



## *"The Seminar to See for 2003" Technical Seminar*

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### ***AUTOMATIC TRANSMISSION SERVICE GROUP***

9200 South Dadeland Boulevard Suite 720

Miami, Florida 33156

(305) 670-4161

WWW.ATSG.BIZ



## *“The Seminar to See for 2003”*

### *Introduction*

Welcome to ATSG’s “Seminar to See For 2003” as it is another year of practical information presented to you in the most proficient and professional fashion in the entire industry. We are a proud employee owned company with a staff that works hard to bring to you the latest information and fixes that helps you to be your very best. Technology has not slacked in being forth coming and neither has ATSG. It is imperative for a transmission business to belong to a tech service and we are a tech service that helps. We are staying with and looking beyond the cutting edge of our industries technology and bringing this information and training to you.

As with our previous seminars, most of the information presented throughout the entire day has been placed into three technical manuals. The White, Red and Blue. These are your tools to bring back into your shop which you will use for years to come. So sit back and enjoy a great day of learning in ATSG’s Seminar to See for 2003.

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PRESIDENT

**PETER LUBAN**  
TECHNICAL SUPERVISOR

**JON GLATSTEIN**  
TECHNICAL CONSULTANT

**GERALD CAMPBELL**  
TECHNICAL CONSULTANT

**JERRY GOTT**  
TECHNICAL CONSULTANT

**MARIO ARISTIDES**  
LATIN TECHNICAL CONSULTANT

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**GREGORY LIPNICK**  
TECHNICAL CONSULTANT

**DAVID CHALKER**  
TECHNICAL CONSULTANT

**STANTON ANDERSON**  
TECHNICAL CONSULTANT

**ROLAND ALVAREZ**  
TECHNICAL CONSULTANT

***AUTOMATIC TRANSMISSION SERVICE GROUP***

**9200 S. DADELAND BLVD. SUITE 720**

**MIAMI, FLORIDA 33156**

**(305) 670-4161**



# "2003" SEMINAR INFORMATION VIDEO

4

## SATURN DELAYED AND OR NO REVERSE

**COMPLAINT:** Before or after overhaul, Saturn vehicles equipped with the MP6 or MP7 transaxle may exhibit a delayed and or no Reverse condition when *hot*. This condition is usually accompanied with a soft or flared 2nd gear upshift.

**CAUSE:** The cause may be, a loose Mainshaft Nut, as shown in Figure 1, causing a leak in the 2nd clutch circuit. When the nut loosens the mainshaft tends to walk back and forth in the mid case. This causes a gap between the 1st Clutch and the nut, which is where the leak in the 2nd Clutch circuit appears. In Figure 2 the cutaway shows how the 2nd Clutch is fed around the outside of the feed pipe for the 3rd clutch. **Notice** that the area over and under the nut are all part of the 2nd Clutch circuit.

**CORRECTION:** Install a new Mainshaft nut, which has a factory thread locker, as part of every repair. Using a 23mm. 12 point socket torque the new nut to 111 ft.lb.

### SERVICE INFORMATION:

MAINSHAFT NUT.....21001680

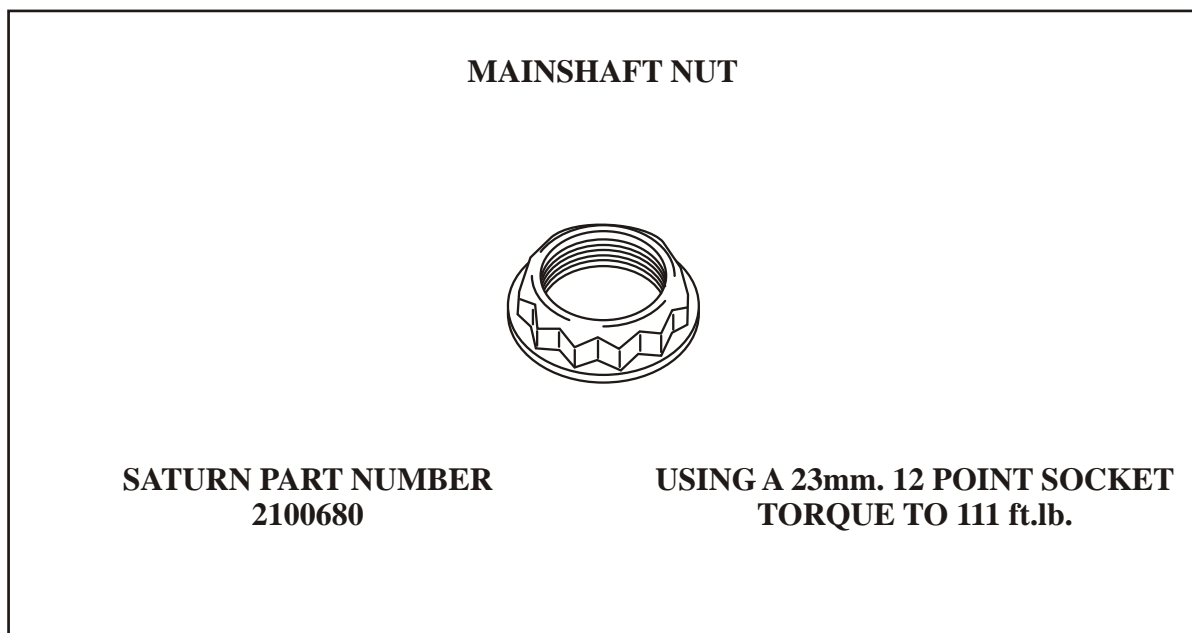
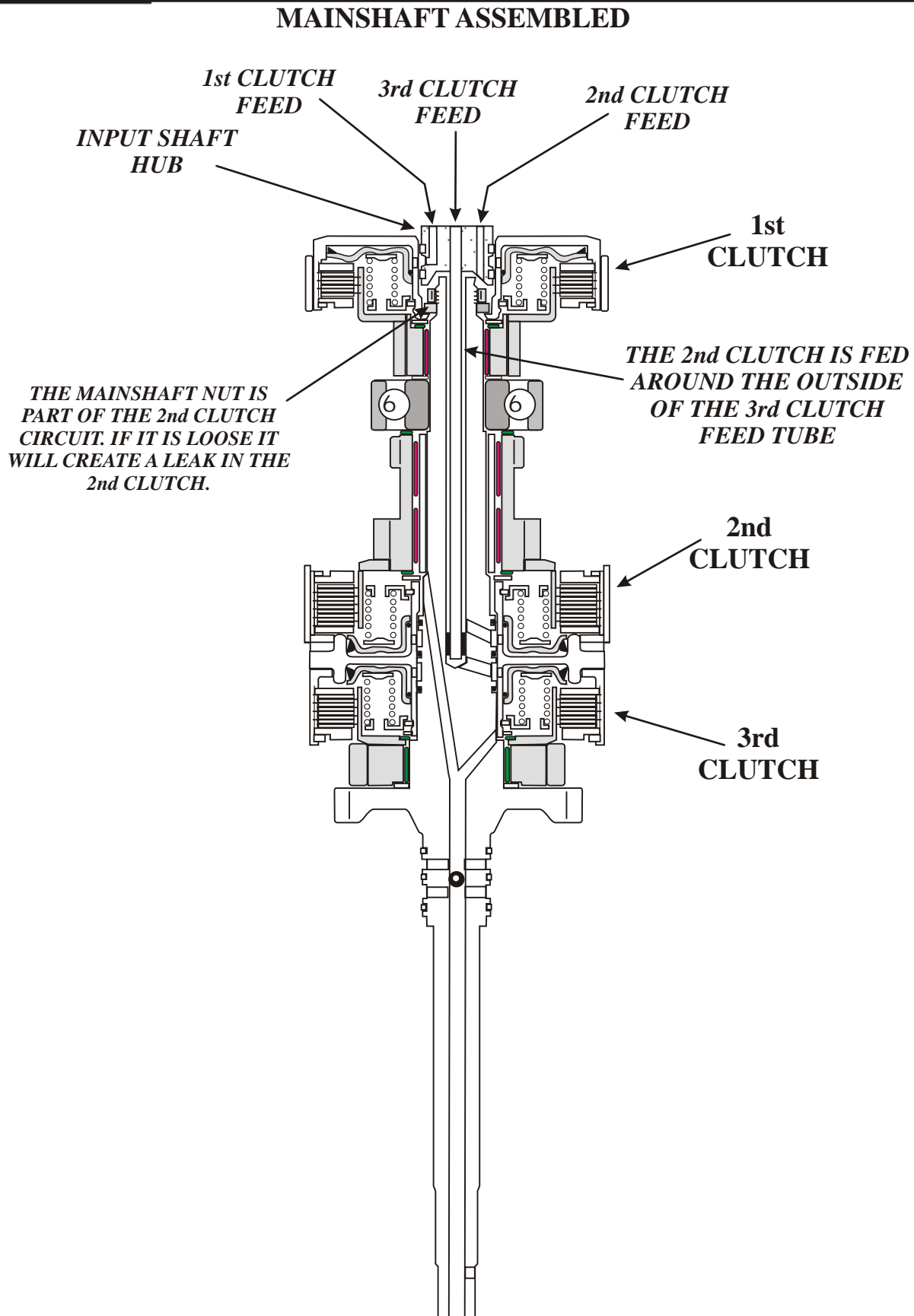


Figure 1



## SATURN

### DELAY IN "D" AND / OR BIND IN REVERSE

**COMPLAINT:** Before or after overhaul, Saturn vehicles equipped with the MP6 or MP7 transaxle, may exhibit a slight engagement delay in "D" and / or a binding condition in Reverse.

**CAUSE:** The cause may be, shrunken or damaged 1st Clutch sealing rings, as shown below in Figure 3. When these rings leak they can cause a slow fill of the 1st Clutch, which results in a delayed engagement in "D." The first sealing ring also separates the 2nd clutch from the 1st Clutch. When this ring leaks while in the Reverse range, the 1st Clutch can now be applied with 2nd clutch pressure, which results in a bind-up. See Figure4 for a cross-sectional view of the Main shaft .

**CORRECTION:** Replace the 1st Clutch sealing rings as part of every overhaul.

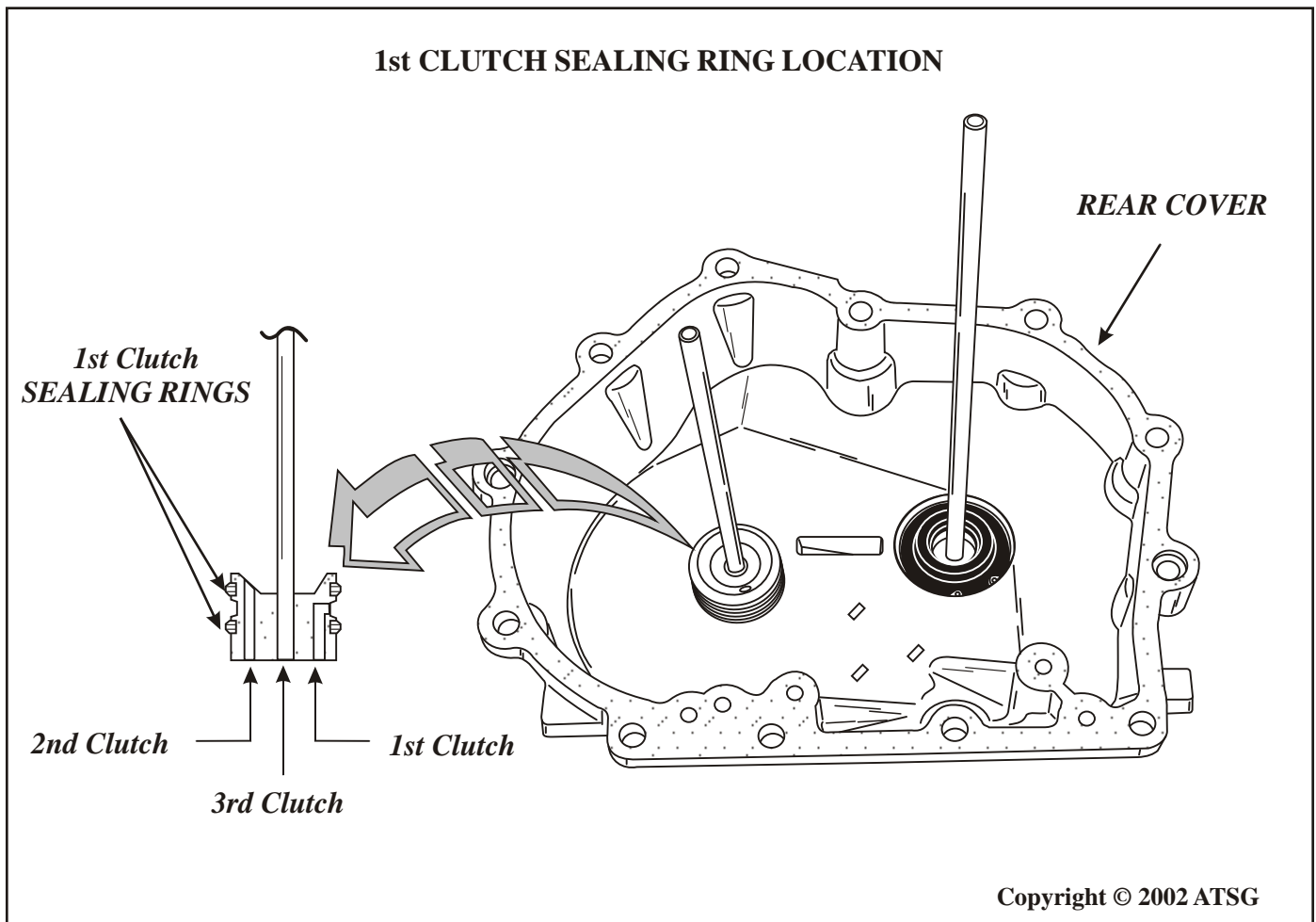
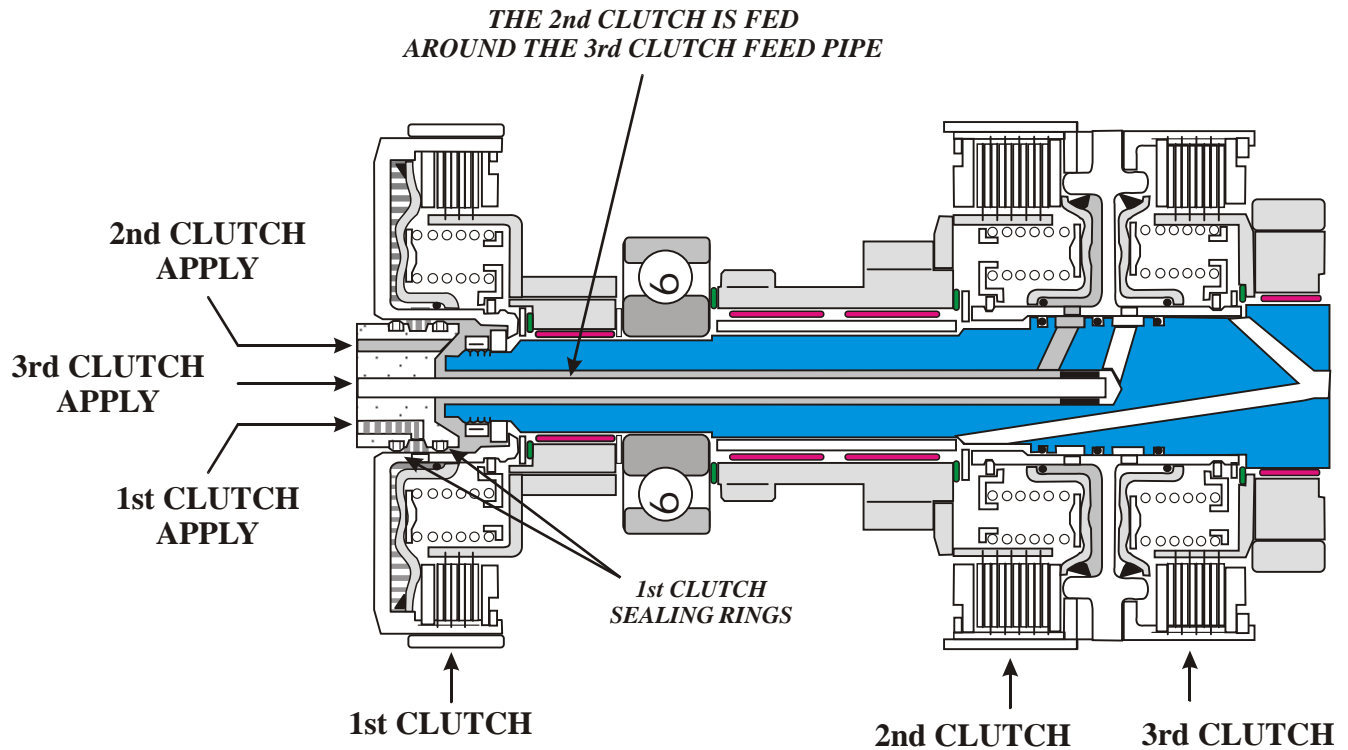


Figure 3

# MAINSHAFT CROSS-SECTIONAL VIEW



*Summary: When the 2nd Clutch is applied in Reverse, shrunken 1st Clutch sealing rings may allow the 1st Clutch to be applied at the same time, causing a bind-up*

Figure 4

**SPX**

## SATURN FALLS OUT OF DRIVE AT A STOP

**COMPLAINT:** After overhaul, Saturn vehicles equipped with the MP6 or MP7 transaxle, may exhibit a complaint of falling out of "Drive" at a stop, or a slipping condition on take off.

**CAUSE:** The cause may be, that during overhaul, the 2nd, 3rd or 4th Clutch return spring assembly was mistakenly used in place of the 1st Clutch spring assembly. When this happens, the 1st Clutch can not fully engage until line pressure is increased. Refer to Figure 5 and 6 to compare the 1st Clutch return spring assembly to the 2nd, 3rd and 4th. Notice that the coil diameter of the springs, on 2nd, 3rd and 4th are approximately .010" larger and the number of coils are one more than the 1st which makes them stronger.

**CORRECTION:** Refer to Figure 5 to identify the 1st Clutch return spring assembly, and ensure it is in the correct location.

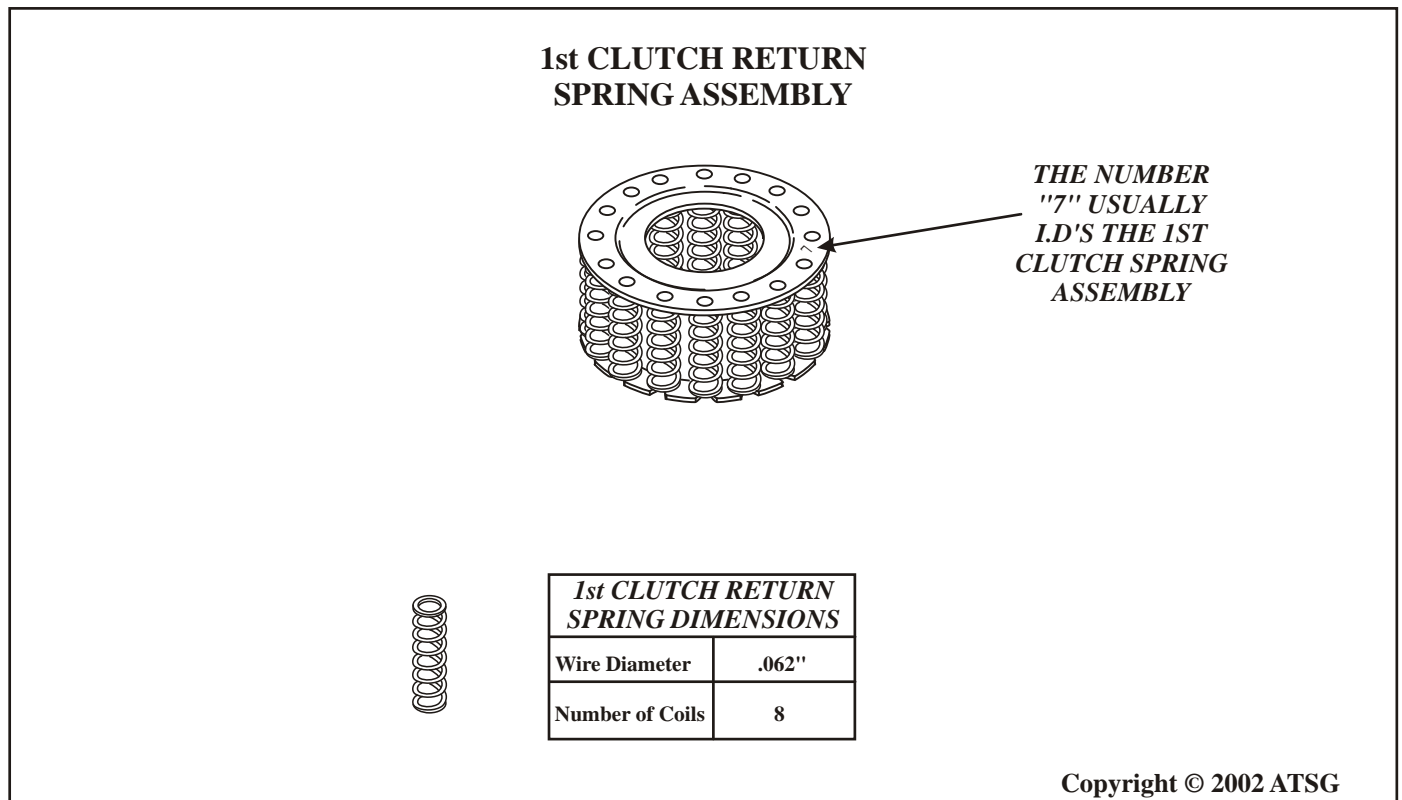
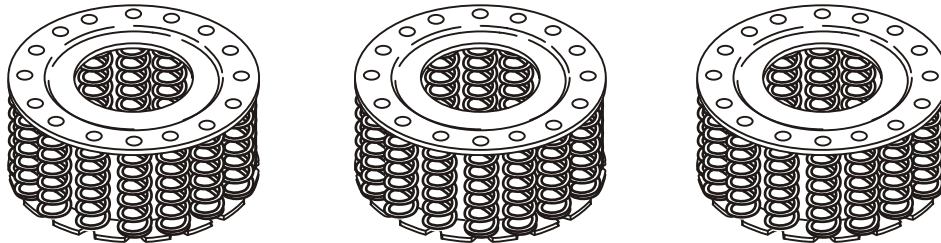


Figure 5



**2nd, 3rd and 4th CLUTCH RETURN  
SPRING ASSEMBLIES**



<i>2nd, 3rd and 4th CLUTCH RETURN SPRING DIMENSIONS</i>	
Wire Diameter	.072"
Number of Coils	9

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Figure 6



## GM ELECTRONICALLY CONTROLLED TRANSMISSIONS

### FALSE OUTPUT SIGNALS

**COMPLAINT:** Some of the transmission related complaints may be, no TCC apply, wrong gear start, missing gears, falling out of gear, or line pressure control problems.  
***There are NO CODES stored and the scan tool indicates that all signals are OPERATING NORMALLY!***

**CAUSE:** The cause could be the computer's internal driver circuit, a faulty cold solder joint on the computer's circuit board or a wire or connector problem. The reason why there are no related codes stored and the scan tool indicates that the outputs are operating normally (See Figure 1) is because downstream of the computer's diagnostic checkpoint, in the output circuit, the target voltage is incorrect, while at the diagnostic check point in another area of the computer's circuit board, the target voltage *is* correct.

**CORRECTION:** Use a digital multi-meter to check the ***actual signal*** (Refer to Figure 2) on the circuit in question. In this example, a 4L60E PWM solenoid's voltage should ramp from low to high (system voltage) on the solenoid's ground side which means TCC is fully applied and the voltage seen at this time on the ground circuit should be system voltage because the solenoid is turned off, duty cycle will be zero, only when the enable solenoid is on. Transmissions that use this type of operation are 4L60E and 4T60E.

**NOTE:** Early 4T60Es displayed duty cycle from 100% to 0% indicating percentage of "ON TIME".

Late 4T60Es and 1995 and later 4L60Es display duty cycle from 0% to 100% indicating the percentage of "OFF TIME", however solenoid operation is identical.

PWM TCC solenoid operation would be different on a transmission with only a PWM TCC solenoid such as a 4T65E, 4T80E or 4T40E. The computer will produce up to 98% duty cycle for maximum TCC apply which means the solenoid is fully on and less than 1 volt would be seen on the PWM solenoid ground circuit.

If it is a duty cycle type of solenoid, set your multi-meter to Duty Cycle (%) or Voltage, if it is an on/off solenoid set your multi-meter to DC Volts and utilize the meter's MIN/MAX feature. If it is a variable type solenoid, set your multi-meter to Amps or Duty Cycle.

**NOTE:** It is a good practice to compare the signal you see on a scan tool to the same signal you see on a multi-meter.

## GM ELECTRONICALLY CONTROLLED TRANSMISSIONS

### FALSE OUTPUT SIGNALS

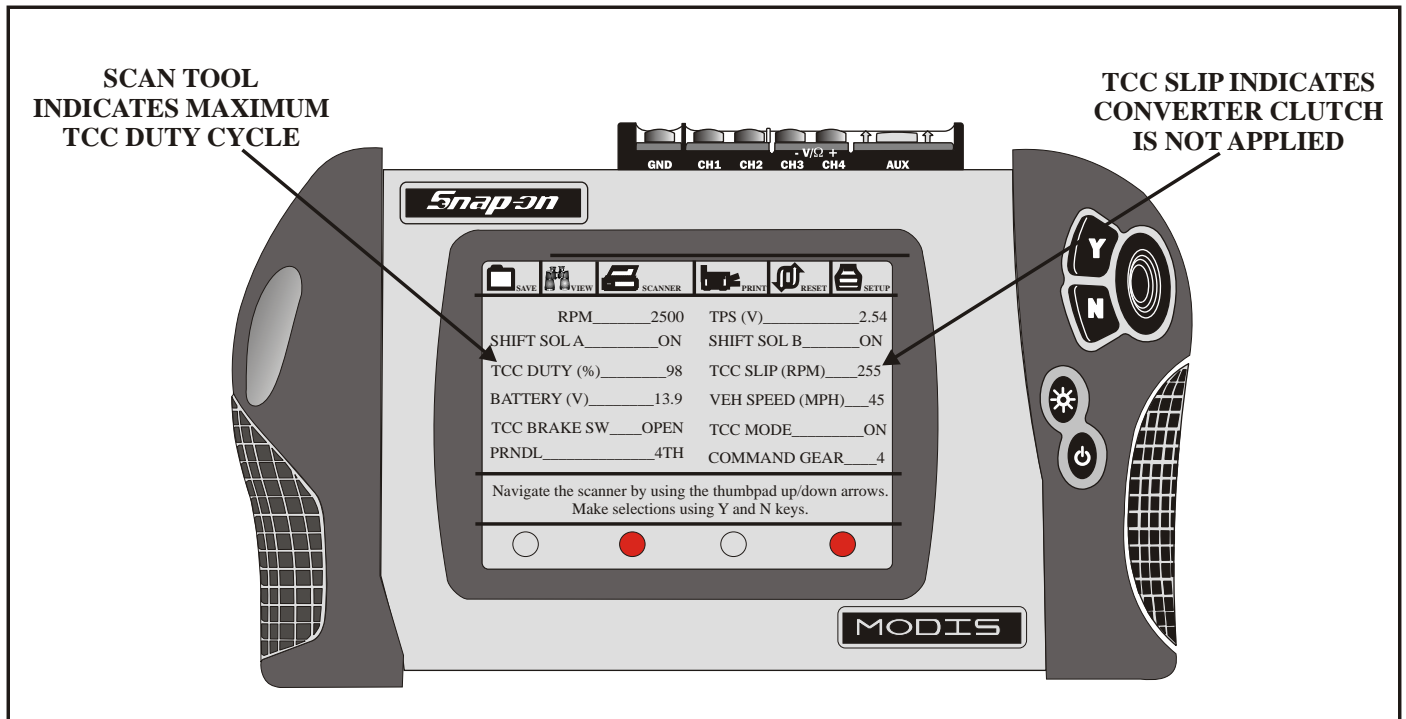


Figure 1

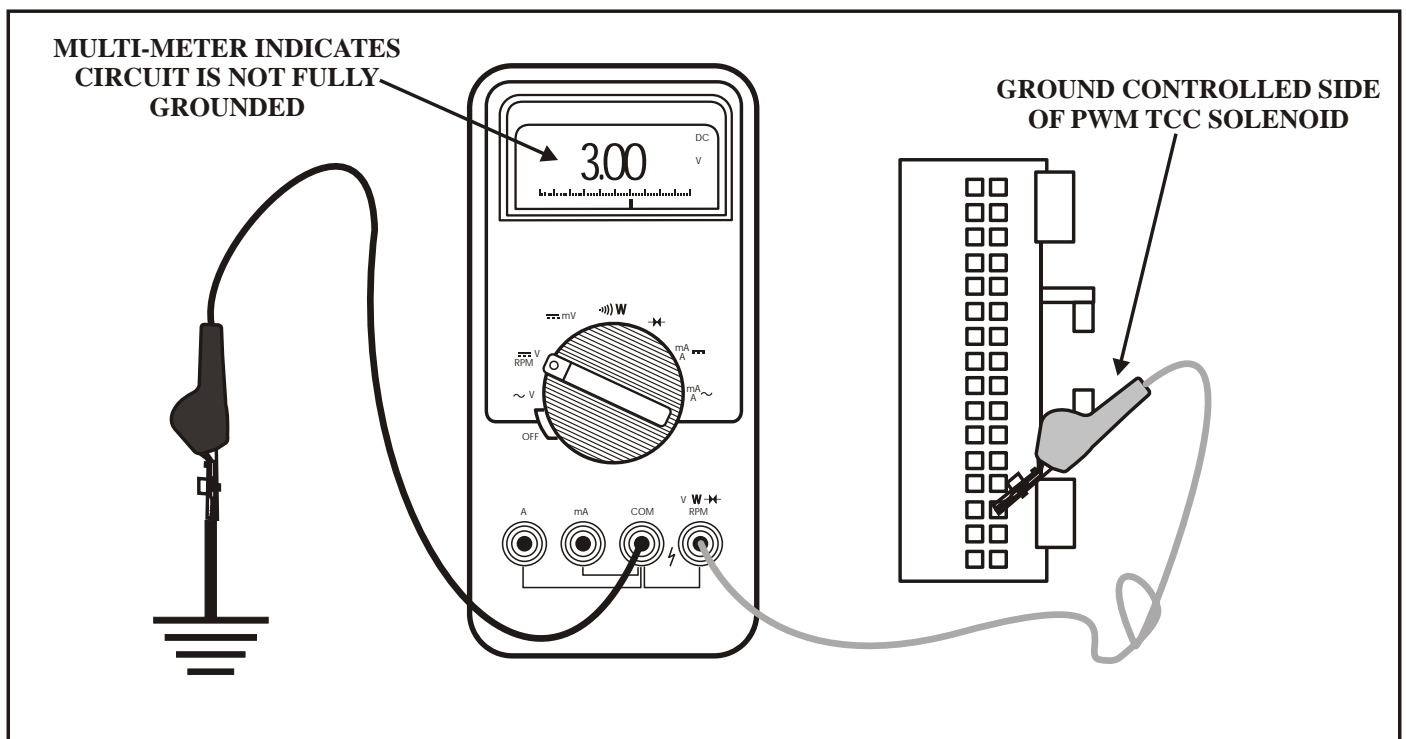


Figure 2

## GM 4L60E & 4L80E

### NEW DESIGN CONVERTER BOLTS

**COMPLAINT:** Some times when removing the internal Allen slot style torque converter bolts, the technician may find them difficult to remove and possibly round it out in the process.

**CAUSE:** A combination of bolt design and exposure to the elements.

**CORRECTION:** GM has released a new style internal/external hex head design bolt to replace the previous design, shown in figure 1.

**SERVICE INFORMATION:**

*Torque Converter Bolts (6), External/Internal Hex Design.....Part # 11519291*

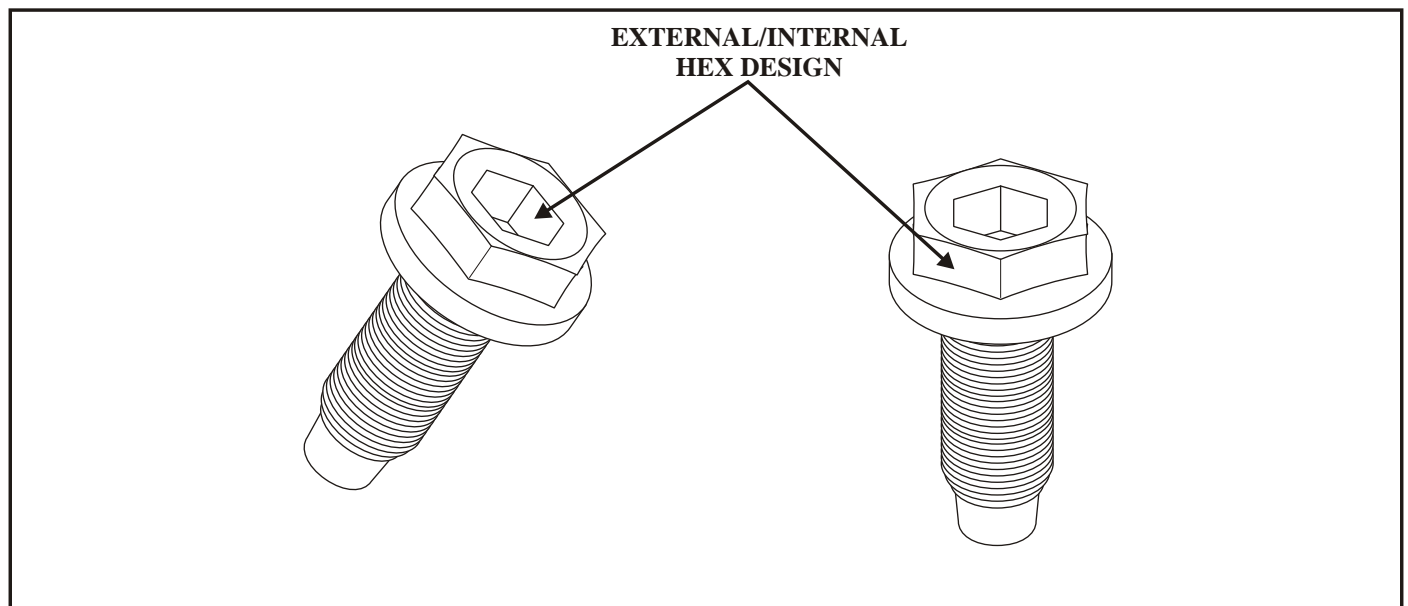


Figure 1

# Transmission Digest



**THM 4L60-E**  
**NEW DESIGN VALVE BODY AND**  
**SPACER PLATE FOR 2001**

**CHANGE:** Beginning at the start of production for 2001, all 4L60-E transmissions were produced with a new design converter clutch regulator valve line-up located in the valve body, in the location shown in Figure 1.

**REASON:** Reduced bore wear and improved performance for apply and release of the converter clutch.

**PARTS AFFECTED:**

- (1) **TCC REGULATOR AND ISOLATOR VALVES** - This line-up now has re-designed aluminum TCC Regulator Valve and Isolator Valves, instead of the previous steel, as shown in Figure 1.
- (2) **VALVE BODY CASTING** - Has changed in the worm track areas that are identified inside the circles, as shown in Figure 2, to accommodate the new design converter clutch regulator and isolator valves.
- (3) **SPACER PLATE** - There are two holes in the spacer plate that have been revised, as shown in Figure 3, to accommodate the new design converter clutch regulator and isolator valves.

**INTERCHANGEABILITY:**

None of the parts listed above will interchange with the previous design level parts. However, when new design valve body and spacer plate are used as a service package, they will back service to 1998 models.

**CONVERTER CLUTCH REGULATOR VALVE LINE-UP**

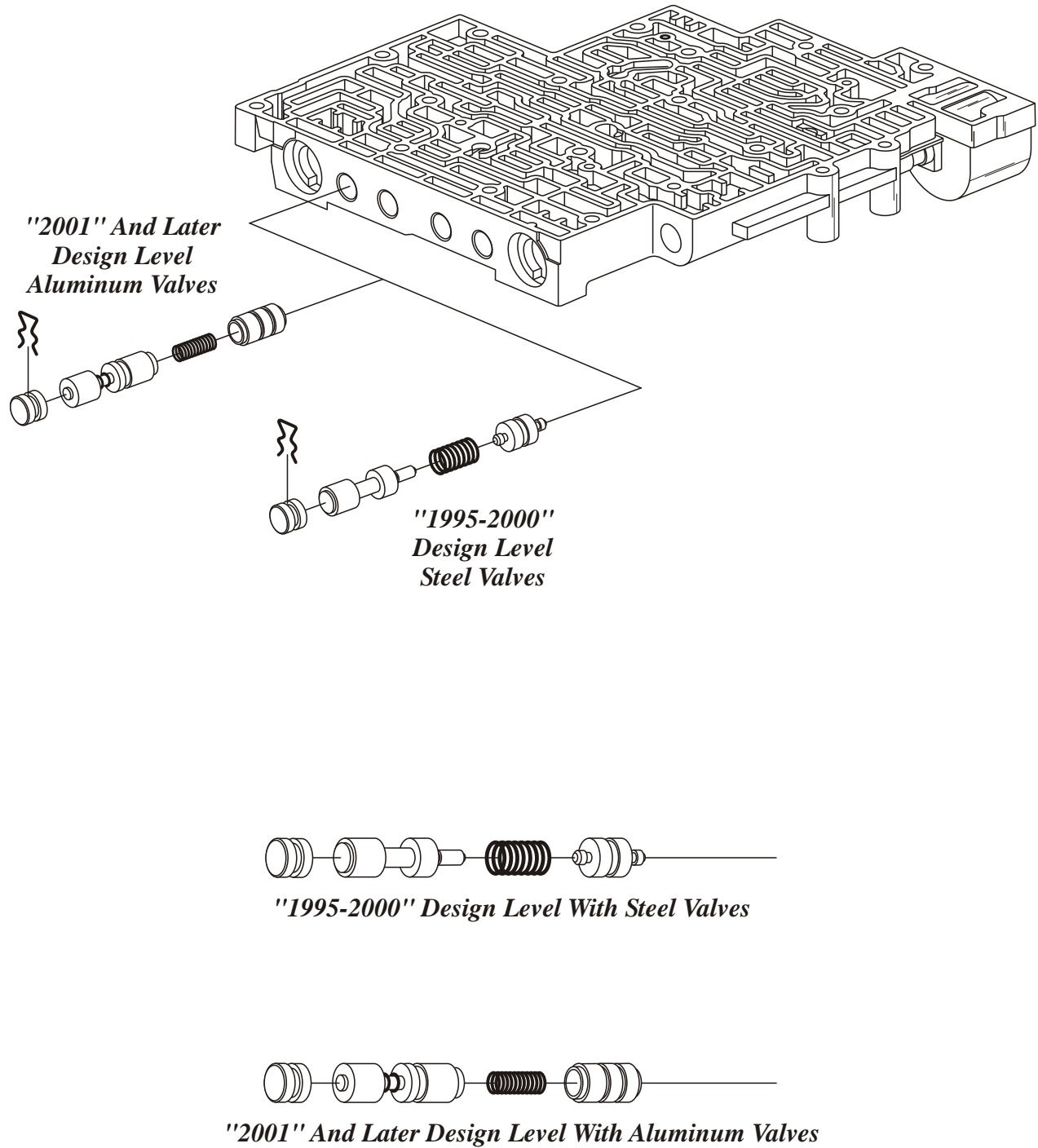
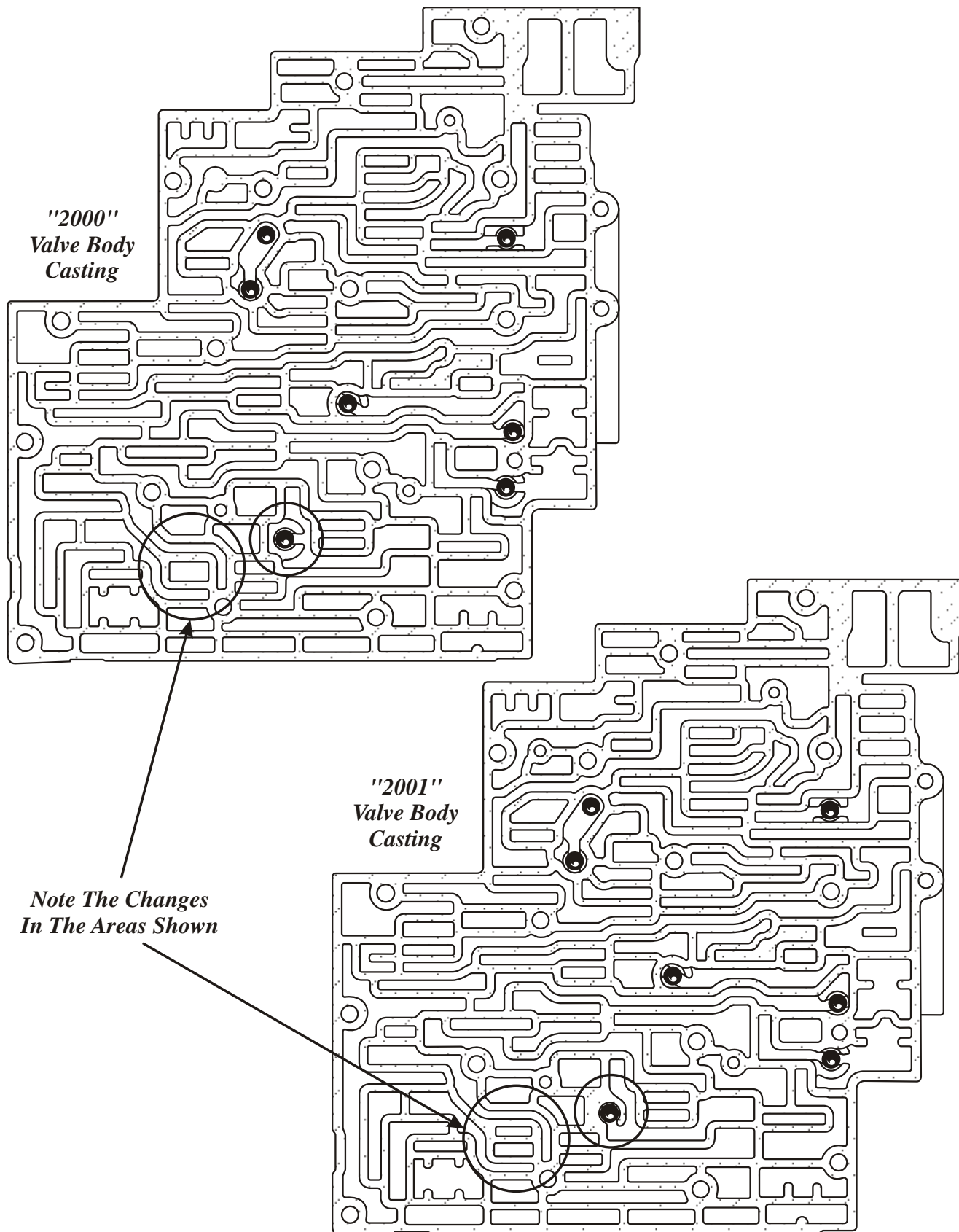


Figure 1

2000 AND 2001 VALVE BODY CASTINGS

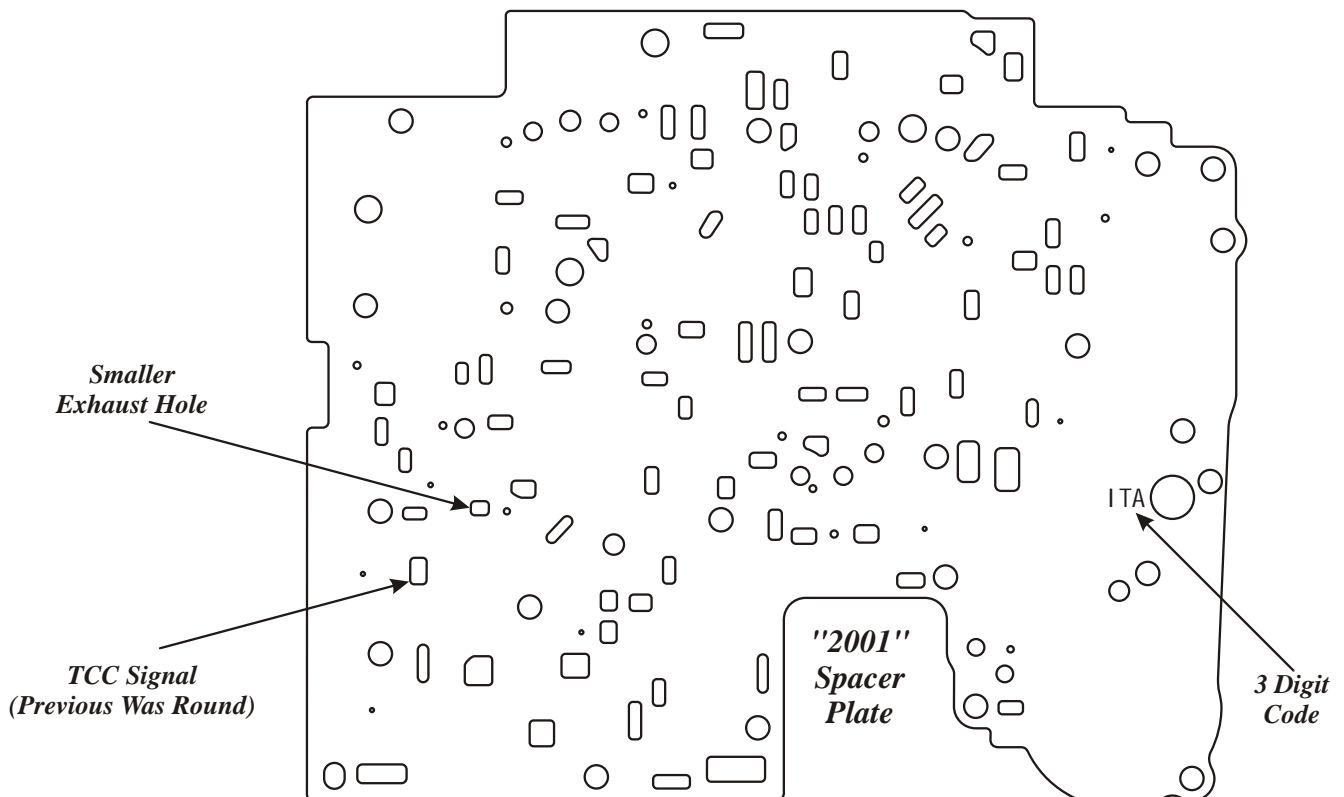
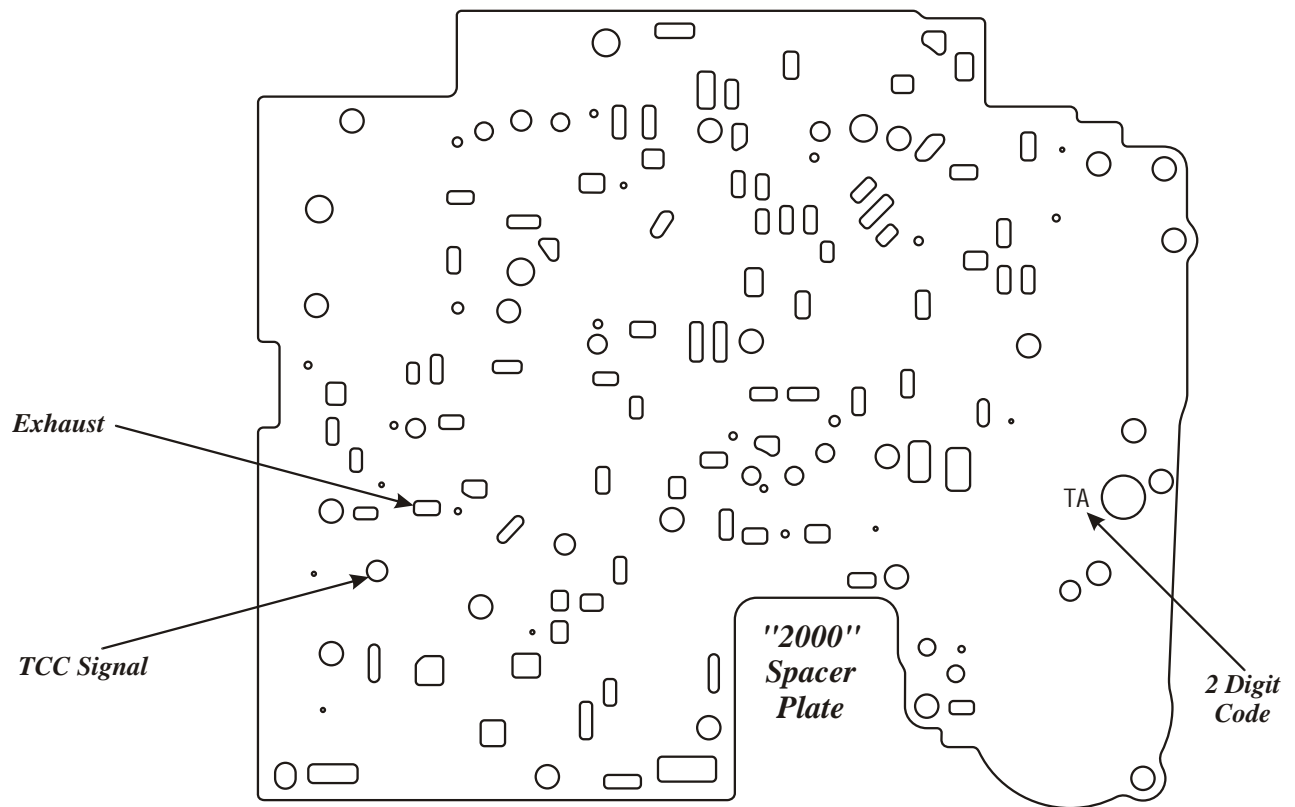


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Figure 2



### 2000 AND 2001 SPACER PLATES



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Figure 3

# Transgo

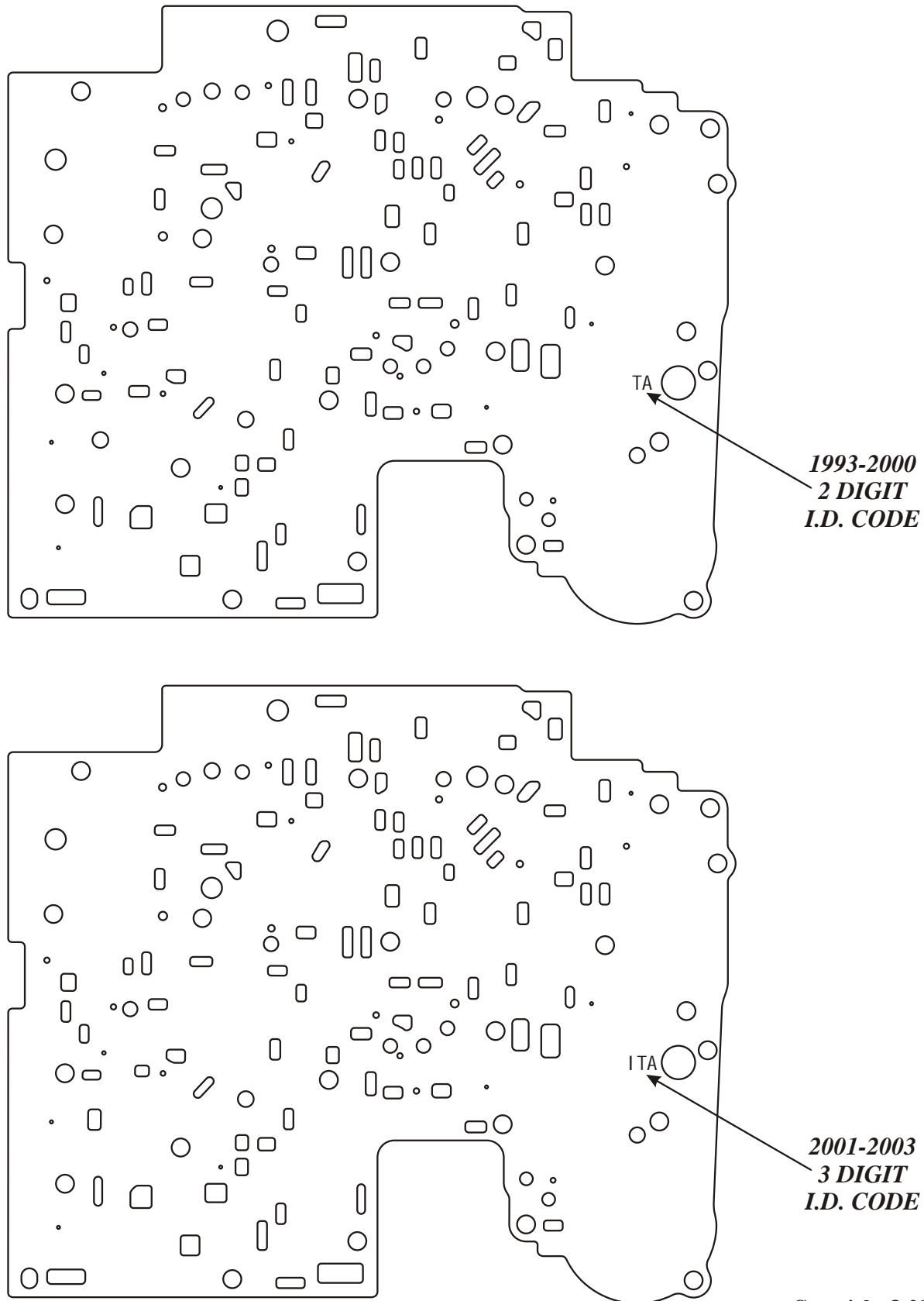


## **THM 4L60-E 1993-2003 SPACER PLATE IDENTIFICATION**

The Valve Body Spacer Plate for the THM 4L60-E transmission has changed every year, since it was first introduced in 1993, and they will not interchange from year to year. The valve body casting changed once again for model year 2001 and at that time the I.D. code on the spacer plate went to 3 digits, as shown in Figure 1. The location of the I.D. code stamped in the spacer plates are also shown in Figure 1. Use the chart below that refers you to a Figure number to identify the spacer plates, which models they fit and the part number to purchase one if necessary.

*Refer to Figure 2 for 1993 4L60-E spacer plate identification.  
Refer to Figure 3 for 1994 4L60-E spacer plate identification.  
Refer to Figure 4 for 1995 4L60-E spacer plate identification.  
Refer to Figure 5 for 1996 4L60-E spacer plate identification.  
Refer to Figure 6 for 1997 4L60-E spacer plate identification.  
Refer to Figure 7 for 1998 4L60-E spacer plate identification.  
Refer to Figure 8 for 1999 4L60-E spacer plate identification.  
Refer to Figure 9 for 2000 4L60-E spacer plate identification.  
Refer to Figure 10 for 2001 4L60-E spacer plate identification.  
Refer to Figure 11 for 2002 4L60-E spacer plate identification.  
Refer to Figure 12 for 2003 4L60-E spacer plate identification.*

**THM 4L60-E SPACER PLATE I.D. CODE LOCATIONS**



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Figure 1

# Drivetek



*"2003" SEMINAR INFORMATION*  
*SLIDE*

**23**

1993 THM 4L60-E SPACER PLATE CHART						
PART NO.	8684122	8684123	8684124	8684125	8684126	
I.D. CODE	JV	JW	JX	JY	JZ	
FITS THESE MODELS	MJD MND MSD TAD TBD MDD	SHD TLD CAD CBD KAD TWD	CCD CFD KBD	CJD CHD KCD	CKD CLD KDD	

Figure 2

1994 THM 4L60-E SPACER PLATE CHART						
PART NO.	8686011	8686012	8686013	8686037	8686038	8686039
I.D. CODE	KO	KP	KS	KT	KU	KV
FITS THESE MODELS	BBD	BWD	FDD SFD	FFD YDD	HBD	HDD
PART NO.	8686040	8686041	8686042	8686043	8686044	8686045
I.D. CODE	KW	KX	KY	KZ	LA	LB
FITS THESE MODELS	SHD TLD MJD CAD CBD KAD MND TWD	MSD TAD TBD MDD	SAD	CCD CFD KBD	CHD CJD KCD CPD	CMD CUD KPD
PART NO.	24200361	24200608	24200609			
I.D. CODE	LC	LD	LE			
FITS THESE MODELS	BFD	AHD	BCD			

Figure 3

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# Axiline

<b>1995 THM 4L60-E SPACER PLATE CHART</b>						
<b>PART NO.</b>	<b>24201484</b>	<b>24201485</b>	<b>24201486</b>	<b>24201487</b>	<b>24201488</b>	<b>24201489</b>
<b>I.D. CODE</b>	<b>MP</b>	<b>MS</b>	<b>MT</b>	<b>MU</b>	<b>MV</b>	<b>MW</b>
<b>FITS THESE MODELS</b>	<b>STD</b>	<b>SHD TLD CAD CBD KHD CRD CSD</b>	<b>TAD TBD TYD TZD</b>	<b>CCD CDD CHD CJD CLD CND CWD KTD KWD LHD</b>	<b>CKD CMD KMD LUD</b>	<b>MSD MDD</b>
<b>PART NO.</b>	<b>24201490</b>	<b>24201491</b>	<b>24201492</b>	<b>24201493</b>	<b>24201494</b>	<b>24202313</b>
<b>I.D. CODE</b>	<b>MX</b>	<b>MY</b>	<b>MZ</b>	<b>NA</b>	<b>NB</b>	<b>NC</b>
<b>FITS THESE MODELS</b>	<b>BBD BCD</b>	<b>BWD</b>	<b>AHD</b>	<b>BFD</b>	<b>FFD YDD</b>	<b>HBD</b>
<b>PART NO.</b>	<b>24202314</b>	<b>24202813</b>	<b>24203084</b>	<b>24203918</b>		
<b>I.D. CODE</b>	<b>ND</b>	<b>NE</b>	<b>NG</b>	<b>NH</b>		
<b>FITS THESE MODELS</b>	<b>HDD HCD</b>	<b>FCD</b>	<b>HSD</b>	<b>FDD</b>		

Figure 4



<b>1996 THM 4L60-E SPACER PLATE CHART</b>						
<b>PART NO.</b>	<b>24203222</b>	<b>24204438</b>	<b>24203283</b>	<b>24203947</b>	<b>24203948</b>	<b>24203949</b>
<b>I.D. CODE</b>	<b>PA</b>	<b>PC</b>	<b>PG</b>	<b>PL</b>	<b>PM</b>	<b>PN</b>
<b>FITS THESE MODELS</b>	<b>SAD</b>	<b>CCD CFD KBD WBD</b>	<b>HDD HCD</b>	<b>BBD</b>	<b>BCD</b>	<b>BWD</b>
<b>PART NO.</b>	<b>24203950</b>	<b>24203951</b>	<b>24203952</b>	<b>24203953</b>	<b>24203946</b>	<b>24204435</b>
<b>I.D. CODE</b>	<b>PP</b>	<b>PS</b>	<b>PT</b>	<b>PU</b>	<b>PW</b>	<b>PX</b>
<b>FITS THESE MODELS</b>	<b>AHD</b>	<b>FBD FCD</b>	<b>BFD BKD</b>	<b>FFD YDD</b>	<b>CPD</b>	<b>SHD TLD MSD TAD TBD MDD</b>
<b>PART NO.</b>	<b>24204438</b>	<b>24207492</b>	<b>24205978</b>	<b>24205979</b>		
<b>I.D. CODE</b>	<b>PY</b>	<b>PZ</b>	<b>SC</b>	<b>SD</b>		
<b>FITS THESE MODELS</b>	<b>CAD CBD KAD</b>	<b>CHD CJD KCD WHD</b>	<b>HBD</b>	<b>HSD</b>		

Figure 5

<b>1997 THM 4L60-E SPACER PLATE CHART</b>						
<b>PART NO.</b>	<b>24203222</b>	<b>24203224</b>	<b>24203225</b>	<b>24203283</b>	<b>24203951</b>	<b>24203953</b>
<b>I.D. CODE</b>	<b>PA</b>	<b>PC</b>	<b>PD</b>	<b>PG</b>	<b>PS</b>	<b>PU</b>
<b>FITS THESE MODELS</b>	<b>SAD</b>	<b>CCD CFD KBD</b>	<b>CHD CJD KCD</b>	<b>HDD HCD</b>	<b>FBD FCD</b>	<b>FFD YDD</b>
<b>PART NO.</b>	<b>24204435</b>	<b>24204438</b>	<b>24205978</b>	<b>24205979</b>	<b>24207864</b>	
<b>I.D. CODE</b>	<b>PX</b>	<b>PY</b>	<b>SC</b>	<b>SD</b>	<b>SE</b>	
<b>FITS THESE MODELS</b>	<b>SHD TLD MSD TAD TBD MDD</b>	<b>CAD CBD KAD</b>	<b>HBD</b>	<b>HSD</b>	<b>HLD</b>	

Figure 6

<b>1998 THM 4L60-E SPACER PLATE CHART</b>						
<b>PART NO.</b>	<b>24203222</b>	<b>24203224</b>	<b>24203283</b>	<b>24203951</b>	<b>24203953</b>	<b>24205978</b>
<b>I.D. CODE</b>	<b>PA</b>	<b>PC</b>	<b>PG</b>	<b>PS</b>	<b>PU</b>	<b>SC</b>
<b>FITS THESE MODELS</b>	<b>SAD</b>	<b>CHD CJD CPD KCD KXD LPD</b>	<b>HCD HDD HFD</b>	<b>FBD FCD</b>	<b>FFD YDD</b>	<b>HBD</b>
<b>PART NO.</b>	<b>24205979</b>	<b>24207864</b>	<b>24209351</b>	<b>24210565</b>		
<b>I.D. CODE</b>	<b>SD</b>	<b>SE</b>	<b>TA</b>	<b>TB</b>		
<b>FITS THESE MODELS</b>	<b>HSD</b>	<b>HLD HND</b>	<b>CAD CBD KAD MSD SHD TAD</b>	<b>HJD</b>		

Figure 7

<b>1999 THM 4L60-E SPACER PLATE CHART</b>						
<b>PART NO.</b>	<b>24203222</b>	<b>24203224</b>	<b>24203283</b>	<b>24203951</b>	<b>24203953</b>	<b>24205978</b>
<b>I.D. CODE</b>	<b>PA</b>	<b>PC</b>	<b>PG</b>	<b>PS</b>	<b>PU</b>	<b>SC</b>
<b>FITS THESE MODELS</b>	<b>SAD</b>	<b>CPD KBD KCD KXD LHD LPD LSD LUD</b>	<b>HCD HDD HFD</b>	<b>FBD FCD</b>	<b>FFD YDD</b>	<b>HBD</b>
<b>PART NO.</b>	<b>24205979</b>	<b>24207864</b>	<b>24209351</b>	<b>24210565</b>	<b>24210523</b>	
<b>I.D. CODE</b>	<b>SD</b>	<b>SE</b>	<b>TA</b>	<b>TB</b>	<b>TC</b>	
<b>FITS THESE MODELS</b>	<b>HSD</b>	<b>HLD HND</b>	<b>CAD CBD KAD MSD SHD TAD WBD</b>	<b>HJD</b>	<b>CCD CFD CHD CJD KBD KCD</b>	

Figure 8

<b>2000 THM 4L60-E SPACER PLATE CHART</b>						
<b>PART NO.</b>	<b>24203222</b>	<b>24203224</b>	<b>24203283</b>	<b>24203951</b>	<b>24203953</b>	<b>24205978</b>
<b>I.D. CODE</b>	<b>PA</b>	<b>PC</b>	<b>PG</b>	<b>PS</b>	<b>PU</b>	<b>SC</b>
<b>FITS THESE MODELS</b>	<b>SAD</b>	<b>KXD LHD LPD LUD</b>	<b>HCD HDD HFD</b>	<b>FBD FCD</b>	<b>FFD HPD YDD</b>	<b>HBD</b>
<b>PART NO.</b>	<b>24207864</b>	<b>24209351</b>	<b>24210565</b>	<b>24210523</b>		
<b>I.D. CODE</b>	<b>SE</b>	<b>TA</b>	<b>TB</b>	<b>TC</b>		
<b>FITS THESE MODELS</b>	<b>HND</b>	<b>CAD CBD KAD MSD SHD TAD WBD</b>	<b>HJD</b>	<b>CCD CFD CHD CJD KBD KCD</b>		

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Figure 9

<b>2001 THM 4L60-E SPACER PLATE CHART</b>						
<b>PART NO.</b>	<b>24218156</b>	<b>24218157</b>	<b>24218158</b>	<b>24218160</b>	<b>24218161</b>	<b>24218159</b>
<b>I.D. CODE</b>	<b>IPA</b>	<b>IPC</b>	<b>IPG</b>	<b>IPS</b>	<b>IPU</b>	<b>ISE</b>
<b>FITS THESE MODELS</b>	<b>SAD</b>	<b>LHD</b>	<b>HFD</b>	<b>FBD FCD</b>	<b>FFD HPD YDD</b>	<b>HND</b>
<b>PART NO.</b>	<b>24218162</b>	<b>24218163</b>				
<b>I.D. CODE</b>	<b>ITA</b>	<b>ITC</b>				
<b>FITS THESE MODELS</b>	<b>CAD CBD KAD MSD SHD TAD WBD</b>	<b>CCD CFD CHD CJD KBD KCD</b>				

Figure 10

<b>2002 THM 4L60-E SPACER PLATE CHART</b>						
<b>PART NO.</b>	<b>24218156</b>	<b>24218157</b>	<b>24218158</b>	<b>24218160</b>	<b>24218161</b>	<b>24218159</b>
<b>I.D. CODE</b>	<b>IPA</b>	<b>IPC</b>	<b>IPG</b>	<b>IPS</b>	<b>IPU</b>	<b>ISE</b>
<b>FITS THESE MODELS</b>	<b>SAD</b>	<b>LHD</b>	<b>HFD</b>	<b>FBD FCD</b>	<b>FFD HPD YDD</b>	<b>HND</b>
<b>PART NO.</b>	<b>24218162</b>	<b>24218163</b>	<b>24220200</b>			
<b>I.D. CODE</b>	<b>ITA</b>	<b>ITC</b>	<b>ITJ</b>			
<b>FITS THESE MODELS</b>	<b>CAD CBD KAD MSD SHD TAD WBD</b>	<b>CCD CFD CHD CJD KBD KCD</b>	<b>SDD TDD</b>			

Figure 11



*"2003" SEMINAR INFORMATION*  
*SLIDE*

**30**

2003 THM 4L60-E SPACER PLATE CHART						
PART NO.	24218156	24218158	24218161	24218159		
I.D. CODE	IPA	IPG	IPU	ISE		
FITS THESE MODELS	SAD	HFD	YDD	HND		
PART NO.	24218162	24218163	24220200			
I.D. CODE	ITA	ITC	ITJ			
FITS THESE MODELS	CAD CBD KAD MSD SHD TAD	CHD CJD KCD SCD	SDD TDD			

Figure 12



## THM 4L60E

### DRIVELINE VIBRATION

**COMPLAINT:** 2000 4L60E's in Trucks behind either a 4.8 Liter Engine or a 5.3 Liter Engine may experience a driveline vibration at speeds between 35 to 50 mph during lift foot low engine rpm conditions.

**CAUSE:** The torque converter clutch being applied during these low engine rpm conditions (100-1400) transfers engine torsional vibration into the drivetrain resulting in noises and vibration that could either be heard or felt.

**CORRECTION:** Verify the vehicle year by the 10th VIN number being "Y". Next, verify the engine size by the VIN's 8th digit. "V" indicates a 4.8L with RPO code LR4. "T" indicates a 5.3L with RPO code LM7. These codes can be located on the left side of the engine block below the left side cylinder head. Once this is verified, the vehicle's PCM will need to be reprogrammed. Refer to the Chart in Figure 1 for the appropriate Calibration Number.

**Special Note:** Any ECC application requiring the torque converter to contain the woven carbon clutch, be sure that this style clutch is used. Kevlar, Cellulose or any clutch other than the special carbon clutch by General Motors will not live in this environment and may also cause driveline vibration before failure.

VEHICLE APPLICATION CHART			
ENGINE	CALIBRATION#	AXLE	APPLICATION
4.8	9358172	3.42	C100
4.8	9358173	3.73	CK100
4.8	9358174	4.10	K100
5.3	9358175	3.42	C100/200
5.3	9358176	3.73	C100/200 K100
5.3	9358177	4.10	C100/200 K100

Figure 1

## THM 4L60-E "SKF" SINGLE CAGE FORWARD SPRAG DURABILITY

*This bulletin is being reprinted to help eliminate some confusion as several technicians are not aware that the "SKF" sprag is okay to use, as long as "second" design mating parts are used with it.*

**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 29 element "SKF" Forward Sprag Assembly.

**PARTS AFFECTED:**

- (1) FORWARD SPRAG INNER RACE - Dimensional changes on the new design inner race, with the removal of the champfer, and now fully supports the sprag end bearing, on the end bearing inside diameter. Compare the previous cutaway illustration in Figure 2, with the current cutaway illustration in Figure 3.
- (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, to keep the end bearing inside diameter fully on the inner race. Compare the previous clutch hub illustration in Figure 2, with the current clutch hub illustration in Figure 3.

**INTERCHANGEABILITY:**

The "SKF" single cage sprag is OK to use, *as long as*, the new design inner race and the new design overrun clutch hub are used with it as a service package (See Figure 1). The complete Forward Sprag Assembly is available under OEM part number 8657928.

The 29 element single cage "SKF" sprag and cage is available from Raybestos.

The 29 element dual cage sprag is available from Borg Warner.

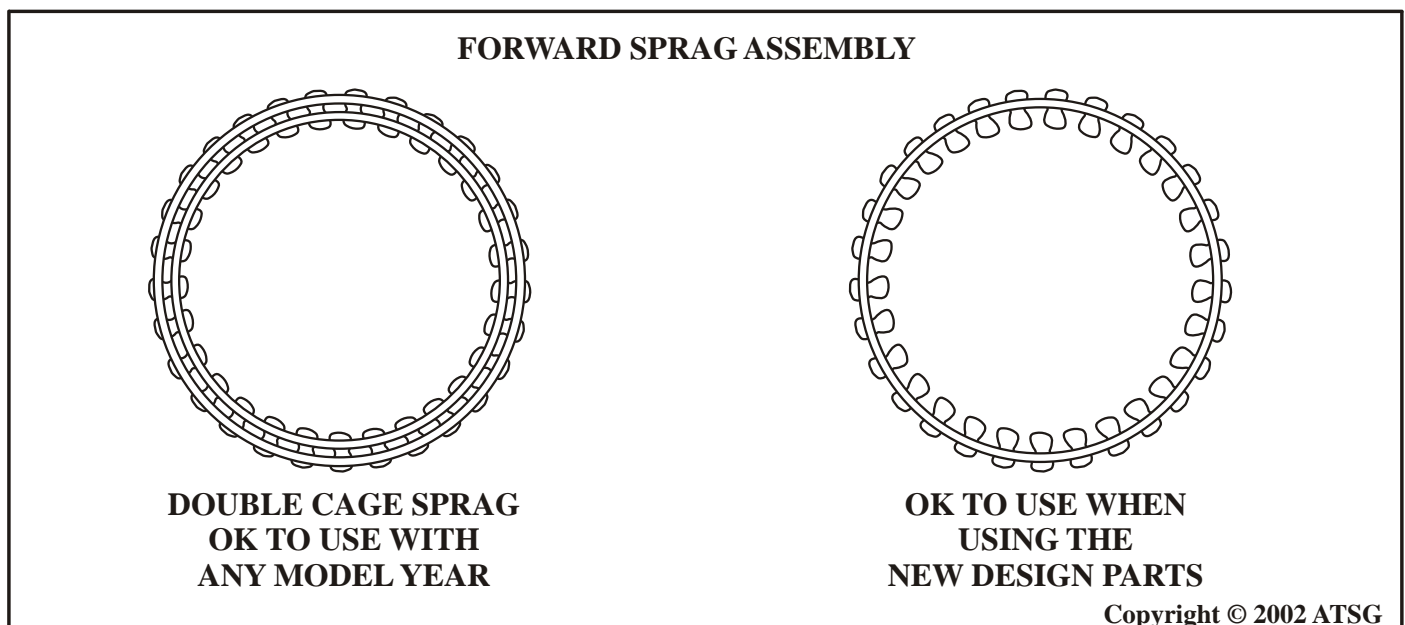
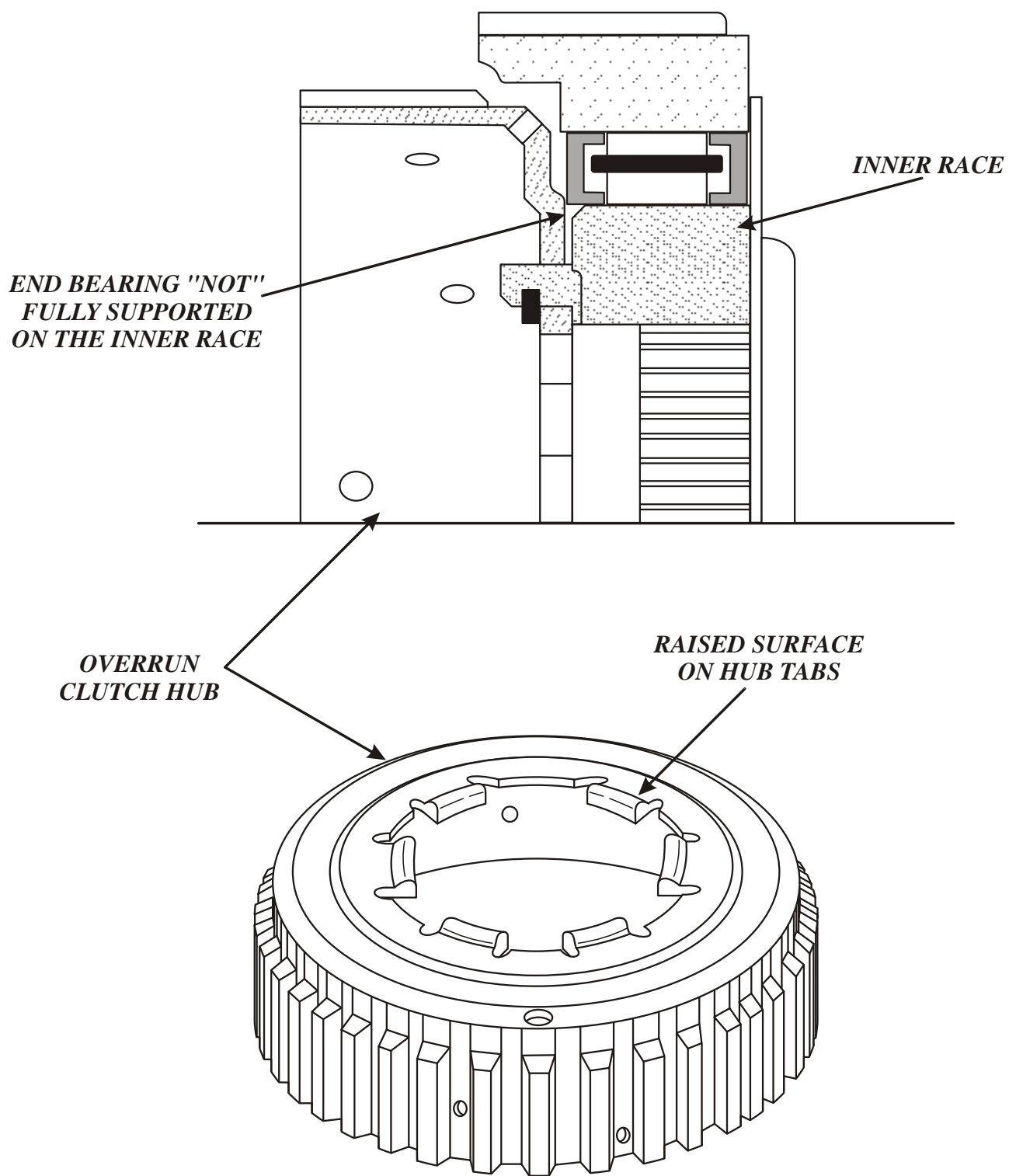


Figure 1

OTS



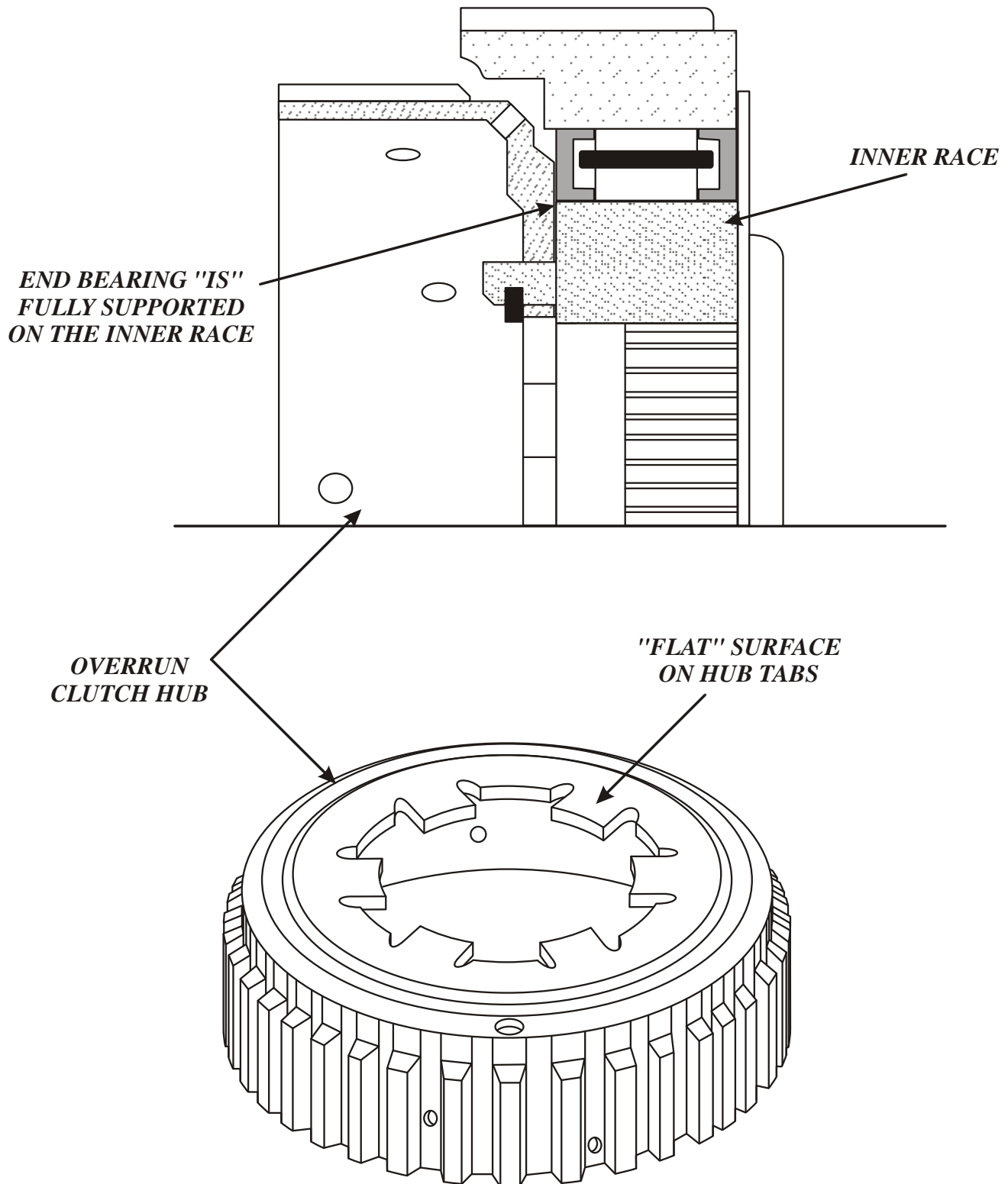
**PREVIOUS "SKF" INPUT SPRAG**



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Figure 2

**CURRENT "SKF" INPUT SPRAG**



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Figure 3



## 1999-2002 4WD GM TRUCKS SERVICE 4WD INDICATOR ILLUMINATED

**COMPLAINT:** 1999 to 2002 four wheel drive trucks with a New Venture Gear 236/246 Transfer Case (RPO NP8) may experience a "Service 4WD" Indicator light that remains on. A Service Code B2725, ATC Mode Switch Circuit Malfunction, may be found accompanying this concern.

**CAUSE:** An intermittent fault in the Transfer Case Select Switch may be causing this condition. The Transfer Case Control Module should not be immediately suspected or replaced unless it has been determined to be faulty.

The Transfer Case Select (Push Button) Switch contains four normally open switches as seen in Figure 1 and is located in the center of the Instrument Panel, on the right hand side of the steering column shift lever. This switch is used by the driver to select the desired transfer case operation. The switch selection sends the appropriate signal to the Transfer Case Control Module located left of the instrument cluster behind the head lamp switch on full size trucks, or, behind the passenger kick panel on Blazer type trucks. This module provides an 8 volt reference to the switch's C1 connector at terminal A. If no buttons are pressed, the switch sends back to the module a 0.5 to 1.0 volt signal in its C1 connector at terminal F16. This as well as the other Transfer Case Select Switch values can be seen in the chart in figure 2.

Should the module detect a voltage level outside of this range for longer than 5 minutes, the module will set code B2725. Simultaneously the module will ground the wire at terminal E2 in its C1 connector illuminating the "Service 4WD" light in the Instrument Cluster.

**NOTE:** The NV236/246 transfer cases do not have a button on the Transfer Case Select Switch for "NEUTRAL", however, neutral can be obtained through the Transfer Case Select Switch when the following conditions have been met:

1. The Engine must be running.
2. The automatic transmission must be in neutral, or, the manual transmissions clutch pedal must be depressed.
3. Vehicle speed in below 3 MPH.
4. The transfer case in the 2HI mode.

Once these conditions have been met, neutral can be obtained by pressing and holding the 2HI and 4LO buttons simultaneously for 10 seconds, at which time the **RED** neutral indicator lamp will illuminate and the transfer case will shift to neutral.

**CORRECTION:** Replace the Transfer Case Select Switch or the Transfer Case Control Module (TCCM), only if necessary.

### SERVICE INFORMATION:

*Transfer Case Select Switch.....15709327*  
*Transfer Case Control Module.....15749703*

# TRANSFER CASE SELECT SWITCH SCHEMATIC

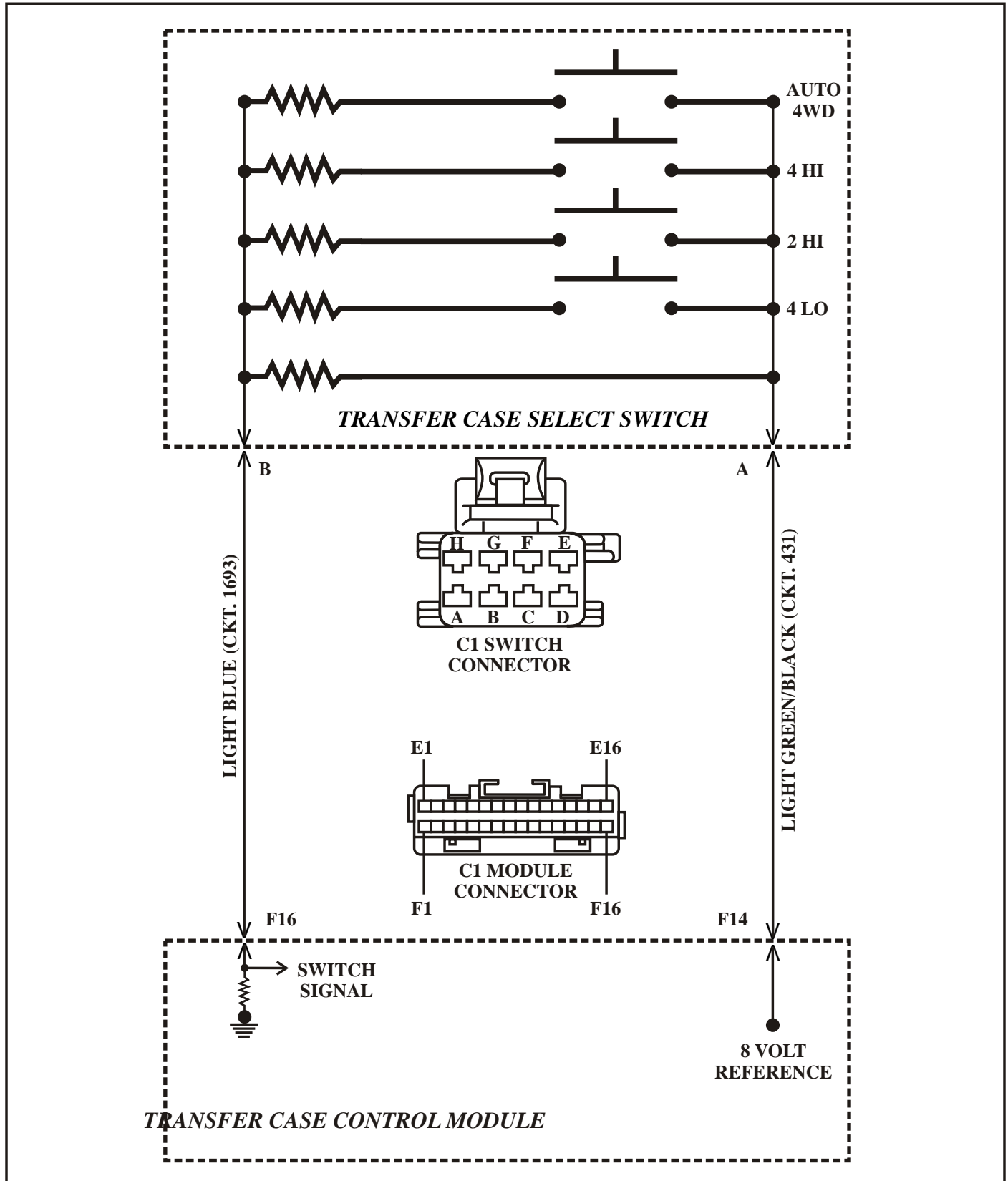


Figure 1

# Worldwide



**1999-2002 4WD GM TRUCKS**  
**SERVICE 4WD INDICATOR ILLUMINATED**

**TRANSFER CASE SELECT SWITCH DIAGNOSTIC CHART**

<b>SWITCH STATE</b>	<b>SWITCH TERMINAL "B" RESISTANCE</b>	<b>SWITCH TERMINAL "B" VOLTAGE</b>
NO BUTTONS PUSHED	3630 - 9540	0.5 - 1.0
4LO CLOSED	2320 - 2370	1.7 - 2.7
2HI CLOSED	1500 - 1530	2.8 - 3.5
NEUTRAL	1015 - 1035	3.0 - 4.3
4HI CLOSED	656 - 670	3.9 - 5.1
AUTO 4WD CLOSED	61.7 - 68.1	7.3 - 7.5

Figure 2

# Transonline

## GM ELECTRONICALLY SHIFTED VEHICLES

### LATE SHIFTS

**COMPLAINT:** The transmission exhibits a late 2-3 and 3-4 shift under heavy throttle conditions but seems to operate properly under normal throttle conditions. The transmission also has an elongated forced detent shift with no increase in vehicle speed which may require the driver to back off the throttle to complete the shift.

**CAUSE:** The cause may be a restricted fuel filter (See Figure 1) rather than an actual transmission problem.

**NOTE:** This complaint can also be caused by other fuel supply related items such as the fuel pump strainer and fuel pump located inside the fuel tank.

**CORRECTION:** Have a fuel flow and fuel pressure test performed and replace fuel filter if results are below specs.

**IN-LINE FUEL FILTER USUALLY LOCATED ON THE DRIVER SIDE  
FRAME RAIL APPROXIMATELY IN THE MIDDLE OF THE VEHICLE**

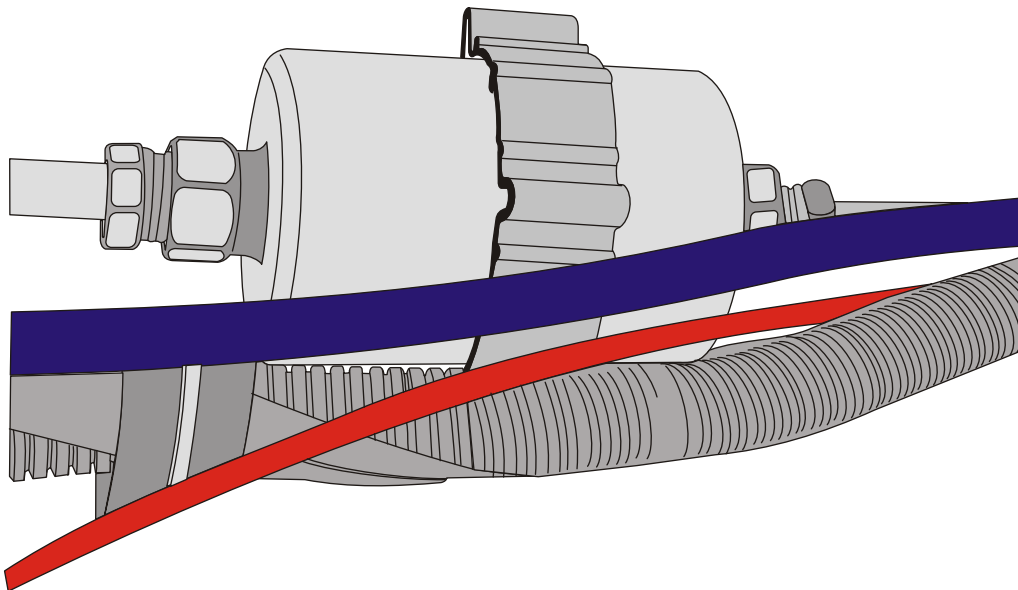


Figure 1





## THM 4L60E/4L80E LATE SHIFTS WHEN COLD

**COMPLAINT:** Some 1999-2001 model Chevrolet and GMC C/K Trucks and/or 1999-2001 Cadillac Escalades with 4.3, 4.8, 5.3 or 6.0 Liter engines and equipped with the 4L60E or 4L80E transmission, may, on initial start up during cold weather, exhibit late 2-3 and 3-4 shifts and delayed converter clutch application.

When viewing solenoid command on the scan tool, the scan tool confirms that the late shift is being commanded and there is no TCC signal sent, until the vehicle is driven for a few miles, at which time the 2-3 and 3-4 shifts return to normal operation as well as normal TCC operation.

**CAUSE:** Cold weather transmission shift characteristics *have been revised* by the OEM, on the above mentioned vehicles to provide faster engine warm-up and improved heater performance.

**CORRECTION:** During the initial start-up, if Intake Air Temperature (IAT) is below 32°F (32°C) the 2-3 shift, 3-4 shift and TCC application will be affected as follows, and is considered *normal*.

### **2-3 SHIFT:**

- If throttle position (TPS) is below 37%, the 2-3 shift will occur at a minimum speed of 32 mph (51 km/h).
- If the TPS is above 37% throttle opening, the 2-3 shift will revert back to a normal shift pattern.
- When engine coolant temperature (ECT) reaches 171°F (77°C), the 2-3 shift will revert back to a normal shift pattern.

### **3-4 SHIFT:**

- If throttle position (TPS) is below 37%, the 3-4 shift will occur at a minimum speed of 47 mph (75 km/h).
- If TPS is above 37% throttle opening, the 3-4 shift will revert back to a normal shift pattern.
- When engine coolant temperature (ECT) reaches 171°F (77°C), the 3-4 shift will revert back to a normal shift pattern.

### **TCC: APPLICATION**

- If the transmission fluid temperature is less than 62.6°F (17°C), TCC operation will be inhibited, and will not resume until the transmission fluid temperature is greater than 68°F (20°C).

### **SERVICE INFORMATION:**

*Refer to Chevrolet/GMC factory TSB 01-07-30-013A*



## 4L80E CONVERTER DESIGN CHANGE

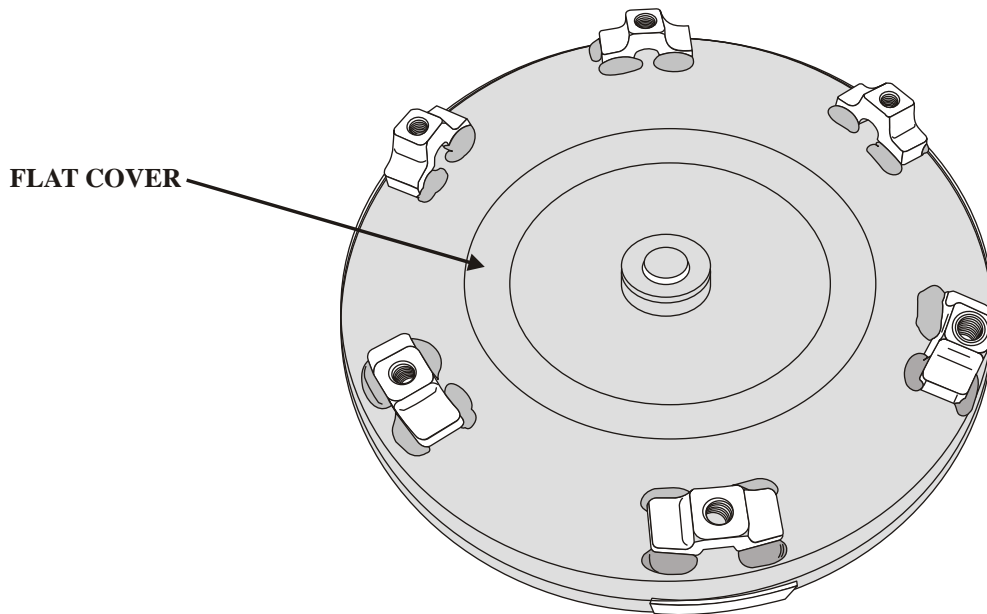
### CODE P1870 STORED

- COMPLAINT:** The truck comes into the shop with a "Component Slipping" P1870 code stored. No slip is felt when the code is cleared and the truck is driven, but, when the transmission data is viewed, maximum "TCC Duty Cycle" is indicated but the "TCC Slip" is excessive. When the transmission is disassembled, it appears the transmission is in perfect condition. The pump and stator bushings as well as the TCC Regulator Valve, the TCC Enable Valve and the TCC Shift Valve are all in perfect condition.  
*The transmission is reassembled, and because the vehicle has relatively low mileage, the converter is reused.*
- CAUSE:** **The converter is the reason code P1870 is being stored.** Beginning with the 2000 model year, the torque converter received a design change which can be seen in figure 1. Notice that the front cover of the 1991-99 converter is flat, while the front cover of the 2000 and later converter is raised up. This increase in angle also included the converter clutch plate as seen in figure 2. Because of this increased angle and the fact that the two piece converter clutch plate is riveted together, is what causes the converter clutch plate to separate which causes a leak in converter clutch apply oil, finally resulting in the P1870 slip code being stored.
- CORRECTION:** Some converter remanufacturers are reenforcing the clutch plate with welds around the clutch plate to prevent the clutch plate from separating.

## 4L80E CONVERTER DESIGN CHANGE

CODE P1870 STORED

### *1991-99 TORQUE CONVERTER*



### *2000 & LATER TORQUE CONVERTER*

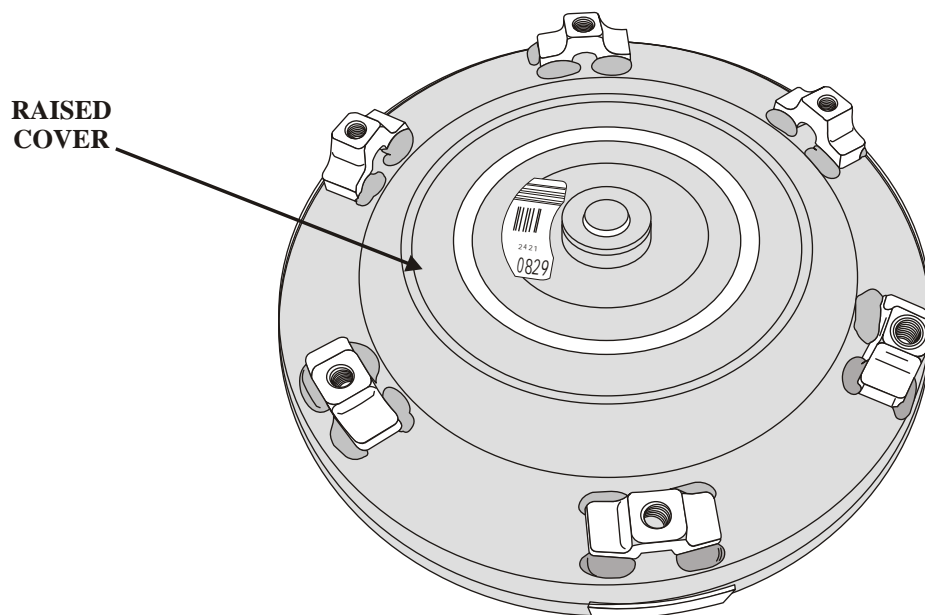


Figure 1

## 4L80E CONVERTER DESIGN CHANGE

CODE P1870 STORED

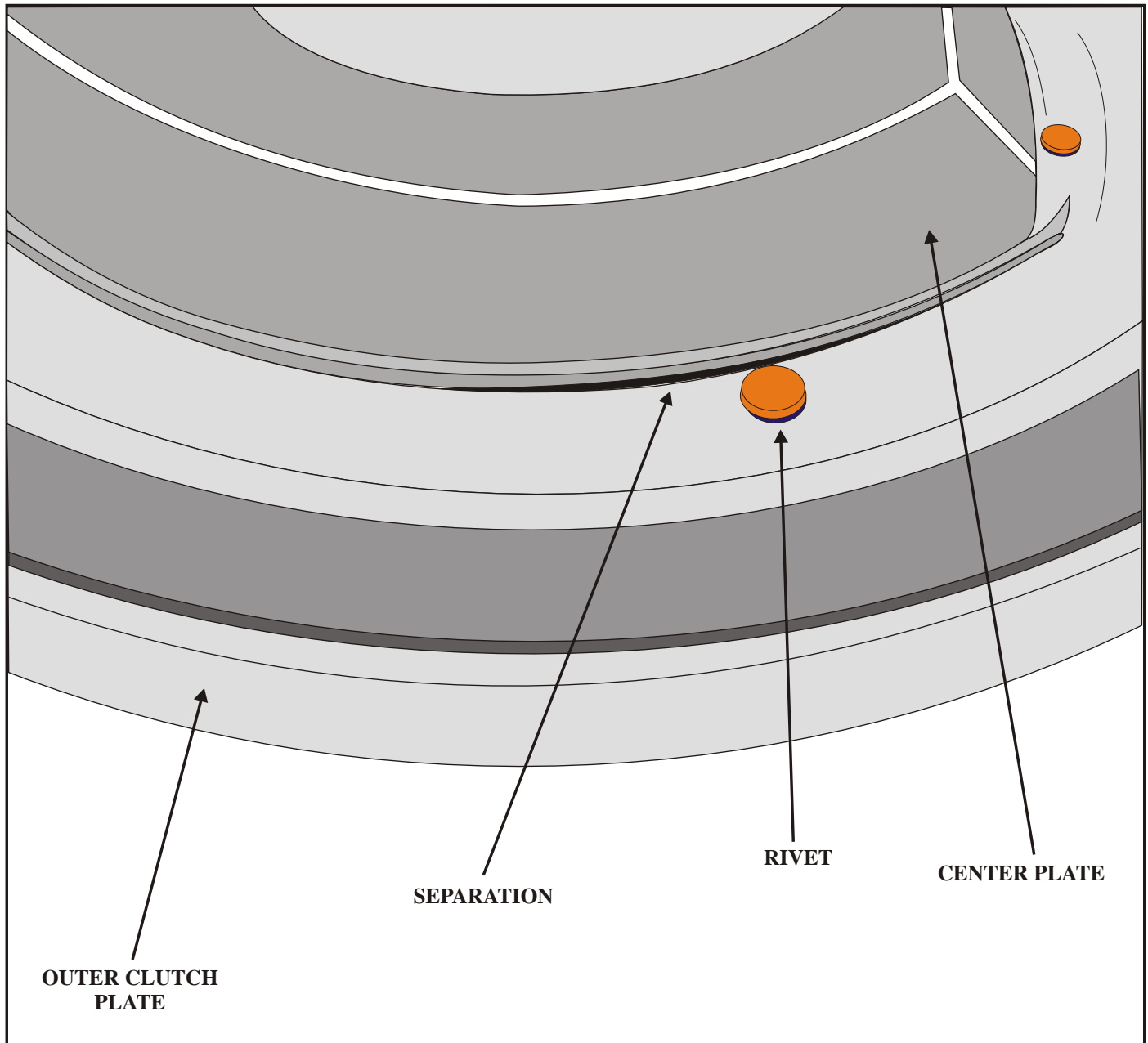


Figure 2



## THM 4L80-E NEW DESIGN MANUAL 2ND BAND

**CHANGE:** Beginning at the start of production for 1999 models, all THM 4L80-E transmissions were built with a revised manual 2nd band that is wider than the previous design (See Figure 1).

**REASON:** Improved durability and reliability.

**PARTS AFFECTED:**

- (1) MANUAL 2ND BAND - Now 1-1/2 inches wide instead of the previous 1 inch wide, and manufactured with a revised band apply pin anchor, as illustrated in Figure 2.
- (2) MANUAL 2ND BAND APPLY PIN - The band apply pin has a revised overall length, 2.730" instead of the previous 2.530", to accommodate the revised apply pin anchor, as illustrated in Figure 2.

**INTERCHANGEABILITY:**

The new design "Wide Band" will retro-fit back, but you must purchase the new design band apply pin that is .200" longer than the previous design. Currently, it is only available in a service package that includes the piston and the return spring, under part number 24223081, as shown in Figure 2.

**SERVICE INFORMATION:**

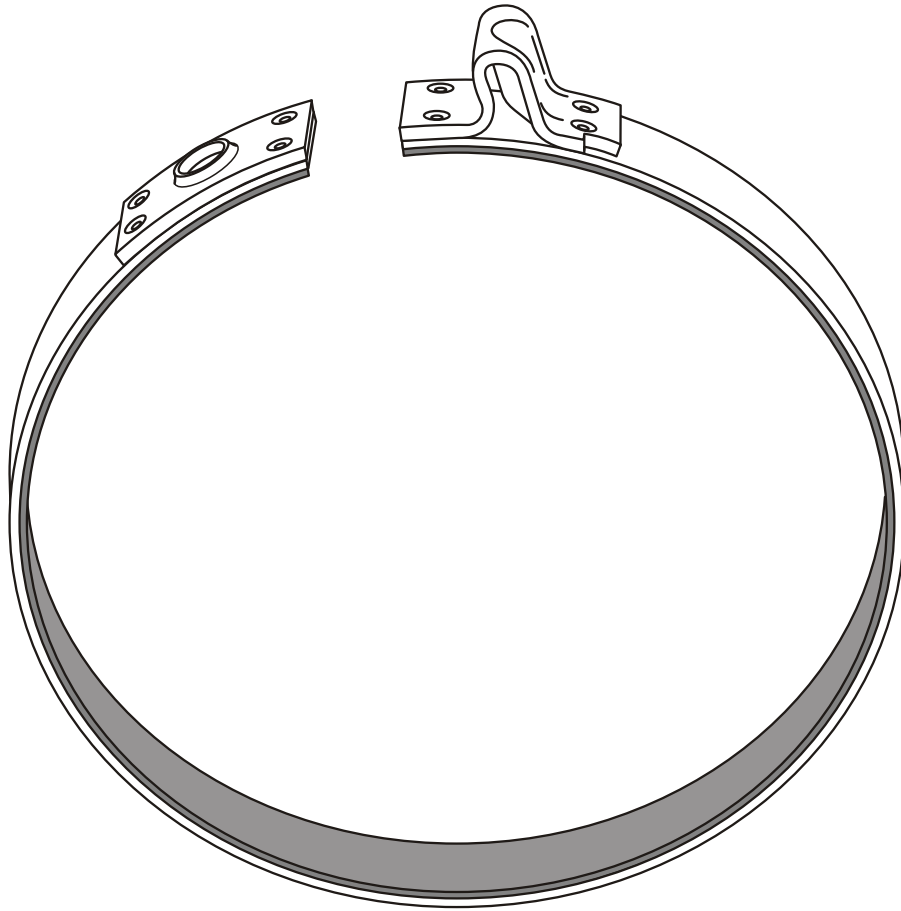
"Narrow" Manual 2nd Band .....	24202631
"Wide" Manual 2nd Band .....	24210080
Apply Pin Service Package (Narrow Band) .....	24200418
Apply Pin Service Package (Wide Band) .....	24223081

**Special Service Note:**

*If the "Wide Band" is used with the Narrow Band Apply Pin, the result will be No Engine Braking when selector lever is moved to the Manual 2nd position, because the apply pin is not long enough to apply the band.*

*If the "Narrow Band" is used with the Wide Band Apply Pin, the result will be 2nd Gear Starts and tie-up on the 2-3 shift and tie-up in reverse, because you have mechanically applied the band because of the length of the pin.*

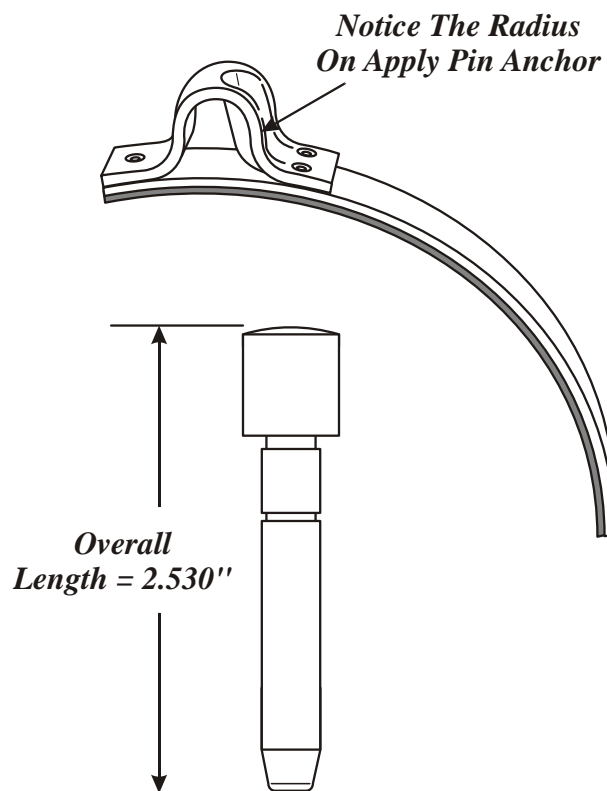
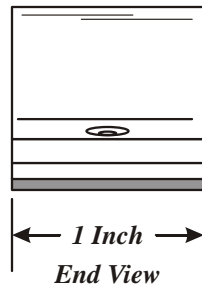
MANUAL 2ND BAND



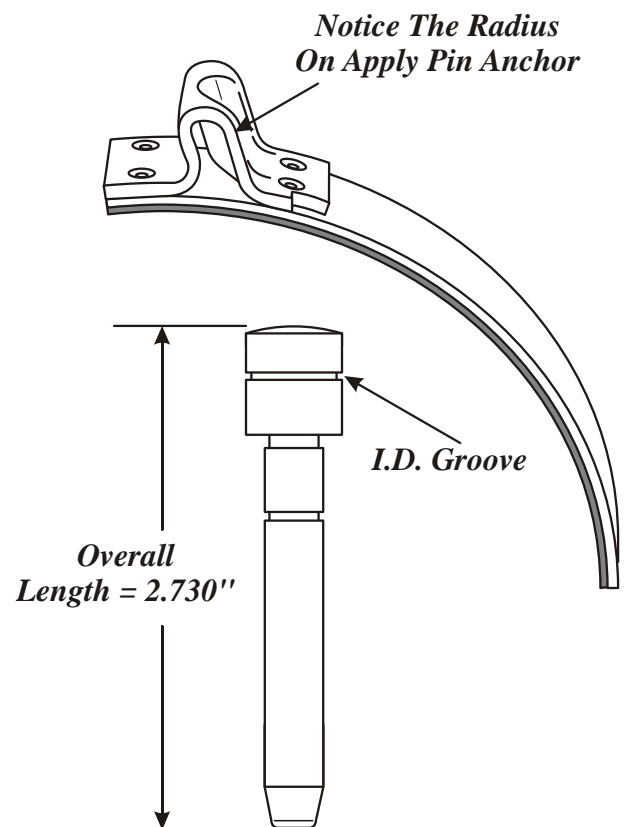
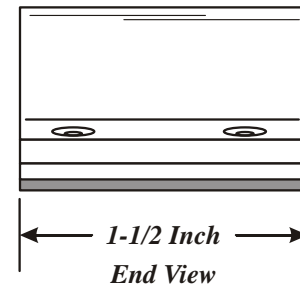
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Figure 1

**"NARROW" MANUAL 2ND BAND**

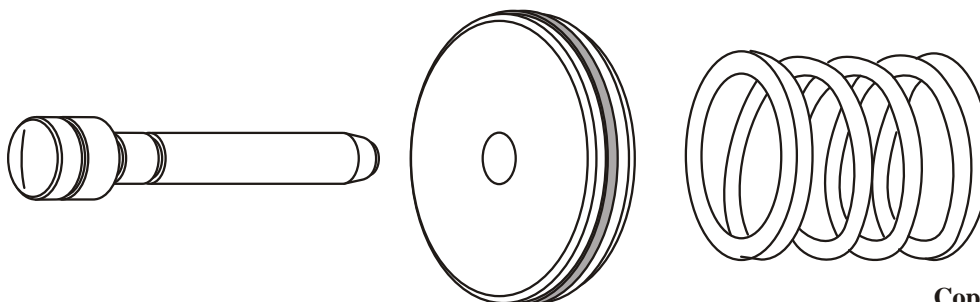


**"WIDE" MANUAL 2ND BAND**



**CONTENTS OF SERVICE PACKAGES**

"Wide Band" Service Package Part Number 24223081  
"Narrow Band" Service Package Part Number 24200418



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Figure 2



**THM 4T40-E  
NEW PRESSURE REGULATOR VALVE  
AND SPACER PLATE FOR 2000**

**CHANGE:** Beginning at the start of production for the 2000 model year, all THM 4T40-E transaxles were produced with a new design Pressure Regulator Valve, Spacer Plate and Valve Body Gaskets.

**REASON:** Improved line pressure rise and stability.

**PARTS AFFECTED:**

- (1) PRESSURE REGULATOR VALVE - New design PR valve is not drilled through on the center line nor cross drilled, like the previous design PR valve, as shown in Figure 1.
- (2) VALVE BODY SPACER PLATE - New design spacer plate has one "Added" hole and one hole that has been made smaller, to redirect balance oil for the PR valve and accommodate the new design level, as shown in Figure 3.
- (3) VALVE BODY SPACER PLATE GASKETS - New design spacer plate gaskets with an added hole to accommodate the new design spacer plate.

**INTERCHANGEABILITY:**

None of the parts listed above will interchange with any previous design level parts. However, when used together as a service package, they will retro-fit back to 1997 models. The 1st design "cross-drilled" PR valve *must* be used with the 1st design spacer plate, as shown in Figure 2.

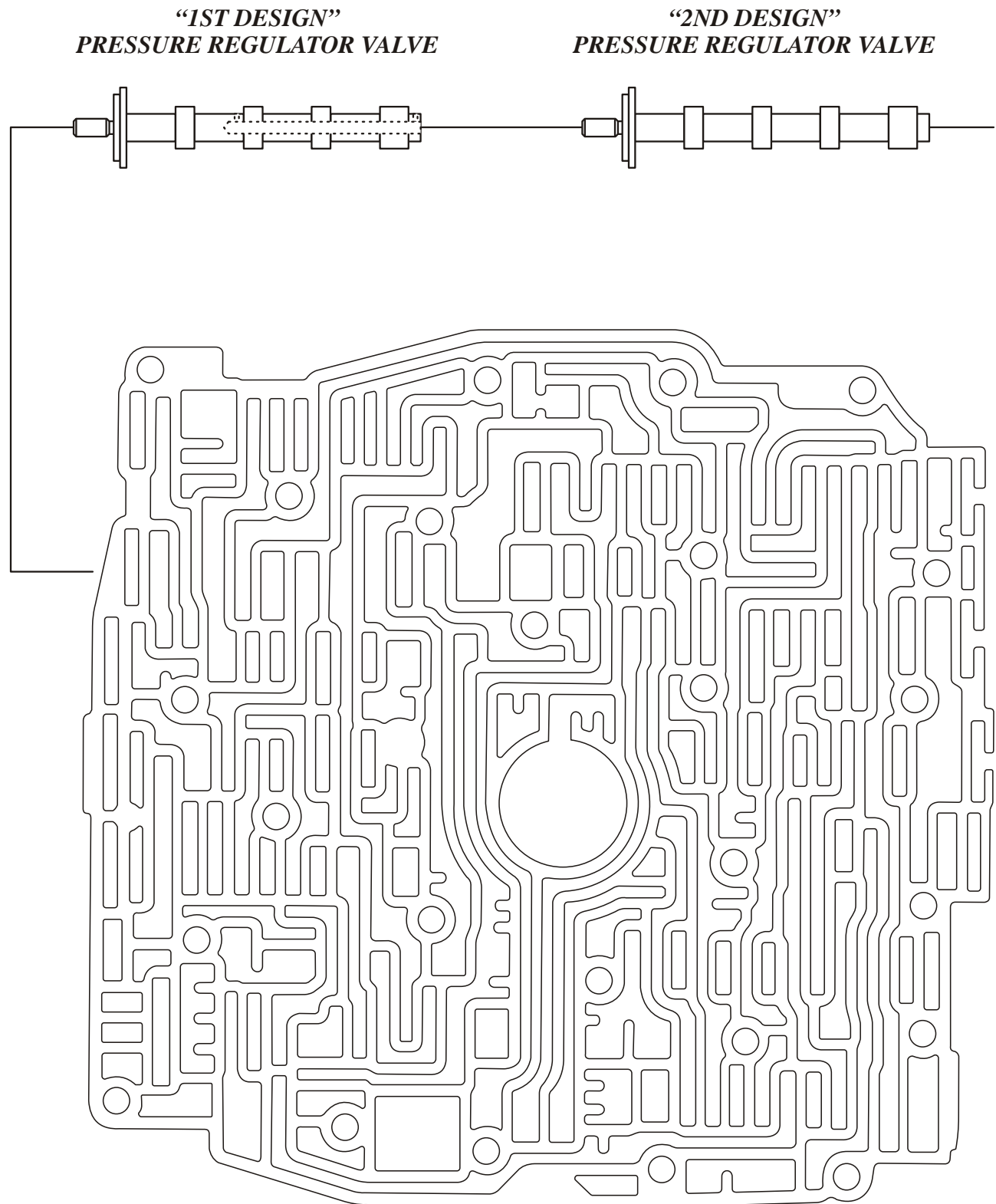
The 2nd design "Non-drilled" PR valve *must* be used with the 2nd design spacer plate, as shown in Figure 3.

***SPECIAL NOTE:***

Using 1st design valve body spacer plate gaskets with 2nd design level parts will create extremely high line pressure and possibly no converter fill.

The 2nd design valve body spacer plate gaskets can be used to back service all models.

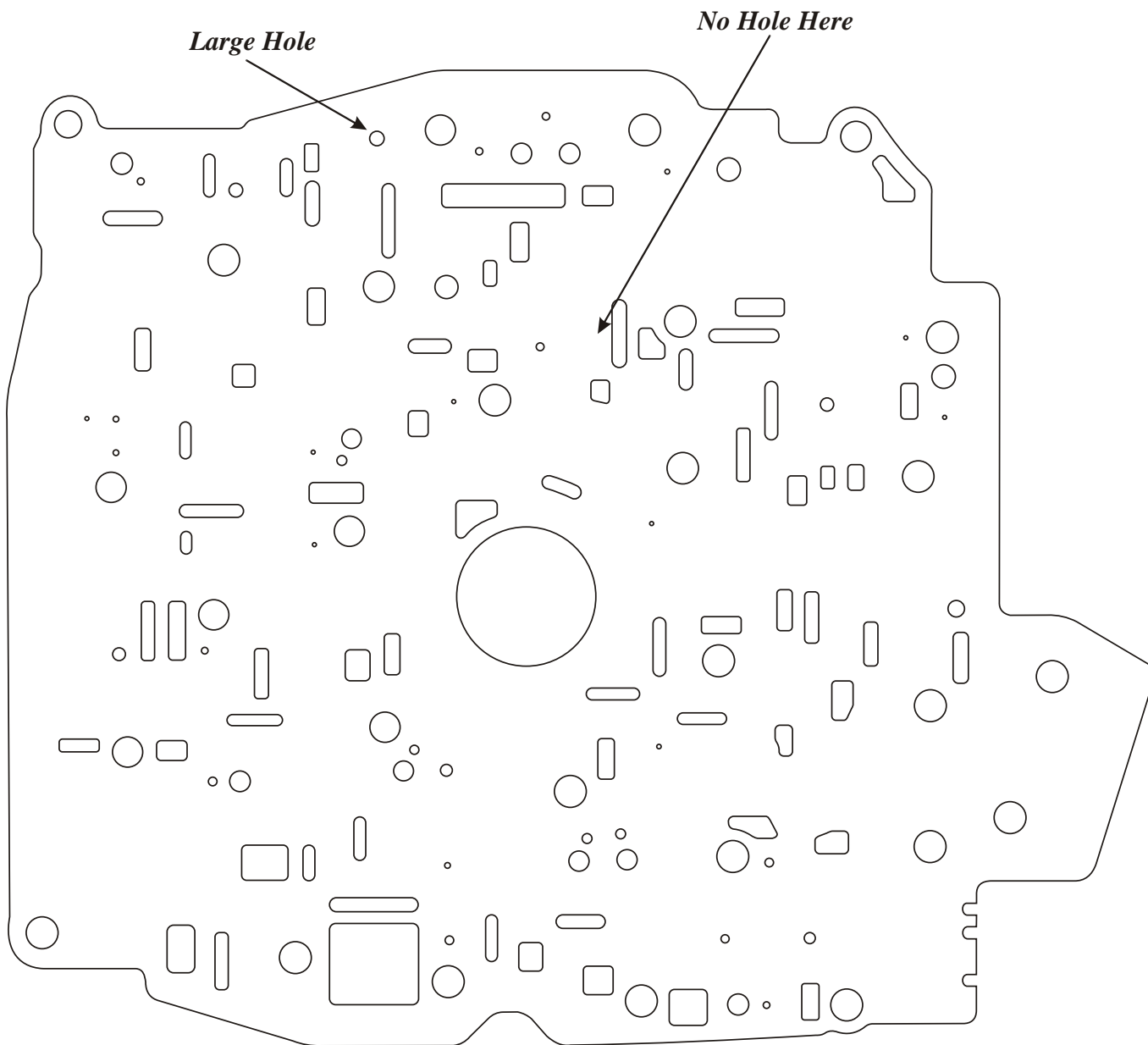




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Figure 1

*Automatic Transmission Service Group*



*This Spacer Plate "Requires"  
This "Cross Drilled" PR Valve*

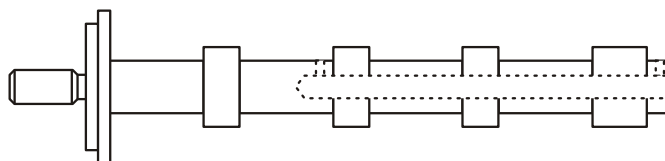
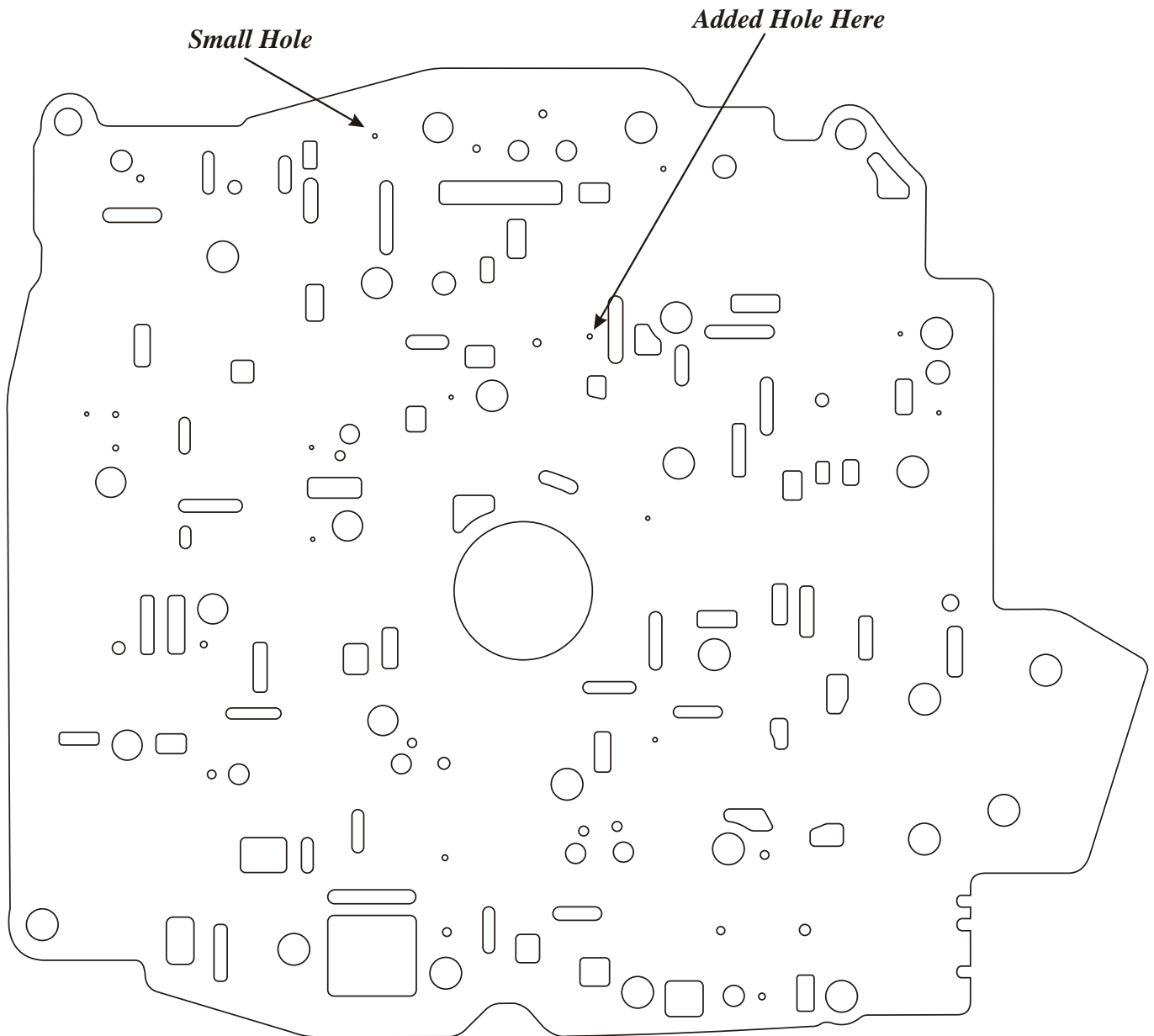


Figure 2



*This Spacer Plate "Requires"  
This "Non-Drilled" PR Valve*

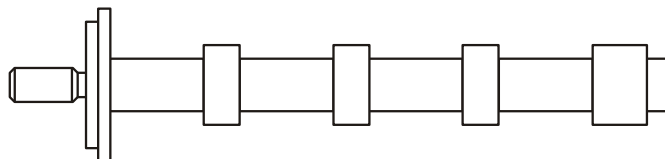


Figure 3

## HYDRA-MATIC 4T65E TRANSMISSION FLUID LEAK FROM VENT

**COMPLAINT:** Vehicles with the Hydra-Matic 4T65E transaxle having RPO codes MN3, MN7, M15 and M76 may experience chronic transmission fluid leaks coming from the breather (vent) on top of the transaxle before and/or after rebuild.

**CAUSE:** The line pressure which passes through the upper channel plate gasket to reach the pressure tap is blowing past the gasket into the vent circuit and exiting the vent.

**CORRECTION:** Replace the Upper Channel Plate Cover Gasket with an updated gasket issued by General Motors or when using an aftermarket overhaul kit, insure correct gasket usage by referring to this service information. The most susceptible area of the gasket which the line pressure was able to blow across has been closed off allowing for greater retention eliminating the leak (See Figure 1).

**SERVICE INFORMATION:**

*New Upper Channel Plate Cover Gasket.....24206391*

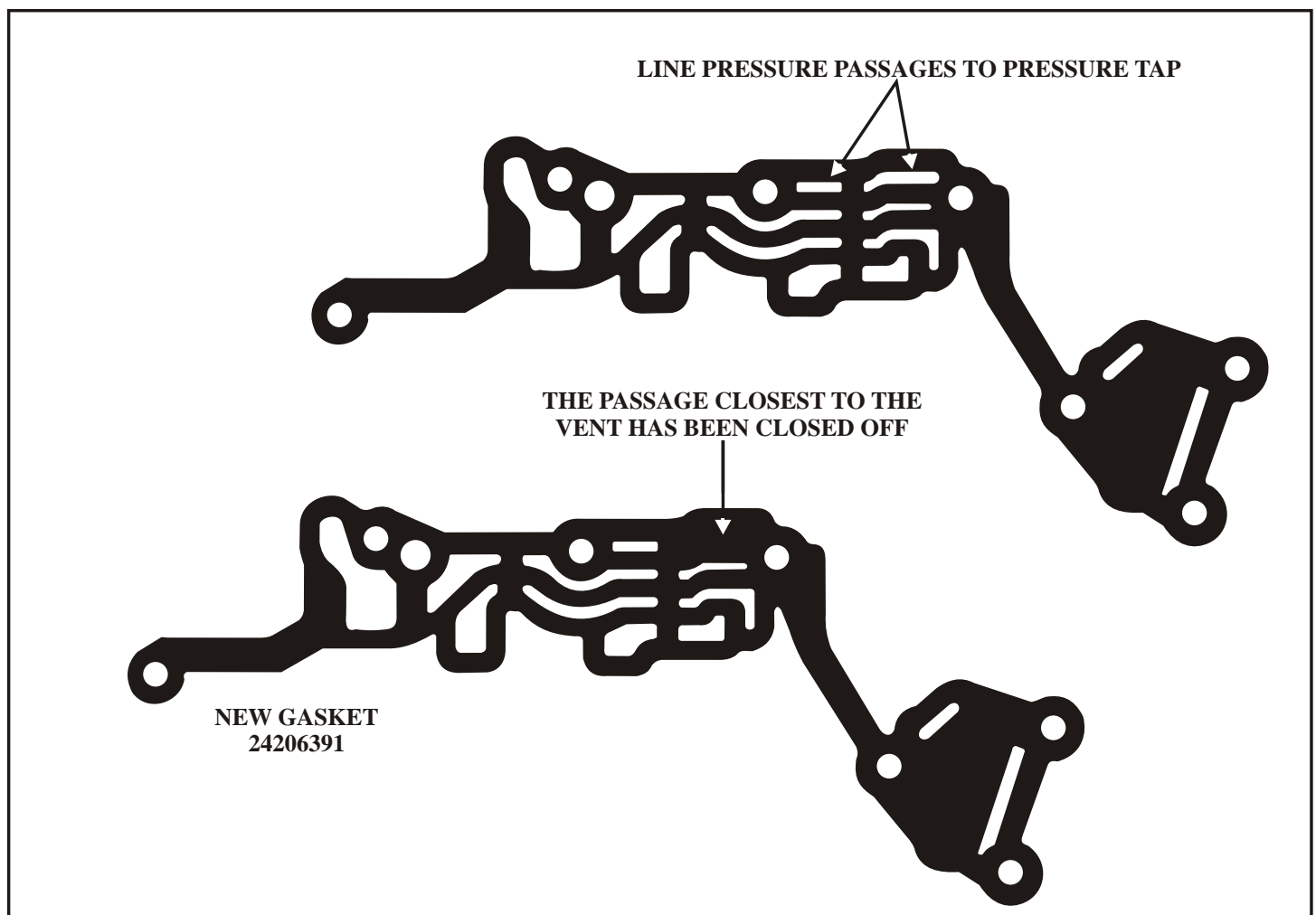


Figure 1

## THM 4T65-E RATTLING NOISE WITH ENGINE RUNNING

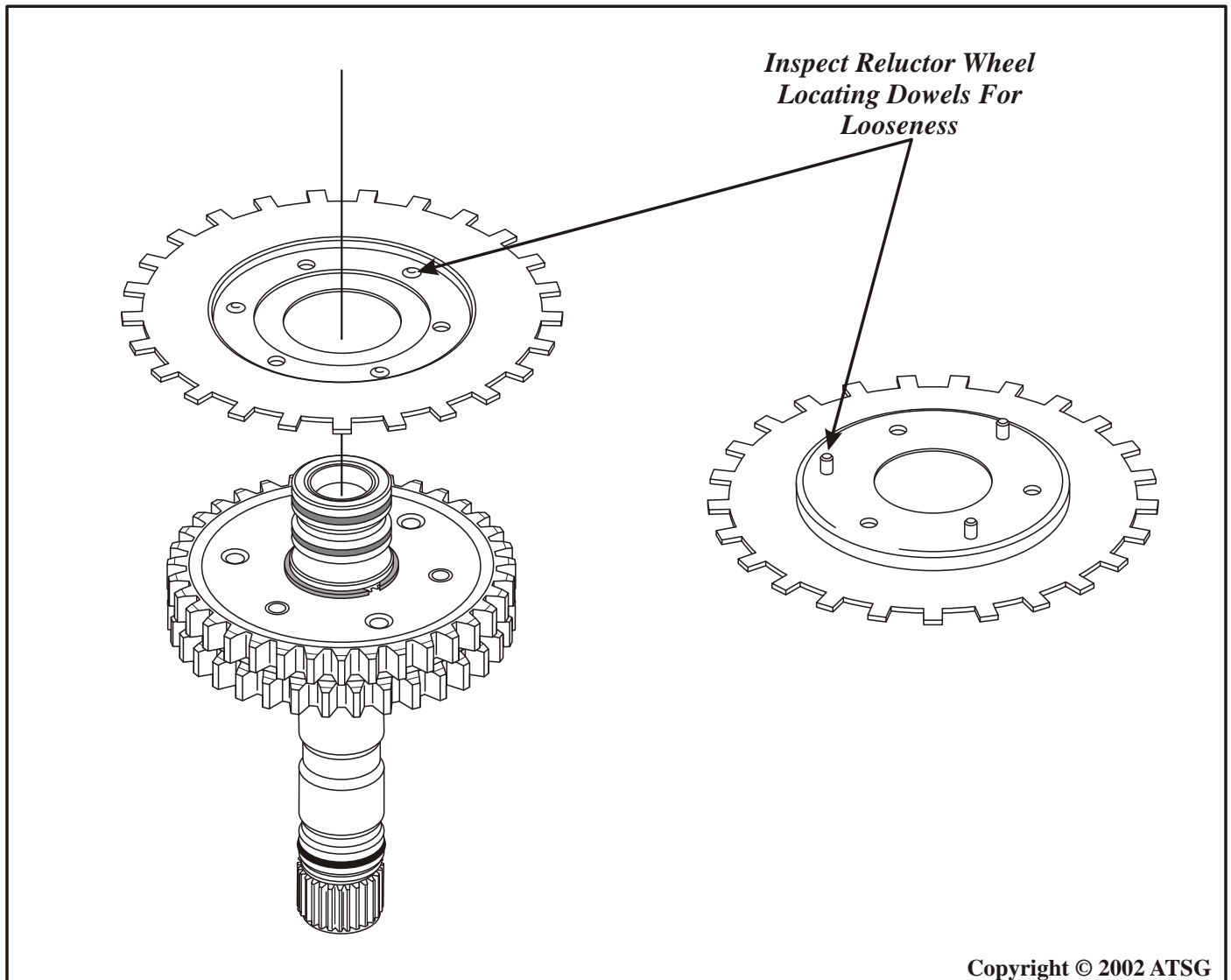
**COMPLAINT:** Some vehicles equipped with the THM 4T65-E transaxle may exhibit a rattling noise coming from the area of the side cover, and may occur in any gear.

**CAUSE:** The cause may be, the locating dowels (rivets) being loose in the input speed sensor reluctor wheel. Refer to Figure 1.

**CORRECTION:** Replace the input speed sensor reluctor wheel with updated OEM part number 24212217.

**SERVICE INFORMATION:**

Input Speed Sensor Reluctor Wheel ..... 24212217



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## THM 4T80-E TURBINE SHAFT SPEED SENSOR CHANGES

**CHANGE:** Beginning in the 1996 model year, on Julian Date 113, all THM 4T80-E transaxles were produced with a new design case casting, manual shaft and turbine shaft speed sensor.

**REASON:** Elimination of case cracks and ease of assembly on the factory final assembly line.

**PARTS AFFECTED:**

- (1) TRANSAXLE CASE - Thicker casting in the front seal area to help eliminate possible cracks and leakage and revised machining in the manual shaft seal bore area (See Figure 1).
- (2) MANUAL SHAFT - New design manual shaft has groove cut in shaft, to accept the bump on bottom of the turbine speed sensor wiring bracket, to locate and hold the manual shaft in the proper location in case (See Figure 1).
- (3) TURBINE SPEED SENSOR - Now manufactured with the bump on the bottom of turbine speed sensor wiring harness bracket, to position and retain manual shaft. The 1st design parts are shown in Figure 2 and the 2nd design parts are shown in Figure 3.

**INTERCHANGEABILITY:**

None of the parts listed above will interchange with previous design level parts, however, when using all three as a service package, they will retro-fit back to 1993.

**SERVICE INFORMATION:**

Turbine Shaft Speed Sensor, 93 to 96 (Julian Date 112) .....	24209654
Turbine Shaft Speed Sensor, 96 (Julian Date 113 to 2002) .....	24207491

*Special Note: Manual Shafts are not serviced seperately, must purchase complete case.*

**CAUTION!**

**CAUTION!**

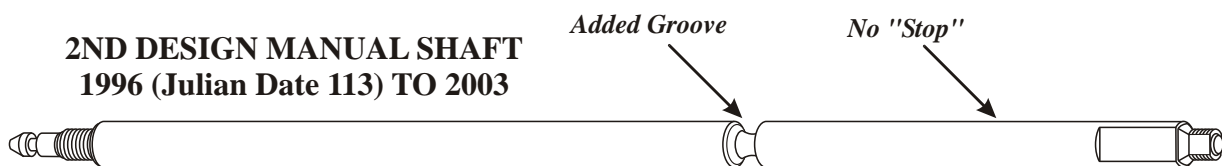
**CAUTION!**

*If it becomes necessary to replace the turbine speed sensor, ensure that your new sensor has the wires in terminals "A" and "C", as shown in Figures 2 and 3. We have had some reports that the new sensor came with the green wire in terminal "B" and had to be moved to terminal "C". We have also had some reports of the black wire being in terminal "A" and the green wire being in terminal "B" on both sides of the connecting harness. Ensure that your wires match on both sides of connector, regardless of where they are located. Refer to Figures 2 and 3.*

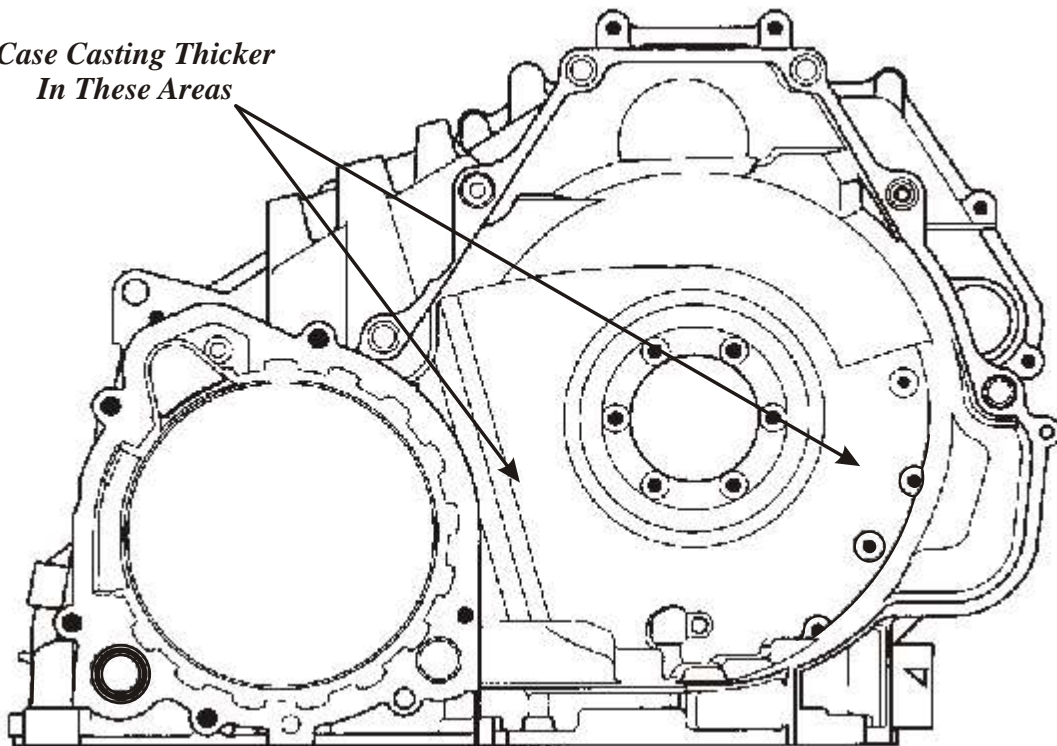
**1ST DESIGN MANUAL SHAFT  
1993 TO 1996 (Julian Date 112)**



**2ND DESIGN MANUAL SHAFT  
1996 (Julian Date 113) TO 2003**



*Case Casting Thicker  
In These Areas*

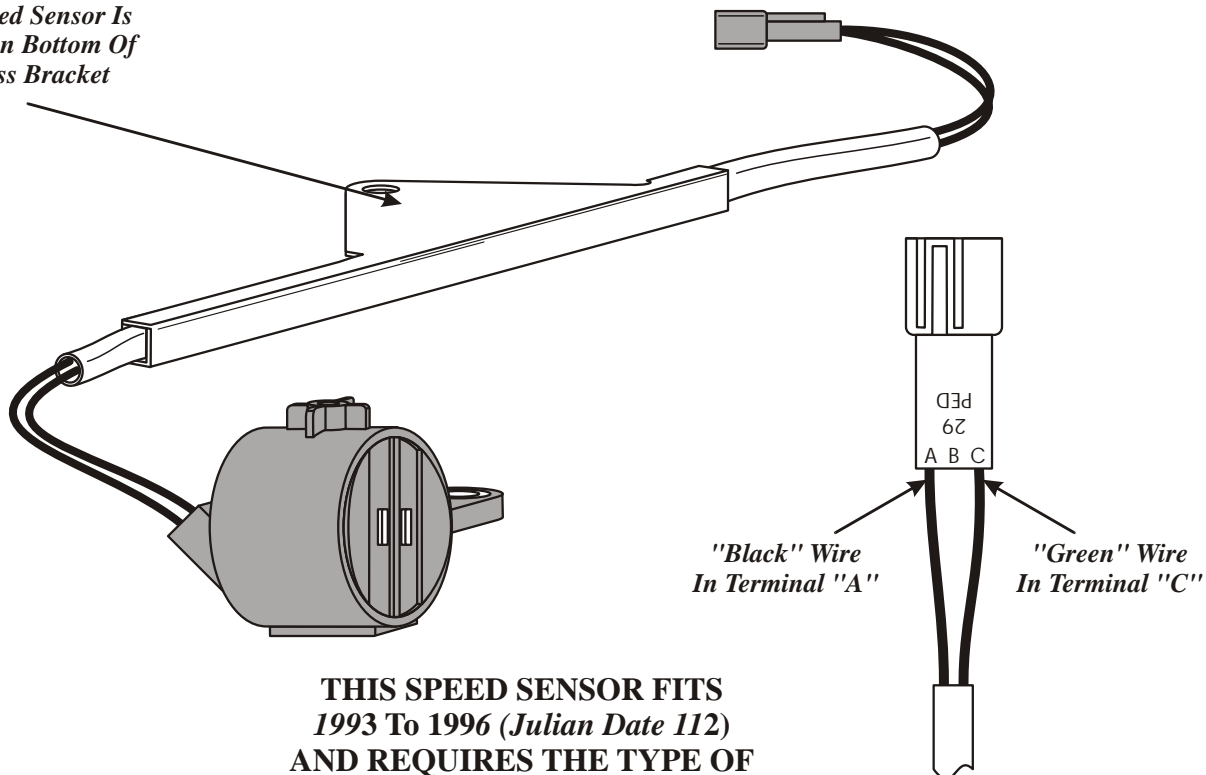


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Figure 1

### THM 4T80-E 1ST DESIGN TURBINE SHAFT SPEED SENSOR OEM PART NUMBER 24209654

*This Speed Sensor Is  
"Flat" On Bottom Of  
Harness Bracket*



**THIS SPEED SENSOR FITS  
1993 To 1996 (Julian Date 112)  
AND REQUIRES THE TYPE OF  
MANUAL SHAFT SHOWN BELOW**



**CAUTION!**

**CAUTION!**

**CAUTION!**

*If it becomes necessary to replace the turbine speed sensor, ensure that your new sensor has the wires in terminals "A" and "C", as shown here. We have had some reports that the new sensor came with the green wire in terminal "B" and had to be moved to terminal "C". We have also had some reports of the black wire being in terminal "A" and the green wire being in terminal "B" on both sides of the connecting harness. Ensure that your wires match on both sides of connector, regardless of where they are located.*

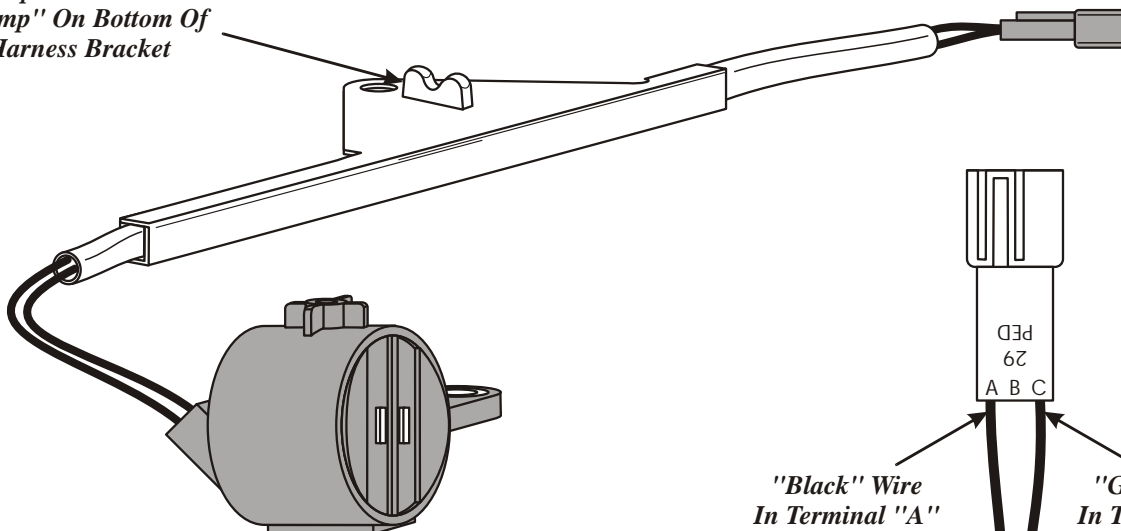
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Figure 2



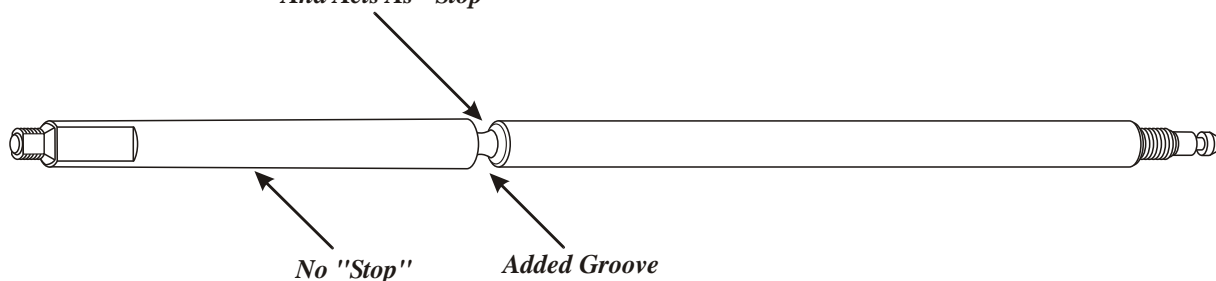
### THM 4T80-E 2ND DESIGN TURBINE SHAFT SPEED SENSOR OEM PART NUMBER 24207491

*This Speed Sensor Has  
"Bump" On Bottom Of  
Harness Bracket*



**THIS SPEED SENSOR FITS  
1996 (Julian Date 113) TO CURRENT  
AND IS "MANDATORY" FOR  
THESE MODELS AS TRANSAXLE  
IS EQUIPPED WITH THE MANUAL  
SHAFT SHOWN BELOW**

*"Bump" On Bottom Of Harness Bracket  
Fits Into Groove In Manual Shaft And  
Positions Manual Shaft In Case  
And Acts As "Stop"*



**CAUTION!**

**CAUTION!**

**CAUTION!**

*If it becomes necessary to replace the turbine speed sensor, ensure that your new sensor has the wires in terminals "A" and "C", as shown here. We have had some reports that the new sensor came with the green wire in terminal "B" and had to be moved to terminal "C". We have also had some reports of the black wire being in terminal "A" and the green wire being in terminal "B" on both sides of the connecting harness. Ensure that your wires match on both sides of connector, regardless of where they are located.*

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Figure 3



**THM 4T80-E  
DTC 76 AND 84  
1995 AURORA OR 1995 CADILLAC**

**COMPLAINT:** Before and/or after rebuild or transaxle replacement, some vehicles may set DTC 76 and DTC 84 at the same time, *and set the very instant that the key is turned on* and before the engine is started. The definition for DTC 76 is, "Pressure Control Solenoid Circuit". There is **NO** DTC 84 listed in the OEM manuals for 1995 model vehicles, however, the Snap-On scanners say DTC 84 is set, and Snap-Ons definition for 84 is the same as the OEM manuals definition of DTC 83 which is, "No 4X or 24X Crank Position Signal from IC Module".

**CAUSE:** ATSG has found this concern to be, a defective Powertrain Control Module (PCM).

**CORRECTION:** First, we must verify that we have no problems in the Pressure Control Solenoid Circuit. To do this, disconnect the external wire harness from the transaxle connector and verify that there is no oil present and the pin cavities look good. Using a DVOM with Ohms selected on the meter and DVOM leads across terminals C and D, as shown in Figure 1, and verify that we have a reading of 3-6 ohms resistance. If this is correct reconnect the external harness to the transaxle.

Second, disconnect the PCM "C2" connector which is "White" in color. Place the DVOM leads across pin cavities C15 (Lt. Blue/White) wire and C16 (Red/Black) wire, as shown in Figure 1, and verify that we have a reading of 3-6 ohms resistance. We have now verified the pressure Control Solenoid Circuit all the way back to the Powertrain Control Module, *and PCM replacement will now be necessary.*

**Special Note:** After PCM replacement, there may be a Current DTC 80 set, which is "TPS/IDLE RELEARN NOT COMPLETE". The 1995 Aurora *requires* the TECH 1 ISC SYSTEM relearn procedure in the MISC. TESTS.

**NOTICE:** *While performing the "TPS/IDLE LRN" procedure on the Aurora, ensure that nothing touches or interferes with the accelerator pedal. Also ensure that the A/C is "Off" and there is no load on the Power Steering while performing the procedure.*

**NOTICE:** *The Cadillac "TPS/IDLE LRN" procedure is totally different than the Aurora and does not require a scanner. The Cadillac procedure is described in detail in Figures 2 and 3.*

# Lubegard

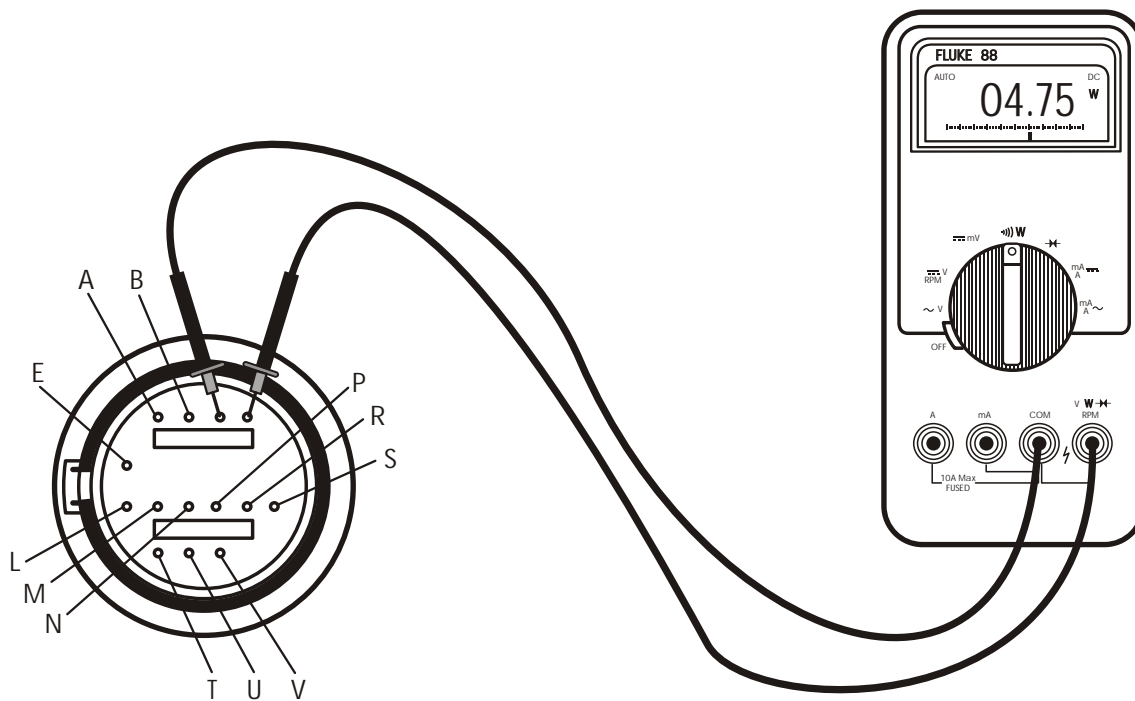
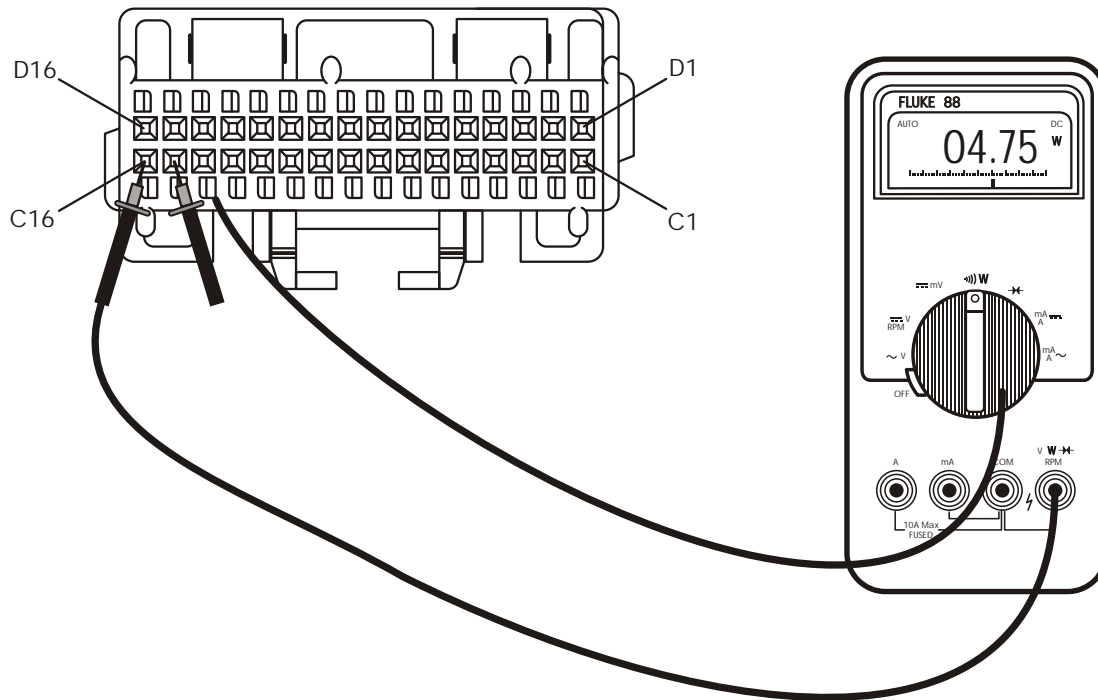
## Centerfold

# Lubegard

## Centerfold

PCM CONNECTOR C2

"White" In Color



View Looking Into  
Transaxle Case Connector

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Figure 1

## THM 4T80E, 1995 CADILLAC

### CODE P080, TP SENSOR IDLE RELEARN NOT COMPLETE

**COMPLAINT:** Some 1993-95 Cadillacs equipped with the THM 4T80-E transaxle may illuminate the "Service Engine Soon" lamp and store P080 as a current code. After attempting to clear the code, it continues to remain as a "*hard code*".

**CAUSE:** This complaint occurs when the PCM has *NO* Throttle Position Sensor or Idle Learn values stored and may be caused by one or more of the following:

- (1) A loss of power to the PCM such as a prolonged battery disconnect.
- (2) PCM replacement.
- (3) High electrical loads such as headlamps, rear defogger, high HVAC blower operation or high speed cooling fan operation.
- (4) Rough or unstable idle conditions.

**Note:** If high electrical loads are the cause of this complaint, turn off the above mentioned items and momentarily run the engine above 1000 rpm to clear the high loads. Since cooling fans cannot be manually controlled, it will be necessary to have engine coolant temperature below 220°F (105°C) and A/C refrigerant temperature below 124°F (51°C).

If rough or unstable idle is the cause, this condition *must* be corrected before the relearn procedure is performed.

**IMPORTANT:** *Because of engine load differences with A/C on versus off, the idle relearn MUST be performed under both A/C on and off conditions!*

**CORRECTION:** A TP Sensor/Idle Rellearn procedure must be performed, as shown in Figure 3. This will then allow you to clear the code and extinguish the Service Engine Soon Light. If the relearn procedure has been successful, code P080 will become a historical code, at which time, it can be cleared.

If after the relearn procedure has been performed, the code *still* remains current and the Service Engine Soon Lamp is *still* illuminated, the following reasons may be at fault:

- (1) Throttle Position Sensor
- (2) Throttle Position Switch
- (3) Vehicle Speed Sensor
- (4) Transaxle Range Switch
- (5) Power Steering Pressure Switch
- (6) Brake Switch

**IMPORTANT:** *Before performing the relearn procedure make certain of the following:*

- (1) *Nothing is interfering with the accelerator or brake pedals.*
- (2) *The heated windshield is turned off.*
- (3) *There is NO load on the power steering.*

*If these conditions are not met, the PCM will NOT be able to perform the relearn routine.*



**THM 4T80E, 1995 CADILLAC**  
**CODE P080, TP SENSOR IDLE RELEARN NOT COMPLETE**

**TP SENSOR IDLE RELEARN PROCEDURE**

- (1) Turn ignition to "ON", engine "OFF".*
- (2) Enter diagnostics by pressing the "Off" and "Warmer" buttons on the Climate Control Center.*
- (3) Turn ignition "OFF".*
- (4) Wait a minimum of 20 seconds.*
- (5) Turn ignition "ON", Engine "OFF".*
- (6) Enter diagnostics by pressing the "Off" and "Warmer" buttons on the Climate Control Center.*
- (7) Turn ignition "OFF".*
- (8) Wait a minimum of 20 seconds.*
- (9) Turn ignition "ON", Engine "OFF".*
- (10) Enter diagnostics by pressing the "Off" and "Warmer" buttons on the Climate Control Center.*
- (11) Turn ignition "OFF".*
- (12) Wait a minimum of 20 seconds.*

**IMPORTANT NOTE:** *Make certain that the outside air temperature is at least 50°F (10°C) so that the A/C compressor will turn "ON".*

- (13) Start the engine.*
- (14) Allow the engine to idle continuously until the coolant temperature is 176°F (80°C), then let the engine idle an additional 5 minutes.*
- (15) Apply the brakes and place the transmission in "DRIVE".*
- (16) Turn the Climate Control Center (CCC) to "OFF" and allow the engine to idle for 30 seconds.*
- (17) Turn the CCC to "AUTO" and allow the engine to idle for another 30 seconds.*
- (18) Place the transmission in "PARK" and turn ignition "OFF".*
- (19) Clear codes and verify proper operation.*

Figure 3



## THM 4T80-E INTERMITTENT RATIO CODES P0731 AND P0732

**COMPLAINT:** The vehicle may suddenly exhibit firm shifts due to default maximum line pressure. This may or may not be accompanied with the illumination of the malfunction indicator light on Oldsmobile models, or a "Service Transmission" displayed in Cadillac's Driver Information Center (DIC).

When the vehicle is scanned for codes, a first gear ratio error P0731 and/or second gear ratio error P0732 is found to be stored in PCM's failure and history records.

**CAUSE:** Besides the typical possibilities such as low fluid level, restricted filter, a compromised forward clutch circuit, forward sprag, low/reverse band circuit, 2nd clutch, 2nd sprag, stuck or sticking shift valves or mechanically failed solenoids, another possibility that needs to be considered is a faulty Transmission Fluid Pressure (TFP) Switch (See Figure 2).

Should the TFP suddenly indicate an erroneous Park/Neutral position signal to the PCM during heavy throttle demands, the PCM will initiate a torque abuse protection strategy. This strategy will manage engine torque resulting in a decreased input speed signal from the transmission altering gear ratio calculation beyond the acceptable tolerances which will produce these false gear ratio error codes.

As a result of the torque abuse strategy being employed by the PCM, a loss of power during heavy throttle acceleration may be observed providing a tip that the TFP may be the culprit.

**CORRECTION:** Fortunately the TFP is accessible from the bottom pan as it is mounted on the lower control valve assembly as previously seen in Figure 2 making its replacement an easy task. This switch can be monitored via a scanner or through the DIC to ensure that its replacement will solve the problem.

Clear codes and drive the vehicle with the selector lever in the D4 position. The pressure switch status should always indicate this D4 position to the PCM. Observe this reading under various throttle demands especially under heavy throttle conditions. If the switch changes state, the switch assembly and/or wiring should be repaired or replaced.

Refer to the chart in figure 1 to obtain the correct TFP voltage range for each gear shift lever position as viewed through a scan tool or on board diagnostics.

### SERVICE INFORMATION:

*Transmission Fluid Pressure Switch Assembly.....24209545*  
*Refer to TSB.....01-07-30-009A*





**THM 4T80-E**  
**INTERMITTENT RATIO CODES P0731 AND P0732**

TFP VOLTAGE RANGE CHART			
GEAR SHIFT LEVER POSITION	RANGE Z	RANGE Y	RANGE X
PARK	12	0	12
REVERSE	12	0	0
NEUTRAL	12	0	12
D4	0	0	12
D3	0	12	12
2	12	12	12
1	12	12	0
ILLEGAL	0	12	0
ILLEGAL	0	0	0

Figure 1

**THM 4T80-E**  
**INTERMITTENT RATIO CODES P0731 AND P0732**

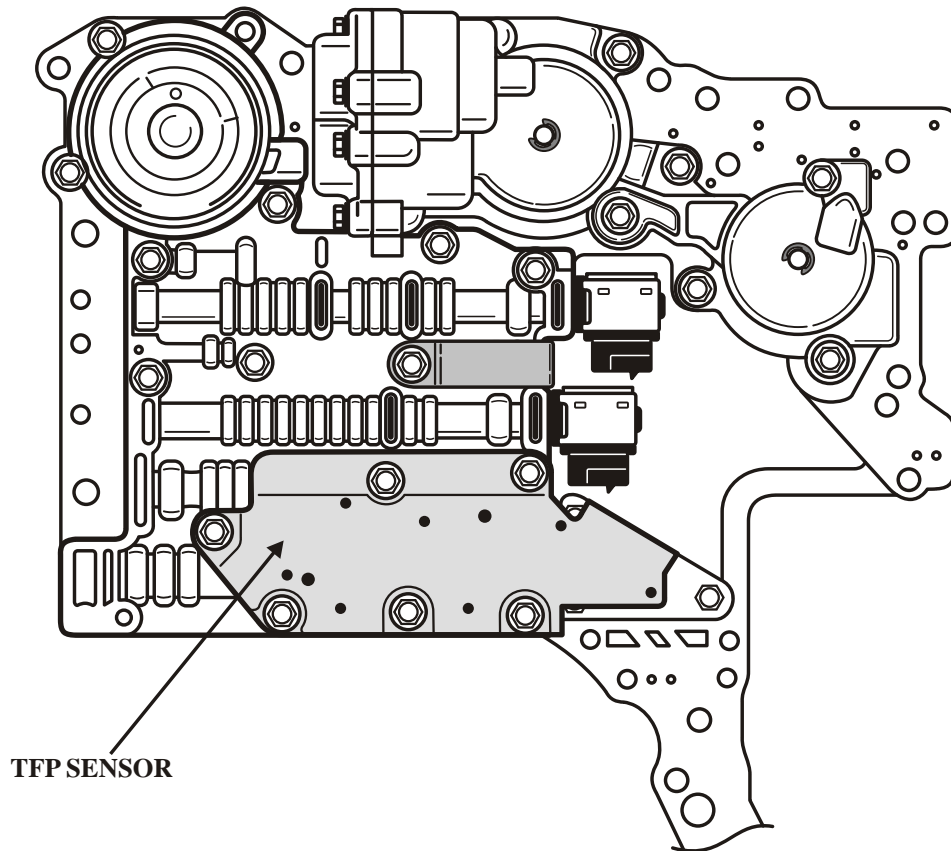


Figure 2



## ALLISON WORLD TRANSMISSIONS

### APPLICATIONS & DESIGNATIONS

Allison World Transmissions are fully computer controlled transmissions that come in Three Truck Models and Four Bus Models.

The designations are "AD" Models, "MD" Models and "HD" Models which are rated at different Gross Vehicle Weights (GVW).

The following information indicates which "GVW" categories they fall into and what the abbreviations that follow the transmission model number mean.

*The chart in Figure 1 indicate the model designations, vehicle applications and GVW categories.*

*The chart in Figure 2 indicate model designations for six and seven speed models.*

*The charts in Figures 3 and 4 indicate the meaning of model designation abbreviations.*

**NOTE:** When the letters "RM" follow the transmission model number, this means it has been *ReManufactured*.

TRANSMISSION MODEL	VEHICLE APPLICATION	GVW CATEGORY
AD	2000 TRUCK MODELS	UP TO 40,000 LBS.
AD	B200 BUS MODELS	UP TO 40,000 LBS.
MD	3000 TRUCK MODELS	UP TO 65,000 LBS.
MD	B300/B400 BUS MODELS	UP TO 65,000 LBS.
HD	4000 TRUCK MODELS	UP TO 90,000 LBS.
HD	B500 BUS MODELS	UP TO 90,000 LBS.

Figure 1

SIX SPEED MODELS	SEVEN SPEED MODELS
HD4000, B500 (P) (R)	MD3070PT
MD3000, B300/400 (P) (R)	
HD4060 (P) (R)	
HD4560 (P) (R)	
MD3060 (P) (R)	
MD3560 (P) (R)	
MD3566 (P) (R)	

Figure 2

## ALLISON WORLD TRANSMISSIONS

### APPLICATIONS & DESIGNATIONS

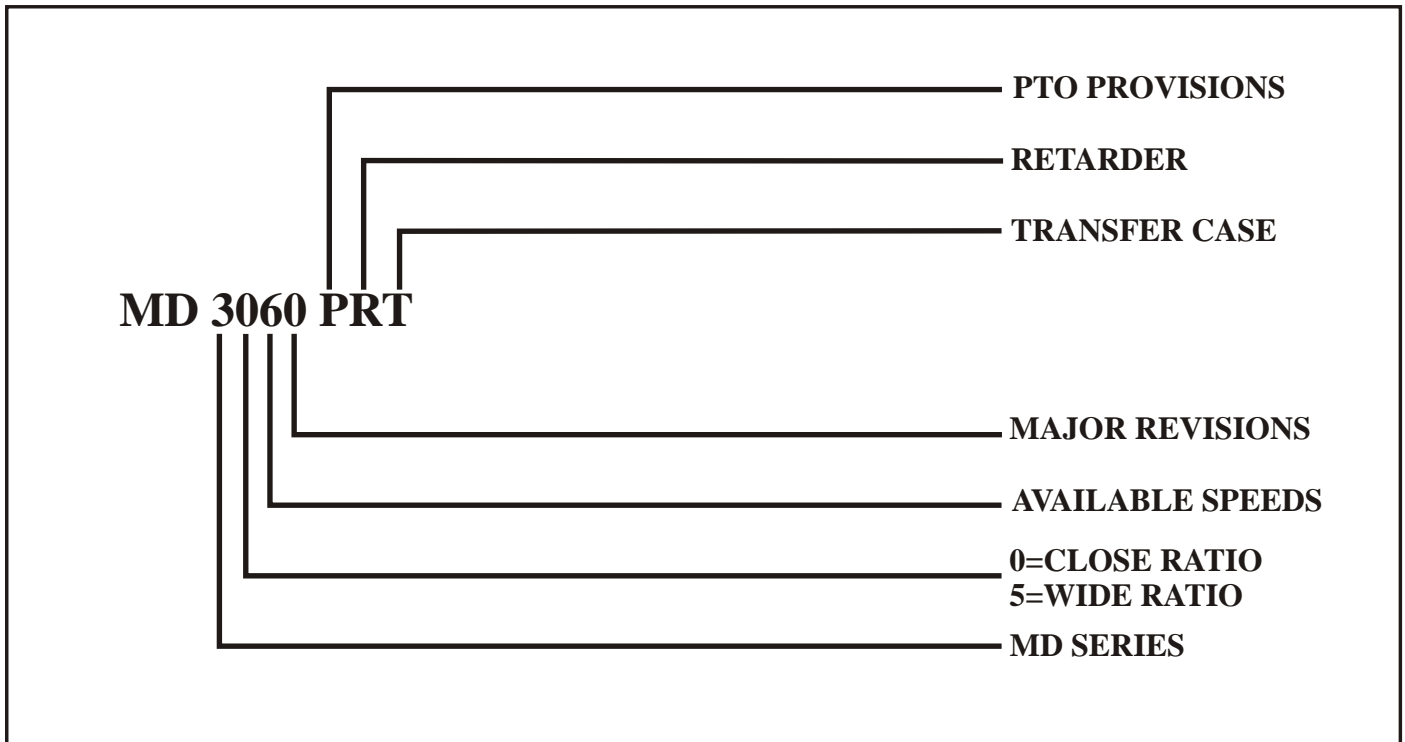


Figure 3

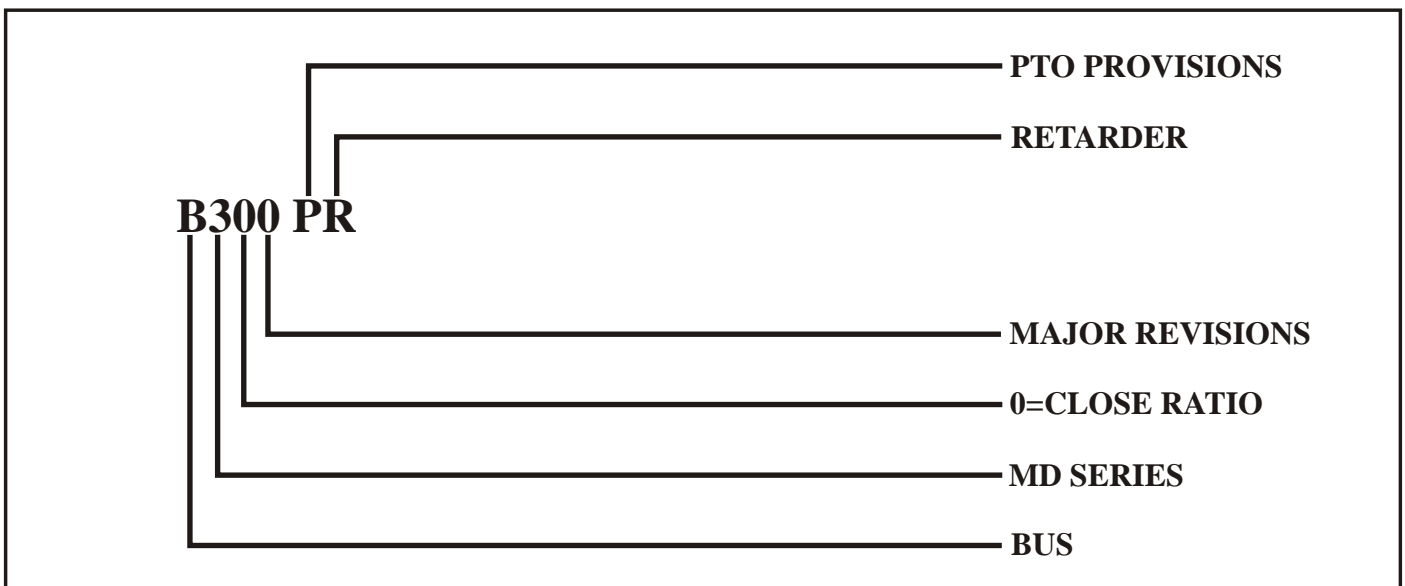


Figure 4



## ALLISON WORLD TRANSMISSIONS

### MANUAL CODE RETRIEVAL PROCEDURE

**COMPLAINT:** The technician is unable to retrieve codes on vehicles equipped with computer controlled Allison World Transmissions such as, 3000, B300, B400 Series, and 4000, B500 Series Transmissions, Etc.

**CAUSE:** A lack of diagnostic equipment available to the aftermarket to successfully communicate with the computer control systems in the various vehicles that are equipped with the Allison World Transmissions.

**CORRECTION:** There is a manual procedure that can be used to retrieve codes on Allison World Transmission equipped vehicles. It can be somewhat confusing without clarification as to what the display means once the code retrieval sequence has been initiated.

The code retrieval procedure will vary depending whether the vehicle is equipped with a Shift Lever or a Keypad shifter and whether or not the transmission is equipped with an Oil Level Sensor. The "Flash Code" display will also vary if the shifter is a single digit display or a double digit display type.

The single digit display Keypad and Shift Lever Selector models are shown in figure 1. The double digit shifter display models are illustrated in figure 2.

When an active diagnostic code is stored, the **LED Indicator** next to the **MODE BUTTON** will be illuminated on vehicles equipped with a single digit display shifter.

On vehicles equipped with a double digit display shifter, the **"MODE ON" LIGHT** will illuminate. At this time the transmission may or may not be in "Limp Mode".

**NOTE:** To initiate the code retrieval sequence, the **UP and DOWN** arrow buttons on Keypad shifter models are pressed simultaneously. On Shift Lever Selector models, the **DISPLAY MODE** button is pressed once.

**IF** the transmission is equipped with an Oil Level Sensor and the above procedure is performed, you will not be in the diagnostic code retrieval mode, you will be in the Oil Level Information Mode.

To skip the Oil Level Information Mode, press the **UP and DOWN** arrow buttons or the **DISPLAY MODE** button **TWICE**. You will now be in the Diagnostic Mode.

#### **OIL LEVEL INFORMATION MODE:**

Once the Oil Level Information Mode is activated, a two minute countdown begins once the following conditions are met: 1. Engine is at idle.

2. Sump oil is at operating temperature.
3. Transmission output shaft is stopped.
4. Transmission is in neutral.
5. Oil level sensor is functioning properly.

Oil level will be displayed at the end of the two minute countdown. During the countdown, the display will begin to flash the numbers 8, 7, 6, 5, 4, 3, 2, 1. These numbers will countdown by reducing each number by one digit once every 15 seconds.



## ALLISON WORLD TRANSMISSIONS

### MANUAL CODE RETRIEVAL PROCEDURE

**CORRECTION** *continued:* Failure to meet any of the above conditions will stop the two minute countdown, and a oil level code will be displayed. The two minute countdown will resume at the point it was stopped once all the above conditions are met.  
Shift selectors with single digit display will display the four digit codes one digit at a time. Shift selectors with double digit displays will display two digits at a time.

Oil Level codes can be seen in the chart in figure 3. Once oil level information conditions are met, the shifter display window will display the oil level information which can be found in the chart in figure 4.

To exit the Oil Level Information Mode, on Keypad shifters, either press the **NEUTRAL** button **TWICE** or simultaneously press the **UP and DOWN** arrow buttons **TWICE**.  
On Shift Lever Selector models press the **DISPLAY** button **TWICE**, or momentarily move the shift selector to any range and then back to the neutral position.

#### **IMPORTANT NOTE:**

To bypass the oil level information mode, on vehicles equipped with the Keypad shifter, the **UP and DOWN** arrow buttons **MUST** be pressed simultaneously **TWICE**.  
On Shift Lever Selector models, you **MUST** press the **DISPLAY MODE** button **TWICE**.

#### **DIAGNOSTIC CODE MODE:**

To enter the Diagnostic Code Mode using the Keypad shifter, press the **UP and DOWN** arrow buttons **ONCE**, *without* an oil level sensor, or **TWICE with** an oil level sensor.  
To enter the Diagnostic Code Mode using a Shift Lever Selector, press the **DISPLAY MODE** button **ONCE**, *without* an oil level sensor, or **TWICE with** an oil level sensor.

If no codes are present, the display will show dash (-) on single display shifters, or a double dash (--) on two digit display shifters.

If codes are present, first the two digit "Code List Position" is displayed followed by the two digit "Main Code", followed by the two digit "Sub Code" as shown in the following example, **Code List Position...d1, Main Code...25, Sub Code...11**.

This means that in the D1 shift position a code 25 for an output speed sensor was stored, and a sub code 11 for zero mph in first gear was stored.

Each digit is displayed for about one second and the cycle will repeat it self whenever the **MODE** button is pressed.

To view codes in the d2, d3, d4 or d5 positions, momentarily press the **MODE** button once. When the fifth position codes are displayed, pressing the **MODE** button **ONCE**, will restart the sequence by displaying codes stored in the d1 position.



## ALLISON WORLD TRANSMISSIONS

### MANUAL CODE RETRIEVAL PROCEDURE

#### **CORRECTION CLEARING CODES:**

*continued:*

While in the diagnostic mode, **PUSH** and **HOLD** the **MODE** button for about ten (10) seconds to clear all stored codes.

Shift selector models with double digit displays will sound a tone in eight seconds, and a another tone in about ten seconds indicating "All Clear".

Shift selector models with single digit displays flash the LED indicator **THREE** times after about three seconds and three times again after about ten seconds indicating that all codes have been cleared.

#### **EXIT DIAGNOSTIC MODE:**

On Keypad shifters, press the Neutral button or simultaneously press the **UP and DOWN** arrow buttons **ONCE**.

On Shift Lever Selector models, press the **DISPLAY MODE** button or move the shift lever to any range and then back to the neutral position.

A list of Main Codes and Sub Codes can be found in the charts in figures 5 to 10.

## ALLISON WORLD TRANSMISSIONS

### SINGLE DIGIT DISPLAY SHIFTER MODELS

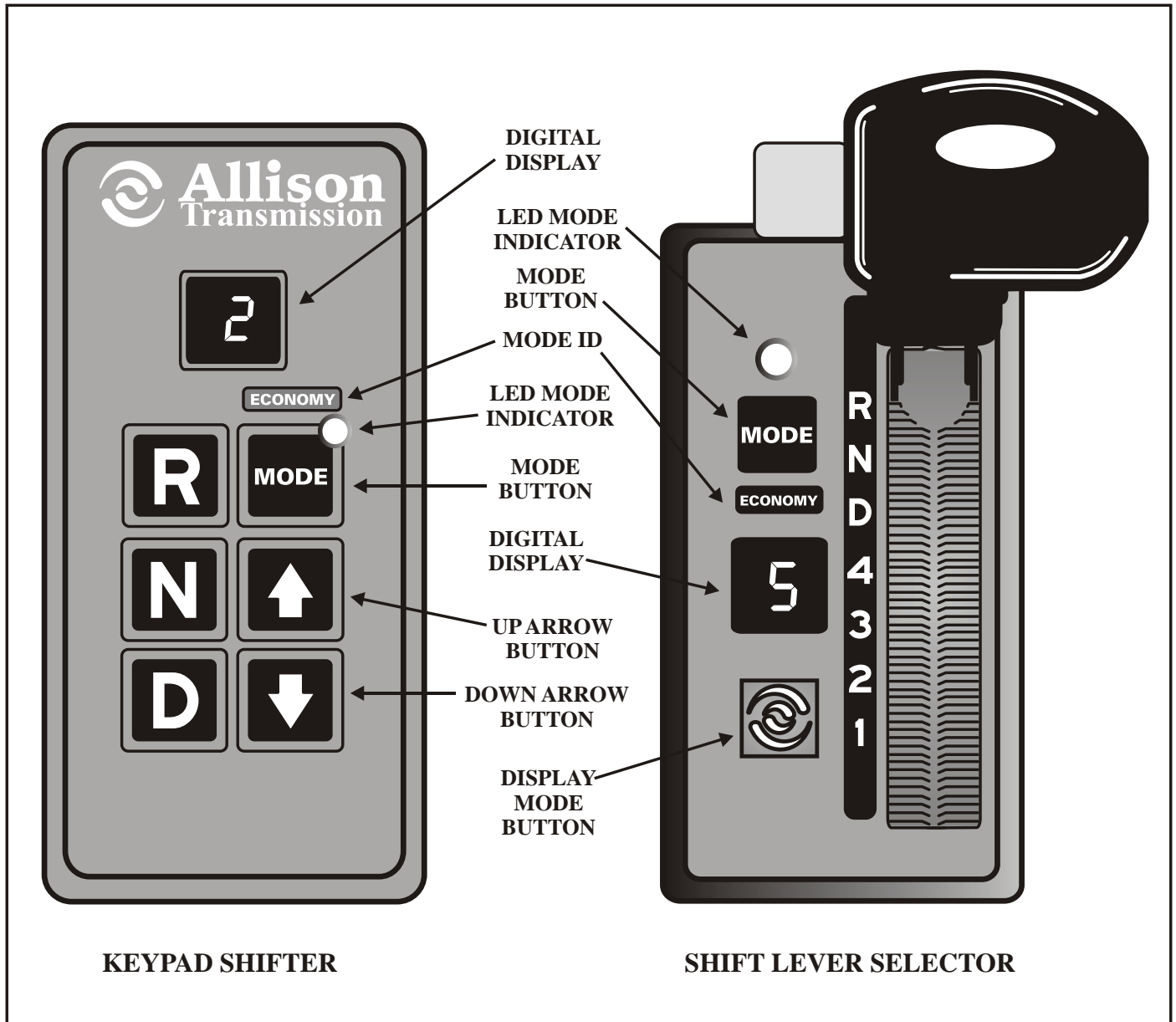


Figure 1



## ALLISON WORLD TRANSMISSIONS

### DOUBLE DIGIT DISPLAY SHIFTER MODELS

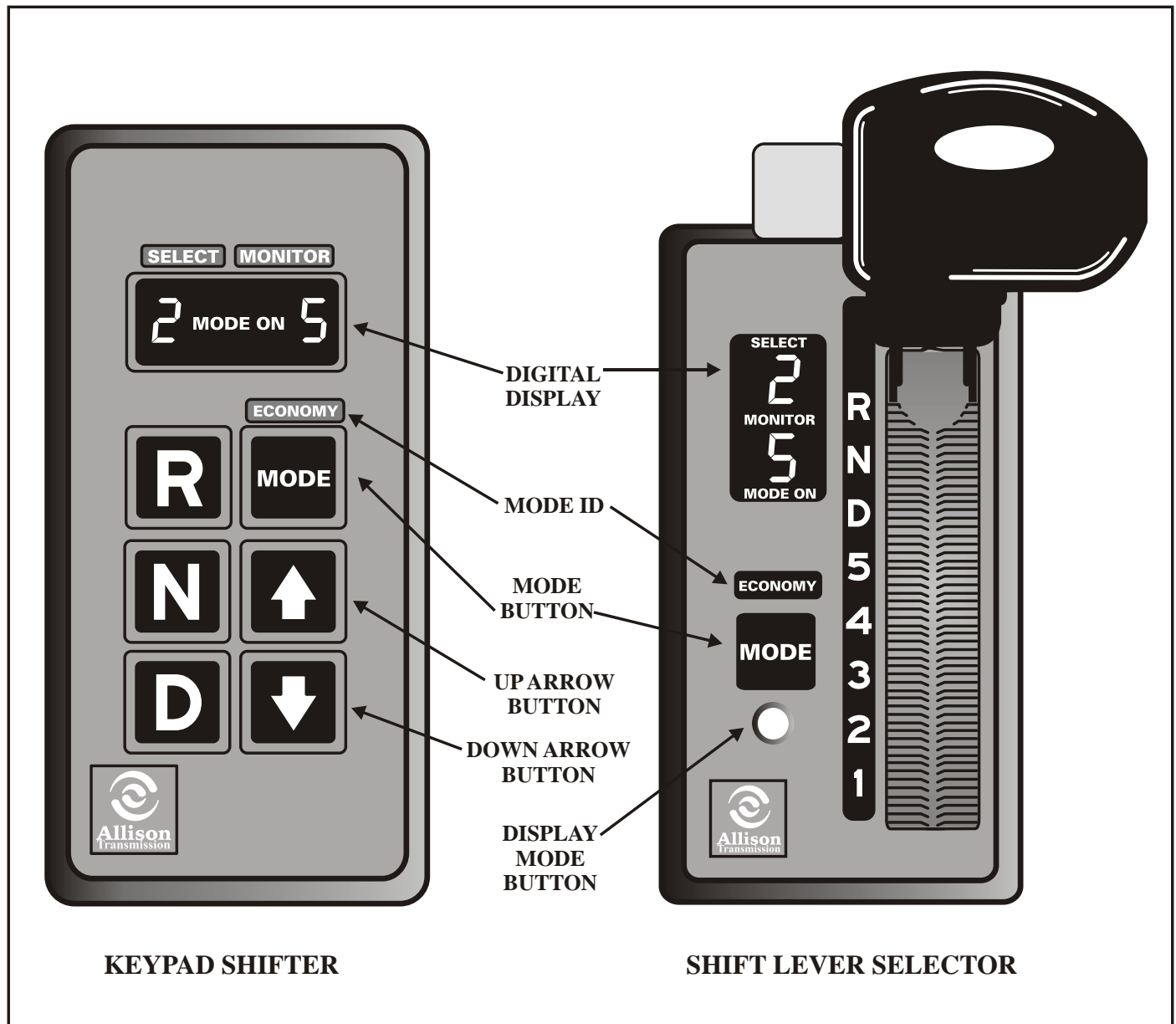


Figure 2

## ALLISON WORLD TRANSMISSIONS

### OIL LEVEL INFORMATION

OIL LEVEL CODE	CODE DESCRIPTION
o L 0 X	Setting time to short
o L 5 0	Engine RPM too low
o L 5 9	Engine RPM too high
o L 6 5	Neutral not selected
o L 7 0	Sump fluid temperature too low
o L 7 9	Sump fluid temperature too high
o L 8 9	Output shaft rotation detected
o L 9 5	Oil level sensor failed

Figure 3

OIL LEVEL READINGS	DESCRIPTION
o L o K	Fluid level is correct
o, L, L, o, 1 or OL, LO, 01	Fluid level is 1 quart low
o, L, H, I, 1 or OL, HI, 01	Fluid level is 1 quart high

Figure 4

## ALLISON WORLD TRANSMISSIONS

### CODES AND CODE DEFINITIONS

MAIN CODE	SUB CODE	CODE DESCRIPTION
12	12	Oil Level Low
	23	Oil Level High
13	12	ECU Input Voltage Low
	13	ECU Input Voltage Medium Low
	23	ECU Input Voltage High
14	12	Oil Level Sensor Failed Low
	23	Oil Level Sensor Failed High
21	12	Throttle Position Sensor Failed Low
	23	Throttle Position Sensor Failed High
22	14	Engine Speed Sensor
	15	Turbine Speed Sensor
	16	Output Speed Sensor
23	12	Primary Shift Selector
	13	Primary Shift Selector Mode Fault
	14	Secondary Shift Selector
	15	Secondary Shift Selector Mode Fault
	16	Shift Selector Display Line Fault
24	12	Sump Fluid Temperature Cold
	23	Sump Fluid Temperature Hot
25	00	Output Speed Sensor @ 0 In Low
	11	Output Speed Sensor @ 0 In 1st
	22	Output Speed Sensor @ 0 In 2nd
	33	Output Speed Sensor @ 0 In 3rd
	44	Output Speed Sensor @ 0 In 4th
	55	Output Speed Sensor @ 0 In 5th
	66	Output Speed Sensor @ 0 In 6th
	77	Output Speed Sensor @ 0 In Reverse
26	00	Throttle Source Not Detected
	11	Engine Coolant Source Not Detected
32	00	C3 Pressure Switch Open In Low
	33	C3 Pressure Switch Open In 3rd
	55	C3 Pressure Switch Open In 5th
	77	C3 Pressure Switch Open In Reverse
33	12	Sump Temperature Sensor Failed Low
	23	Sump Temperature Sensor Failed High
34	12	EPROM Compatibility Number Incorrect
	13	EPROM Calibration Block Checksum
	14	EPROM Power Off Block Checksum
	15	EPROM Diagnose Queue Block Checksum

Figure 5

## ALLISON WORLD TRANSMISSIONS

### CODES AND CODE DEFINITIONS

MAIN CODE	SUB CODE	CODE DESCRIPTION
34 <i>cont.</i>	16	EPROM Real Time Block Checksum
	17	EPROM Modifiable Constants Checksum
35	00	Power Interruption
	16	Real Time Write Interruption
36	00	Hardware / Software Not Compatible
41	12	"A" Solenoid Open or Shorted To Ground
	13	"B" Solenoid Open or Shorted To Ground
	14	"C" Solenoid Open or Shorted To Ground
	15	"D" Solenoid Open or Shorted To Ground
	16	"E" Solenoid Open or Shorted To Ground
	21	"F" Solenoid Open or Shorted To Ground
	22	"G" Solenoid Open or Shorted To Ground
	23	"H" Solenoid Open or Shorted To Ground
	24	"J" Solenoid Open or Shorted To Ground
	25	"K" Solenoid Open or Shorted To Ground
42	26	"N" Solenoid Open or Shorted To Ground
	12	"A" Solenoid Shorted To Power
	13	"B" Solenoid Shorted To Power
	14	"C" Solenoid Shorted To Power
	15	"D" Solenoid Shorted To Power
	16	"E" Solenoid Shorted To Power
	21	"F" Solenoid Shorted To Power
	22	"G" Solenoid Shorted To Power
	23	"H" Solenoid Shorted To Power
	24	"J" Solenoid Shorted To Power
44	25	"K" Solenoid Shorted To Power
	26	"N" Solenoid Shorted To Power
	12	"A" Solenoid Shorted To Ground
	13	"B" Solenoid Shorted To Ground
	14	"C" Solenoid Shorted To Ground
	15	"D" Solenoid Shorted To Ground
	16	"E" Solenoid Shorted To Ground
	21	"F" Solenoid Shorted To Ground
	22	"G" Solenoid Shorted To Ground
	23	"H" Solenoid Shorted To Ground
	24	"J" Solenoid Shorted To Ground
	25	"K" Solenoid Shorted To Ground
	26	"N" Solenoid Shorted To Ground

Figure 6

## ALLISON WORLD TRANSMISSIONS

### CODES AND CODE DEFINITIONS

MAIN CODE	SUB CODE	CODE DESCRIPTION
45	12	"A" Solenoid Circuit Open
	13	"B" Solenoid Circuit Open
	14	"C" Solenoid Circuit Open
	15	"D" Solenoid Circuit Open
	16	"E" Solenoid Circuit Open
	21	"F" Solenoid Circuit Open
	22	"G" Solenoid Circuit Open
	23	"H" Solenoid Circuit Open
	24	"J" Solenoid Circuit Open
	25	"K" Solenoid Circuit Open
	26	"N" Solenoid Circuit Open
46	21	"F" Solenoid Circuit Over Current
	26	"N" & "H" Solenoid Circuits Over Current
	27	"A" & "H" Solenoid Circuits Over Current
51	01	Off Going Ratio Test Low To 1
	10	Off Going Ratio Test 1 To Low
	12	Off Going Ratio Test 1 To 2
	21	Off Going Ratio Test 2 To 1
	23	Off Going Ratio Test 2 To 3
	24	Off Going Ratio Test 2 To 4
	35	Off Going Ratio Test 3 To 5
	42	Off Going Ratio Test 4 To 2
	43	Off Going Ratio Test 4 To 3
	45	Off Going Ratio Test 4 To 5
	46	Off Going Ratio Test 4 To 6
	53	Off Going Ratio Test 5 To 3
	64	Off Going Ratio Test 6 To 4
	65	Off Going Ratio Test 6 To 5
	XY	Off Going Ratio Test X To Y
52	01	Off Going C3PS Test Low To 1
	08	Off Going C3PS Test Low To N1
	32	Off Going C3PS Test 3 To 2
	34	Off Going C3PS Test 3 To 4
	54	Off Going C3PS Test 5 To 4
	56	Off Going C3PS Test 5 To 6
	71	Off Going C3PS Test Reverse To 1
	72	Off Going C3PS Test Reverse To 2
	78	Off Going C3PS Test Reverse To N2
	79	Off Going C3PS Test Reverse To NNC To 2

Figure 7

## ALLISON WORLD TRANSMISSIONS

### CODES AND CODE DEFINITIONS

MAIN CODE	SUB CODE	CODE DESCRIPTION
52 <i>cont.</i>	99	Off Going C3PS Test N3 To N2
	XY	Off Going C3PS Test X To Y
53	08	Off Going Speed Test Low To N1
	18	Off Going Speed Test 1 To N1
	28	Off Going Speed Test 2 To N1
	29	Off Going Speed Test 2 To N2
	38	Off Going Speed Test 3 To N1
	39	Off Going Speed Test 3 To N3
	48	Off Going Speed Test 4 To N1
	49	Off Going Speed Test 4 To N3
	58	Off Going Speed Test 5 To N1
	59	Off Going Speed Test 5 To N3
	68	Off Going Speed Test 6 To N1
	69	Off Going Speed Test 6 To N4
	78	Off Going Speed Test Reverse To N1
	99	Off Going Speed Test N2 To N3 / N3 To N2
	XY	Off Going Speed Test X To Y
54	01	On Coming Ratio Test Low To 1
	07	On Coming Ratio Test Low To Reverse
	10	On Coming Ratio Test 1 To Low
	12	On Coming Ratio Test 1 To 2
	17	On Coming Ratio Test 1 To Reverse
	21	On Coming Ratio Test 2 To 1
	23	On Coming Ratio Test 2 To 3
	24	On Coming Ratio Test 2 To 4
	27	On Coming Ratio Test 2 To Reverse
	32	On Coming Ratio Test 3 To 2
	34	On Coming Ratio Test 3 To 4
	35	On Coming Ratio Test 3 To 5
	42	On Coming Ratio Test 4 To 2
	43	On Coming Ratio Test 4 To 3
	45	On Coming Ratio Test 4 To 5
	46	On Coming Ratio Test 4 To 6
	53	On Coming Ratio Test 5 To 3
	54	On Coming Ratio Test 5 To 4
	56	On Coming Ratio Test 5 To 6
	64	On Coming Ratio Test 6 To 4
	65	On Coming Ratio Test 6 To 5
	70	On Coming Ratio Test Reverse To Low

Figure 8



## ALLISON WORLD TRANSMISSIONS

### CODES AND CODE DEFINITIONS

MAIN CODE	SUB CODE	CODE DESCRIPTION
54 <i>cont.</i>	71	On Coming Ratio Test Reverse To 1
	72	On Coming Ratio Test Reverse To 2
	80	On Coming Ratio Test N1 To Low
	81	On Coming Ratio Test N1 To 1
	82	On Coming Ratio Test N1 To 2
	83	On Coming Ratio Test N1 To 3
	85	On Coming Ratio Test N1 To 5
	86	On Coming Ratio Test N1 To 6
	92	On Coming Ratio Test N2 To 2
	93	On Coming Ratio Test N3 To 3
	95	On Coming Ratio Test N3 To 5
	96	On Coming Ratio Test N4 To 6
	97	On Coming Ratio Test 2 To Reverse
	XY	On Coming Ratio Test X To Y
55	07	On Coming C3PS Test Low To Reverse
	17	On Coming C3PS Test 1 To Reverse
	27	On Coming C3PS Test 2 To Reverse
	80	On Coming C3PS Test N1 To Low
	87	On Coming C3PS Test N1 To Reverse
	97	On Coming C3PS Test NVL To Reverse
	XY	On Coming C3PS Test X To Y
56	00	Low Range Verification Test
	11	1st Range Verification Test
	22	2nd Range Verification Test
	33	3rd Range Verification Test
	44	4th Range Verification Test
	55	5th Range Verification Test
	66	6th Range Verification Test
	77	Reverse Range Verification Test
57	11	1st Range Verification C3PS Test
	22	2nd Range Verification C3PS Test
	44	4th Range Verification C3PS Test
	66	6th Range Verification C3PS Test
	88	N1 Range Verification C3PS Test
	99	N2 To N4 Range Verification C3PS Test
61	00	Retarder Oil Temperature Hot
62	12	Retarder Oil Temperature Sensor Failed Low
	23	Retarder Oil Temperature Sensor Failed High
	32	Engine Coolant Temperature Sensor Failed Low
	33	Engine Coolant Temperature Sensor Failed High

Figure 9

# Superior



## ALLISON WORLD TRANSMISSIONS

### CODES AND CODE DEFINITIONS

MAIN CODE	SUB CODE	CODE DESCRIPTION
63	00	Input Function Fault
	26	Kickdown Input Failed On
	40	Service Brake Status Input Failed On
64	12	Retarder Modulation Sensor Failed Low
	23	Retarder Modulation Sensor Failed High
65	00	Engine Rating Too High
66	00	Serial Communication Interface Fault
	11	S.C.I. Engine Coolant Source Fault
69	12	"A" Solenoid Driver Open In ECU
	13	"B" Solenoid Driver Open In ECU
	14	"C" Solenoid Driver Open In ECU
	15	"D" Solenoid Driver Open In ECU
	16	"E" Solenoid Driver Open In ECU
	21	"F" Solenoid Driver Open In ECU
	22	"G" Solenoid Driver Open In ECU
	23	"H" Solenoid Driver Open In ECU
	24	"J" Solenoid Driver Open In ECU
	25	"K" Solenoid Driver Open In ECU
	26	"N" Solenoid Driver Open In ECU
	27	A-High Switch Inoperative In ECU
	28	F-High Switch Inoperative In ECU
	29	N & H-High Switch Inoperative In ECU
	32	SPI Communications Link Fault In ECU
	33	Central Operating Processor Timeout
	34	EPROM Write Timeout In ECU
	35	EPROM Checksum Test In ECU
	36	Ram Self Test In ECU
	39	Communications Chip Addressing Error
	41	I/O ASIC Addressing Test In ECU
	42	SPI Output Failure
	43	SPI Input Failure

Figure 10



## ALLISON 500 SERIES TRANSMISSIONS

### INCORRECT ASSEMBLY OF THE FIRST CLUTCH

**COMPLAINT:** After overhaul the transmission binds up on the 1-2 shift, initial take-off in first and reverse have no complaints.

**CAUSE:** The first clutch has been assembled incorrectly and is causing the above complaints. The order of the friction and steel plates in relation to the rear ring gear, can be confusing even with a factory manual.  
Without the correct clutch/steel arrangement, the first clutch is jammed on *mechanically*. Since the first clutch is used with the fourth clutch to attain reverse, there is no reverse complaint. Nor is there a complaint on initial take-off because the first clutch is applied with the forward clutch. But, once a 1-2 shift is attempted, the first clutch cannot release resulting in a bind-up on the 1-2 shift.

**CORRECTION:** Place the rear ring gear on the work bench with the extended teeth down as seen in figure 1. Load six steel plates and six friction plates onto the ring gear. Grab the entire ring gear and clutch pack assembly and turn it upside down so the extended teeth are at the **TOP** of the clutch pack as seen in figure 2.  
Now, install the assembly into the case using care to align the external tabs of the steel plates with the slots in the case. Then install the last steel plate and then the last friction plate, so that it is sitting on top of the extended teeth of the ring gear, followed by the pressure plate and snap ring. Refer to figure 3 for the correct assembly of the first clutch and ring gear. Figure 4 shows the incorrect assembly of the first clutch pack and ring gear.

#### SERVICE INFORMATION:

This procedure is necessary on 500 series transmissions **AFTER** serial number 5071. Prior to 5071 units, the ring gear did not have extended teeth. 5071 are the last four digits of the serial number.

**ALL** Allison transmission identification for parts and service needs are obtained from the identification tag on the transmission case as shown in figure 5. *It is necessary to have the transmission serial number, part number and transmission model number to receive the correct parts and technical information.*

**Schaffer**

## ALLISON 500 SERIES TRANSMISSIONS

### ASSEMBLY OF THE FIRST CLUTCH

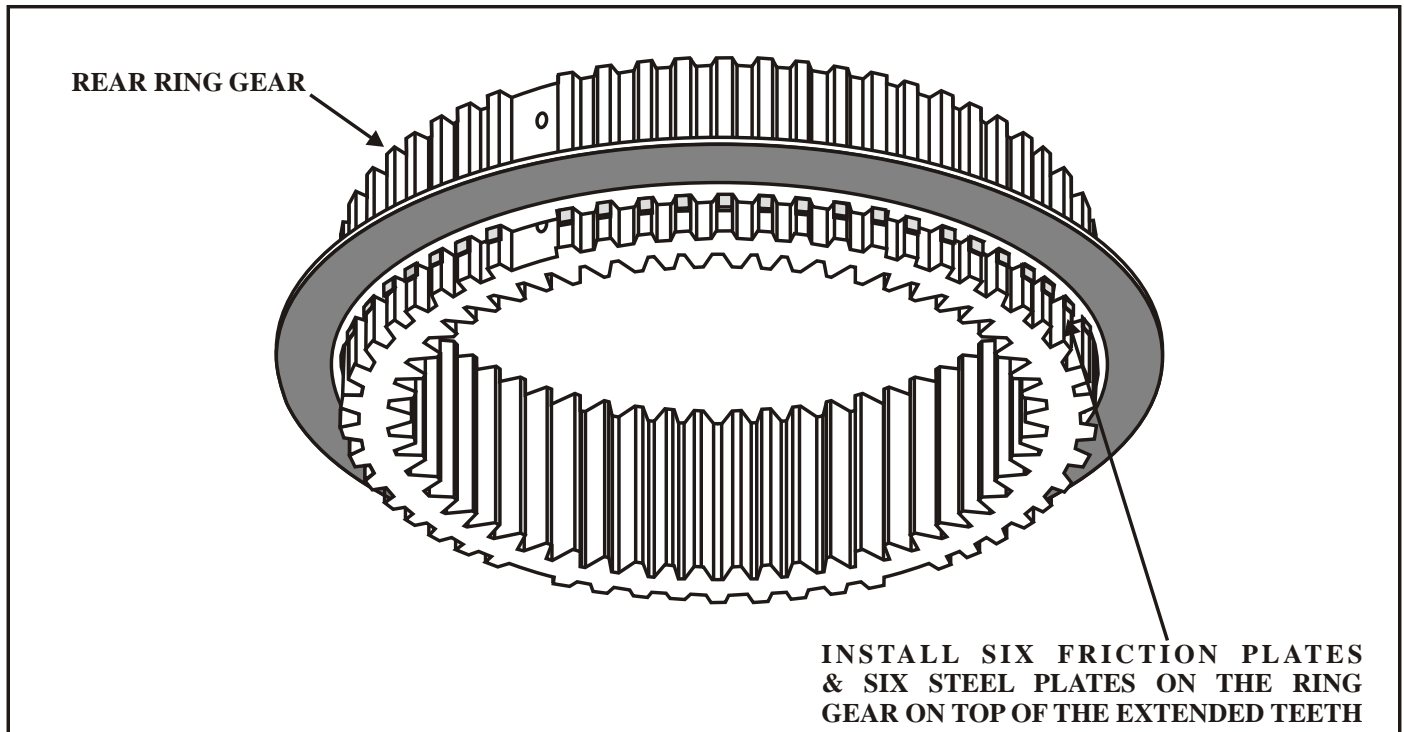


Figure 1

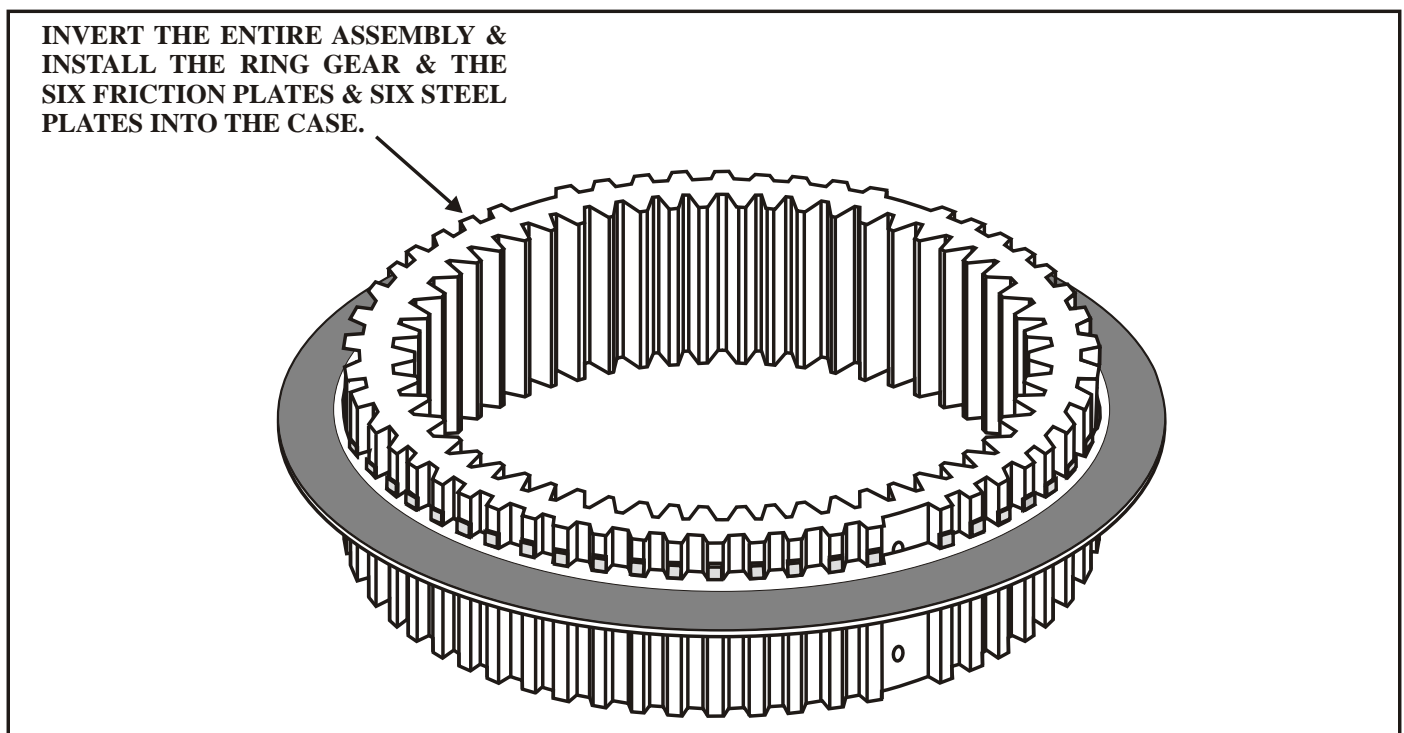


Figure 2

## ALLISON 500 SERIES TRANSMISSIONS

### CORRECT ASSEMBLY OF THE FIRST CLUTCH

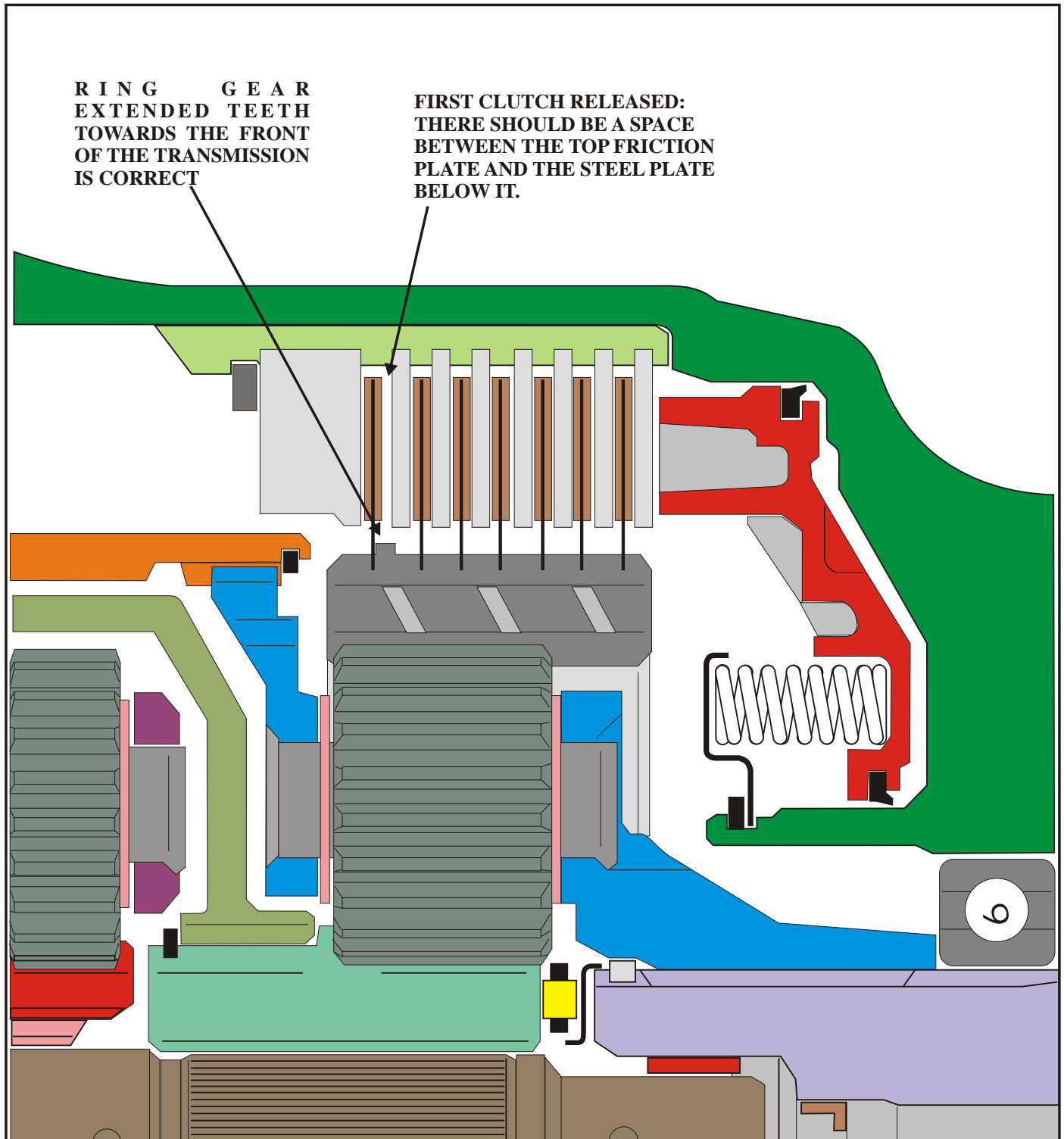


Figure 3

## ALLISON 500 SERIES TRANSMISSIONS

### INCORRECT ASSEMBLY OF THE FIRST CLUTCH

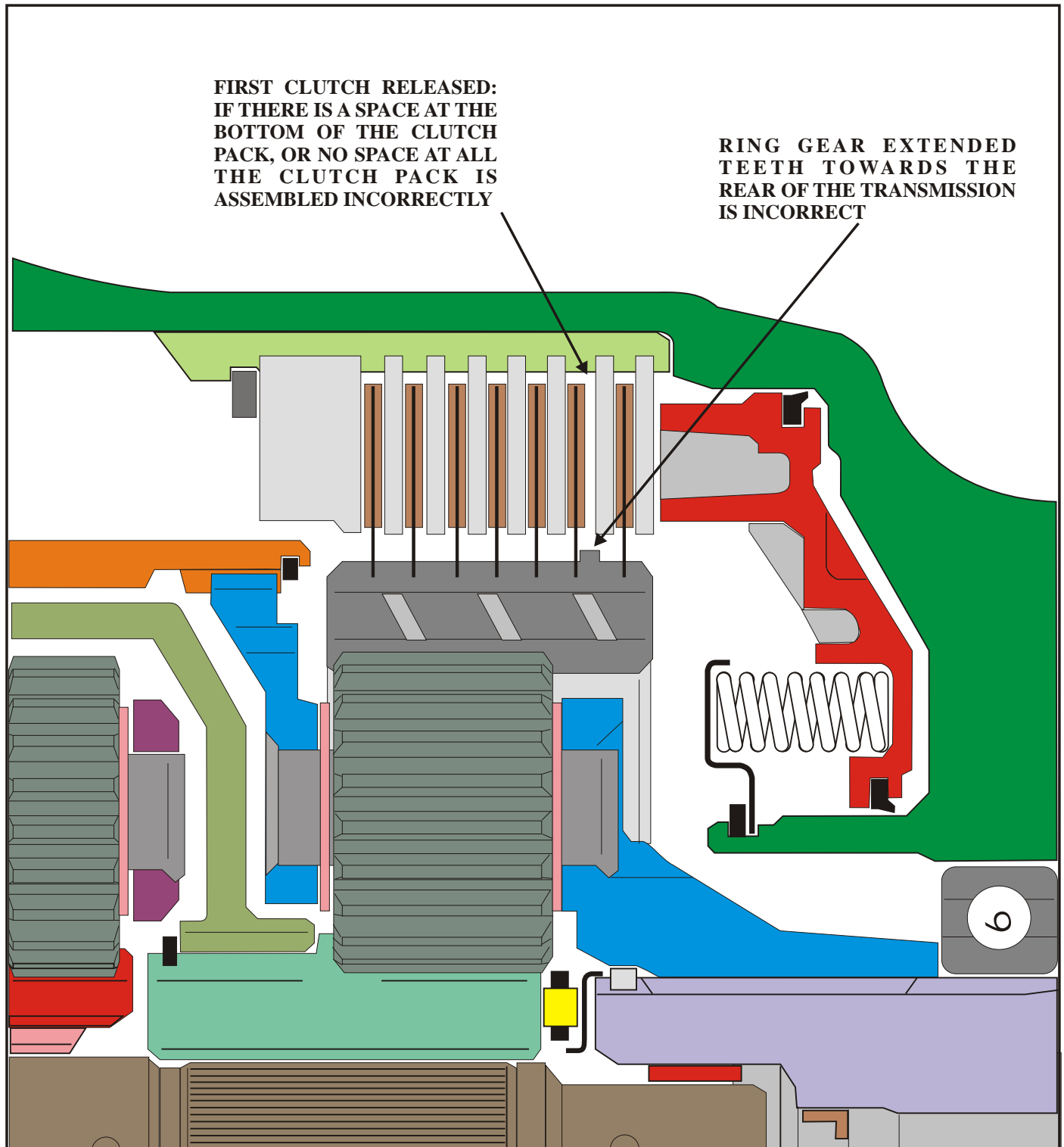


Figure 4

# Rostra

## ALLISON 500 SERIES TRANSMISSIONS

### TRANSMISSION IDENTIFICATION TAG

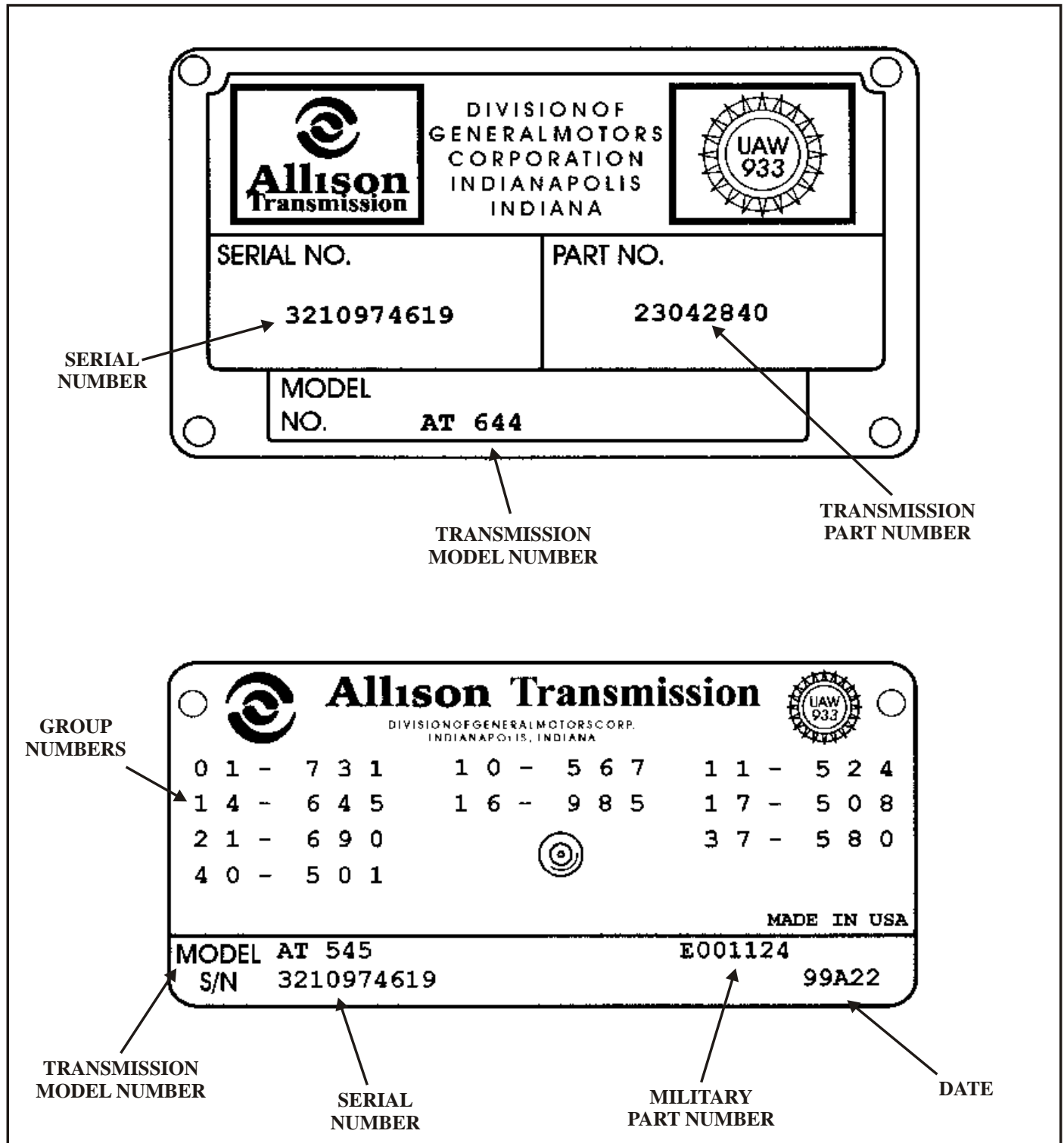


Figure 5



## AISIN SEIKI 450-43LE

### PRELIMINARY INFORMATION

Beginning with the 1999 model year, Isuzu NPR, GMC Forward Tiltmaster, Chevrolet Forward, Nissan UD and Mitsubishi Fuso Trucks will no longer be equipped with the JR403E Electromatic transmission. These trucks will now be equipped with the Aisin Seiki 450-43LE transmission (Refer to Figure 1) which is a Toyota designed transmission. It is *almost* identical to a 1993-94 Toyota Land Cruiser A442F transmission.

The 450-43LE is fully computer controlled using two shift, one timing, one lock-up and one pressure control solenoid for transmission operation all controlled by a Transmission Control Module.

The transmission uses a three element lock-up type converter, six friction elements, two one-way clutches and three planetary gear sets as illustrated in the cutaway in figure 2 and the clutch on/off chart in figure 3. The Shift Solenoid Firing Order is shown in figure 4.

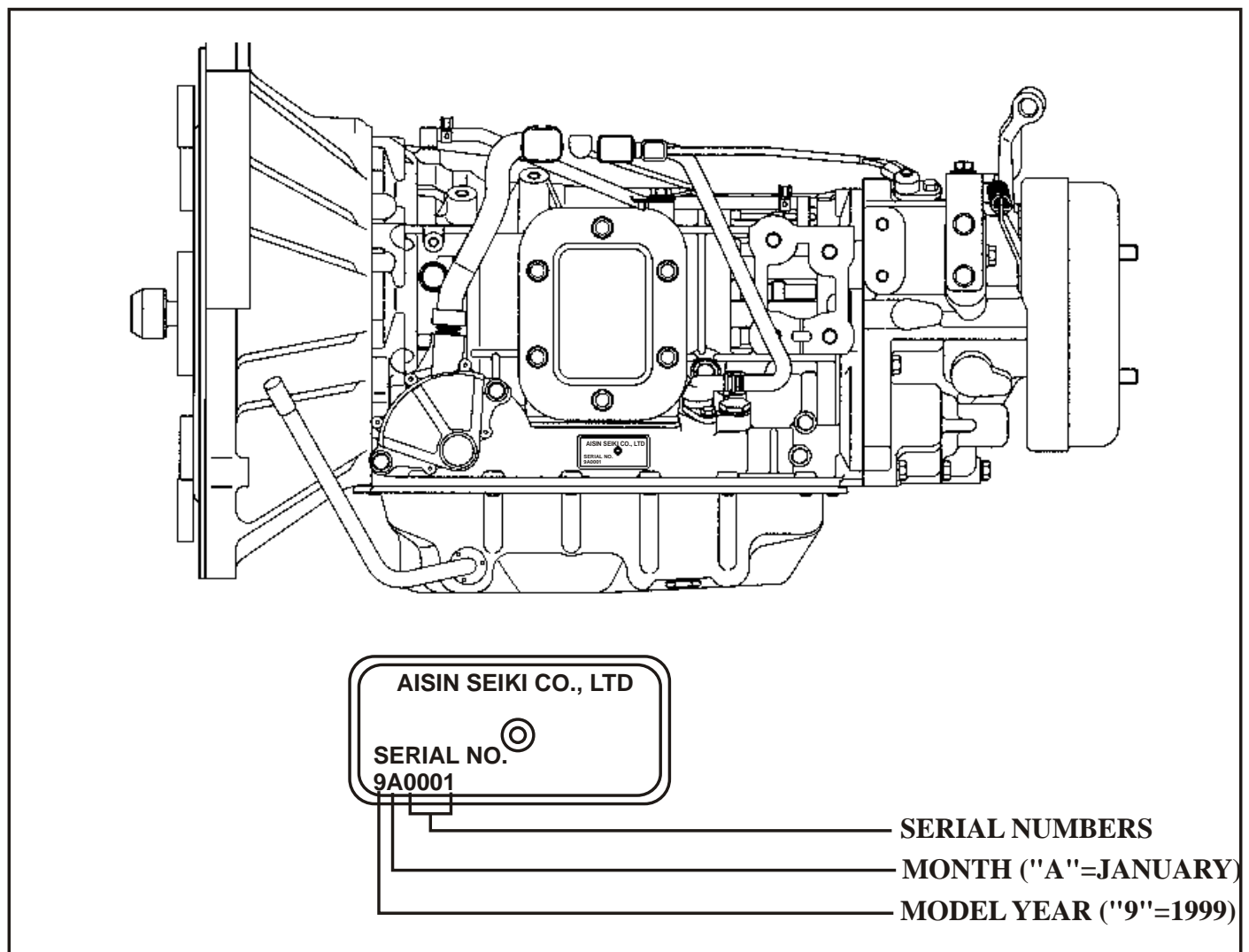
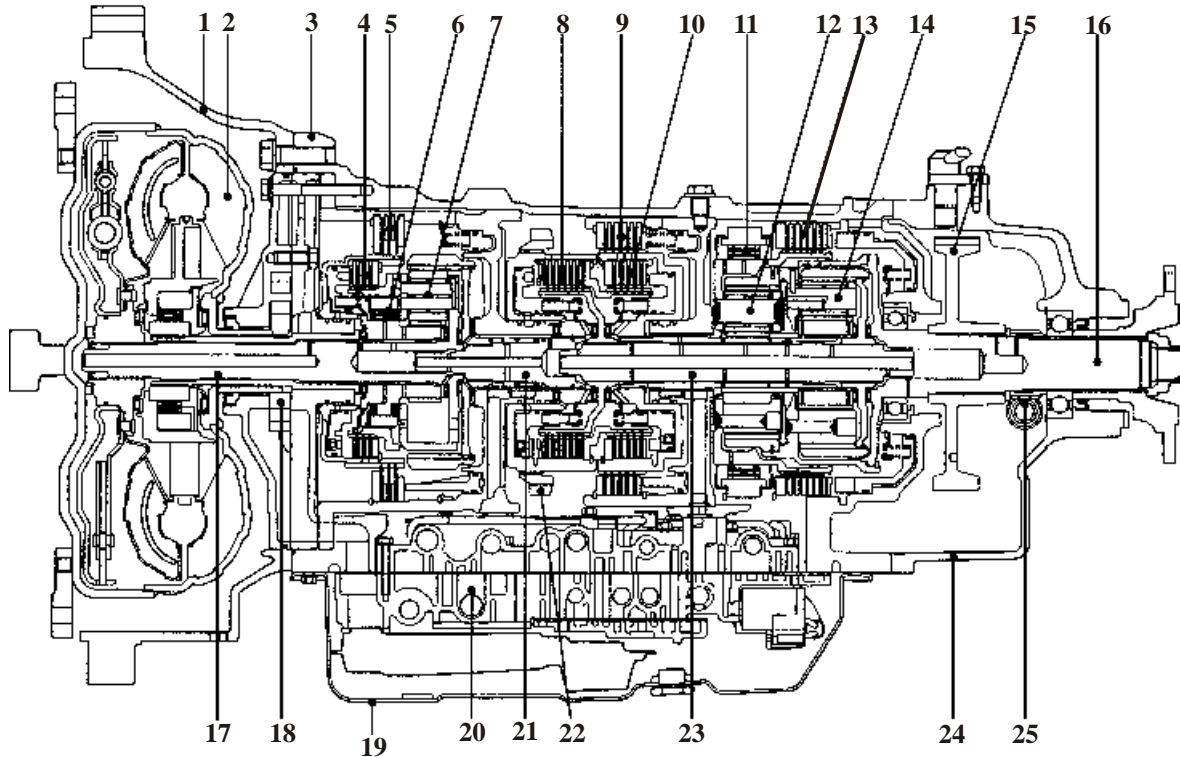


Figure 1

## AISIN SEIKI 450-43LE

### COMPONENT IDENTIFICATION



1. Torque Converter Housing
2. Torque Converter
3. Transmission Case
4. Overdrive Direct Clutch
5. Overdrive Brake
6. Overdrive One-Way Clutch
7. Overdrive Planetary Gear
8. Front Clutch (C1)
9. 2nd Clutch (B1)
10. Rear Clutch C2)
11. Front Planetary Gear
12. #2 One-Way Clutch
13. 1st/Reverse Clutch (B2)

14. Rear Planetary Gear
15. Park Gear
16. Output Shaft
17. Overdrive Input Shaft
18. Oil Pump
19. Oil Pan
20. Valve Body
21. Input Shaft
22. PTO Drive Gear
23. Intermediate Shaft
24. Extension Housing
25. Speedometer Drive Pinion

Figure 2



**AISIN SEIKI 450-43LE  
CLUTCH APPLICATION CHART**

GEAR POSITION		OVERDRIVE DIRECT CLUTCH (CO)	FRONT (FORWARD) CLUTCH (C1)	REAR (DIRECT) CLUTCH (C2)	OVERDRIVE CLUTCH (BO)	2ND CLUTCH (B1)	LOW/REV CLUTCH (B2)	OVERDRIVE ONE-WAY CLUTCH (F0)	LOW ONE-WAY CLUTCH (F1)
P					APPLIED				
R		APPLIED		APPLIED			APPLIED	1	
N					APPLIED				
D	1ST	APPLIED	APPLIED					1	1
	2ND		APPLIED			APPLIED		1	
	3RD	APPLIED	APPLIED	APPLIED				1	
	4TH		APPLIED	APPLIED	APPLIED				
2	1ST	APPLIED	APPLIED					1	1
	2ND	APPLIED	APPLIED			APPLIED		1	
	3RD	APPLIED	APPLIED	APPLIED				1	
L	1ST	APPLIED	APPLIED				APPLIED	1	1
	2ND	APPLIED	APPLIED			APPLIED		1	
	3RD	APPLIED	APPLIED	APPLIED				1	
<i>I=Operative when accelerating</i>									

Figure 3

SHIFT SOLENOID FIRING ORDER	
FIRST GEAR.....	SHIFT SOLENOID 1 - ON.....SHIFT SOLENOID 2 - OFF
SECOND GEAR.....	SHIFT SOLENOID 1 - ON.....SHIFT SOLENOID 2 - ON
THIRD GEAR.....	SHIFT SOLENOID 1 - OFF.....SHIFT SOLENOID 2 - ON
FOURTH GEAR.....	SHIFT SOLENOID 1 - OFF.....SHIFT SOLENOID 2 - OFF

Figure 4

## AISIN SEIKI 450-43LE

### NO FORWARD MOVEMENT

**COMPLAINT:** The truck will not move in any forward gear range, there is no problem with reverse.

**CAUSE:** The low sprag, shown in figure 1 has failed, the sprag elements have flattened and the inner race, which is the front planet carrier, has been worn (Refer to Figure 2) down to the point where it will not hold.

**CORRECTION:** The entire front planet carrier and sprag assembly will have to be replaced.

**SERVICE INFORMATION:**

*These and other parts for the 450-43LE can be purchased from RC Truck Parts...305-863-3933*

**FRONT PLANET CARRIER AND LOW SPRAG ASSEMBLY**

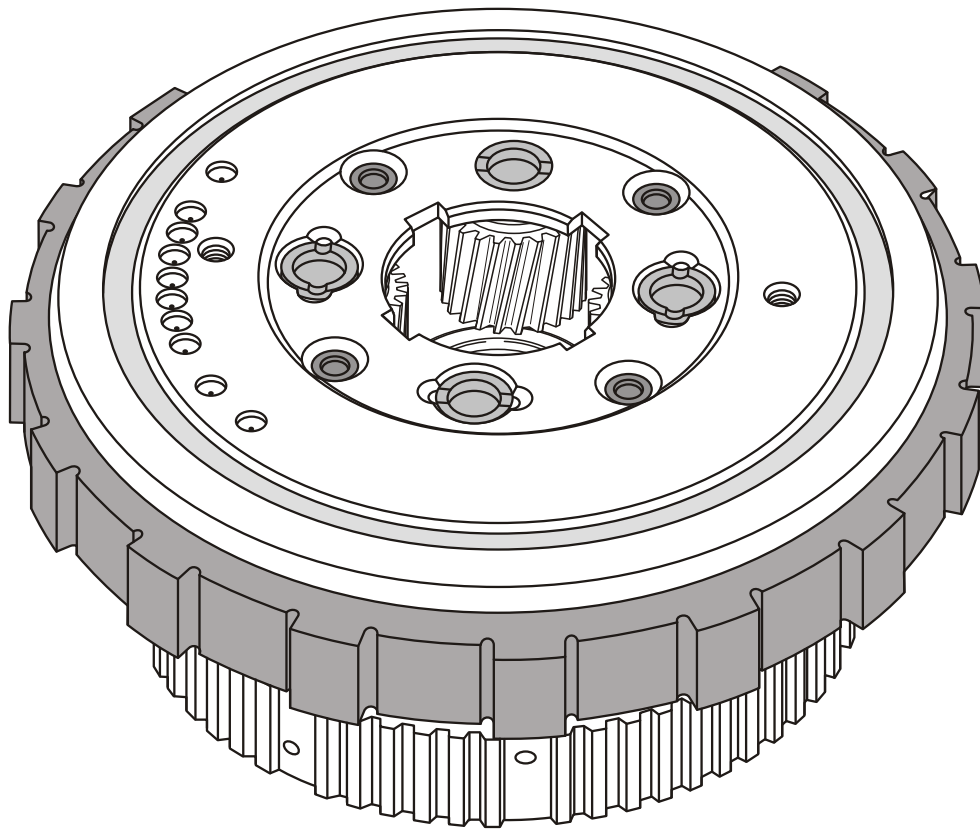


Figure 1

**AISIN SEIKI 450-43LE**  
**NO FORWARD MOVEMENT**

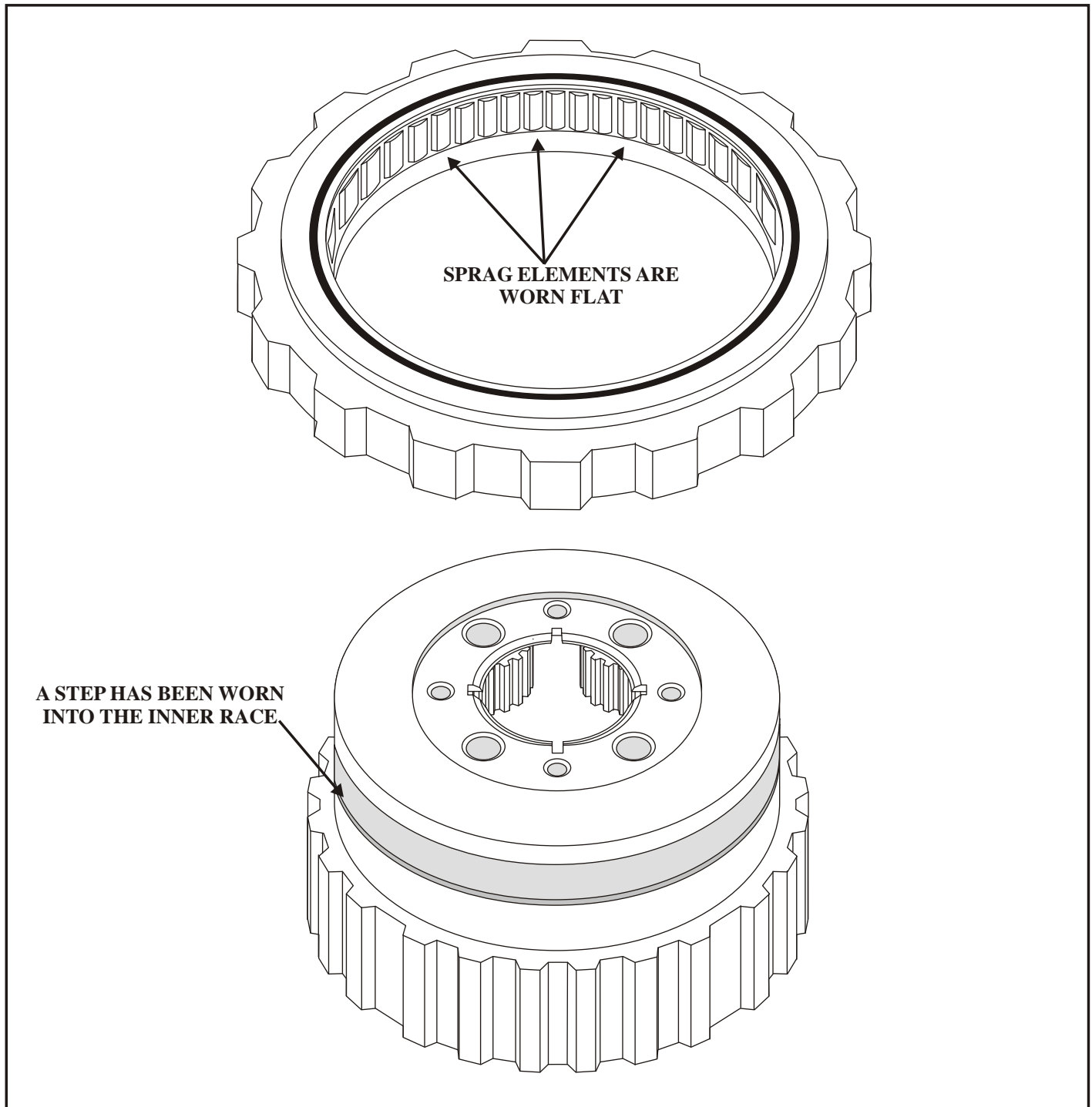


Figure 2



**AISIN SEIKI 450-43LE**  
**SEVERE TORQUE CONVERTER DAMAGE**

**COMPLAINT:** The truck barely moves or there is considerable noise coming from the torque converter area. The transmission fluid, when checked, is very dark and has a foul odor. When the pan is dropped and inspected it is loaded with metal.

**CAUSE:** The torque converter has catastrophically failed internally resulting in the above conditions as illustrated in figure 1.

**NOTE:** When the transmission fluid is in this condition, the torque converter is almost certainly damaged and the pump body and pump cover are also unuseable shown in figure 2.

**CORRECTION:** Replace the torque converter along with other necessary repairs and a thorough flush of the transmission cooling system.

**NOTE:** Observation of this condition has shown that the valve body is usually trash and cannot be successfully reconditioned. The valve body components are identified in figure 3.

**SERVICE INFORMATION:**

*These and other parts for the Aisin Seiki transmission can be purchased at RC Truck Parts.....305-863-3933*

**AISIN SEIKI 450-43LE**  
**SEVERE TORQUE CONVERTER DAMAGE**

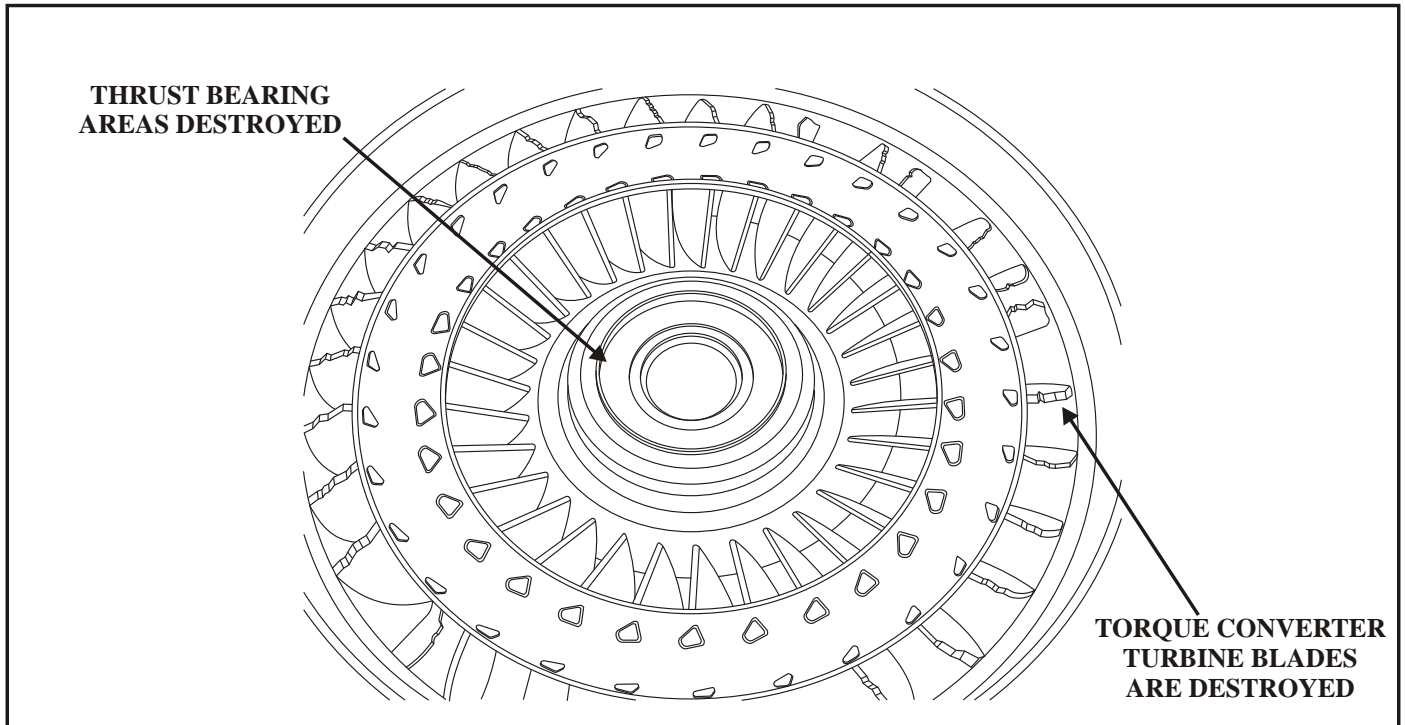


Figure 1

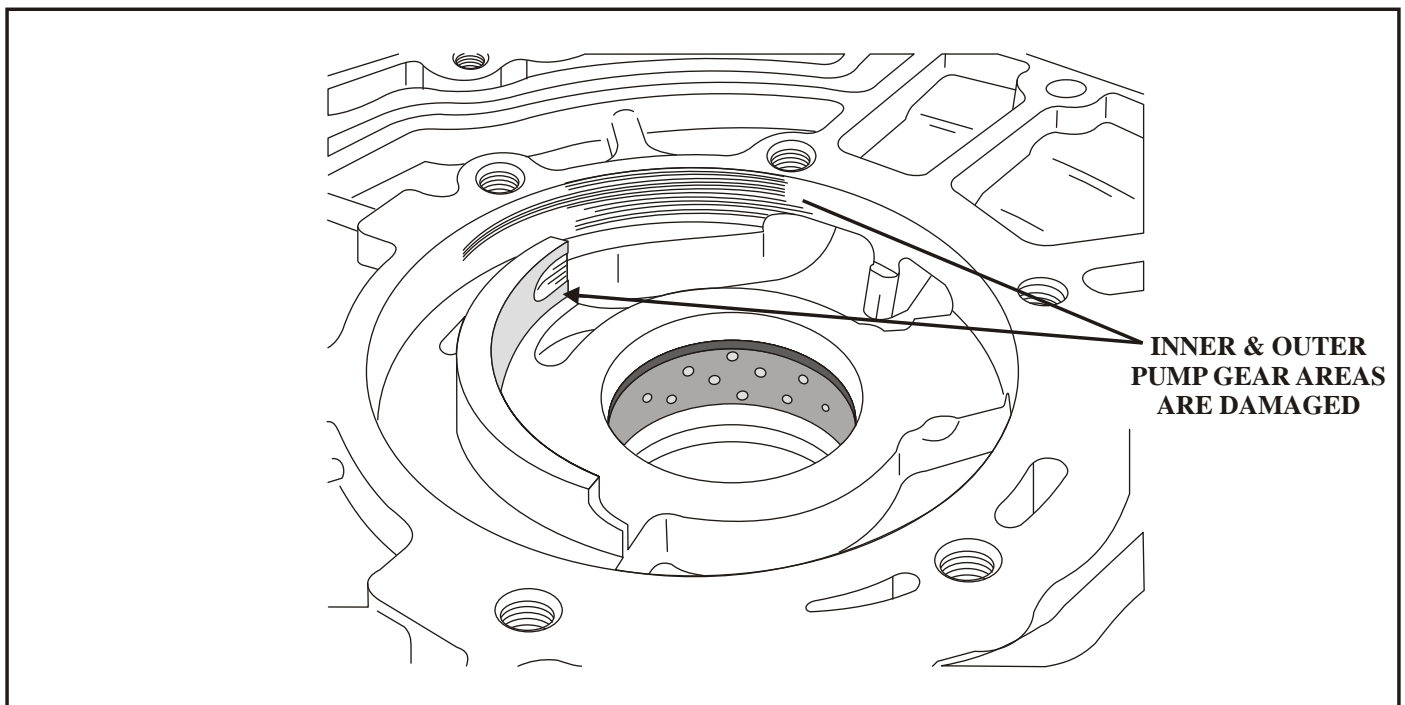


Figure 2

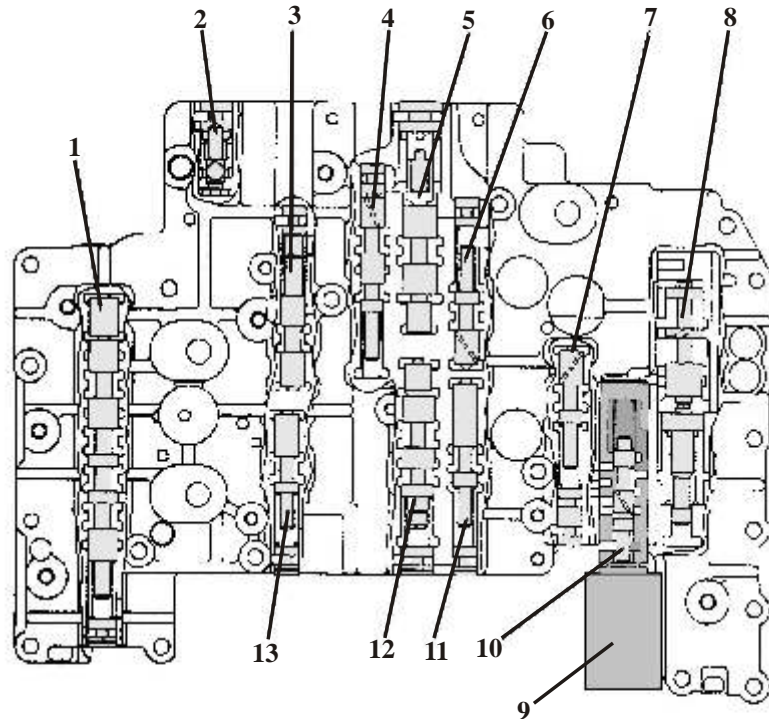


## AISIN SEIKI 450-43LE

### SEVERE TORQUE CONVERTER DAMAGE

#### UPPER VALVE BODY

1. 2-3 Shift Valve
2. Check Valve
3. Low Inhibitor Valve
4. Low Coast Modulator Valve
5. Reverse Inhibitor Valve
6. Modulator Valve
7. Reducing Valve
8. Secondary Regulator Valve
9. Pressure Control Solenoid
10. Throttle Valve
11. Lock-Up Signal Valve
12. Accumulator Valve
13. Orifice Control Valve



#### LOWER VALVE BODY

1. Lock-Up Solenoid
2. 2-3 Timing Valve
3. 1-2 Shift Valve
4. 3-4 Shift Valve
5. CO Exhaust Valve
6. Cut Back Valve
7. Pressure Relief Valve
8. Primary Regulator/Boost Valve
9. Lock-Up Control Valve
10. Manual Valve
11. Timing Solenoid
12. Shift Solenoid 1
13. Shift Solenoid 2

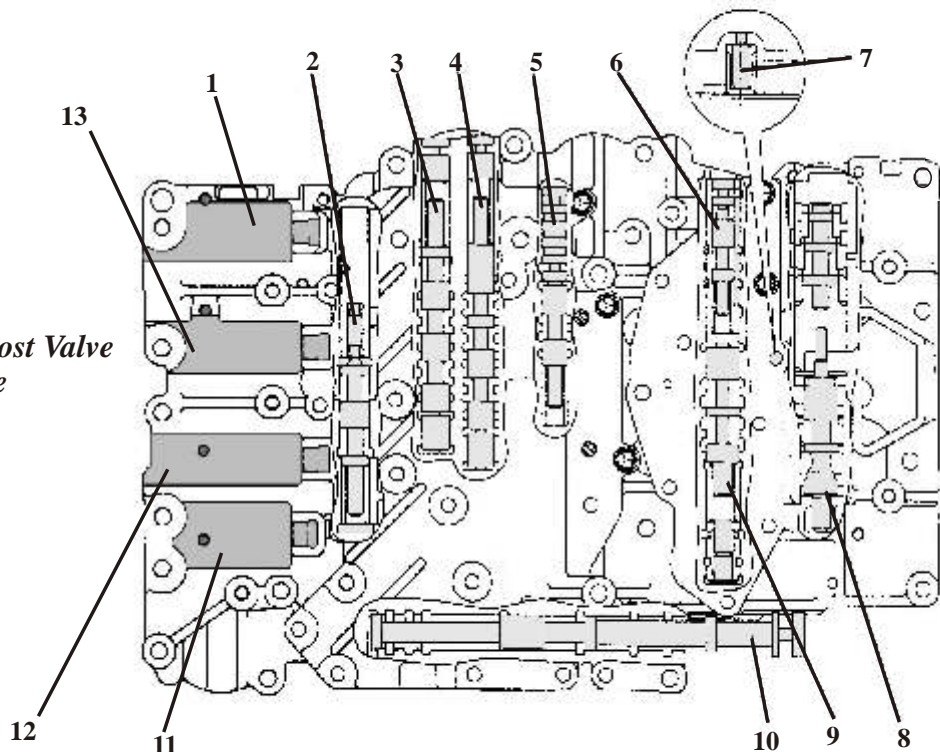


Figure 3





## AISIN SEIKI 450-43LE

### SLIPPING OR NO FIRST, THIRD AND REVERSE

**COMPLAINT:** The transmission is slipping badly in first, third and reverse gears. In some instances there may be difficulty in movement in either direction.

**CAUSE:** These complaints are due to the failure of the Front (C1) Clutch and the Rear (C2) Clutch, which is also known as the Forward and Direct clutch respectively. This however, is not the "root cause" of the problem. The "root cause" is the sealing ring area of the center support, which seals the Rear Clutch, Refer to Figure 1, and the O/D Housing, Refer to Figure 2, which seals the Front Clutch. The steel rings wear the aluminum ring lands of the center support and the O/D Housing which results in the failure of the front and rear clutch causing the above complaints.

**CORRECTION:** Replacement of the Center Support and the O/D Housing will be necessary.

**NOTE: NEVER** use Teflon® rings on either of these assemblies, it will destroy the ring lands in a relatively short period of time.

*Special thanks to Roly Farradas of Rainbow Transmission for his assistance in the compilation of this material.*

**AISIN SEIKI 450-43LE**

**SLIPPING OR NO FIRST, THIRD AND REVERSE**

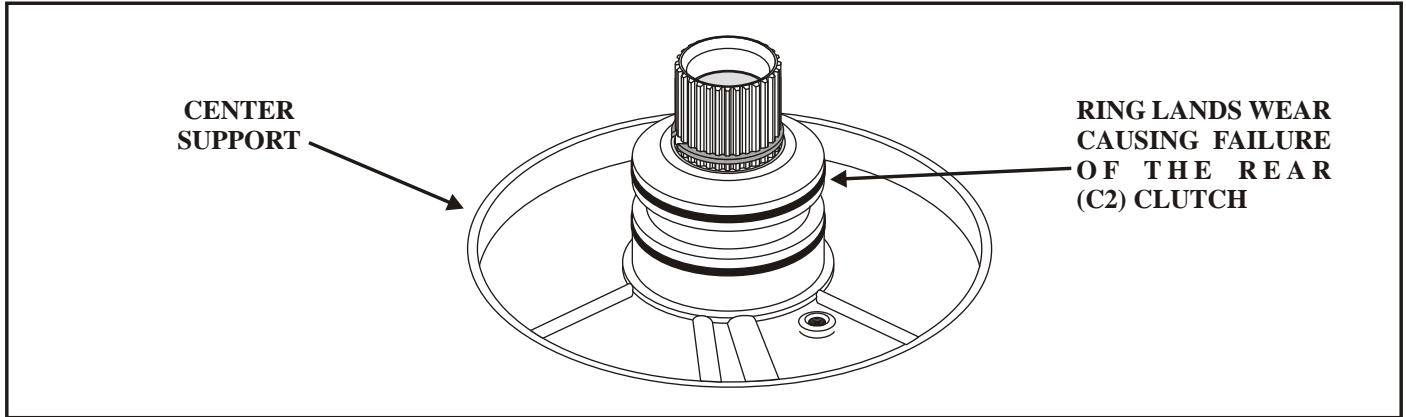


Figure 2

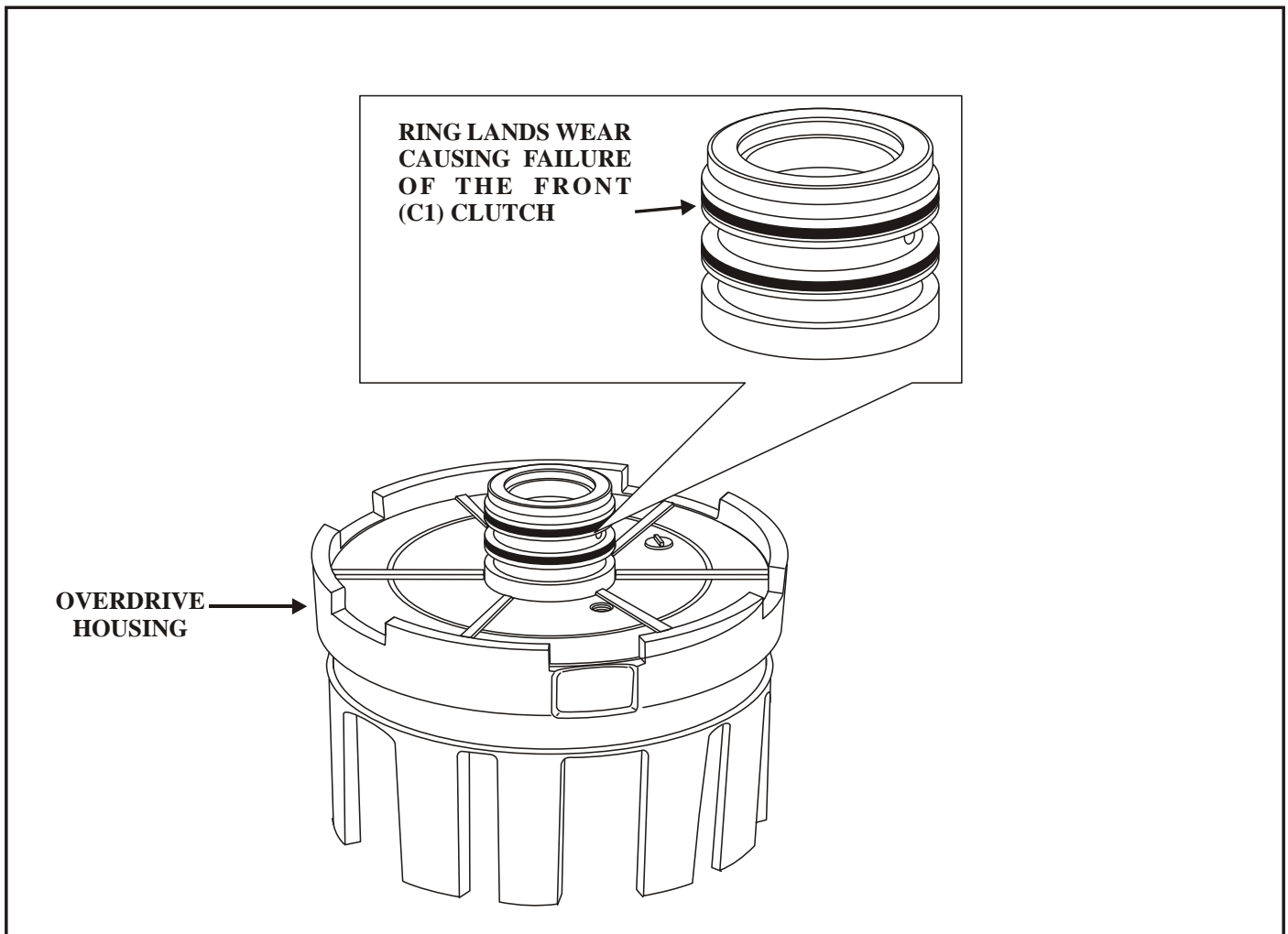


Figure 1



## "2003" SEMINAR INFORMATION VIDEO

100

### FORD CD4E CODE P0741 STORED, AFTER REBUILD

**COMPLAINT:** Some vehicles equipped with the CD4E transaxle, after overhaul, may store trouble code P0741 in memory after the engine is up to operating temperature. You should also notice converter slippage when monitored on the scanner.

**CAUSE:** One cause may be, a mis-matched turbine shaft and torque converter that was mistakenly installed in the vehicle. The turbine shaft and oil pump drive shaft for the 2.0L engine are approximately 5/8" shorter than the turbine shaft and oil pump drive shaft for the 2.5L engine as shown in Figures 1 and 2. If the short turbine shaft is installed with the 2.5L engine and converter, the vehicle will exhibit the above concerns. Torque converter identification is provided for you in Figure 3, and as you can see in the height dimension chart, there is approximately 5/8" difference.

**CORRECTION:** Remove transaxle and ensure that the proper turbine shaft and oil pump drive shaft have been installed for the engine size that you have. Refer to Figure 1 to identify the turbine shaft, Figure 2 to identify oil pump drive shaft and Figure 3 for converter identification.

#### **SPECIAL NOTE:**

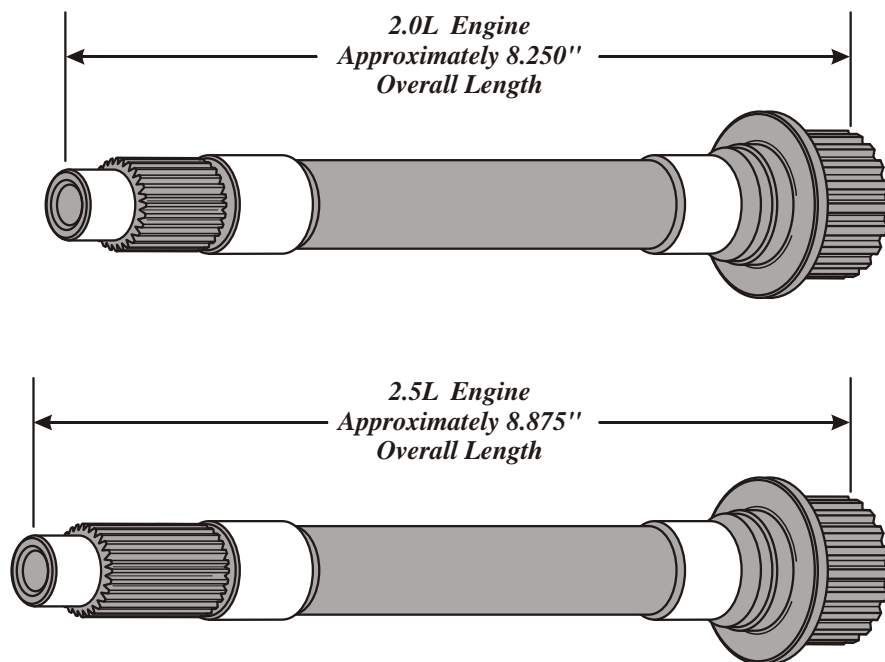
*All we have to do , is exercise a little extra care when selecting replacement parts for this location, depending on the vehicles engine size. Also, under the extra care category, I want to point you to an excellent article written, by Bob Warnke, in the September 2001 issue of Transmission Digest Magazine, entitled "CD4E Converter Clutch Codes". This article has several tests, including but not limited to, a CD4E converter bench test. We have experienced several remanufactured and new converters, that turned out to be the root cause of converter slip codes being set. This bench test would have eliminated these concerns, and saved the technician many hours of diagnostic time. This article is also available, at no charge, on our web site, at [ATSGMIAMI.COM](http://ATSGMIAMI.COM), or [ATSGBIZ](http://ATSGBIZ).*

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Dan Klopp  
Klopp's Transmission  
Corning, New York*

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*Automatic Transmission Service Group*

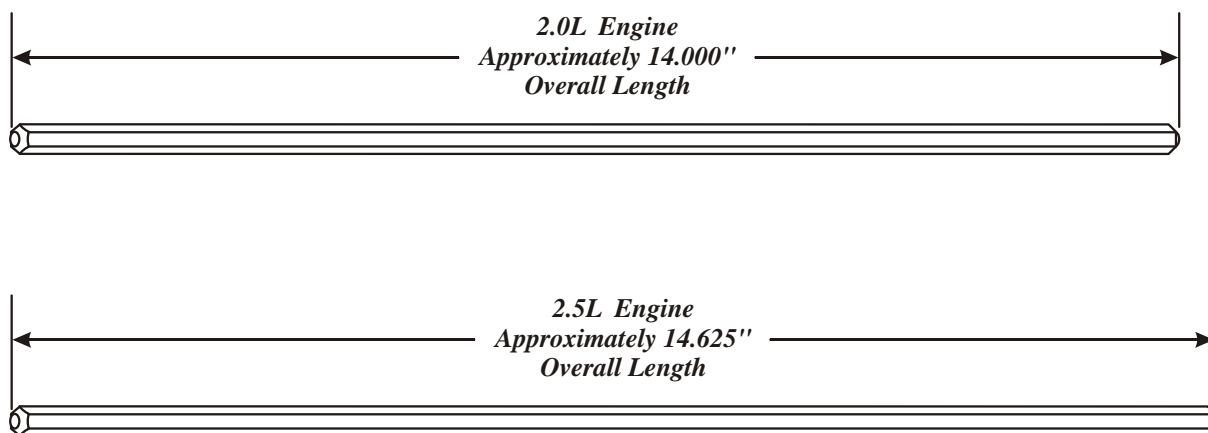
## CD4E TURBINE SHAFT DIFFERENCES



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Figure 1

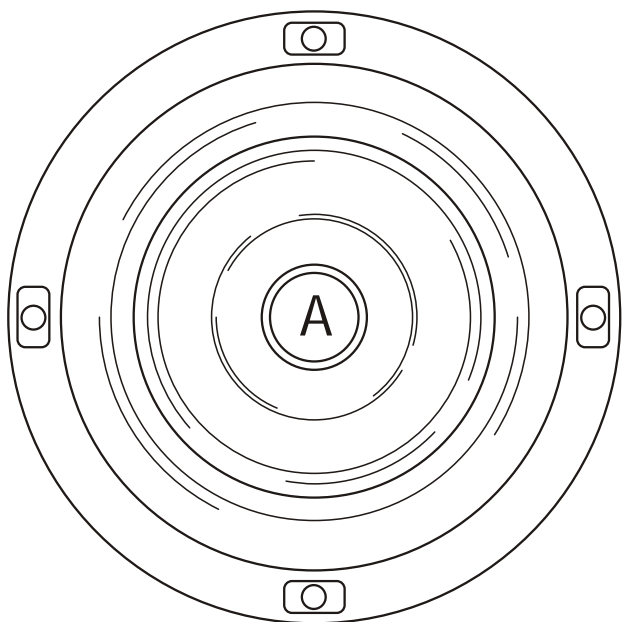
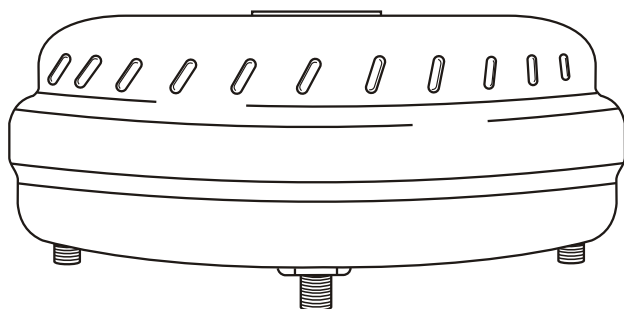
## CD4E PUMP DRIVE SHAFT DIFFERENCES



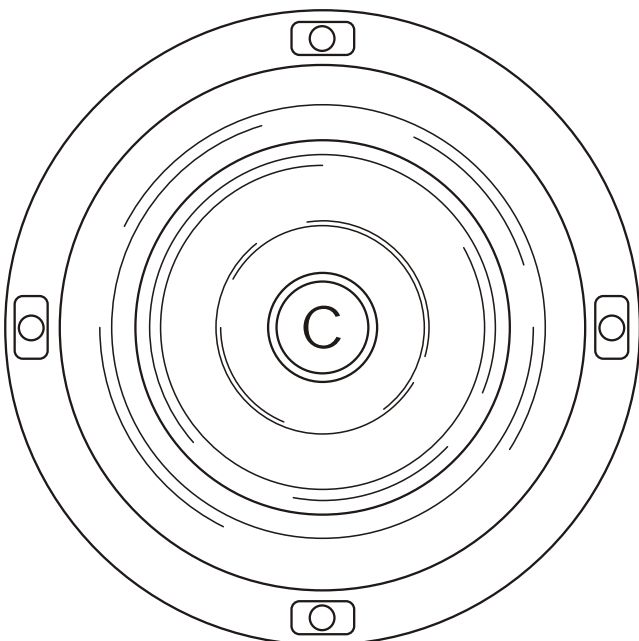
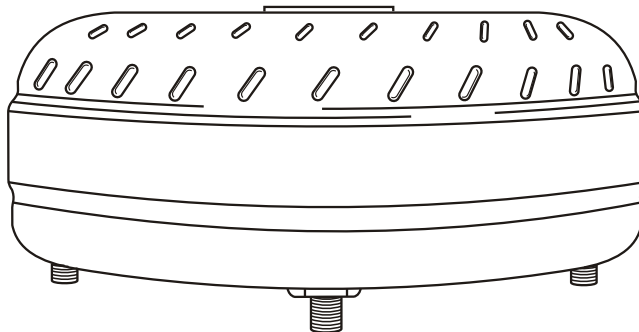
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Figure 2

**F-67**



**F-69**



**NOTE: THE PART NUMBERS LISTED ARE DACCO PART NUMBERS.**

PART NUMBER	F-67	F-69
DIAMETER	10.50"	11"
HEIGHT	3.710"	4.125"
STAMP	A	C
MODEL	PROBE 626 MX6 CONTOUR MYSTIQUE	CONTOUR MYSTIQUE
ENGINE SIZE	2.0L	2.5L

*This Converter "Requires" The Short  
Turbine Shaft And Pump Drive Shaft*

*This Converter "Requires" The Long  
Turbine Shaft And Pump Drive Shaft*

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Figure 3

## FORD CD4E/MAZDA L4AEL

### ERRATIC BEHAVIOR WITH OR WITHOUT CODES

**COMPLAINT:** The transmission behaves erratically with sudden inappropriate possibly violent up shifts and downshifts. The hold light may or may not be flashing, codes may or may not be present and if they are present, they may be valid or non-existent (I can not find this code anywhere!).

**CAUSE:** One possible cause for this behavior is a bad connection in the "Signal Return" circuit. The Signal Return circuit is a wire coming off of pin 46 in an EEC IV system or pin 91 and 30 on an EEC V system (See Figure 1). This "signal return" is the ground for a large number of sensors. It is routed through several splice points and connectors (See Figure 2). The route the wire takes is different for different vehicles. To further complicate matters, sensors between the poor connection and the PCM may operate normally.

**CORRECTION:** There are three possible methods to repair this problem. One is to simply ground that wire at a point past the problem. Say for example at the Transmissions Range Sensor (TRS) as seen in Figure 3. Another would be to run a bypass wire from a downstream sensor to the computer. The preferred repair method is to find the bad connection, clean or repair it, and protect it from whatever caused it to fail. Refer to the chart in Figure 4 for the color of the Signal Return wire at the Transmissions Range Sensor harness connector.

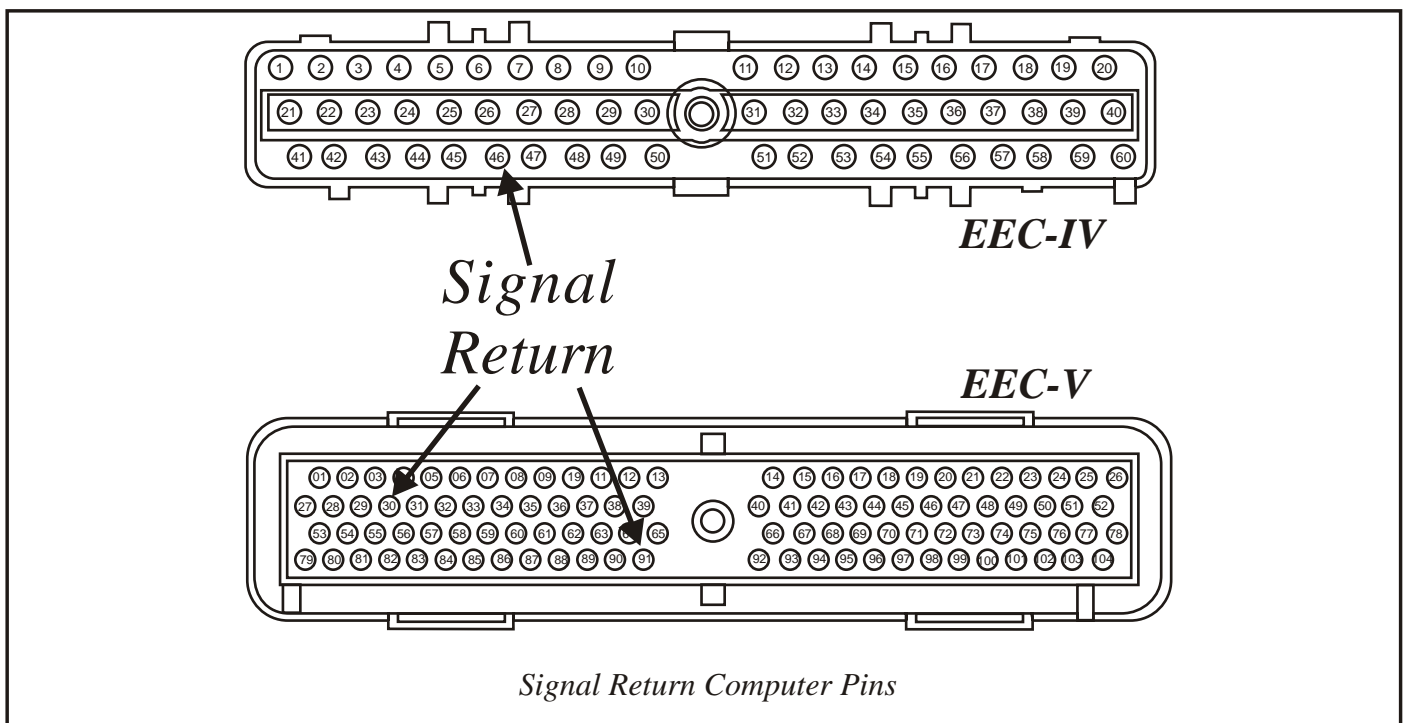


Figure 1

## FORD CD4E/MAZDA L4AEL

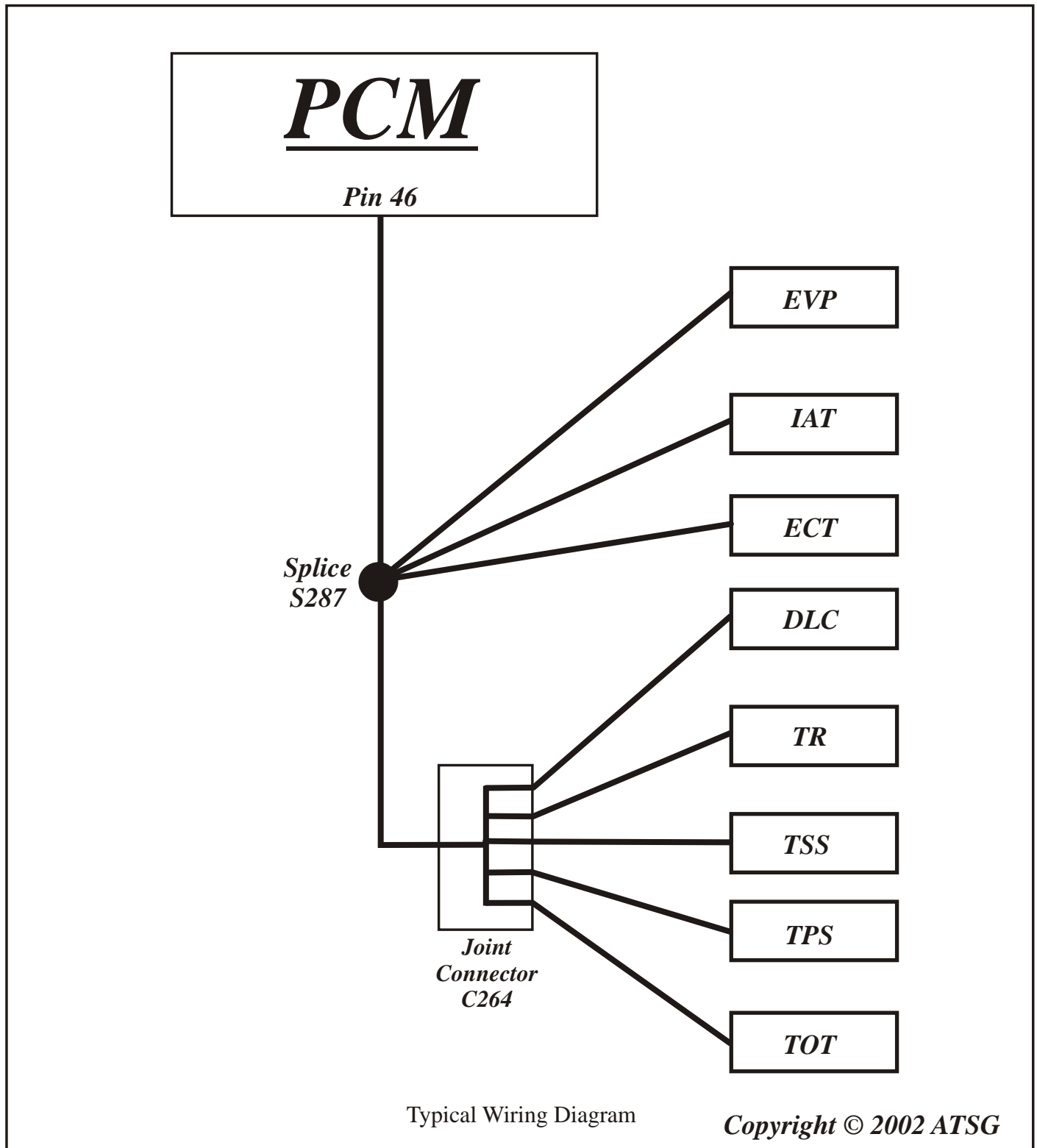


Figure 2

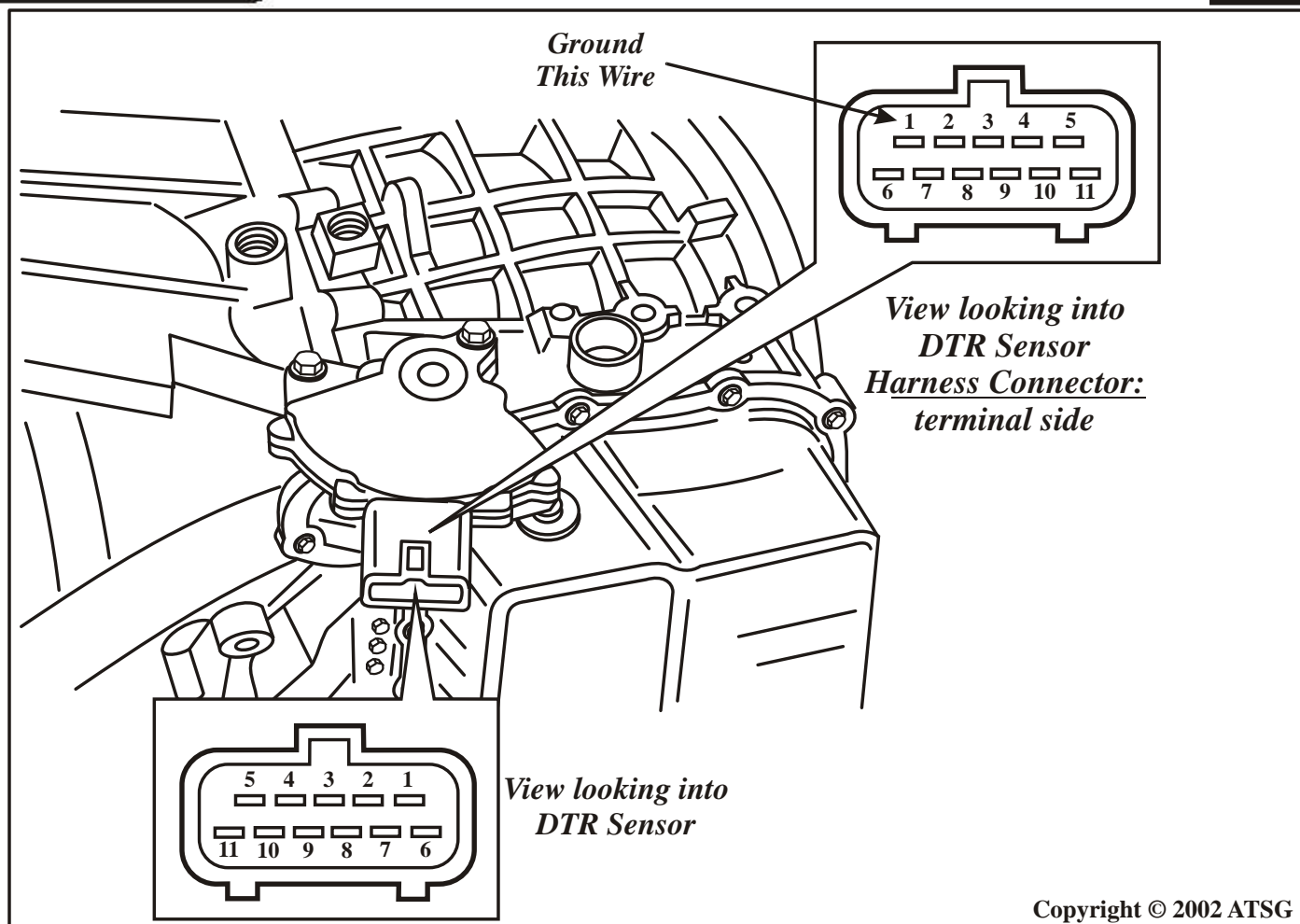


Figure 3

<i>Transmission Range Sensor, Signal Return Wire Color Chart</i>						
<i>Model Year</i>	<i>Ford Mystique</i>	<i>Ford Contour</i>	<i>Ford Probe</i>	<i>Ford Escape</i>	<i>Ford Cougar</i>	<i>Mazda 626</i>
<i>1994</i>	<i>N/A</i>	<i>N/A</i>	<i>Black/Blue</i>	<i>N/A</i>	<i>N/A</i>	<i>Black/Pink</i>
<i>1995</i>	<i>Brown/Red</i>	<i>Brown/Red</i>	<i>Black/Blue</i>	<i>N/A</i>	<i>N/A</i>	<i>Black/Pink</i>
<i>1996</i>	<i>Brown/Green</i>	<i>Brown/Green</i>	<i>Black/Blue</i>	<i>N/A</i>	<i>N/A</i>	<i>Black/Pink</i>
<i>1997</i>	<i>Brown/Green</i>	<i>Brown/Green</i>	<i>Black/Blue</i>	<i>N/A</i>	<i>N/A</i>	<i>Black/Yellow</i>
<i>1998</i>	<i>Brown/Green</i>	<i>Brown/Green</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>Black/Yellow</i>
<i>1999</i>	<i>Brown/Green</i>	<i>Brown/Green</i>	<i>N/A</i>	<i>N/A</i>	<i>Brown/Green</i>	<i>Black/Yellow</i>
<i>2000</i>	<i>Brown/Green</i>	<i>Brown/Green</i>	<i>N/A</i>	<i>N/A</i>	<i>Brown/Green</i>	<i>Black/Yellow</i>
<i>2001</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>Dark Green</i>	<i>Brown/Green</i>	<i>Black/Yellow</i>
					Copyright © 2002 ATSG	

Figure 4





**FORD CD4E**  
**"TIE-UP" IN FOURTH GEAR**

- (1) Late design level coast clutch piston mistakenly installed with early design level parts.*
- (2) Crack in the forward clutch piston allowing forward clutch oil to also apply the coast clutch.*
- (3) Defective forward clutch inner seal allowing forward clutch oil to also apply the coast clutch.*
- (4) Defective sealing rings on pump tower allowing forward clutch oil to also apply the coast clutch.*
- (5) Mis-assembly using any of the parts in the following bulletin, that would allow the coast clutch to be Applied. The coast clutch "CANNOT" be on when transaxle shifts to 4th gear.*

*We have reproduced the following bulletin concerning the addition of the "Wave" plate in the forward clutch for the CD4E transaxle and all of the parts changes that were involved in this change. There were many changes in this area that affected many parts, and has created much confusion and many mis-assembly concerns. Please review this bulletin carefully, with attention focused on the dimensions.*

**FORD CD4E**  
**NEW "WAVE" PLATE ADDED**  
**TO FORWARD CLUTCH ASSEMBLY**

**CHANGE:** Beginning on January 5 1998, all CD4E transaxles were built with an added wave plate in the forward clutch pack that has created many engineering changes to related parts. This bulletin will help you identify the various design levels that the new parts have created, and the part numbers for the new design level parts.

**REASON:** Wave plate added to cushion the forward clutch engagement.

*Continued on next Page*



**PARTS AFFECTED:**

- (1) FORWARD/COAST/DIRECT CLUTCH HOUSING - There is a new forward clutch snap ring groove location to help accommodate the addition of the wave plate. This has now created two new clutch housings, one for the 4 cylinder and one for the V6 cylinder, just for the 1998 1/2 models. Identification and approximate dimensions are provided on the new design level clutch housings in Figure 1.  
However, we still have 3 different previous design level clutch housings to contend with, which creates a total of five different clutch housings. Identification and approximate dimensions are provided on the previous design level clutch housings in Figures 2 and 3.
- (2) FORWARD CLUTCH RETURN SPRING - Now has a single open coil design return spring instead of the previous multiple spring design as shown in Figure 4.
- (3) COAST CLUTCH PISTON - Has been made 2.25mm (.089") **taller** to accommodate the addition of the wave plate in forward clutch, as shown in Figure 5.
- (4) FORWARD CLUTCH PISTON - Has been made 0.5mm (.020") **taller** to help accommodate for the addition of the wave plate, and positive identification can be made by the casting number on the piston. New casting number will have **RFF8RP** prefix, as shown in Figure 5.
- (5) FORWARD ONE-WAY CLUTCH OUTER RACE - Has been made 2.0mm (.079") **thinner** than the previous design level to accommodate the addition of the wave plate in the forward clutch, as shown in Figure 5.
- (6) COAST CLUTCH PRESSURE PLATE - Has been made 4.3mm (.169") **thinner** to help accommodate the addition of the wave plate in forward clutch, as shown in Figure 5.
- (7) FORWARD CLUTCH WAVE PLATE - Added to the forward clutch pack to help cushion the forward clutch apply, as shown in Figure 5. A valve body calibration change was also made and is coordinated with the new clutch design level.
- (8) FORWARD CLUTCH SNAP RING - Has always been selective to achieve the proper clutch clearance, but the above changes necessitated a new set of selective snap ring thickness to ensure the proper clutch clearance. Refer to Figure 8 for dimensions and part numbers.
- (9) FORWARD ONE-WAY CLUTCH AND SUN GEAR ASSEMBLY - The forward sprag and sun gear assembly is available only as a complete service package of all of the pieces shown in Figure 6 under OEM part number F8RZ-7A089-AA. However, many of the service package parts have revised dimensions that you need to be aware of and are as follows:
  - (A) **Coast Clutch Hub Retaining Ring** - No changes. Refer to Figure 6.
  - (B) **Coast Clutch Hub** - Has been made .053" **taller** to accommodate changes in the forward clutch pack, as shown in Figure 6.  
Previous Design = .592".  
New Design = .640".
  - (C) **Forward Sprag Outer Race** - Has been made .077" **narrower** to accommodate the changes in the forward clutch pack, as shown in Figure 6.  
Previous Design Cage = .693".  
New Design Cage = .616".



# "2003" SEMINAR INFORMATION

## SLIDE

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### PARTS AFFECTED: (Continued)

- (D) **Thick End Bearing** - Has been made **.020" thinner** to accommodate the changes in the forward clutch pack, as shown in Figure 6. Both end bearings now the same.  
Previous Design = .134" (Black in color)  
New Design = .114" (Gold in color).
- (E) **Forward Sprag Assembly** - Has been made **.050" narrower** to accommodate the changes in the forward clutch pack, as shown in Figure 6.  
Previous Design = .593", Sprag Elements = .372".  
New Design = .543", Sprag Elements = .307".
- (F) **Thin End Bearing** - Has been made **.003" thinner** to accommodate the changes in the forward clutch pack, as shown in Figure 6. Both end bearings now the same.  
Previous Design = .117" (Black in color).  
New Design = .114" (Gold in color).
- (G) **Forward Sprag Retainer** - No Changes. Refer to Figure 6.
- (H) **Forward Sprag Retaining Ring** - No Changes. Refer to Figure 6.
- (J) **Forward Sprag Inner Race And Sun Gear Assembly** - Has been made **.075" shorter** to accommodate the changes in the forward clutch pack, as shown in Figure 6.  
Previous Design = 1.760".  
New Design = 1.685".

### INTERCHANGEABILITY:

*Most of the parts listed in this bulletin will not interchange with previous design level parts because of dimensional changes in the parts concerned. Extra care should be exercised when it is necessary to replace any of the parts listed above.*

### SERVICE INFORMATION:

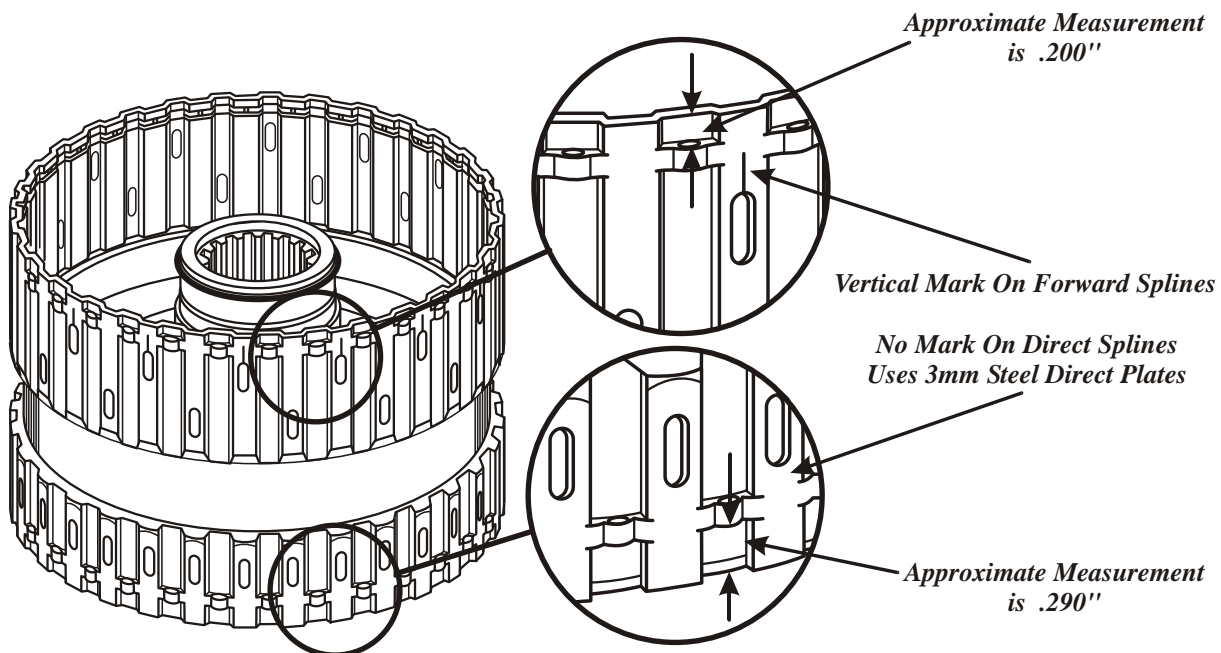
Forward/Coast/Direct Clutch Housing, 4 Cyl, 1998 1/2 and Beyond .....	F8RZ-7G120-AA
Forward/Coast/Direct Clutch Housing, V6 Cyl, 1998 1/2 and Beyond .....	F8RZ-7G120-BA
Forward/Coast/Direct Clutch Housing, 4 Cyl, 3mm Direct Steels, Prior to 1998 .....	F5RZ-7G120-A
Forward/Coast/Direct Clutch Housing, V6, 2mm Direct Steels, Prior to 1998 .....	F4RZ-7G120-A
Forward/Coast/Direct Clutch Housing, 4 Cyl, 2mm Direct Steels, Prior to 1998 .....	F7RZ-7G120-AA
Forward Clutch Return Spring Assembly (New Design) .....	F8RZ-7G299-AA
Coast Clutch Piston and Seal Assembly (New Design) .....	F8RZ-7A262-BA
Forward Clutch Piston Assembly (New Design) .....	F8RZ-7A262-AB
Coast Clutch Pressure Plate (New Design) .....	F8RZ-7B066-AA
Forward Sprag and Sun Gear Assembly (New Design) .....	F8RZ-7A089-AA
Forward Clutch Wave Plate (New Design) .....	F8RZ-7E085-AA
Forward Clutch Selective Snap Ring, 1.48mm (.058") .....	F8RZ-7D483-AA
Forward Clutch Selective Snap Ring, 1.64mm (.065") .....	F8RZ-7D483-BA
Forward Clutch Selective Snap Ring, 1.80mm (.071") .....	F8RZ-7D483-CA
Forward Clutch Selective Snap Ring, 1.97mm (.078") .....	F8RZ-7D483-DA

### SPECIAL NOTE:

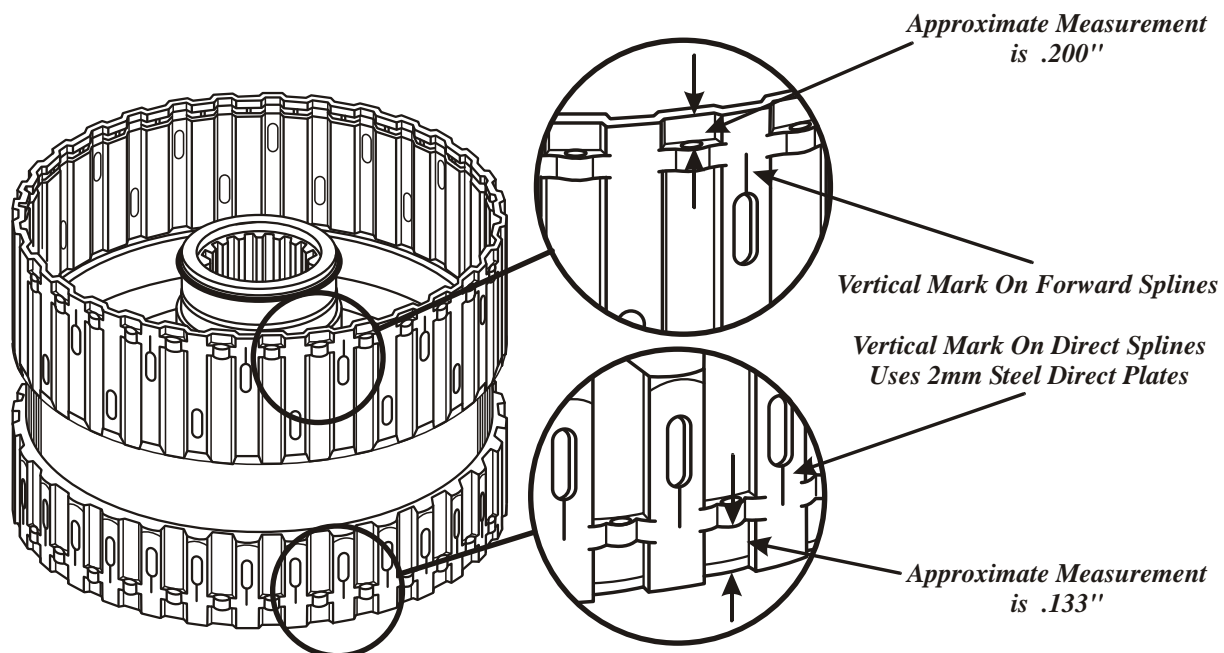
*Refer to Figure 7 to ensure that you have the new design level parts assembled correctly.*

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**CD4E COAST/FORWARD/DIRECT CLUTCH HOUSING**  
**OEM PART NUMBER F8RZ-7G120-AA**  
**FITS 4 CYL 1998-1/2 AND BEYOND**



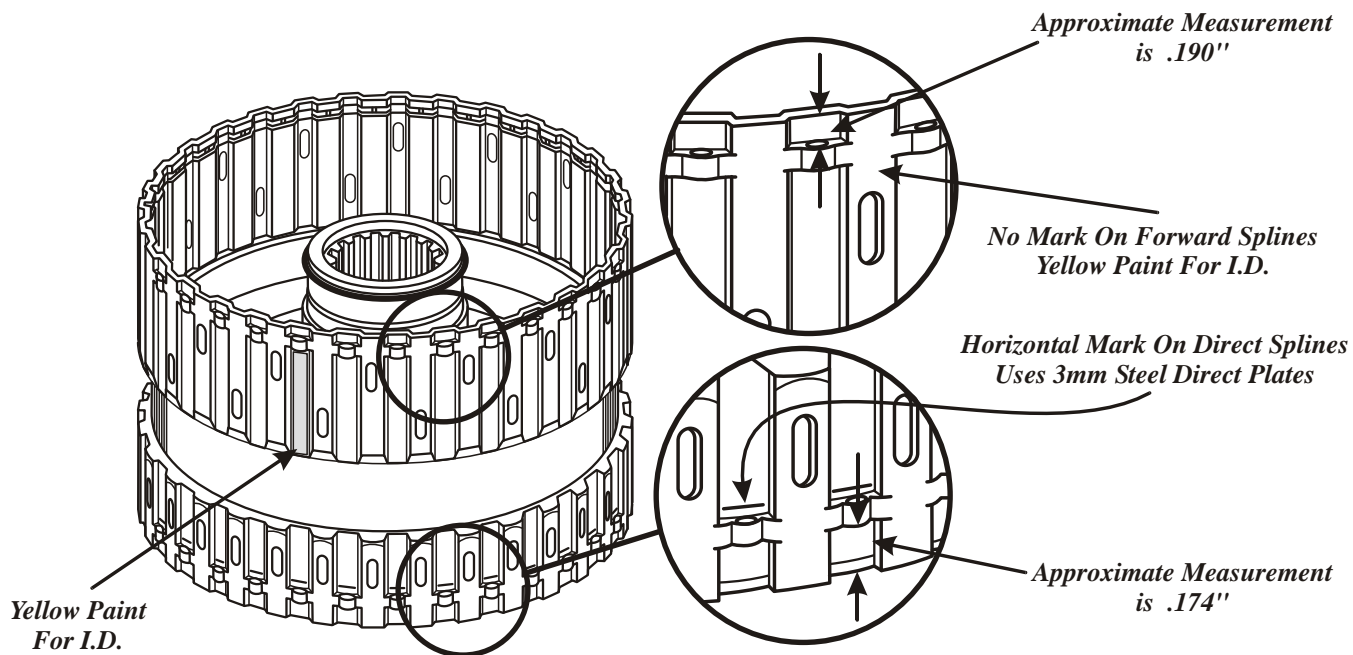
**CD4E COAST/FORWARD/DIRECT CLUTCH HOUSING**  
**OEM PART NUMBER F8RZ-7G120-BA**  
**FITS V6 CYL 1998-1/2 AND BEYOND**



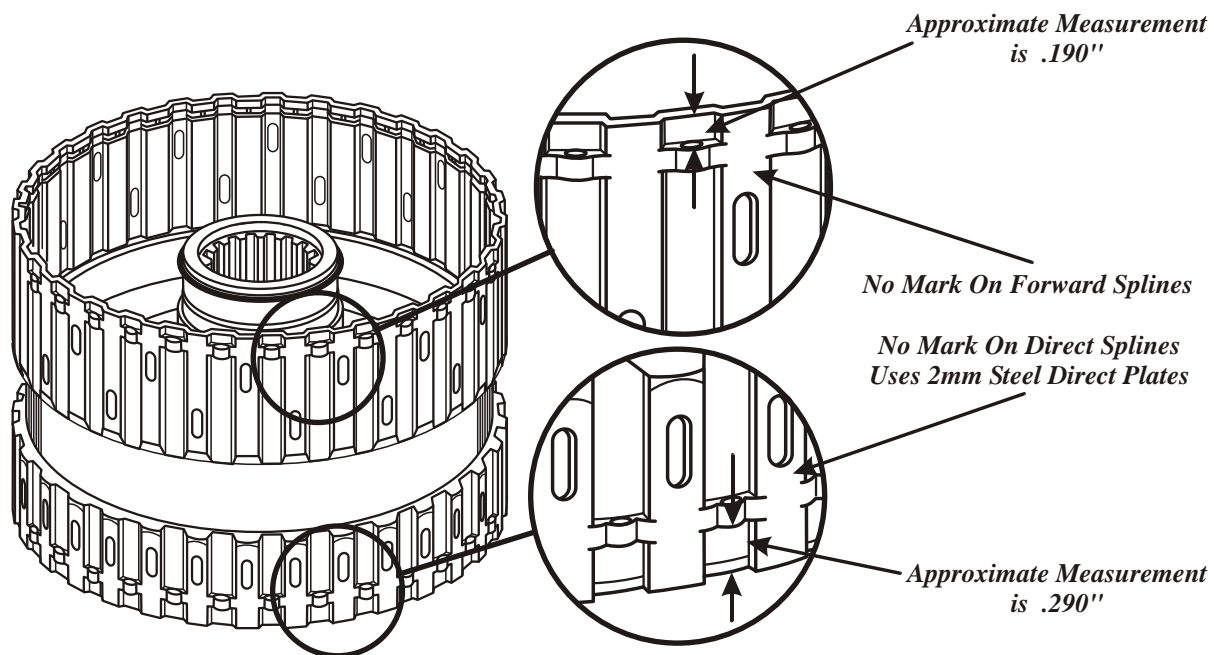
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Figure 1

**CD4E COAST/FORWARD/DIRECT CLUTCH HOUSING**  
**OEM PART NUMBER F5RZ-7G120-A**  
**FITS 4 CYL PRIOR TO 1998-1/2**



**CD4E COAST/FORWARD/DIRECT CLUTCH HOUSING**  
**OEM PART NUMBER F7RZ-7G120-AA**  
**FITS 4 CYL PRIOR TO 1998-1/2**

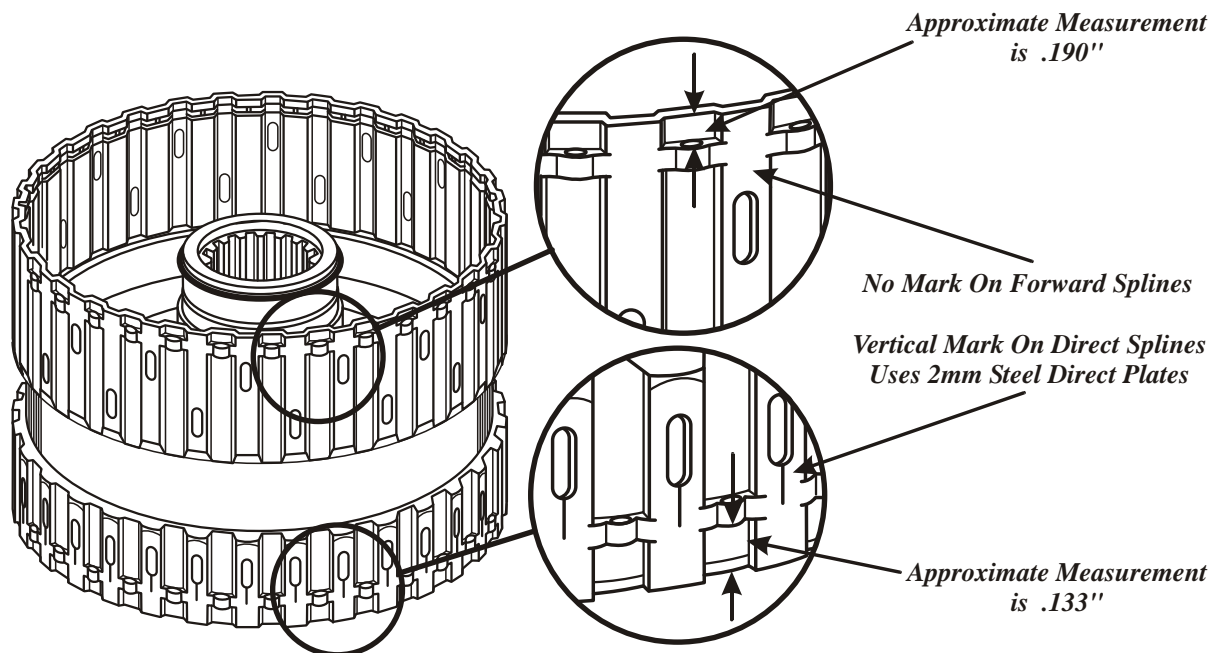


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Figure 2



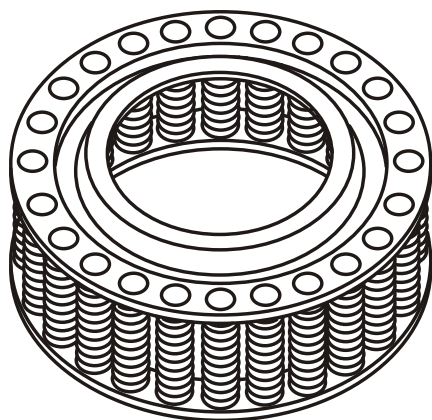
**CD4E COAST/FORWARD/DIRECT CLUTCH HOUSING**  
**OEM PART NUMBER F4RZ-7G120-A**  
**FITS V6 CYL PRIOR TO 1998-1/2**



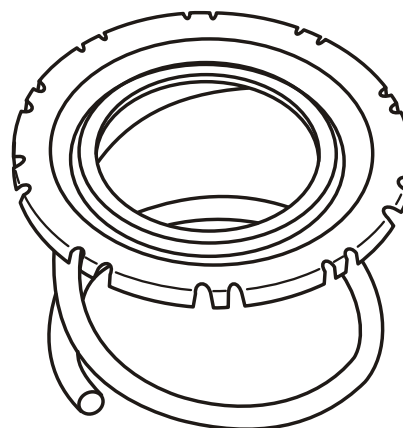
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Figure 3

**FIRST DESIGN CLUTCH  
RETURN SPRING ASSEMBLY**



**NEW DESIGN CLUTCH  
RETURN SPRING ASSEMBLY**

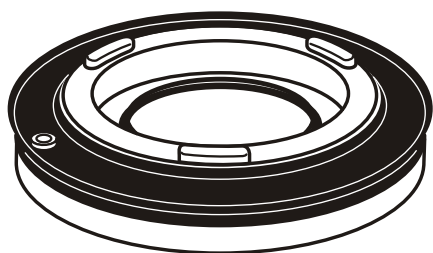


**OEM PART NUMBER  
F8RZ-7G299-AA**

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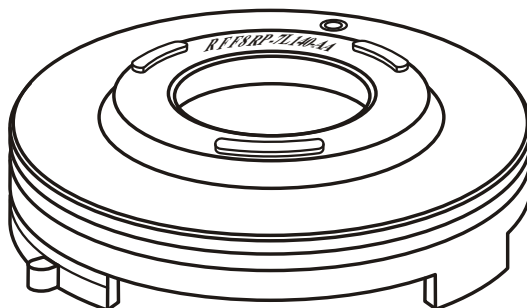
Figure 4

**COAST CLUTCH PISTON ASSEMBLY**  
*.089" Taller Than Previous Design*  
*Stamped "F8RP"*



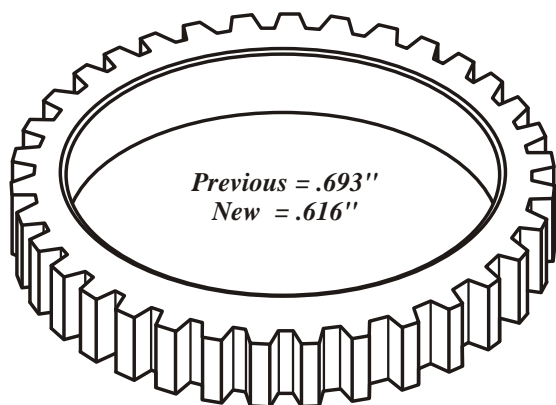
**OEM PART NUMBER**  
**F8RZ-7A262-BA**

**FORWARD CLUTCH PISTON ASSEMBLY**  
*.020" Taller Than Previous Design*  
*New Casting No. Prefix RFF8RP*



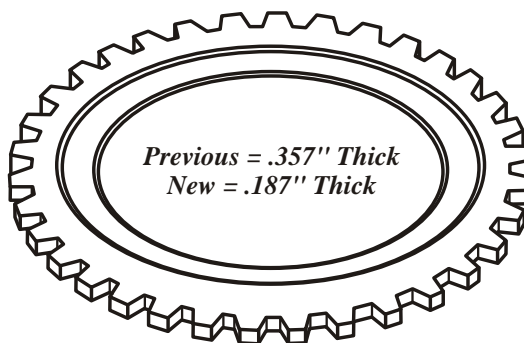
**OEM PART NUMBER**  
**F8RZ-7A262-AB**

**ONE-WAY CLUTCH OUTER RACE**  
*.077" Thinner Than Previous Design*



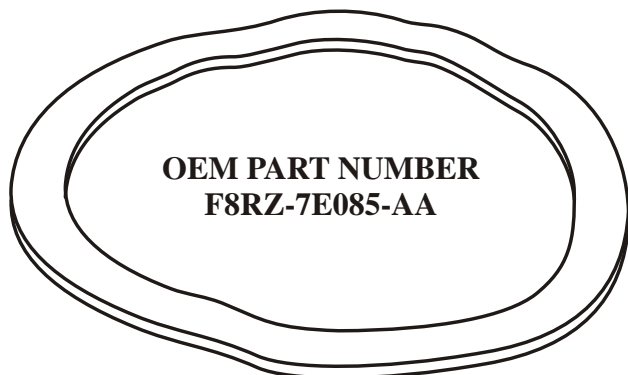
**CONTAINED IN PACKAGE**  
**F8RZ-7A089-AA**

**COAST CLUTCH PRESSURE PLATE**  
*.170" Thinner Than Previous Design*



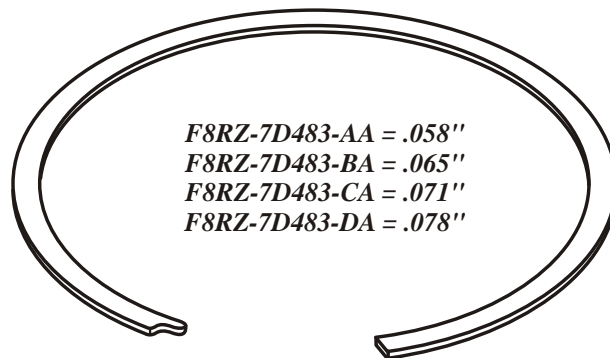
**OEM PART NUMBER**  
**F8RZ-7B066-AA**

**FORWARD CLUTCH WAVE PLATE**  
*Added To New Design Level*



**OEM PART NUMBER**  
**F8RZ-7E085-AA**

**NEW SELECTIVE FORWARD CLUTCH SNAP RING**

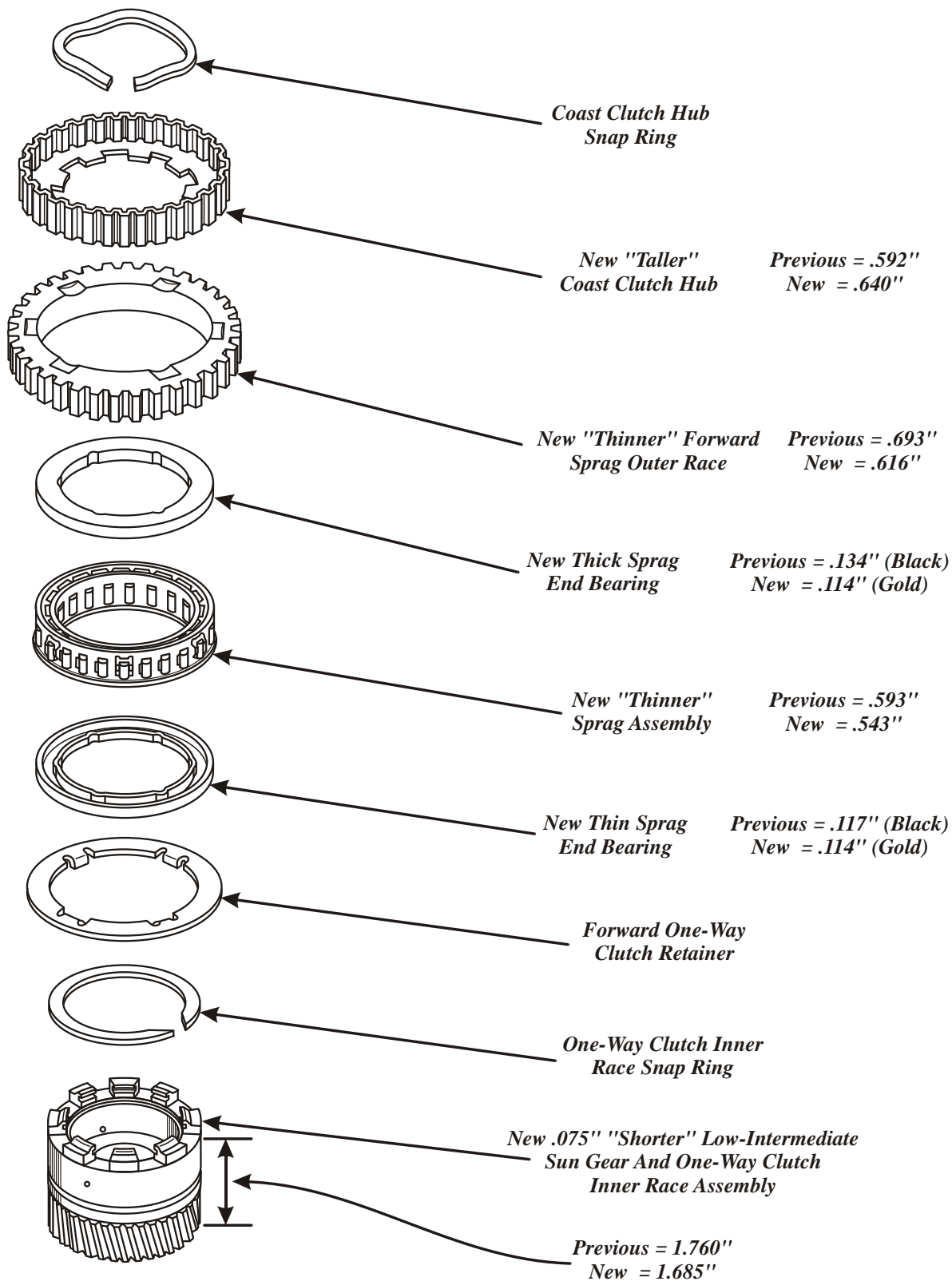


*F8RZ-7D483-AA = .058"*  
*F8RZ-7D483-BA = .065"*  
*F8RZ-7D483-CA = .071"*  
*F8RZ-7D483-DA = .078"*

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Figure 5

**LOW/INTERMEDIATE SPRAG AND SUN GEAR ASSEMBLY**  
**PART NUMBER F8RZ-7A089-AA**



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Figure 6



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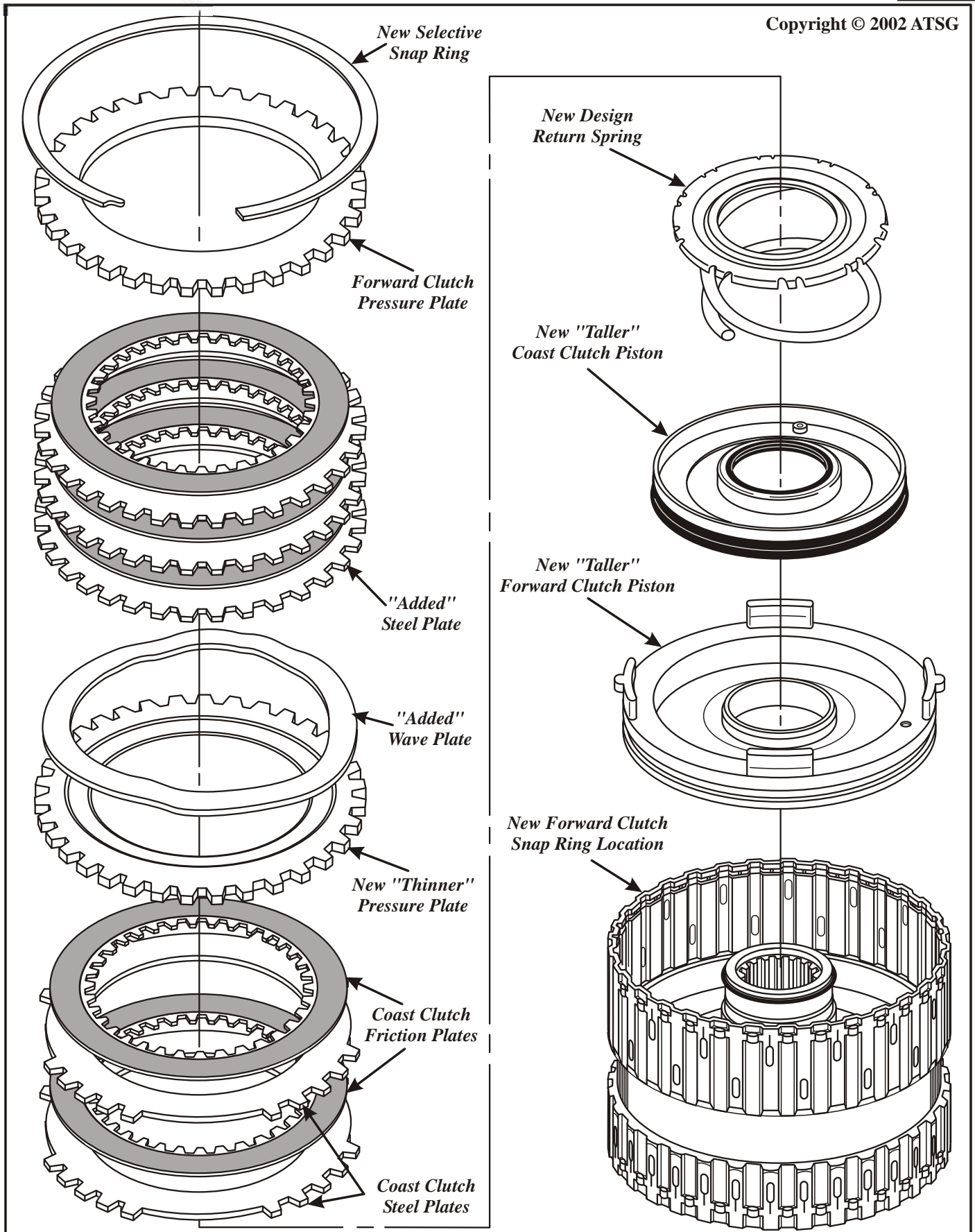


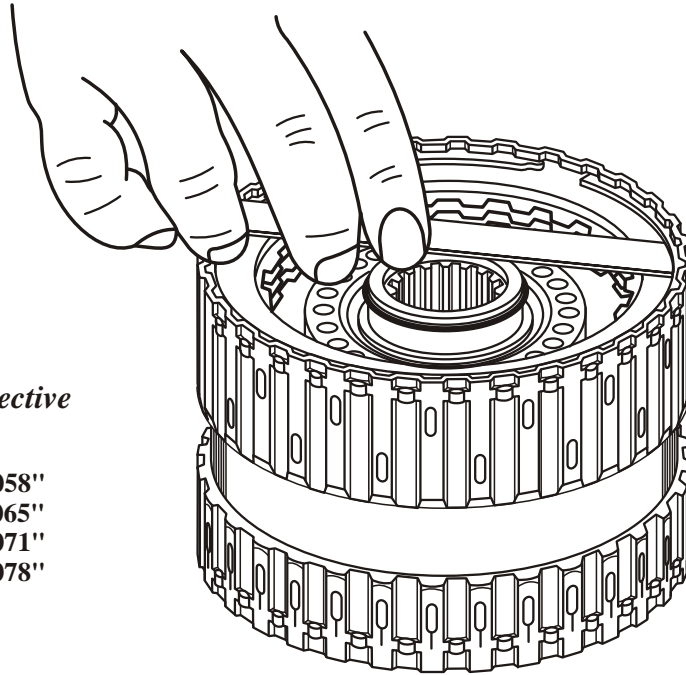
Figure 7

### MEASURE FORWARD CLUTCH CLEARANCE

*Forward Clutch clearance should be .012" - .038". If clearance is not within specification, select and install the proper thickness forward clutch snap ring from the chart below*

#### *Forward Clutch Selective Snap Rings*

F8RZ-7D483-AA = .058"  
F8RZ-7D483-BA = .065"  
F8RZ-7D483-CA = .071"  
F8RZ-7D483-DA = .078"



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Figure 8



## FORD/MERCURY CD4E ERRATIC AND/OR NO VEHICLE SPEED

**COMPLAINT:** Some 1999 and later Mercury Cougar's may exhibit an erratic and/or no vehicle speed being displayed in the instrument cluster. The data stream viewed through a scanner, is consistent with that which is observed in the instrument cluster.

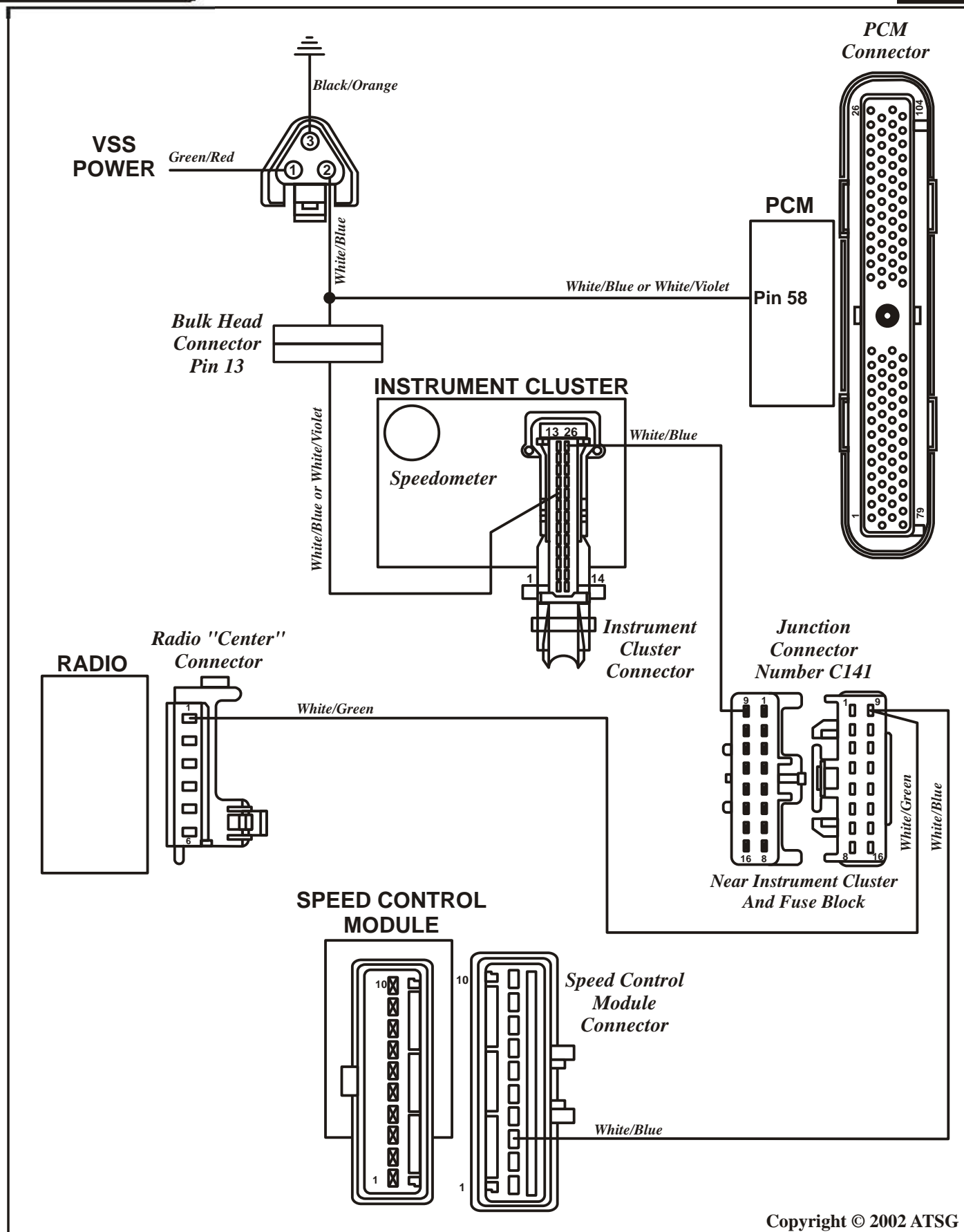
**CAUSE:** One cause may be a defective radio. Most 1999 and later Mercury Cougars are equipped with a Luxury/Comfort Package. Part of this package provides a vehicle speed signal to the radio. Its purpose is to raise the volume proportional to vehicle speed, to compensate for the increased road noise experienced during higher driving speeds. The vehicle speed signal is simultaneously sent to both the PCM and speedometer. From the speedometer, it is sent to the radio, thru the C141 junction connector as seen in the wiring schematic provided for you in Figure 1. When the radio malfunctions, it effects the vehicle speed signal to both the speedometer and the PCM. This will also effect shift strategy.

**CORRECTION:** Remove the radio retaining brackets, so that you can pull it forward out of the dash, as shown in Figure 2. There is enough wiring to gain access to the rear of the radio as shown in Figure 3. There you will find three connectors plugged into the back of the radio. The center connector will contain a White wire with a Green tracer. Unplug this connector and drive the vehicle. If the vehicle speed signal problem no longer exists, the radio is defective and will need to be replaced.

### COMPONENT LOCATIONS:

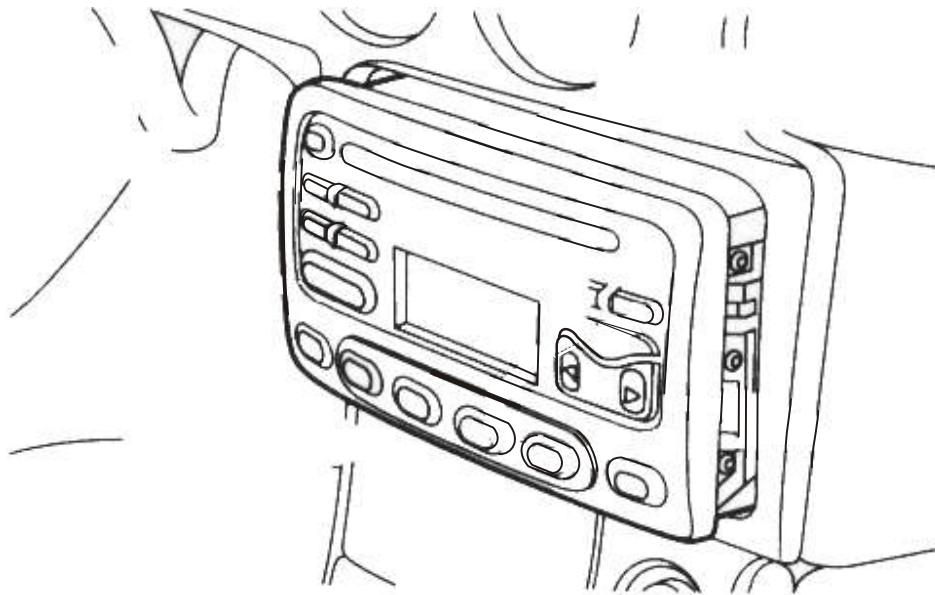
Speed Control Module ..... Refer to Figure 4  
Junction Connector Number C141 ..... Near Instrument Cluster and Fuse Block

*Compliments of:  
Sonny at Pinpoint Diagnostics  
and  
Glenn Myers at Bayport Trans*



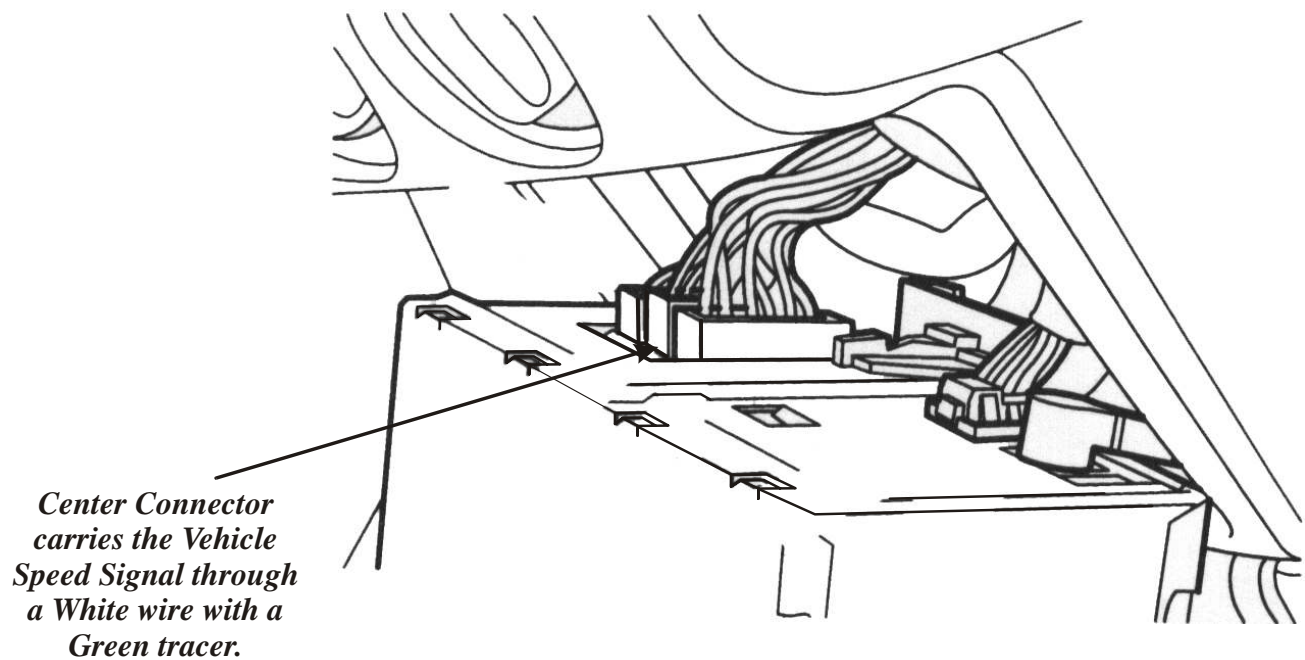
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Figure 1



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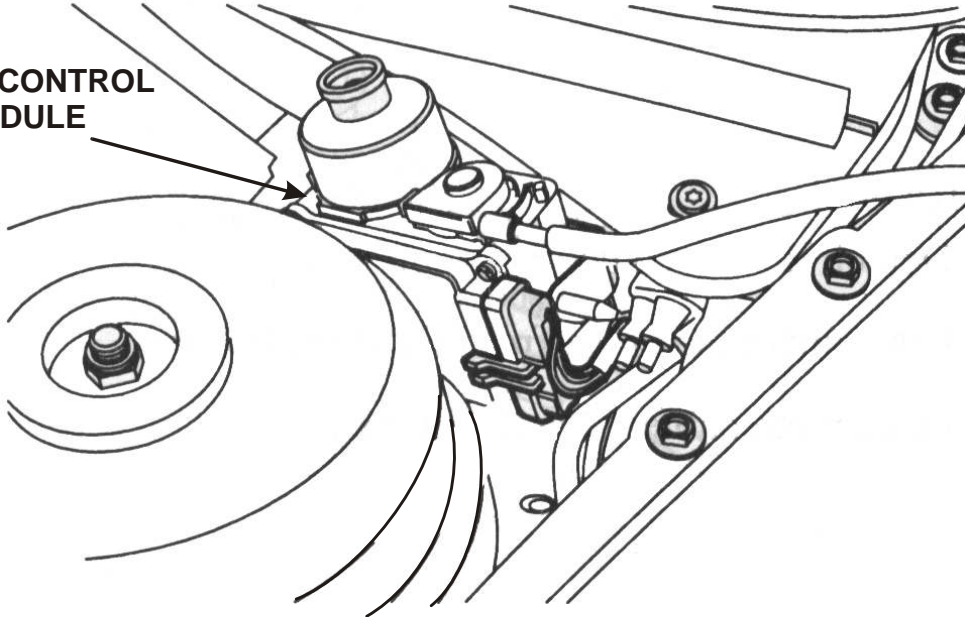
Figure 2



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Figure 3

SPEED CONTROL  
MODULE



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Figure 4

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# **Transtech**



# Life Automotive