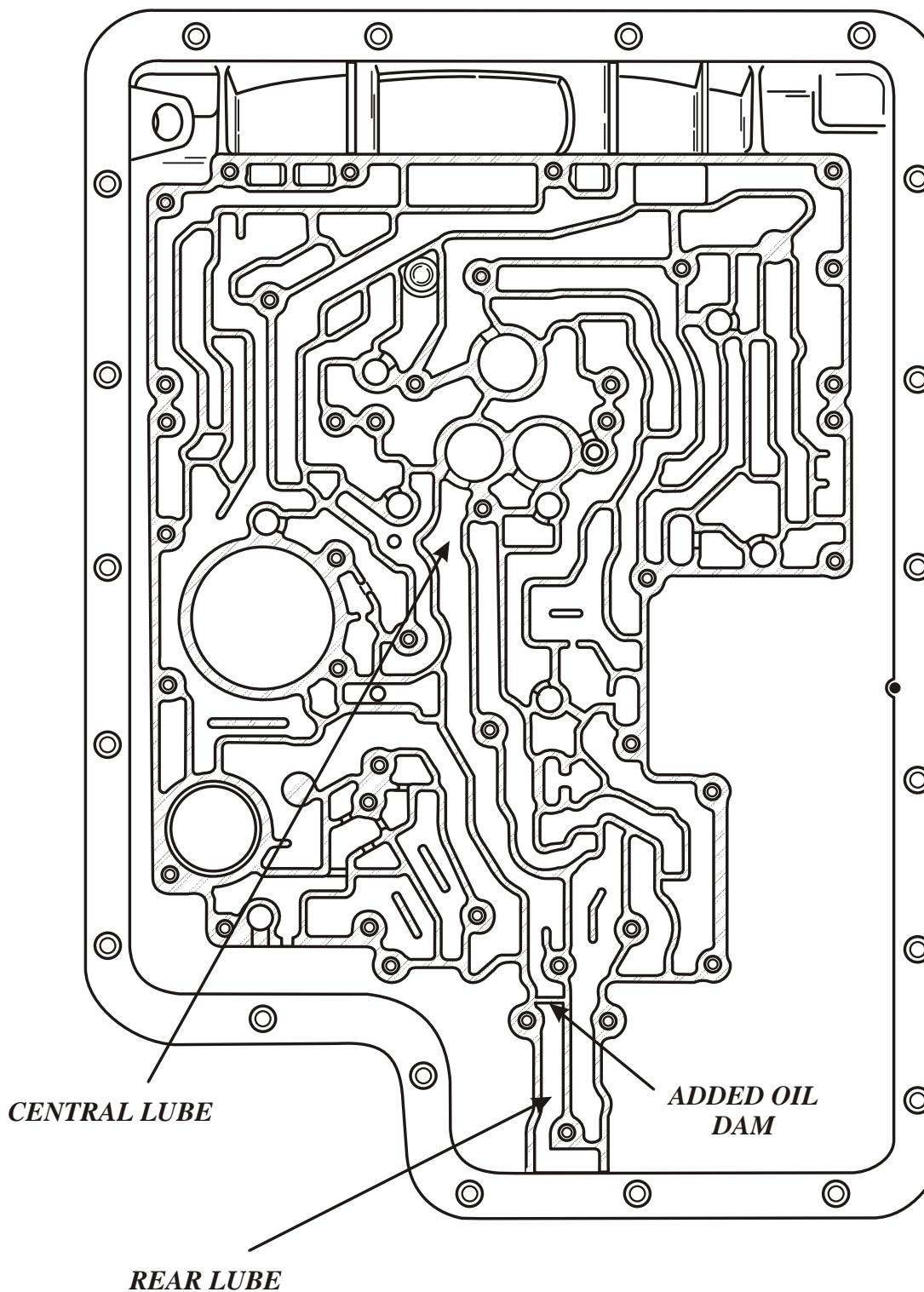
None of the parts listed above will interchange between "NON-PTO" and "PTO" versions.

SERVICE INFORMATION:

Valve Body To Case Spacer Plate (Non-PTO)	F81Z-7A008-DA
Valve Body To Case Spacer Plate (PTO)	F81Z-7A008-BA

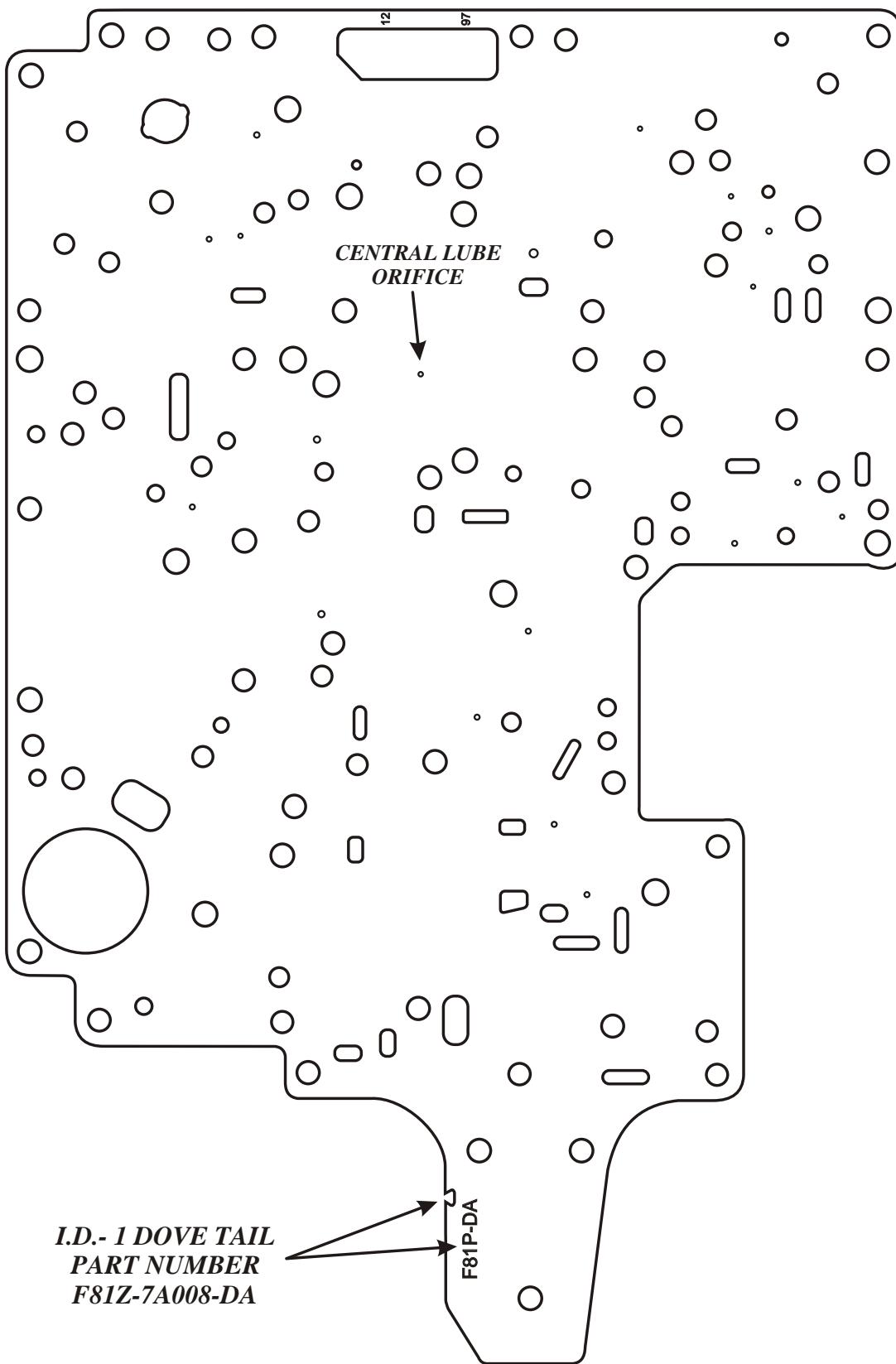
Partial Hydraulic Schematic is provided for you in Figure 40 on Page 49.

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4R100 CASE "NON-PTO" AND "PTO"

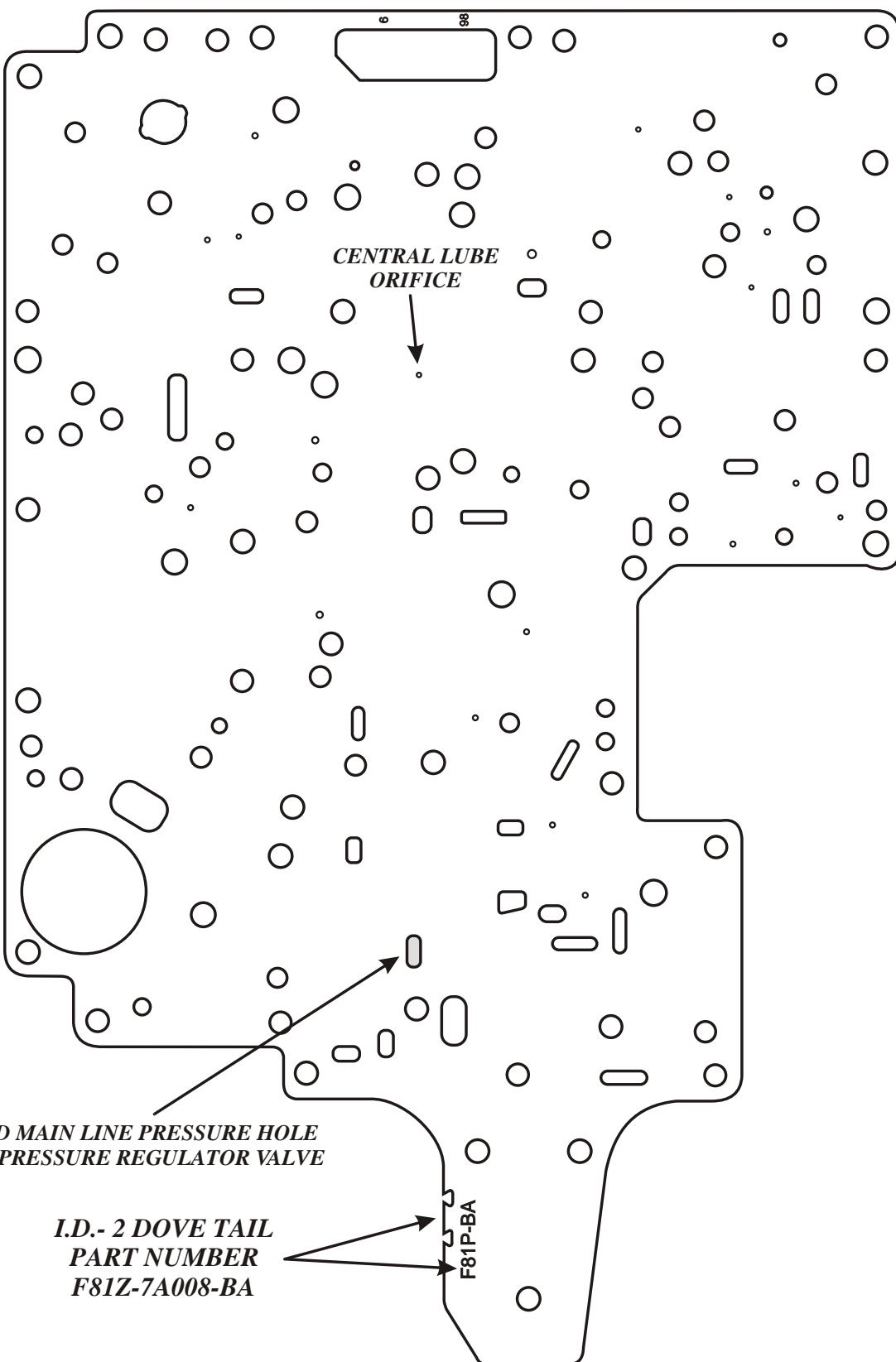
Copyright © 2005 ATSG

Figure 30

4R100 MAIN SPACER PLATE "NON-PTO"

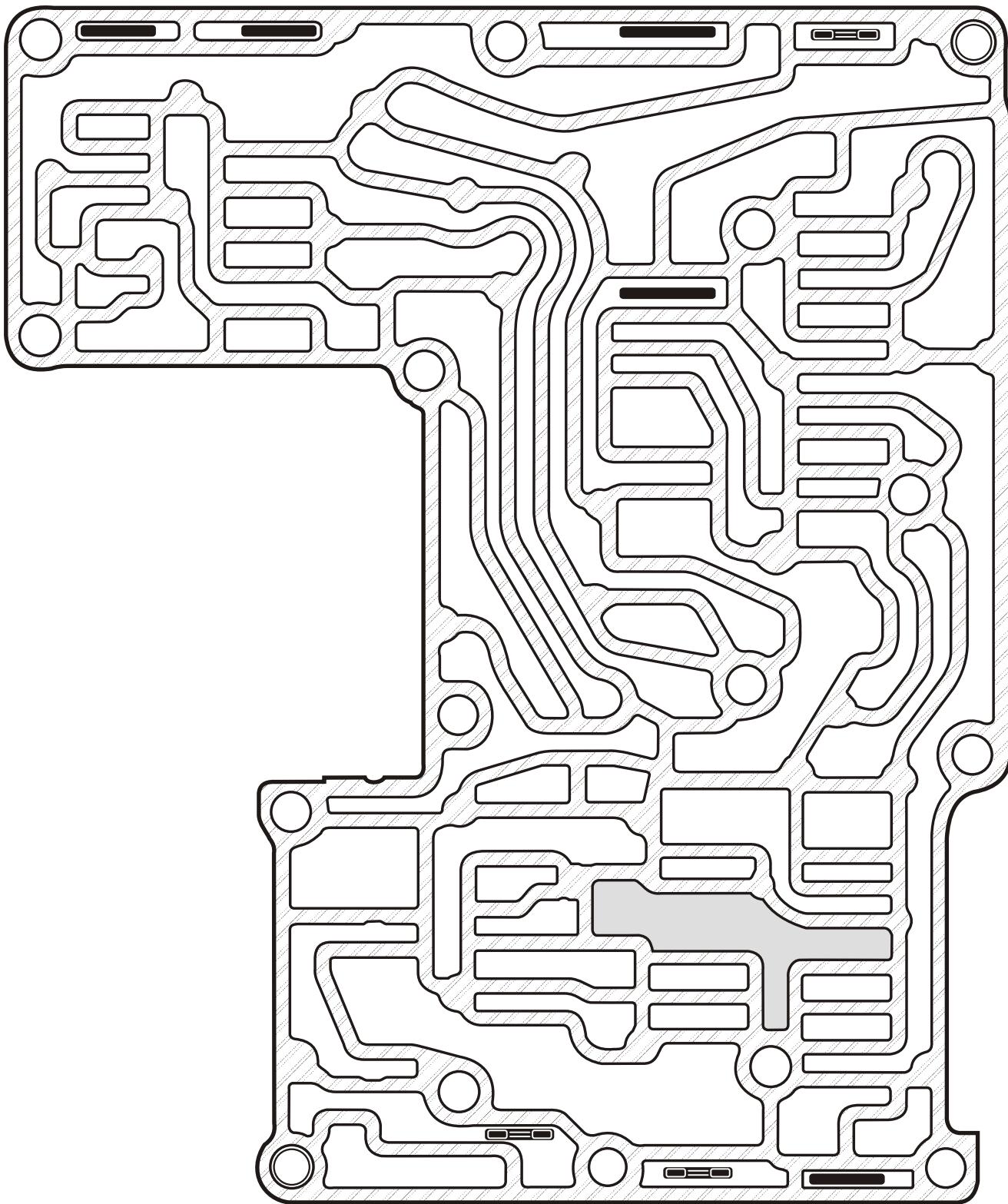
Copyright © 2005 ATSG

Figure 31

4R100 MAIN SPACER PLATE "PTO"

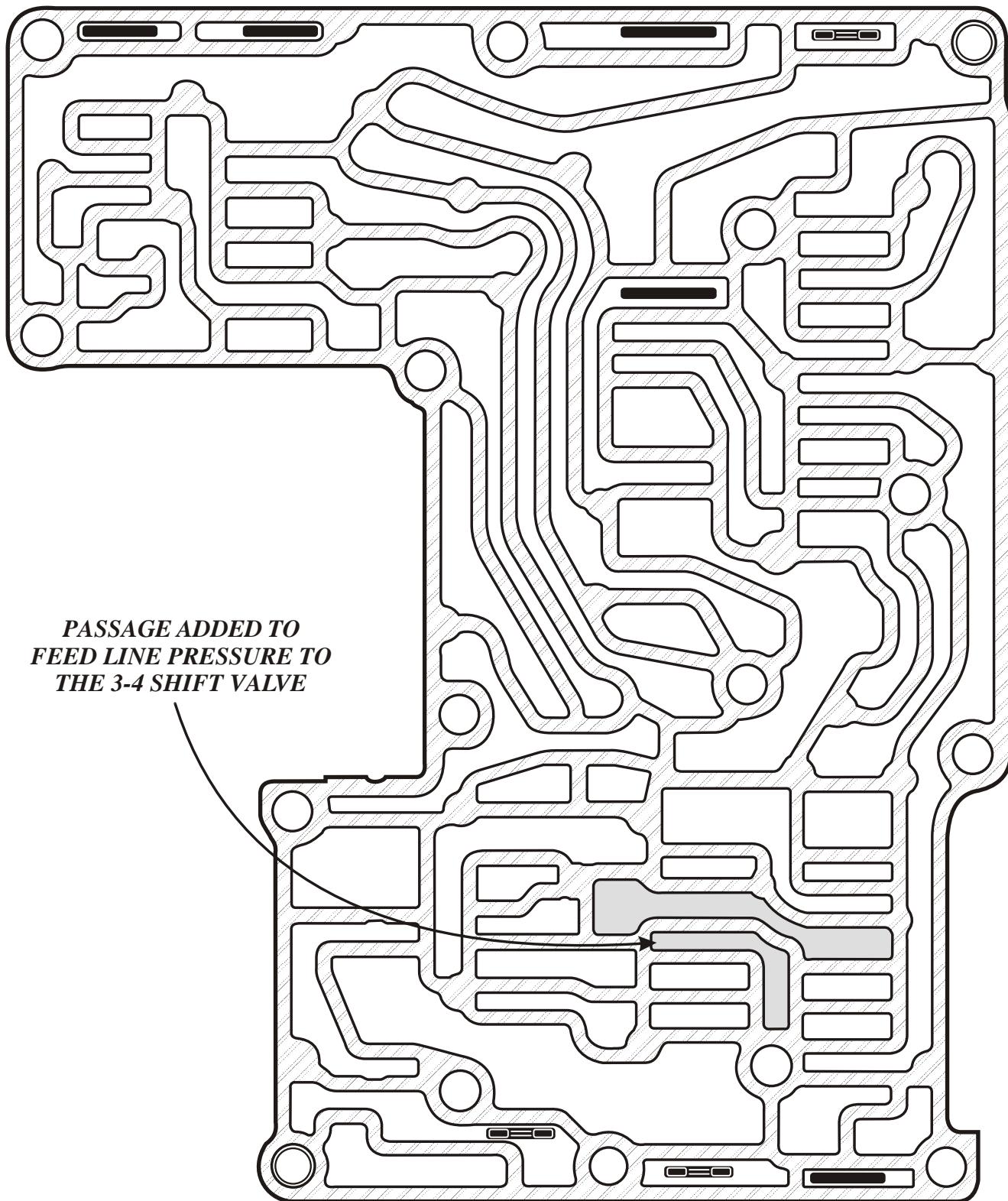
Copyright © 2005 ATSG

Figure 32

"UPPER SIDE" 4R100 MAIN VALVE BODY "NON-PTO"

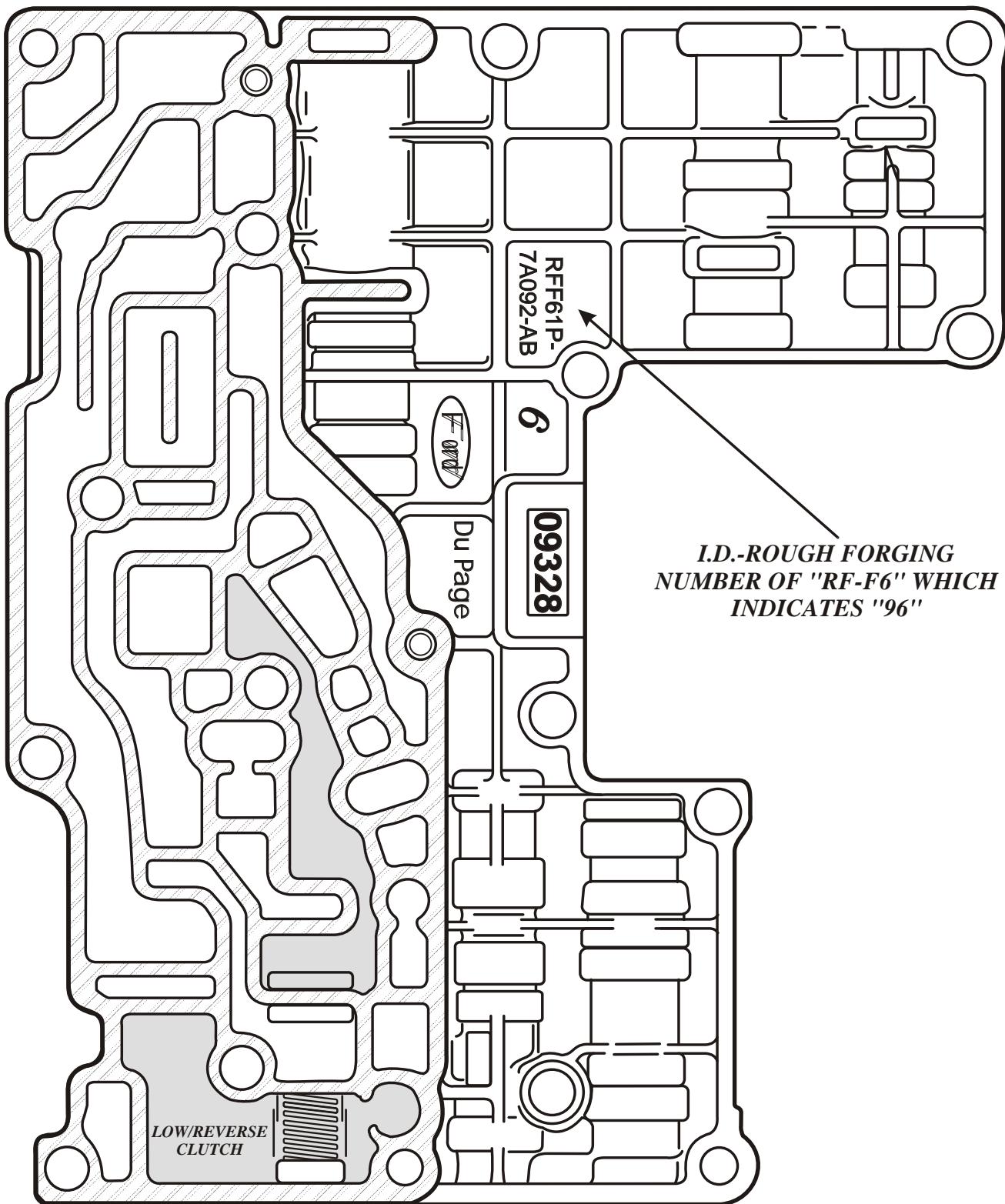
Copyright © 2005 ATSG

Figure 33

"UPPER SIDE" 4R100 MAIN VALVE BODY "PTO"

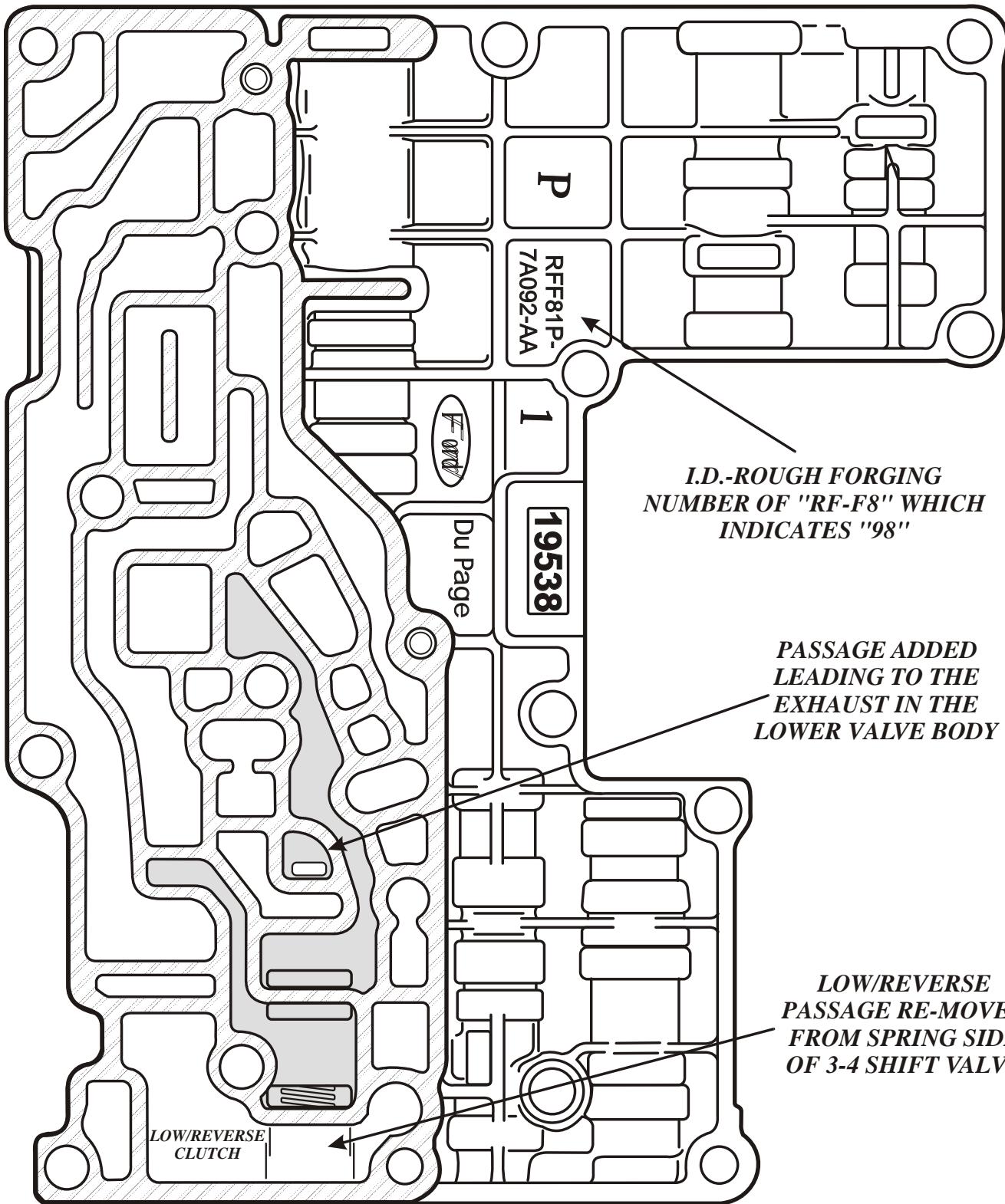
Copyright © 2005 ATSG

Figure 34

"LOWER SIDE" 4R100 MAIN VALVE BODY "NON-PTO"

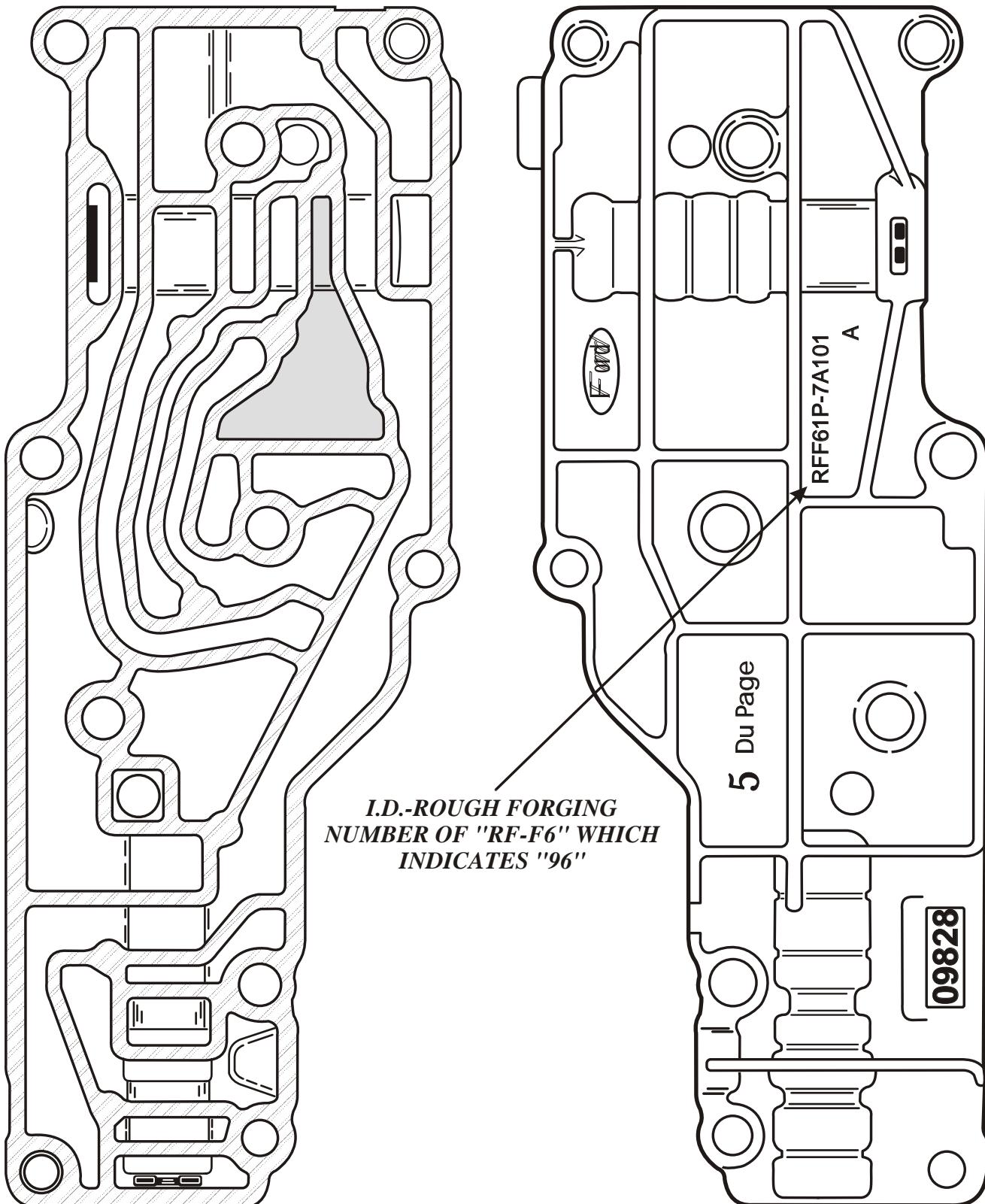
Copyright © 2005 ATSG

Figure 35

"LOWER SIDE" 4R100 MAIN VALVE BODY "PTO"

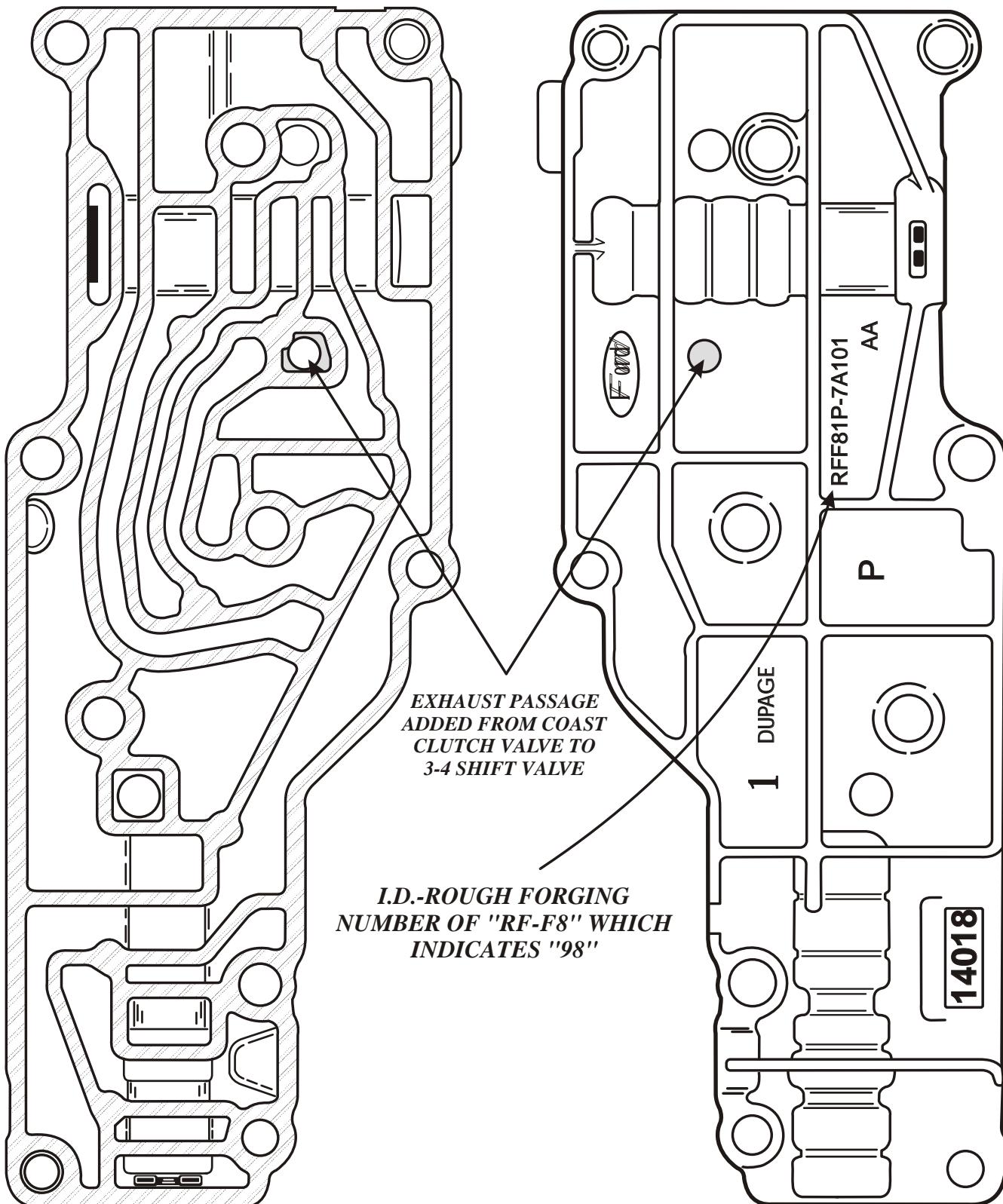
Copyright © 2005 ATSG

Figure 36

4R100 LOWER VALVE BODY "NON-PTO"

Copyright © 2005 ATSG

Figure 37

4R100 LOWER VALVE BODY "PTO"

Copyright © 2005 ATSG

Figure 38

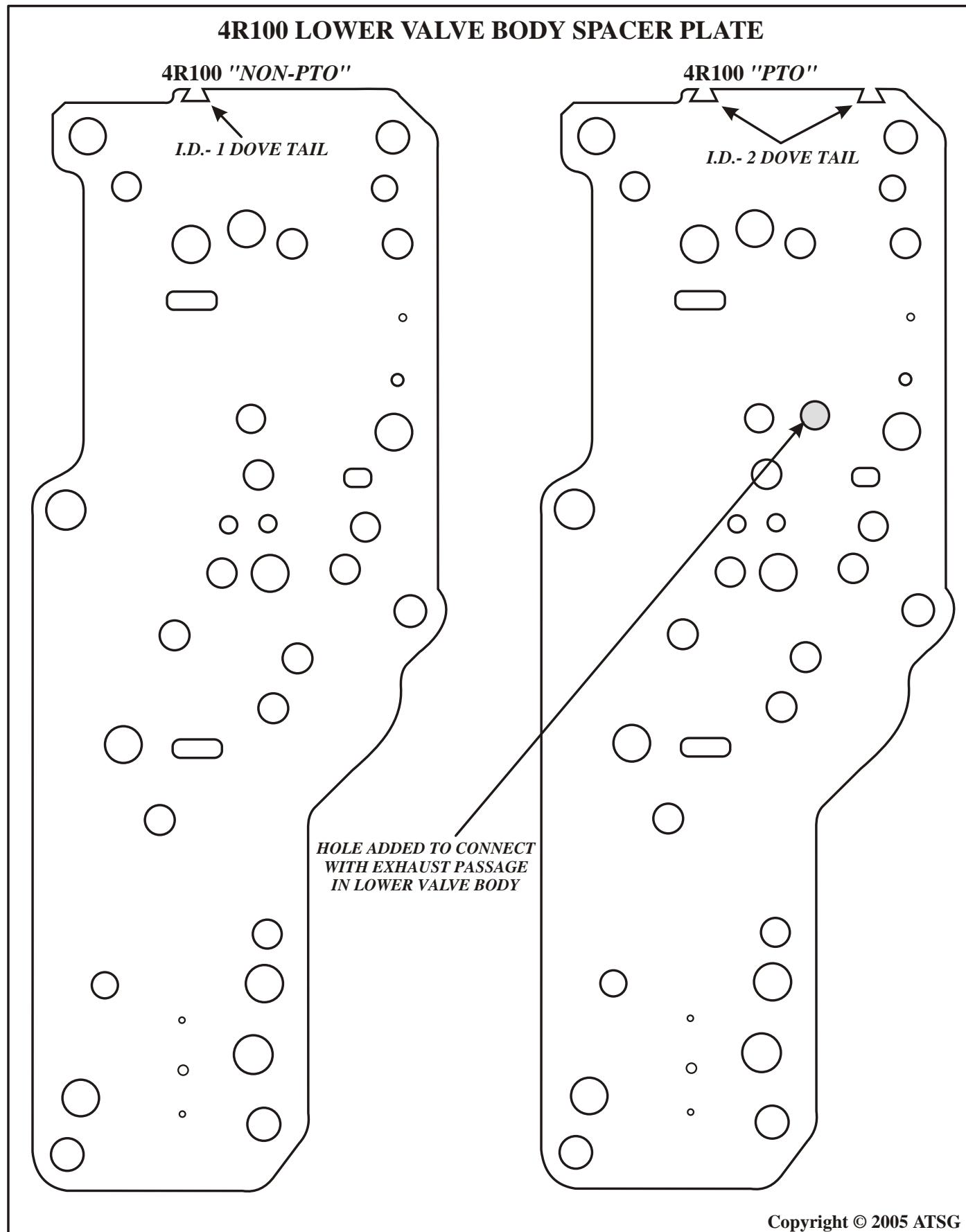
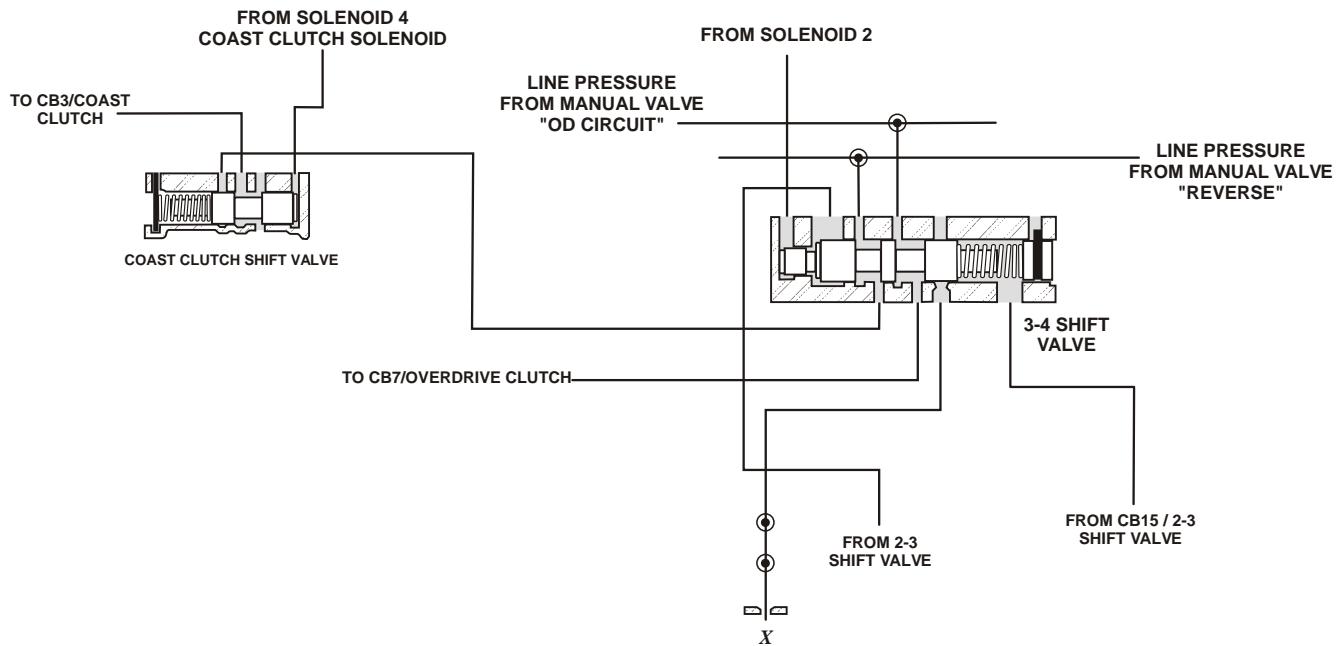
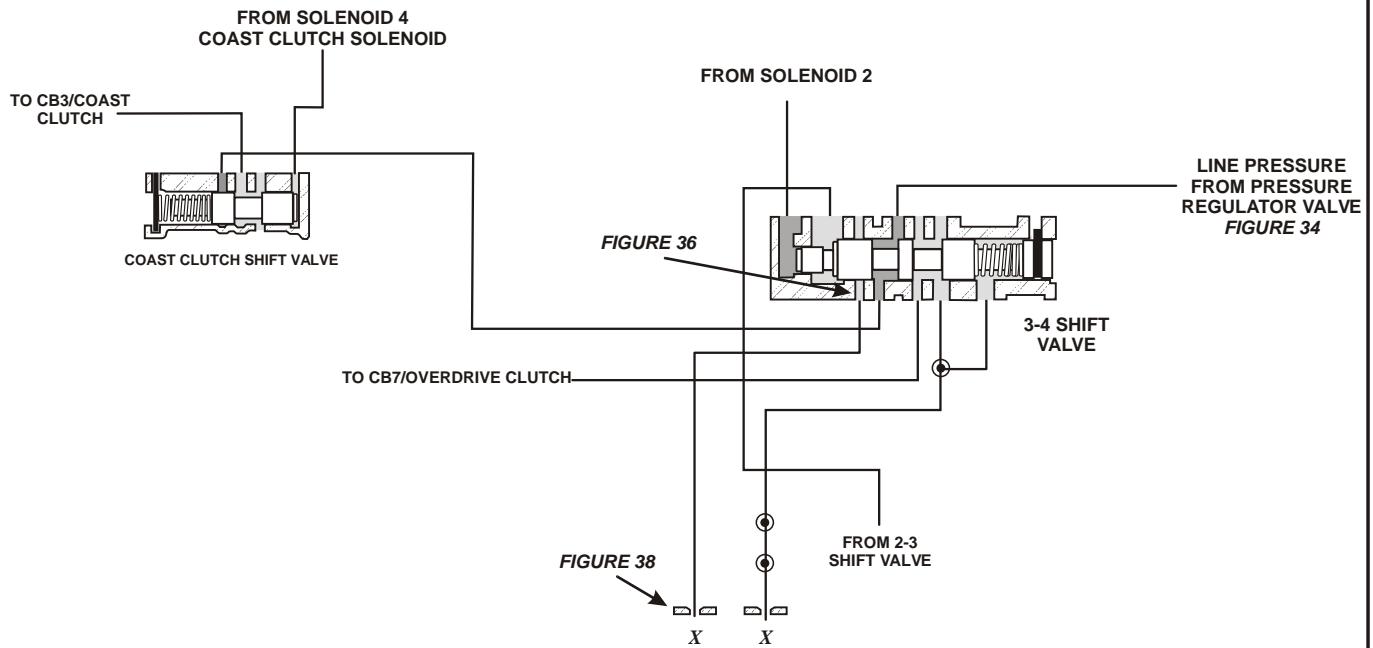


Figure 39

"NON-PTO" 3-4 SHIFT VALVE HYDRAULIC CIRCUIT



"PTO" 3-4 SHIFT VALVE HYDRAULIC CIRCUIT



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Figure 40



Technical Service Information

FORD 4R100 "PWM" AND "NON-PWM" PUMP DIFFERENCES

CHANGE: Beginning at the start of production in 1999, the 4R100 transmission was offered with two different torque converter clutch application strategies. A "PWM" (Pulse Width Modulated) version, was added in V-10 gas powered vehicles and all diesel, and a "NON-PWM" version, offered in all other gas powered vehicles. This required two different solenoid packs as well as two different pump assemblies.

REASON: For smooth converter apply on V-10 gas and diesel engine models.

PARTS AFFECTED:

(1) PUMP ASSEMBLY:

- The pump cover assembly had the rear of the Converter Clutch Valve bore enlarged approximately .070" to accommodate the enlarged land of the Converter Clutch Valve, as shown in Figure 41.
- A .036" orifice and an air bleed were added to the TCC Solenoid signal passage, as shown in Figure 43.
- The Converter Clutch Control Valve's rear spool was enlarged approximately .070". There was also a bushing and valve added to the end of the valve train, as shown in Figure 41.
- A hole was added to the pump cover to connect the Converter Clutch Control Valve Bushing to the Converter Regulator Valve oil, as shown in Figure 43.
- The Converter release orifice in the NON-PWM pump cover, as shown in Figure 42, was removed from the PWM pump cover, as shown in Figure 43.
- Refer to Figure 44 for the NON-PWM pump hydraulic circuit.
- Refer to Figure 45 for the PWM pump hydraulic circuit with all hydraulic changes shown.

SOLENOID PACK:

The PWM solenoid pack requires a Pulse Width Modulated torque converter clutch solenoid and

- (2) the NON-PWM solenoid pack requires an on-off torque converter clutch solenoid.
• Refer to Figure 46 to identify the differences between the two solenoid packs.

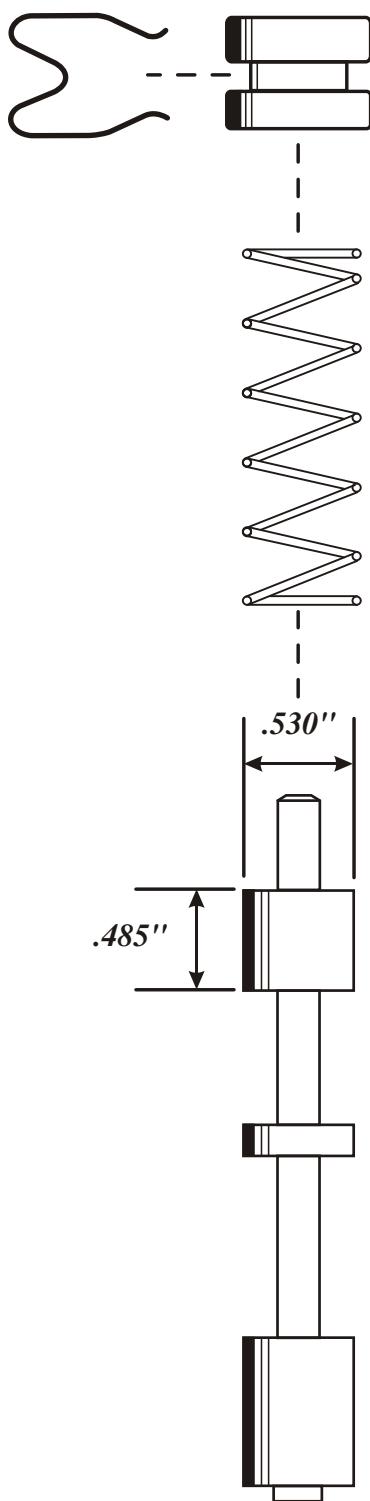
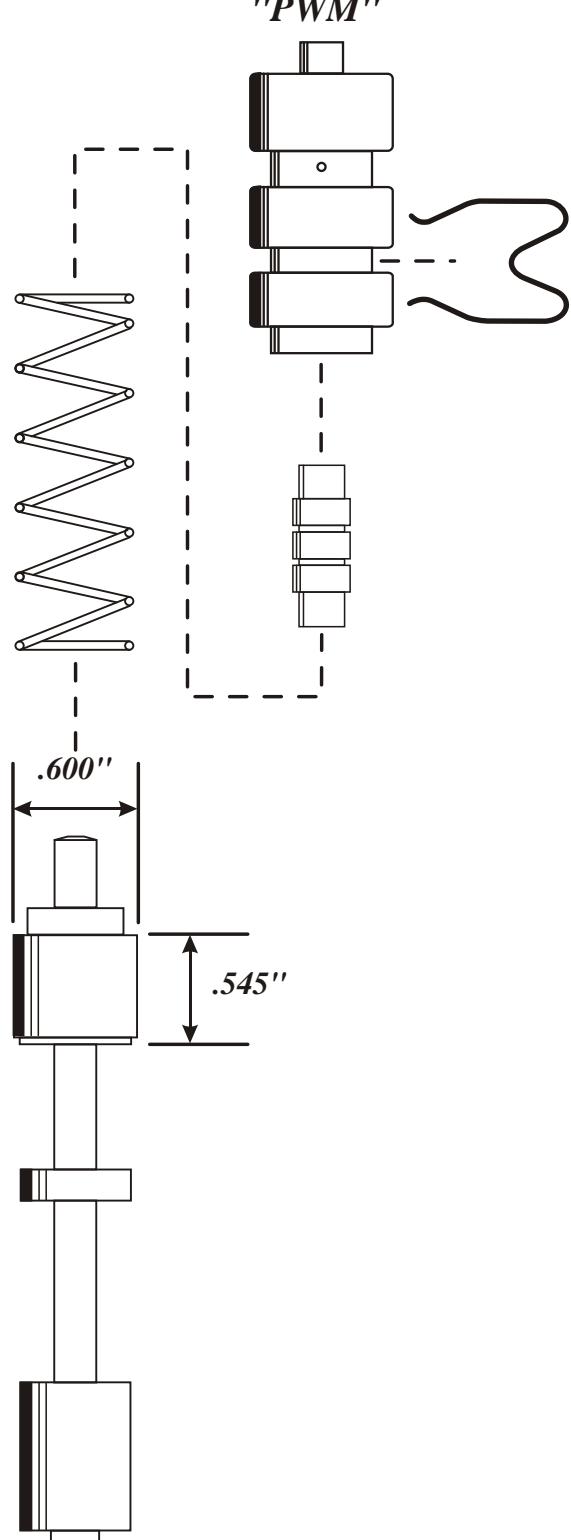
INTERCHANGABILITY:

None of the parts listed above are interchangeable from model to model.

SERVICE INFORMATION:

"NON-PWM" Pump assy. (with "Cast Iron" coast clutch drum).....	F81Z-7A103-AA
"NON-PWM" Pump assy. (with "Stamped Steel" coast clutch drum).....	F81Z-7A103-BA
"PWM" Pump assy. (with "Stamped Steel" coast clutch drum).....	F81Z-7A103-CA
"NON-PWM" Solenoid Pack.....	F81Z-7G391-BA
"PWM" Solenoid Pack.....	F81Z-7G391-AB

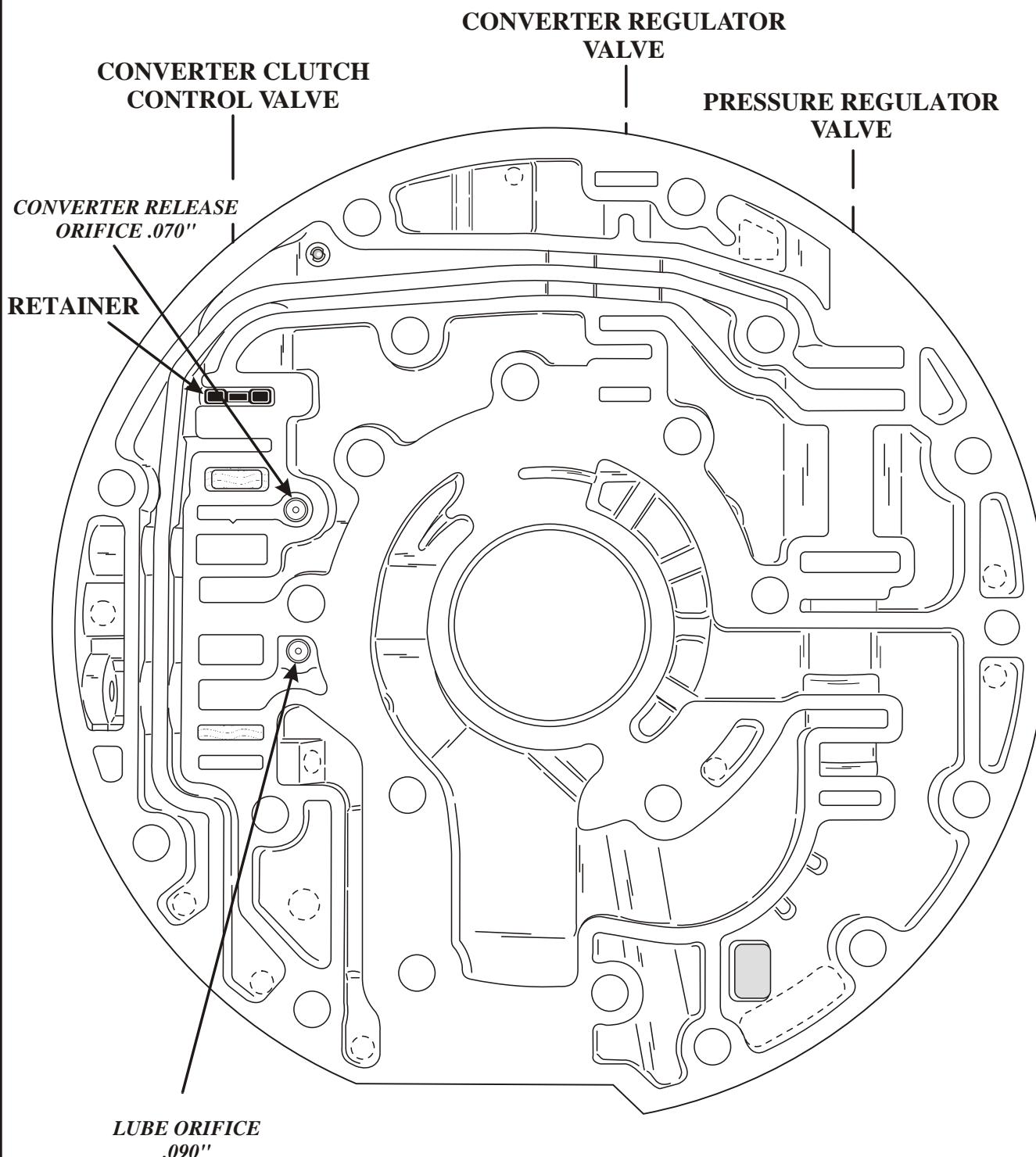
CONVERTER CLUTCH CONTROL VALVE

"NON-PWM"**"PWM"**

THE DIAMETER AND THE LENGTH OF THE SPOOL ON THE VALVE LAND SHOWN ABOVE,
WERE INCREASED ON PWM VERSIONS. THE BORE IN THE PUMP WAS ALSO ENLARGED
APPROXIMATELY .070" TO ACCOMMODATE THE CHANGES IN THE DIAMETER OF THE VALVE

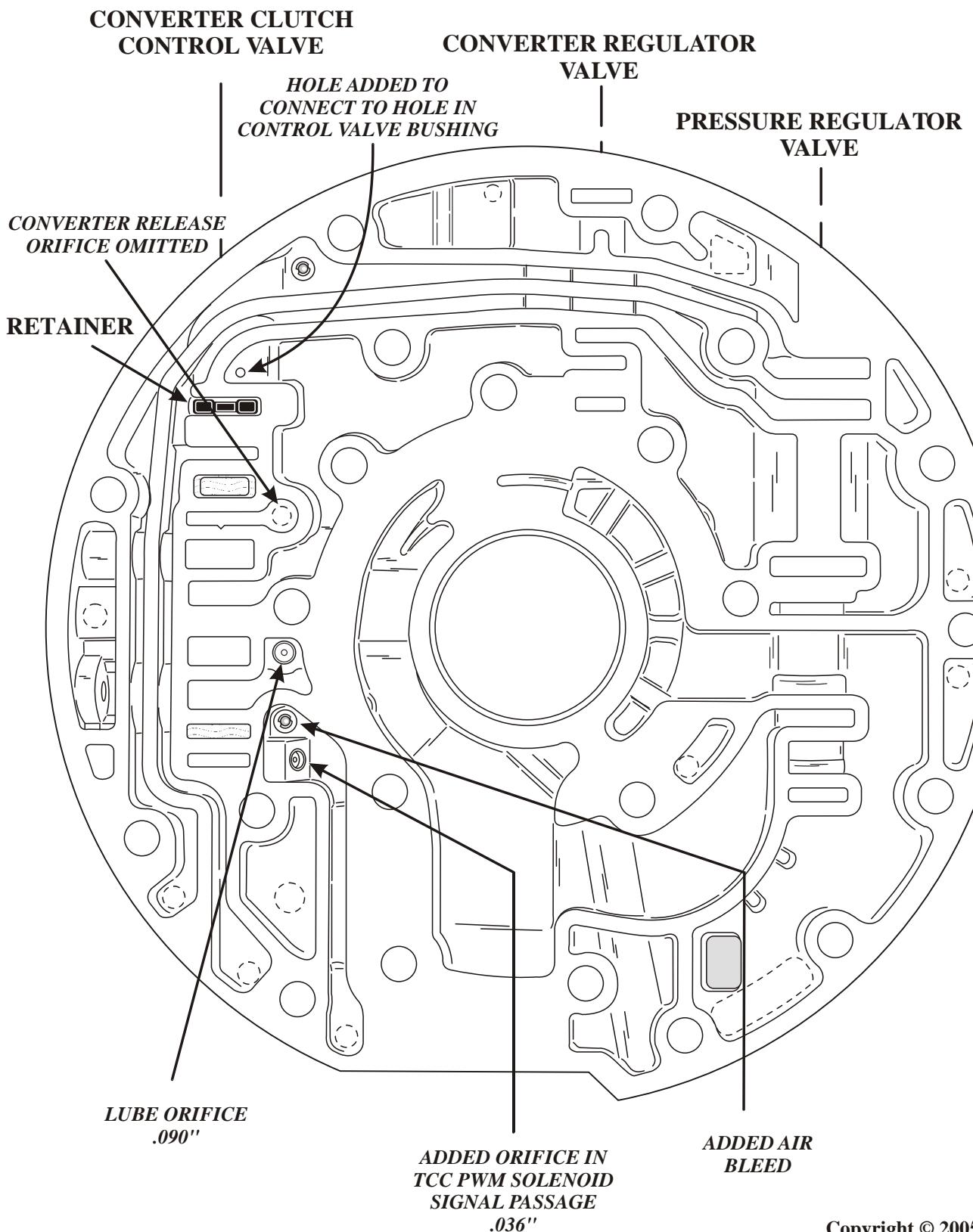
Copyright © 2005 ATSG

Figure 41

**4R100 "NON-PWM" PUMP
COVER ASSEMBLY**

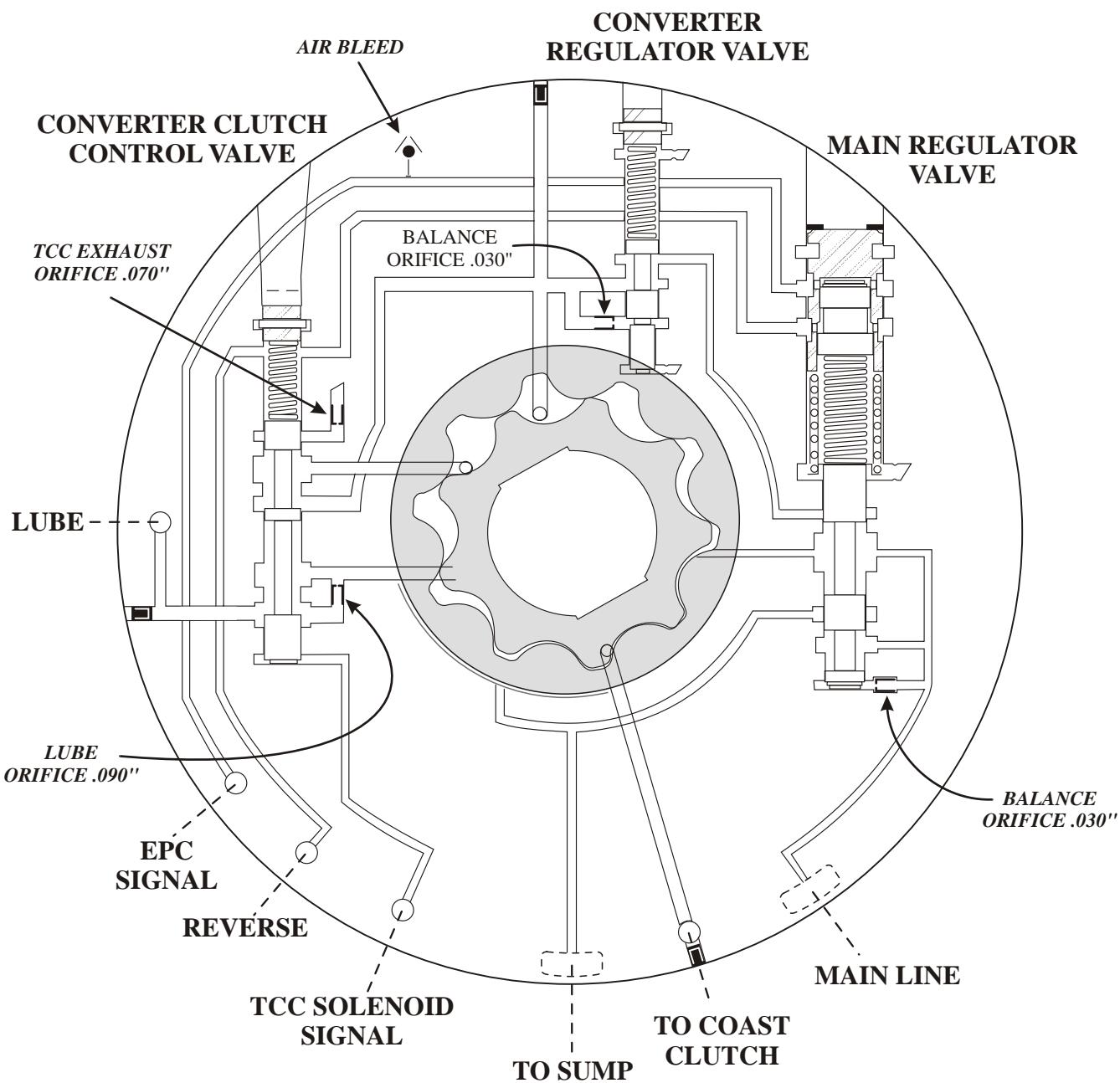
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Figure 42

**4R100 "PWM" PUMP
COVER ASSEMBLY**

Copyright © 2005 ATSG

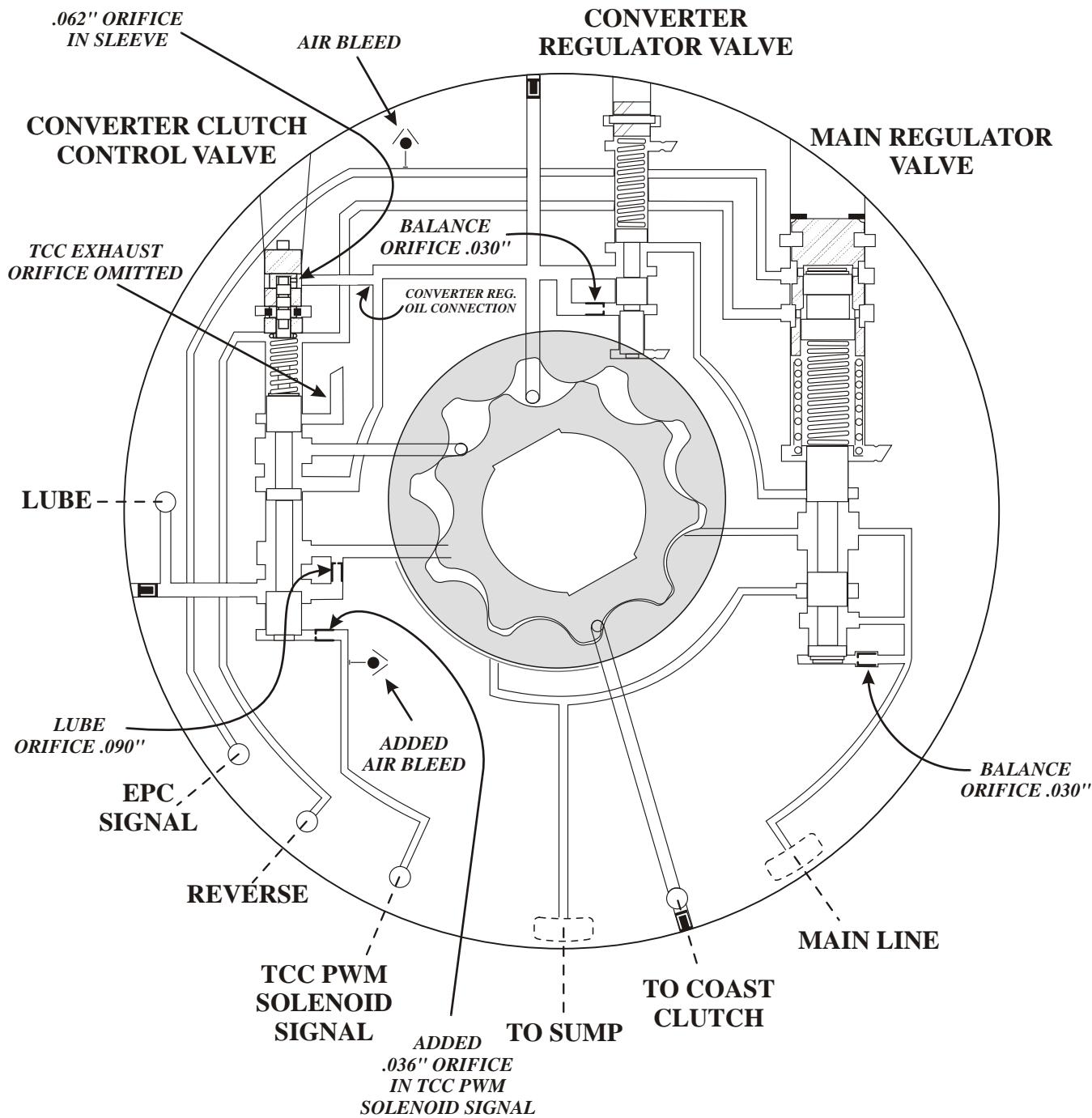
Figure 43

**4R100 "NON-PWM" PUMP
HYDRAULIC CIRCUIT**

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Figure 44

4R100 "PWM" PUMP HYDRAULIC CIRCUIT



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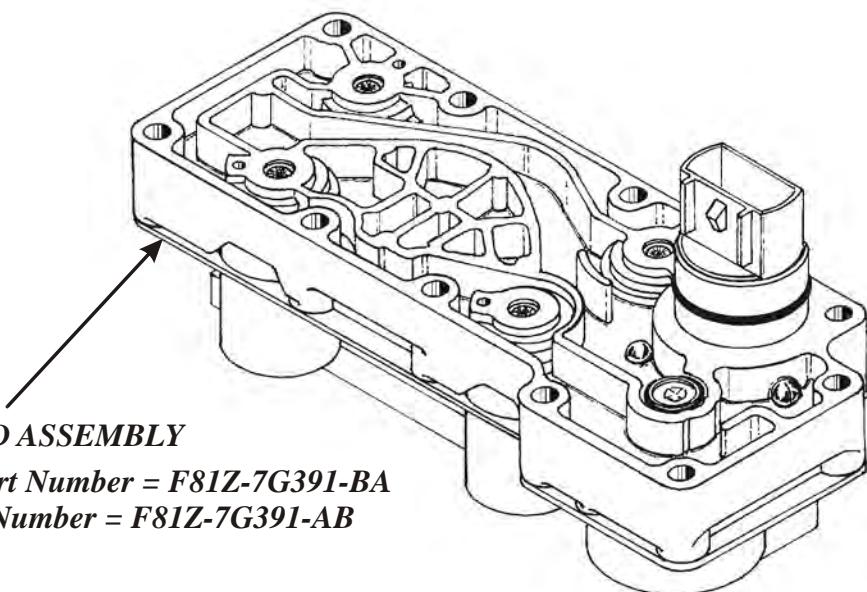
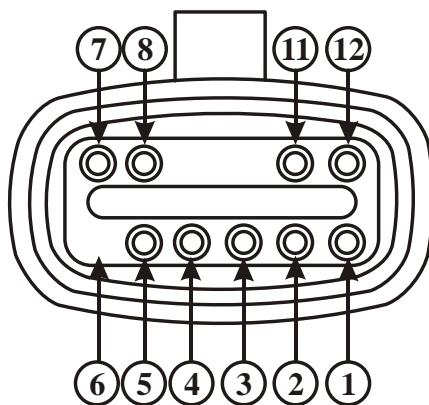
Figure 45

FORD 4R100

SOLENOID RESISTANCE CHARTS

<i>Solenoid Resistance Chart</i>		
<i>Solenoid</i>	<i>Solenoid Body Pin Numbers</i>	<i>Resistance</i>
<i>Shift Solenoid "B" (2)</i>	<i>1 and 2</i>	<i>20-30 Ohms</i>
<i>Shift Solenoid "A" (1)</i>	<i>1 and 3</i>	<i>20-30 Ohms</i>
<i>TCC Solenoid, On-Off (NON-PWM)</i>	<i>1 and 4</i>	<i>20-30 Ohms</i>
<i>TCC Solenoid, Diesel & V10 (PWM)</i>	<i>1 and 4</i>	<i>10-20 Ohms</i>
<i>Coast Clutch Solenoid</i>	<i>1 and 5</i>	<i>20-30 Ohms</i>
<i>Electronic Pressure Control Solenoid</i>	<i>11 and 12</i>	<i>3.0-5.0 Ohms</i>
<i>Transmission Fluid Temp Sensor</i>	<i>7 and 8</i>	<i>Variable</i>

SOLENOID BODY CONNECTOR



"NON-PWM" versions - Part Number = F81Z-7G391-BA
 "PWM" versions ----- Part Number = F81Z-7G391-AB

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Figure 46



FORD E4OD/4R100 NEW DESIGN 6 PINION FORWARD AND REVERSE PLANETARY CARRIER

CHANGE: Beginning at the start of production for all 1998 model E4OD transmissions, *some models* will be equipped with a new design 6 pinion forward planetary carrier (See Figure 47), and a new design 6 pinion reverse planetary carrier (See Figure 48).

REASON: Increased torque carrying capacity and increased planetary carrier durability.

PARTS AFFECTED:

- (1) FORWARD PLANETARY CARRIER - Now has 6 pinions instead of the previous 4 pinions for increased torque carrying capacity and increased durability (See Figure 47).
- (2) REVERSE PLANETARY CARRIER - Now has 6 pinions instead of the previous 4 pinions for increased torque carrying capacity and increased durability (See Figure 48).

INTERCHANGEABILITY:

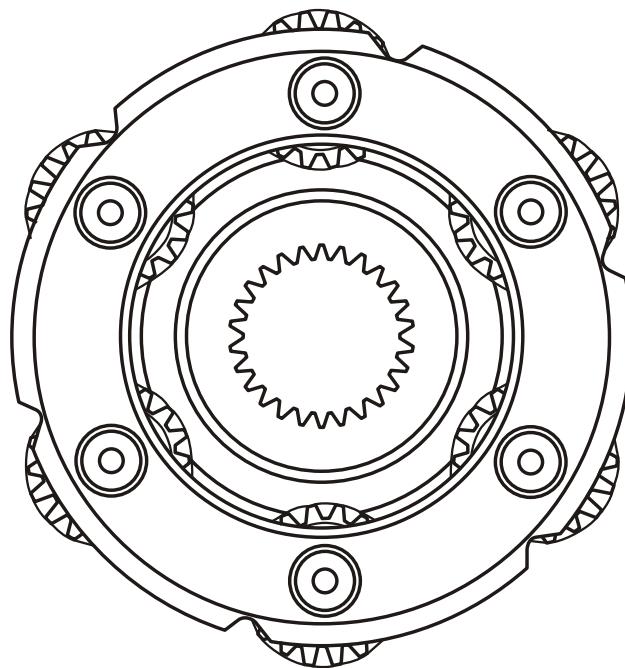
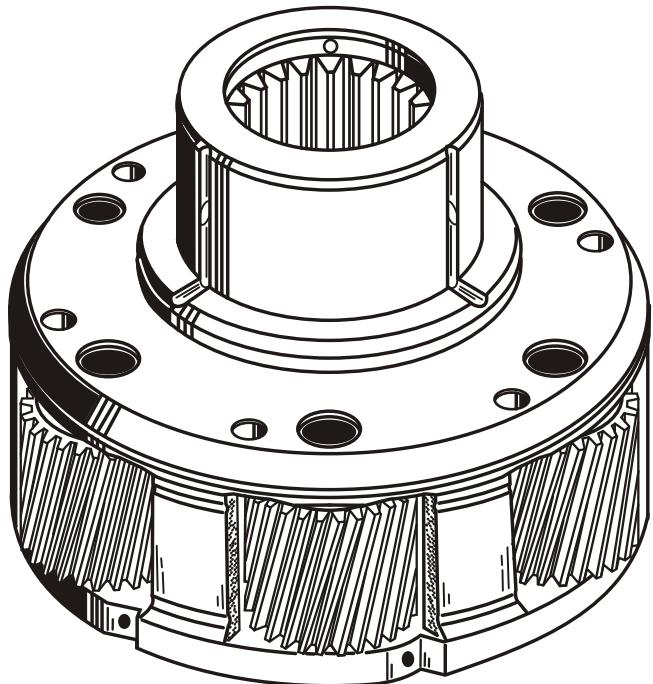
The new design forward planetary carrier *will back service all models* of the E4OD, but it *does require* the latest design forward ring gear hub and bearing assembly, as there are no holes for the previous design thrust washer (See Figure 47).

The new design reverse planetary carrier *will back service all models* of the E4OD, but it *does require* the latest design reverse clutch hub and three tang thrust washer for *both* sides, of the planetary carrier as shown in Figure 48.

SERVICE INFORMATION:

Forward Planetary Carrier (6 Pinion)	F81Z-7A398-CA
Reverse Planetary Carrier (6 Pinion)	F81Z-7D006-AA

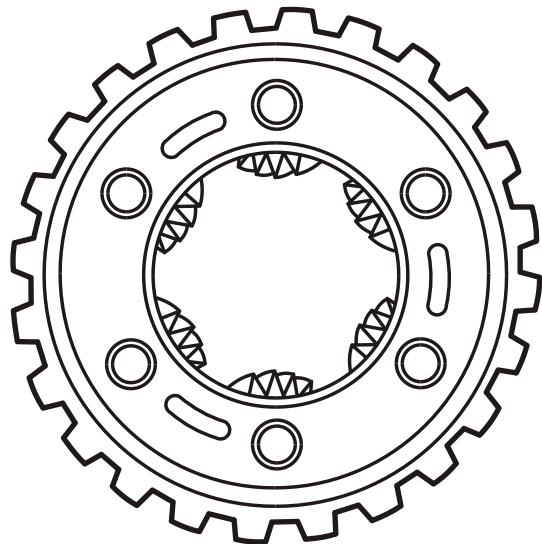
NEW DESIGN 6 PINION FORWARD PLANETARY CARRIER
PART NUMBER F81Z-7A398-CA



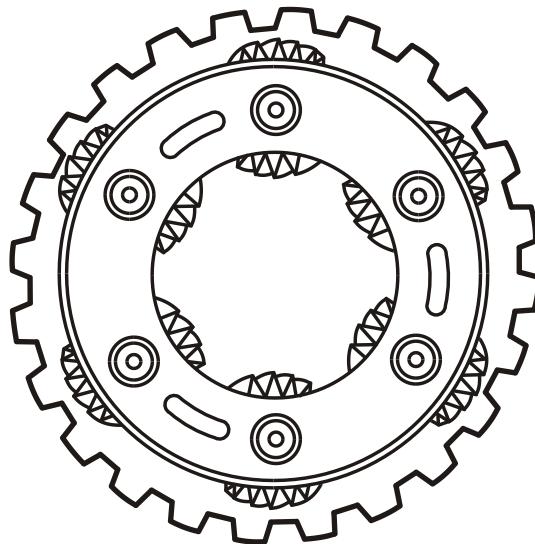
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Figure 47

**NEW DESIGN 6 PINION REVERSE PLANETARY CARRIER
PART NUMBER F81Z-7D006-AA**



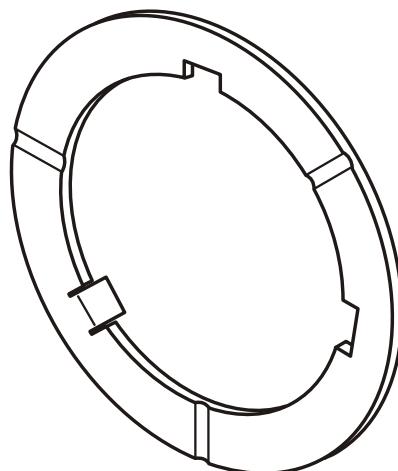
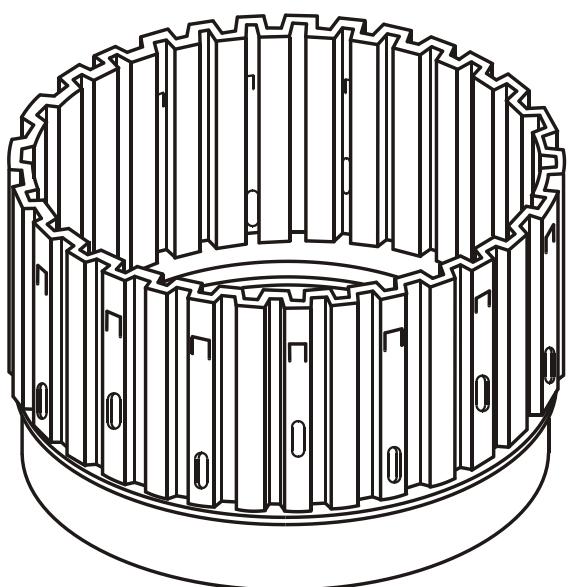
Front View



Rear View

**REQUIRES 1997-UP DESIGN LEVEL
REVERSE CLUTCH HUB ASSEMBLY**

**REQUIRES 3 TANG THRUST WASHERS
ON BOTH SIDES OF REAR CARRIER
PART NUMBER F0TZ-7A166-D**



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Figure 48



FORD E4OD/4R100 NEW DESIGN SUN SHELL

CHANGE: There is now a new design Sun Shell with "Tabs" added to the center of the sun shell slots, as shown in Figure 49, implemented by Ford Motor Co. as a running change, during the 2000 model year. This change eliminated the need for the number 8 thrust washer between the forward and direct drums.

REASON: Main reason for this change was cost savings and ease of assembly.

PARTS AFFECTED:

- (1) INPUT SUN SHELL - New design have "Tabs" added to the center of the sun shell slots, as shown in Figure 49, which now support the direct drum for the required clearance between the direct and forward clutch housings, and allows elimination of the number 8 thrust washer, as shown in Figure 50.
- (2) DIRECT CLUTCH HOUSING - Manufactured "Without" slots in the center hub, as they were no longer needed to accept the number 8 thrust washer tabs. Both design direct drums are illustrated in Figure 50, and cut-away in Figure 51.
- (3) NUMBER 8 THRUST WASHER - Eliminated (See Figure 50 and 51).

INTERCHANGEABILITY:

The 1st design Sun Shell is no longer available from Ford Motor Co, as the 2nd design Sun Shell *will* retro-fit back on all models, with or without the number 8 thrust washer.

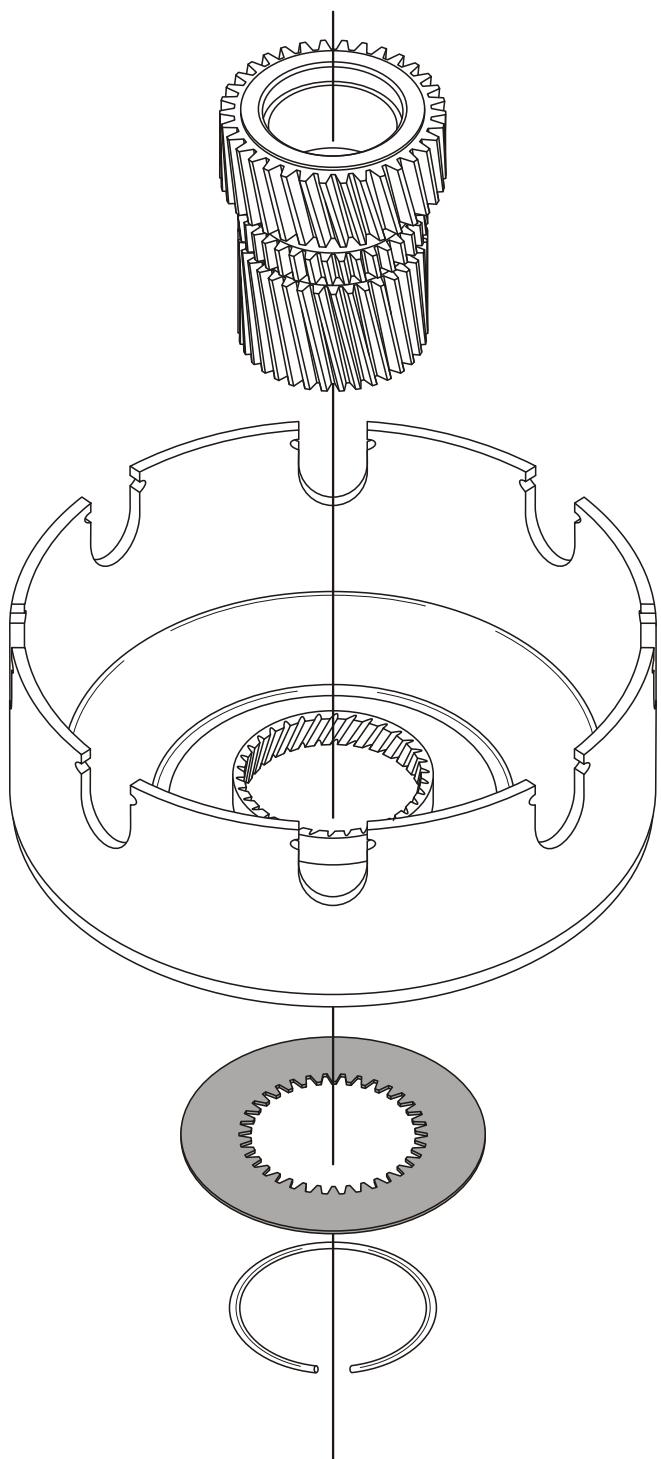
The 2nd design Direct Clutch Housing (No Slots For Washer) *must* be used with the 2nd design Sun Shell, as there are no accommodations for the number 8 thrust washer.

Refer to "Service Information" below for current OEM part numbers.

SERVICE INFORMATION:

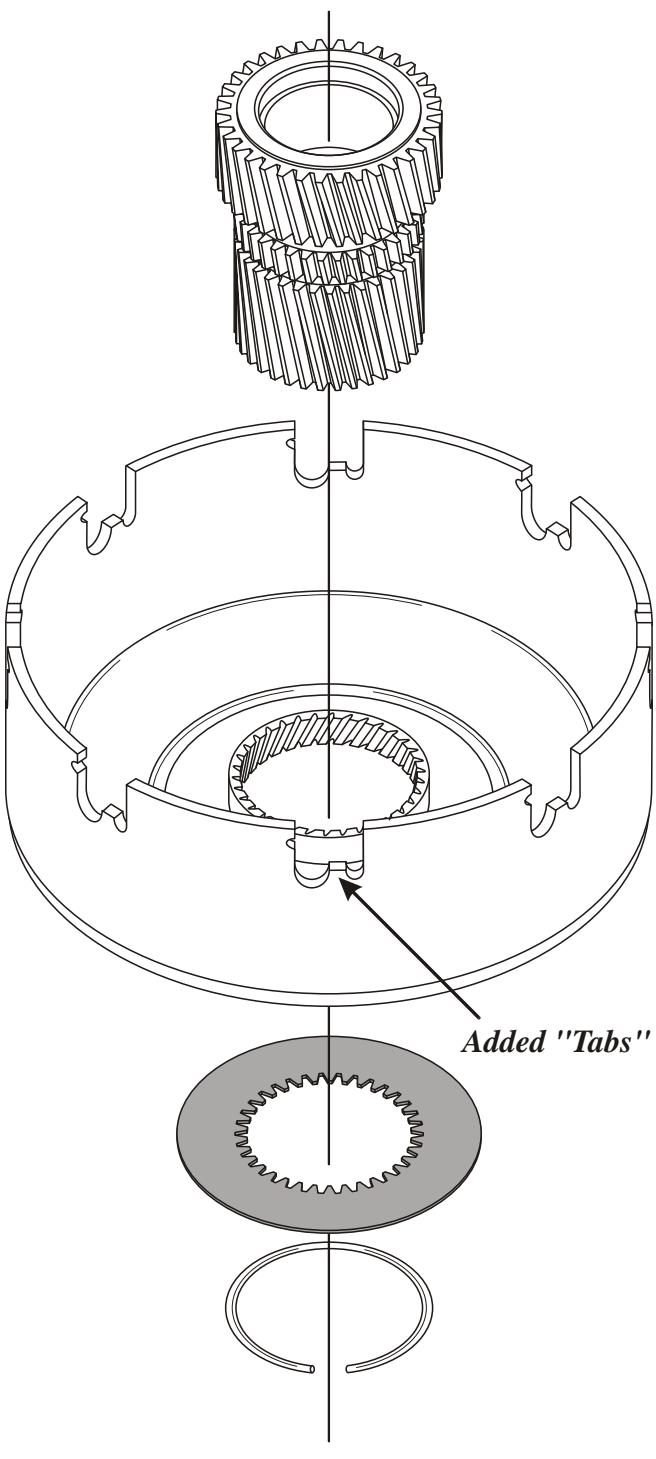
Direct Clutch Housing, 2nd Design (Without 4 Tab Washer)	YC3Z-7D044-BA
Direct Clutch Housing, 1st Design (With 4 Tab Washer)	F81Z-7D044-BA
Sun Shell, Hardened, 2nd Design	YC3Z-7D064-BA
Sun Shell, Regular, 2nd Design	YC3Z-7D064-AA
Direct to Forward Drum (No. 8) 4 Tab Thrust Washer	E9TZ-7C096-A

PREVIOUS DESIGN SUN SHELL
"No Longer Available From Ford"



*May Be Used With "ONLY"
The Previous Design Direct Drum
And Requires The No. 8 Washer
(See Figure 50)*

NEW DESIGN SUN SHELL
*Hardened = YC3Z-7D064-BA
Regular = YC3Z-7D064-AA*

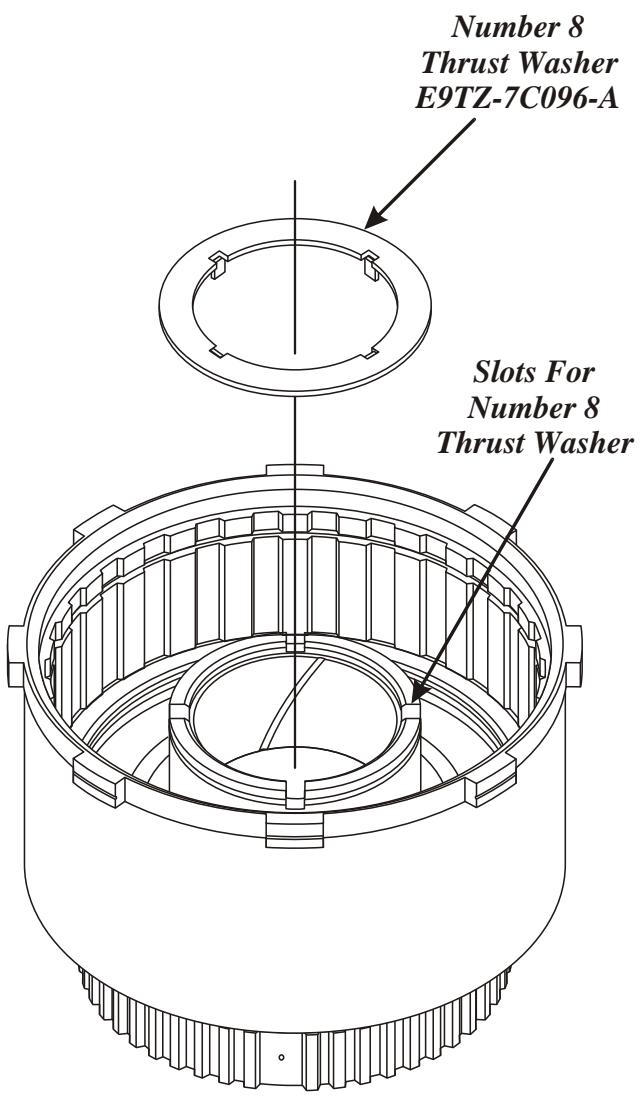


*May Be Used With
Both Design Direct Drums
With Or Without Washer
(See Figure 50)*

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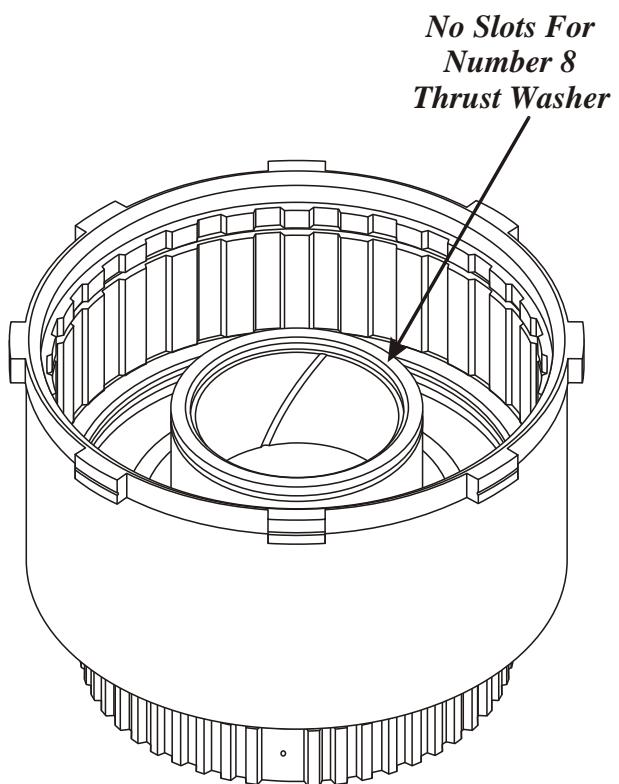
Figure 49

**PREVIOUS DESIGN DIRECT CLUTCH
DRUM "WITH" SLOTS FOR THE
NUMBER 8 THRUST WASHER
PART NO. F81Z-7D044-BA**



*May Be Used With
Both Design Sun Shells
(See Figure 49)*

**NEW DESIGN DIRECT CLUTCH
DRUM "WITHOUT" SLOTS FOR THE
NUMBER 8 THRUST WASHER
PART NO. YC3Z-7D044-BA**



*May Be Used With "ONLY"
The New Design Sun Shell
(See Figure 49)*

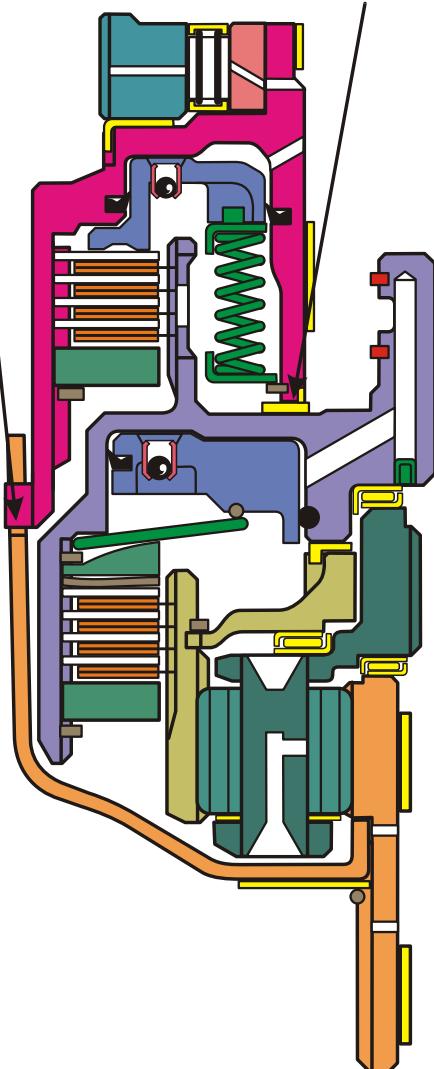
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Figure 50

**PREVIOUS DESIGN DIRECT CLUTCH
DRUM "WITH" SLOTS FOR THE
NUMBER 8 THRUST WASHER
AND PREVIOUS SUNSHELL**

*When Direct Clutch Housing
Is Not Supported Here,*

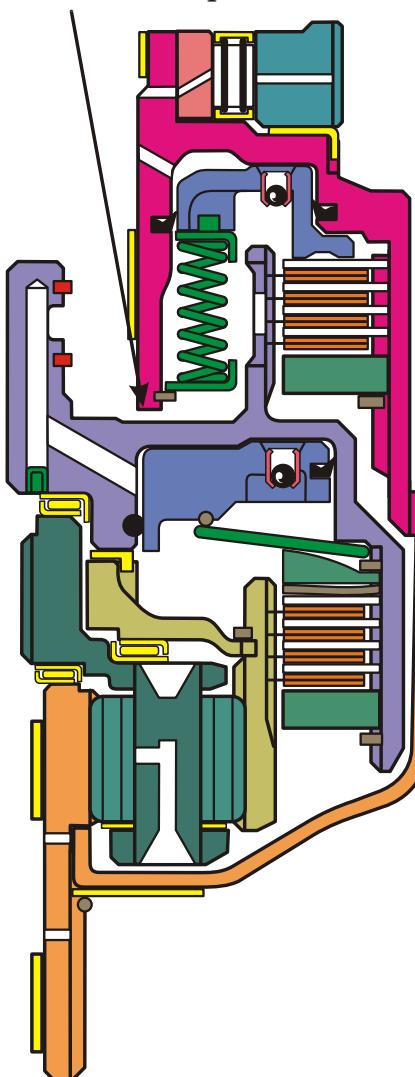
*The Number 8 Thrust
Washer Is Required*



**NEW DESIGN DIRECT CLUTCH
DRUM "WITHOUT" SLOTS FOR THE
NUMBER 8 THRUST WASHER
AND NEW SUNSHELL**

*When Direct Clutch Housing
Is Supported By The "Added"
Raised Tabs Here,*

*The Number 8 Thrust
Washer Is Not Required*



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Figure 51

INTERMEDIATE FORD 4R100 DIODE FREEWHEEL FAILURE

COMPLAINT: Some Ford Motor Company vehicles equipped with the 4R100 transmission may exhibit premature failure of the newly introduced Intermediate "Diode" Freewheel device that was installed in model year 2001 and illustrated in Figure 52.

CAUSE: The cause may be, more than expected load factors.

CORRECTION: The Intermediate "Diode" is **no longer serviced** by Ford Motor Company. The part number now supercedes to all of the previous design level parts, which include the direct clutch housing, intermediate sprag assembly, outer race to direct drum thrust washer, and the intermediate friction plates. All of the previous design level parts are illustrated in Figure 53, with the OEM part numbers. The intermediate frictions must be replaced because the tooth count on the outer race between the diode and the sprag are different.

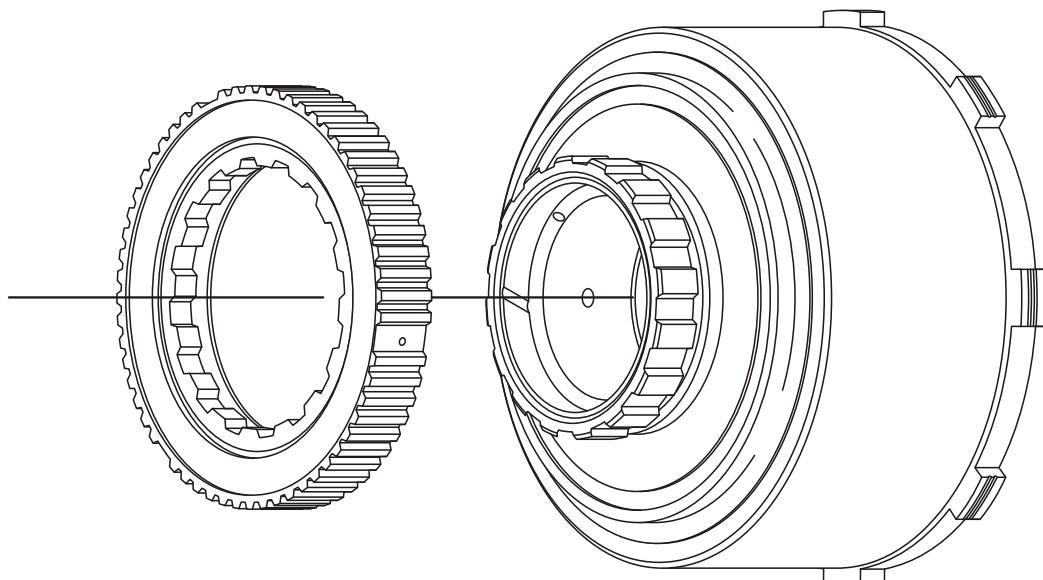
Special Note: ATSG recommends replacing the Intermediate "Diode" during service, even if it has not yet failed, to protect yourself from possible future failures.

SERVICE INFORMATION:

Direct Clutch Housing, 2nd Design (Without 4 Tab Washer)	YC3Z-7D044-BA
Direct Clutch Housing, 1st Design (With 4 Tab Washer)	F81Z-7D044-BA
Sun Shell, Hardened, 2nd Design	YC3Z-7D064-BA
Sun Shell, Regular, 2nd Design	YC3Z-7D064-BA
Direct to Forward Drum 4 Tab Thrust Washer	E9TZ-7C096-A
Direct Drum to Outer Sprag Race Thrust Washer	E9TZ-7G401-A
Intermediate Sprag Assembly	E9TZ-7A089-B
Intermediate Friction Plates (Special 50 Tooth, 3 Required)	1C3Z-7B164-BA

4R100 INTERMEDIATE "DIODE"

No Longer Available For Service



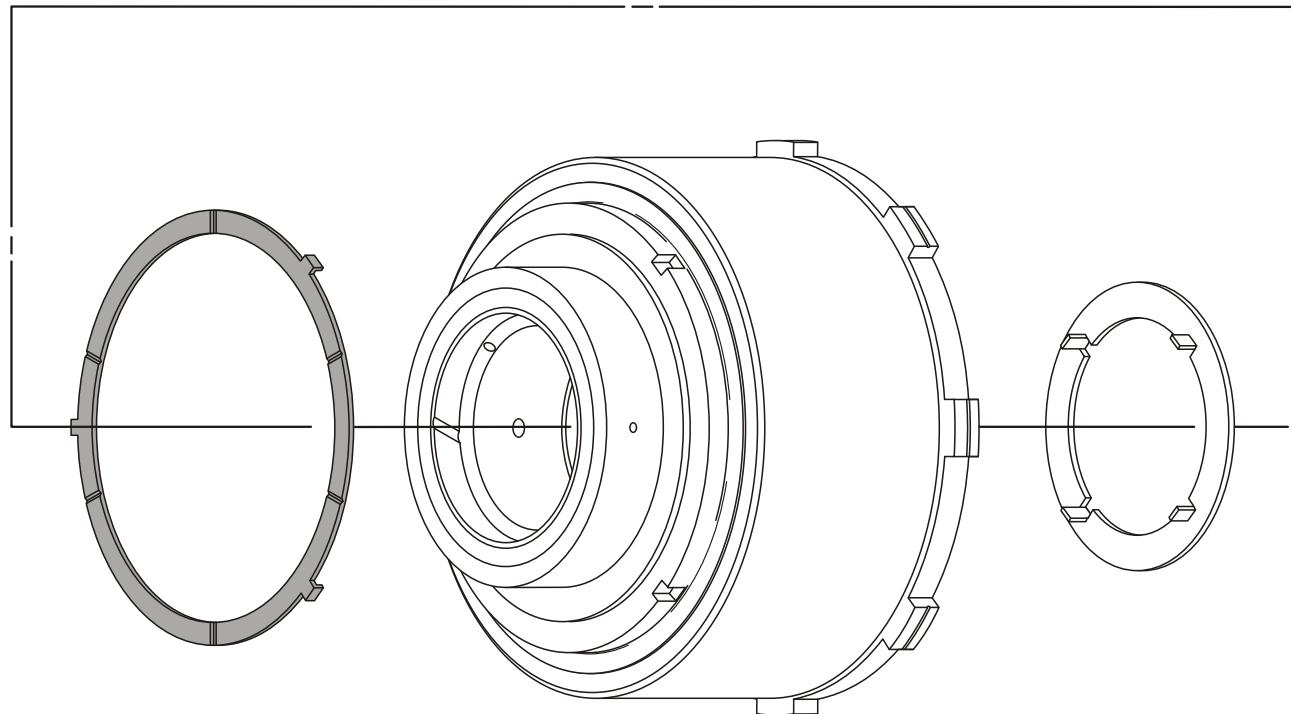
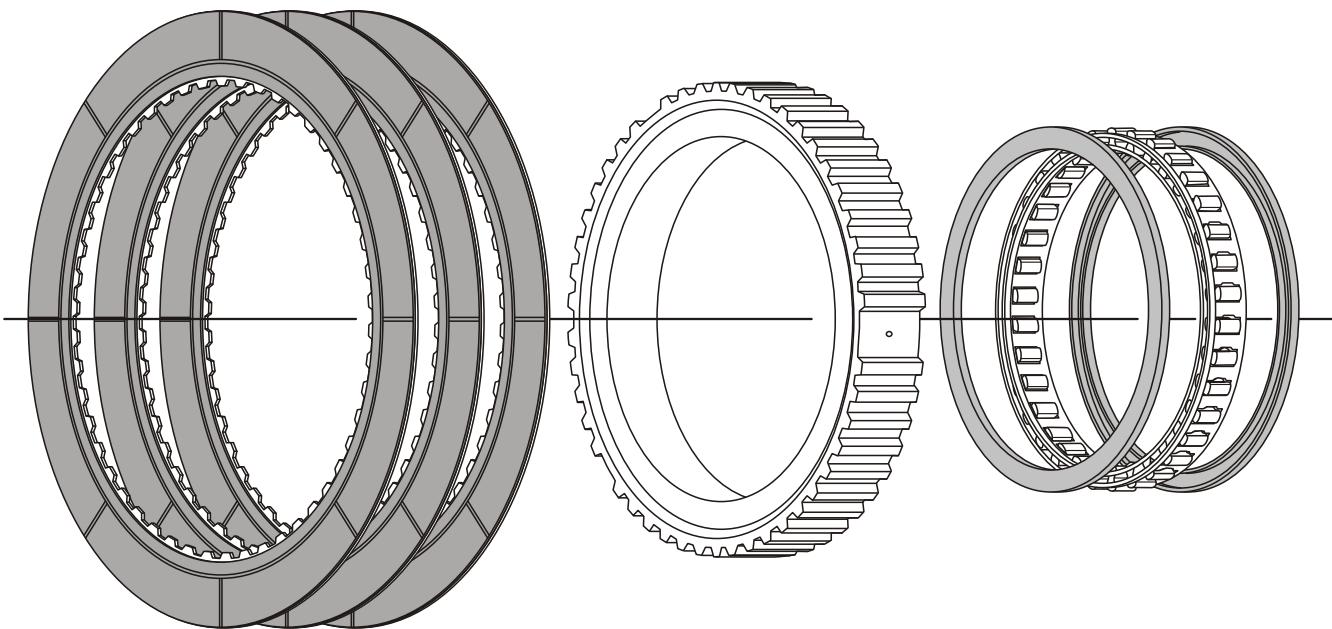
Copyright © 2005 ATSG

Figure 52

PARTS NEEDED TO REPLACE INTERMEDIATE DIODE

Intermediate Friction Plates
Part Number 1C3Z-7B164-BA
(Or Raybestos Plates OK)
(3 Required)

Intermediate Sprag Assembly
Part Number E9TZ-7A089-B



Outer Race To Drum Thrust Washer
Part Number E9TZ-7G401-A

Direct Clutch Housing
Part No. YC3Z-7D044-BA (No Washer)
Part No. F81Z-7D044-BA (With Washer)

4 Tab Thrust Washer
Part Number E9TZ-7C096-A

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Figure 53



FORD 4R100

The following pages provide you with hydraulic passage identification in Figure 55 through Figure 64 for the transmission case, all valve bodies and all oil pump configurations. The legend for the abbreviations is found in Figure 54.

PASSAGE IDENTIFICATION LEGEND

1-R = 1st-Reverse

1-R/M2 = 1st-Reverse/Manual 2

C-CL = Coast Clutch

CONV = Converter

D-CL = Direct Clutch

EPC = Electronic Pressure Control

EX = Exhaust

F-CL = Forward Clutch

INT-CL = Intermediate Clutch

L/R-CL = Low/Reverse Clutch

M123/R = Manual 1, 2, 3/Reverse

OD = Overdrive

OD234 = Overdrive 2nd, 3rd, 4th

OD34/R = Overdrive 3rd, 4th/Reverse

PRN1 = Park, Reverse, Neutral, 1st

PRN1/M2 = Park, Reverse, Neutral, 1st/Manual 2

R/1 = Reverse/1st

R/M2 = Reverse/Manual 2

R/M2/S2 = Reverse/Manual 2/Solenoid 2

R = Reverse

S1 = Solenoid 1

S2 = Solenoid 2

S3 = Solenoid 3

S4 = Solenoid 4

S4/1-R/M2 = Solenoid 4/1st-Reverse/Manual 2

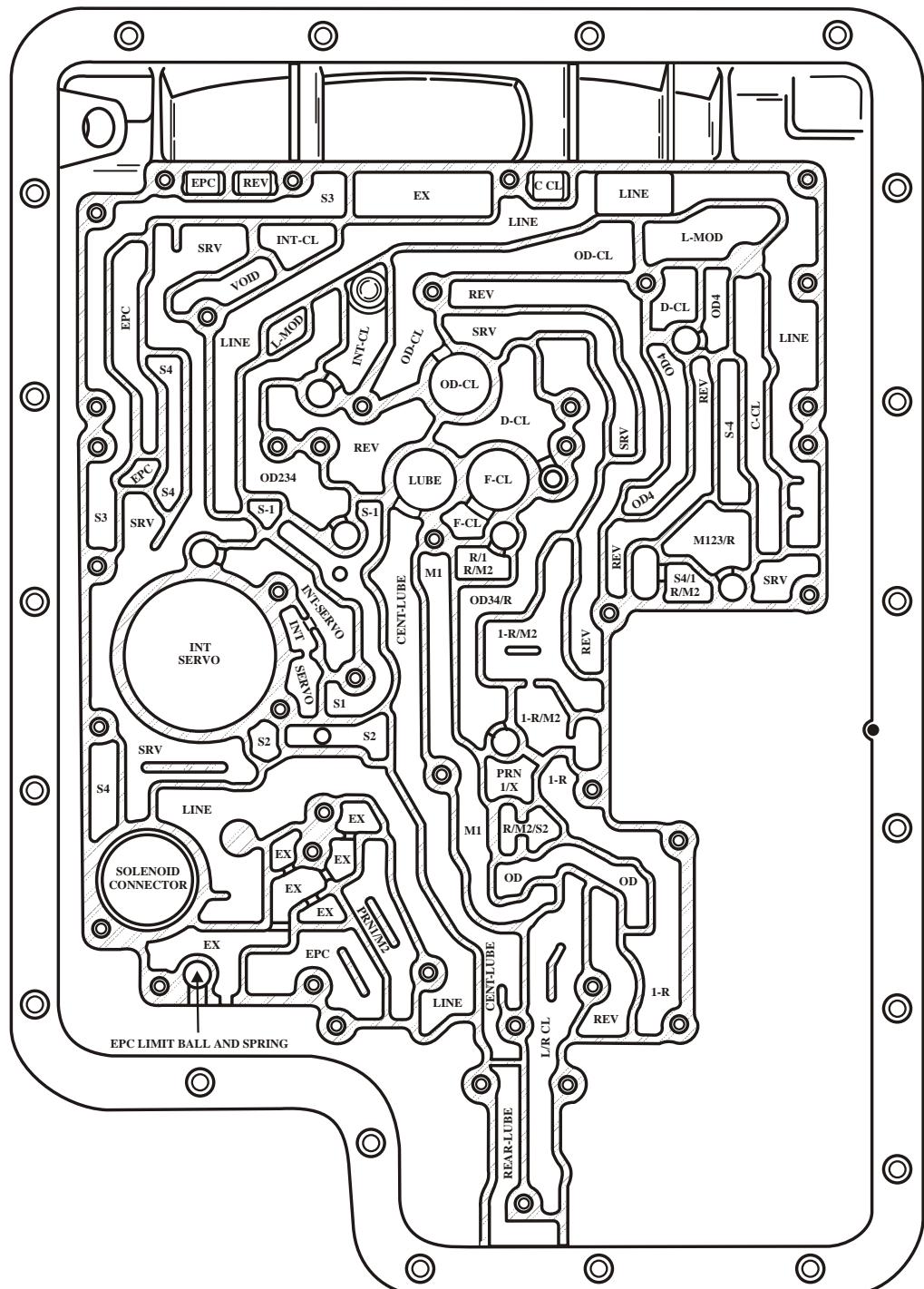
SRV = Solenoid Regulator Valve

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Figure 54

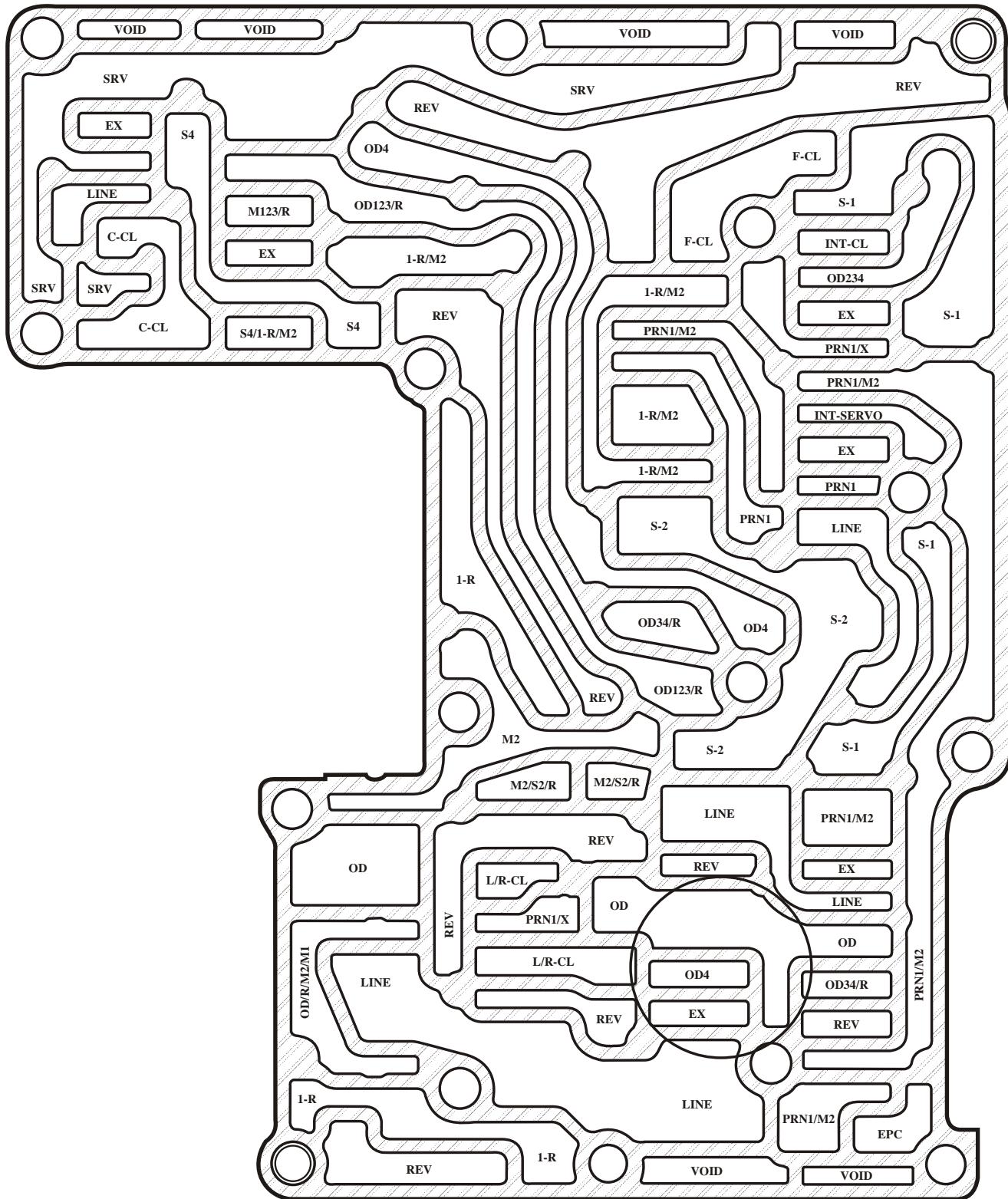
4R100 CASE PASSAGE IDENTIFICATION "PTO AND NON-PTO"



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Figure 55

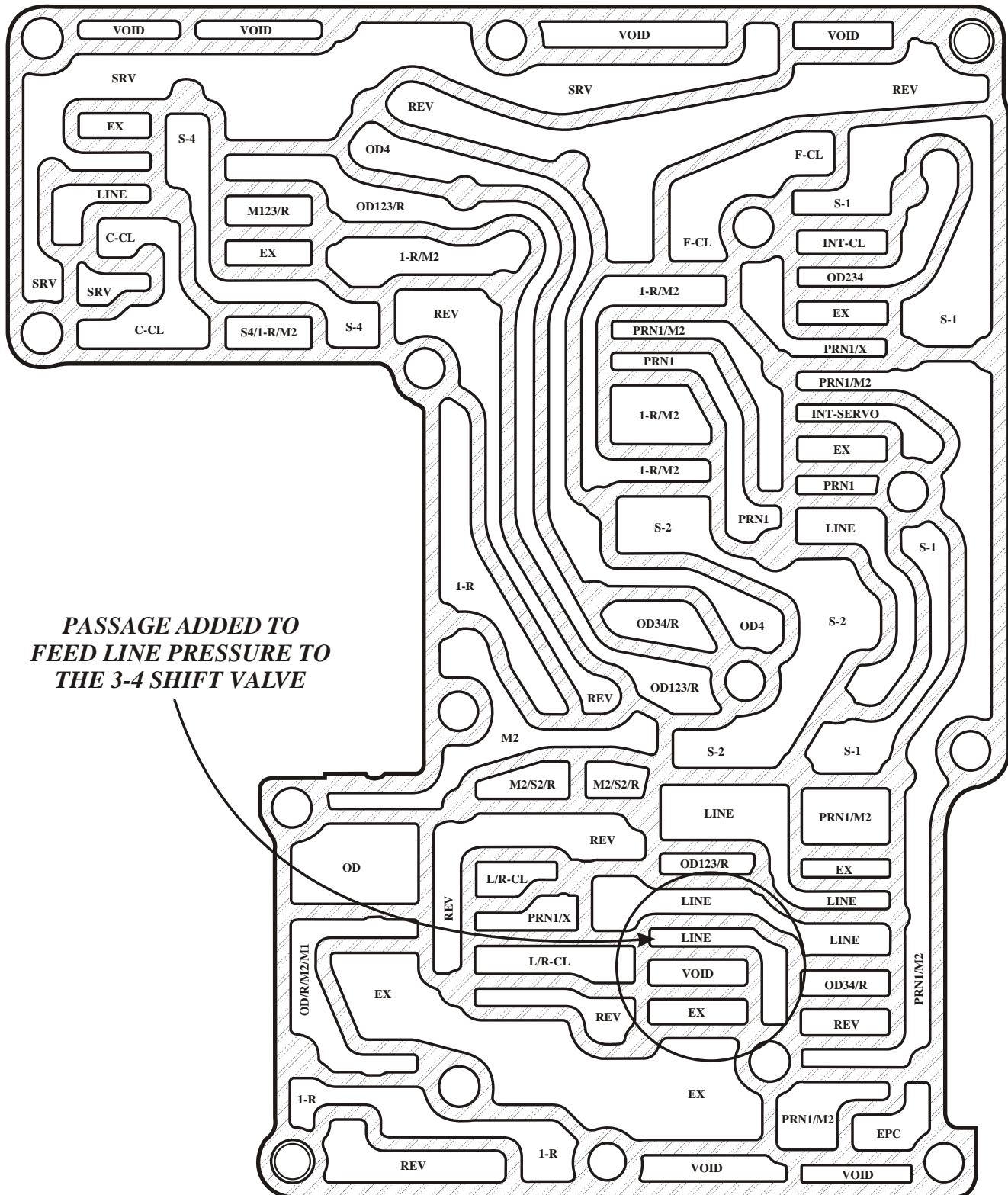
**"UPPER SIDE" 4R100 MAIN VALVE BODY
"NON-PTO" MODELS ONLY**



Copyright © 2005 ATSG

Figure 56

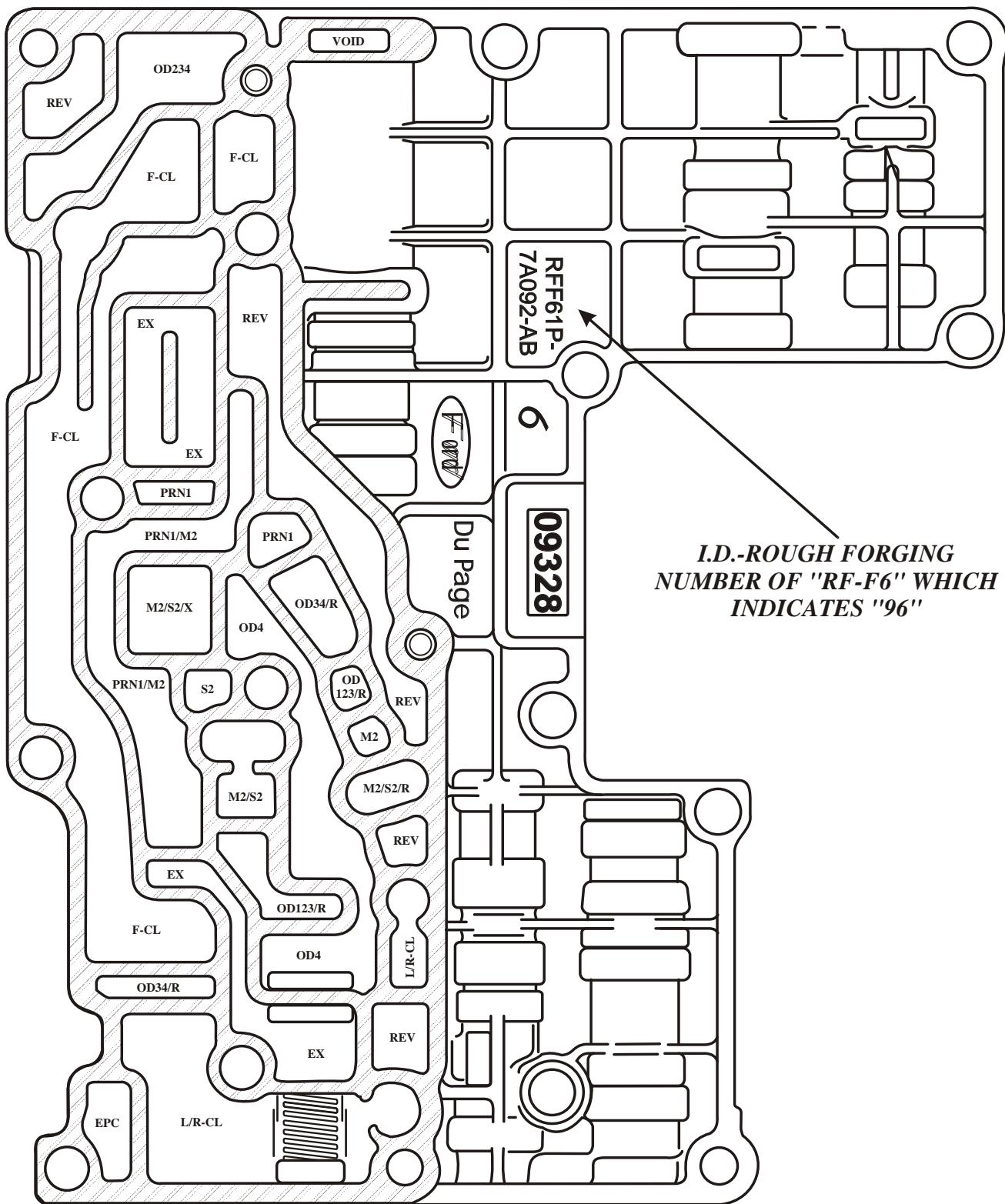
**"UPPER SIDE" 4R100 MAIN VALVE BODY
"PTO" MODELS ONLY**



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Figure 57

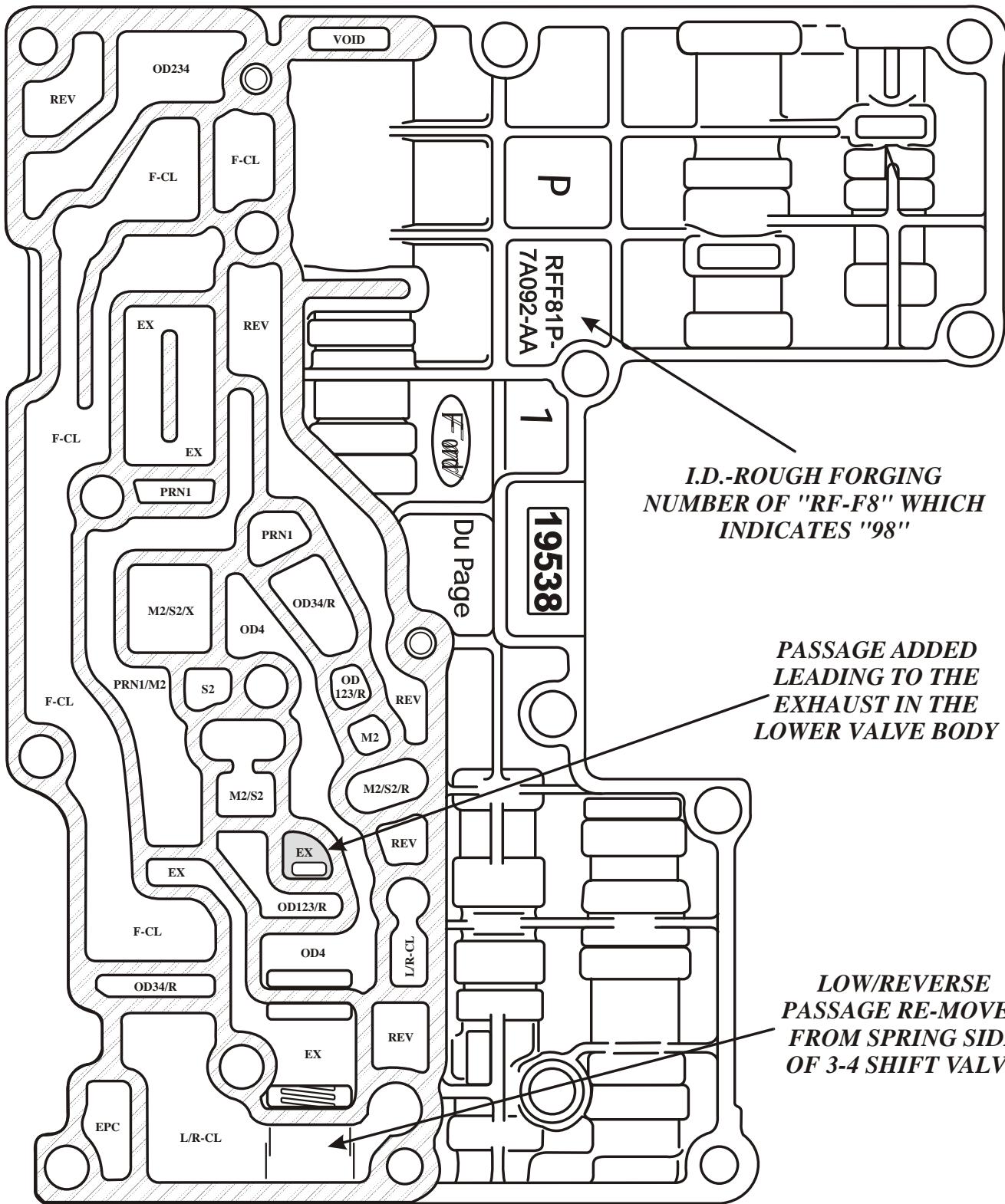
**"LOWER SIDE" 4R100 MAIN VALVE BODY
"NON-PTO" MODELS ONLY**



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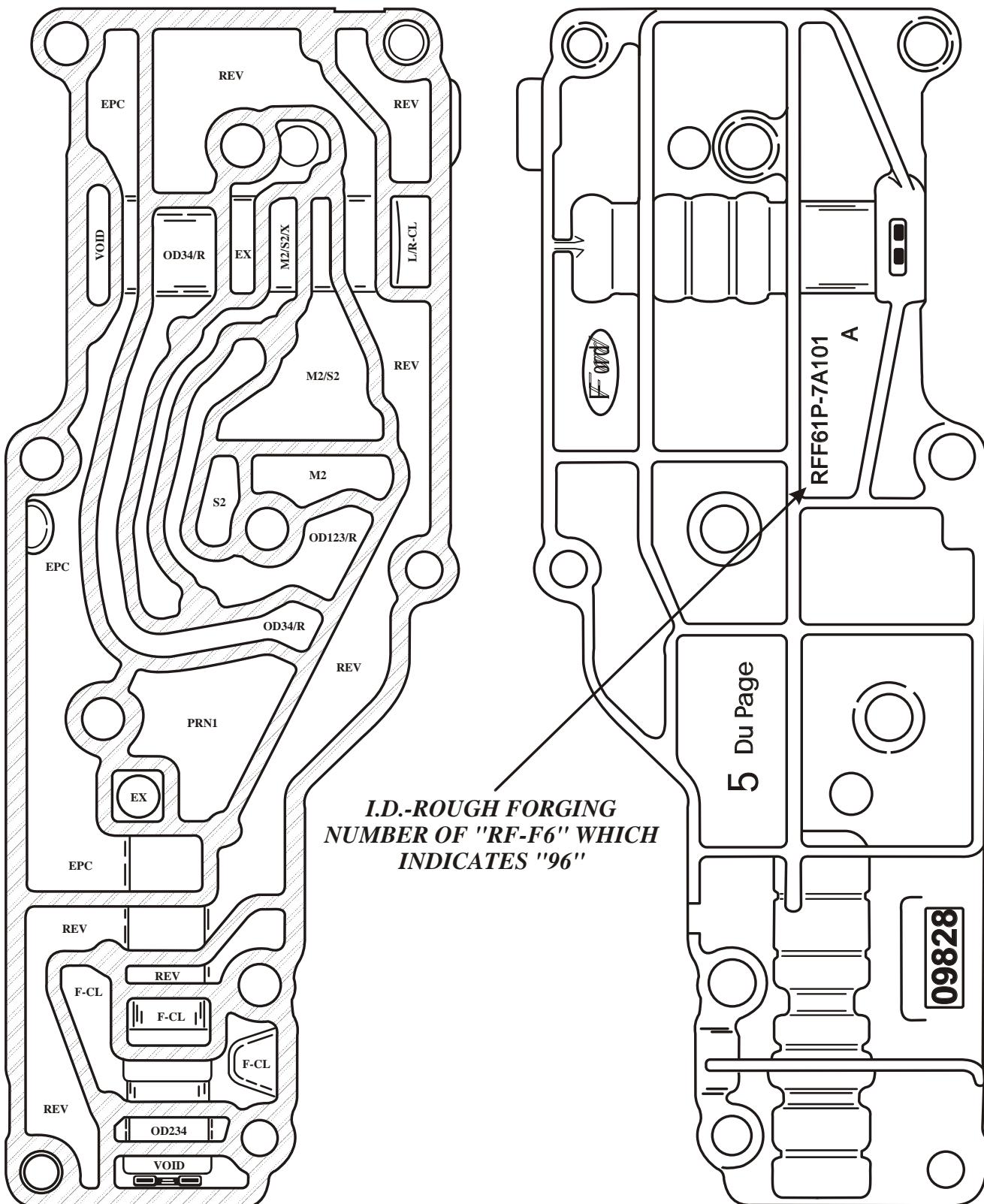
Figure 58

**"LOWER SIDE" 4R100 MAIN VALVE BODY
"PTO" MODELS ONLY**



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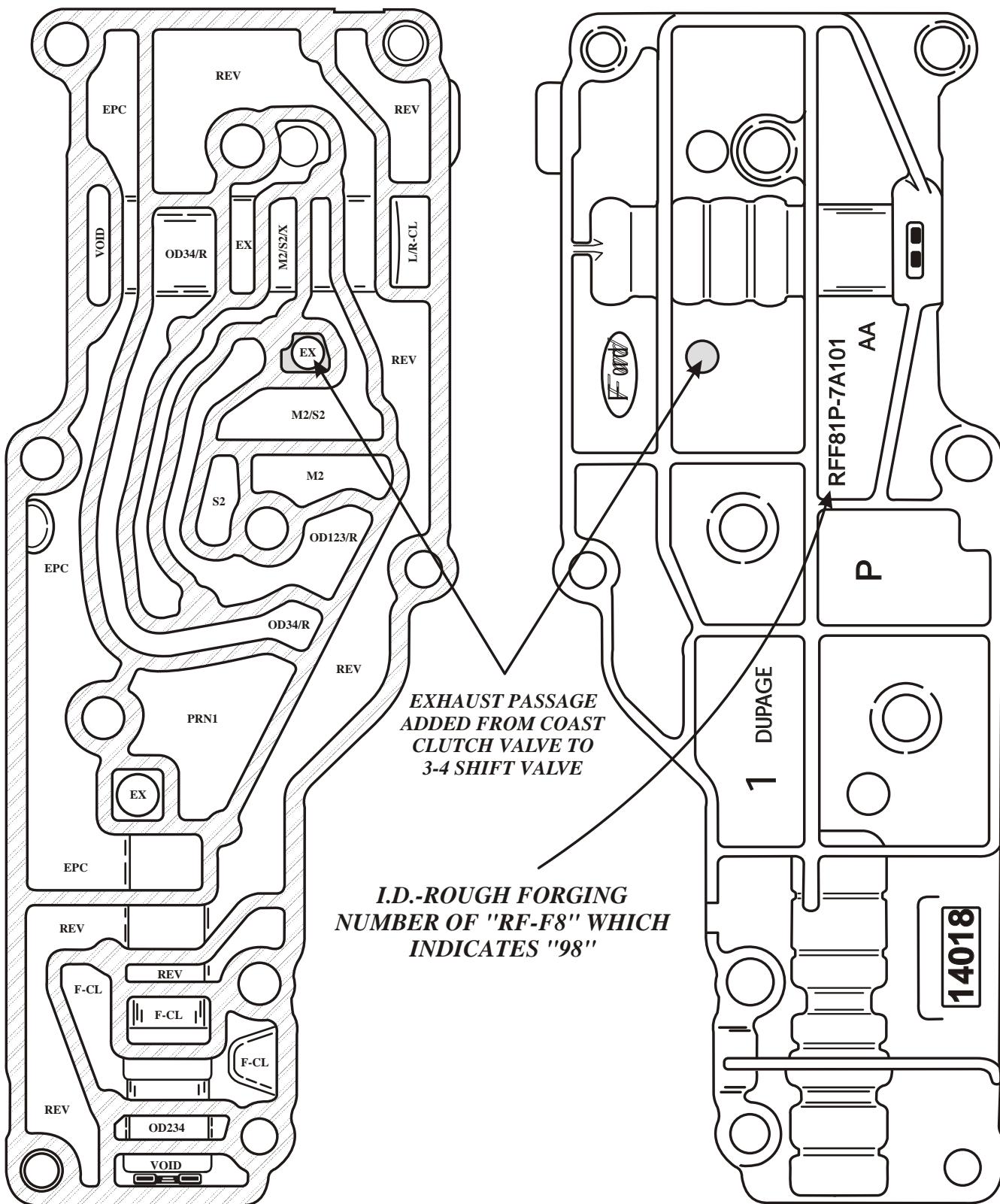
Figure 59

**4R100 LOWER VALVE BODY
"NON-PTO" MODELS ONLY**

Copyright © 2005 ATSG

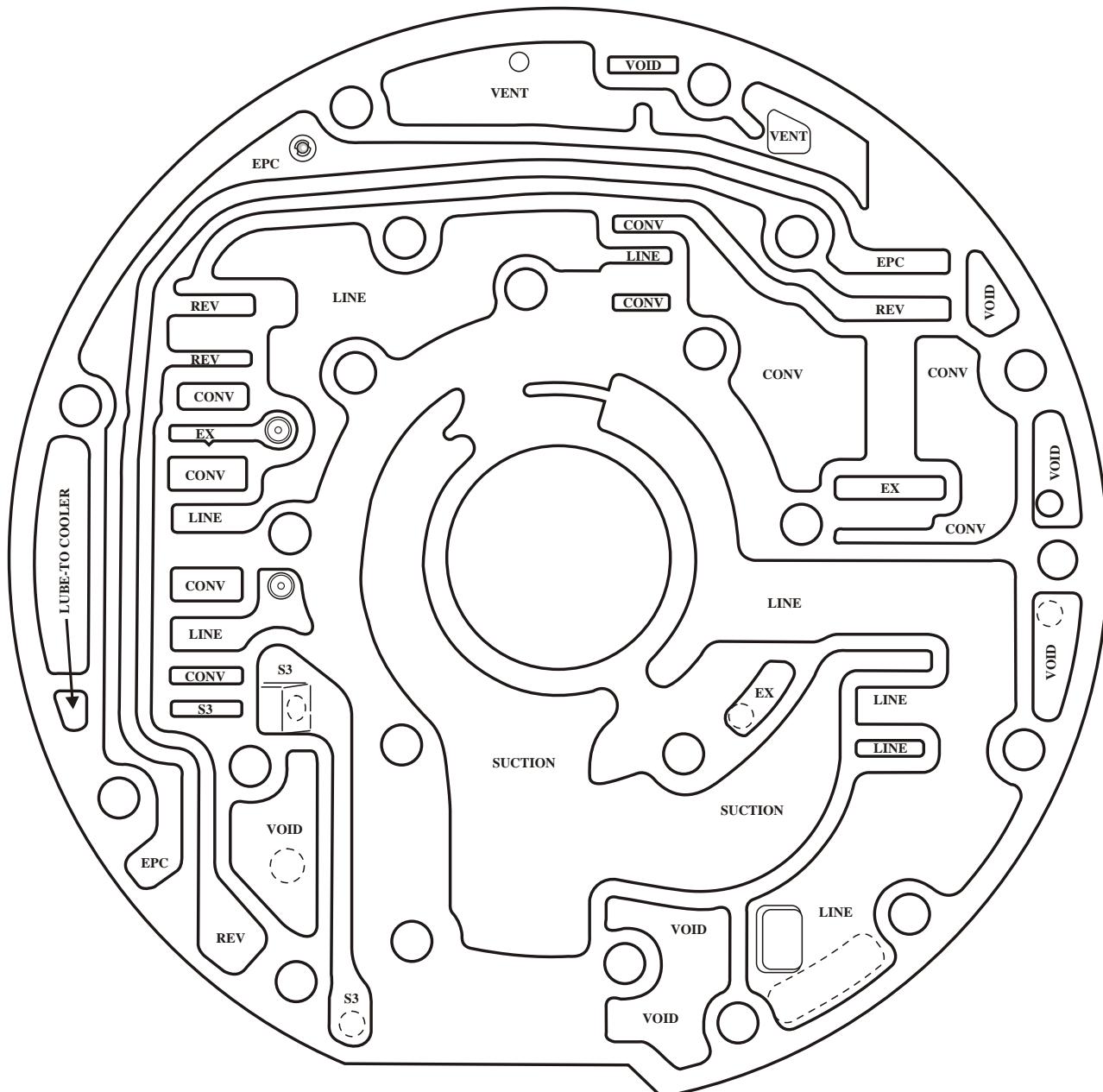
Figure 60

4R100 LOWER VALVE BODY "PTO" MODELS ONLY



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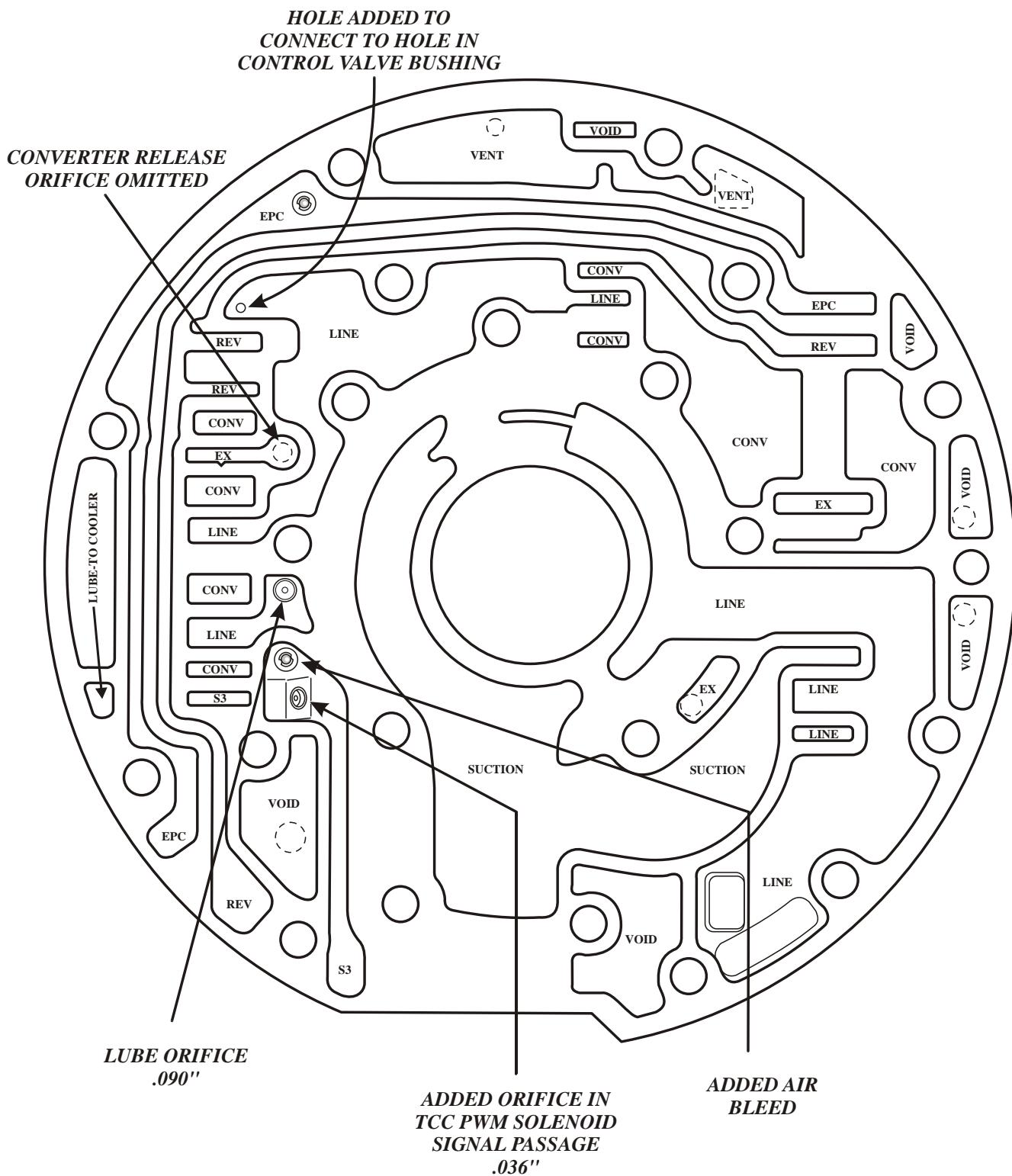
Figure 61

**4R100 PUMP COVER ASSEMBLY
"NON-PWM" MODELS ONLY**

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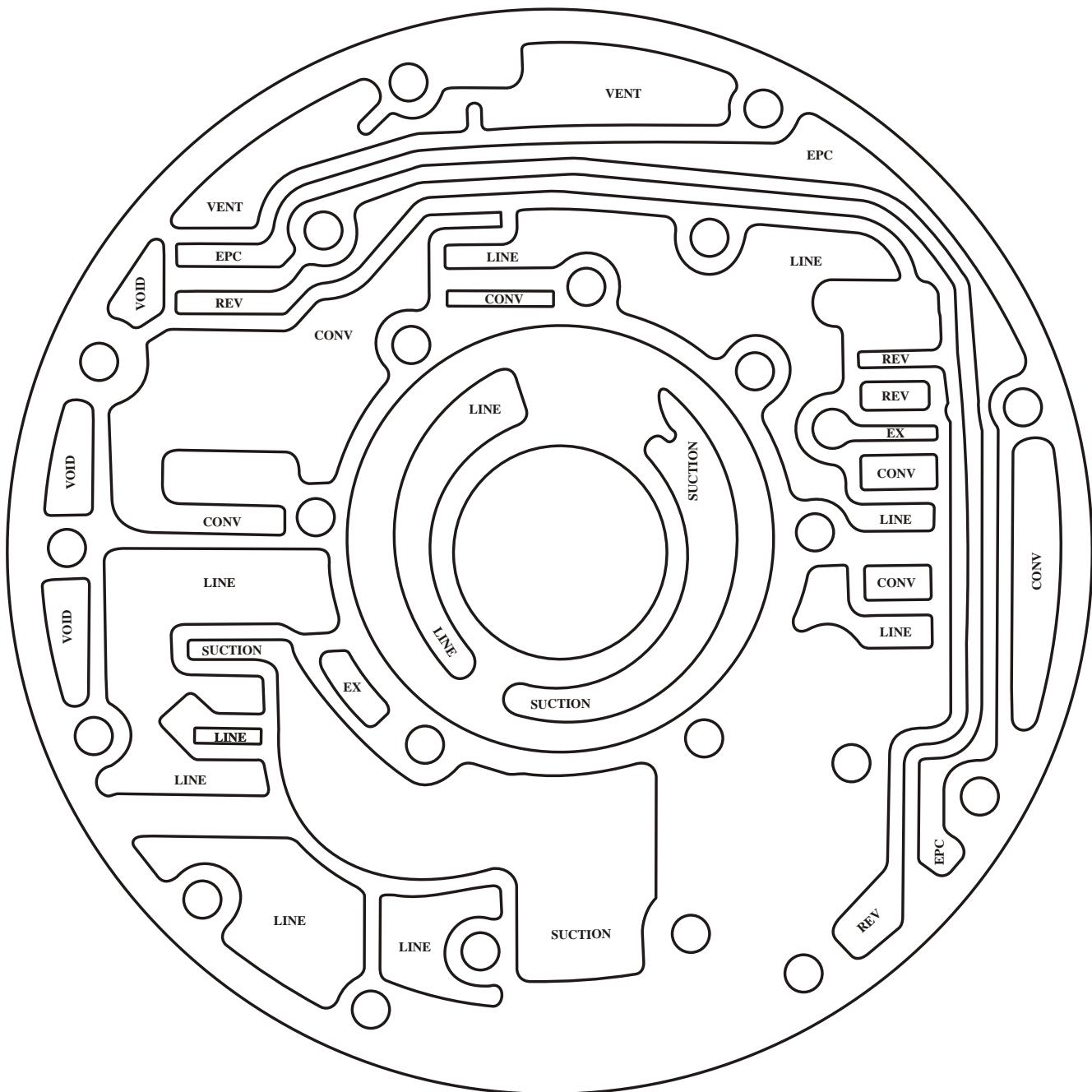
Figure 62

4R100 PUMP COVER ASSEMBLY "PWM" MODELS ONLY



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Figure 63

**4R100 PUMP BODY
"PWM" AND "NON-PWM"**

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Figure 64



FORD MOTOR COMPANY TRUCKS 1996 AND LATER

NO TORQUE CONVERTER CLUTCH APPLICATION AT LESS THAN 30 PERCENT THROTTLE

COMPLAINT: Some Ford Motor Company Trucks, 1996 and later, may exhibit a no Torque Converter Clutch application at less than 30 percent throttle. No Trouble Codes present.

CAUSE NO. 1: One cause for this condition may be that one or more of the vehicle brake light bulbs, including the High Mount brake light may be burned out, or have a damaged filament (See Figure 65). When this condition is present, the PCM will detect an open in the brake lamp circuit, and due to a pull-up resistor in the PCM, will output voltage from PCM terminal 92 to the brake on-off switch (See Figure 66). As a result, the Torque Converter Clutch will not be applied at less than 30 percent throttle.

CAUSE NO. 2: Recently there has been an increase in the popularity of replacing the stock incandescent brake lamp bulbs, with aftermarket LED lamp assemblies. Refer to Figures 67 and 68. The main advantages of switching to LED lamp assemblies is that there are no fragile filaments to burn out or break, which means that the LED lamp assemblies may possibly last for the entire life of the vehicle, and LED lamps consume much less energy than the stock incandescent bulbs. Due to the low power consumption, the PCM *may* view this reduced current draw as being a burned out bulb, resulting in a no Torque Converter Clutch apply at less than 30 percent throttle.

CORRECTION NO. 1:

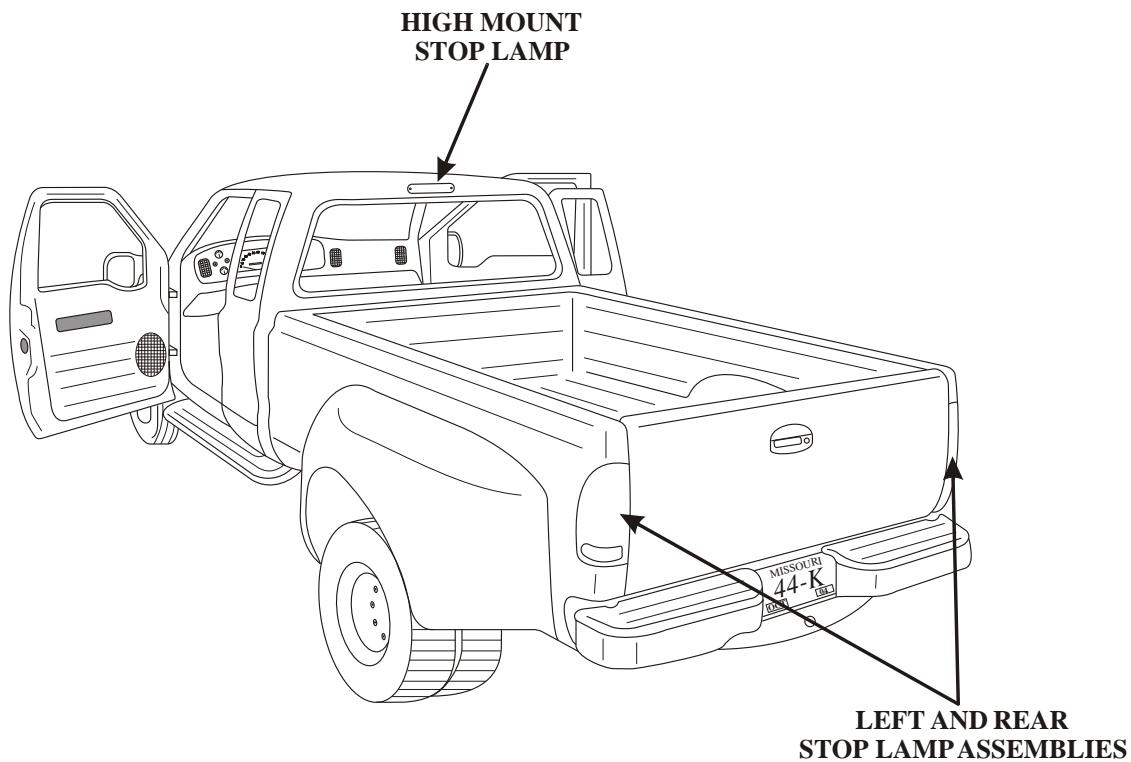
Prior to any part replacement or modifications, it would be recommended to check for a 5 to 8 volt DC signal coming out of the PCM at terminal 92 using a volt meter set to read DC voltage. Voltage may also be checked at the Light Green wire located at the back of the Brake On-Off Switch. *Note: The example given is for a 1996 F-Series 7.3 Diesel.* This test will help to confirm that a circuit fault has been detected by the PCM. Refer to Figure 66. *Normal operation will be 0 volts DC, brake off, and 12 volts DC, brake on.*

Replace any burned out brake lamp bulbs, including the High Mount brake lamp bulb, as shown in Figure 65. It is also important to note, that a bad ground for the rear lamp assembly, has also been known to cause the identical symptom. Refer to Figure 69 for the rear lamp assemblies ground location.

CORRECTION NO. 2:

For those vehicles that have had the stock incandescent bulbs replaced with aftermarket LED bulb assemblies, it *may* be necessary to install a 6 ohm- 50 watt Load Resistor across the brake light power wire to simulate the load of the regular stock incandescent bulb (See Figure 70). *Note: One resistor is required for use on each LED bulb assembly.*

The 6 ohm, 50 watt Load Resistors are available from the suppliers of the LED bulb assemblies. Two examples are "superbrightleds.com" and "digikey.com". Cost of the resistor is approximately five dollars U.S.

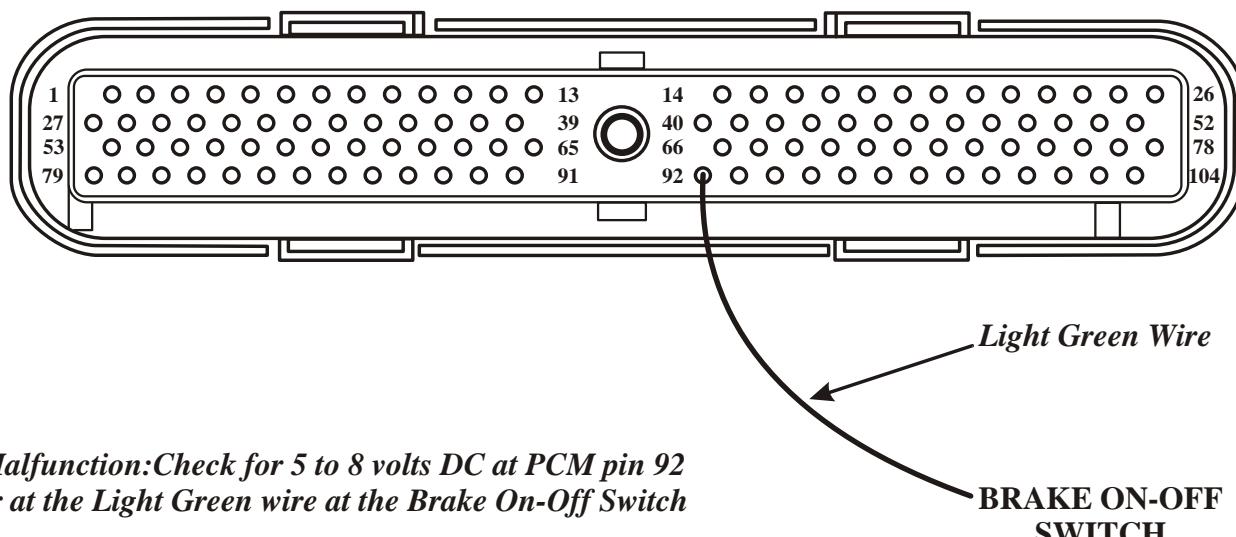


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Figure 65

*Note: Example given is for
a 1996 F Series 7.3 Diesel*

Ford EEC 5 PCM Terminal Identification

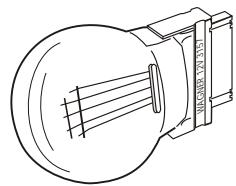


*Malfunction: Check for 5 to 8 volts DC at PCM pin 92
or at the Light Green wire at the Brake On-Off Switch*

*Normal Operation: 0 volts DC brake off
12 volts DC brake on*

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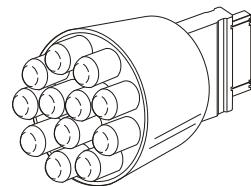
Figure 66



**FACTORY STYLE
INCANDESCENT BULB**

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Figure 67

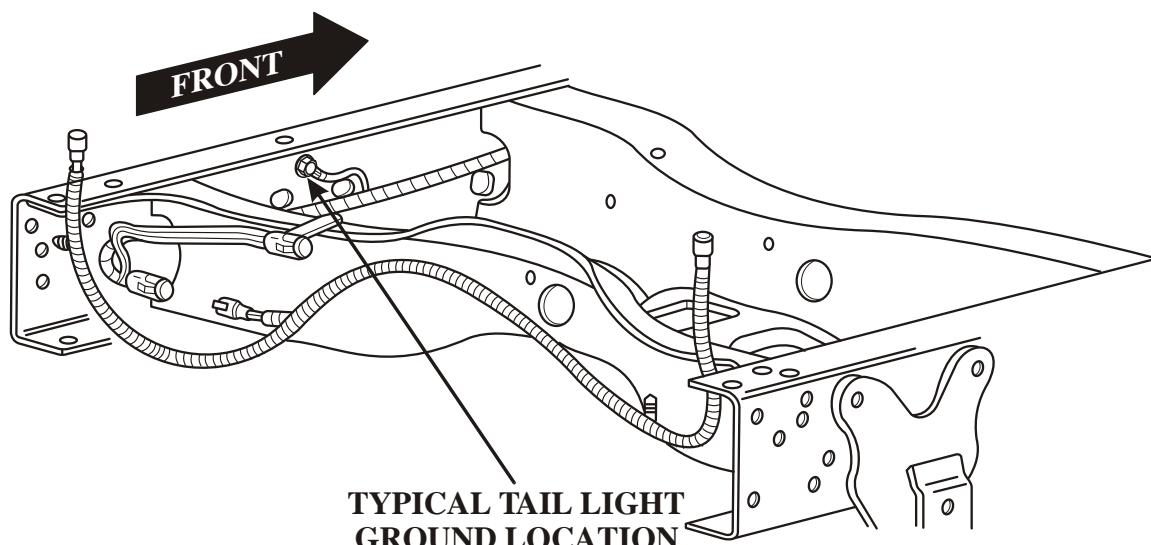


**AFTERMARKET
LED BULB**

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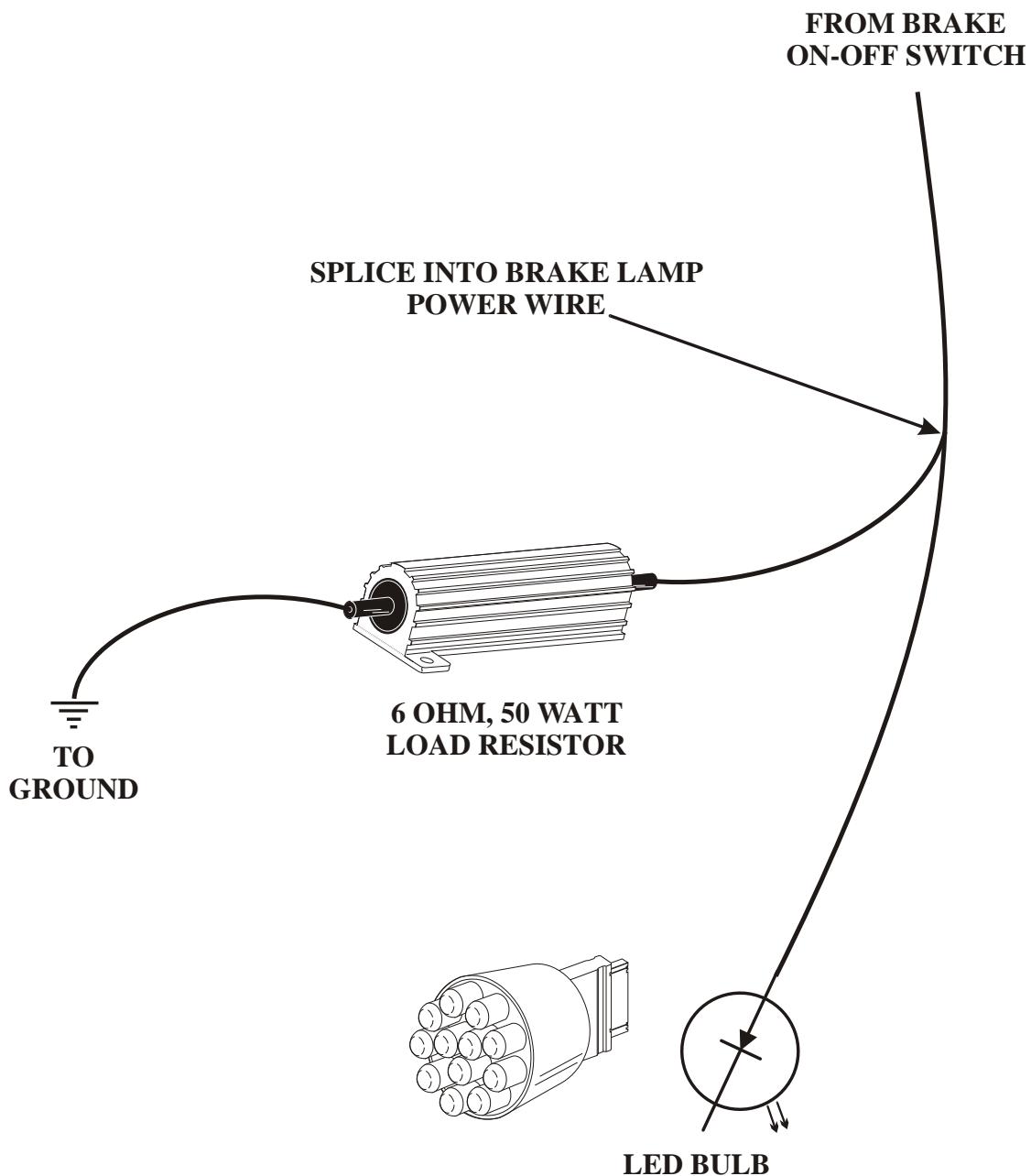
Figure 68

GROUND LOCATION



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Figure 69



Copyright © 2005 ATSG

Figure 70



Technical Service Information

Notes

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Technical Service Information

FORD E4OD/4R100

NEW "SPECIAL" CASE ASSEMBLY FROM FORD MOTOR CO.

CHANGE: Currently, the "*only*" new case available from Ford Motor Company, for replacement in any E4OD equipped vehicles, is a modified 4R100 case. Ford has machined out the dam in the case that separates center and rear lube, near the rear of the case, as shown in Figure 71.

CAUTION: This case *requires* special main spacer plate, spacer plate gaskets, speed sensor plugs and extension housing, that *do not* come with the new case from Ford Motor Company.

We have provided you with a list of additional parts that will be required to use this case, under "Parts Affected", depending on the model year that you are repairing. The older the unit, the more parts required.

REASON: Cost savings due to not having to maintain separate dies for the case assemblies.

PARTS AFFECTED:

REQUIREMENTS FOR 1996 THRU 1998 MODELS ONLY:

- (1) SPACER PLATE - Ford Motor Co. part number F81Z-7A008-EA or F8UZ-7A008-CA, as shown in Figure 72.
- (2) CASE TO SPACER PLATE GASKET - Ford Motor Co. part number F81Z-7C155-AA, with "White" stripe for identification, as shown in Figure 73.
- (3) SPACER PLATE TO V.B. GASKET - Ford Motor Co. part number F81Z-7D100-AB, with "Blue" stripe for identification, as shown in Figure 73.
- (4) COOLER BYPASS ASSEMBLY - Ford Motor Co. part number F81Z-7H322-AA for 1996 models only, as shown in Figure 74. 1997 and 1998 models came with cooler bypass.
- (5) SPEED SENSOR PLUG - Ford Motor Co. part number F81Z-7H183-AA, and 2 are required, as shown in Figure 75.
- (6) LUBE ORIFICE PLUG - Ford Motor Co. part number F81Z-7E380-AA, which should come with the new case from Ford, as shown in Figure 76.
- (7) EXTENSION HOUSING - A4R100 style with boss in the extension housing to retain the lube plug in the new design case, as shown in Figure 76.

Continued on next Page

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Technical Service Information

PARTS AFFECTED (Cont'd):

REQUIREMENTS FOR 1989 THRU 1995 MODELS ONLY:

- (1) SPACER PLATE - Ford Motor Co. part number F81Z-7A008-EA or F8UZ-7A008-CA, as shown in Figure 72.
- (2) CASE TO SPACER PLATE GASKET - Ford Motor Co. part number F81Z-7C155-AA, with "White" stripe for identification, as shown in Figure 73.
- (3) SPACER PLATE TO V.B. GASKET - Ford Motor Co. part number F81Z-7D100-AB, with "Blue" stripe for identification, as shown in Figure 73.
- (4) COOLER BYPASS ASSEMBLY - Ford Motor Co. part number F81Z-7H322-AA, as shown in Figure 74.
- (5) SPEED SENSOR PLUG - Ford Motor Co. part number F81Z-7H183-AA, and 2 are required, as shown in Figure 75.
- (6) LUBE ORIFICE PLUG - Ford Motor Co. part number F81Z-7E380-AA, which should come with the new case from Ford, as shown in Figure 76.
- (7) EXTENSION HOUSING - A4R100 style with boss in the extension housing to retain the lube plug in the new design case, as shown in Figure 76.
- (8) MAIN VALVE BODY - Requires 1996 hydraulics which is identified by RF-F6 cast into the valve body, in location shown in Figure 77, and checkball locations are shown in Figure 78.
- (9) LOWER VALVE BODY - Requires 1996 hydraulics which is identified by RF-F6 cast into the lower valve body, in location shown in Figure 77.
- (10) LOWER VALVE BODY SPACER PLATE - The 1996 hydraulics version which is identified by the 2 holes for bathtub checkball and 3 small holes, as shown in Figure 77.
- (11) ACCUMULATOR VALVE BODY - Requires 1996 hydraulics which is identified by RF-F6 cast into the accumulator valve body and slot cast shut, as shown in Figure 77.
- (12) CASE CHECKBALL LOCATIONS - Requires the 1996 and later case checkball locations, which is eight checkballs in locations shown in Figure 79.

INTERCHANGEABILITY:

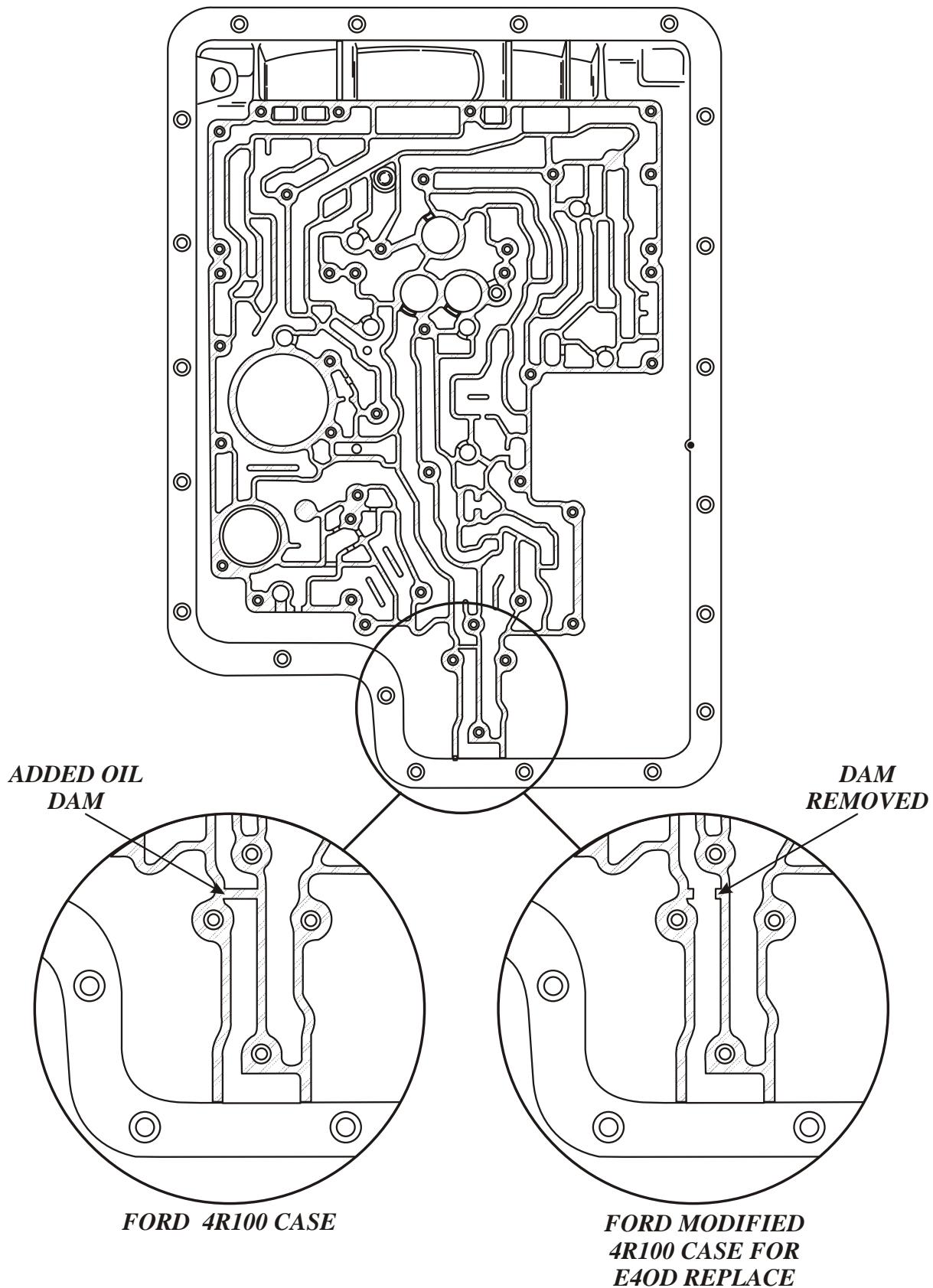
Parts that have been mis-matched, depending on what you have done, can create;

- Harsh Shifts ● No Overdrive ● Bind in Manual 1
- Lack of Lube ● Bind in Reverse ● Slip in Reverse

SERVICE INFORMATION:

Main Valve Body Spacer Plate	F81Z-7A008-EA
Main Valve Body Spacer Plate (Optional)	F8UZ-7A008-CA
Case To Spacer Plate Gasket (White Stripe)	F81Z-7C155-AA
Spacer Plate To Valve Body Gasket (Blue Stripe)	F81Z-7D100-AB
Cooler Bypass Assembly	F81Z-7H322-AA
Speed Sensor Plugs (2 Required)	F81Z-7H183-AA
Lube Orifice Plug (Comes with new case)	F81Z-7E380-AA

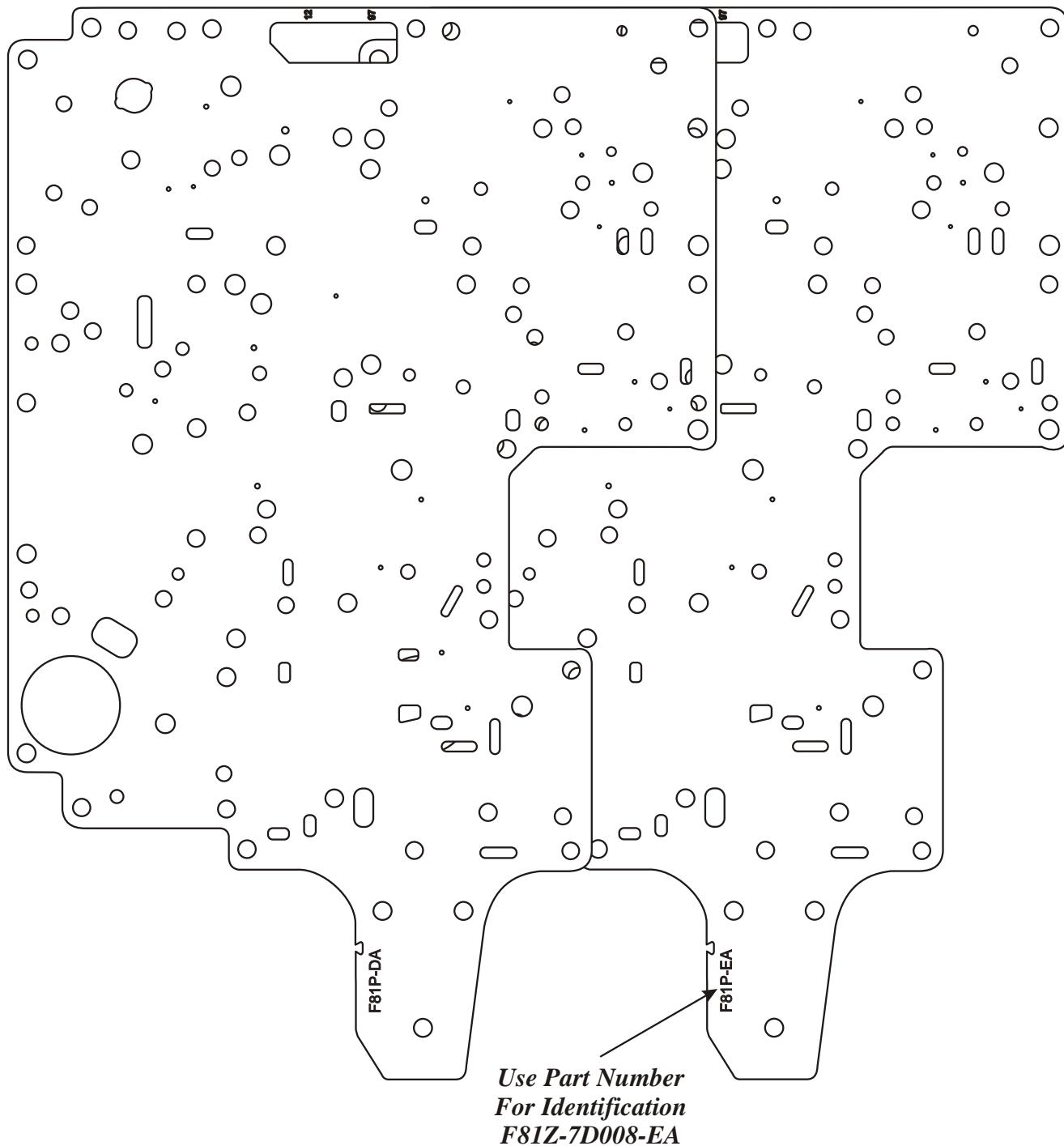
FORD 4R100 MODIFIED CASE FOR USE IN E4OD MODELS



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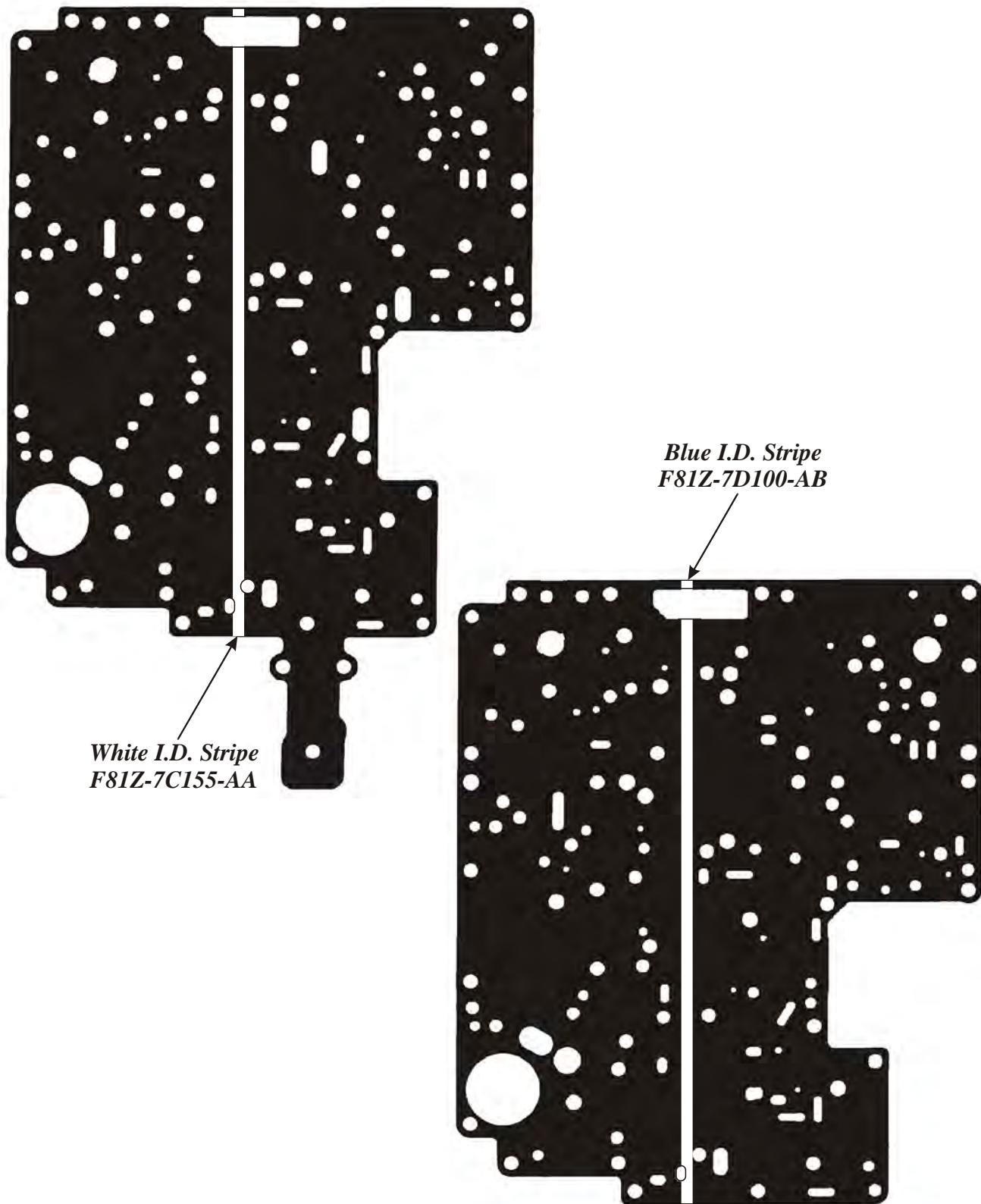
Figure 71

**"SPECIAL" MAIN SPACER PLATE REQUIRED
FOR MODIFIED 4R100 CASE**



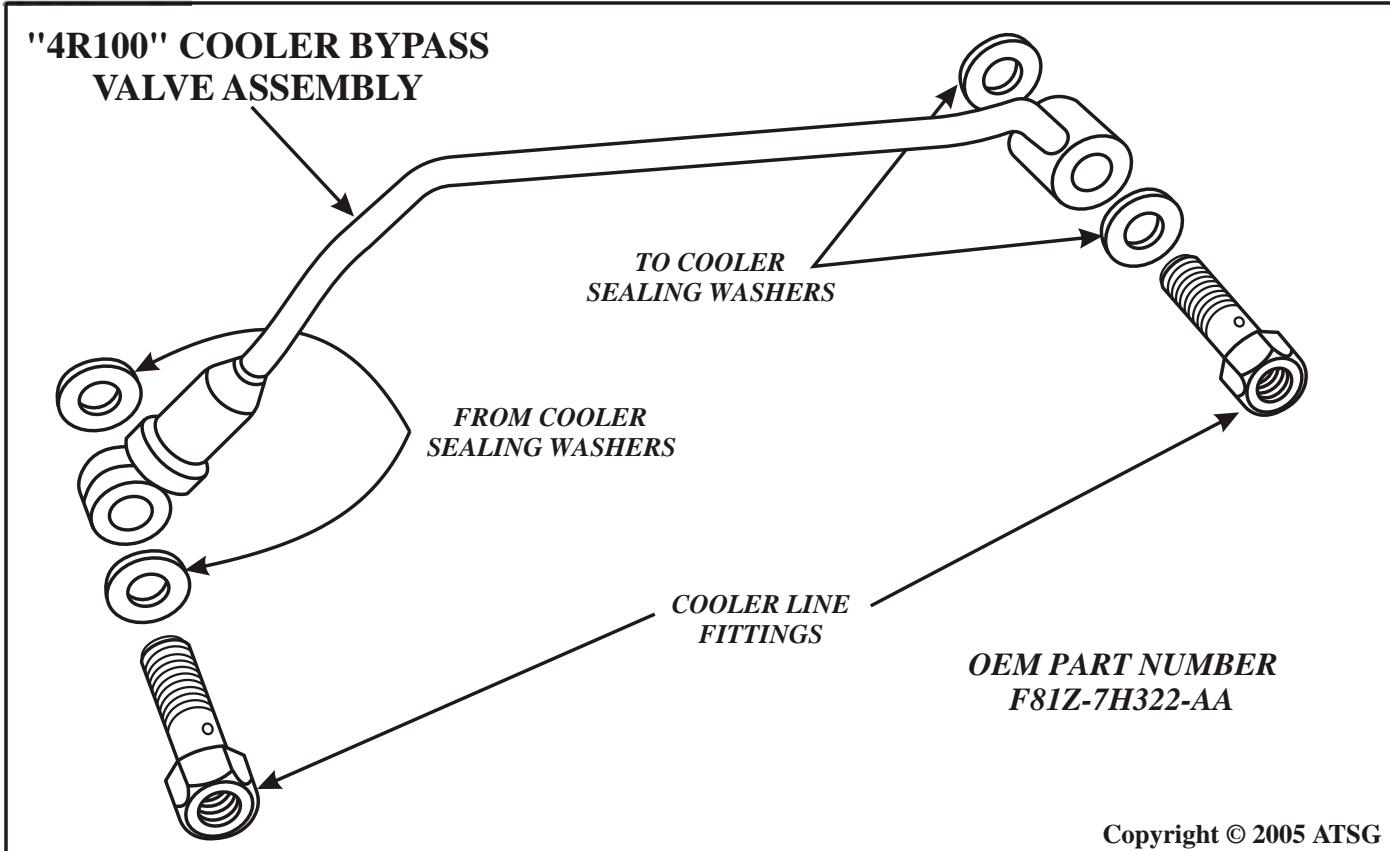
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Figure 72

**CASE AND VALVE BODY GASKETS REQUIRED
FOR MODIFIED 4R100 CASE**

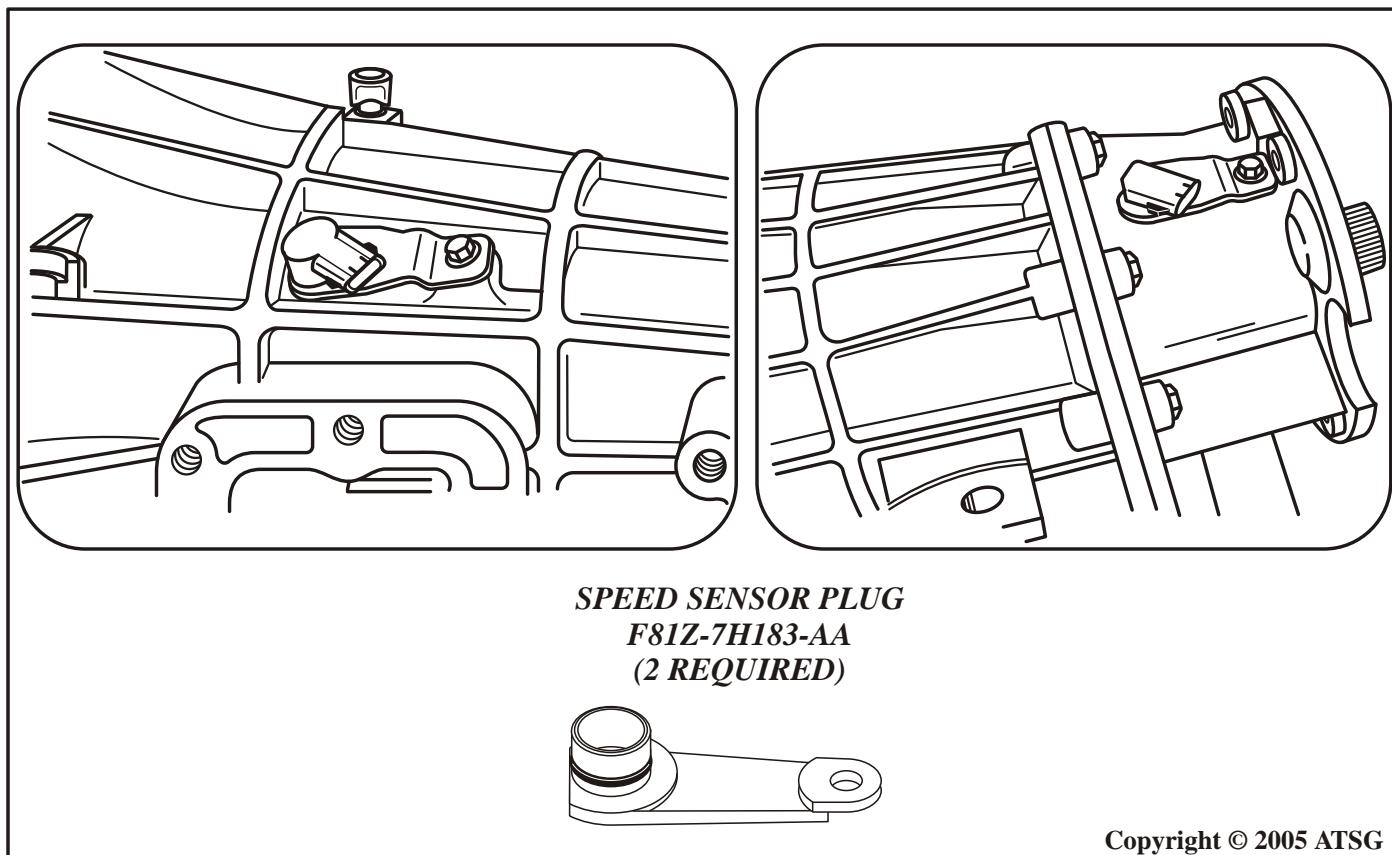
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Figure 73



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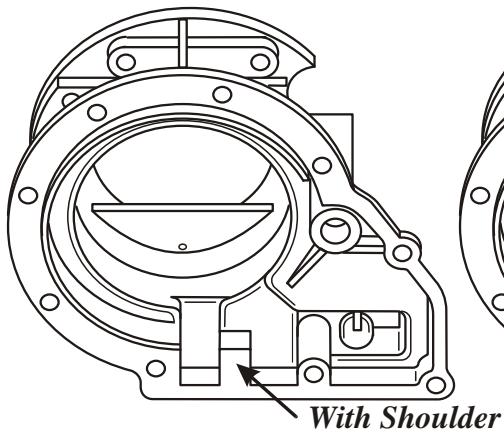
Figure 74



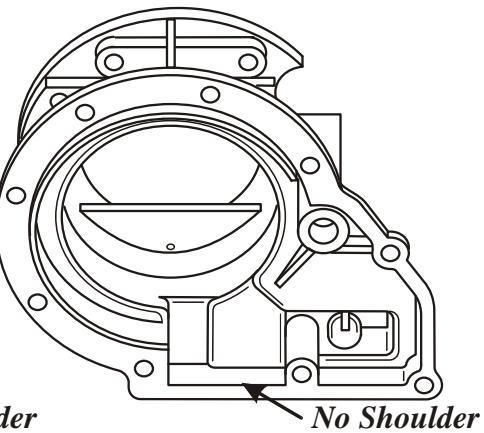
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Figure 75

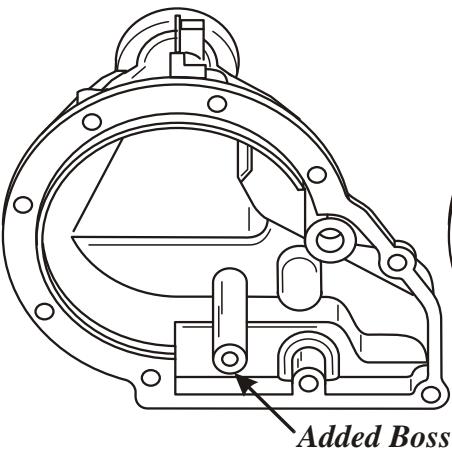
**TYPICAL
4 WHEEL DRIVE**



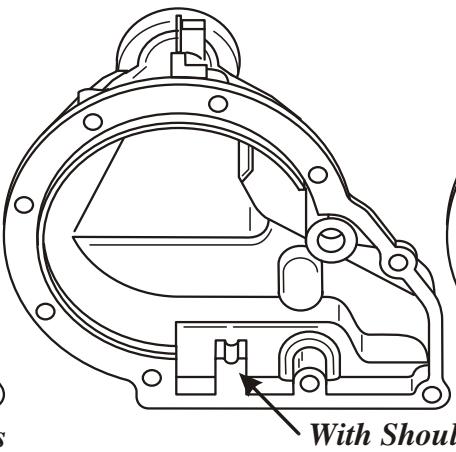
**E4OD 4X4 WITHOUT
LUBE PLUG**



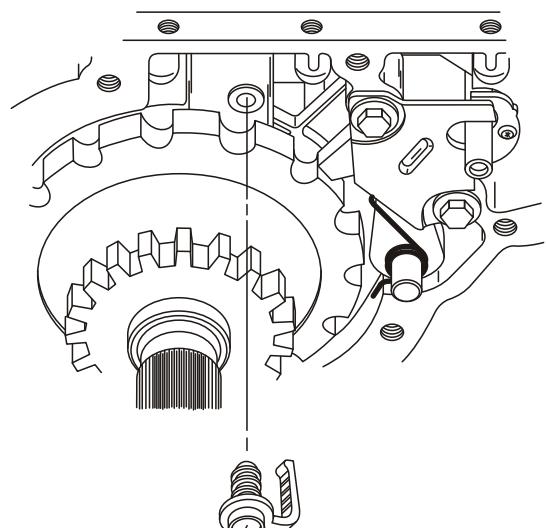
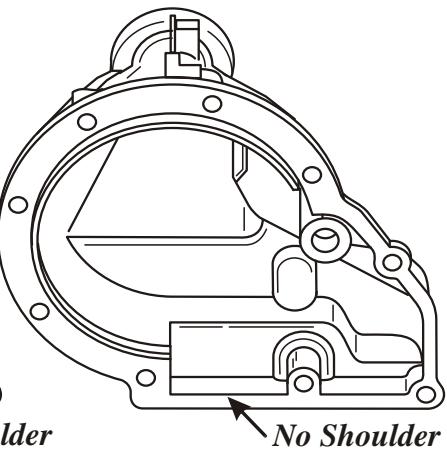
**FORD 4R100
6.8L AND 7.3L
2 WHEEL DRIVE**



**ALL OTHER
2 WHEEL DRIVE
APPLICATIONS**



**E4OD WITHOUT
LUBE PLUG**



*Must use extension housing with shoulder or boss,
to retain the lube orifice plug in the new case*

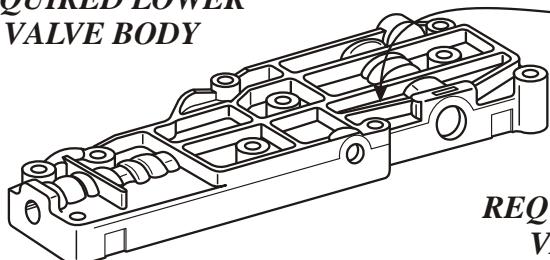
**LUBE ORIFICE PLUG
FORD PART NUMBER
F81Z-7E380-AA**

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Figure 76

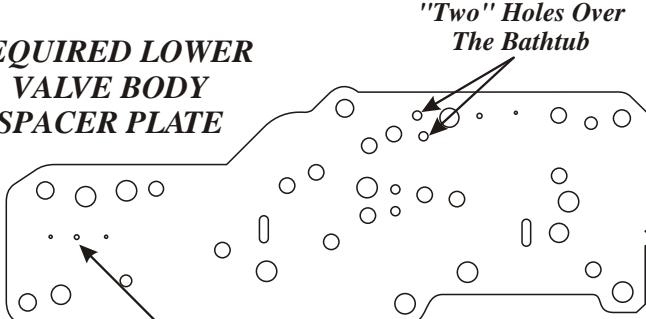
VALVE BODY CASTINGS REQUIRED FOR MODIFIED 4R100 CASE

**REQUIRED LOWER
VALVE BODY**



**I.D.-ROUGH FORGING
NUMBER OF "RF-F6" WHICH
INDICATES "96" MODEL**

**REQUIRED LOWER
VALVE BODY
SPACER PLATE**



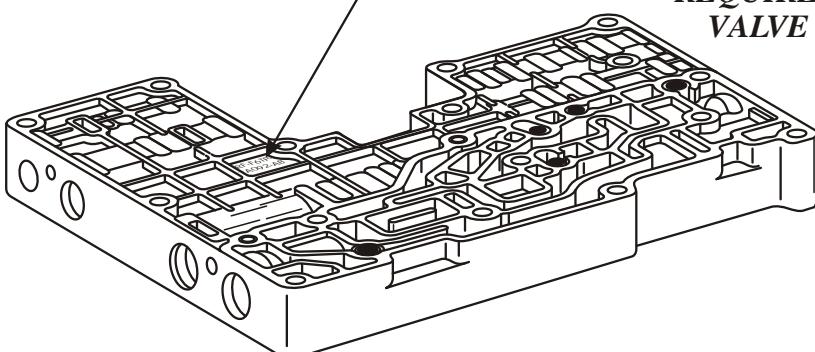
"Two" Holes Over
The Bathtub

THREE "SMALL" HOLES

Identification
One "V" Notch

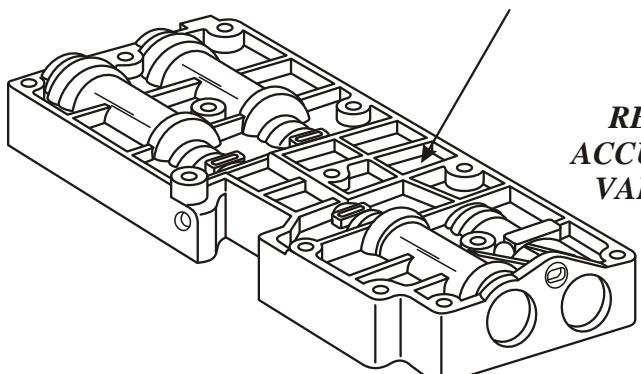
**I.D.-ROUGH FORGING
NUMBER OF "RF-F6" WHICH
INDICATES "96" MODEL**

**REQUIRED MAIN
VALVE BODY**



**I.D.-ROUGH FORGING
NUMBER OF "RF-F6" WHICH
INDICATES "96" MODEL**

**REQUIRED
ACCUMULATOR
VALVE BODY**

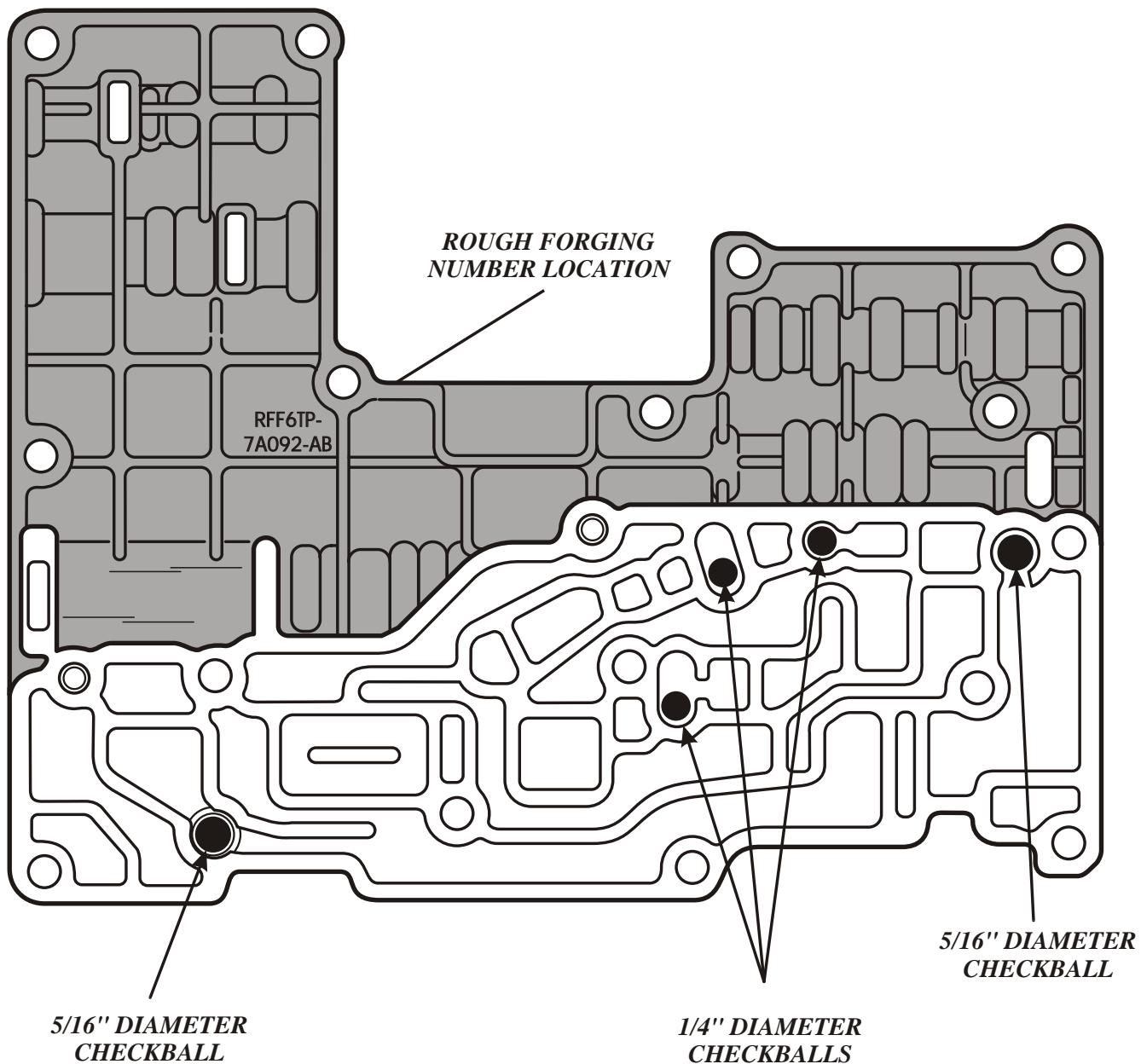


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Figure 77

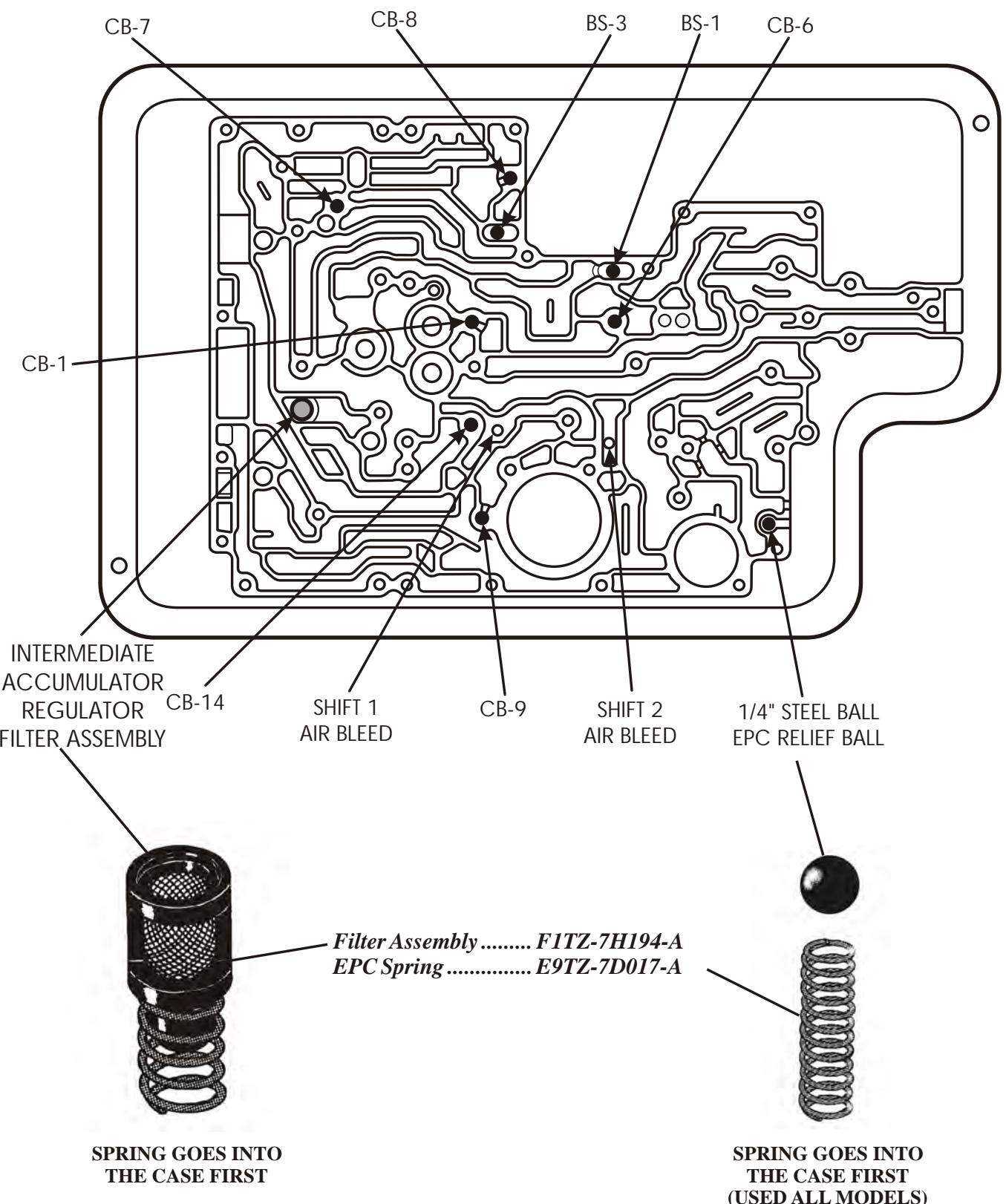
**VALVE BODY CHECKBALL LOCATIONS REQUIRED
FOR MODIFIED 4R100 CASE**

**VALVE BODY CHECKBALL LOCATIONS
REQUIRES THREE 1/4" RUBBER BALLS,
AND TWO 5/16" RUBBER BALLS**



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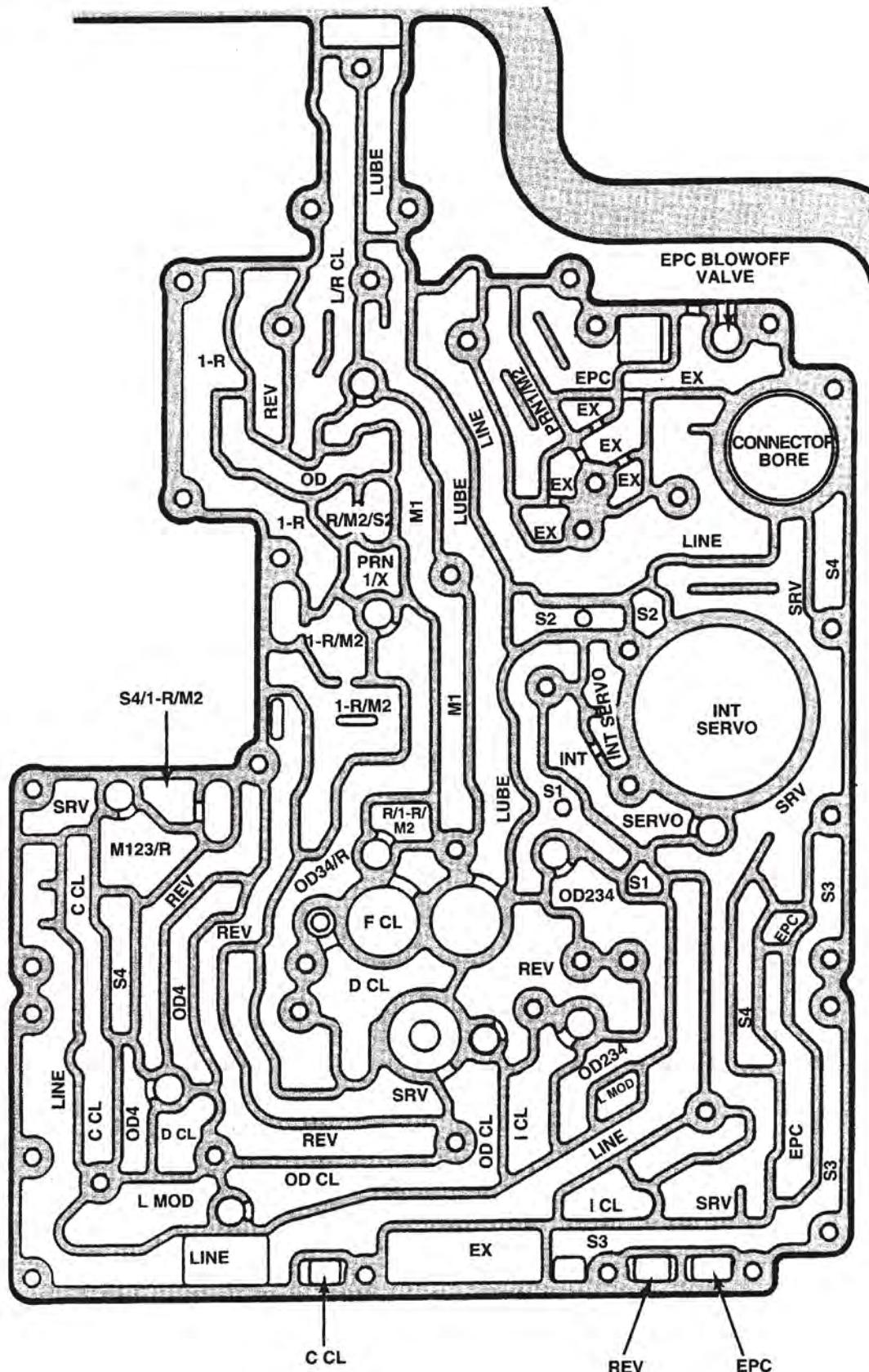
Figure 78

**4R100 "MODIFIED" CASE CHECKBALL LOCATIONS
REQUIRES EIGHT (5/16") RUBBER BALLS**

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Figure 79

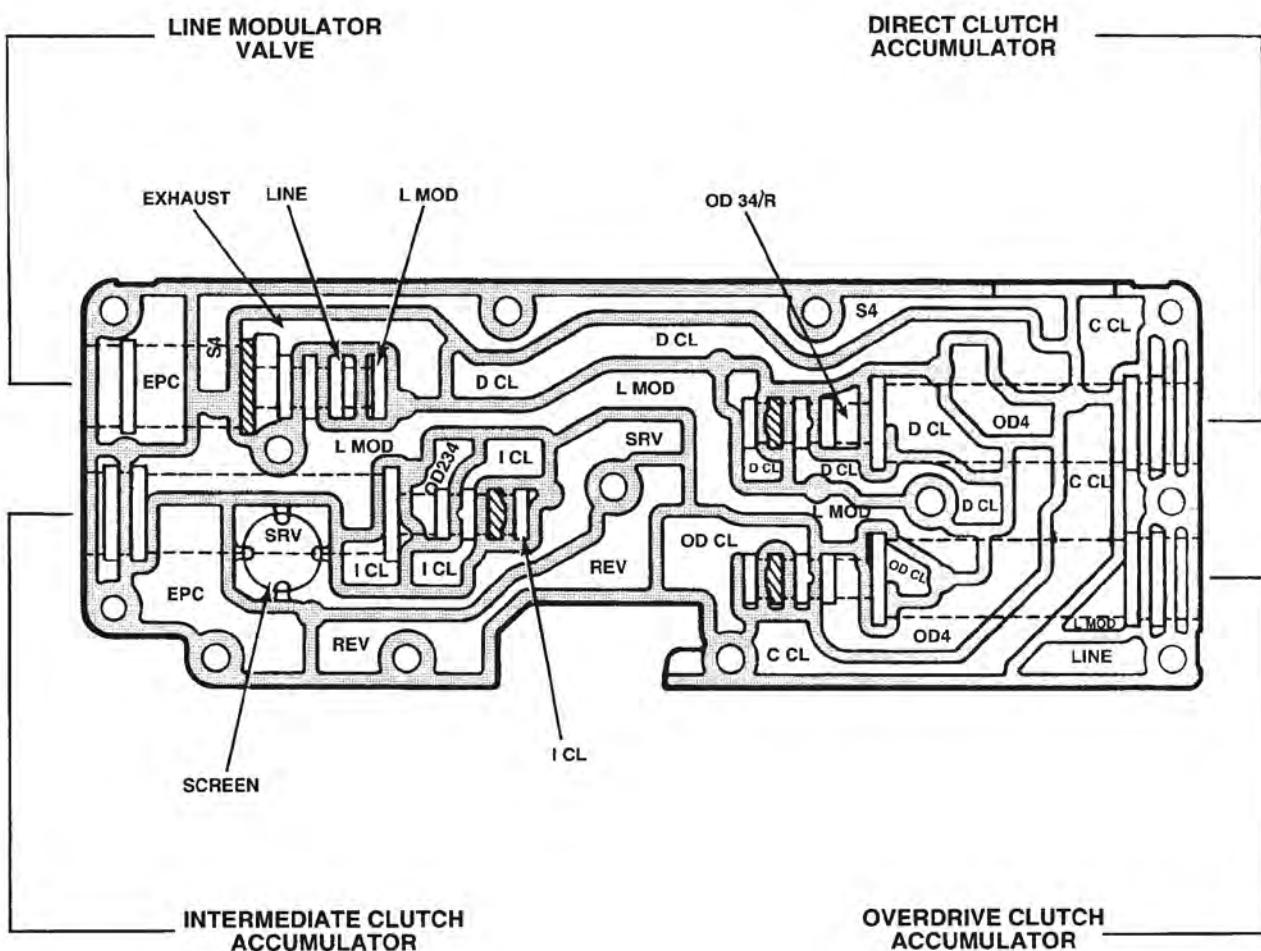
4R100 CASE PASSAGE IDENTIFICATION



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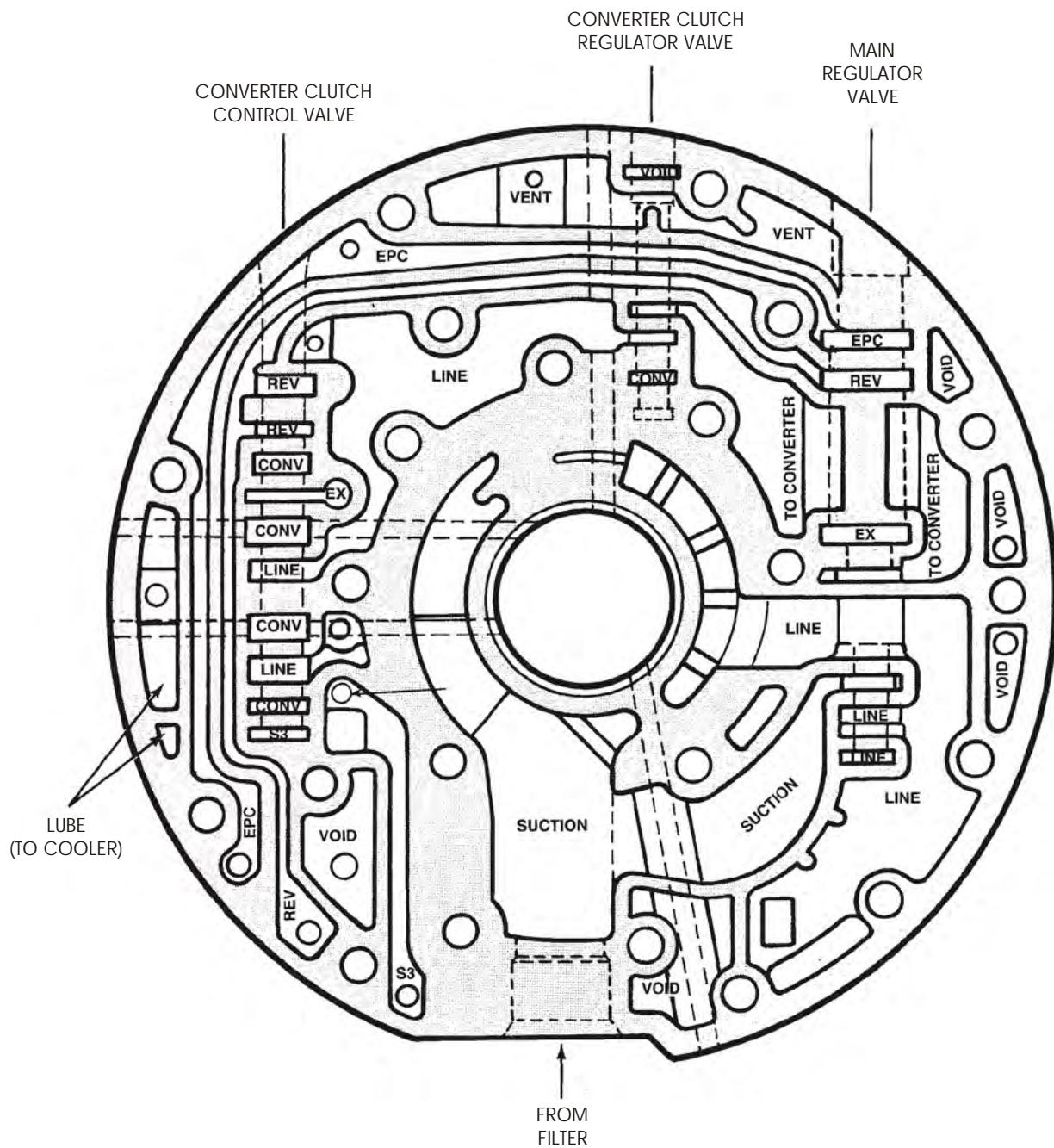
Figure 80

ACCUMULATOR BODY PASSAGE IDENTIFICATION



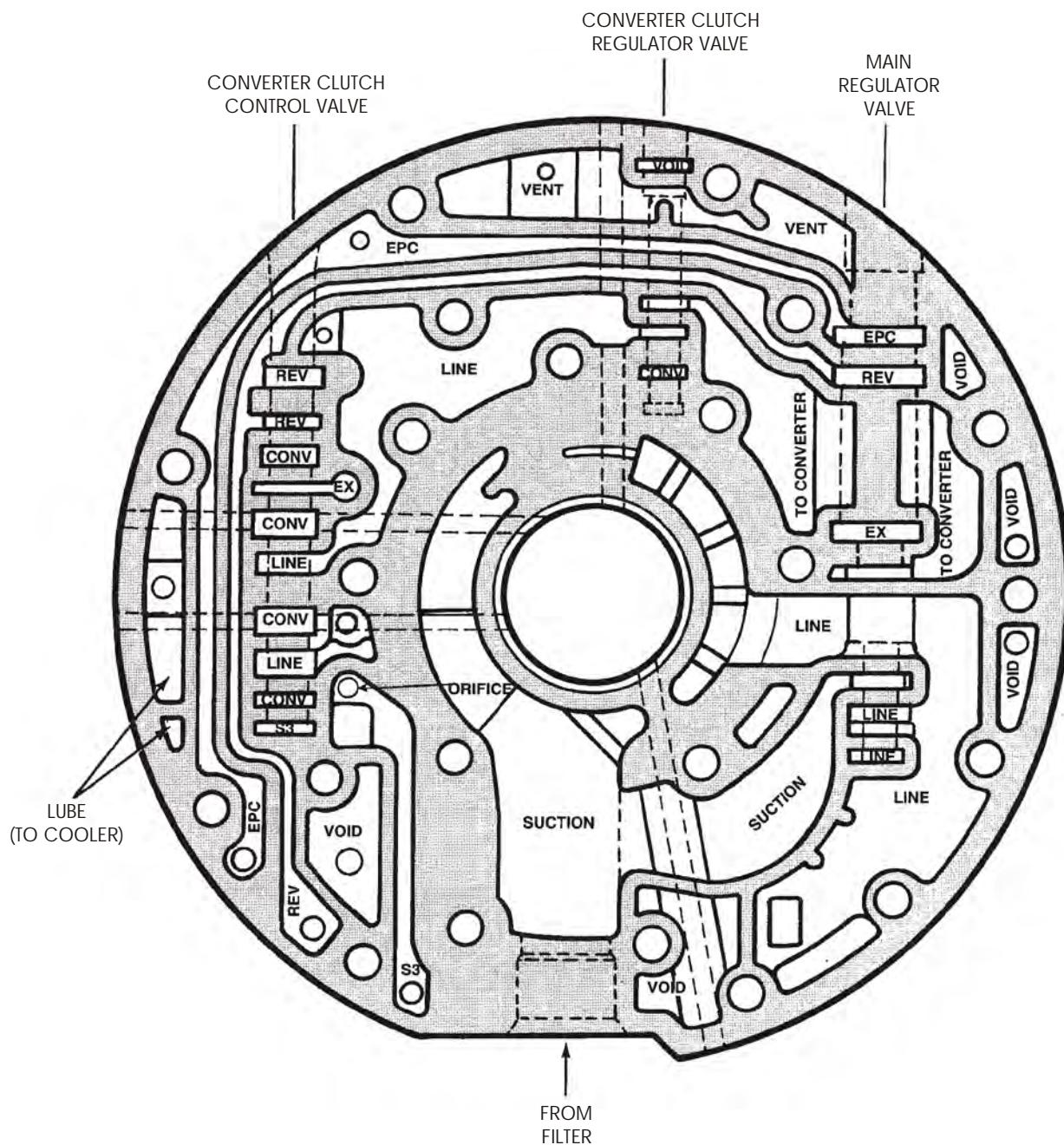
Copyright © 2005 ATSG

Figure 81

"ON/OFF" TCC PUMP COVER PASSAGE IDENTIFICATION

Copyright © 2005 ATSG

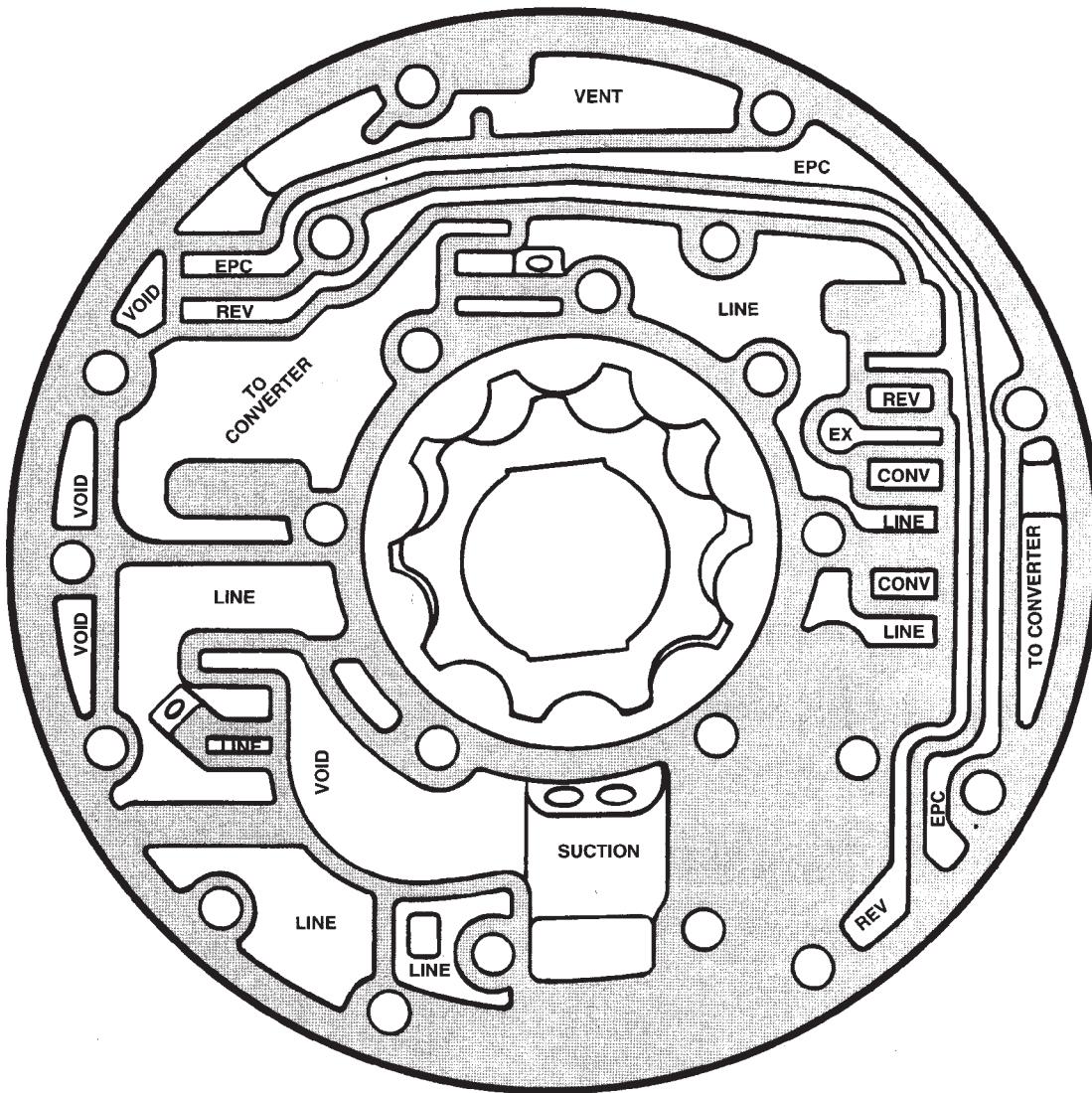
Figure 82

"PWM" TCC PUMP COVER PASSAGE IDENTIFICATION

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Figure 83

OIL PUMP BODY PASSAGE IDENTIFICATION



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Figure 84



Technical Service Information

THE REAL SCOOP ON FORD'S 4R100 POWER TAKE OFF OPERATION

BY: JIM DIAL
TECHNICAL CONSULTANT
FOR ATSG

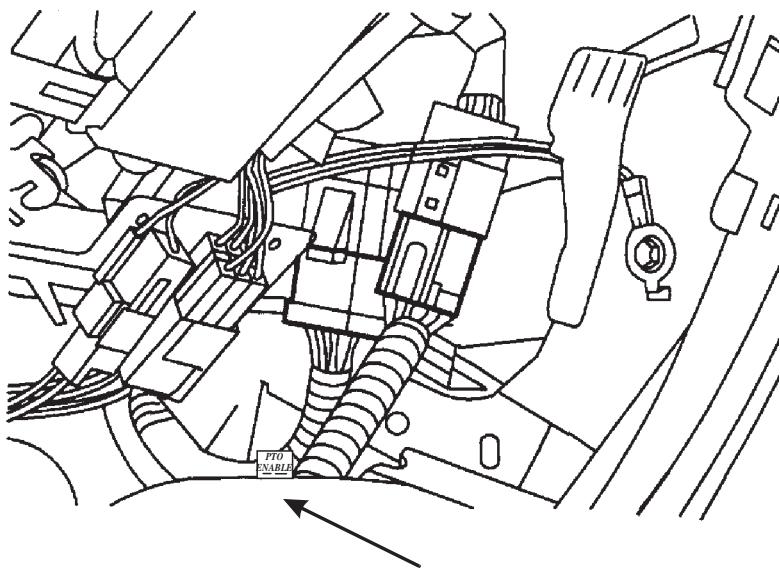
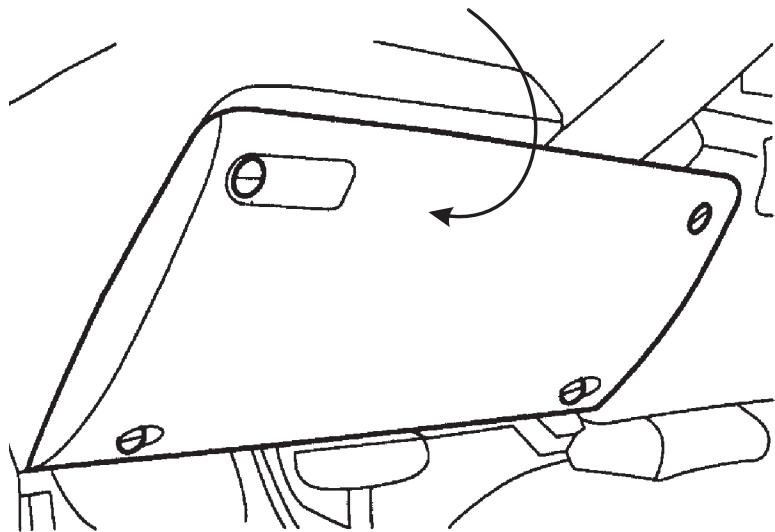
In the last two years we have discussed in bulletins and seminars about all of the changes the 4R100 had to go through to be able to drive a "Power Take Off" (PTO) unit. This article is the real scoop on how the whole system operates electronically and hydraulically.

Dale England and I had an opportunity to check out a 1999 Ford F550 Super Duty truck equipped with a 7.3 "Powerstroke" diesel. This vehicle had just been fitted with a PTO, to drive a pump, to run a "bucket type lift" for T.V. cable repair. We thought that this would be a great time to clear up some questions that we were curious about. The first question that needed to be answered was, What does the Powertrain Control Module (PCM) do when the "PTO" is turned on? Before we could answer that question, we had to find out how 12 volts was supplied to terminal 66 at the PCM. This was something we covered in last years seminar. We discussed how the technician, that was installing the PTO, had to supply their own 12 volt power source to terminal 66 on diesel models or terminal 4 on gas models, to tell the PCM when the PTO mode was selected. We decided to check terminal 66 of the PCM where we found a Blue with a Yellow stripe wire that headed back in towards the cab. We followed the wire under the column area , as shown in Figure 1, and found a tag that was taped to the wire that stated "PTO Enable." This wire is supplied by Ford, which is information we were not sure of before. The company that installed the PTO on this truck, had set up their own relay that was wired so there would be "no" voltage supplied to terminal 66 until the selector is in the Park position and the Parking brake is "on." This is an obvious safety precaution.

It was now time to find out the shift solenoid strategy, now that terminal 66 was handled. We proceeded to hook up some test equipment to the solenoid pack to monitor the PCM signals and we placed the selector in Park and set the Parking brake. I started the vehicle and reached up and pushed the PTO button.....nothing happened. GREAT!.....it worked before we touched it, famous last words! The first thing we thought wasmaybe we disturbed a connection along the way to terminal 66. We checked all of our conectors and verified 12 volts at terminal 66, with the PTO button "on", and still nothing. After screwing around for half an hour we decided to swallow our pride and call the person that installed the PTO. He came to the phone and we told him about the problem and what we had done. The first thing out of his mouth was, "did anyone , by chance, disconnect the batteries for any reason?" My jaw hit the floor.....when we checked terminal 66 at the PCM we had to disconnect the batteries so we could unplug the connector from the PCM safely. Long story short, the PCM must have a 7 mile drive cycle at speeds over 50 mph. before it remembers that it is capable of running a PTO! Well, needless to say, we felt like complete idiots! and yes, that fixed it. So..... now after wasting all of this time, we placed the selector in Park and set the Parking brake. When the PTO button was depressed the following things happened:

- The PCM turned the no.2 solenoid "ON"
- The OD Cancel Light came on and the Coast Clutch Solenoid was turned "ON"
- The PCM brought engine rpm up to approximately 1500. (Powerstroke diesels are "Drive By Wire" as they have NO throttle cable).
- EPC pressure rose to about 55psi
- When engine idle hit about 1500 rpm the TCC solenoid came on.

All of this happened within a few seconds. In Figure 2 we have provided a partial hydraulic circuit diagram to show some of the hydraulic changes that had to be made to the 3-4 shift valve and why these changes were necessary. As you can see, the 3-4 shift valve is now connected to line pressure

REMOVE STEERING COLUMN COVER

**THE PTO ENABLE WIRE IS LOCATED IN THE WIRING LOOM
UNDER THE STEERING COLUMN**

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Figure 1

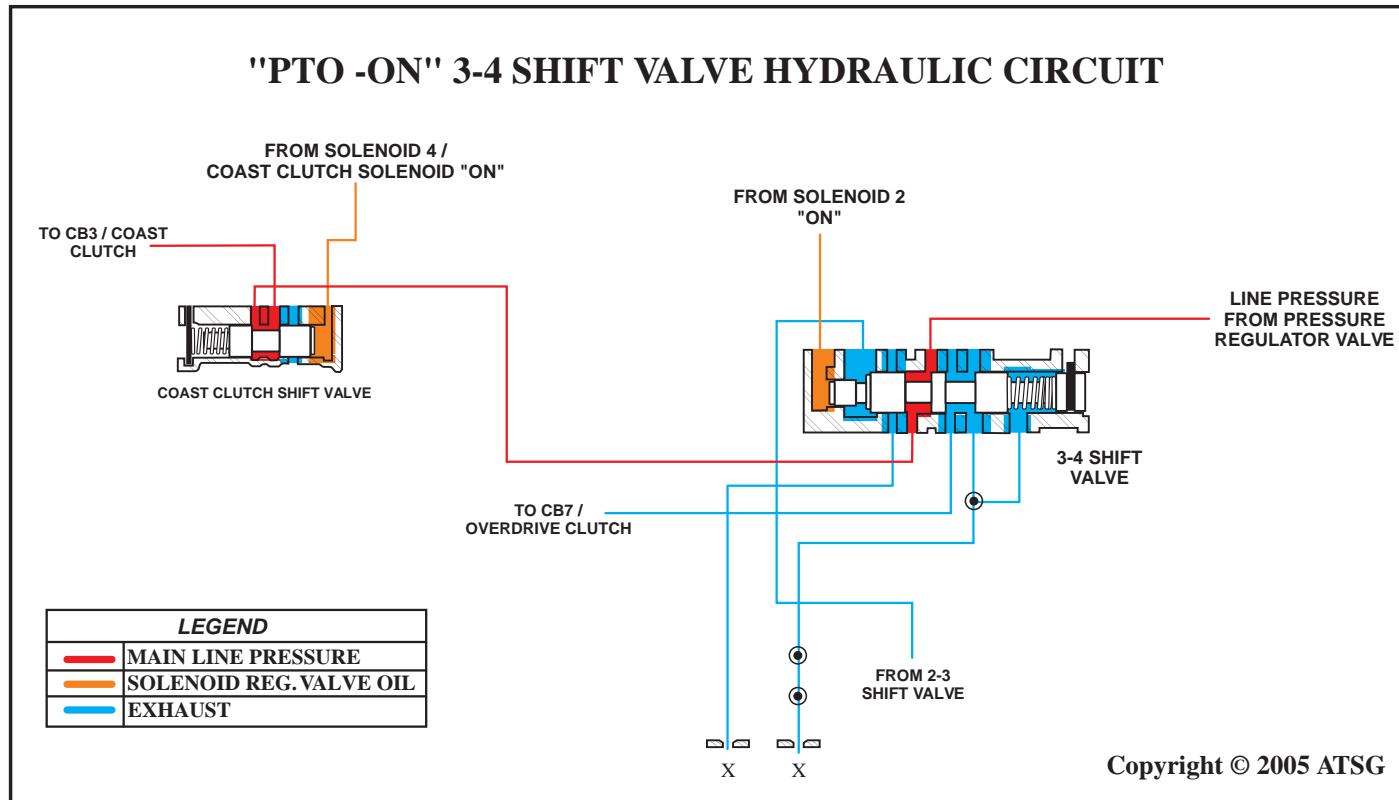
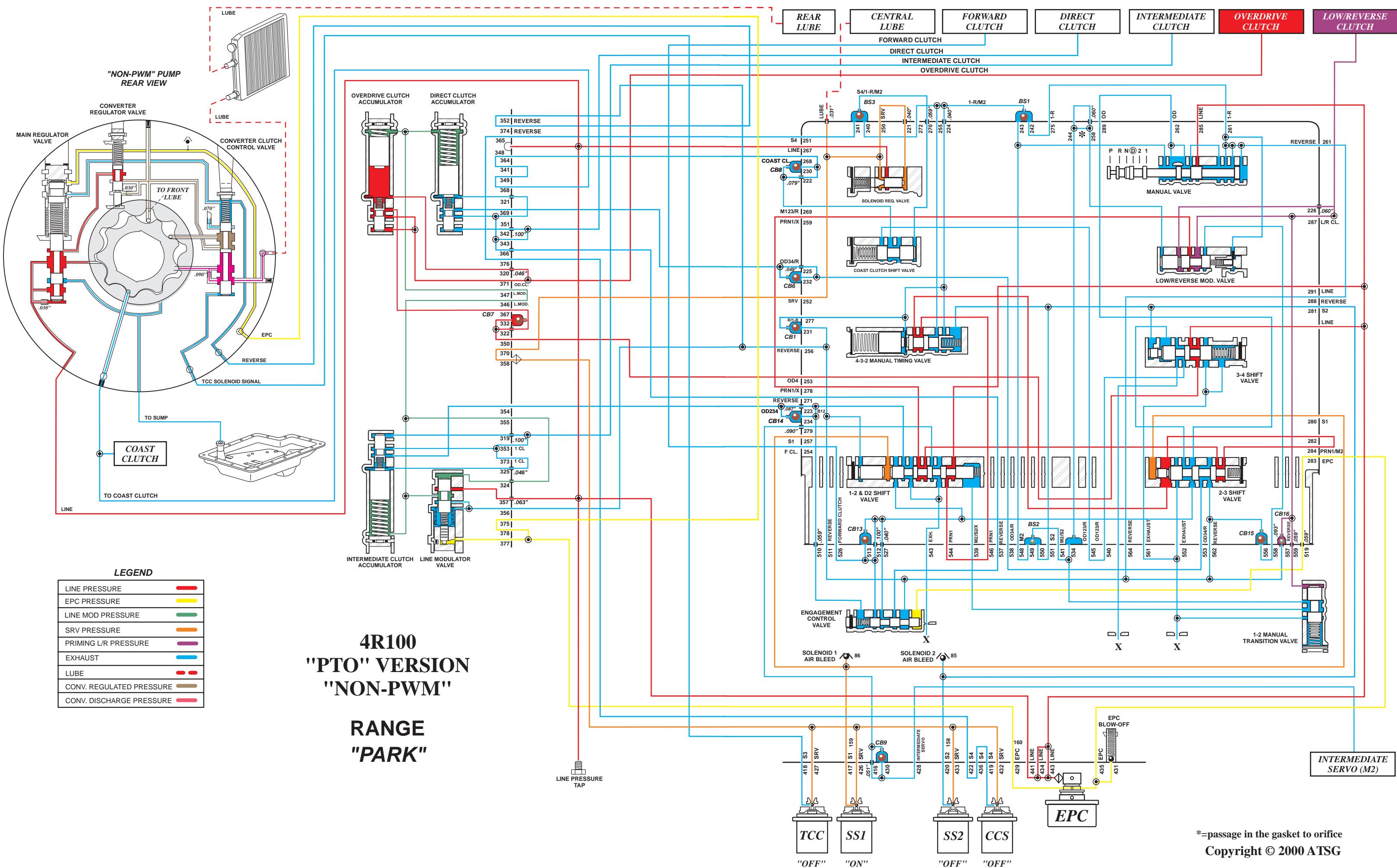
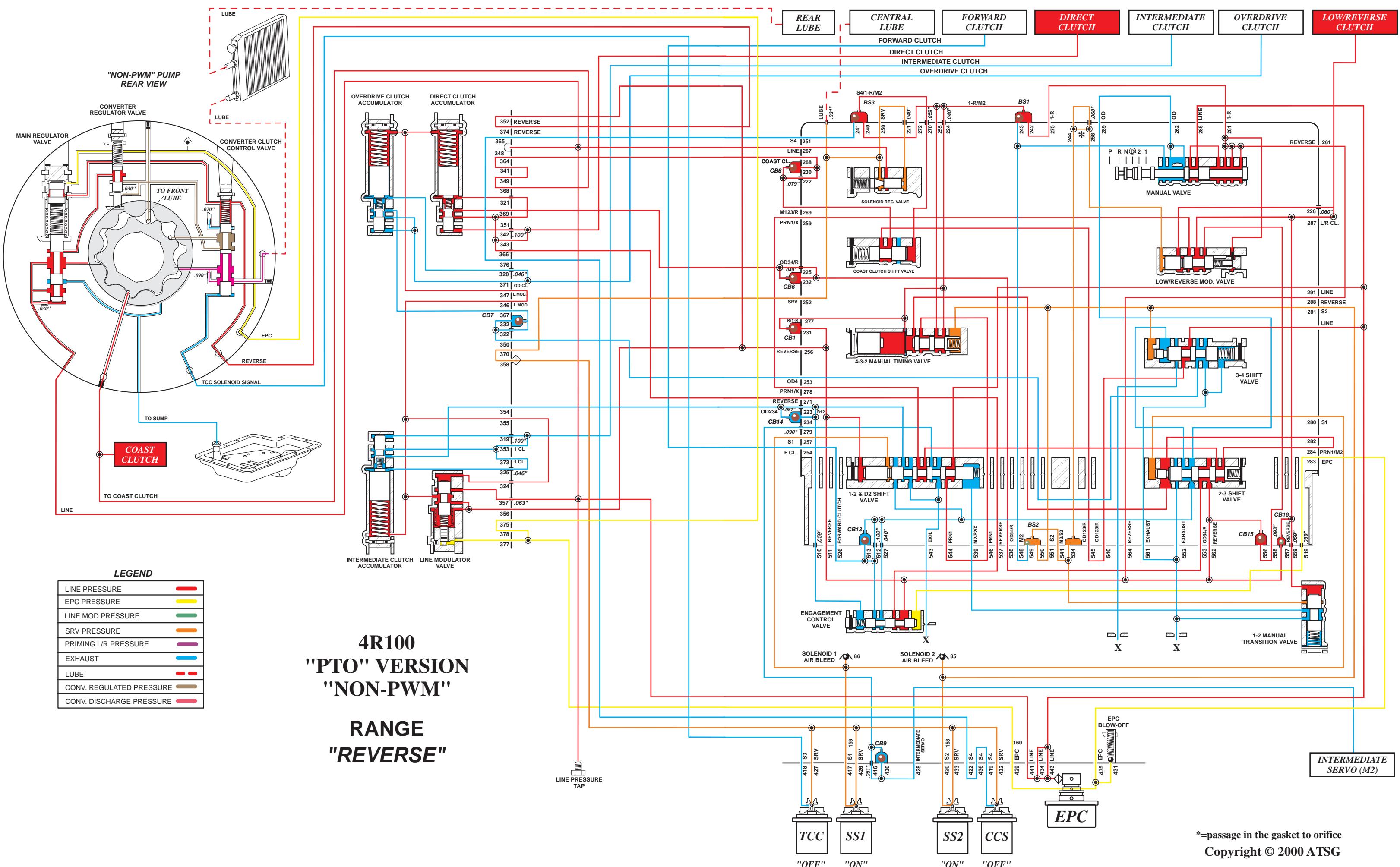
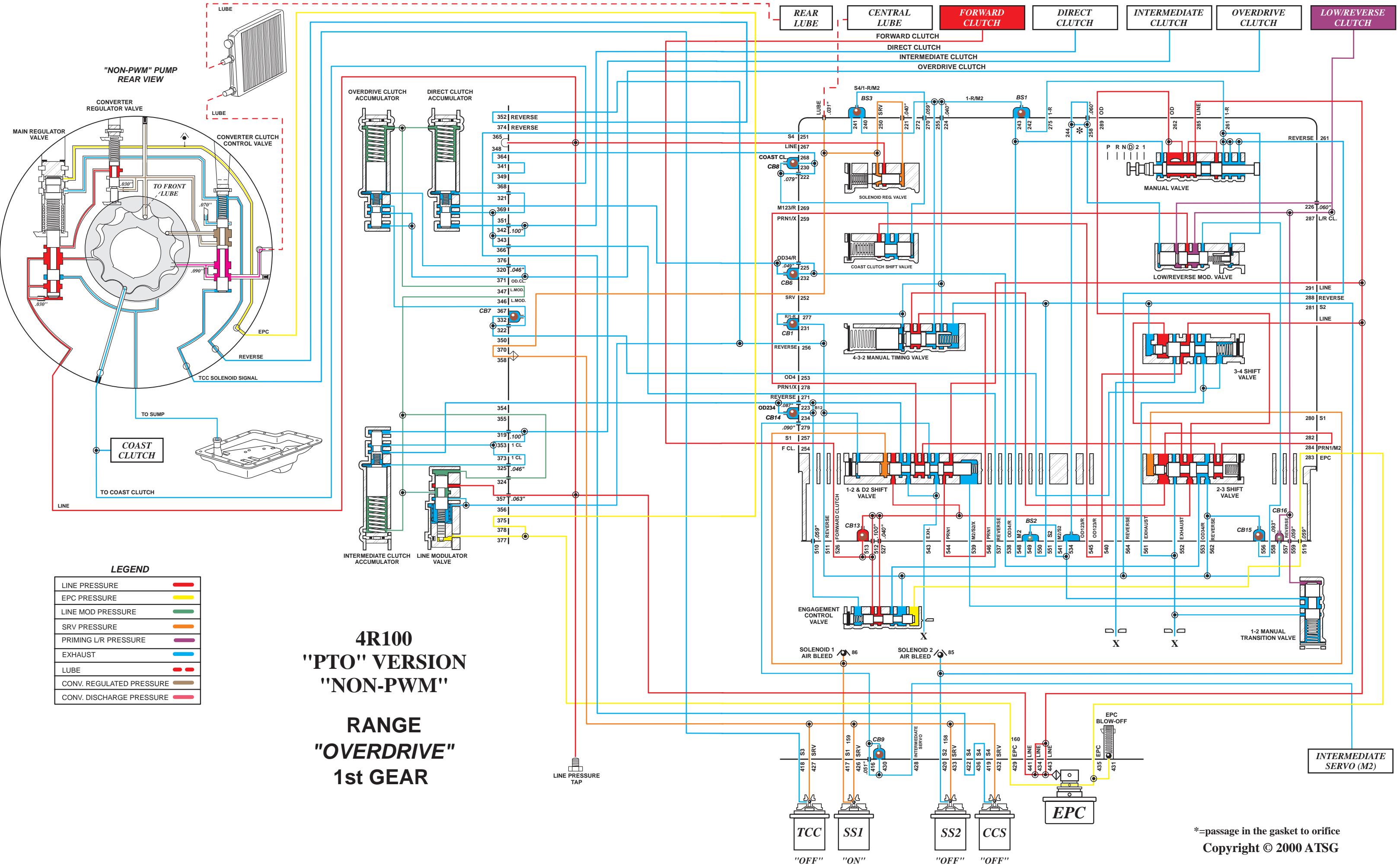


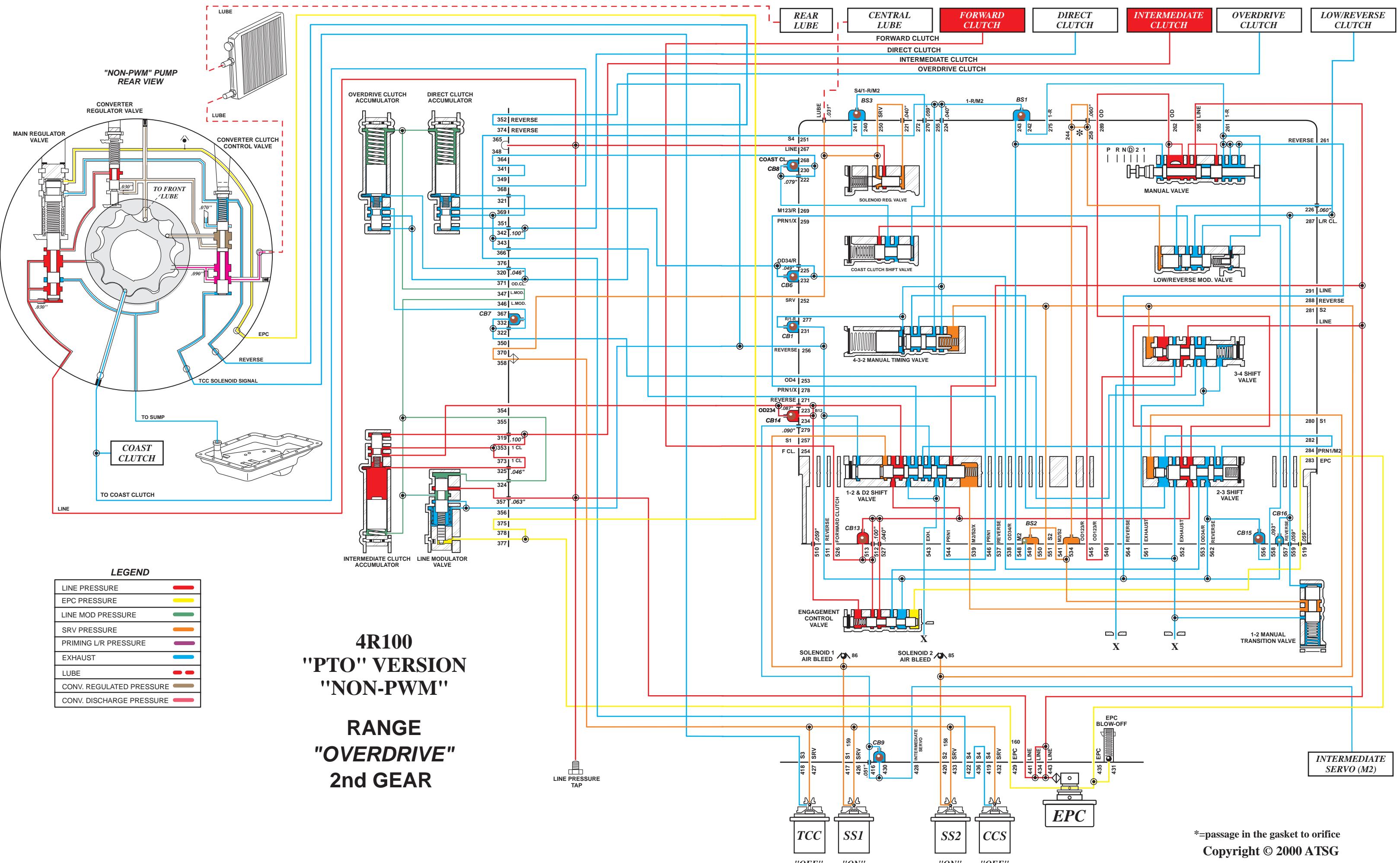
Figure 2



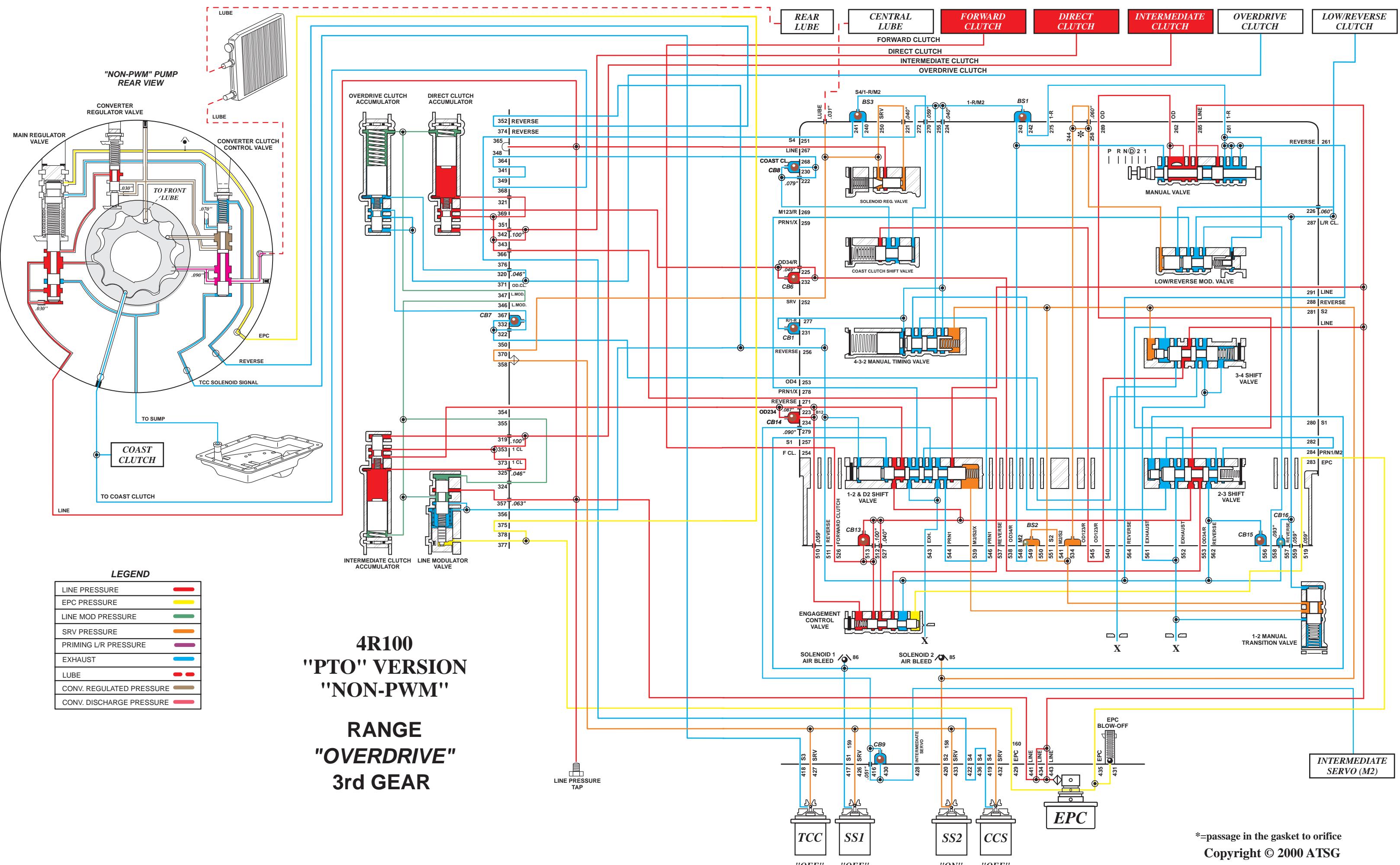




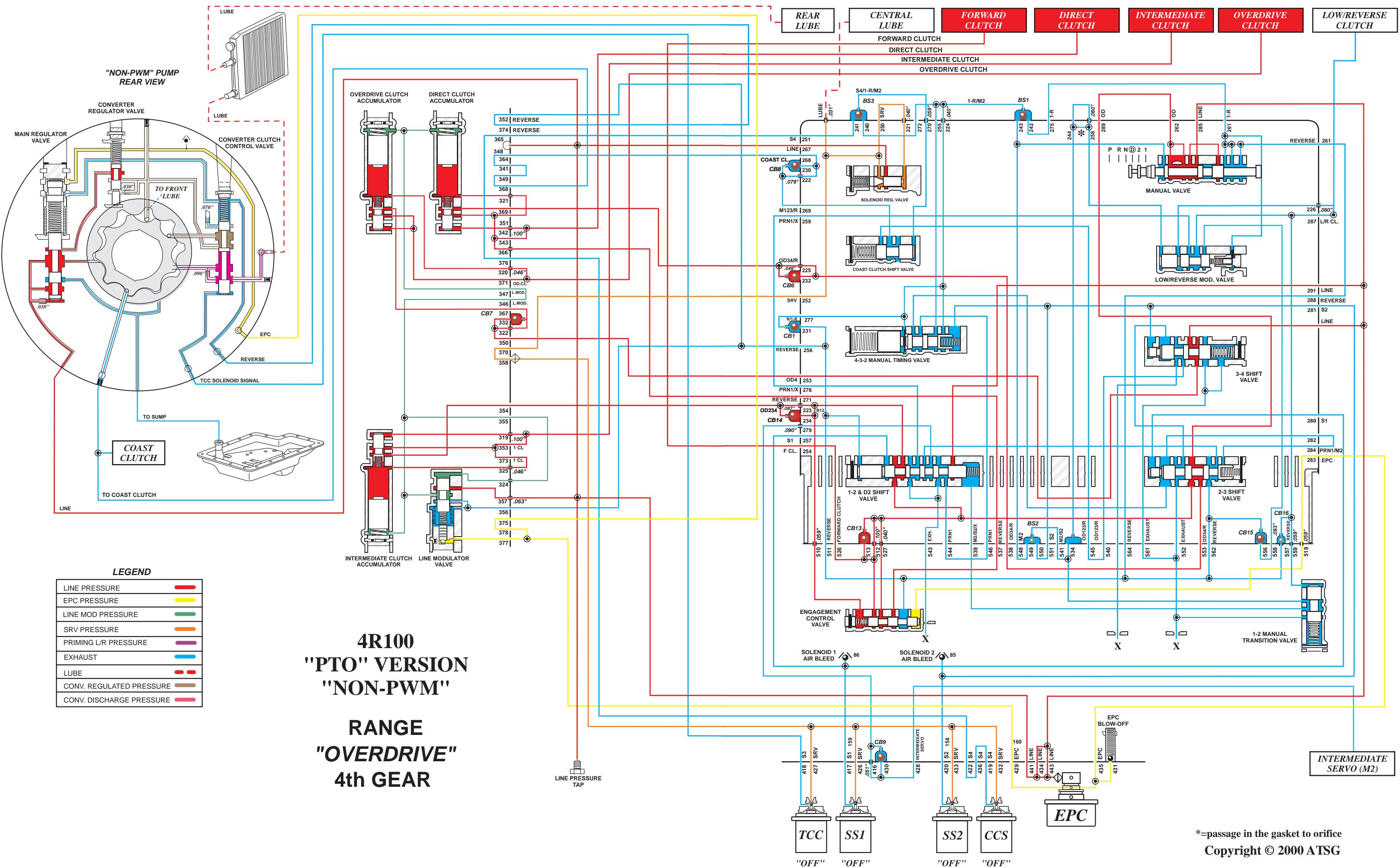
*=passage in the gasket to orifice

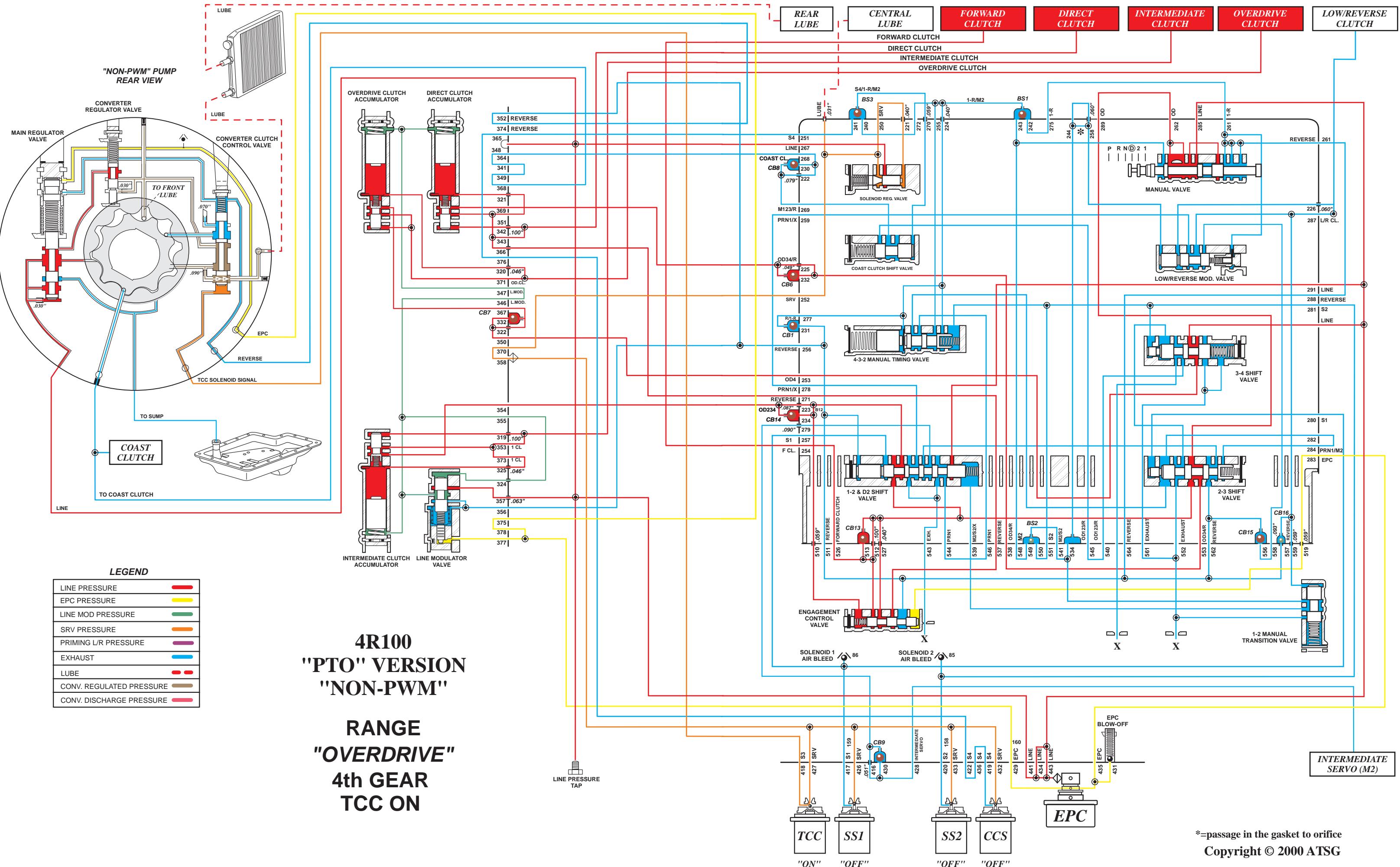


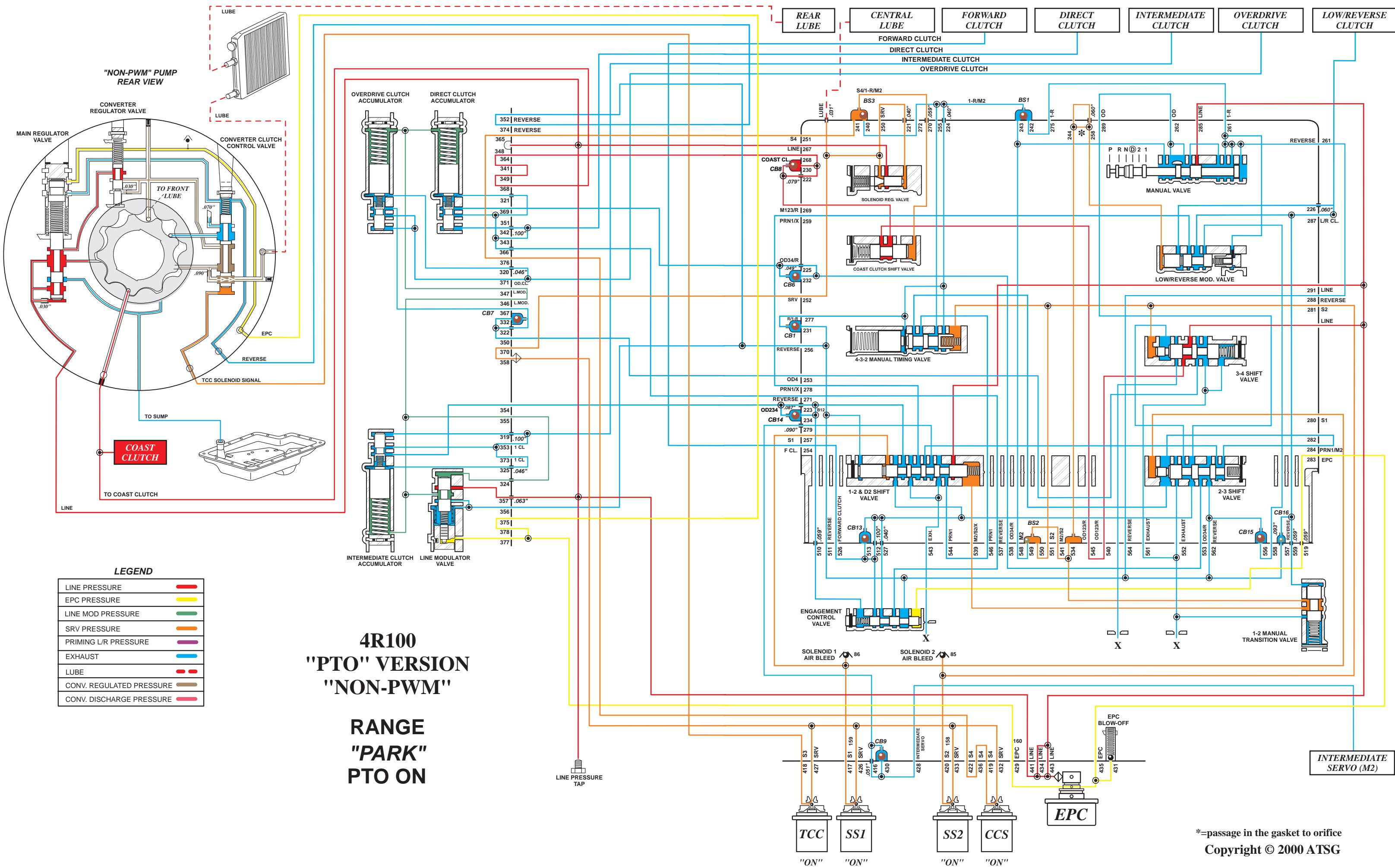
*=passage in the gasket to orifice



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