1996 SEMINAR INFORMATION

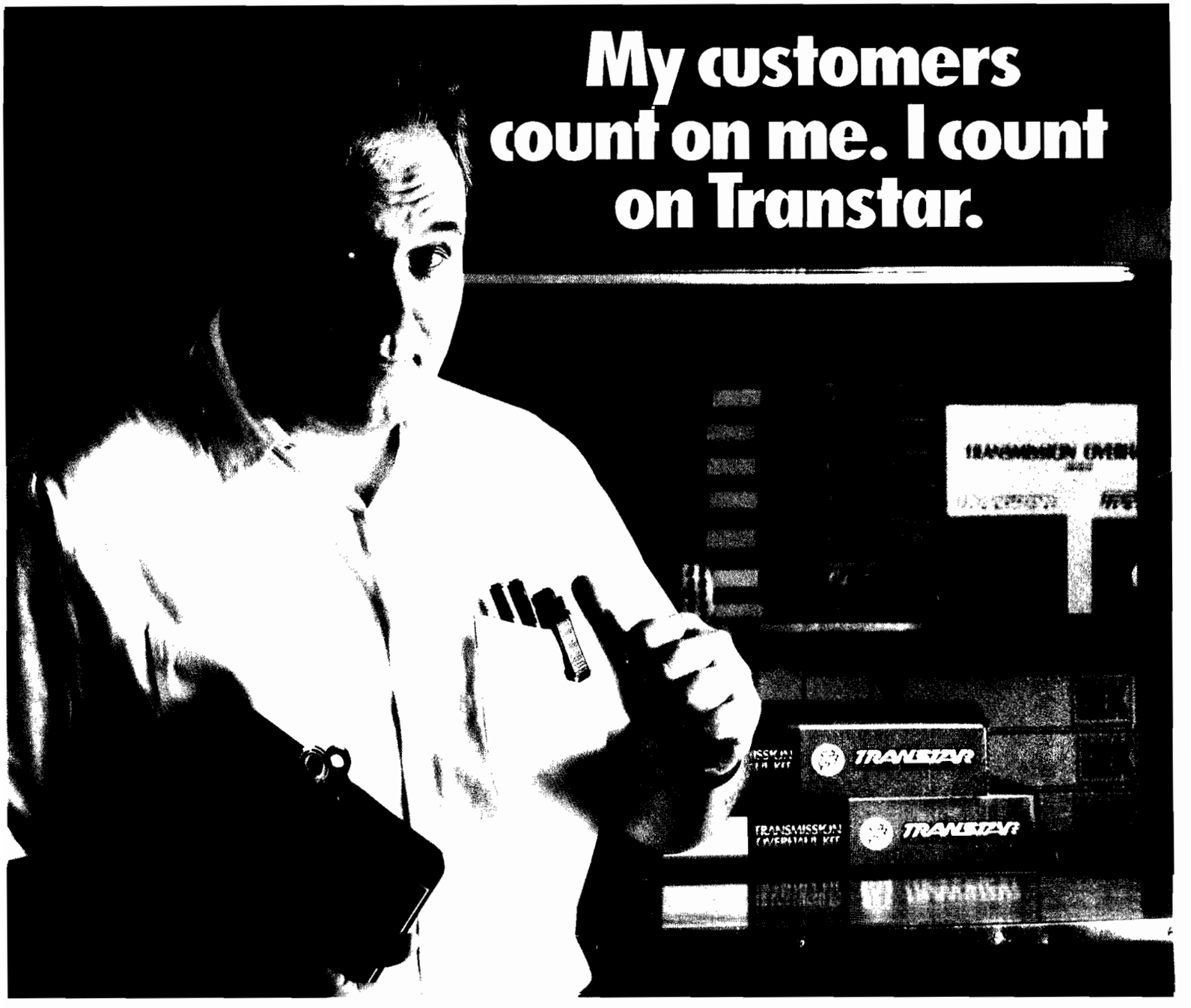
"THE BEST FIX IN '96"

INDEX

GENERAL MOTORS

FORD

AUTOMATIC TRANSMISSION SERVICE GROUP
9200 S. DADELAND BLVD. STE 720
MIAMI, FLORIDA 33156
(305) 670-4161



The transmission business is simple. Customers want their cars fixed right the first time. They want them back fast. And they count on you to do that. No excuses. Which is why so many transmission shops across the country rely on Transtar. You can trust our OEM-quality parts. And, with over 96% order fill, we'll come through for you with the right parts delivered fast. So your customers stay happy. And stay away from the competitor on the corner.

LuK Clutches

TRANSTAR®

TRANSTAR INDUSTRIES, INC.

7350 YOUNG DRIVE, CLEVELAND, OHIO 44146 U.S.A.

Main Office & International Division 216/232-5100

Thirteen "neighborhood" locations to serve you.

Main Office & International Division 7350 Young Drive, Cleveland, OH 44146 U.S.A.

Toll Free 800-321-8830 • Telephone 216-232-5100 • Fax 216-232-0632

Cincinnati, OH 800/543-2723	**Chicago, IL** 800/214-8710	**Denver, CO** 800/525-9096	**Edison, NJ** 800/654-3442	**Houston, TX** 800/882-8844	**Nashua, NH** 800/446-9888
New Orleans, LA 800/525-2512	**Sacramento, CA** 800/446-2600	**Sarasota, FL** 800/899-9623	**St. Louis, MO** 800/446-7171	**Van Nuys, CA** 800/231-9000	**Yauco, Puerto Rico** 800/981-3332

1996 SEMINAR INFORMATION

"THE BEST FIX IN '96"

INTRODUCTION

In this second manual on "THE BEST FIX IN '96" seminar, we continue with the General Motors portion of the seminar. Concluding with updates and fixes to the 4L80E, 4L60E, 4T60E and the 4T80E transaxle. With the General Motors segment concluded, the manual then details the Updates to the FORD CD4E, 4R44E/4R55E and the AX4N/AXODE transaxle with the Video section on these transmission. The manual concludes with the beginning of the live presentation on the E4OD transmission.

ROBERT D. CHERRNAY
TECHNICAL DIRECTOR

DALE ENGLAND
FIELD SERVICE CONSULTANT

WAYNE COLONNA
TECHNICAL SUPERVISOR

ED KRUSE
TECHNICAL CONSULTANT

PETE LUBAN
TECHNICAL CONSULTANT

JIM DIAL
TECHNICAL CONSULTANT

GREGORY LIPNICK
TECHNICAL CONSULTANT

JERRY GOTT
TECHNICAL CONSULTANT

DAVID CHALKER
TECHNICAL CONSULTANT

AUTOMATIC TRANSMISSION SERVICE GROUP
9200 S. DADELAND BLVD.
SUITE 720
MIAMI, FL 33156
(305) 670-4161

4 WHEEL DRIVE LOW CIRCUIT
1991-93 4X4 WITH 4L80E

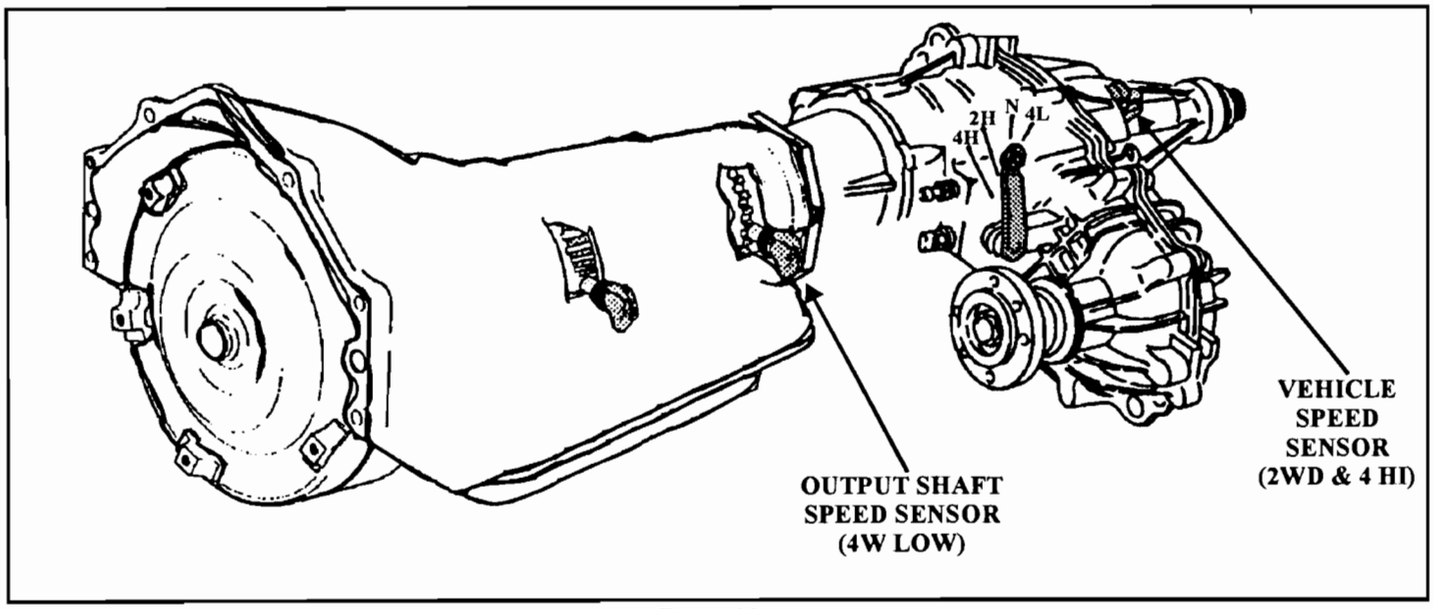


Figure 33

GM 4 wheel drive equipped vehicles with 4L80E transmissions will use the VSS located in the transfer case to calculate vehicle speed when in 2 wheel drive and 4 wheel high modes.

But what happens, when 4 wheel LOW is selected, which results in a gear reduction? How can the VSS be accurate? How will the transmission know when to shift?

In model years 1991-93, when 4 wheel low is selected, the gear reduction is seen by the computer through the VSS in the transfer case. At this time the computer switches strategy and now uses the output shaft speed sensor to calculate vehicle speed which is sent unbuffered to the PCM/TCM. (Refer to Figures 33 and 34)

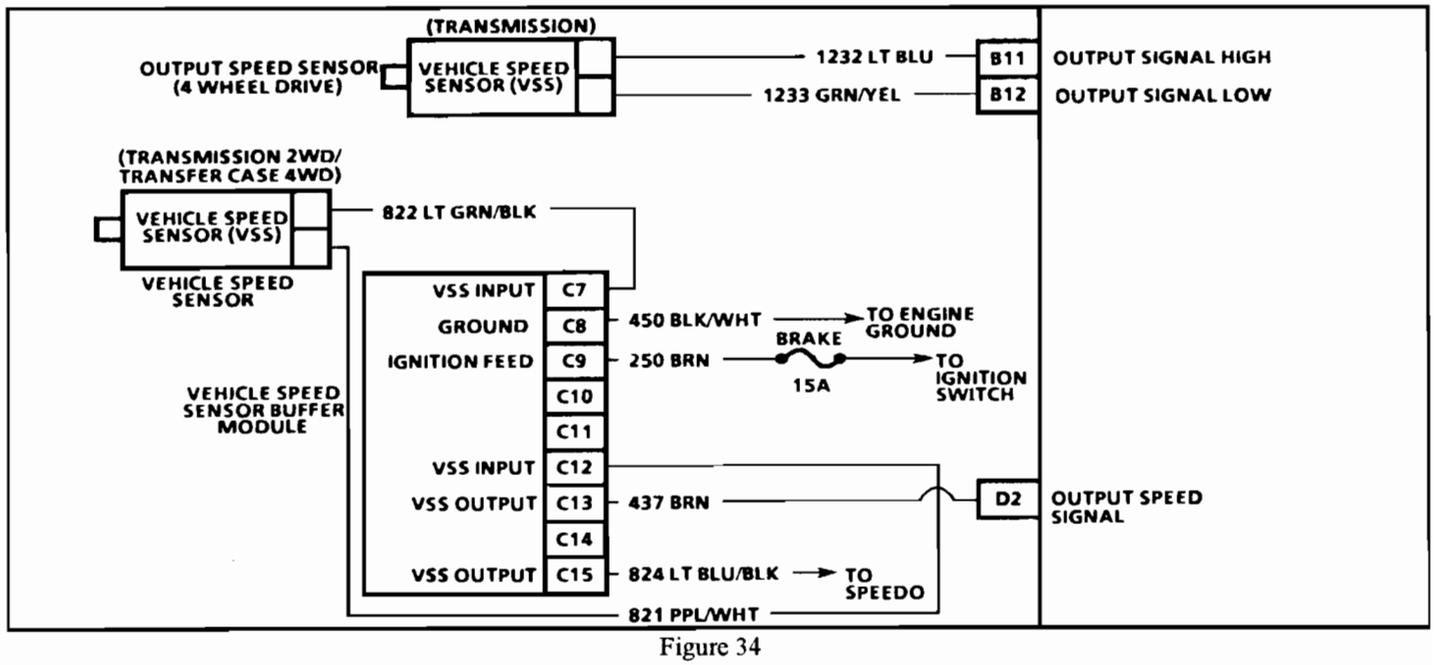


Figure 34

4 WHEEL DRIVE LOW CIRCUIT
1994-95 4X4 WITH 4L80E

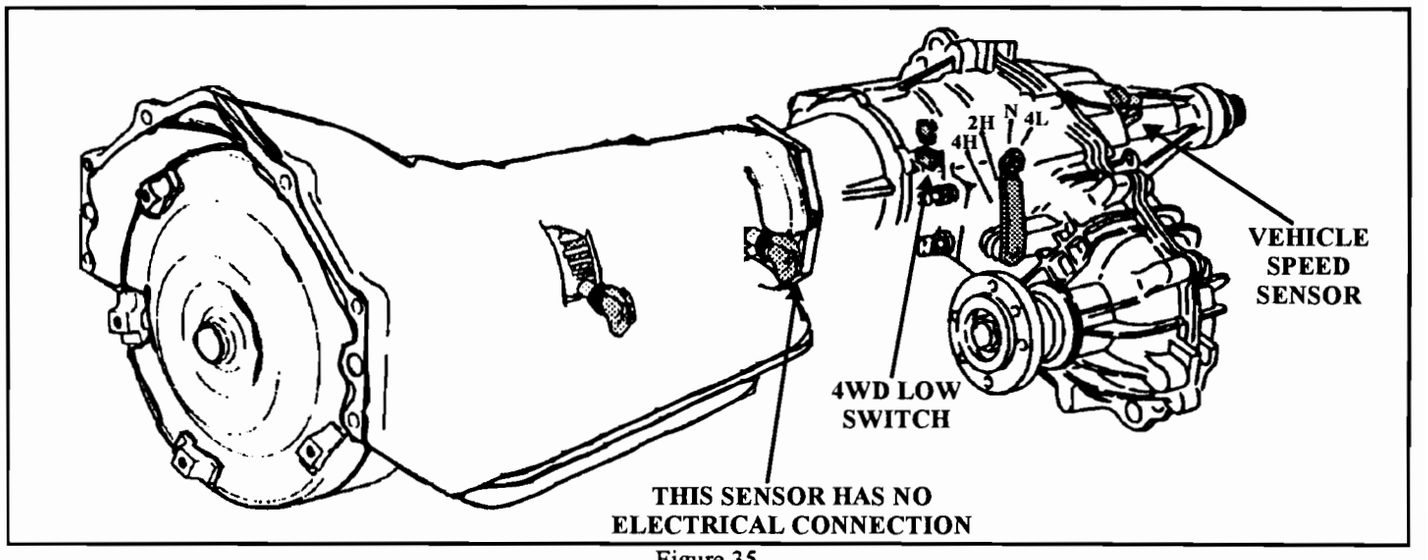


Figure 35

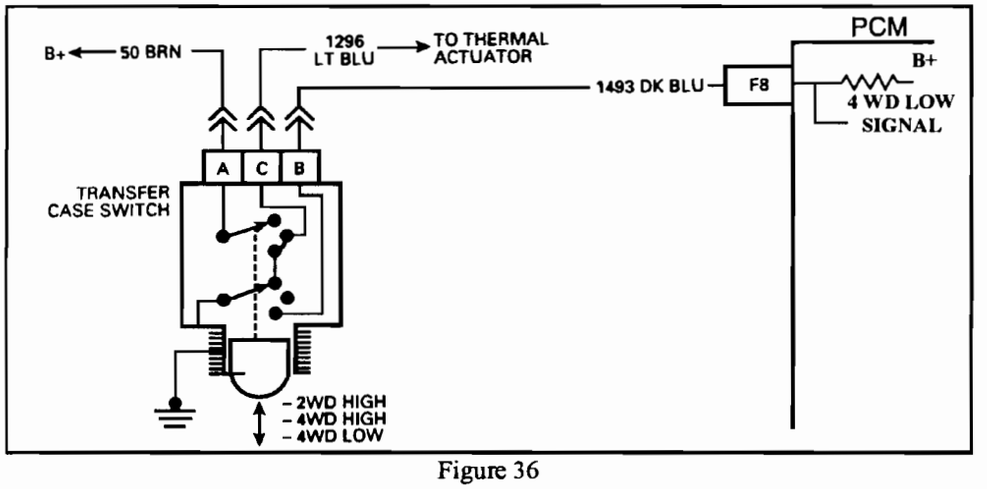


Figure 36

1994 & up vehicles with 4L80E transmission utilize a 4WD low switch to signal the computer that 4W LOW has been selected. It does this by supplying 12V to the PCM when in 2WD or 4W HI mode. When 4W LOW is selected the 4W LOW switch grounds the 12V signal changing it to 0V. The computer then changes its strategy in order to calculate vehicle speed. (Refer to figures 35, 36 and 37)

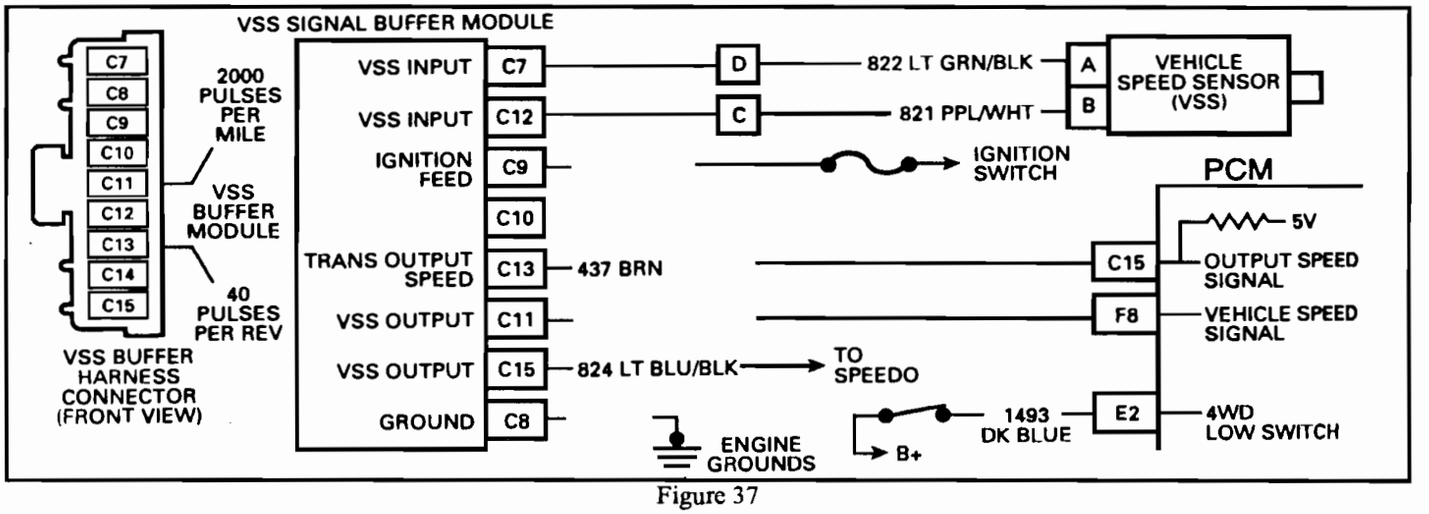


Figure 37

SPEED SENSOR FREQUENCY INTERFERENCE

Frequency interference in today's electronically controlled vehicles has become a relatively common problem. The interference occurs when a magnetic field produced by an electrical device interferes with the magnetic field of another electrical device.

For instance if a cellular telephone is installed in a vehicle with a 4L80E, the magnetic field produced by the telephones transmitter can interfere with the transmissions speed sensor signal causing various types of erratic operation.

Some of the devices which are known to cause this interference are:

CELLULAR TELEPHONES
2 WAY RADIOS
ELECTRONIC TRAILER BRAKES
HIGH POWERED STEREO SYSTEMS
ELECTRONIC ALARM SYSTEMS
PROPANE CONVERSION SYSTEMS

Frequency interference can also be caused by OEM equipment such as a faulty ALTERNATOR or an ENGINE RPM SENSOR which are both AC generators.

Beginning with the 1994 model year the Engine RPM Sensor is replaced by a Crankshaft sensor which is NOT an AC generator.

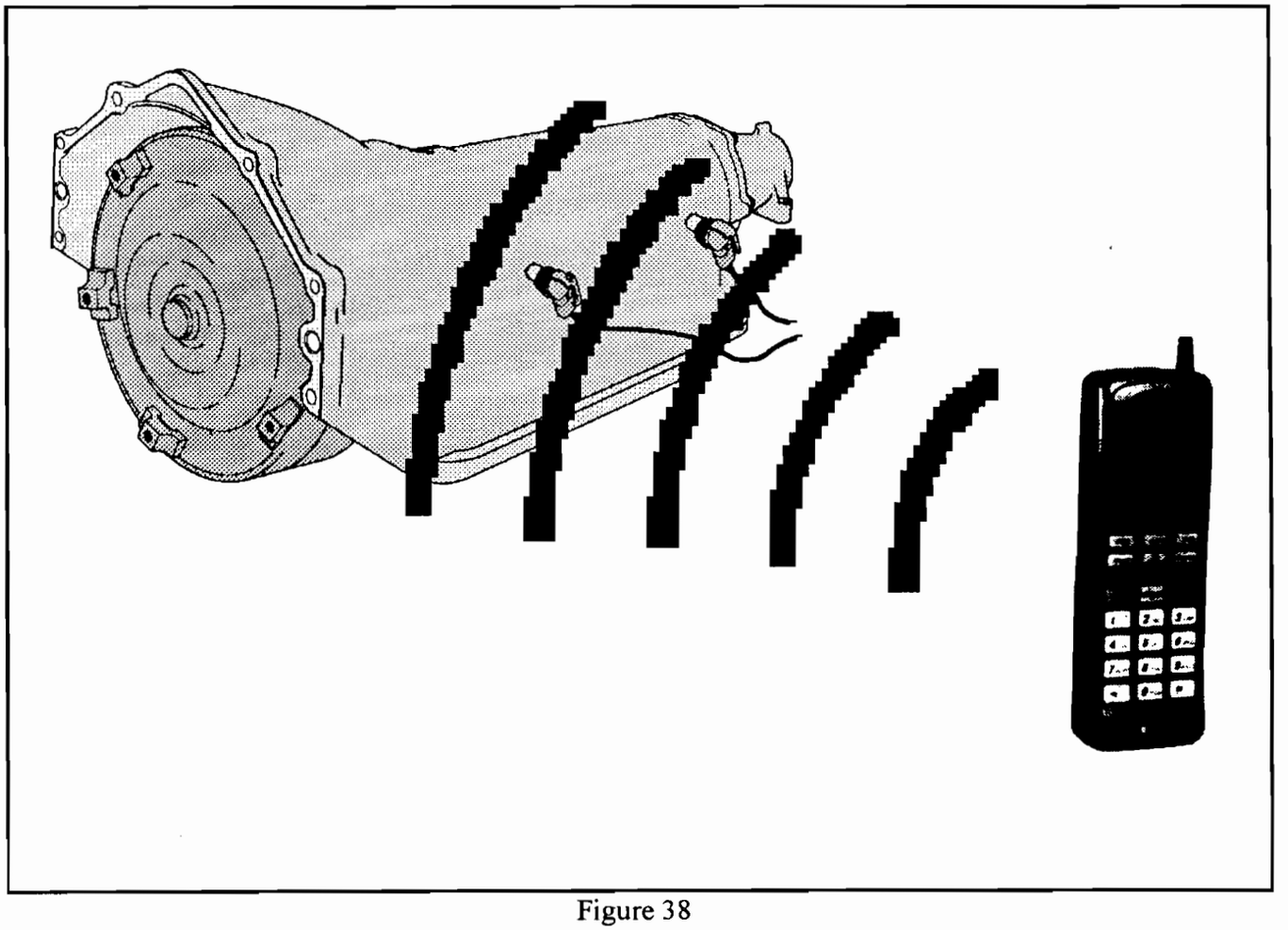


Figure 38

4L80E PRESSURE SWITCH MANIFOLD (PSM) DIAGNOSIS

The pressure switch manifold is a multi-switch assembly made up of 5 normally open pressure switches which are fed line pressure direct from the manual valve. These fluid pressures, depending on manual valve position, will determine the signal delivered to the PCM/TCM so the PCM/TCM will know which gear shift position has been selected. (Refer to figure 39)

The fluid pressure switches contained in the Pressure Switch Manifold are normally open. When no fluid pressure is present at these switches, a 12 volt signal will result at PSM terminals A, B and C. When fluid pressure closes these switches, a ground path is provided which results in 0 volts at PSM terminals A, B or C, depending on manual valve position. (Refer to figure 40) Therefore, when 12 volts are present the circuit is OPEN. When 0 volts are present the circuit is CLOSED. This can better be seen in the example in figure 41 which is manual third. Notice the PSM switch pattern as shown in the chart in figure 42. The switch pattern is A is CLOSED, B is CLOSED and C is OPEN if the scanner is reading the 12 volt side if the circuit. If the scanner is reading the ground side of the circuit, the scanner would display the range parameters reversed which would be A=OPEN, B=OPEN, C=CLOSED. This is how the computer knows that manual third has been selected and will now prevent an upshift to 4th.

It is this opening and closing of these pressure switches which creates the 7 valid switch combinations as seen in the chart in figure 42. There are however, 2 invalid gear combinations which will result in a code 28 being stored. In most cases a malfunctioning PSM will not log any codes, therefore it must be checked to see if the gear combination that is present agrees with the actual gear shift position.

This can best be accomplished through a scanner where the PSM RANGE can be viewed. The PSM can also be checked, removed from the transmission, with an ohmmeter.

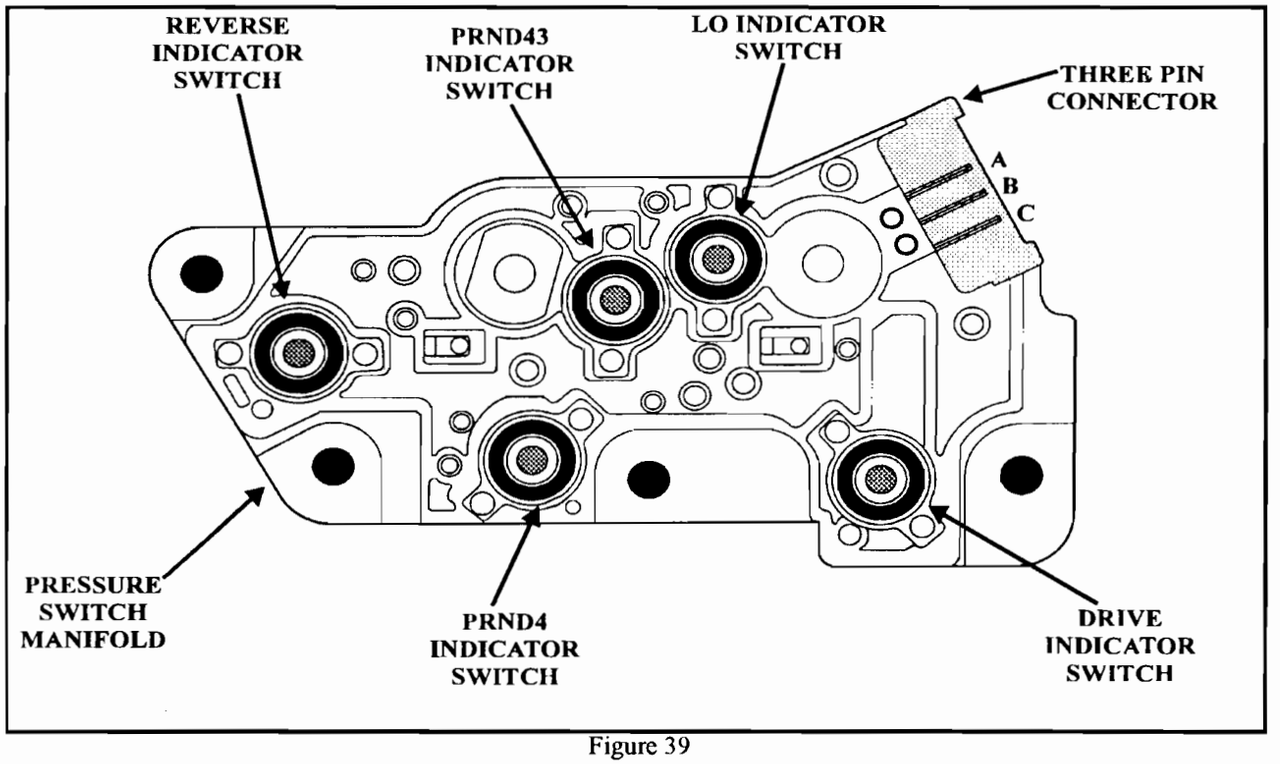
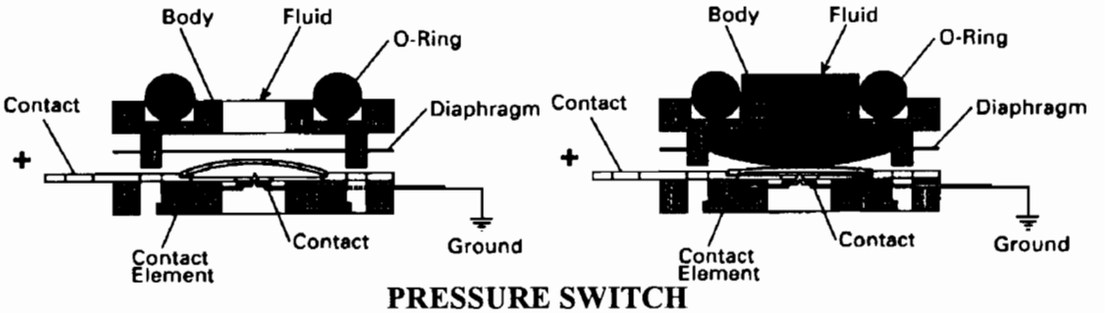


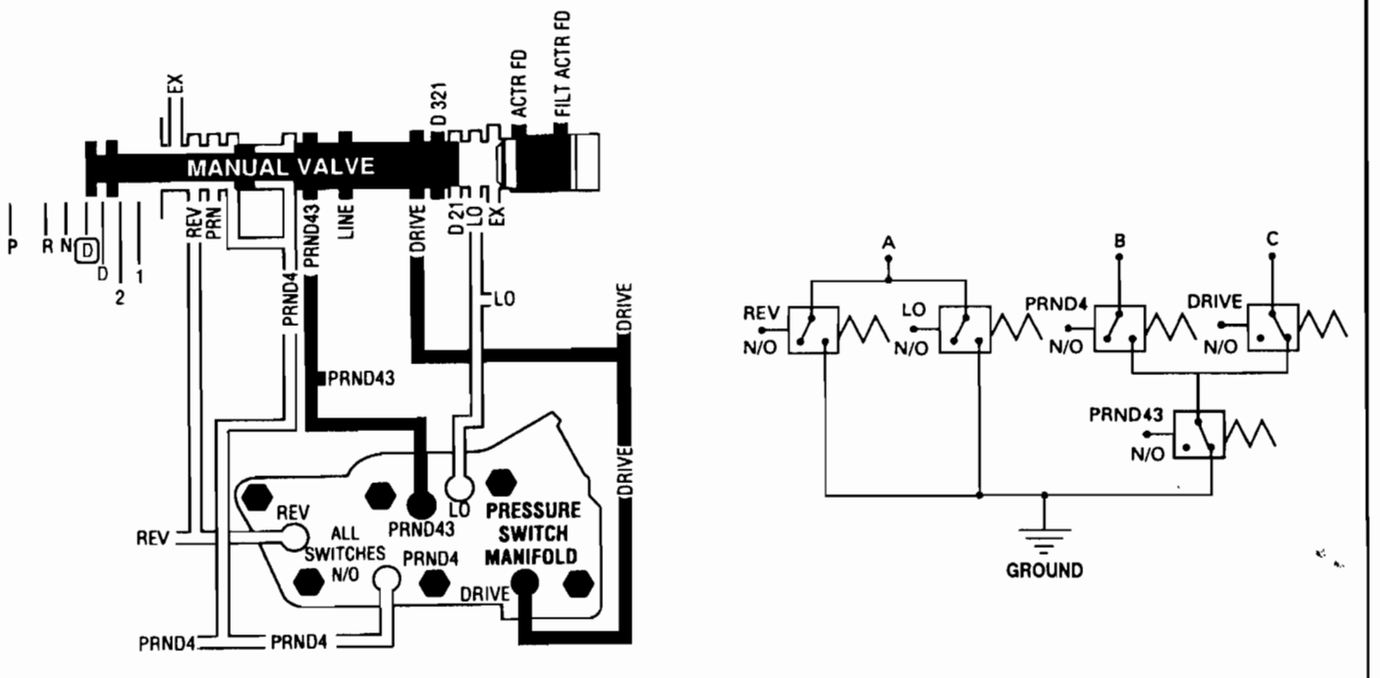
Figure 39

4L80E PRESSURE SWITCH MANIFOLD (PSM) DIAGNOSIS



PRESSURE SWITCH

Figure 40



MANUAL THIRD

Figure 41

RANGE INDICATOR	OIL PRESSURE				
	REV	D4	PRND4	PRND43	LO
PARK			■	■	
REVERSE	■		■	■	
NEUTRAL			■	■	
D4		■	■	■	
D3		■		■	
D2		■			
LO		■			■

■ OIL PRESSURE PRESENT

VALID PSM COMBINATION CHART

	A	B	C
PARK	12	0	12
REV	0	0	12
NEUTRAL	12	0	12
4TH	12	0	0
3RD	12	12	0
2ND	12	12	12
1ST	0	12	12
ILLEGAL	0	12	0
ILLEGAL	0	0	0

EXPECTED VOLTAGE READINGS

Figure 42

GM DIESEL TRUCKS 1994 AND UP

ACCELERATOR PEDAL POSITION MODULE

The Accelerator Pedal Position Module (APP) is currently used in 1994 and later GM trucks equipped with the 6.5 liter diesel engine which is a "drive by wire" electronic fuel injected system. In other words, a throttle cable is not used with this system.

The APP module contains 3 throttle position sensors (Refer to figure 43) which overlap each other. This is done to prevent over fueling or a WOT condition, which could occur if one TPS were used and it failed.

The APP module will find its way into the next generation of gasoline powered engines produced by GM. Figure 44 shows the location of the APP module which is serviced as a complete unit.

All 3 TP Sensors can be viewed on a scanner. They are displayed as follows:

APP SENSOR 1>>> 0.45 V @ CLOSED THROTTLE to 3.7 V @ WOT
APP SENSOR 2>>>> 4.5 V @ CLOSED THROTTLE to 1.5 V @ WOT
APP SENSOR 3>>>> 4.0 V @ CLOSED THROTTLE to 2.0 V @ WOT

It can be seen that APP 1 starts at low voltage and goes high, while APP 2 starts high and goes low, while APP 3 fills in the middle. In this manner, all accelerator pedal positions are compensated for while proper fuel delivery is maintained. Both idle and wot operation are illustrated in figures 45 and 46.

Should ONE sensor fail, a trouble code would be stored with no further action being taken.

Should TWO sensors fail, the engine will operate at reduced power, and the "SERVICE THROTTLE SOON" lamp will be illuminated.

Should THREE sensors fail, The PCM will reduce engine power to an idle as well as all of the above.

The codes that a malfunction of this module can generate are 21, 22, 25, 26, 27, 63, 64, 65, 84 and 99.

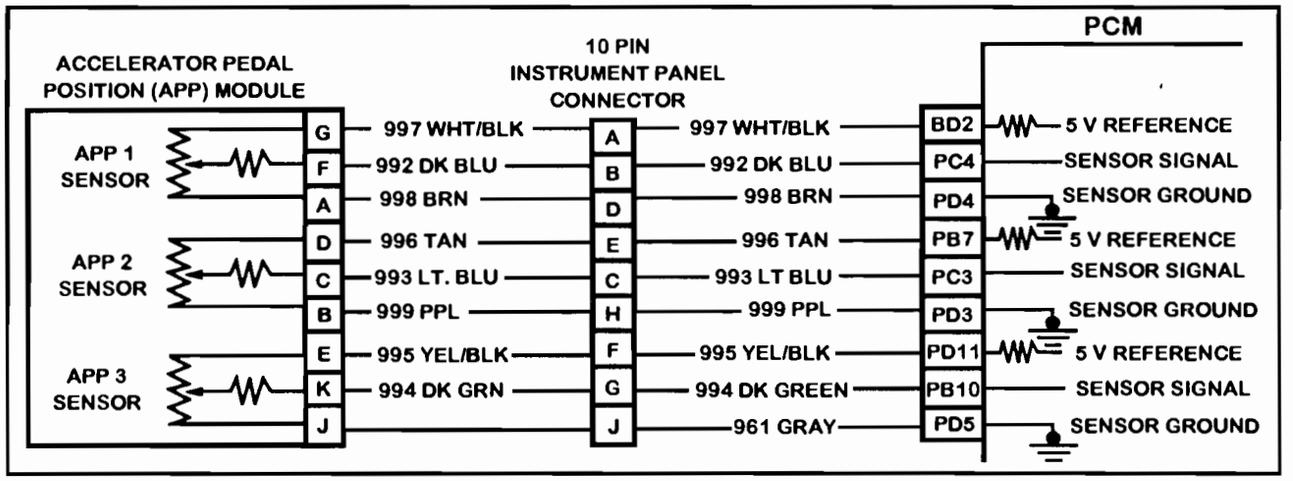


Figure 43

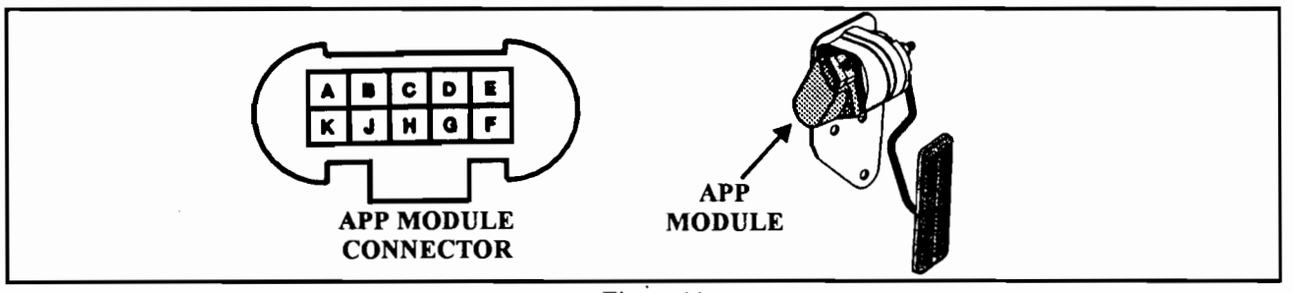


Figure 44

GM DIESEL TRUCKS 1994 AND UP

ACCELERATOR PEDAL POSITION MODULE

KEY ON...ENGINE RUNNING @ IDLE

1995 GMC INCOMPLETE	A/C
6.5L V8-T CHEV DIESEL	A/T
-58 CODES & DATA	
NO CODES PRESENT	
RPM 769	OK TO DRIVE
DESIRED IDLE 769	THROTTLE(%) 0
BARO ("Hg) 30.0	COOLANT(F) 161
PEDAL POS 1(V) 0.78	BARO(V) 4.94
PEDAL POS 3(V) 3.98	PEDAL POS 2(V) 4.26
EGR PRESS("Hg) 29.9	INTAKE AIR -9
EGR DUTY CYCLE 0	EGR PRESS(V) 4.04
BOOST("Hg) 31.4	WASTEGATE(%) 67
FUEL TEMP -2	BOOST PRESS(V) 2.12
GLOW PLUG(V) 0.1	FUEL RATE(MM) 16.0
INJ TIMING 9.3	GLOW PLUG RLY(V) 0.1
INJ PW(MS) 1.68	DES INJ TIM 9.1
CAM REF MISSED 0	TDC OFFSET 0.00
VEH SPEED(MPH) 0	CRANK REF MISSED 0
1-2 SOLENOID ON	IGNITION(V) 13.5
CC ON/OFF SW OFF	2-3 SOLENOID OFF
TCC BRAKE SW OPEN	CC BRAKE SW CLSD
PROM ID 6875	TCC APPLIED NO

Figure 45

KEY ON...ENGINE OFF @ WOT

1995 GMC INCOMPLETE	A/C
6.5L V8-T CHEV DIESEL	A/T
-34 CODES & DATA	
NO CODES PRESENT	
RPM 0	OK TO DRIVE
DESIRED IDLE 750	THROTTLE(%) 100
BARO ("Hg) 30.0	COOLANT(F) 86
PEDAL POS 1(V) 3.92	BARO(V) 4.94
PEDAL POS 3(V) 2.14	PEDAL POS 2(V) 1.20
EGR PRESS("Hg) 29.9	INTAKE AIR -10
EGR DUTY CYCLE 0	EGR PRESS(V) 4.04
BOOST("Hg) 31.4	WASTEGATE(%) 0
FUEL TEMP -5	BOOST PRESS(V) 2.12
GLOW PLUG(V) 0.1	FUEL RATE(MM) 0.0
INJ TIMING 8.3	GLOW PLUG RLY(V) 0.1
INJ PW(MS) 1.95	DES INJ TIM 0.0
CAM REF MISSED 0	TDC OFFSET 0.00
VEH SPEED(MPH) 0	CRANK REF MISSED 0
1-2 SOLENOID OFF	IGNITION(V) 11.8
CC ON/OFF SW OFF	2-3 SOLENOID OFF
TCC BRAKE SW CLSD	CC BRAKE SW OPEN
PROM ID 6875	TCC APPLIED NO

Figure 46

4L80E MOVIE DIAGNOSIS WITH SNAP-ON SCANNER

SKEWED OR SHIFTED SENSORS

COMPLAINT: Vehicle exhibits a symptom without storing fault codes

CAUSE #1: This condition is caused by a sensor malfunction that did NOT remain BAD ENOUGH, LONG ENOUGH, or the sensor return voltage remained at a fixed value which did not exceed specification or time limits.
The Snap-on Scan Gra-Fix® program, which is responsible for the graph shown in figure 47, indicates a normal pattern of throttle position sensor operation.
The movie frame shown in figure 48 indicates all electrical functions are normal.
When computer software is designed for a given application, a spec value and a time clock is programmed into the computer. In order to store a code for this sensor, the sensor must fail outside the specification window and the internal time clock.
If the sensor failure stays within the time limit or the spec value, this will create **a symptom but not a code.**
In movie frame -26 shown in figure 49, the only parameter that is incorrect is the TCC duty cycle which went to zero. Consequently TCC slip goes up and as a result of the slippage created by the converter being unlocked, the gear ratio is incorrect.
However, when an engine data movie frame is viewed, such as the one in figure 51, we can see that the TPS voltage has spiked to 4.56 volts for 2/10 of a second as shown in the graph in figure 50. The sensor was not out of range for a long enough period of time. This causes a symptom but not a code, which in this case caused the converter to unlock.
Eventually a code 68 would be stored due to the converter remaining unlocked, which would be totally misleading.

CAUSE #2: If the sensor skirts the spec or time operating window but does not go outside this window, this is a shifted sensor which is shown in the graph in figure 52 and in the Snap-on Scan-Gra-Fix® printout in figure 53.
The TPS voltage is frozen at .6 volts for a little over a second. The printout in figure 53 indicates TCC unlocked, input and engine rpm went up drastically in frame -53, force motor amps went up causing a drop in line pressure and at 43 mph the transmission went to neutral because at that speed low gear is unobtainable.
In frame -53 the transmission went to low gear due the TPS voltage drop.
If this condition were to happen repeatedly, the complaint could be shift hunting.
Once again, you have a symptom but no codes.

CORRECTION #1: A skewed sensor is typically caused by an outside influence such as a faulty engine rpm sensor or a faulty alternator.

CORRECTION #2: A shifted sensor is typically caused by the sensor which will require replacement.

4L80E MOVIE DIAGNOSIS WITH SNAP-ON SCANNER

SKEWED THROTTLE POSITION SENSOR

NORMAL PATTERN...41% THROTTLE OPENING...ELAPSED TIME=2/10 SECOND

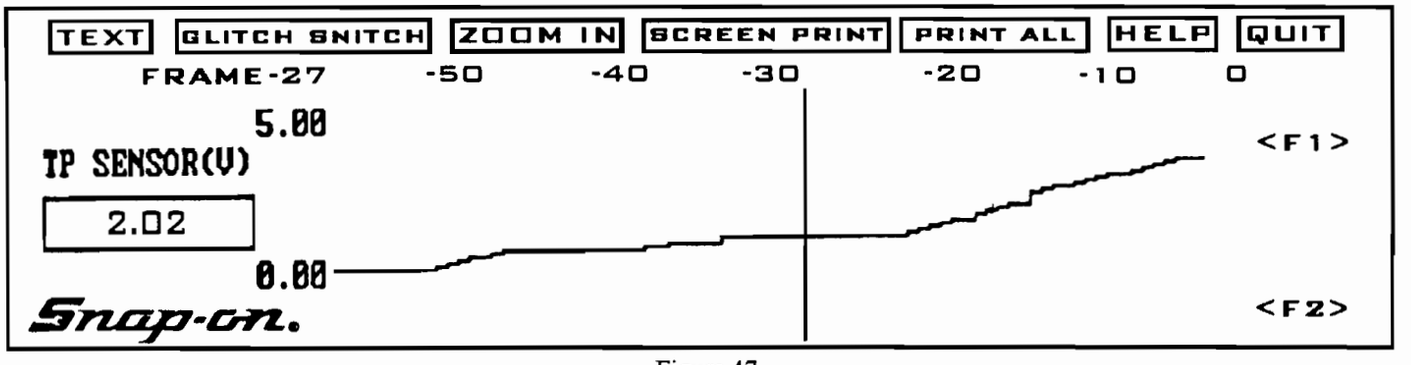


Figure 47

-27 INPUT RPM	2980	OUTPUT RPM	2977
CODES & DATA		OK TO DRIVE	
NO CODES PRESENT			
I/O RPM (RATIO)	1.00	VEH SPEED (MPH)	64
TURBINE RPM	2234	COOLANT (F)	188
TCC DUTY CYCLE	87	TRANS FLUID (F)	186
TORQUE SIG (PSI)	52	GEAR RATIO	0.75
BRAKE REQUEST	NO	BRAKE SW	OPEN
TCC SLIP (RPM)	4	THROTTLE (%)	41
BATTERY (V)	13.8		
PRESS CTRL AMP	0.51	DES PCS AMP	0.49
ENGINE RPM	2285	INPUT RPM	2980
OVERDRIVE RATIO	0.75	VEH SPEED (MPH)	64
CURRENT GEAR	4TH	PRNDL SW	4TH
SOLENOID A	ON	SOLENOID B	ON
RANGE A	CLSD	RANGE B	OPEN
RANGE C	OPEN	POWER ENRICH	NO
1-2 SHIFT (SEC)	0.38	2-3 SHIFT (SEC)	0.50
3-4 SHIFT (SEC)	0.03	A/C REQUEST	NO
A/C CLUTCH	OFF		

CLUES: This truck had over 100,000 miles on the odometer.
This truck is gasoline powered.
In movie frame -27 shown above all parameters are normal.

Figure 48

4L80E MOVIE DIAGNOSIS WITH SNAP-ON SCANNER

SKEWED THROTTLE POSITION SENSOR

-26 INPUT RPM	3184	OUTPUT RPM	3183
CODES & DATA			
NO CODES PRESENT		OK TO DRIVE	
I/O RPM (RATIO)	1.00	VEH SPEED (MPH)	64
TURBINE RPM	2388	COOLANT (F)	188
TCC DUTY CYCLE	0	TRANS FLUID (F)	186
TORQUE SIG (PSI)	42	GEAR RATIO	0.66
BRAKE REQUEST	NO	BRAKE SW	OPEN
TCC SLIP (RPM)	44	THROTTLE (%)	41
BATTERY (V)	13.8		
PRESS CTRL AMP	0.57	DES PCS AMP	0.59
ENGINE RPM	2303	INPUT RPM	3184
OVERDRIVE RATIO	0.75	VEH SPEED (MPH)	69
CURRENT GEAR	4TH	PRNDL SW	4TH
SOLENOID A	ON	SOLENOID B	ON
RANGE A	CLSD	RANGE B	OPEN
RANGE C	OPEN	POWER ENRICH	NO
1-2 SHIFT (SEC)	0.28	2-3 SHIFT (SEC)	0.38
3-4 SHIFT (SEC)	0.03	A/C REQUEST	NO
A/C CLUTCH	OFF		

CLUE: In frame -26 shown above TCC duty cycle went to zero, TCC slip has gone up. Gear ratio is incorrect.
All other parameters appear normal.

Figure 49

4L80E MOVIE DIAGNOSIS WITH SNAP-ON SCANNER
SKEWED THROTTLE POSITION SENSOR

SKEWED PATTERN...41% THROTTLE OPENING...ELAPSED TIME=2/10 SECOND

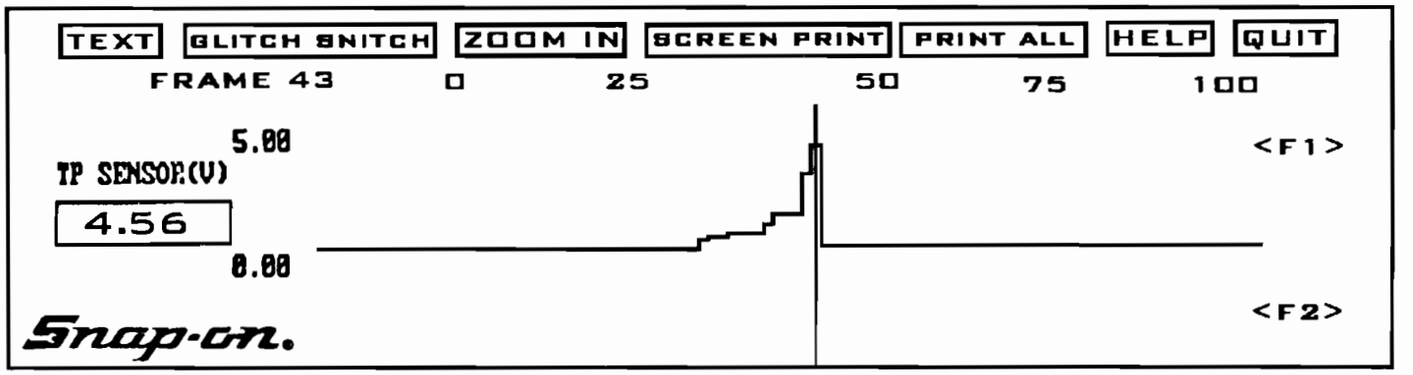


Figure 50

1991 CHEVROLET TRUCK	AC		
7.4L V8 CHEV TBI	A/T		
CODES & DATA			
NO CODES PRESENT		OK TO DRIVE	
-43 RPM	2450	O2 (MV)	451
OPEN/CLSD LOOP	CLSD	EXHAUST OXYGEN	LEAN
TPS (V)	4.56	TPS (%)	41
DESIRED IDLE	750	BLK LEARN	122
IDLE AIR CONTROL	74	IAC COIL A	ON
IAC COIL ENABLE	YES	IAC COIL B	OFF
IAC DIRECTION	REV	PROM ID	8091
MAP (Hg)	24.1	MAP (V)	3.86
BARO (Hg)	29.2	BARO (V)	4.78
COOLANT (F)	190	START CLNT (F)	92
EGR DUTY CYCLE	75	AIR CONTRL SOL	NORM
A/F LEARNED	YES	A/F RATIO	14.7
VEH SPEED (MPH)	64	KNOCK	NO
CLEAR FLOOD	NO	SPARK ADV(DEG	24
BATTERY (V)	14.1	FUEL PUMP (V)	14.1
LOW BATTERY	NO	TRANS TEMP HOT	NO
PRNDL SW	4TH	A/C REQUEST	NO
TCC APPLIED	NO	TIME	7:42
TCC SLIPPING	NO	TCC FORCED OFF	NO

CLUE: Why are we concerned with ENGINE data?
Why is the TPS voltage 4.56 with only a 41% throttle opening.
TCC is not applied at 64 MPH.
System indicates that TCC was NOT forced off.
Why are there no codes stored?

Figure 51

4L80E MOVIE DIAGNOSIS WITH SNAP-ON SCANNER

SHIFTED THROTTLE POSITION SENSOR

SHIFTED PATTERN...31% THROTTLE OPENING...ELAPSED TIME=1.2 SECONDS

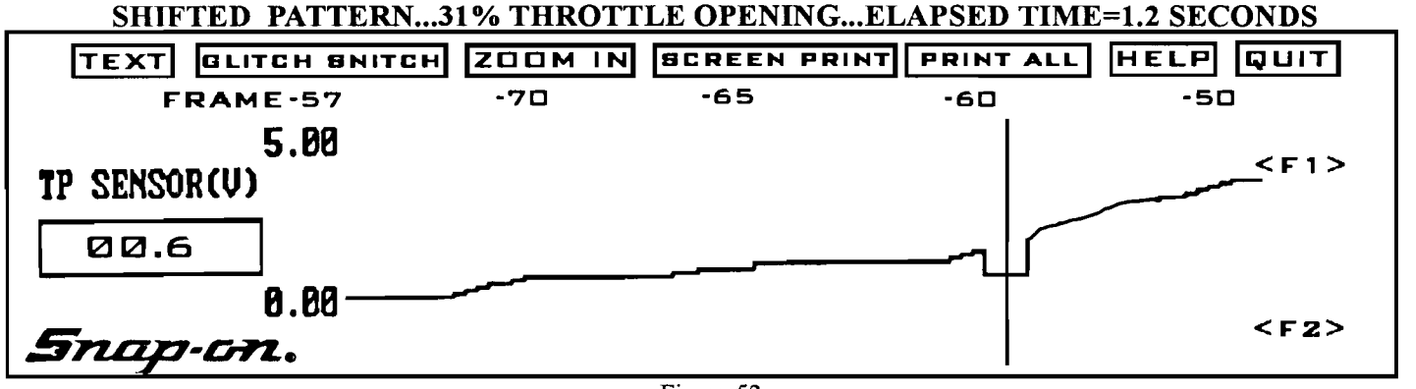


Figure 52

4l80eshiftpsmovie	1991 CHEVROL 7.4L V8 CHEVY TBI						
Frame:	-57	-56	-55	-54	-53	-52	-51
INPUT RPM	2101	2117	2125	2141	3241	3282	3351
OUTPUT RPM	2097	2113	2120	2135	1893	1109	1837
I/O RATIO	100	100	100	100	270	256	261
VEH SPEED (MPH)	45	46	46	46	43	41	38
TURBINE RPM	2101	2117	2125	2141	3241	3282	3351
COOLANT (degF)	202	202	202	202	202	202	202
TCC DUTY CYCLE (%)	0	0	0	0	0	0	0
TRANS FLUID (degF)	174	173	173	174	174	174	174
TORQUE SIG (PSI)	34	34	34	34	29	26	23
GEAR RATIO	100	100	100	100	270	256	255
BRAKE REQUEST	NO	NO	NO	NO	NO	NO	NO
BRAKE SW	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD
TCC SLIP (RPM)	243	258	277	321	556	576	614
TPS (V)	00.6	00.6	00.6	00.6	00.6	00.6	00.6
THROTTLE (%)	31	31	31	31	31	31	31
BATTERY (V)	13.4	13.4	13.4	13.4	13.4	13.4	13.4
PROM ID	2061	2061	2061	2061	2061	2061	2061
PRESS CTRL AMP	0.63	0.63	0.63	0.63	0.75	0.78	0.82
DES PCS AMP	0.63	0.61	0.62	0.62	0.74	0.76	0.82
ENGINE RPM	2329	2351	2373	2379	3797	4115	4353
OVERDRIVE RATIO	111	109	109	109	331	295	284
CURRENT GEAR	3RD	3RD	3RD	3RD	LOW	LOW	LOW
PRNDL SW	4TH	4TH	4TH	4TH	4TH	4TH	4TH
SOLENOID A	OFF	OFF	OFF	OFF	ON	ON	ON
SOLENOID B	ON	ON	ON	ON	OFF	OFF	OFF
RANGE A	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD
RANGE B	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
RANGE C	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
POWER ENRICH	NO	NO	NO	NO	NO	NO	NO
1-2 SHIFT (SEC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-3 SHIFT (SEC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-4 SHIFT (SEC)	0.03	0.03	0.03	0.03	0.03	0.03	0.03
A/C REQUEST	YES	YES	YES	YES	YES	YES	YES
A/C CLUTCH	ON	ON	ON	ON	ON	ON	ON

Figure 53

MECHANICAL PROBLEM OR ELECTRICAL PROBLEM?

4L80E FALLS OUT OF 4TH INTO NEUTRAL OR 3RD GEAR CODE 68...OVERDRIVE RATIO INCORRECT

The most common cause of this problem is faulty shift solenoids that are stuck open due to the rubber seat inside them deteriorating. This problem will generate a code 68 (Overdrive Ratio Incorrect) because when the solenoid exhausts the transmission will instantly downshift into 3rd gear when the "A" shift solenoid malfunctions or neutral when the "B" shift solenoid malfunctions, which in reality is a downshift to 1st gear. The transmission goes to neutral because at cruising speed low gear is unobtainable.

The chart in figure 54 illustrates which gear is commanded and which gear will result when either "A" or "B" shift solenoid malfunctions. It is important to realize, when the solenoid is shown OFF it is OPEN, and when it is shown ON it is CLOSED.

4L80E SHIFT SOLENOID MECHANICAL FAILURE CHART

COMMANDED GEAR	SOLENOID A MECHANICAL FAULT	SOLENOID B NORMAL	ACTUAL GEAR
1st	OFF	OFF	2nd
2nd	OFF	OFF	2nd
3rd	OFF	ON	3rd
4th	OFF	ON	3rd
1st	ON	OFF	1st
2nd	ON	OFF	1st
3rd	ON	ON	4th
4th	ON	ON	4th

COMMANDED GEAR	SOLENOID A NORMAL	SOLENOID B MECHANICAL FAULT	ACTUAL GEAR
1st	ON	OFF	1st
2nd	OFF	OFF	2nd
3rd	OFF	OFF	2nd
4th	ON	OFF	1st
1st	ON	ON	4th
2nd	OFF	ON	3rd
3rd	OFF	ON	3rd
4th	ON	ON	4th

Figure 54

4L80E MOVIE DIAGNOSIS WITH SNAP-ON SCANNER

CODE 68...OVERDRIVE RATIO INCORRECT

The "Movie" feature that current scan tools offer can be one of the most valuable diagnostic aid available to the technician. It is most valuable when an intermittent problem occurs because in some instances the malfunction happens so quickly (2/10 of a second) that the only way it would be seen is by recording a movie.

The SNAP-ON scanner, for example, will record approximately 75 frames of data stream information before the movie was triggered and 25 frames after the movie was triggered allowing the technician to return to the shop and review what has malfunctioned during the road test. In this way the technician can determine what has caused the malfunction which, under other circumstances would not have been detected.

The information in figures 55, 56 and 57 are actual recorded movies which will display the information that will lead to the diagnosis of these examples of faults that generate code 68.

-15			
INPUT RPM	2841	OUTPUT RPM	2841
CODES & DATA		OK TO DRIVE	
68 OVERDRIVE RATIO INCORRECT			
I/O RPM (RATIO)	1.00	VEH SPEED (MPH)	58
TURBINE RPM	2841	COOLANT (F)	190
TCC DUTY CYCLE	0	TRANS FLUID (F)	186
TORQUE SIG (PSI)	59	GEAR RATIO	1.00
BRAKE REQUEST	NO	BRAKE SW	OPEN
TCC SLIP (RPM)	255	THROTTLE (%)	55
BATTERY (V)	13.8		
PRESS CTRL AMP	0.41	DES PCS AMP	0.43
ENGINE RPM	2508	INPUT RPM	2841
OVERDRIVE RATIO	0.75	VEH SPEED (MPH)	58
CURRENT GEAR	4TH	PRNDL SW	????????
SOLENOID A	ON	SOLENOID B	ON
RANGE A	CLSD	RANGE B	OPEN
RANGE C	OPEN	POWER ENRICH	NO
1-2 SHIFT (SEC)	0.47	2-3 SHIFT (SEC)	0.41
3-4 SHIFT (SEC)	0.03	A/C REQUEST	NO
A/C CLUTCH	OFF		

Figure 55

CLUES: Comanded solenoid state is 4th gear
Overdrive gear ratio is 0.75
There should be at least a 3-5 rpm difference between output rpm and input rpm.
TCC duty cycle has gone to zero which will raise the TCC slip rpm.
Question marks at PRNDL SW indicates an invalid gear ratio.
PSM range indicates the manual valve is in the D4 position.

4L80E MOVIE DIAGNOSIS WITH SNAP-ON SCANNER

CODE 68...OVERDRIVE RATIO INCORRECT

-15	INPUT RPM 2577	OUTPUT RPM	2498
	CODES & DATA	OK TO DRIVE	
NO CODES PRESENT			
I/O RPM (RATIO)	1.00	VEH SPEED (MPH)	55
TURBINE RPM	1977	COOLANT (F)	190
TCC DUTY CYCLE	98	TRANS FLUID (F)	210
TORQUE SIG (PSI)	59	GEAR RATIO	0.79
BRAKE REQUEST	NO	BRAKE SW	OPEN
TCC SLIP (RPM)	234	THROTTLE (%)	55
BATTERY (V)	13.8		
PRESS CTRL AMP	0.41	DES PCS AMP	0.43
ENGINE RPM	2208	INPUT RPM	2501
OVERDRIVE RATIO	0.75	VEH SPEED (MPH)	55
CURRENT GEAR	4TH	PRNDL SW	??????
SOLENOID A	ON	SOLENOID B	ON
RANGE A	CLSD	RANGE B	OPEN
RANGE C	OPEN	POWER ENRICH	NO
1-2 SHIFT (SEC)	0.47	2-3 SHIFT (SEC)	0.41
3-4 SHIFT (SEC)	0.03	A/C REQUEST	NO
A/C CLUTCH	OFF		

Figure 56

-14	INPUT RPM 2967	OUTPUT RPM	2842
	CODES & DATA	OK TO DRIVE	
68 OVERDRIVE RATIO INCORRECT			
I/O RPM (RATIO)	1.00	VEH SPEED (MPH)	58
TURBINE RPM	2941	COOLANT (F)	190
TCC DUTY CYCLE	0	TRANS FLUID (F)	210
TORQUE SIG (PSI)	255	GEAR RATIO	0.89
BRAKE REQUEST	NO	BRAKE SW	OPEN
TCC SLIP (RPM)	330	THROTTLE (%)	55
BATTERY (V)	13.8		
PRESS CTRL AMP	0.00	DES PCS AMP	0.00
ENGINE RPM	2508	INPUT RPM	2841
OVERDRIVE RATIO	0.75	VEH SPEED (MPH)	58
CURRENT GEAR	4TH	PRNDL SW	??????
SOLENOID A	ON	SOLENOID B	ON
RANGE A	CLSD	RANGE B	OPEN
RANGE C	OPEN	POWER ENRICH	NO
1-2 SHIFT (SEC)	0.47	2-3 SHIFT (SEC)	0.41
3-4 SHIFT (SEC)	0.03	A/C REQUEST	NO
A/C CLUTCH	OFF		

Figure 57

CLUE: In frame -15 the duty cycle of the TCC solenoid is 98%, TCC slip is 234 RPM.
Input rpm and output rpm have to much of a difference.
Gear ratio is higher than it should be in 4th gear.
In frame -14, code 68 is stored.
Gear ratio is higher than in the previous frame.
Pressure control solenoid amps are zero.
TCC duty cycle is at zero resulting in a higher TCC slip rpm.
IS THE 4TH CLUTCH SLIPPING?>>>>>>>>>>>>>>>>>>>>>>Go to next movie

4L80E MOVIE DIAGNOSIS WITH SNAP-ON SCANNER

CODE 39...TCC STUCK OFF

4l80econslpmovie	1991 CHEVROL 7.4L V8 CHEVY TBI						
Frame:	-24	-23	-22	-21	-20	-19	-18
INPUT RPM	2093	2105	2120	2141	2148	2156	2158
OUTPUT RPM	2091	2100	2120	2135	2142	2152	2154
I/O RATIO	109	109	109	111	111	109	109
VEH SPEED (MPH)	45	45	46	46	46	47	47
TURBINE RPM	2097	2105	2125	2140	2147	2156	2158
COOLANT (degF)	210	210	210	210	210	210	210
TCC DUTY CYCLE (%)	98	98	98	98	98	98	98
TRANS FLUID (degF)	198	198	198	198	198	198	198
TORQUE SIG (PSI)	41	41	41	38	42	38	35
GEAR RATIO	109	109	109	111	111	109	109
BRAKE REQUEST	NO	NO	NO	NO	NO	NO	NO
BRAKE SW	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD
TCC SLIP (RPM)	243	258	277	321	556	576	614
TPS (V)	1.78	1.78	1.78	1.62	1.56	1.45	1.33
THROTTLE (%)	33	32	32	30	27	24	20
BATTERY (V)	13.4	13.4	13.4	13.4	13.4	13.4	13.4
PROM ID	2061	2061	2061	2061	2061	2061	2061
PRESS CTRL AMP	0.64	0.55	0.64	0.57	0.64	0.57	0.66
DES PCS AMP	0.63	0.53	0.62	0.60	0.63	0.59	0.63
ENGINE RPM	2345	2329	2330	2357	2318	2324	2318
OVERDRIVE RATIO	109	109	109	111	111	109	109
CURRENT GEAR	3RD	3RD	3RD	3RD	4TH	4TH	4TH
PRNDL SW	3RD	3RD	3RD	3RD	3RD	3RD	3RD
SOLENOID A	OFF	OFF	OFF	OFF	ON	ON	ON
SOLENOID B	ON	ON	ON	ON	ON	ON	ON
RANGE A	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD
RANGE B	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD	CLSD
RANGE C	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
POWER ENRICH	NO	NO	NO	NO	NO	NO	NO
1-2 SHIFT (SEC)	0.28	0.28	0.28	0.28	0.28	0.28	0.28
2-3 SHIFT (SEC)	0.28	0.28	0.28	0.28	0.28	0.28	0.28
3-4 SHIFT (SEC)	0.03	0.03	0.03	0.03	0.03	0.03	0.03
A/C REQUEST	YES	YES	YES	YES	YES	YES	YES
A/C CLUTCH	ON	ON	ON	ON	ON	ON	ON

Figure 58

CLUES: The movie in figure 58 indicates the PSM and PRNDL switch ranges are in the manual 3rd position.
TCC duty cycle is high, yet the TCC slip rpm is also high. Code 39 is stored.
Third gear ratio should be 1.00. It is not.
The transmission is in manual third, therefore the 4th clutch cannot be slipping which was suspected in the previous code 68 movie in figure 57.

TIP: Beginning in frame -20 the current gear is 4th and the commanded solenoid state is 4th gear, yet the transmission is in D3.
This is NORMAL. Sensor input is telling the PCM that the transmission SHOULD be in 4th gear, therefore 4th gear is commanded, but the manual valve hydraulically blocks oil from applying the

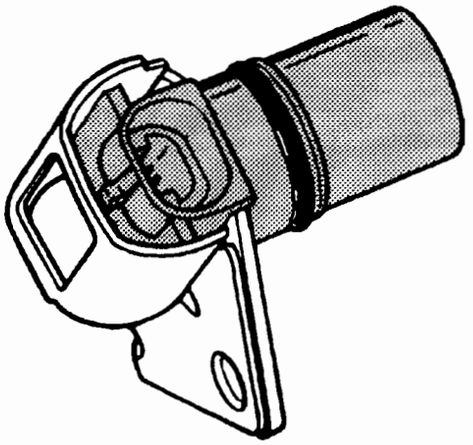
THM 4L80-E/4L80-EHD
NEW DESIGN TURBINE AND OUTPUT SHAFT SPEED SENSORS

There is now available from G.M. Service Parts, a 4th design Turbine and Output Shaft Speed Sensor for the THM 4L80-E/4L80-EHD transmissions, as shown in Figure 59.
The previous OEM part number does not automatically supercede to the current part number. The new design level Speed Sensor is available under OEM part number 24203876, and two per transmission are required for all models except 1994 and later 4WD models.

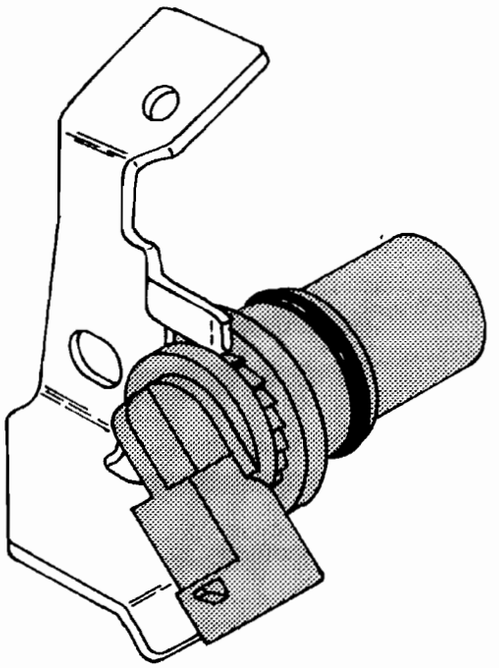
Always replace the Turbine and Output Shaft Speed Sensors with the newest design level part.

4L80-E TURBINE AND OUTPUT SPEED SENSORS

PREVIOUS DESIGN LEVEL
NO LONGER AVAILABLE



NEW DESIGN LEVEL
PART NO. 24203876



SENSOR RESISTANCE SHOULD BE 1260-1540 OHMS WHEN MEASURED AT 70°F.

Figure 59

THM 4L80-E/4L80-EHD

1994 OUTPUT SPEED SENSOR CHANGES

CHANGE: Beginning at the start of production for the 1994 model year, ***all 4WD models only*** of the THM 4L80-E/4L80-EHD transmissions have revised vehicle speed sensor wiring circuits, and the Output Shaft Speed Sensor in the case has been eliminated, ***on 4WD models only.*** The speed sensor in the transfer case is now used for both output shaft speed and vehicle speed.

REASON: Cost considerations, and improved reliability when the Transfer Case is placed in 4WD LOW.

PARTS AFFECTED:

(1) TRANSMISSION OUTPUT SHAFT SPEED SENSOR - Eliminated ***on 4WD models only***, and a plated steel expansion plug was installed in the case bore to retain a common case, as shown in Figure 60. All 4WD models now use the Output Speed Sensor located on the transfer case as the ***only*** vehicle speed information sent to the speed buffer (See Figure 61).

NOTE: The Output Speed Sensor Bore Plug may ***fall out,*** or fluid may leak past the bore plug. Beginning on January 21, 1994, 4L80-E, 4WD models will have a speed sensor installed in the output speed sensor bore in the transmission case.
THE SPEED SENSOR IS USED AS A PLUG ONLY.
IT WILL NOT BE ELECTRICALLY CONNECTED.

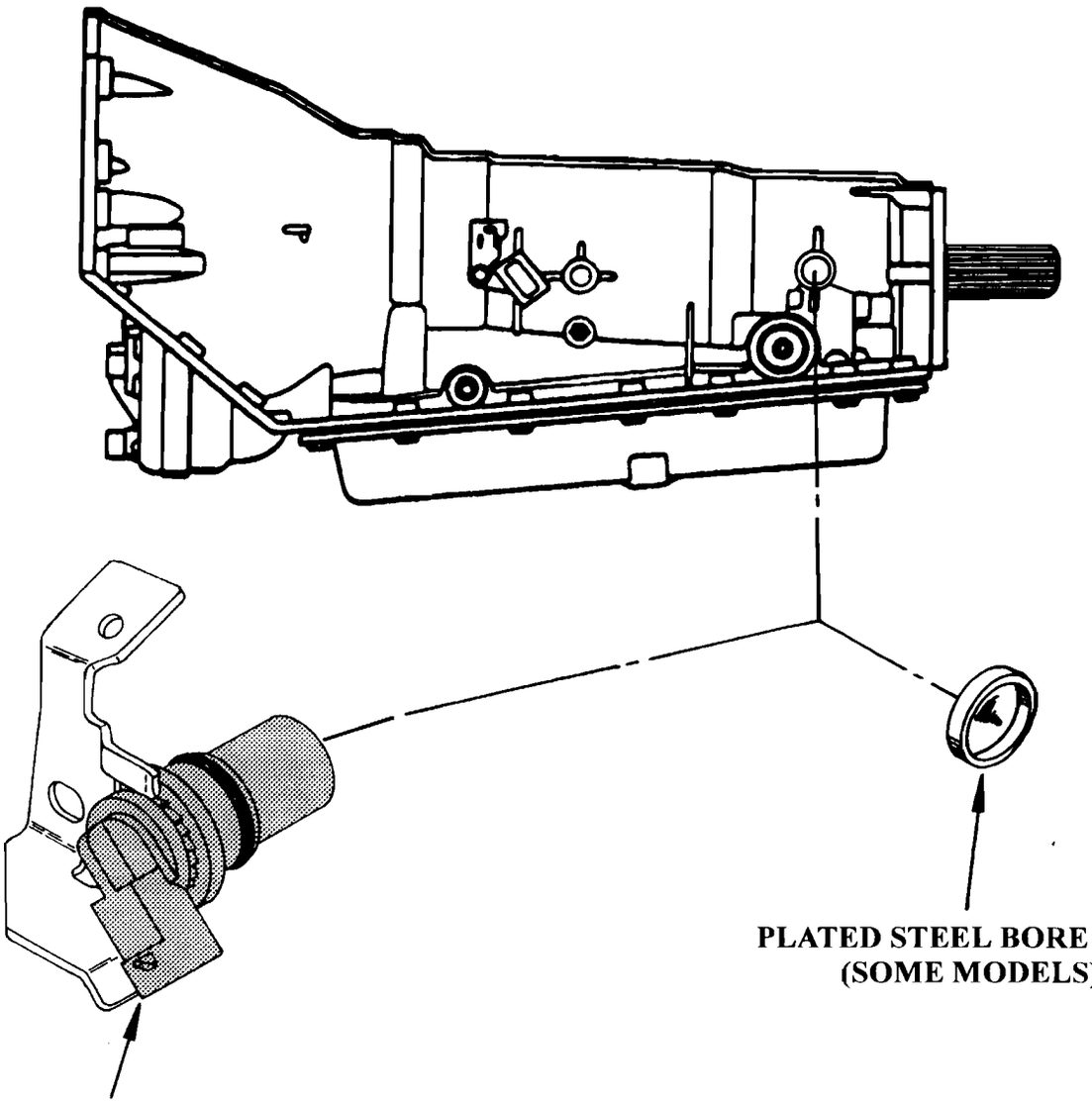
(2) TRANSFER CASE SWITCH - Previously used to energize the front drive axle thermal actuator, now has an added set of contacts incorporated inside the switch, and an added wire to signal the PCM/TCM when the ***4WD LOW*** range has been selected (See Figure 61).

(3) SPEED SENSOR ROTOR - Located on the Output Carrier, has been eliminated on ***1994-1996 4WD models only,*** as there is no longer any need for it, and is a cost savings. Extra care should be used to ensure that a late Output Carrier ***without*** the Speed Sensor Rotor, does not inadvertently get installed into a 2WD transmission (See Figure 62).

SERVICE INFORMATION:

Transmission Output Shaft Speed Sensor ***(New Design)*** 24203876

4WD VEHICLES WITH 4L80-E TRANSMISSION
1994-1996 MODELS



CAUTION: The Output Speed Sensor Bore Plug may ***fall out,*** or fluid may leak past the bore plug. Beginning on January 21, 1994, 4L80-E 4WD models will have a speed sensor installed in the output speed sensor bore in the transmission case.

THE SPEED SENSOR IS USED AS A PLUG ONLY.
IT WILL NOT BE ELECTRICALLY CONNECTED.

Figure 60

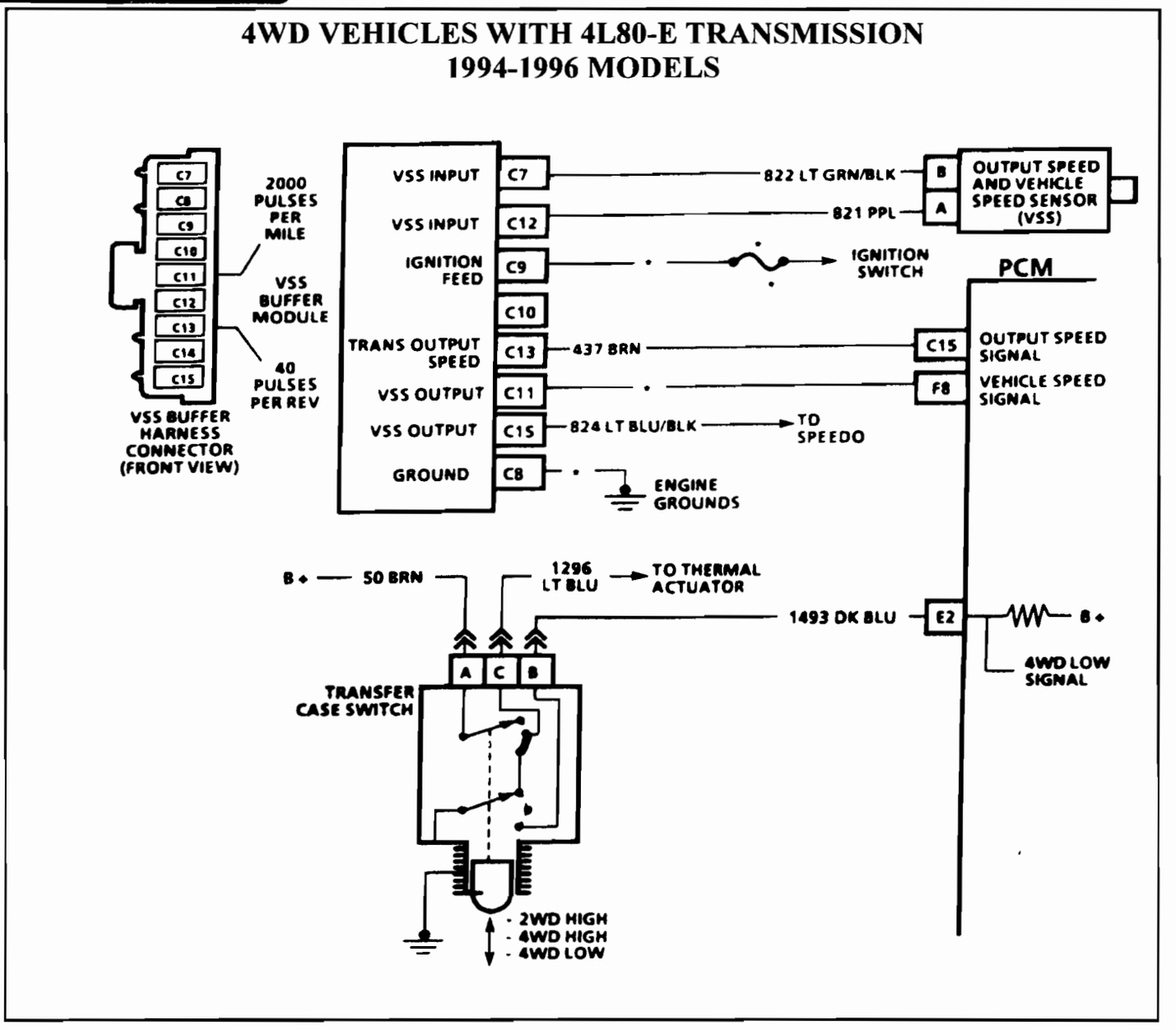

4WD VEHICLES WITH 4L80-E TRANSMISSION
1994-1996 MODELS
C7
C8
C9
C10
C11
C12
C13
C14
C15
2000 PULSES PER MILE
VSS BUFFER MODULE
40 PULSES PER REV
VSS BUFFER HARNESS CONNECTOR (FRONT VIEW)
VSS INPUT
VSS INPUT
IGNITION FEED
TRANS OUTPUT SPEED
VSS OUTPUT
VSS OUTPUT
GROUND
C7
C12
C9
C10
C13
C11
C15
C8
822 LT GRN/BLK
821 PPL
IGNITION SWITCH
437 BRN
824 LT BLU/BLK
TO SPEEDO
ENGINE GROUNDS
B
A
OUTPUT SPEED AND VEHICLE SPEED SENSOR (VSS)
PCM
C15
OUTPUT SPEED SIGNAL
F8
VEHICLE SPEED SIGNAL
B+
50 BRN
1296 LT BLU
TO THERMAL ACTUATOR
1493 DK BLU
E2
B+
4WD LOW SIGNAL
A
C
B
TRANSFER CASE SWITCH
- 2WD HIGH
- 4WD HIGH
- 4WD LOW

Figure 61

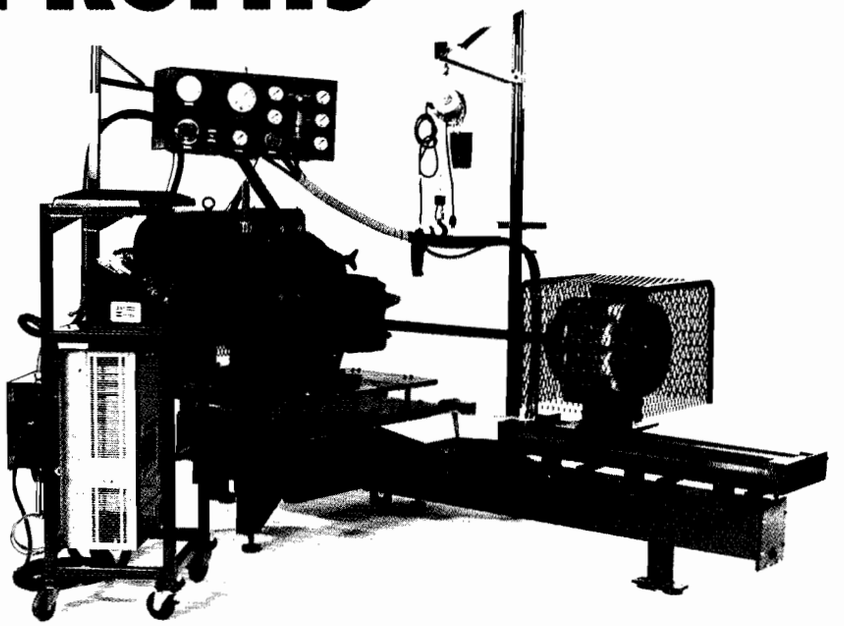
Serious Rebuilders

KEEP YOUR PROFITS

Comebacks eat up profits and damage your image. Axi-Line's NEW Dynadrome M310-AL with the variable loading device option adds more testing capabilities by simulating a greater range of road driving conditions, and helps prevent costly comebacks.

Your *Axi-Line* equipment:

- Lowers Initial equipment cost
- Reduces labor — more profit per job
- Needs less floor space
- Provides greater job confidence



Dynadrome M310AL

Transmission Road Test Simulator

TESTING CAPABILITIES

- All gears — planetaries, sun, etc.
- Noise — mechanical, hydrosonic.
- Hot and cold testing.
- All AFT pressure patterns — line, boost.
- Shift points.
- Front pump — capacity, flow, pressure.
- Leaks — internal, external.
- Stall speed — forward, reverse.
- TV pressure.
- Auto and manual upshifts, downshifts.
- Vacuum pressure modulator.
- ❒ Solenoid.
- ❒ Converter — lockup, non-lockup types.
- ❒ Output loading and inertia loading.
- ❒ RPM test — left and right outputs.
- ❒ Converter and cooling line temperature.
- ❒ Throttle valve.
- ❒ Flow metering of cooling line.
- ❒ Hydraulic function cf the governor, clutch, valve body and overdrive.
- ❒ Kick down.
- ❒ FWD differential matching.

Toll Free
1-800-245-2203
Nationwide

EQUIPMENT FEATURES

- Inertia discs matched to brake horsepower
- Foot operated hydraulic brake
- Fast alignment with precision dowel pins
- Vibration free running
- Line bored bearing mounts
- Full instrumentation
- Engine remains level in FWD and RWD modes
- Frames stress relieved to remain in constant alignment
- Easy to convert from FWD to RWD

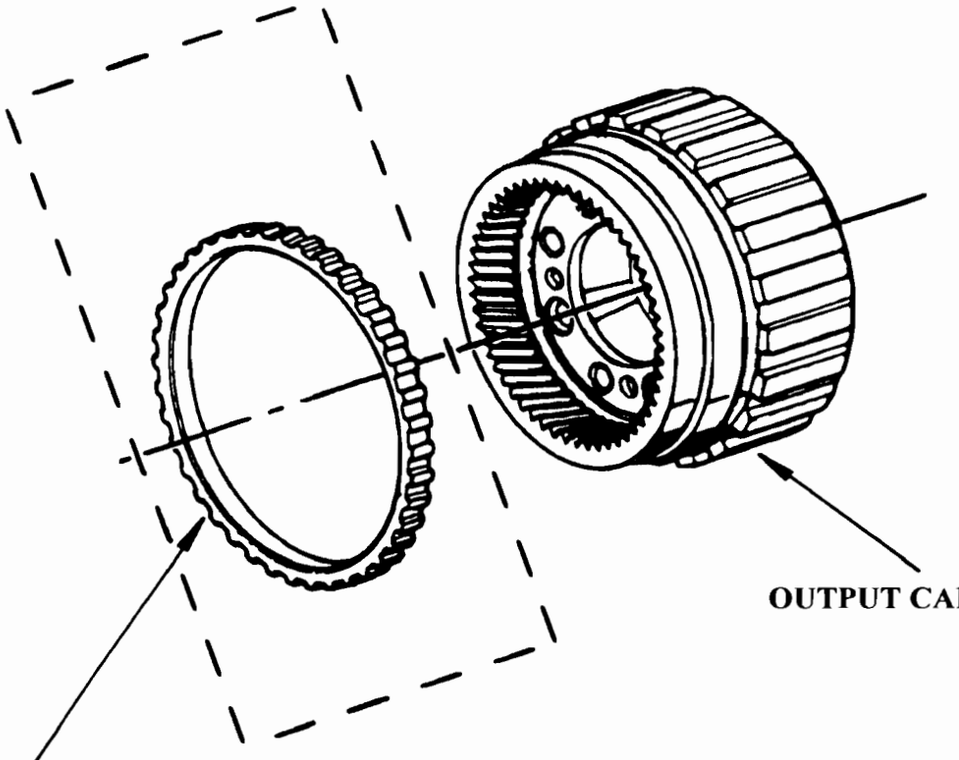
SAFETY FEATURES

- ❒ Inertia discs ultrasonically inspected.
- ❒ Four new disc brakes and calipers per model.
- ❒ Drive shaft safety guards.
- ❒ Microswitch engine shutoffs in turret and guards, to prevent unsafe operation.
- ❒ Torque converter crash belt, prevents loose tools from contacting moving flexplate, converter.
- ❒ Automatic overspeed protection.

axi-line®
Precision Products
Dynadrome Division

P.O. Box 70, Suamico, WI 54173

4WD VEHICLES WITH 4L80-E TRANSMISSION
1994-1996 MODELS



CAUTION: TWO WHEEL DRIVE TRANSMISSIONS *MUST* HAVE SPEED SENSOR ROTOR INSTALLED.

Figure 62

THM 4L80-E/4L80-EHD

NEW PART NUMBER FOR THE FORCE MOTOR/PRESSURE CONTROL SOLENOID

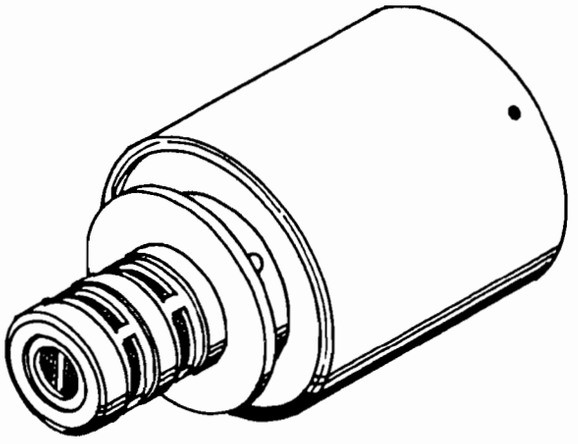
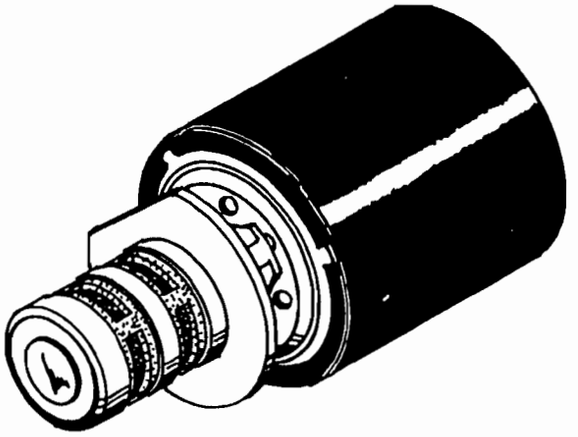
PREVIOUS DESIGN (BOSCH)	NEW DESIGN (HOLLEY)
	
G.M. PART NUMBER FOR THE BOSCH 8677314	**G.M. PART NUMBER FOR THE HOLLEY 24203101**
CAN BE USED ON 4HP22 *(CANNOT BE USED ON 4HP24)*	**USE THIS ONE ON** *ALL* **4L80-E TRANSMISSIONS**
	BRACKET REQUIRED WHEN INSTALLING HOLLEY TO REPLACE THE BOSCH PART NUMBER 8684217

Figure 63

Automatic Transmission Service Group

THM 4L80-E
CONVERTER CLUTCH SHUDDER

COMPLAINT: Before and/or after rebuild, the vehicle displays a Converter Clutch Shudder condition as the torque converter clutch is applying.

CAUSE: The cause may be, an inadequate amount of "Regulated Apply" oil to the converter.

CORRECTION: Machine a 45 degree chamfer that is .030" wide, on the TCC Regulator Apply Valve, on the land that is shown in Figure 64. This will allow more line pressure in to the TCC regulated apply circuit. Do not machine any wider than .030".

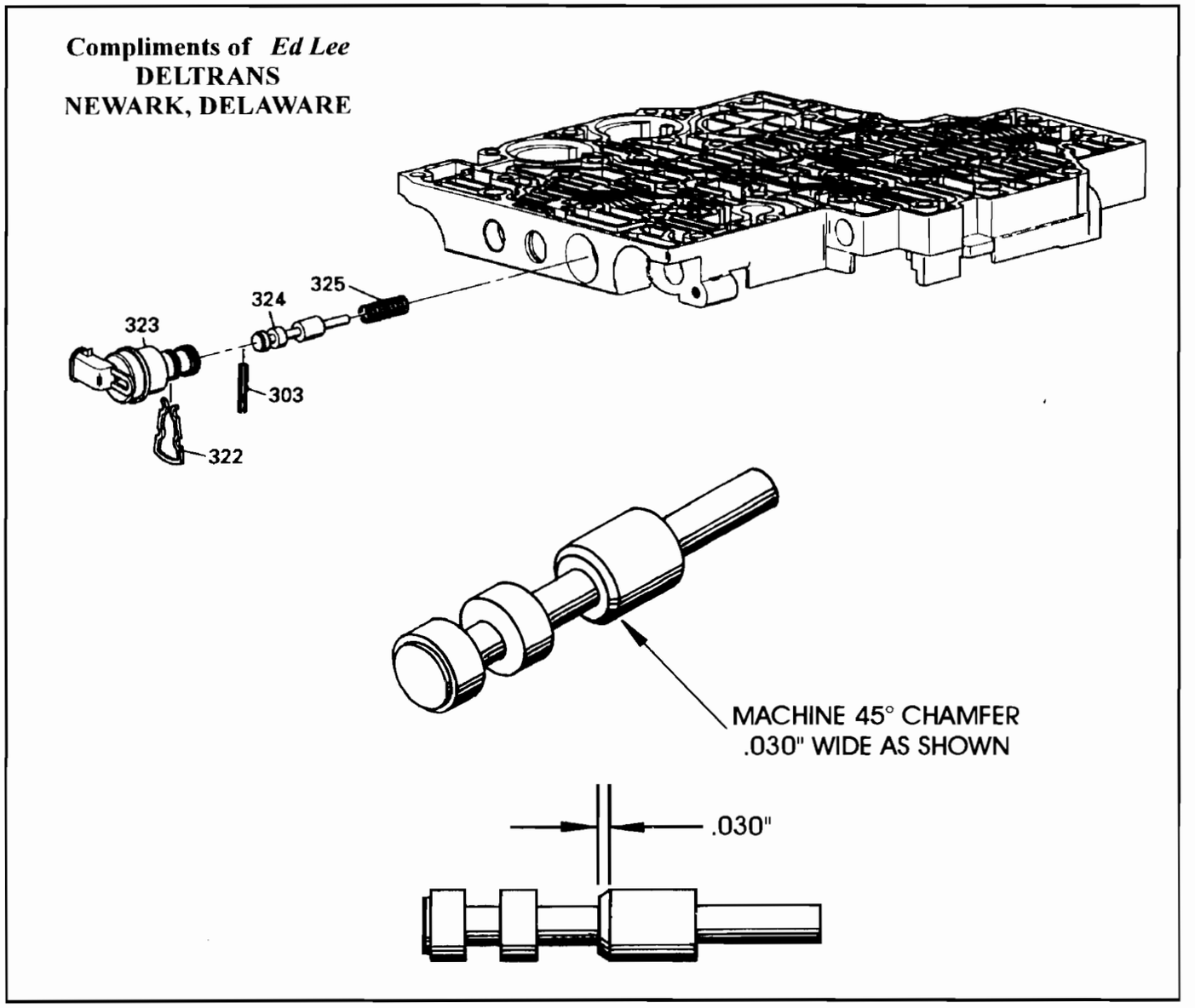


Figure 64

THM 4L80-E/4L80-EHD

HIGH LINE PRESSURE IN REVERSE

COMPLAINT: Before and/or after rebuild, the vehicle has a very high line pressure reading when the selector lever is in the Reverse position, and may repeatedly break direct clutch piston and/or reverse band assembly.

CAUSE: The cause may be, a worn boost valve sleeve and/or boost valve in the pimp assembly.

CORRECTION: Replace the Boost Valve and/or Boost Valve Sleeve, as necessary (See Figure 65). Parts are currently available from G.M. Service Parts, and part numbers are listed below.

SERVICE INFORMATION:

Boost Valve Sleeve 8682856
Boost Valve, Line Pressure 8680549

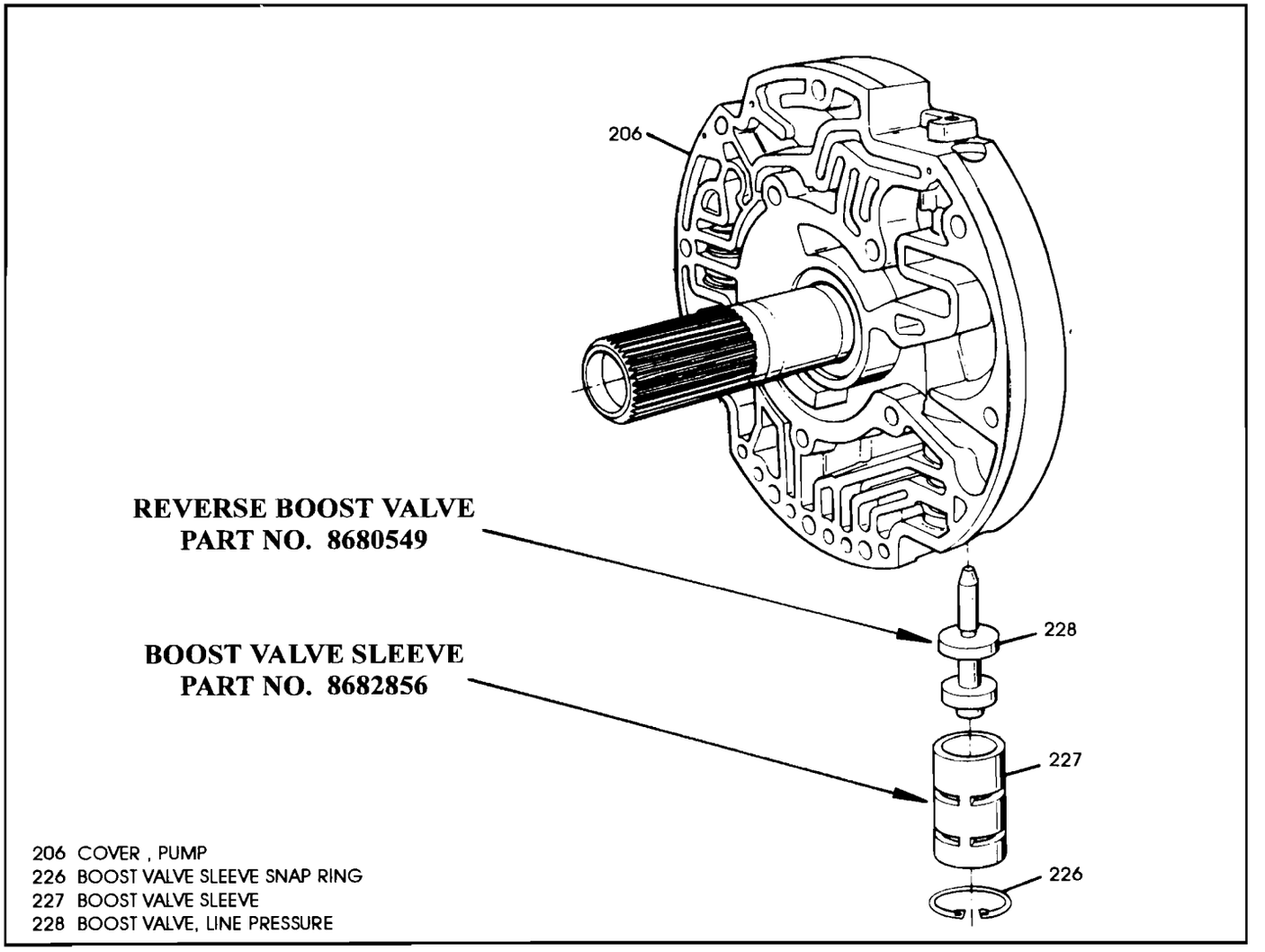


Figure 65

THM 4L60-E

TCC "PWM" SOLENOID ADDED IN1995 AND NEW OIL PUMP ASSEMBLY FOR 1995

CHANGE: Beginning at the start of production for 1995 models, all THM 4L60-E transmissions were built with an added "PWM" solenoid on the valve body to control TCC apply feel. The new TCC PWM Solenoid ramps the torque converter clutch on and off, as in most other GM units.

REASON: Improved pleaseability of torque converter clutch apply and release.

PARTS AFFECTED:

(1) VALVE BODY CASTING - 1995 models are now machined to accept the added TCC PWM Solenoid, as shown in Figure 1. The added TCC PWM Solenoid is exactly the same and will interchange with the 3-2 downshift solenoid (See Figure 1).

(2) VALVE BODY SPACER PLATE - There were two holes added in the spacer plate to accommodate the added TCC PWM Solenoid as shown in Figure 2. The 1995 spacer plate can be identified with the first letter of the two digit code being either an "M" or "N", as shown in Figure 2. The first letter of the two digit code on the 1994 spacer plate will be "K" or "L". The 1993 spacer plate first letter will be "J". Refer to Figure 2 for location of the I.D. code stamped into the spacer plate

(3) OIL PUMP BODY - There were changes in the worm track configuration on the new design pump body to accommodate the added TCC PWM solenoid. The pump body can be easily identified with "PWM" cast into the pump body, in the location shown in Figure 4. Refer to Figure 3 for the differences in the worm track area, which we have shaded for easy reference.

(4) OIL PUMP COVER (STATOR) - There were changes in the worm track configuration on the new design pump cover to accommodate the added TCC PWM solenoid. The pump cover can be easily identified with "PWM" cast into the pump cover, in the location shown in Figure 6. Refer to Figure 5 for the differences in the worm track area, which we have shaded for easy reference.

(5) TURBINE SHAFT BALL CAPSULE - Change in orifice sizes to accommodate the added TCC PWM solenoid, and calibrate converter release oil to the new TCC PWM solenoid.

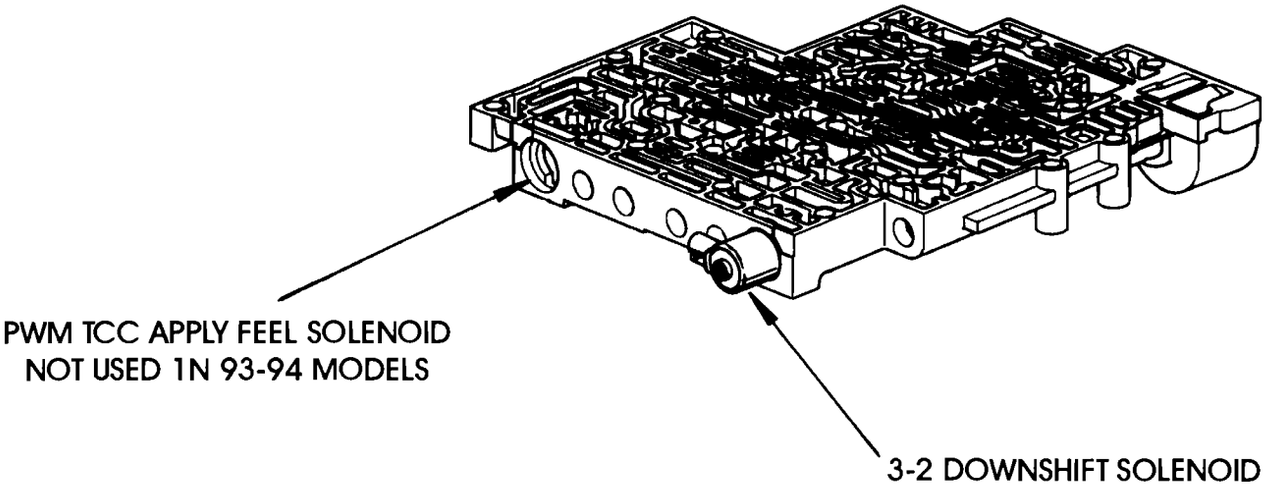
INTERCHANGEABILITY:

None of the parts listed above will interchange with one another, nor will any of these parts back service any 1993-1994 model transmissions.

SERVICE INFORMATION:

TCC PWM Solenoid (95-96 Models) 8683187
Turbine Shaft Ball Capsule (Bronze - 298mm Converter) 24201472
Turbine Shaft Ball Capsule (Silver - 245mm Converter) 8654326

1993-1994 VALVE BODY
WITH 3-2 DOWNSHIFT SOLENOID
(REQUIRES "NON PWM" PUMP ASSEMBLY)



1995 VALVE BODY
WITH 3-2 DOWNSHIFT SOLENOID
AND TCC APPLY FEEL SOLENOID
(REQUIRES "PWM" PUMP ASSEMBLY)

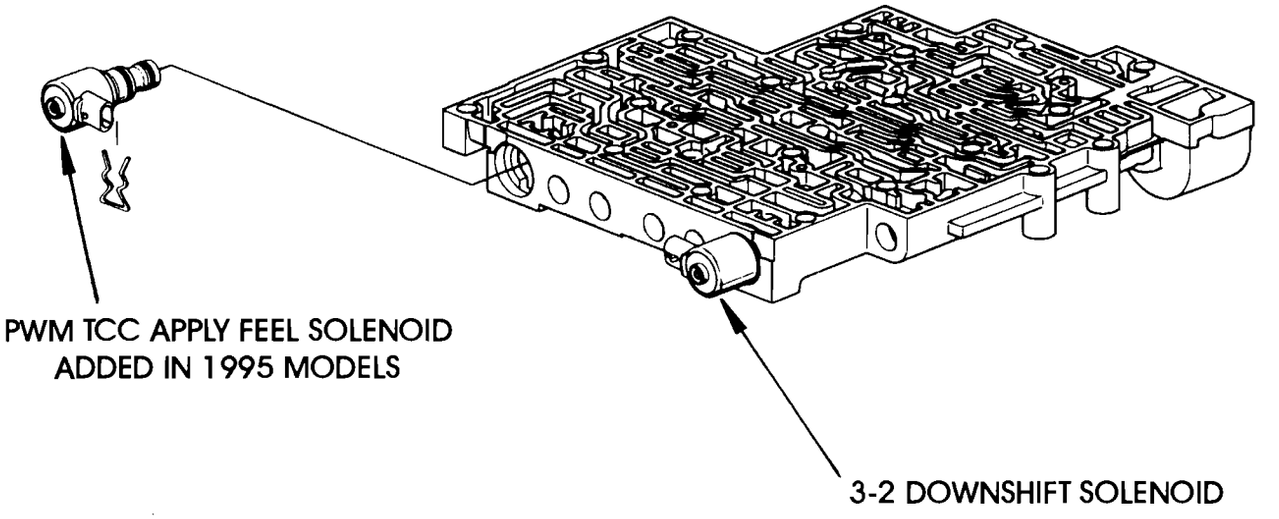


Figure 1

1995 SPACER PLATE

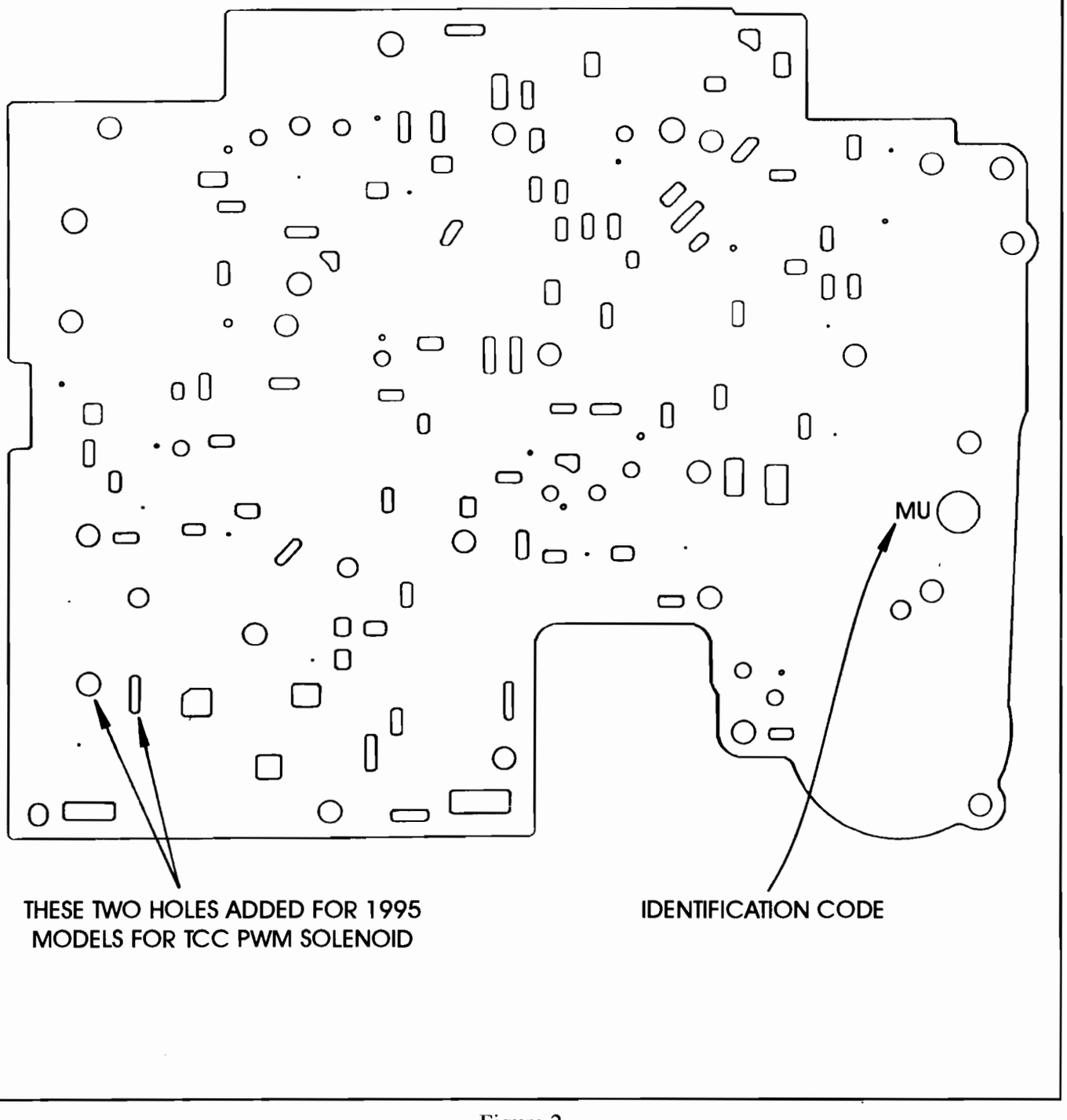
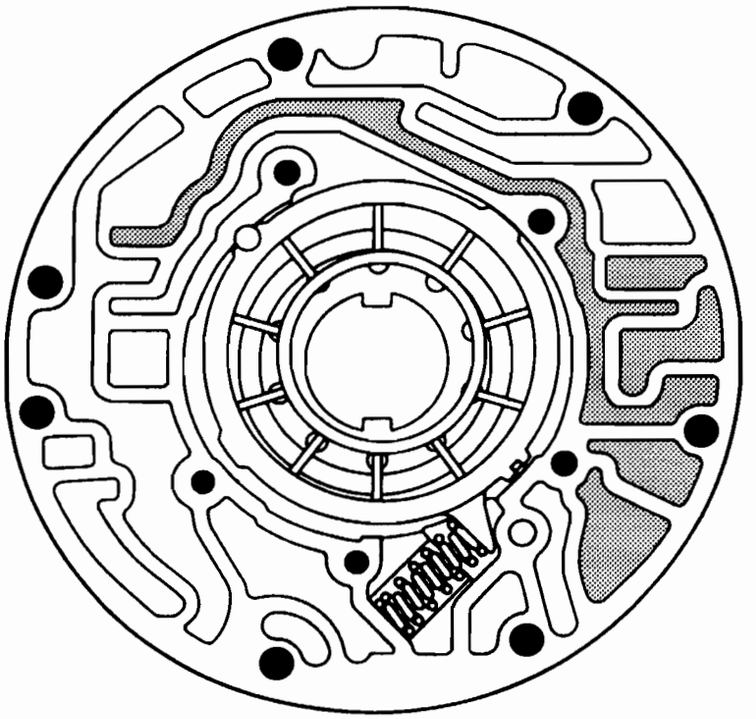


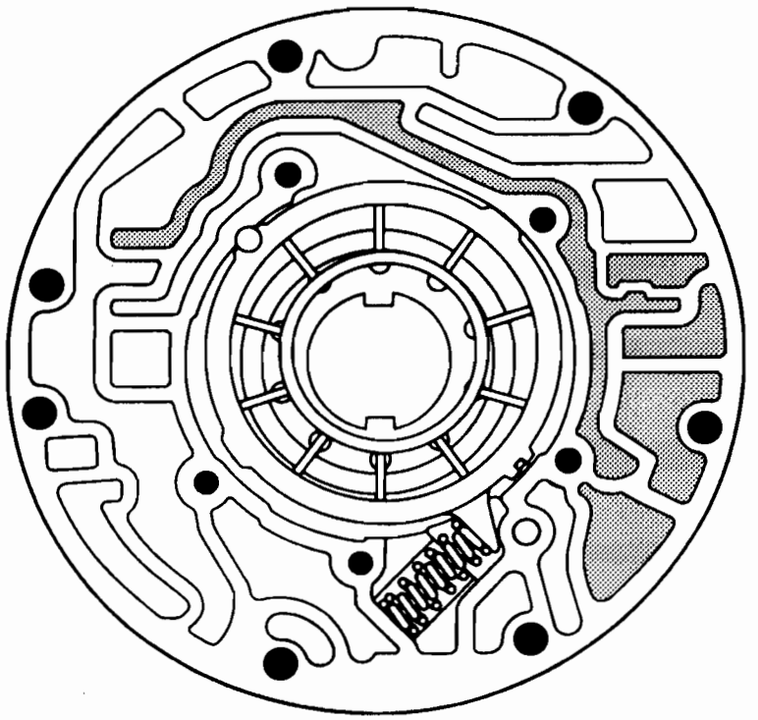
Figure 2

1993-1994 "NON PWM"
PUMP BODY ASSEMBLY



SHADED AREAS ARE DIFFERENT BETWEEN THE "PWM" AND THE NON PWM PUMP BODY

1995 "PWM"
PUMP BODY ASSEMBLY



SHADED AREAS ARE DIFFERENT BETWEEN THE "PWM" AND THE NON PWM PUMP BODY

Figure 3

1995 "PWM" PUMP BODY IDENTIFICATION

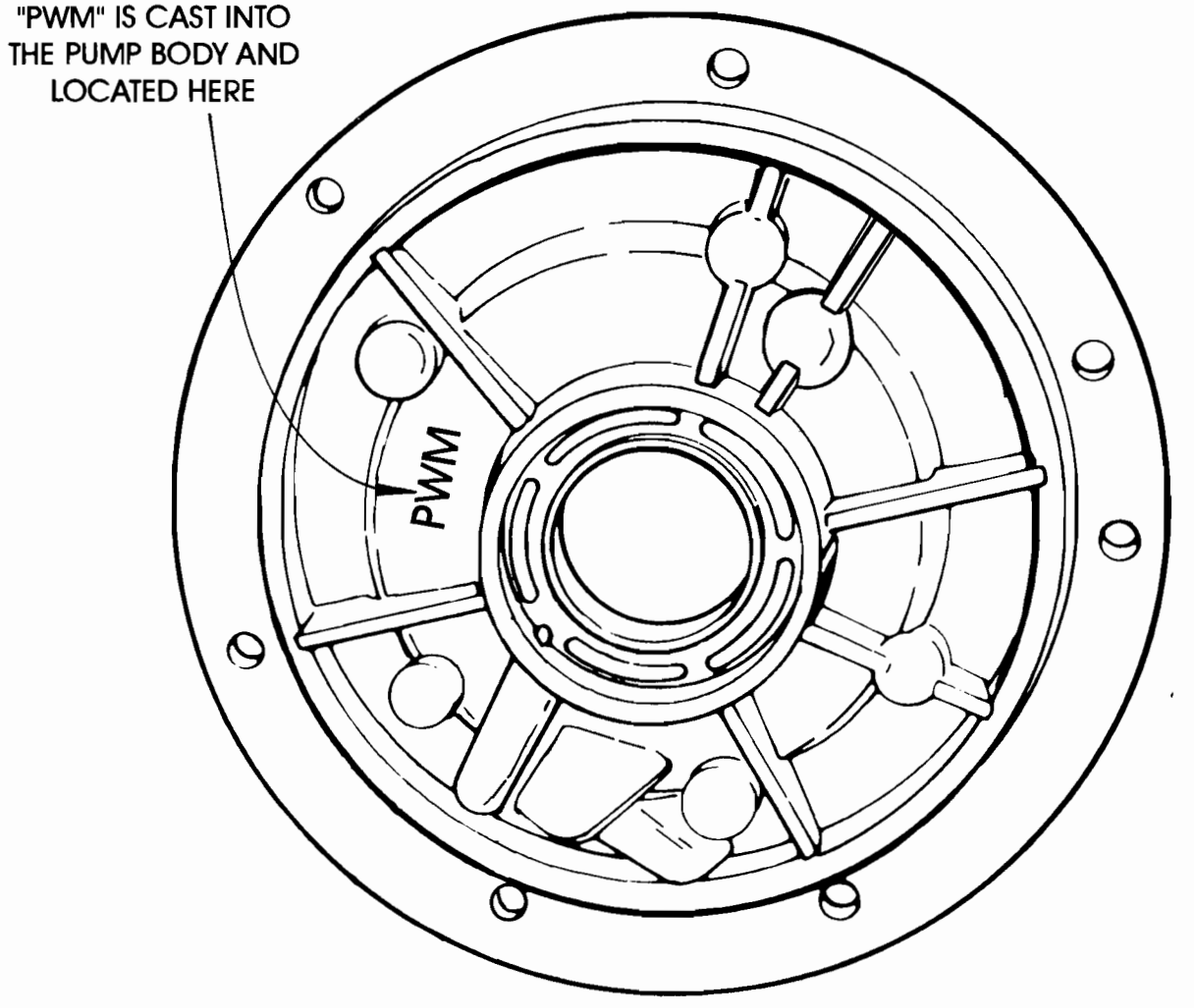
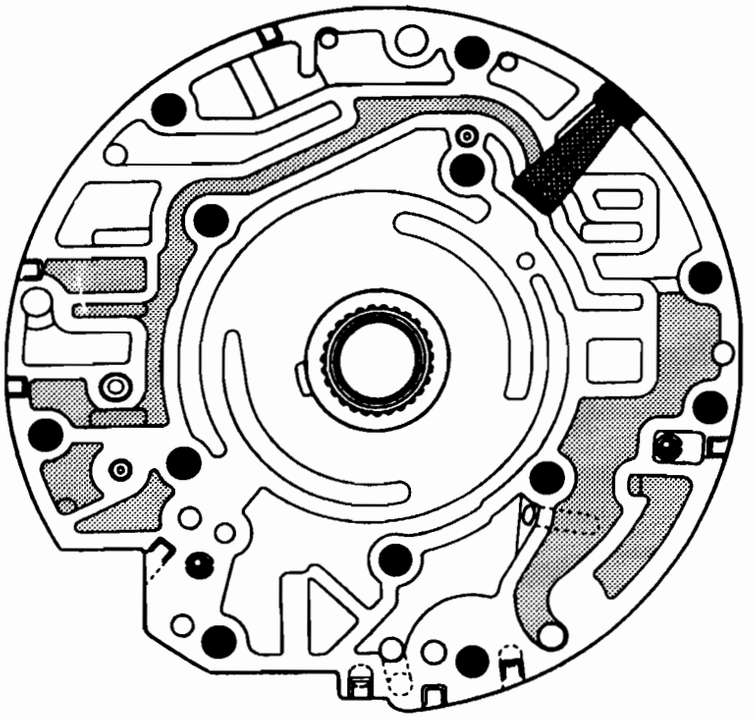


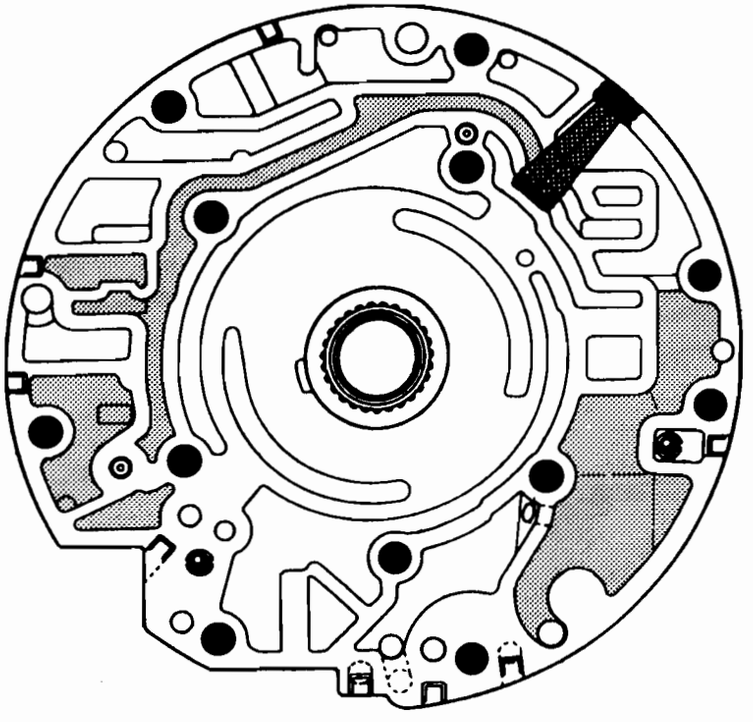
Figure 4

1993-1994 "NON PWM"
PUMP COVER ASSEMBLY



SHADED AREAS ARE DIFFERENT
BETWEEN THE "PWM" PUMP COVER
AND THE NON PWM PUMP COVER

1995-1996 "PWM"
PUMP COVER ASSEMBLY



SHADED AREAS ARE DIFFERENT
BETWEEN THE "PWM" PUMP COVER
AND THE NON PWM PUMP COVER

Figure 5

1995-1996 "PWM" PUMP COVER IDENTIFICATION

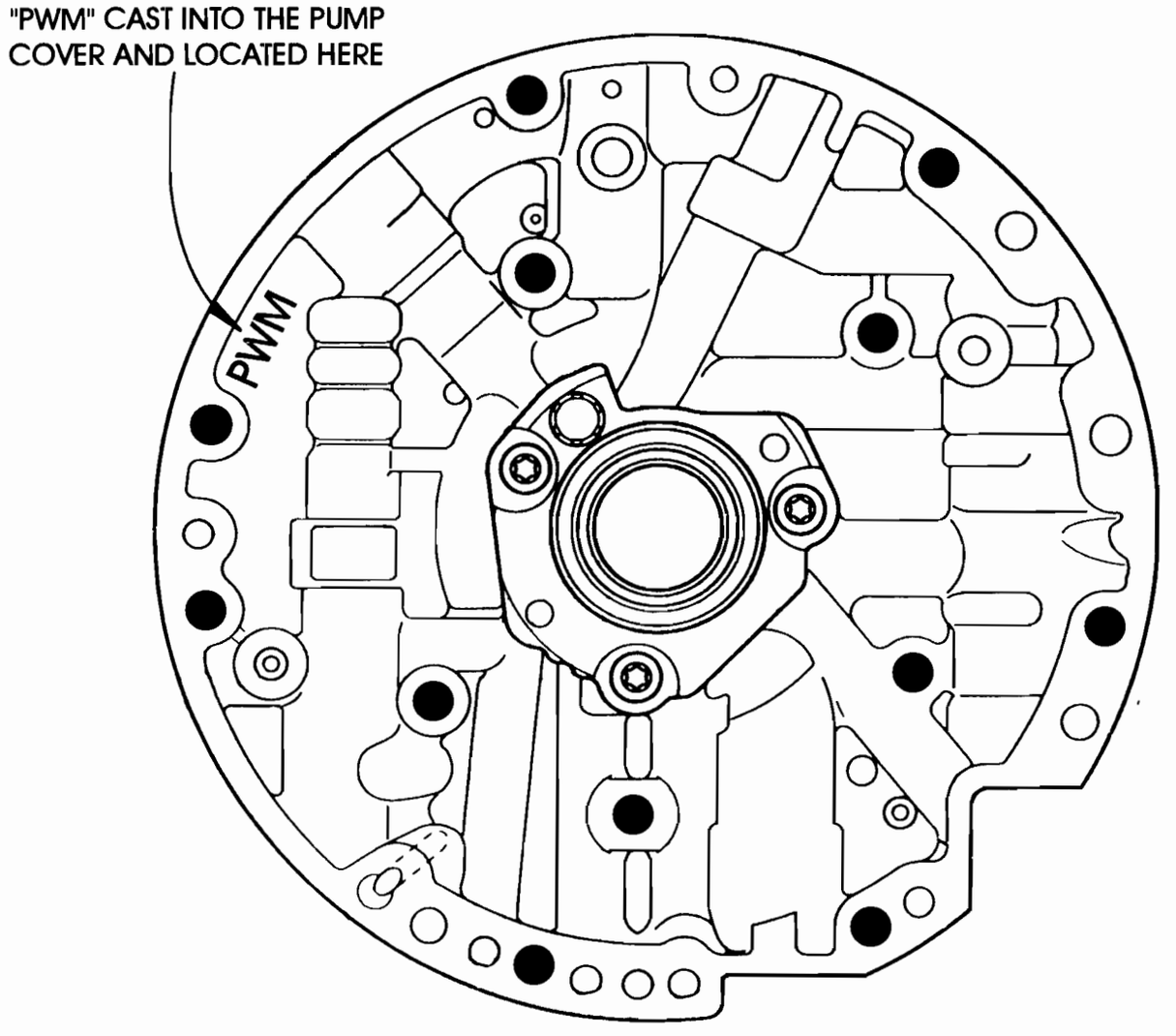


Figure 6

THM 4L60-E
CHANGES IN 3-2 DOWNSHIFT VALVE AND THE 3-2 DOWNSHIFT SOLENOID

CHANGE: Beginning at the start of production for all 1996 models, the THM 4L60-E transmissions were built with a new design "On-Off" 3-2 downshift solenoid, and a new design 3-2 downshift valve line-up in the valve body.

REASON: Improved 3-2 downshift quality and 2-4 band durability.

PARTS AFFECTED:

(1) 3-2 DOWNSHIFT SOLENOID - Changes from a Pulse Width Modulated (PWM) solenoid to a regular "On-Off" (Normally Open) solenoid, which also requires a different Powertrain Control Module (PCM). The new design "On-Off" 3-2 downshift solenoid can be identified by the case diameter, which is smaller than the previous design, and the new design solenoid also has a ***plastic*** stem that fits into the valve body bore, where the previous design was ***metal***. The solenoid connector was also changed to prevent the solenoids from being accidentally installed in the wrong models. Refer to Figure 7 for 1995 models, and Figure 8 for 1996 models.

(2) 3-2 DOWNSHIFT VALVE - The entire 3-2 downshift valve line-up changes to accommodate the new design "On-Off" 3-2 downshift solenoid. Refer to Figure 7 for 1995 models, and Figure 8 for 1996 models.

(3) VALVE BODY SPACER PLATE - There were two holes eliminated in the 1996 spacer plate, over the 3-2 downshift valve line-up, to accommodate the new design 3-2 downshift valve. The 1995 spacer plate can be identified with the first letter of the two digit code being either an "M" or "N", as shown in Figure 9. The 1996 spacer plate can be identified with the first letter of the two digit code being a "P", as shown in Figure 10.

INTERCHANGEABILITY:

None of the parts listed above will interchange with one another.
1995 parts must be used on 1995 models.
1996 parts must be used on 1996 models.

SERVICE INFORMATION:

3-2 Downshift Solenoid (PWM for 95 Models) 8683187
3-2 Downshift Solenoid (On-Off for 96 Models) 24203267

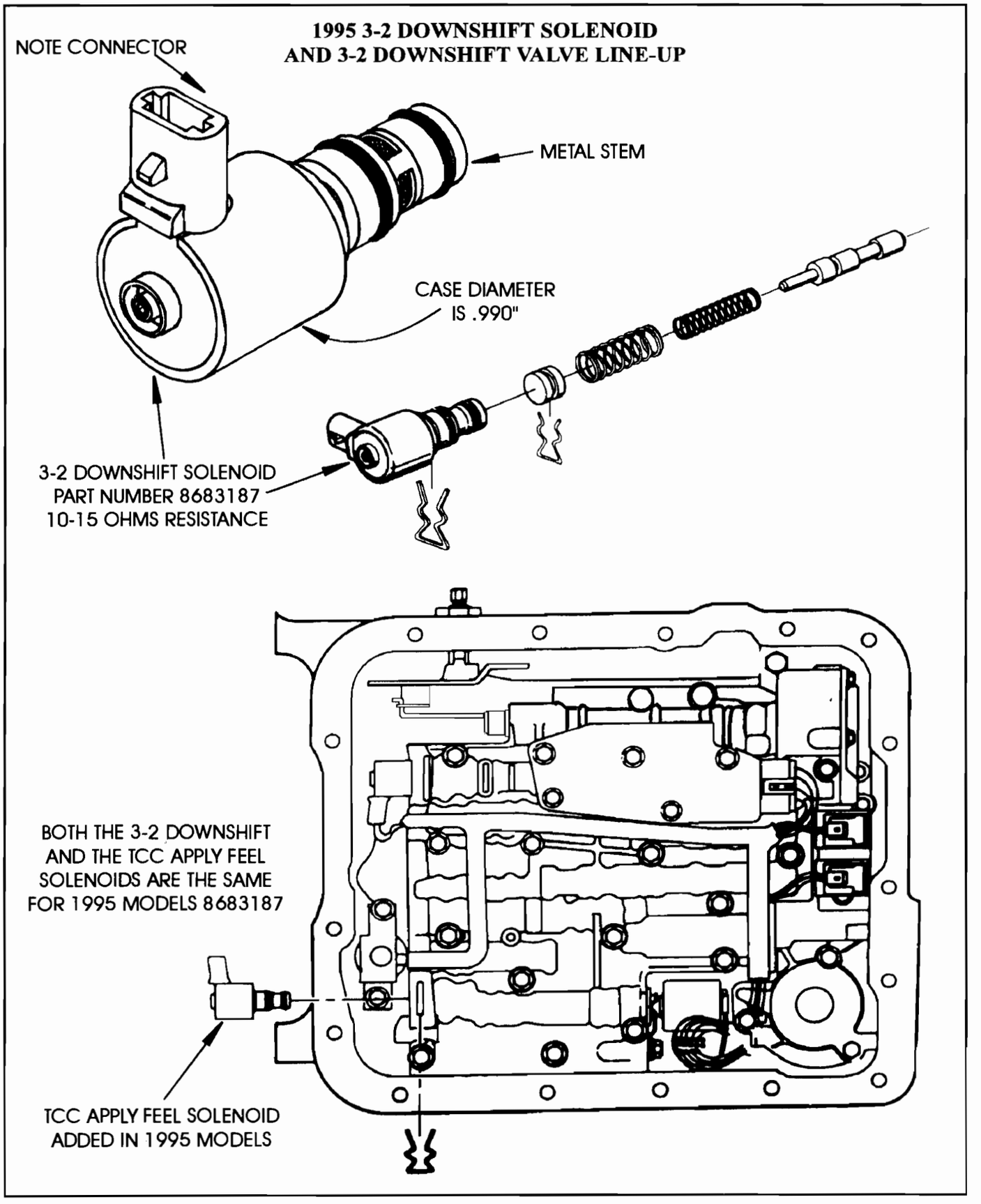

1995 3-2 DOWNSHIFT SOLENOID
AND 3-2 DOWNSHIFT VALVE LINE-UP
NOTE CONNECTOR
METAL STEM
CASE DIAMETER
IS .990"
3-2 DOWNSHIFT SOLENOID
PART NUMBER 8683187
10-15 OHMS RESISTANCE
BOTH THE 3-2 DOWNSHIFT
AND THE TCC APPLY FEEL
SOLENOIDS ARE THE SAME
FOR 1995 MODELS 8683187
TCC APPLY FEEL SOLENOID
ADDED IN 1995 MODELS

Figure 7

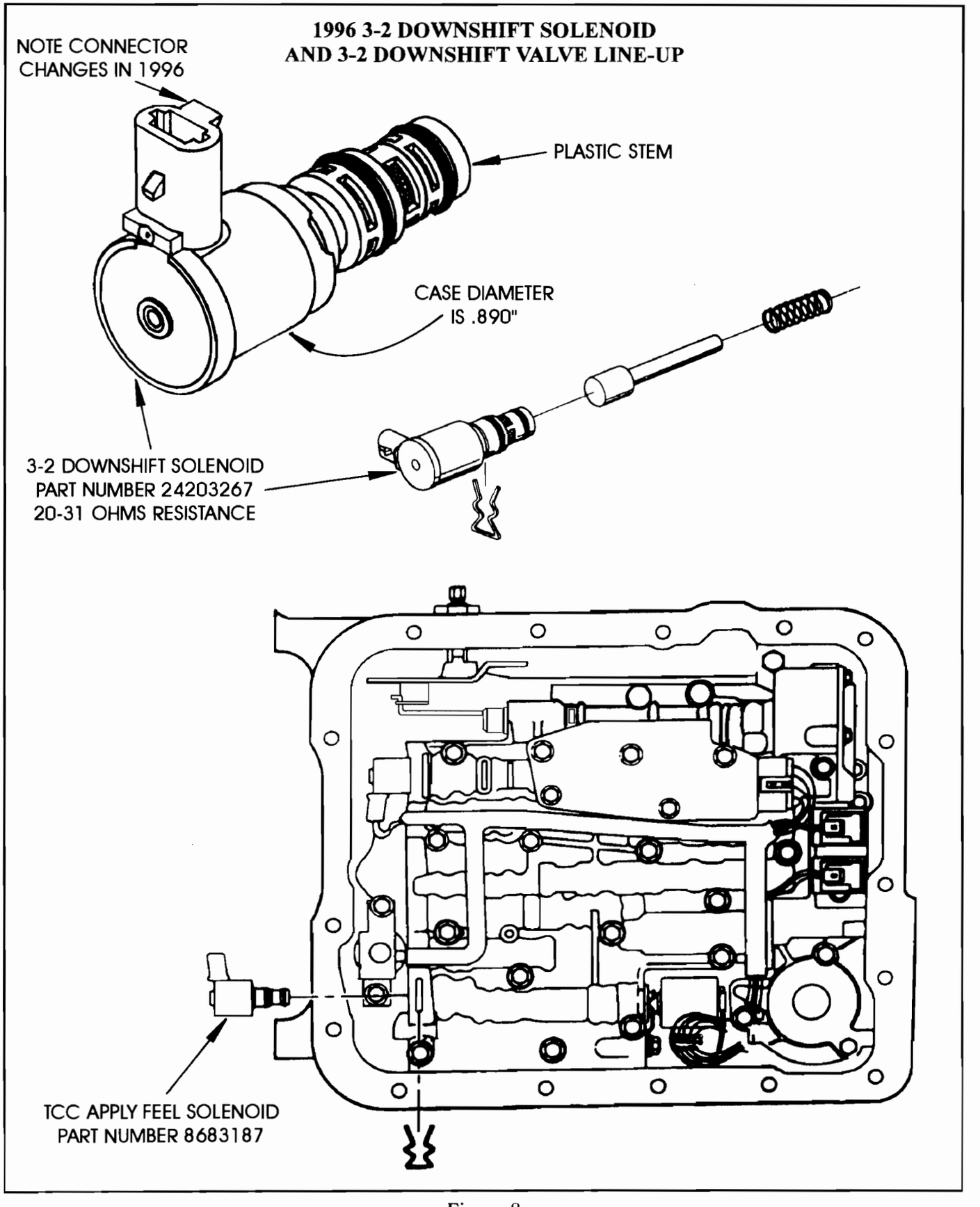

1996 3-2 DOWNSHIFT SOLENOID
AND 3-2 DOWNSHIFT VALVE LINE-UP
NOTE CONNECTOR
CHANGES IN 1996
PLASTIC STEM
CASE DIAMETER
IS .890"
3-2 DOWNSHIFT SOLENOID
PART NUMBER 24203267
20-31 OHMS RESISTANCE
TCC APPLY FEEL SOLENOID
PART NUMBER 8683187

Figure 8

1995 SPACER PLATE
USES "PWM" 3-2 DOWNSHIFT SOLENOID

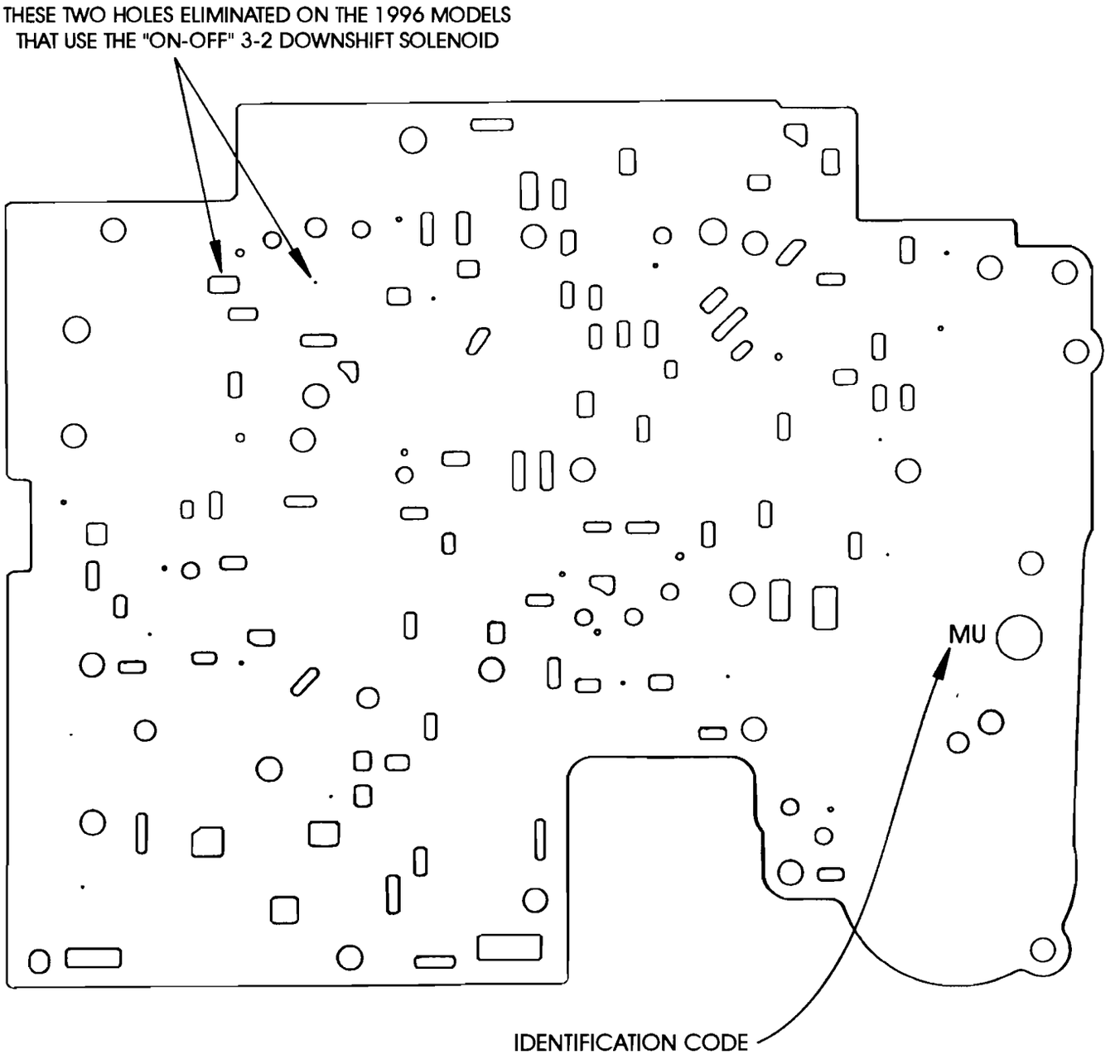


Figure 9

1996 SPACER PLATE
USES "ON-OFF" 3-2 DOWNSHIFT SOLENOID

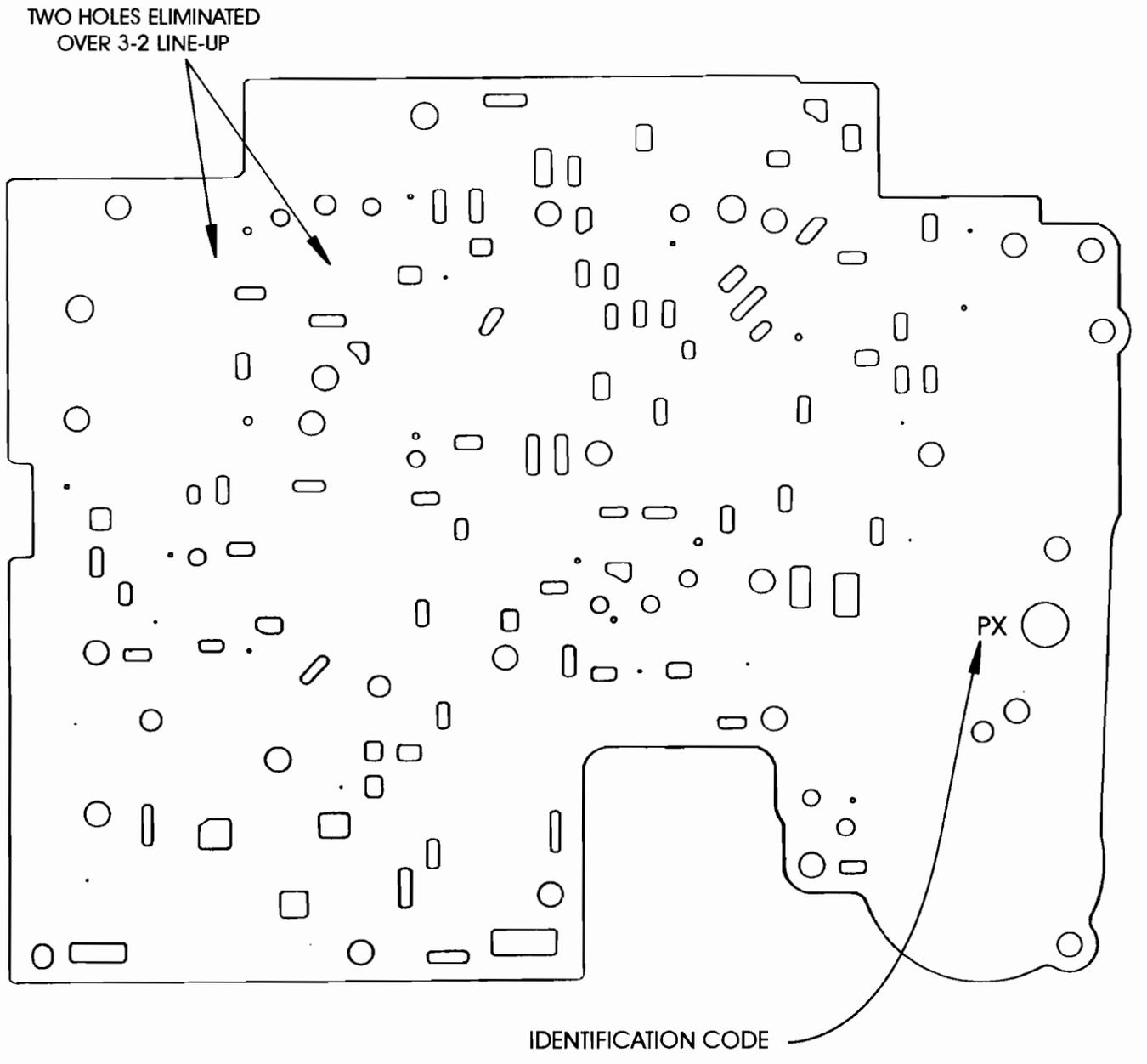


Figure 10

THM 4L60-E
PREMATURE LOW/REVERSE CLUTCH FAILURE (1993-1995 MODELS ONLY)

COMPLAINT: Premature and/or repeat failure of the Low/Reverse Clutch pack, on 1993-1995 models only, and may occur in as little as 5000 miles.

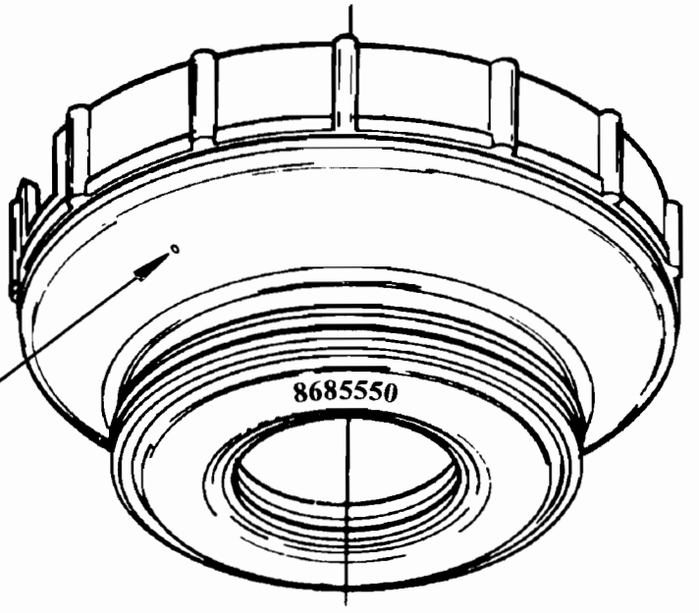
CAUSE: The cause may be, the Low/Reverse Clutch not totally exhausting the apply oil when the shift lever is moved from Park to the Drive position. On 1993-1995 models, the exhaust path for L/R apply oil is not large enough.

CORRECTION: **STEP 1:** Drill a .030" hole through the Low/Reverse Piston, in the tapered area between the outer seal and the center seal, as shown in Figure 11. This will provide an immediate exhaust path for PR apply oil when the selector lever is placed into the Drive position.

STEP 2: Remove the ***ball only*** from the capsule in the reverse passage at the rear of the case worm track area, as shown in Figure 12. Leave the capsule in the case. This will allow a larger volume of oil to the oiston to overcome the leak we have created with the exhaust hole we drilled in the piston. This is now a ***feed-bleed*** system.

STEP 3: ***If you have a "T" Truck,*** which is the small "S" type truck with 4 wheel drive, ***remove and discard the brace from transmission bell to the transfer case,*** as shown in Figure 13. This will require a shorter bolt at the bell housing.

LOW/REVERSE PISTON



DRILL .030" HOLE THROUGH PISTON IN THIS AREA

ENSURE THAT YOUR PISTON HAS CASTING NUMBER 8685550 AS SHOWN ABOVE. IF IT DOES NOT, REPLACE IT WITH OEM PART NUMBER 8685549.

Figure 11

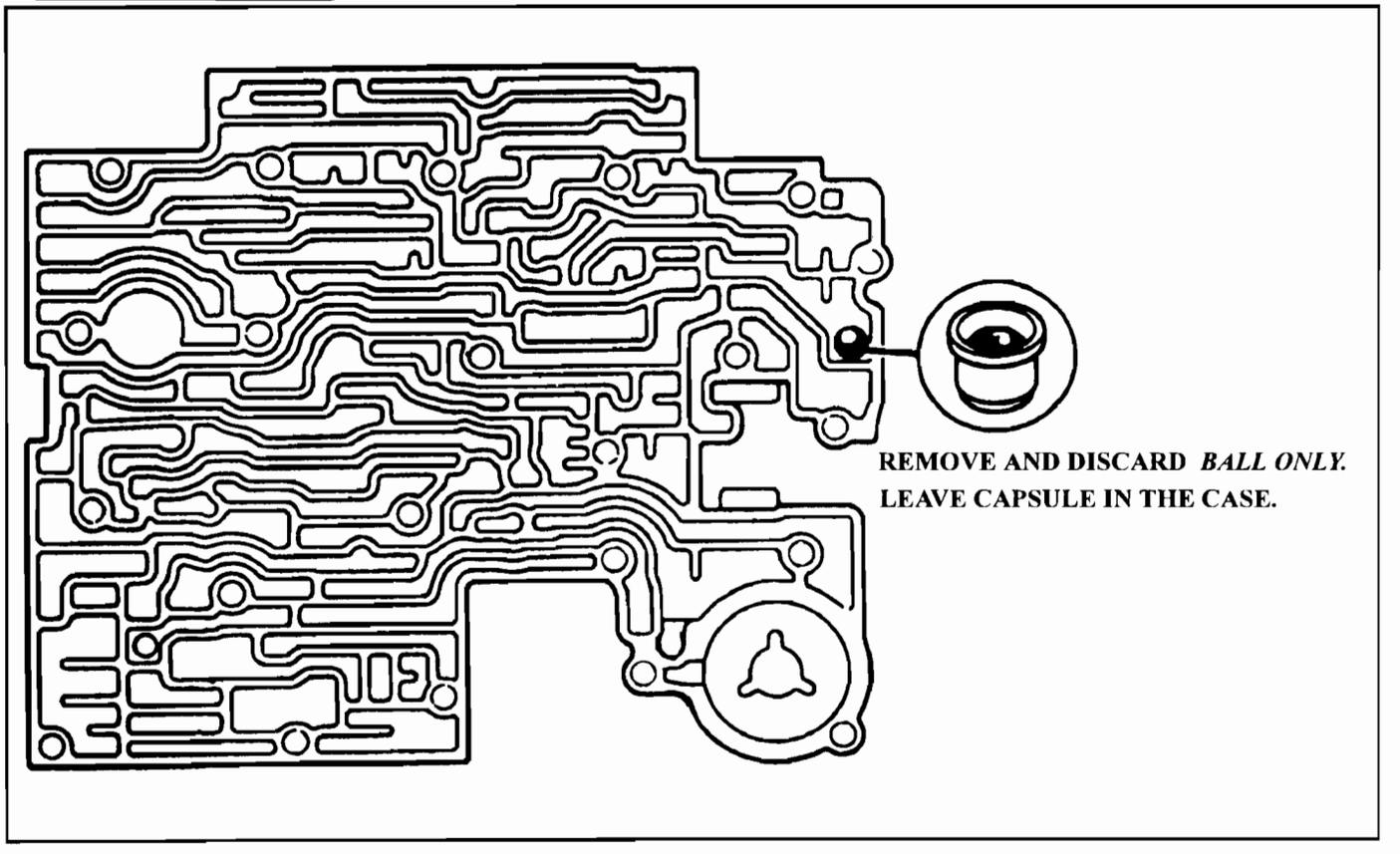


Figure 12

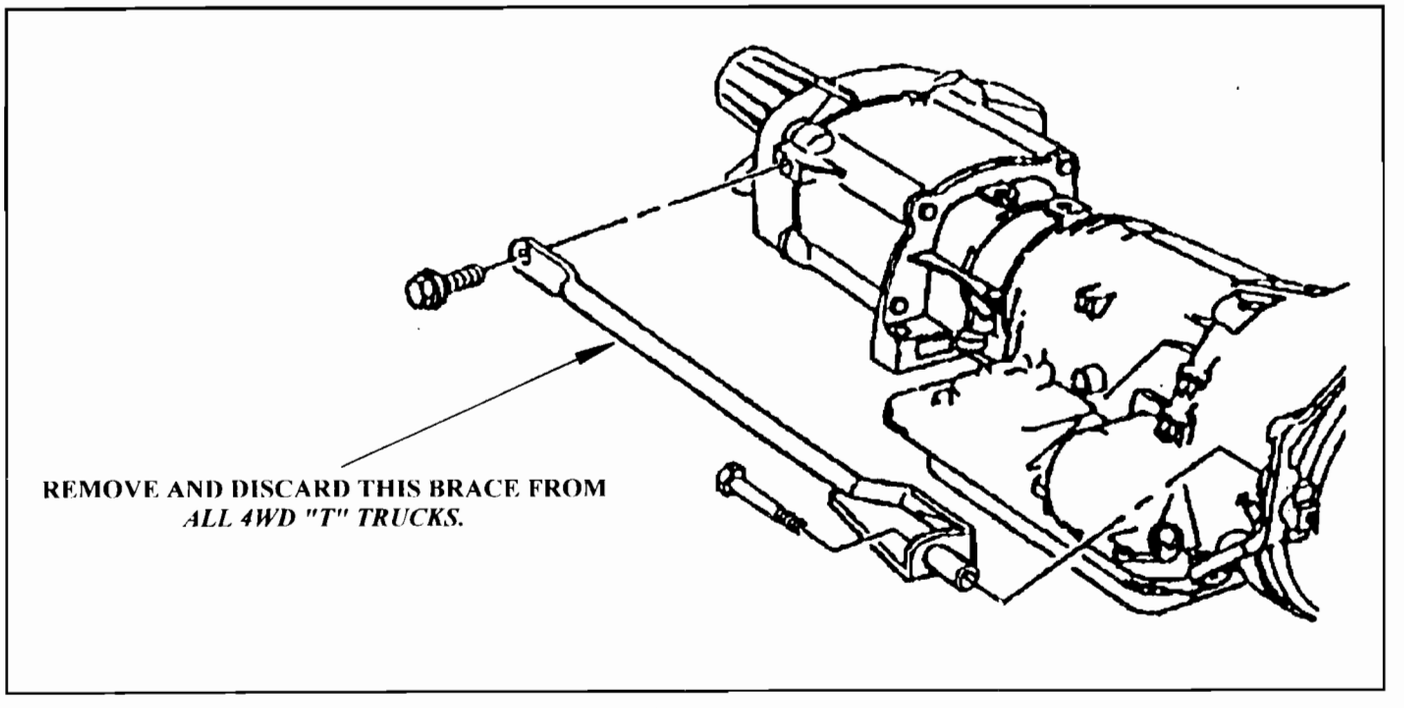


Figure 13

THM 4L60-E
NEW MANUAL VALVE AND VALVE BODY CASTING FOR 1996

CHANGE: Beginning at the start of production for all 1996 models, the THM 4L60-E transmissions were built with a new design Manual Valve, and a new design Valve Body Casting. Refer to Figures 14 and 15.

REASON: Improved exhaust path for Lo/Reverse clutch oil, when the selector lever is in the Drive position, which greatly improves Lo/Reverse clutch durability.

PARTS AFFECTED:

(1) VALVE BODY CASTING - Added exhaust hole through the valve body casting in the manual valve bore, to exhaust Lo/Reverse clutch oil at a faster rate when the manual valve is in the Drive position. Refer to Figure 14 for 1995 models, and to Figure 15 for 1996 models.

(2) MANUAL VALVE - Totally different design to accommodate the added exhaust hole in the valve body casting. Refer to Figure 14 for 1995 models, and to Figure 15 for 1996 models.

INTERCHANGEABILITY:

None of the parts listed above are interchangeable with one another. The 1996 valve body and manual valve cannot be used on 1995 models because of other changes that occured in the 3-2 downshift valve line up, and the 3-2 downshift solenoid.
1995 parts must be used on 1995 models.
1996 parts must be used on 1996 models.

1995 MANUAL VALVE AND VALVE BODY CASTING

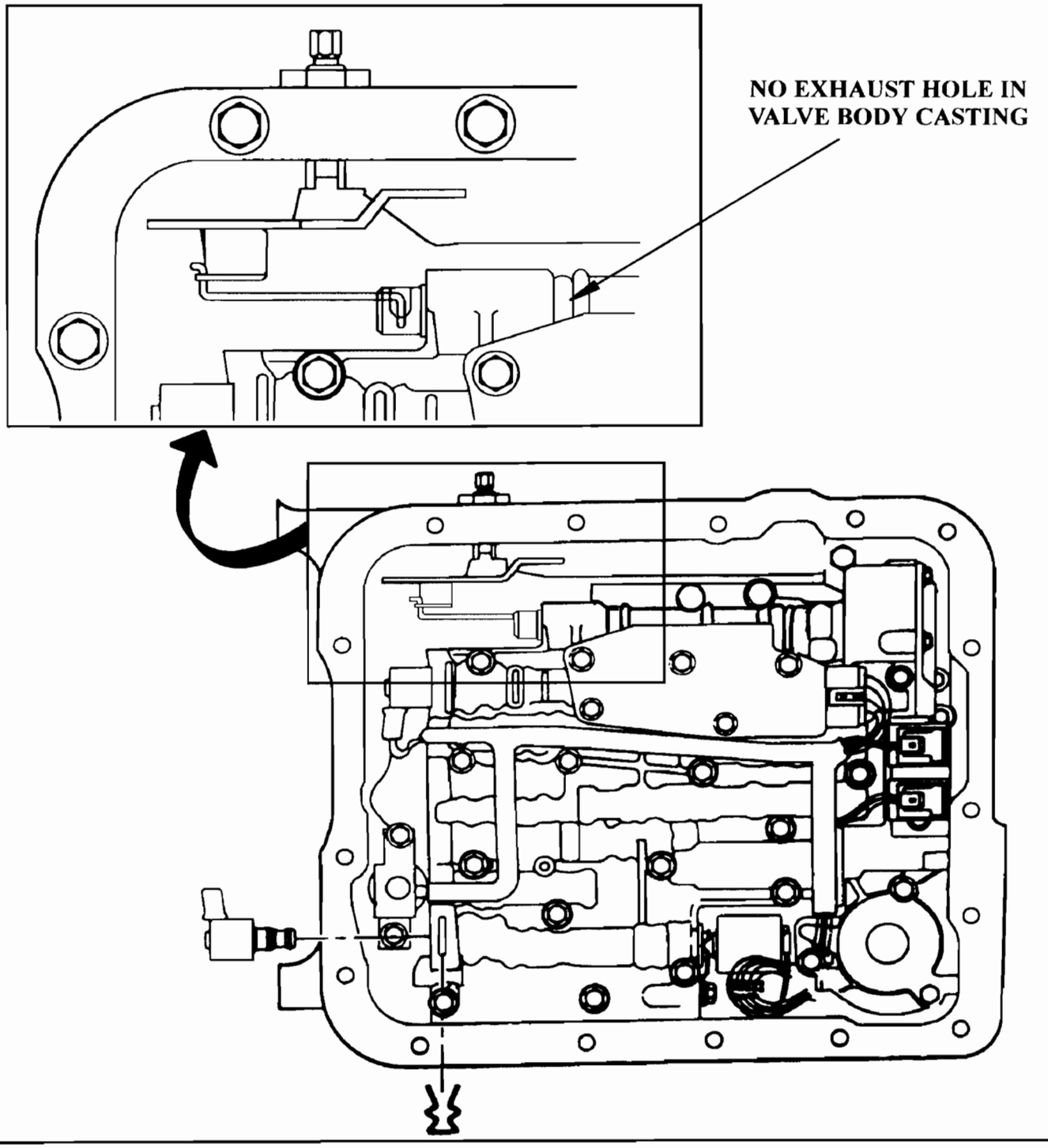


Figure 14

Automatic Transmission Service Group

1996 MANUAL VALVE AND VALVE BODY CASTING

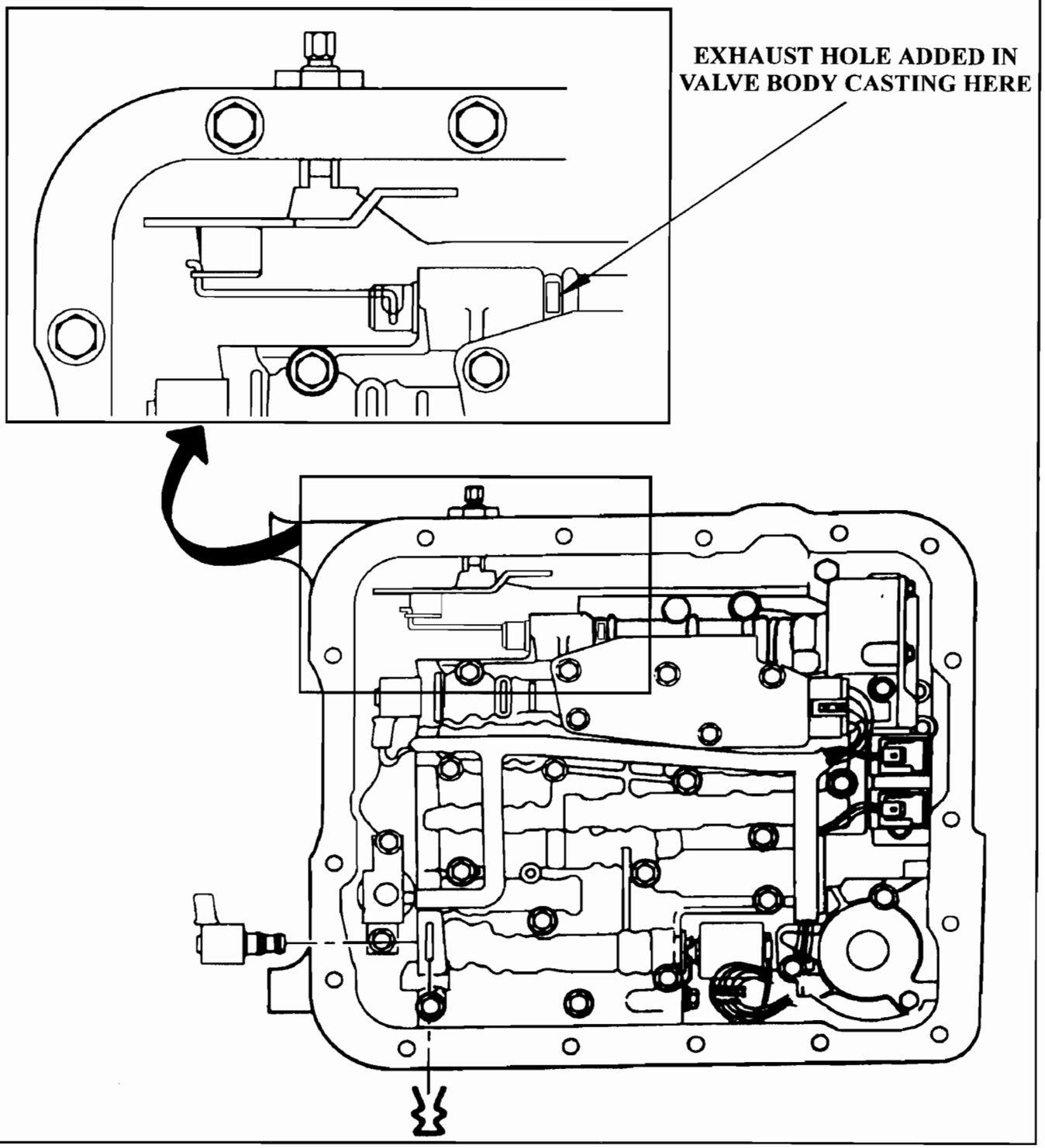


Figure 15

Automatic Transmission Service Group

THM 4L60-E
BOLT-ON BELLHOUSING

CHANGE: Beginning at the start of production for 1996 models, some THM 4L60-E transmissions were built with a bolt-on bellhousing. The 4.3L V6 engine is the only one to recieve the bolt-on bellhousing for 1996 models, and will be expanded to most other engine sizes for 1997. Refer to Figure 16 for illustrations.

REASON: Makes the THM 4L60-E transmission much more versatile, for a wide variety of engine sizes and a wide variety of vehicles.

PARTS AFFECTED:

(1) BELLHOUSING - Now bolted to the main case with eight bolts that require what appears to be a normal 50 Torx-bit to remove. ***These bolts require a "TORX PLUS 50-IP" bit to remove.*** The normal 50 Torx-bit will strip the head on most bellhousing bolts, if used for removal. Refer to Figure 16 for the profile of both bits.

(2) MAIN CASE - Totally different casting to accommodate the bolt-on bellhousing, as shown in Figure 16. There were no changes in worm track configuration, or bolt hole locations for the bottom pan and valve body area.

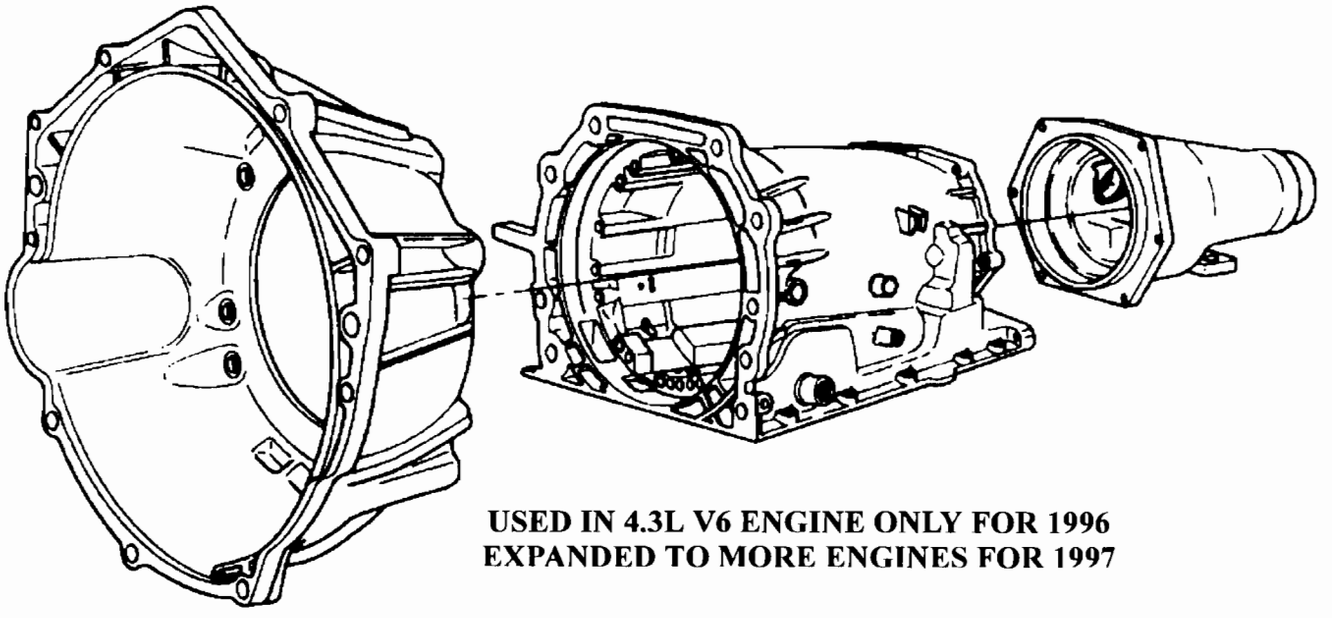
(3) EXTENSION HOUSING - Totally different casting to accommodate the changes in the case design, and notice the new design has six retaining bolts instead of the previous four, as shown in Figure 16.

(4) OIL PUMP BODY - A machined ring has been added to the front of the pump body to accommodate and center the bolt-on bellhousing, as shown in Figure 17.

INTERCHANGEABILITY:

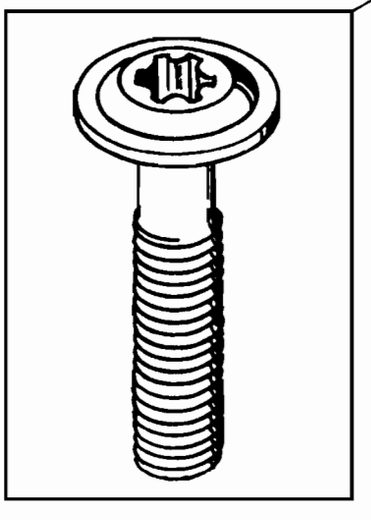
All of the parts listed above are unique to the 1996 model 2-piece case. However, the pump body with the added machined ring, will be found in some 1995 models, and will back service to 1995 models ***only.*** It cannot be used in 93-94 models because of worm track cavity differences that occured in 1995.

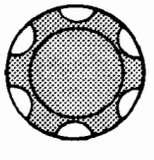
1996 BOLT-ON BELLHOUSING



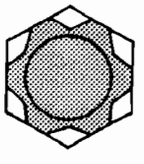
USED IN 4.3L V6 ENGINE ONLY FOR 1996
EXPANDED TO MORE ENGINES FOR 1997

USE "TORX-PLUS 50-IP" BIT ONLY ON BELLHOUSING BOLTS





"TORX PLUS 50-IP"
OK TO USE



50 TORX BIT
DO NOT USE

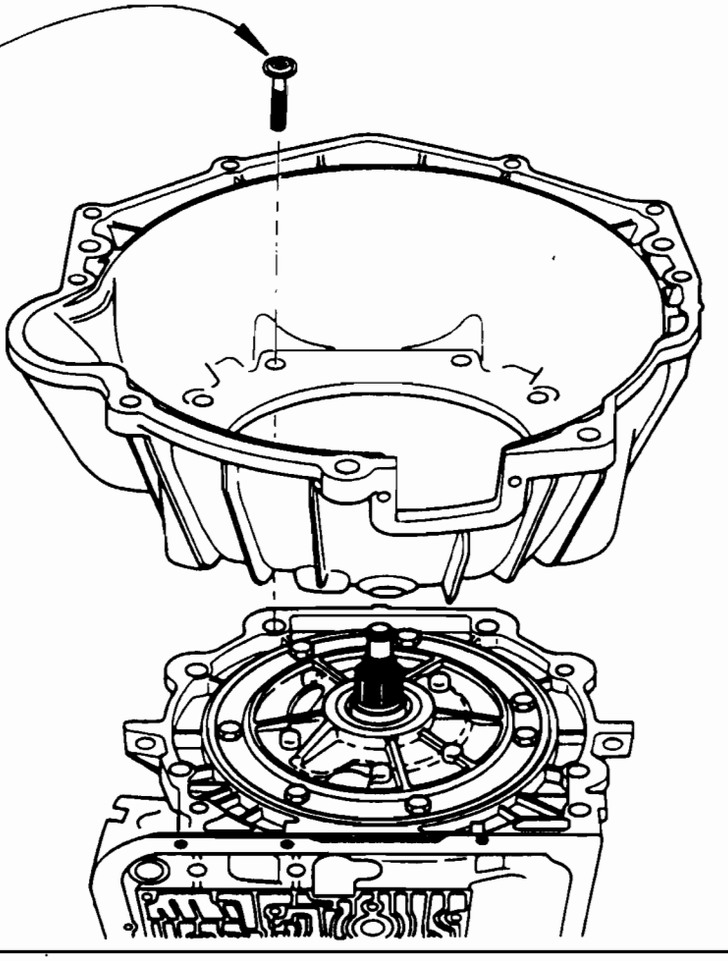
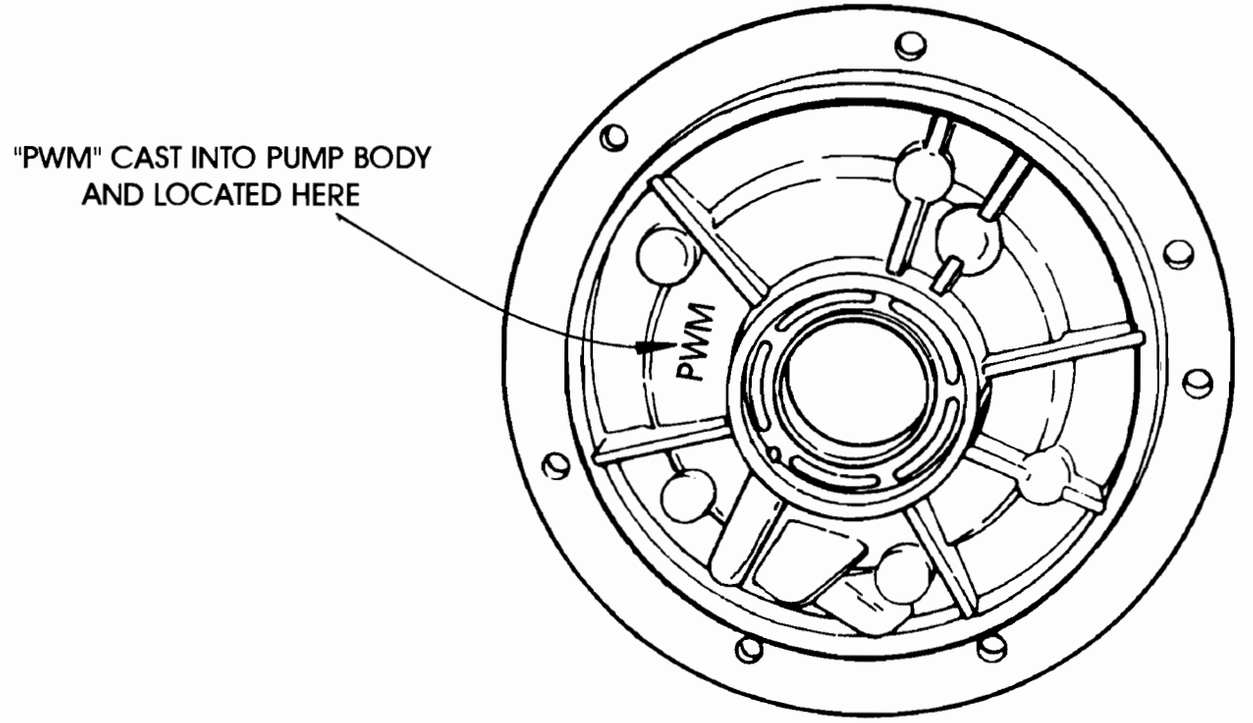


Figure 16

1995-1996 "PWM" PUMP BODY
FOR REGULAR CASE



1996 "PWM" PUMP BODY
FOR BOLT-ON BELL HOUSING

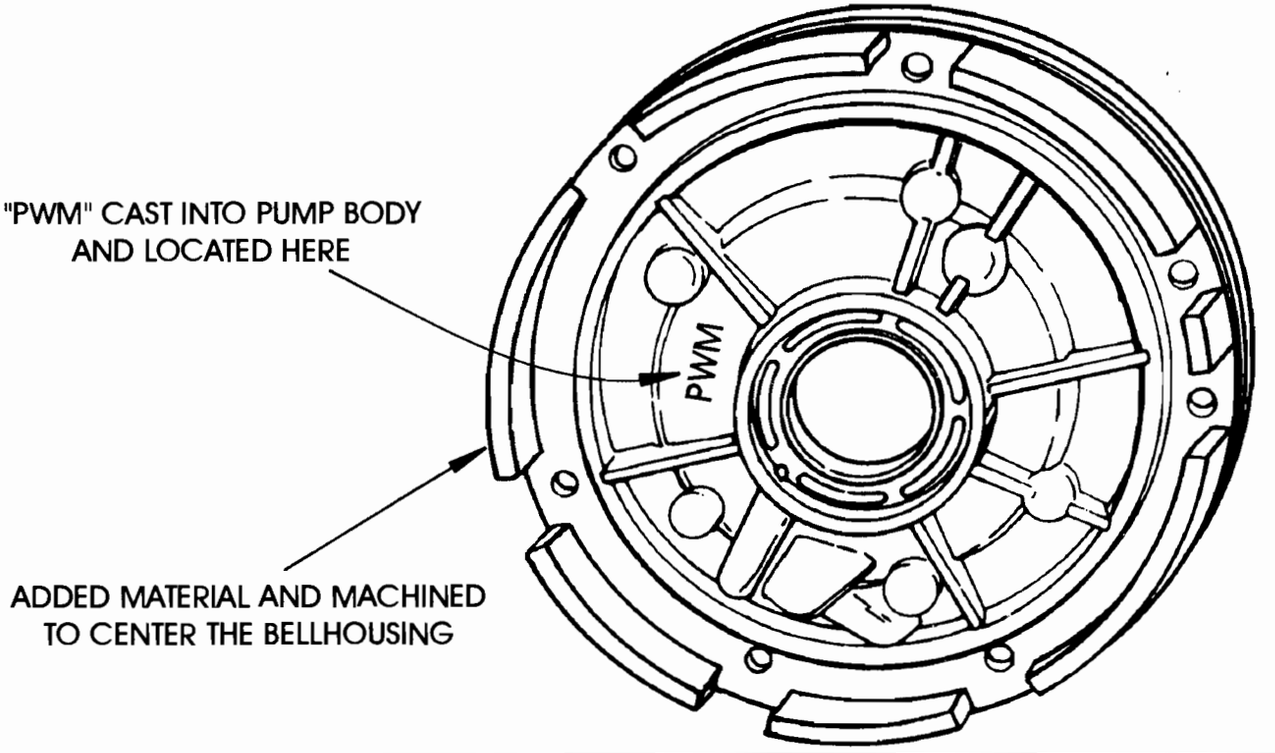


Figure 17

THM 4L60-E
"SKF" SINGLE CAGE FORWARD SPRAG CHANGE

CHANGE: Beginning in January 1995, all THM 4L60-E transmissions were built with dimensional changes on the Forward Sprag Inner Race and the Overrun Clutch Hub.

REASON: Greatly improved durability of the "SKF" Forward Sprag Assembly.

PARTS AFFECTED:

(1) FORWARD SPRAG INNER RACE - Dimensional changes on the new design inner race, and it now fully supports the sprag end bearing on the end bearing inside diameter. Compare the previous cutaway illustration in Figure 19, with the current cutaway illustration in Figure 20.

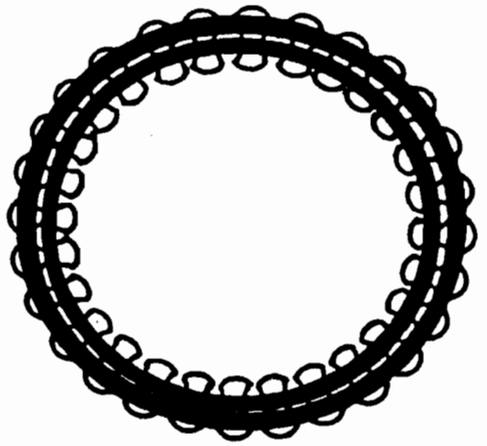
(2) OVERRUN CLUTCH HUB - Dimensional changes on the new design clutch hub, with the elimination of the raised tabs on the teeth. The back side of the clutch hub is now flat. Compare the previous clutch hub illustration in Figure 19, with the current clutch hub illustration in Figure 20.

INTERCHANGEABILITY:

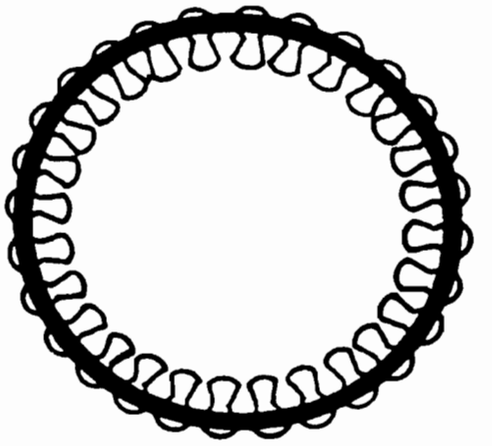
The new design parts listed above will not interchange unless both are used as a package, and they are not serviced seperately. Complete Forward Sprag Assembly is available as a service package under OEM part number 8657928.

NOTE: Do not use the "SKF" single cage aprag, unless the new design inner race and the new design overrun clutch hub are used with it as a package (See Figure 18).

FORWARD SPRAG ASSEMBLY



DOUBLE CAGE SPRAG "OK TO USE"



"DO NOT USE" UNLESS USED WITH THE NEW DESIGN PARTS

Figure 18

PREVIOUS "SKF" INPUT SPRAG

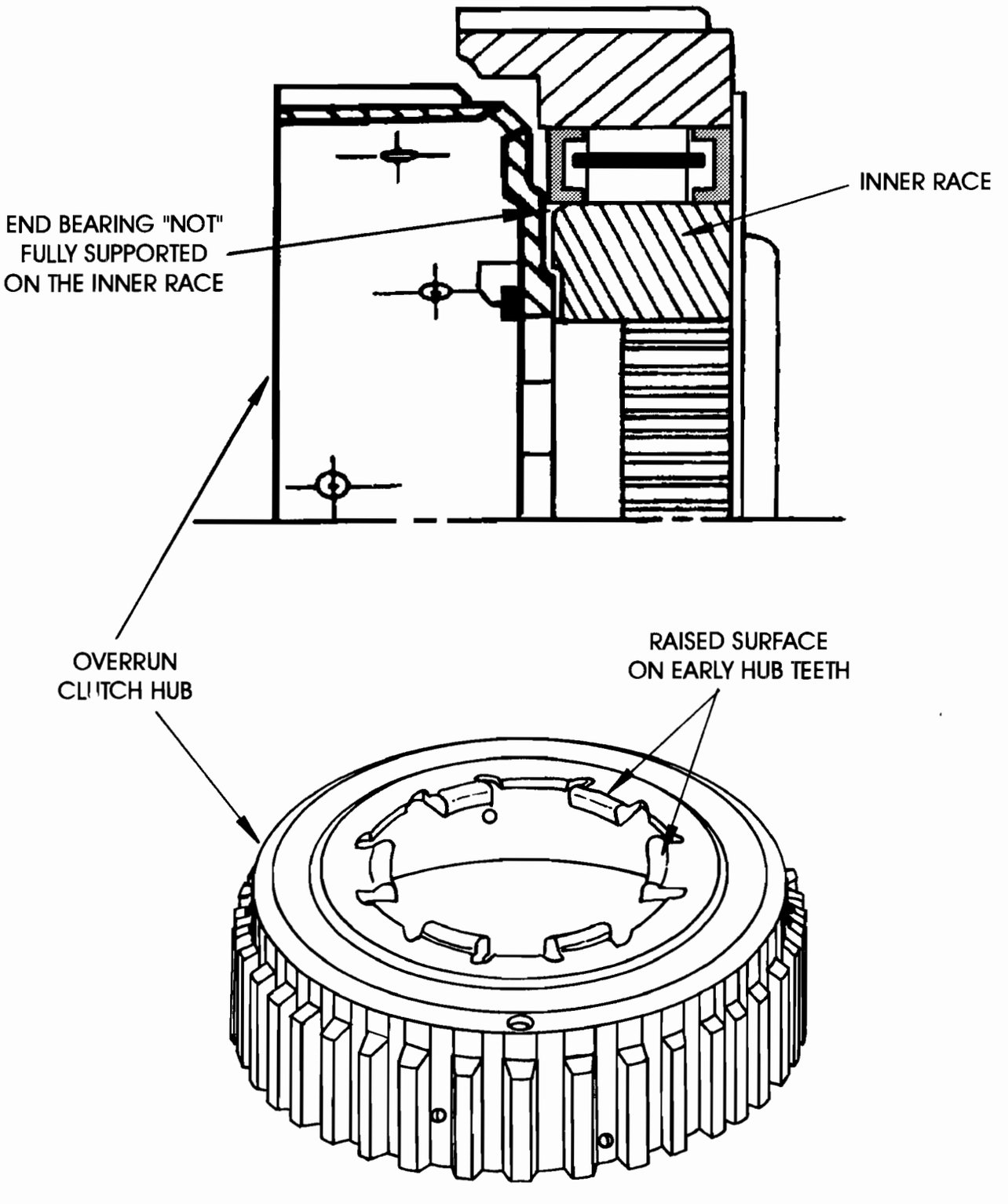


Figure 19

CURRENT "SKF" INPUT SPRAG

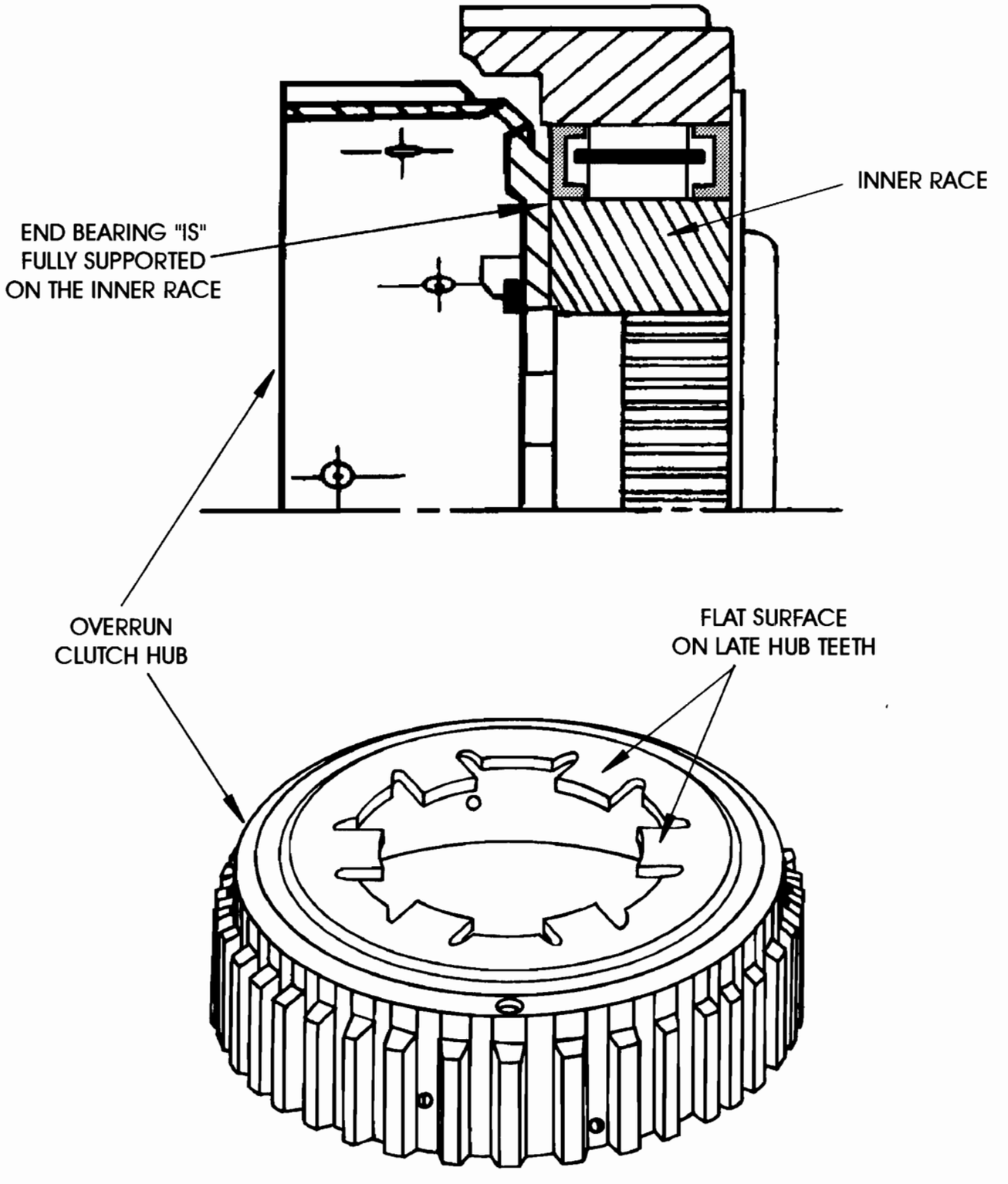


Figure 20

Automatic Transmission Service Group

THM 4L60-E
PUSH-IN COOLER LINE FITTINGS FOR TRUCK AND VANS

CHANGE: Beginning at the start of production for 1996 models, all "C" and "K" Trucks and "G" Vans were built with a new design "Push-In" cooler line fittings for the transmission, as shown in Figure 21.

REASON: Ease of installation at the Truck Assenbly Plants.

PARTS AFFECTED:

VEHICLE COOLER LINES - Modified oil cooler lines to accommodate the new design "Push-In" transmission cooler line fittings.

NOTE: General Motors recommends that the retaining "Clip" in the new design cooler line fittings be replaced every time that the cooler line is removed.

SERVICE INFORMATION:

Cooler Line Fitting (5/16" Lines)	8637742
Cooler Line Fitting (3/8" Lines)	8651654
Cooler Line Fitting (Push-In)	24205102
Cooler Line Fitting Retaining Clip (Push-In)	24205103

1996 PUSH-IN COOLER LINE FITTINGS
TRUCK AND VAN ONLY FOR 1996

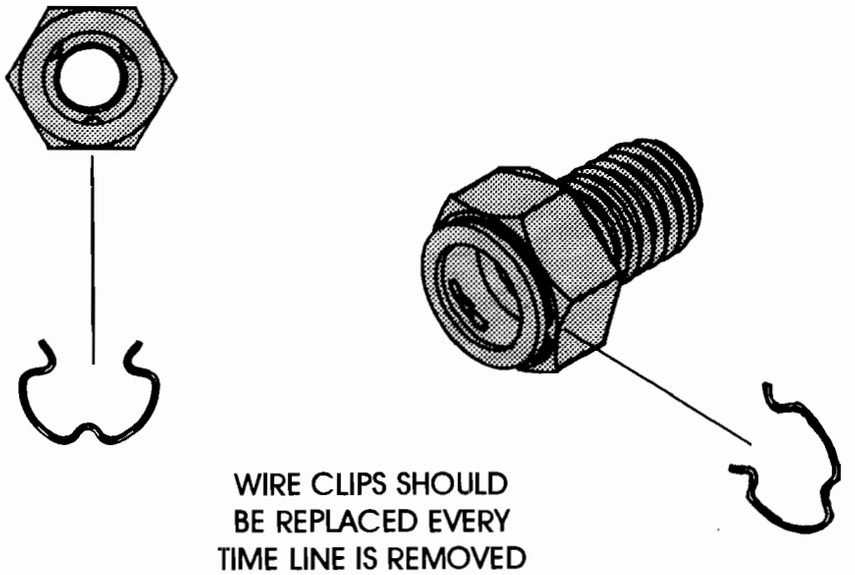


Figure 21

THM 4L60-E
NEW DESIGN OUTPUT SHAFT SPEED SENSOR

CHANGE: Beginning at the start of production for 1996 models, some THM 4L60-E transmissions were built with a new design Output Shaft Speed Sensor, as shown in Figure 22. Corvette models will be the only vehicle that will continue to use the previous design speed sensor, as shown in Figure 22.

REASON: Ease of assembly and cost savings.

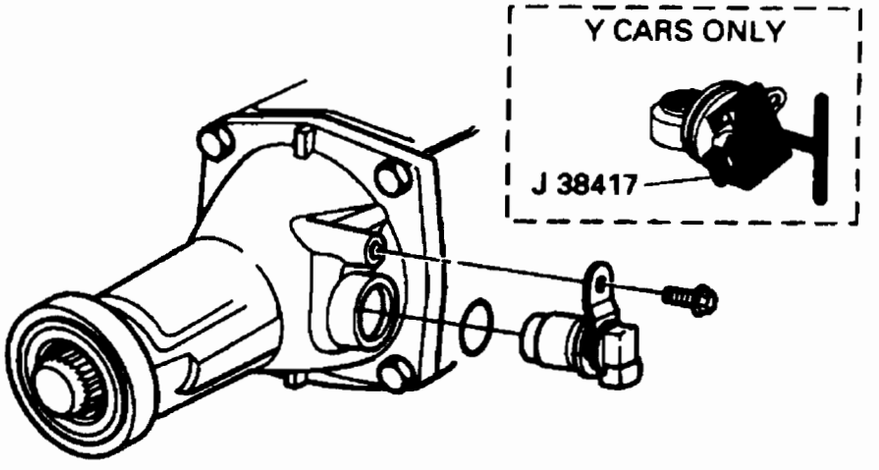
PARTS AFFECTED:

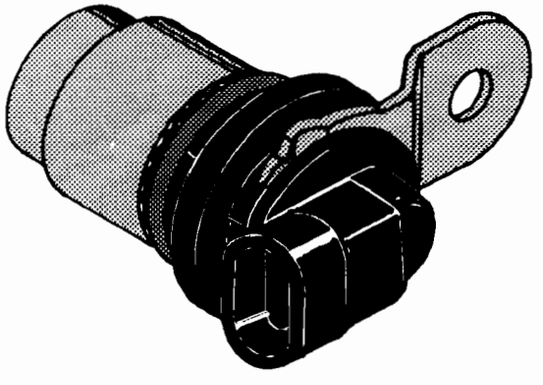
(1) EXTENSION HOUSING - New casting with smaller speed sensor bore diameter, to accept the new design Output Shaft Speed Sensor, as shown in Figure 22.

SERVICE INFORMATION:

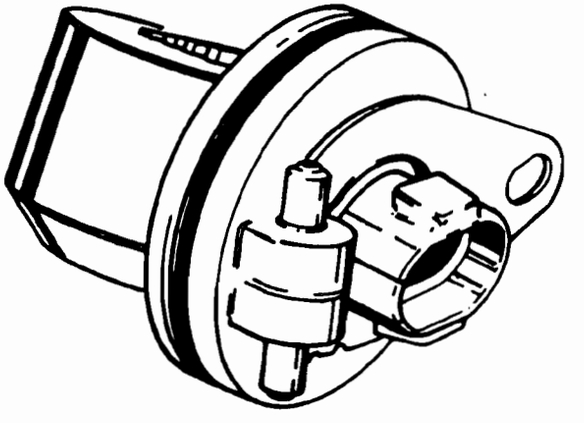
Output Shaft Speed Sensor (Previous Design) 8673299
Output Shaft Speed Sensor (1996 New Design) 10456194

1996 SPEED SENSORS





1996 SPEED SENSOR
ALL "EXCEPT" CORVETTE
PART NUMBER 10456194



1996 SPEED SENSOR
CORVETTE ONLY
PART NUMBER 8673299

Figure 22

THM 4L60-E
SOFT 1-2 UPSHIFT

COMPLAINT: Some 1994 model vehicles, equipped with the THM 4L60-E transmission may exhibit a soft 1-2 upshift condition.

CAUSE: The cause may be, calibration of the 1-2 accumulator valve in the valve body.

CORRECTION: There is now available a new calibration service package consisting of a 1-2 accumulator valve, valve spring, and 1-2 accumulator valve bushing for the valve body. These are items 370, 371, and 372, as shown in Figure 23 below. This new service package is available under OEM part number 24202698.

SERVICE INFORMATION:

1-2 Accumulator Valve Service Package 24202698

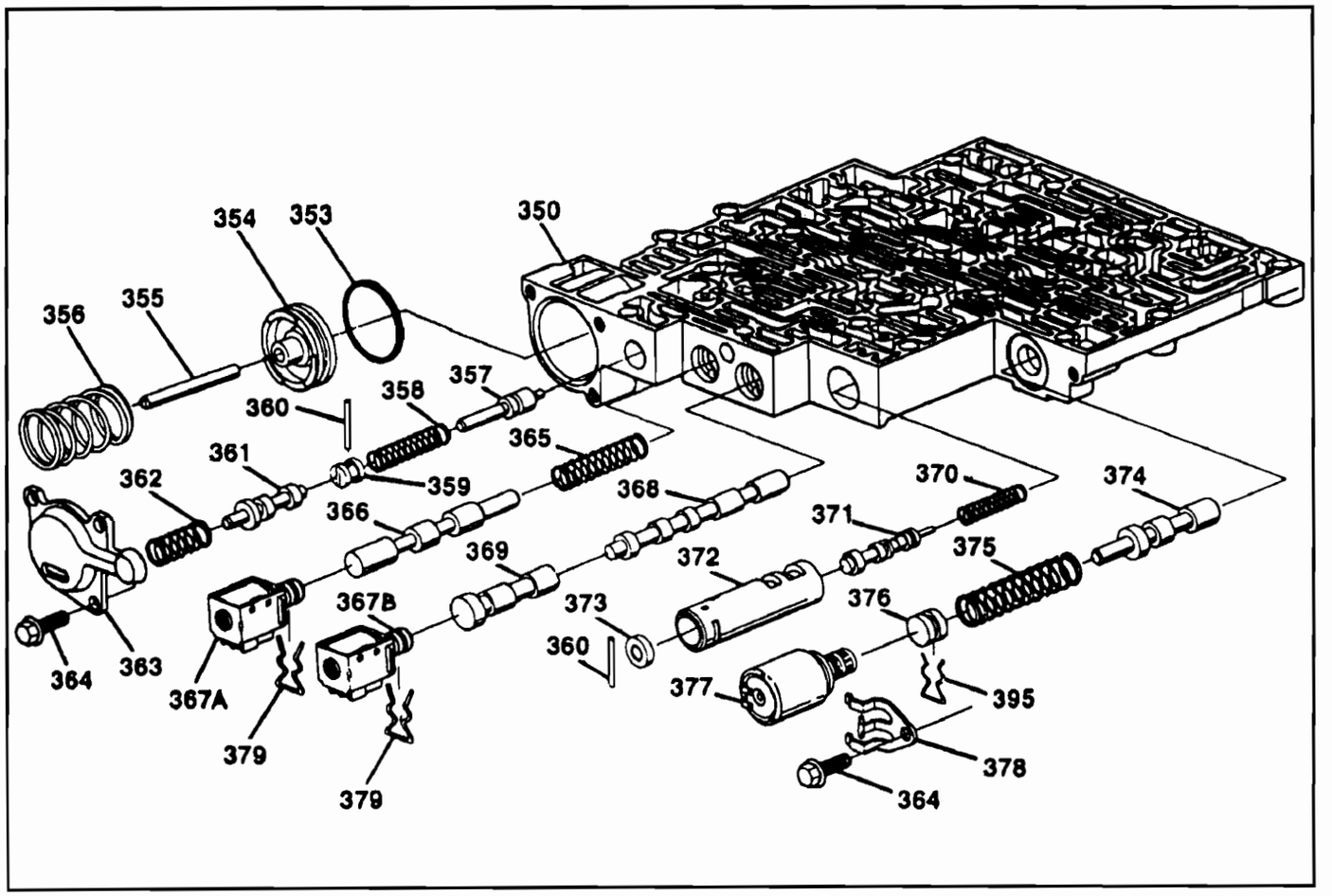


Figure 23

THM 4T60-E

ENGINE STALLS IN DRIVE ONLY DOES NOT STALL IN REVERSE

COMPLAINT: After rebuild, the vehicle will have a good reverse, but when the manual shift lever is placed into the Drive position, the engine will stall immediately.

CAUSE: The cause may be, the wires and connector for Shift Solenoid "B" and the TCC Apply Solenoid reversed. This can happen very easily when the wire conduit is removed from the internal wiring harness (See Figure 1). In this configuration, the transaxle will be in 4th gear, with the converter clutch applied when the selector lever is placed into Drive.

CORRECTION: Install the solenoid connectors in their proper locations. ***Most all*** of the 4T60-E transaxles, have the wire colors on the internal wire harness as shown in Figure 1. However, some models are different colors. To positively identify the wire and connector that belongs on the TCC Apply Solenoid, look for the diode in the harness (under shrink-wrap), as shown in Figure 1. The other long wires and connector will go to Shift Solenoid "B" ***regardless*** of the color of the ground wire, which could be Blue, Green, or Yellow, depending on the model.

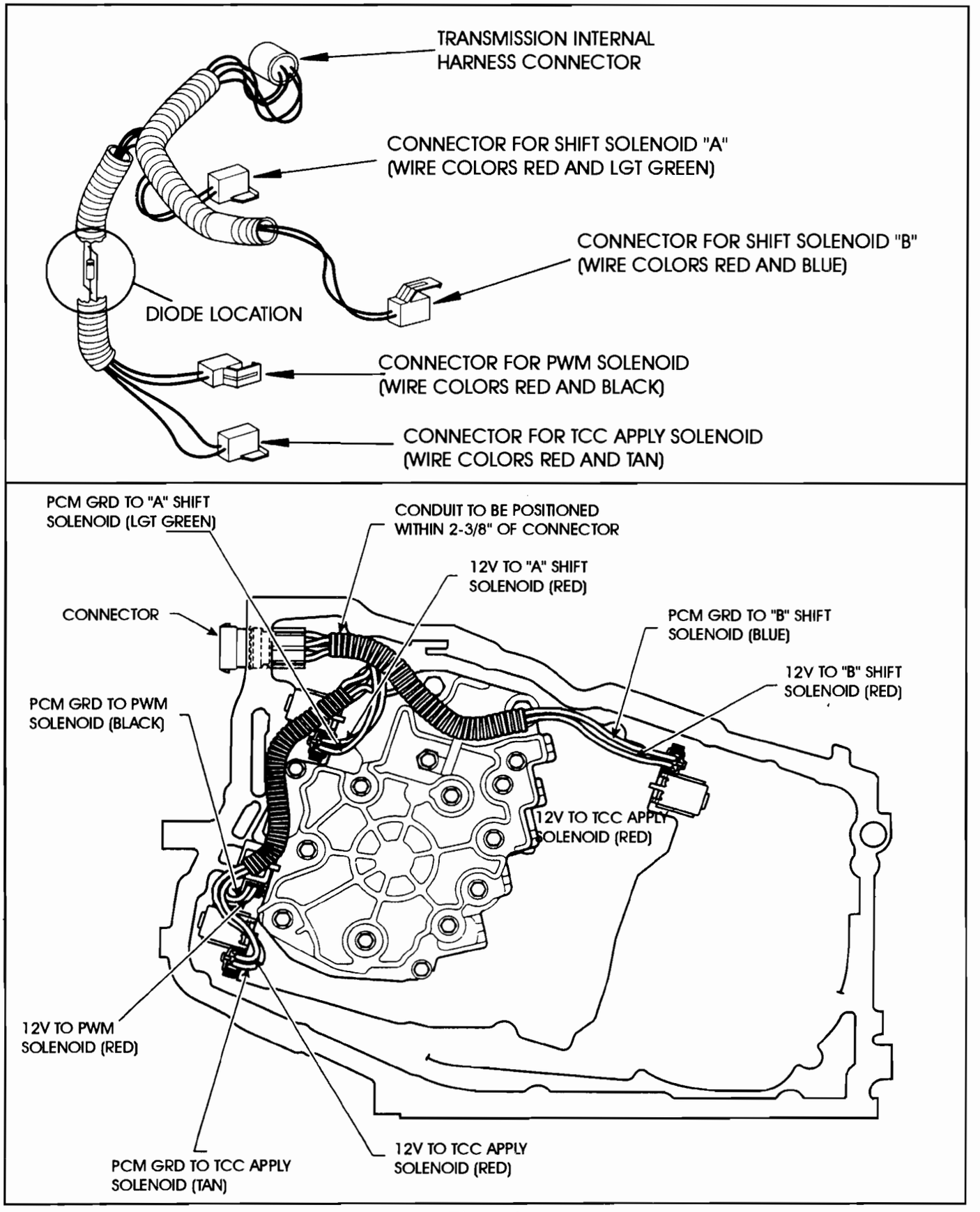

TRANSMISSION INTERNAL HARNESS CONNECTOR
CONNECTOR FOR SHIFT SOLENOID "A" (WIRE COLORS RED AND LGT GREEN)
CONNECTOR FOR SHIFT SOLENOID "B" (WIRE COLORS RED AND BLUE)
DIODE LOCATION
CONNECTOR FOR PWM SOLENOID (WIRE COLORS RED AND BLACK)
CONNECTOR FOR TCC APPLY SOLENOID (WIRE COLORS RED AND TAN)
PCM GRD TO "A" SHIFT SOLENOID (LGT GREEN)
CONDUIT TO BE POSITIONED WITHIN 2-3/8" OF CONNECTOR
12V TO "A" SHIFT SOLENOID (RED)
CONNECTOR
PCM GRD TO "B" SHIFT SOLENOID (BLUE)
12V TO "B" SHIFT SOLENOID (RED)
PCM GRD TO PWM SOLENOID (BLACK)
12V TO TCC APPLY SOLENOID (RED)
12V TO PWM SOLENOID (RED)
PCM GRD TO TCC APPLY SOLENOID (TAN)
12V TO TCC APPLY SOLENOID (RED)

Figure 1

THM 4T60-E

TIE-UP IN PARK AND REVERSE
MOVES FORWARD IN NEUTRAL
TIE-UP ON 2-3 SHIFT

COMPLAINT: After rebuild, the vehicle displays a tie-up condition (In Gear) while the selector lever is in the Park position, a tie-up condition in Reverse, moves forward in Neutral, and a tie-up condition on the 2-3 shift.

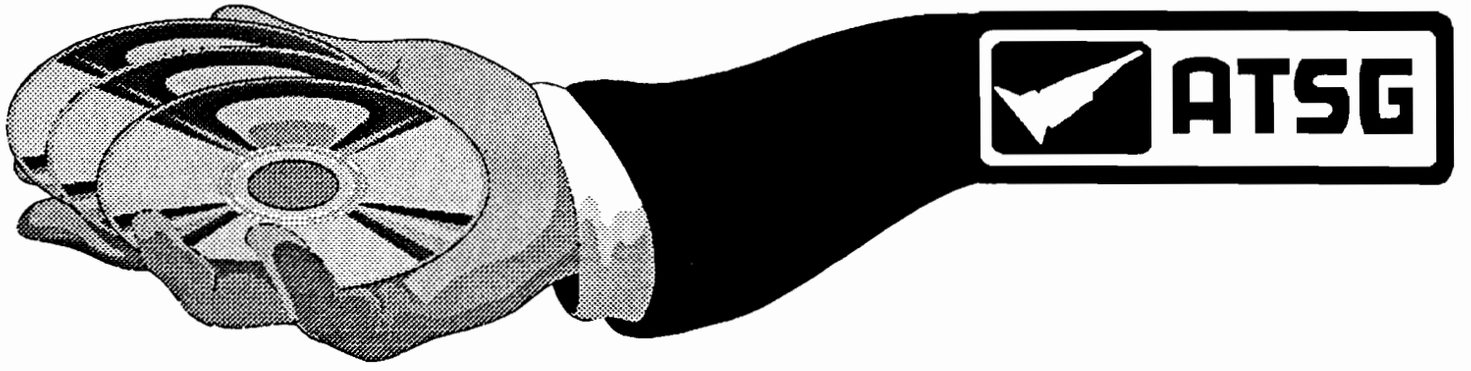
CAUSE: The cause may be, the rear lube pipe and the apply pipe for the 2-1 manual servo, reversed in the accumulator housing cover (See Figure 2). This will allow lube oil to apply the 2-1 manual servo and the band as soon as the engine is started.

CORRECTION: Install the tubes into the accumulator housing cover with the 2-1 manual servo apply pipe in the "Center" hole, as shown in Figure 3, and the rear lube pipe in the right hand hole, as shown in Figure 3. The forward servo apply pipe cannot be installed in the wrong hole as it is a larger diameter than the other two.

NOTE:
Figure 2 shows the "Incorrect" assembly of the pipes.
Figure 3 shows the "Correct" assembly of the pipes.

HERE IT IS!!!

THE MOST COMPLETE LINE OF DOMESTIC AND IMPORT MANUALS ATSG TECHNICAL BULLETINS FROM 1986 - '95 ALL IN THE PALM OF YOUR HAND



Are you tired of looking through piles of technical information for a bulletin or manual and not remembering where you saw it last? The paper chase is over. ATSG now has technical bulletins 1986 - 1995 Most Domestic & Import manuals on CD-ROM. Search for information first by manufacturer then by transmission type, its never been easier!! At the touch of a button you can:

- SEARCH FOR INFORMATION QUICKLY
- SAVE PERSONAL NOTES DIRECTLY ON THE PAGE FOR FUTURE REFERENCE
- PRINT OR FAX SPECIFIC PAGES OR COMPLETE DOCUMENTS

Don't waste any more valuable time searching through piles and piles of paper. Order the ATSG CD-ROM NOW!!!

FOR MORE INFORMATION CALL
(800) 245-7722

"INCORRECT" INSTALLATION

REAR LUBE PIPE IS IN CENTER HOLE IN ACCUMULATOR COVER

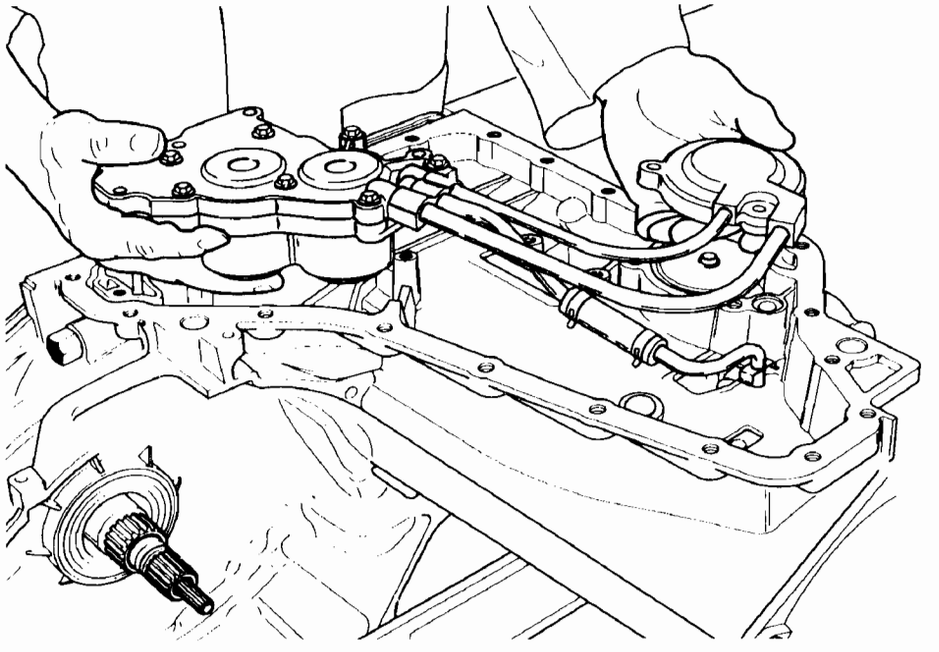


Figure 2

"CORRECT" INSTALLATION

REAR LUBE PIPE IS IN RIGHT HOLE IN ACCUMULATOR COVER

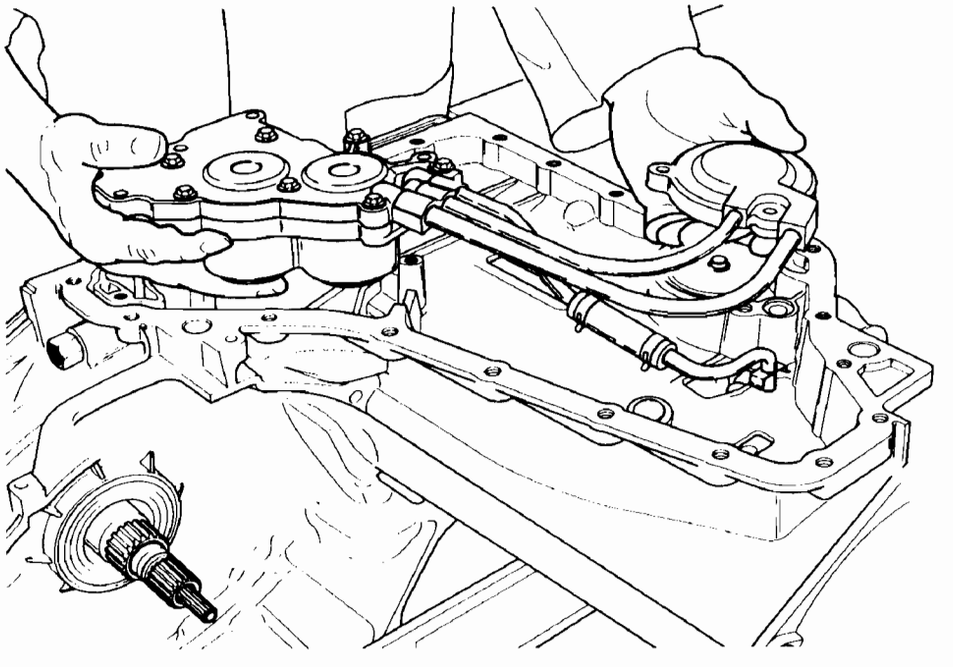


Figure 3

THM 4T60-E
TRANSAXLE CASE SEAL POCKET CHANGE AND NEW DESIGN 2-1 SERVO SEAL

CHANGE: Beginning on February 20, 1995, approximately half way through the 1995 model year, all THM 4T60-E transaxles were built using a new design 2-1 servo square cut seal, which also required a deeper seal pocket in the transaxle case (See Figure 4). Since this was implemented as a running change about half of the 95 models will require the previous seal and the other half will require the new design seal.

REASON: Developed to improve the assembly process.

PARTS AFFECTED:

(1) 2-1 SERVO "SQUARE CUT" SEAL - New design square cut seal was made twice as tall as the previous design seal. The new design square cut seal measires .132" tall, and the previous design measures .066" tall, as shown in Figure 4. The wall thickness and seal diameter did not change. This seal retains drive oil in the forward servo circuit to apply the forward band.

(2) TRANSAXLE CASE - The seal pocket in the case was machined deeper to accommodate the new design square cut seal. The new design seal pocket measures .112" deep, and the previous design seal pocket measures .054" deep, as shown in Figure 4.

NOTE: ***The new design square cut seal is not currently included in all gasket packages, but is available seperately under OEM service package part number 24204817, which will get you both design seals.***

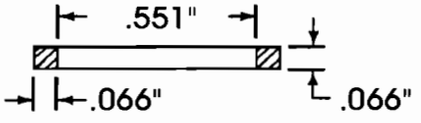
INTERCHANGEABILITY:

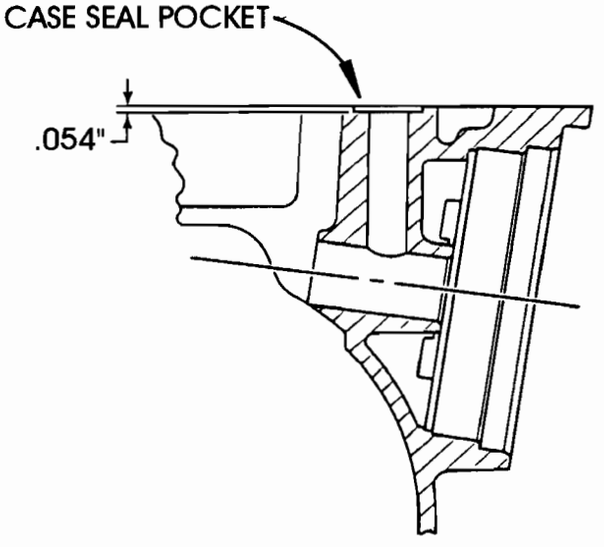
The 2-1 servo square cut seals are not interchangeable.
Previous design seal must be used in .054" deep case pocket.
New design seal must be used in .112" deep case pocket.

SERVICE INFORMATION:

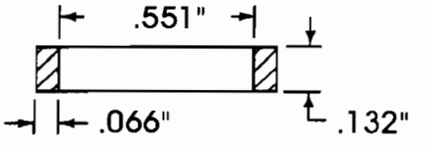
2-1 Servo Square Cut Seal Package (Includes Both Seals) 24204817

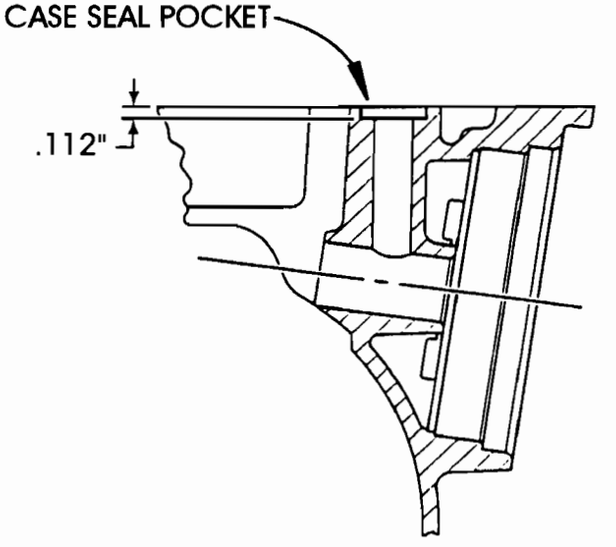
PREVIOUS DESIGN
1991-PARTIAL 1995





NEW DESIGN
PARTIAL 1995-1996





SEAL AND POCKET
LOCATION IN CASE

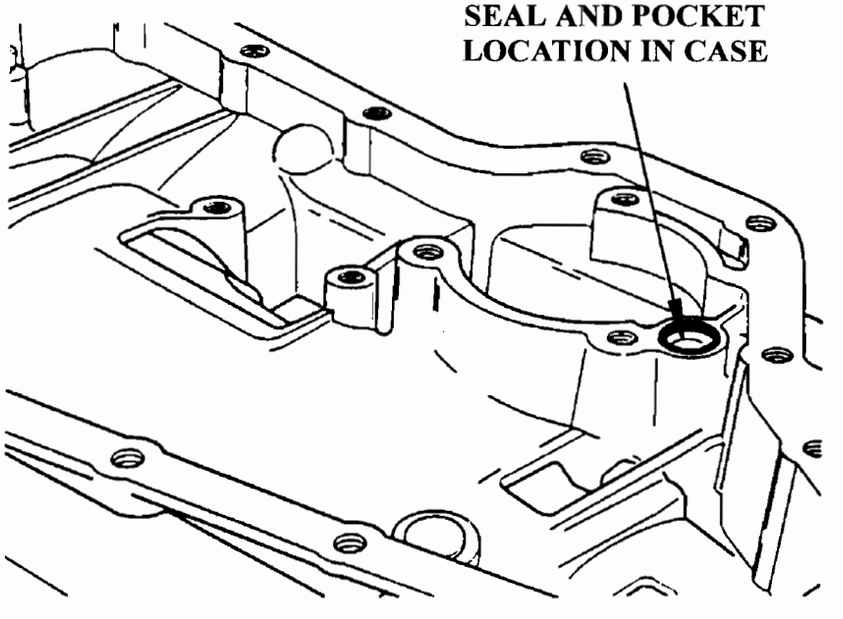


Figure 4

THM 4T60-E
1-2 ROLLER CLUTCH FAILURE

COMPLAINT: NO. 1: Some 1991-1995 model vehicles equipped with the THM 4T60-E transaxle may exhibit a no movement condition, with the selector lever in the D4 or D3 ranges, but will move when the selector lever is placed into D2 or Lo range.

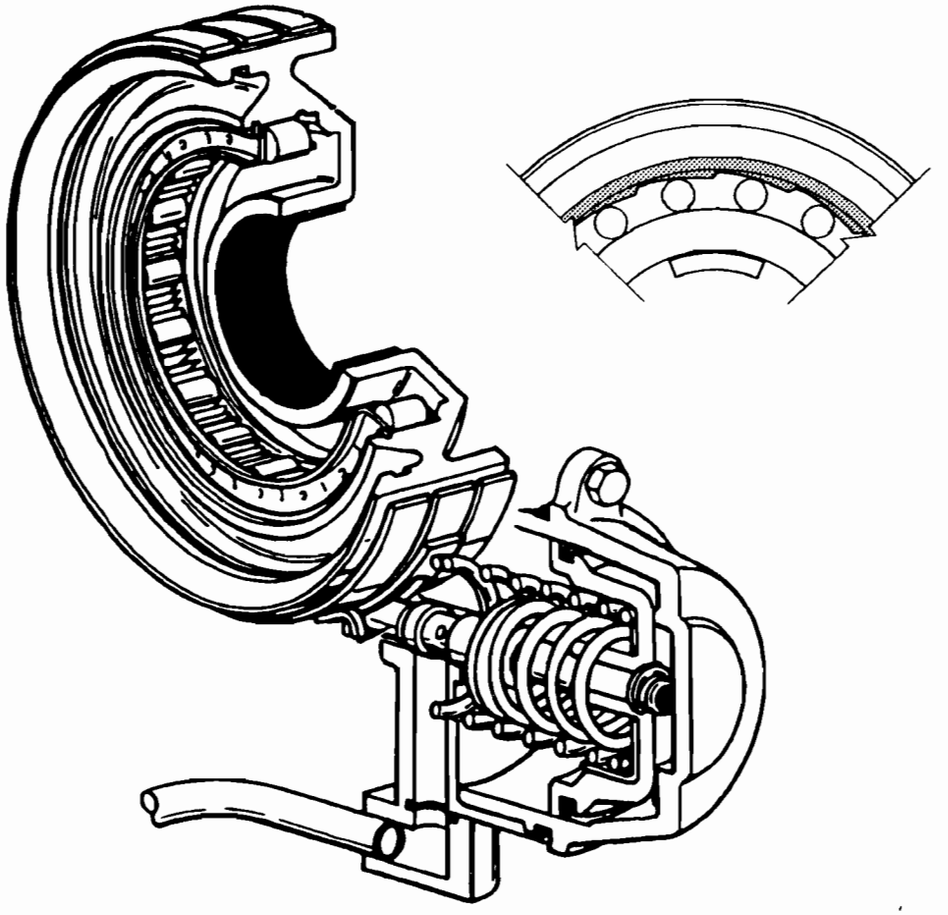
NO. 2: When the engine RPM is increased with the selector lever in the Park or Neutral position, you may hear a noise that sounds like "Marbles in a Can", but still moves and shifts properly.

CAUSE: The cause for both complaints listed above is a 1-2 roller clutch failure.

CORRECTION: Replace the 1-2 Roller Clutch Assembly and any related parts that may be damaged or broken (See Figure 5).
Before installing into the transaxle, always replace the OEM 1-2 roller clutch springs with Sonnax part number ***K84956-SP***, which contains 16 ***stronger*** accordian springs and is available from your aftermarket parts supplier (See Figure 5).
This is recommended as part of every rebuild to increase transaxle durability.

WARNING: ***DO NOT EXCEED 3000 RPM WITH THE SELECTOR LEVER IN REVERSE AND THE WHEELS OFF THE GROUND.***
IF YOU DO THIS WITH OEM 1-2 ROLLER CLUTCH SPRINGS, YOU CAN FAIL THE 1-2 ROLLER CLUTCH BEFORE IT EVER LEAVES THE SHOP!

1-2 ROLLER CLUTCH ASSEMBLY



ALWAYS REPLACE THE 1-2 ROLLER CLUTCH SPRINGS WITH SONNAX PART NUMBER K84956-SP

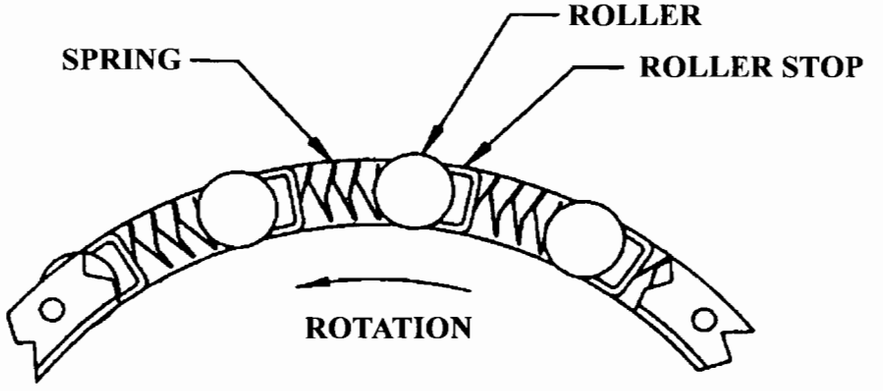


Figure 5

THM 4T60-E
NEW DESIGN 1-2 ROLLER CLUTCH

CHANGE: Beginning at the start of production for 1996 models, all THM 4T60-E transaxles were built with a new design 1-2 Roller Clutch Assembly, as shown in Figure 6.

REASON: Eliminates a potential high speed freewheel failure and reduces the number of parts needed for the assembly process.

PARTS AFFECTED:

(1) 1-2 ROLLER CLUTCH SUPPORT - Roller clutch cam is now the inside diameter design instead of the previous outside diameter design, and the bushing that supports it on the final drive ring gear has doubled in width for much improved stability of the 1-2 Roller Clutch Support. Refer to Figure 6 for illustrations.

(2) THRUST BEARING - Dimensional changes to accommodate the new design 1-2 roller clutch support (See Figure 6).

(3) 1-2 SUPPORT SPACER - Eliminated, as shown in Figure 6.

(4) 1-2 ROLLER CLUTCH ASSEMBLY - Dimensional changes to accommodate the new inside diameter cam design 1-2 roller clutch parts, as shown in Figure 6.

(5) 1-2 ROLLER CLUTCH SNAP RING - Eliminated, as shown in Figure 6.

(6) 1-2 ROLLER CLUTCH INNER RACE - Eliminated, as shown in Figure 6.

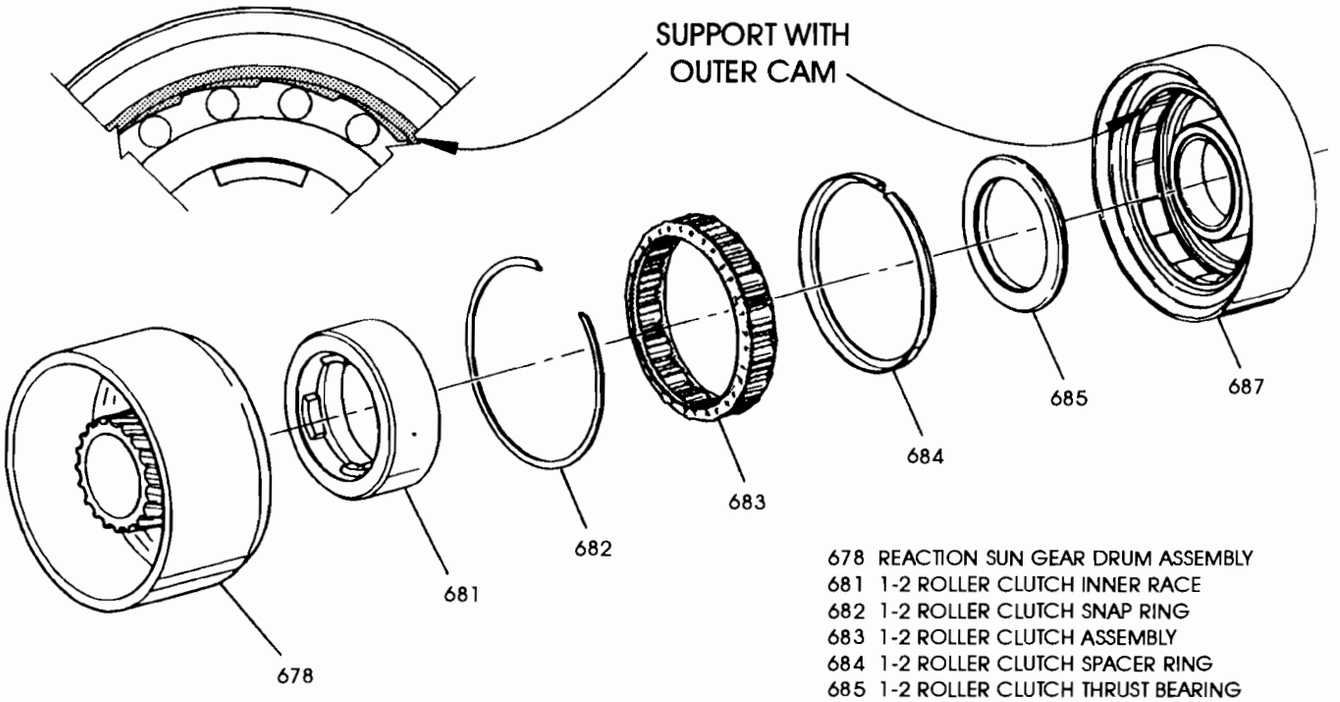
(7) REACTION SUN GEAR DRUM - Redesigned with the 1-2 roller clutch outer race now made as part of the sun gear drum, to accommodate the new design 1-2 roller clutch parts, as shown in Figure 6.

(8) FINAL DRIVE RING GEAR - Revised lubrication hole sizes and locations in support to accommodate the new design 1-2 roller clutch assembly, as shown in Figure 7.

INTERCHANGEABILITY:

The new design 1-2 Roller Clutch Assembly will back service all THM 4T60-E transaxles to 1991, however, ***all*** parts listed above ***must*** be used as a package.

1991-1995 1-2 ROLLER CLUTCH



678 REACTION SUN GEAR DRUM ASSEMBLY
681 1-2 ROLLER CLUTCH INNER RACE
682 1-2 ROLLER CLUTCH SNAP RING
683 1-2 ROLLER CLUTCH ASSEMBLY
684 1-2 ROLLER CLUTCH SPACER RING
685 1-2 ROLLER CLUTCH THRUST BEARING
687 1-2 ROLLER CLUTCH SUPPORT

1996 1-2 ROLLER CLUTCH

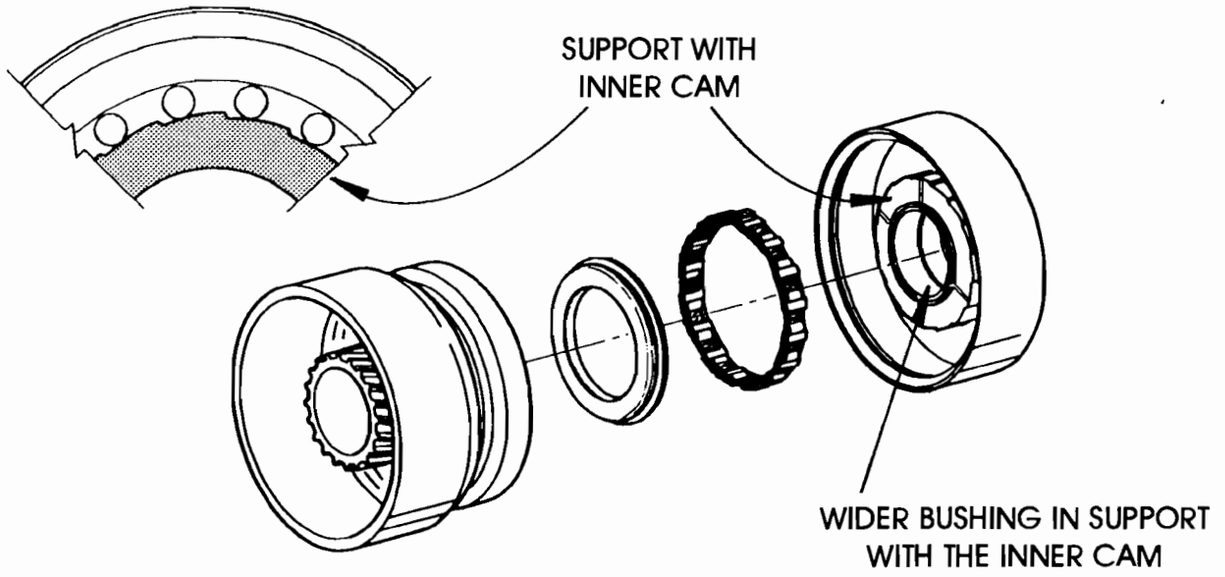
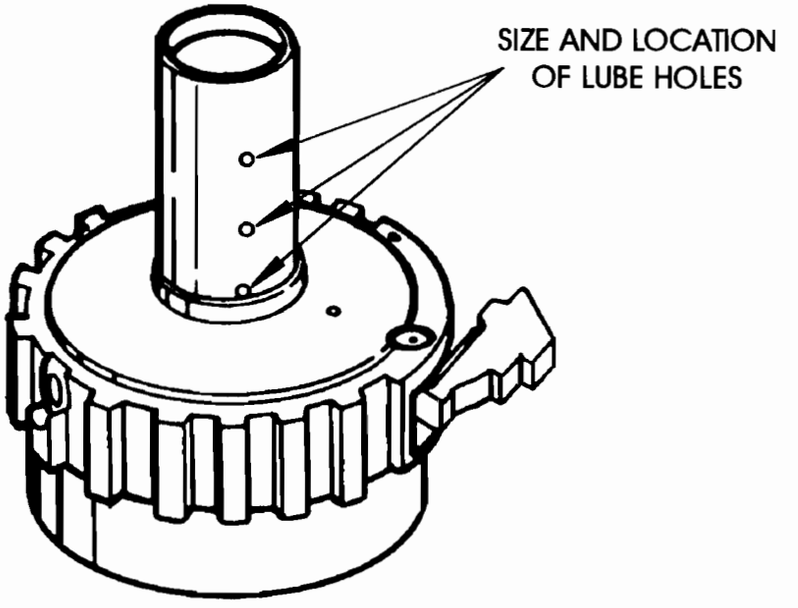


Figure 6

1991-1995 FINAL DRIVE
RING GEAR SUPPORT



1996 FINAL DRIVE
RING GEAR SUPPORT

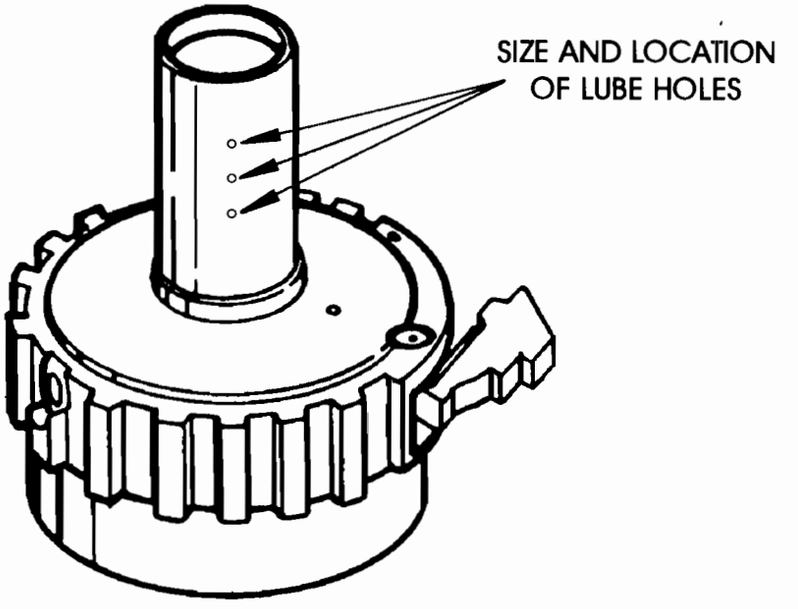


Figure 7

THM 4T60-E
INPUT CLUTCH CHANGES

CHANGE: Beginning on August 22, 1994 (Julian Date 234) all 1995 model 4T60-E transaxles were produced with a revised thickness input clutch plates on both lined and steels. This was implemented as a running change and ***will*** have an affect on service, as the previous design steel plates are no longer available.

REASON: Greatly improved durability of the input clutch plates.

PARTS AFFECTED:

(1) INPUT CLUTCH LINED PLATES - Were made thinner by approximately .026" to accommodate the thicker steel plates. The new design input clutch lined plates are approximately .065" thick, and the previous design lined plates are approximately .091" thick, as shown in Figure 8.

(2) INPUT CLUTCH STEEL PLATES - Were made thicker by approximately .020" to improve heat displacement and thereby improve durability. The new design input clutch steel plates are approximately .070" thick, and the previous design steel plates are approximately .050" thick, as shown in Figure 8. The new design input clutch steel plates are now the same as the 3T40 (125C) steel plates.

INTERCHANGEABILITY:

(1) The new design input clutch pack, available under OEM part number 24203185, as a service package, ***will*** back service all 1991-1995 4T60-E transaxles.

(2) The new design input clutch pack, available under OEM part number 24203185, as a service package, will also back service 4T60 (440-T4) transaxles from late 1990 (Julian Date 016 and later), through 1993 models. These are the transaxles with the input clutch accumulator eliminated and a wave plate added to a new input housing. They ***cannot*** be used on any 4T60 (440-T4) models previous to the Julian Date listed above.

(3) Previous and new design clutch plates ***cannot*** be mixed. Clutch plates must be measured to verify their thickness. Refer to Figure 9 for the previous design, and new design input clutch stack-ups.

SERVICE INFORMATION:

Service Package, Input Clutch Plates (Lined and Steel - New Design)	24203185
Lined Plate, Input Clutch (Previous Design - .091" Thick)	8662850
Steel Plate, Input Clutch (Previous Design - .050" Thick)	8651446
Lined Plate, Input Clutch (New Design - .065" Thick)	24202333
Steel Plate, Input Clutch (New Design - .070" Thick)	8683084

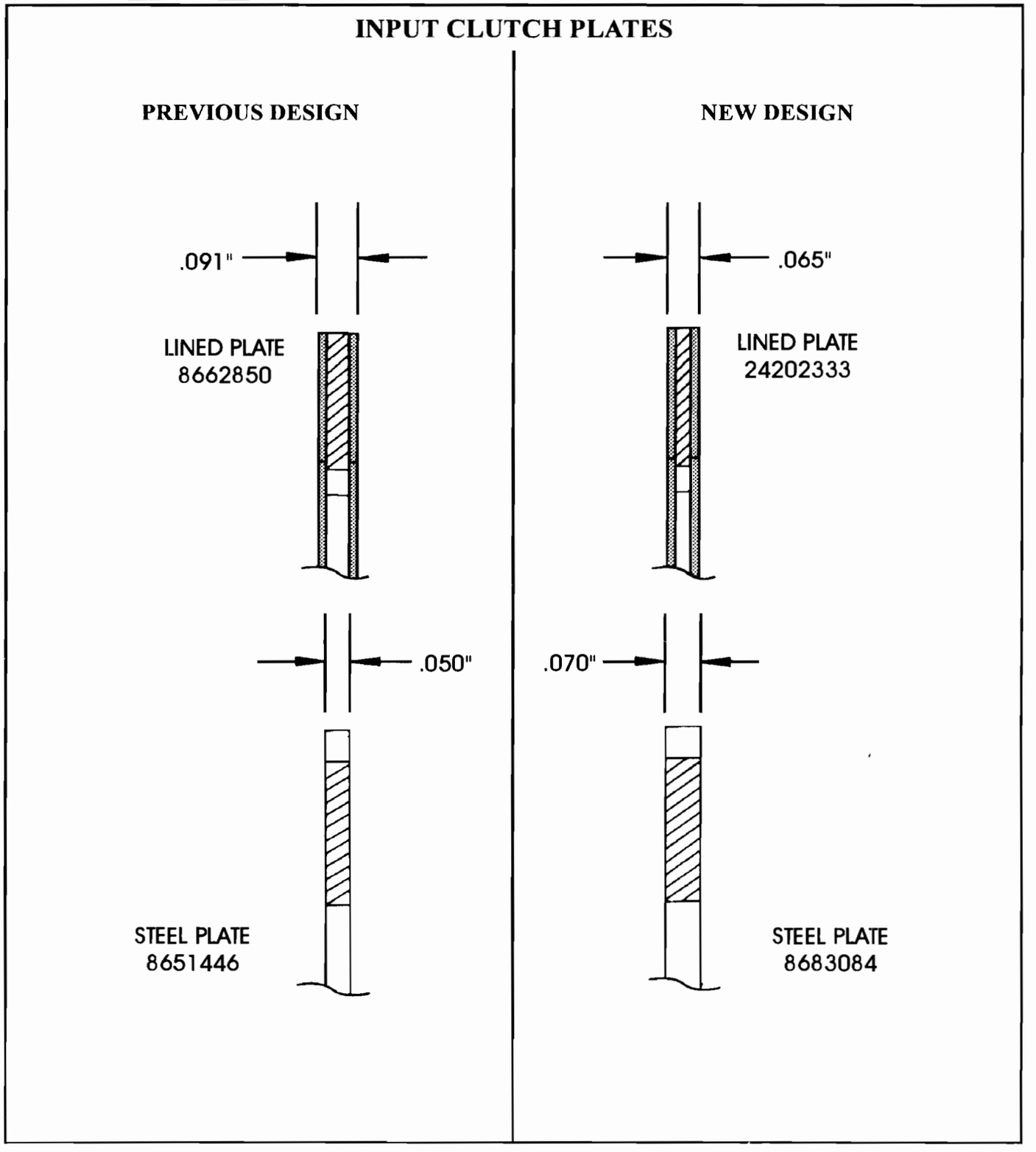

INPUT CLUTCH PLATES
PREVIOUS DESIGN
NEW DESIGN
.091"
LINED PLATE
8662850
.065"
LINED PLATE
24202333
.050"
.070"
STEEL PLATE
8651446
STEEL PLATE
8683084

Figure 8

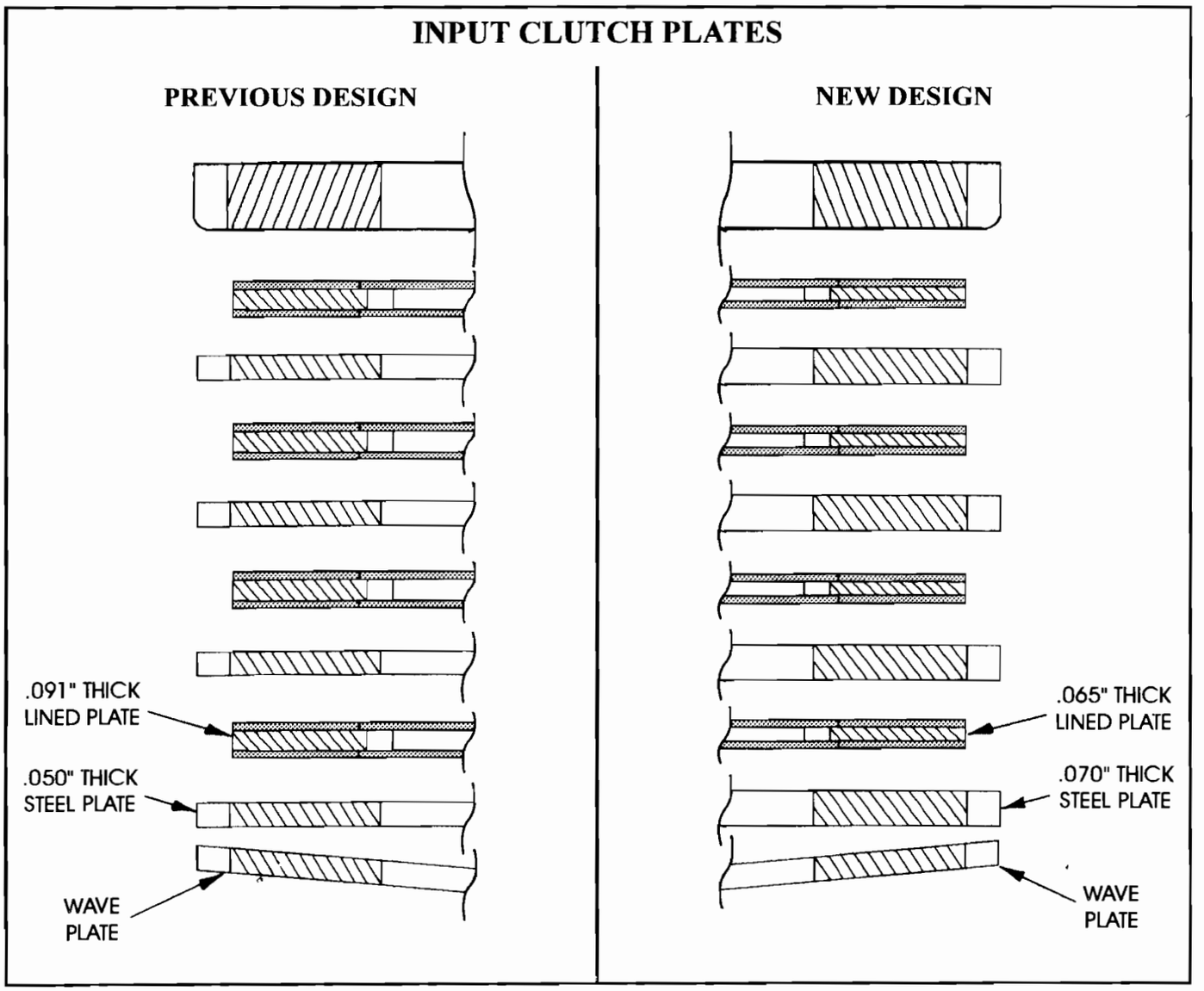

INPUT CLUTCH PLATES
PREVIOUS DESIGN
NEW DESIGN
.091" THICK LINED PLATE
.050" THICK STEEL PLATE
WAVE PLATE
.065" THICK LINED PLATE
.070" THICK STEEL PLATE
WAVE PLATE

Figure 9

THM 4T60-E

"TWO" NEW DESIGN DRIVE CHAINS FOR 1995, AND DIFFERENT MEASUREMENT PROCEDURE

CHANGE: There have been "Two" new design rocker joint drive chains introduced as a running change for 1995 model 4T60-E transaxles, to replace the previous design rocker joint drive chain. The first models to recieve the ***"Elastically Tuned"*** rocker joint drive chain were 5ATW, 5YDW and 5YNW, and these were implemented on October 3, 1994 (Julian Date 276). The remaining models will phase into production by the end of the model year, except Buick Riveria and the Oldsmobile Aurora (5BFW, 5CAW). these two models (5BFW, 5CAW) use a ***"Special"*** rocker joint drive chain, as shown in Figure 10.

REASON: ***"Elastically Tuned"*** rocker joint drive chain has strength improvements to improve high mileage durability.
"Special" rocker joint drive chain is specifically designed to reduce noise in the 1995 Buick Riveria, and Oldsmobile Aurora.

PARTS AFFECTED:

(1) "ELASTICALLY TUNED" DRIVE CHAIN - Can be identified by the "Mouse Ears" shape of the outer guide links, as shown in Figure 10, and has one copper colored master link.

(2) "SPECIAL" DRIVE CHAIN - Can be identified by the two copper colored master links, where the previous design rocker joint chain has only one copper colored master link, as shown in Figure 10. The internal links slao have a slightly different profile.

SPECIAL NOTE: Only use the drive chain measurement procedure listed in the ATSG Service Manual when checking the "Round Pin Drive Chain" for wear. A ***"Good"*** Rocker Joint Drive Chain may not check as acceptable, using the procedure in the service manual. Use the following procedure to check all Rocker Joint Drive Chains for wear:

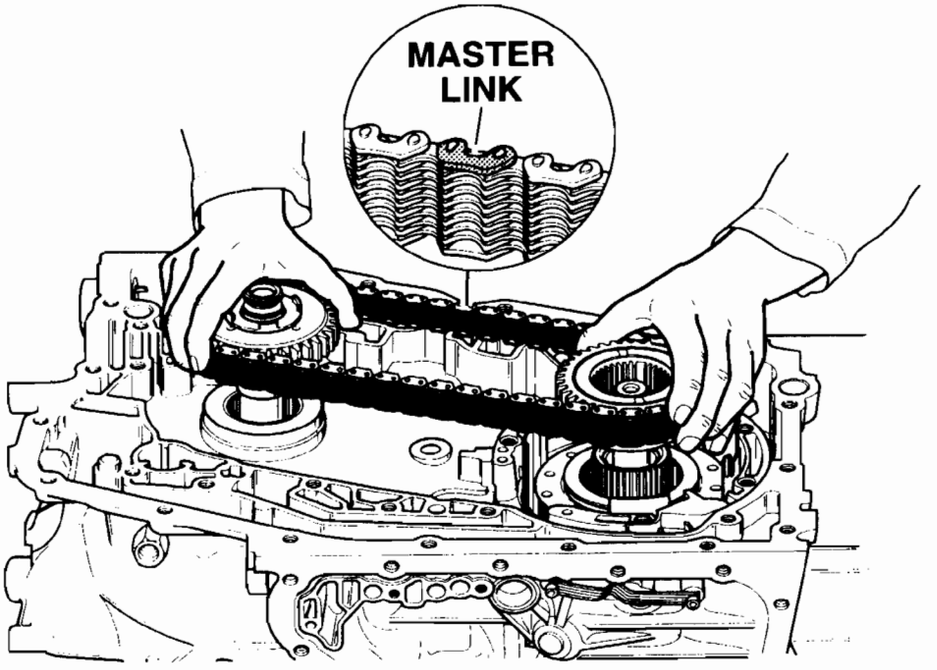
1. Pull the drive chain toward the case at the location of arrows, as shown in Figure 11.
2. Measure the gap between the drive chain and case with a straight edge ruler.
3. If the measurement is 1/8" or greater, the drive chain can be reused. If the measurement is less than 1/8", replace the drive chain (See Figure 11).

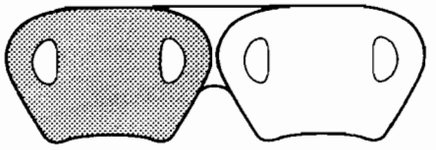
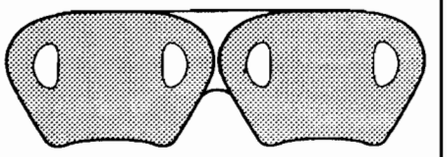
INTERCHANGEABILITY:

The ***"Elastically Tuned"*** rocker joint drive chain will back service any 1993-1995 4T60-E transaxle that was originally equipped with the previous design rocker joint drive chain, except Riveria and Aurora. The ***"Special"*** rocker joint drive chain should be used on Riveria and the Aurora models for noise reduction, as the chain is chordal compensating.
On the 1991-1993 4T60-E transaxles equipped with the "Round Pin" design drive chain (See ATSG Bulletin 93-38), the drive and driven sprockets ***must*** be updated to the rocker joint design to use the "Elastically Tuned" drive chain. Part numbers for the rocker joint design sprockets are included in "Service Information" on the next page.

SERVICE INFORMATION:

Rocker Joint Drive Chain (Previous Design - One Copper Link)	8682603
Rocker Joint Drive Chain ("Elasticall Tuned" - "Mouse Ears)	24202447
Rocker Joint Drive Chain ("Special" - Two Copper Links)	24200771
Drive Sprocket, 33 Tooth (Rocker Joint Design)	8682597
Drive Sprocket, 35 Tooth (Rocker Joint Design)	8682598
Drive Sprocket, 37 Tooth (Rocker Joint Design)	8682599
Driven Sprocket, 33 Tooth (Rocker Joint Design)	8682600
Driven Sprocket, 35 Tooth (Rocker Joint Design)	8682601
Driven Sprocket, 37 Tooth (Rocker Joint Design)	8682602

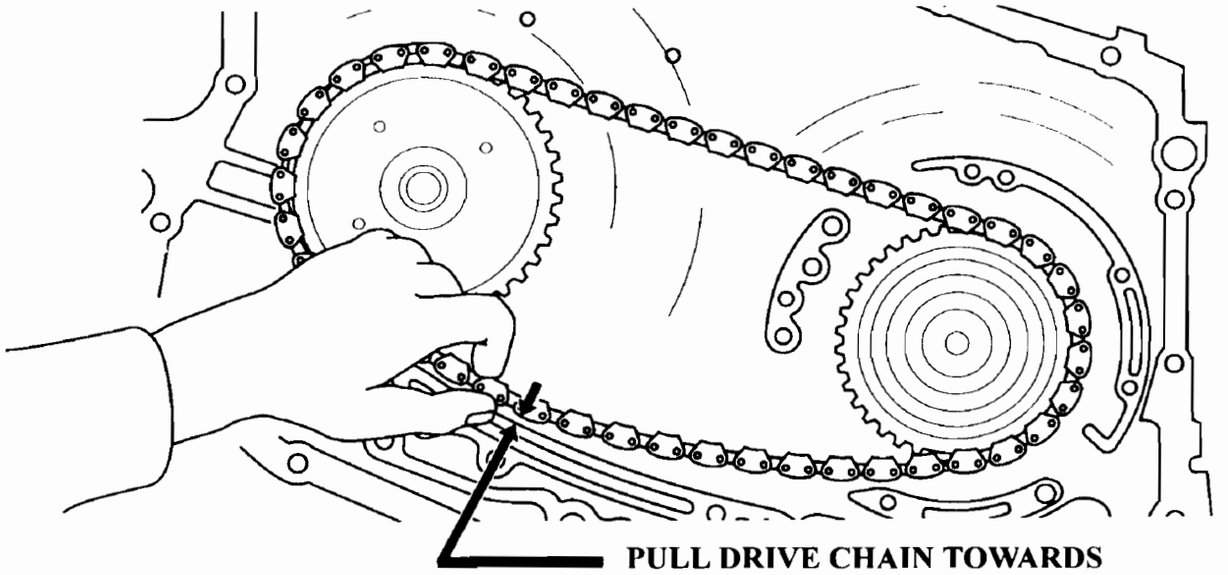


PREVIOUS DESIGN ROCKER JOINT DRIVE CHAIN	**NEW DESIGN "ELASTICALLY TUNED" ROCKER JOINT DRIVE CHAIN**	**95 RIVERIA & AURORA "SPECIAL" ROCKER JOINT DRIVE CHAIN**
		
ONE COPPER COLORED MASTER LINK	**ONE COPPER COLORED "MOUSE EARS" MASTER LINK**	**TWO COPPER COLORED MASTER LINKS**

ALL THREE OF THESE DRIVE CHAIN DESIGNS USE THE ROCKER JOINT DESIGN DRIVE AND DRIVEN SPROCKETS. ON UNITS ORIGINALLY EQUIPPED WITH THE ROUND PIN DRIVE CHAIN (SEE ATSG BULLETIN 93-38), THE DRIVE AND DRIVEN SPROCKETS MUST BE UPDATED TO THE ROCKER JOINT DESIGN.

Figure 10

DRIVE CHAIN MEASUREMENT FOR ALL "ROCKER JOINT" DESIGN CHAINS *ONLY.*



IF MEASUREMENT IS LESS THAN 1/8", REPLACE THE DRIVE CHAIN

NOTE: FOR THE ROUND PIN DRIVE CHAIN MEASUREMENT REFER TO THE 4T60-E SERVICE MANUAL, AS THE PROCEDURE IS DIFFERENT THAN THE "ROCKER JOINT" DRIVE CHAINS.

Figure 11

ANSWERMATIC®

ANSWERS YOU CAN TAKE TO THE BANK!

1-800-322-0806

Losing valuable time and income due to superficially worn hard parts or non-sealing soft parts? Then bank on the original Answermatic® VBT-2000, or our AMI® Hydraulic Circuit Analyzer.

Let Answermatic® answer all your transmission repair questions. Call toll free **1-800-322-0806** or Fax (910) 754-2954 for our free brochure.

- *Eliminate no-goes and come-backs.*
- *Locate small cracks and imperfections in seconds.*
- *Custom calibrate your transmissions.*
- *Adapts to electronic transmissions.*
- *Very affordable, units start at $3,995.*
- *Easy-to-learn and easy-to-use.*
- *Fits virtually all foreign and domestic front and rear wheel cars and trucks.*

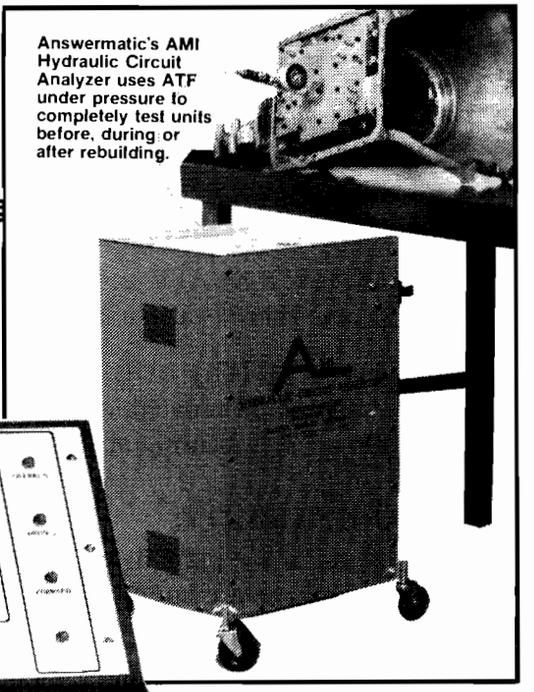
Equipment For Rebuilding Profits!

Answermatic, Inc.

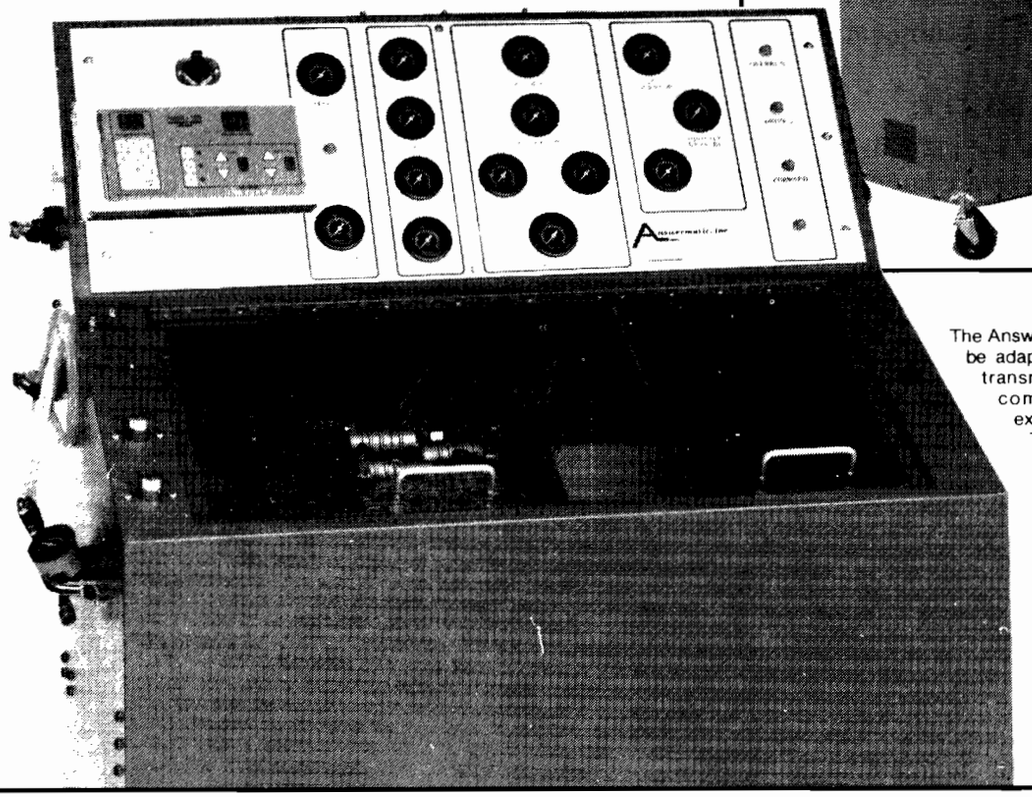
Patented

TM

225 SMITH AVE., SHALLOTTE, NC 28470
(910) 754-2944 • FAX (910) 754-2954



Answermatic's AMI Hydraulic Circuit Analyzer uses ATF under pressure to completely test units before, during or after rebuilding.



The Answermatic VBT-2000 can be adapted to test electronic transmissions using any compatible electronic exciter, such as the TRAN-X shown here.

Answermatic®
Patent #4809544, 4998437
Other patents pending.

THM 4T60-E
NEW DESIGN HEAVY DUTY FINAL DRIVE ASSEMBLY, FOR SUPERCHARGED MODELS

CHANGE: Beginning at the start of production for 1996 models, some models of the 4T60-E transaxles were built with a "Heavy Duty" final drive assembly. The models affected will go behind the new 3800 Supercharged (L67) applications.

REASON: Torque load requirements because of 3800 supercharged engine.

PARTS AFFECTED:

(1) FINAL DRIVE ASSEMBLY - The final drive housing has added material in the cross shaft area, is longer than the previous model, has larger side gears and pinion gears, has a larger diameter cross shaft, and a hardened sleeve added that rides in a new torrington bearing in the final drive housing. Refer to Figure 12 for comparisons between the previous and new design.

(2) FINAL DRIVE HOUSING - Now a different dimension to accommodate the new design final drive assembly and has an added needle bearing that replaces the previous design bushing, and is shown in Figure 13.

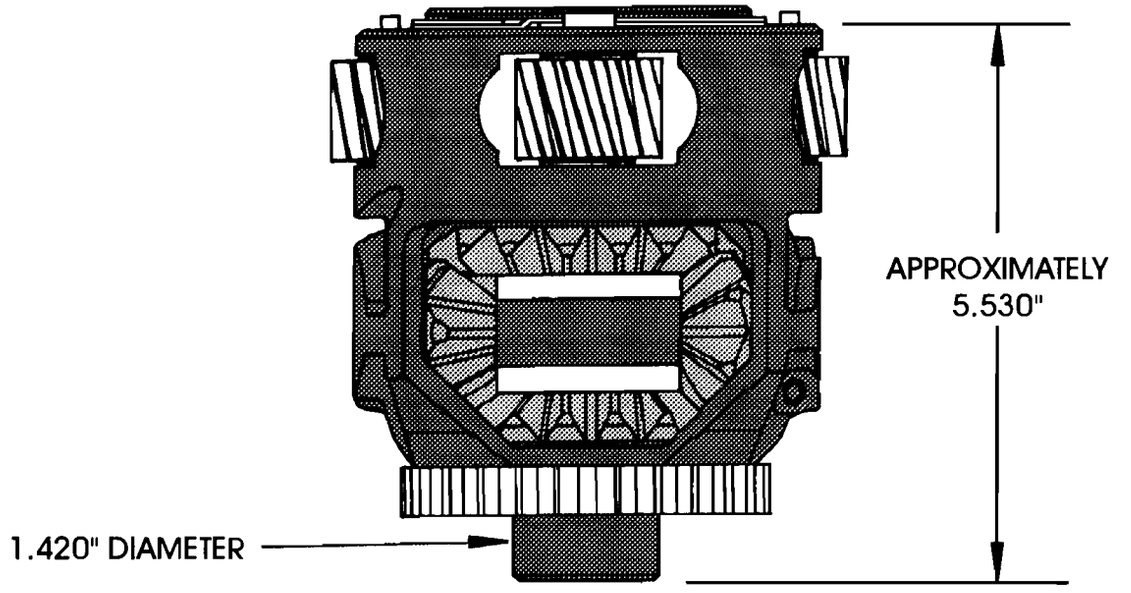
(3) OUTPUT SHAFT - Approximately 1/4" longer to accommodate the thicker and larger side gears. There is also a new bearing added to support the 4th clutch hub (See Figure 14).

(4) 4TH CLUTCH HUB AND SHAFT - The previous needle bearing inside the 4th clutch hub has been eliminated, and a hardened sleeve added to the inside diameter to accommodate the new design bearing on the output shaft (See Figure 14).

INTERCHANGEABILITY:

None of the parts listed above will back service ***any*** previous model 4T60-E transaxle. All of these parts are unique to the supercharged models.

CURRENT FINAL DRIVE HOUSING



HEAVY DUTY FINAL DRIVE HOUSING
FOR SUPERCHARGED APPLICATIONS

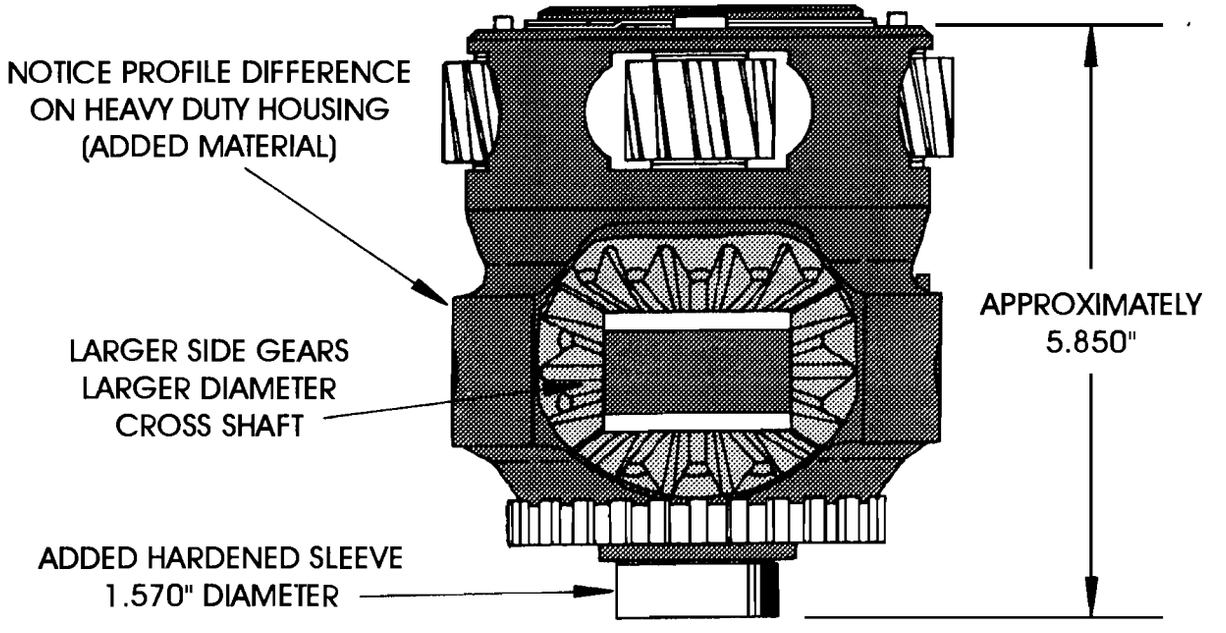


Figure 12

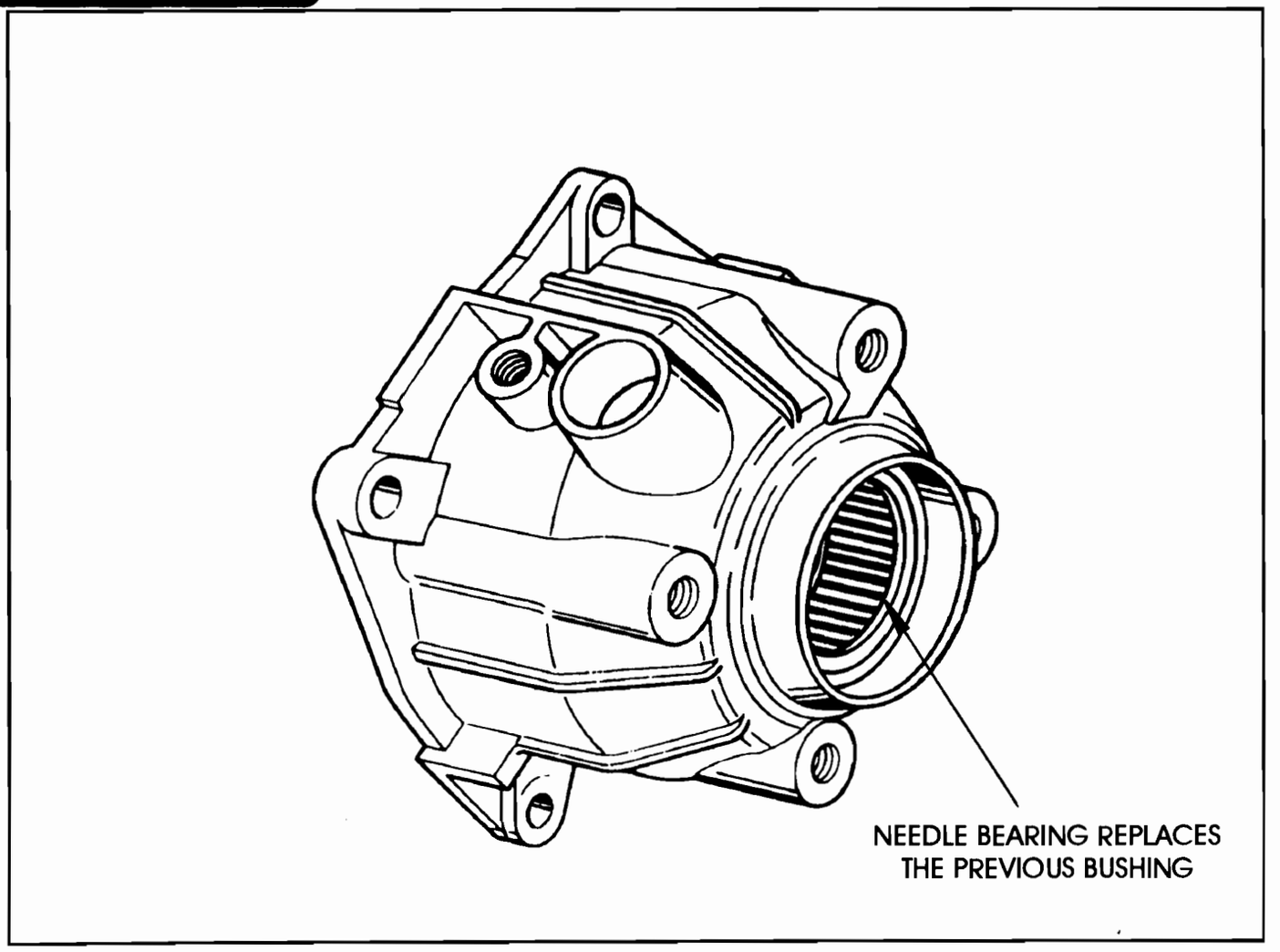


Figure 13

NEW DESIGN 4TH CLUTCH HUB AND OUTPUT SHAFT

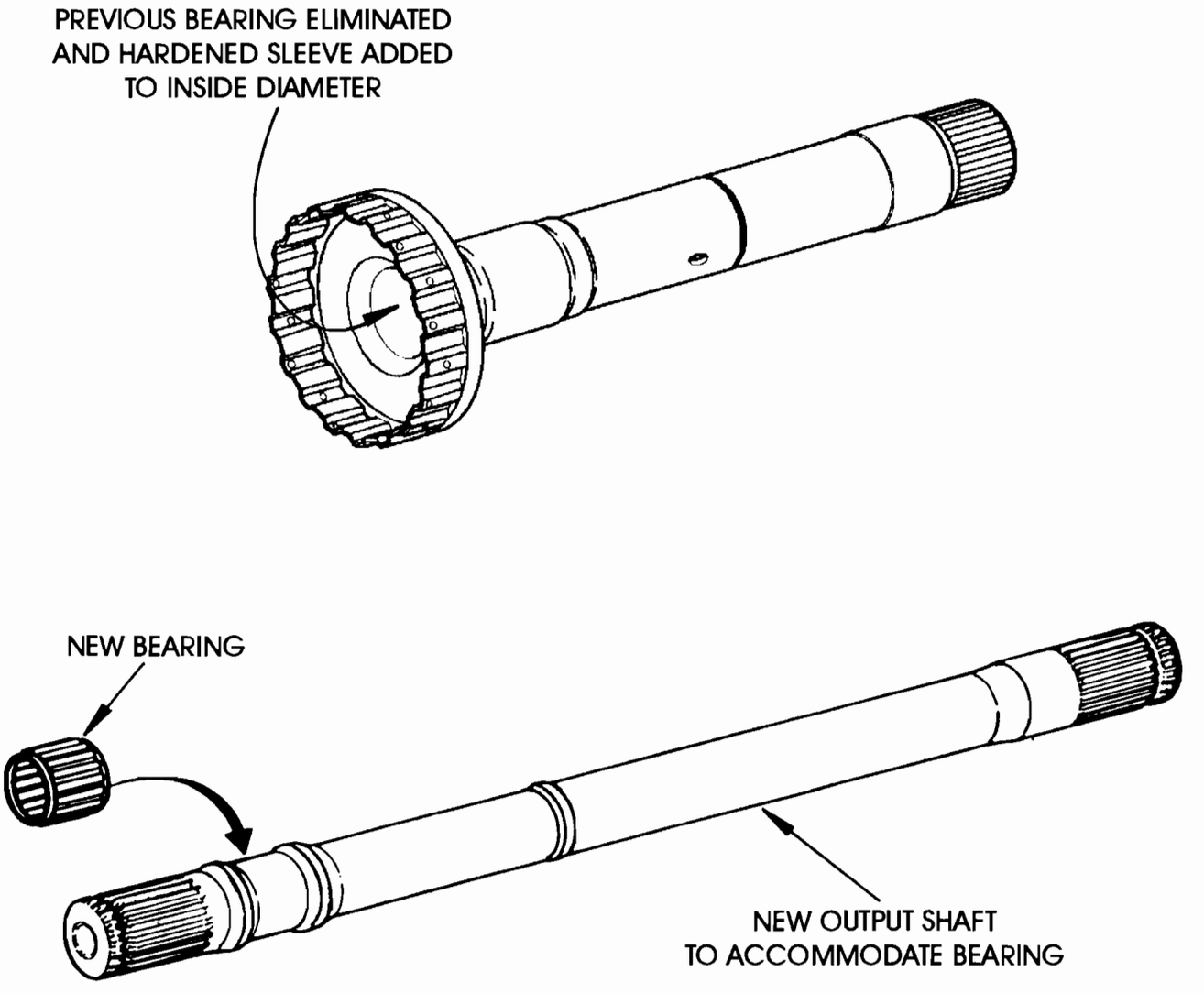


Figure 14

THM 4T80-E
NEW DESIGN CENTER SUPPORT AND CENTER GASKET

CHANGE: Beginning at the Start Of Production for 1995 models, all THM 4T80-E transaxles were produced with a new design level Driven Sprocket Support and center gasket (See Figure 15). This allowed the use of four 2nd clutch plates, instead of the previous three.

REASON: Improved 2nd clutch durability.

PARTS AFFECTED:

(1) DRIVEN SPROCKET SUPPORT - New design level to accommodate 4 second clutch plates instead of the previous 3 second clutch plates. This required moving the two "Bathtub" feed holes in the Driven Sprocket Support (See Figure 15).

(2) SPROCKET SUPPORT GASKET - The two "Bathtub" feed holes in the gasket were moved to accommodate the new design sprocket support. The slot in the gasket was also removed on the new design gasket (See Figure 15).

INTERCHANGEABILITY:

The Driven Sprocket Support Gaskets "WILL NOT" interchange. The 93-94 gasket must be used with the 93-94 sprocket support, and the 95-96 gasket must be used with the 95-96 sprocket support (See Figure 15).

SERVICE INFORMATION:

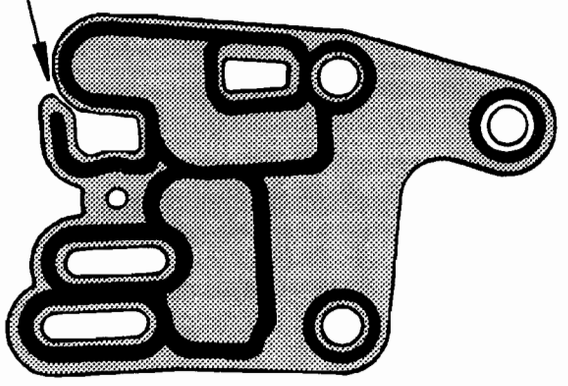
Driven Sprocket Support Gasket (93-94 Model Only) 8683149
Driven Sprocket Support Gasket (95-96 Model Only) 24201535

Compliments of, *Joe Smith*
TRANCOR TRANSMISSION
CHICAGO, ILL

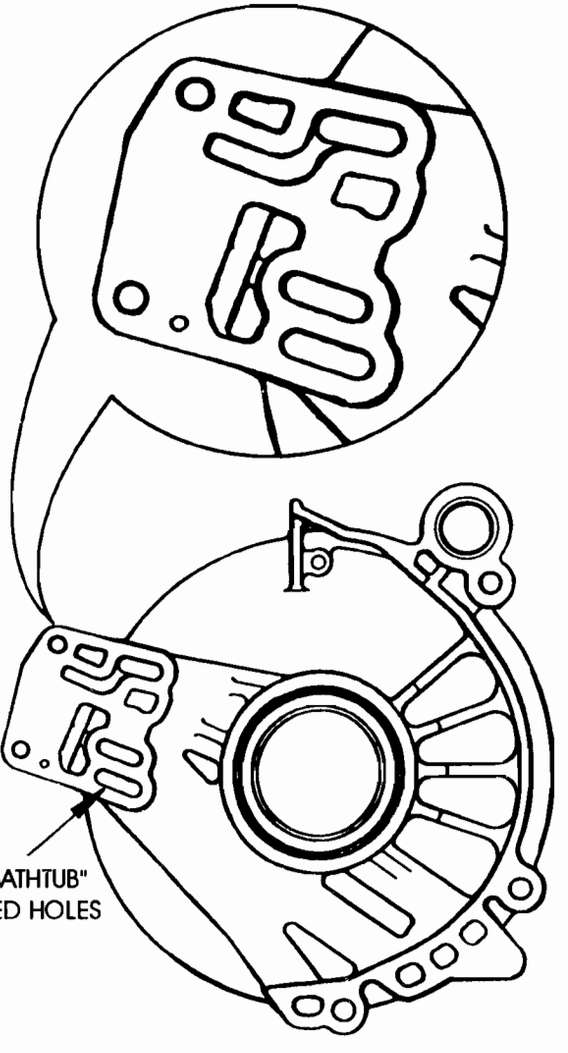
1993-1994
DESIGN LEVEL PARTS

SLOT IN GASKET

8683149



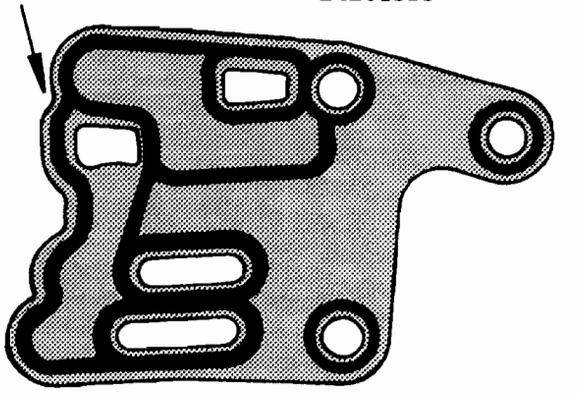
NOTE POSITION OF BATHTUB HOLES IN SUPPORT AND GASKET



1995-1996
DESIGN LEVEL PARTS

NO SLOT IN GASKET

24201535



NOTE "NEW" POSITION OF BATHTUB HOLES IN SUPPORT AND GASKET

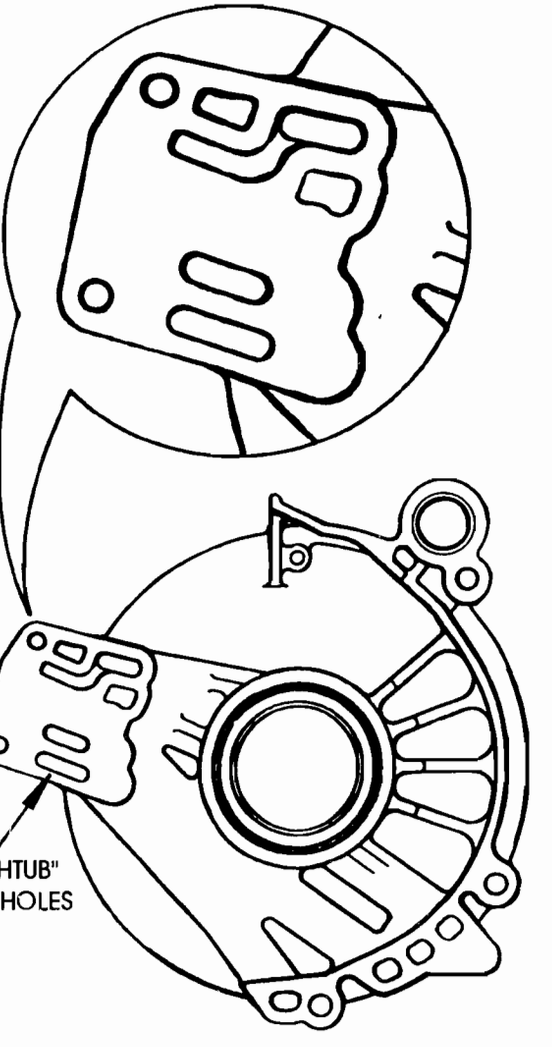


Figure 15

FORD CD4E

TCC SOLENOID MEASURES HIGH RESISTANCE
REVISED TCC SOLENOID FOR 1995

COMPLAINT: When checking resistance values on the solenoid pack on 1995 CD4E transaxles during rebuild, the TCC Solenoid shows a resistance value well above the specification shown in the service manuals.

CAUSE: Some 1995 CD4E transaxles, built after May 1995, were assembled with solenoid bodies that contain a ***high impedance*** TCC Solenoid, is identified with a Natural/Beige colored case connector, and has a resistance value of 12.5 - 19.0 ohms.
The previous design solenoid bodies contain a ***low impedance*** TCC Solenoid, identified with a Black colored case connector, and has a resistance value of 1.0 - 2.0 ohms, as indicated in the service manuals.

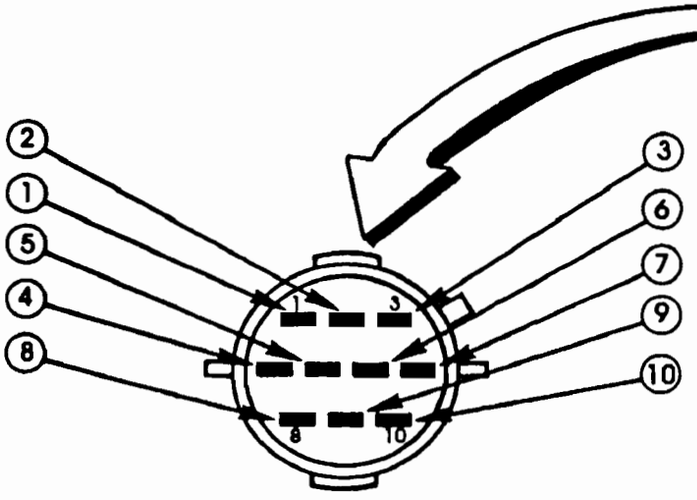
CORRECTION: 1993-1995 CD4E transaxles may be serviced with a Solenoid Body Assembly containing ***either the high impedance or low impedance*** TCC Solenoid, with no adverse effects. The TCC Solenoid resistance can be checked across pins 3 and 4 of the transaxle case connector as shown in Figure 1.
The Natural/Beige colored connector should measure 12.5 - 19.0 ohms resistance.
The Black colored connector should measure 1.0 - 2.0 ohms resistance.

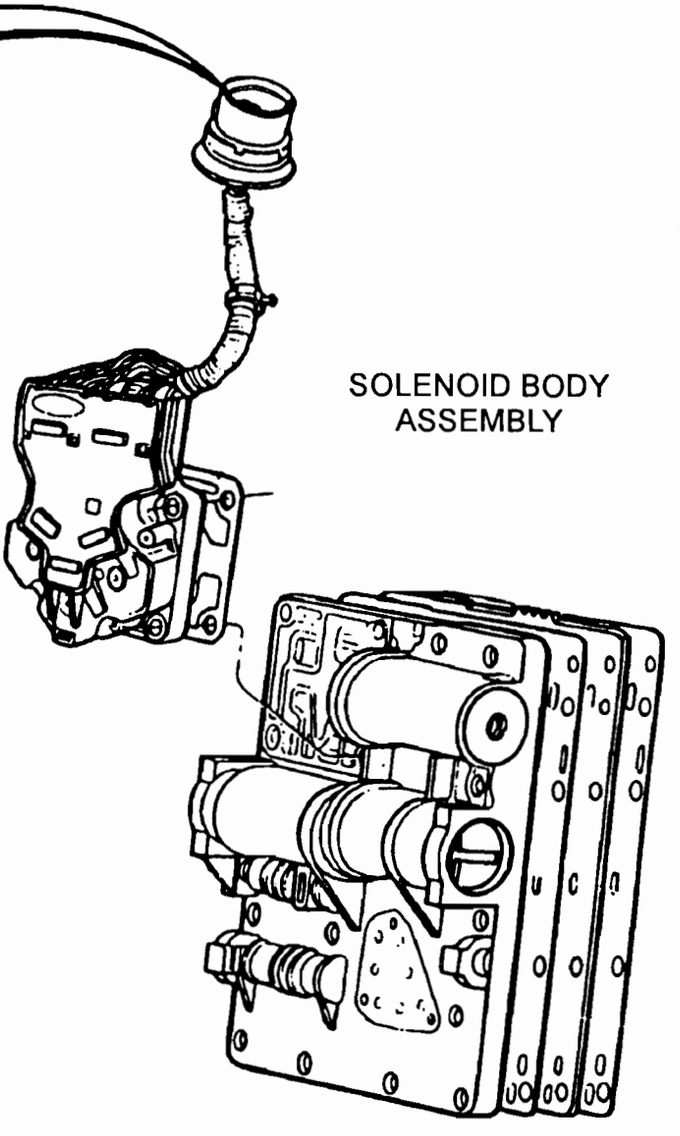
CAUTION: DO NOT USE SOLENOID BODY WITH LOW IMPEDANCE (BLACK CONNECTOR) FOR SERVICE ON CD4E TRANSAXLES BEYOND THE 1995 MODEL YEAR.

SERVICE INFORMATION:

Solenoid Body Assembly (High Impedance-Beige Connector) F6RZ-7G391-A

CD4E CASE CONNECTOR AND SOLENOID PACK ASSEMBLY





PIN	DESCRIPTION
1	TFT SIGNAL
2	SIGNAL RETURN
3	TCC POWER IN
4	TCC SIGNAL FROM PCM
5	SS2 SIGNAL FROM PCM
6	SHIFT SOLENOID POWER IN
7	SS1 SIGNAL FROM PCM
8	3-2T/CCS SIGNAL FROM PCM
9	EPC POWER IN
10	EPC SIGNAL FROM PCM

Figure 1

FORD CD4E

LUBE TUBE LOCATIONS

The CD4E transaxle provides lubrication for rotating mechanical components through two lubrication tubes, and the lube tube locations are shown in Figure 3.

Lubrication for final drive parts is fed through one of these tubes, which has a seal located in the case which must be replaced during the rebuild process, and requires Tool T91P-76085-A (or equivalent), as shown in Figure 2 below. The Final Drive Lube Tube is fed with oil from the solenoid feed circuit.

The Differential Lube Tube fits directly into the case (press fit) and must be seated fully, and is retained on the other end with a 8mm bolt through the bracket, as shown in Figure 3. The Differential Lube Tube is fed with "To Cooler" oil from the pressure regulator valve, and also lubricates the drive chain (See Figure 3).

NOTE: USE CARE NOT TO BEND LUBE TUBES DURING THE DISASSEMBLY PROCESS, AND INSTALL BOTH LUBE TUBES INTO CASE BEFORE ASSEMBLING THE TRANSAXLE.

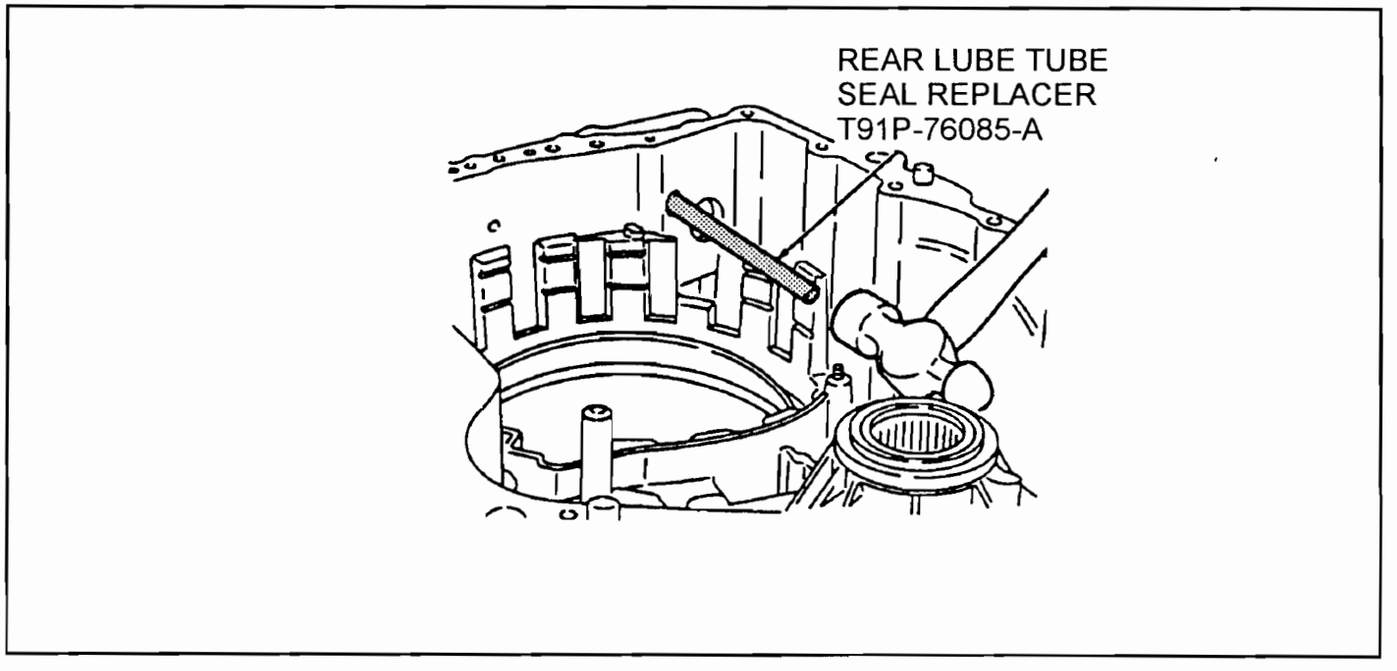
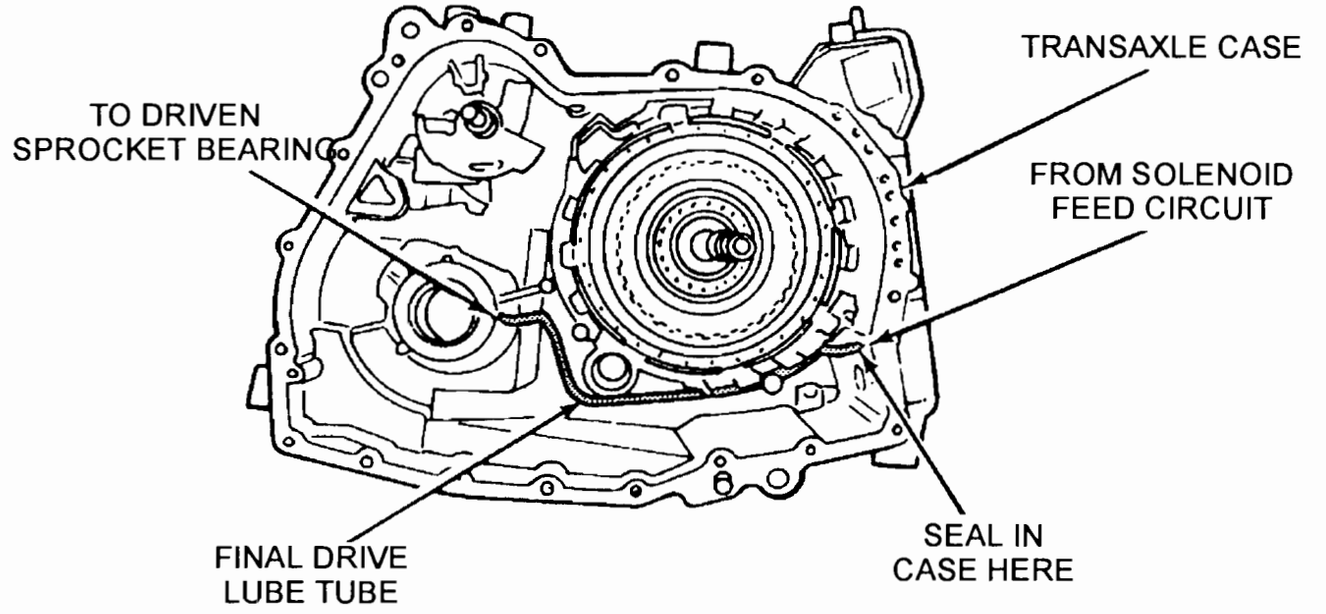


Figure 2

CD4E LUBE PIPE IDENTIFICATION AND LOCATIONS



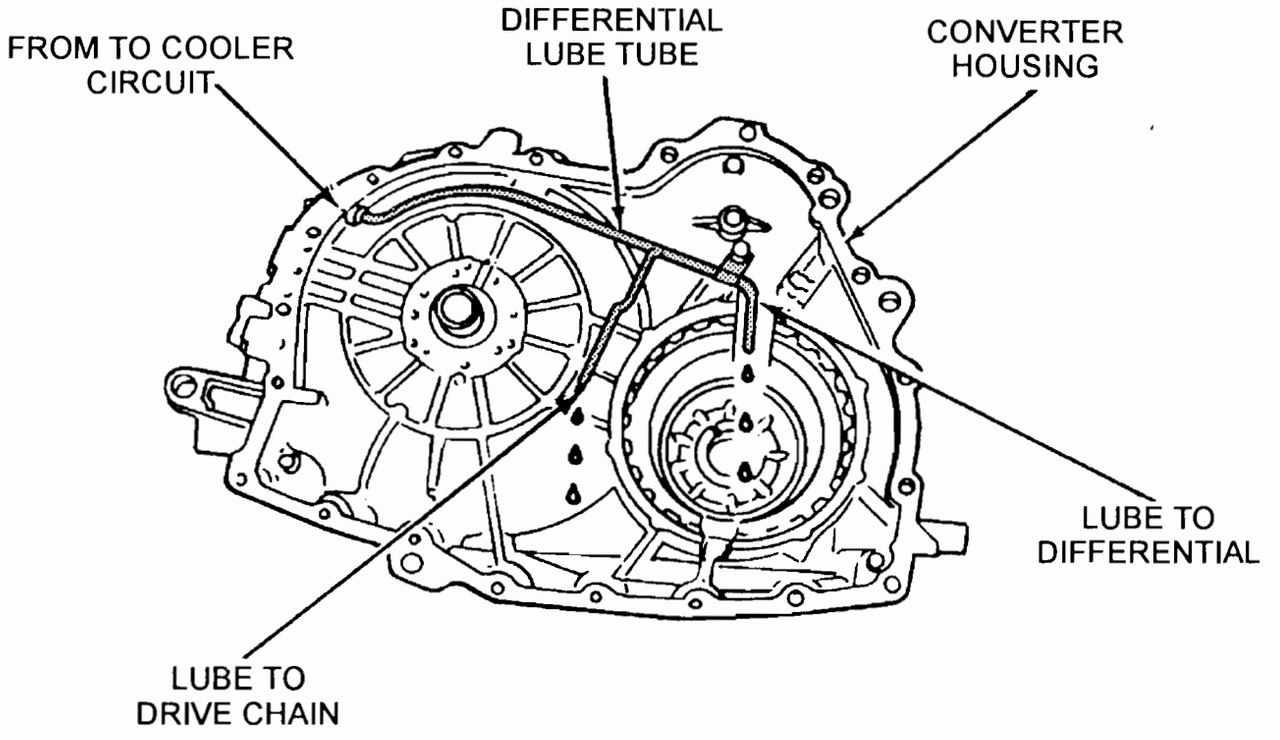
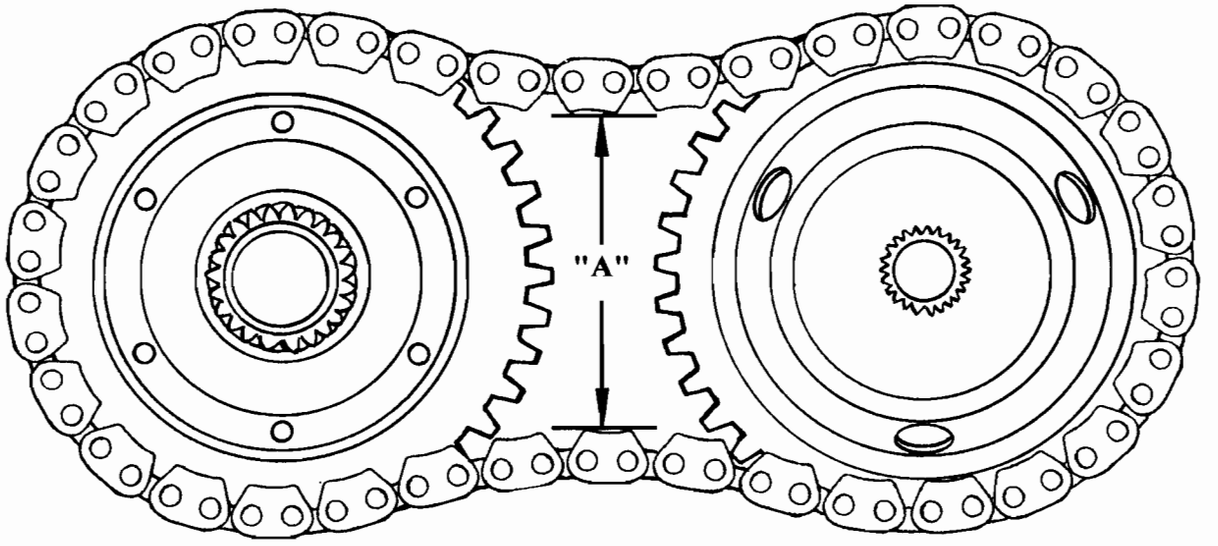
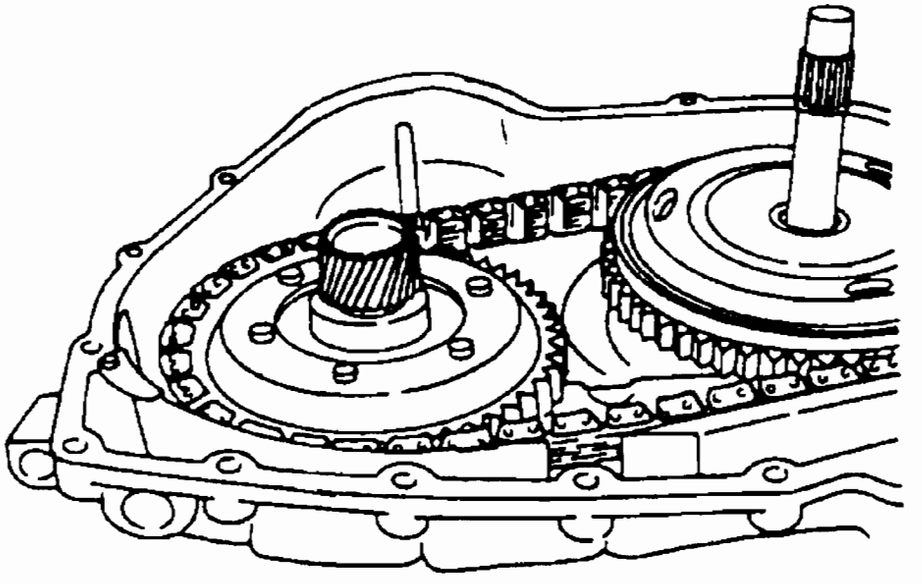


Figure 3

FORD CD4E
DRIVE CHAIN MEASUREMENT

SQUEEZE CHAIN TOGETHER AND MEASURE DIMENSION "A". IF DISTANCE BETWEEN CHAIN TEETH IS 5-1/2" OR LESS, THEN REPLACE THE DRIVE CHAIN





SERVICE PARTS INFORMATION

Drive Chain (2.0L 4 Cyl - 3/4")	F3RZ-7G249-A
Drive Chain (2.5L 6 Cyl - 1")	F5RZ-7G249-B
Driven Sprocket (2.0L 4 Cyl - 3.92 F.D.)	F3RZ-7G132-A
Driven Sprocket (2.5L 6 Cyl - 3.77 F.D.)	F4RZ-7G132-B
Drive Sprocket (2.0L 4 Cyl - .605" Wide)	F3RZ-7A153-A
Drive Sprocket (2.5L 6 Cyl - .855" Wide)	F3RZ-7A153-B

Figure 4

FORD CD4E

NO FORWARD ENGAGEMENT AND/OR NO 3RD GEAR

COMPLAINT: No forward engagement and/or no 3rd gear engagement may be present, before rebuild, on some CD4E transaxles built between Sept 28, 1994 and Oct 30, 1994. The transaxle serial numbers that are of concern are 4271-0000 thru 4303-9999.

CAUSE: The cause may be due to a defective weld condition on the Forward/Coast/Direct Clutch Cylinder, which results in fluid leakage from the forward clutch into the direct clutch. The clutch cylinder and hub weld condition may not be identifiable visually.

CORRECTION: When extensive wear is observed on the forward clutch plates and/or the direct clutch plates, and the transaxle serial number is 4271-0000 thru 4303-9999, built between the dates listed above, replace the Forward/Coast/Direct Clutch Cylinder Assembly with the appropriate service part number listed below.

SERVICE INFORMATION:

Clutch Cylinder and Hub Assembly (4 Cyl) F5RZ-7G120-A
Clutch Cylinder and Hub Assembly (6 Cyl) F4RZ-7G120-A

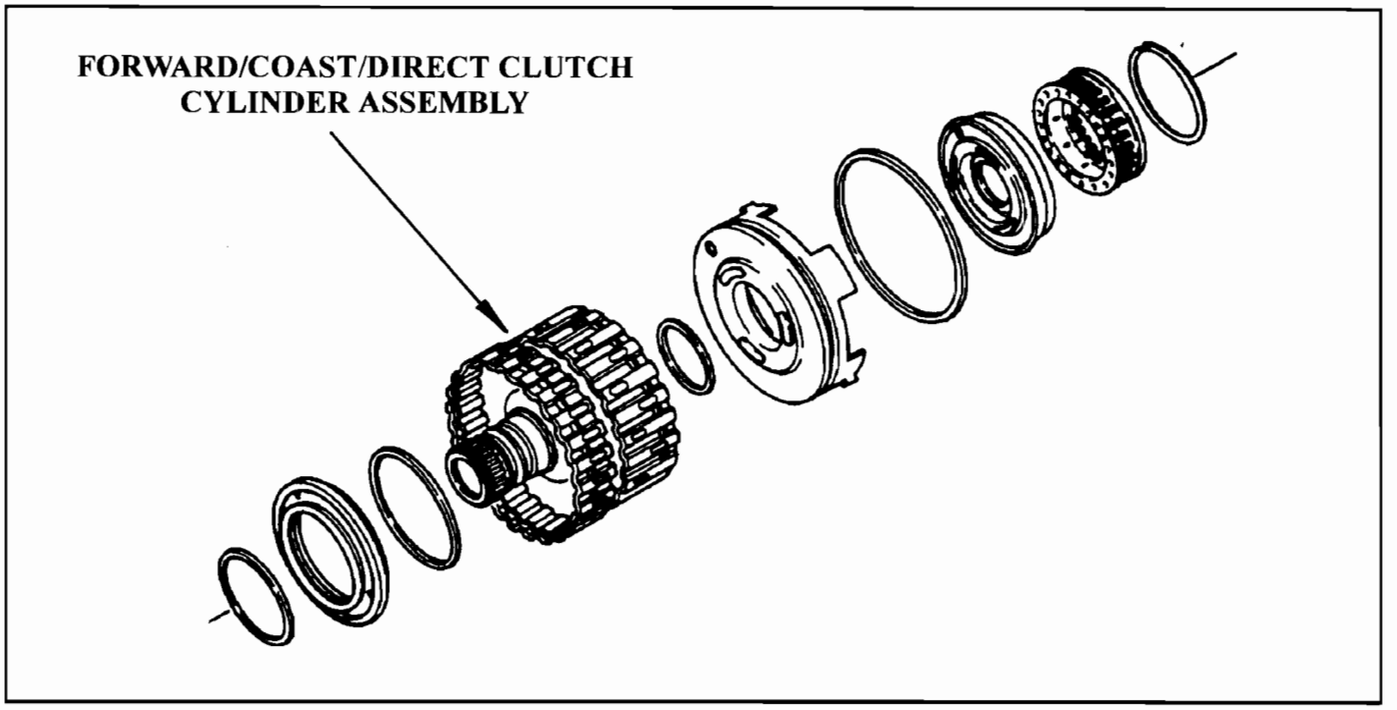


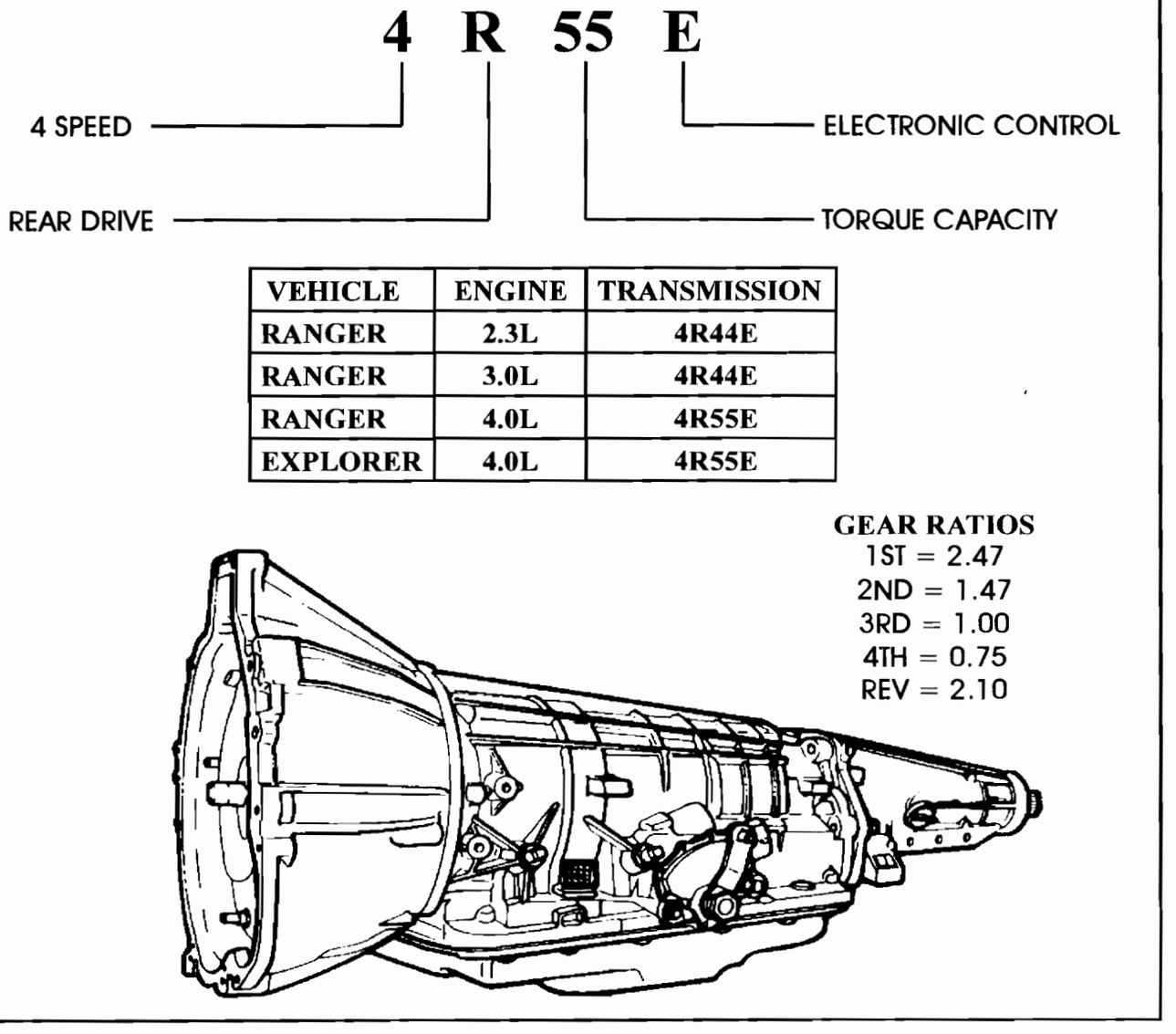
Figure 5

FORD 4R44E/4R55E

PRELIMINARY INFORMATION AND ELECTRICAL DIAGNOSIS

The Ford 4R44E and 4R55E were introduced by Ford Motor Company in model year 1995, and are basically total electronic controlled A4LD units. Refer to illustration in Figure 6. They are found in Ranger and Explorer vehicles for 1995 model year as standard equipment. The difference in the number designations is identification for different torque carrying capacity, as shown in the chart in Figure 6. Notice also in Figure 6 that the 4R55E transmission is found behind the 4.0L engines, and the 4R44E transmission is found in 2.3L and 3.0L models. The 4R55E version has more clutch plates.

Continued on next Page



VEHICLE	ENGINE	TRANSMISSION
RANGER	2.3L	4R44E
RANGER	3.0L	4R44E
RANGER	4.0L	4R55E
EXPLORER	4.0L	4R55E

Figure 6

We have provided you with the clutch and band application chart and the shift solenoid pattern, as shown in Figure 7. This unit has a total of 6 solenoids mounted on the valve body, 3 Shift Solenoids, EPC Solenoid, Coast Clutch Solenoid, and TCC Solenoid. Solenoid locations are identified in Figure 8. Case connector pin functions, and resistance specifications for all internal components, can be found in the charts in Figure 9, and case connector pin locations are identified in Figure 10.

The Turbine Shaft Speed Sensor, which is mounted inside the unit and bolts into the center support, is also unique to this unit. The Turbine Shaft Speed Sensor is triggered by a new "Wheel" pressed onto the overdrive carrier, and the set-up of all of these parts are shown in Figure 11.

CLUTCH AND BAND APPLICATION CHART

FUNCTION	POSITION	OVERDRIVE BAND	INTERMEDIATE BAND	LOW/REVERSE BAND	FORWARD CLUTCH	DIRECT CLUTCH	COAST CLUTCH	OVERDRIVE ONE-WAY CLUTCH		REAR ONE-WAY CLUTCH	
								DRIVE	COAST	DRIVE	COAST
PARK	P										
REVERSE	R			A		A	A/W	H	OR*		
NEUTRAL	N										
1ST	Ⓓ				A		A/W	H	OR*	H	OR
2ND	Ⓓ		A		A		A/W	H	OR*	OR	OR
3RD	Ⓓ				A	A	A/W	H	OR*	OR	OR
4TH	Ⓓ	A			A	A		OR	OR	OR	OR
MANUAL 2ND	2		A		A		A	H	H		
MANUAL 1ST	1			A	A		A	H	H	H	H
PLANETARY COMPONENT		OS	FS	RP	FR	FS	OS/OP	ODR/OP	ODR	RP	RP

A = APPLIED
OR = OVER RUNNING
FS = FORWARD SUN GEAR
FR = FORWARD RING GEAR
H = HOLDING
ODR = OVERDRIVE RING GEAR
A/W = APPLIED WITH TCIL ON OVERDRIVE CANCELLED
OS = OVERDRIVE SUN GEAR
RP = REAR PLANETARY ASSEMBLY
OP = OVERDRIVE PLANETARY ASSEMBLY

* = HOLDING WITH OVERDRIVE CANCELLED – TCIL ON

SOLENOID APPLICATION CHART

GEAR SELECTOR POSITION	POWERTRAIN CONTROL MODULE (PCM) GEAR COMMANDED	SOLENOIDS				
		ENGINE BRAKE	SS1	SS2	SS3	CCS
P	P	NE	On	Off	Off	Off
R	R	No	On	Off	Off	Off
R	R*	Yes	On	Off	Off	On
N	N	NE	On	Off	Off	Off
Ⓓ	1st	No	On	Off	Off	Off
Ⓓ	1st*	Yes	On	Off	Off	On
Ⓓ	2nd	No	On	On	Off	Off
Ⓓ	2nd*	Yes	On	On	Off	On
Ⓓ	3rd	No	Off	Off	Off	Off
Ⓓ	3rd*	Yes	Off	Off	Off	On
Ⓓ	4th	No	Off	Off	On	Off
MAN 2nd	2nd	Yes	On	On	Off	On
MAN 1st	1st	Yes	On	Off	Off	On

NE = No Effect
* = Overdrive Cancelled – TCIL ON

Figure 7

4R44E/4R55E SOLENOID LOCATIONS

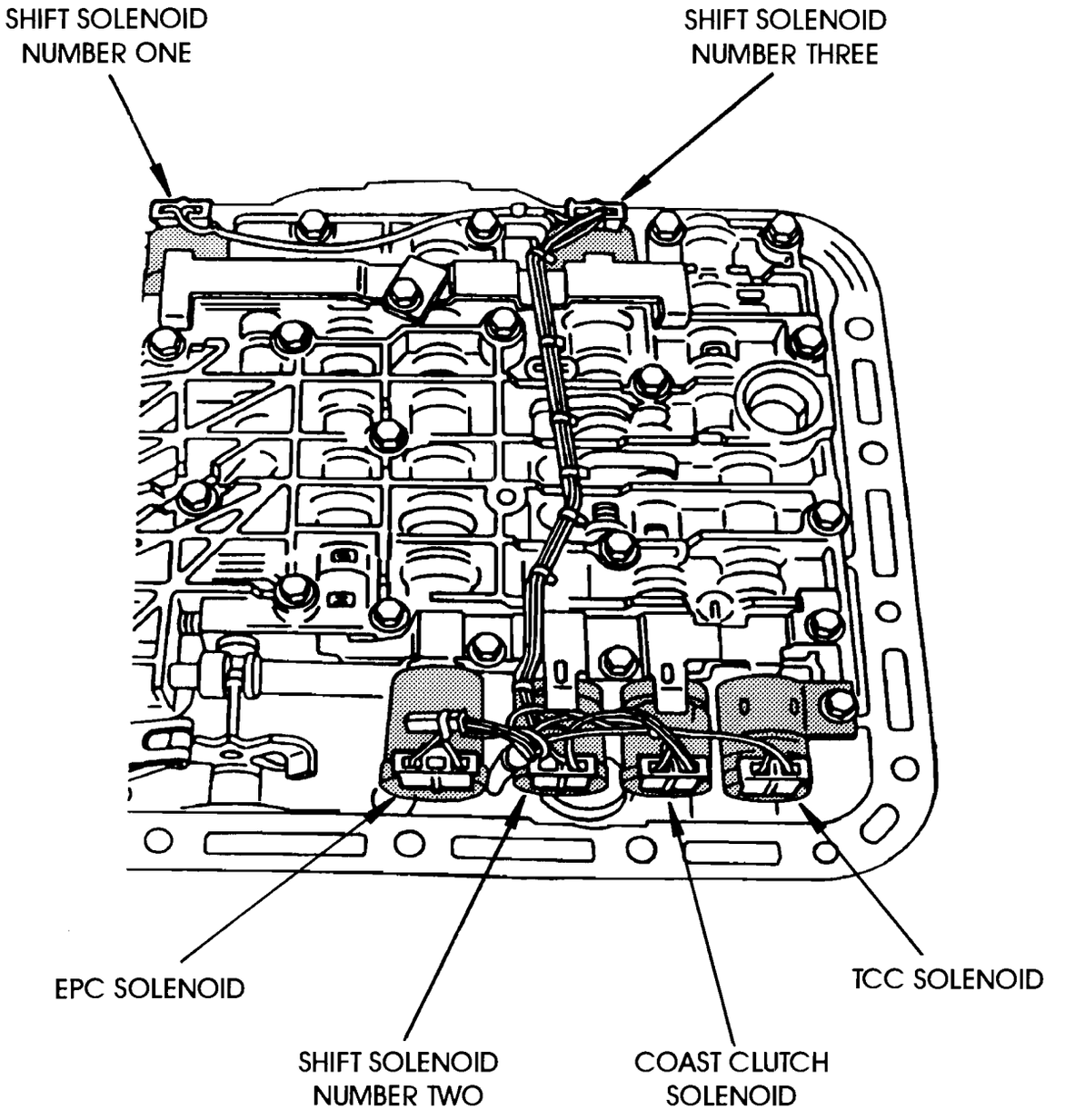


Figure 8

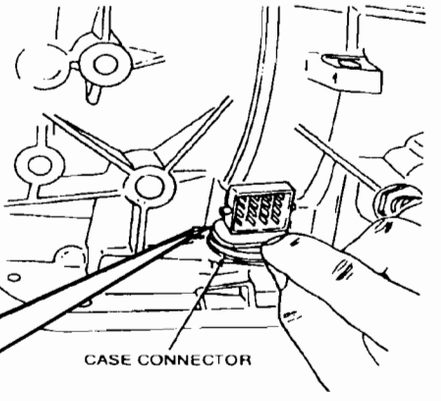
PIN NUMBER	INTERNAL WIRE COLOR	CIRCUIT FUNCTION
1	BLACK	TCC SOLENOID POWER IN
2	RED	TSS SIGNAL
3	WHITE	TSS SIGNAL RETURN
4	RED	TFT SENSOR SIGNAL
5	PURPLE	TCC SOLENOID GROUND
6		NOT USED
7	YELLOW	SHIFT SOLENOID 3 GROUND
8	RED	TFT SENSOR SIGNAL RETURN
9	ORANGE	COAST CLUTCH SOLENOID GRND
10	WHITE	SHIFT SOLENOID POWER - 12V IN
11	GREEN	EPC SOLENOID POWER IN
12	BLUE	EPC SOLENOID PWM GRND
13		NOT USED
14	BROWN	SHIFT SOLENOID 2 GROUND
15		NOT USED
16	GRAY	SHIFT SOLENOID 1 GROUND

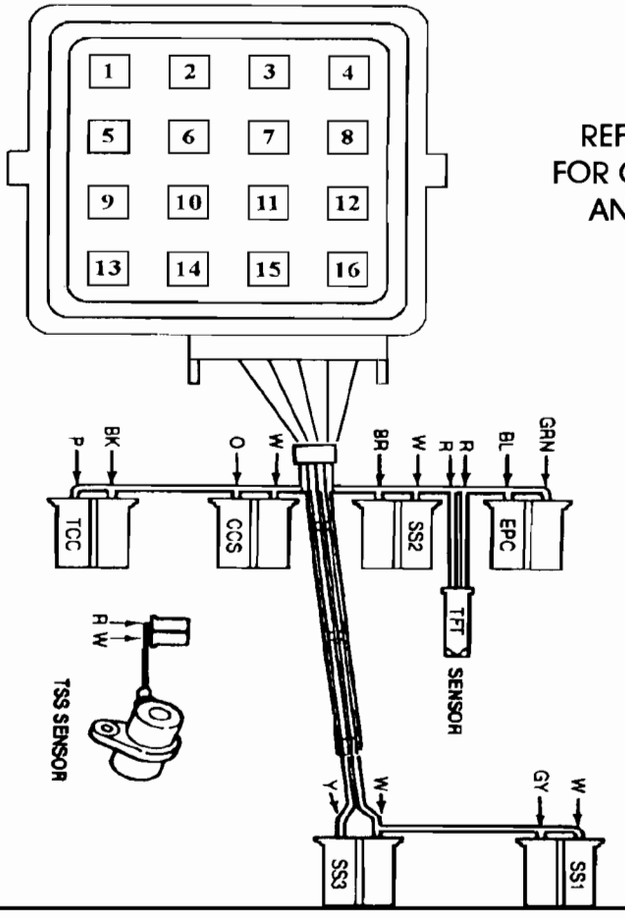
SOLENOID	OHMS	PIN NUMBERS
SHIFT SOLENOID ONE	22 -48	10 AND 16
SHIFT SOLENOID TWO	22 -48	10 AND 14
SHIFT SOLENOID THREE	22 -48	10 AND 7
COAST CLUTCH SOLENOID	22 -48	10 AND 9
EPC SOLENOID	3.1 - 5.7	11 AND 12
CONVERTER CLUTCH SOLENOID	8.9 - 16.0	1 AND 5
TURBINE SHAFT SPEED SENSOR	64 - 120	4 AND 8
TRANS FLUID TEMP SENSOR	SEE CHART	2 AND 3

°C	°F	OHMS RESISTANCE
0-20	32-68	100k-37k
21-40	69-104	37k-16k
41-70	105-158	16k-5k
71-90	159-194	5k-2.7k
91-109	195-230	2.7k-1.5k
110-130	231-166	1.5k-0.8k
131-150	267-302	0.8k-0.5k

Figure 9

CASE CONNECTOR PIN IDENTIFICATION





REFER TO CHART IN FIGURE 9
FOR CONNECTOR PIN FUNCTION
AND RESISTANCE READINGS

Figure 10

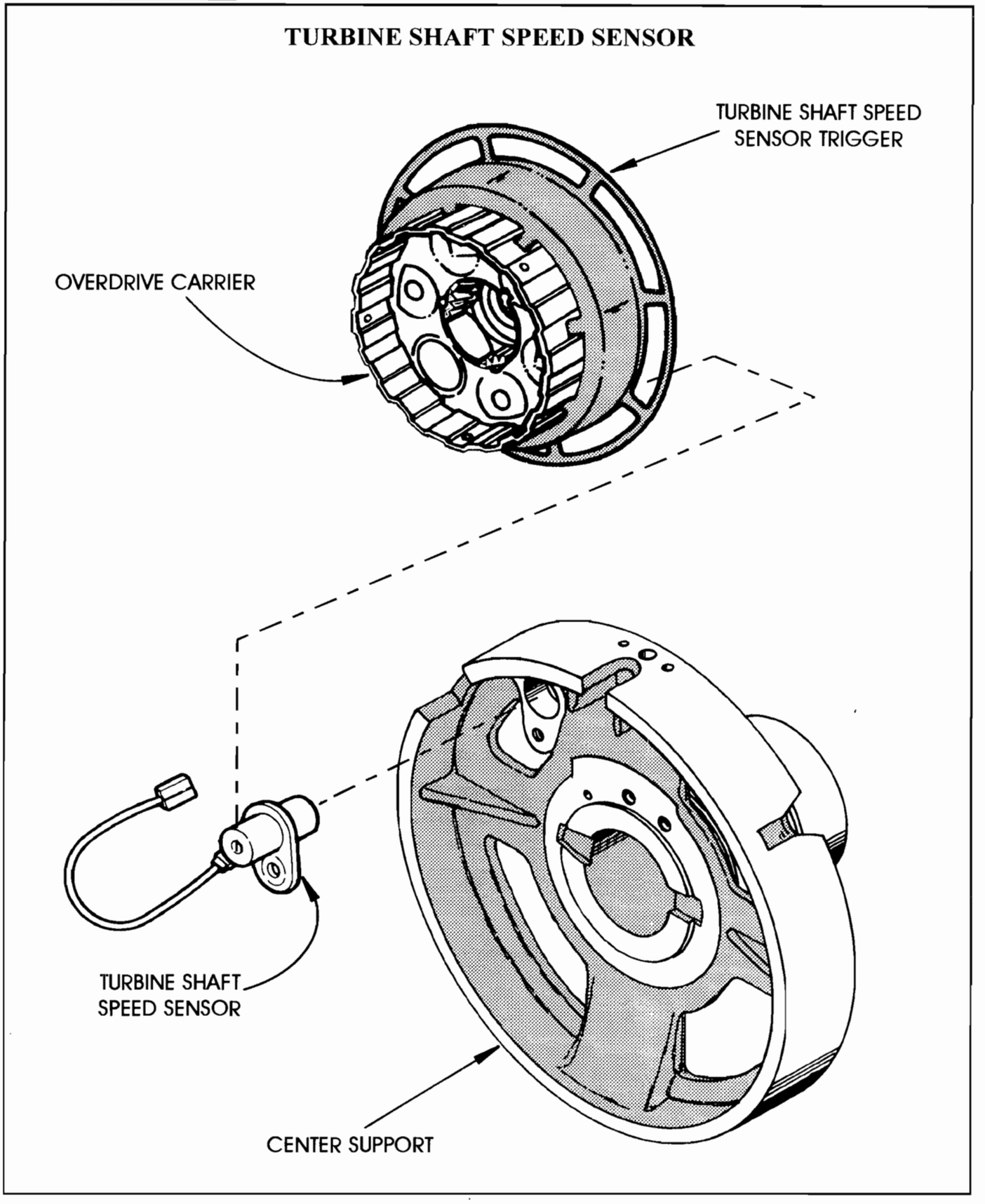

TURBINE SHAFT SPEED SENSOR
TURBINE SHAFT SPEED SENSOR TRIGGER
OVERDRIVE CARRIER
TURBINE SHAFT SPEED SENSOR
CENTER SUPPORT

Figure 11

FORD 4R44E/4R55E

SLIPPING AND/OR NO 1-2, 2-3, 3-4 SHIFT AND POSSIBLE FLASHING "OD OFF" LAMP

COMPLAINT: Some 1995 Ranger and Explorer vehicles equipped with the 4R44E/4R55E transmission may exhibit a slipping condition on upshifts and/or possibly a no upshift condition. If the "OD OFF" lamp is flashing, Disgnostic Trouble Codes (DTCs) 645, 646, 647, 648, P0731, P0732, P0733, P0734 may be stored in the PCM memory. These symptoms are more prevalent on transmisions built before June 20, 1995.

CAUSE: The cause may be, a damaged intermediate and/or overdrive servo piston seal, and may be damaged on the release (Case Bore) side.

CORRECTION: Replace the intermediate and/or overdrive servo pistons as necessary (See Figure 12).

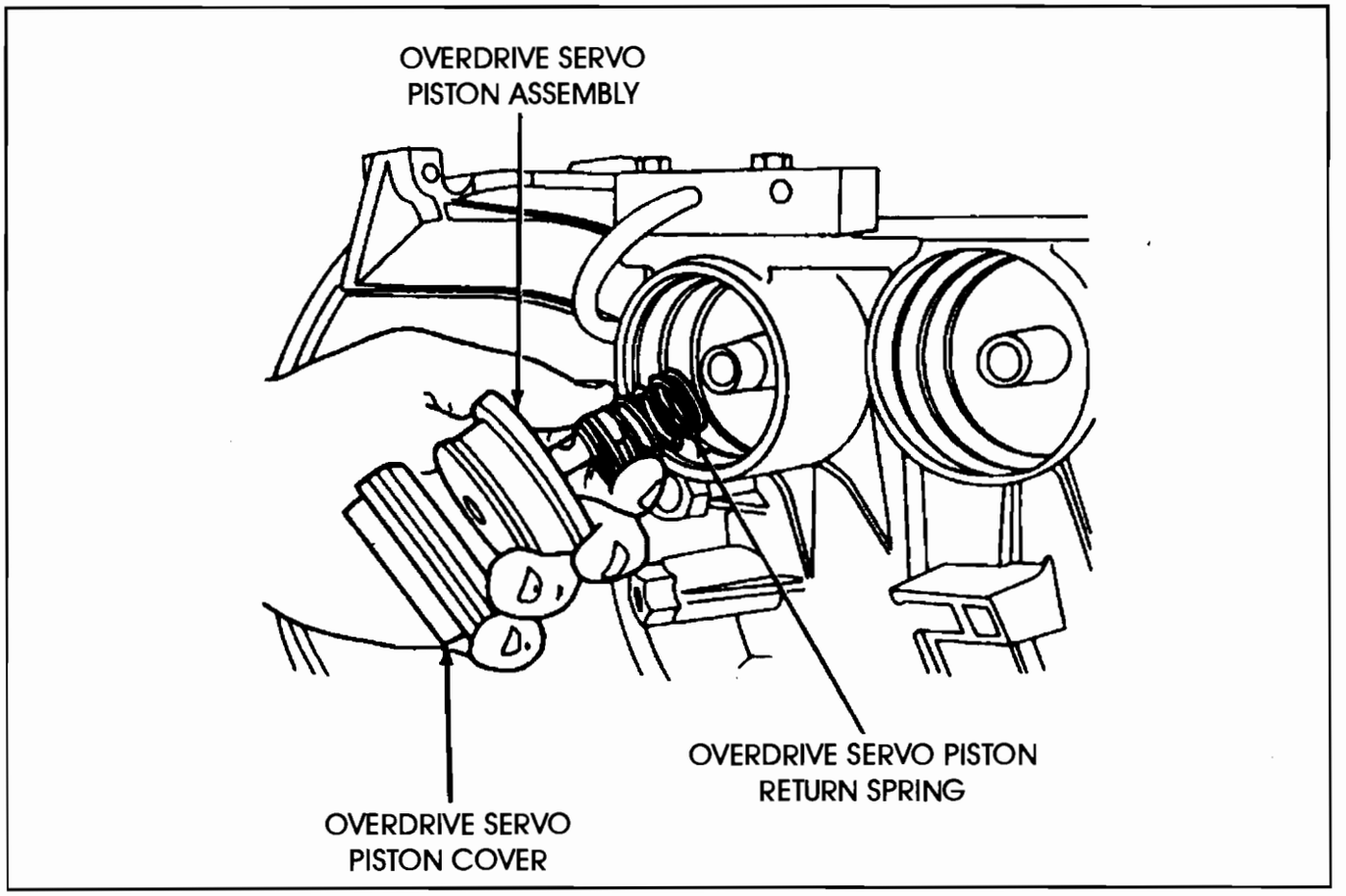


Figure 12

FORD AX4N

PRELIMINARY INFORMATION AND DIFFERENCES WITH AX4S (AXODE)

EXTERNAL DIFFERENCES:

The AX4N transaxle was introduced by Ford Motor Company in model year 1994, and has been expanded into more models for 1995. The AX4N is found in ***some*** Taurus and Sable vehicles, and ***all*** 1995 Lincoln Continentals. The AX4N transaxle is a completely different unit than the AX4S/AXODE, but could be easily mistaken for an AX4S/AXODE at a quick glance. Refer to Figure 13, and you will notice that there is no servo cover on the AX4N, and "AX4N" is stamped into the side cover.

SOLENOID LOCATIONS:

The Shift Solenoids, EPC Solenoid, and TCC Solenoid are in different locations between these two units, as shown in Figure 14.

We have provided you with both of the internal wiring schematics to identify case connector pin cavities and internal wiring colors, as shown in Figure 15. Notice also in Figure 15, that the case connectors and wire colors are the same for 93-96 AX4S/AXODE and the AX4N transaxles. This may present problems in the future, ***as these transaxles will not interchange.***

Notice in Figure 16 that ***the solenoid shift patterns are different between AX4S/AXODE and AX4N,*** even though the resistance values and the OEM part numbers are the same.

OIL TUBE LOCATIONS:

The difference in oil tube locations, located in the bottom pan, are shown in Figure 17, and we have shown both the early and the late "Cross-Over" tube locations on the AX4S/AXODE version.

OIL FILTER DIFFERENCES:

The bottom pan oil filters are also different between these two units, as shown in Figure 18. Complicating things even further, the AX4N transaxle has two different types of oil filters, two different depth bottom pans, and ***some models*** require a "Baffle", as shown in Figure 18.

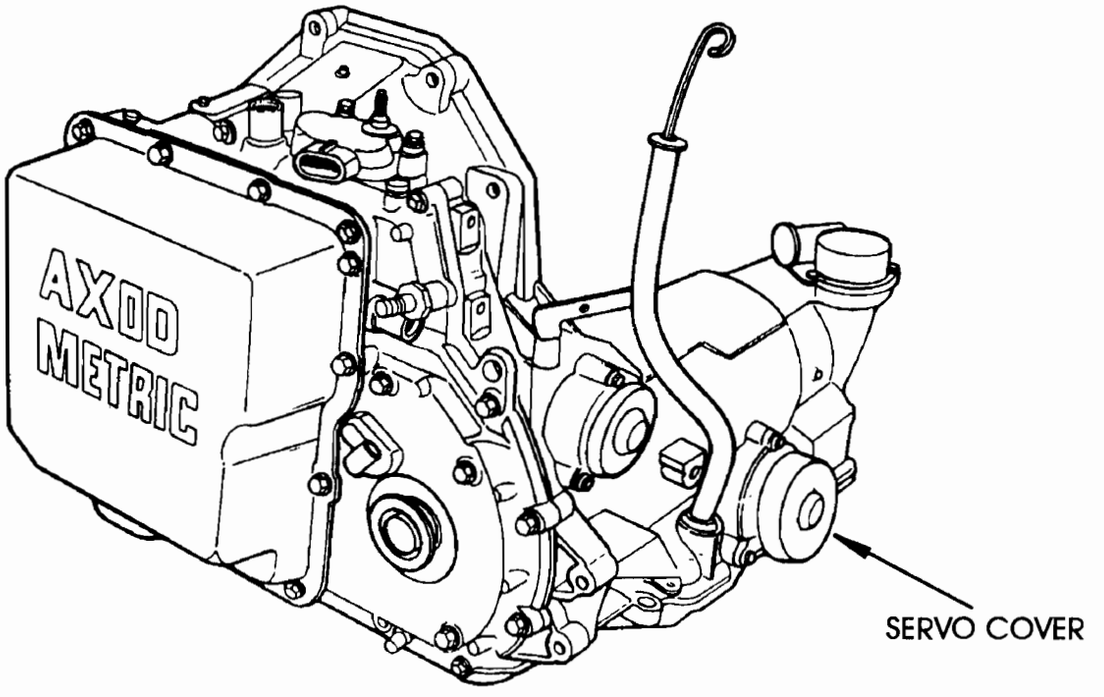
INTERNAL DIFFERENCES:

Internally there is an added Low Intermediate Roller Clutch, an added Low Intermediate Clutch Pack Assembly, and an added Overrun Band that goes around the rear sun gear drum to provide engine braking in low and second are just a few of the internal changes. There are many others. Refer to Figure 19 for the new roller clutch changes.

SERVICE INFORMATION:

EPC Solenoid, 91-UP, All Models, AX4S/AXODE and AX4N	F4DZ-7H144-A
Lock-up Solenoid, 1991 Taurus/Sable Only	F1DZ-7G136-A
Lock-up Solenoid, 91-93 Continental (Before 5-15-93)	F1OY-7G136-A
Lock-up Solenoid, 1993 Continental (After 5-15-93)	F3DZ-7G136-A
Lock-up Solenoid, 92-93 All Models (Before 5-15-93	F1OY-7G136-A
Lock-up Solenoid, 93-95 All Models (After 5-15-93), AX4S/AXODE and AX4N	F3DZ-7G136-A
Shift Control Solenoid (3 Req'd), All Models, AX4S/AXODE and AX4N	F1DZ-7G484-A
Turbine Shaft Speed Sensor, All Models, AX4S/AXODE and AX4N	F1DZ-7M101-A

AXOD-E (AX4S) TRANSAXLE



AX4N TRANSAXLE

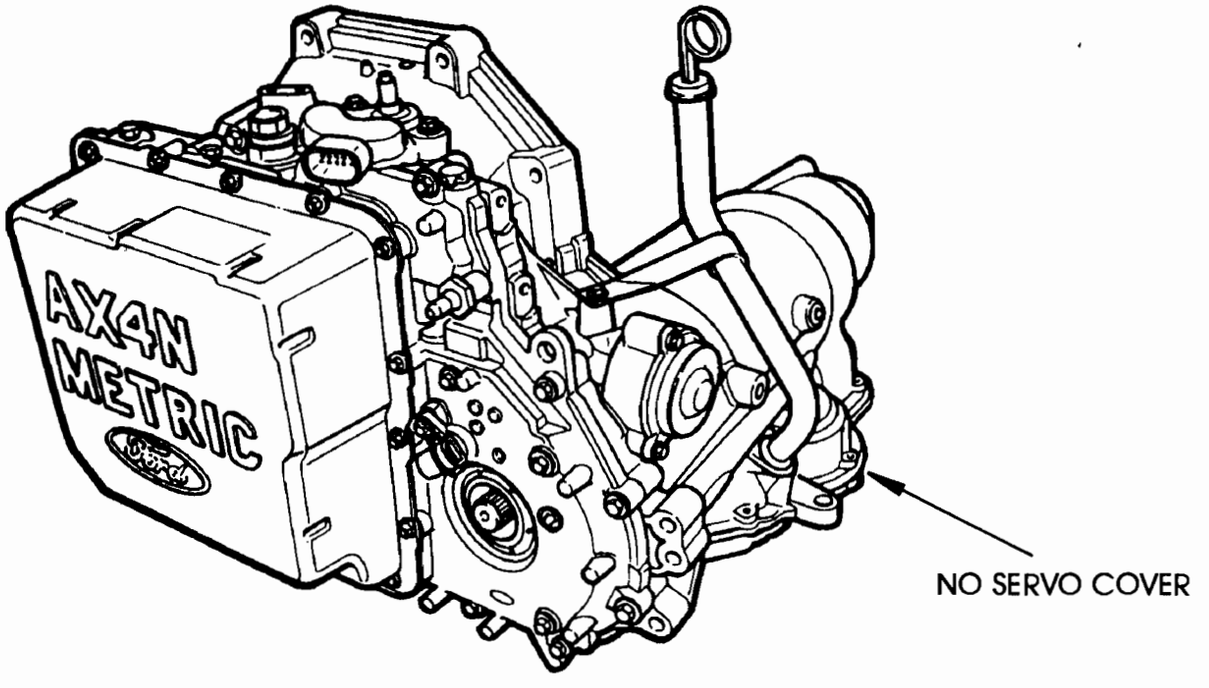


Figure 13

Tired of AXOD Planetary Failure?

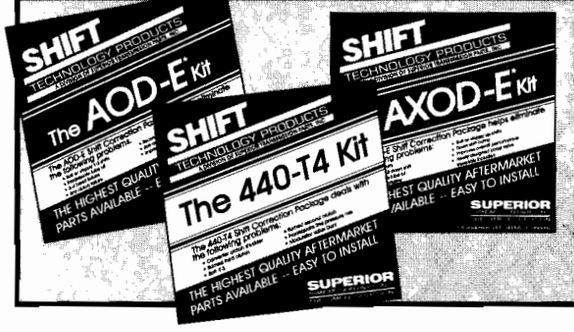
Introducing The AXOD Dam, the simple solution to AXOD lube problems.

The AXOD Dam was developed to help eliminate planetary failure in the AXOD and AXOD-E transmissions. This simple, yet effective, product allows AXOD planetaries to run cooler and last much, much longer.

When properly installed, the Lube Dam floods the section between the reverse cylinder and the rear planet support, where the front and rear planetary assemblies are located. By flooding this section lube oil has adequate time for heat exchange from the pinions to the lube oil. The pinions and needle bearings run in an oil bath, ensuring total lubrication. Since the amount of lubrication is increased dramaticially, better cooling is assured.

The AXOD Dam virtually eliminates planetary failure.

Try Our SUPERIOR Shift Correction Packages



Available For:

700-R4, 440-T4, 200-4R, 400, 350, 200, 125, E4OD, A4LD, AXOD, 722.3-4, AOD, & C-6.

High Performance Kits Also Available For: 200-4R HP, AOD HP, 350 HP, & 700-R4 HP.

Ask Your Distributor Or Call:

800-451-3115

Make the shift to...

SUPERIOR
TRANSMISSION PARTS, INC.
THE SIMPLE SOLUTION

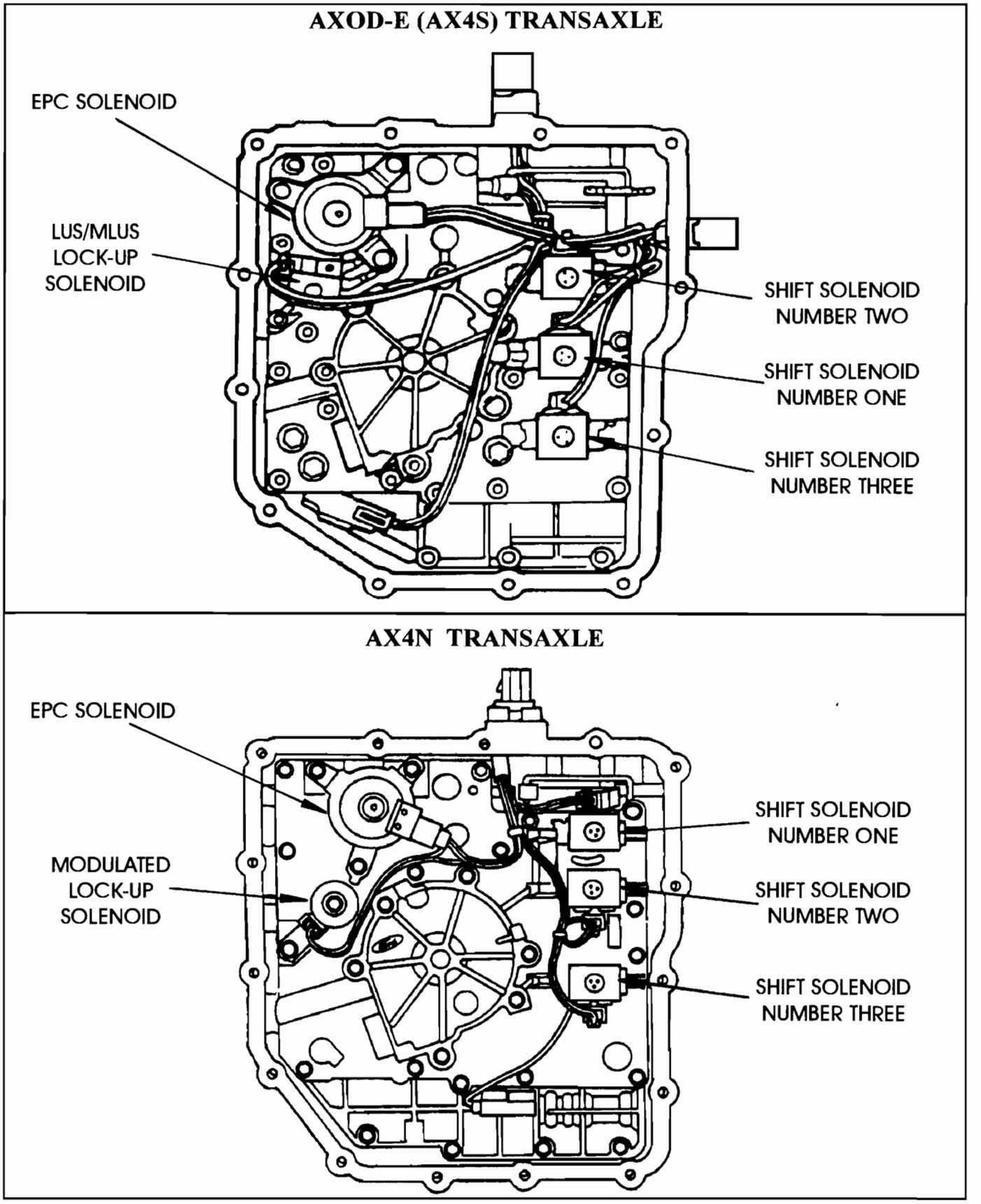
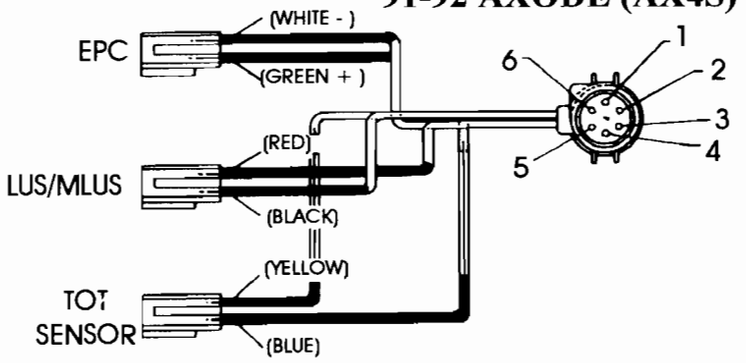


Figure 14

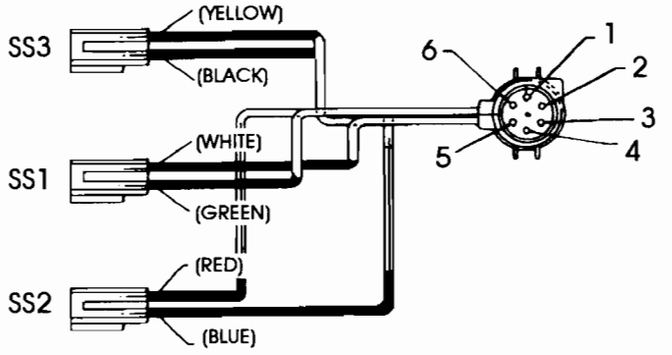
Automatic Transmission Service Group

91-92 AXODE (AX4S) ONLY



91-92 CASE CONNECTOR ON THE "*TOP*" OF THE TRANSAXLE

1. EPC POWER (WHITE)
2. TOT (YELLOW)
3. TOT (BLUE)
4. LUS/MLUS POWER (RED)
5. LUS/MLUS GROUND (BLACK)
6. EPC GROUND (GREEN)



91-92 CASE CONNECTOR ON THE "*SIDE*" OF THE TRANSAXLE

1. SS2 POWER (RED)
2. SS2 GROUND (BLUE)
3. SS3 GROUND (BLACK)
4. SS3 POWER (YELLOW)
5. SS1 POWER (WHITE)
6. SS1 GROUND (YELLOW)

93-96 AX4S AND ALL AX4N

1. EPC GROUND (BLUE)
2. EPC/MCCC POWER (GREEN)
3. SS3 GROUND (YELLOW)
4. MCCC GROUND (BROWN)
5. SHIFT SOLENOID POWER (RED)
6. SS1 GROUND (ORANGE)
7. TFT (BLACK)
8. SS2 GROUND (PINK)
9. TOT RETURN (WHITE)

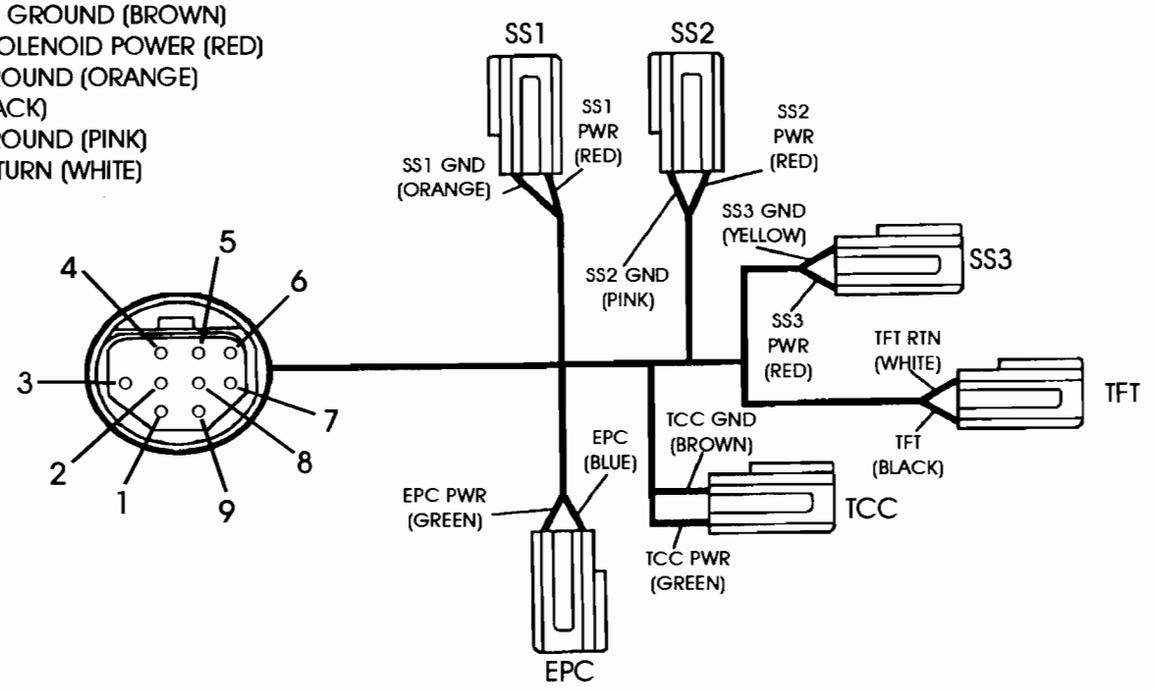


Figure 15

SHIFT SOLENOID PATTERN

AX4S/AXODE *ONLY*				
GEAR SELECTOR	PCM GEAR COMMANDED	SHIFT SOLENOIDS		
		SS1	SS2	SS3
P/N	P/N	OFF	ON	OFF
REV	REV	OFF	ON	OFF
OD	1ST	*OFF*	*ON*	*OFF*
OD	2ND	*ON*	*ON*	*OFF*
OD	3RD	*OFF*	*OFF*	*ON*
OD	4TH	*ON*	*OFF*	*ON*

SHIFT SOLENOID PATTERN

AX4N *ONLY*				
GEAR SELECTOR	PCM GEAR COMMANDED	SHIFT SOLENOIDS		
		SS1	SS2	SS3
P/N	P/N	OFF	OFF	OFF
REV	REV	OFF	OFF	OFF
OD	1ST	*OFF*	*ON*	*OFF*
OD	2ND	*OFF*	*OFF*	*OFF*
OD	3RD	*ON*	*OFF*	*ON*
OD	4TH	*ON*	*ON*	*ON*

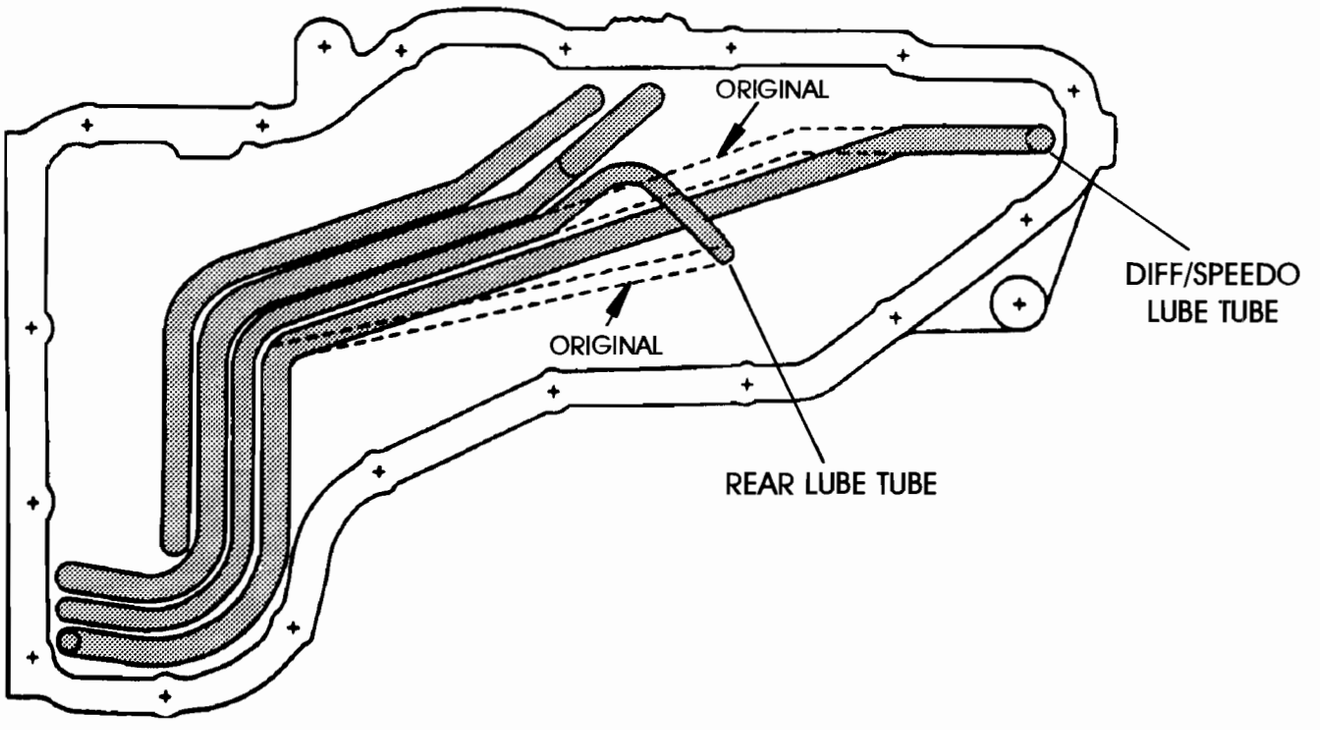
SHIFT SOLENOID RESISTANCE CHART AND TFT SENSOR RESISTANCE CHART FOR BOTH AX4S AND AX4N

SOLENOID	SOLENOID RESISTANCE (OHMS)
SS1	15 - 25
SS2	15 - 25
SS3	15 - 25
LUS	21 - 36
MLUS	.98 - 1.6
EPC	3.23 - 5.50
TSS	100 - 200

°C	°F	TFT SENSOR (OHMS)
0-20	32-58	100k - 37k
21-40	59-104	37k - 16k
41-70	105-158	16k - 5k
71-90	159-194	5k - 2.7k
91-110	195-230	2.7k - 1.5k
111-130	231-266	1.5k - 0.8k
131-150	267-302	0.8k - 0.5k

Figure 16

AXOD-E (AX4S) TUBE LOCATIONS



AX4N TRANSAXLE TUBE LOCATIONS

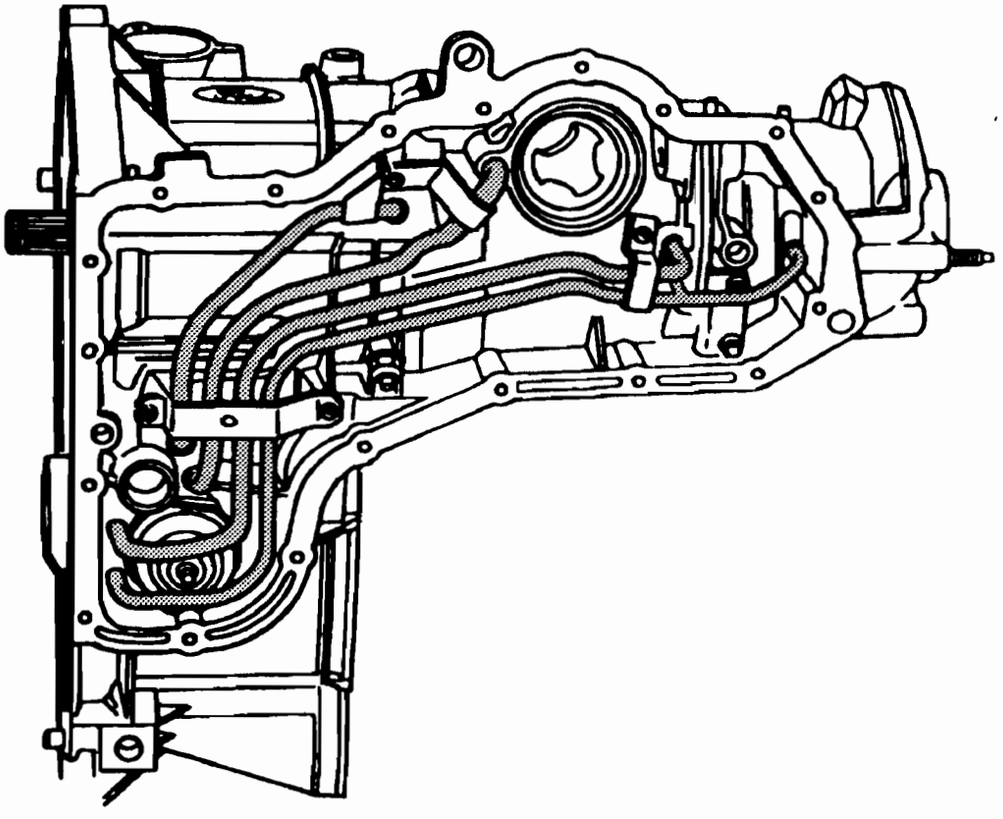
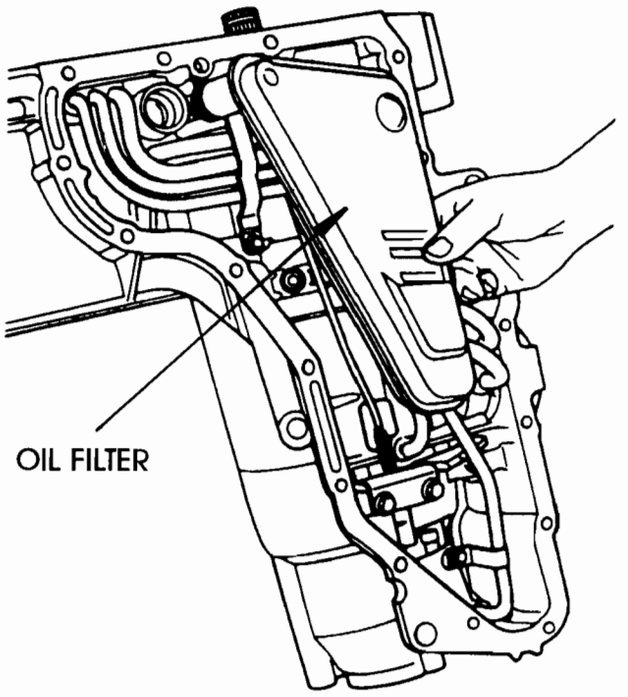
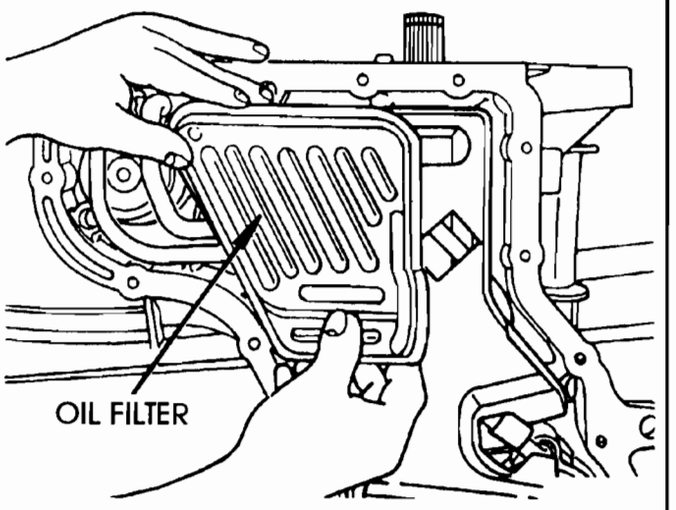


Figure 17

AXOD-E (AX4S) FILTER



AX4N FILTER



FILTER BAFFLE FOUND ON SOME MODELS

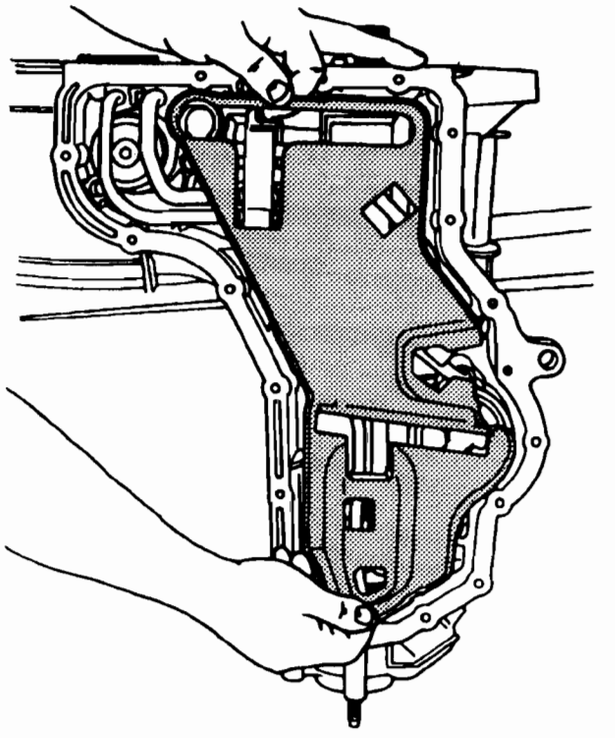
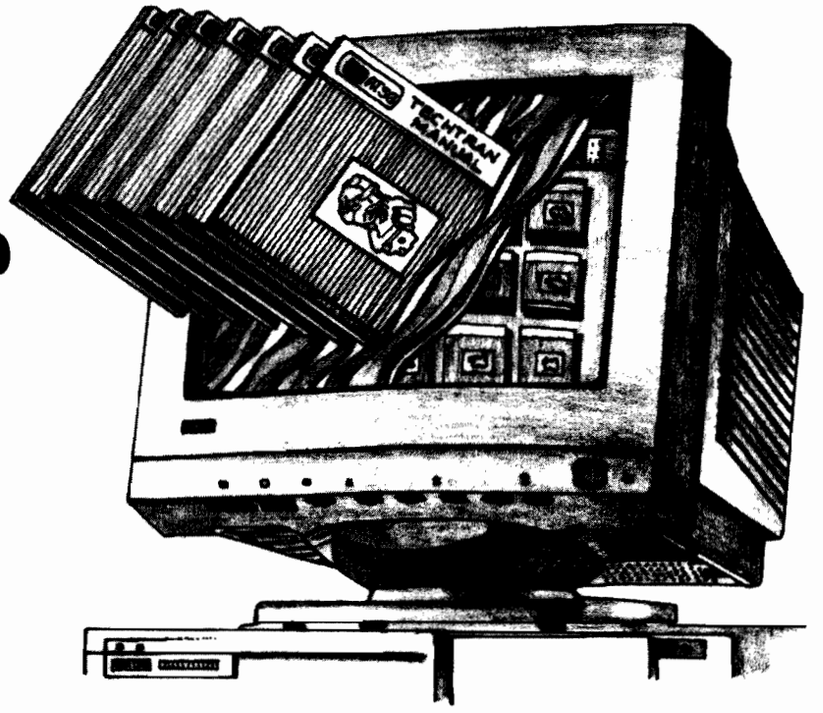


Figure 18

Automatic Transmission Service Group

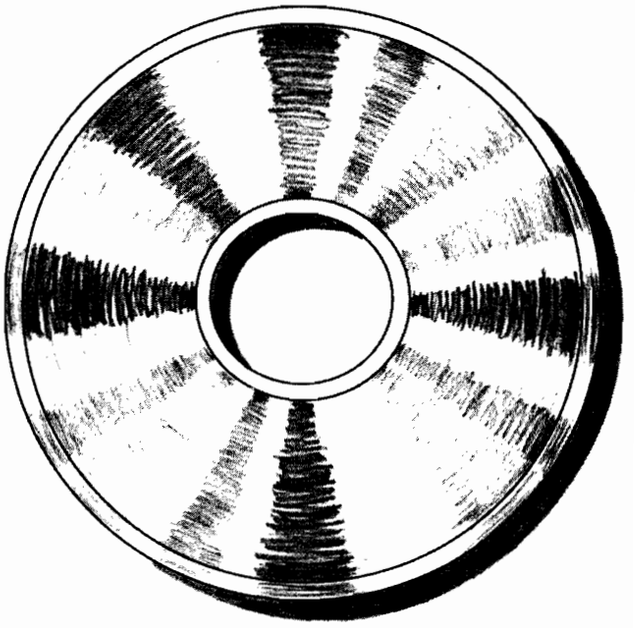
Another First ...



Transmission Manuals Now On CD Rom

DOMESTIC TRANSMISSIONS
General Motors, Ford, Chrysler,
Pass Books, Updates and Transfer Cases

IMPORT TRANSMISSIONS
Toyota, Honda, Nissan, Mercedes,
BMW, Mitsubishi, Mazda and more



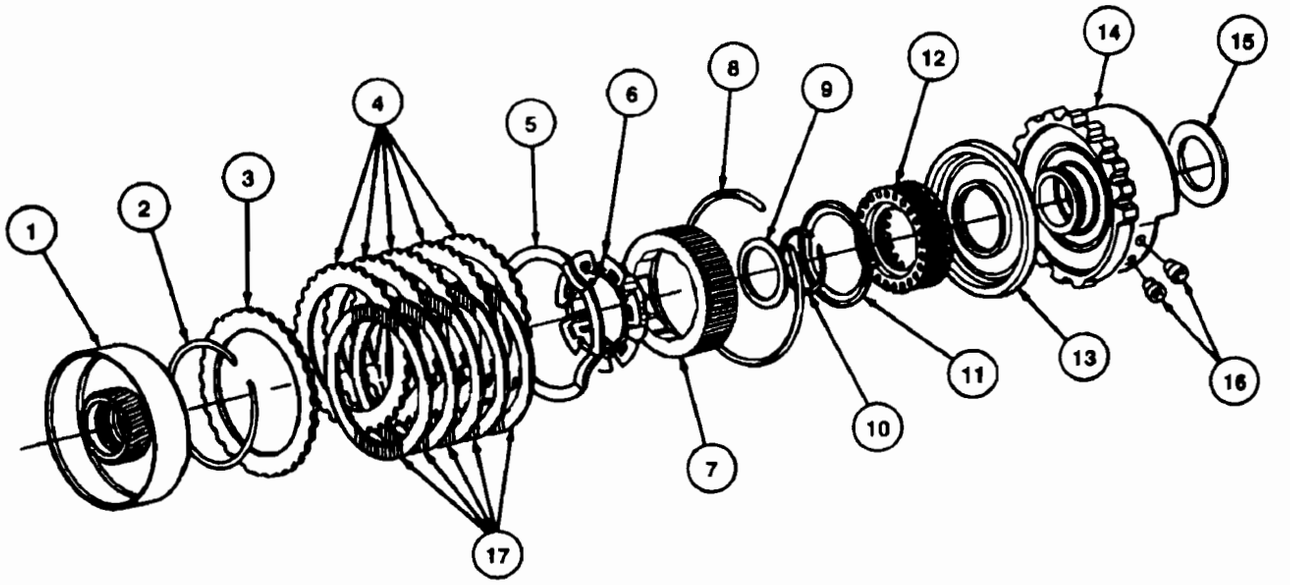
ATSG TECH BULLETINS
1986 - 1995 on CD Rom

Call Our Toll Free Number for Prices and Information

ATSG

1-800-245-7722
9200 S. DADELAND BLVD.
SUITE 720 • MIAMI, FL 33156

LOW INTERMEDIATE ROLLER CLUTCH AND LOW INTERMEDIATE CLUTCH PACK ASSEMBLY



1. REAR SUN GEAR ASSEMBLY
2. LOW INTERMEDIATE CLUTCH SNAP RING (SELECTIVE)
3. LOW INTERMEDIATE PRESSURE PLATE
4. LOW INTERMEDIATE STEEL CLUTCH PLATES
5. LOW INTERMEDIATE CLUTCH WAVE PLATE
6. LOW INTERMEDIATE ROLLER CLUTCH ASSEMBLY
7. LOW INTERMEDIATE ROLLER CLUTCH OUTER RACE
8. REAR PLANET SUPPORT BEVELED SNAP RING (SELECTIVE)
9. NUMBER 15 SUN GEAR THRUST BEARING
10. RETAINING SNAP RING
11. NUMBER 15 THRUST WASHER
12. LOW INTERMEDIATE CLUTCH RETURN SPRING ASSEMBLY
13. LOW INTERMEDIATE CLUTCH PISTON AND SEAL ASSEMBLY
14. REAR PLANETARY SUPPORT ASSEMBLY
15. NUMBER 16 THRUST WASHER
16. LUBE OIL TRANSFER TUBE SEALS (2 REQUIRED)
17. LOW INTERMEDIATE CLUTCH LINED PLATES

Figure 19

FORD
MASS AIR FLOW SENSOR DIAGNOSIS

The Mass Air Flow (MAF) sensor is located in between the air cleaner and the throttle body. **(See Figure 20)** The MAF sensor uses a heated wire as a sensing element to measure the amount of air that is entering the engine. The air that passes over the heated wire causes the wire to cool. The MAF sensor then outputs a DC analog voltage signal to the PCM, which uses that signal to determine the amount of air that is entering the engine. The PCM will calculate the fuel injector pulse width in order to provide the proper air/fuel ratio. The MAF sensor signals are also used for electronically controlled transmissions and transaxles in determining EPC pressure control, shift and TCC strategies. For the purpose of transmission and transaxle diagnosis, symptoms of MAF sensor malfunction or failure could include high or low EPC pressure, improper shift scheduling, incorrect TCC scheduling. These symptoms will feel similar to a throttle position sensor malfunction. Testing the MAF will require the use of a Digital Volt-Ohm Meter, set to D.C. volts. Connect the leads to the sensor harness wires at terminals **C and D (See Figure 21)**. With the engine running at an idle, the voltage should read in between .60 - 1.2 volts. This idle reading voltage will vary due to engine and ambient outside temperature. Refer to the chart **(See Figure** 22) below for sensor data.

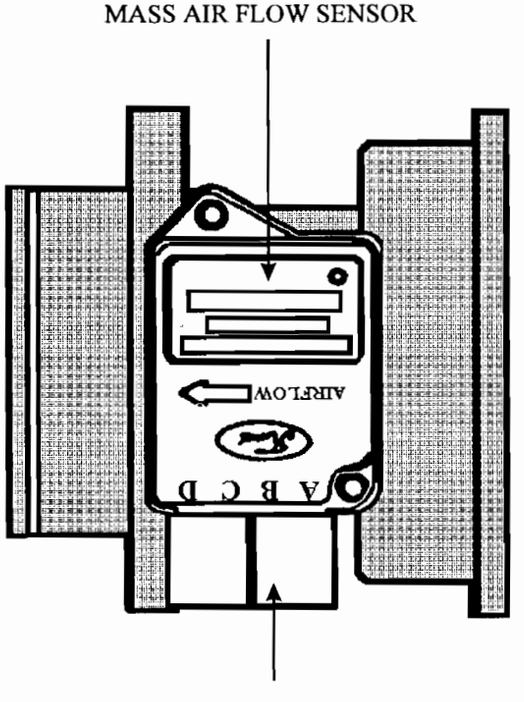


Figure 20

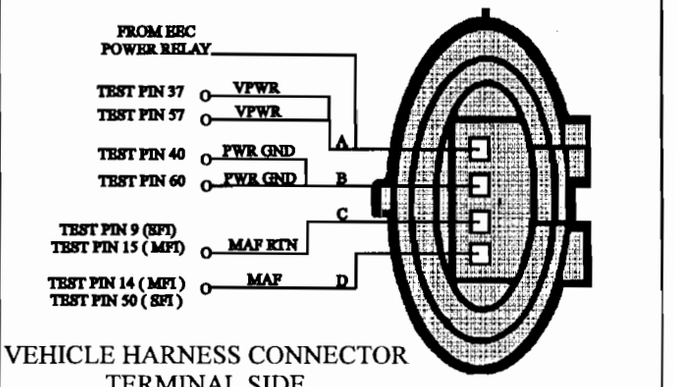


Figure 21

MAF SIGNAL VOLTAGE

IDLE	.6-1.3 VOLTS
20 MPH	1.1 VOLTS
40 MPH	1.7 VOLTS
60 MPH	2.1 VOLTS

MAF signal voltage is typical for engines at normal operating temperature. Voltage signal may vary due to engine load and temperature.

Figure 22

FORD E4OD

DELAYED FORWARD ENGAGEMENT AND/OR BURNT FORWARD CLUTCH AFTER INSTALLING FORD CENTER SUPPORT SERVICE KIT F4TZ-7A130-B

COMPLAINT: Delayed forward engagement and/or prematurely burnt forward clutch plates may be evident on vehicles which have had the new Ford Ball Bearing Center Support Kit, OEM part number F4TZ-7A130-B.

CAUSE: The cause may be, forward clutch oil leaking between the steel hub and the aluminum support ring because of mis-machining of the aluminum support ring in the area where the steel hub bolts to it.

CORRECTION: Install a new Center Support Service Kit, F4TZ-7A130-B, that has yellow paint on the wide leg of the center support as shown in Figure 1, and a yellow dot on the shipping carton as shown in Figure 1. There was no part number change and Ford has since recalled and reboxed the defective part.

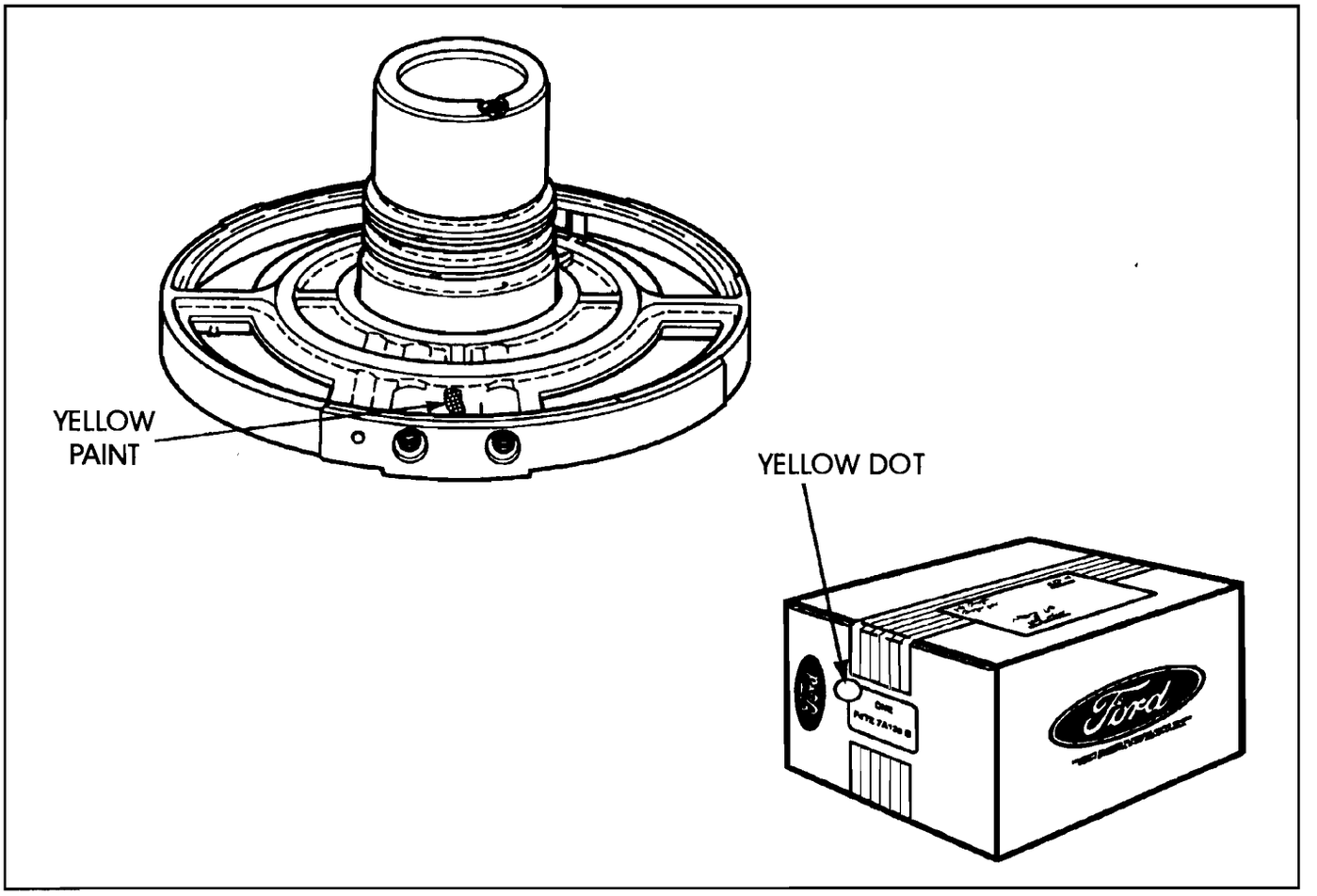


Figure 1

FORD E4OD
NEW DESIGN CENTER SUPPORT SERVICE KIT WITH BALL BEARING

CHANGE: There is now available, from Ford Motor Co, a new design center support service kit with a ball bearing in the support. The new design service package is available under OEM part number F4TZ-7A130-B, and will back service all past model 89-94 E4OD transmissions only. The parts in this service kit are different dimensions than 1995 model year production parts. Refer to Figure 2 for service package kit contents.

REASON: Greatly increases transmission durability.

PARTS AFFECTED:

(1) CENTER SUPPORT - Different machining dimensions on the inside bore, to accommodate an added ball bearing that will now support the overdrive center shaft. The new design ball bearing can be identified as a "Service Part", by the letter "S" stamped on the hub, in the location shown in Figure 3. The Service Kit Ball Bearing Center Support has different dimensions than the 1995 production ball bearing center support. Refer to Dimension "A" on the cutaway drawing in Figure 3.

(2) OVERDRIVE CENTER SHAFT - Different machining dimensions on the center shaft to accommodate the added ball bearing, and the pilot on the center shaft has been removed. The new design Overdrive Center Shaft can be identified as a "Service Part", by the letter "S" stamped on the shaft in one of two locations, as shown in Figure 4. The Service Kit Overdrive Center Shaft has different dimensions than 1995 model year production center shaft. Refer to Dimensions "A" and "B" on the cutaway drawing in Figure 4.
The Overdrive Center Shaft in this service kit is bored to accept either the long or short overdrive planetary carrier assembly and input shaft, and is reflected in Dimension "A", as shown in Figure 4.
Special Note: There is also an updated Overdrive Carrier and Input Shaft, available under OEM part number F4TZ-7B446-B, to help improve durability. Both pieces have different dimensions than the previous parts, as shown in Figure 7. The new overdrive carrier hub is 12mm (.472") shorter than the previous models, and the internal splines now run the full length of the hub which makes it stronger. The Input Shaft is also 12mm (.472") shorter than the previous models, to accommodate the new overdrive carrier, and has I.D. groove cut in shaft for identification (See Figure 7).

(3) OUTPUT SHAFT - Small bushing ***must*** be removed and the orifice cup plug included in the service kit ***must*** be installed, to accommodate the removal of the pilot from the overdrive center shaft. This will now ensure that lube oil is directed to the proper areas. Refer to Figure 5 for the bushing removal and orifice cup plug installation.
The orifice cup plug in this service kit is different dimensions than the 1995 production models, and will fit ***only*** an output shaft that previously had the bushing.

Continued on next Page.

PARTS AFFECTED: (Continued)

(4) NO. 5 NEEDLE BEARING - Make certain the No. 5 Needle Bearing included in service kit is installed with the service kit parts ***regardless*** of whether your unit had one or did not have one. Some 1994 model year transmissions were built with some or all of the parts that "Resemble" the parts in this service kit, and may or may not have a No. 5 needle bearing. Make certain that the No. 5 needle bearing from the service kit is installed. Refer to Figure 6 for proper installation of the needle bearing.

INTERCHANGEABILITY:

(1) This Service Kit will service all past model E4OD transmissions 1989 thru 1994 model years, when used in it's entirety, and is highly recommended on ***all*** previous model E4OD units.

(2) The parts in this Service Kit are different dimensions than 1995 model year production parts and ***will not*** interchange with 1995 model parts (See Figures 3 and 4).

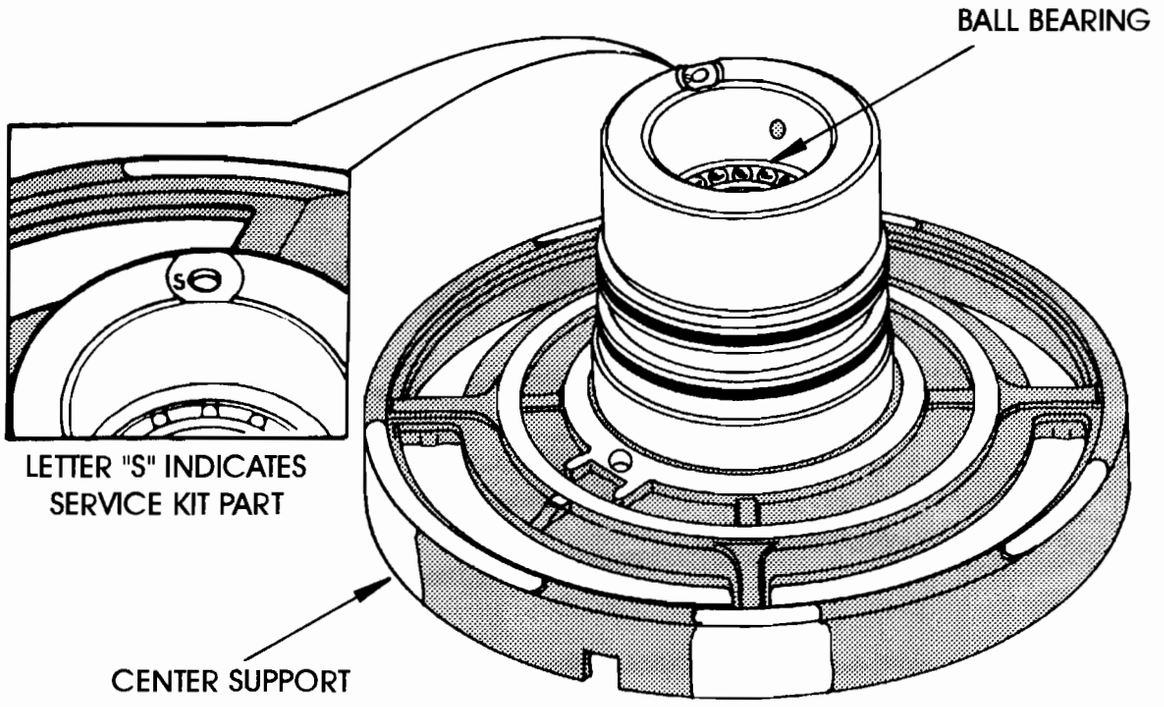
(3) Some 1994 model year transmissions were built with some or all of the parts that "Resemble" the parts in this service kit. When servicing these units, use all of the parts in the kit ***except***, the orifice cup plug. These units already have a cup plug in the output shaft and it is a different diameter. The Service Kit orifice cup plug will fit ***only*** an output shaft that previously had a bushing (See Figure 5).

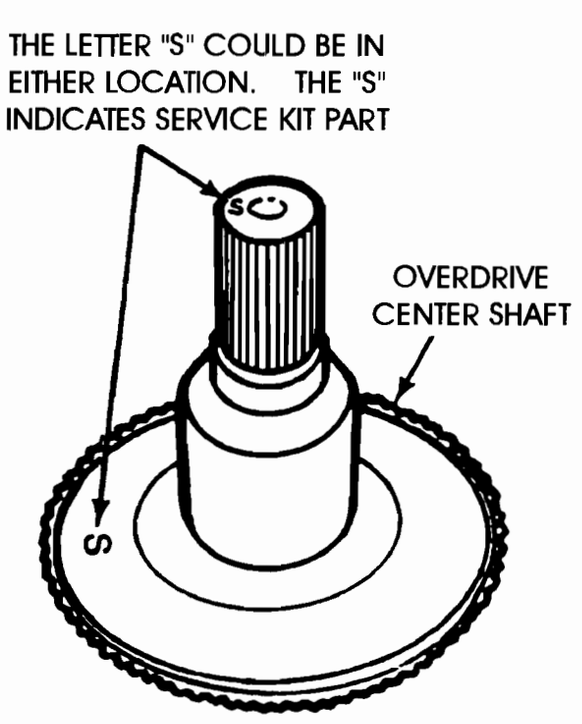
(4) The Overdrive Carrier Assembly and Input Shaft are matching components and ***must*** be serviced as a package.
DO NOT MIX LONG AND SHORT COMPONENTS.
Refer to Figure 8 to ensure that you have built the unit with matching components. The Input Shaft must extend 1-1/2" past the end of the oil pump stator, if you used the correct input shaft and overdrive carrier. Refer to Figure 8 for proper assembly dimensions.

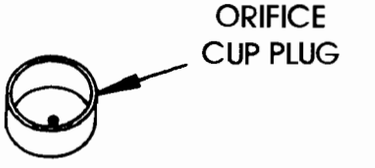
SERVICE INFORMATION:

Ball Bearing Center Support Service Kit (Yellow Dot) F4TZ-7A130-B
Overdrive Carrier/Input Shaft Service Kit F4TZ-7B446-B

F4TZ-7A130-B SERVICE KIT CONTENTS







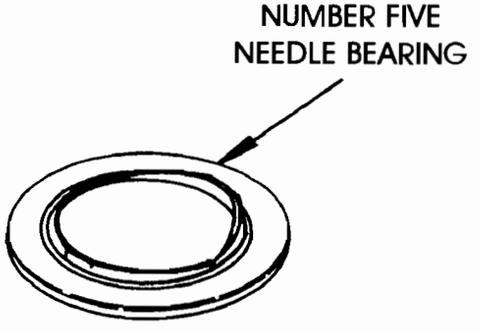
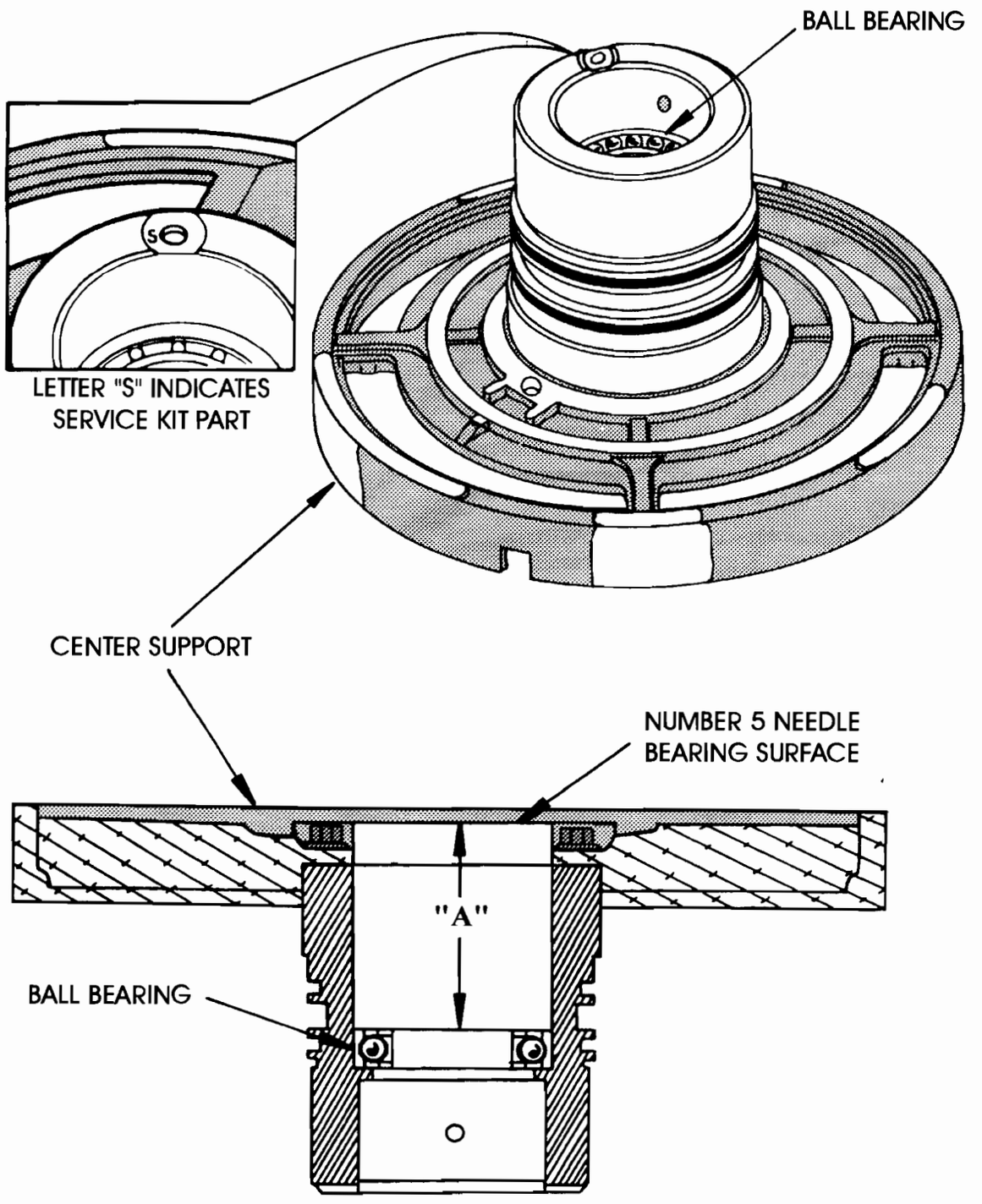


Figure 2

BALL BEARING CENTER SUPPORT



DIMENSION "A"

SERVICE KIT PART = 2.062"
1995 PRODUCTION = 1.838"

Figure 3

OVERDRIVE CENTER SHAFT

DIMENSION "A"
SERVICE KIT PART = 1.938"
1995 PRODUCTION = 1.710"

DIMENSION "B"
SERVICE KIT PART = 2.368"
1995 PRODUCTION = 2.592"

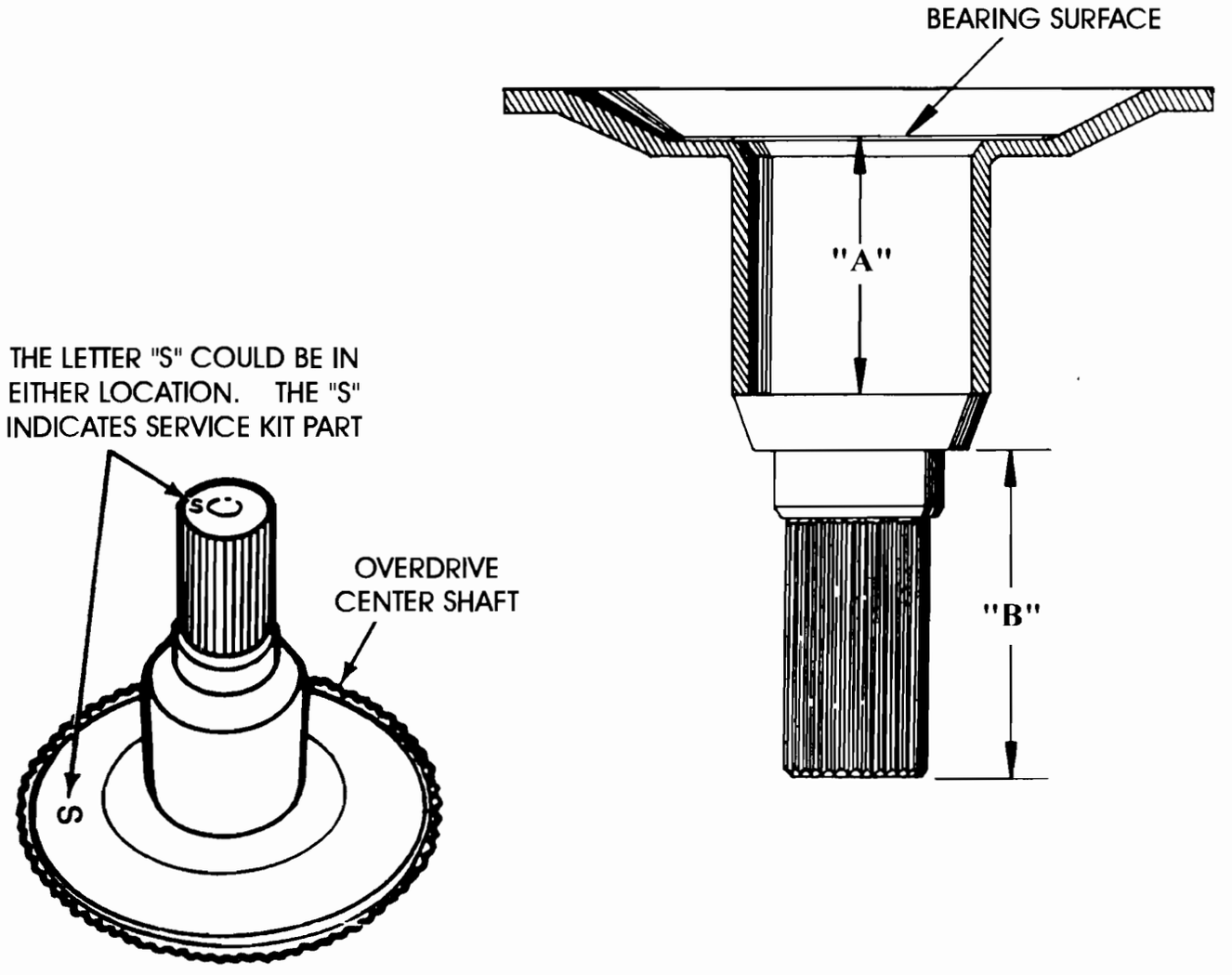
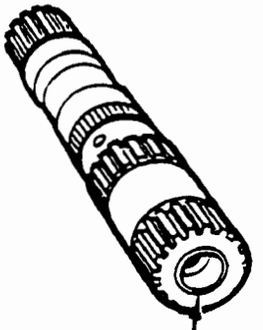
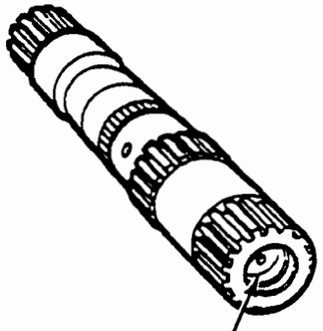


Figure 4

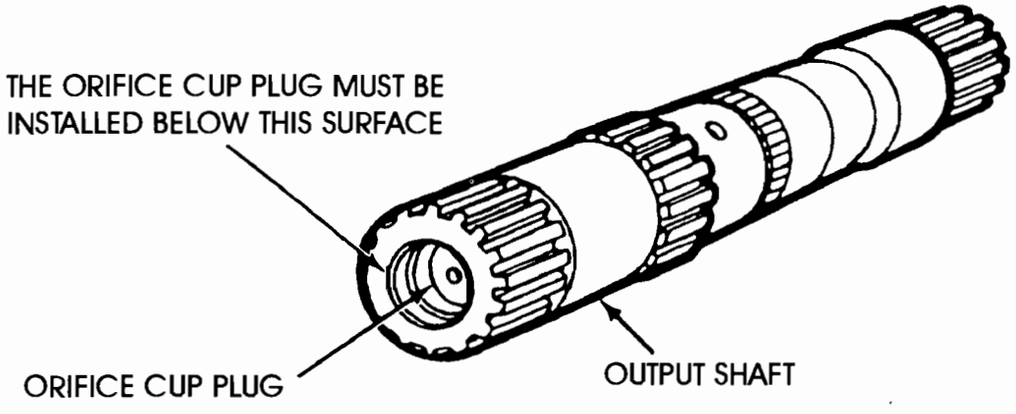
OUTPUT SHAFT AND ORIFICE CUP PLUG



REMOVE THE ORIGINAL BUSHING



INSTALL THE ORIFICE CUP PLUG FROM SERVICE KIT



NOTE: THE ORIFICE CUP PLUG IN THIS SERVICE KIT IS DIFFERENT DIMENSIONS THAN 1995 PRODUCTION MODELS, AND WILL FIT *ONLY* AN OUTPUT SHAFT WITH A BUSHING.

Figure 5

NUMBER 5 NEEDLE BEARING
PROPER INSTALLATION

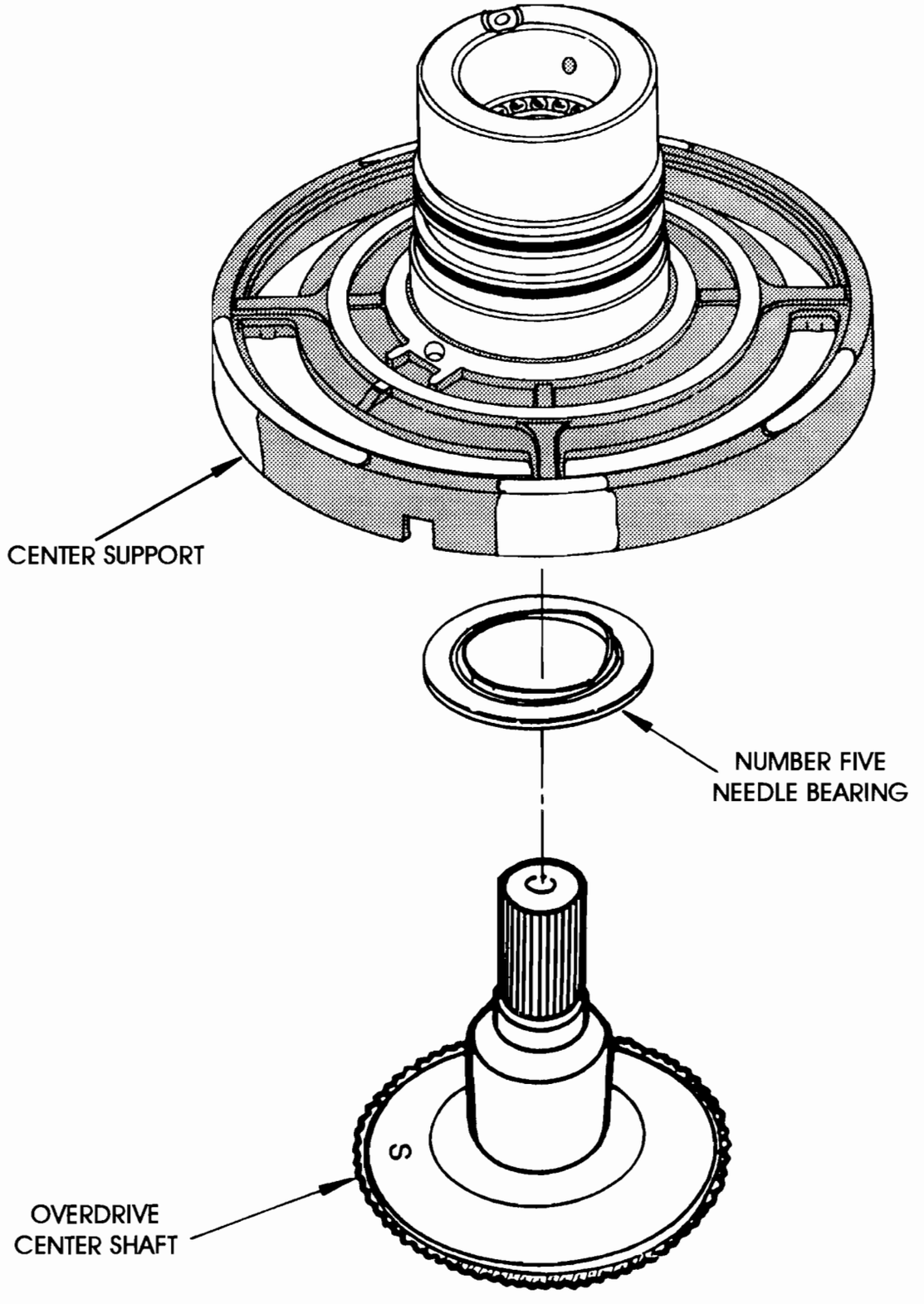


Figure 6

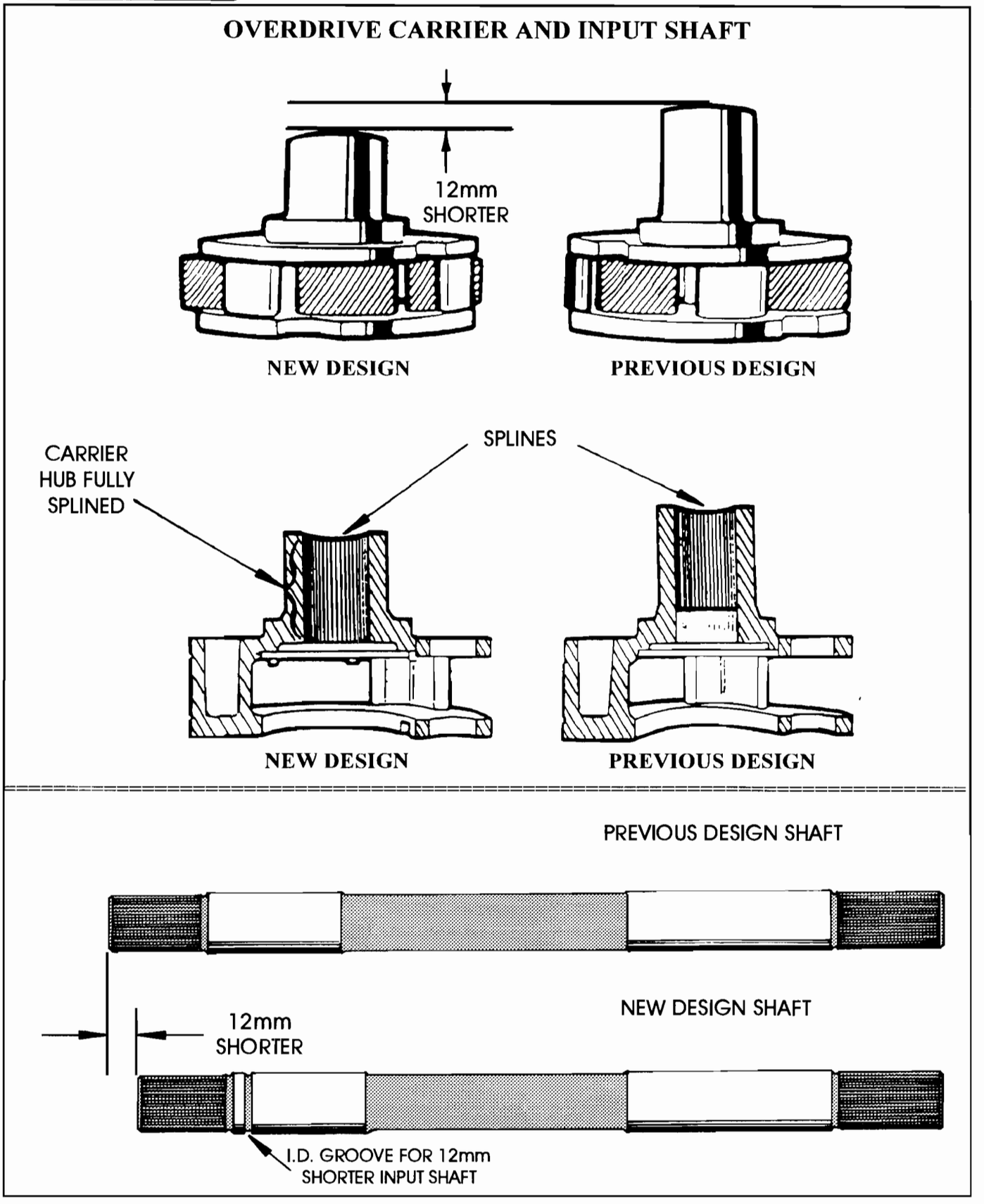
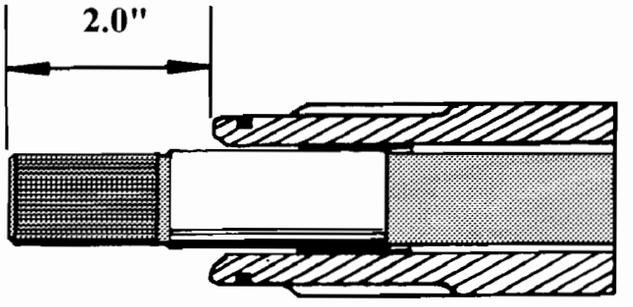

OVERDRIVE CARRIER AND INPUT SHAFT
12mm
SHORTER
NEW DESIGN
PREVIOUS DESIGN
CARRIER
HUB FULLY
SPLINED
SPLINES
NEW DESIGN
PREVIOUS DESIGN
PREVIOUS DESIGN SHAFT
NEW DESIGN SHAFT
12mm
SHORTER
I.D. GROOVE FOR 12mm
SHORTER INPUT SHAFT

Figure 7

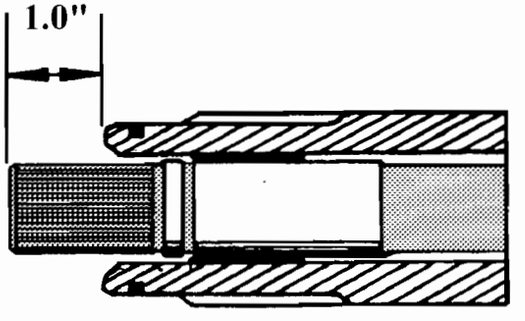
OVERDRIVE CARRIER AND INPUT SHAFT USAGE

"INCORRECT"



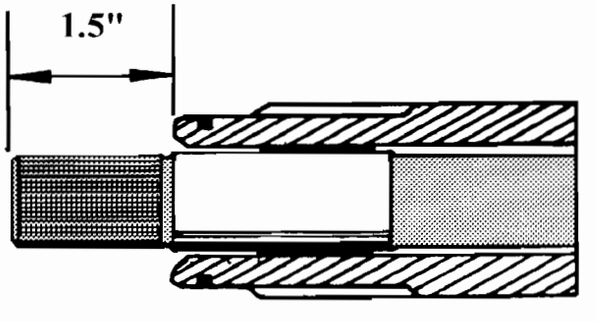
PREVIOUS (LONG) INPUT SHAFT USED
WITH NEW DESIGN OVERDRIVE CARRIER

"INCORRECT"



NEW DESIGN (SHORT) INPUT SHAFT USED
WITH PREVIOUS DESIGN OVERDRIVE CARRIER

"CORRECT USAGE"



THE INPUT SHAFT MUST EXTEND 1.5" PAST THE END OF THE PUMP STATOR
IF THE CORRECT INPUT SHAFT AND OVERDRIVE CARRIER WERE USED.

Figure 8

FORD E4OD
NEW DESIGN CAST IRON OVERDRIVE CARRIER

CHANGE: There is now available from Ford Motor Company, a new design Overdrive Planetary Carrier that is made out of cast iron and available under part number F5TZ-7B446-A.

REASON: Greatly increased durability of the Overdrive Carrier.

PARTS AFFECTED:

(1) OVERDRIVE PLANETARY CARRIER - New design is made out of cast iron and is the shorter design that requires the new design input shaft (See Figure 9).

(2) INPUT SHAFT - Now 12mm shorter than the previous design shaft to accommodate the new design overdrive planetary carrier, and is required with the new carrier.

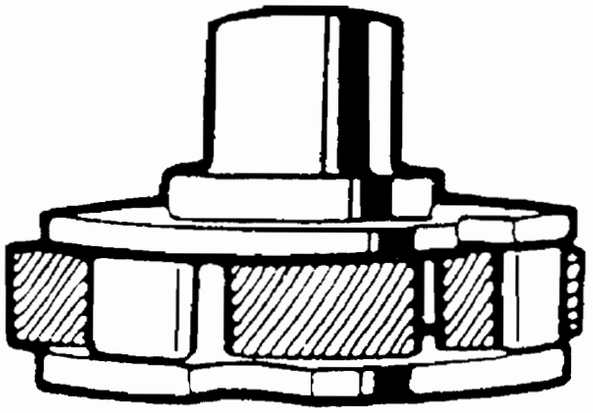
INTERCHANGEABILITY:

The new design cast iron Overdrive Planetary Carrier will back service all models to 1989, but the new design Input Shaft is required to be used with it (See Figure 9).

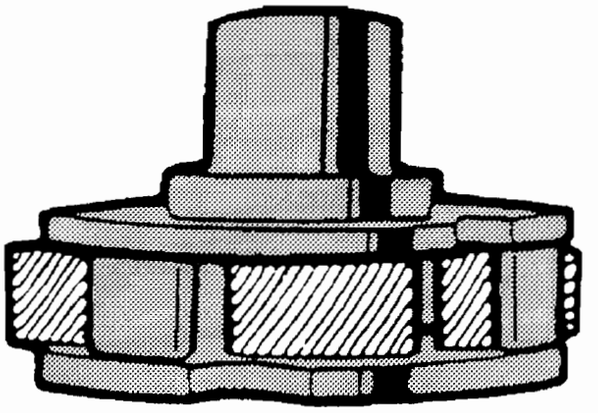
SERVICE INFORMATION:

Overdrive Planetary Carrier (Cast Iron) F5TZ-7B446-A
Input Shaft (Short with I.D. Groove) F4TZ-7017-D

NEW DESIGN CAST IRON OVERDRIVE CARRIER



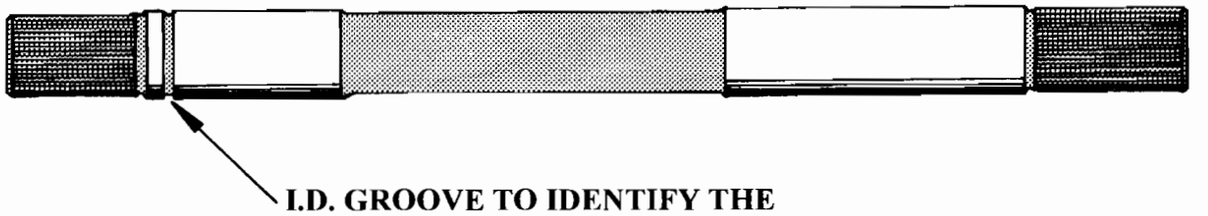
PREVIOUS DESIGN ALUMINUM OVERDRIVE CARRIER



NEW DESIGN CAST IRON OVERDRIVE CARRIER F5TZ-7B446-A

THE NEW DESIGN CAST IRON OVERDRIVE CARRIER IS THE SHORTER VERSION OF THE PREVIOUS CARRIERS, AND *MUST* BE USED WITH THE SHORT INPUT SHAFT WITH I.D. GROOVE, AS SHOWN BELOW.

CAST IRON OVERDRIVE CARRIER CAN BE USED ONLY WITH THE SHORT INPUT SHAFT



I.D. GROOVE TO IDENTIFY THE 12mm SHORTER INPUT SHAFT F4TZ-7017-D

Figure 9