



"2001" SEMINAR INFORMATION

"PRACTICAL TECH"

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AUTOMATIC TRANSMISSION SERVICE GROUP

9200 South Dadeland Boulevard Suite 720

Miami, Florida 33156

WWW.TRANSONLINE.COM

(305) 670-4161

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"2001" SEMINAR INFORMATION

"PRACTICAL TECH"

1

INTRODUCTION

ATSG welcomes you to the "New Millennium" seminar edition of the year 2001. ATSG's Tech team continues to remain on the cutting edge of today's ever-changing automotive technology. This means valuable and useful information to those who attend ATSG's seminars. Presented in both Video and Slides, ATSG puts all the information in Manuals that can be brought back to the shop to be used the very next business day. It is not a surprise to see that ATSG has once again orchestrated a DO NOT MISS seminar. Sit back and enjoy the New Millennium seminar edition.

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

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ROBERT D. CHERRNAY
TECHNICAL DIRECTOR

DALE ENGLAND
FIELD SERVICE CONSULTANT

JIM DIAL
TECHNICAL CONSULTANT

JERRY GOTTL
TECHNICAL CONSULTANT

DAVID CHALKER
TECHNICAL CONSULTANT

ED KRUSE
TECHNICAL CONSULTANT

GREGORY LIPNICK
TECHNICAL CONSULTANT

WAYNE COLONNA
TECHNICAL SUPERVISOR

PETER LUBAN
TECHNICAL CONSULTANT

MIKE EGELAND
TECHNICAL CONSULTANT

GERALD CAMPBELL
TECHNICAL CONSULTANT

JON GLATSTEIN
ELECTRICAL CONSULTANT

MARIO ARISTIDES
MERCEDES CONSULTANT

AUTOMATIC TRANSMISSION SERVICE GROUP

9200 South Dadeland Boulevard Suite 720

Miami, Florida 33156

(305) 670-4161

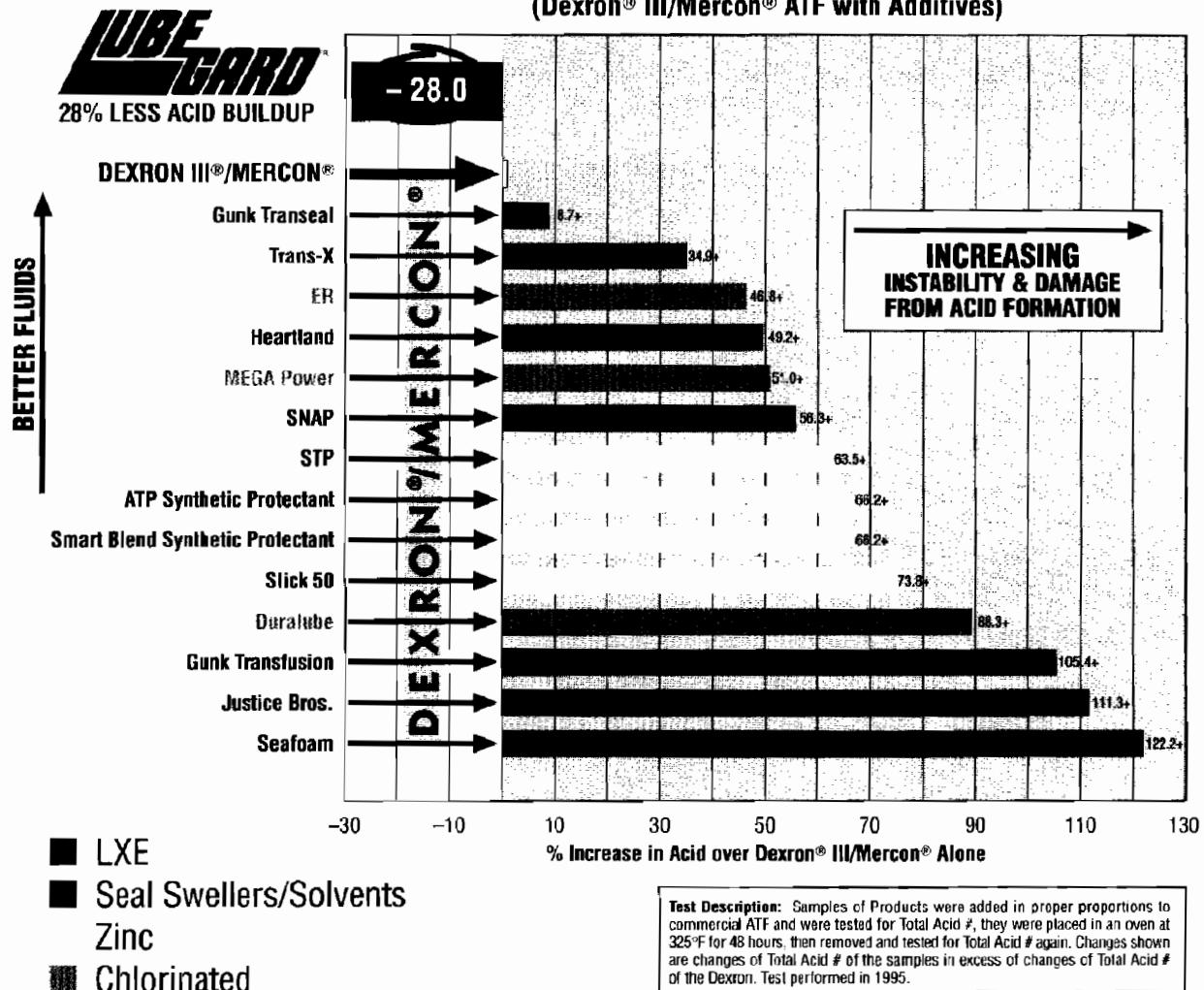
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Chemicals Used As Additives: How Thermally Stable Are They? (see chart below)

NOTE: ACID FORMATION LEADS TO SLUDGE!

(Dexron® III/Mercon® ATF with Additives)



90% OF ALL TRANSMISSION FAILURES ARE CAUSED BY OVERHEATING.

Source: Automatic Transmission Rebuilders Assoc.



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P.O. Box 24743 • Seattle, WA 98124-0743
(206) 762-5343 • Fax: (206) 762-7989
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THM 4T40-E TRANSAXLE CASE, CHANNEL PLATE AND CHECKBALL LOCATION CHANGES FOR 1997

CHANGE: Beginning in the middle of the 1997 model year, the transaxle case, channel plate and the checkball locations were changed on all THM 4T40-E transaxles, that may create some confusion for service.

REASON: Improved clutch durability, and improved 4-2 downshift.

PARTS AFFECTED:

- (1) TRANSAXLE CASE - Added boss and the second threaded hole to the case in the area shown in Figure 2, to accommodate valve body bolt and channel plate changes for improved clamping. The previous design case, with the single boss and hole is shown in Figure 1.
- (2) CHANNEL PLATE - New casting with an added boss, and one of the threaded holes in the channel plate changes to a non-threaded hole to accomodate the valve body bolt changes for improved clamping force. The previous design channel plate is shown in Figure 3, and the new design channel plate is shown in Figure 4.
- (3) CHECKBALL LOCATIONS - The number 6 checkball moves from the direct clutch apply circuit, and into the 2-3 accumulator circuit. There were no changes in worm track configuration, however we also show the "Threaded" hole that changed to a "Non-Threaded" hole in the channel plate. Refer to Figure 5 for 1995-1996 checkball locations, and Figure 6 for the 1997-Up checkball locations.
- (4) SPACER PLATE - The number 45 exhaust passage in the spacer plate has changed from a rectangular hole to a small oval hole, as shown in Figure 7.
- (5) DRIVEN SPROCKET SUPPORT - Ball capsule added in the direct clutch circuit to act as an air bleed to improve direct clutch apply, as shown in Figure 8.

INTERCHANGEABILITY:

NONE of the parts listed above will interchange with previous design level transaxles. Any transaxle using the ball capsule in the direct clutch circuit must use the 1997 channel plate and all associated parts listed above.

"SPECIAL ASSEMBLY NOTE":

When using the 1997 and later case with the two threaded holes in the case, as shown in Figure 2, the Turbine Speed Sensor must be installed in the hole closest to the turbine shaft hole, as shown in Figure 2.

If you install it into the threaded hole for the added channel plate bolt, you will break the channel plate as you tighten it down to the case. Some people will break two!

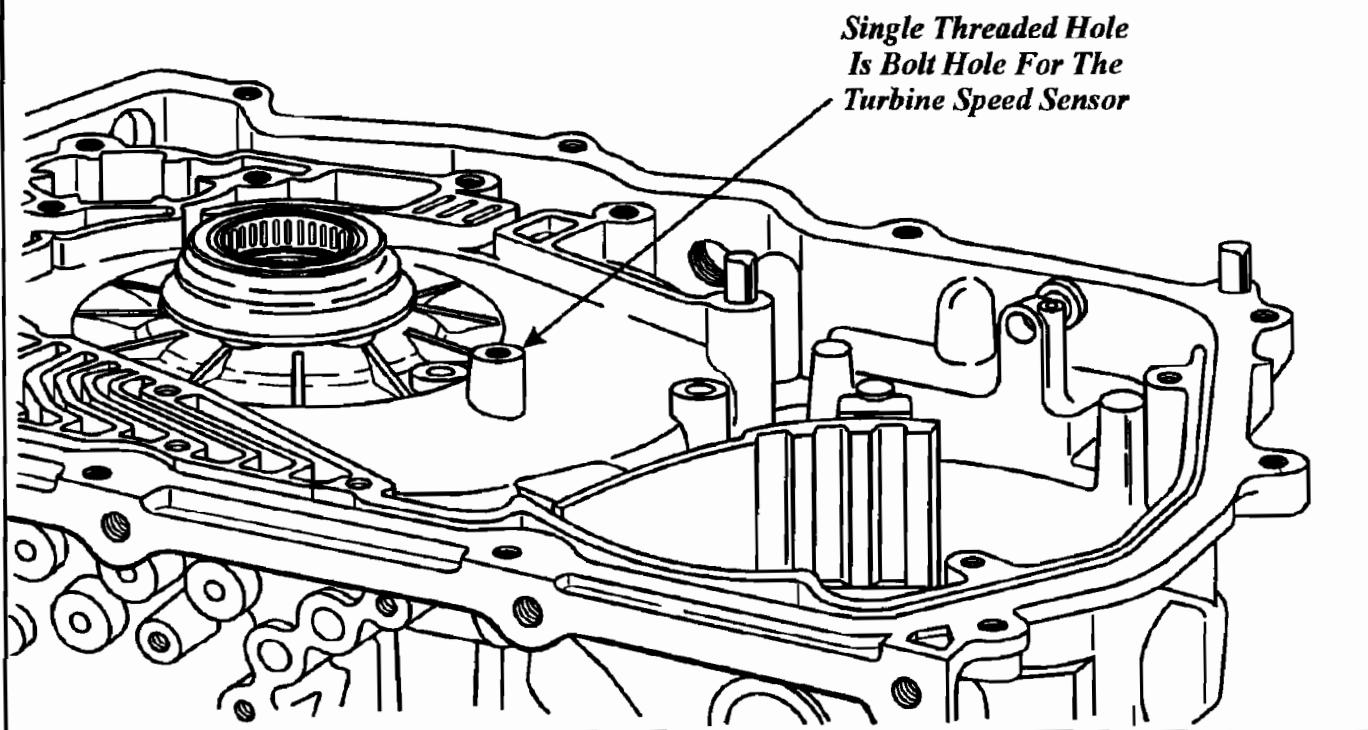
1995-1996 TRANSAXLE CASE

Figure 1

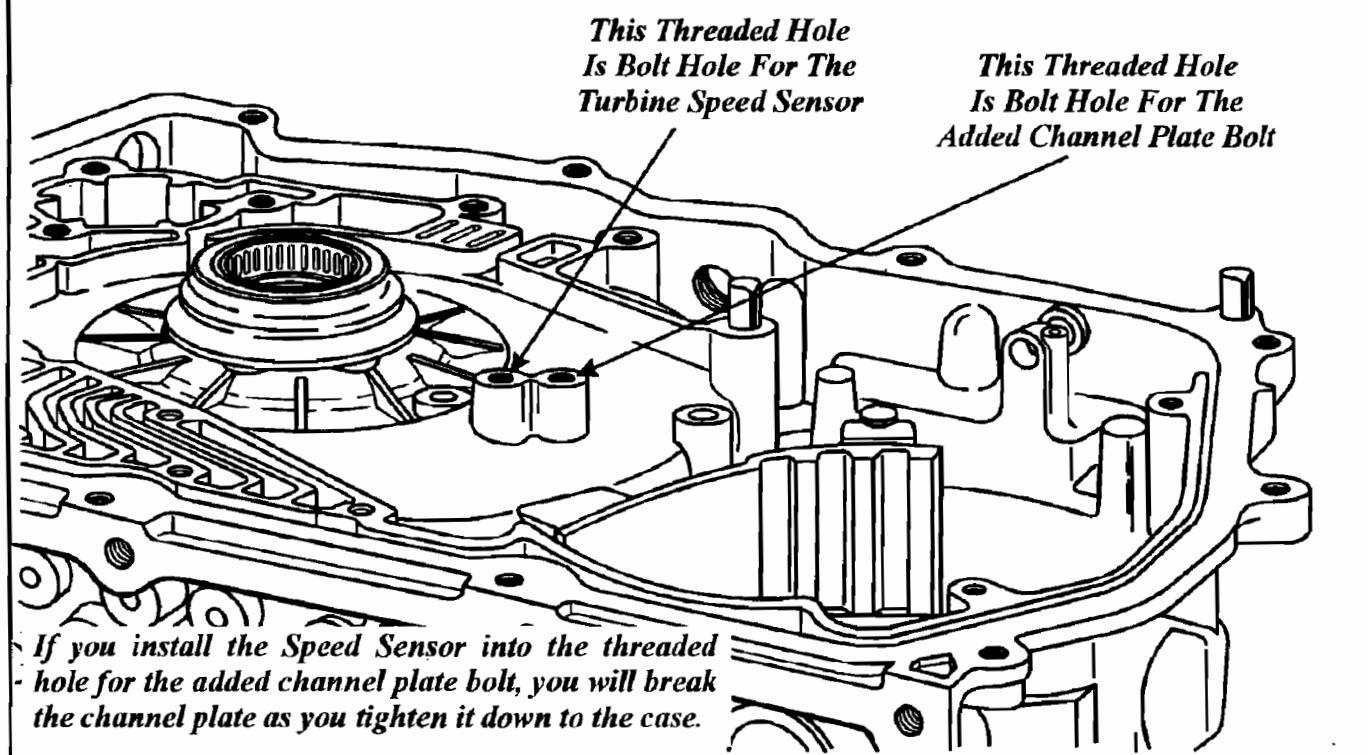
1997-UP TRANSAXLE CASE

Figure 2

Copyright © 2000 ATSG

1995-1996 CHANNEL PLATE

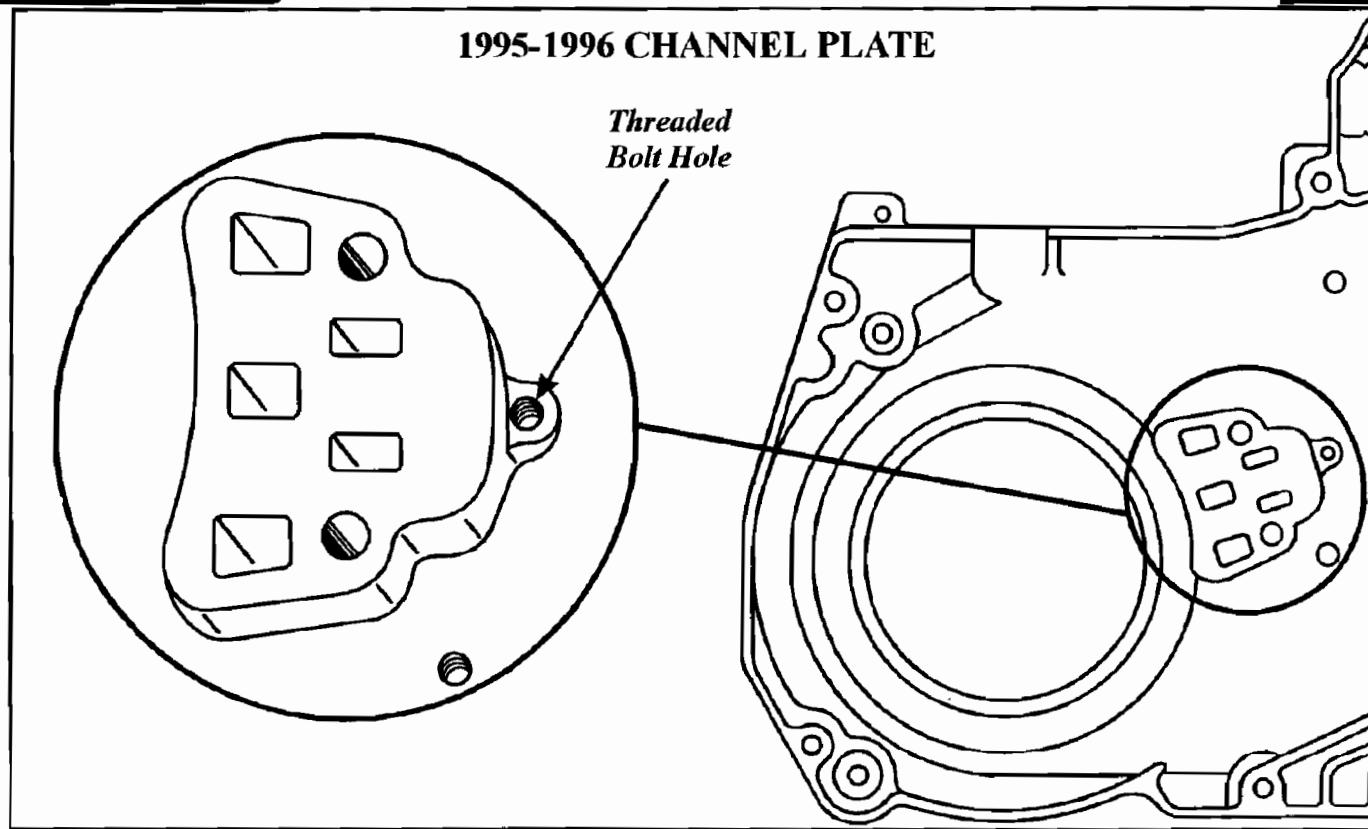
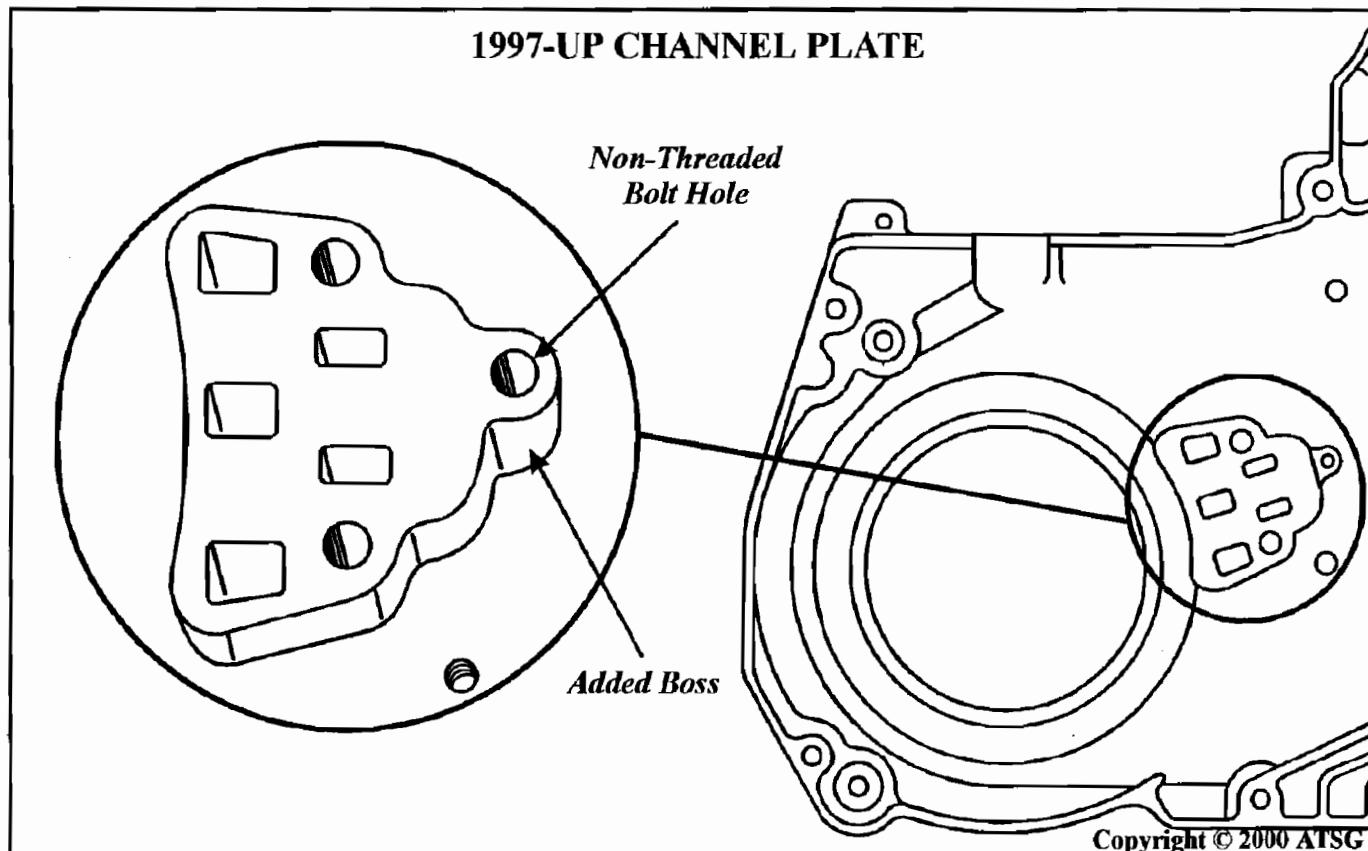


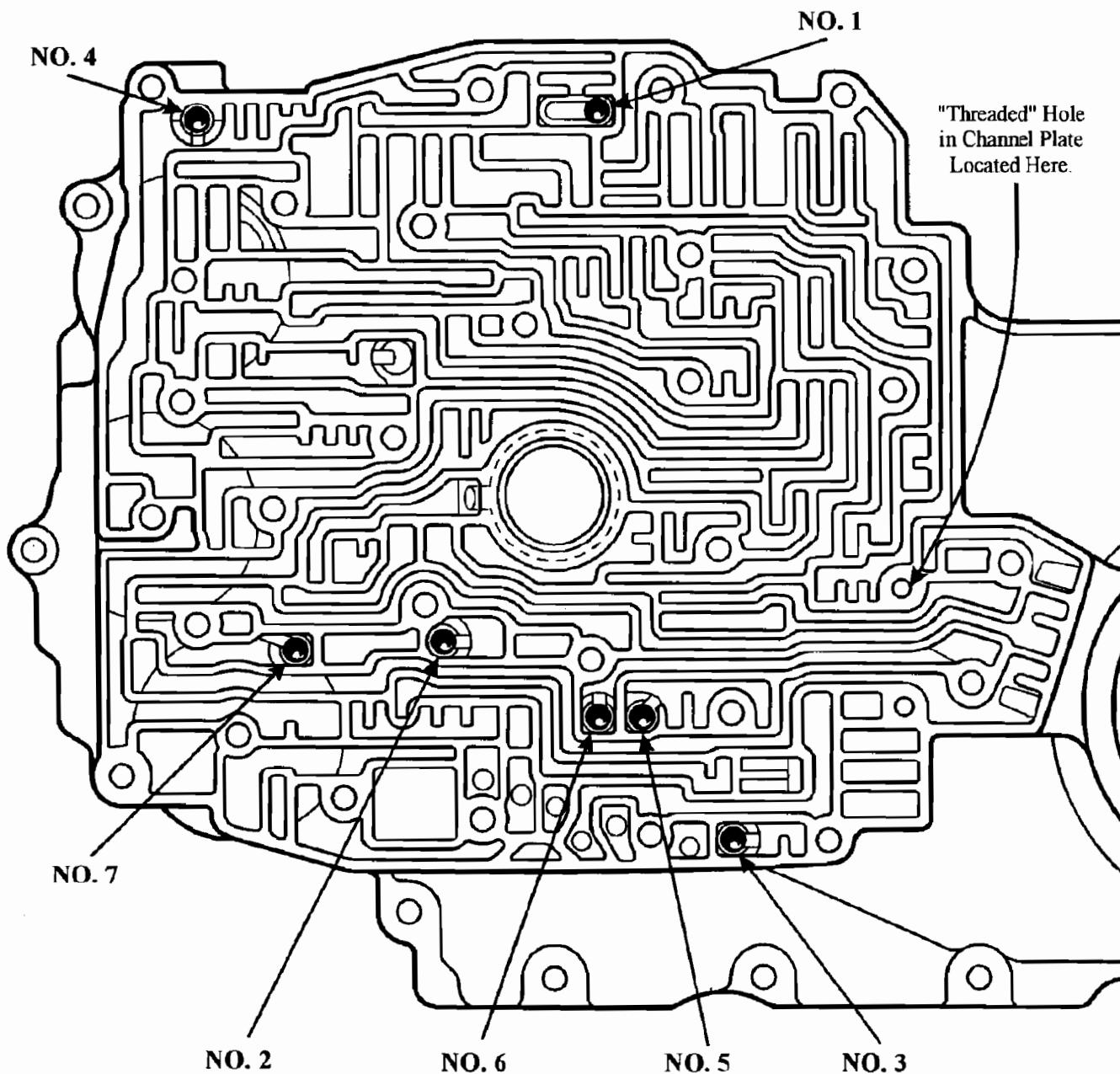
Figure 3

1997-UP CHANNEL PLATE



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Figure 4

THM 4T40-E 1995-1996 MODELS ONLY
CHECKBALL LOCATIONS

NO. 1 SEPARATES LO/PRN FLUID CIRCUITS.

NO. 2 FORCES 2-3 DRIVE FLUID THRU ORIFICE #3 TO CONTROL 1-2 SHIFT FEEL.

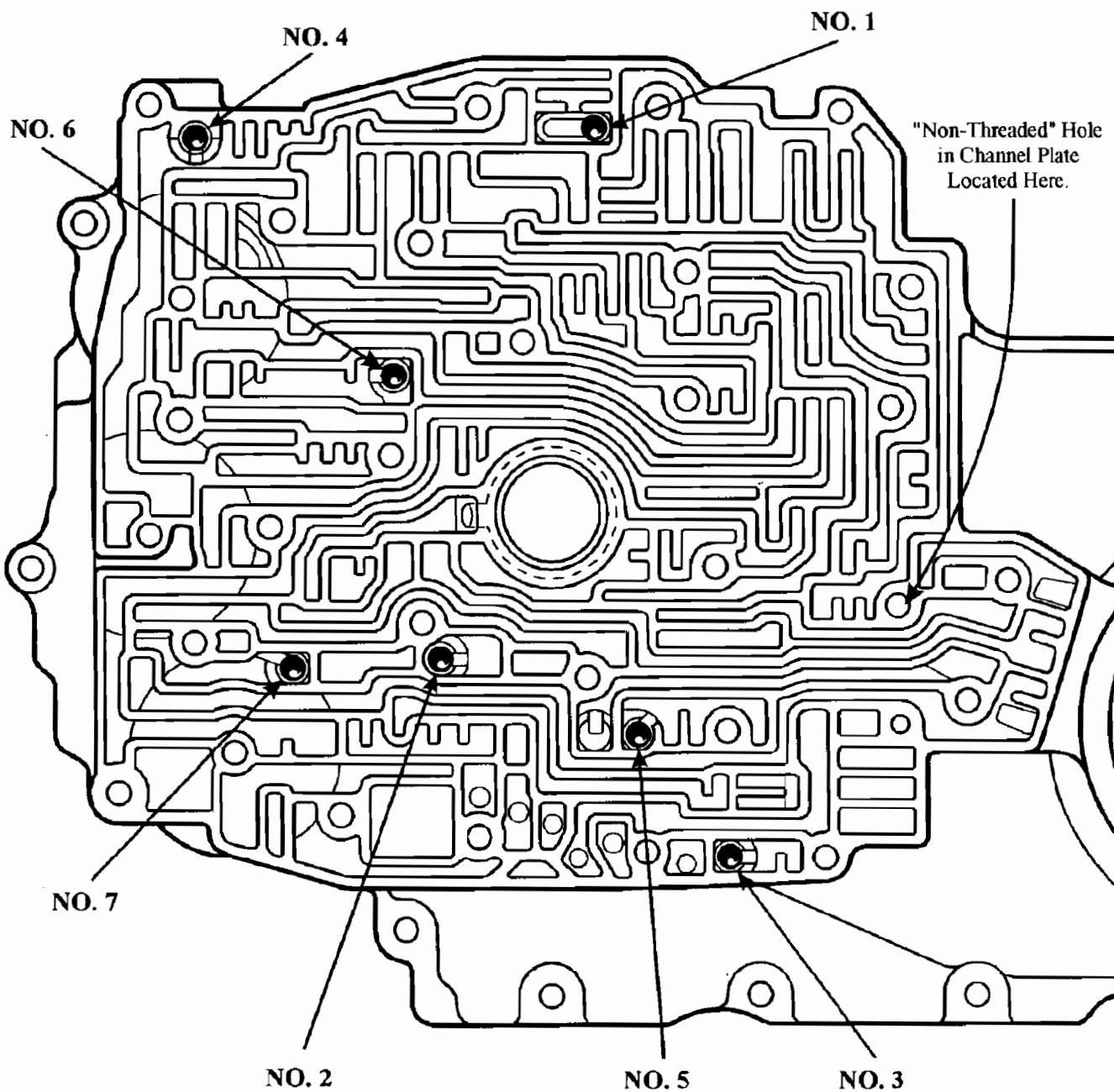
NO. 3 FORCES INTERMEDIATE BAND APPLY OIL THRU ORIFICE #8 FOR APPLY FEEL.

NO. 4 FORCES ACCUMULATOR OIL THRU ORIFICE #24 TO THE 1-2 ACCUMULATOR.

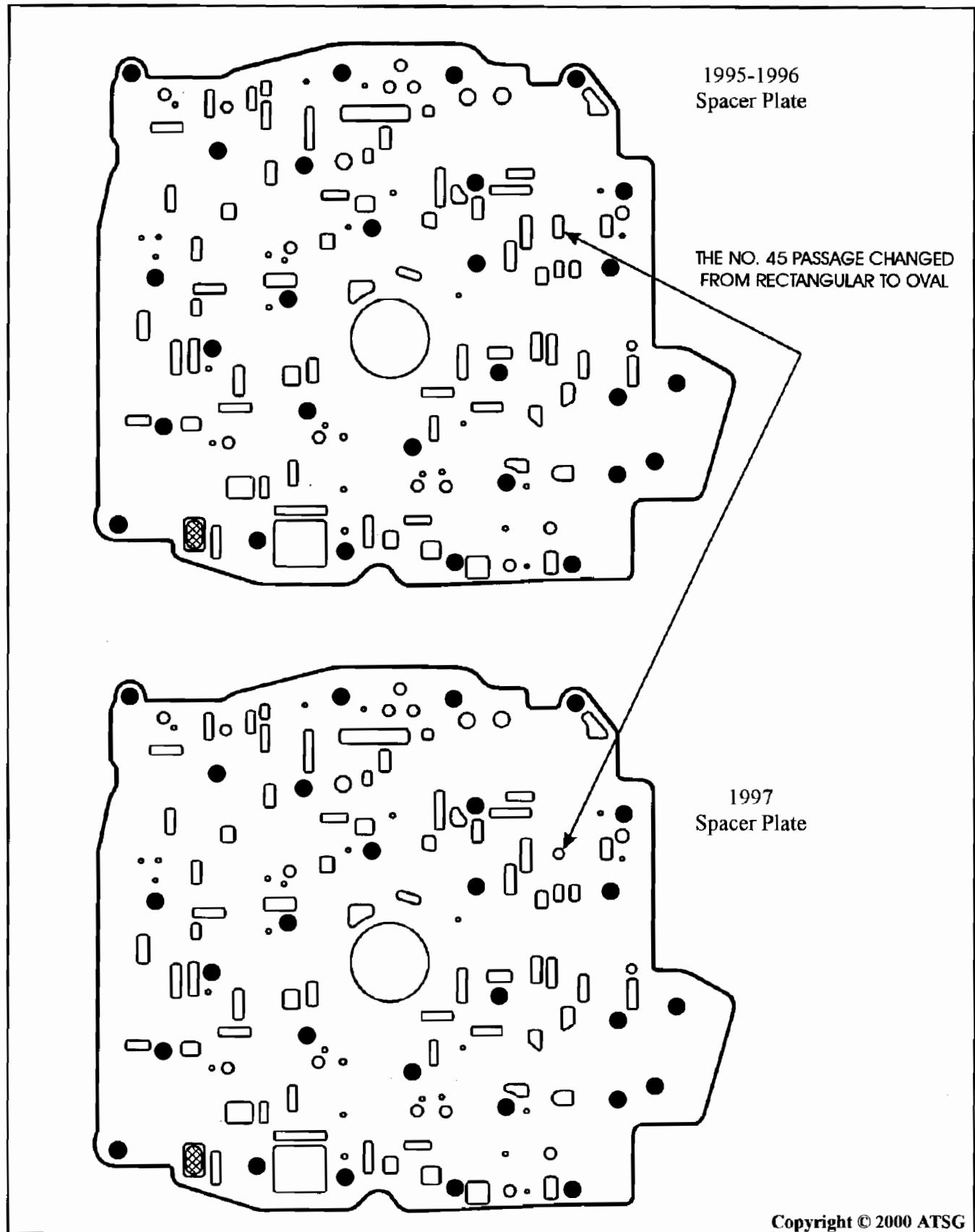
NO. 5 FORCES 3-4 DRIVE OIL THRU ORIFICE #26 TO CONTROL 2-3 SHIFT FEEL.

NO. 6 FORCES EXHAUSTING DIRECT CLUTCH OIL THRU ORIFICE #25 TO CONTROL RELEASE. OF DIRECT CLUTCH.

NO. 7 FORCES ACCUMULATOR OIL THRU ORIFICE #28 TO THE 3-4 ACCUMULATOR.

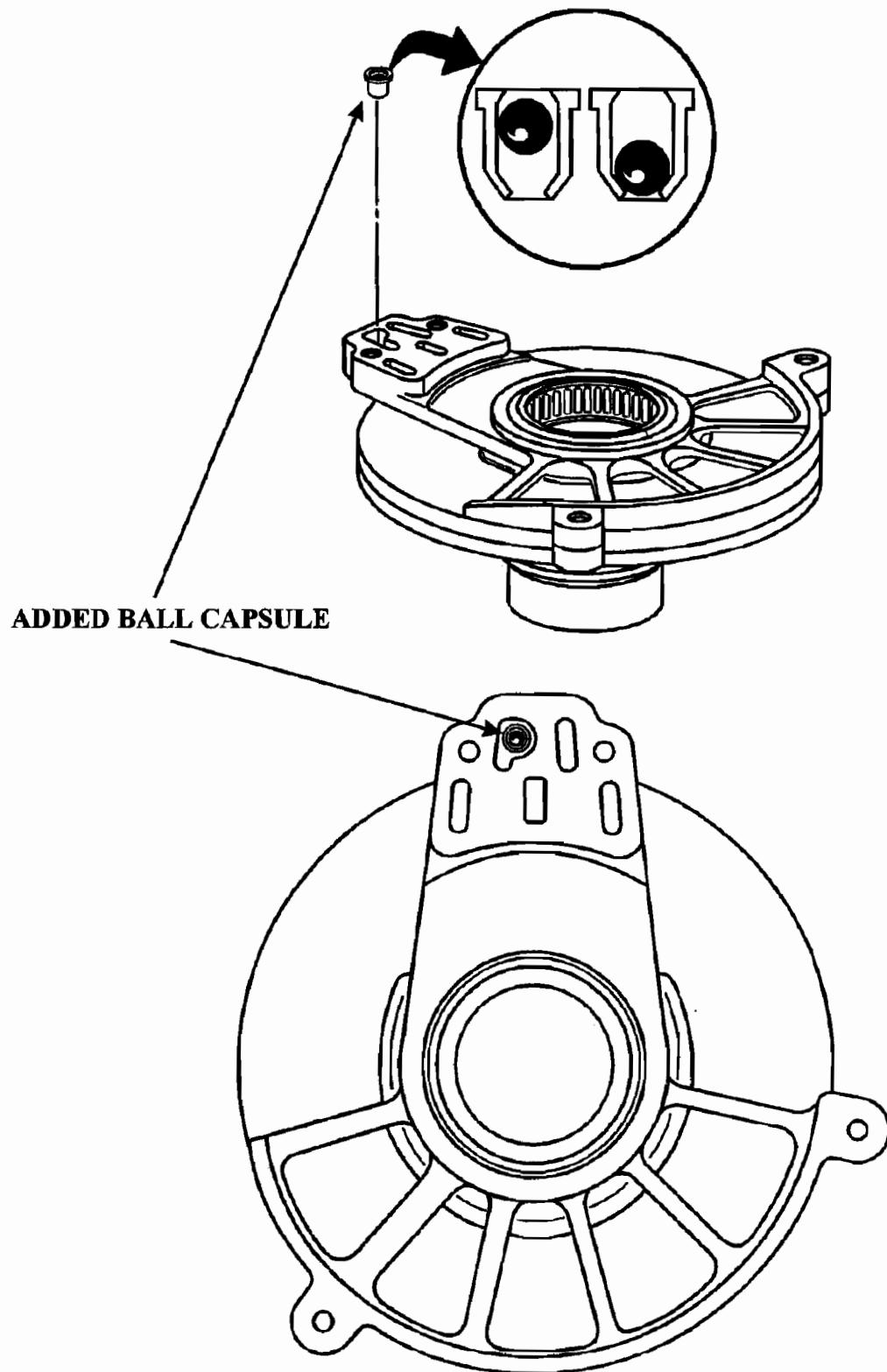
THM 4T40-E 1997-UP MODELS ONLY
CHECKBALL LOCATIONS

- NO. 1 SEPERATES LO/PRN FLUID CIRCUITS.
- NO. 2 FORCES 2-3 DRIVE FLUID THRU ORIFICE #3 TO CONTROL 1-2 SHIFT FEEL.
- NO. 3 FORCES INTERMEDIATE BAND APPLY OIL THRU ORIFICE #8 FOR APPLY FEEL.
- NO. 4 FORCES ACCUMULATOR OIL THRU ORIFICE #24 TO THE 1-2 ACCUMULATOR.
- NO. 5 FORCES 3-4 DRIVE OIL THRU ORIFICE #26 TO CONTROL 2-3 SHIFT FEEL.
- NO. 6 FORCES ACCUMULATOR OIL THRU ORIFICE #27 TO THE 2-3 ACCUMULATOR.
- NO. 7 FORCES ACCUMULATOR OIL THRU ORIFICE #28 TO THE 3-4 ACCUMULATOR.



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Figure 7

THM 4T40-E 1997-UP MODELS ONLY
DRIVEN SPROCKET SUPPORT

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Figure 8



**THM 4T40-E
TROUBLE CODE P1887 OR P0742**

COMPLAINT: Before and/or after rebuild, the vehicle illuminates the check engine lamp and stores code P1887 or P0742 in memory. Once the code is stored, TCC will be inhibited and maximum line pressure will be set creating harsh engagements and shifts.

P1887 Code Definition; TCC Release Switch Circuit Malfunction.

P0742 Code Definition; TCC Locked On.

CAUSE: This is usually created by a leak of TCC release oil through the needle bearing and seal assembly located in the oil pump, as shown in Figure 1.

CORRECTION: The unfortunate part of the correction process is that the Needle Bearing and Seal Assembly is not available as a service item from General Motors. The *only* way to acquire the Needle Bearing and Seal Assembly is to purchase a complete pump assembly from the OEM supplier, available under OEM part number 24208987.

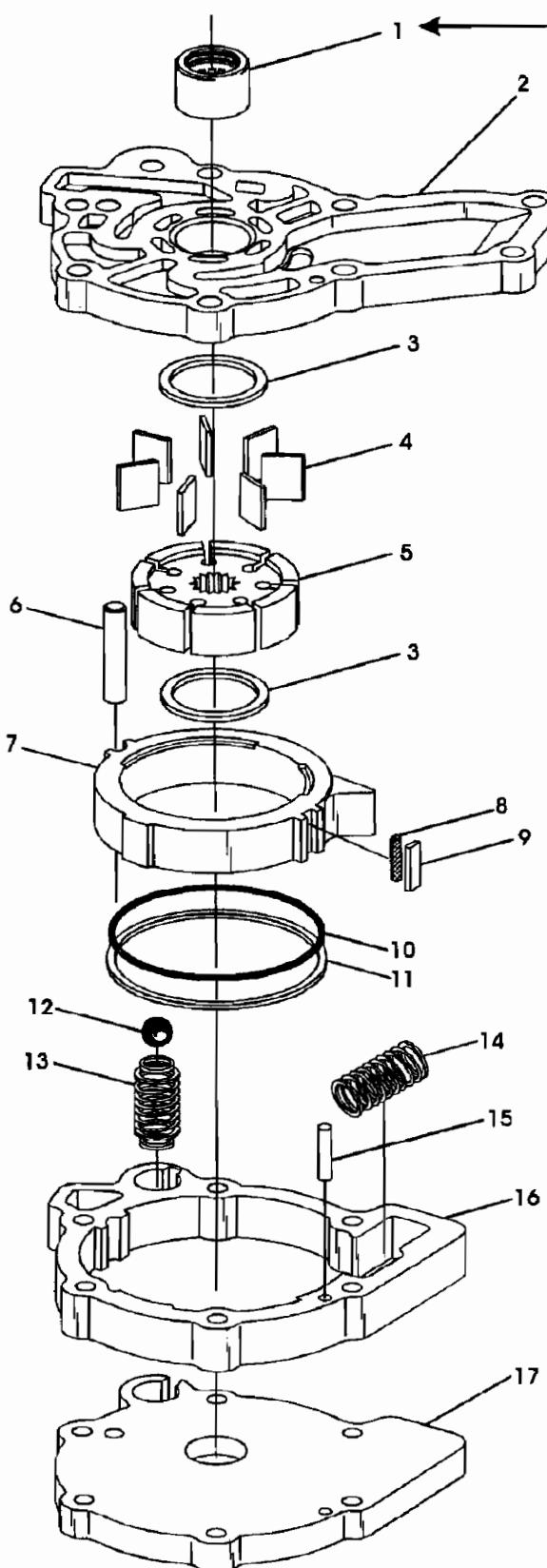
This Needle Bearing and Seal Assembly has been such a high failure item that ATSG recommends the pump assembly be replaced on every rebuild.

SERVICE INFORMATION:

Oil Pump Assembly Complete 24208987

THM 4T40-E OIL PUMP ASSEMBLY

This Needle Bearing and Seal Assembly
Is Not Serviced. You Must Purchase The
Complete Pump Assembly Available Under
OEM Part Number 24208987



1. NEEDLE BEARING AND SEAL ASSEMBLY (NOT SERVICED)
2. OIL PUMP BASE
3. OIL PUMP VANE RING (2 REQUIRED)
4. OIL PUMP VANES (7 REQUIRED)
5. OIL PUMP ROTOR
6. OIL PUMP SLIDE PIVOT PIN
7. OIL PUMP SLIDE
8. OIL PUMP SLIDE SEAL SUPPORT
9. OIL PUMP SLIDE SEAL
10. OIL PUMP SLIDE SEAL "O" RING
11. OIL PUMP SLIDE TO COVER SEAL
12. PRESSURE RELIEF BALL
13. PRESSURE RELIEF SPRING
14. OIL PUMP SLIDE PRIMING SPRING (SAME AS 125C)
15. LOCATING DOWEL
16. OIL PUMP BODY
17. OIL PUMP COVER



GM Fluid Pressure Switches

Code 28, P1810

COMPLAINT: General Motors vehicles transmissions equipped with fluid pressure switch assemblies may store trouble codes 28 or P1810.

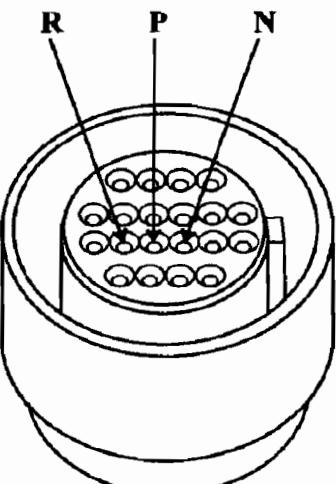
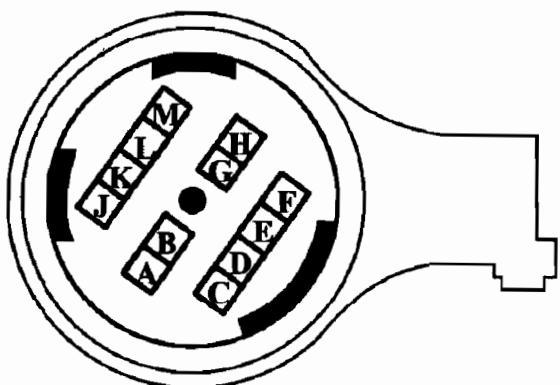
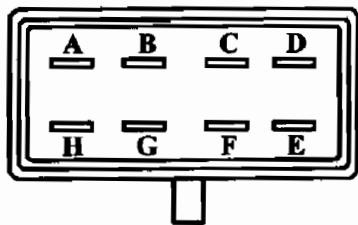
CAUSE: A possible cause of this problem may be damaged wiring between the transmission harness connector and the vehicle computer.

CORRECTION: To isolate a problem with either the wiring, or possibly the computer, simply unplug the vehicle harness connector from the transmission, turn the ignition key to the on position, engine off. Now, check for system voltage on each of the range A,B, and C wires, or X,Y, and Z wires as in many Cadillac models. At this point, if voltage is present on all three wires, then the wires should be good, as this voltage is supplied by the computer.

A further check can be made at this time to see if the computer will recognize the changes in voltage. Connect your scan tool to the diagnostic connector and get in to the data list. Find the trans range A,B, and C or X,Y, and Z as indicated. If the key is on and the harness connector is unplugged from the transmission, then all three ranges should indicate HI or 12. Using a jumper wire connected to a known good ground, touch each of the range wire terminals in the harness connector one at a time. When these wires are grounded in turn your scan tool should indicate 0 or LOW. At this time, you have verified the proper function of each circuit between the vehicle harness connector and the computer.

Important Note:

You will set multiple solenoid and possibly TFT sensor or TCC release switch codes while you have the harness unplugged with the ignition on. Be sure to clear all codes prior to road testing the vehicle and recheck it again after your road test to be sure all repairs are complete.

PSM TERMINAL IDENTIFICATION**Late Harness Connector
All Models****R = Pressure Switch "B" Circuit****P = Pressure Switch "C" Circuit****N = Pressure Switch "A" Circuit****Early Harness Connector
4L80-E****D = Pressure Switch "A" Circuit****E = Pressure Switch "B" Circuit****F = Pressure Switch "C" Circuit****Early Harness Connector
4T80-E****A = Pressure Switch "X" Circuit****B = Pressure Switch "Y" Circuit****H = Pressure Switch "Z" Circuit****Figure 1**



1993-95 CADILLAC WITH 4T80E TRANSMISSION 1995 OLDS AURORA WITH 4T80E TRANSMISSION

CODE PO39/39

COMPLAINT: Code PO39/39 is stored for excessive converter clutch slip. It is usually assumed that the converter is at fault, but, after converter replacement the code returns along with the illumination of the MIL Lamp and cancellation of the TCC signal.

CAUSE: Due to the fact that code PO39/39 is usually thought to be caused by a **mechanical** problem, and the fact that most of the Cadillac models that are equipped with the 4T80E transmission are also equipped with a viscous type of converter clutch, it is the converter that is usually replaced in an attempt to cure this complaint, and in many situations, it is the converter.
The 4T80E does not have too many problems with the PWM TCC Solenoid or the TCC regulator valve in the valve body, although a fault with these items can cause excessive TCC slip and PO39/39 code storage.
A problem with the channel plate seals can also cause excessive TCC slip and code PO39/39 to be stored. These are all examples of **mechanically generated** reasons to store code PO39/39.

CORRECTION: The cause of excessive TCC slip and the resulting storage of code PO39/39 that generated this bulletin, however, is an **electrically generated** fault.

The early style case connector for the 1993 model only along with terminal identification and **internal** wire color is shown in figure 1.

The 1994-95 case connector with terminal identification and **internal** wire color is shown in figure 2.

The electrical schematic shown in figure 3 illustrates a **Purple** wire at terminal "U" at the vehicle wire harness connector that connects to the transmission case connector, it is **White** on the transmission side of the case connector. Terminal "U" is the battery voltage supply circuit for the TCC Solenoid. The schematic also illustrates that power for terminal "U" is supplied through the brake switch.

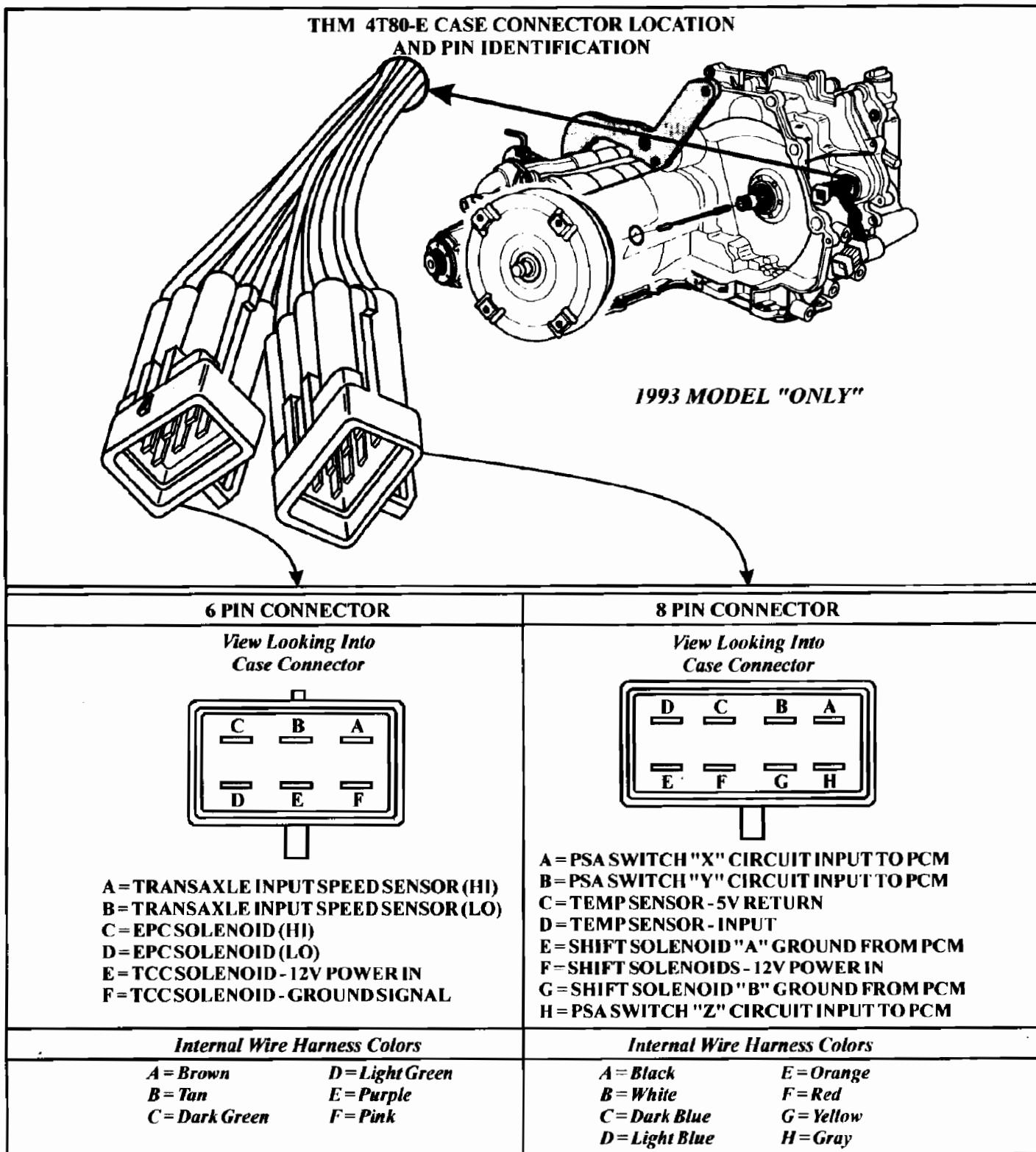
A fault can develop in the brake switch that can reduce the amount of voltage available at terminal "U" for the TCC Solenoid. When this occurs, the solenoid cannot provide enough oil to stroke the converter clutch control valve which causes insufficient TCC apply oil which then allows excessive converter clutch slippage and the storage of code PO39/39.

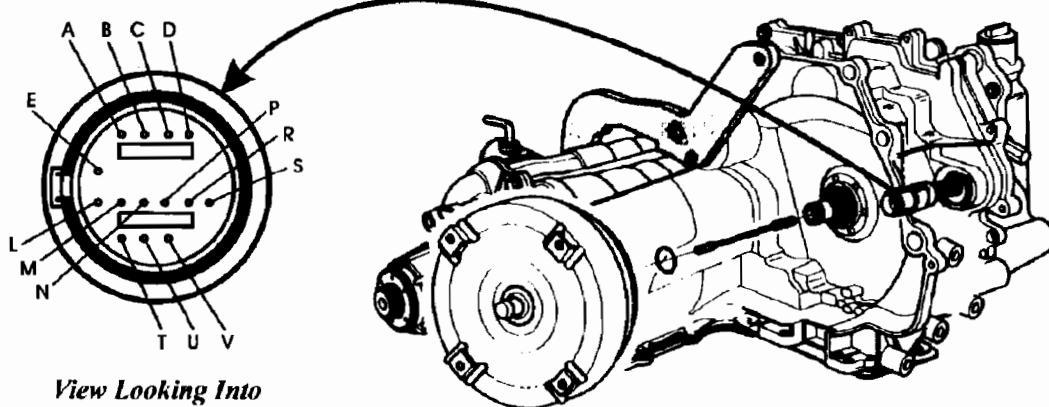
Check the voltage at the transmission case connector terminal "U", if less than system voltage is seen, go to the brake switch and check the voltage coming into the brake switch. If the voltage into the brake switch is correct, but the voltage out of the brake switch is incorrect, it is the brake switch that is causing the above complaint and will require replacement.

NOTE: This is **NOT** an issue on 1996 and later 4T80E equipped vehicles because the TCC Solenoid does **NOT** receive power from the brake switch.

1993-95 CADILLAC WITH 4T80E TRANSMISSION
1995 OLDS AURORA WITH 4T80E TRANSMISSION

CODE PO39/39

Figure 1
Automatic Transmission Service Group

**1993-95 CADILLAC WITH 4T80E TRANSMISSION
1995 OLDS AURORA WITH 4T80E TRANSMISSION**
CODE PO39/39
**1994-UP THM 4T80-E CASE CONNECTOR
LOCATION AND PIN IDENTIFICATION**


<i>Ohms Resistance Chart</i>			
Cavities	Component	Resistance @ 68°F	Resistance @ 190°F
A-E	1-2 Shift Solenoid	20-30Ω	23-50Ω
B-E	2-3 Shift Solenoid	20-30Ω	23-50Ω
T-U	TCC/PWM Solenoid	10-15Ω	11-25Ω
C-D	EPC Solenoid	3-5Ω	5-6Ω
S-V	Input Speed Sensor	1260-1540Ω	
M-L	TFT Sensor	3164-3867Ω	225-285Ω
	Output Speed Sensor	1260-1540Ω	

CASE CONNECTOR PIN FUNCTION

Pin	Internal Wire Color	Function
A	Light Green	Ground signal from PCM for the 1-2 Shift Solenoid (A)
B	Yellow/Black	Ground signal from PCM for the 2-3 Shift Solenoid (B)
C	Purple	Electronic Pressure Control Solenoid, HIGH Control
D	Light Blue	Electronic Pressure Control Solenoid, LOW Control
E	Red	Transaxle Solenoid 12V Power In
L	Brown	Transaxle Fluid Temperature (TFT) Sensor HIGH
M	Gray	Transaxle Fluid Temperature (TFT) Sensor LOW
N	Pink	Pressure Switch Assembly, Range Signal "X"
P	Orange	Pressure Switch Assembly, Range Signal "Z"
R	Dark Blue	Pressure Switch Assembly, Range Signal "Y"
S	Light Green	Input Speed Sensor (ISS) signal HIGH
T	Tan	Ground signal from PCM for the TCC/PWM Converter Clutch Solenoid
U	White	TCC Solenoid Feed
V	Purple	Input Speed Sensor (ISS) signal LOW

Figure 2

**1993-95 CADILLAC WITH 4T80E TRANSMISSION
1995 OLDS AURORA WITH 4T80E TRANSMISSION**

CODE PO39/39

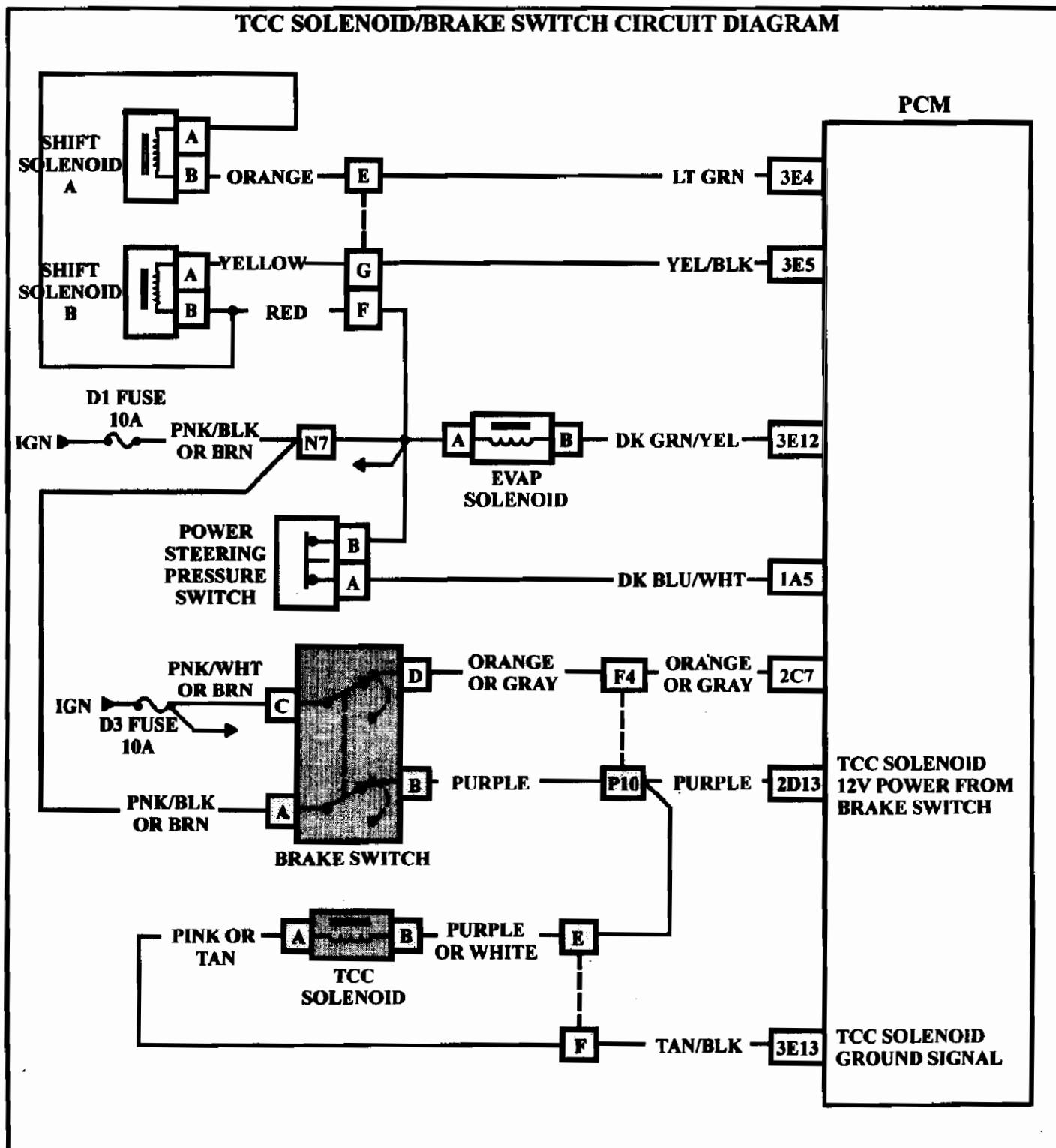


Figure 3



THM 4L60-E LACK OF LUBRICATION

COMPLAINT: Vehicle is brought to your shop and has failed because of lack of lubrication. You check the cooler or possibly replace the cooler as a precaution. After replacing the necessary failed parts, the vehicle is returned with the same problem.

CAUSE: The cause may be, a defective pump cover (Stator) from the factory, that was not drilled completely through the "Lube From Cooler" passage, as shown in Figure 1. If this passage is not drilled through, there will be no lubrication to the rear of this unit as all lube must pass through the pump cover (See Figure 1). Every one that we have encountered, and we have seen several, had been drilled just deep enough that the cup plug that seals this passage after drilling was installed in the cover.

CORRECTION: Replace the pump cover as necessary with a new one and inspect *every* one that enters your shop to ensure no return failures. All of the pump covers we have seen at this point, were the 13 vane variety.

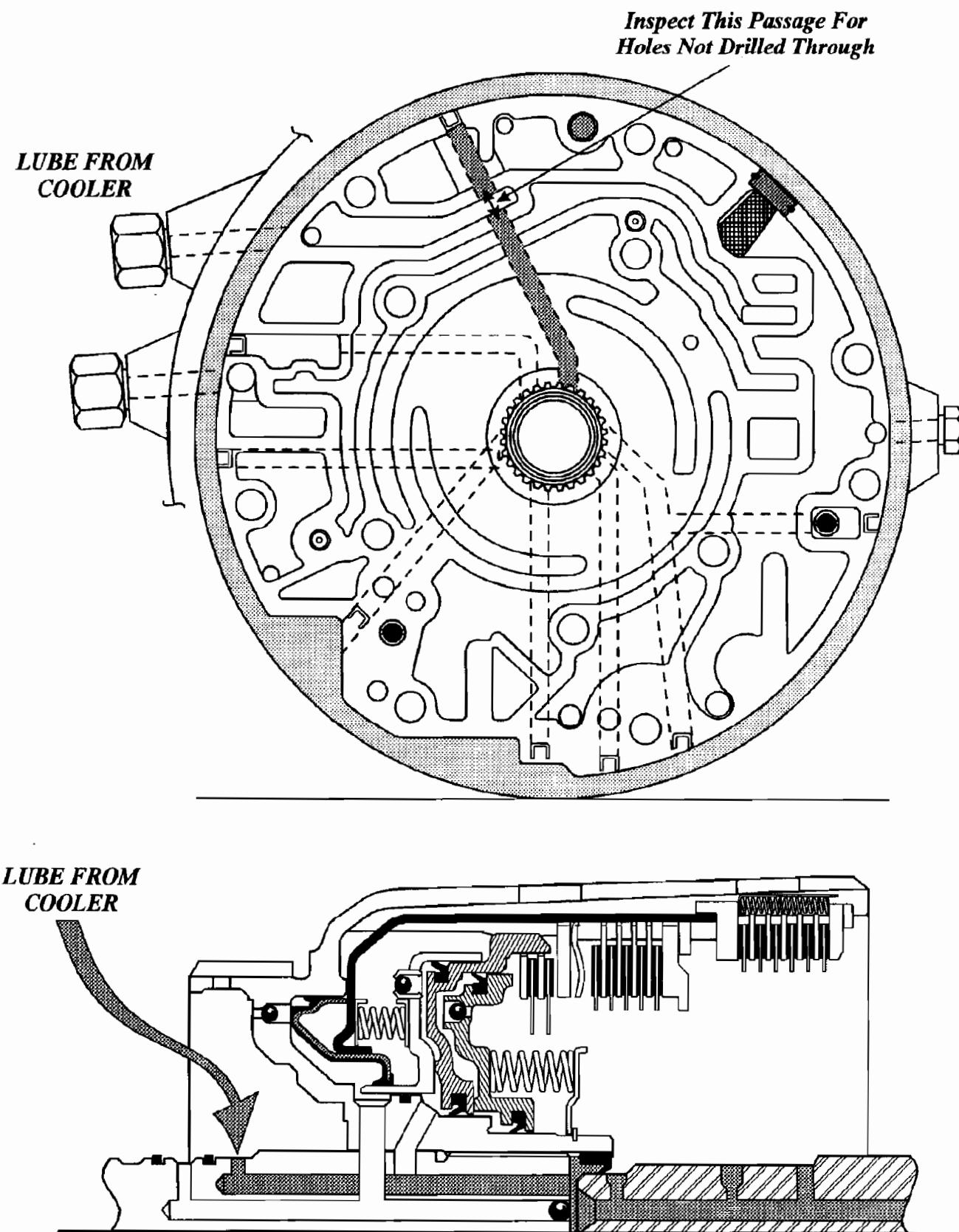
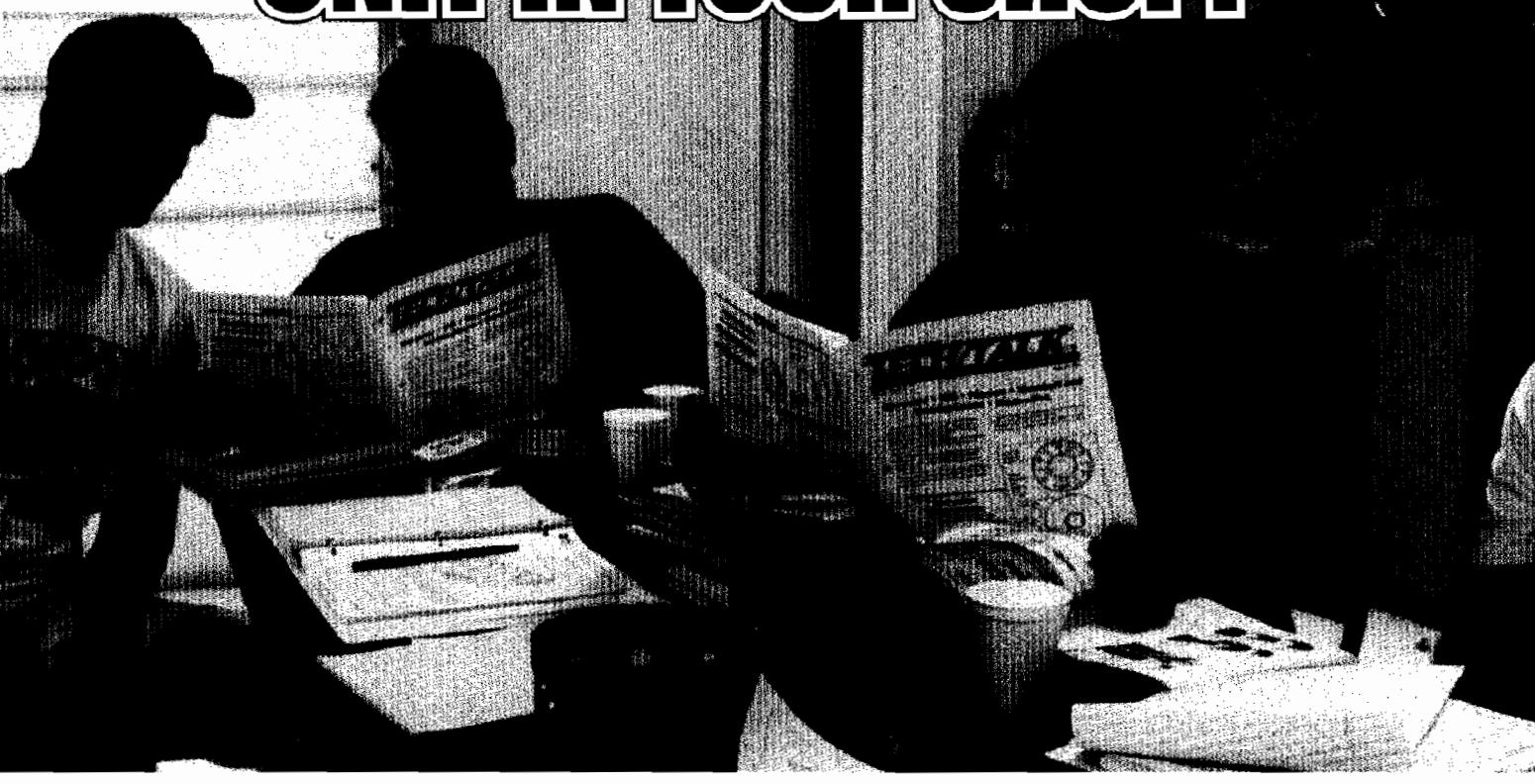


Figure 1

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PROBLEMS WITH A UNIT IN YOUR SHOP?



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**THM 4L60-E
PARK/NEUTRAL SWITCH DIAGNOSIS**

COMPLAINT: Vehicles equipped with 4L60-E transmissions may exhibit a no start in Neutral range, PRNDL indicator lights in the dash not functioning properly and/or improper back-up light operation.

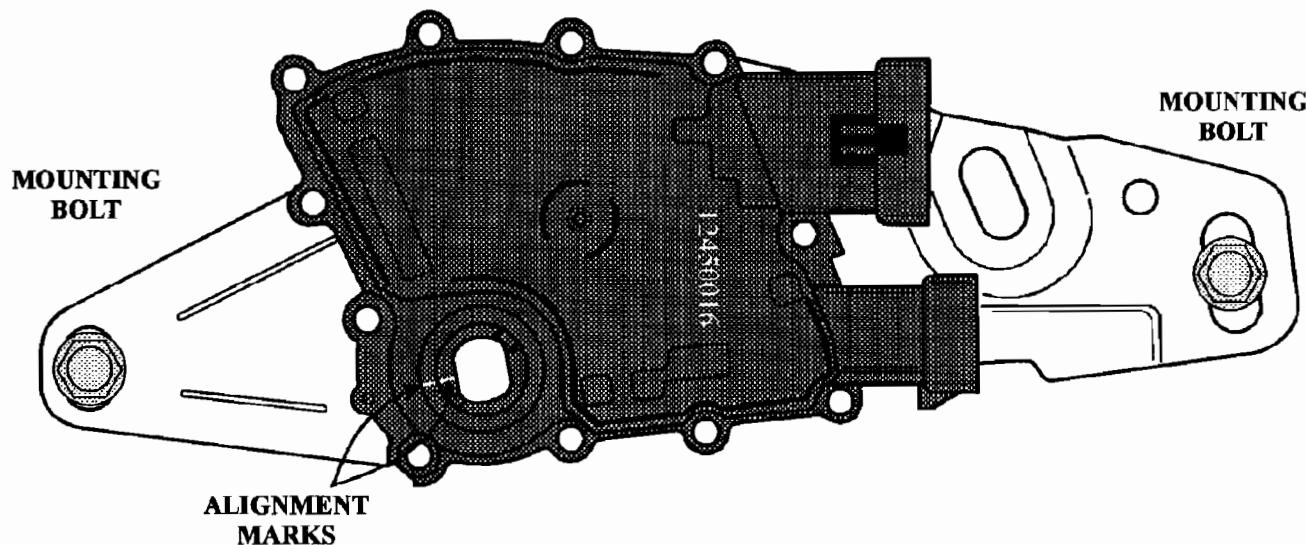
CAUSE: The cause may be, an improperly adjusted or faulty Park/Neutral switch or an improperly wired C1 or C2 repair harness.

CORRECTION: Refer to Figure 1 to adjust the Park/Neutral switch correctly. Refer to Figure 2 to check the Park/Neutral switch in each range to ensure its integrity. Refer to Figure 3 for a wire schematic illustrating the common wire colors and their placement in the C1 and C2 harness connectors.

SERVICE INFORMATION:

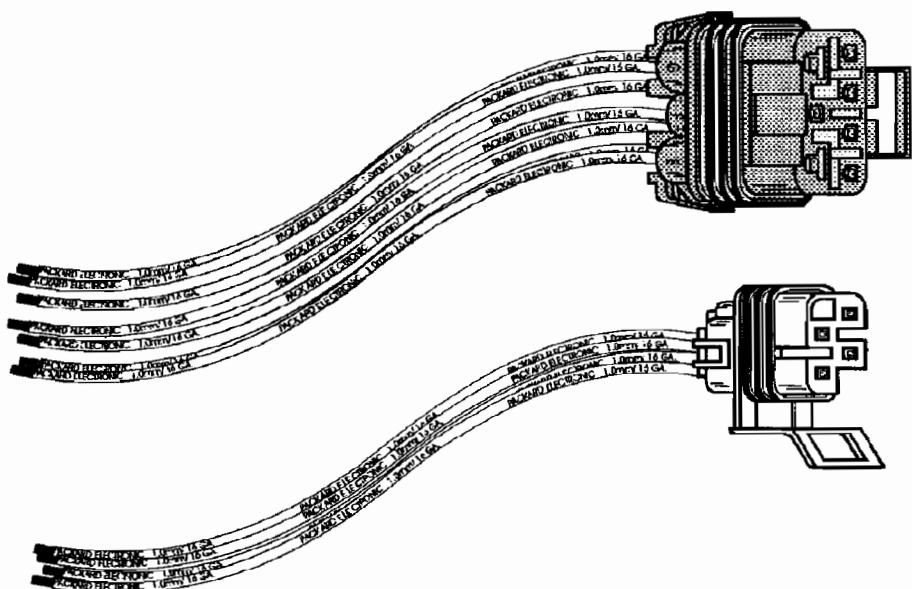
Park/Neutral Switch.....	12450016
C1 Repair Connector Assembly, (<i>with heat shrink tube</i>).....	15305887
C2 Repair Connector Assembly, (<i>with heat shrink tube</i>).....	15305925

NEUTRAL SWITCH ADJUSTMENT

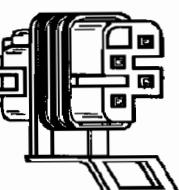


PLACE THE SELECTOR IN THE NEUTRAL POSITION AND LINE UP THE TWO MARKS AS SHOWN ABOVE THEN SECURE THE MOUNTING BOLTS

C1 AND C2 HARNESS REPAIR KITS



PART NUMBER
15305887



PART NUMBER
15305925

Figure 1

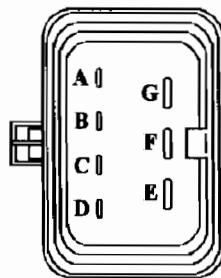
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PARK/NEUTRAL SWITCH CONTINUITY CHART

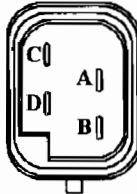
	RANGE SELECTED							
TERMINAL	P	R	N	O/D	D	2	1	
C2 CONNECTOR CONNECTION	A							
		●		●				
	B	●						
	C	●	●					
	D	●	●	●	●	●	●	
	E	●		●				
	F		●					
	G	●						
	A	●	●		●	●		
	B				●	●	●	

PARK/NEUTRAL SWITCH TERMINALS

C1 CONNECTOR



C2 CONNECTOR



OHM METER SHOULD INDICATE CONTINUITY BETWEEN THE CONNECTED DOTS LISTED ABOVE WHEN CHECKING THE SPECIFIED RANGE

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Figure 2

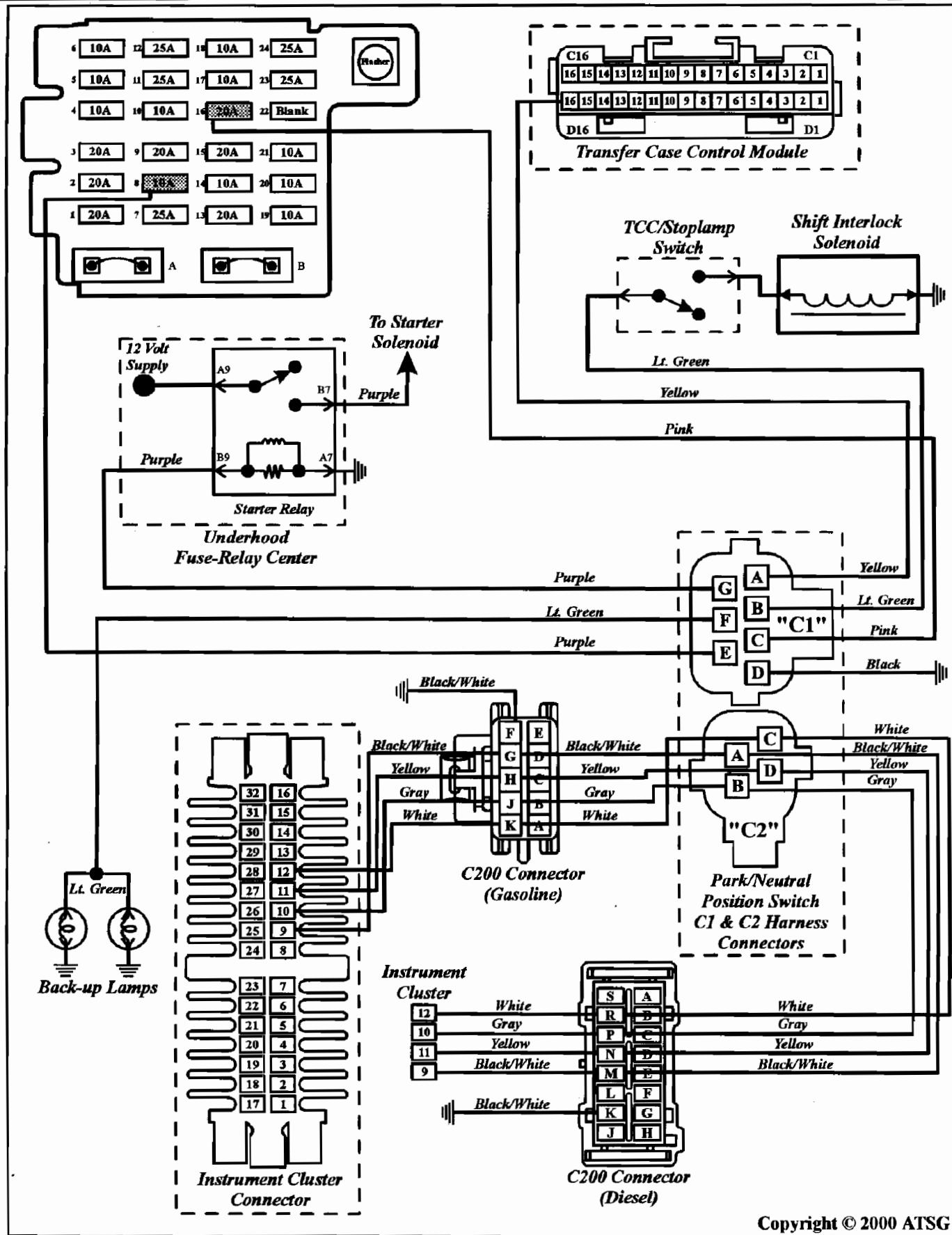


Figure 3



THM 4L60-E TROUBLE CODE P1870

COMPLAINT: Some vehicles may consistently return, before and/or after rebuild, with "Check Engine" lamp illuminated and trouble code P1870, (Internal Component Slipping), stored in memory.

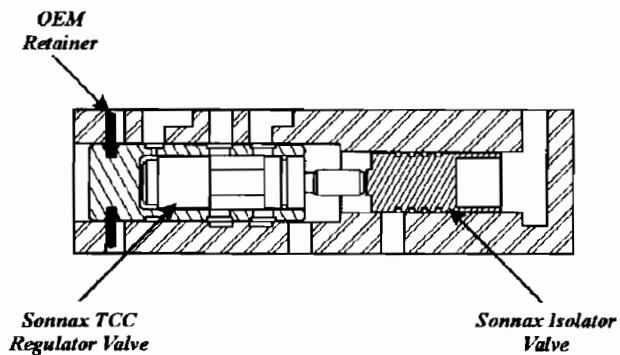
CAUSE: The cause is usually Torque Converter Clutch slippage, created by a badly worn valve body casting in the Converter Clutch Regulator Valve bore.

CORRECTION: Sonnax manufactures two different kits to repair the current valve body castings, both of which require a reamer, also available from Sonnax. One of the kits, Sonnax part number 77754-03K, fits 1993 thru 1997 model transmissions, but they require different assembly processes. Refer to Figure 1 for the 1994-1994 models and Figure 2 for the 1995-1997 models, for the proper assembly. The other kit, Sonnax part number 77754-04K, fits only the 1998 and later ECCC models, as it is a different calibration. Refer to Figure 3 for proper assembly of the 1998 and later models. The reamer required is the same for either kit and is available under Sonnax part number 77754-R2.

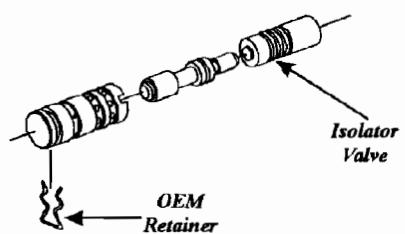
Special Note: The difference between the kits are as follows;

1993-1997 Models, The TCC Regulator Valve is .398" in diameter, which is .042" smaller than the Isolater Valve, for improved rate of apply.

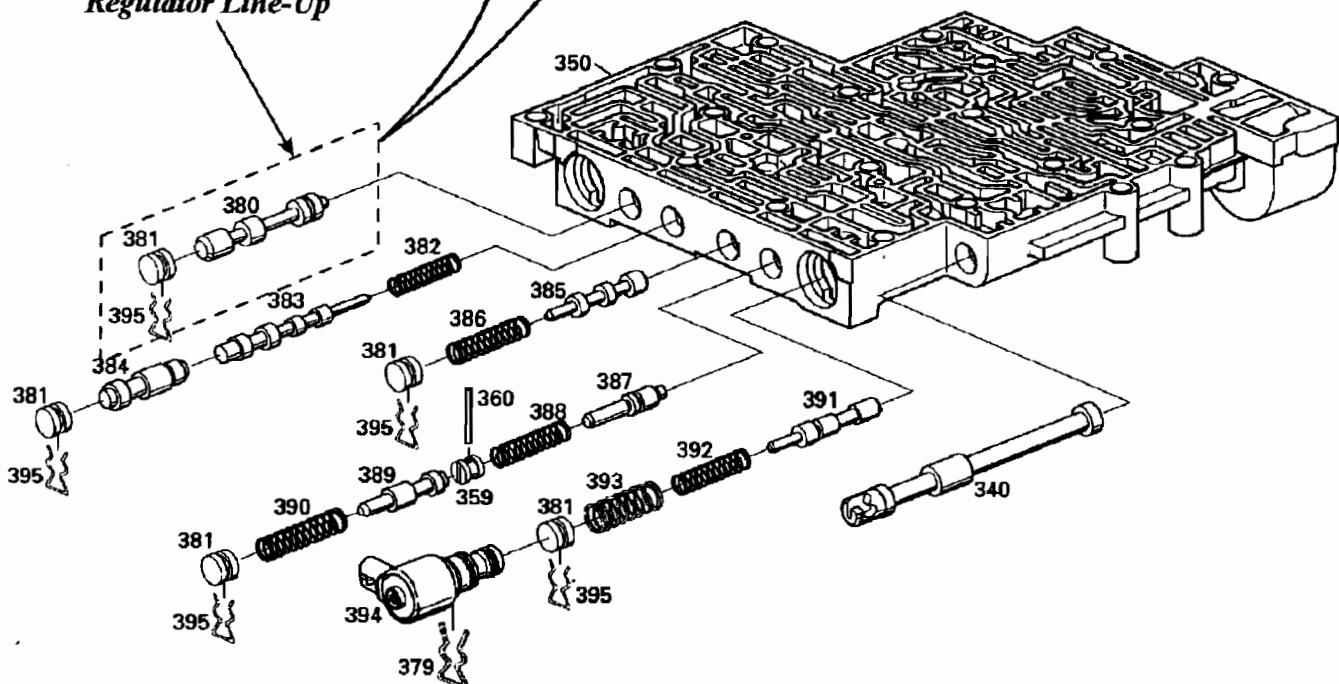
1998-Up Models, The TCC Regulator Valve is .440" in diameter, which is the same diameter as the Isolater Valve, and is **not recommended** for the earlier models.

**1993-1994 NON-PWM MODELS ONLY
ASSEMBLY PROCEDURE**

**Sonnax kit for 93-94 NON-PWM Models:
Install Isolator Valve as shown below
and use OEM retaining clip.**



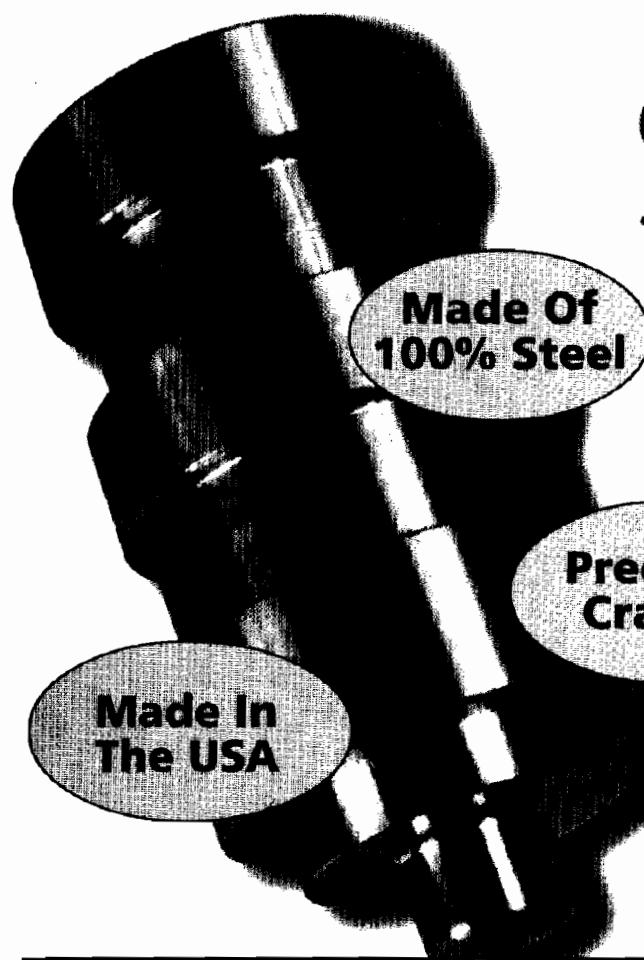
**Converter Clutch
Regulator Line-Up**



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Figure 1

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Crafted

Made In
The USA

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THE 700-R4
STEEL SERIES REPLACEMENT
BOOST VALVE & SLEEVE (.471)
Part # K022



THE 4L60-E
STEEL SERIES REPLACEMENT
BOOST VALVE & SLEEVE
Part # K021



THE E40D
STEEL SERIES REPLACEMENT
BOOST VALVE & SLEEVE
Part # K024



THE AOD-E
STEEL SERIES REPLACEMENT
BOOST VALVE & SLEEVE
Part # K026



THE C-6
STEEL SERIES REPLACEMENT
BOOST VALVE & SLEEVE
Part # K028



THE AXOD
STEEL SERIES REPLACEMENT
BOOST VALVE & SLEEVE
Part # K009, Also For AXOD-E, AX4S & AX4N

THE 700 LOW-REVERSE STEEL SERIES REPLACEMENT BOOST VALVE & SLEEVE (Part #K020)

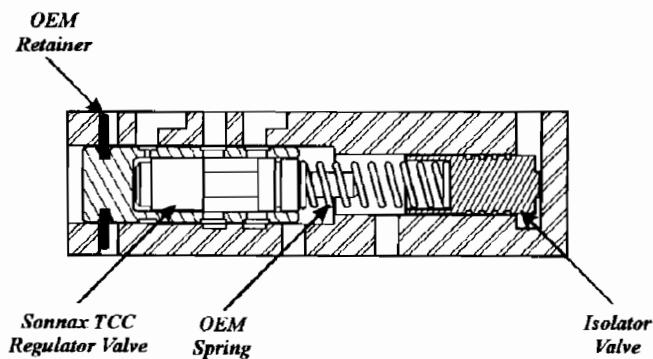
- Holds manual low to a higher road speed
- Able to pull down to manual low at a higher road speed
- Creates greater line pressure in manual low and 2nd



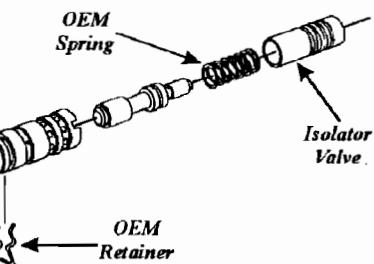
SUPERIOR

800-451-3115

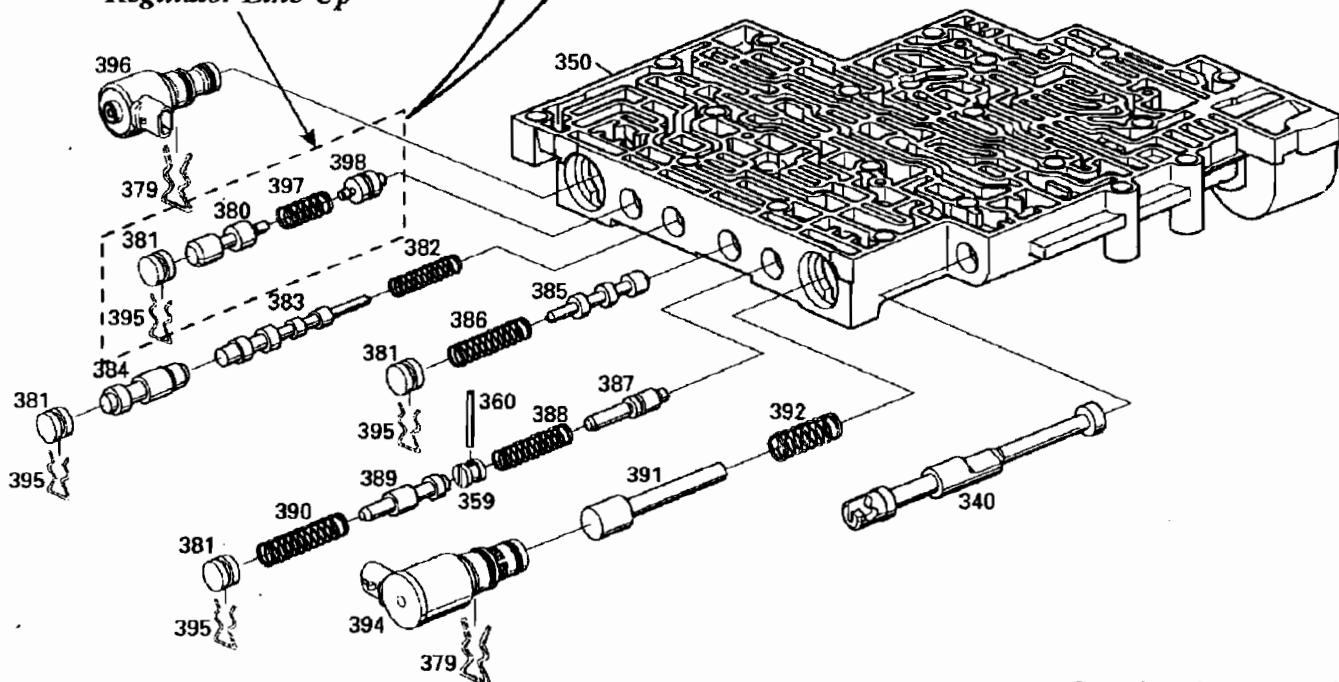
**1995-1997 PWM MODELS ONLY
ASSEMBLY PROCEDURE**



**Sonnax kit for 1995-1997 PWM Models:
Install Isolator Valve as shown below
and use OEM spring and clip.**

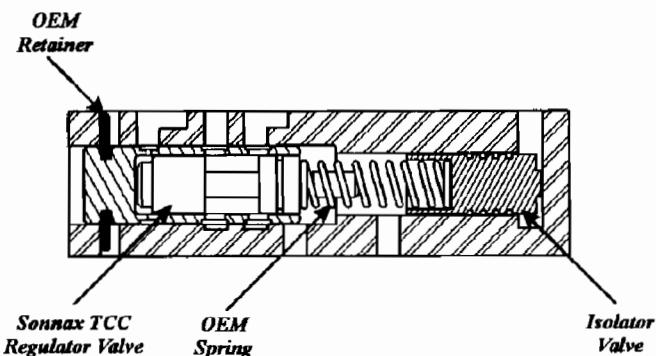


**Converter Clutch
Regulator Line-Up**

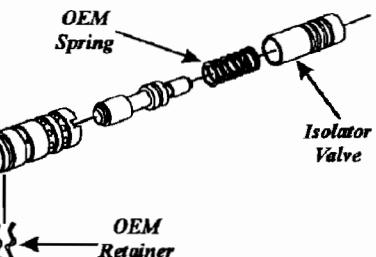


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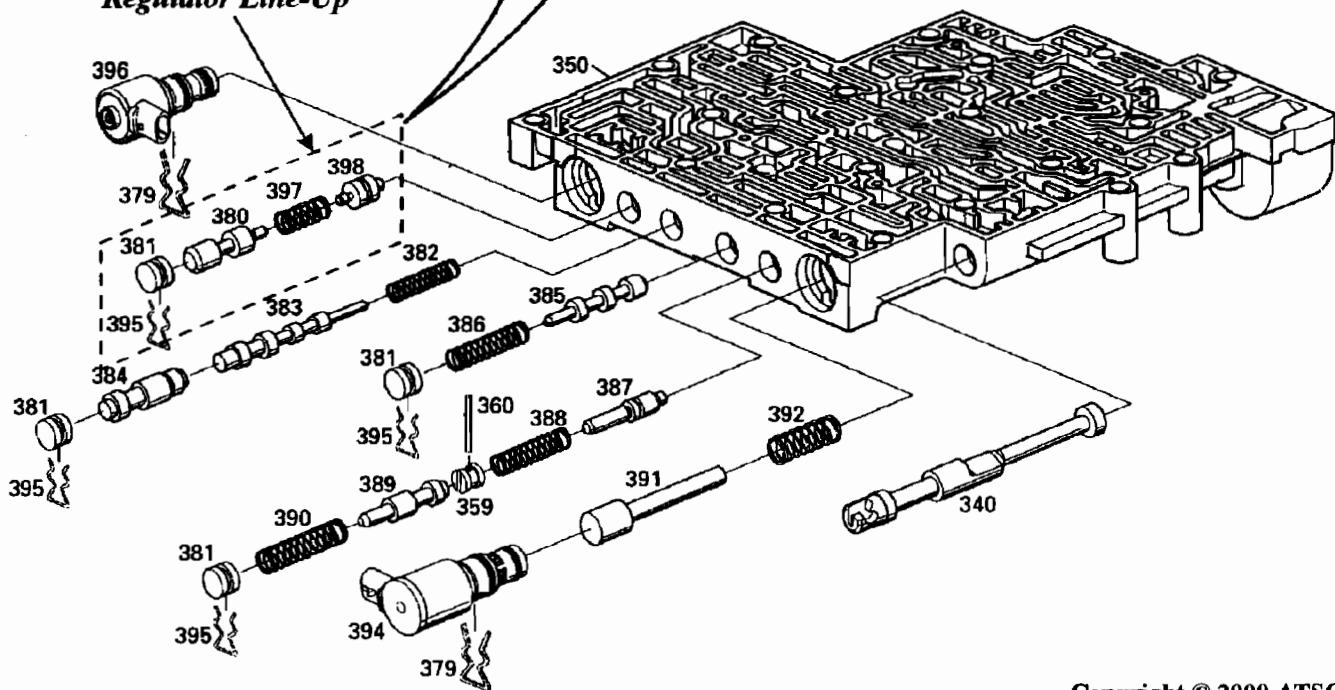
Figure 2

**1998-UP ECCC MODELS ONLY
ASSEMBLY PROCEDURE**

Sonnax kit for 1998-UP ECCC Models:
Install Isolator Valve as shown below
and use OEM spring and clip.



*Converter Clutch
Regulator Line-Up*



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Figure 3

**TORQUE CONVERTER IDENTIFICATION FOR
298mm AND 300mm CONVERTERS ONLY.**

<i>ID Code "3rd" Digit</i>	<i>Type Of Lining On Plate</i>
"G", "H", "L"	<i>"Smooth" Black Carbon Fiber</i>
"N", "P"	<i>"Woven" Carbon Fiber (ECCC)</i>

This is the latest information available at time of printing, and may be updated!

THM 4L60-E CHANGE IN BELLHOUSINGS FOR THE 1998 MODEL YEAR

CHANGE: Beginning in the 1998 model year, General Motors added a new design "Bolt-On" bellhousing that is approximately 1/2" deeper than the previous design. The best identification is the added bolt hole at the top of the bellhousing, as shown in Figure 1. The new design bellhousing is designed to accommodate a new 300mm torque converter, and in the 1998 model year was used only in the Firebird and Camaro. All other models in 1998 used the 298mm converter which required the bellhousing shown in Figure 2. Currently the 300mm converter is used in **many** more models.

REASON: To accommodate the new 300mm torque converter.

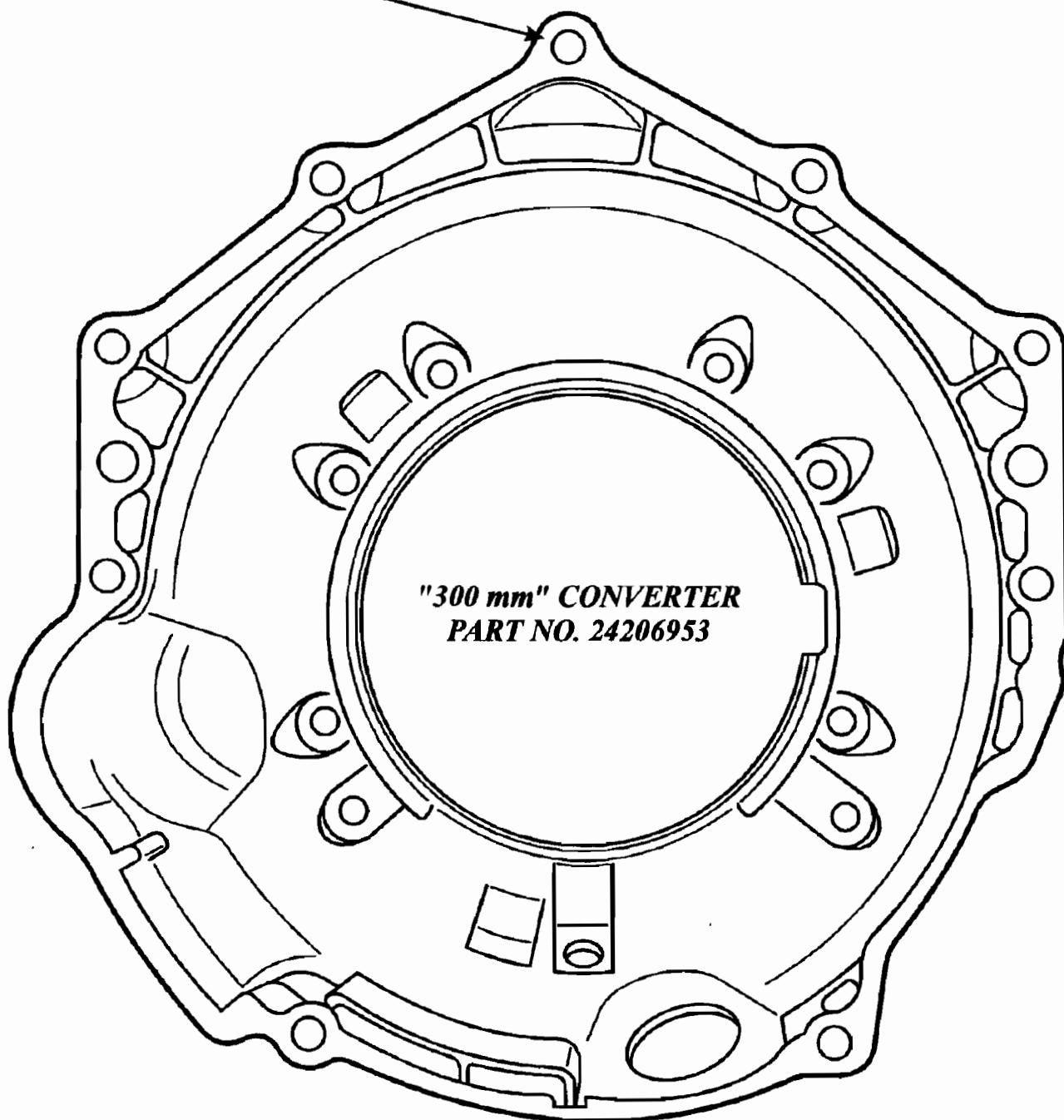
PARTS AFFECTED:

- (1) BELL HOUSING - Now has an added hole at the top of the bellhousing and is approximately 1/2" deeper to accommodate the new 300mm torque converter (See Figure 1).
- (2) PUMP COVER - Now requires a stator shaft that is approximately 1/2" longer to accommodate the new 300mm torque converter (See Figure 3).
- (3) TURBINE SHAFT - Now is longer and has the "O" ring behind the splines, as illustrated in Figure 3, to accommodate the new 300mm torque converter.

INTERCHANGEABILITY:

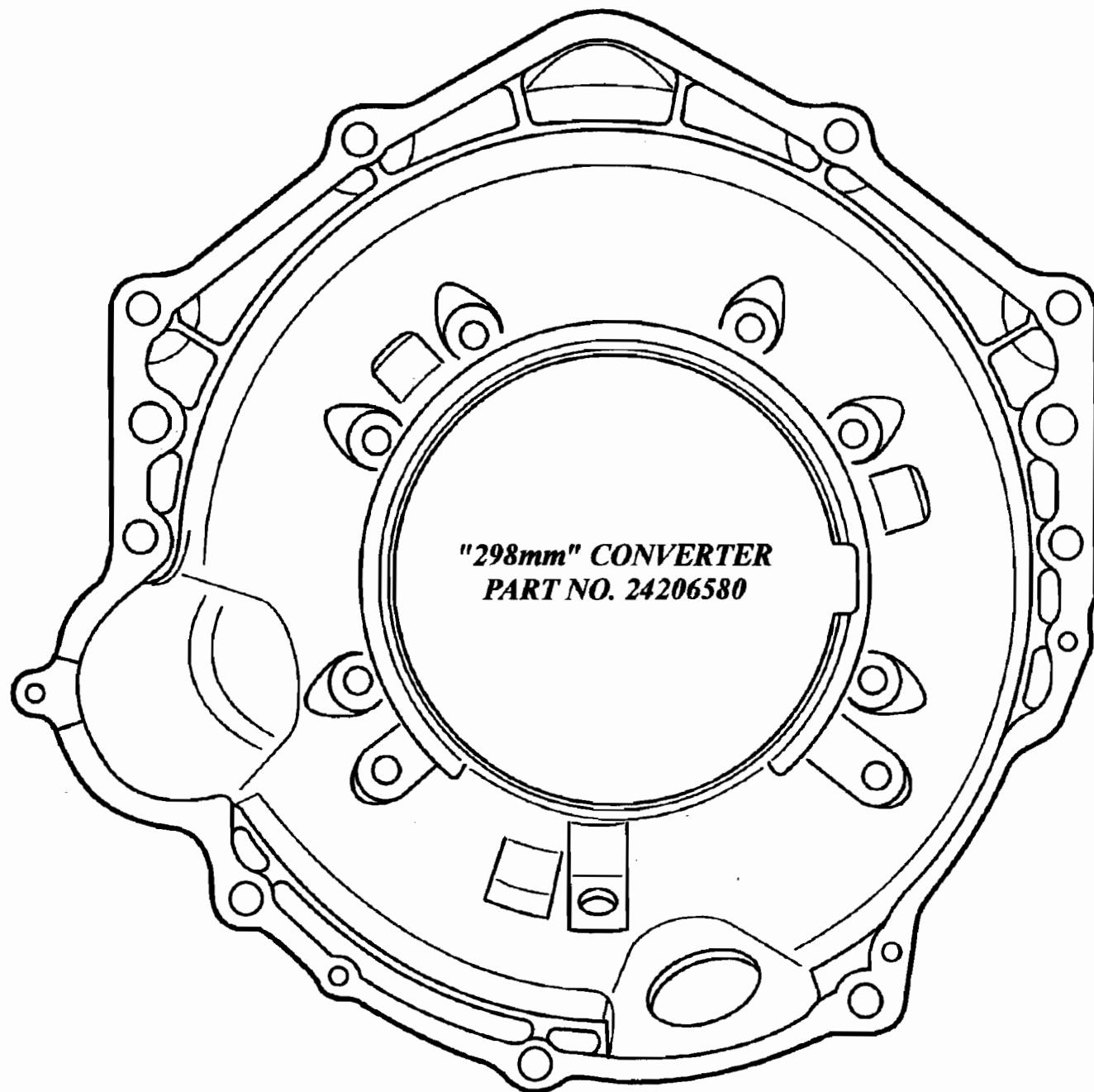
None of the parts listed above will interchange with previous design parts and the 300mm torque converter must be used in the models they were intended, and 298mm torque converters must be used in the models they were intended for.

ADDED BOLT HOLE AND
IS APPROX. 1/2" DEEPER



This style bellhousing and the 300mm torque converter also require a new design turbine shaft and stator shaft that are approximately 1/2" longer than the 298mm torque converter models.

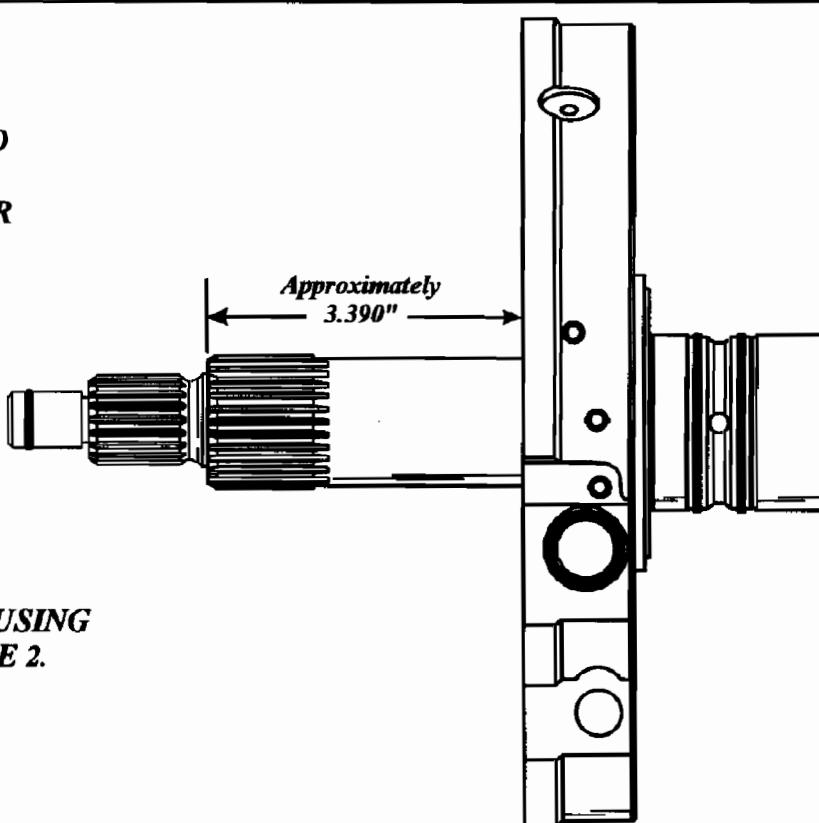
REFER TO FIGURE 3



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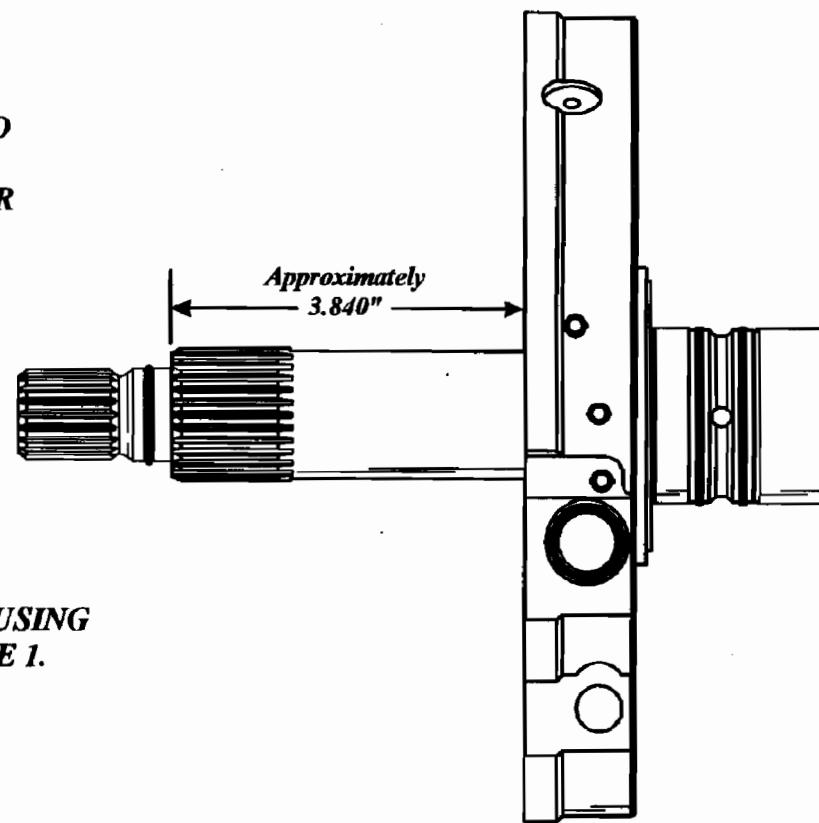
Figure 2

**TURBINE SHAFT AND
PUMP COVER FOR
"298mm" CONVERTER**



**REQUIRES BELL HOUSING
SHOWN IN FIGURE 2.**

**TURBINE SHAFT AND
PUMP COVER FOR
"300mm" CONVERTER**



**REQUIRES BELL HOUSING
SHOWN IN FIGURE 1.**

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Figure 3

GM TRUCKS AND VANS WITH 4L80E TRANSMISSION**SHIFT SHUTTLE**

COMPLAINT: After initial take-off a 1-2-2-1 shift shuttle occurs and continues up to approximately 12 mph, then shifts to third and fourth gears.

When throttle was increased to more than 50%, a 3-4-4-3, or a 2-3-3-2 shift shuttle occurred. Gear ratio error codes 85 and 87 were stored and the gear ratio in third and fourth gear was 1.66, it should have been 1.00.

CAUSE: The input and output speed sensor connectors have been switched.

CORRECTION: Make certain the connector plugged into the input speed sensor contains the *Dark Blue/White* and the *Gray/Red* wires, and the connector plugged into the output shaft speed sensor contains the *Light Green/Black* and the *Purple/White* wires on all models EXCEPT "P" series which are *Light Blue* and *Dark Green/Yellow* wires. (Refer to Figure 1)

NOTE: 1993 and earlier 4X4 vehicles will have a third speed sensor in the transfer case, the connector plugged into this speed sensor contains the *Light Blue* and the *Dark Green/Yellow* wires.

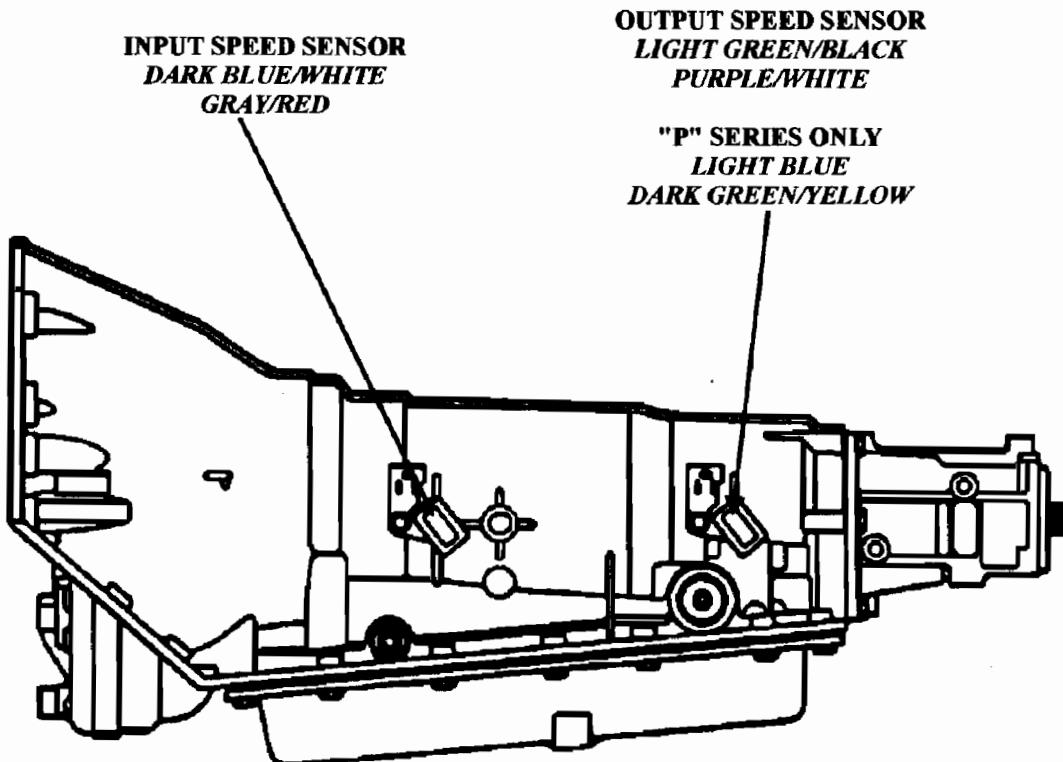


Figure 1



GM TRUCKS AND VANS WITH 4L80E TRANSMISSION

GEAR RATIO ERROR

COMPLAINT: Line pressure is at maximum, codes 85, P0730 or P1871 for an undefined gear ratio error are stored.

When viewing the data list on the scan tool, the first gear ratio parameter indicates zero, the second gear ratio parameter indicates 2.48 which is a first gear ratio. In third gear a 1.09 gear ratio is indicated, which is higher than it should be, and input and output rpm were *NOT* the same. The fourth gear ratio parameter indicated 0.78, which is higher than it should be. Refer to the chart in figure 1 for the correct gear ratio in each gear.

CAUSE: An output carrier without a speed sensor excitor ring was installed in a transmission intended for a vehicle that requires one, *HOWEVER, the output shaft speed sensor is close enough to the output carrier park lugs which creates enough of a signal to cause the erratic gear ratios.* (Refer to Figure 2)

CORRECTION: If the vehicle system being serviced requires a functional output shaft speed sensor, be sure to install an output carrier that has a speed sensor excitor ring when output carrier replacement is necessary.

SERVICE INFORMATION:

With the start of production for the 1994 model year, all "K" (4X4) Trucks had the output shaft speed sensor function eliminated. As a result of this action, the output carrier installed in this vehicle application had the output carrier speed sensor excitor ring eliminated as well.

1993 and earlier "K", "V" and *ALL* two wheel drive applications require a functional output shaft speed sensor and therefore, also require an output carrier *WITH* a speed sensor excitor ring.

GM TRUCKS AND VANS WITH 4L80E TRANSMISSION**GEAR RATIO ERROR****4L80E GEAR RATIO CHART**

GEAR	GEAR RATIO
1st	2.48
2nd	1.48
3rd	1.00
4th	0.75

Figure 1

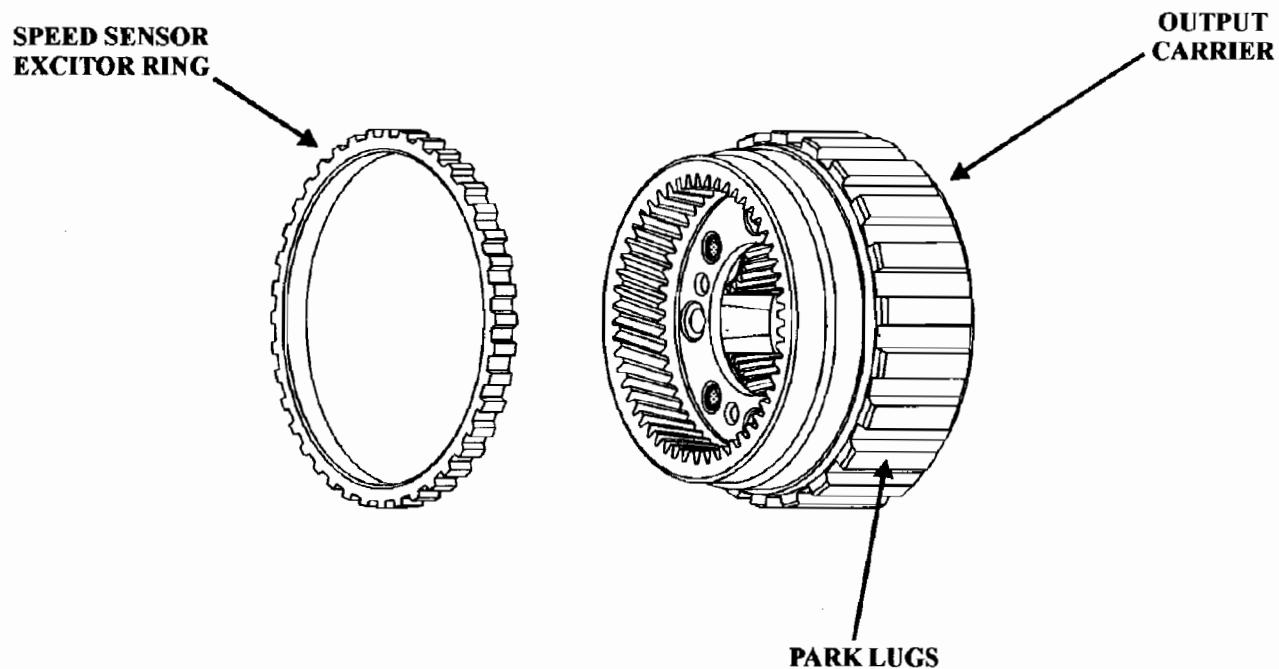
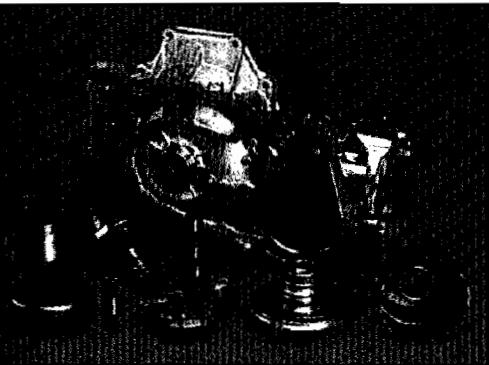


Figure 2



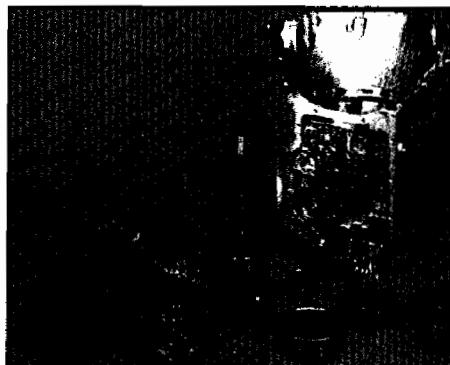
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GM TRUCKS & VANS WITH GASOLINE ENGINES**HIGH LINE PRESSURE & CODE 43**

COMPLAINT: Harsh engagements and shifts with code 43 stored for a Knock Sensor circuit malfunction.

CAUSE: The problem usually begins with the knock sensor wire having melted because the engine wiring harness was disturbed and because the knock sensor being so close to the exhaust manifold, (Refer to figure 1) the knock sensor wire leans against the exhaust manifold and burns it through. As a result of the wire damage the knock sensor is damaged and requires replacement. After repair of the wire and knock sensor replacement, the high line pressure and code 43 still exist. The problem is, a knock sensor that belongs with a **DUAL KNOCK SENSOR** application was mistakenly installed into an engine that requires a knock sensor for a **SINGLE KNOCK SENSOR** application.

CORRECTION: A knock sensor meant for a single sensor application contains a 3900 Ohm resistor, while a knock sensor meant for a dual sensor application contains an 8200 Ohm resistor. (See figure 2)

These two sensors are NOT interchangeable!

SERVICE INFORMATION:

<i>Single System Knock Sensor.....</i>	<i>10456549</i>
<i>Dual System Knock Sensor.....</i>	<i>10456146</i>

Many thanks to John Parmenter, Lee Myles Transmission, Centereach, N.Y.

GM TRUCKS & VANS WITH GASOLINE ENGINES
HIGH LINE PRESSURE & CODE 43

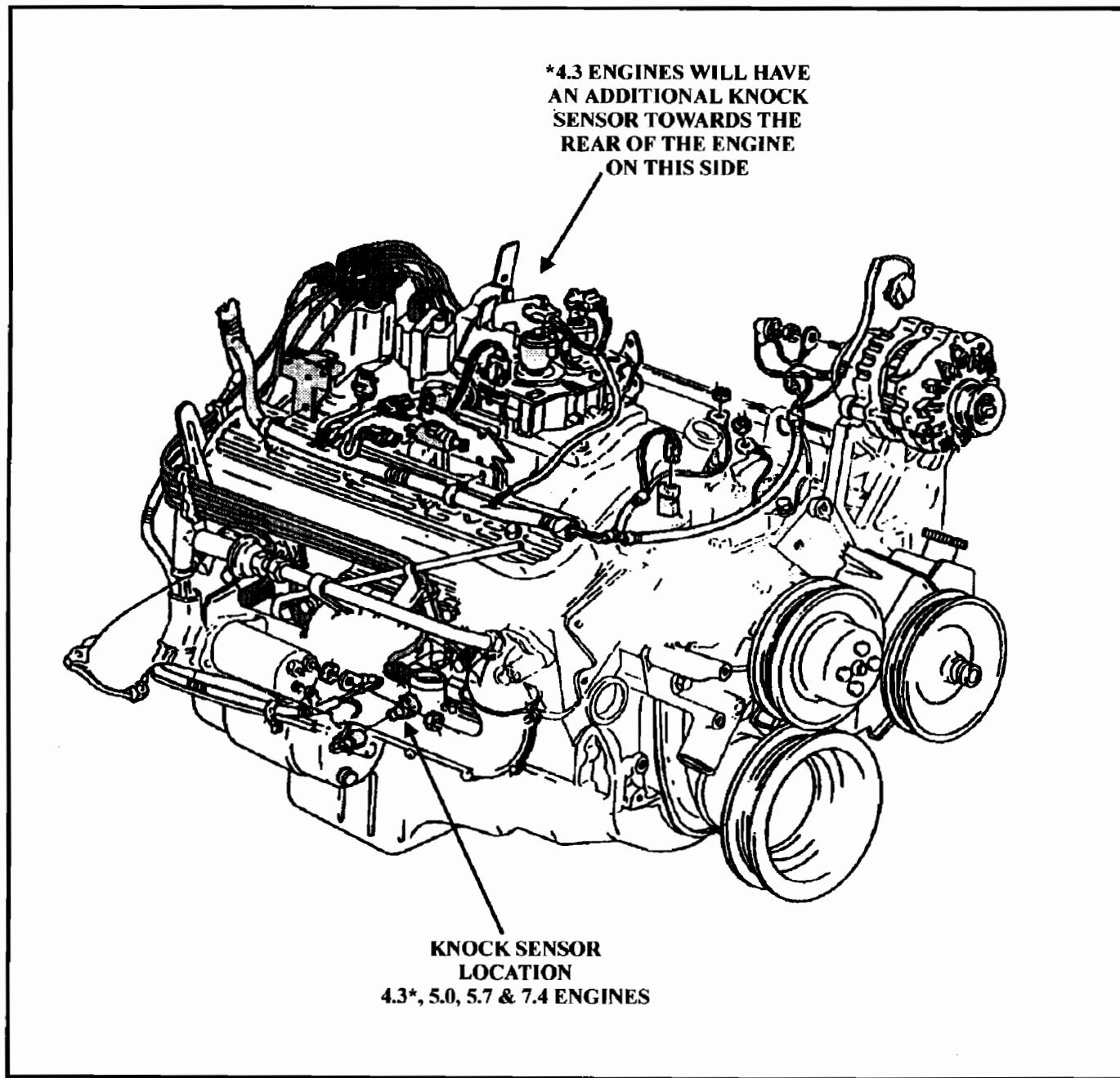


Figure 1

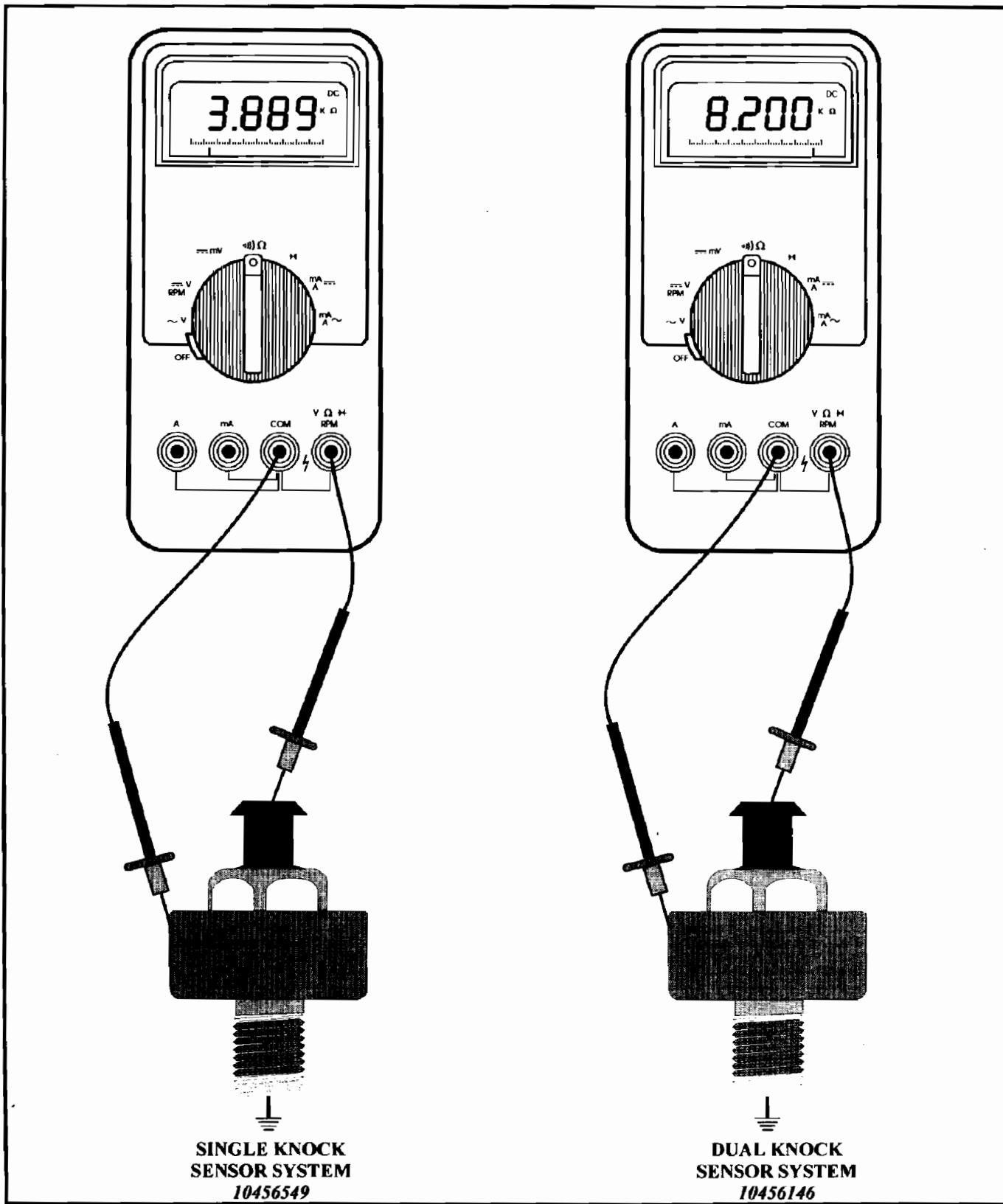
**GM TRUCKS & VANS WITH GASOLINE ENGINES
HIGH LINE PRESSURE & CODE 43**

Figure 2
Automatic Transmission Service Group



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UPDATED INFORMATION 1997-1999 THM 4T60-E GEAR RATIOS

1997 THM 4T60-E MODELS

TRANSAXLE MODEL CODE	ENGINE/BODY	FINAL DRIVE RATIO/ROTOR	SPROCKETS DRIVE/DRIVEN	STALL SPEED
7ACW	3800 C/H - BODY	306/30	35/35	1897
7AFW	3.1L W - BODY	333/30	35/35	2095
7AHW		* 329/30	35/35	
7ASW	3800 C/H - BODY	* 286/30	35/35	1420
7AWW		* 329/30	35/35	
7BSW	3.1L N - BODY	* 329/30	37/33	1630
7BXW		306/30	35/35	
7CUW		* 305/30	33/37	
7HBW	3800 W - BODY	* 305/30	35/35	1897
7YAW		* 329/30	35/35	

1998 THM 4T60-E MODELS

8AHW		* 329/30	35/35	
8BSW	3.1L N - BODY	* 329/30	37/33	1630
8CUW		* 305/30	33/37	
8DKW		* 329/30	35/35	

1999 THM 4T60-E MODELS

9AHW		* 329/30	35/35	

TORQUE CONVERTER IDENTIFICATION FOR 245mm CONVERTERS ONLY

ID Code "3rd" Digit	Type Of Lining On Plate
"9", "D", "L"	"Cellulose" Paper Lining
"A", "B"	"Smooth" Black Carbon Fiber
"H", "F"	"Woven" Carbon Fiber (ECCC)

This is the latest information available at time of printing, and may be updated!

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THM 4T60-E**1-2 AND 2-3 ACCUMULATOR SPRING IDENTIFICATION
AND PROPER ASSEMBLY PROCEDURE**

Since the introduction of the 4T60-E transaxle in 1991, there have been three different design levels of the 1-2 Accumulator Piston used, and some of them are installed in different directions. The 2-3 Accumulator Piston has been the same through out the same period. Refer to Figure 1 for the three different design levels of the 1-2 Accumulator Piston and their part numbers.

The accumulator spring charts used in this information have been prepared using the "Broadcast Code" off of the identification tag on the transaxle, and is mandatory information for these charts to be accurate. The information below will refer you to a Chart number for component identification, and a Figure number for the proper assembly procedure based on the OEM transaxle identification code.

I.D. Codes 1A7W, 1AYW, 2A7W, 2AYW,

Use Chart Number 1 for component identification and Figure 3 for proper assembly procedure.

I.D. Codes 1BTW, 1CWW, 1YMW, 1YPW, 1YZW,

2B1W, 2B2W, 2BTW, 2BYW, 2C1W, 2C2W, 2C3W, 2C4W, 2C5W, 2C6W, 2CLW, 2CTW,

2CWW, 2CXW, 2CZW, 2P1W, 2PHW, 2W1W, 2WAW, 2Y1W, 2Y2W, 2Y4W, 2YLW, 2YMW,

2YXW,

3B1W, 3B2W, 3BTW, 3BYW, 3C1W, 3C2W, 3C3W, 3C4W, 3CSW, 3CLW, 3CMW, 3CSW,

3CTW, 3CWW, 3CXW, 3CZW, 3P1W, 3PHW, 3W1W, 3WAW, 3Y1W, 3Y2W, 3Y3W, 3YLW,

3YMW, 3YRW, 3YZW,

4PBW,

5A1W, 5ACW, 5B2W, 5B3W, 5BKW, 5BXW, 5C1W, 5CAW, 5PBW,

Use Chart Number 2 for component identification and Figure 2 for proper assembly procedure.

I.D. Codes 1A2W, 1AMW,

2A1W, 2A2W, 2A3W, 2A5W, 2A8W,

3ABW, 3AMW, 3ANW, 3AQW, 3AVW, 3AZW,

Use Chart Number 3 for component identification and Figure 3 for proper assembly procedure.

I.D. Codes 1A4W, 1APW,

2A4W, 2A6W,

3APW, 3AWW,

Use Chart Number 4 for component identification and Figure 3 for proper assembly procedure.

Continued on next Page.

I.D. Codes 3BHW, 4AFW, 5AFW,
Use Chart Number 5 for component identification and Figure 3 for proper assembly procedure.

I.D. Codes 4ATW, 5ATW,
Use Chart Number 6 for component identification and Figure 3 for proper assembly procedure.

**I.D. Codes 4YMW,
5Y3W, 5YMW, 5YQW,
7AWW,**
Use Chart Number 7 for component identification and Figure 4 for proper assembly procedure.

**I.D. Codes 4BLW, 4KUW, 4P1W, 4PFW, 4PMW, 4W1W, 4WAW, 4YZW,
5BLW, 5KUW, 5PMW, 5Y4W, 5YZW,**
Use Chart Number 8 for component identification and Figure 2 for proper assembly procedure.

**I.D. Codes 4KHW, 4YCW,
5B1W, 5BFW, 5Y1W, 5Y2W, 5YDW, 5YNW,
6CTW, 6YLW, 6YRW,**
Use Chart Number 9 for component identification and Figure 2 for proper assembly procedure.

I.D. Codes 4CWW,
Use Chart Number 10 for component identification and Figure 2 for proper assembly procedure.

**I.D. Codes 4PAW, 4WSW,
5WFW,
6BSW, 6WFW,**
Use Chart Number 11 for component identification and Figure 2 for proper assembly procedure.

**I.D. Codes 4CLW, 4PHW,
5PCW,
6CUW,
7CUW,
8BSW, 8CUW,**
Use Chart Number 12 for component identification and Figure 2 for proper assembly procedure.

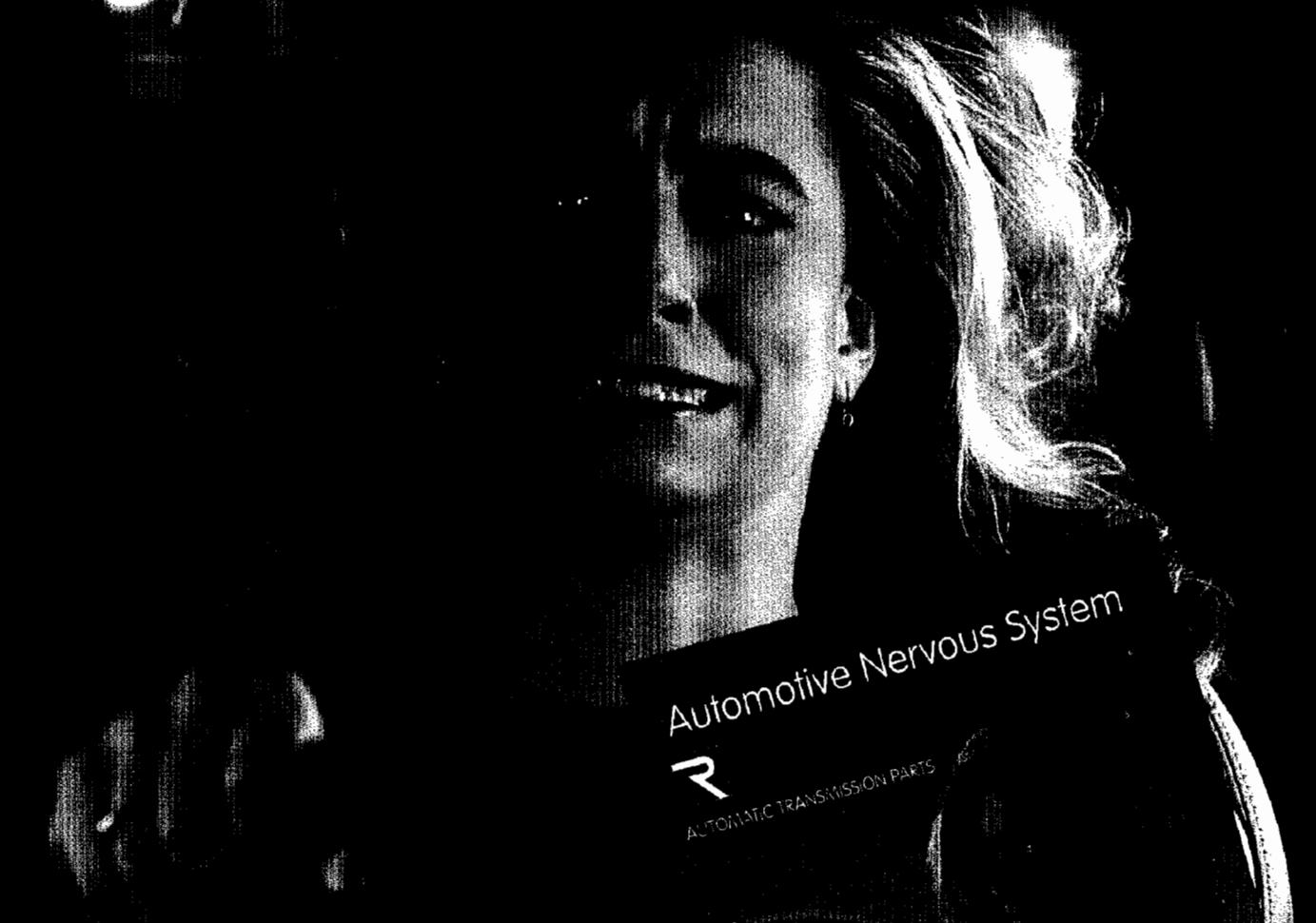
I.D. Codes 4CMW,
Use Chart Number 13 for component identification and Figure 4 for proper assembly procedure.

**I.D. Codes 4AJW,
5AJW,**
Use Chart Number 14 for component identification and Figure 4 for proper assembly procedure.

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I.D. Codes 5A2W, 5AQW, 5ASW,
Use Chart Number 15 for component identification and Figure 4 for proper assembly procedure.

I.D. Codes 5PAW,
Use Chart Number 16 for component identification and Figure 2 for proper assembly procedure.

I.D. Codes 6AFW,
Use Chart Number 17 for component identification and Figure 3 for proper assembly procedure.

I.D. Codes 6PBW,
Use Chart Number 18 for component identification and Figure 4 for proper assembly procedure.

I.D. Codes 6ACW, 6ASW, 6BXW, 6CAW, 6HBW, 6QSW,
7ACW, 7ASW, 7BXW, 7HBW,
Use Chart Number 19 for component identification and Figure 4 for proper assembly procedure.

I.D. Codes 6PAW,
Use Chart Number 20 for component identification and Figure 4 for proper assembly procedure.

I.D. Codes 6PKW,
7YAW,
Use Chart Number 21 for component identification and Figure 4 for proper assembly procedure.

I.D. Codes 7AFW, 7AHW,
Use Chart Number 22 for component identification and Figure 3 for proper assembly procedure.

I.D. Codes 7BSW,
Use Chart Number 23 for component identification and Figure 2 for proper assembly procedure.

I.D. Codes 8AHW,
9AHW,
Use Chart Number 24 for component identification and Figure 3 for proper assembly procedure.

I.D. Codes 8DKW,
Use Chart Number 25 for component identification and Figure 2 for proper assembly procedure.

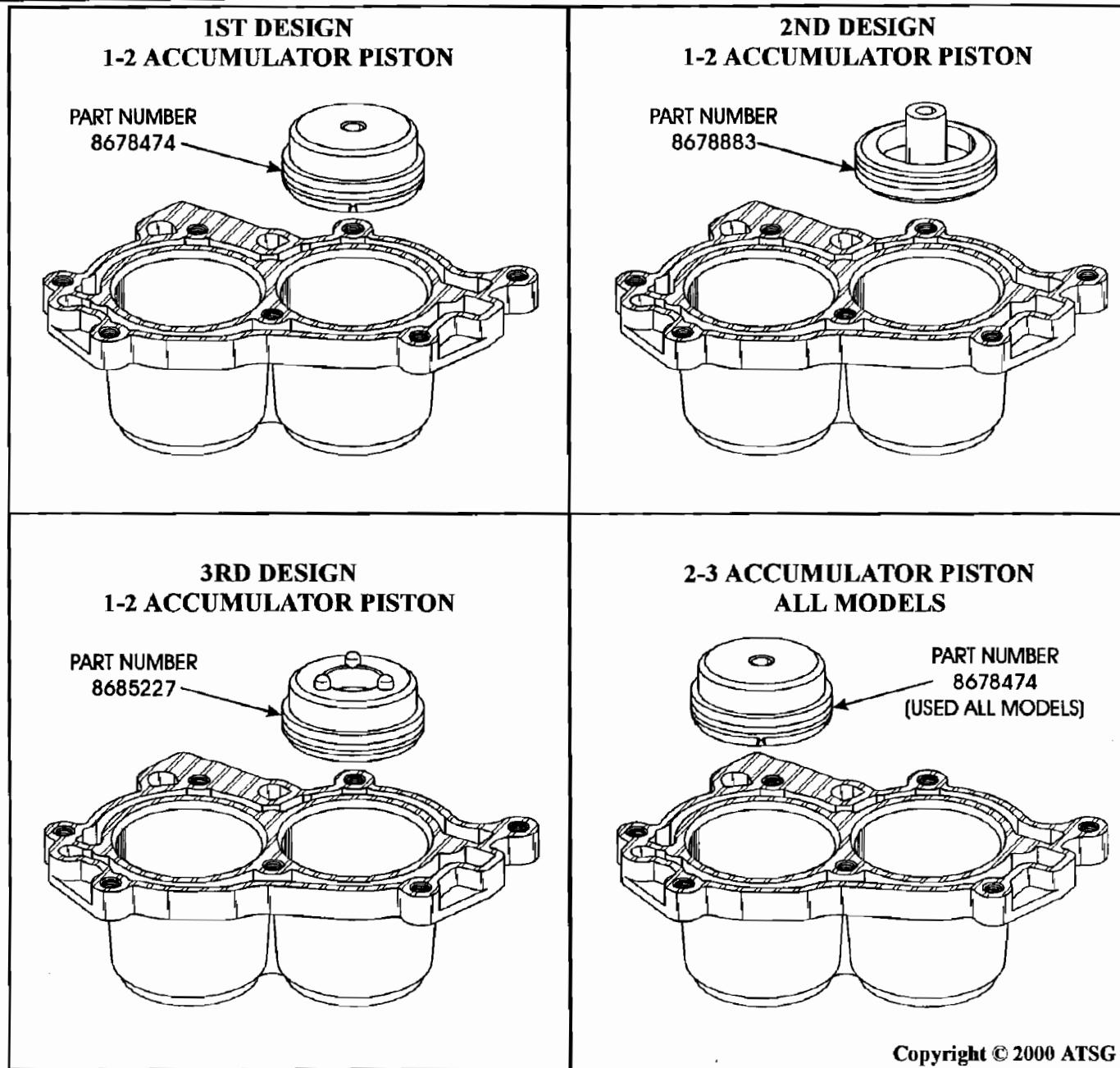


Figure 1

CHART NUMBER 1 (Assembly Number 8681206)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8679540	Lt Blue/Violet Or Pink/Violet
1-2 Accum. Inner Spring	8677661	Lt Green/Orange
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678883	Goes In Upside Down
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	None Used	None Used
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"2ND DESIGN" Use Figure 3 For Assembly Procedure

CHART NUMBER 2 (Assembly Number 8681209)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8649091	No Color Or Orange
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678474	Same As 2-3 Accum Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"1ST DESIGN" Use Figure 2 For Assembly Procedure



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CHART NUMBER 3 (Assembly Number 8681211)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8679540	Lt Blue/Violet Or Pink/Violet
1-2 Accum. Inner Spring	8651774	White
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678883	Goes In Upside Down
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"2ND DESIGN" Use Figure 3 For Assembly Procedure

CHART NUMBER 4 (Assembly Number 8681212)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8677427	Lt Blue/Dark Blue
1-2 Accum. Inner Spring	8651774	White
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678883	Goes In Upside Down
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"2ND DESIGN" Use Figure 3 For Assembly Procedure

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"2001" SEMINAR INFORMATION

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CHART NUMBER 5 (Assembly Number 8686138)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8682700	No Color
1-2 Accum. Inner Spring	8668631	Lt Green
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678883	Goes In Upside Down
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"2ND DESIGN" Use Figure 3 For Assembly Procedure

CHART NUMBER 6 (Assembly Number 8685217)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8679540	Lt Blue/Violet Or Pink/Violet
1-2 Accum. Inner Spring	8651774	White
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678883	Goes In Upside Down
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8685219	White/Pink
2-3 Accum. Inner Spring	8685218	White/Dk Blue
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"2ND DESIGN" Use Figure 3 For Assembly Procedure

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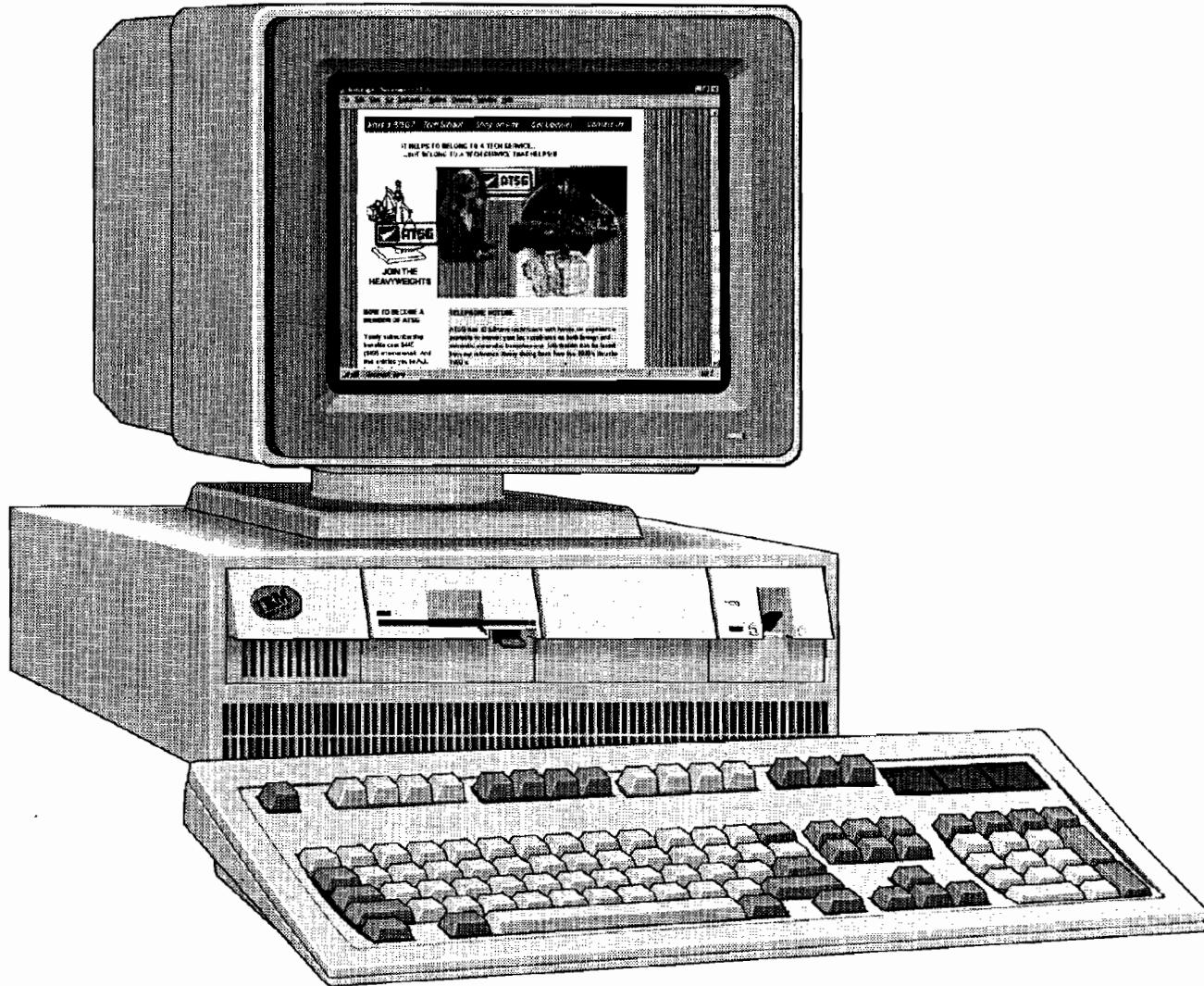


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CHART NUMBER 7 (Assembly Number 8685505)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8649091	No Color Or Orange
1-2 Accum Cushion Spring & Retainer	8685229	On Top Of Piston, Retainer Up
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8685227	"Bumps" On Top
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"3RD DESIGN" Use Figure 4 For Assembly Procedure

CHART NUMBER 8 (Assembly Number 8683186)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8649091	No Color Or Orange
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678474	Same As 2-3 Accum Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8649091	No Color Or Orange
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"1ST DESIGN" Use Figure 2 For Assembly Procedure

CHART NUMBER 9 (Assembly Number 8685648)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8649091	No Color Or Orange
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678474	Same As 2-3 Accum Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8685219	White/Pink
2-3 Accum. Inner Spring	8685218	White/Dk Blue
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"1ST DESIGN" Use Figure 2 For Assembly Procedure**CHART NUMBER 10 (Assembly Number 8683576)**

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8682513	Dark Green
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678474	Same As 2-3 Accum Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"1ST DESIGN" Use Figure 2 For Assembly Procedure



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CHART NUMBER 11 (Assembly Number 8685427)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8682513	Dark Green
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678474	Same As 2-3 Accum Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8677661	Lt Green/Orange
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"1ST DESIGN" Use Figure 2 For Assembly Procedure

CHART NUMBER 12 (Assembly Number 8685444)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8646400	White/Red
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678474	Same As 2-3 Accum Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"1ST DESIGN" Use Figure 2 For Assembly Procedure

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CHART NUMBER 13 (Assembly Number 24200236)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8682513	Dark Green
1-2 Accum Cushion Spring & Retainer	24200220	Top Of Piston, Retainer Up
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8685227	"Bumps" On Top Of Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"3RD DESIGN" Use Figure 4 For Assembly Procedure

CHART NUMBER 14 (Assembly Number 24200572)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8646400	White/Red
1-2 Accum Cushion Spring & Retainer	8685229	Top Of Piston, Retainer Up
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8685227	"Bumps" On Top Of Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8677661	Lt Green/Orange
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"3RD DESIGN" Use Figure 4 For Assembly Procedure

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CHART NUMBER 15 (Assembly Number 24201826)

Part Name	Part Number	Identification
<i>Accumulator Housing</i>	8677163	<i>Used On All Models</i>
<i>1-2 Accum. Outer Spring</i>	8649091	<i>No Color Or Orange</i>
<i>1-2 Accum Cushion Spring & Retainer</i>	24200220	<i>Top Of Piston, Retainer Up</i>
<i>1-2 Accum. Inner Spring</i>	<i>None Used</i>	<i>None Used</i>
<i>Accumulator Piston Seals</i>	8678473	<i>2 Required</i>
<i>1-2 Accum. Piston</i>	8685227	<i>"Bumps" On Top Of Piston</i>
<i>Accumulator Piston Pins</i>	8644298	<i>2 Required</i>
<i>2-3 Accum. Outer Spring</i>	8649091	<i>No Color Or Orange</i>
<i>2-3 Accum. Inner Spring</i>	8685218	<i>White/Dk Blue</i>
<i>2-3 Accum. Piston</i>	8678474	<i>Used On All Models</i>
<i>Spacer Plate And Gasket Assem.</i>	8682085	<i>Used On All Models</i>
<i>Accumulator Cover</i>	8651533	<i>Used On All Models</i>
<i>Accumulator Cover Bolts</i>	8651722	<i>Used On All Models</i>

"3RD DESIGN" Use Figure 4 For Assembly Procedure**CHART NUMBER 16 (Assembly Number 24201454)**

Part Name	Part Number	Identification
<i>Accumulator Housing</i>	8677163	<i>Used On All Models</i>
<i>1-2 Accum. Outer Spring</i>	8649091	<i>No Color Or Orange</i>
<i>1-2 Accum. Inner Spring</i>	<i>None Used</i>	<i>None Used</i>
<i>Accumulator Piston Seals</i>	8678473	<i>2 Required</i>
<i>1-2 Accum. Piston</i>	8678474	<i>Same As 2-3 Accum Piston</i>
<i>Accumulator Piston Pins</i>	8644298	<i>2 Required</i>
<i>2-3 Accum. Outer Spring</i>	8668487	<i>White/Lt Green</i>
<i>2-3 Accum. Inner Spring</i>	8677661	<i>Lt Green/Orange</i>
<i>2-3 Accum. Piston</i>	8678474	<i>Used On All Models</i>
<i>Spacer Plate And Gasket Assem.</i>	8682085	<i>Used On All Models</i>
<i>Accumulator Cover</i>	8651533	<i>Used On All Models</i>
<i>Accumulator Cover Bolts</i>	8651722	<i>Used On All Models</i>

"1ST DESIGN" Use Figure 2 For Assembly Procedure

CHART NUMBER 17 (Assembly Number 24204014)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8682700	No Color
1-2 Accum. Inner Spring	8668631	Lt Green
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678883	Goes In Upside Down
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8651774	White
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"2ND DESIGN" Use Figure 3 For Assembly Procedure**CHART NUMBER 18 (Assembly Number 24204313)**

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8668487	White/Lt Green
1-2 Accum Cushion Spring & Retainer	8685229	Top Of Piston, Retainer Up
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8685227	"Bumps" On Top Of Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8685219	White/Pink
2-3 Accum. Inner Spring	8685218	White/Dk Blue
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"3RD DESIGN" Use Figure 4 For Assembly Procedure

CHART NUMBER 19 (Assembly Number 24204045)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8682513	Dark Green
1-2 Accum Cushion Spring & Retainer	8685229	Top Of Piston, Retainer Up
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8685227	"Bumps" On Top Of Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8649091	No Color Or Orange
2-3 Accum. Inner Spring	8685218	White/Dk Blue
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"3RD DESIGN" Use Figure 4 For Assembly Procedure**CHART NUMBER 20 (Assembly Number 24203618)**

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8649091	No Color Or Orange
1-2 Accum Cushion Spring & Retainer	8685229	Top Of Piston, Retainer Up
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8685227	"Bumps" On Top Of Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8677661	Lt Green/Orange
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"3RD DESIGN" Use Figure 4 For Assembly Procedure

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CHEVROLET GM THM

THM 125

THM 200, 200C

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4T60E	84754-12K & 17K

THM 350

THM 400

4L60	34910-03K
4L60E	77917-06

4L80E

FORD

C6

E4OD	36424-01K
A4LD	56947-02K & 04K

4R44E, 4R55E

AXOD

AXODE

AX4N, AX4S

AOD

AODE, 4R70W

ATX

CD4E

A904/A500

A727/A518

A618

A404, A413,

A470, A670

A604

92835-07

MAZDA

G4A-EL

GF4A-EL

MITSUBISHI

KM four speeds

41750-03 (Manual Valve)

JATCO

L4N71B

TOYOTA

A130

A131

A132(L)

A540

OTHER

ZF4HP14

85991-01 (PR Valve)

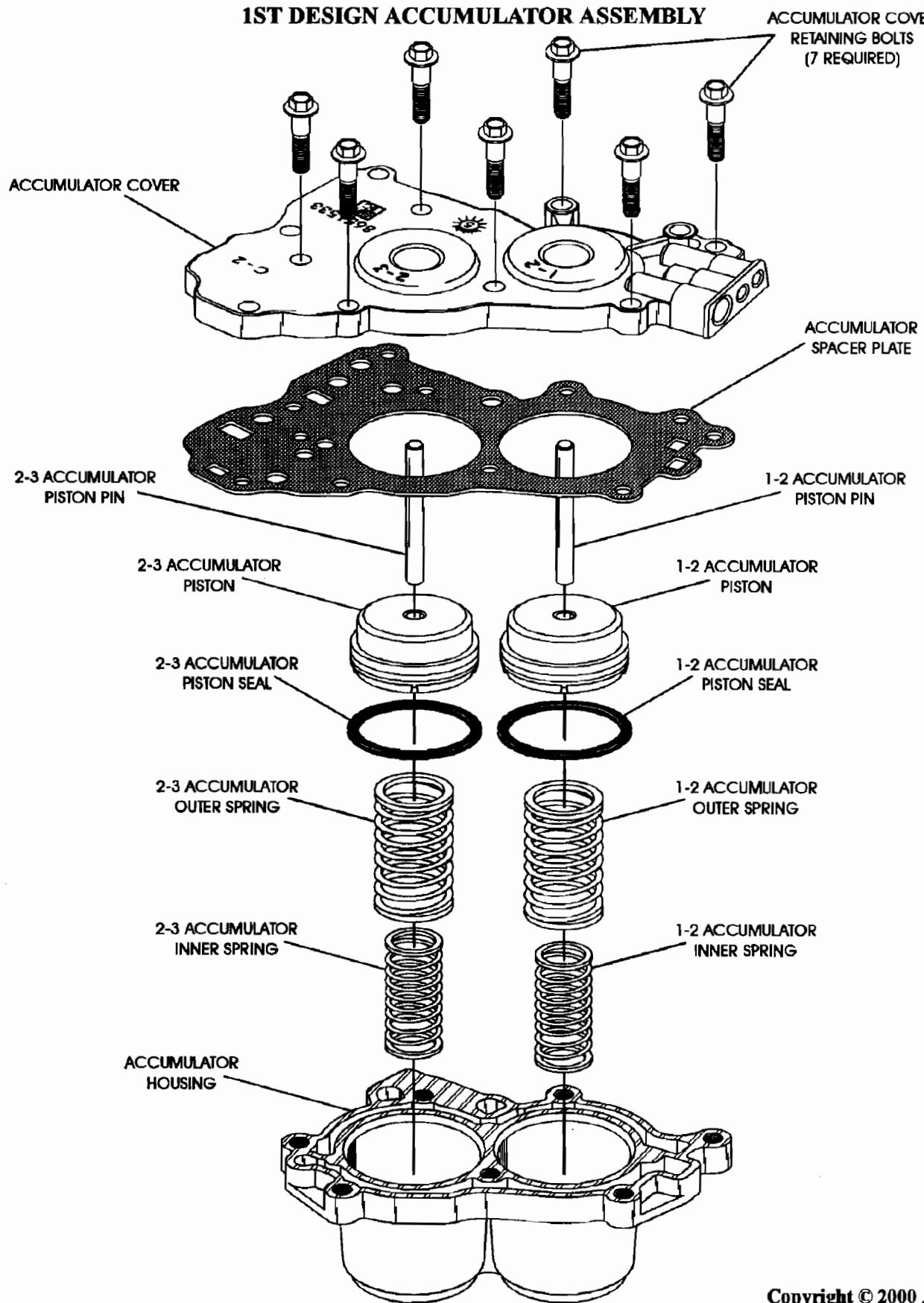


TV Boost/Control	TCC/Bypass	Reverse Boost	Manual Valve	Acc. Pin Kits	Acc. Sleeve Kits	Shims
75918-01K 65754 Series		75918-01K				
	84754-01K, 08K, 16K & 22K	84754-14K & 19K 84754-14K & 19K		84573-01K 84573-01K		75410-10, 84733-10 & 20 75410-10, 84733-10 & 20
34910-01K		34910-01K		35718-01K 34105-01K		77406-10 34500-Z
77917 Series, 77968, 77966 Series	77805-K	K77898		77999	77998-01K	77406-10, 77409-15
77898E-K, & 77898E-4K	77754-03K & 04K, 77805E-K, 77805-K	77898E-K		77999	77998-01K	77406-10, 77409-15
	34994-01K	34200-03K				34500-Z
		36946 Series				36428-Z & Z 36402-Z
			56947-01 (Index)			
96201-01K	96201-06K	96201-01K	96201-05		96511K, 12K, 13K	
96201-07K	96206-01K	96201-01K	96201-05		96511K, 12K, 13K	
96201-01K 76989K, 76970		96206-03K (AX4N), 96206-01K	96201-01K	96201-05		
		76948-04K				
86940-01 & 03		73840-BK, MK				86539-Z5
				73840-24, -LR & -FWD		
22771-01K	22771A-01 (AS500 only)					12780-Z
22771-01K	22771A-01 (AS118 only)					22700-Z



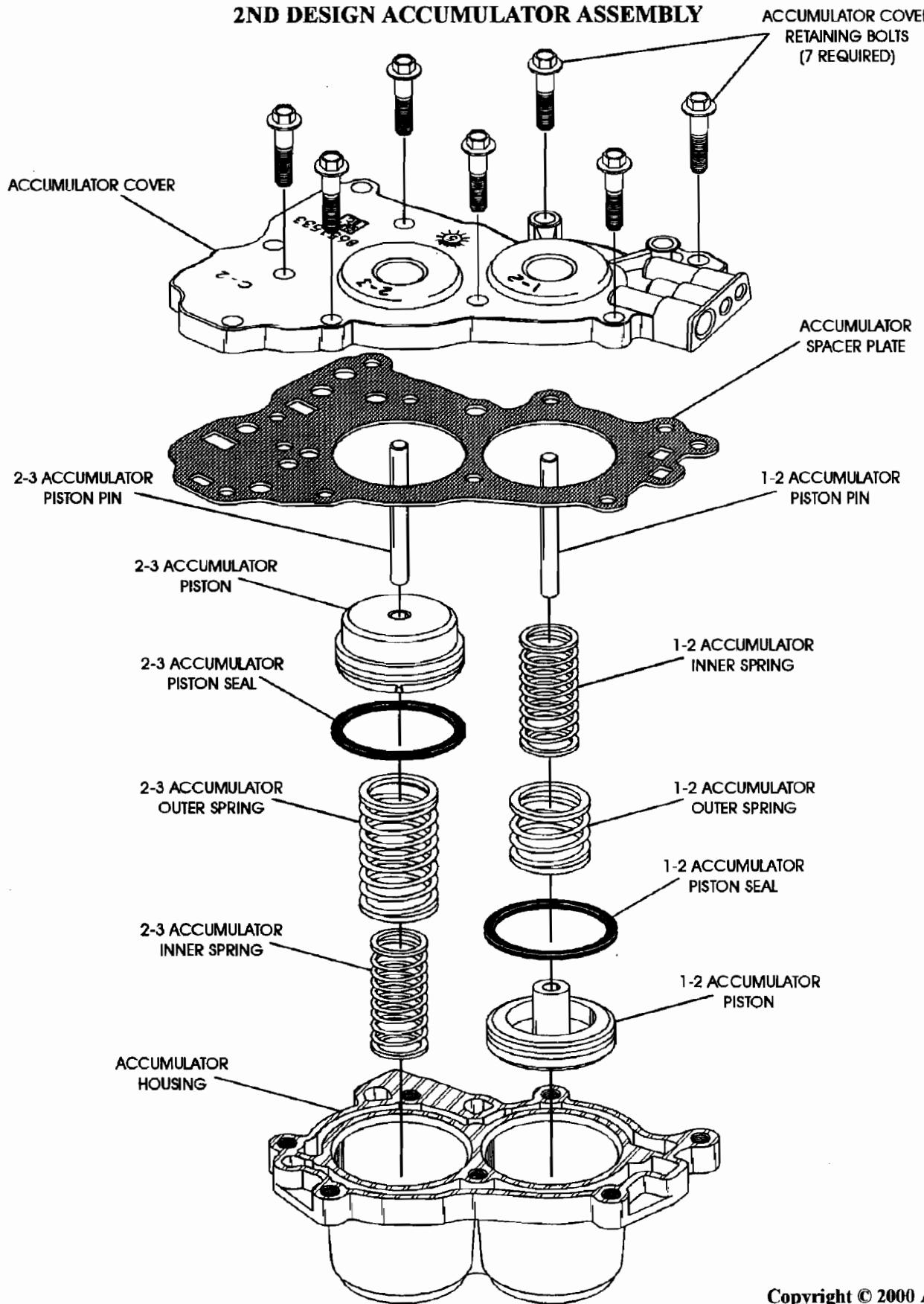
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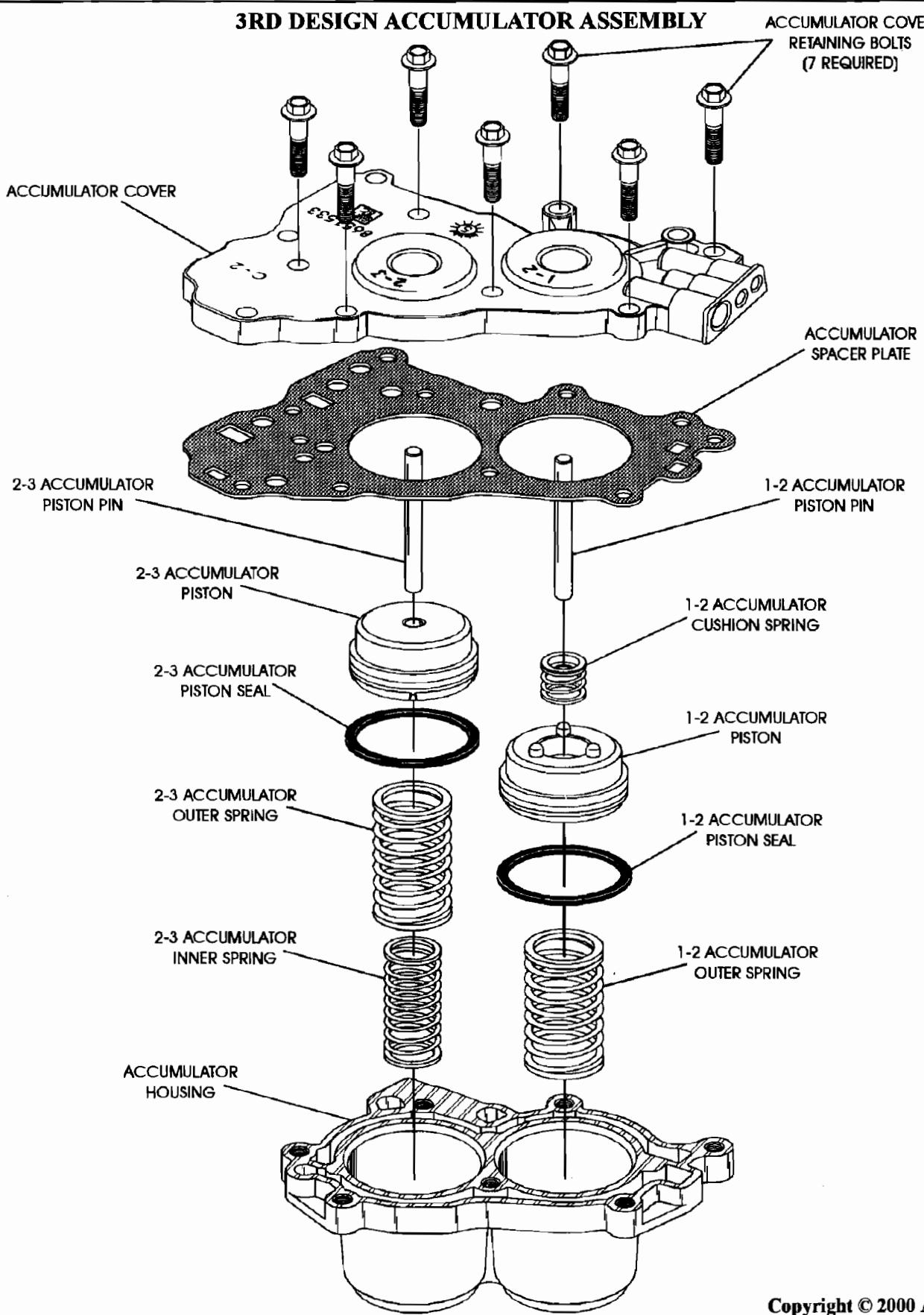
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Figure 2

2ND DESIGN ACCUMULATOR ASSEMBLY

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Figure 3



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Figure 4



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CHART NUMBER 21 (Assembly Number 24205108)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8682513	Dark Green
1-2 Accum Cushion Spring & Retainer	8685229	Top Of Piston, Retainer Up
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8685227	"Bumps" On Top Of Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8685219	White/Pink
2-3 Accum. Inner Spring	8685218	White/Dk Blue
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"3RD DESIGN" Use Figure 4 For Assembly Procedure

CHART NUMBER 22 (Assembly Number 24208179)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8682701	Lt Brown
1-2 Accum. Inner Spring	8668631	Lt Green
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8668883	Goes In Upside Down
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8651774	White
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"2ND DESIGN" Use Figure 3 For Assembly Procedure

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CHART NUMBER 23 (Assembly Number 24207199)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8646400	White/Red
1-2 Accum. Inner Spring	None Used	None Used
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678474	Same As 2-3 Accum Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8668487	White/Lt Green
2-3 Accum. Inner Spring	8677661	Lt Green/Orange
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"1ST DESIGN" Use Figure 2 For Assembly Procedure

CHART NUMBER 24 (Assembly Number 24210277)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8682701	Lt Brown
1-2 Accum. Inner Spring	8668631	Lt Green
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8668883	Goes In Upside Down
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8682513	Dark Green
2-3 Accum. Inner Spring	8681456	No Color
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"2ND DESIGN" Use Figure 3 For Assembly Procedure

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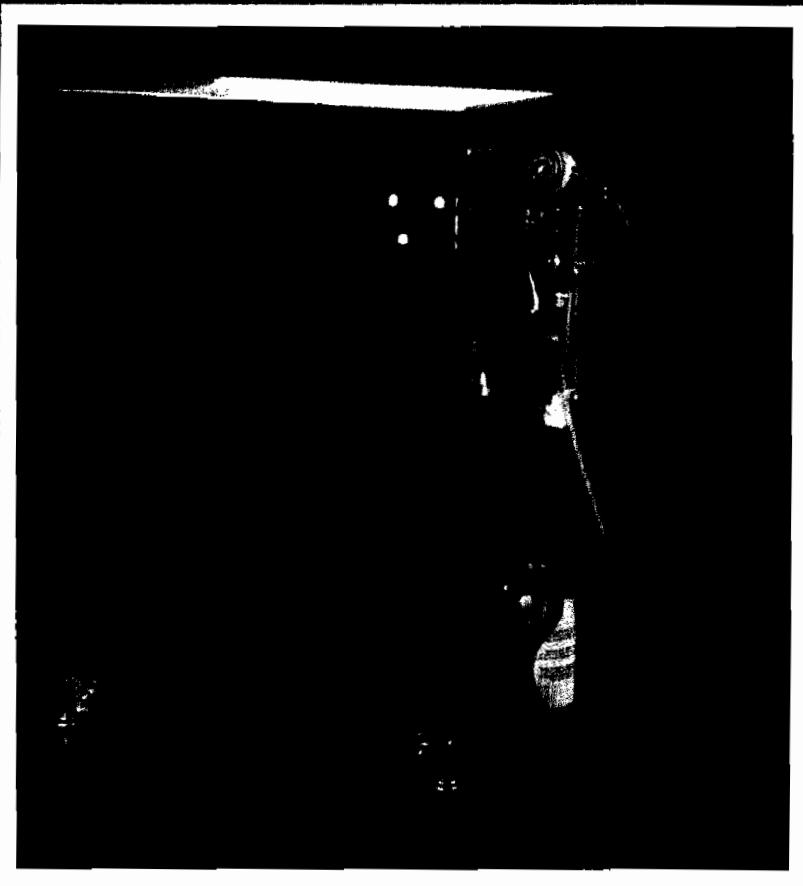
CHART NUMBER 25 (Assembly Number 24210296)

Part Name	Part Number	Identification
Accumulator Housing	8677163	Used On All Models
1-2 Accum. Outer Spring	8646400	White/Red
1-2 Accum. Inner Spring	8651774	White
Accumulator Piston Seals	8678473	2 Required
1-2 Accum. Piston	8678474	Same As 2-3 Accum Piston
Accumulator Piston Pins	8644298	2 Required
2-3 Accum. Outer Spring	8685219	White/Pink
2-3 Accum. Inner Spring	8651774	White
2-3 Accum. Piston	8678474	Used On All Models
Spacer Plate And Gasket Assem.	8682085	Used On All Models
Accumulator Cover	8651533	Used On All Models
Accumulator Cover Bolts	8651722	Used On All Models

"1ST DESIGN" Use Figure 2 For Assembly Procedure



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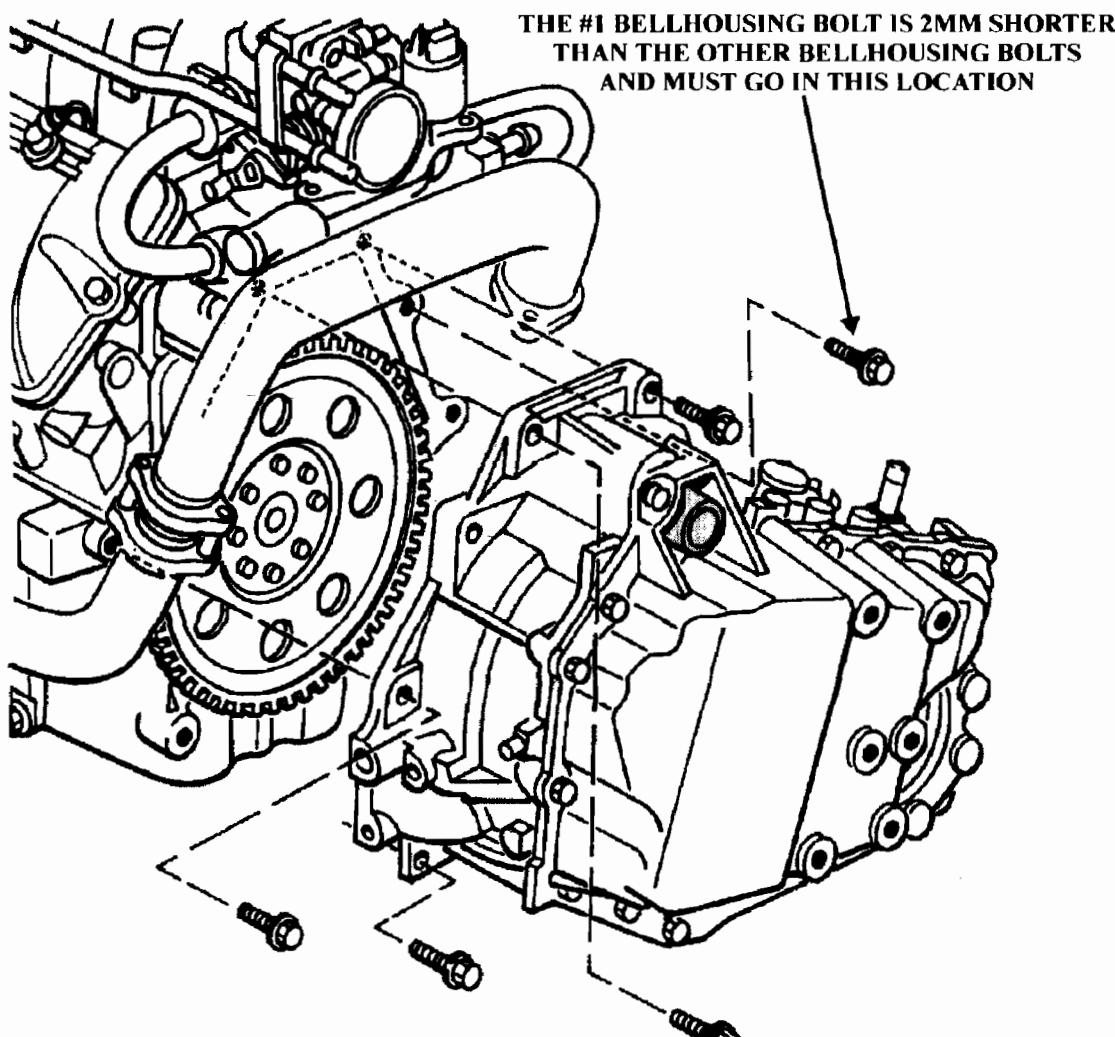
Patents #4809544, #4998437. Other US & Foreign Patents Pending.

GM ENGINE OIL PASSAGEWAY DAMAGE**1999 & LATER OLDSMOBILE INTRIGUE WITH 3.5L ENGINE
AND 4T65E TRANSMISSION**

COMPLAINT: An engine oil leak has developed between the engine and transmission after a 4T65E has been reinstalled in a 1999 Oldsmobile Intrigue with a 3.5 Liter DOHC V6 (VIN H) engine.

CAUSE: The number 1 bellhousing bolt in this application is **2MM SHORTER** ($5/64"$) than the other bellhousing bolts as shown in the illustration below.
If any of the longer bellhousing bolts are installed in the number 1 location, it will penetrate an oil passageway in the back of the engine block, creating the above complaint.

CORRECTION: Make certain **ALL** installation personnel are made aware of this bulletin in order to avoid this catastrophe.



CADILLAC WITH 4T80E TRANSMISSION**PARK/NEUTRAL SWITCH REPLACEMENT**

COMPLAINT: After replacing the Park/Neutral Switch, (Refer to Figure 1), the technician is unable to connect the **four terminal connector** to the new switch, *it doesn't fit!* When checking with the parts dealer, the technician is told that a connector repair kit must be purchased that will plug into the new switch. The technician now has to cut away the old connector and spend time wiring in the new connector, solder the connections and shrink wrap the splices, and, if that isn't enough, *all the wires in the connector repair kit are WHITE!*

CAUSE: The new Park/Neutral Switch has an added guide rail that the original switch did not have, which means the original connector does not have a provision for the added guide rail and will not plug into the new switch.

CORRECTION: To avoid taking the time to rewire the Park/Neutral Switch connector, unless necessary, remove the added guide rail in the new switch with a utility knife to allow the original connector to plug in. (Refer to Figure 2)
Refer to figures 3, 4 and 5 for Park/Neutral Switch terminal identification and function.

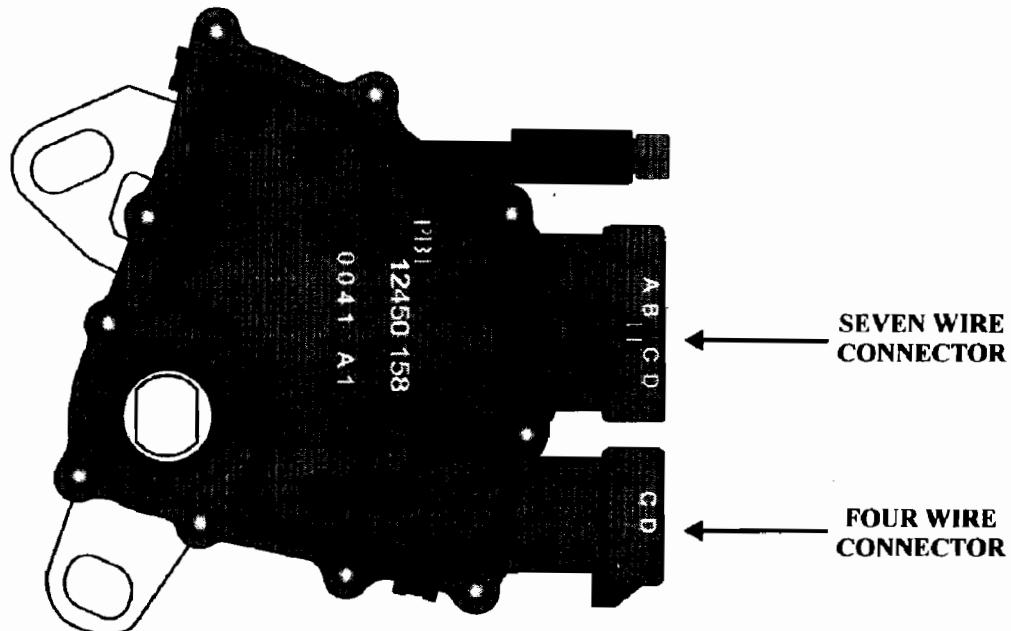
NOTE: A connector repair kit is also available for the seven terminal connector. (Refer to Figure 2)

SERVICE INFORMATION:

<i>Park/Neutral Switch.....</i>	<i>12450158</i>
<i>Four Terminal Repair Kit.....</i>	<i>15305925</i>
<i>Seven Terminal Repair Kit.....</i>	<i>15305887</i>

PARK/NEUTRAL SWITCH

PART NUMBER
12450158

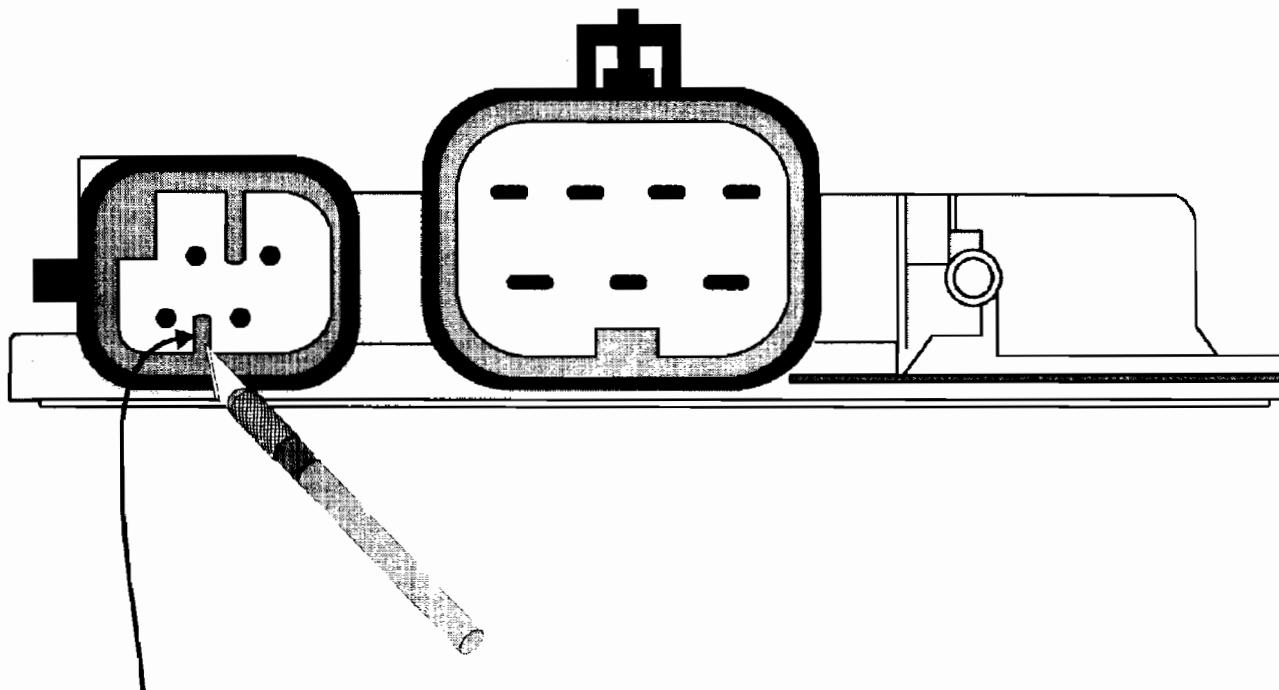


Many thanks to John Parmenter, Lee Myles Transmission, Centereach, N.Y.

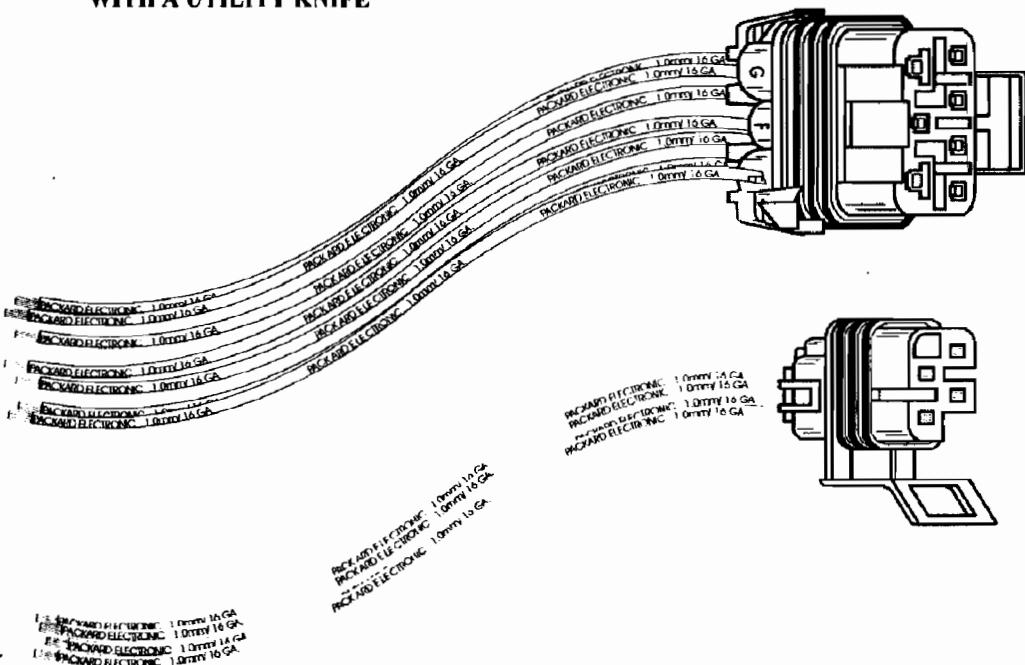
Figure 1

CADILLAC WITH 4T80E TRANSMISSION

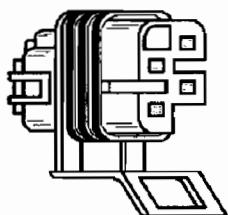
PARK/NEUTRAL SWITCH REPLACEMENT



**REMOVE THIS GUIDE RAIL
WITH A UTILITY KNIFE**



PART NUMBER
15305887



**PART NUMBER
15305925**

Figure 2

CADILLAC WITH 4T80E TRANSMISSION

PARK/NEUTRAL SWITCH REPLACEMENT

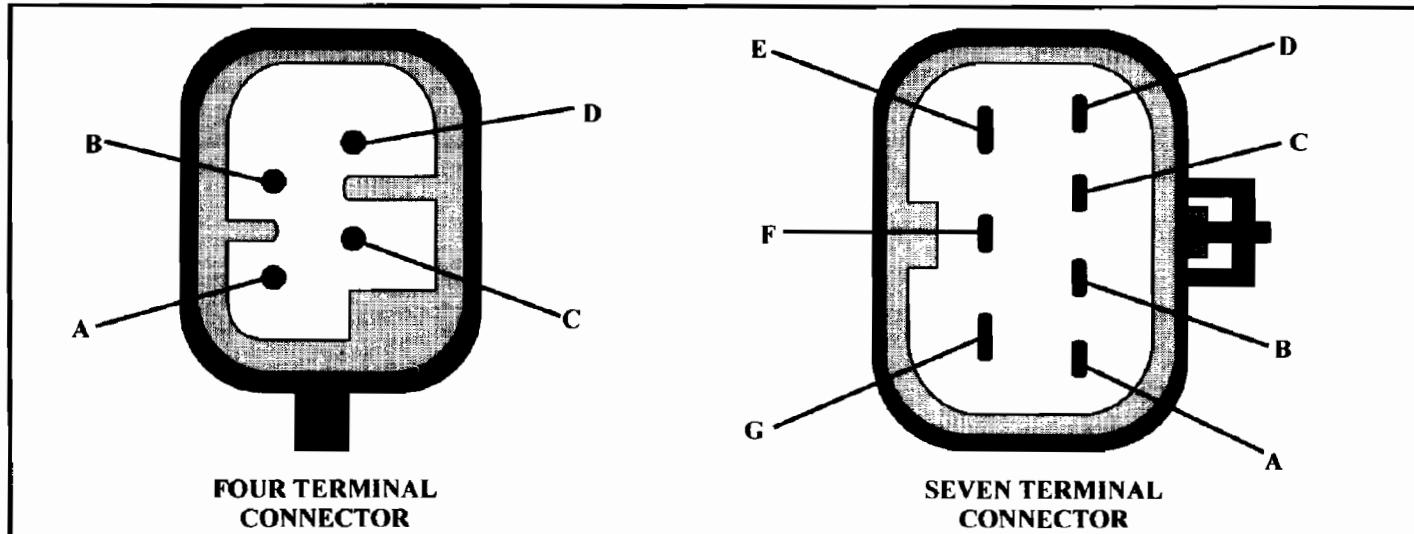


Figure 3

FOUR TERMINAL CONNECTOR FUNCTION CHART

CAVITY	WIRE COLOR	CIRCUIT	CIRCUIT FUNCTION
A	WHITE	776	PARK/NEUTRAL SWITCH SIGNAL - PARITY
B	YELLOW	772	PARK/NEUTRAL SWITCH SIGNAL - RANGE B
C	GRAY	773	PARK/NEUTRAL SWITCH SIGNAL - RANGE C
D	BLACK/WHITE	771	PARK/NEUTRAL SWITCH SIGNAL - RANGE A

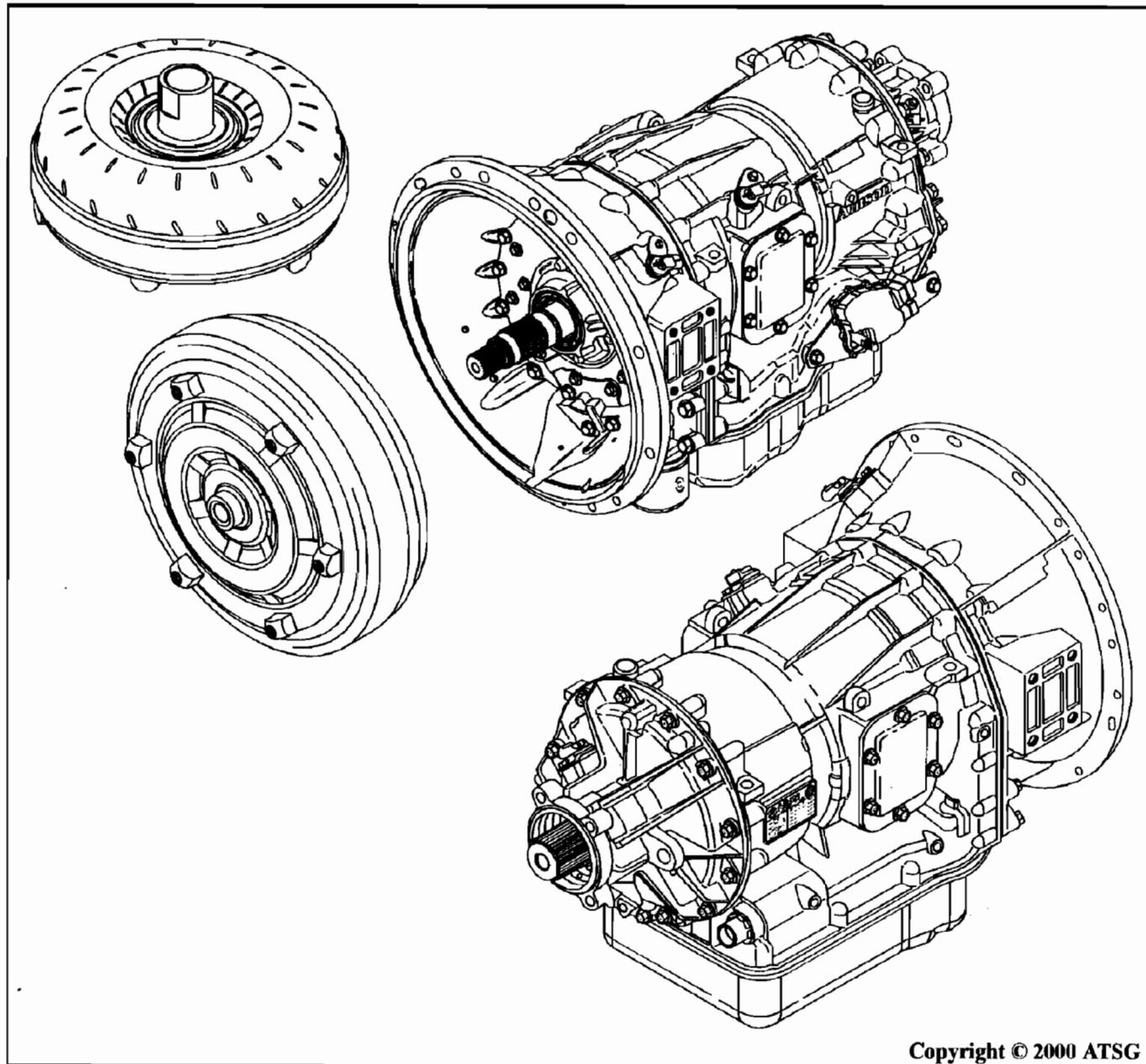
Figure 4

SEVEN TERMINAL CONNECTOR FUNCTION CHART

CAVITY	WIRE COLOR	CIRCUIT	CIRCUIT FUNCTION
A	ORANGE/BLACK	434	PARK/NEUTRAL POSITION SWITCH SIGNAL
B	PINK	339	FUSED OUTPUT - IGNITION 1
C	LT. GREEN	275	PNP SWITCH OUTPUT - PARK
D	BLACK/WHITE	451	GROUND
E	YELLOW	1737	PNP SWITCH OUTPUT - NEUTRAL
F	LT. GREEN	24	BACKUP LAMP FEED
G	YELLOW	5	IGNITION SWITCH OUTPUT - CRANK

Figure 5

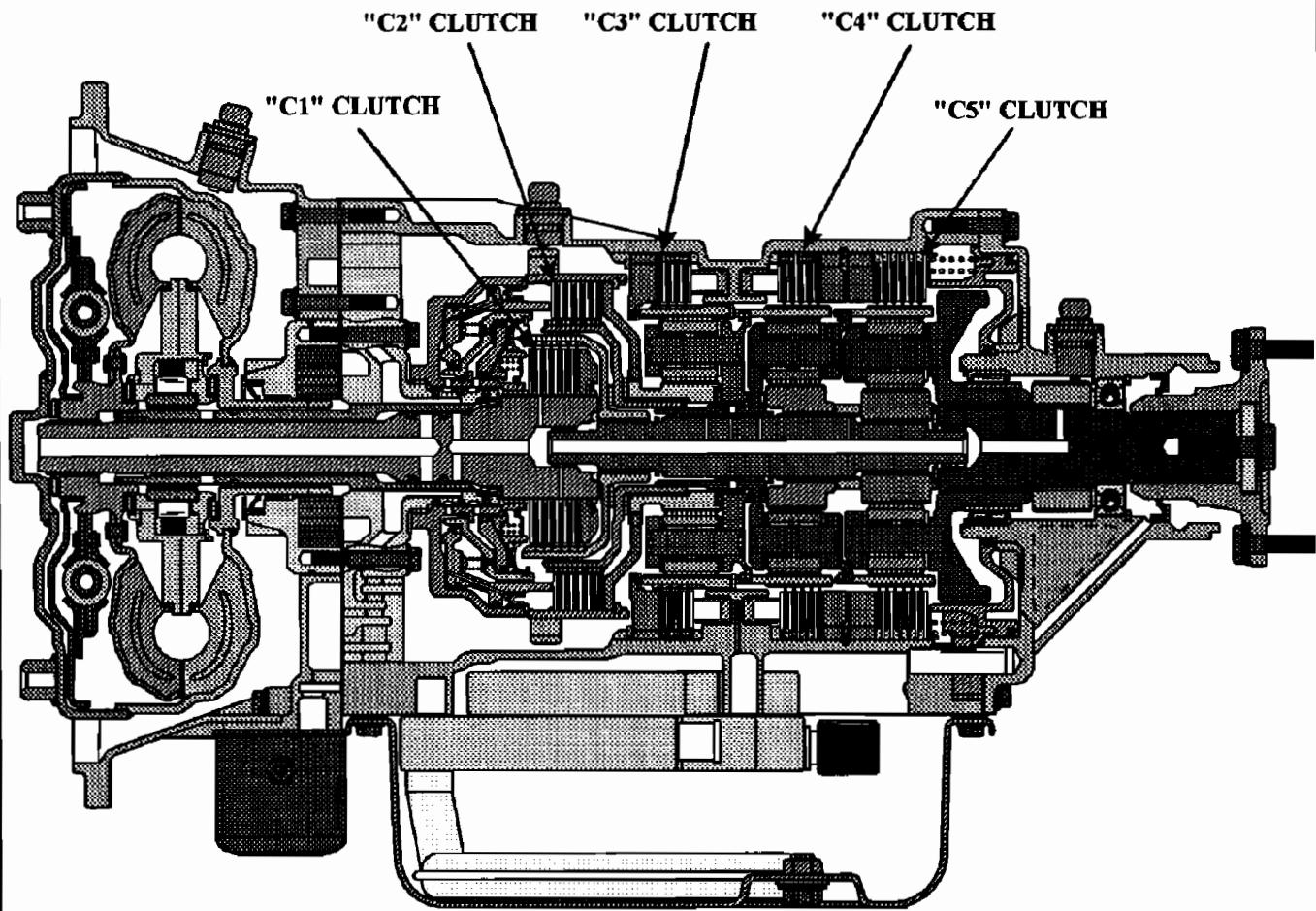
ALLISON 1000/2000/2400 SERIES
PRELIMINARY INFORMATION



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Figure 1

ALLISON 1000/2000 SERIES TRANSMISSION



Range	C1 Clut	C2 Clut	C3 Clut	C4 Clut	C5 Clut	Sol "A"	Sol "B"	Sol "C"	Sol "D"	Sol "E"	Sol "F"		Ratios
												1000	2000
Park						ON	**	**	X	X	X		
Reverse			ON			ON	**	**		X	X	4.49	5.09
Neutral						ON	**	**	X	X	X		
OD-1st	ON					ON	**	**		X		3.10	3.51
OD-2nd	ON			ON			**	**			*	1.81	1.90
OD-3rd	ON		ON				**	**	X		*	1.41	1.44
OD-4th	ON	ON					**	**	X		X	1.00	1.00
OD-5th	ON	ON	ON				**	**		X	*	0.71	0.74

X = Electrical Power Applied To Solenoid

* = Apply Solenoid "F" To Apply Converter Clutch

** = Solenoids "A" and "B" are "Trim" solenoids used to control oncoming, off-going, and holding pressure to the five clutch packs.

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Figure 2

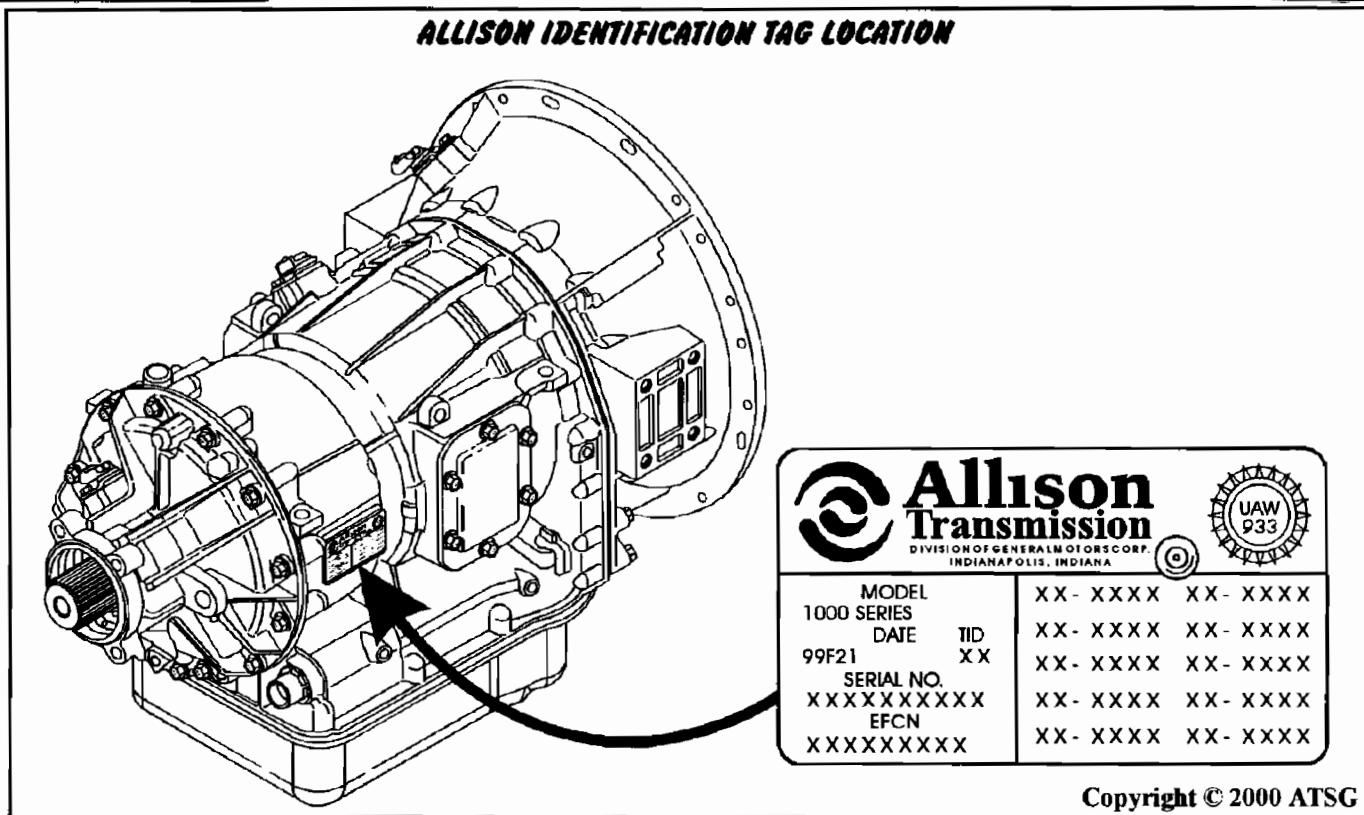


Figure 3

TRANSMISSION IDENTIFICATION TAG

Several different transmission configurations are available within the 1000/2000/2400 Series. The different models are identified as follows:

1000 Series	Heavy-duty automatic transmission with parking pawl. Maximum GVW = 19850 lb.
2000 Series	Heavy-duty automatic transmission without parking pawl. Maximum GVW = 30000 lb.
2400 Series	Heavy-duty automatic transmission with parking pawl. Maximum GVW = 26000 lb.

Each transmission is identified by a model designation, group numbers, and serial number. This information is included on the transmission identification tag located on the right rear side of the transmission case, as shown in Figure 3.

This information must be used when discussing specific service issues, or when parts replacement is necessary. The transmission identification tag also includes the date of manufacture, and also the transmission identification number used with the diagnostic systems.

Special Note:

Allison Series 1000/2000/2400 transmissions are designed and manufactured to metric standards, and metric tools are required for service.

The cooler ports and the main line pressure tap are the only non-metric fittings on the transmission case. The output flange/yoke retaining bolt is also non-metric.

GENERAL DESCRIPTION AND OPERATION

Allison 1000/2000/2400 Series transmissions are torque converter driven fully automatic units. All models have neutral, reverse, and up to 5 forward speeds, with 5th gear being overdrive. Refer to Figure 2 for the different gears ratios available in the different models.

The torque converter housings of these units mate directly to SAE No. 2, SAE No. 3, or direct to the engine block in some cases. Flexplate drive is used for all engine to transmission torque transfer.

Several different torque converters are available to match the transmissions to a wide variety of diesel and gasoline engines. The torque converter is a single stage, three element unit, consisting of a pump, stator, and turbine, with the addition of a converter clutch to provide direct drive from the engine to the transmission. The converter clutch is applied and released electronically, and changes the direction of fluid flow in the converter as in most typical converters today.

Internally these units contain 2 rotating clutches (C1 and C2), and 3 brake clutches (C3, C4 and C5), to direct the flow of torque through the unit. All clutch packs are hydraulically applied and spring released, with automatic wear compensation, and their locations in the transmission are shown in the cut-away in Figure 2.

The Transmission Control Module (TCM) signals six different solenoids, located on the valve body, to apply and release clutches based on vehicle speed and power combinations, and the range selected by the operator.

The planetary gear train consists of three constant mesh, helical gear planetary sets, referred to as P1, P2, and P3. By the engagement of the 5 clutch packs in various combinations, the planetary gear sets react singly or together to provide 5 forward speeds, neutral, and reverse.

A common hydraulic system provides fluid for all hydraulic operations, lubrication, and cooling. The front oil pump, driven by the converter, provides the pressure needed for the hydraulic system, and comes from the common sump in the bottom pan.

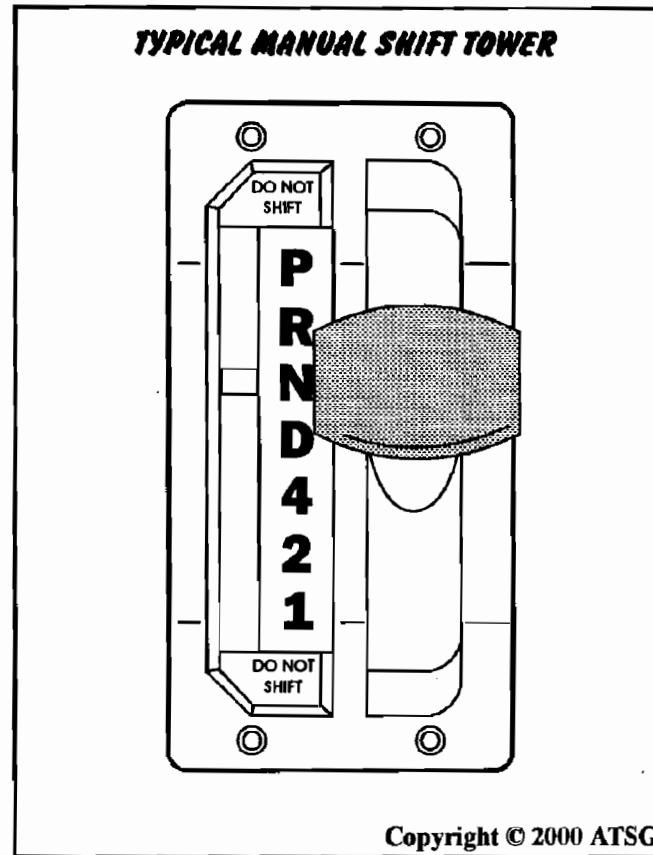
A suction filter, located in the bottom pan provides general protection to the entire hydraulic system, and a spin-on filter provides full time protection for the control solenoids and multipass protection for the entire system.

The spin-on filter is located externally on the converter housing at the lower left front of the transmission.

Some 1000/2000/2400 Series transmissions are available with an optional extension housing that accommodates an OEM installed two shoe, expanding type, drum parking brake.

The 1000/2000/2400 Series transmissions use lever type shift selectors, as shown in Figure 4. The vehicle may be equipped with one or two shift selectors, depending on the number of operator stations for driving the vehicle and/or operating a variety of chassis mounted equipment. The shift positions on the shift selector can vary according to the shift selector installed in the vehicle.

NOTE: Refer to Figure 5 for the various Shift Selector positions, and corresponding ranges that can be attained for all 1000/2000/2400 Series models.



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Figure 4

ALL 1000 AND 2400 SERIES

Shift Selector Position	Gears Available	Shift Selector Position	Gears Available	Shift Selector Position	Gears Available
P (Park)	Neutral*	P (Park)	Neutral*	P (Park)	Neutral*
R (Reverse)	Reverse	R (Reverse)	Reverse	R (Reverse)	Reverse
N (Neutral)	Neutral	N (Neutral)	Neutral	N (Neutral)	Neutral
D (Drive)	1-5	D (Drive)	1-5	D (Drive)	1-5 (1-4)**
4 (Fourth)	1-4	4 (Fourth)	1-4	3 (Third)	1-3
3 (Third)	1-3	2 (Second)	1-2	2 (Second)	1-2
1 (First)	1st	1 (First)	1st	1 (First)	1st

* With Park Pawl Engaged

** 4 Speed Calibration or Trailering Mode

ALL 2000 SERIES "WITH" AUTO-APPLY PARKING BRAKE

Shift Selector Position	Gears Available	Shift Selector Position	Gears Available	Shift Selector Position	Gears Available
PB = (Park)	Neutral*	PB = (Park)	Neutral*	PB = (Park)	Neutral*
R (Reverse)	Reverse	R (Reverse)	Reverse	R (Reverse)	Reverse
N (Neutral)	Neutral	N (Neutral)	Neutral	N (Neutral)	Neutral
D (Drive)	1-5	D (Drive)	1-5	D (Drive)	1-5 (1-4)**
4 (Fourth)	1-4	4 (Fourth)	1-4	3 (Third)	1-3
3 (Third)	1-3	2 (Second)	1-2	2 (Second)	1-2
1 (First)	1st	1 (First)	1st	1 (First)	1st

* With Auto-Apply Parking Brake Engaged

** 4 Speed Calibration or Trailering Mode

PB = Auto-Apply Parking Brake

ALL 2000 SERIES "WITHOUT" AUTO-APPLY PARKING BRAKE

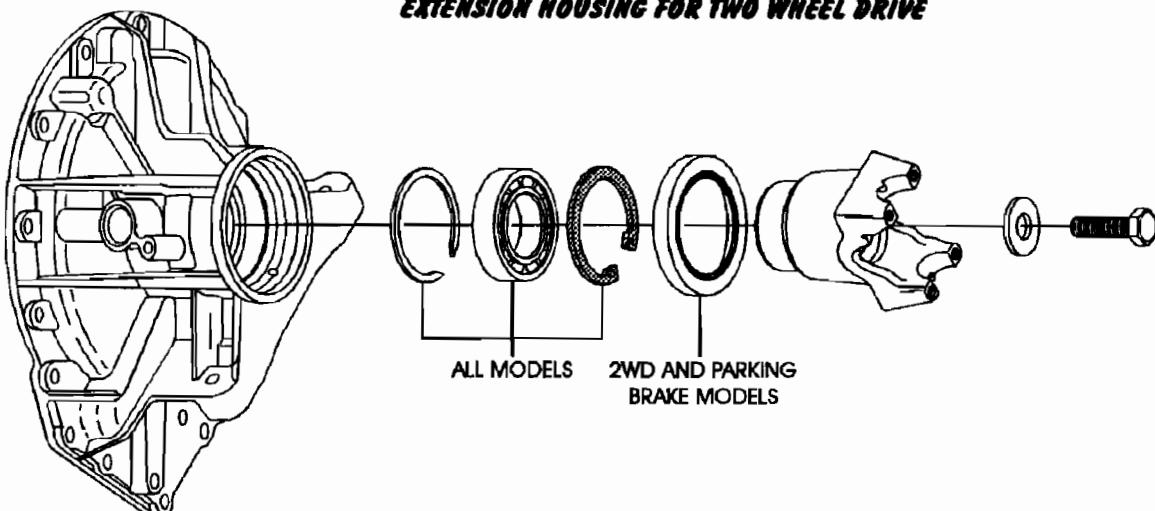
Shift Selector Position	Gears Available	Shift Selector Position	Gears Available	Shift Selector Position	Gears Available
R (Reverse)	Reverse	R (Reverse)	Reverse	R (Reverse)	Reverse
N (Neutral)	Neutral	N (Neutral)	Neutral	N (Neutral)	Neutral
D (Drive)	1-5	D (Drive)	1-5	D (Drive)	1-5 (1-4)**
4 (Fourth)	1-4	4 (Fourth)	1-4	3 (Third)	1-3
3 (Third)	1-3	2 (Second)	1-2	2 (Second)	1-2
1 (First)	1st	1 (First)	1st	1 (First)	1st

** 4 Speed Calibration or Trailering Mode

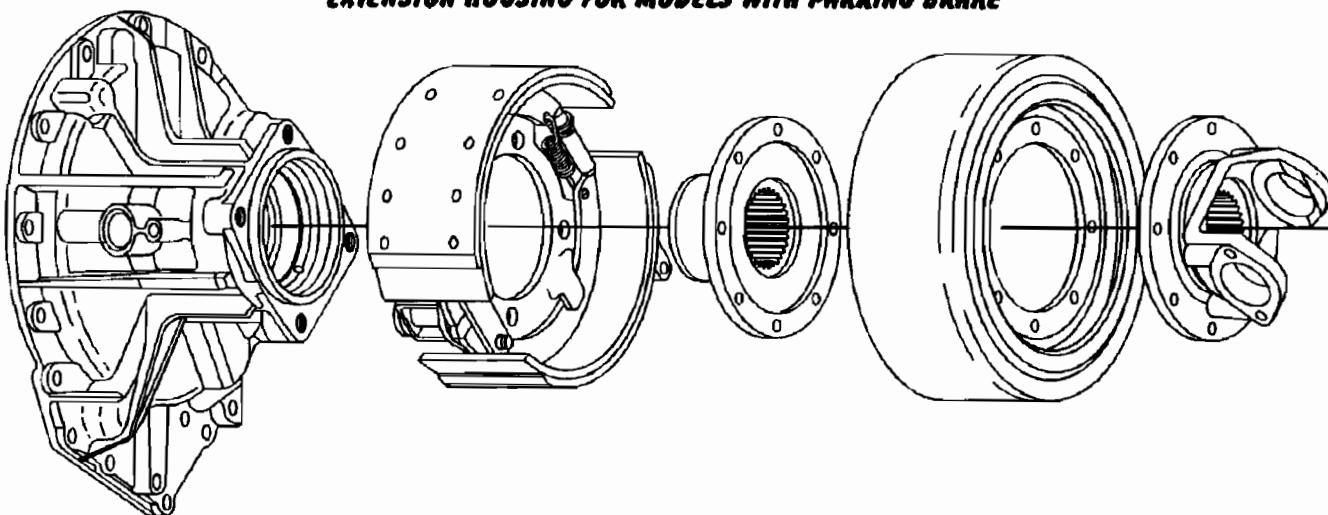
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Figure 5

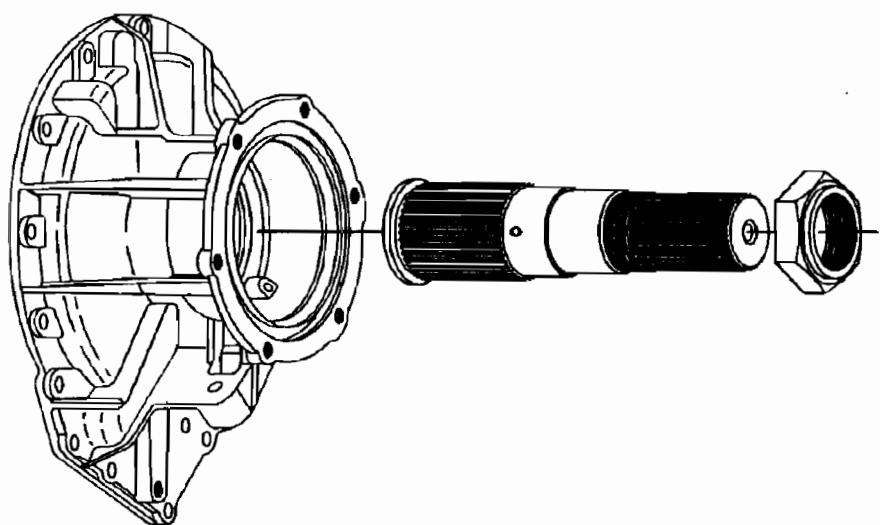
EXTENSION HOUSING FOR TWO WHEEL DRIVE



EXTENSION HOUSING FOR MODELS WITH PARKING BRAKE



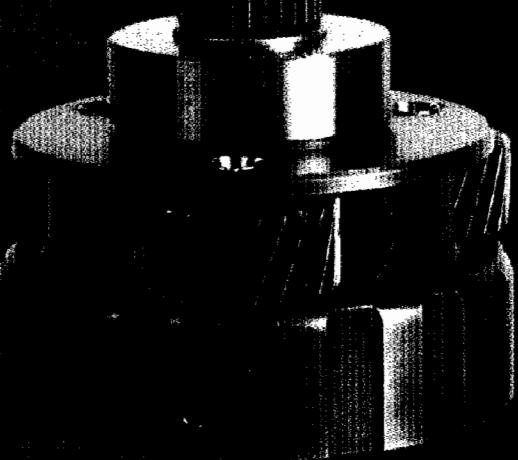
EXTENSION HOUSING FOR FOUR WHEEL DRIVE



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Figure 6

Automatic Transmission Service Group



Of Course
It's Tough
We Built It!

Complete Line of
Used and Rebuilt
Automatic Hard Parts

- ▶ **Hard Parts**
- ▶ **Service Parts**
- ▶ **OTC Electronics**

- ▶ **Automatic Transmission Parts**
- ▶ **Shop Equipment**
- ▶ **Transmission Mounts**
- ▶ **Transmission Coolers**
- ▶ **Flywheels**
- ▶ **Modular Diagnostic System**
- ▶ **Reconditioned Hard Parts**

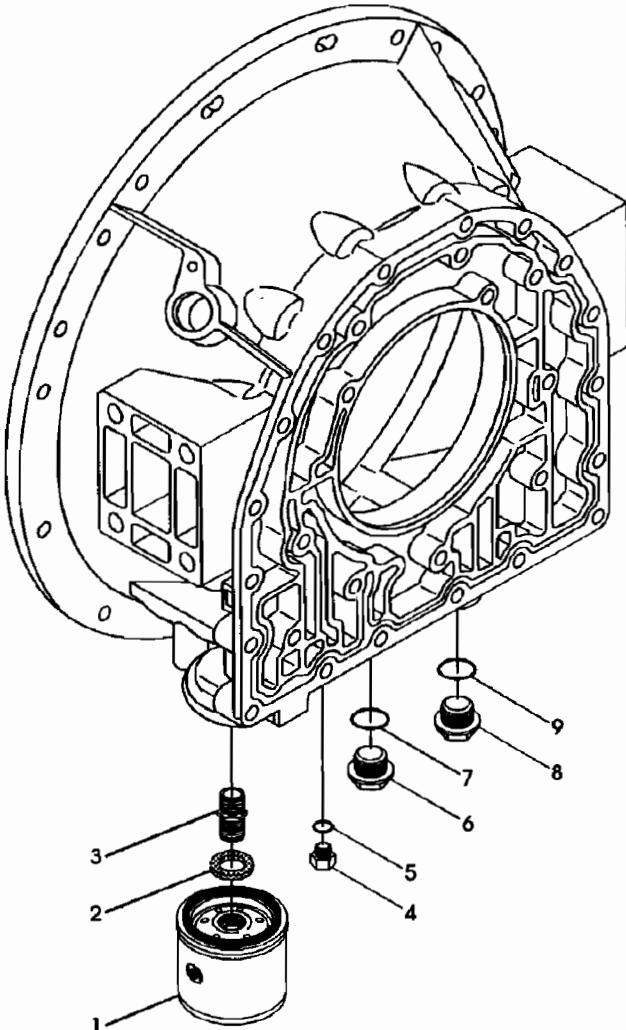
OTS Transmission Parts

Oklahoma City - Headquarters
927 NW 1st Street
Oklahoma City, OK 73106-7617
Fax 405-236-1176

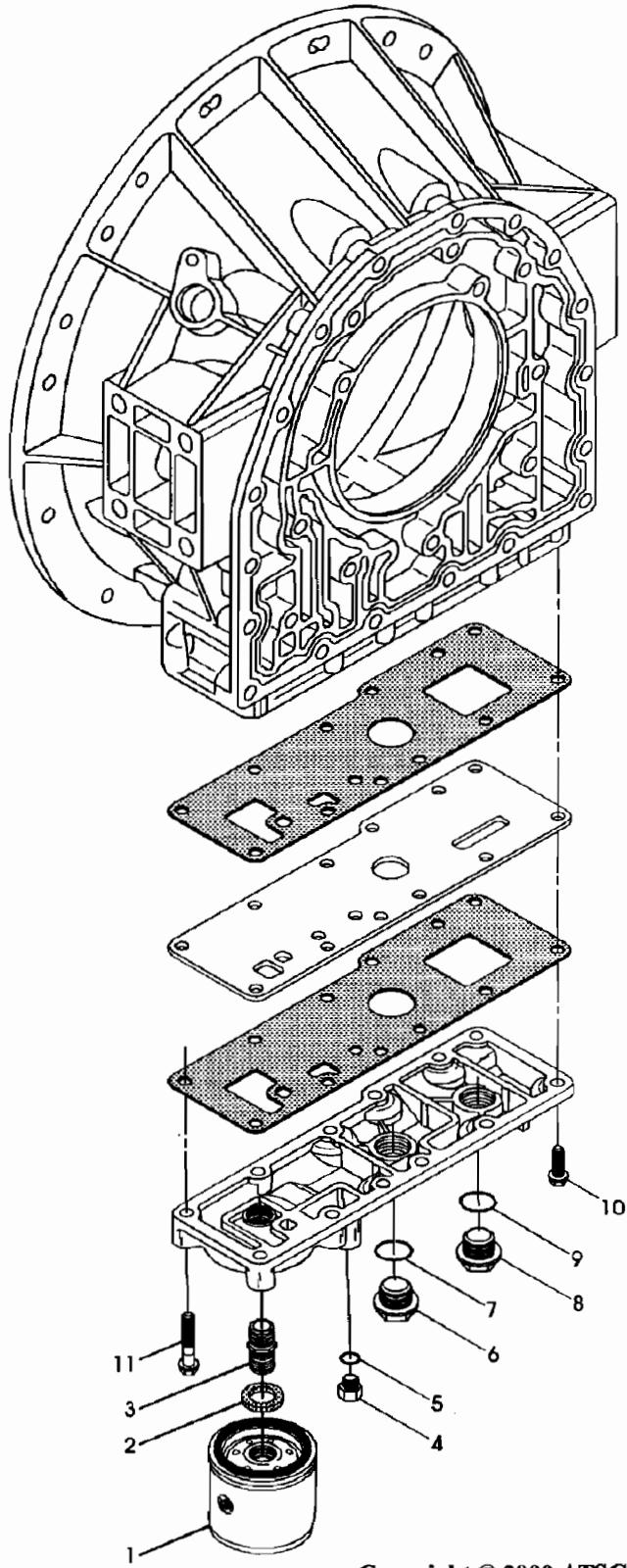
Tulsa - Branch Office
1510 E. Third Street
Tulsa, OK 74120
Fax 918-584-1208

Toll Free
1-866-OTS-PARTS
(687-7278)

www.otsparts.com

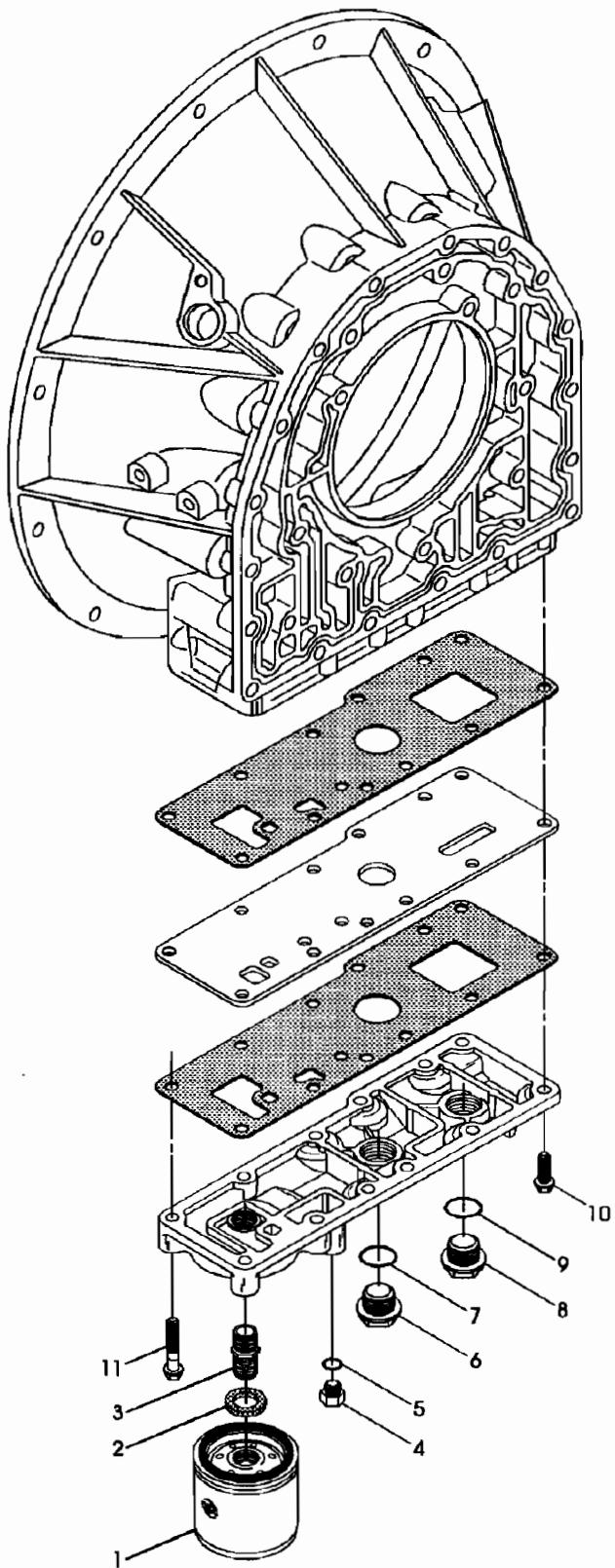
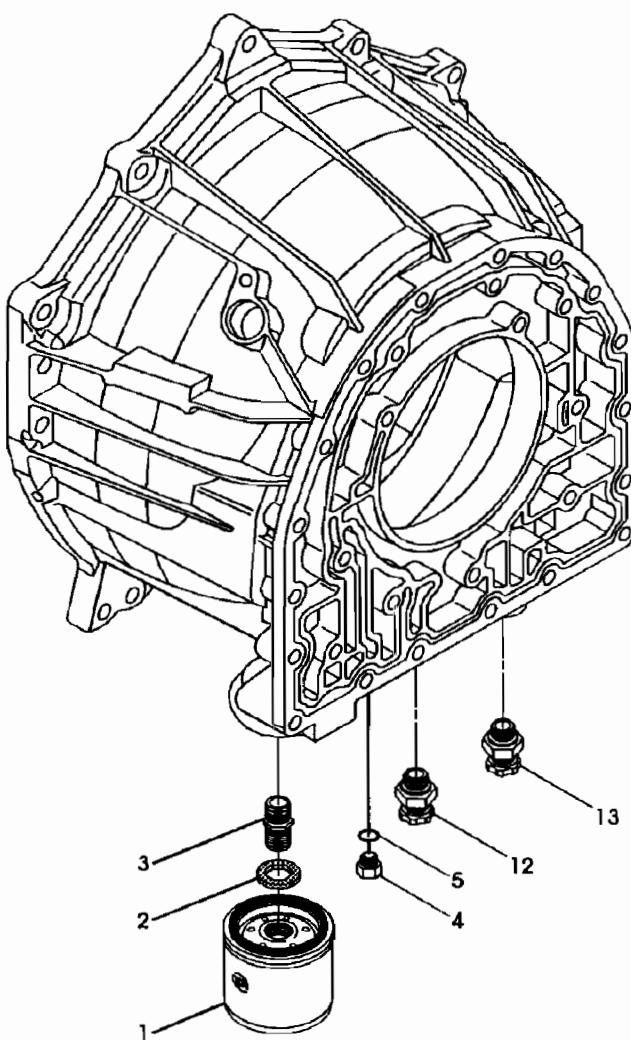
**SAE NUMBER 3 BELL HOUSING
WITH INTEGRAL FILTER AND
COOLER PORTS**

1. MAIN CONTROL FILTER ASSEMBLY.
2. MAIN CONTROL FILTER MAGNET.
3. MAIN CONTROL FILTER ADAPTER TUBE.
4. MAIN LINE PRESSURE TAP PLUG.
5. MAIN LINE PRESSURE PLUG "O" RING.
6. TO COOLER SHIPPING PLUG.
7. TO COOLER SHIPPING PLUG "O" RING.
8. FROM COOLER SHIPPING PLUG.
9. FROM COOLER SHIPPING PLUG "O" RING.
10. COOLER MANIFOLD RETAINING BOLT, M8 x 1.25 x 30 (8 REQ).
11. COOLER MANIFOLD RETAINING BOLT, M8 x 1.25 x 40 (4 REQ).

**SAE NUMBER 3 BELL HOUSING
WITH MANIFOLD FOR FILTER
AND COOLER PORTS**

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Figure 7

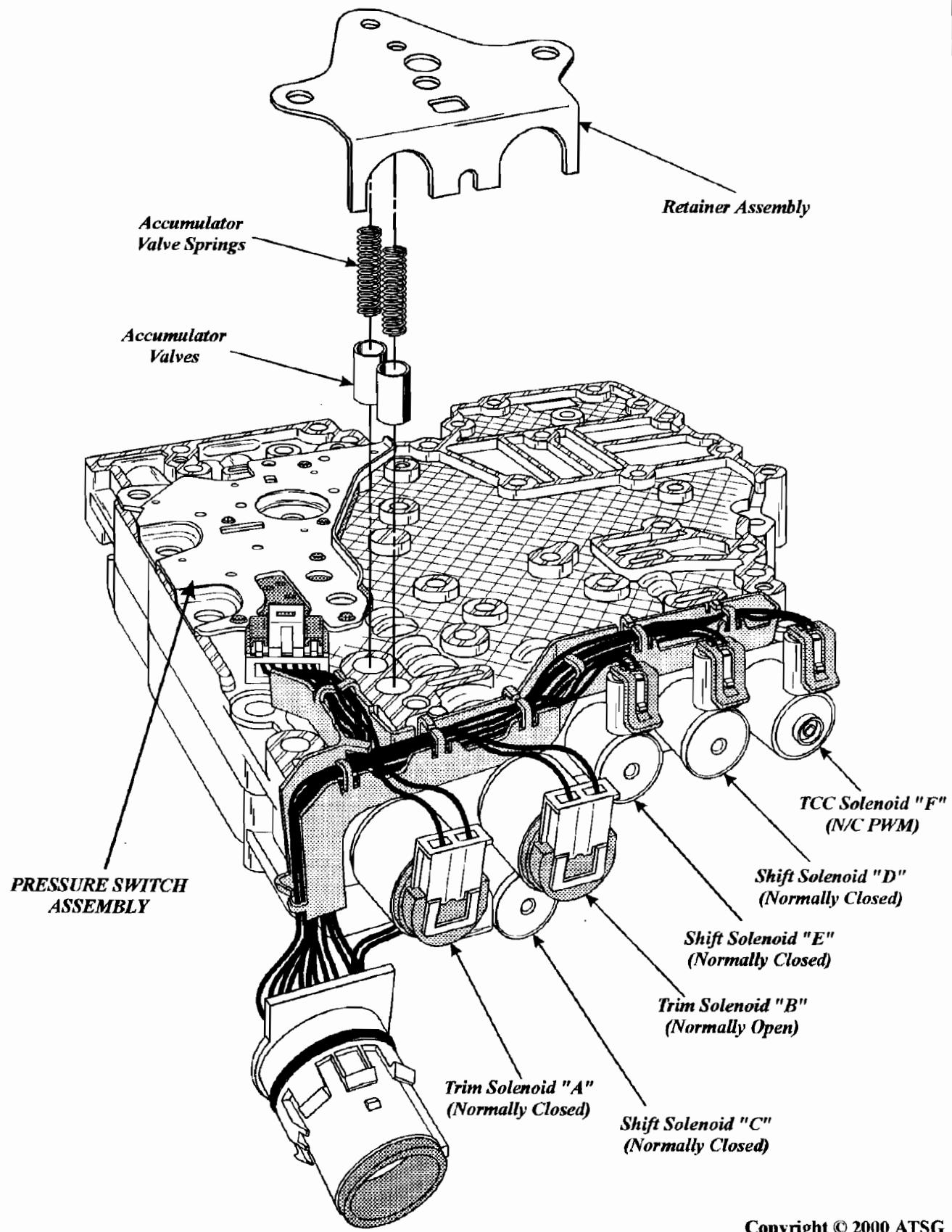
SAE NUMBER 2 BELL HOUSING
WITH MANIFOLD FOR FILTER
AND COOLER PORTSSAE NUMBER 8 BELL HOUSING
WITH INTEGRAL FILTER AND
COOLER PORTS

1. MAIN CONTROL FILTER ASSEMBLY.
2. MAIN CONTROL FILTER MAGNET.
3. MAIN CONTROL FILTER ADAPTER TUBE.
4. MAIN LINE PRESSURE TAP PLUG.
5. MAIN LINE PRESSURE PLUG "O" RING.
6. TO COOLER SHIPPING PLUG.
7. TO COOLER SHIPPING PLUG "O" RING.
8. FROM COOLER SHIPPING PLUG.
9. FROM COOLER SHIPPING PLUG "O" RING.
10. COOLER MANIFOLD RETAINING BOLT, M8 x 1.25 x 30 (8 REQ).
11. COOLER MANIFOLD RETAINING BOLT, M8 x 1.25 x 40 (4 REQ).
12. TO COOLER CONNECTOR FITTING ASSEMBLY.
13. FROM COOLER CONNECTOR FITTING ASSEMBLY.

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Figure 8

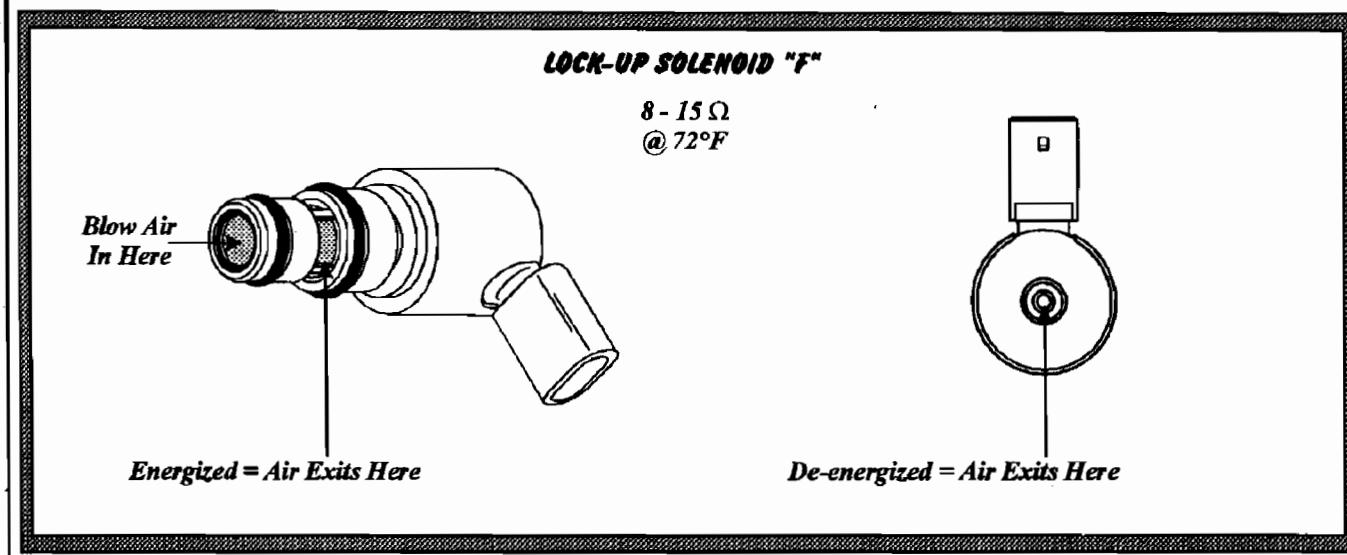
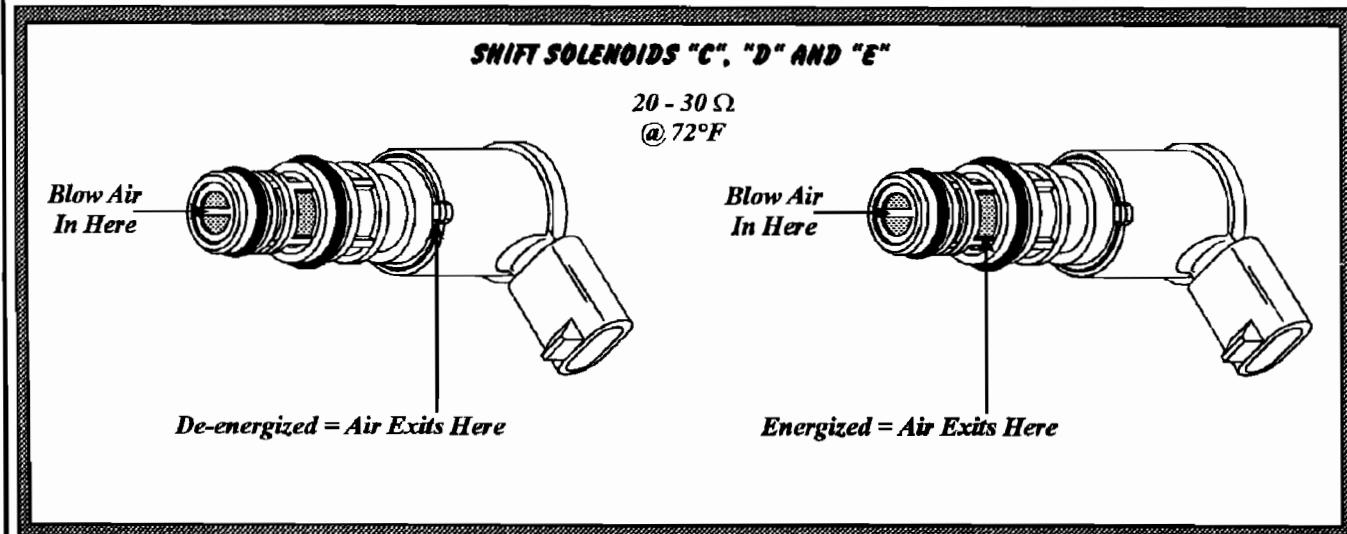
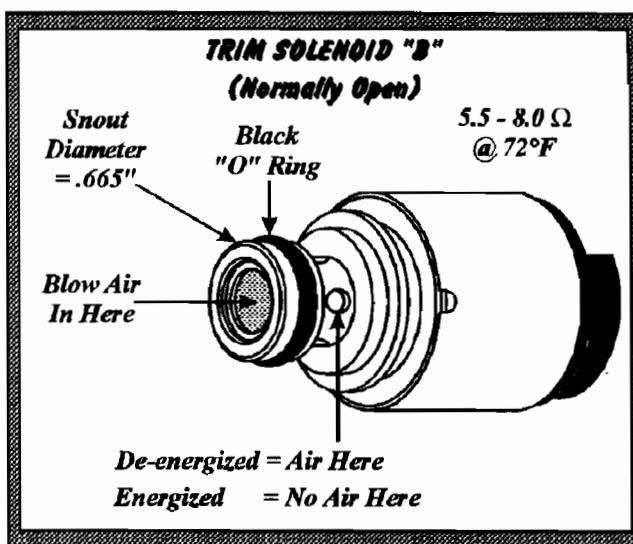
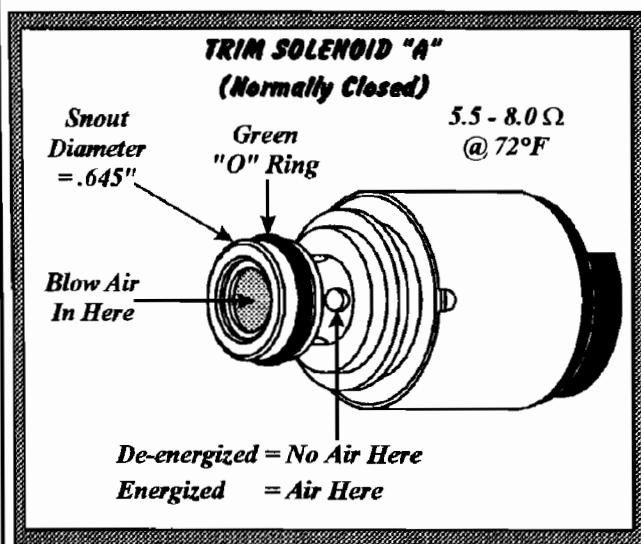
ALLISON SERIES 1000/2000 COMPLETE VALVE BODY



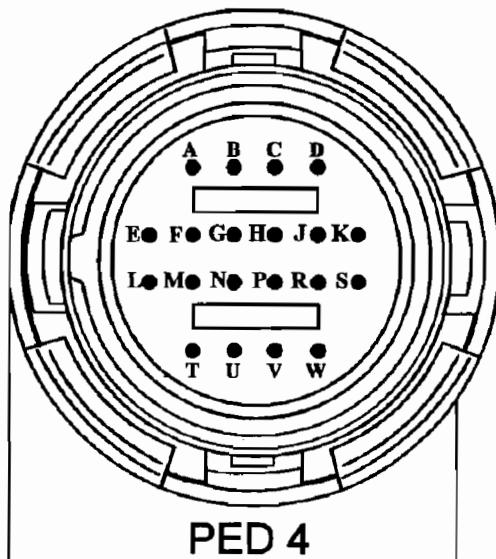
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Figure 9

SOLENOID AIR CHECKS

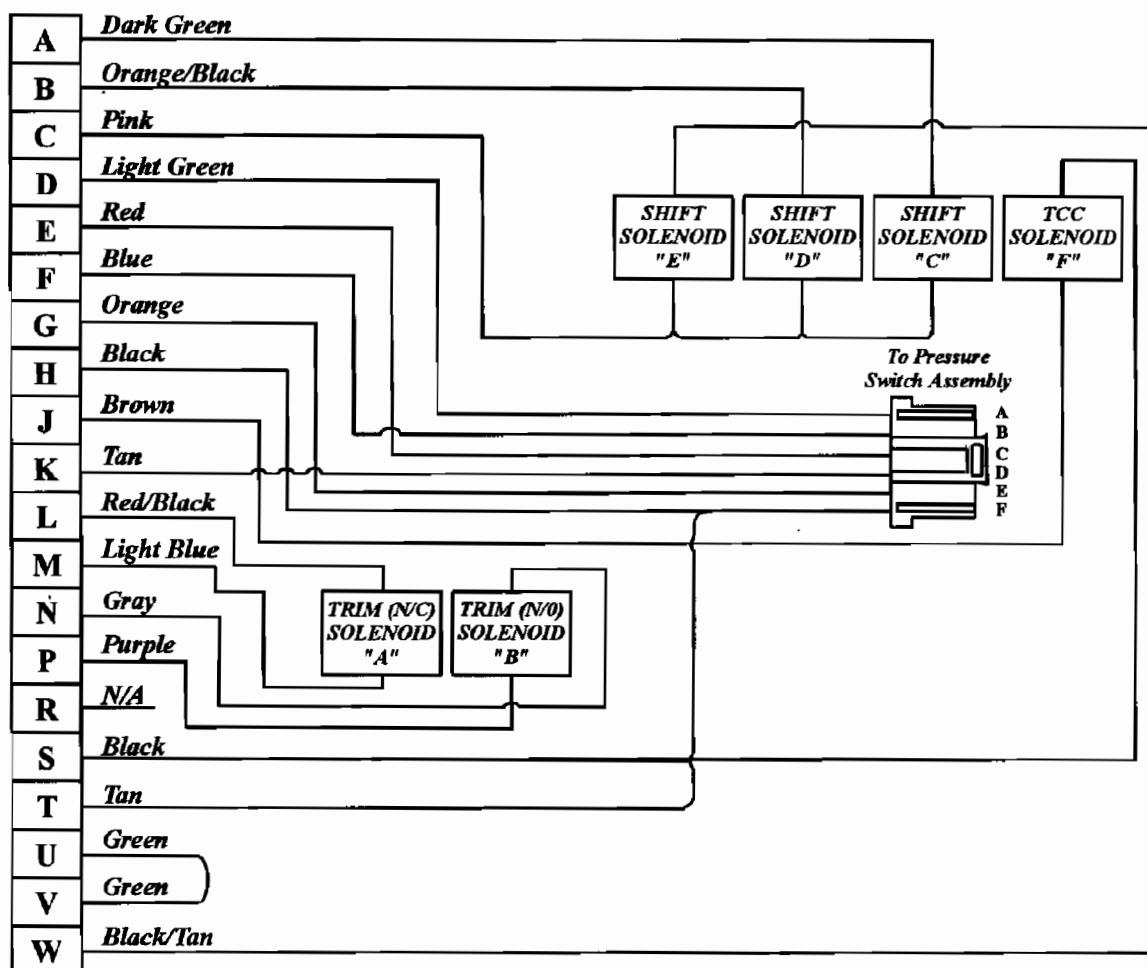


INTERNAL WIRING SCHEMATIC

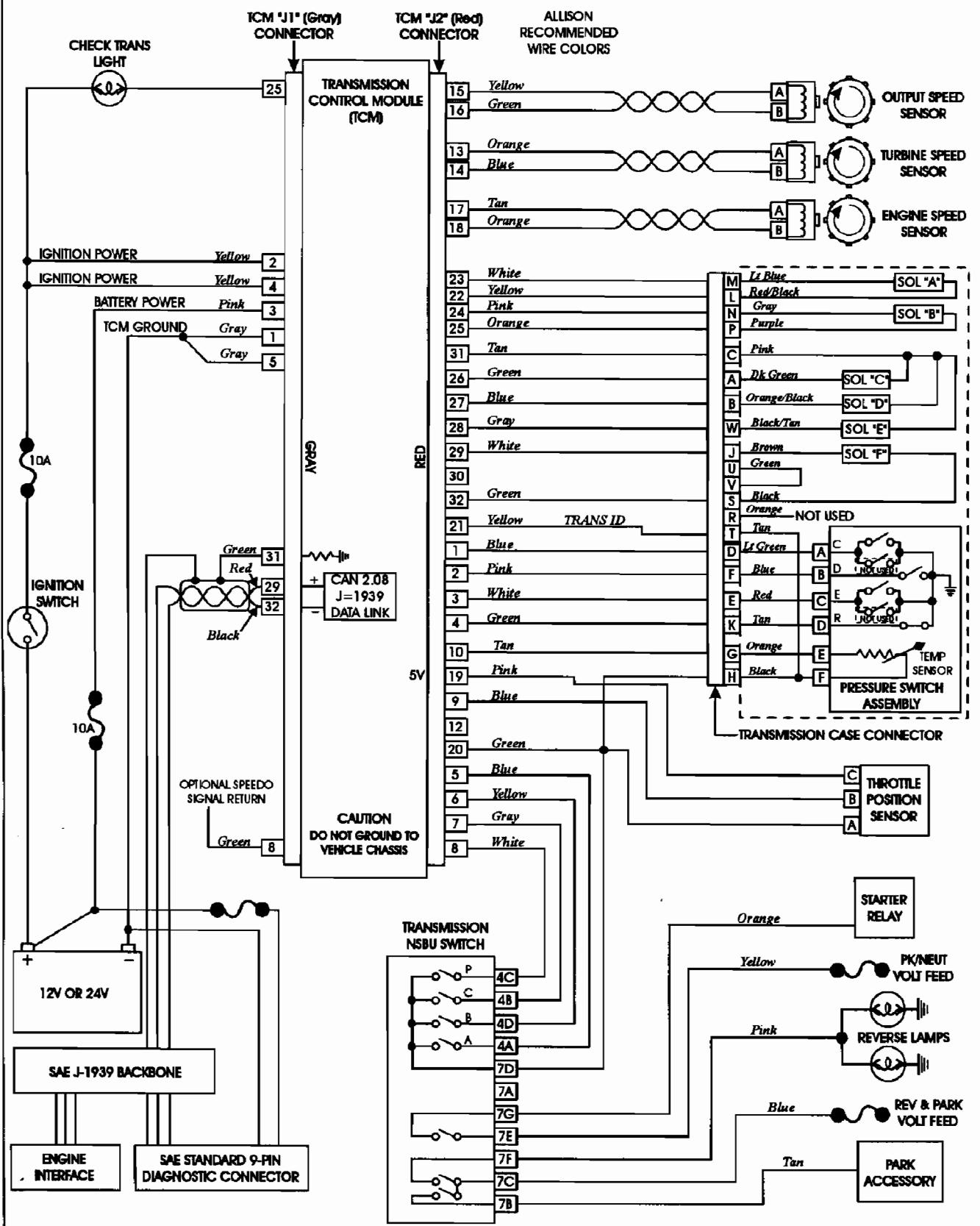


Solenoid	Terminals	Resistance In Ohms @ 72°F
TRIM "A"	L and M	5.5 - 8.0 Ω
TRIM "B"	N and P	5.5 - 8.0 Ω
SHIFT "C"	C and A	20 - 30 Ω
SHIFT "D"	C and B	20 - 30 Ω
SHIFT "E"	C and W	20 - 30 Ω
TCC "F"	J and S	8 - 15 Ω
TEMP SENSOR	H and G	2.8K Ω @ 72°F

TRANSMISSION EXTERNAL CONNECTOR FACE VIEW

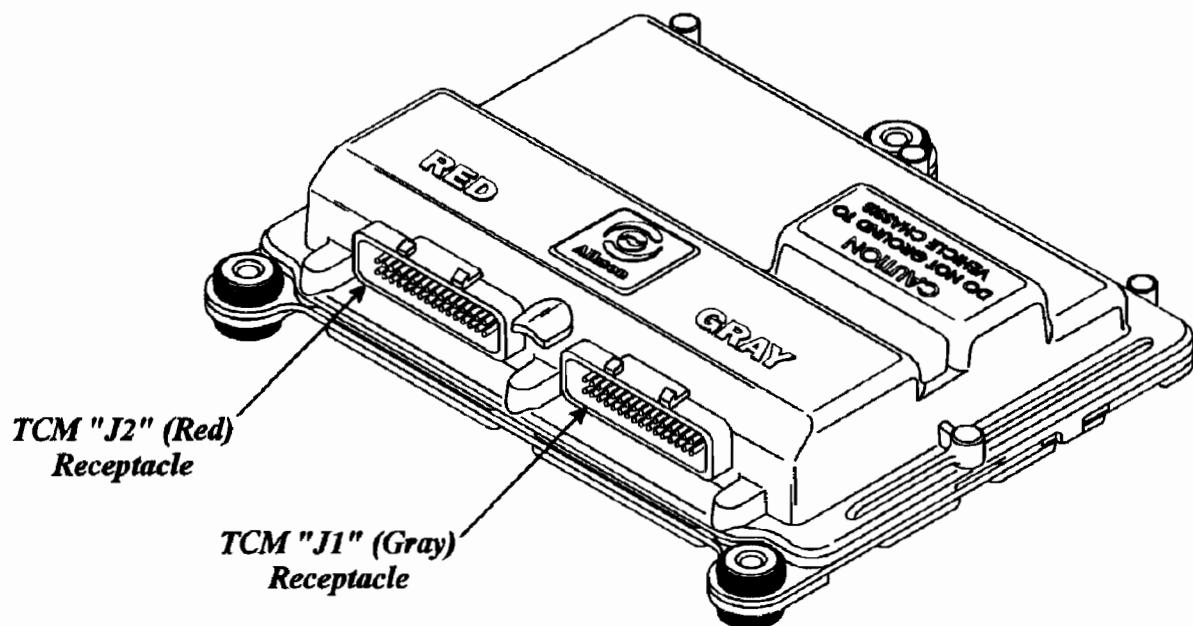


EXTERNAL WIRE SCHEMATIC

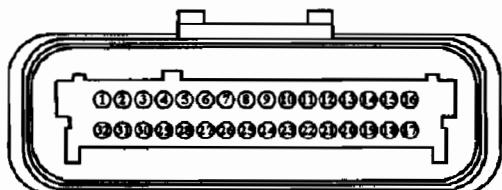


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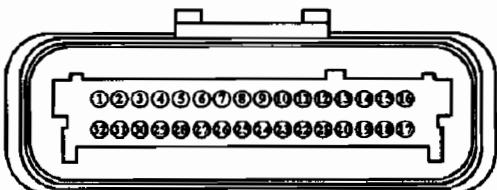
Figure 12



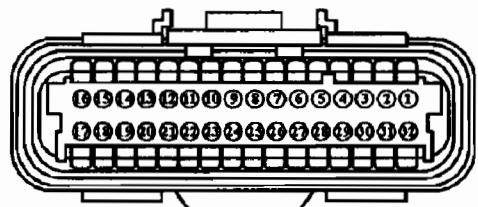
TRANSMISSION CONTROL MODULE (TCM)



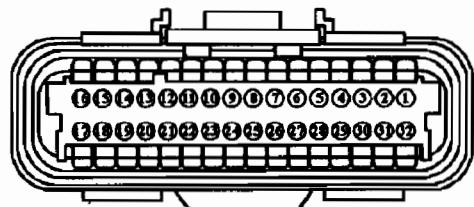
TCM "J2" (Red)
Receptacle



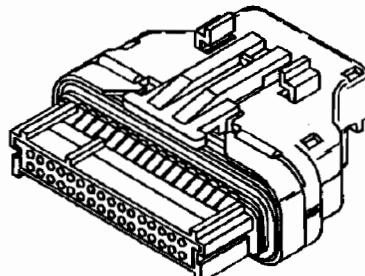
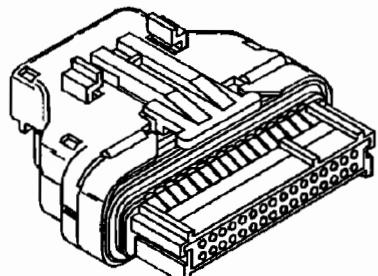
TCM "J1" (Gray)
Receptacle



TCM "J2" (Red)
Harness Connector
(Face View)



TCM "J1" (Gray)
Harness Connector
(Face View)

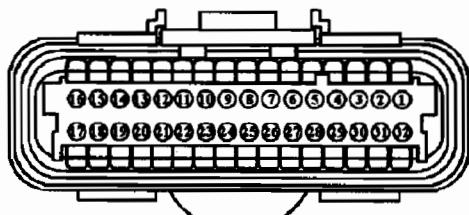


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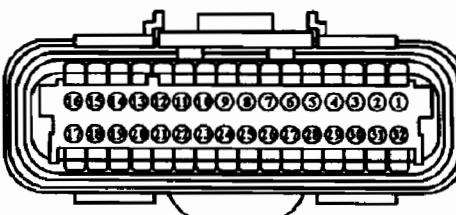
Figure 13



TCM CONNECTOR PIN IDENTIFICATION CHART



**TCM "J2" (Red)
Harness Connector
(Face View)**



**TCM "J1" (Gray)
Harness Connector
(Face View)**

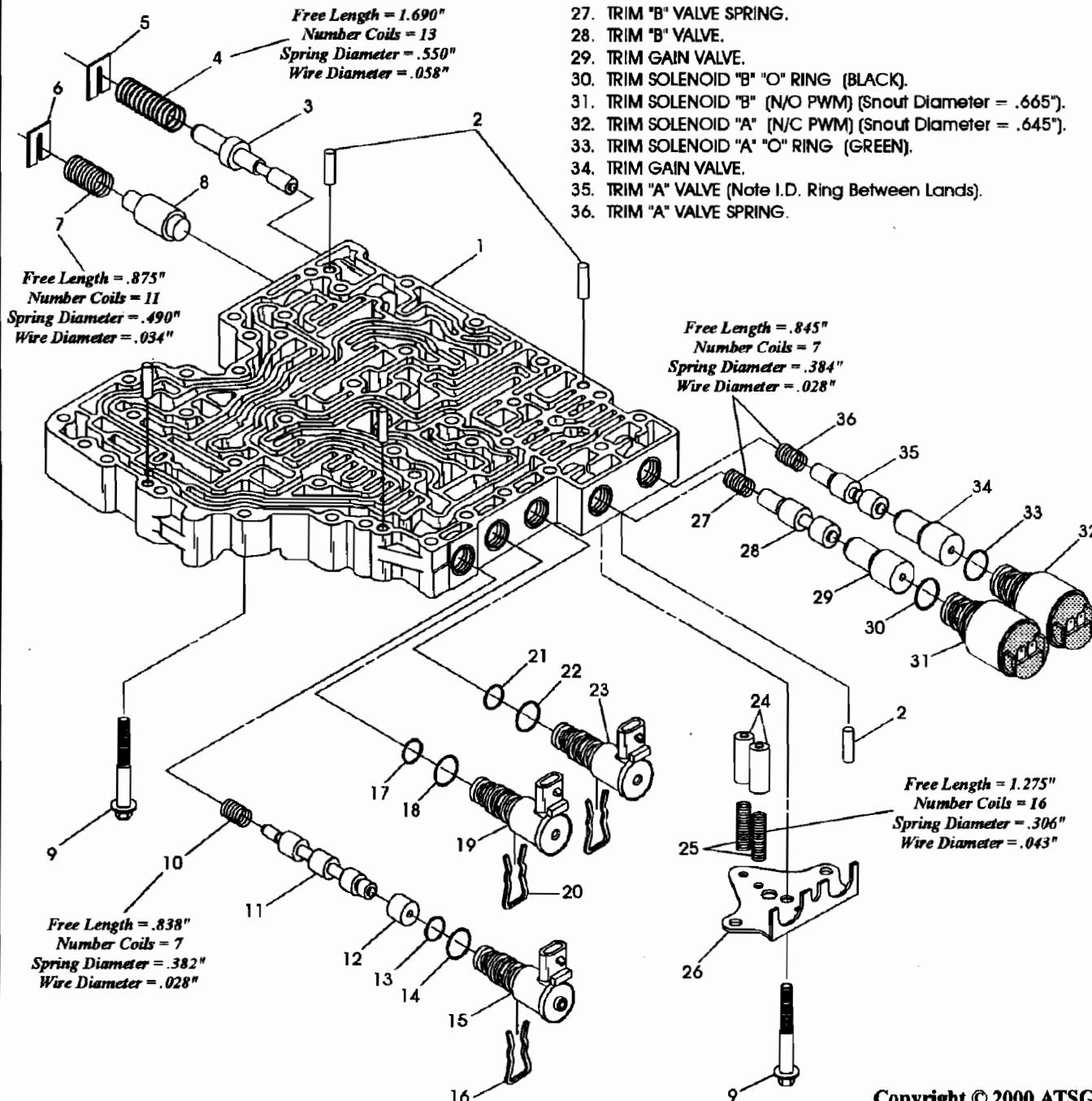
Term.	Color	Circuit Function	Circuit Ends	Term.	Color	Circuit Function	Circuit Ends
1	Blue	PSA Input	Trans-D	1	Gray	Battery Ground	Vehicle System
2	Pink	PSA Input	Trans-F	2	Yellow	Ignition Power	Vehicle System
3	White	PSA Input	Trans-E	3	Pink	Battery Power	Vehicle System
4	Green	PSA Input	Trans-K	4	Yellow	Ignition Power	Vehicle System
5	Blue	NSBU Input	NSBU-4A	5	Gray	Battery Ground	Vehicle System
6	Yellow	NSBU Input	NSBU-4D	6	Blue	GPI 1	Vehicle System
7	Gray	NSBU Input	NSBU-4B	7	Orange	GPI 2	Vehicle System
8	White	NSBU Input	NSBU-4C	8	Green	GPI 3	Vehicle System
9	Blue	Throttle Position Sensor	TPS-B	9	White	GPI 4	Vehicle System
10	Tan	Trans Sump Temp Input	Trans-G	10	Yellow	GPI 5	Vehicle System
11	Orange	Retarder Temp Input (Opt)	R Temp-A	11	Green	GPI 6	Vehicle System
12	Blue	Engine Coolant Temp	ECTS-A	12	Blue	GPI 7	Vehicle System
13	Orange	Turbine Speed Sensor (High)	TSS-A	13	Pink	GPI 8	Vehicle System
14	Blue	Turbine Speed Sensor (Low)	TSS-B	14	Orange	GPI 9	Vehicle System
15	Yellow	Output Speed Sensor (High)	OSS-A	15	Yellow	Retarder Mod. Reg. (Opt)	RMR-B
16	Green	Output Speed Sensor (Low)	OSS-B	16	White	PWM Throttle	Vehicle System
17	Tan	Engine Speed Sensor (High)	ESS-A	17	Pink	Sensor Power	RMR-C
18	Orange	Engine Speed Sensor (Low)	ESS-B	18	Green	Analog Ground	RMR-A
19	Pink	TPS Voltage Supply	TPS-C	19	Tan	GPO 1	Vehicle System
20	Green	Analog Ground	Trans-H, ECTS-A, Temp-B, NSBU-7D R-Temp-B, TPS-A	20	Orange	GPO 2	Vehicle System
				21	White	GPO 3	Vehicle System
21	Yellow	TRANS ID	Trans-T	22	Blue	GPO 4	Vehicle System
22	Yellow	Trim Solenoid A (High)	Trans-L	23	Pink	Range Inhibit Indicator	Vehicle System
23	White	Trim Solenoid A (Low)	Trans-M	24	White	GPO 6	Vehicle System
24	Pink	Trim Solenoid B (High)	Trans-N	25	Green	CHECK TRANS	Vehicle System
25	Orange	Trim Solenoid B (Low)	Trans-P	26	Tan	Vehicle Speed	Vehicle System
26	Green	C Solenoid Ground (On/Off)	Trans-A	27	Pink	Vehicle Speed	Vehicle System
27	Blue	D Solenoid Ground (On/Off)	Trans-B	28	Yellow	Digital Ground	Vehicle System
28	Gray	E Solenoid Ground (On/Off)	Trans-W	29	Red	CAN High	J 1939 A or H
29	White	F Solenoid Low (PWM)	Trans-J	30	Blue	ISO 9141	Vehicle System
30	Orange	G Solenoid Low (PWM)(Opt)	Trans-J	31	Green	CAN Shield	J 1939 C or S
31	Tan	C, D, E Solenoid V Supply	Trans-C	32	Black	CAN Low	J 1939 B or L
32	Green	F Solenoid High (PWM)	Trans-S				

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Figure 14

"MAIN" VALVE BODY EXPLODED VIEW

1. MAIN VALVE BODY CASTING.
2. ALIGNMENT DOWELS (5 REQUIRED).
3. MAIN CONTROL RELIEF VALVE.
4. MAIN CONTROL RELIEF VALVE SPRING.
5. MAIN CONTROL RELIEF VALVE SPRING RETAINER.
6. EXHAUST BACKFILL VALVE SPRING RETAINER.
7. EXHAUST BACKFILL VALVE SPRING.
8. EXHAUST BACKFILL VALVE.
9. BOLT, M6 X 1.0 X 50 (23 REQUIRED)
10. SOLENOID "F" TRIM VALVE SPRING.
11. SOLENOID "F" TRIM VALVE.
12. SOLENOID "F" TRIM VALVE SLEEVE.
13. SOLENOID "F" SMALL "O" RING.
14. SOLENOID "F" LARGE "O" RING.
15. SOLENOID "F" (LOCK-UP PWM).
16. SOLENOID "F" RETAINING CLIP.
17. SHIFT SOLENOID "D" SMALL "O" RING.
18. SHIFT SOLENOID "D" LARGE "O" RING.
19. SHIFT SOLENOID "D".
20. SHIFT SOLENOID "D" RETAINING CLIP.
21. SHIFT SOLENOID "E" SMALL "O" RING.
22. SHIFT SOLENOID "E" LARGE "O" RING.
23. SHIFT SOLENOID "E".
24. TRIM PRESSURE ACCUMULATORS.
25. TRIM PRESSURE ACCUMULATOR SPRINGS.
26. TRIM SOLENOID "A" AND "B" RETAINING BRACKET.
27. TRIM "B" VALVE SPRING.
28. TRIM "B" VALVE.
29. TRIM GAIN VALVE.
30. TRIM SOLENOID "B" "O" RING (BLACK).
31. TRIM SOLENOID "B" (N/O PWM) (Snout Diameter = .665").
32. TRIM SOLENOID "A" (N/C PWM) (Snout Diameter = .645").
33. TRIM SOLENOID "A" "O" RING (GREEN).
34. TRIM GAIN VALVE.
35. TRIM "A" VALVE (Note I.D. Ring Between Lands).
36. TRIM "A" VALVE SPRING.

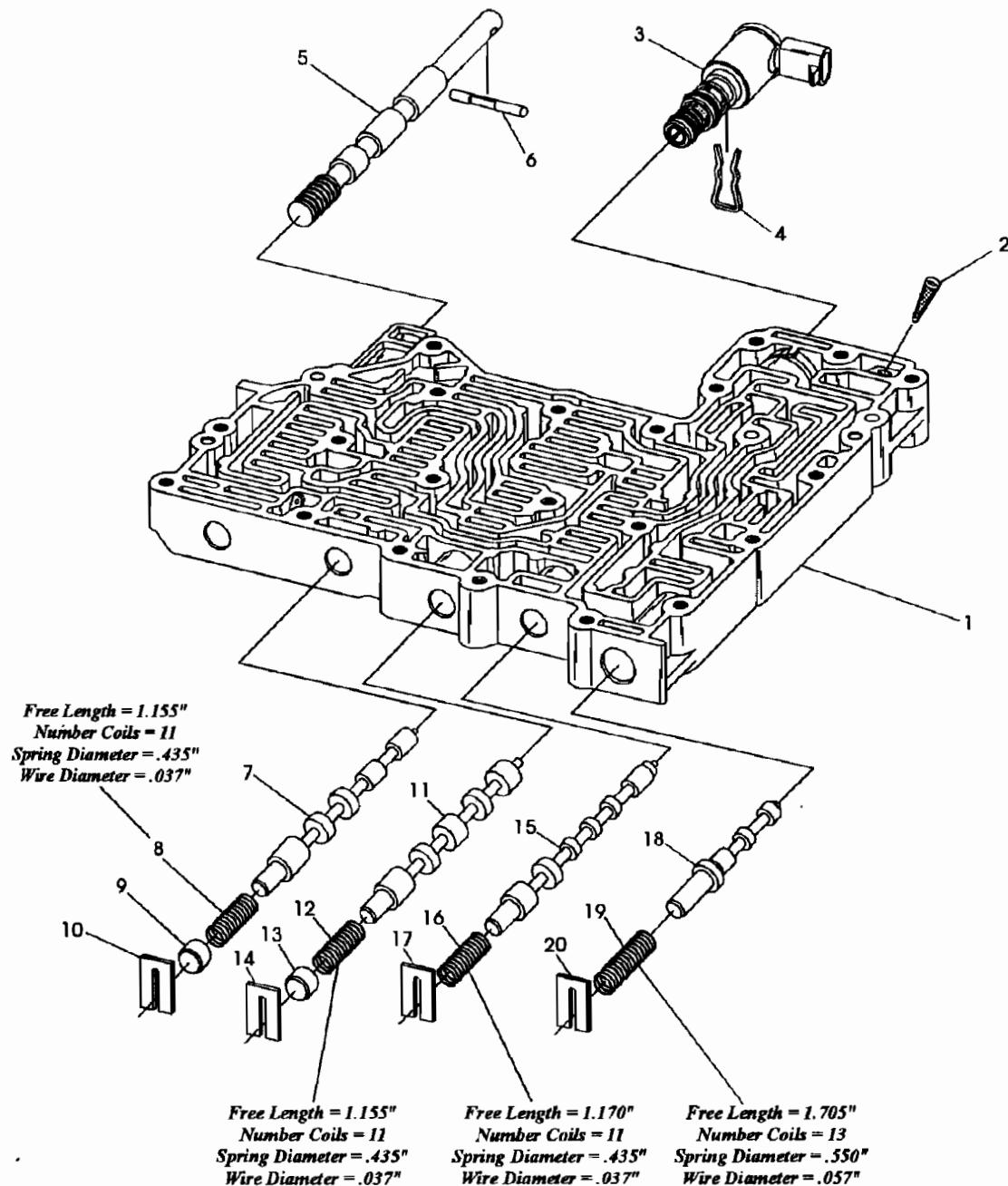


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Figure 15

"SHIFT" VALVE BODY EXPLODED VIEW

1. SHIFT VALVE BODY CASTING.
2. SOLENOID SCREEN.
3. SHIFT SOLENOID "C".
4. SHIFT SOLENOID "C" RETAINING CLIP.
5. MANUAL SELECTOR VALVE.
6. MANUAL SELECTOR VALVE PIN.
7. SOLENOID "D" SHIFT VALVE.
8. SOLENOID "D" SHIFT VALVE SPRING.
9. SOLENOID "D" SHIFT VALVE BORE PLUG.
10. SOLENOID "D" SHIFT VALVE LINE-UP RETAINER.
11. SOLENOID "E" SHIFT VALVE.
12. SOLENOID "E" SHIFT VALVE SPRING.
13. SOLENOID "E" SHIFT VALVE BORE PLUG.
14. SOLENOID "E" SHIFT VALVE LINE-UP RETAINER.
15. SOLENOID "C" SHIFT VALVE.
16. SOLENOID "C" SHIFT VALVE SPRING.
17. SOLENOID "C" SHIFT VALVE LINE-UP RETAINER.
18. MAIN CONTROL VALVE.
19. MAIN CONTROL VALVE SPRING.
20. MAIN CONTROL VALVE LINE-UP RETAINER.



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Figure 16



Winners Know How To Make Every Second Count.

Whether you're tearing down a drag strip or tearing down a transmission, you know that every second counts.

For you, the winning edge comes from doing a transmission job quickly and efficiently. And making sure it doesn't come back to haunt you.

Ask your parts supplier for Torrington Transmission Bearings Kits. Or ask yourself this question, "Do I have time to waste

looking for old, worn out transmission bearings and reducing my profit margin when I can replace them for a fraction of the total cost of the job?"

Torrington Kits make it easy. You get the entire set of quality replacement bearings in one neat package.

If your goal is smooth running transmission repair work, let Torrington put you in the driver's seat.

*Torrington Transmission
Bearings Kits get you to
the finish line faster.*

SNAP RING IDENTIFICATION CHART FOR C1/C2 CLUTCH HOUSING

Snap Ring Number 1 = .090" Thick, Largest Diameter "Eyelet" Snap Ring.

(C1 Clutch Housing Retaining Snap Ring)

Snap Ring Number 2 = .079" Thick, Approximate 3-3/16" Diameter.

(C1 Clutch Piston Return Spring Retaining Snap Ring)

Snap Ring Number 3 = .079" Thick, Approximate 6-1/2" Diameter.

(C1 Clutch Balance Piston Retaining Snap Ring)

Snap Ring Number 4 = .092" Thick, Approximate 8-3/8" Diameter, Same as Snap Ring Number 8.

(C2 Clutch Balance Piston Retaining Snap Ring)

Snap Ring Number 5 = .090" Thick, Smallest Diameter "Eyelet" Snap Ring.

(Turbine Shaft Retaining Snap Ring)

Snap Ring Number 6 = .078" Thick, Approximate 2-7/8" Diameter.

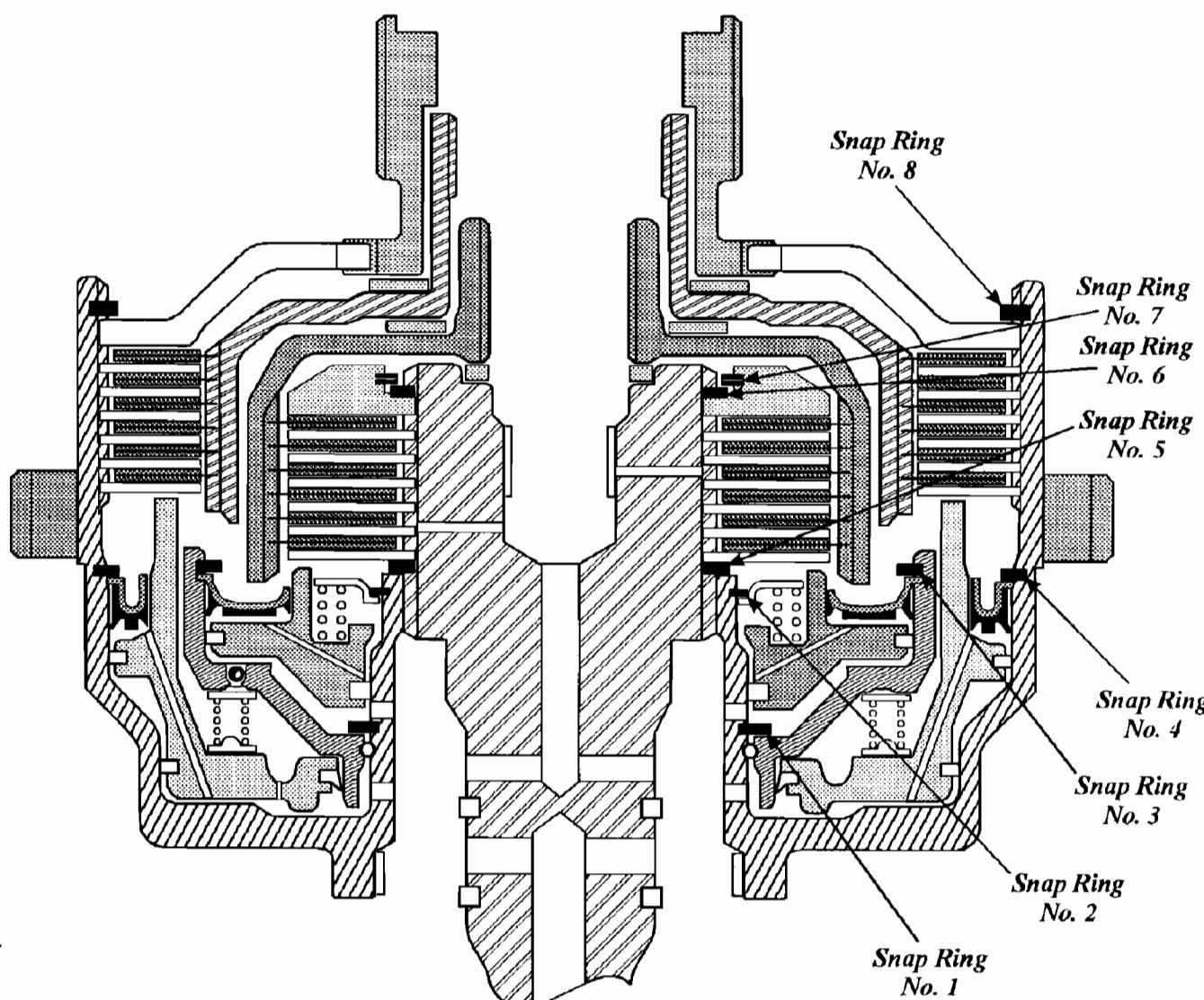
(C1 Clutch Backing Plate Retaining Snap Ring)

Snap Ring Number 7 = "Spiral" Snap Ring, Approximate 3-1/4" Diameter.

(C1 Clutch Backing Plate Snap Ring, "Spiral" Retaining Snap Ring)

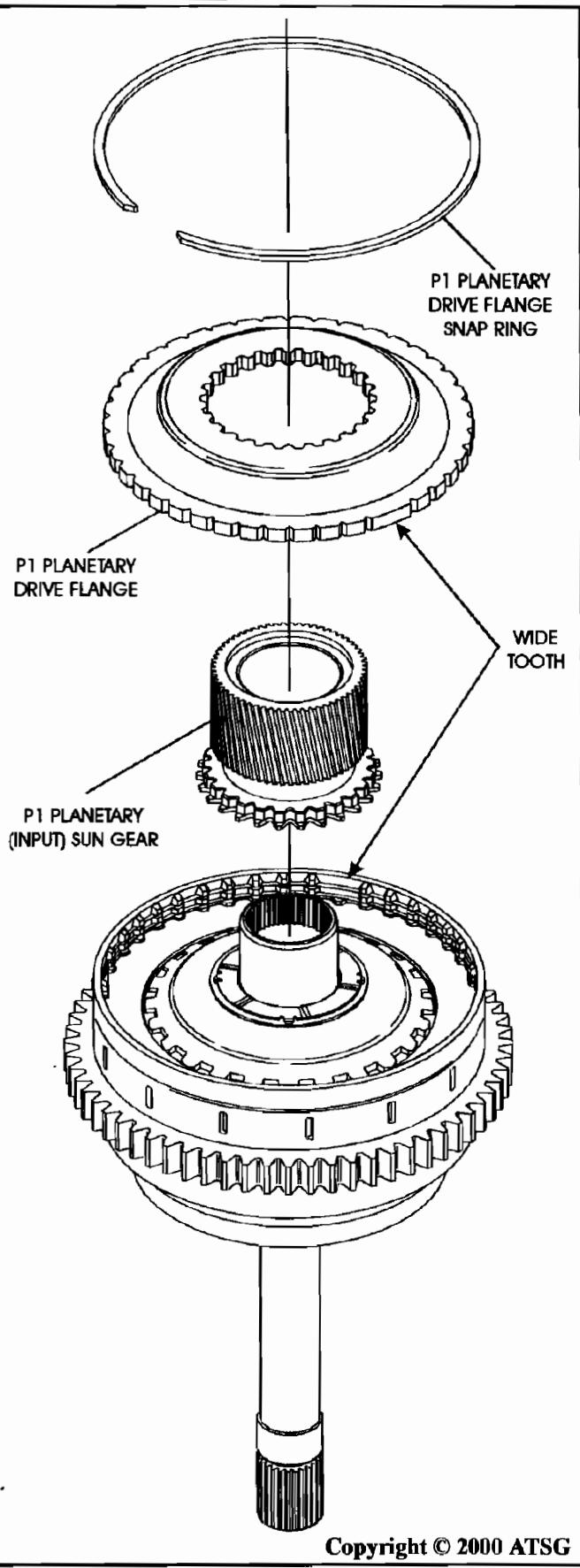
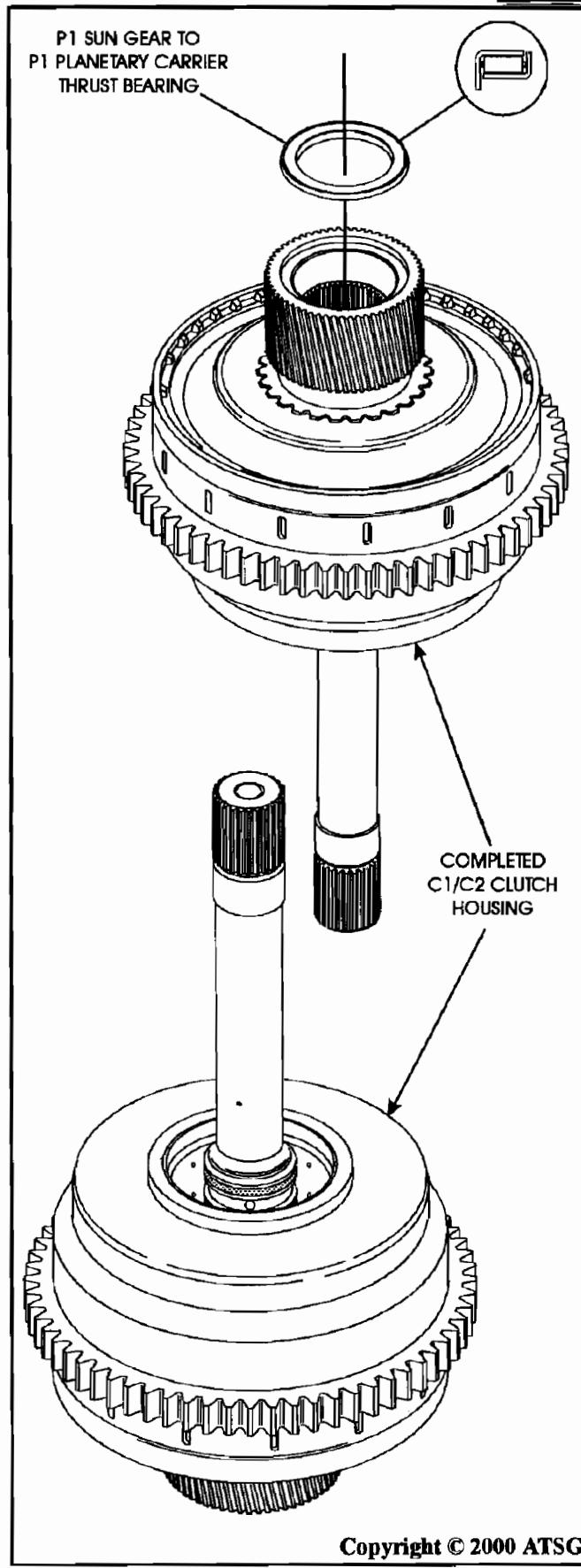
Snap Ring Number 8 = .092" Thick, Approximate 8-3/8" Diameter, Same as Snap Ring Number 4.

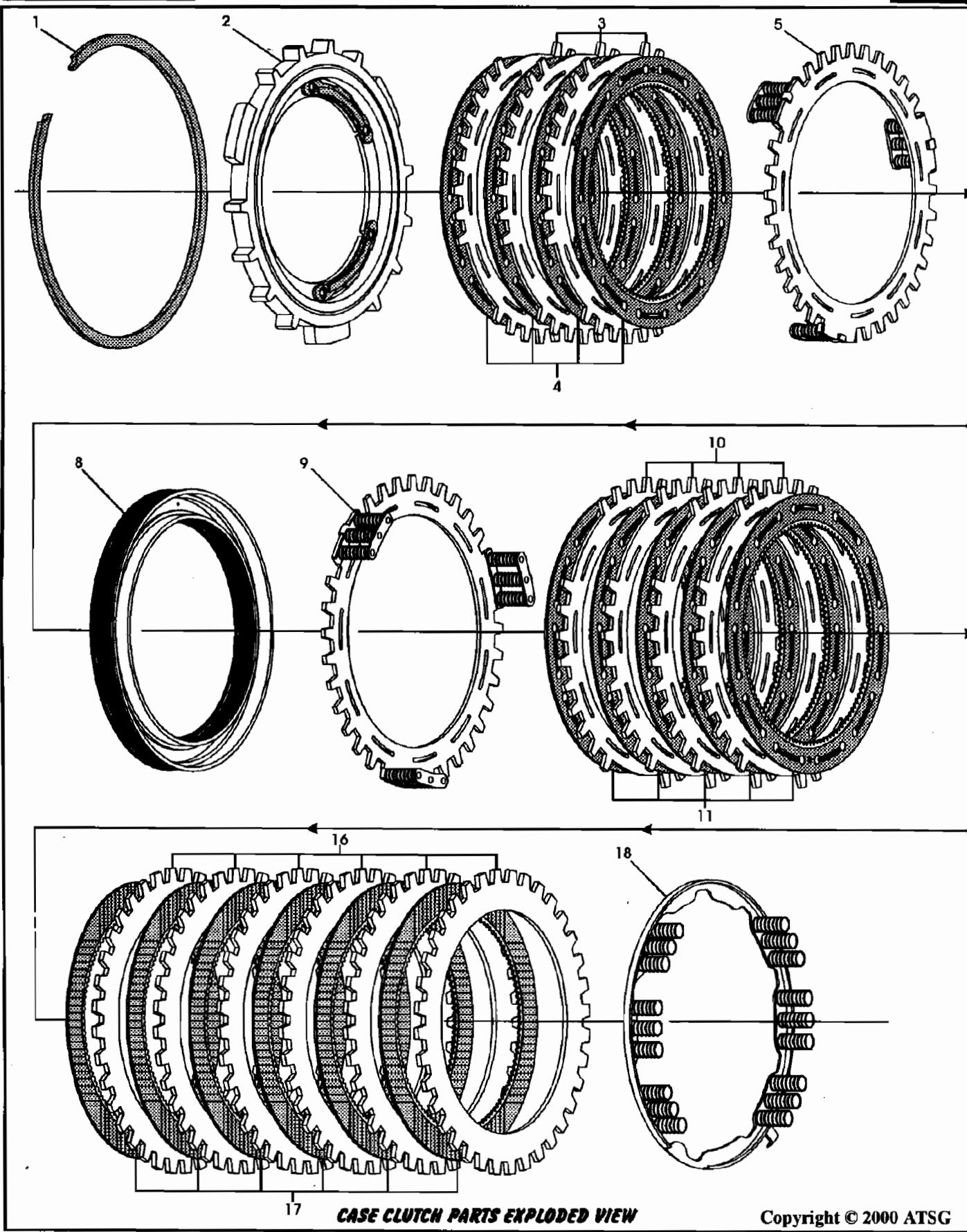
(C2 Clutch Backing Plate Retaining Snap Ring)



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Figure 17

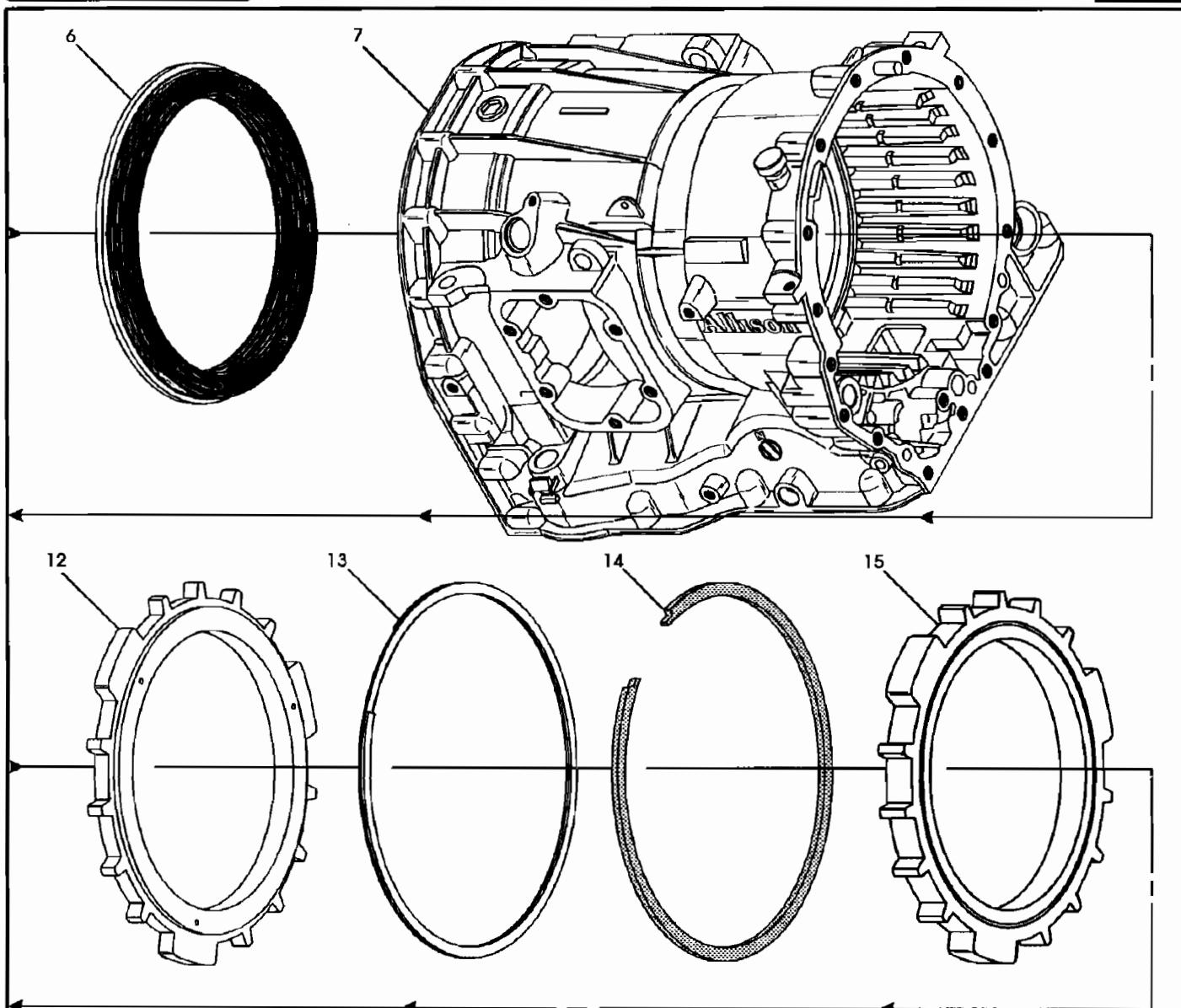
**Figure 18****Figure 19**



17 CASE CLUTCH PARTS EXPLODED VIEW

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Figure 20

**CASE CLUTCH PARTS EXPLODED VIEW**

1. C3 CLUTCH BACKING PLATE RETAINING SNAP RING.
2. C3 CLUTCH BACKING PLATE ASSEMBLY.
3. C3 CLUTCH STEEL PLATES, .097" THICK (3 REQUIRED).
4. C3 CLUTCH LINED PLATES (4 REQUIRED).
5. C3 CLUTCH APPLY PLATE WITH SPRINGS, .125" THICK.
6. C3 CLUTCH MOLDED PISTON ASSEMBLY.
7. TRANSMISSION MAIN CASE ASSEMBLY.
8. C4 CLUTCH MOLDED PISTON ASSEMBLY.
9. C4 CLUTCH APPLY PLATE WITH SPRINGS, .125" THICK.
10. C4 CLUTCH STEEL PLATES, .097" THICK (4 REQUIRED).
11. C4 CLUTCH LINED PLATES (5 REQUIRED).
12. C4 CLUTCH BACKING PLATE.
13. C4 CLUTCH "SPIRAL" SNAP RING.
14. C4 CLUTCH BACKING PLATE SNAP RING.
15. C5 CLUTCH BACKING PLATE.
16. C5 CLUTCH "SELECTIVE" STEEL PLATES, .097" THICK (6 REQUIRED).
16. C5 "SELECTIVE" STEEL PLATE, 1.935 - 2.065mm (.076" - .081").
16. C5 "SELECTIVE" STEEL PLATE, 2.435 - 2.565mm (.096" - .101").
16. C5 "SELECTIVE" STEEL PLATE, 2.935 - 3.065mm (.115" - .120").
17. C5 CLUTCH LINED PLATES (6 REQUIRED).
18. C5 CLUTCH RETURN SPRING ASSEMBLY.

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Figure 21

Put Science Friction to work for you with Clutchtex®!

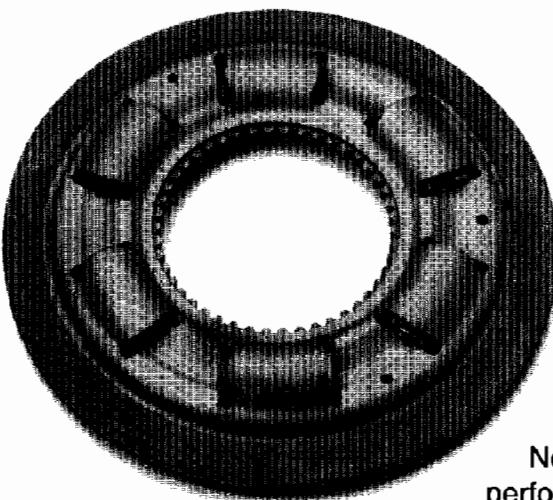
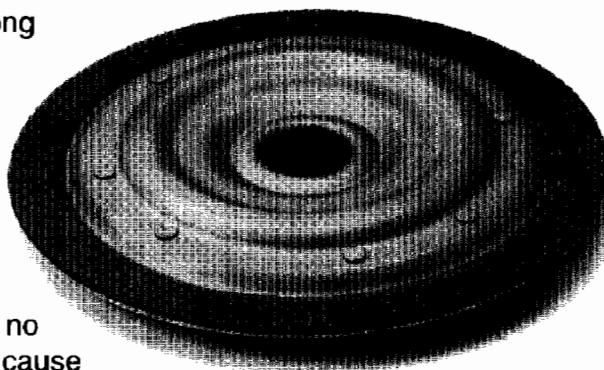
Clutchtex® lasts at least three times longer than carbon fiber—and ALL other torque converter linings!

Reduce lining related comebacks!

You can reduce or eliminate lining-related comebacks and problems with Clutchtex! The reason is Clutchtex is NOT paper. Clutchtex is the world's first and only 100% Kevlar fibered composite textile friction lining. Simply put, we don't use the outmoded materials and manufacturing techniques that stand in the way of improved friction lining performance.

Instead, Clutchtex is manufactured with a patented textile sheet-making process that enables us to use 100% long Kevlar fibers. Consequently, Clutchtex does NOT contain Kevlar pulp or cotton fibers that break down easily because of heat, resulting in lining failure and other problems. Because Clutchtex withstands higher heat, it is ideal for heavy duty, performance and commercial applications.

Clutchtex is also nonabrasive—and won't grind down the converter cover like many other linings do. So you no longer have to worry about metal particles that can cause torque converter failure.



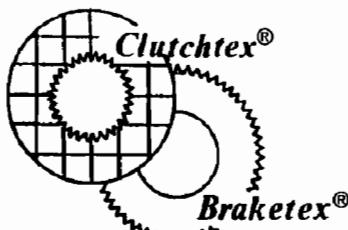
All lining sizes available

We stock ready-to-bond Clutchtex lockup facings in many popular sizes and will custom cut ANY other size that you need—at no extra cost.

We also have Clutchtex lined bands and friction plates for automatic transmissions and offer a full line of buttons, blanks and plates for manual clutches. Call for prices and availability—your call will be answered by our helpful, knowledgeable staff, not a machine.

Clutchtex is performance proven worldwide

Never heard of Clutchtex? Rest easy because Clutchtex has been performance proven for more than twenty years in thousands of dry and wet clutch, brake, power transmission, PTO and torque converter applications around the world. Bottom line? Clutchtex is the way more and more smart rebuilders are getting an edge on their competitors! Call now for availability and prices.



Tribco Inc.

Developer and manufacturer of the world's first 100% Kevlar® fibered textile composite friction lining for brakes, clutches and other industrial applications

1700 London Road, Cleveland OH 44112 U.S.A.
Phone: 216-486-2000 Fax: 216-486-2099



FORD 4F27E/MAZDA FN4A-EL PRELIMINARY INFORMATION

Ford Motor Company in a joint venture with Mazda in Japan have developed a new transaxle designed for use in the 1999 Mazda Protegé and the 2000 Ford Focus. Ford's designation for this transaxle is the 4F27E while Mazda calls it the FN4A-EL. This new transaxle is produced by Ford Motor Company in Sterling Heights, Michigan.

This is a four speed, Front Wheel Drive, with fully electronic controls for the up shifts and downshifts, with 4th gear being overdrive. The individual gear ratios are achieved through two planetary gear sets connected one behind the other. The components of the planetary gear sets are driven or locked by means of four multiple plate clutches, one brake band and a one-way roller clutch, and are illustrated in Figure 1 along with the component application chart for each gear.

Special Note: This transaxle currently shows two different axle ratios and Figure 2 also shows how to identify which ratio belongs in the vehicle that you may have. Surely you must know by now that the PCM will recognize almost instantly if you install the wrong axle ratio.

To minimize fuel consumption, the torque converter clutch is applied by the PCM in 3rd and 4th gears, depending on throttle position and vehicle speed. This unit is designed to use Mercon® V automatic transmission fluid.

The "Powertrain Warning Indicator Lamp" as seen in Figure 2 will illuminate when there is a Diagnostic Trouble Code stored, not the traditional O/D cancel light flashing. Refer to Figure 3 for the description of the Diagnostic Trouble Codes.

A line pressure tap is located between the bell housing and main case. Refer to Figure 4 for the tap location and pressure check chart and stall speed information as well as the identification for the cooler out and cooler in fittings.

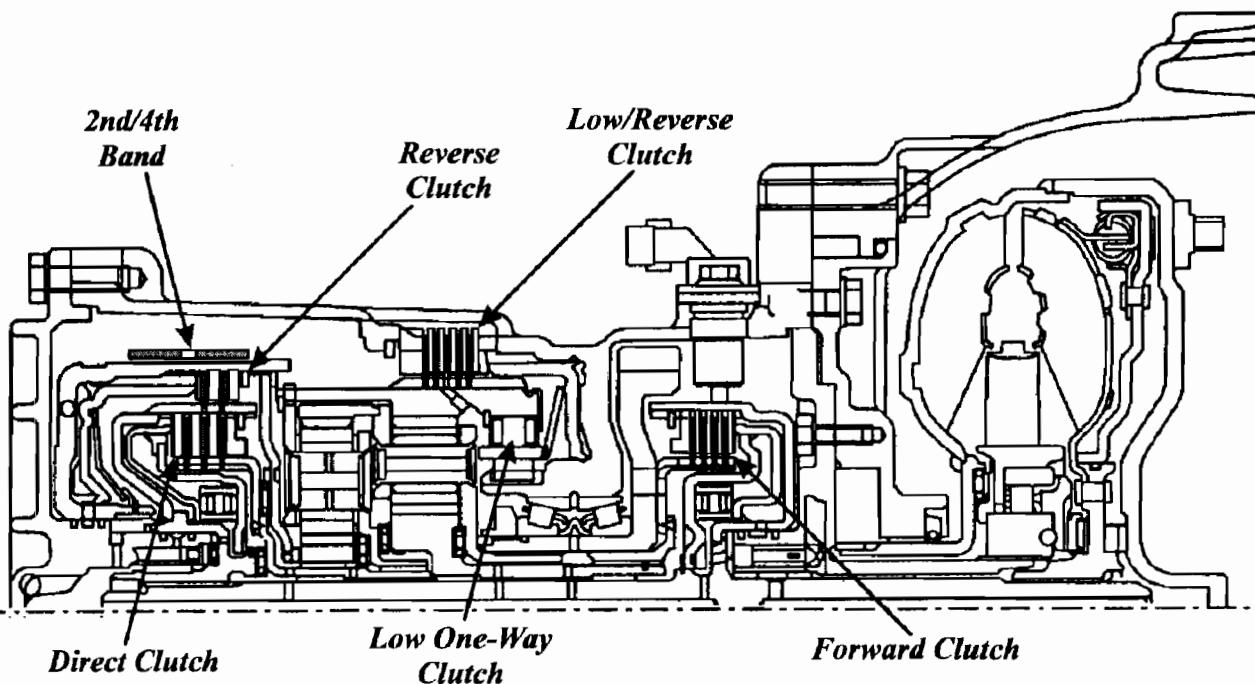
There are three main inputs to the PCM on this transaxle. The first to look at is the typical Transaxle Range Sensor (TRS) located on the same side of the transaxle as the case connector (See Figure 5). The manual selector lever gives the driver a choice of "P", "R", "N", "D", "2", "1", and all ranges are explained in detail in Figure 6. It is also possible to operate an O/D cancel switch, located on the selector lever, to prevent the transaxle from shifting into 4th gear or to shift down to 3rd gear as shown in Figure 6. Refer to Figure 7 for the TRS connector pin identification and wiring to the PCM.

The other two inputs are the Turbine Speed Sensor (TSS) and the Output Speed Sensor (OSS). Refer to Figure 8 for their locations and the resistance chart to check these two sensors. Figure 9 gives you the location of the PCM and pin identification for the PCM with a wiring diagram provided in Figure 10.

As outputs from the PCM to the transaxle through the case connector (See Figure 10), there are six different solenoids to control shift timing, shift feel and TCC operation. Refer to Figure 11 for the location and identification of each solenoid on the valve body and the resistance chart for the internal components. Shift Solenoids "A" and "B" are On-Off solenoids while shift Solenoids "C", "D" and "E" are Pulse Width Modulated (PWM) solenoids and control the pressures to the various apply components. The sixth solenoid is the Electronic Pressure Control (EPC) solenoid. Refer to Figure 12 for the solenoid application chart for each gear.

NOTE: Referring to Figure 10 which contains pin identification for the case connector and the vehicle harness connector as well as the internal wire schematic, notice also in Figure 10 that we have labeled the internal harness connectors for each solenoid. It is mandatory that the internal harness connectors be installed as shown in Figure 10. The harness connector color letters are also cast into the valve body, and can be seen in Figure 11.

Refer to Figures 13 and 14 for the exploded view of the valve body and solenoids.



4F27E TRANSAXLE COMPONENT APPLICATION CHART

RANGE	Forward Clutch	2nd-4th Band	Direct Clutch	Reverse Clutch	Low/Rev Clutch	Low One-Way Clutch	Gear Ratio
PARK							
REVERSE				ON	ON		2.649
NEUTRAL							
DRIVE-1st	ON					HOLD	2.816
DRIVE-2nd	ON	ON					1.498
DRIVE-3rd	ON		ON				1.000
DRIVE-4th		ON	ON				0.726
MANUAL-2nd	ON	ON					1.498
MANUAL-1st	ON				ON		2.816

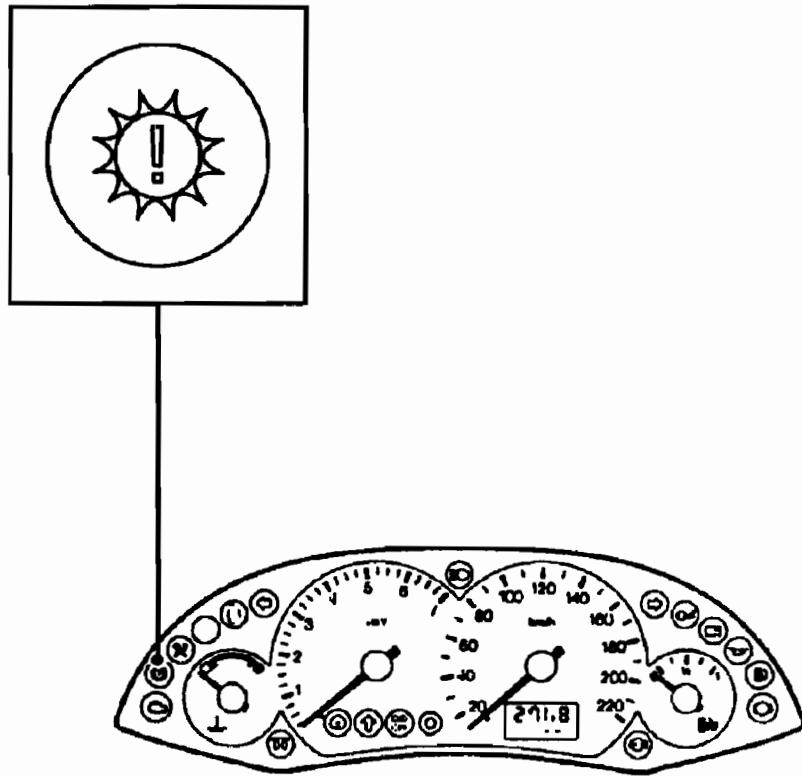
NOTE: Failsafe on this unit is 3rd gear in all forward ranges

NOTE: There are two different axle ratios listed for this transaxle;

NN = 3.693 Automatic

WW = 3.904 Automatic

REFER TO DOOR TAG INFORMATION IN FIGURE 6
TO DETERMINE GEAR RATIO FOR YOUR VEHICLE.

POWERTRAIN WARNING INDICATOR

The "Powertrain Warning Indicator" is located on the left side of the instrument cluster as shown above and is Orange in color.

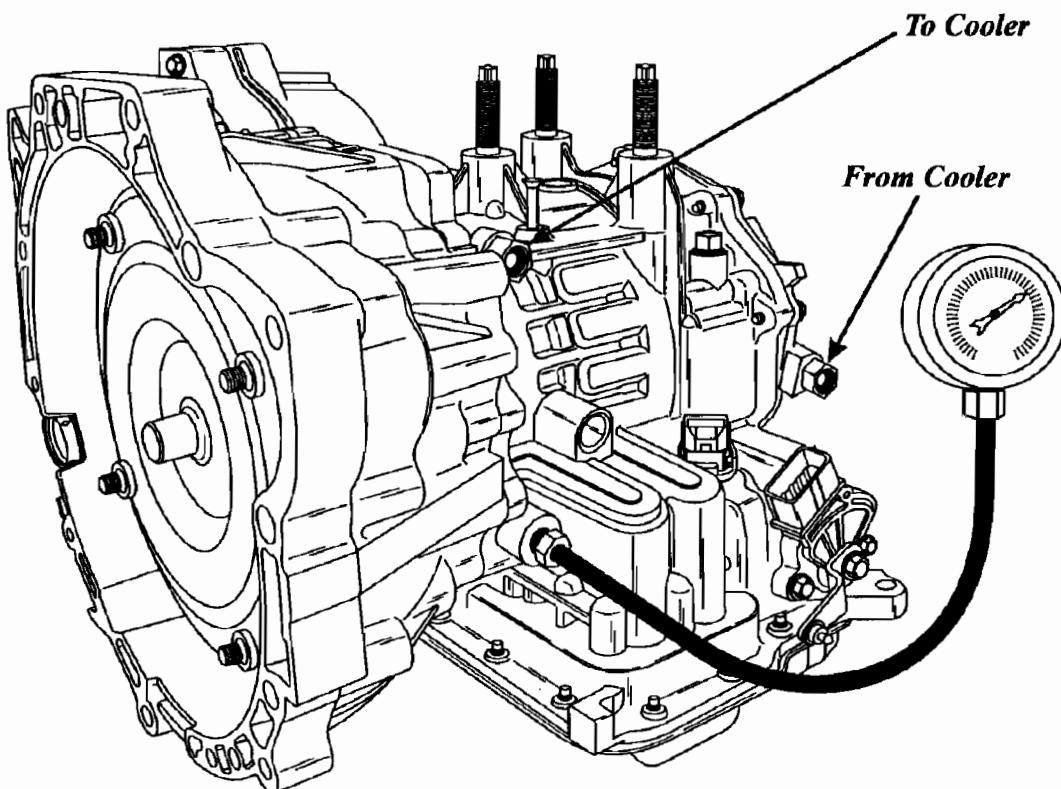
The "Powertrain Warning Indicator" illuminates to inform the driver that the transaxle has been put into "Failsafe", which is 3rd gear, and that a DTC has been stored into memory. This is contrary to Ford tradition with the O/D cancel light flashing to inform the driver of problems.

DIAGNOSTIC TROUBLE CODE CHARTS	
DTC	DESCRIPTION
P0705	<i>Transmission Range Sensor Circuit Failure</i>
P0712	<i>Transmission Fluid Temperature Sensor Circuit Grounded, 315°F Indicated</i>
P0713	<i>Transmission Fluid Temperature Sensor Circuit Open, -40°F Indicated</i>
P0715	<i>Turbine Shaft Speed Sensor, Insufficient Input</i>
P0717	<i>Turbine Shaft Speed Sensor, Intermittent Signal</i>
P0718	<i>Turbine Shaft Speed Sensor Erratic</i>
P0720	<i>Output Shaft Speed Sensor, Insufficient Input</i>
P0721	<i>Output Shaft Speed Sensor Erratic</i>
P0722	<i>Output Shaft Speed Sensor, Intermittent Signal</i>
P0731	<i>1st Gear Error - Shift Solenoid "A", "B", "C", Or Internal Parts</i>
P0732	<i>2nd Gear Error - Shift Solenoid "A", "B", "C", Or Internal Parts</i>
P0733	<i>3rd Gear Error - Shift Solenoid "A", "B", "C", Or Internal Parts</i>
P0734	<i>4th Gear Error - Shift Solenoid "A", "B", "C", Or Internal Parts</i>
P0741	<i>Torque Converter Clutch Slippage Detected</i>
P0745	<i>EPC Solenoid Circuit Failure, Circuit Shorted</i>
P0750	<i>Shift Solenoid "A" Circuit Failure</i>
P0751	<i>Shift Solenoid "A", Mechanical Or Hydraulic Failure</i>
P0755	<i>Shift Solenoid "B" Circuit Failure</i>
P0756	<i>Shift Solenoid "B", Mechanical Or Hydraulic Failure</i>
P0760	<i>Shift Solenoid "C" Circuit Failure</i>
P0761	<i>Shift Solenoid "C", Mechanical Or Hydraulic Failure</i>
P0765	<i>Shift Solenoid "D" Circuit Failure</i>
P0766	<i>Shift Solenoid "D", Mechanical Or Hydraulic Failure</i>
P0770	<i>Shift Solenoid "E" Circuit Failure</i>
P0771	<i>Shift Solenoid "E", Mechanical Or Hydraulic Failure</i>
P1700	<i>Internal Transaxle Mechanical Failure</i>
P1705	<i>Transmission Range Sensor, Not In Park Or Neutral During KOEO/KOER</i>
P1711	<i>Transmission Fluid Temperature Sensor, Out Of On-Board Diagnostic Range</i>
P1713	<i>Transmission Fluid Temperature Sensor, No Change In Low Range</i>
P1718	<i>Transmission Fluid Temperature Sensor, No Change In High Range</i>
P1746	<i>EPC Solenoid Circuit Failure, Circuit Open</i>
P1747	<i>EPC Solenoid Circuit Failure, Circuit Shorted</i>
P1760	<i>EPC Solenoid Circuit, Intermittent Short To Ground</i>
P1780	<i>Transaxle Control Switch, Input Incorrect For Selected Position</i>
P1783	<i>Transaxle Overtemp Condition Indicated</i>

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Figure 3

4F27E TRANSAXLE LINE PRESSURE TEST

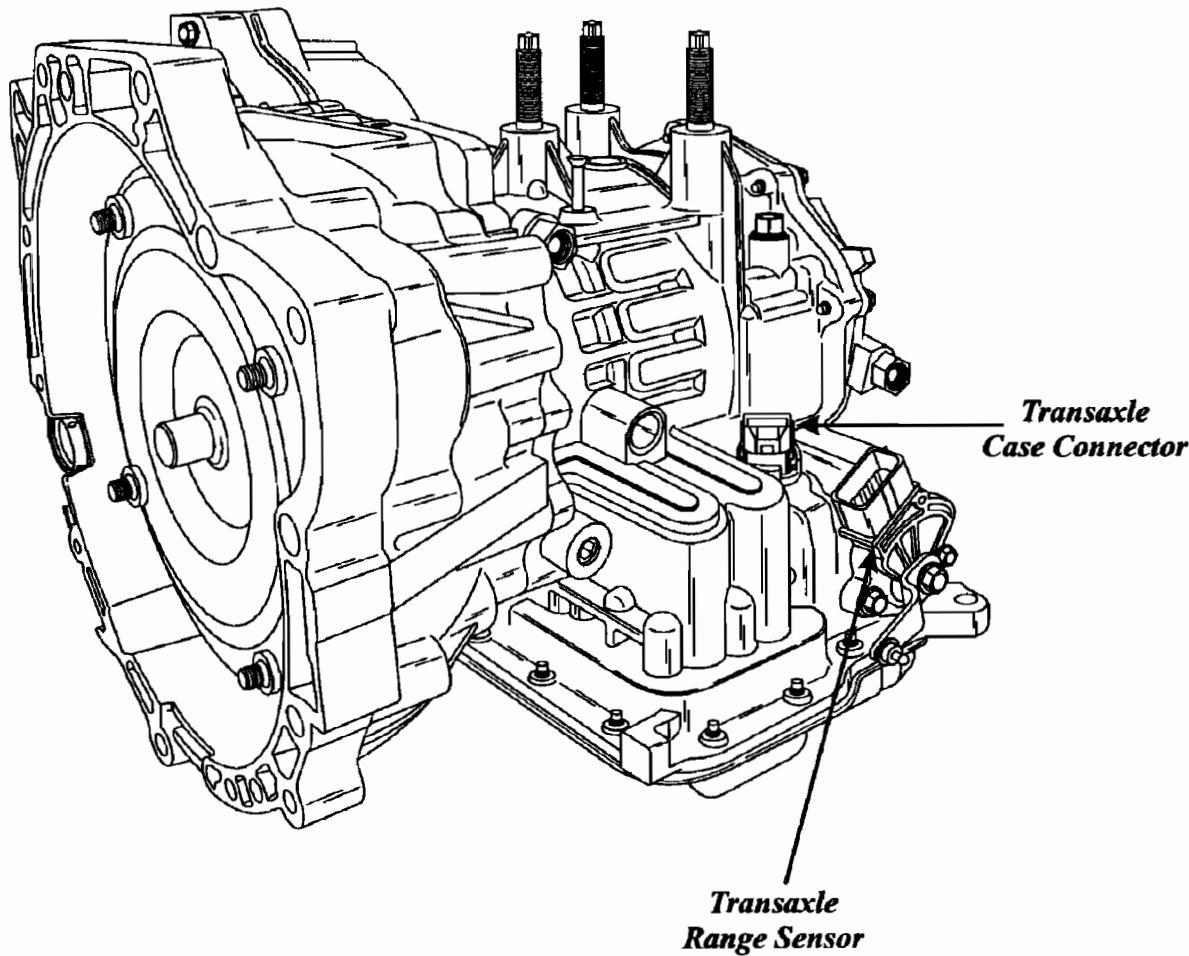


4F27E TRANSAXLE LINE PRESSURE TEST		
RANGE	IDLE	STALL
Park/Neutral	50-65 PSI (345-450 KPA)	
Reverse	65-85 PSI (450-585 KPA)	280-335 PSI (1930-2310 KPA)
D, 2, 1	50-65 PSI (345-450 KPA)	180-210 PSI (1240-1450 KPA)

STALL SPEED CHART	
ENGINE	RPM
2.0L SPI (Split Port Induction)	2330-2740
2.0L "Zetec"-E	2300-2800

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Figure 4

FORD 4F27E/MAZDA FN4A-EL TRANSAXLE
(Found In 1999 Protégé and the 2000 Focus)**4 — FOUR FORWARD SPEEDS****F — FRONT WHEEL DRIVE****27 — RELATIVE TORQUE CARRYING CAPACITY****E — FULLY ELECTRONIC CONTROLLED**

MANUAL SELECTOR LEVER

P In manual selector lever position "P" no gear is selected. The parking pawl is engaged manually by the shift shaft linkage.

R In manual selector lever position "R" reverse gear is selected. Reverse allows the vehicle to be operated in a rearward direction, at a reduced gear ratio.

N In manual selector lever position "N" no gear is selected. The driveline is not locked, so the wheels are free to rotate. The engine may be started in Neutral.

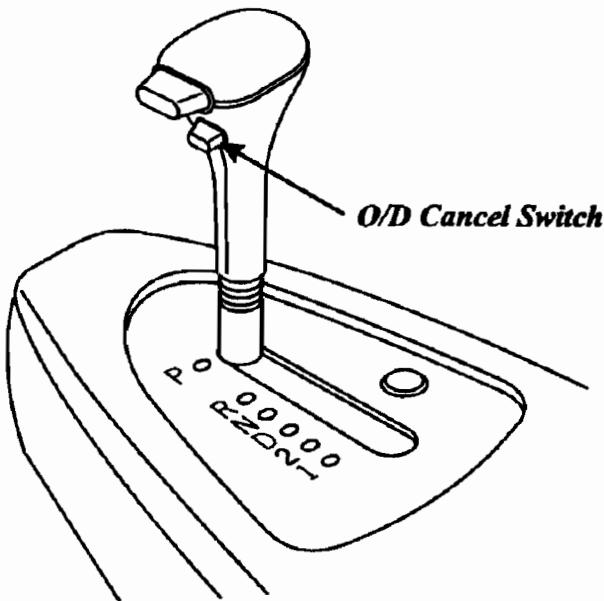
D In manual selector lever position "D" the transmission control system allows upshifts first through fourth gears automatically. When the O/D cancel switch is pressed, shifting into 4th gear is prevented, or if it is already in 4th gear, the transmission shifts down to 3rd gear.

2 In manual selector lever position "2" *only* 2nd gear is selected. The transmission controls will not allow a shift into first gear.

If the manual selector lever is moved to position "2" at an excessive vehicle speed for 2nd gear, the computer only allows the shift to take place when a safe vehicle speed has been reached.

1 In manual selector lever position "1" *only* first is selected. The transmission control system applies the Low/Reverse clutch to provide engine braking effect.

If the manual selector lever is moved to position "1" at an excessive vehicle speed for 1st gear, the computer only allows the shift to take place when a safe vehicle speed has been reached.



MFD BY FORD MOTOR CO IN USA		
DATE: 12/99	GWRR 4792LB 173KG	
FRONT GAWR	2491LB 1129KG	
REAR GAWR	2324LB 1054KG 2324LB 1054KG	
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL		
MOTOR VEHICLE SAFETY, BUMPER AND THEFT PREVENTION		
VIN 1FAPP6235VH103589	F8169	
TYPE PASSENGER	RO114	
EXT PNT KM	RC: 71	DSO 2450
BRK IN TR TP PS	R AXLE	TR SPR
4 A2	H NN	L DOMM

Axle Ratio Codes _____

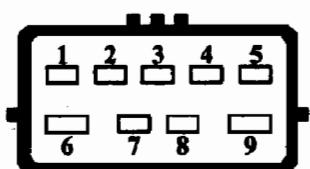
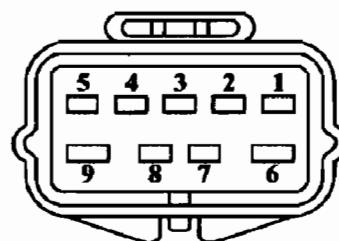
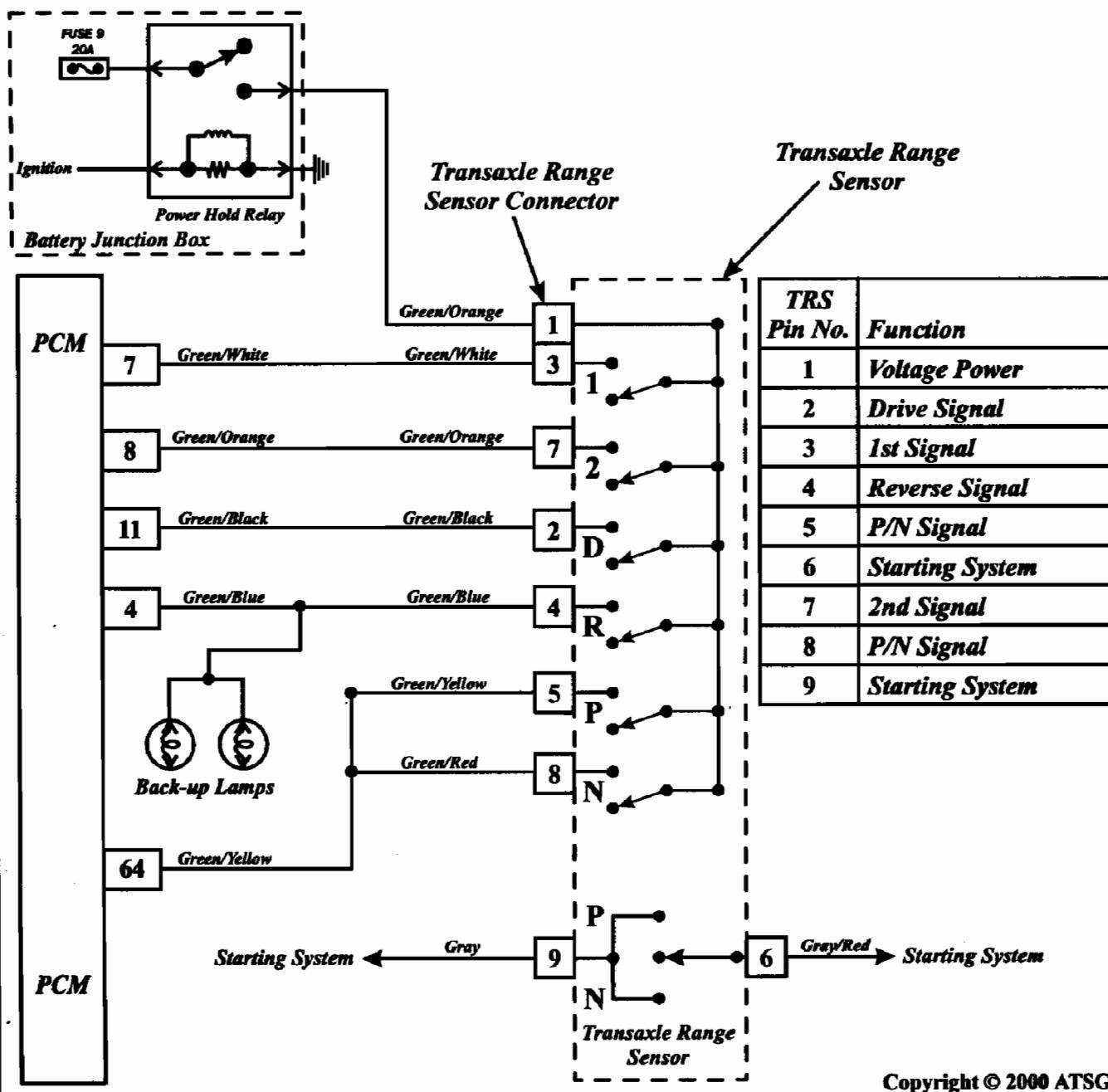
Transmission/Transaxle Codes _____

(See Component Application Chart)

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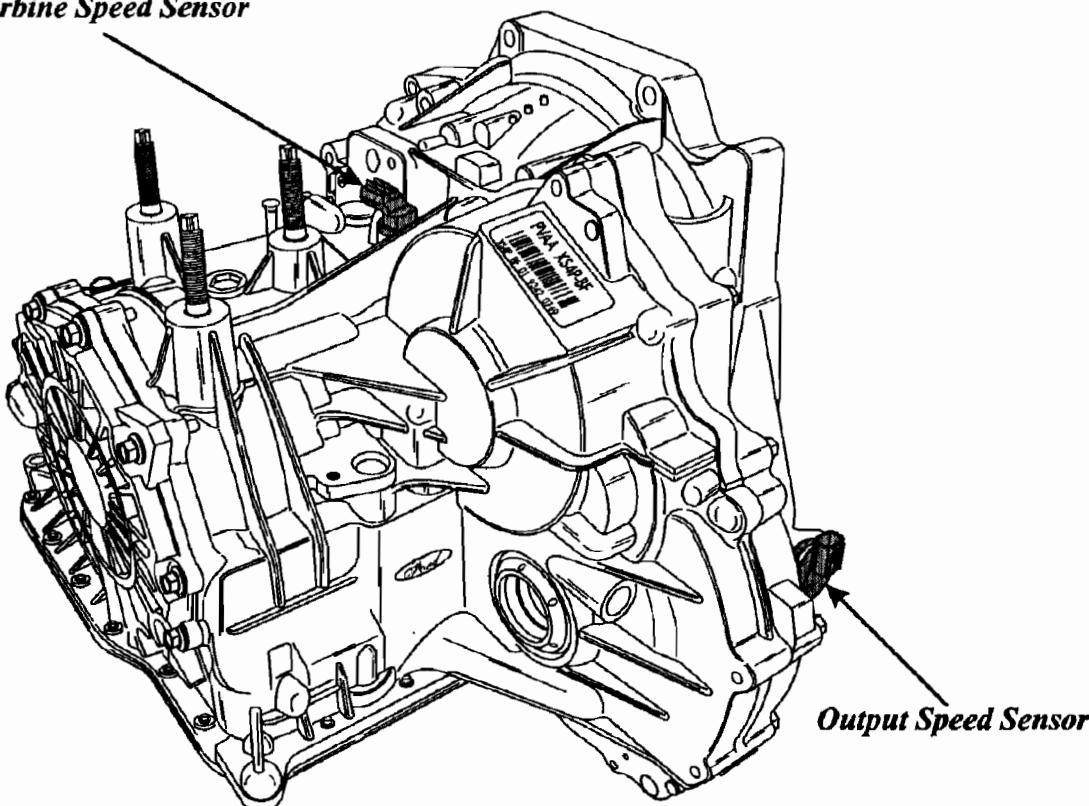
Figure 6

TRANSAXLE RANGE SENSOR WIRE SCHEMATIC

Transaxle Case Connector
(Face View)Vehicle Harness Connector
(Face View)

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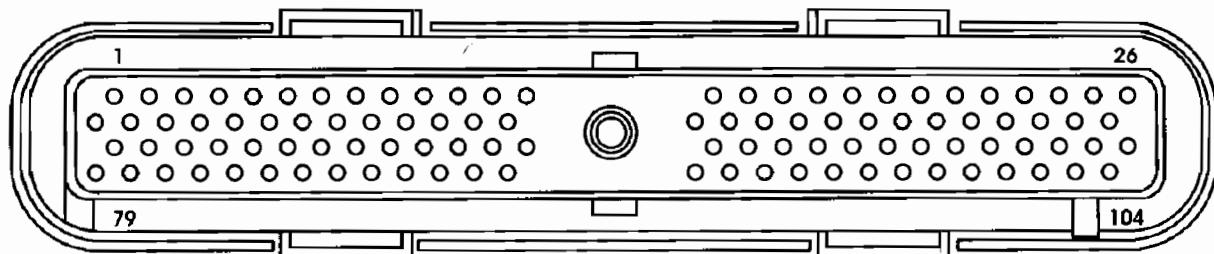
Figure 7

TURBINE AND OUTPUT SPEED SENSORS*Turbine Speed Sensor***TRANSAXLE SPEED SENSOR RESISTANCE CHART**

<i>Transaxle Component</i>	<i>Ohms Resistance At 20°C (70°F)</i>
<i>Turbine Speed Sensor (TSS)</i>	<i>330 - 390 Ohms</i>
<i>Output Speed Sensor (OSS)</i>	<i>720 - 800 Ohms</i>

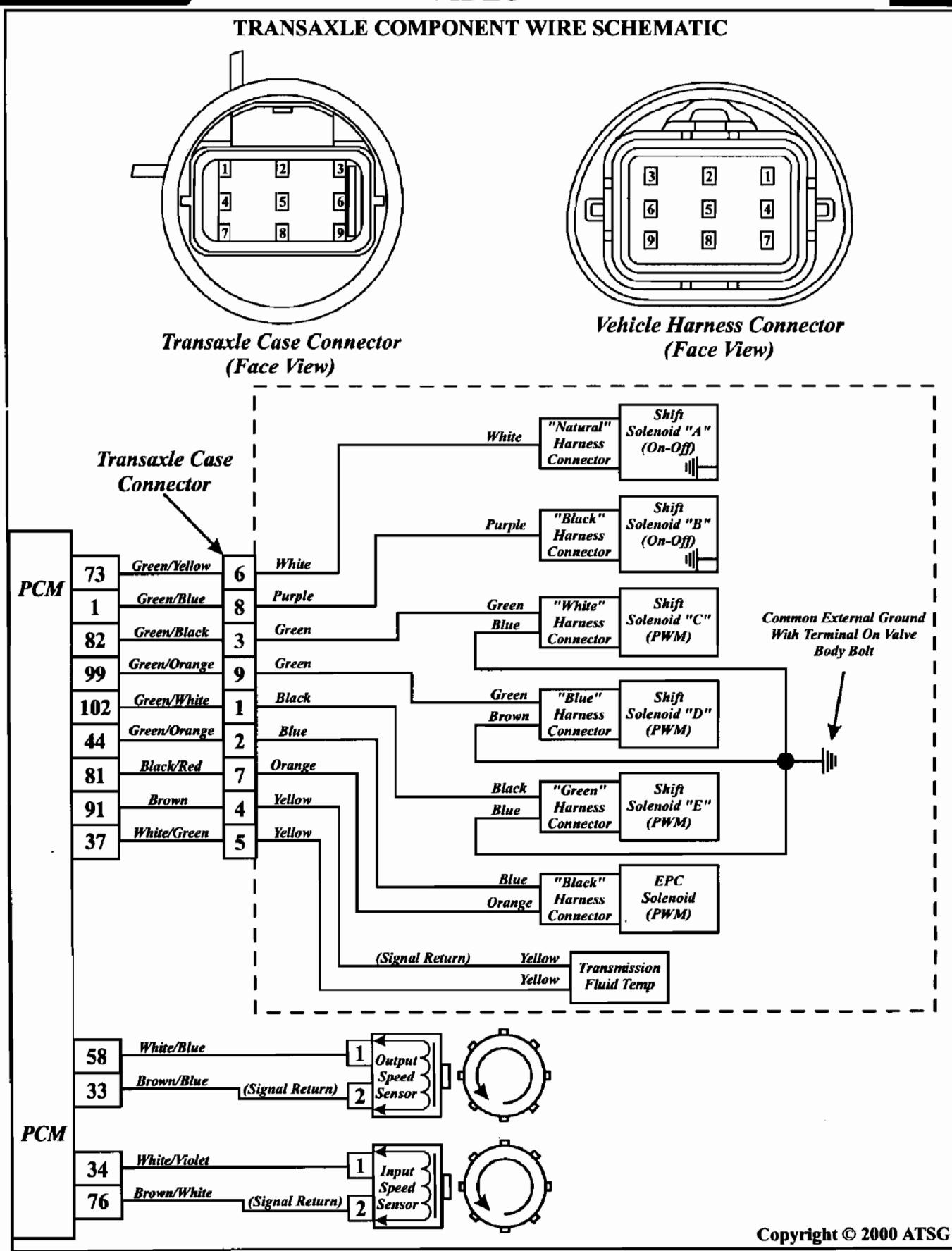
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Figure 8

PCM PIN IDENTIFICATION**PCM IS LOCATED BEHIND THE RIGHT HAND KICK PANEL**

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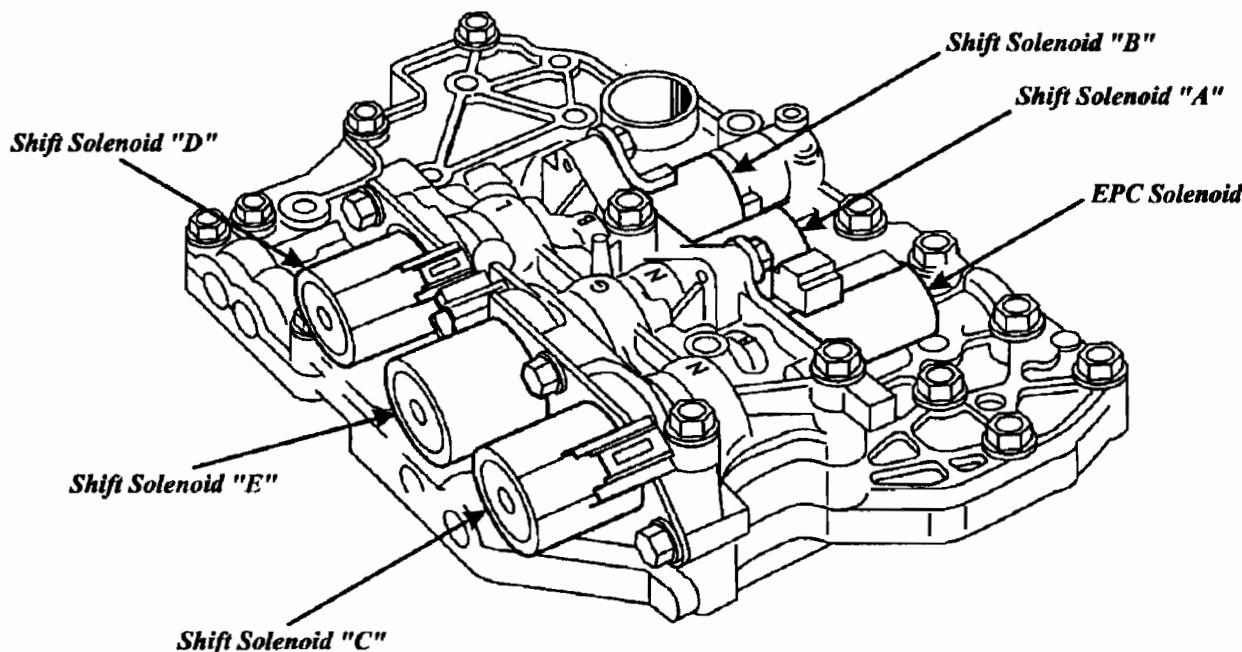
Figure 9



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Figure 10

SOLENOID IDENTIFICATION AND RESISTANCE CHART



INTERNAL TRANSAKLE COMPONENTS RESISTANCE CHART

Transaxle Component	Ohms Resistance At 20°C (70°F)
Shift Solenoid "A" (On-Off)	10.9 - 26.2
Shift Solenoid "B" (On-Off)	10.9 - 26.2
Shift Solenoid "C" (PWM)	1.0 - 4.2
Shift Solenoid "D" (PWM)	1.0 - 4.2
Shift Solenoid "E" (PWM)	1.0 - 4.2
EPC Solenoid (PWM)	2.4 - 7.3

Transaxle Temperature Sensor Resistance Chart

0°C (32°F) = 83.2k - 107k Ohms

20°C (70°F) = 33.5k - 41.2k Ohms

40°C (104°F) = 14.6k - 17.6k Ohms

60°C (140°F) = 7.08k - 8.01k Ohms

80°C (176°F) = 3.61k - 4.06k Ohms

100°C (212°F) = 1.96k - 2.20k Ohms

120°C (248°F) = 1.13k - 1.25k Ohms

130°C (266°F) = 0.87k - 0.96k Ohms

SHIFT SOLENOID APPLY CHART						
Range	Shift "A" (On-Off)	Shift "B" (On-Off)	Shift "C" (PWM)	Shift "D" (PWM)	Shift "E" (PWM)	EPC Solenoid
Park	ON	OFF	Not Fed	Not Fed	Not Fed	***
Reverse	ON	ON	Not Fed	OFF	Not Fed	***
Neutral	ON	OFF	Not Fed	Not Fed	Not Fed	***
Drive-1st	OFF	OFF	OFF	ON	ON	***
Drive-2nd	OFF	OFF	OFF	OFF	ON	***
Drive-3rd	OFF	OFF **	OFF **	OFF	OFF	***
Drive-4th	ON	OFF **	ON	OFF	OFF	***
Manual-1st	ON	ON	OFF	OFF	ON	***

*** EPC Control dependent on throttle position and vehicle speed.
 ** TCC control dependent on throttle position, vehicle speed, brake switch.

4F27E TRANSAXLE COMPONENT APPLICATION CHART							
RANGE	Forward Clutch	2nd-4th Band	Direct Clutch	Reverse Clutch	Low/Rev Clutch	Low One-Way Clutch	Gear Ratio
PARK							
REVERSE				ON	ON		2.649
NEUTRAL							
DRIVE-1st	ON					HOLD	2.816
DRIVE-2nd	ON	ON					1.498
DRIVE-3rd	ON		ON				1.000
DRIVE-4th		ON	ON				0.726
MANUAL-2nd	ON	ON					1.498
MANUAL-1st	ON				ON		2.816

NOTE: Failsafe on this unit is 3rd gear in all forward ranges

NOTE: There are two different axle ratios listed for this transaxle;

NN = 3.693 Automatic

WW = 3.904 Automatic

Typical I.D. Tag Info → PVAA XS4P-BF

↑
1st Digit Of Suffix Identifies Ratio

B = Sigma Engine, 4.15 Ratio (European Only)

C = 2.0L SPI Engine, 3.69 Ratio

D = 2.0L Z-Tec Eng, 3.90 Ratio

VALVE BODY EXPLODED VIEW

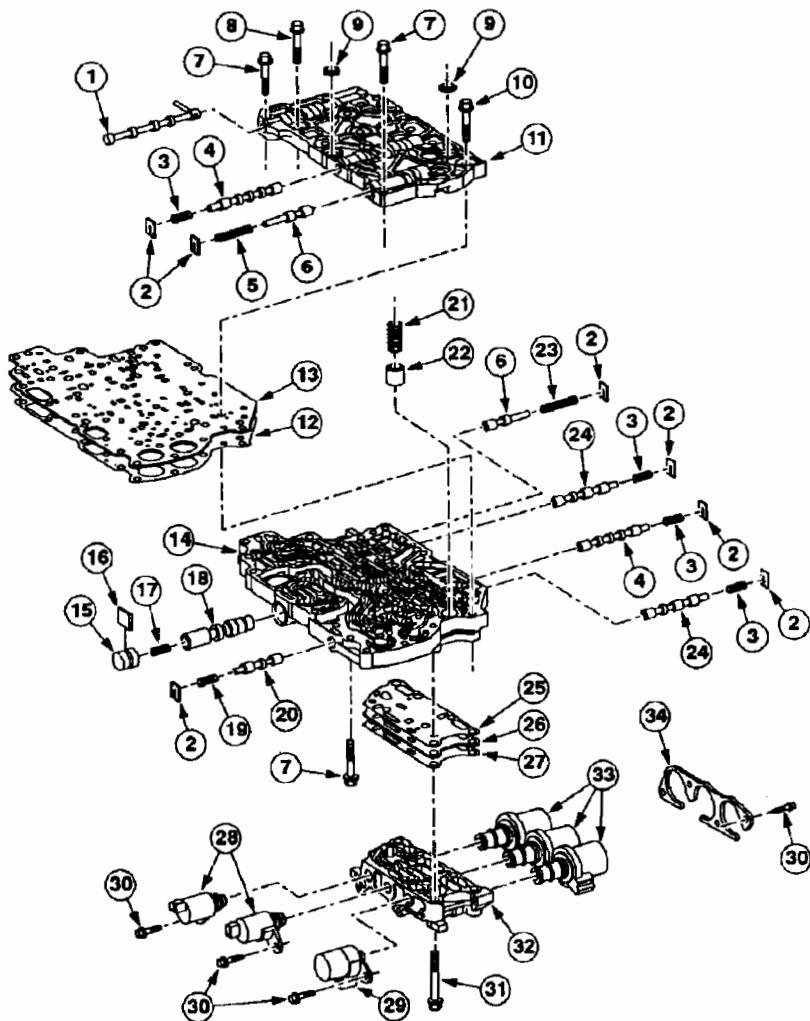


Figure 13

- | | |
|--|---|
| 1. MANUAL VALVE. | 18. MAIN PRESSURE REGULATOR VALVE. |
| 2. VALVE BODY SPRING RETAINERS (7 REQUIRED). | 19. SOLENOID REGULATOR VALVE SPRING. |
| 3. BYPASS CLUTCH CONTROL VALVE SPRING. | 20. SOLENOID REGULATOR VALVE. |
| 4. BYPASS CLUTCH CONTROL VALVE (2 REQUIRED). | 21. INTERMEDIATE SERVO ACCUMULATOR SPRING. |
| 5. LINE PRESSURE MODULATION VALVE SPRING. | 22. INTERMEDIATE SERVO ACCUMULATOR PISTON. |
| 6. LINE PRESSURE MODULATION VALVE. | 23. CONVERTER REGULATOR VALVE SPRING. |
| 7. VALVE BODY BOLT M6X40 (3 REQUIRED). | 24. CONVERTER REGULATOR VALVE. |
| 8. VALVE BODY BOLT M6X30 (5 REQUIRED). | 25. SOLENOID BODY GASKET. |
| 9. VALVE BODY TO CASE SEALS (2 REQUIRED). | 26. SOLENOID BODY SPACER PLATE. |
| 10. VALVE BODY BOLT M6X30 (5 REQUIRED). | 27. SOLENOID BODY GASKET/SCREEN. |
| 11. UPPER VALVE BODY. | 28. SHIFT SOLENOIDS "A" AND "B" (ON-OFF). |
| 12. MAIN VALVE BODY GASKETS, BONDED TO SPACER PLATE. | 29. EPC SOLENOID. |
| 13. MAIN VALVE BODY SPACER PLATE, WITH BONDED GASKETS. | 30. SOLENOID RETAINING BOLTS, M6X20 (7 REQUIRED). |
| 14. LOWER CONTROL VALVE BODY. | 31. VALVE BODY BOLT M6X72. |
| 15. MAIN PRESSURE REGULATOR VALVE BORE PLUG. | 32. SOLENOID BODY. |
| 16. MAIN PRESSURE REGULATOR VALVE RETAINER. | 33. SHIFT SOLENOIDS "C", "D", AND "E" (PWM). |
| 17. MAIN PRESSURE REGULATOR VALVE SPRING. | 34. SHIFT SOLENOID RETAINING BRACKET. |

Figure 14

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

CHANGE: Beginning at the start of production in 1998, the 4R100 transmission was offered with two different torque converter clutch application strategies. A "PWM" (Pulse Width Modulated) version, was added in V-10 gas powered vehicles and all diesel, and a "NON-PWM" version, offered in all other gas powered vehicles. This required two different solenoid packs as well as two different pump assemblies. Beginning at start of production in 1999 *all* models used the "PWM" version for TCC application strategies.

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

PARTS AFFECTED:

(1) PUMP ASSEMBLY:

- The pump cover assembly had the rear of the Converter Clutch Valve bore enlarged approximately .070" to accommodate the enlarged land of the Converter Clutch Valve as shown in Figure 3.
- A .036" orifice and an air bleed were added to the TCC Solenoid signal passage as shown in Figure 2.
- The Converter Clutch Control Valve's rear spool was enlarged approximately .070." There was also a bushing and valve added to the end of the valve train as shown in Figure 3.
- A hole was added to the pump cover to connect the Converter Clutch Control Valve Bushing to Converter Regulator Valve oil, as shown in Figure 2.
- The Converter release orifice in the NON-PWM pump cover, as shown in Figure 1, was removed from the PWM pump cover as shown in Figure 2.

Refer to Figure 4 for the NON-PWM pump hydraulic circuit.

Refer to Figure 5 for the PWM pump hydraulic circuit with all of the hydraulic changes shown.

(2) THE SOLENOID PACK:

- The PWM solenoid pack requires a Pulse Width Modulated torque converter clutch solenoid and the NON-PWM solenoid pack requires an on-off torque converter clutch solenoid. *Refer to Figure 6 to identify the differences between the two solenoid packs.*

INTERCHANGABILITY:

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

SERVICE INFORMATION:

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

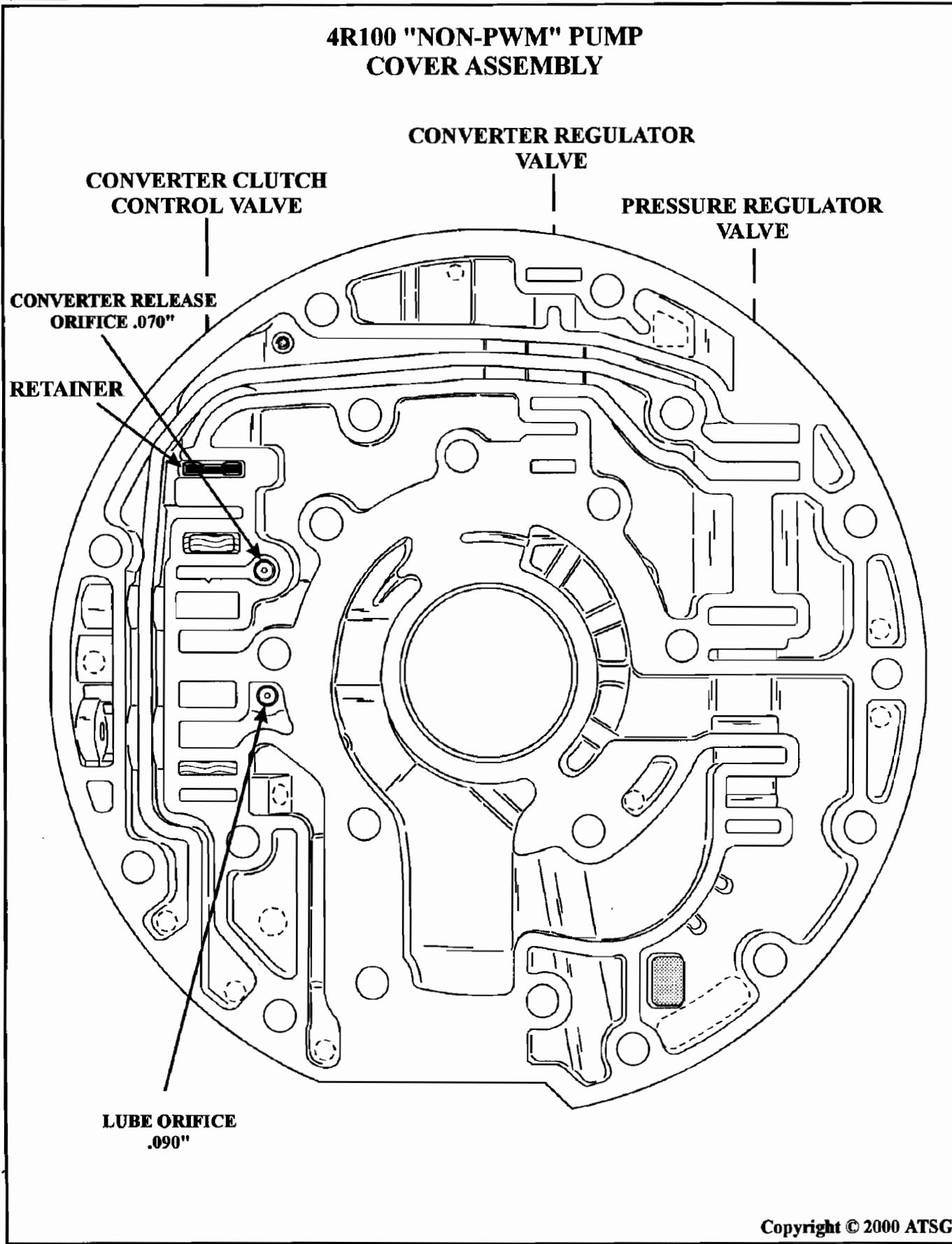
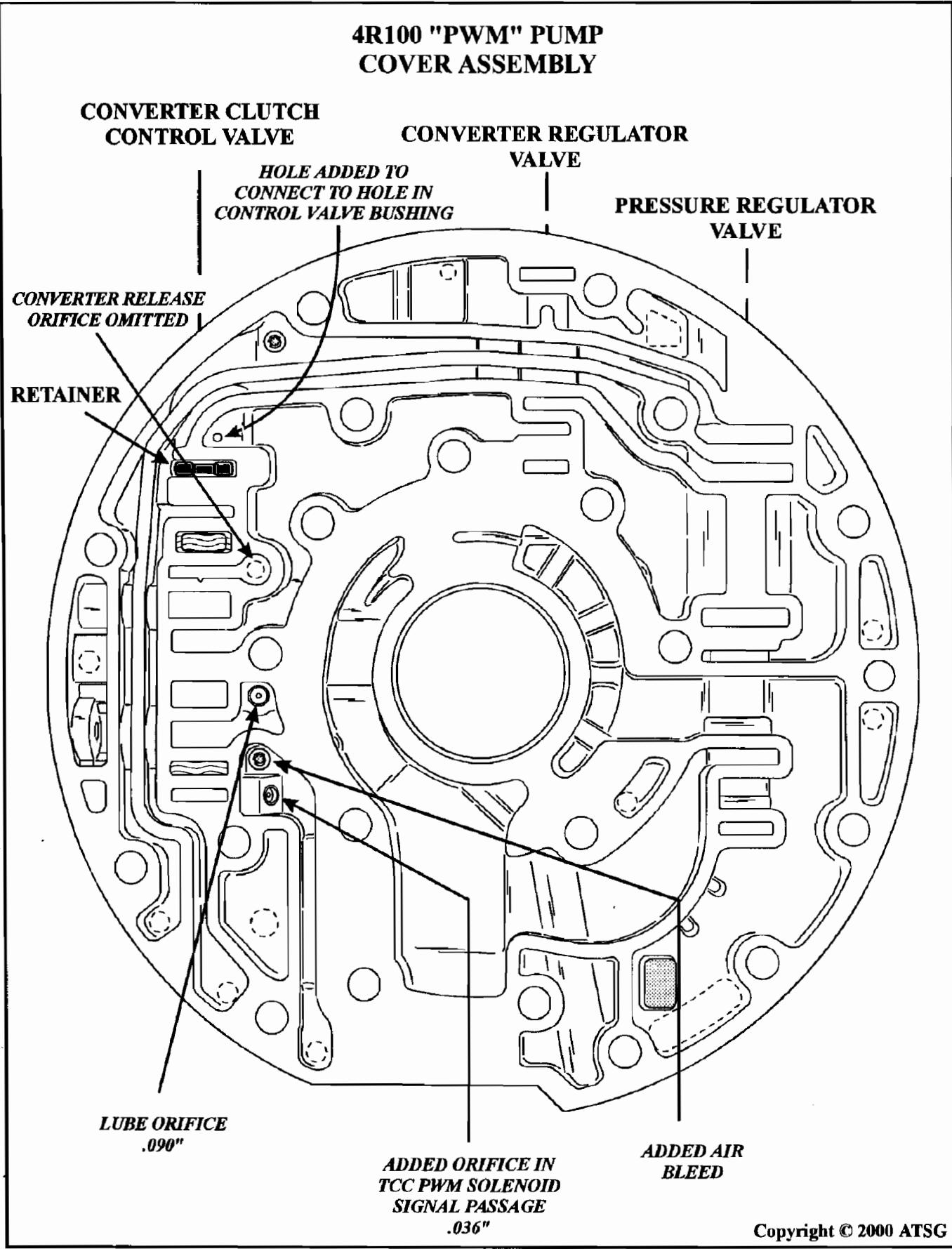


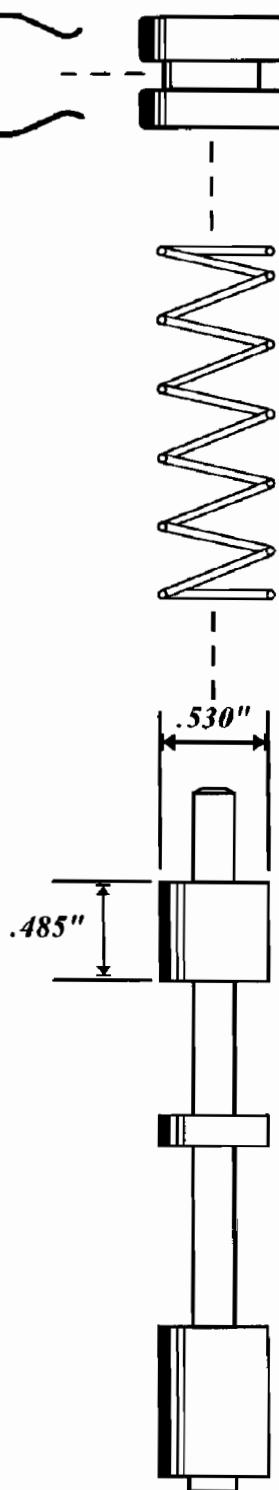
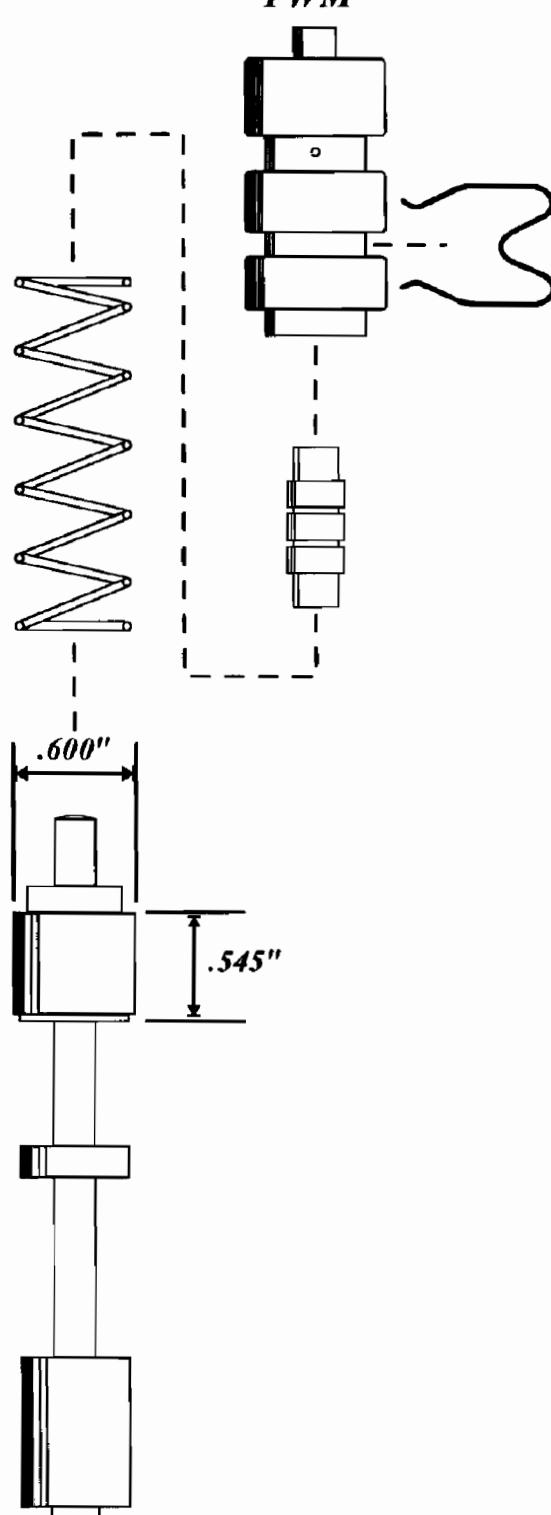
Figure 1



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Figure 2

CONVERTER CLUTCH CONTROL VALVE

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

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

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Figure 3

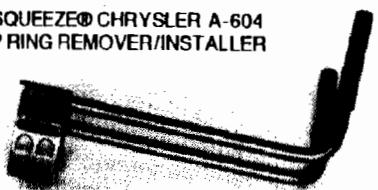
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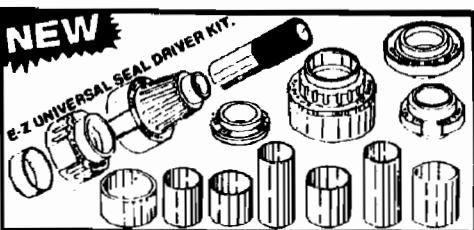
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E-Z SQUEEZE® SERVO PISTON REMOVER
FOR: FORD AOD-E



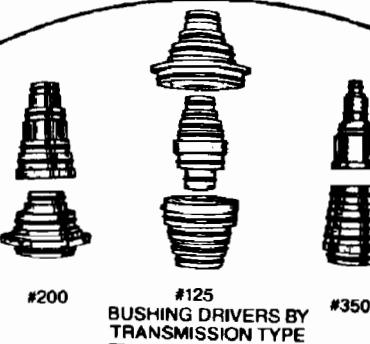
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604 - in the case.

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Compressing Diaphragm Springs

TOOLS FROM A TO Z



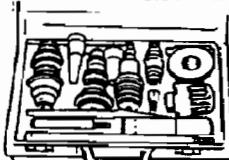
U.S. PATENT
TUFFY
#2994

AXEL SEAL INSTALLER
#1250

#200
#125
#350
BUSHING DRIVERS BY
TRANSMISSION TYPE



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COMPRESSOR KIT
#2987 U.S. PATENT



UNIVERSAL BUSHING
DRIVER SET
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RING INSTALLER
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SEAL PULLER
U.S. PATENT

New E40D
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PUMP ALIGNMENT
TOOLS

#2992
#2996
GEAR & PUMP PULLER

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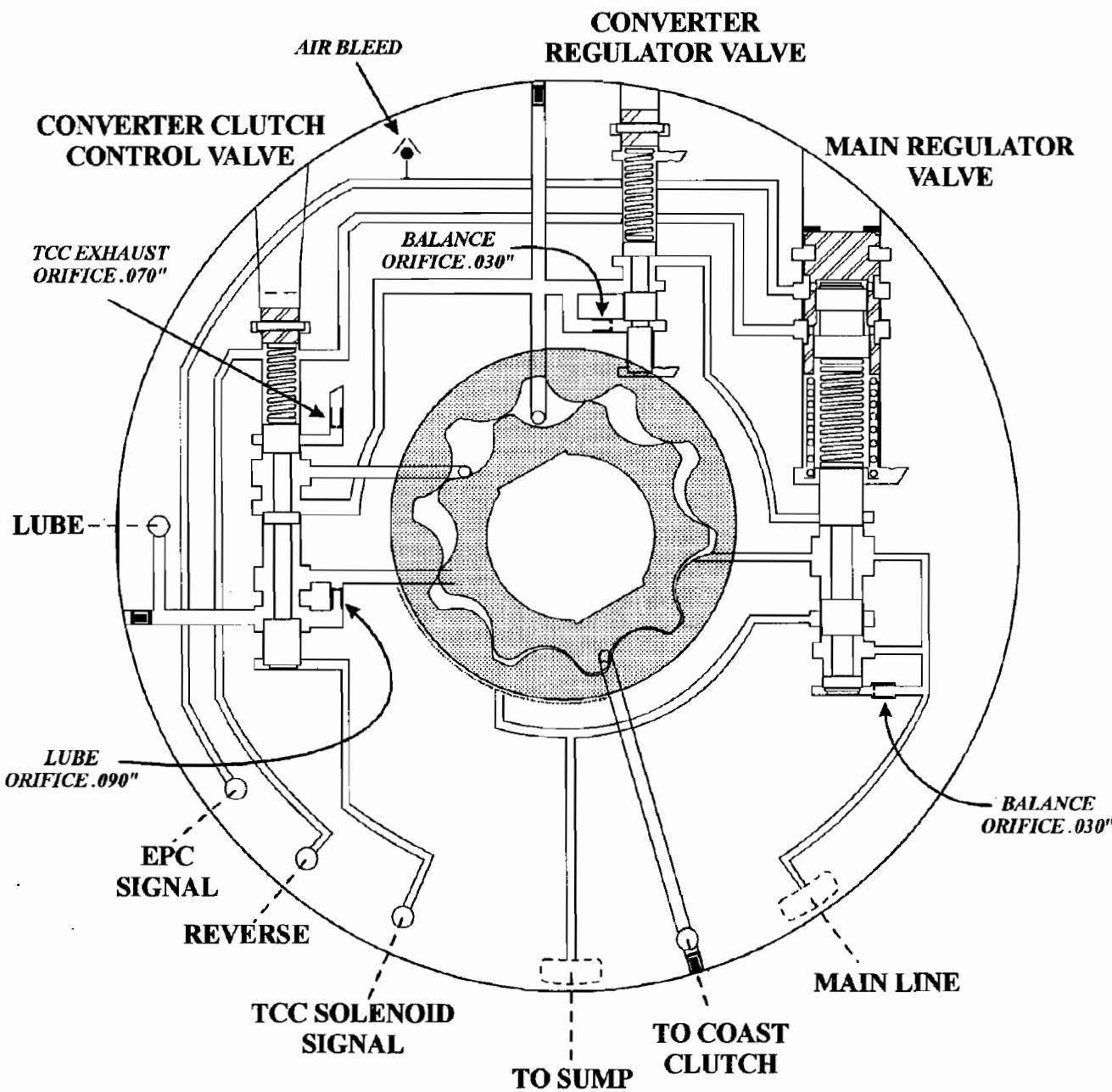
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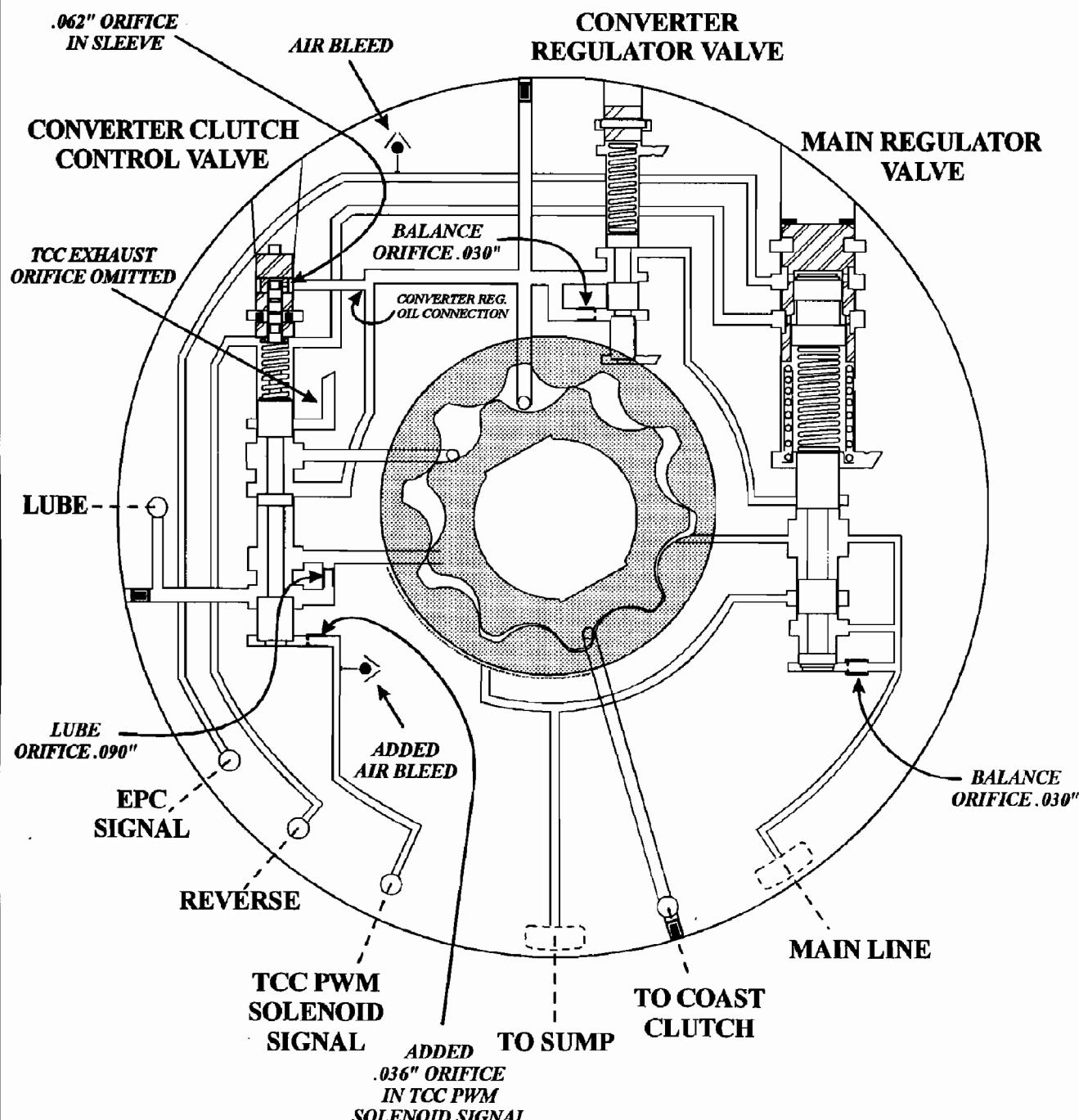
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4R100 "NON-PWM" PUMP
HYDRAULIC CIRCUIT

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Figure 4

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



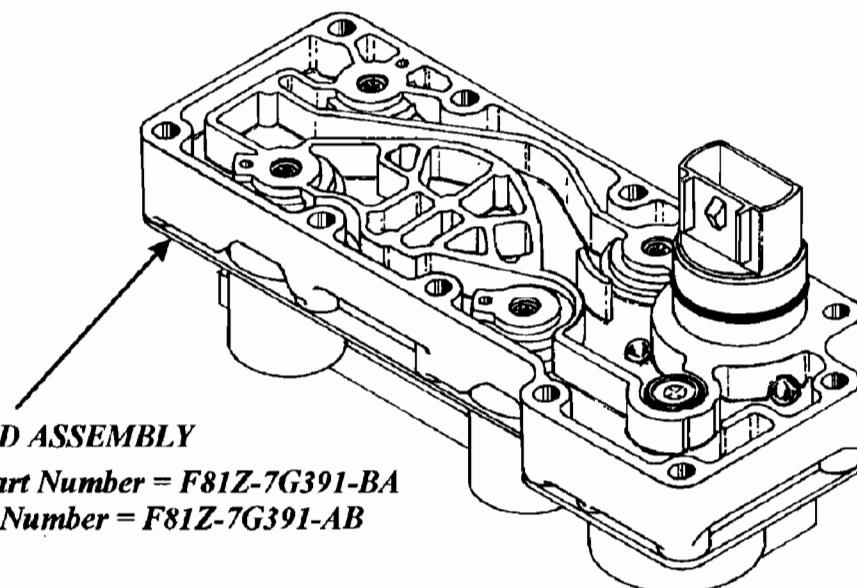
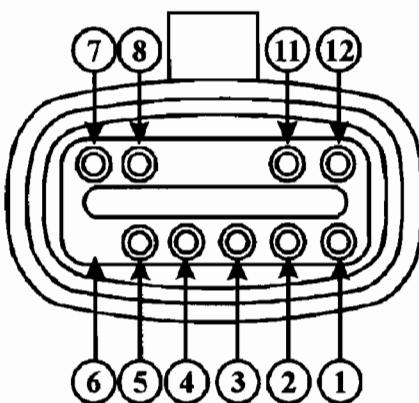
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Figure 5

FORD 4R100

SOLENOID RESISTANCE CHARTS

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

SOLENOID BODY
CONNECTOR

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

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Figure 6

Ford CD4E, Mazda LA4A-EL**High Gear Starts in Manual Low**

COMPLAINT: After valve body or computer replacement pulling the shifter to manual 1 (low) results in a high gear (Fourth) start.

CAUSE: One possible cause is that 1996 and earlier vehicles use a different solenoid firing order when in manual low because they use a Pull-In valve. 1997 and later vehicles do not have a Pull-In valve and use the same solenoid commands in all ranges. Using the wrong valve body or computer will cause this problem.

CORRECTION: The recommended solution is to use the correct valve body or computer for the vehicle. If this cannot be accomplished, keeping the accumulator section of the valve body matched with the computer will solve the problem.

To determine which computer you have, check the actual solenoid commands using a Trans-X or test lights. Compare your test results with Figure 1 to determine which computer you have.

To determine which valve body you have compare your valve body with those shown in Figure 2.

Manual Lever Position	Gear	1996 and Earlier		1997 and Later	
		SS1	SS2	SS1	SS2
Drive	4	On	Off	On	Off
	3	Off	Off	Off	Off
	2	Off	On	Off	On
	1	On	On	On	On
Manual Low	3	Off	On	Off	Off
	2	Off	Off	Off	On
	1	On	Off	On	On

Figure 1

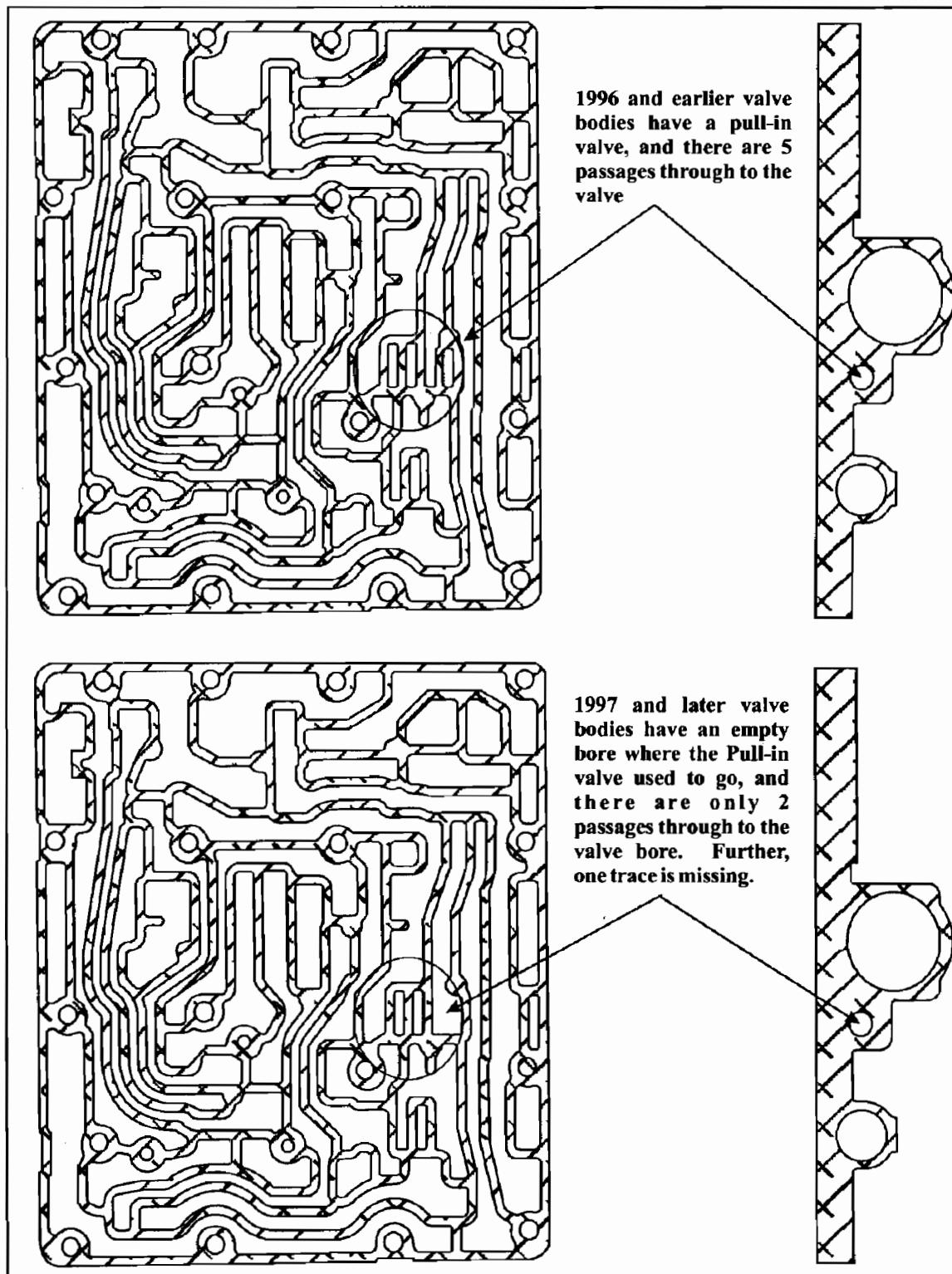
Ford CD4E, Mazda LA4A-EL**High Gear Starts in Manual Low**

Figure 2

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Automatic Transmission Service Group



BENCH TESTING SPEED SENSORS

ZOOM TECHNOLOGY SPEEDX®

Bench testing inductive (permanent magnet) and mechanically driven sensors has previously been difficult and inconclusive. It is now possible to bench test, as well as in vehicle testing, of these type of speed sensors with a new speed sensor test system called the **SPEEDX®** as shown in figure 1 and is made available from *Zoom Technology*.

INDUCTIVE SPEED SENSOR TESTING

With one or two inductive speed sensors clamped in the **SPEEDX**, the digital multi-function display at the bottom of the **SPEEDX** will indicate actual frequency in hertz with a reference frequency to compare it to as well as an AC voltage output. The output of the signal can be controlled by the speed control knob.

Pushing the mode switch will change the display from volts to ohms at which time the resistance of the speed sensor can be checked.

The advantage of having two sensor clamps is, a good known sensor can be clamped in one clamp, and its signal compared to the suspect sensor in the other clamp. This type of speed sensor testing is limited only by the sensors diameter which cannot exceed .950".

NOTE: *The rotor in the SPEEDX must be stopped to check speed sensor resistance.*

MECHANICALLY DRIVEN SENSOR TESTING

The **SPEEDX** has a drive wheel that is accessible on the front panel (See Figure 1). Remove the sensor drive gear and insert the square drive into the square hole in the drive wheel, then vary the rpm using the testers speed control knob as seen in figure 1.

CAUTION: *The SPEEDX can spin the sensor at a high rate of speed, therefore, be sure to wear eye protection and take necessary precautions to prevent injury.*

Sensor outputs fall into two categories:

1. **TWO WIRE**... Typically these can provide an output that is either a pulsed signal, an on/off signal or an AC voltage signal.
2. **THREE WIRE**... These type of sensors require a voltage source and a ground which allows the third wire to become the signal out. The **SPEEDX** can provide power and ground as seen in figure 1. The output can be a pulsed signal, an AC voltage signal or a digital square wave.

The **SPEEDX** comes with color coded wire leads to connect to power, ground and both input channels. Other test equipment can be used with the **SPEEDX** such as a graphing multi-meter or an oscilloscope.

BENCH TESTING SPEED SENSORS

ZOOM TECHNOLOGY SPEEDX®

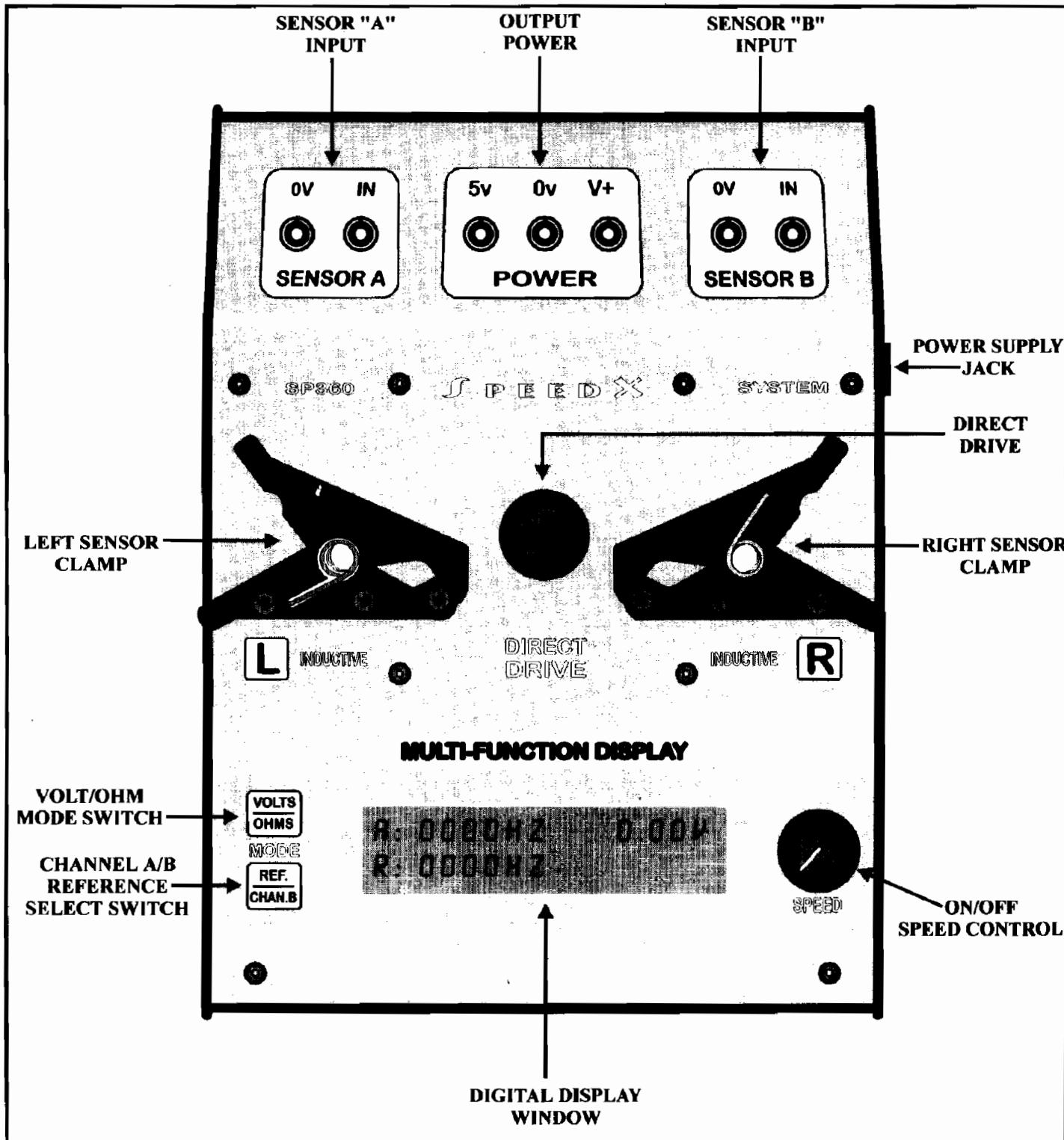


Figure 1