1999 SEMINAR INFORMATION

"TECH ON TIME FOR '99"

INDEX

GENERAL MOTORS

ADVERTISERS

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"TECH ON TIME FOR '99"

INTRODUCTION

In this second manual on "TECH ON TIME FOR '99" seminar, we begin with the General Motors portion of the seminar. This portion of the seminar will also take a look at the advantage of using an oscilloscope and how it differs from a digital graphing multi meter. This section of the seminar will conclude with updates and fixes for many of General Motors transmissions.

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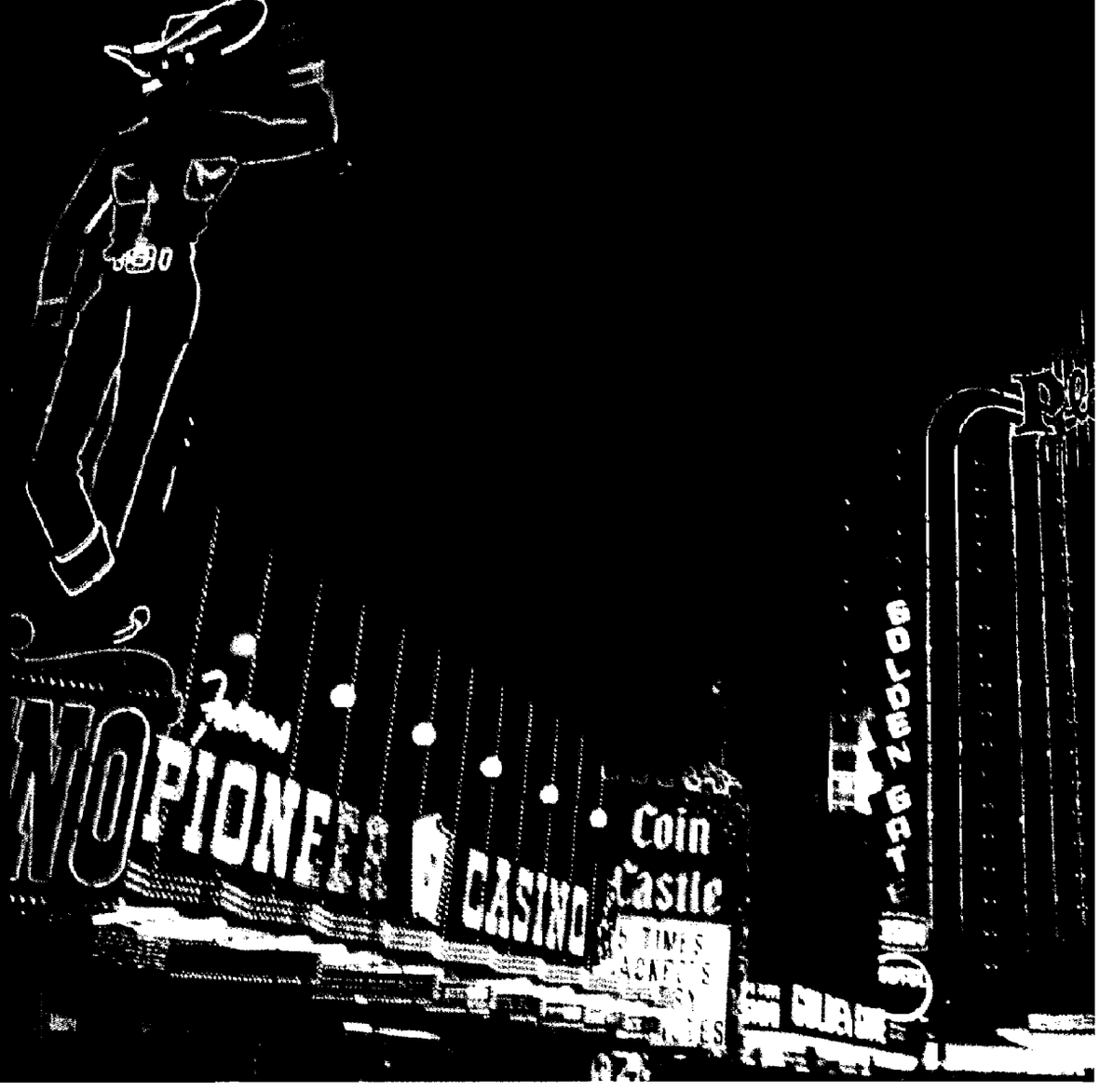

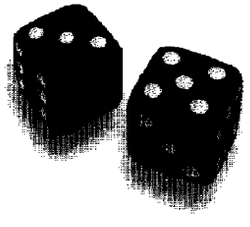

INSTALLING OLD BEARINGS DURING A TRANSMISSION REBUILD IS KIND OF LIKE ROLLING THE DICE. MANY USED BEARINGS HAVE UNDETECTED DAMAGE WHICH CAN LEAD TO FAILURE. SO YOU RISK HAVING WARRANTEED TRANSMISSIONS COME BACK AGAIN. WHICH MEANS YOU RISK LOSING REVENUE. TIME. AND ULTIMATELY, CUSTOMERS. FORTUNATELY, WE HAVE A RELIABLE AND INEXPENSIVE SOLLTION: ORIGINAL REPLACEMENT BEARING KITS FROM TORRINGTON. THEY IMPROVE REBUILD RELIABILITY AND REMOVE A POTENTIAL CAUSE FOR WARRANTEED RETURNS. DON'T WAIT UNTIL YOUR LUCK RUNS OUT. INVEST IN TORRINGTON BEARING KITS TODAY. CALL 1-800-372-4669 FOR YOUR LOCAL DISTRIBUTOR.

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INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

As automotive technology advances and computer controlled systems become more sophisticated and complex, the ability to capture an intermittent "GLITCH" becomes more difficult because of the rate of speed at which this glitch can occur.
In many cases it will cause a symptom but will not store any codes because the fault did not go outside the specifications for that particular device. In other words, ***"it wasn't bad enough, long enough"*** to store a code, but it did cause a malfunction.
For example, If a 1995 GM truck with a 4L60E transmission had a loss of VSS signal, in order to store a code, the loss of signal would have to be present for at least 2.5 seconds.
If the loss of signal occurred for ½ a second, it would not store a code but could cause the computer to command the shift solenoids to first gear which may feel like a momentary shift shuttle condition.

Understanding computer time is essential in order to realize why this happens. For example, an early GM computer system takes about 1.2 seconds to update the data stream, later systems will accomplish this in about 200 to 300 milliseconds, 500 milliseconds is equal to a ½ second. Some OBDII will update the data stream in about 11 milliseconds.
As you can see 2.5 seconds to store a VSS code is a snails pace in computer time.

Why is a digital multi-meter sometimes not able to catch this glitch? Most multi-meters will update the screen every 250 milliseconds, or four times a second, this may not be fast enough. You may be able to speed this up by using the MIN/MAX feature. This is why when the VSS digital signal is checked on a GM truck with a speed buffer, the signal appears to stand still rather than toggle between 0 volts and 5 volts, the meter is just not fast enough to show the voltage toggle.

Scan tools are slowed down by baud rate of computers, in other words, how fast data is allowed to be sent to the scan tool and by prioritized data, which means that the computer's first order of business is engine management and transmission operation, then, maybe the scan tool. The movie feature may help to capture the glitch if the movie is triggered at the correct time.

As a result of the above problems, oscilloscopes are finding their way into an increasing number of shops due to the speed at which it will sample a signal. The average "O" scope is 100,000 times faster than a scan tool and 1,000 times faster than the average digital multi-meter.

There are different types of oscilloscopes as well as graphing multi meters available to the technician, however it is important to know the differences between these pieces of test equipment to insure the one that fits your requirements is acquired.

The following information is meant to help the technician make the correct choice when the decision to get into oscilloscope testing is made.

INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

The oscilloscope is a two dimensional volt meter that measures voltage across time and is viewed on the oscilloscope screen as a wave form.
The oscilloscope does not become obsolete because electricity does not change from model year to model year, or from one make of vehicle to another and import electricity is the same as domestic electricity.
The "O" scope will sample a signal from a 1981 vehicle the same as it can a signal from a 1998 vehicle without cartridge updates or circuit board replacements.
Although the oscilloscope is considered a voltmeter, it will display AC voltage, DC voltage, Frequency, Duty Cycle, Pulse Width or any other electrical signal when properly set up.

When viewing the waveform, voltage is viewed from bottom to the top of the screen. The lower the volt setting, the taller the trace. The higher the volt setting, the shorter the trace. (Refer to figure 1)
Time is viewed from left to right. Adjusting the time division will determine how much of the trace you see on the screen as shown in figure 2.
The difference between the lowest voltage display and the highest is called AMPLITUDE.
The less time the division is set for, the more spread out the trace will be, the more time the division is set for, the tighter the trace will be.

There are basically two types of oscilloscopes, ANALOG and DIGITAL STORAGE (DSO), also available to the technician is the GRAPHING MULTI-METER.
This is included because it can view waveforms similar to the way a genuine "O" scope does although it does it in a different manner.

ANALOG OSCILLOSCOPE - The analog scope (See figure 3) is primarily used for electronics in the communications industry and not really suited for automotive use.
The primary advantage of the analog scope is to look at the signal being sampled at the tip of the probe in REAL TIME.
This means that if the problem is not happening right at the split second you are viewing the signal, you are not going to see it. In order to catch the glitch, it would have to be repetitive because the signal cannot be stored for review at a future time and many automotive signals are to slow for this type of oscilloscope. Which would make the trace virtually invisible.
Another drawback to the analog scope is due to the signal sample being in real time, the signal can occur so quickly, it will be erratic and hard to evaluate (free running) unless the scope is "synchronized".
This means the signal you wish to view must be put in step with another stable signal in order to keep it from jumping around and if it is a very fast signal, it may show up as very dim on the screen and therefore hard to see.

As can be seen in figure 3, the are many adjustments on the analog scope in order to be able to tune the signal in that is being sampled. This can be multiplied by two if the scope is a two channel scope like the one seen in figure 3 which means two signals can be viewed by switching from channel 1 to channel 2.

INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

DIGITAL STORAGE OSCILLOSCOPE - A Digital Storage Oscilloscope (DSO) (See figure 4) is primarily suited for automotive use. The DSO has a small computer inside it that converts the analog signal sampled by the probe and converts it to a digital trace that is displayed on the screen.
This is better suited to allow the user to spot a glitch because the signal displayed at the time of viewing actually took place a split second before.
Since the digital display is automatically being updated, it tends to display the trace slower than the analog scope and therefore allows for a more stable trace which makes it easier to capture a glitch.
The DSO will also sample any electrical signal and can also store it in memory for future viewing or can be printed for future reference.
Some oscilloscopes also store good known waveforms for comparison to the current waveform being sampled which makes it easier to recognize a problem in the trace pattern.

GRAPHING MULTI-METER - The GMM (See figure 5) may appear to function like a DSO but, sample and transmit the signal differently. The GMM has a rapid sampling rate of speed and is continuously monitoring minimum and maximum voltage in the circuit being tested.
It then stores these values internally and then calculates and plots a trace on the screen that represents circuit conditions based on the sampling taken at the meters probes.
This process repeats itself at an incredible rate of speed which is why it is so well suited for capturing glitches. The GMM also has the ability to record and store waveforms for later viewing or printing for future reference and will also sample any electrical signal as well as having full digital multi meter capabilities.
Most DSO's and GMM's have the ability to store reference material and waveforms and have the ability to print or down load waveforms for reference purposes as illustrated in figure 6.

The waveform in figure 7 is the raw AC voltage signal from a vehicle speed sensor. The signal when first sampled "RUNS FREE". This means it is unstable and is jumping across the screen which makes it hard to read.
In order to stabilize the trace, it must have the "TRIGGER" set. Triggering the horizontal sweep on the oscilloscope determines the beginning point of the waveform which stabilizes the trace as seen in figures 7 and 8.
Figure 9 indicates a normal linear TPS signal, while figure 10 indicates a TPS ***"glitch"*** or ***"sensor dropout"***. The illustration on the left indicates 4.39 volts just before the glitch, and illustration on the right indicates 0.93 volts when the glitch occurred.
This "dropout took place in 200 milliseconds, or about ¼ of a second!

Figure 11 displays the normal operation of a PWM TCC solenoid. This is a duty cycle solenoid and the "ON" time and "OFF" time can be seen in the illustration.
Figure 12 displays an example of "NOISE", which is frequency interference (RF) and makes the signal trace ragged. Noise exists in all signals, but is excessive in this signal and is most likely caused by a failing solenoid coil. Noise is usually picked up by the test leads and the oscilloscope probes, the trick is to reduce as much of the noise as possible.
This why oscilloscope test leads are as short as possible and they should be kept as far as possible from spark plug wires, drop light cords and other highly conductive devices.
Changing to longer test leads is not a good idea , doing so may change the signal trace because the leads that are supplied with your scope are rated for that piece of equipment unless otherwise stated.
It is also a good practice not to place the scope itself on highly conductive components.
As with anything new, there is also new terminology associated with it, an oscilloscope glossary can be found in figure 13.

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INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

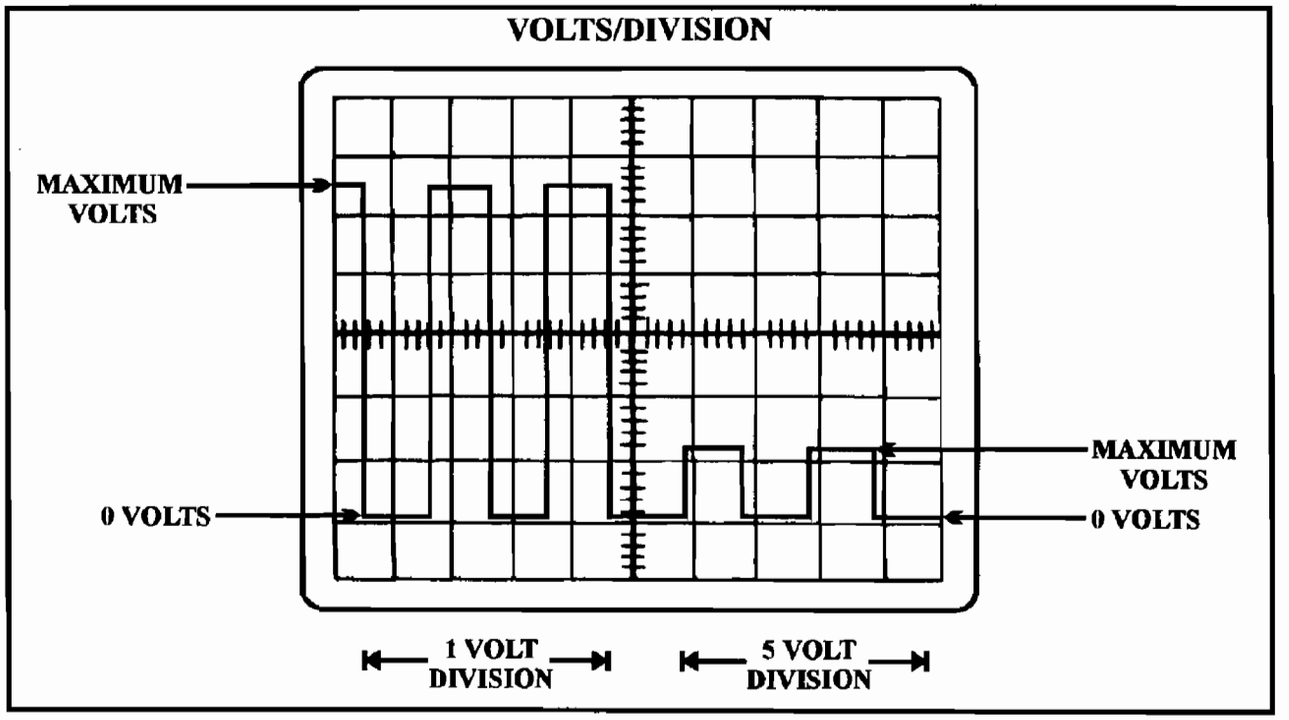


Figure 1

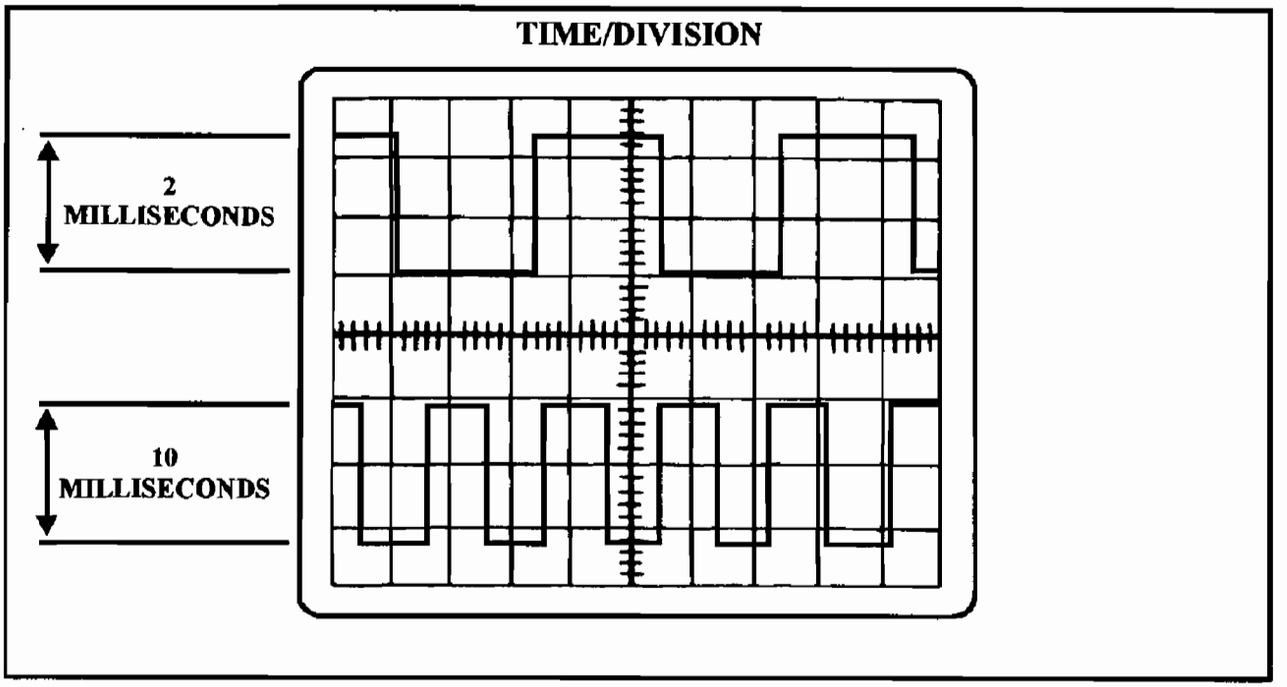


Figure 2

INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

ANALOG OSCILLOSCOPE

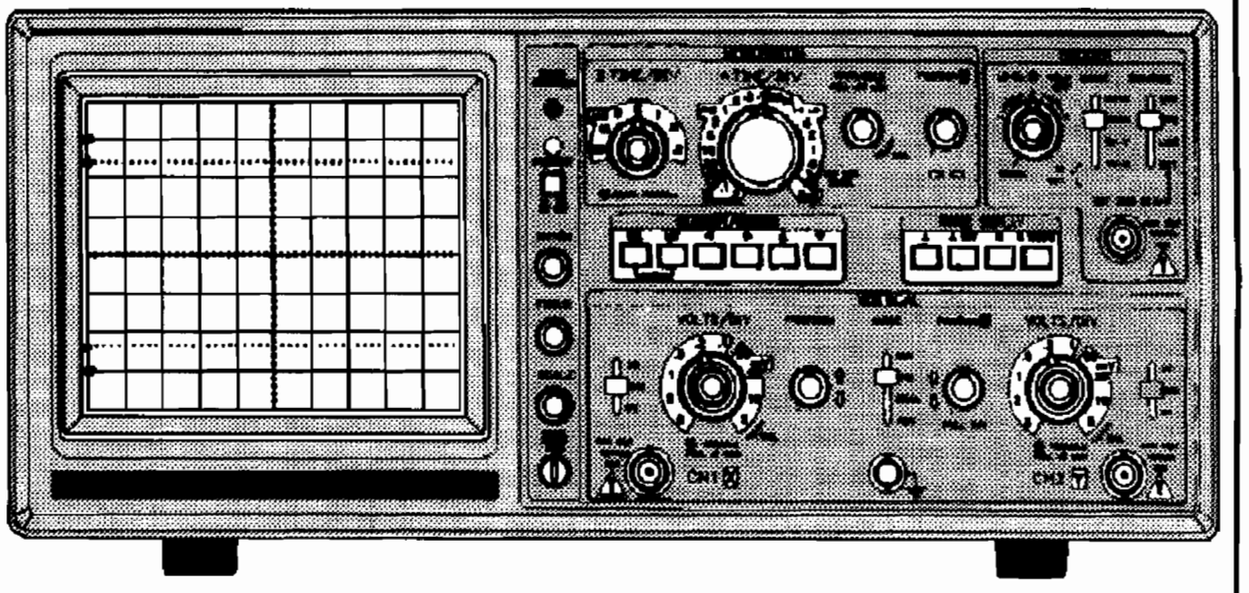


Figure 3

DIGITAL STORAGE OSCILLOSCOPE

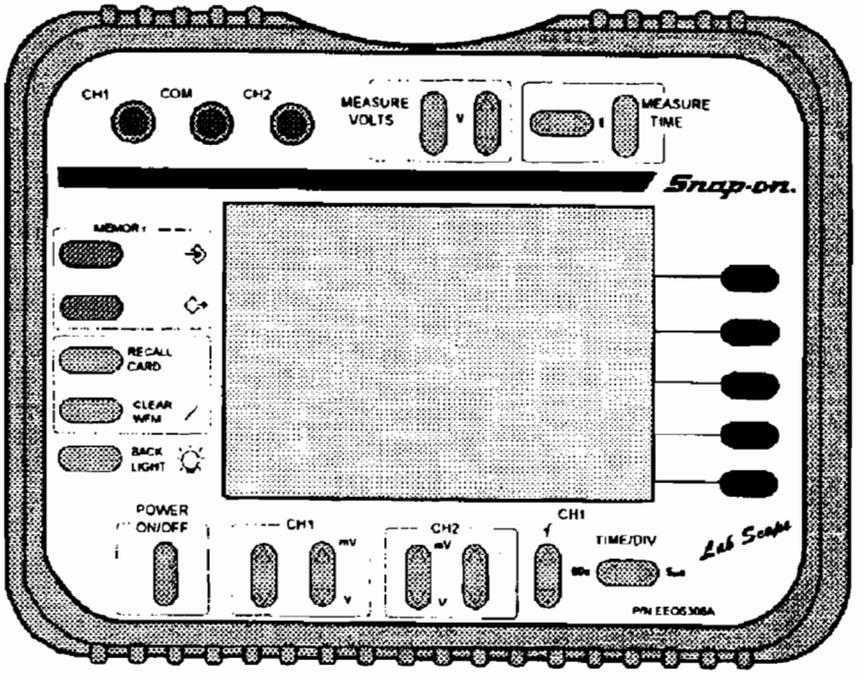


Figure 4

INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

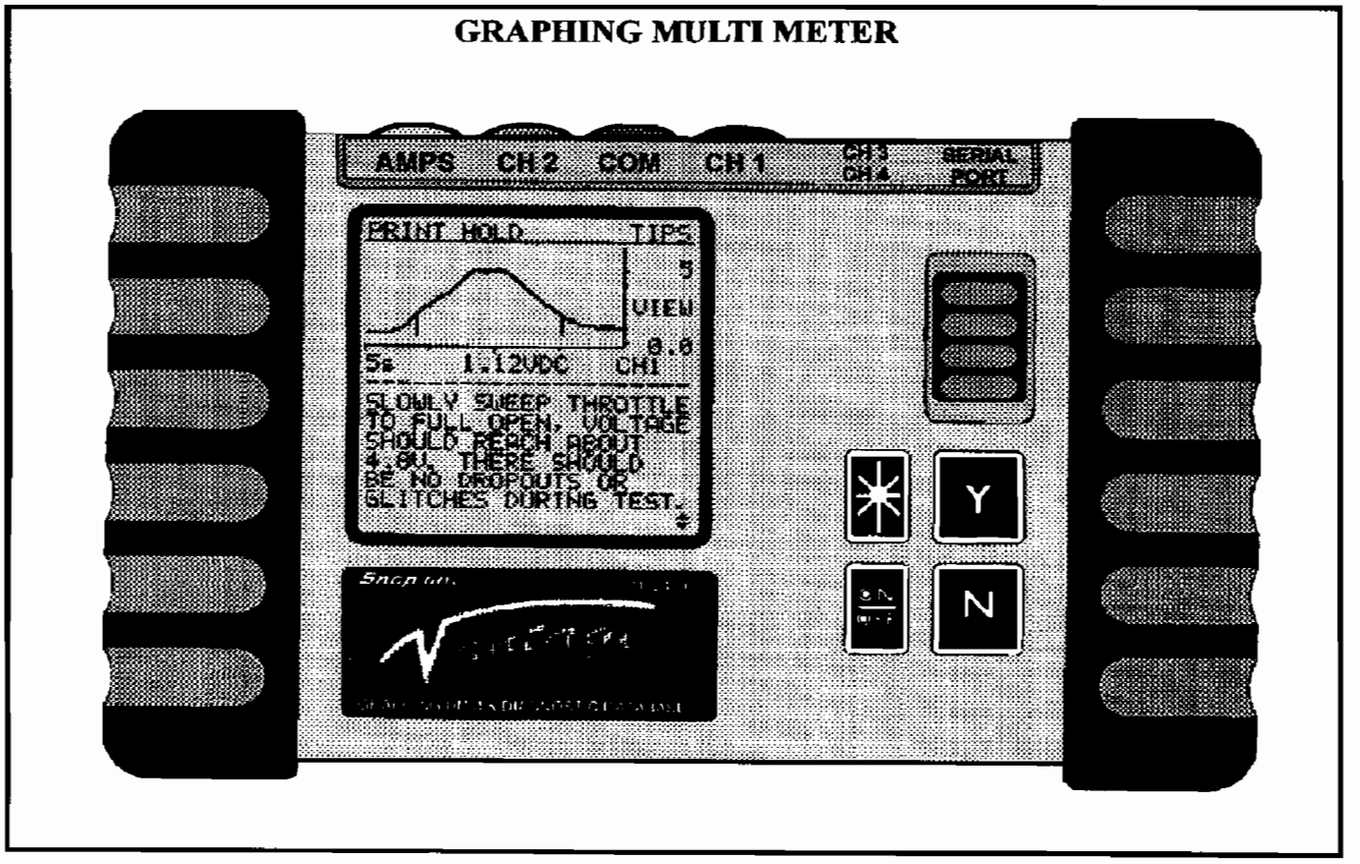


Figure 5

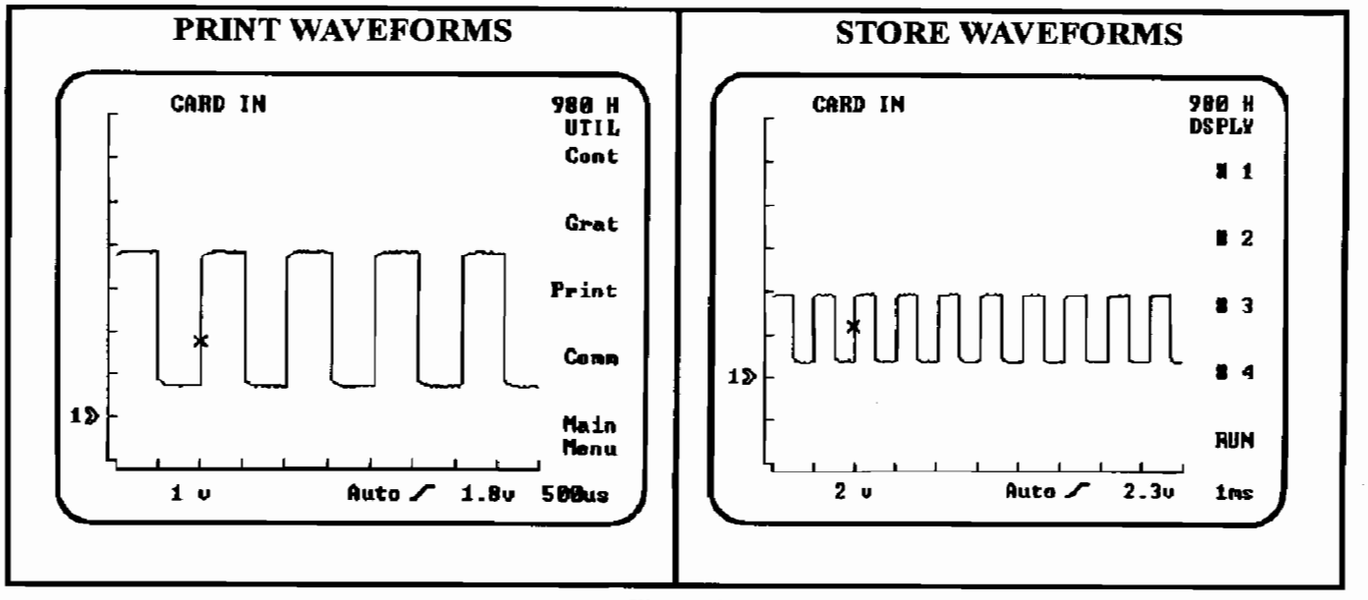


Figure 6

INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

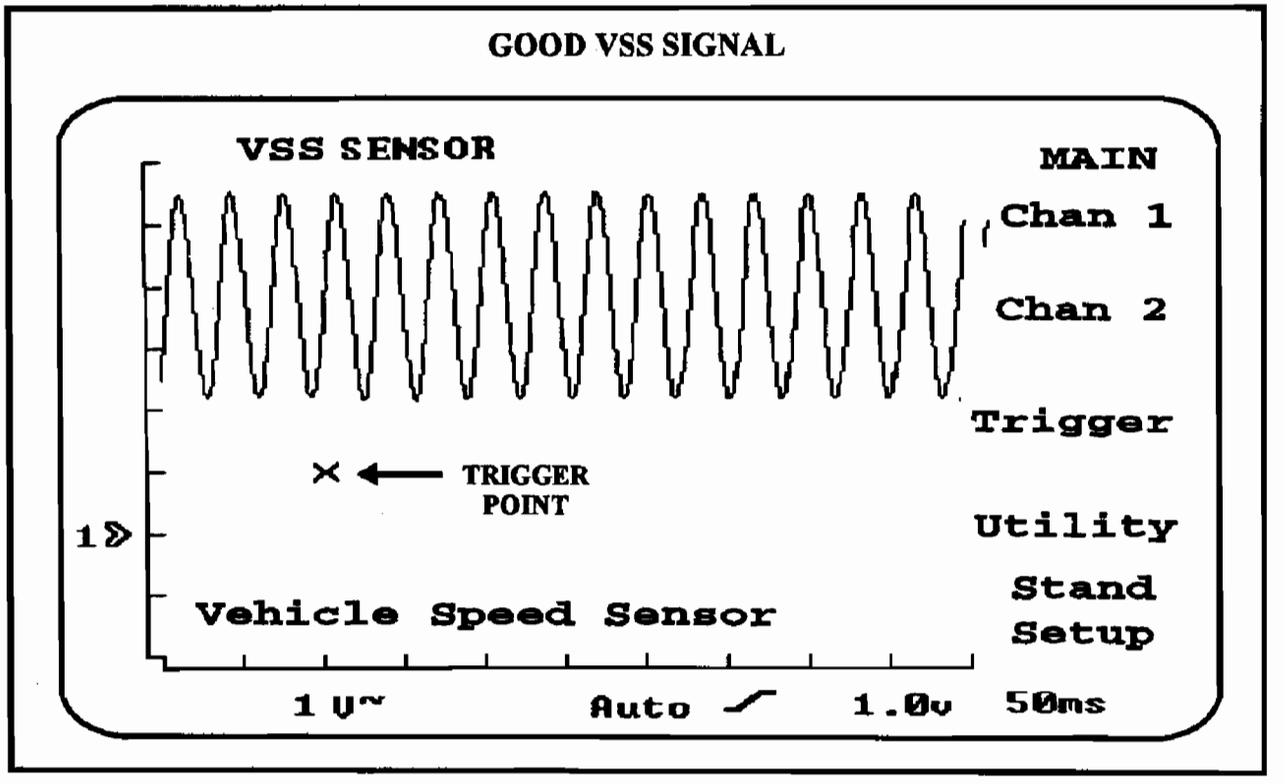


Figure 7

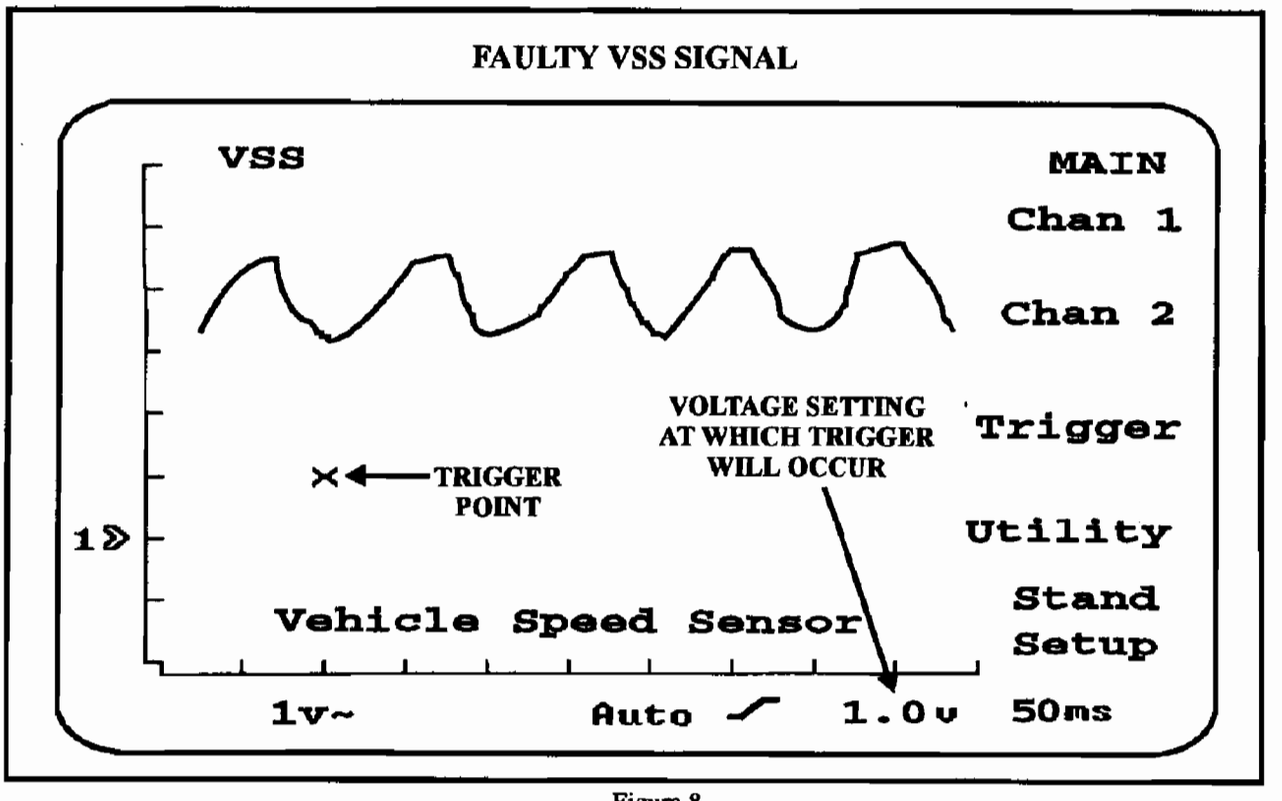
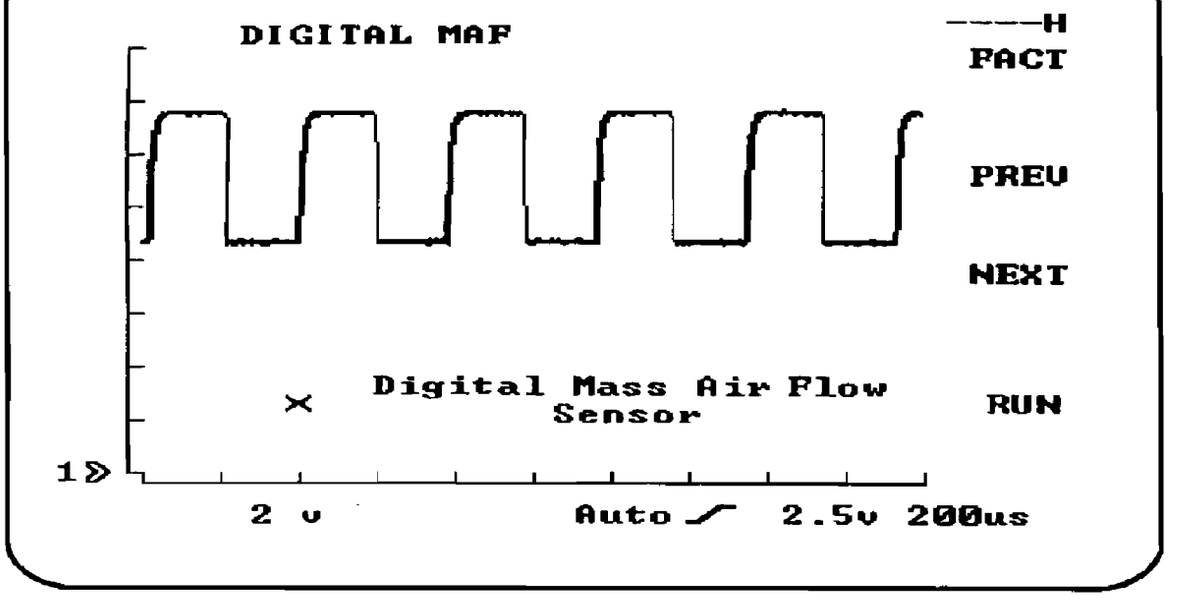


Figure 8

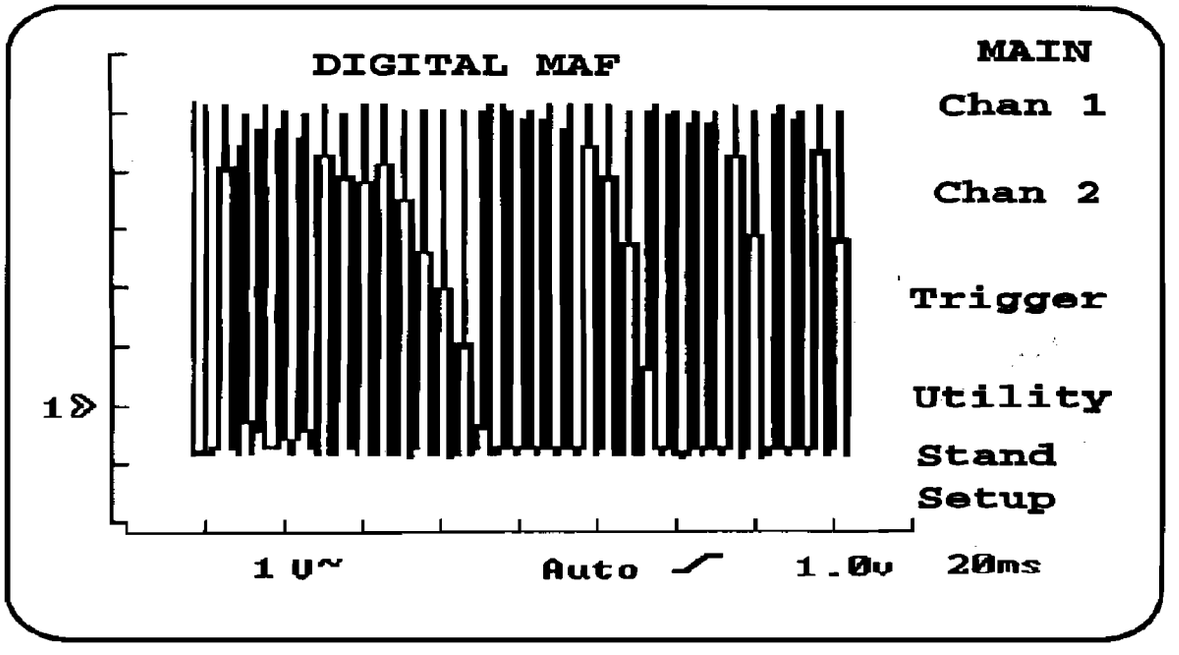
INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

MAF SIGNAL @ IDLE



MAF SIGNAL @ SNAP THROTTLE



INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

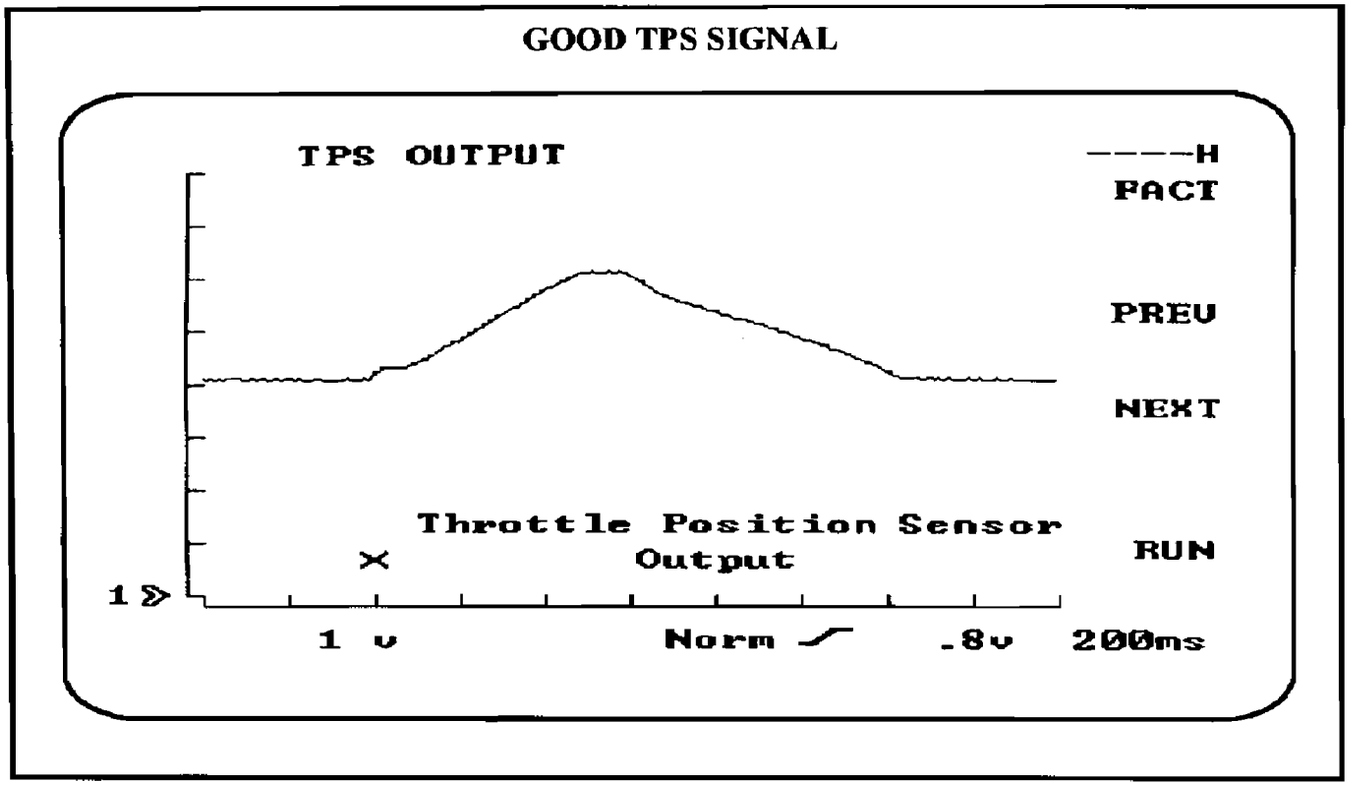


Figure 9

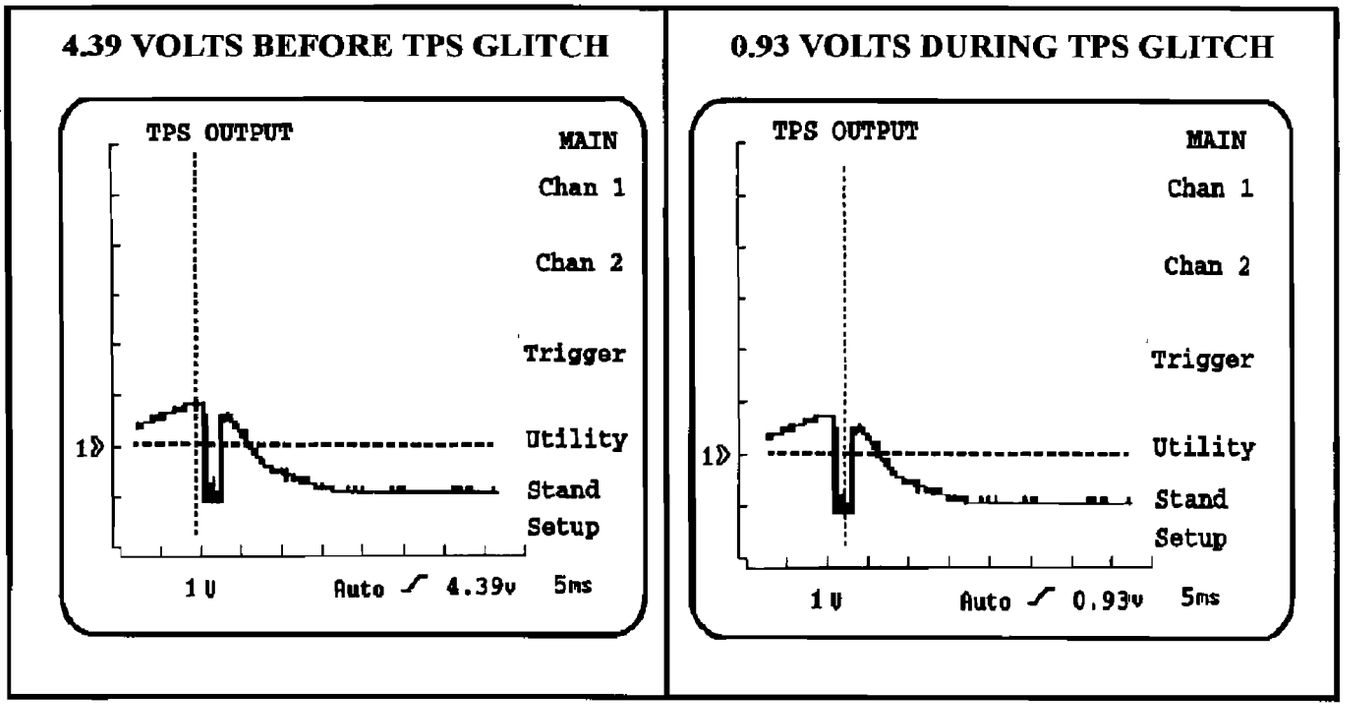


Figure 10

INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE TESTING

PWM SOLENOID SIGNAL @ 100% DUTY CYCLE

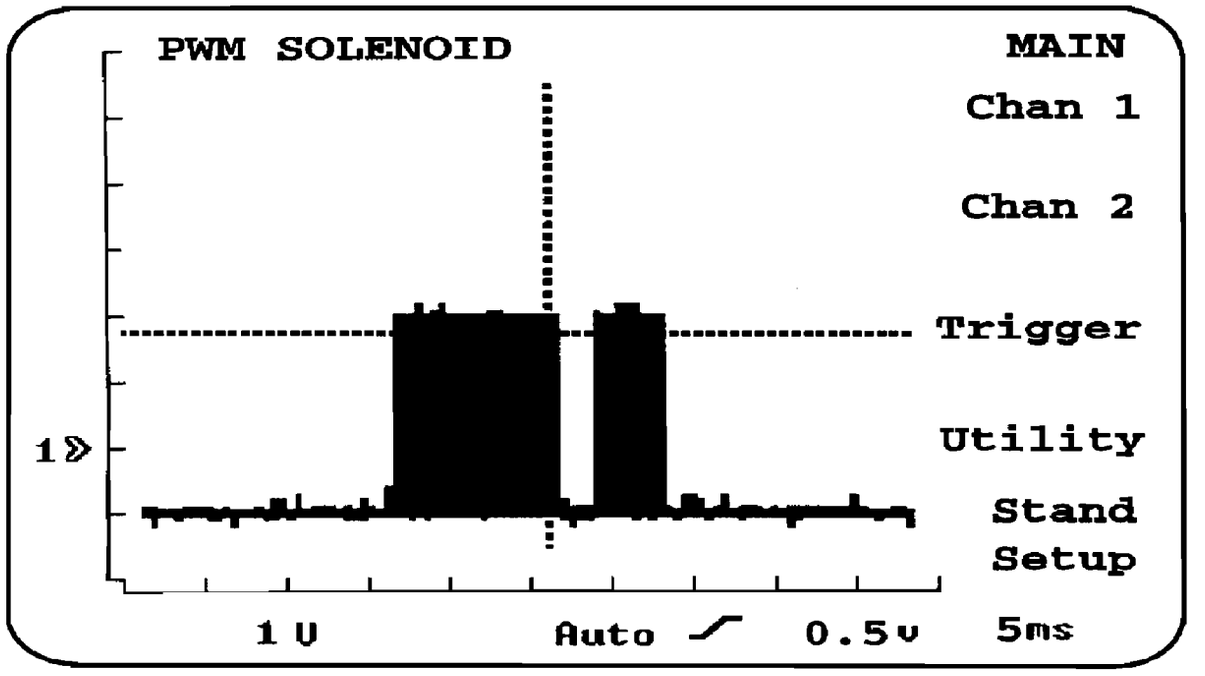


Figure 11

NOISEY PWM SOLENOID SIGNAL @ 0% DUTY CYCLE

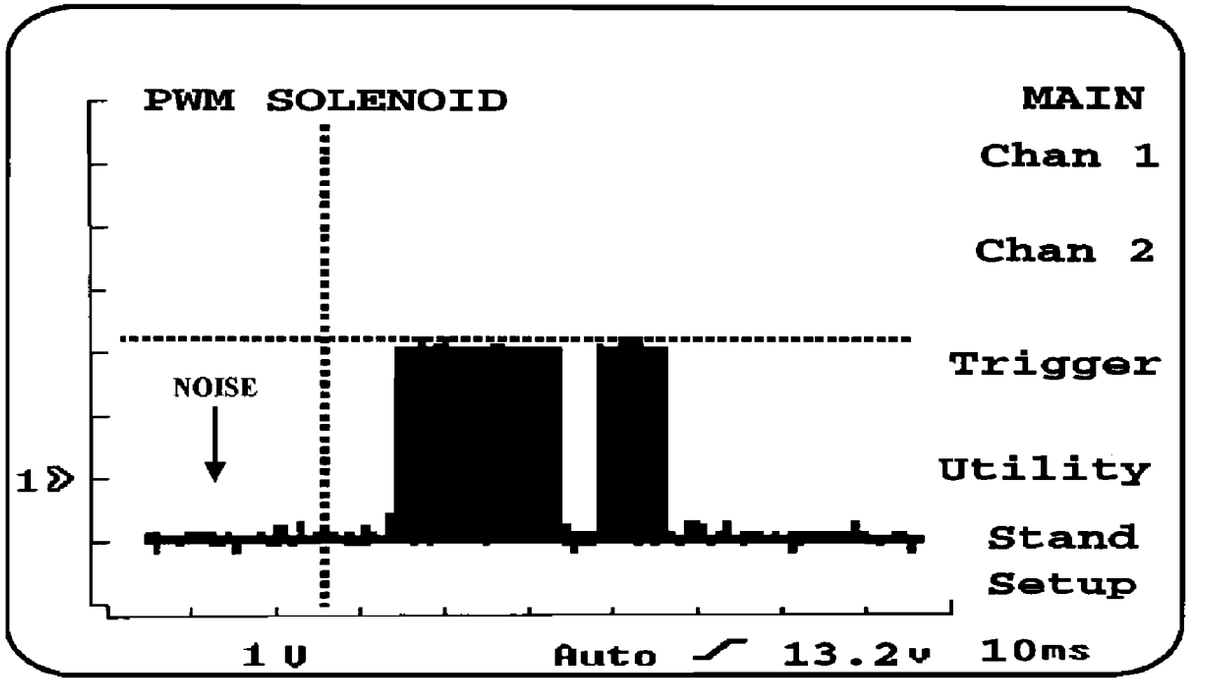
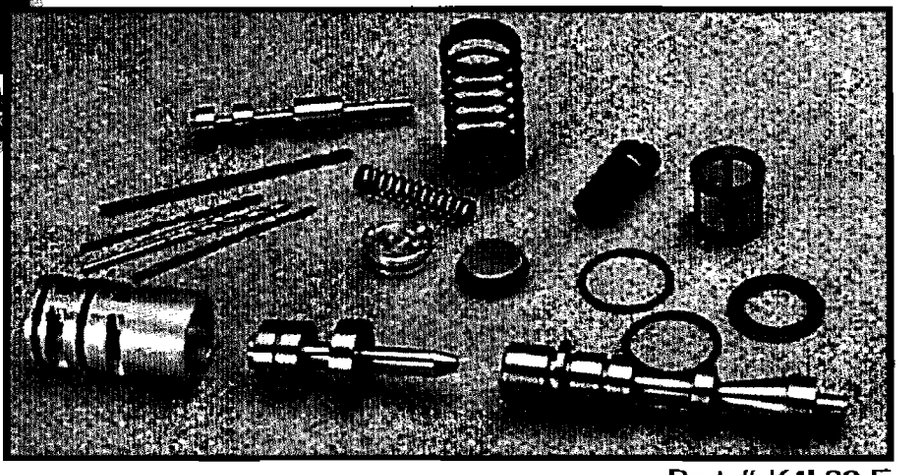


Figure 12

New From Superior!

The 4L80E Shift Correction Package!

Improve overall transmission performance with Superior Transmission Parts' new 4L80E Shift Correction Package. For normal or heavy duty applications, the 4L80E Kit comes with a complete custom pressure regulator valve train and a custom anti-shudder converter clutch control valve.



Helps To Eliminate:

- Runaway high pressure
- Erratic pressure rise
- Converter shudder
- Inconsistent shift feel
- Premature unit failure
- Shift solenoid filter blow-out

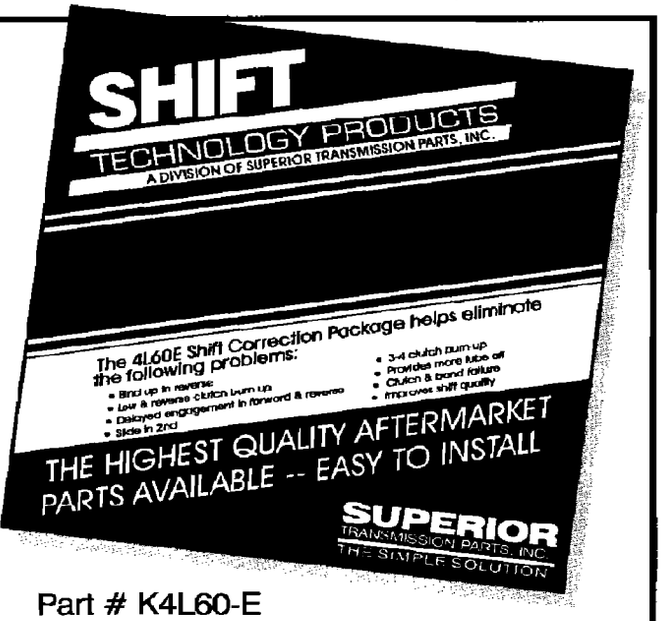
Part # K4L80-E

Be Sure To Try Our 4L60E Shift Correction Package!

Like all Superior valve body products the 4L60E Shift Correction Package is easy to install, features simple instructions, uses only quality-made parts and offers consistent product performance.

The 4L60E Shift Correction Package helps to eliminate the following problems:

- Bind up in reverse
- Low & reverse clutch burn up
- Delayed engagement in forward & reverse
- Slide in 2nd
- 3-4 clutch burn up
- Provides more lube oil
- Clutch & band failure
- Improves shift quality.



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INTRODUCTION TO OSCILLOSCOPES

OSCILLOSCOPE GLOSSARY

ALIASING
When a digital oscilloscope does not take enough samples on a particular signal.

AMPLITUDE
The difference between the lowest voltage and the highest voltage of a signal.

AVERAGING
A process used by digital oscilloscopes to minimize noise.

BANDWIDTH
A frequency range.

CIRCUIT LOADING
The unintentional interaction of the probe and the scope with the circuit being tested, causing signal distortion.

COUPLING
The method of connecting two circuits together either with a wire or a capacitor.

DIVISION
Measurement markings on the oscilloscope screen.

FREQUENCY
The number of times a signal repeats itself in one second (hertz).

GLITCH
An intermittent error in a circuit.

GRATICULE
The grid lines on the oscilloscope screen for measuring traces.

HERTZ
One cycle per second, the unit of frequency.

KILOHERTZ
1000 hertz, a unit of frequency.

MEGAHERTZ
1,000,000 hertz, a unit of frequency.

MICROSECOND
A unit of time equivalent to 0.000001 seconds.

MILLISECOND
A unit of time equivalent to 0.001 seconds.

NOISE
An unwanted voltage or current in an electrical circuit.

OSCILLOSCOPE
An instrument used to make voltage changes visible over time.

OSCILLOSCOPE
An instrument used to make voltage changes visible over time. Comes from the word oscillate.

PEAK
The maximum voltage level measured from a zero reference point.

PERIOD
The amount of time it takes a wave to complete one cycle.

PHASE
The amount of time that passes from the beginning of a cycle to the beginning of the next cycle.

PROBE
An oscilloscope input device for making contact with an electrical circuit to transmit signal to the scope through a wire.

SAMPLE POINT
The raw data used to calculate waveform points.

SINE WAVE
A common curve wave shape that is mathematically defined.

SLOPE
The ratio of a vertical distance to a horizontal distance.

SQUARE WAVE
A common wave shape consisting of repeating square pulses.

SWEEP
One horizontal pass of a trace from left tp right.

TIME BASE
The timing of a sweep (sweep speed).

TRACE
The visible shapes drawn on the scopes screen.

TRANSIENT
A signal measured by a scope that only occurs once (single shot event).

TRIGGER
The circuit that initiates a horizontal sweep and determines the beginning point of the waveform.

TRIGGER LEVEL
The voltage level that a trigger source signal must reach before the trigger circuit initiates a sweep.

WAVEFORM
A graphic representation of a voltage varying over time.

Figure 13

THM 4T80-E
NEW DESIGN SHIFT SOLENOIDS

CHANGE: All vehicles equipped with the THM 4T80-E transaxle are now being built with a new design level of Shift Solenoids. Shift Solenoid "A" and Shift Solenoid "B" previously had a "Tab" incorporated on the solenoid to retain the Shift Solenoid Feed Screen in the valve body, as shown in Figure 2. The Shift Solenoids are now manufactured without the "Tab" on the solenoid, and an additional bracket is used to retain the screen in the valve body, as shown in Figure 3. Previously General Motors has not serviced the Shift Solenoids, except on a complete valve body. The Shift Solenoids are now a service item from General Motors available under OEM part number 24207662 for the 2nd design solenoids only. There is also available under OEM part number 24211355, a service package that includes two 2nd design Shift Solenoids, a new bracket to retain the screen and a longer bolt for the new bracket, as shown in Figure 1.

REASON: Constant actuator feed oil pressure on the solenoid screen pushing on the "Tab" on the first design shift solenoids, would break the shift solenoid plastic neck. The new design Shift Solenoids will greatly increase durability of the solenoid.

PARTS AFFECTED:

(1) SHIFT SOLENOID "A" AND "B" - Now manufactured without the "Tab" on the solenoid, as shown in Figures 2 and 3.

(2) SOLENOID SCREEN BRACKET - Additional bracket added to retain the Shift Solenoid Screen in the valve body, as shown in Figure 3.

(3) BRACKET BOLT - Longer bolt also included in service package part number 24211355 to accommodate the added bracket, as shown in Figure 1.

INTERCHANGEABILITY:

If you are servicing one of the previous design vehicles with the "Tab" on the Shift Solenoids, you must purchase service package part number 24211355, as the 1st design solenoids are not available. If you are servicing one of the 2nd design vehicles, you can now order just the Shift Solenoids "A" and "B" under Oem part number 24207662.

SERVICE INFORMATION:

Shift Solenoid "A" (2nd Design)	24207662
Shift Solenoid "B" (2nd Design)	24207662
Service Package (To Service 1st Design Level)	24211355
Solenoid Filter Retaining Bracket	24205848
Solenoid Filter Retaining Bracket Bolt	8680869
Solenoid Filter	8680389

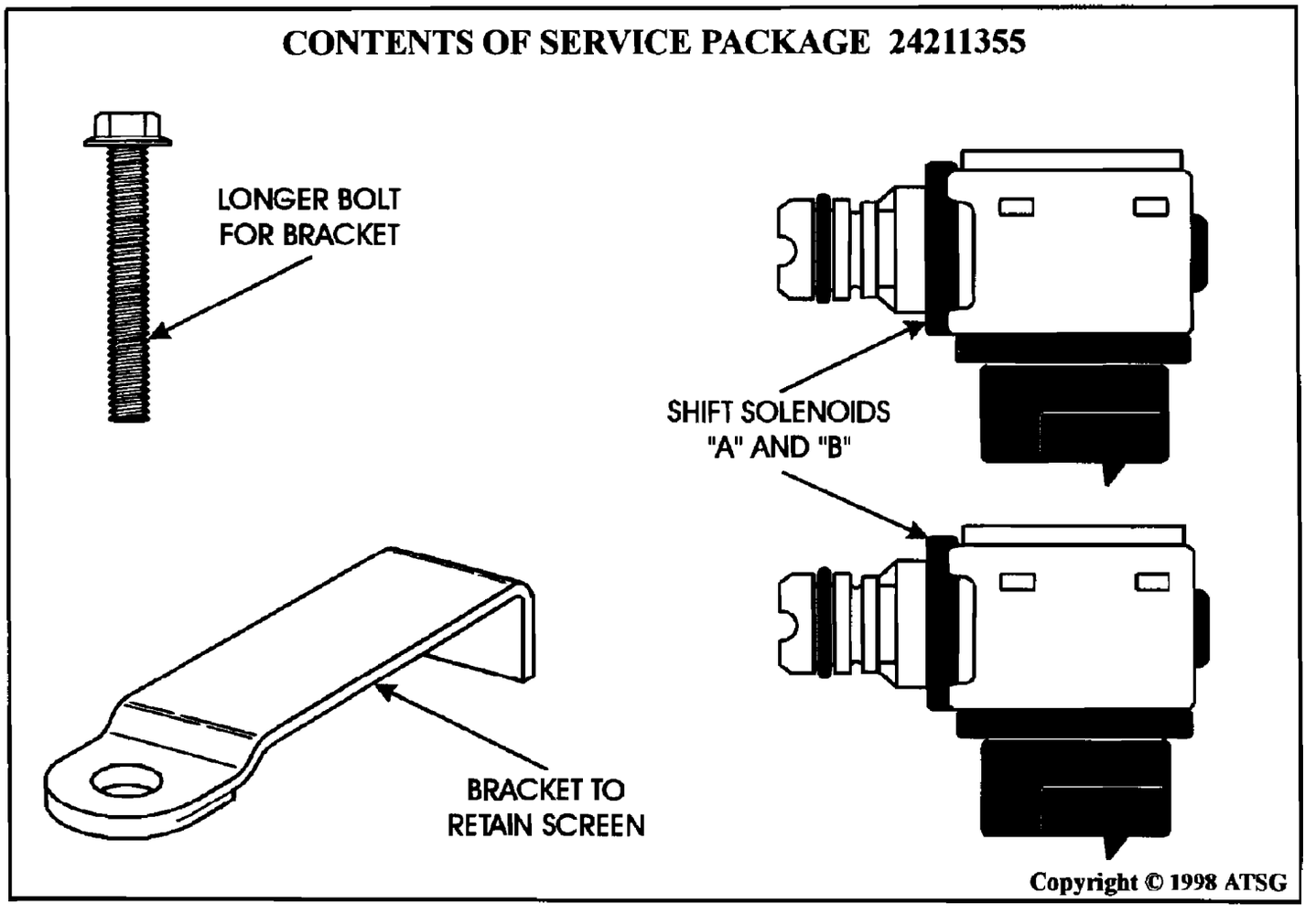
CONTENTS OF SERVICE PACKAGE 24211355
LONGER BOLT
FOR BRACKET
SHIFT SOLENOIDS
"A" AND "B"
BRACKET TO
RETAIN SCREEN
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Figure 1

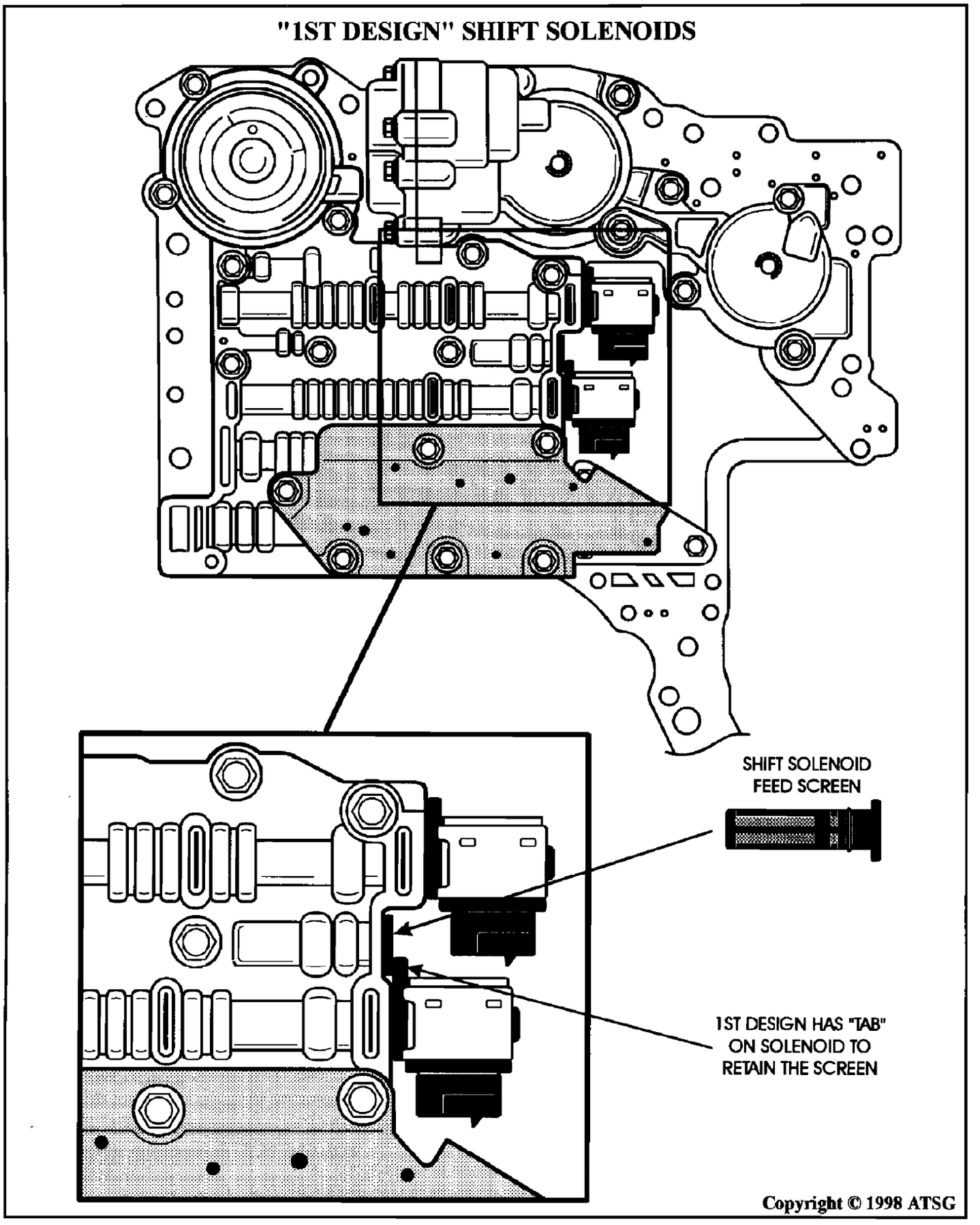
"1ST DESIGN" SHIFT SOLENOIDS
SHIFT SOLENOID
FEED SCREEN
1ST DESIGN HAS "TAB"
ON SOLENOID TO
RETAIN THE SCREEN
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Figure 2

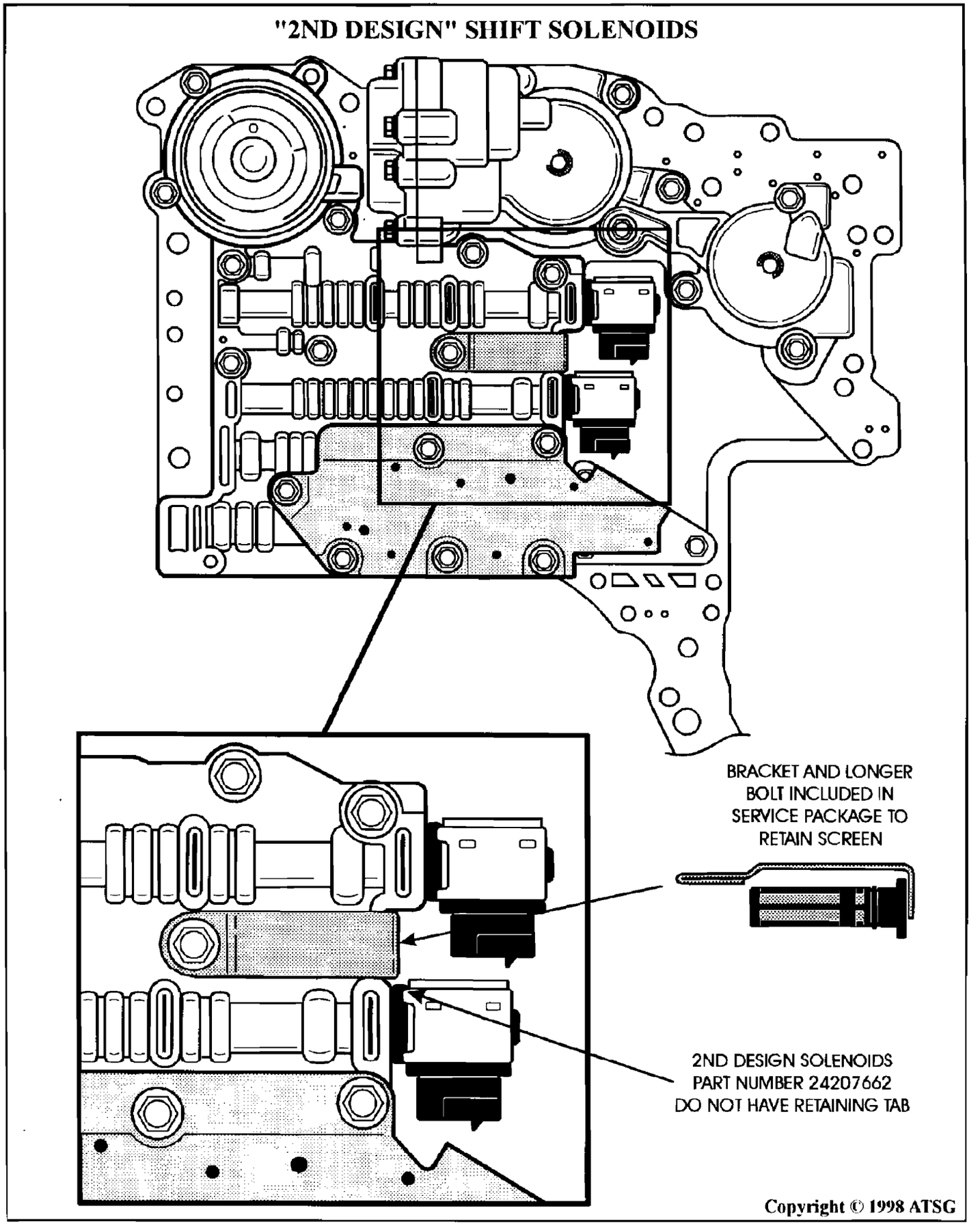
"2ND DESIGN" SHIFT SOLENOIDS
BRACKET AND LONGER BOLT INCLUDED IN SERVICE PACKAGE TO RETAIN SCREEN
2ND DESIGN SOLENOIDS PART NUMBER 24207662 DO NOT HAVE RETAINING TAB
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Figure 3

THM 4T80-E
TURBINE SHAFT SPEED SENSOR
TROUBLE CODE "P056"

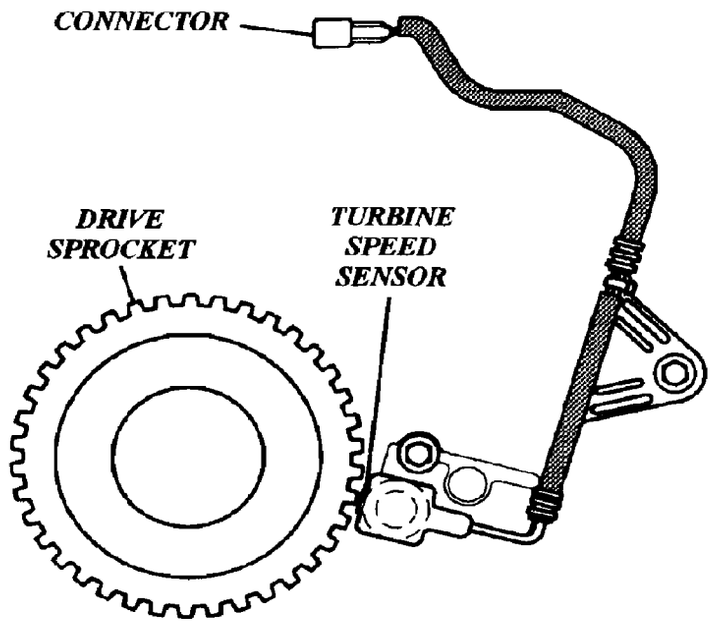
COMPLAINT: Some 1993-1996 model Cadillac vehicles equipped with the THM 4T80-E transaxle, may exhibit a second gear start condition, and have trouble code "P056" stored in the PCM. Trouble codes ***should*** be accessed through the on-board diagnostic system and will be displayed on the Climate Control Center. We have seen scanners give us incorrect information on these models.

CAUSE: The cause may be, a defective Turbine Shaft Speed Sensor, that is located under the channel plate and triggered by the drive sprocket, as shown in Figure 1.

CORRECTION: Replace the the Turbine Shaft Speed Sensor with a new OEM part, available under OEM Part Number 8685532. We have also provided you with wire connector pin identification for both case connector configurations so that you can check the resistance values on the TSS and Shift Solenoids. Refer to Figure 2 for the 1993 case connector and Figure 3 for the 1994 and later case connector.
Special Note: Since this has been the ***number two problem*** that we have been faced with on the telephone, we would highly recommend replacing the TSS as a mandatory replacement part on every rebuild, because of its location.

SERVICE INFORMATION:

Turbin Shaft Speed Sensor (All) 24209654



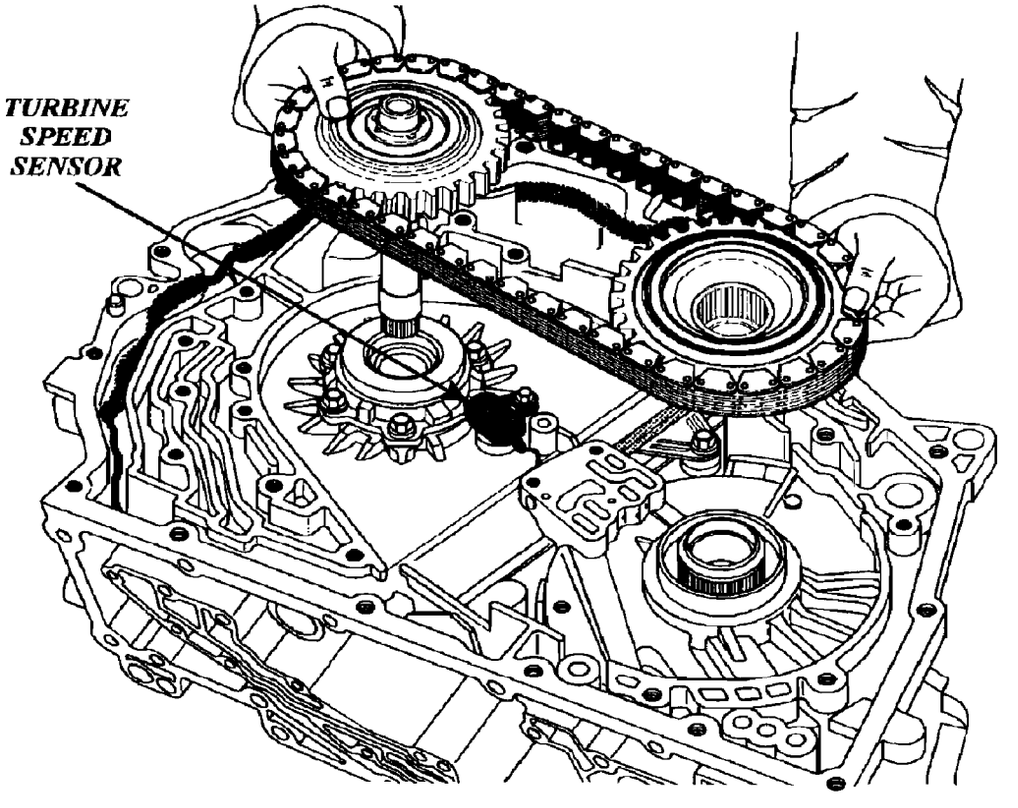
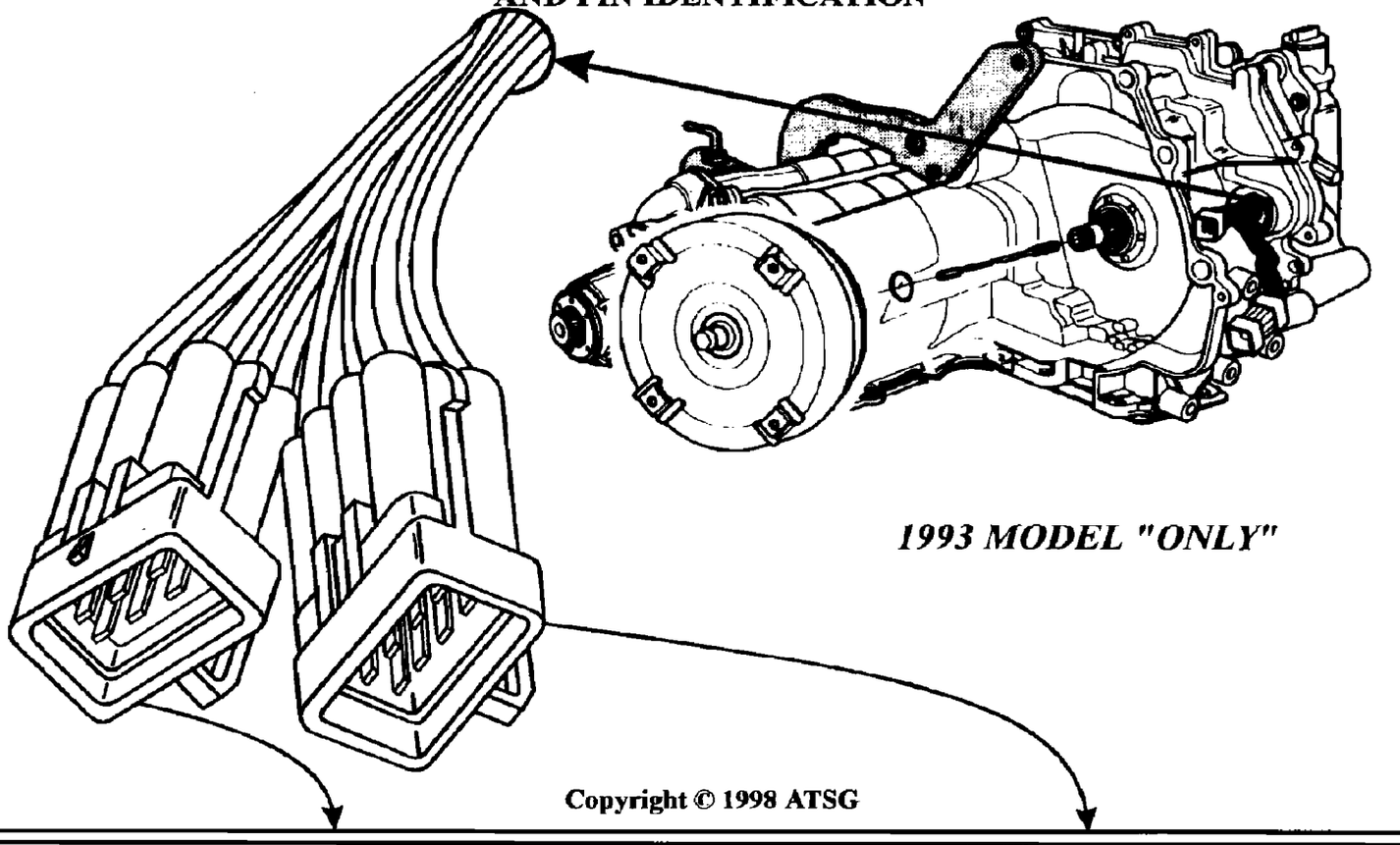


Figure 1

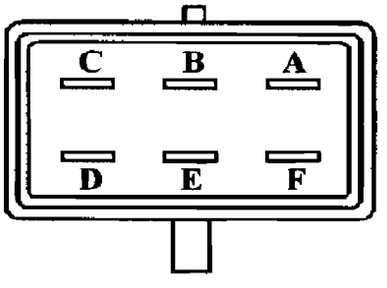
THM 4T80-E CASE CONNECTOR LOCATION AND PIN IDENTIFICATION



1993 MODEL "ONLY"

CONNECTOR NUMBER 130
6 PIN CONNECTOR

View Looking Into Case Connector



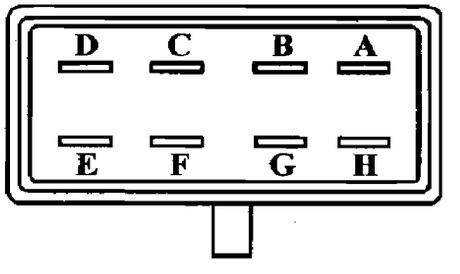
A = TRANSAXLE INPUT SPEED SENSOR (HI)
B = TRANSAXLE INPUT SPEED SENSOR (LO)
C = EPC SOLENOID (HI)
D = EPC SOLENOID (LO)
E = TCC SOLENOID - 12V POWER IN
F = TCC SOLENOID - GROUND SIGNAL

Internal Wire Harness Colors

A = Brown
B = Tan
C = Dark Green
D = Light Green
E = Purple
F = Pink

CONNECTOR NUMBER 129
8 PIN CONNECTOR

View Looking Into Case Connector



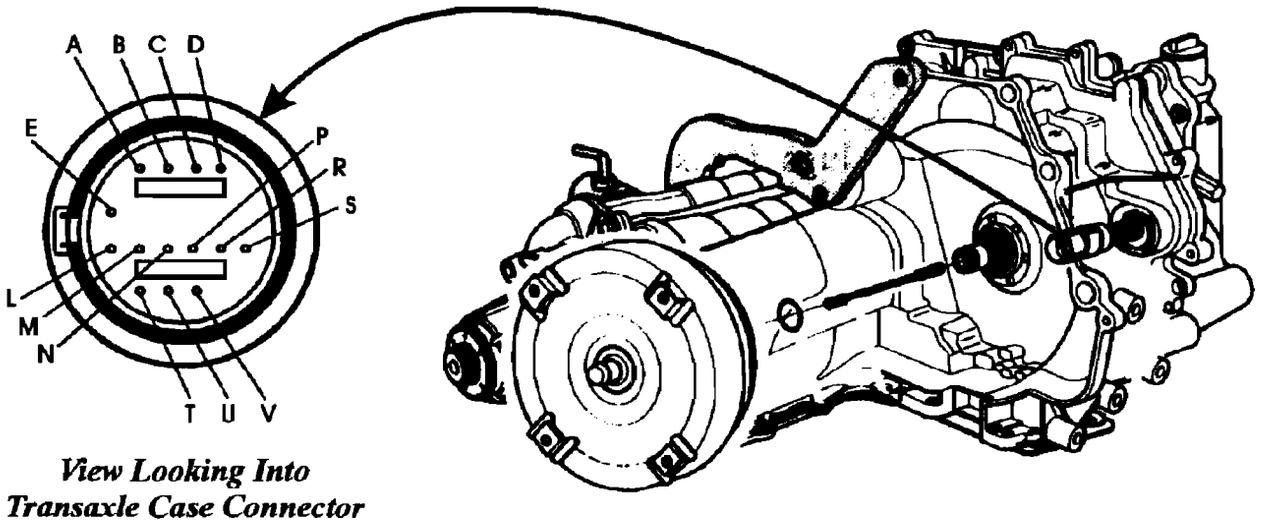
A = PSA SWITCH "X" CIRCUIT INPUT TO PCM
B = PSA SWITCH "Y" CIRCUIT INPUT TO PCM
C = TEMP SENSOR - 5V RETURN
D = TEMP SENSOR - INPUT
E = SHIFT SOLENOID "A" GROUND FROM PCM
F = SHIFT SOLENOIDS - 12V POWER IN
G = SHIFT SOLENOID "B" GROUND FROM PCM
H = PSA SWITCH "Z" CIRCUIT INPUT TO PCM

Internal Wire Harness Colors

A = Black
B = White
C = Dark Blue
D = Light Blue
E = Orange
F = Red
G = Yellow
H = Gray

Figure 2

1994-UP THM 4T80-E CASE CONNECTOR LOCATION AND PIN IDENTIFICATION



View Looking Into Transaxle Case Connector

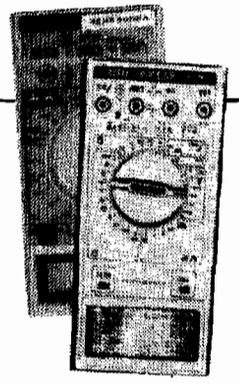
Ohms Resistance Chart			
Cavities	Component	Resistance @ 68°F	Resistance @ 190°F
A-E	1-2 Shift Solenoid	20-30Ω	23-50Ω
B-E	2-3 Shift Solenoid	20-30Ω	23-50Ω
T-U	TCC/PWM Solenoid	10-15Ω	11-25Ω
C-D	EPC Solenoid	3-5Ω	5-6Ω
S-V	Input Speed Sensor	1260-1540Ω	
M-L	TFT Sensor	3164-3867Ω	225-285Ω
	Output Speed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

SCHAFFER® TEST PRODUCTS, INC.

(941) 859-1070 • Fax (941) 853-1548



DIGITAL MULTI-METERS

VOLTS - OHMS - AMPS
CAPACITANCE-
FREQUENCY
LARGE READOUT

•

No frills model,
under $100

•

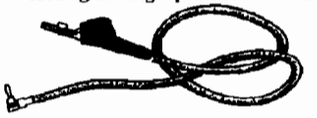
All the frills,
under $200

•

Also with PC Interface

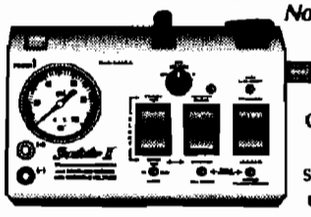
4 ft. DMM TEST LEADS

with insulation piercing probes!
allows testing during operation - ***set of 2***



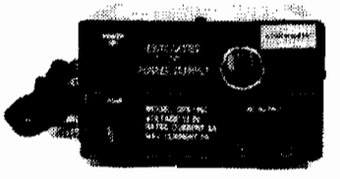
SMARTESTER II™

Solenoid & Switch Bench Tester
Now with variable voltage for domestic EPC Control.



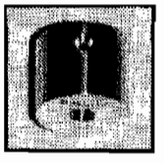
Checks pressure switches and simple solenoids under simulated operating conditions.

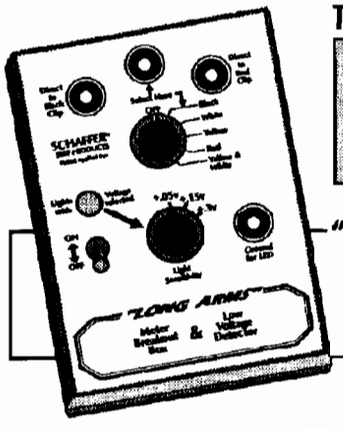
6 Amp Regulated Bench POWER SUPPLY



Multiple hook-ups allow versatility
- cigar lighter, screw posts and banana jacks.

A4LD TEST SPOOL





"LONG ARMS®" DMM Breakout Box

Electronic Test Light and Monitor

- Multi-Meter Breakout Box
- True Electronic Test Light
- Works as a signal monitor

The Only Equipment of it's kind in the World!

SAFE JUMP™

The Limiter *"takes the heat"*

Allows only 1.5 amps through it.

•

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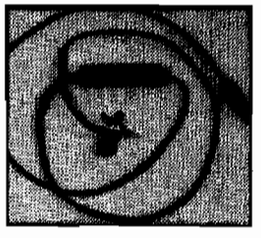
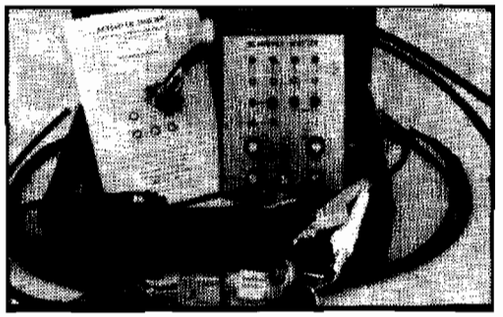


BACK PROBE KIT

Includes 2 - 4 ft. leads with large and small probes.

SCHAFFER SHIFTER® Transmission Tester



- Color-coded adapters serve as breakouts
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- Largest Connector Coverage on the Market
- Fastest and Simplest to Operate
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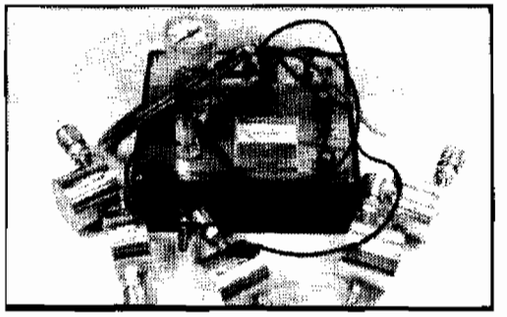
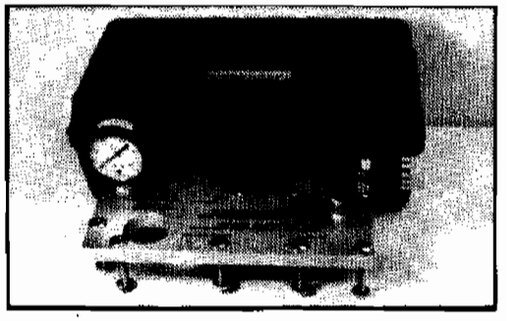
3-IN-1 SOLENOID TESTER

SOLENOID REGULATION **- In or Out of Vehicle**



- Bench Test All Automatic Transmission Solenoid Types - Simple, Modulated, and Variable Force
- Simulated In - Car Operational Tests

E40D SOLENOID PACK BENCH TEST MANIFOLD



- Mounted pressure regulator and gauge.
- Individual passages to identify which solenoid is being tested.
- EPC valve check by cycling the solenoid through the operating ranges.

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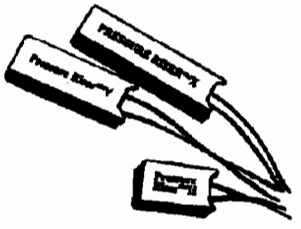
ELECTRONIC PRESSURE MODIFIER



- Corrects Slow Pressure Increase
- Extends Transmission life
- Improves Driveability
- Inexpensive and Easy to Install
- Works on All Pulse Width Modulated Pressure and L/U Solenoids
- DRIVER ADJUSTABLE MODELS

ALL THREE PRESSURES IN ONE!

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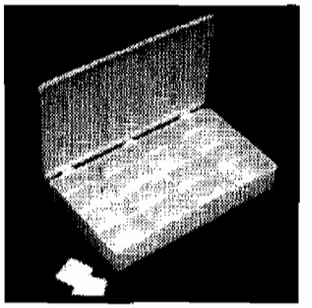
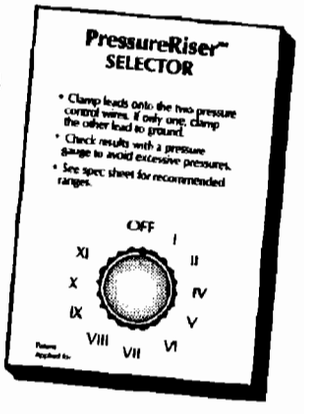


Always have a PressureRiser® on hand when you need it!

SELECTOR

- Check Its Effect Before Installing
- Quickly Determine the Proper PressureRiser® to Install
- Hook-up Instructions for Most Transmissions Provided with the Selector



THM 4T80-E
FLUID LEAKING FROM BELLHOUSING

COMPLAINT: Transaxle fluid leaking from the bell housing area, even after rebuild or a converter seal and torque converter replacement.

CAUSE: The cause may be, a transaxle case with a small hairline crack in the shaded area shown in Figure 1, from high line pressure conditions.

CORRECTION: Inspect the transaxle case closely in the shaded area shown in Figure 1, for small hairline cracks and replace the transaxle case as necessary. Hydra-matic cast the case thicker in this area during the 1996 model year to eliminate this condition.

SERVICE INFORMATION:

Transaxle Case Assembly (All Domestic Models) 24210377

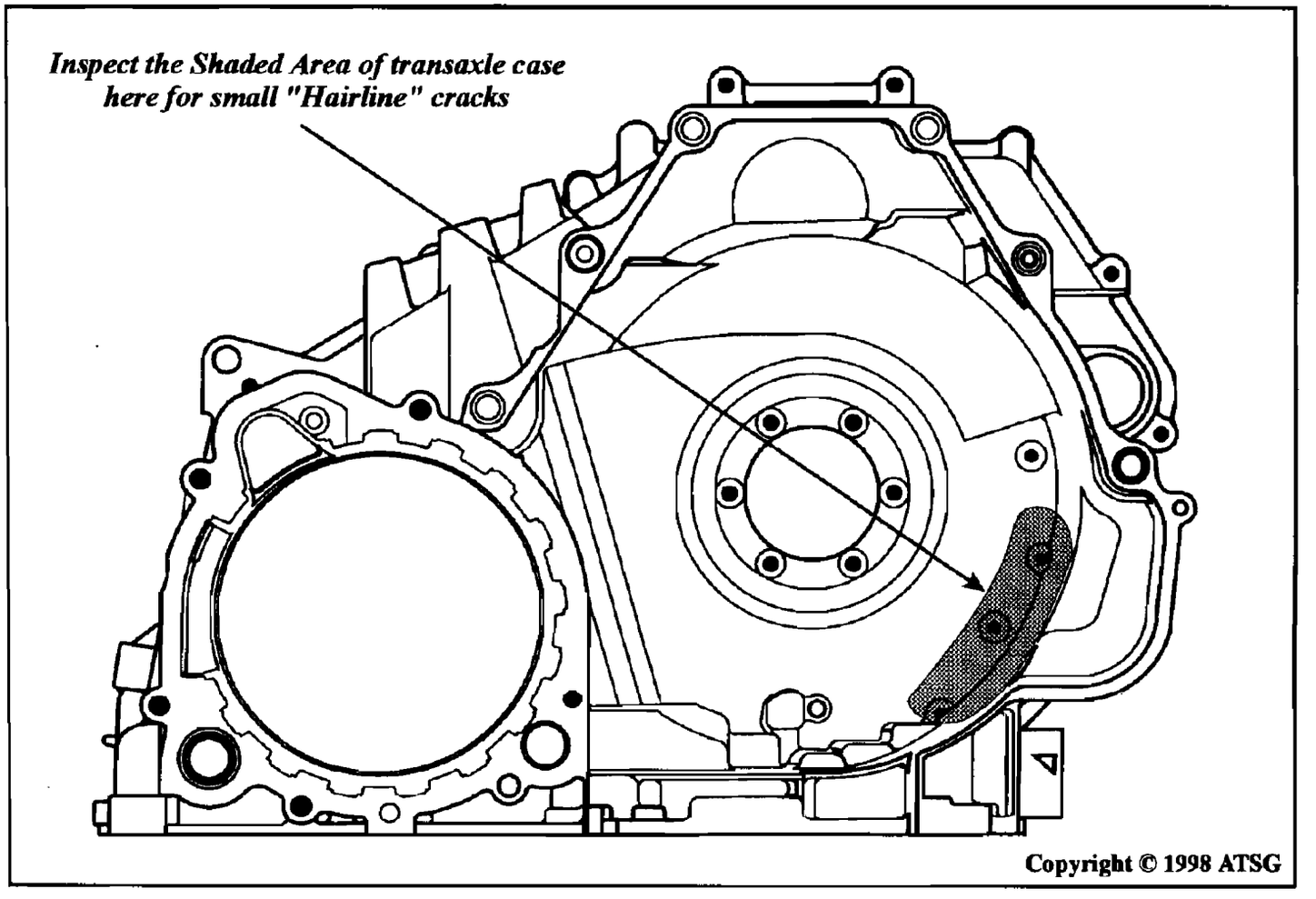


Figure 1

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

CHANGE: Beginning at the Start Of Production for 1995 models, all THM 4T80-E transaxles were produced with a new design level Driven Sprocket Support and center gasket (See Figure 1). This allowed the use of four 2nd clutch plates, instead of the previous three.

REASON: Improved 2nd clutch durability.

PARTS AFFECTED:

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

(2) SPROCKET SUPPORT GASKET - The two "Bathtub" feed holes in the gasket were moved to accommodate the new design sprocket support. The slot in the gasket was also removed on the new design gasket (See Figure 1).

INTERCHANGEABILITY:

The Driven Sprocket Support Gaskets ***"WILL NOT"*** interchange. The 93-94 gasket must be used with the 93-94 sprocket support, and the 95-96 gasket must be used with the 95-96 sprocket support (See Figure 1).

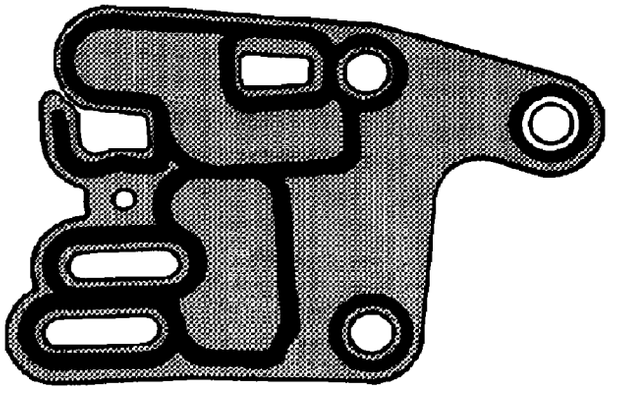
SERVICE INFORMATION:

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

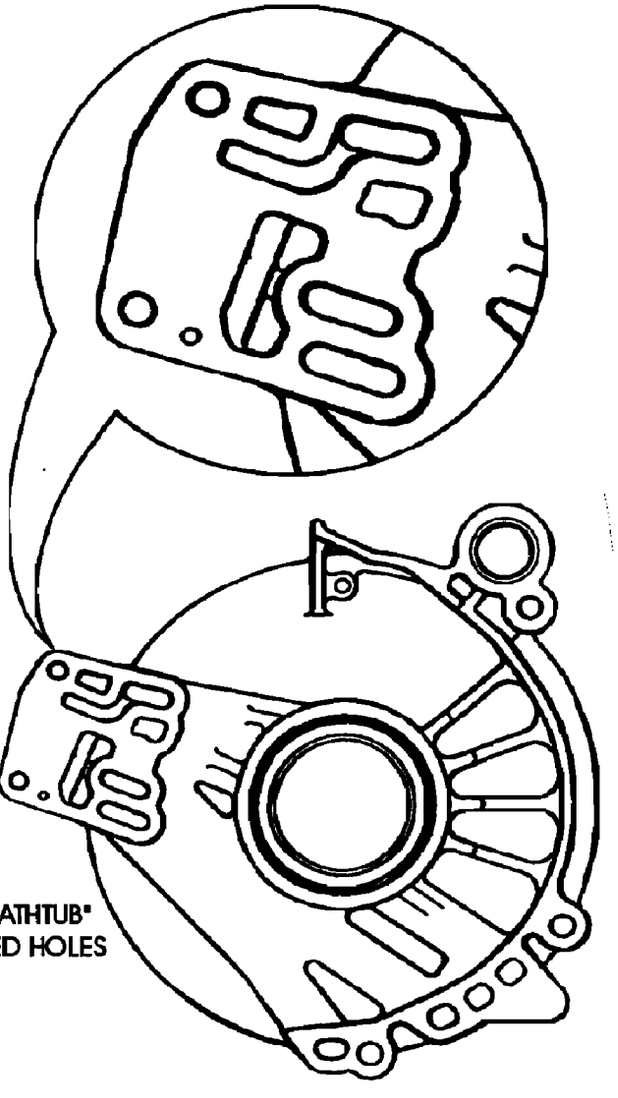
1993-1994 DESIGN LEVEL PARTS

SLOT IN GASKET

8683149



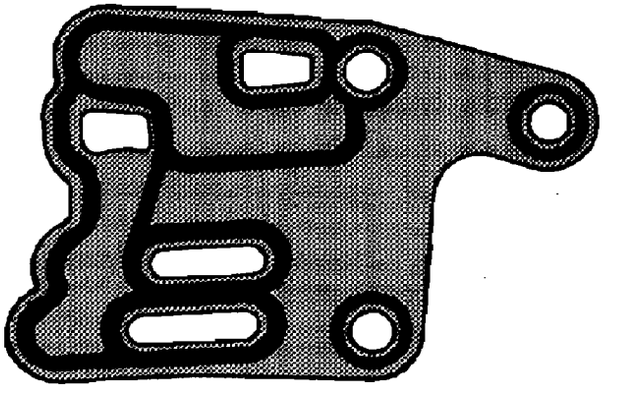
NOTE POSITION OF BATHTUB HOLES IN SUPPORT AND GASKET



1995-1996 DESIGN LEVEL PARTS

NO SLOT IN GASKET

24201535



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

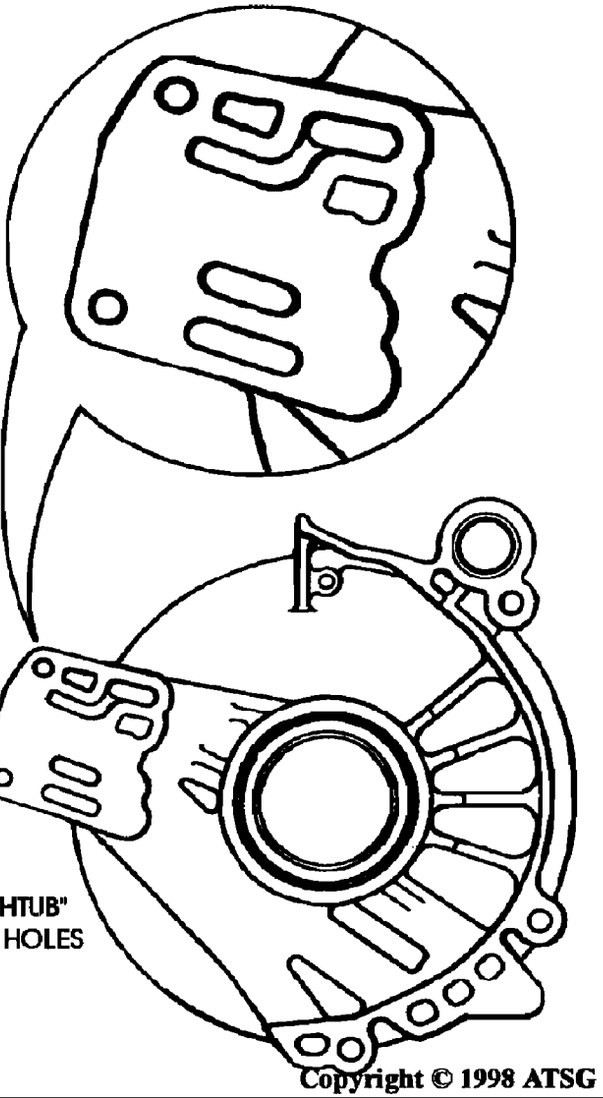


Figure 1

THM 4T80-E
TROUBLE CODE P039
OR OBD II CODE P0741

COMPLAINT: Vehicle iluminates the "Check Engine" lamp and stores Diagnostic Trouble Code P039 on 1993-1995 models, or OBD II Code P0741 on 1996-Up models. The converter clutch may or may not be operational.

CAUSE: The cause may be, one or both of the metal clad seals located in the channel plate not installed during the rebuilding process. Some overhaul kits do not include the turbine shaft seal in the kit.

CORRECTION: After removing both seals from the channel plate, install the Turbine Shaft Seal into the channel plate first, using the seal driver shown in Figure 1. The Turbine Shaft Seal is a double lip metal clad seal that is incorporated into a steel sleeve, and should be installed in the direction shown in Figure 1, as it is off-set in the sleeve.
Next install the Drive Sprocket Seal into the channel plate, using the seal driver shown in Figure 2. Install the Drive Sprocket Seal with lip facing direction shown in Figure 2.
If your overhaul kit did not include one or both of these seals, use the OEM part numbers listed under "Service Information" to obtain them.

SERVICE INFORMATION:

Turbine Shaft Seal	24201991
Drive Sprocket Seal	24201992

TURBINE SHAFT SEAL ASSEMBLY

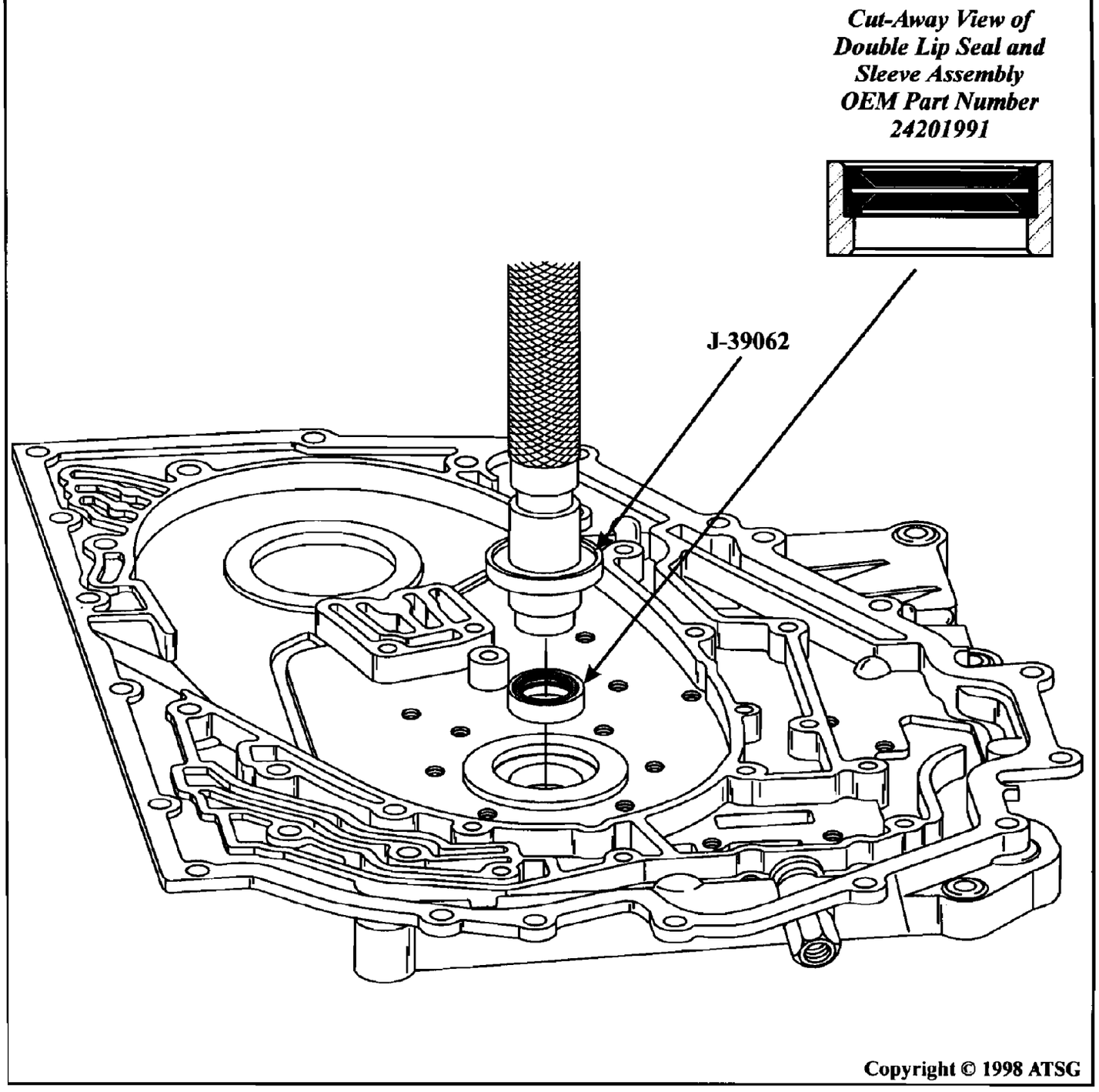


Figure 1

DRIVE SPROCKET SEAL ASSEMBLY

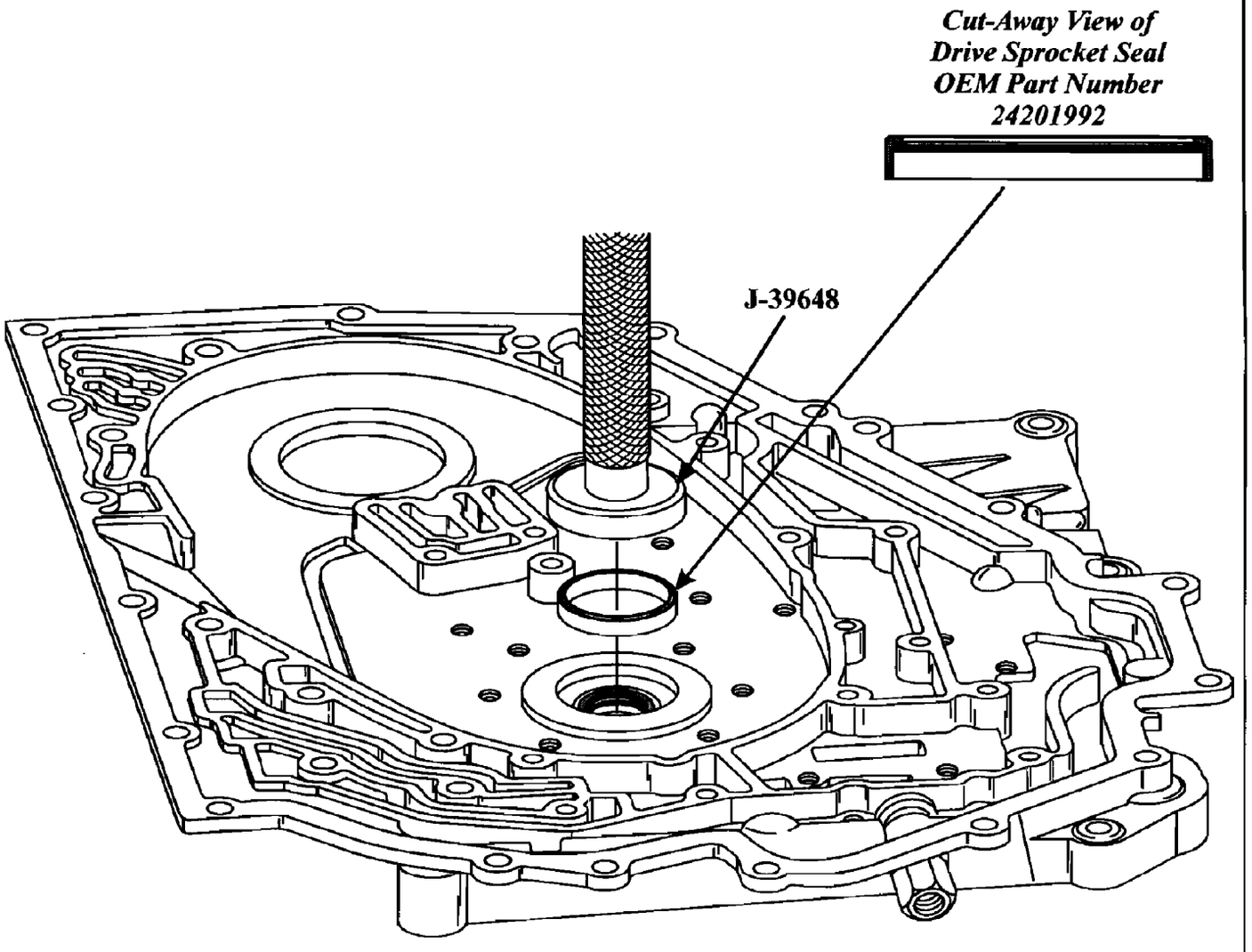


Figure 2

THM 4T80-E
FINAL DRIVE IDENTIFICATION

COMPLAINT: There may be several different complaints and/or trouble codes stored, such as but not limited to, gear ratio error, converter clutch slippage, internal component slipping, and usually right after a salvage yard unit has been installed.

CAUSE: The cause may be, the wrong unit installed, as there are two different final drive ratios for the 4T80-E transaxle, 3.71 ratio and 3.11 ratio, that ***will not*** interchange.

CORRECTION: The first thing that must be done is to determine which final drive ratio belongs in the vehicle that you have. This can be done only by refering to the component identification tag located in the trunk. Next to the word "Trans" will be one of two codes, either FV4 or FV3. After you have this information, refer to the chart in Figure 1 to determine the proper amount of teeth on the final drive components, and install the proper final drive assembly for the vehicle.

4T80-E FINAL DRIVE IDENTIFICATION

TAG IN TRUNK	FINAL DRIVE RATIO	RING GEAR	SUN GEAR	PINION GEAR
FV4	3.71:1	114 TEETH	42 TEETH	36 TEETH
FV3	3.11:1	114 TEETH	54 TEETH	30 TEETH

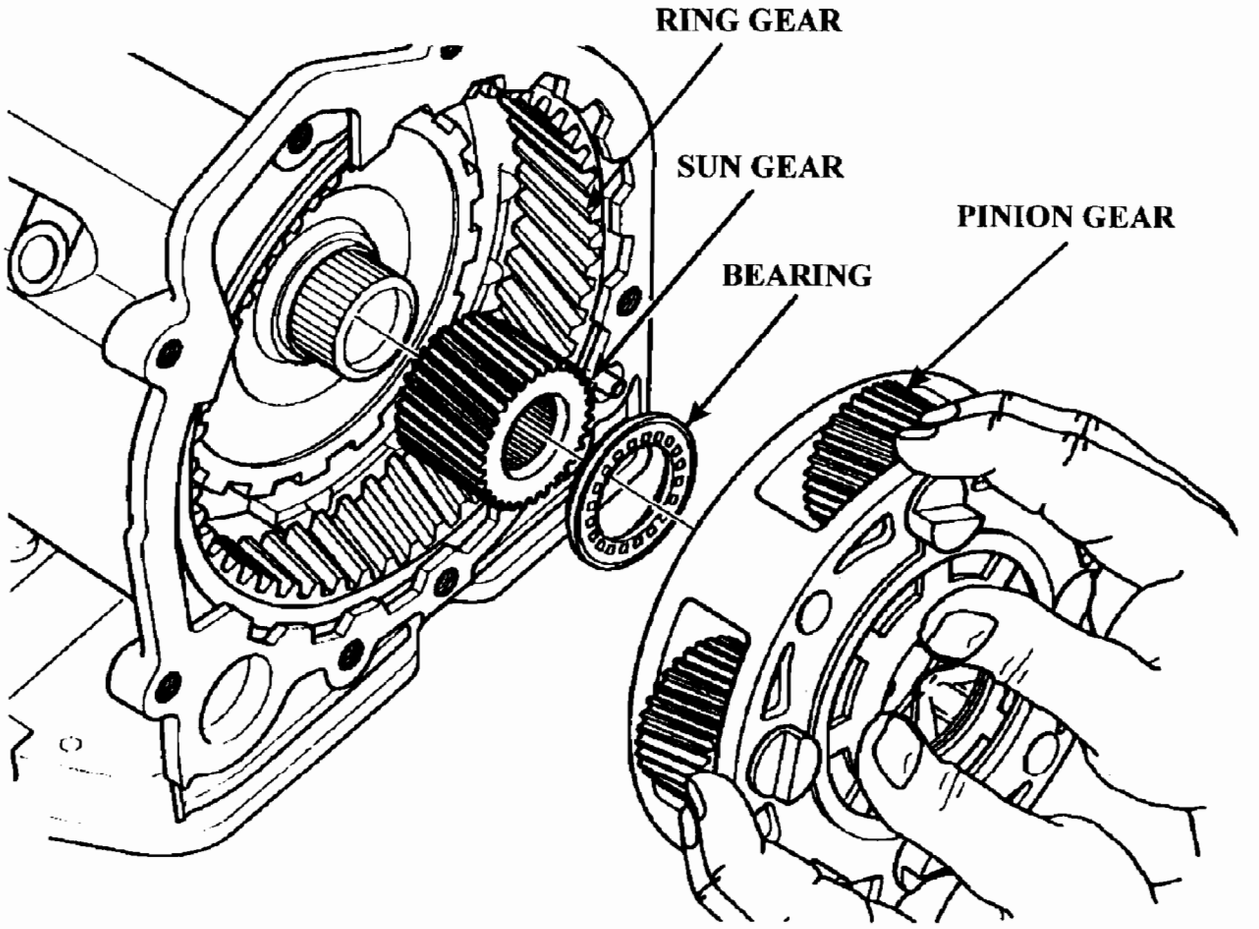


Figure 1

THM 4T80-E

NO ENGINE BREAKING AND OR DELAYED ENGAGEMENT IN THE D3 POSITION

COMPLAINT: Units built prior to October 24, 1997, Julian date 297 may experience a loss of engine breaking in the D3 position and/or a several second delayed engagement in the D3 position.

CAUSE: The complaint may be caused by the coast clutch piston side of the forward clutch piston restricting the coast clutch apply fluid.

CORRECTION: There is now a revised forward clutch piston available where an additional machining process occurred lessening the restriction of coast clutch apply fluid. The new forward clutch piston can be easily identified by a shiny surface at the center hub of the forward clutch piston as seen in Figure 1.

SERVICE INFORMATION:

Forward Clutch Piston Kit..... 24213271

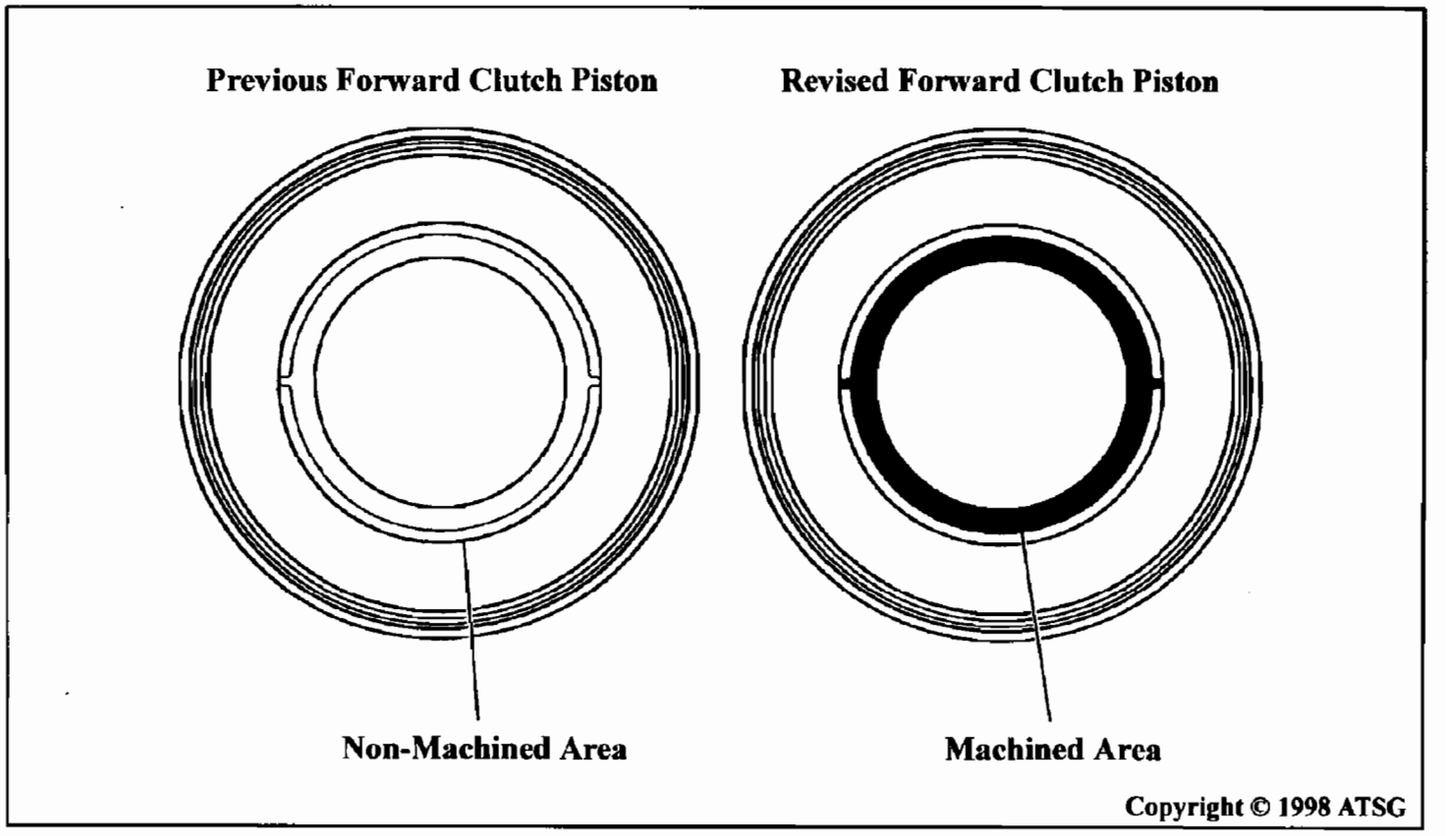
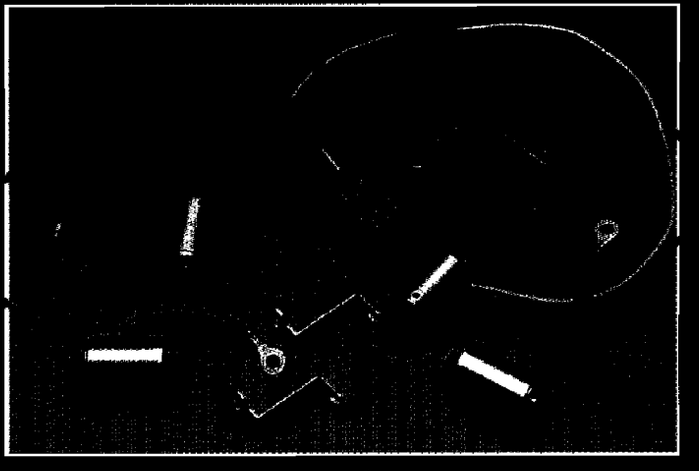


Figure 1

What's the big deal about Rostra solenoids for Mazda?



1. OE quality at a fraction of OE cost

As one of the leading developers and manufacturers of OE components for the global automotive industry, we take full advantage of our position. We offer solenoids built to OE specifications at a lower cost!

2. A complete new wiring harness

All Rostra solenoids come complete with the entire wire harness and OE plug-in connector. Improve your installation time without ever cutting a wire.

3. Intermittent grounding protection

Performance is our main concern. Our solenoids offer extra protection by utilizing an external lead wire to ensure certain ground.

A New Generation of Technology

Rostra Precision Controls, Inc.

2519 Dana Drive, Laurinburg, NC 28352

CADILLAC 4T80-E

ON BOARD DIAGNOSTIC PROCEDURE

To enter the On Board Diagnostic system on the Cadillacs equipped with the THM 4T80-E transaxle, press the "Off" and "Warmer" buttons simultaneously on the Climate Control Center as shown in Figure 1. Refer to the flow chart in Figure 3 for 1993-1996 models and flow chart in Figure 4 for 1996-1998 models. The reason for the overlap is that we have seen OBD II and Non OBD II vehicles in the 1996 model year. Refer to Figure 2 for the explaination of the status light display when in the On Board Diagnostics.

Refer to Figures 5, 6, and 7 for 1993-1996 Diagnostic Codes.
Refer to Figures 8, 9, and 10 for 1996-1998 OBD II Diagnostic Codes.

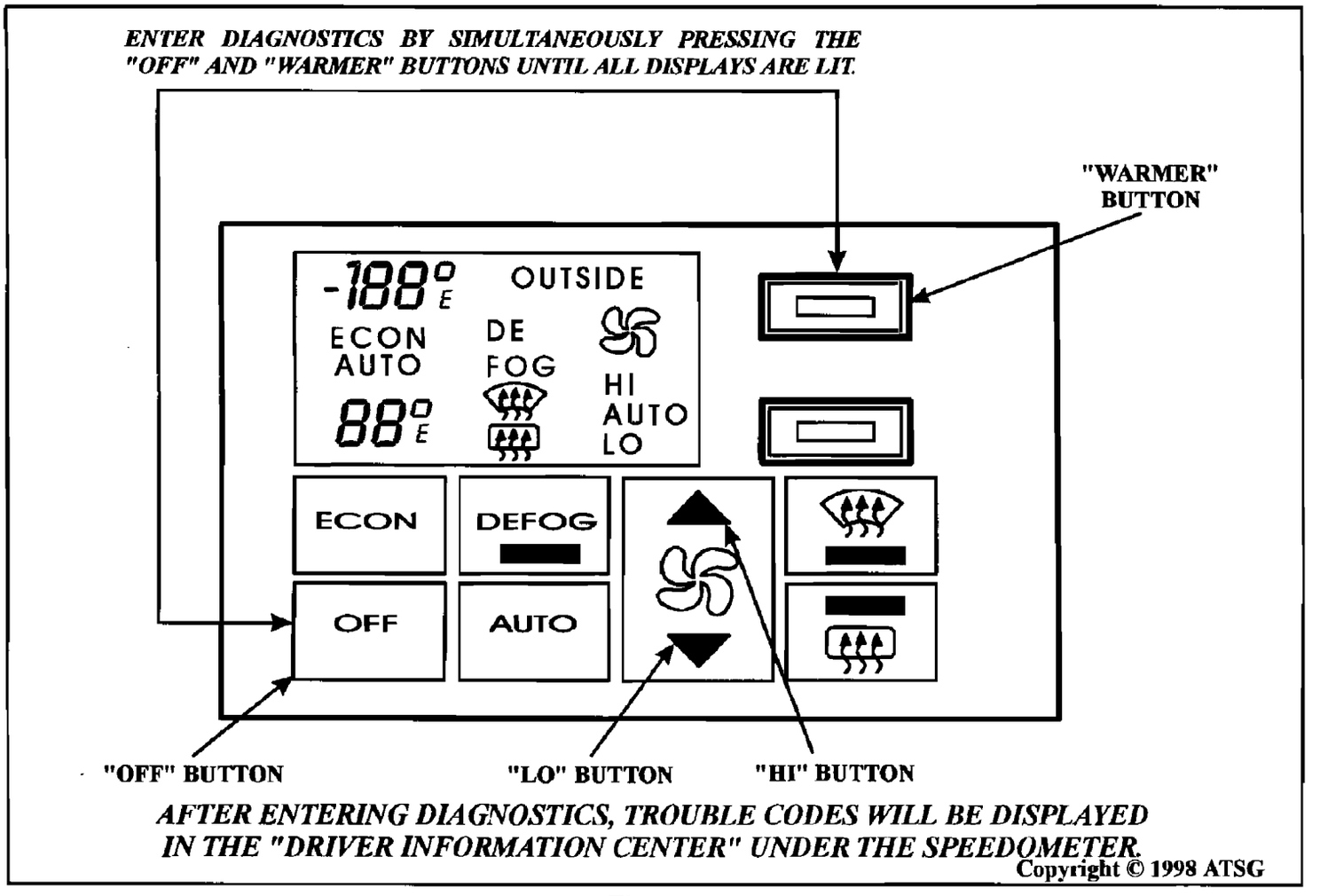
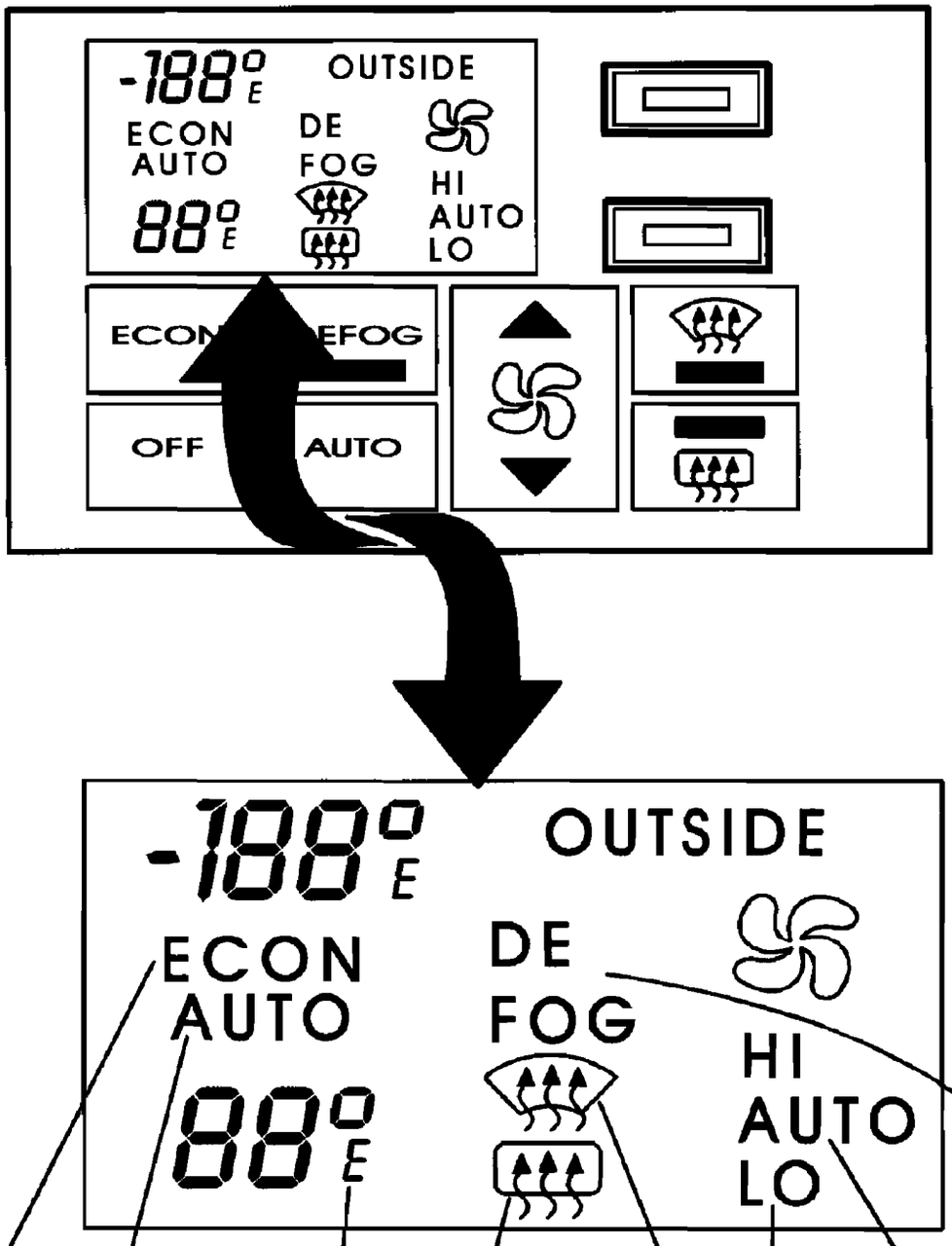


Figure 1

CLIMATE CONTROL CENTER

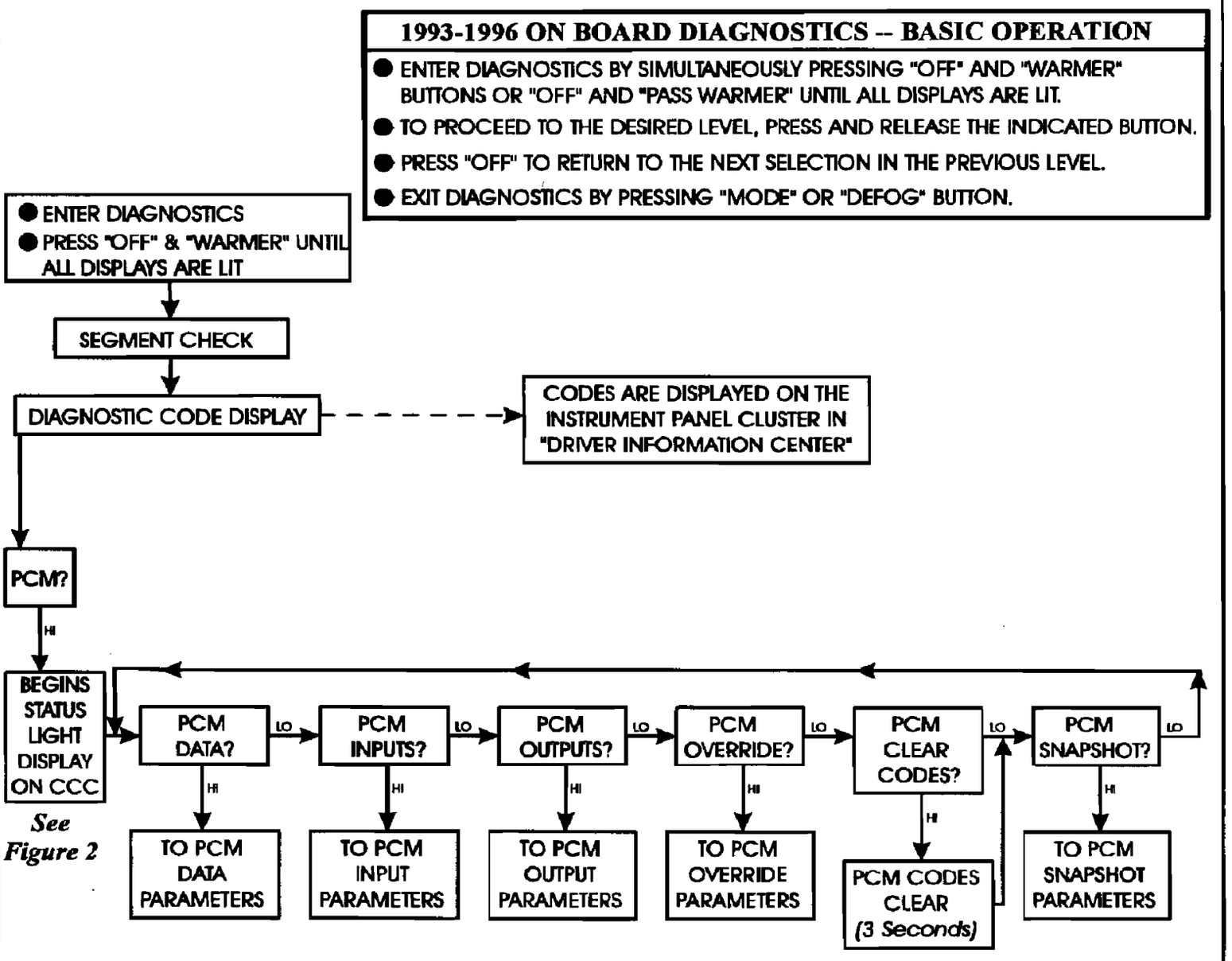


INDICATOR	**ECON**	**AUTO**	**°E**	**REAR DEF.**	**FRONT DEF.**	**LO**	**AUTO**	**DEFOG**
LIGHT ON	ENERGIZED	CLOSED LOOP	DISABLED	ENABLED	ENERGIZED	CLOSED	PARK/NEUT	ENERGIZED
LIGHT OFF	DE-ENERGIZED	OPEN LOOP	ENABLED	DISABLED	DE-ENERGIZED	OPEN	NOT P/N	DE-ENERGIZED
FUNCTION	SHIFT "B" SOLENOID	PCM OPERATING MODE (LOOP)	SHIFT ADAPT STATUS	TCC OUTPUT	A/C CLUTCH COMMAND	THROTTLE SWITCH	TRANS RANGE SWITCH	SHIFT "A" SOLENOID

PCM STATUS LIGHT DISPLAY

Figure 2

1993-1996 ON BOARD DIAGNOSTIC MODELS



POWERTRAIN CONTROL MODULE (PCM) CODES = P0XX

INSTRUMENT PANEL CLUSTER (IPC) CODES = I0XX

AIR CONDITIONING PROGRAMMER (ACP) CODES = A0XX

SUPPLEMENTAL INFLATABLE RESTRAINT (SIR) CODES = R0XX

ROAD SENSING SUSPENSION (RTD) CODES = S0XX

ANTI-LOCK BRAKE & TRACTION CONTROL SYSTEM (ABS/TCS) CODES = T0XX

Figure 3

SLIDE

1996-1998 OBD II MODELS

- ENTER DIAGNOSTICS
- PRESS "OFF" & "WARMER" UNTIL ALL DISPLAYS ARE LIT

SEGMENT CHECK

DIAGNOSTIC CODE DISPLAY

1996-1998 OBD II -- BASIC OPERATION

- ENTER DIAGNOSTICS BY SIMULTANEOUSLY PRESSING "OFF" AND "WARMER" BUTTONS OR "OFF" AND "PASS WARMER" UNTIL ALL DISPLAYS ARE LIT.
- TO PROCEED TO THE DESIRED LEVEL, PRESS AND RELEASE THE INDICATED BUTTON.
- PRESS "OFF" TO RETURN TO THE NEXT SELECTION IN THE PREVIOUS LEVEL.
- EXIT DIAGNOSTICS BY PRESSING "MODE" OR "DEFOG" BUTTON.

SELECT SYSTEM

PCM? (LO) IPC? (LO) ACM? (LO) SDM? (LO) TCS? (LO) RSS? (LO) PZM? (LO) IRC? (LO) RFA? (LO) CCP? (LO) PHN? (LO)

HI HI HI HI HI HI HI HI HI HI HI

STATUS LIGHT DISPLAY BEGINS

SELECT TEST TYPE *

DATA (LO) INPUTS (LO) OUTPUTS (LO) OVERRIDES (LO) CLEAR CODES (LO)

HI HI HI HI HI

CODES CLEAR

SELECT TEST

X X X # #

SYSTEM

IP = IPC	RF = RFA
TC = TCS	CC = CCP
RS = RSS	PH = PHN
PZ = PZM	PC = PCM
IR = IRC	AC = ACM
	SD = SDM

PARAMETER VALUE

DATA ACTUAL VALUE AS USED BY THE SYSTEM.
INPUT VOLTAGE LEVEL (HI/LO) AND
CHANGE OF STAT INDICATOR (0 = NO CHANGE, X = CHANGE).
OUTPUT VOLTAGE LEVEL (HI/LO).
OVERIDE ACTUAL USED PARAMETER VALUE CAN BE "OVERRIDDEN" BY USING "WARMER/COOLER" BUTTONS.

TEST TYPE

D = DATA
I = INPUT
O = OUTPUT
S = OVERRIDE

TEST NUMBER

HI BUTTON INCREASES NUMBER
LO BUTTON DECREASES NUMBER

Figure 4

1993-1996 POWERTRAIN CONTROL MODULE (PCM) DIAGNOSTIC CODES

CODE	DESCRIPTION
P012	No 4X Reference Signal From Ignition Control Module
P013	Rear Heated Oxygen Sensor Not Ready
P014	Shorted Engine Coolant Temperature Sensor
P015	Open Engine Coolant Temperature Sensor
P016	Generator Voltage Out Of Range (EVAP, EGR, CRUISE, TCC Transaxle Pressure Control, Long Term Fuel Trim)
P017	Front Heated Oxygen Sensor Not Ready
P019	Shorted Fuel Pump Circuit
P020	Open Fuel Pump Circuit
P021	Shorted Throttle Position Sensor
P022	Open Throttle Position Sensor
P023	Ignition Control Circuit Problem
P024	Vehicle Speed Sensor Circuit Problem
P025	24X Reference Signal Low
P026	Shorted Throttle Position Switch Circuit
P027	Open Throttle Position Switch Circuit
P028	Transaxle Pressure Switch Circuit Problem
P029	Transaxle Shift "B" Solenoid Problem (1st, 3rd, 4th Gear)
P030	Idle Speed Control RPM Out Of Range
P031	Shorted Manifold Absolute Pressure Sensor
P032	Open Manifold Absolute Pressure Sensor
P033	Cruise Brake Switch Input Circuit Problem
P034	Manifold Absolute Pressure Sensor Signal High
P035	Ignition Ground Voltage Out Of Range
P036	EGR Valve Pintle Position Out Of Range
P037	Shorted Intake Air Temperature Sensor
P038	Open Intake Air Temperature Sensor
P039	Torque Converter Clutch Engagement Problem
P040	Power Steering Pressure Switch Open
P041	No Cam Reference Signal From Igntion Module
P042	Front Heated Oxygen Sensor Lean Exh. Signal
P043	Front Heated Oxygen Sensor Rich Exh. Signal
P044	Rear Heated Oxygen Sensor Lean Exh. Signal
P045	Rear Heated Oxygen Sensor Rich Exh. Signal
P046	Left To Right Bank Fueling Difference
P047	PCM/BCM Data Link Problem
P048	EGR System Malfunction
P051	PROM Checksum Mismatch
P052	PCM Keep Alive Memory Reset
P053	4X Reference Signal Interrupt From Ign. Module
P055	Closed Throttle Angle Out Of Range (TPS Learn)
P056	Transaxle Input Speed Sensor Circuit Problem
P057	Shorted Transaxle Temperature Sensor Circuit
P058	PASS Key ® Fuel Enable Problem
P059	Open Transaxle Temperature Sensor Circuit
P060	Cruise Control, Transaxle Not In Drive
P061	Cruise Control, Vent Solenoid Problem
P062	Cruise Control, Vacuum Solenoid Problem
P063	Set vs Vehicle Speed Difference
P064	Vehicle Acceleration Too High (Cruise)
P065	Cruise Control Servo Position Sensor Failure
P066	Cruise Control, Engine RPM Too High
P067	Set/Coast Or Resume/Accel Input Shorted
P068	Cruise Control Servo Position Out Of Range
P069	Traction Control Active While In Cruise
P070	Intermittent Throttle Position Sensor
P071	Intermittent Manifold Absolute Pressure Sensor
P073	Intermittent Engine Coolant Temp Sensor
P074	Intermittent Intake Air Temperature Sensor
P075	Vehicle Speed Sensor Signal Interrupt
P076	Transaxle EPC Solenoid Circuit Malfunction
P080	TP Sensor/Idle Learn Not Complete
P081	CAM To 4X Reference Correlation Problem
P083	24X Reference Signal High
P085	Idle Throttle Angle Too High
P086	Undefined Gear Ratio
P088	Torque Converter Clutch Not Disengaging
P089	Long Shift And Maximum Adapt
P090	TCC Brake Switch Input Circuit Problem
P091	Transaxle Range Switch Problem (Cruise)
P092	Heated Winshield Request Problem
P093	Traction Control System PWM Link Failure
P094	Transaxle Shift "A" Solenoid Problem
P095	Engine Stall Detected
P096	Torque Converter Overstress
P097	P/N To D/R At High Throttle Angle
P099	Cruise Control Servo Applied, Not In Cruise
P102	Shorted Brake Booster Vacuum Sensor
P103	Open Brake Booster Vacuum Sensor
P105	Brake Booster Vacuum Too Low
P106	Stop Lamp Switch Input Circuit Problem
P107	PCM/BCM Data Link Problem
P108	PROM Checksum Mismatch
P109	PCM Keep Alive Memory Reset
P110	Generator L - Terminal Circuit Problem
P112	Total EEPROM Failure
P117	Shift "A"/Shift "B" Circuit, Open/Shorted
P131	Active Knock Sensor Failure
P132	Knock Sensor Circuitry Failure
P137	Loss Of ABS/TCS Data

Figure 5

CADILLAC 4T80-E 1993-1996 MODELS

INSTRUMENT PANEL CLUSTER (IPC) DIAGNOSTIC CODES

CODE	DESCRIPTION	CODE	DESCRIPTION
I022	Dimming Potentiometer Problem	I039	CCR Or RTD System Problem
I032	Loss Of ABS/TCS Data Communication	I041	Battery Voltage Low
I033	Loss Of SIR Data Comunication	I042	Battery Voltage High
I034	Loss Of PCM Data Comunication	I052	IPC Loss Of Memory
I037	Loss Of ACP Data Comunication	I056	IPC EEPROM Error

AIR CONDITIONING PROGRAMMER (ACP) DIAGNOSTIC CODES

CODE	DESCRIPTION	CODE	DESCRIPTION
A010	Outside Air Temperature Sensor Circuit	A046	Low Refrigerant Charge
A011	High Side Temperature Sensor Circuit	A047	Low Refrigerant Charge
A012	Low Side Temperature Sensor Circuit	A048	Low Refrigerant Pressure
A013	Inside Air Temperature Sensor Circuit	A049	High Side Temperature Too High
A015	Sunload Sensor Circuit	A050	AC Coolant Temperature Too High
A037	Loss Of IPC Data	A052	Keep Alive Memory Error
A040	Air Mix Door Circuit Problem		

SUPPLEMENTAL INFLATABLE RESTRAINT (SIR) DIAGNOSTIC CODES

CODE	DESCRIPTION	CODE	DESCRIPTION
R014	Dual Pole Arming Sensor Disconnected	R036	Passengers Loop Energy Reserve Feed Open
R015	Passengers Initiator Circuit Resistance High	R042	Loop Energy Reserve Voltage Low
R016	Passengers Initiator Circuit Resistance Low	R043	Drivers Source Feed Low
R017	Passengers Initiator Circuit Open	R044	Passengers Source Feed Low
R018	Discriminating Sensor Interconnect Open	R051	Frontal Crash Detected
R019	Passengers Initiator Circuit Voltage High	R052	Data Area Full
R021	Drivers Initiator Circuit Resistance High	R053	Drivers Sense Resistance Low/High
R022	Drivers Initiator Circuit Resistance Low	R054	Passengers Sense Resistance Low/High
R023	Drivers Initiator Circuit Voltage High	R061	SIR Indicator Redundant Or Circuit Failure
R024	Initiator Circuit Voltage Low	R062	SIR Indicator Redundant Or Circuit Failure
R025	Initiator Circuit Voltage Short To Ignition	R071	Internal DERM Fault
R026	Drivers Initiator Circuit Open	R081	Drivers Ignition Diode Open
R028	Current Sink Or Source Failure	R082	Passengers Ignition Diode Open
R031	Drivers Loop Energy Reserve Feed Open	R083	(History) Drivers Reserve Diode Shorted
R034	Dual Pole Arming Sensor Feed Open	R084	(History) Passengers Reserve Diode Shorted
R035	Discriminating Sensor Open Or Missing		

Figure 6

CADILLAC 4T80-E 1993-1996 MODELS

ROAD SENSING SUSPENSION (RTD) DIAGNOSTIC CODES

CODE	DESCRIPTION	CODE	DESCRIPTION
S010	LF Damper Solenoid Short To Battery Voltage	S060	LF Position Sensor Fault
S011	LF Damper Solenoid Short To Ground/Open	S061	RF Position Sensor Fault
S015	RF Damper Solenoid Short To Battery Voltage	S062	LR Position Sensor Fault
S016	RF Damper Solenoid Short To Ground/Open	S063	RR Position Sensor Fault
S020	LR Damper Solenoid Short To Battery Voltage	S064	LF Position Sensor Overcurrent
S021	LR Damper Solenoid Short To Ground/Open	S065	RF Position Sensor Overcurrent
S025	RR Damper Solenoid Short To Battery Voltage	S066	LR Position Sensor Overcurrent
S026	RR Damper Solenoid Short To Ground/Open	S067	RR Position Sensor Overcurrent
S030	Speed Sensitive Steering Solenoid Fault	S070	LF Accelerometer Fault
S035	ELC Compressor Short To Battery Voltage	S071	RF Accelerometer Fault
S036	ELC Compressor Short To Ground/Open	S072	LR Accelerometer Fault
S037	ELC Exhaust Valve Short To Battery Voltage	S073	RR Accelerometer Fault
S038	ELC Exhaust Valve Short To Ground/Open	S074	LF Accelerometer Overcurrent
S043	Speed Signal Fault	S075	RF Accelerometer Overcurrent
S044	Lift/Dive Signal Fault	S076	LR Accelerometer Overcurrent
S050	RSS Module Fault	S077	RR Accelerometer Overcurrent
S055	RSS Resistor Module Short To Ground/Open		

ANTI-LOCK BRAKE & TRACTION CONTROL SYSTEM (ABS/TCS) DIAGNOSTIC CODES

CODE	DESCRIPTION	CODE	DESCRIPTION
T021	RF Wheel Speed Sensor Fault	T041	RF ABS Valve Solenoid Fault
T022	RF Wheel Speed Sensor Frequency Error	T044	RF TCS Pilot Valve Fault
T023	RF Wheel Speed Sensor Continuity Fault	T045	LF ABS Valve Solenoid Fault
T025	LF Wheel Speed Sensor Fault	T048	LF TCS Pilot Valve Fault
T026	LF Wheel Speed Sensor Frequency Error	T051	RR ABS Valve Solenoid Fault
T027	LF Wheel Speed Sensor Continuity Fault	T055	LR TCS Pilot Valve Fault
T028	Wheel Speed Sensor Frequency Error	T061	Pump Motor Or Relay Fault
T031	RR Wheel Speed Sensor Fault	T063	Valve Relay Fault
T032	RR Wheel Speed Sensor Frequency Error	T067	Brake Light Switch Fault (TCS Equipped Only)
T033	RR Wheel Speed Sensor Continuity Fault	T071	Electronic Brake & Traction Control (EBTCM/EBCM) Internal Fault
T035	LR Wheel Speed Sensor Fault		
T036	LR Wheel Speed Sensor Frequency Error	T072	Serial Data Link Fault
T037	LR Wheel Speed Sensor Continuity Fault	T073	PCM - EBTCM/EBCM, PWM Signal Fault
		T083	Low Brake Fluid Level

Figure 7

SLIDE

1996-1998 POWERTRAIN CONTROL MODULE (PCM) OBDII DIAGNOSTIC CODES

CODE	DESCRIPTION
P0101	Mass Air Flow System Performance
P0102	Mass Air Flow Sensor Circuit Low Frequency
P0103	Mass Air Flow Sensor Circuit High Frequency
P0105	MAP Sensor Circuit Insufficient Activity
P0106	MAP Sensor Circuit System Performance
P0107	MAP Sensor Circuit Low Voltage
P0108	MAP Sensor Circuit High Voltage
P0111	Intake Air Temp Sensor Circuit Performance
P0112	Intake Air Temp Sensor Circuit Low Voltage
P0113	Intake Air Temp Sensor Circuit High Voltage
P0116	Engine Coolant Temp Sensor Circuit Perf.
P0117	Engine Coolant Temp Sensor Low Voltage
P0118	Engine Coolant Temp Sensor High Voltage
P0120	Throttle Position Sensor System Performance
P0121	TPS Circuit Insufficient Activity
P0122	Throttle Position Sensor Circuit Low Voltage
P0123	Throttle Position Sensor Circuit High Voltage
P0125	Engine Coolant Temp Excessive Time To Closed Loop Fuel Control
P0131	Heated Oxygen Sensor Low Voltage Bank 1, Sensor 1 (Rear)
P0132	Heated Oxygen Sensor High Voltage Bank 1, Sensor 1 (Rear)
P0133	Heated Oxygen Sensor Slow Response Bank 1, Sensor 1 (Rear)
P0134	Heated Oxygen Sensor Insufficient Activity Bank 1, Sensor 1 (Rear)
P0135	Heated Oxygen Sensor Heater Circuit Bank 1, Sensor 1 (Rear)
P0137	Heated Oxygen Sensor Low Voltage Bank 1, Sensor 2 (Pre-Converter)
P0138	Heated Oxygen Sensor High Voltage Bank 1, Sensor 2 (Pre-Converter)
P0139	Heated Oxygen Sensor Slow Response Bank 1, Sensor 2 (Pre-Converter)
P0140	Heated Oxygen Sensor Insufficient Activity Bank 1, Sensor 2 (Pre-Converter)
P0141	Heated Oxygen Sensor Heater Circuit Bank 1, Sensor 2 (Pre-Converter)
P0143	Heated Oxygen Sensor Low Voltage Bank 1, Sensor 3 (Post-Converter)
P0144	Heated Oxygen Sensor High Voltage Bank 1, Sensor 3 (Post-Converter)
P0146	Heated Oxygen Sensor Insufficient Activity Bank 1, Sensor 3 (Post-Converter)
P0147	Heated Oxygen Sensor Heater Circuit Bank 1, Sensor 3 (Post-Converter)
P0151	Heated Oxygen Sensor Low Voltage Bank 2, Sensor 1 (Front)
P0152	Heated Oxygen Sensor High Voltage Bank 2, Sensor 1 (Front)
P0153	Heated Oxygen Sensor Slow Response Bank 2, Sensor 1 (Front)
P0154	Heated Oxygen Sensor Insufficient Activity Bank 2, Sensor 1 (Front)
P0155	Heated Oxygen Sensor Heater Circuit Bank 2, Sensor 1 (Front)
P0171	Fuel Trim System Lean Bank 1
P0172	Fuel Trim System Rich Bank 1
P0174	Fuel Trim System Lean Bank 2
P0175	Fuel Trim System Rich Bank 2
P0201	Injector No. 1 Control Circuit
P0202	Injector No. 2 Control Circuit
P0203	Injector No. 3 Control Circuit
P0204	Injector No. 4 Control Circuit
P0205	Injector No. 5 Control Circuit
P0206	Injector No. 6 Control Circuit
P0207	Injector No. 7 Control Circuit
P0208	Injector No. 8 Control Circuit
P0218	Transaxle Fluid Overtemperature
P0231	Fuel Pump Feedback Circuit Low Voltage
P0232	Fuel Pump Feedback Circuit High Voltage
P0300	Engine Misfire Detected
P0322	Ignition Control Module 4X Reference Circuit No Frequency
P0325	Knock Sensor Module Circuit
P0326	Knock Sensor Circuit Excessive Spark Retard
P0327	Knock Sensor Circuit Low Voltage
P0340	Ignition Control Module Cam Reference Circuit No Frequency
P0371	Ignition Control Module 24X Reference Circuit Too Many Pulses
P0372	Ignition Control Module 24X Reference Circuit Missing Pulses
P0401	Exhaust Gas Recirculation (EGR) System
P0404	EGR System Performance
P0405	EGR Sensor Circuit Voltage Out Of Range
P0420	Three Way Catalyst Low Efficiency
P0441	Evaporative System No Flow During Purge
P0502	Vehicle Speed Sensor Circuit Low Input
P0503	Vehicle Speed Sensor Circuit Intermittent
P0506	Idle Speed Low
P0507	Idle Speed High
P0550	Power Steering Pressure Swit. Circuit Low Volt.
P0560	System Voltage Low
P0563	System Voltage High
P0601	PCM Memory
P0602	PCM Not Programmed
P0603	PCM Memory Reset
P0606	PCM Internal Communication Interrupted

Figure 8

SLIDE

1996-1998 POWERTRAIN CONTROL MODULE (PCM) OBDII DIAGNOSTIC CODES

CODE	DESCRIPTION
P0711	Transaxle Fluid Temperature Sensor Circuit Range/Performance
P0712	TFT Sensor Circuit Low Input
P0713	TFT Sensor Circuit High Input
P0716	Input Speed Sensor Circuit Intermittent
P0717	Input Speed Sensor Circuit Low Input
P0719	Brake Switch Circuit Low Input
P0724	Brake Switch Circuit High Input
P0730	Incorrect Gear Ratio
P0741	TCC System - Stuck OFF
P0742	TCC System - Stuck ON
P0748	Pressure Control Solenoid Circuit Electrical
P0751	1-2 Shift Solenoid Valve - Performance
P0753	1-2 Shift Solenoid Circuit - Electrical
P0756	2-3 Shift Solenoid Valve - Performance
P0758	2-3 Shift Solenoid Circuit - Electrical
P1106	MAP Sensor Circuit Intermittent High Voltage
P1107	MAP Sensor Circuit Intermittent Low Voltage
P1108	BARO To MAP Signal Circuit Comparison Too High
P1111	Intake Air Temperature Sensor Circuit Intermittent High Voltage
P1112	Intake Air Temperature Sensor Circuit Intermittent Low Voltage
P1114	Engine Coolant Temperature Sensor Circuit Intermittent Low Voltage
P1115	Engine Coolant Temperature Sensor Circuit Intermittent High Voltage
P1121	TPS Circuit Intermittent High Voltage
P1122	TPS Circuit Intermittent Low Voltage
P1133	Heated Oxygen Sensor Insufficient Switching Bank 1, Sensor 1 (Rear)
P1134	Heated Oxygen Sensor Transition Time Ratio Bank 1, Sensor 1 (Rear)
P1139	Heated Oxygen Sensor Insufficient Switching Bank 1, Sensor 2 (Pre-Converter)
P1140	Heated Oxygen Sensor Transition Time Ratio Bank 1, Sensor 2 (Pre-Converter)
P1153	Heated Oxygen Sensor Insufficient Switching Bank 2, Sensor 1 (Front)
P1154	Heated Oxygen Sensor Transition Time Ratio Bank 2, Sensor 1 (Front)
P1258	Engine Metal Overtemperature Protection
P1320	Ignition Control Module 4X Reference Circuit No Pulses
P1323	Ignition Control Module 4X Reference Circuit Low Frequency
P1350	Ignition Control System
P1370	Ignition Control Module 4X Reference Circuit, Too Many Pulses
P1371	Ignition Control Module 4X Reference Circuit, Too Few Pulses
P1375	Ignition Control Module 24X Reference Circuit, High Voltage
P1376	Ignition Ground Circuit
P1377	Ignition Control Module Cam Pulse To 4X Reference Circuit, Pulse Comparison
P1380	EBTCM DTC Detected Rough Road Data Unusable
P1381	Misfire Detected No EBTCM/PCM Serial Data
P1404	EGR Valve Pintle Stuck Open
P1406	EGR Valve Pintle Position Circuit
P1441	Evaporator System Flow During Non-Purge
P1508	Idle Air Control System, Low RPM
P1509	Idle Air Control System, High RPM
P1520	Gear Indicator System
P1524	Throttle Position Sensor Learned Closed Throttle Angle Degrees Out Of Range
P1526	Throttle Position Sensor Learn Not Complete
P1527	Transaxle Range/Pressure Switch Comparison
P1554	Cruise Engaged Circuit High Voltage
P1580	Cruise Control System, Transaxle Not In Drive
P1584	Cruise Control System, Acceleration Too High
P1586	Cruise Control System, Engine RPM Too High
P1570	Cruise Control System, Traction Control Active
P1571	Traction Control System, PWM Circuit No Frequency
P1574	EBTCM System, Stop Lamp Switch Circuit Voltage High
P1575	Extended Travel Brake Switch High Voltage
P1576	Brake Booster Vacuum Sensor, High Voltage
P1577	Brake Booster Vacuum Sensor, Low Voltage
P1578	Brake Booster Vacuum Sensor, Low Vacuum
P1579	P/N To D/R At High Throttle Angle
P1599	Engine Stall Or Near Stall Detected
P1602	Loss Of EBTCM Serial Data
P1604	Loss Of IPC Serial Data
P1605	Loss Of HVAC Serial Data
P1610	Loss Of PZM Serial Data
P1611	Loss Of CVRTD Serial Data
P1621	PCM Memory Performance
P1626	Theft Deterent System, Fuel Enable Circuit
P1630	Theft Deterent System, PCM In Learn Mode
P1631	Theft Deterent System, Password Incorrect
P1632	Theft Deterent System, Fuel Disabled

Figure 9

1996-1998 POWERTRAIN CONTROL MODULE (PCM) OBDII DIAGNOSTIC CODES

CODE	DESCRIPTION	CODE	DESCRIPTION
P1633	Ignition Supplement Power Circuit Low Voltage		
P1634	Ignition 1 Power Circuit Low Voltage		
P1640	Driver 1 Input High Voltage		
P1641	Malfunction Indicator Lamp Control Circuit		
P1642	Vehicle Speed Output Circuit		
P1644	Delivered Torque Output Circuit		
P1645	EVAP Solenoid Output Circuit		
P1650	Driver 2 Input High Voltage		
P1652	Lift/Dive Output Circuit		
P1654	Cruise Disable Output Circuit		
P1660	Cooling Fan Control Circuits		
P1810	Transaxle Fluid Pressure Manual Valve Position Switch Circuit Malfunction		
P1811	Maximum Adapt and Long Shift		
P1814	Torque Converter Overstress		
P1868	TCC/PWM Solenoid Circuit, Electrical		

Figure 10

THM 4L60-E

NO FORWARD MOVEMENT IN THE D4 OR D3 SELECTOR POSITIONS

COMPLAINT: When the manual shift lever is placed into the "D4" selector position, the vehicle does not move. This normally indicates that we have made a mistake with the forward sprag assembly, or the forward clutch pack. In the past, to verify this we would simply move the manual shift lever to the "D3" position to apply the overrun clutch, and the vehicle would move if we had made one of the mistakes listed above. In this case the vehicle still does not move until we move the selector lever to the "D2" position.

CAUSE: The THM 4L60-E overrun clutch application is much different than the previous 700-R4 transmission. The 700-R4 applies the overrun clutch any time the selector lever is moved into the "D3" position, as seen in the 700 apply chart in Figure 1.
The THM 4L60-E when in the "D3" position upshifts and downshifts normally between 1st, 2nd and 3rd gears. However, in 1st and 2nd gears, Shift Solenoid "B" is energized and the 2-3 shift valve train is in the downshifted position. The 2-3 shift valve when in the downshifted position blocks "D3" oil from entering the overrun clutch clutch circuit and opens the overrun clutch circuit to an exhaust port at the 2-3 shift valve. This prevents overrun clutch apply and engine braking in the "D3" position, in 1st and 2nd gears only. There is no engine braking or overrun clutch apply until you are in 3rd gear. Refer to the THM 4L60-E apply chart in Figure 1.

CORRECTION: The above explanation means that you will have to move the selector lever on any 4L60-E transmission into the "D2" or the Manual 1st selector position to determine if any mistakes have been made in the forward clutch or forward sprag area.

THM 700-R4 APPLICATION CHART

RANGE	GEAR	FORWARD CLUTCH	2-4 BAND	3-4 CLUTCH	FORWARD SPRAG	OVERRUN CLUTCH	REVERSE INPUT	LO/REV CLUTCH	LO-ROLER CLUTCH
P/N									
OD	1st	ON			HOLD				HOLD
	2nd	ON	ON		HOLD				
	3rd	ON		ON	HOLD				
	4th	ON	ON	ON					
D3	1st	ON			HOLD	ON			HOLD
	2nd	ON	ON		HOLD	ON			
	3rd	ON		ON	HOLD	ON			
D2	1st	ON			HOLD	ON			HOLD
	2nd	ON	ON		HOLD	ON			
M1	1st	ON			HOLD	ON		ON	HOLD
REV	Rev						ON	ON	

THM 4L60-E APPLICATION CHART

RANGE	GEAR	SHIFT SOLENOID		FORWARD CLUTCH	2-4 BAND	3-4 CLUTCH	FORWARD SPRAG	OVERRUN CLUTCH	REVERSE INPUT	LO/REV CLUTCH	LO-ROLER CLUTCH
		1-2	2-3								
P/N		ON	ON								
OD	1st	ON	ON	ON			HOLD				HOLD
	2nd	OFF	ON	ON	ON		HOLD				
	3rd	OFF	OFF	ON		ON	HOLD				
	4th	ON	OFF	ON	ON	ON					
D3	1st	ON	ON	ON			HOLD				HOLD
	2nd	OFF	ON	ON	ON		HOLD				
	3rd	OFF	OFF	ON		ON	HOLD	ON			
D2	1st	ON	ON	ON			HOLD	ON			HOLD
	2nd	OFF	ON	ON	ON		HOLD	ON			
M1	1st	ON	ON	ON			HOLD	ON		ON	HOLD
REV	Rev	ON	ON						ON	ON	

Figure 1

THM 4L60 AND 4L60-E
PREMATURE 3-4 CLUTCH FAILURE

COMPLAINT: After rebuild, the vehicle exhibits premature 3-4 clutch failure, sometimes in as little as 2000 miles of use. Usually associated with Police, Taxi, or heavy duty use.

CAUSE: The cause may be, not using the high energy clutch plates, and the thick (.106") steel plates, or not enough line pressure rise with throttle opening.

CORRECTION NUMBER 1:

Install the latest design 3-4 clutch pack from General Motors that allows the use of the thickest (.106") steel plates, and requires the following parts:

1. New design 3-4 Apply Ring with shorter legs.
2. New design one piece 3-4 Apply Plate.
3. New Design .106" thick 3-4 Steel Plates, 5 required (See Figure 1).
4. New design high energy 3-4 Friction Plates, 6 required (See Figure 1).
5. New design 3-4 Selective Backing Plate, as they are thinner.
6. Re-install the 3-4 Load Release Springs in the late design stack-up (See Figure 2).
7. Ensure that you have .050"-.070" clutch clearance.

CORRECTION NUMBER 2:

There is available from Trans-Go® a new Vacuum Modulator Kit, that ***does solve*** the line pressure rise with throttle opening concerns that are associated with the 4L60-E unit. This new kit replaces the EPC Solenoid with a vacuum modulator and includes all necessary parts for the installation.

SERVICE INFORMATION:

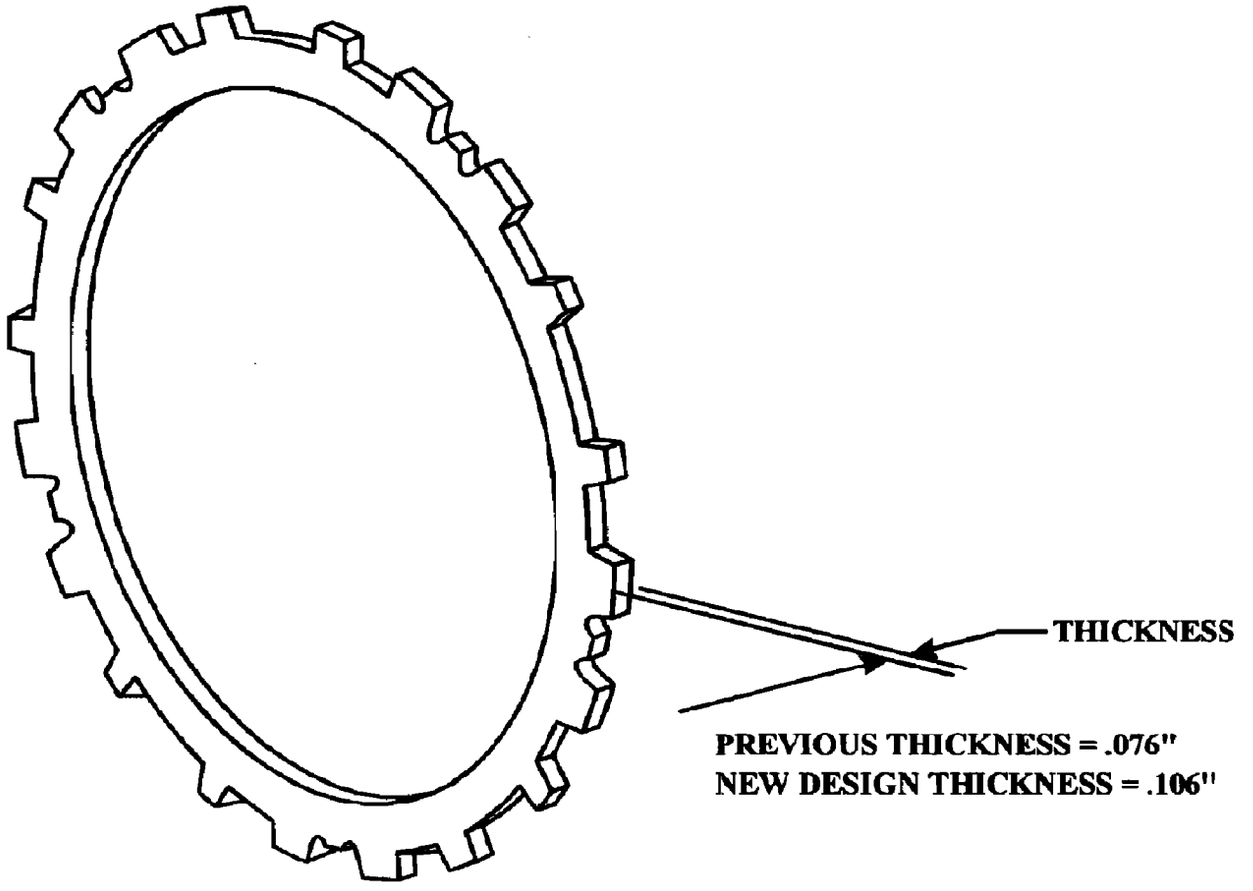
3-4 Clutch Apply Ring (New Design)	8685043
3-4 Clutch Apply Plate (New Design)	8685044
3-4 Clutch Steel Plates (.106" Thick)	8685045
3-4 Clutch Backing Plate (Selective .227", Stamped "A")	8685046
3-4 Clutch Backing Plate (Selective .192", Stamped "B")	8685047
3-4 Clutch Backing Plate (Selective .157", Stamped "C")	8685048
3-4 Load Release Springs	8667424
3-4 Clutch Friction Plates (High Energy)	24207605

3-4 Clutch Service Package (1987-1998)
Includes the parts listed above, plus the 7605 friction plates 8690923

SPECIAL NOTE:

The 2050 high energy friction plates normally associated with the above kit have been replaced with the 7605 high energy friction plates for increased durability. Refer to Figure 1. The 2050 high energy friction plates have been discontinued.

3-4 CLUTCH LINED AND STEEL PLATES



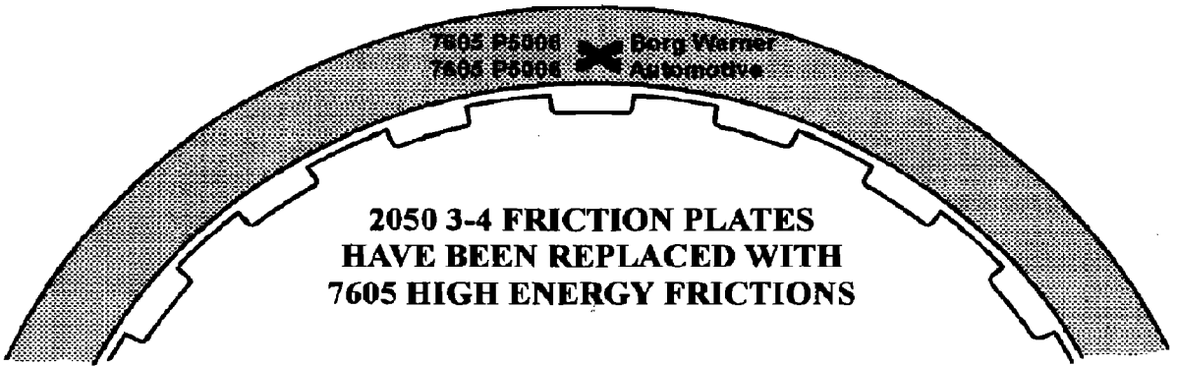


Figure 1

RE-USE THE 3-4 LOAD RELEASE SPRINGS IN THE NEW DESIGN CLUTCH PACK ONLY

Re-install the 3-4 load release springs when you are using the .106" thick steel plates, 7605 high energy lined plates, new design 3-4 apply ring, new design one piece apply plate and new design backing plate.

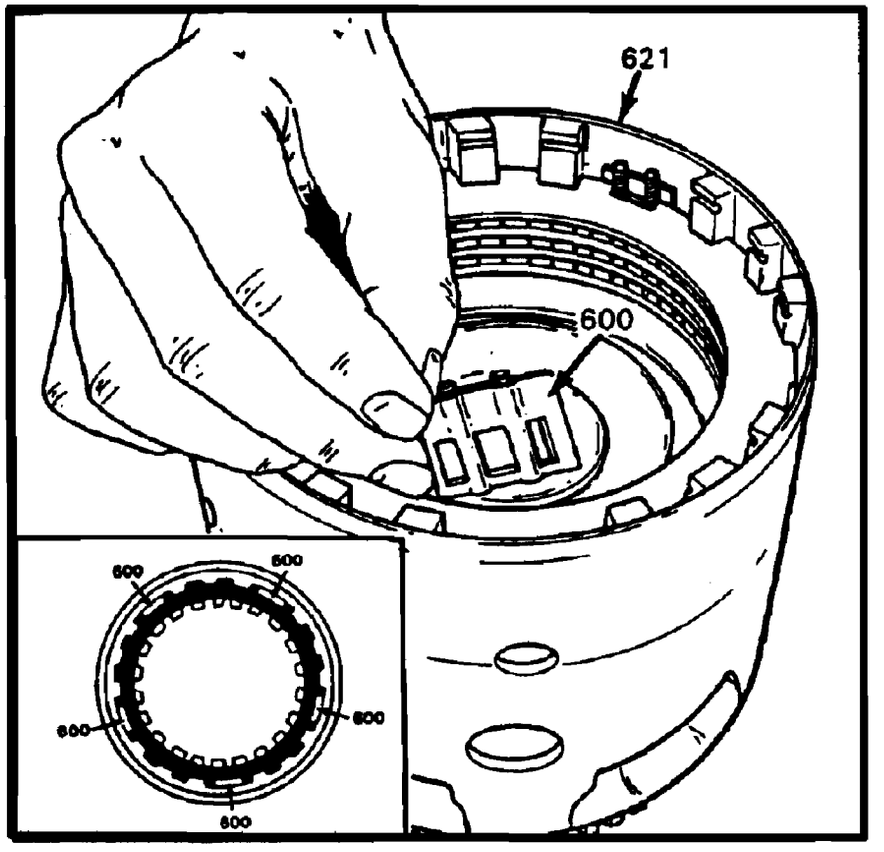


Figure 2

THM 4L60-E

2ND GEAR START, 2-3 SHIFT ONLY OR LACK OF LINE PRESSURE RISE

COMPLAINT: Before and/or after rebuild the vehicle exhibits a 2nd gear start with only a 2-3 shift and possibly a lack of proper line pressure rise with throttle opening.

CAUSE: The cause may be, one or both of the screens in the spacer plate collapsed shut, and restricting solenoid feed oil or actuator feed oil to the Pressure Control Solenoid.

CORRECTION: Replace both screens in the spacer plate as shown in Figure 1, with the part numbers listed below. These ***new part numbers*** are screens with a larger micron screen that will pass more oil easier.

SERVICE INFORMATION:

Electronic Pressure Control Solenoid Screen 24209145
Shift Solenoid Screen 24209144

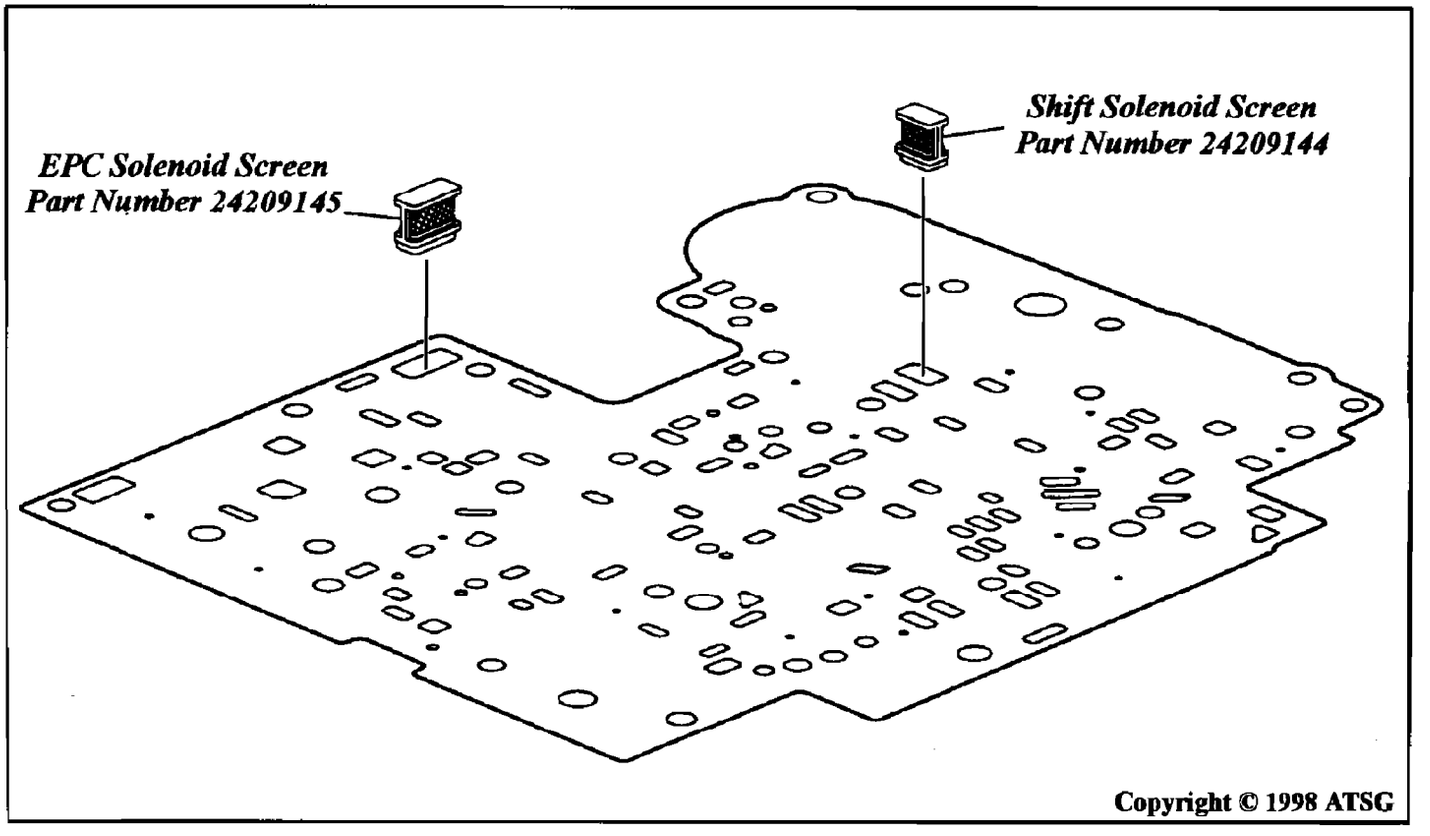


Figure 1

THM 4L60-E

PARK/NEUTRAL POSITION SWITCH CONNECTOR CANNOT BE REMOVED

COMPLAINT: Technicians may experience difficulty in removing the connectord from the Park/Neutral Position Switch, on some 1995-1998 model trucks and vans, usually when trying to remove the switch during transmission service. In rare cases the customer may report switch related electrical problems, such as improper or no shift indication on the dash indicator, or no back-up light operation.

CAUSE: The cause may be high ambient heat causing the sealing compound in the switch to melt and flow into the connectors, sealing the connectors to the switch. This normally causes no customer concerns, but may cause an open electrical circuit in rare cases.

CORRECTION: If the switch is being removed as part of transmission service, ***and there are no switch related concerns,*** the switch can be removed without removing the connectors, and left hanging until time to be re-installed. However, some models have a mounting bolt directly behind the switch connectors, which requires removing the connectors, and the switch ***will be damaged*** in the process (See Figure 3).
There is now available from OEM sources, service repair connectors for both the 7-way and the 4-way connectors under part numbers 15305887 and 15305925 (See Figure 3).
Note: The service connector pigtails use wires that are all the same color. Use the old connector as a pattern to ensure that the new wires are connected to the vehicle harness correctly. This switch is in a wet area, and it is imperative that the wires be soldered and heat-shrink tubing be used to insure water-tight connections. Refer to Figure 1 for the location of the Park/Neutral Position Switch. Refer to Figure 2 for a full wiring schematic of the Park/Neutral Position Switch circuit for diagnostic purposes.

SERVICE INFORMATION:

Park/Neutral Position Switch (All Models)	12450016
7-Way Repair Connector Assembly (Includes Heat-Shrink Connectors)	15305887
4-Way Repair Connector Assembly (Includes Heat-Shrink Connectors)	15305925

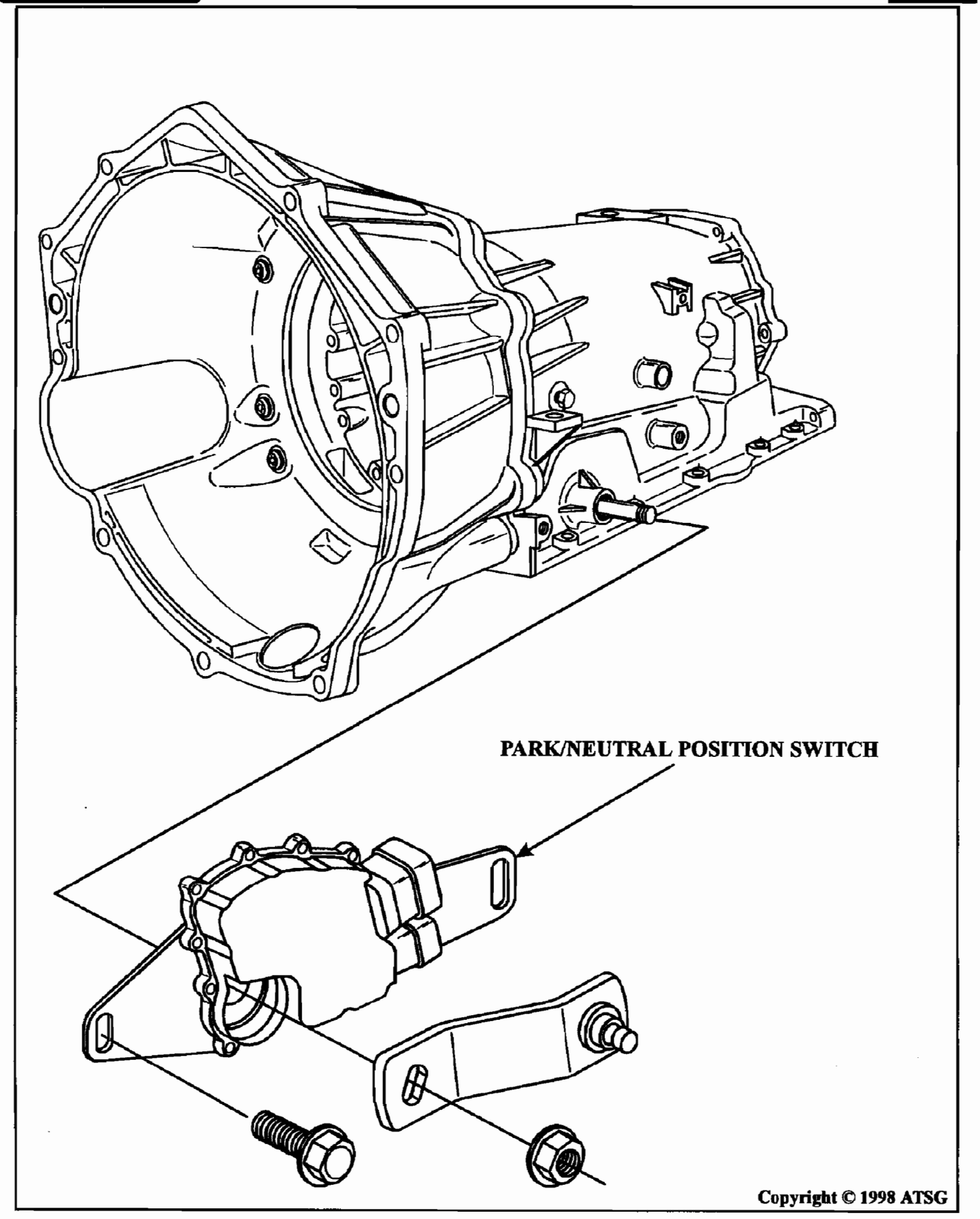


Figure 1

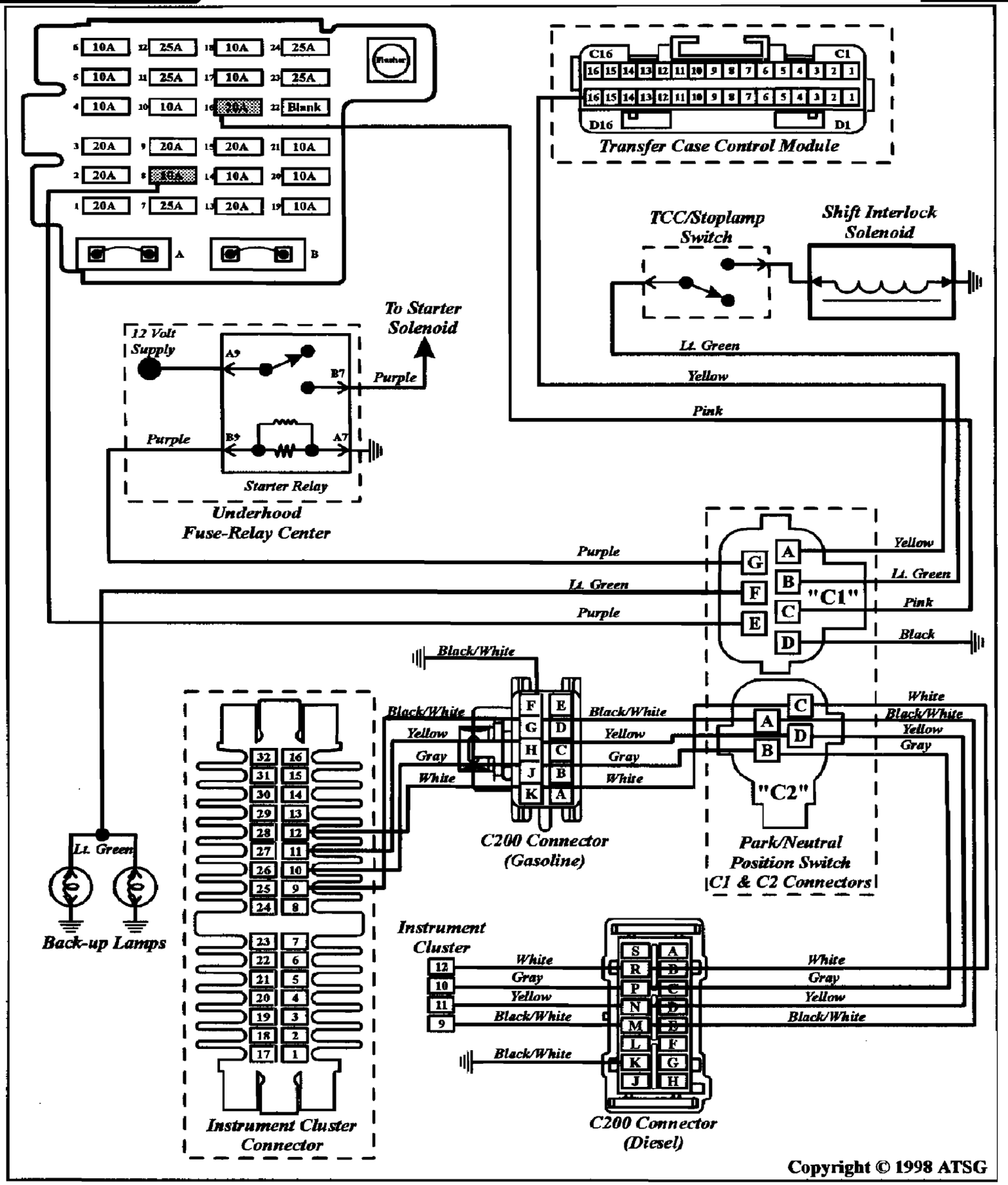

10A
25A
20A
Blank
Flasher
A
B
C16
C1
D16
D1
Transfer Case Control Module
TCC/Stoplamp Switch
Shift Interlock Solenoid
Lt. Green
Yellow
Pink
To Starter Solenoid
12 Volt Supply
A9
B7
Purple
B9
A7
Starter Relay
Underhood Fuse-Relay Center
Purple
Lt. Green
Purple
G
F
E
A
B
C
D
"C1"
Yellow
Lt. Green
Pink
Black
Black/White
Yellow
Gray
White
C200 Connector (Gasoline)
"C2"
Park/Neutral Position Switch
C1 & C2 Connectors
Lt. Green
Back-up Lamps
Instrument Cluster
Instrument Cluster Connector
C200 Connector (Diesel)
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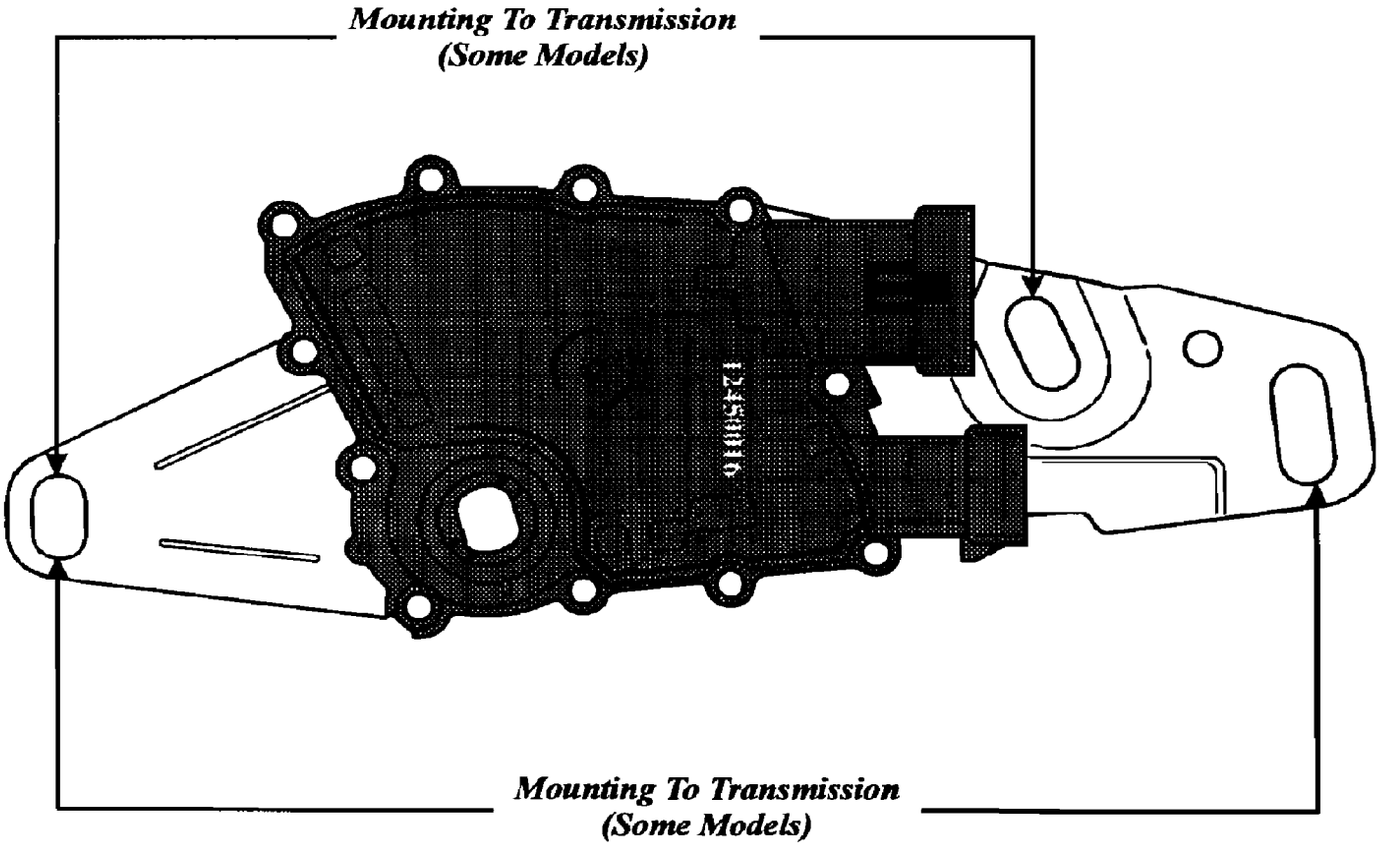
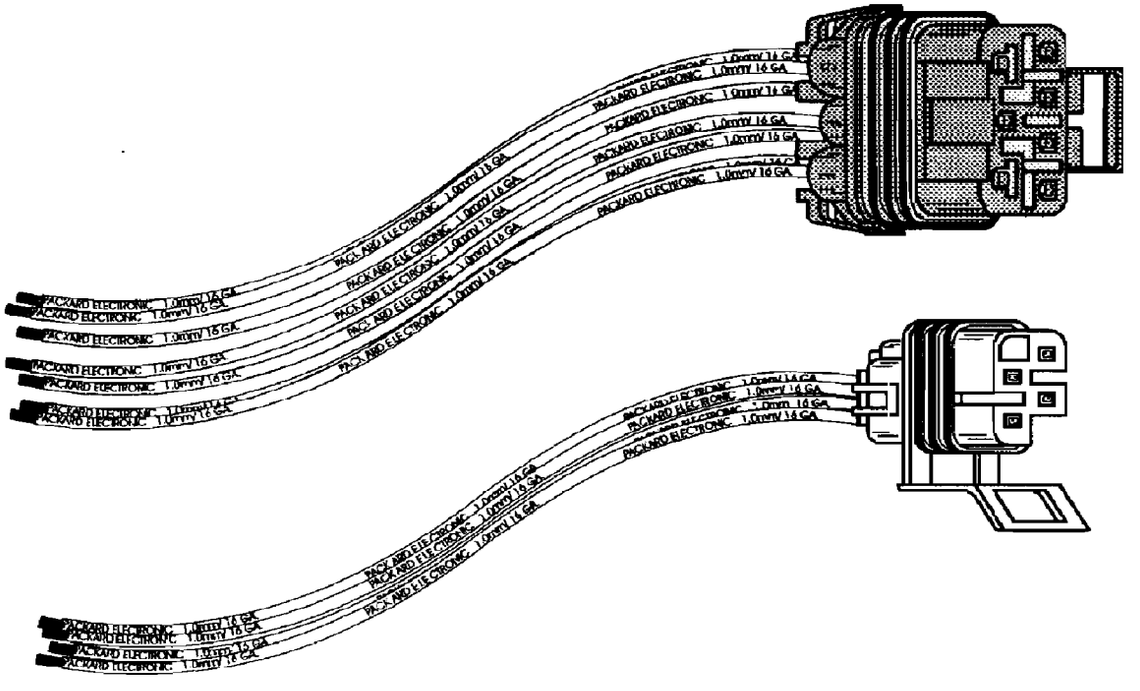
Figure 2





PART NUMBER
15305887

PART NUMBER
15305925

Figure 3

C/K GM TRUCKS

REOCCURRING SOLENOID CODES

COMPLAINT: C/K GM trucks equipped with the 4L60E and 4L80E transmissions can be stuck in their respective failsafe gear.
Code retrieval indicates shift or TCC solenoid codes. An inspection of the fuse box reveals that the 10 amp "TRANS" fuse is blown. (See figure 1)
If the fuse is replaced, it immediately blows again, and the solenoid codes are always present.
In many cases the solenoids have been replaced, circuit integrity has been verified, the computer may have been replaced and even the ignition switch may have been replaced, yet the above complaints still exist.

CAUSE: The wires at the C100 (Refer to figure 2)bulkhead connector at the firewall in the engine bay have been corroded by the elements and are shorting out. In many cases on close inspection of these wires "GREEN" corrosion is present and the wire insulation has been eroded away causing the short circuits and the above complaints.

CORRECTION: Remove the C100 bulkhead connector and repair the wiring, fill the connector cavities with a high quality dielectric grease, replace the 10 amp "TRANS" fuse and clear all codes and verify proper operation.

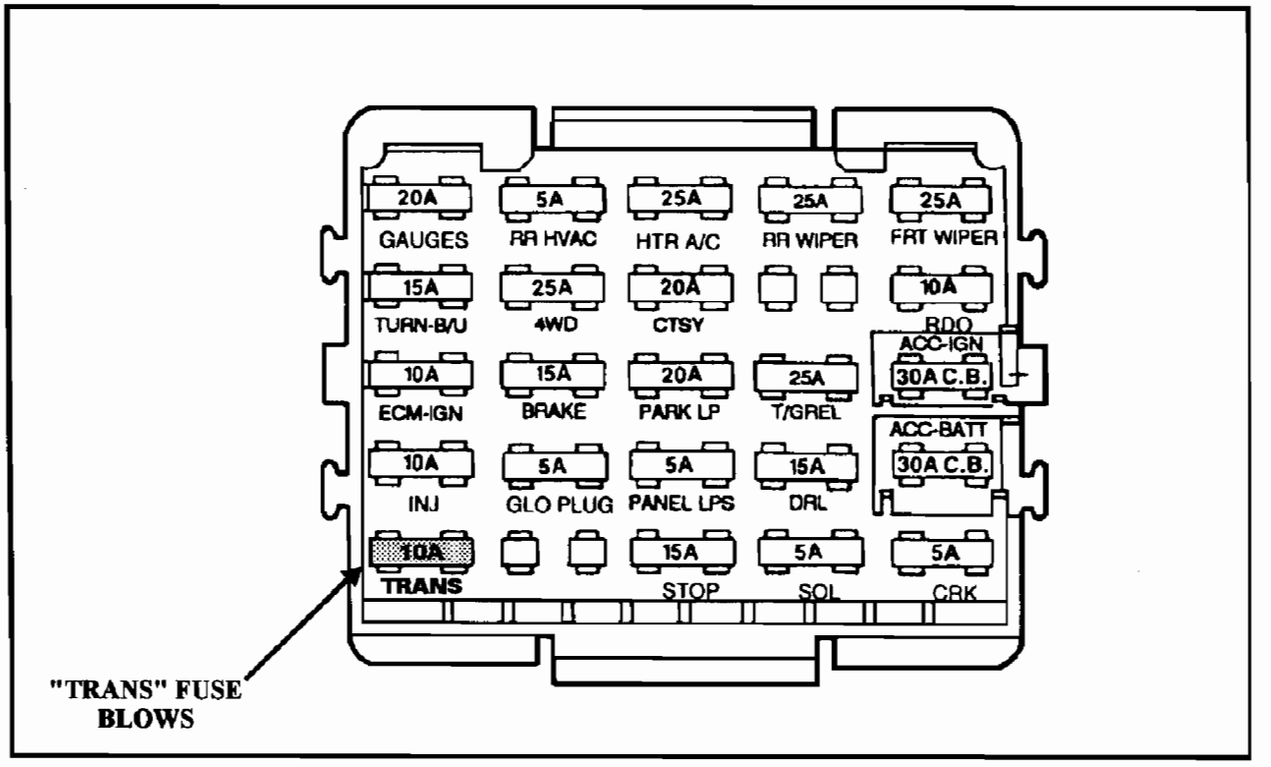


Figure 1

REOCCURRING SOLENOID CODES

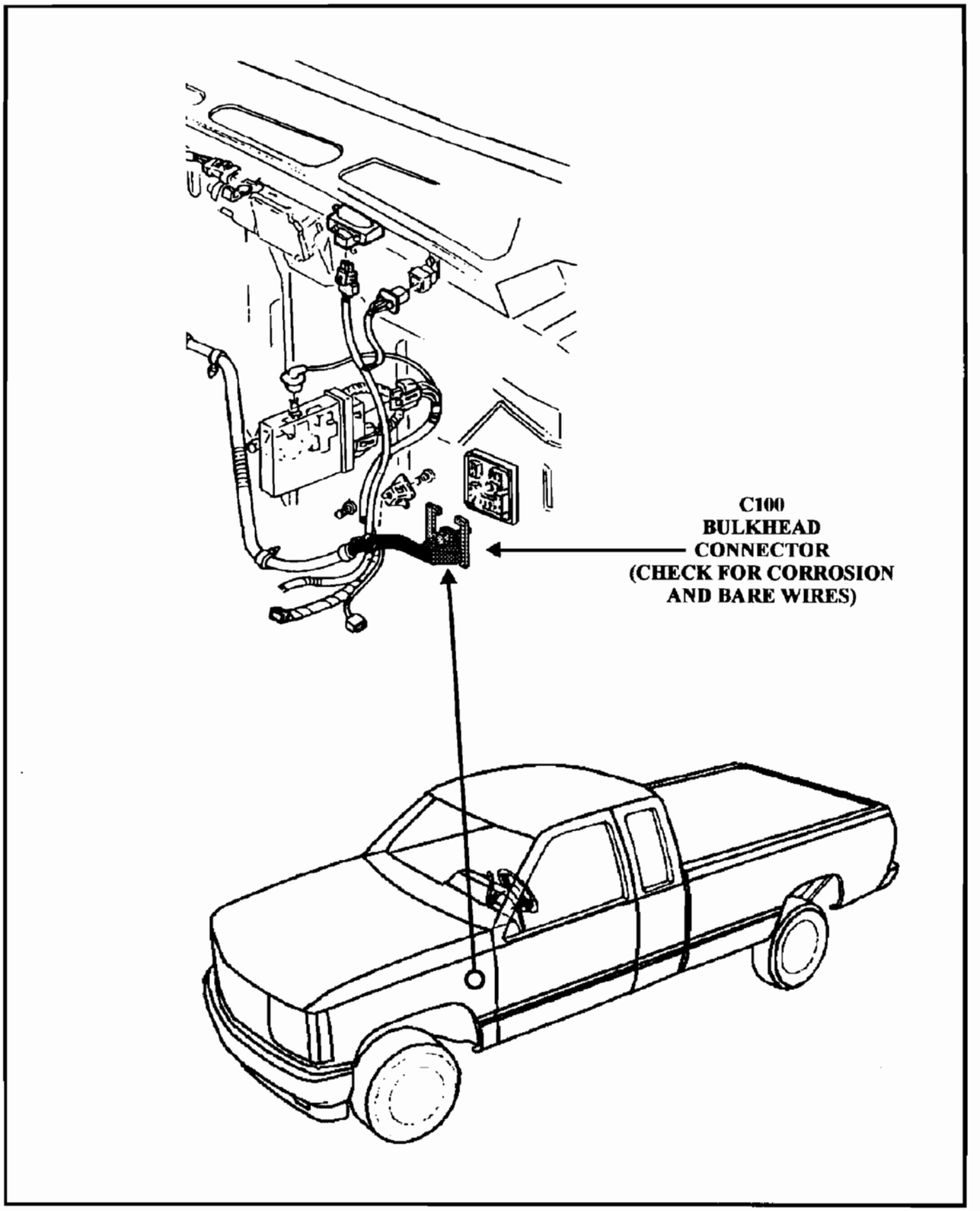


Figure 2

GM REAR WHEEL DRIVE TRUCKS AND VANS

TCC CODE DESCRIPTION FOR 4L60E/4L80E EQUIPPED VEHICLES

COMPLAINT: There is much confusion for the technician when trying to interpret one of the many TCC related codes that vehicles equipped with the 4L80E or the 4L60E can store. The scan tool illustration in figure 1 displays just one of these codes.

CAUSE: The addition of a PWM solenoid to the 4L60E complicated matters as well as the fact that what one code means in a truck will mean something entirely different in a car. This is further complicated due to the fact that one car line will use a code that is invalid in the same car line with a different engine.

CORRECTION: Refer to the following information for TCC code clarification:

1991-94 TRUCKS AND VANS WITH 4L80E

CODE 39... This code is ***mechanically*** generated and is stored when TCC is commanded "ON" but TCC slip is greater than 65 rpm when compared to engine rpm and the transmission is in 3rd gear.
This can be caused by a faulty converter, pump, misassembled or stuck valves, or by a mechanically bad PWM solenoid.
This code is stored when the manual shift lever is in the "D3" position. When driven in the Manual "D4" range, a code 68 will be stored.

CODE 83... This code is stored when an ***electrical*** problem exists in the PWM solenoid circuit. This can be caused by a faulty solenoid, a solenoid wiring or connector problem or a faulty "Quad Driver" inside the computer which would require computer replacement. If voltage in this circuit is to high or to low code 83 will be stored.

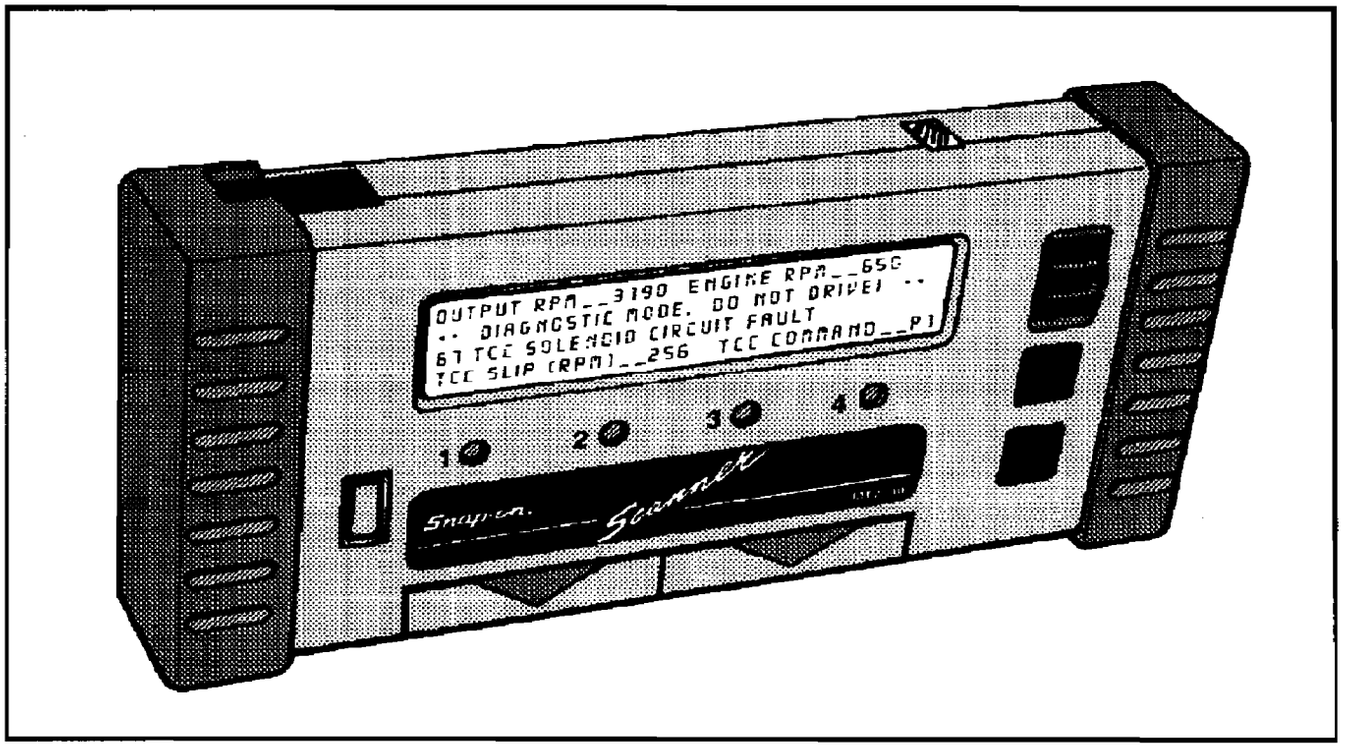


Figure 1

Red-Hot Combo!

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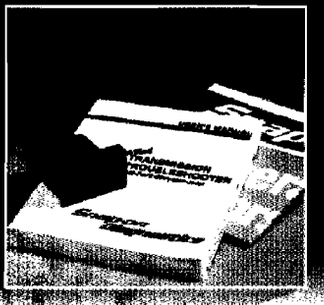

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- ***GM automatic transmissions (1980-97)***
- ***Ford automatic transmissions (1981-97)***
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GM REAR WHEEL DRIVE TRUCKS AND VANS

TCC CODE DESCRIPTION FOR 4L60E/4L80E EQUIPPED VEHICLES

1993-94 TRUCKS AND VANS WITH 4L60E

CODE 67..This code is ***electrically*** generated when a problem exists in the "ON/OFF" TCC solenoid circuit. If the voltage in the circuit is HIGH when the solenoid is commanded "ON" or the voltage in the circuit is LOW when the solenoid is commanded "OFF", code 67 will be stored.
This will usually be shown on the scan tool as "TCC COMMAND"... P1 (OFF) or P2 (ON) parameter.
This can be caused by a faulty solenoid, connector or solenoid wire problem or a faulty computer.

CODE 69..This code is ***mechanically*** generated when TCC slip is under 20 rpm and the TCC solenoid is commanded "OFF".
This can be caused by a stuck valve, faulty converter or a cross leaking pump.

1995 AND LATER TRUCKS AND VANS WITH 4L80E...NON OBDII

CODE 39...This code is ***mechanically*** generated and is stored when TCC is commanded "ON" but TCC slip is greater than 65 rpm when compared to engine rpm and the transmission is in 3rd gear.
This can be caused by a faulty converter, pump, misassembled or stuck valves, or by a mechanically bad PWM solenoid.
This code is stored when the manual shift lever is in the "D3" position. When driven in the Manual "D4" range, a code 68 will be stored.
NOTE: When diagnosing this code be sure to monitor TCC slip and TCC duty cycle. Normal operation is a duty cycle of 98% with a slip of 10 rpm or less.

CODE 69..This code is ***mechanically*** generated when TCC slip is under 20 rpm and the TCC solenoid is commanded "OFF".
This can be caused by a stuck valve, faulty converter or a cross leaking pump.

CODE 83...This code is stored when an ***electrical*** problem exists in the PWM solenoid circuit. This can be caused by a faulty solenoid, the solenoid wiring or connector problem or a faulty "Quad Driver" inside the computer which would require computer replacement.
If voltage in this circuit is to high or to low as compared to TCC slip, code 83 will be stored.

1995 AND LATER TRUCKS AND VANS WITH 4L60E...NON OBDII

CODE 67..This code is electrically generated when a problem exists in the "ON/OFF" TCC solenoid circuit. If the voltage in the circuit is HIGH when the solenoid is commanded "ON" or the voltage in the circuit is LOW when the solenoid is commanded "OFF", code 67 will be stored.
This will usually be shown on the scan tool as "TCC COMMAND"... P1 (OFF) or P2 (ON) parameter.
This can be caused by a faulty solenoid, connector or solenoid wire problem or a faulty computer.

CODE 69..This code is ***mechanically*** generated when TCC slip is under 20 rpm and the TCC solenoid is commanded "OFF".
This can be caused by a stuck valve, faulty converter or a cross leaking pump.

GM REAR WHEEL DRIVE TRUCKS AND VANS

TCC CODE DESCRIPTION FOR 4L60E/4L80E EQUIPPED VEHICLES

CODE 83...This code is stored when an ***electrical*** problem exists in the PWM solenoid circuit. This can be caused by a faulty solenoid, a solenoid wiring or connector problem or a faulty "Quad Driver" inside the computer which would require computer replacement.
If voltage in this circuit is to high or to low as compared to TCC slip code 83 will be stored.

1995 AND LATER TRUCKS AND VANS WITH 4L60E...OBDII

CODE PO742...This code is ***mechanically*** generated when the VCM detects low converter slip (less than 20 rpm) when TCC is commanded "OFF". This can be caused by a mechanical fault of the TCC "ON/OFF" solenoid, a stuck converter clutch apply valve in the pump or a cross leaking pump.

CODE P1860....This code is ***electrically*** generated when the VCM detects a short or an open in the TCC PWM solenoid circuit.
This can be caused by a faulty PWM solenoid, a wiring or connector problem or a faulty VCM.
It is important to verify circuit integrity before condemning the VCM, the entire circuit should contain 10 to 15 ohms of resistance.
NOTE: This code could cause a P1870," component slipping", code to be stored.

CODE P1864....This code is ***electrically*** generated in the TCC "ON/OFF" solenoid circuit when the VCM detects a continuous short or open in the solenoid circuit.
This can be caused by a faulty "ON/OFF" TCC solenoid, a wiring or connector problem or a faulty VCM.
NOTE: This code could cause a P1870," component slipping", code to be stored.
Code **PO740** is used instead of P1864 on 1998 and later vehicles.

1995 AND LATER TRUCKS AND VANS WITH 4L80E...OBDII

CODE PO741...This code is ***mechanically*** generated when the VCM detects a TCC slip of 65 rpm or greater when TCC is commanded "ON".
TCC slip and TCC duty cycle must be monitored. Normal operation is 98% duty cycle with a TCC slip of 10 rpm or less.
This can be caused by a faulty PWM solenoid, misassembled or sticking valves, or a cross leaking pump.
NOTE: A code P1870 could also be stored as a result of this problem.

CODE PO742...This code is ***mechanically*** generated when the VCM detects low converter slip (less than 20 rpm) when TCC is commanded "OFF". This can be caused by a mechanical fault of the TCC PWM solenoid, a stuck converter clutch apply valve in the pump or a cross leaking pump.

CODE P1860....This code is ***electrically*** generated when the VCM detects a short or an open in the TCC PWM solenoid circuit.
This can be caused by a faulty PWM solenoid, a wiring or connector problem or a faulty VCM.
It is important to verify circuit integrity before condemning the VCM, the entire circuit should contain 10 to 15 ohms of resistance.
NOTE: A code P1870 could also be stored as a result of this problem.

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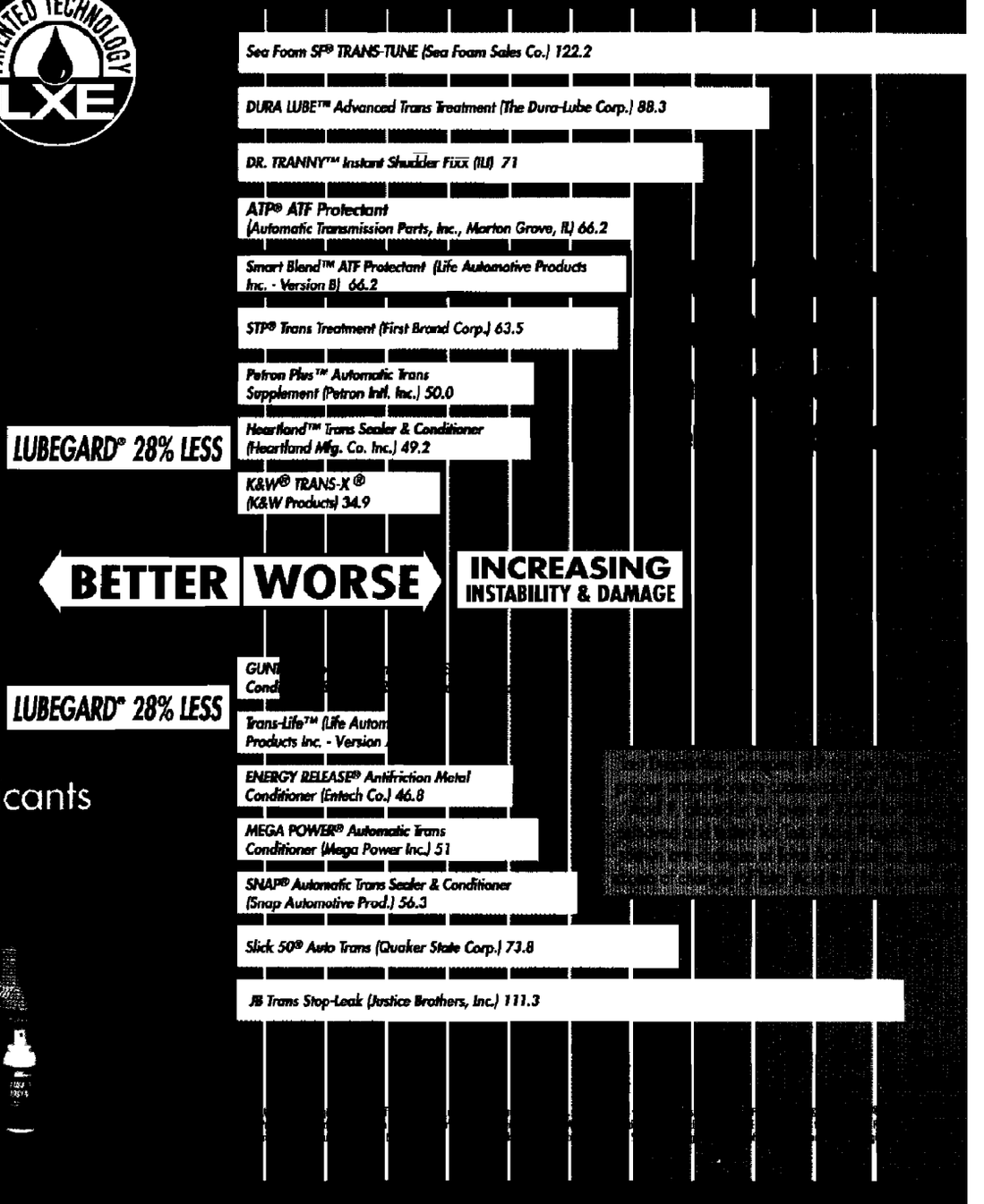

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GM REAR WHEEL DRIVE CARS

TCC CODE DESCRIPTION FOR 4L60E EQUIPPED VEHICLES

1994 CARS WITH 4L60E

CODE 80... This code is ***mechanically*** generated when the PCM detects TCC slip greater than 100 rpm by monitoring the difference between engine rpm and CALCULATED input shaft speed. Other requirements are, TCC is commanded "ON", transmission is in 2nd, 3rd or 4th gear, fluid pressure switch assembly indicates "D3" or "D4".
During normal operation the scan tool should indicate engine rpm close to the calculated input shaft speed.
This code can be caused by a faulty converter, sticking valves a faulty pump or a faulty fluid pressure switch assembly.
NOTE: This code is valid for 1994 model year passenger cars **ONLY.**

CODE 85... This code is ***mechanically*** generated when the PCM detects a TCC slip of 20 rpm or less when the TCC solenoid is commanded "OFF", TPS throttle opening is greater than 25%, commanded gear is 3rd or 4th and engine rpm is greater than 300 for 4 seconds or longer.
This can be caused by a faulty TCC "ON/OFF" solenoid, a stuck converter clutch shift valve, a cross leaking pump or a faulty converter. This condition may cause the engine to stall in the manual 2nd position with the brake applied.
When monitoring this on a scan tool, check "TCC SLIP" and "TCC COMMAND", if "TCC COMMAND" is P1 and TCC SLIP is 20 rpm or less, converter clutch is mechanically stuck "ON".
WARNING: This code is not valid on "F" body (Camaro/Firebird) with 3.4 liter engine **ONLY.** This applies to the 1994 model year **ONLY.**
Code 85 on "F" body cars with 3.4 liter engine is a ***PROM ERROR.***

CODE 90... This code is ***electrically*** generated when the PCM commands the TCC solenoid "ON" and voltage in the circuit remains HIGH or the PCM commands the TCC solenoid "OFF" and the voltage in the circuit is ZERO for 2 seconds or longer.
This can be caused by a faulty TCC "ON/OFF" solenoid, a wiring or connector problem or a faulty computer.
NOTE: This code is used on 3.4 liter "F" body cars for the 1994 model year **ONLY.**

1995 CARS WITH 4L60E

CODE 83... This code is ***electrically*** generated when the PCM commands the PWM TCC solenoid "ON" but voltage in the circuit remains high or the PWM TCC solenoid is commanded "OFF" but the voltage in the circuit is zero for 2 seconds or longer.
This can be caused by a faulty PWM TCC solenoid, a wire or connector problem or a faulty computer.
WARNING: This is not a valid code on "F" body cars with 3.4 liter engine.

GM REAR WHEEL DRIVE CARS

TCC CODE DESCRIPTION FOR 4L60E EQUIPPED VEHICLES

CODE 85... This code is ***mechanically*** generated when the PCM detects a TCC slip of 20 rpm or less when the TCC solenoid is commanded "OFF", TPS throttle opening is greater than 25%, commanded gear is 3rd or 4th and engine rpm is greater than 300 for 4 seconds or longer.
This can be caused by a faulty TCC "ON/OFF" solenoid, a stuck converter clutch shift valve, a cross leaking pump or a faulty converter. This condition may cause the engine to stall in the manual 2nd position with the brake applied.
When monitoring this on a scan tool, check "TCC SLIP" and "TCC COMMAND", if " TCC COMMAND" is P1 and TCC SLIP is 20 rpm or less, converter clutch is mechanically stuck "ON".
WARNING: This code is not valid on "F" body (Camaro/Firebird) with 3.4 liter engine **ONLY.** This applies to the 1995 model year **ONLY.**
Code 85 on "F" body cars with 3.4 liter engine is a ***PROM ERROR.***

CODE 80... This code is ***mechanically*** generated when the PCM detects TCC slip greater than 100 rpm by monitoring the difference between engine rpm and CALCULATED input shaft speed. Additional requirements are, TCC is commanded "ON", transmission is in 2nd, 3rd or 4th gear, fluid pressure switch assembly indicates "D3" or "D4".
This can be caused by a faulty converter, a worn TCC regulator valve bore, a faulty pump or a faulty fluid pressure switch assembly.
During normal operation the scan tool should indicate engine rpm close to the calculated input shaft speed.
NOTE: This code is valid for "F" body cars with 3.4 liter engine **ONLY.**

CODE 90... This code is ***electrically*** generated when the PCM commands the TCC solenoid "ON" and voltage in the circuit remains HIGH or the PCM commands the TCC solenoid "OFF" and the voltage in the circuit is ZERO for 2 seconds or longer.
This can be caused by a faulty TCC "ON/OFF" solenoid, a wiring or connector problem or a faulty computer.

1996 AND LATER CARS WITH 4L60E...OBDII

CODE PO742... This code is ***mechanically*** generated when the VCM detects low converter slip (less than 20 rpm) when TCC is commanded "OFF". This can be caused by a mechanical fault of the TCC "ON/OFF" solenoid, a stuck converter clutch apply valve in the pump or a cross leaking pump.

CODE P1860... This code is ***electrically*** generated when the VCM detects a short or an open in the TCC PWM solenoid circuit.
This can be caused by a faulty PWM solenoid, a wiring or connector problem or a faulty VCM.
NOTE: This code could cause a P1870," component slipping", code to be stored.
It is important to verify circuit integrity before condemning the VCM, the entire circuit should contain 10 to 15 ohms of resistance.

CODE P1864.... This code is ***electrically*** generated in the TCC "ON/OFF" solenoid circuit when the VCM detects a continuous short or open in the solenoid circuit.
This can be caused by a faulty "ON/OFF" TCC solenoid, a wiring or connector problem or a faulty VCM.
NOTE: This code could cause a P1870," component slipping", code to be stored.

THM 4L80-E/4L80-EHD
PUMP BODY AND PUMP COVER IDENTIFICATION FOR SERVICE

CHANGE: Beginning at start of production for all 1997 model THM 4L80-E/4L80-EHD transmissions, the Oil Pump Body and the Oil Pump Cover (stator) recieved worm track configuration changes to accommodate a front lube, center lube and rear lube system. The front lube is what affected both of the oil pump parts.
General Motors has now released an Oil Pump Cover to service 1991-1996 model units, and the service pump cover has a worm track configuration that can easily be mistaken for the 1997 model pump cover. There are however ***machining*** differences in the two oil pump covers. Great care must be used if it is necessary to replace these parts.

REASON: Allows the manufacturer to use one casting mold, to service all models.

PARTS AFFECTED:

(1) OIL PUMP COVER - 1997-Up models ***will*** have the slot machined between the pump cover passages and there ***will*** be a hole drilled in the number 13 cavity, as shown in the top illustration in Figure 1. The 1991-1996 pump cover, part number 24205398, will not have the slot machined and ***no hole drilled*** in cavity 13, as illustrated in Figure 2. However, we have seen one 91-96 oil pump cover for service that had the slot machined but no hole drilled in cavity 13, which is still okay to use.

(2) OIL PUMP BODY AND GEARS - One pump body, part number 24211287, will back service all models of the THM 4L80-E/4L80-EHD transmission and is illustrated in Figure 3.

INTERCHANGEABILITY:

The 1997-Up Oil Pump Cover will fit ***only*** 1997-Up models and cannot be used to back service previous models. The 1991-1996 service Oil Pump Cover will fit ***only*** 91-96 models and cannot be used to service the later models. Great care must be used if it is necessary to replace the parts listed above.

SERVICE INFORMATION:

Oil Pump Body, All Models 24211287
Oil Pump Cover, 1997-Up Models Only 24204303
Oil Pump Cover, 1991-1996 Models Only 24205398

SLIDE

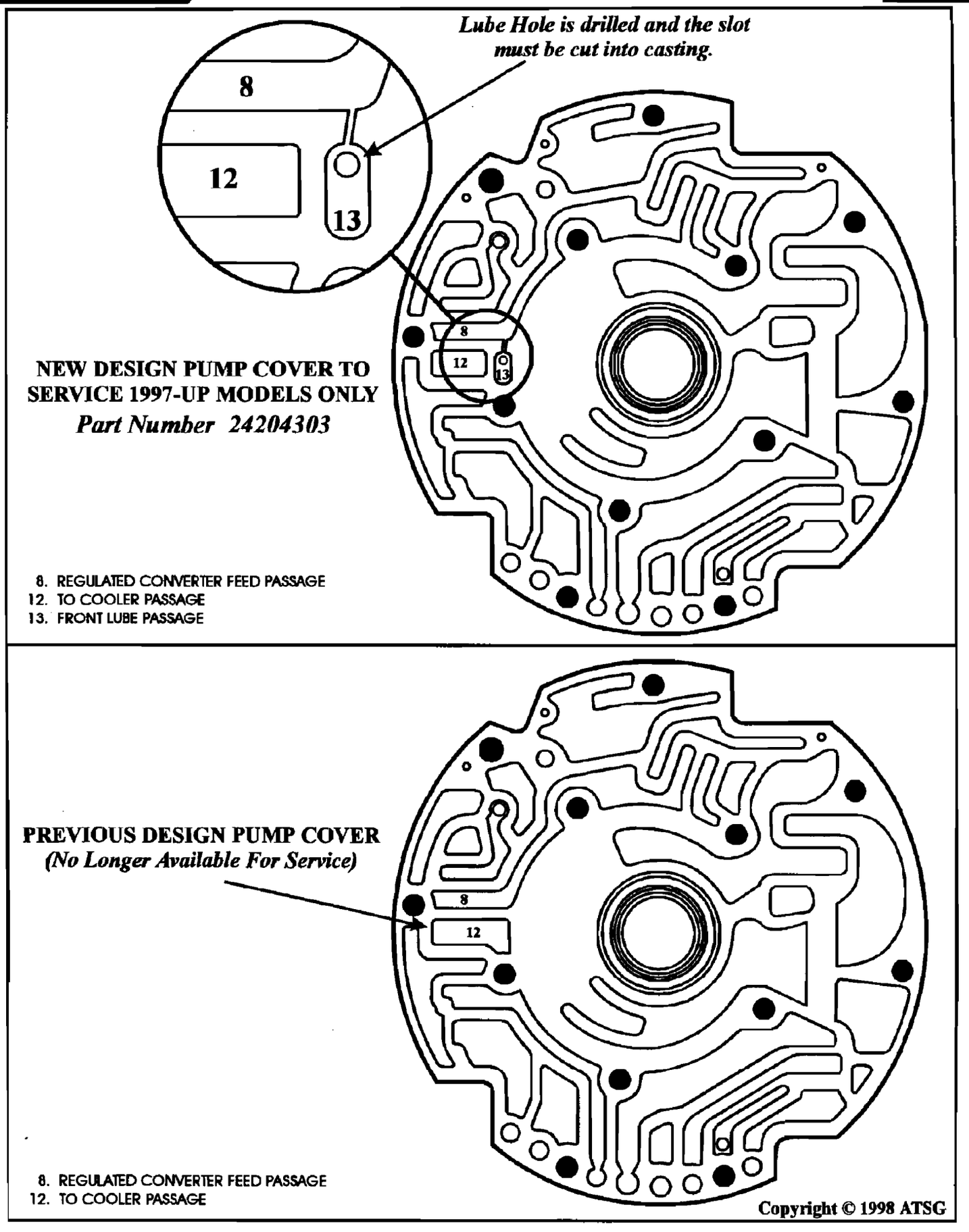


Figure 1

SLIDE

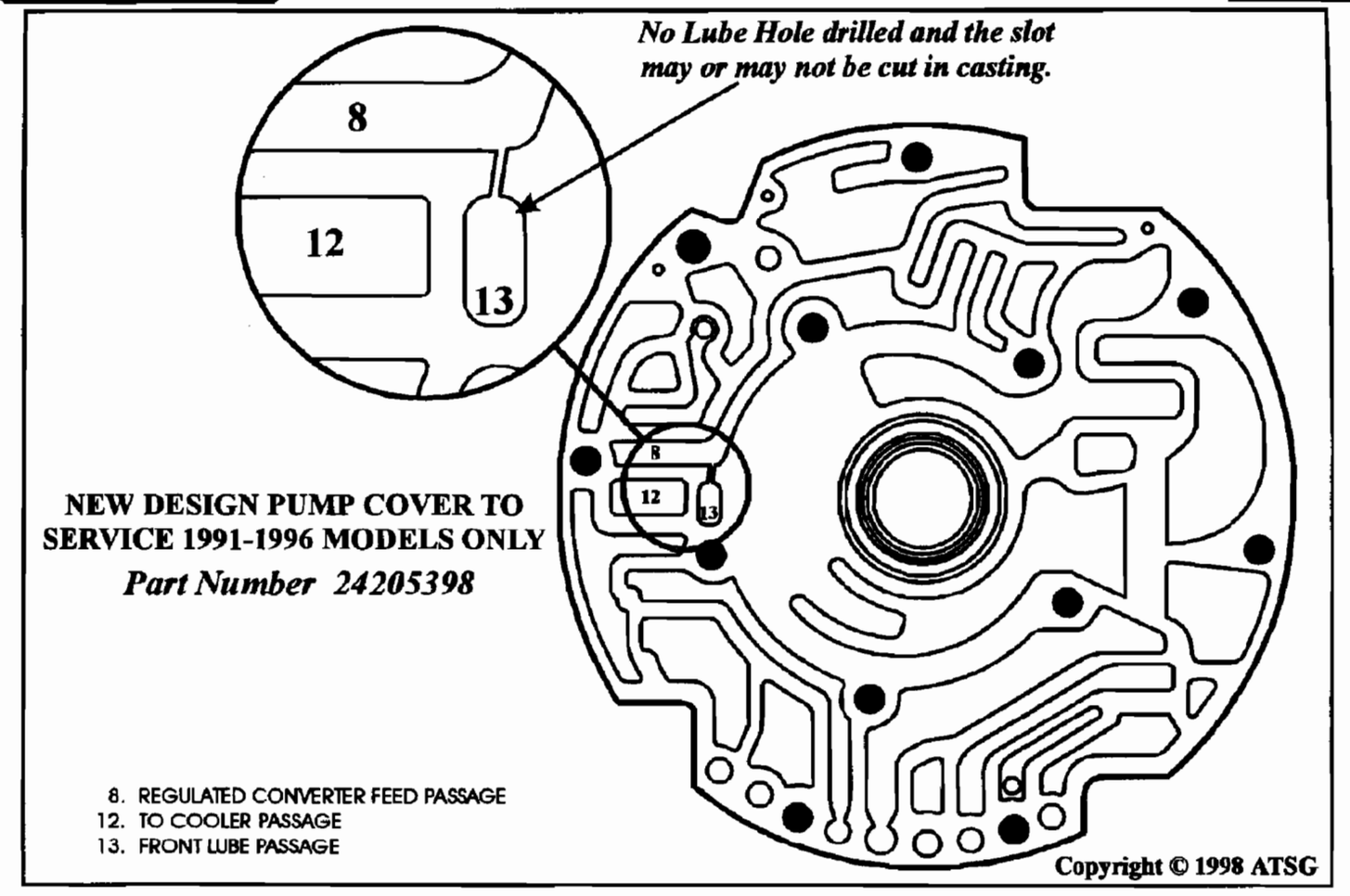
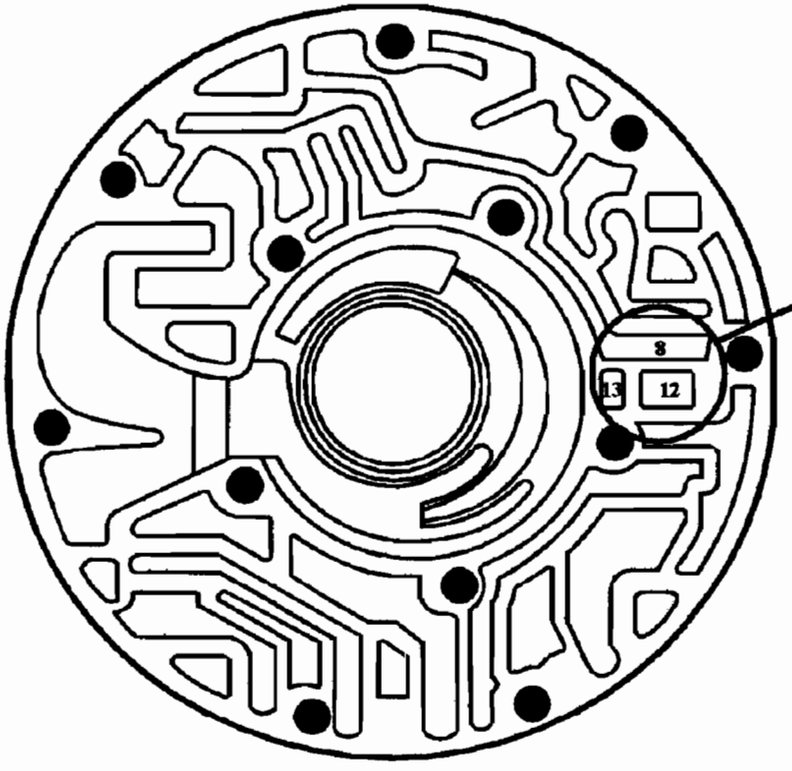
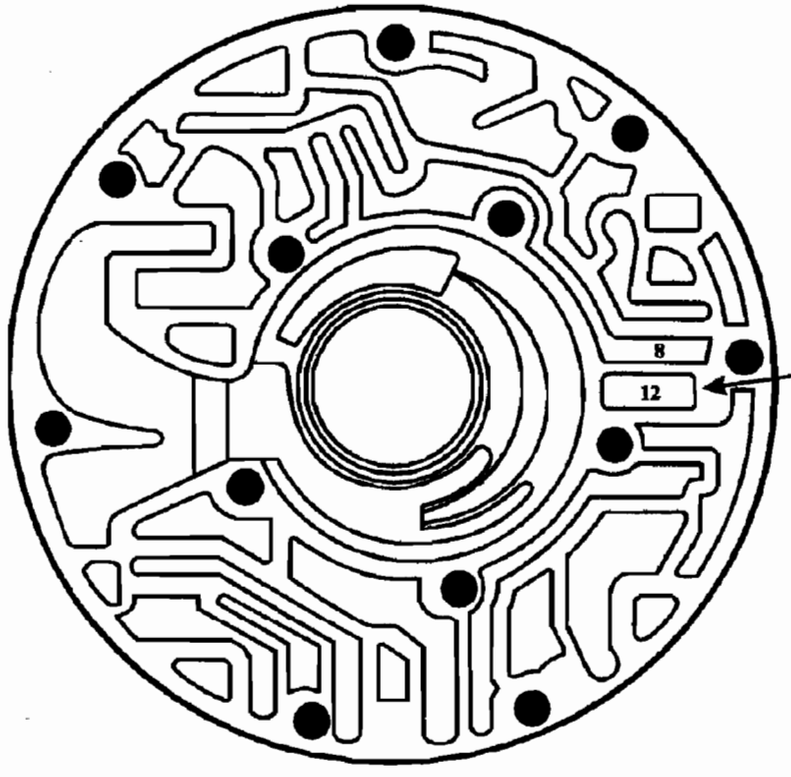


Figure 2



NEW DESIGN PUMP BODY
(Will Back Service All Models)
Part Number 24211287

8. REGULATED CONVERTER FEED PASSAGE
12. TO COOLER PASSAGE
13. FRONT LUBE PASSAGE



PREVIOUS DESIGN PUMP COVER
(No Longer Available For Service)

8. REGULATED CONVERTER FEED PASSAGE
12. TO COOLER PASSAGE

Figure 3

THM 4L80-E/4L80-EHD
NEW SHIFT SOLENOID ASSEMBLIES AND PRESSURE CONTROL SOLENOID

CHANGE: Beginning at the start of production for the 1998 model year, all 4L80E/4L80EHD transmissions were built with revised Shift Solenoids, and a new EPC Solenoid.

REASON: Revised plastic material for seats in the Shift Solenoids, and larger micron screens in the EPC Solenoid for improved durability.

PARTS AFFECTED:

(1) SHIFT SOLENOID "A" - Revised plastic material in the seat area, and connector is still Black in color, but color of plastic for snout where the "O" ring goes changed to Brown instead of the previous White, for identification purposes (See Figure 1).

(2) SHIFT SOLENOID "B" - Revised plastic material in the seat area, and connector is still White in color, but color of plastic for snout where the "O" ring goes changed to Brown instead of the previous White, for identification purposes (See Figure 1).

(3) EPC SOLENOID - Revised (Larger) micron in the solenoid screens for improved operation in cold ambient temperatures (See Figure 2).

INTERCHANGEABILITY:

The new design Shift Solenoids, and the new design EPC Solenoid, will retro-fit back on ***all*** previous models.

SERVICE INFORMATION:

Shift Solenoid "A" (Black connector, Brown snout) 10478142
Shift Solenoid "B" (White connector, Brown snout) 10478143
Pressure Control Solenoid 24209276

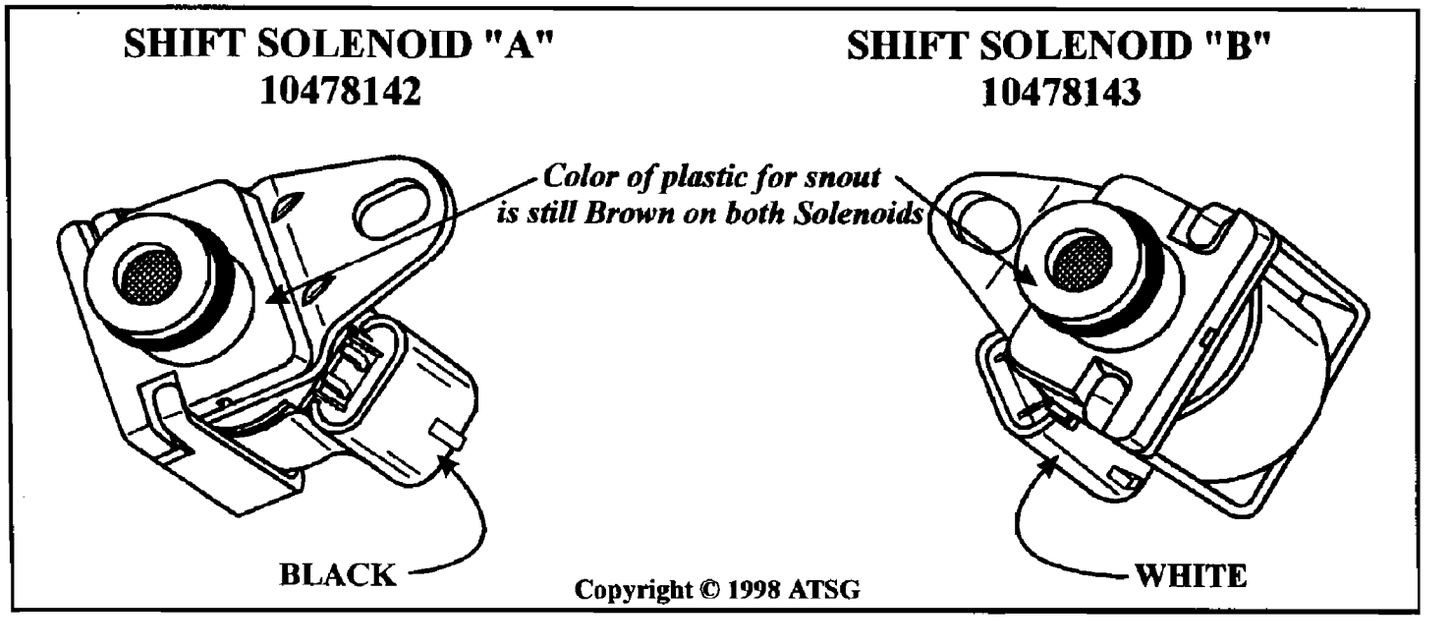


Figure 1

NEW ELECTRONIC PRESSURE CONTROL SOLENOID
PART NUMBER 24209276

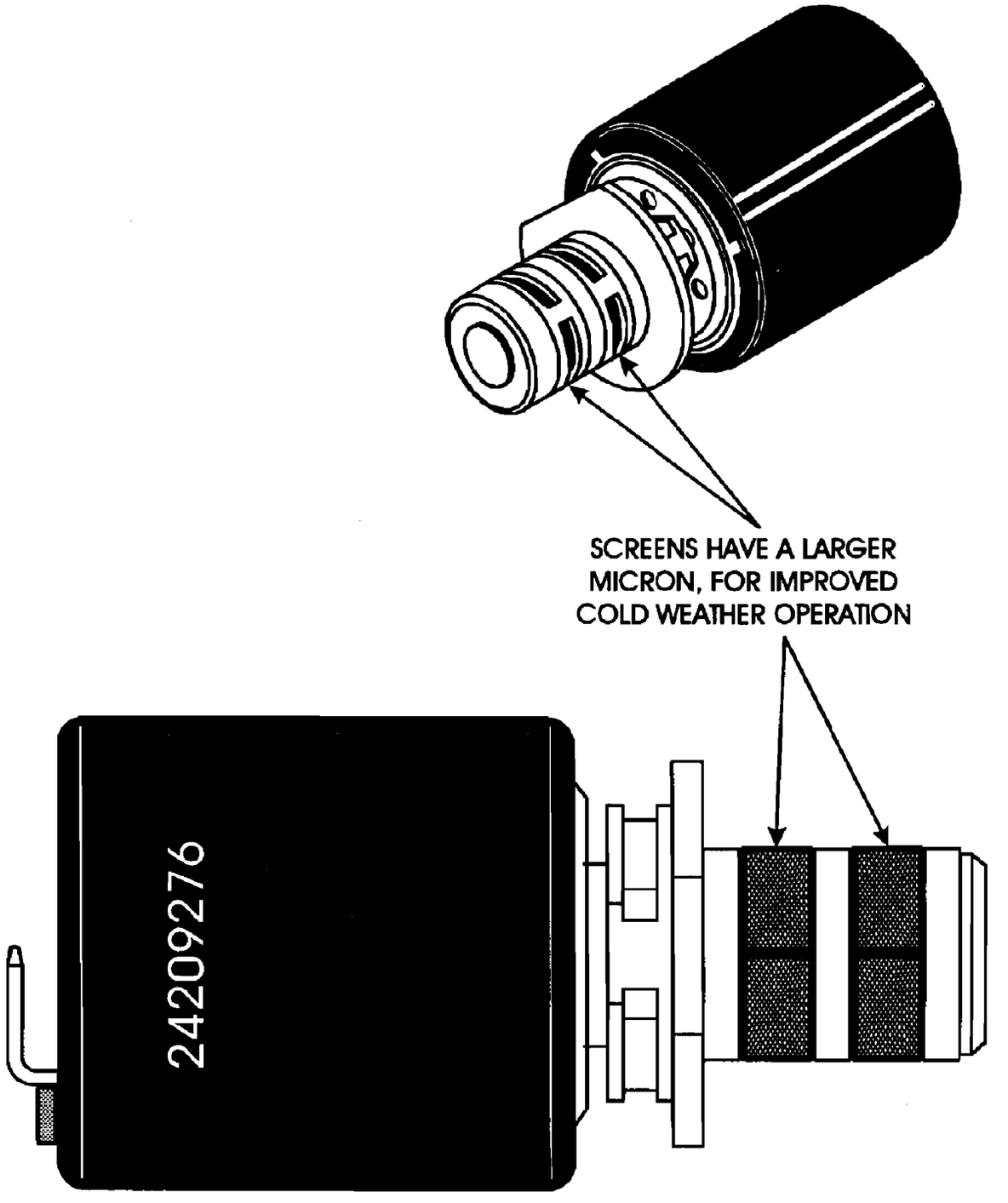


Figure 2

THM 4T60-E

NO FORWARD OR REVERSE

COMPLAINT: After overhaul, vehicles equipped 4T60-E transaxles may exhibit a no Forward or Reverse condition.

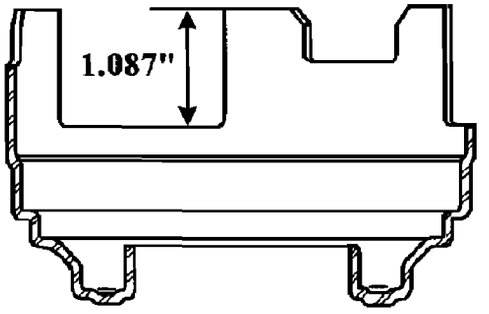
CAUSE: The cause may be, during overhaul, the input piston, which has a cut out that requires 10 3rd clutch plates, was replaced with a previous design 4T60 input piston that requires 8 3rd clutch plates. This mis-assembly stops the input piston from completly clamping the input clutch together, as shown in Figure 2, causing no Forward or Reverse engagement.

CORRECTION: Refer to Figure 1 to identify the 4T60-E input piston. Refer to Figure 2 and locate the hole in the input drum to air check the input clutch to verify proper operation before final assembly.

INPUT CLUTCH PISTON IDENTIFICATION

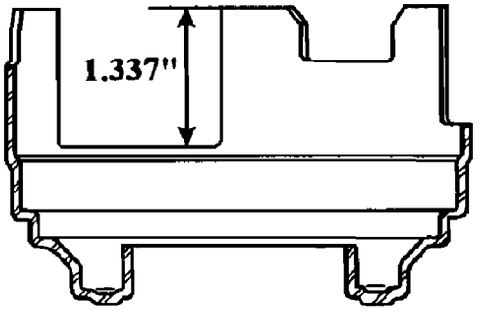
4T60

8 PLATE 3RD CLUTCH INPUT CLUTCH PISTON



4T60-E

10 PLATE 3RD CLUTCH INPUT CLUTCH PISTON

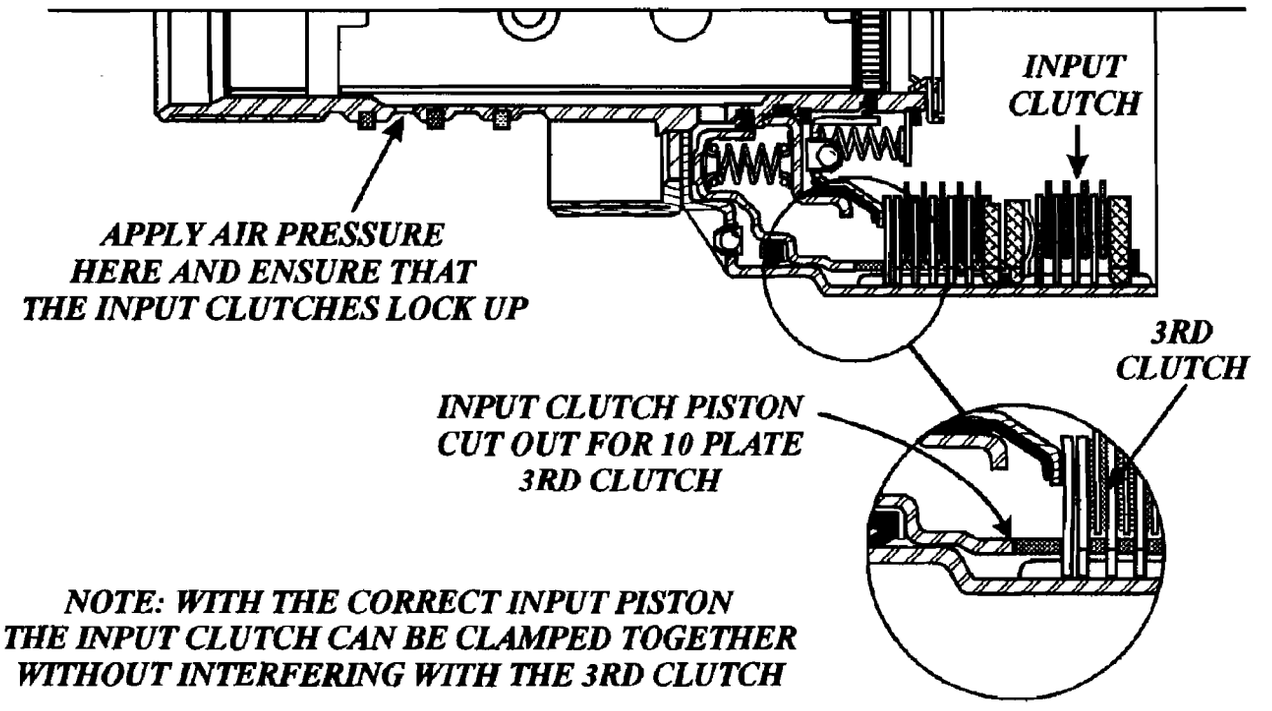


NOTE: THERE IS .250" DIFFERENCE BETWEEN THE 8 PLATE PISTON WINDOW AND THE 10 PLATE PISTON WINDOW.

Figure 1

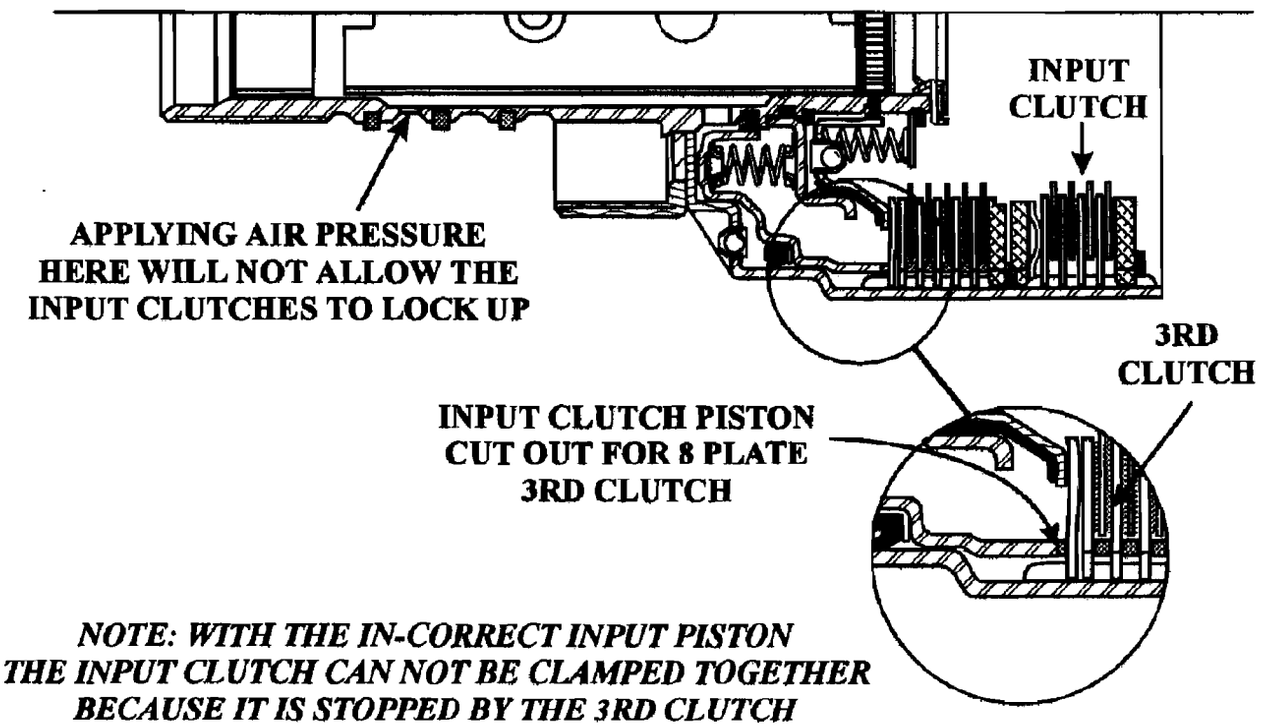
Special Note: ***On THM 4T60 (440-T4) transaxles, that do not use the wave plate in the input clutch, this mis-assembly will create a tie-up on the 1-2 upshift.***

"CORRECT" INPUT DRUM ASSEMBLY



NOTE: WITH THE CORRECT INPUT PISTON THE INPUT CLUTCH CAN BE CLAMPED TOGETHER WITHOUT INTERFERING WITH THE 3RD CLUTCH

"IN-CORRECT" INPUT DRUM ASSEMBLY



NOTE: WITH THE IN-CORRECT INPUT PISTON THE INPUT CLUTCH CAN NOT BE CLAMPED TOGETHER BECAUSE IT IS STOPPED BY THE 3RD CLUTCH

Figure 2

THM 4T60-E
FINAL DRIVE IDENTIFICATION

CHANGE: Beginning in model year 1995, General Motors introduced a "Fine Pitch" final drive assembly with the teeth cut in the opposite direction of the 1st design. With the teeth cut in the opposite direction they were easy to identify from the 1st design. However, for the 1996 model year the "Fine Pitch" final drive assembly has the teeth cut in the same direction as the 1st design, and this sometimes makes it difficult to identify in case parts replacement is necessary. We now have nine different final drive combinations, and not all will interchange.
To complicate this even further there are five different tooth counts on the output speed sensor rotor on the different final drive carriers that will not interchange. We have provided you with all identification information to prevent you from making these mistakes.

Special Note:
If the wrong ratio final drive assembly or the wrong tooth count speed sensor rotor is used, the vehicle will have no 4th gear and/or no converter clutch operation.

REASON: The "Fine Pitch" final drive assemblies were introduced to address noise concerns.

PARTS AFFECTED:

(1) FINAL DRIVE INTERNAL RING GEAR:

"Regular Pitch" This internal ring gear has 70 internal teeth for all three final drive ratios that are available, as illustrated in Figure 1.

"1995 Fine Pitch" This internal ring gear has 78 internal teeth for all three final drive ratios that are available, as illustrated in Figure 2. The internal teeth are also cut in the opposite direction of the regular pitch design.

"1996-Up Fine Pitch" This internal ring gear has 78 internal teeth for all three final drive ratios that are available, as illustrated in Figure 3. The internal teeth are cut in the same direction as the regular pitch design.

(2) FINAL DRIVE SUN GEAR:

"Regular Pitch" There are three different ratios available as shown in Figure 1. The 2.84 ratio sun gear has 38 teeth, the 3.06 ratio sun gear has 34 teeth, and the 3.33 ratio has 30 teeth. The pitch direction is also illustrated in Figure 1.

"1995 Fine Pitch" There are three different ratios available as shown in Figure 2. The 2.86 ratio sun gear has 42 teeth, the 3.05 ratio sun gear has 38 teeth, and the 3.29 ratio has 34 teeth. Notice that the pitch direction is also the opposite direction of the regular pitch, as illustrated in Figure 2.

"1996-Up Fine Pitch" There are three different ratios available as shown in Figure 3. The 2.86 ratio sun gear has 42 teeth, the 3.05 ratio sun gear has 38 teeth, and the 3.29 ratio has 34 teeth. Notice that the pitch direction is the same as the direction of the regular pitch, as illustrated in Figure 3. When the pitch direction is changed, it changes the thrust direction of the final drive carrier.

Continued on next Page.

(3) FINAL DRIVE CARRIER

"Regular Pitch" There are three different final drive carrier ratios available. They are 2.84, 3.06, and 3.33. The 2.84 ratio final drive carrier has 16 teeth on the pinion gears, the 3.06 ratio has 18 teeth on the pinion gears, and the 3.33 has 20 teeth on the pinion gears as illustrated in Figure 1. Notice that the pitch angle of the planetary pinions is to the left as illustrated in Figure 1.

"1995 Fine Pitch" There are three different final drive carrier ratios available. They are 2.86, 3.05, and 3.29. The 2.86 ratio final drive carrier has 18 teeth on the pinion gears, the 3.05 ratio has 20 teeth on the pinion gears, and the 3.29 has 22 teeth on the pinion gears as illustrated in Figure 2. Notice that the pitch angle of the planetary pinions is the opposite, to the right, of the regular pitch as illustrated in Figure 2.

"1996-Up Fine Pitch" There are three different final drive carrier ratios available. They are 2.86, 3.05, and 3.29. The 2.86 ratio final drive carrier has 18 teeth on the pinion gears, the 3.05 ratio has 20 teeth on the pinion gears, and the 3.29 has 22 teeth on the pinion gears as illustrated in Figure 3. Notice that the pitch angle of the planetary pinions is the same, to the left, as the regular pitch as illustrated in Figure 3.

Special Note:
We have also provided you with the formula to calculate the final drive ratios, and provided you with two examples of this formula in Figure 4.

INTERCHANGEABILITY:

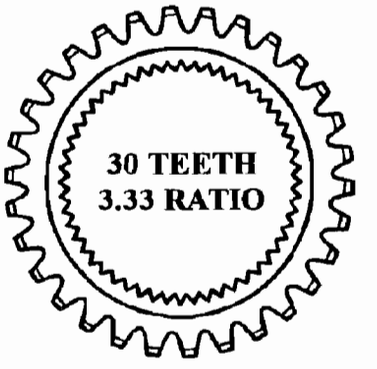
The 2.86 ratio will replace the 2.84 ratio with no adverse effects, as long as the proper speed sensor rotor tooth count is maintained for the model you are working on.
The 3.05 ratio will replace the 3.06 ratio with no adverse effects, as long as the proper speed sensor rotor tooth count is maintained for the model you are working on.
The 3.29 ratio will replace the 3.33 ratio with no adverse effects, as long as the proper speed sensor rotor tooth count is maintained for the model you are working on.
None of the individual components from the "Regular Pitch", "1995 Fine Pitch", or the "1996-Up Fine Pitch" will interchange with one another. You should not have any trouble here because they will not assemble.

TRANSAXLE IDENTIFICATION BY MODEL NUMBER AND RATIO

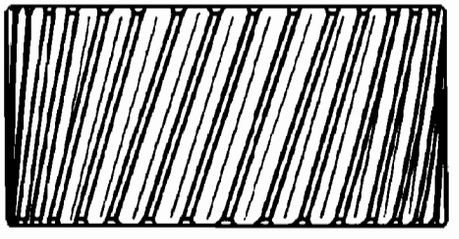
This bulletin will also help you identify 4T60-E transmissions by model number so that you get the right sprocket ratio, final drive ratio, and speed sensor rotor tooth count back into the proper vehicle. The first column gives you the broadcast code off of the I.D. tag, the second column gives you the engine size and vehicle that it came out of, the third column gives you the final drive ratio/speed sensor rotor tooth count, the fourth column gives you the drive/driven sprocket tooth count, the fifth column gives you the stall speed of the torque converter, and the last column tells you which structual side cover is required in that particular model if it requires one.

For 1991 Model vehicles, refer to Figure 5.
For 1992 Model vehicles, refer to Figure 6.
For 1993 Model vehicles, refer to Figure 7.
For 1994 Model vehicles, refer to Figure 8.
For 1995 Model vehicles, refer to Figure 9.
For 1996 Model vehicles, refer to Figure 10.

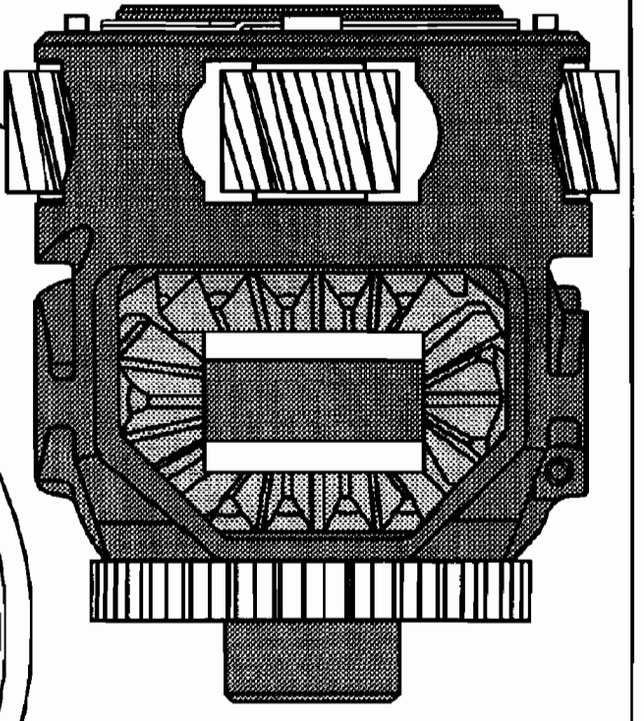
"REGULAR" FINAL DRIVE IDENTIFICATION



DIRECTION OF PITCH



2.84 = 16 Teeth
3.06 = 18 Teeth
3.33 = 20 Teeth



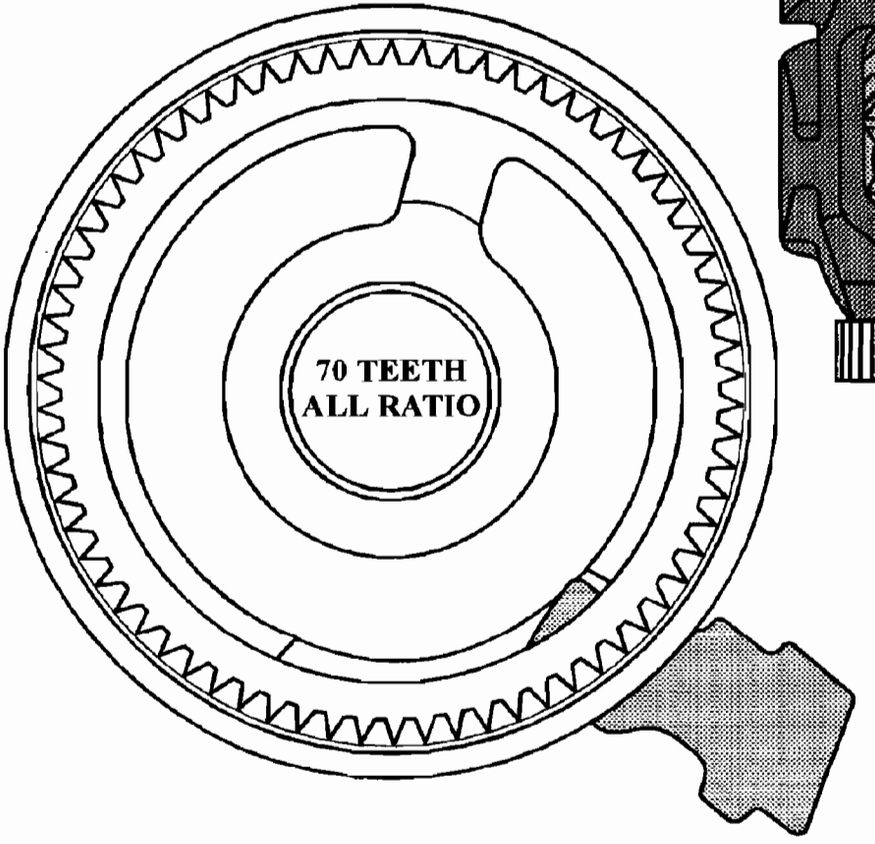
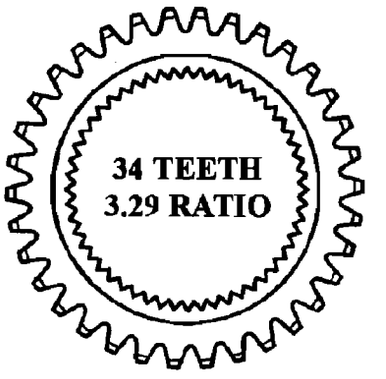
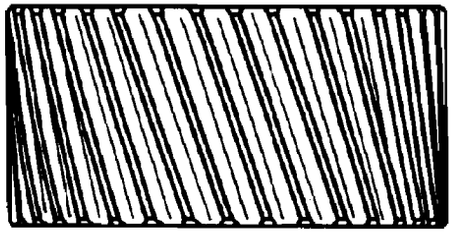


Figure 1

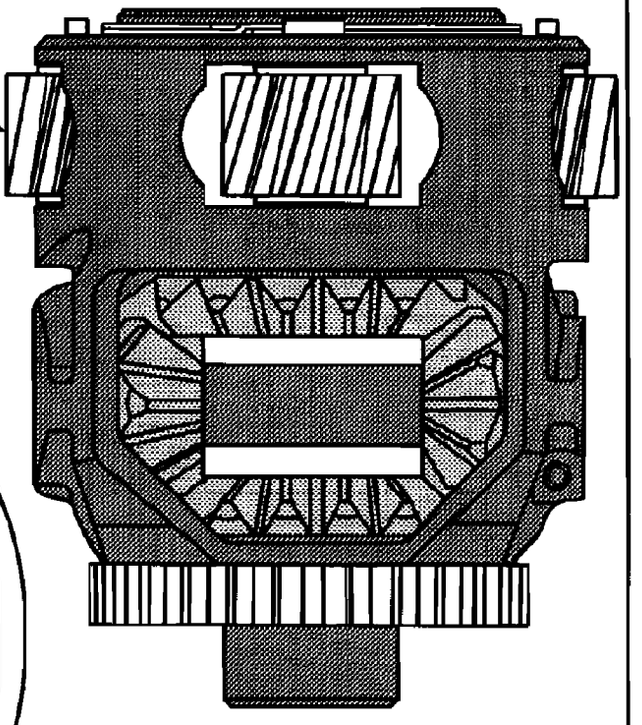
"1995 FINE PITCH" FINAL DRIVE IDENTIFICATION
(Cut Opposite Direction of Regular)



DIRECTION OF PITCH



2.86 = 18 Teeth
3.05 = 20 Teeth
3.29 = 22 Teeth



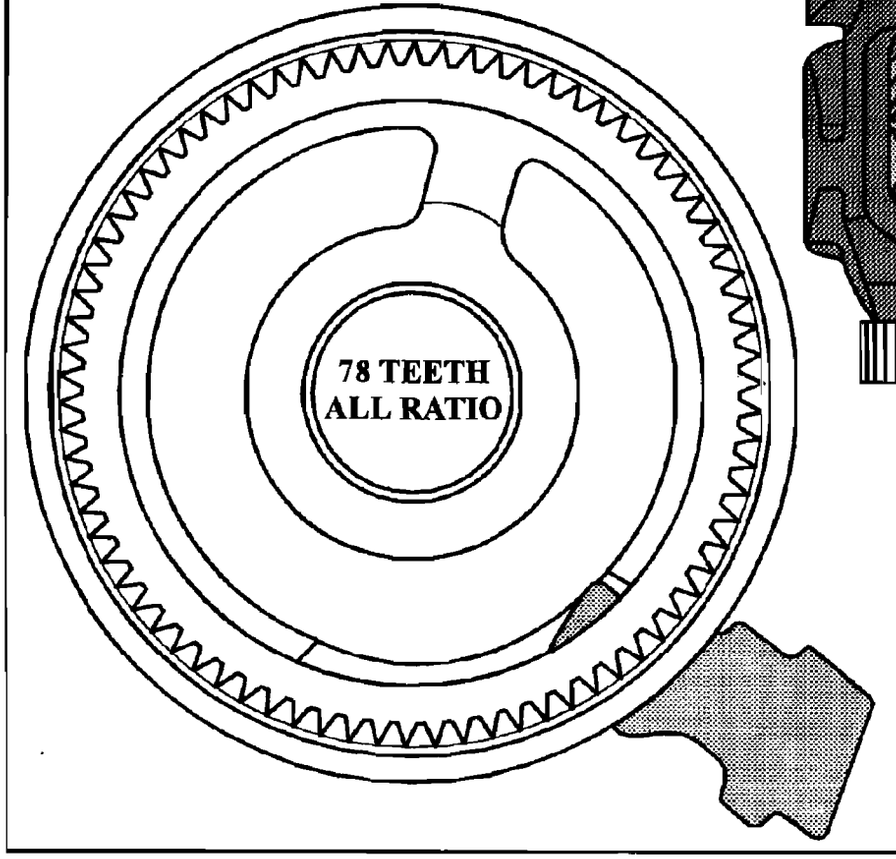


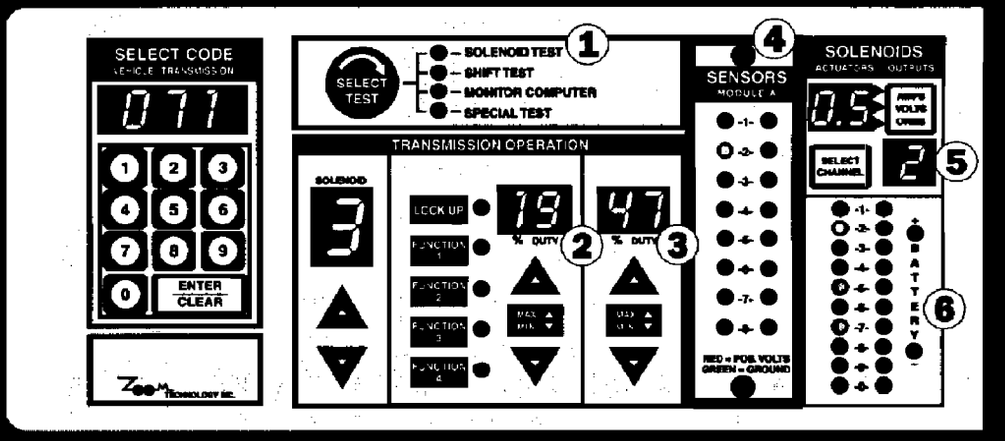
Figure 2

ONE LOOK WILL TELL YOU...

TranX 2000™

SHIFTER MONITOR MULTIMETER BREAKOUT

LEADS THE WAY!



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2. Digital Lock-up Control - 1% duty control along with a separate lock-up on off switch provides you with full testing capabilities!

3. Digital Pressure Control - Set pressure control solenoid duties to within 1% - EACH AND EVERY TIME.

4. Sensor Monitoring - Temperature sensors, pressure switches, & speed sensors are all accessible through the TranX sensor monitoring system.

5. Integral 10 Channel Multimeter - Nothing else to hook up – just press the channel selector!

MEASURES: SOLENOID RESISTANCES
SOLENOID CURRENT DRAWS
ECU DRIVER CURRENTS
BATTERY VOLTAGE

6. 10 Solenoid Channels - TranX 2000™ can operate transmissions with up to **10 solenoids**. Each channel has a separate bicolor status LED as well as a 2mm test point (break-out).

The TranX 2000™ safely, accurately and quickly tests:

- **SOLENOIDS**
- **FORCE MOTORS**
- **TRANSMISSION WIRING**
- **HARNESS WIRING**
- **SHIFTING**
- **ECU OPERATION**
- **SENSORS**

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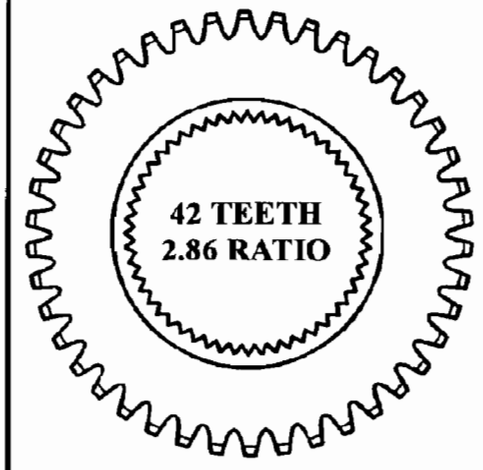
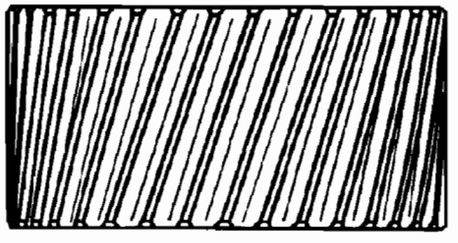
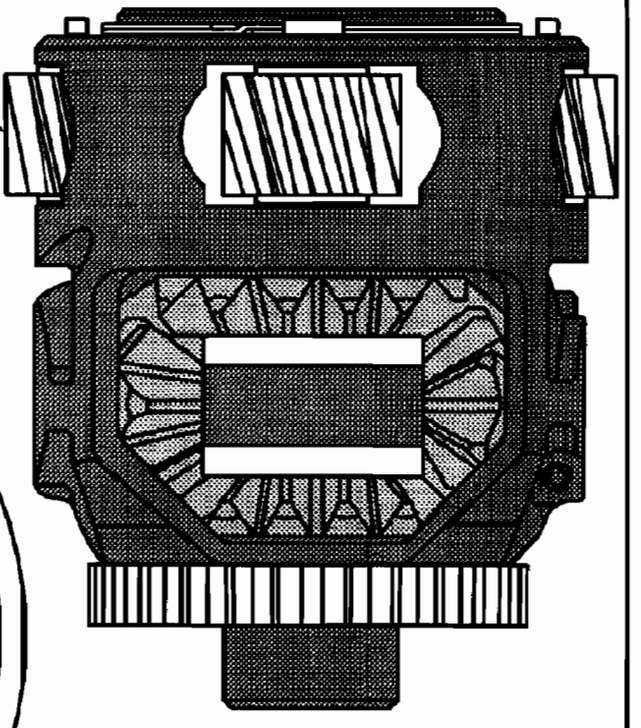
"1996-UP *FINE PITCH*" FINAL DRIVE IDENTIFICATION
(Cut Same Direction as Regular)



DIRECTION OF PITCH



2.86 = 18 Teeth
3.05 = 20 Teeth
3.29 = 22 Teeth



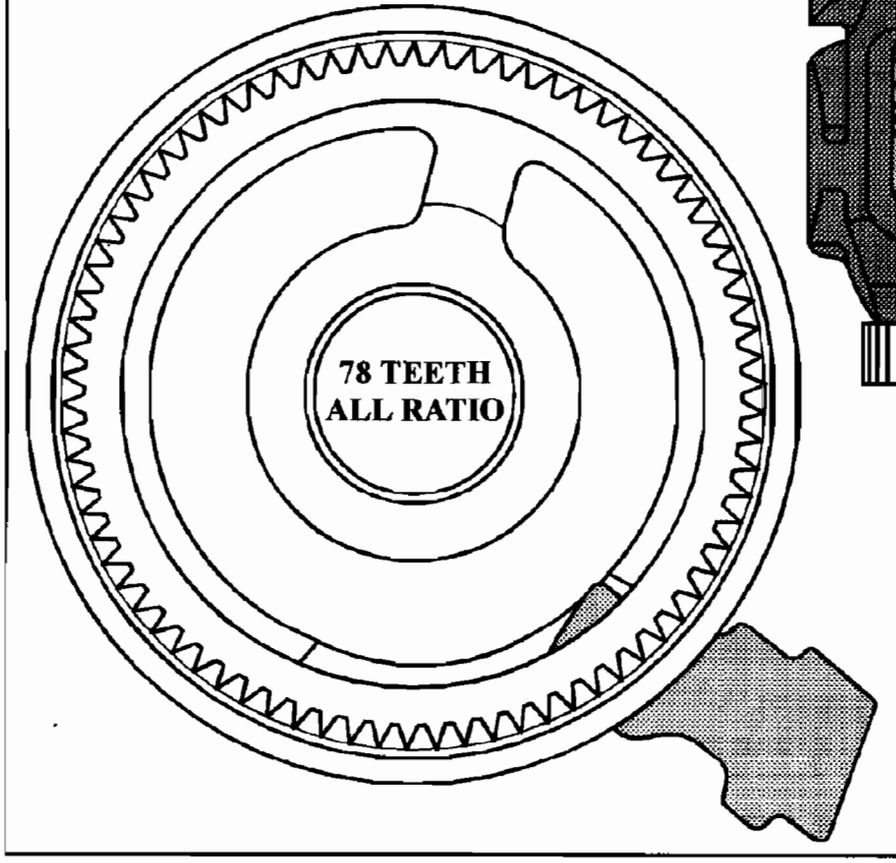
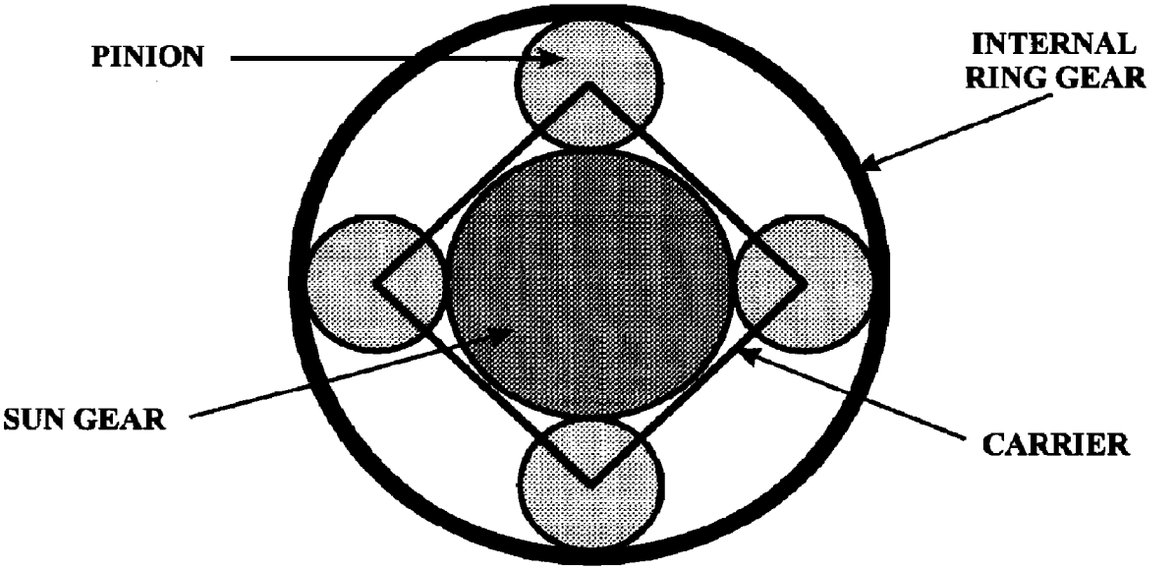


Figure 3

FORMULA FOR FINAL DRIVE RATIO IDENTIFICATION



I = NUMBER OF TEETH ON INTERNAL RING GEAR
S = NUMBER OF TEETH ON SUN GEAR
P = NUMBER OF TEETH ON PINION GEAR

HELD	INPUT	OUTPUT	REVOLUTIONS SUN	REVOLUTIONS CARRIER	REVOLUTIONS INTERNAL	REVOLUTIONS PINION
INTERNAL	SUN	CARRIER	1	$\frac{I+S}{S}$	0	$\left(\frac{S}{I+S}\right)\left(\frac{I}{P}\right)$

Regular Pitch Example: $\frac{I = 78 + S = 34}{S = 34} = \frac{112}{34} = 3.29$

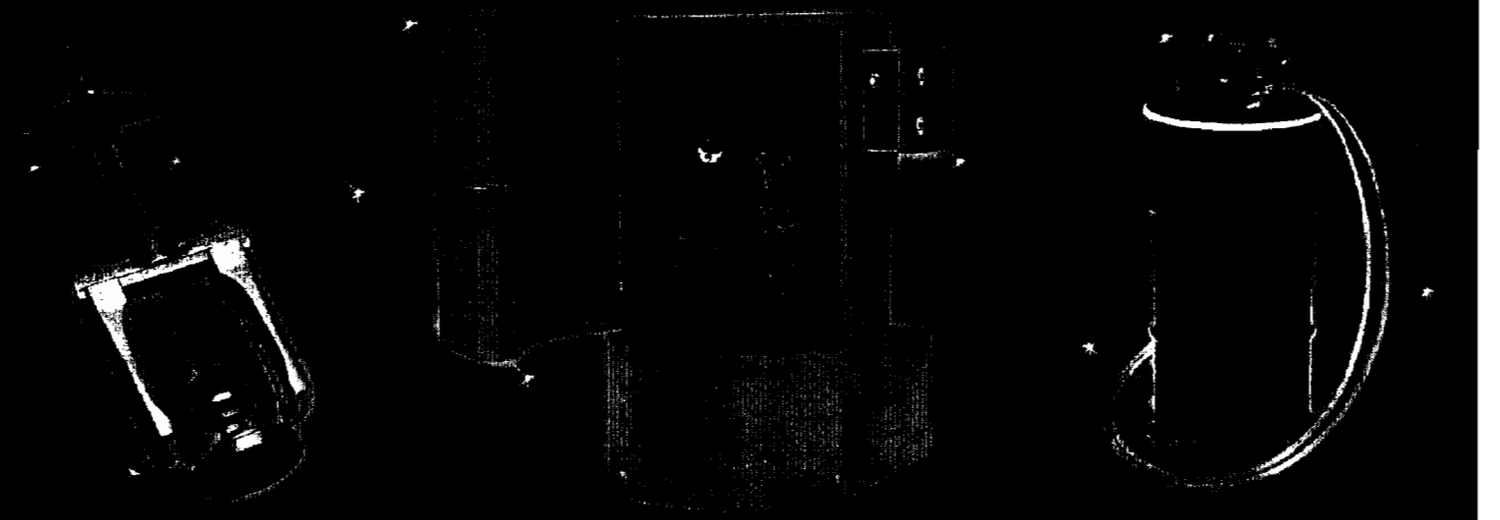
Fine Pitch Example: $\frac{I = 70 + S = 38}{S = 38} = \frac{108}{38} = 2.84$

Figure 4

1991 THM 4T60-E MODELS					
TRANSAXLE MODEL CODE	DESCRIPTION	FINAL DRIVE RATIO/ROTOR	SPROCKETS DRIVE/DRIVEN	STALL SPEED	STRUCTURAL SIDE COVER
1AHW, 1AVW	4.9L CADILLAC (EXPORT)	3.06/30	37/33	1825	
1AMW, 1A2W	4.9L CADILLAC E/K BODY	3.33/30	37/33	1825	
1APW, 1A4W	4.9L CADILLAC C/K BODY (EXPORT)	3.33/30	37/33	1825	
1AYW, 1A7W	4.9L CADILLAC E/K BODY (TOUR)	3.33/30	35/35	1825	
1AZW	4.9L CADILLAC C BODY (LIMO)	3.06/32	37/33	1825	
1YMW	3800 V6 C/H BODY	2.84/30	35/35	1420	
1YPW	3800 V6 REATTA	3.33/30	35/35	1897	
1YZW	3800 V6 C/H BODY	3.33/30	35/35	1897	
1CWW	3.4L DOHC W BODY (NON PWM)	3.06/30	33/37	2095	
1BTW	3800 V6 C BODY	3.33/31	37/33	1897	

Figure 5

ENTER THE ATEC ZONE



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1992 THM 4T60-E MODELS

TRANSAXLE MODEL CODE	DESCRIPTION	FINAL DRIVE RATIO/ROTOR	SPROCKETS DRIVE/DRIVEN	STALL SPEED	STRUCTURAL SIDE COVER
2AVW, 2A5W	4.9L CADILLAC C - BODY (EXPORT)	3.06/30	37/33	1825	
2AMW, 2A2W	4.9L CADILLAC E/K - BODY	3.33/31	37/33	1825	
2ABW, 2A1W	4.9L CADILLAC C - BODY	3.06/30	37/33	1825	
2ANW, 2A3W	4.9L CADILLAC C - BODY	3.33/30	37/33	1825	
2APW, 2A4W	4.9L CADILLAC E/K - BODY (EXPORT)	3.33/31	37/33	1825	
2AWW, 2A6W	4.9L CADILLAC C - BODY (EXPORT)	3.33/30	37/33	1825	
2AZW, 2A8W	4.9L CADILLAC C - BODY (LIMO)	3.06/32	37/33	1825	
2AYW, 2A7W	4.9L CADILLAC E/K - BODY	3.33/31	35/35	1825	
2BTW, 2B1W	3.8L C - BODY	3.33/31	37/33	1897	
2BYW, 2B2W	3800 C/H - BODY SSE	3.06/31	35/35	1897	
2CLW, 2C1W	3800 C/H - BODY	2.84/30	35/35	1420	
2CSW, 2C2W	3800 C/H - BODY	3.06/30	35/35	1897	
2CTW, 2C3W	3800 C/H - BODY SSE	3.06/31	35/35	1897	
2CWW, 2C4W	3.4L W - BODY (NON PWM)	3.06/30	33/37	2095	
2CXW, 2C5W	3800 C - BODY	3.33/31	37/33	1897	
2CZW, 2C6W	3.8L H - BODY SSEI/SSE	3.33/31	37/33	1897	
2PHW, 2P1W	3.8L H - BODY SSE	3.33/31	37/33	1897	
2WAW, 2W1W	3800 C/H - BODY & GM200 (U - BODY)	3.06/31	35/35	1897	
2YLW, 2Y1W	3800 C/H - BODY	2.84/31	35/35	1420	
2YMW, 2Y2W	3800 C/H - BODY	2.84/30	35/35	1420	
2YZW, 2Y4W	3800 C/H - BODY	3.06/30	35/35	1897	

Figure 6

1993 THM 4T60-E MODELS					
TRANSAXLE MODEL CODE	DESCRIPTION	FINAL DRIVE RATIO/ROTOR	SPROCKETS DRIVE/DRIVEN	STALL SPEED	STRUCTURAL SIDE COVER
3ABW	4.9L CADILLAC C - BODY	306/30	37/33	1825	
3AMW	4.9L CADILLAC E/K - BODY	333/31	37/33	1825	
3ANW	4.9L CADILLAC C - BODY	333/30	37/33	1825	
3APW	4.9L CADILLAC E/K - BODY (EXPORT)	333/31	37/33	1825	
3AVW	4.9L CADILLAC C - BODY	306/30	37/33	1825	
3AWW	4.9L CADILLAC C - BODY (EXPORT)	333/30	37/33	1825	
3AZW	4.9L CADILLAC C - BODY (LIMO)	306/32	37/33	1825	
3BTW	3800 C - BODY	333/31	37/33	1897	
3BYW	3800 H - BODY	306/31	35/35	1897	
3CLW	3800 C/H - BODY	284/30	35/35	1420	
3CSW	3800 C/H - BODY (EXPORT)	333/30	35/35	1897	
3CTW	3800 H - BODY SSE	306/31	35/35	1897	
3CXW	3800 C - BODY	306/31	37/33	1897	
3CZW	3800 H - BODY SSEI/SSE	333/31	37/33	1897	
3PHW	3800 H - BODY SSE	333/31	37/33	1897	
3WAW	3800 C/H - BODY & GM200 (U - BODY)	306/31	35/35	1897	
3YMW	3800 C/H - BODY	284/30	35/35	1420	
3YZW	3800 C/H - BODY (EXPORT)	306/30	35/35	1897	
3CWW	3.4L W - BODY (NON PWM)	306/30	33/37	2095	
3CMW	3.1L W - BODY (NON PWM)	333/30	35/35	2060	
3YLW	3800 H - BODY	284/31	35/35	1420	
3YRW	3800 E - BODY	306/30	35/35	1897	
3BHW	3.1L W - BODY	333/30	35/35	2095	YES/4 BOLT

Figure 7

1994 THM 4T60-E MODELS					
TRANSAXLE MODEL CODE	DESCRIPTION	FINAL DRIVE RATIO/ROTOR	SPROCKETS DRIVE/DRIVEN	STALL SPEED	STRUCTURAL SIDE COVER
4ATW	4.9L CADILLAC K - BODY	306/31	37/33	1825	
4CLW	2.3L QUAD-4 N - BODY	306/29	33/37	2095	YES/6 BOLT
4PHW	2.3L QUAD-4 N - BODY	333/29	33/37	2363	YES/6 BOLT
4AFW	3.1L W - BODY	333/30	35/35	2095	YES/4 BOLT
4AJW	3.1L A - BODY (EXPORT)	333/29	37/33	1630	
4CMW	3.1L W - BODY (NON PWM)	333/30	35/35	2060	
4PAW	3.1L A - BODY	333/29	37/33	1630	
4WSW	3.1L L/N - BODY	333/29	37/33	1630	YES/6 BOLT
4PBW	3.4L W - BODY	306/30	33/37	2060	YES/4 BOLT
4BLW	3800 W - BODY	306/31	35/35	1897	YES/4 BOLT
4KUW	3800 U - BODY	306/31	35/35	1897	
4KHW	3800 SUPERCHARGED H - BODY	333/31	37/33	1897	
4PFW	3800 H - BODY	306/31	35/35	1897	
4WAW	3800 C/H - BODY	306/31	35/35	1897	
4YCW	3800 SUPERCHARGED C/H - BODY	333/31	37/33	1897	
4YMW	3800 H - BODY	284/30	35/35	1420	
4YZW	3800 H - BODY	306/30	35/35	1897	

Figure 8

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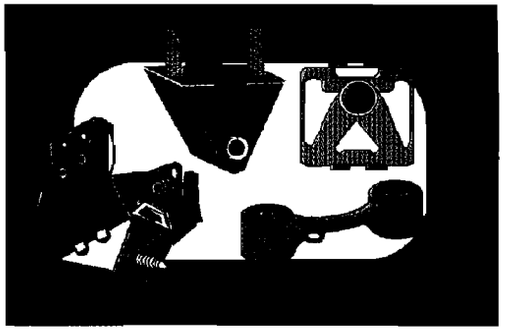

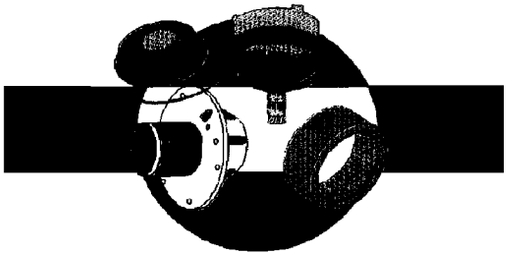

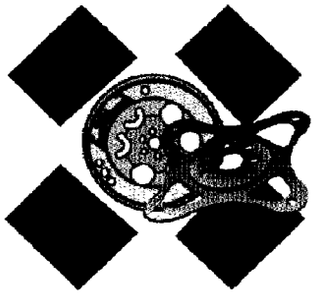

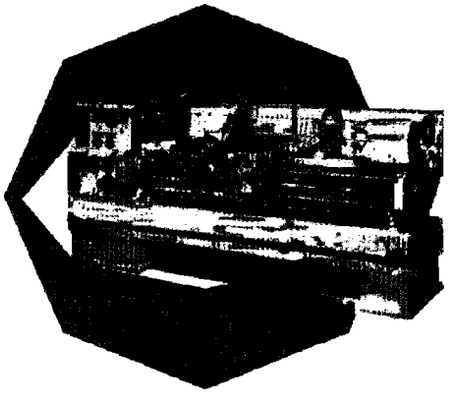

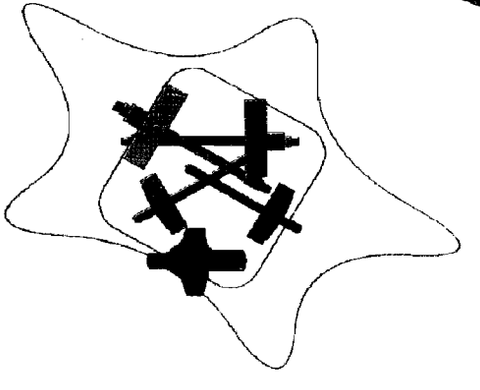

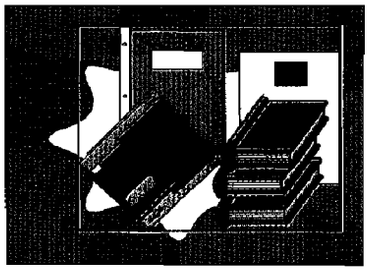

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305-888-8215 fax
secrazsoap@earthlink.net

1995 THM 4T60-E MODELS					
TRANSAXLE MODEL CODE	DESCRIPTION	FINAL DRIVE RATIO/ROTOR	SPROCKETS DRIVE/DRIVEN	STALL SPEED	STRUCTURAL SIDE COVER
5ATW	4.9L CADILLAC K - BODY	306/31	37/33	1825	
5PCW	2.3L QUAD 4 N - BODY	* 329/29	33/37	2363	YES/6 BOLT
5AFW	3.1L W - BODY	333/30	35/35	2095	YES/4 BOLT
5AJW	3.1L A - BODY (EXPORT)	333/29	37/33	1630	
5PAW	3.1L A - BODY	333/29	37/33	1630	
5WFW	3.1L L/N - BODY	* 329/29	37/33	1630	YES/6 BOLT
5PBW	3.4L W - BODY	306/30	33/37	2060	YES/4 BOLT
5BLW	3800 W - BODY	306/31	35/35	1897	YES/4 BOLT
5CAW	3800 G - BODY	* 305/31	35/35	1897	YES/6 BOLT
5BFW	3800 SUPERCHARGED G - BODY	* 329/31	37/33	1897	YES/6 BOLT
5KUW	3800 U - BODY	306/31	35/35	1897	
5PMW	3800 U - BODY (EXPORT)	306/30	35/35	1897	
5ACW	3800 C/H - BODY	306/30	35/35	1897	
5ASW	3800 C/H - BODY	284/30	35/35	1420	
5YZW	3800 H - BODY	306/30	35/35	1897	
5BXW	3800 H - BODY	306/31	35/35	1897	
5BKW	3800 H - BODY	306/31	35/35	1897	
5YMW	3800 H - BODY	284/30	35/35	1420	
5YDW	3800 SUPERCHARGED C/H - BODY	333/31	37/33	1897	
5YNW	3800 SUPERCHARGED H - BODY	333/31	37/33	1897	

** 3.05 AND 3,29 RATIOS ARE "FINE PITCH" FINAL DRIVES. SUN GEARS, INTERNAL RING GEARS AND PINION GEARS ARE NOT INTERCHANGEABLE WITH OTHER FINAL DRIVES.*

Figure 9

1996 THM 4T60-E MODELS

TRANSAXLE MODEL CODE	DESCRIPTION	FINAL DRIVE RATIO/ROTOR	SPROCKETS DRIVE/DRIVEN	STALL SPEED	STRUCTURAL SIDE COVER
6CUW	2.4L N - BODY	* 305/30	33/37	2363	YES/6 BOLT
6AFW	3.1L W - BODY	333/30	35/35	2095	YES/4 BOLT
6AJW	3.1L A - BODY (EXPORT)	333/30	37/33	1630	
6PAW	3.1L A - BODY	333/30	37/33	1630	
6WFW	3.1L L - BODY	* 329/30	37/33	1630	YES/6 BOLT
6BSW	3.1L N - BODY	* 329/30	37/33	1630	YES/6 BOLT
6PBW	3.4L W - BODY	306/30	33/37	2060	YES/4 BOLT
6PKW	3.4L U - VAN	* 329/30	35/35	1897	
6CAW	3800 G - BODY	* 305/30	35/35	1897	YES/6 BOLT
6HBW	3800 W - BODY	306/30	35/35	1897	YES/4 BOLT
6ACW	3800 C/H - BODY	306/30	35/35	1897	
6ASW	3800 C/H - BODY	284/30	35/35	1420	
6BXW	3800 H - BODY	306/30	35/35	1897	
6YLW	3800 SUPERCHARGED C/H - BODY (H.D.)	* 329/30	37/33	1897	
6YRW	3800 SUPERCHARGED H - BODY (H.D.)	* 329/30	37/33	1897	
6CTW	3800 SUPERCHARGED G - BODY (H.D.)	* 329/30	37/33	1897	YES/6 BOLT

** 3.05 AND 3,29 RATIOS ARE "FINE PITCH" FINAL DRIVES. SUN GEARS, INTERNAL RING GEARS AND PINION GEARS ARE NOT INTERCHANGEABLE WITH OTHER FINAL DRIVES.*

Figure 10

THM 4T60-E

CHANNEL PLATE IDENTIFICATION FOR MODELS WITH "NO" MANUAL LOW

CHANGE: Beginning at the start of production for 1994 model vehicles, some models of the 4T60-E Transaxle were produced with a unique six position inside detent lever, and unique channel plate for these models, that eliminates the Manual Lo position on the indicator.

REASON: To allow installation of 4 speed transaxles in vehicles that used the 3 speed shift linkages and were previously equipped with THM 125C transaxles.

PARTS AFFECTED:

(1) INSIDE DETENT LEVER - Stamped with six positions for the detent spring instead of the current seven position, that eliminates the Manual Lo position, as shown in Figure 1. The part numbers are stamped on the detent levers that will help identification.

(2) CHANNEL PLATE - New casting that incorporates the Manual 1st and Manual 2nd cavities, as shown in Figure 1. The two channel plates have different casting numbers for identification as shown in Figure 1.

(3) 2ND START SWITCH - Most of the vehicles using the six position detent lever will also have a 2nd Start Switch located on the instrument panel, and when depressed will allow the vehicle to start off in second gear, when additional traction is needed.

INTERCHANGEABILITY:

None of the parts listed above will interchange with seven position detent lever parts. The six position inside detent lever ***must*** be used with channel plate casting number 8683656, and the seven position inside detent lever ***must*** be used with channel plate casting number 8683657, as shown in Figure 1. We have provided the vehicle models, engine sizes, and transaxle codes that used the six position detent lever in production. Refer to the chart below.

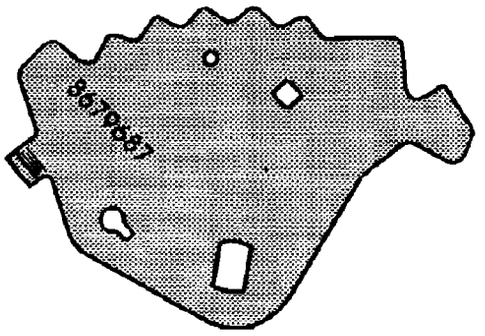
PRODUCT APPLICATION:

Year	*Codes*	*Engine*	*Body*
1994	**4CLW, 4PHW,**	**2.3L**	**"N" Body**
1994	**4WSW,**	**3.1L**	**"L" & "N" Body**
1995	**5PCW,**	**2.3L**	**"N" Body**
1995	**5WFW,**	**3.1L**	**"L" & "N" Body**
1996	**6WFW,**	**3.1L**	**"L" Body**

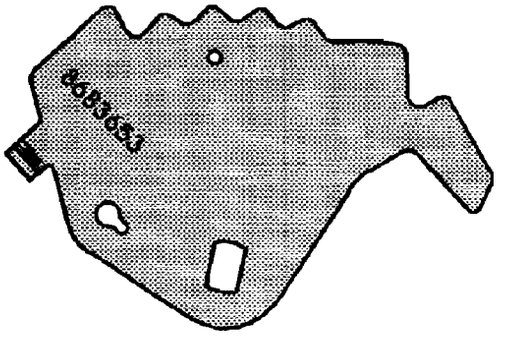
"N" Body = Oldsmobile Achieva, Pontiac Grand Am, Buick Skylark
"L" Body = Chevrolet Corsica, Chevrolet Beretta,

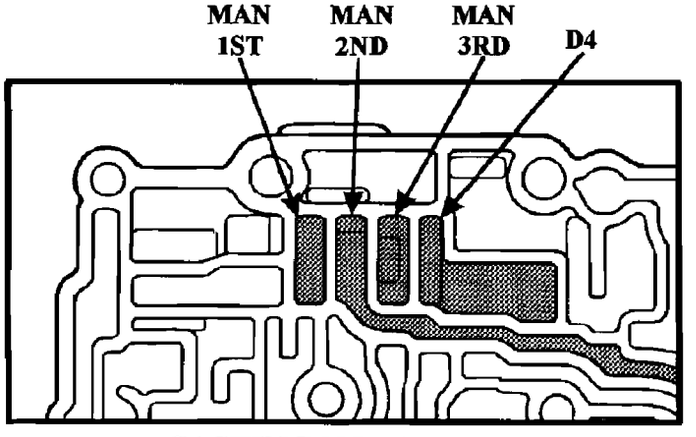
SLIDE

SEVEN POSITION DETENT LEVER

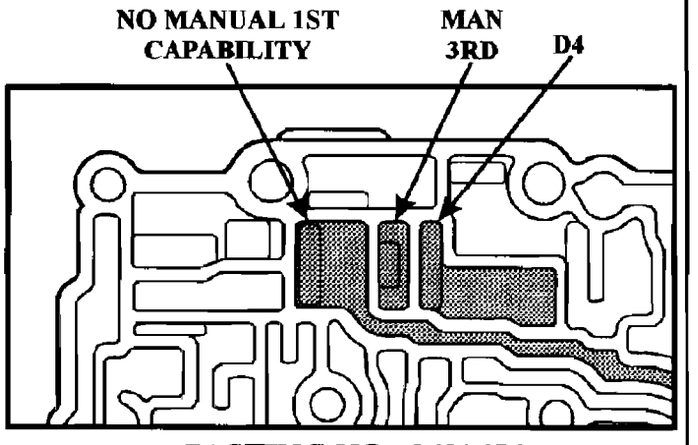


SIX POSITION DETENT LEVER





CASTING NO. 8683657



CASTING NO. 8683656

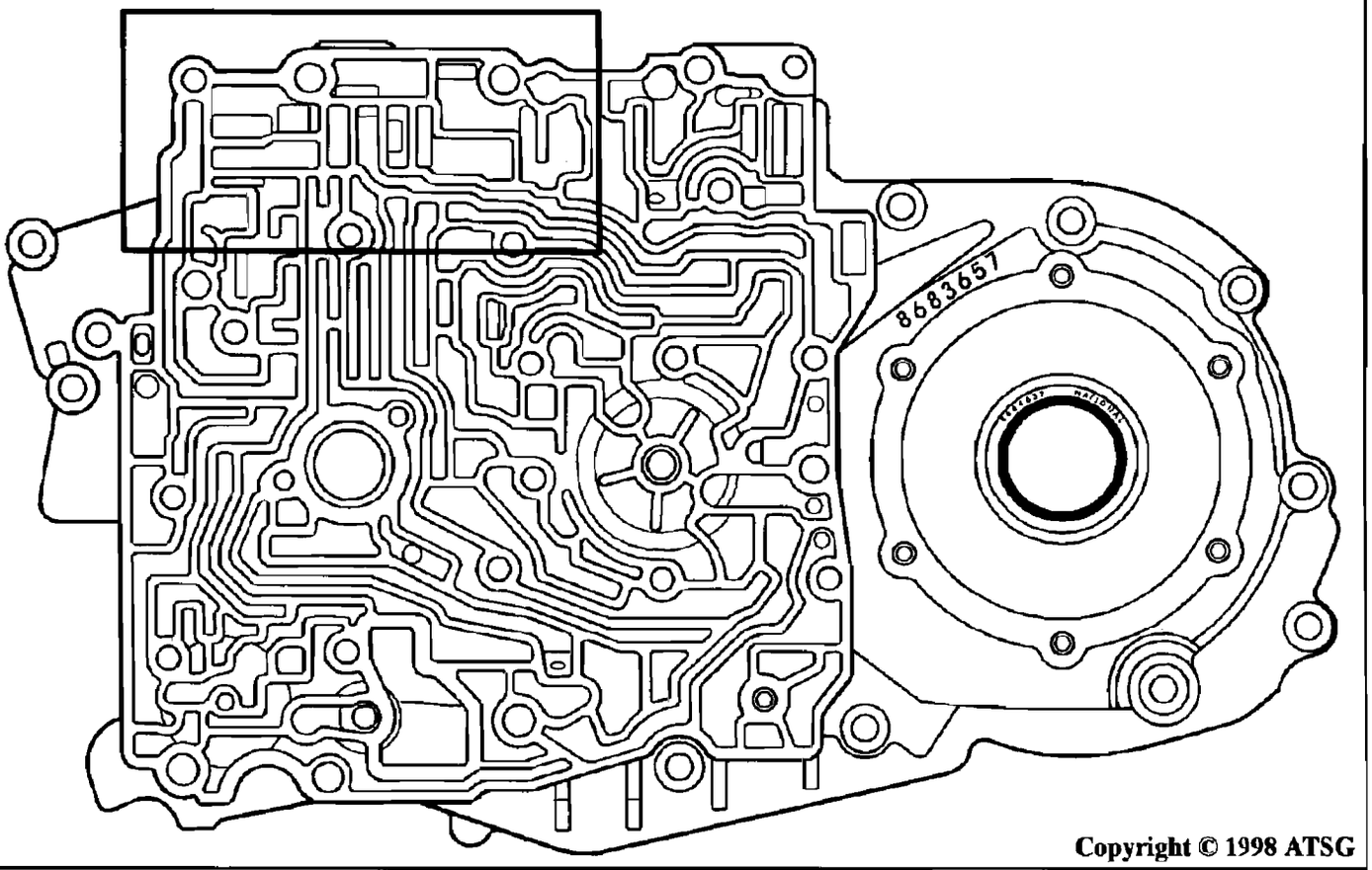


Figure 1

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

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

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

PARTS AFFECTED:

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

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

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

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

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

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

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

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

INTERCHANGEABILITY:

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

Special Note:

The Sonnax 1-2 Roller Spring Kit is highly recommended for 1991-1995 models to eliminate a condition of roller clutch destruction during freewheel. The Sonnax kit will not fit and is not needed for the 1996-Up models as the updated parts listed above eliminated the problem.

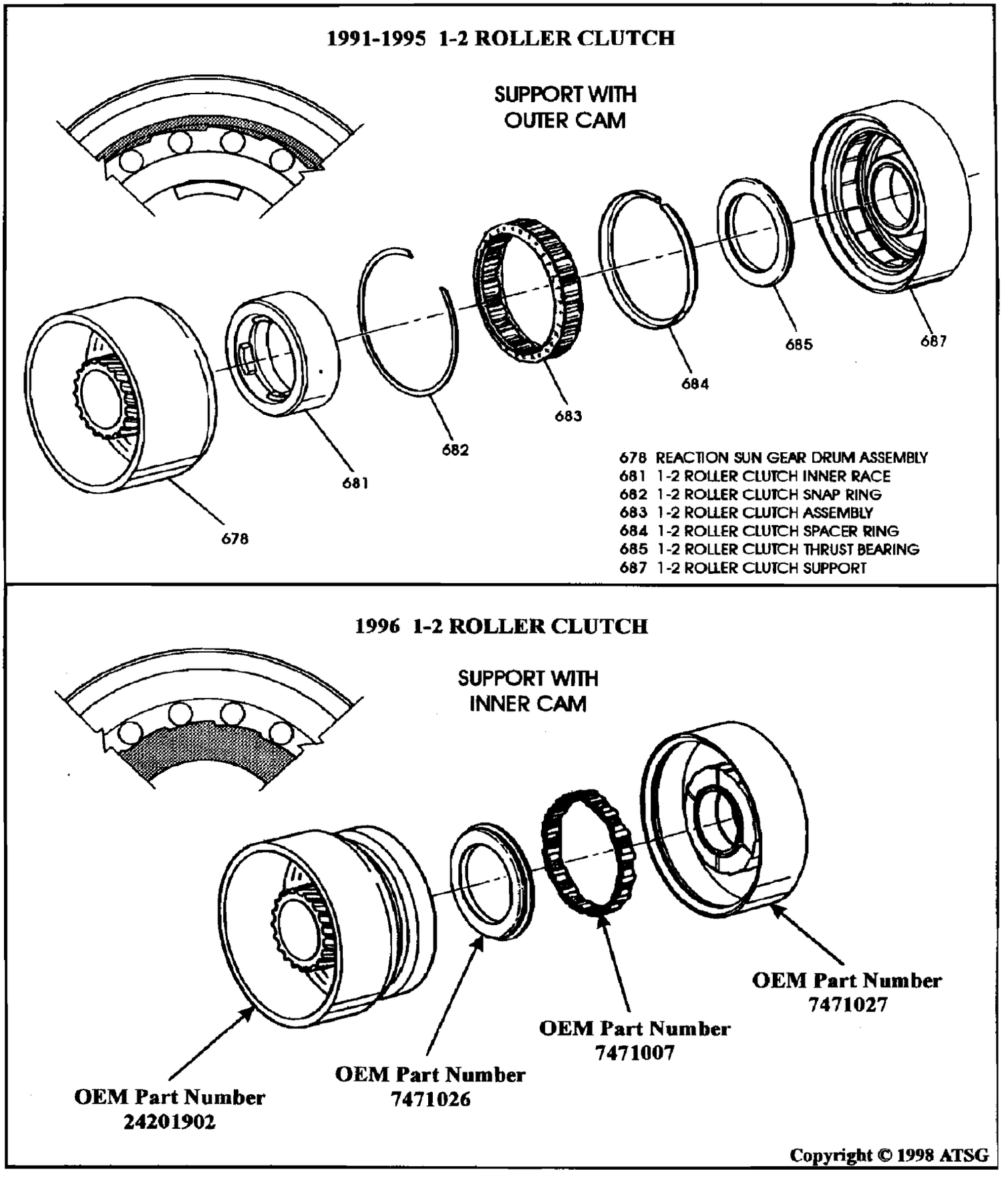

1991-1995 1-2 ROLLER CLUTCH
SUPPORT WITH
OUTER CAM
678
681
682
683
684
685
687
678 REACTION SUN GEAR DRUM ASSEMBLY
681 1-2 ROLLER CLUTCH INNER RACE
682 1-2 ROLLER CLUTCH SNAP RING
683 1-2 ROLLER CLUTCH ASSEMBLY
684 1-2 ROLLER CLUTCH SPACER RING
685 1-2 ROLLER CLUTCH THRUST BEARING
687 1-2 ROLLER CLUTCH SUPPORT
1996 1-2 ROLLER CLUTCH
SUPPORT WITH
INNER CAM
OEM Part Number
24201902
OEM Part Number
7471026
OEM Part Number
7471007
OEM Part Number
7471027
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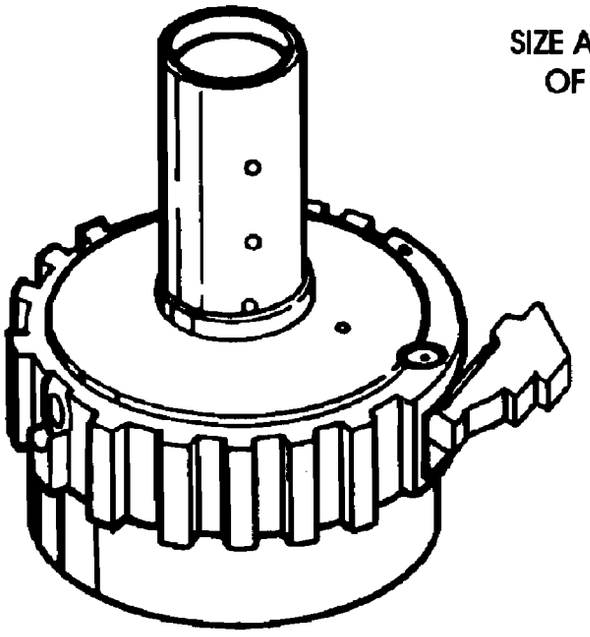
Figure 1

1991-1995 FINAL DRIVE
RING GEAR SUPPORT



1996 FINAL DRIVE
RING GEAR SUPPORT

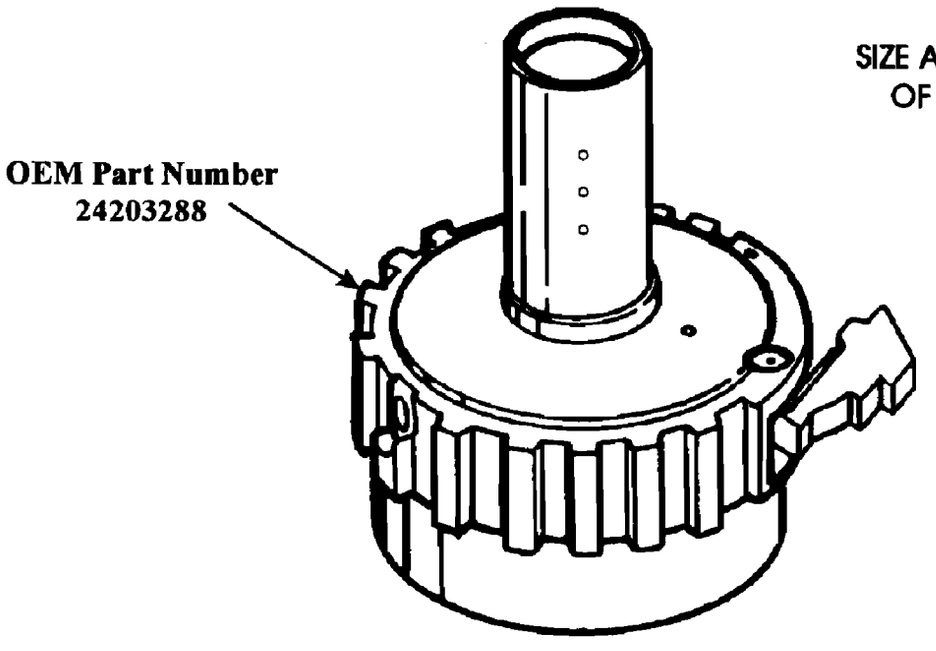


Figure 2

THM 4T60-E

NEW DESIGN PUMP AND ROTOR FOR 1994 MODELS

CHANGE: Beginning at the start of production for 1994 models, all THM 4T60-E transaxles were produced with a new design "Tapered" pump rotor and new design pump casting with location changes for the suction passage. Refer to Figures 1 and 2.

REASON: New tapered rotor increases pump capacity and reduces cavitation for improved durability, and the random vane spacing reduces a noise concern.

PARTS AFFECTED:

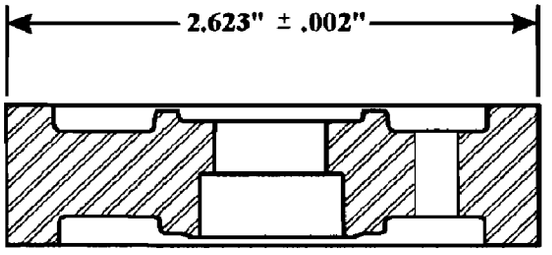
(1) PUMP ROTOR - New design is now "Tapered" instead of the previous straight rotor, as shown in Figure 1. The "L" Body and "N" Body vehicles were built using the random spacing of the rotor vanes (34°, 40° and 46°) similar to the 4L60-E design. All other models will use a "Tapered" rotor with equal spacing of the rotor vanes (40°) as shown in Figure 1. All slides, rotors and vanes are still selective sizes.

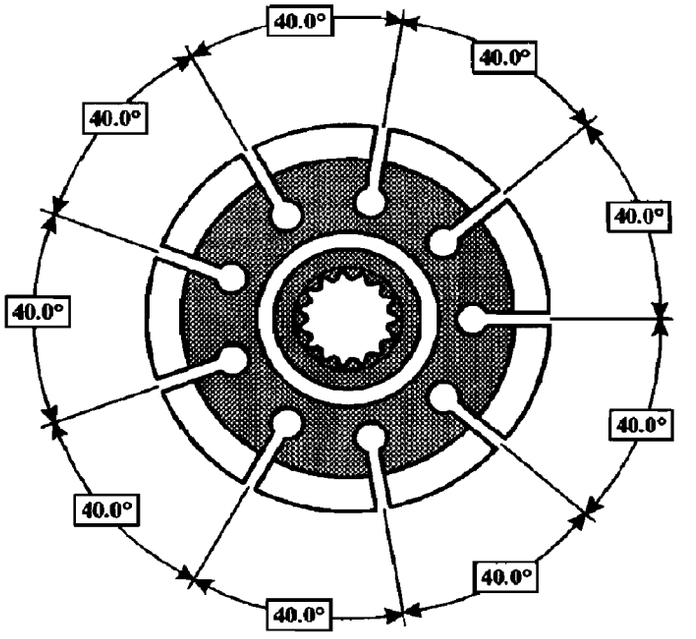
(2) PUMP BODY - The new design pump body for the tapered rotor has the suction slot in the pump pocket re-sized and moved closer to the center hole for the oil pump drive shaft as shown in Figure 2.

INTERCHANGEABILITY:

The new design pump body ***must*** be used with the tapered rotor because of the new location of the suction slot in the pump pocket. If the previous design (Straight) pump rotor is used in the new design casting, the rotor will cover a portion of the suction slot (See Figure 2).
The new design tapered rotor will retro-fit back in all models of the 4T60-E transaxle.
The new design pump assembly as a package, will also back service all models of the 4T60-E.

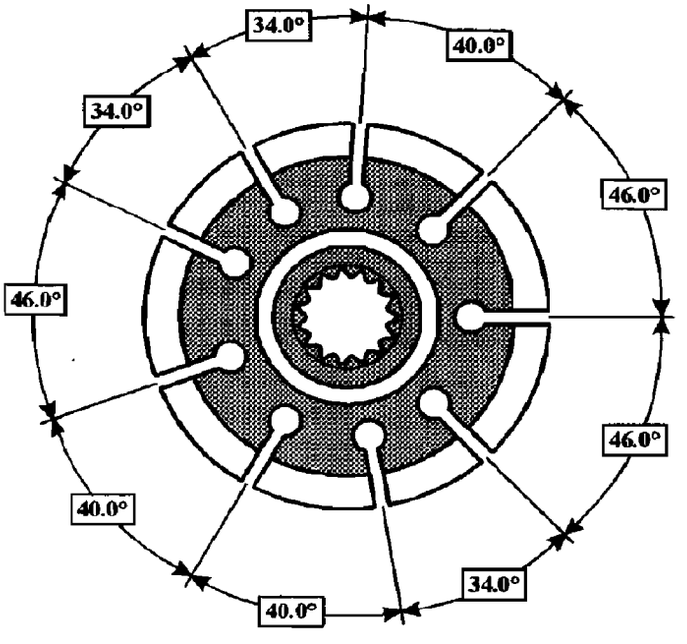
PREVIOUS DESIGN "STRAIGHT" PUMP ROTOR

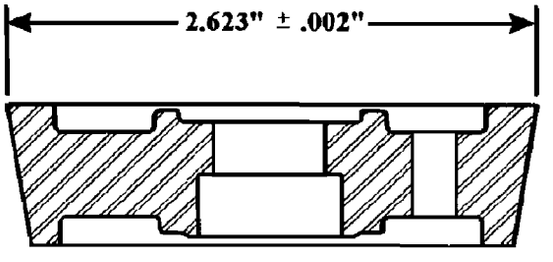




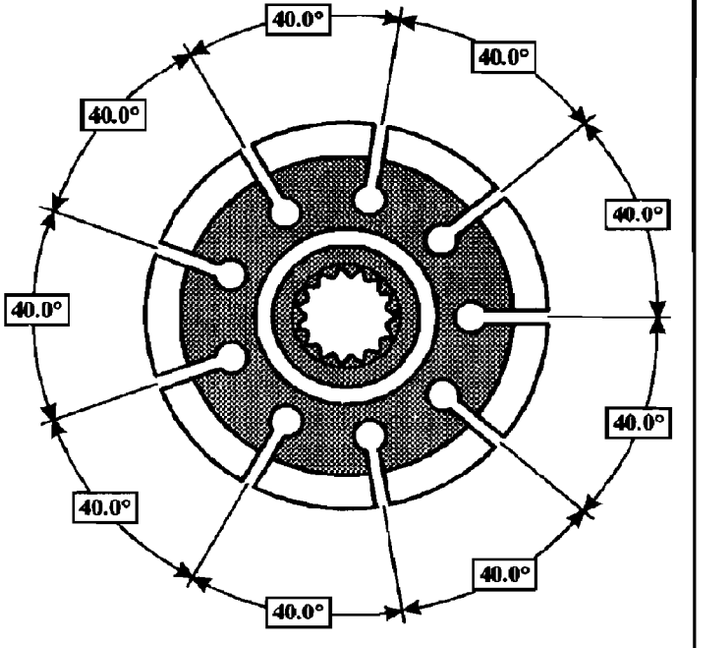
NEW DESIGN "TAPERED" PUMP ROTOR

L & N CAR





A, H, C, K, U & W CAR



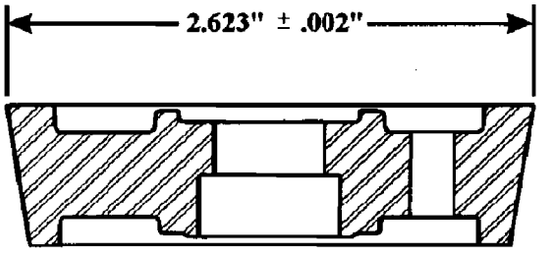


Figure 1

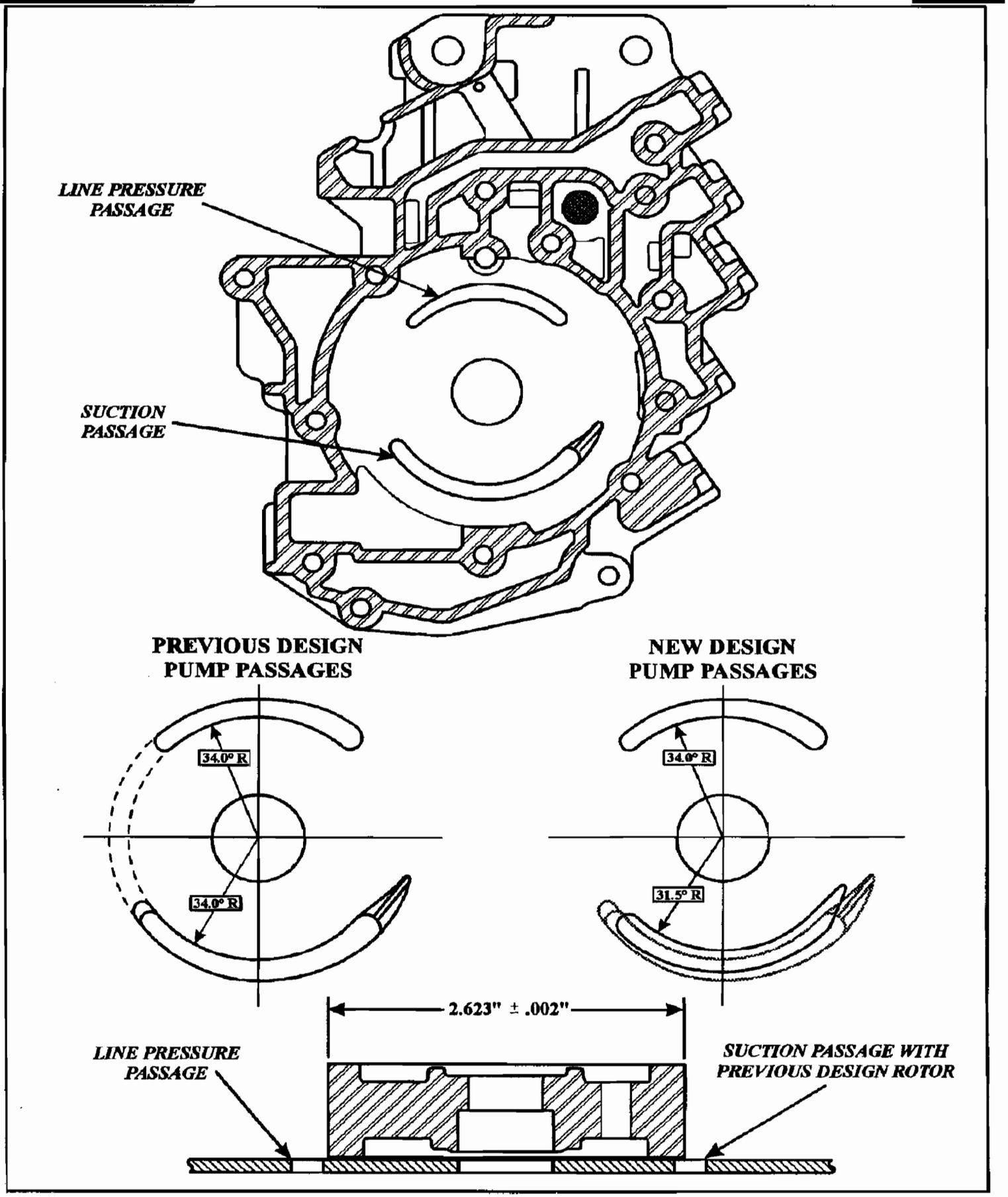

LINE PRESSURE PASSAGE
SUCTION PASSAGE
PREVIOUS DESIGN PUMP PASSAGES
34.0° R
34.0° R
NEW DESIGN PUMP PASSAGES
34.0° R
31.5° R
2.623" ± .002"
LINE PRESSURE PASSAGE
SUCTION PASSAGE WITH PREVIOUS DESIGN ROTOR

Figure 2

THM 4T60-E
NO UPSHIFT, AFTER REBUILD

COMPLAINT: After rebuild, you experience a condition of no upshift, transaxle stays in 1st gear. When checking with a scanner, it indicates that all solenoid commands have been given for second, third and fourth gears.

CAUSE: The cause may be, the 2nd Clutch Return Spring installed upside down in the second clutch housing. The 2nd clutch is the driving member for 2nd, 3rd and 4th gears. With the 2nd clutch return spring upside down, the 2nd clutch cannot be applied. If the 2nd clutch cannot be applied you will remain in 1st gear.

CORRECTION: Install the 2nd Clutch Return Spring assembly into the 2nd clutch housing in the proper direction, as shown in Figure 1. The return spring assembly has four tabs that are bent over to hold the assembly together that should face up. After installation of the complete clutch pack, air check the 2nd clutch housing and ensure that the lined plates are clamped.

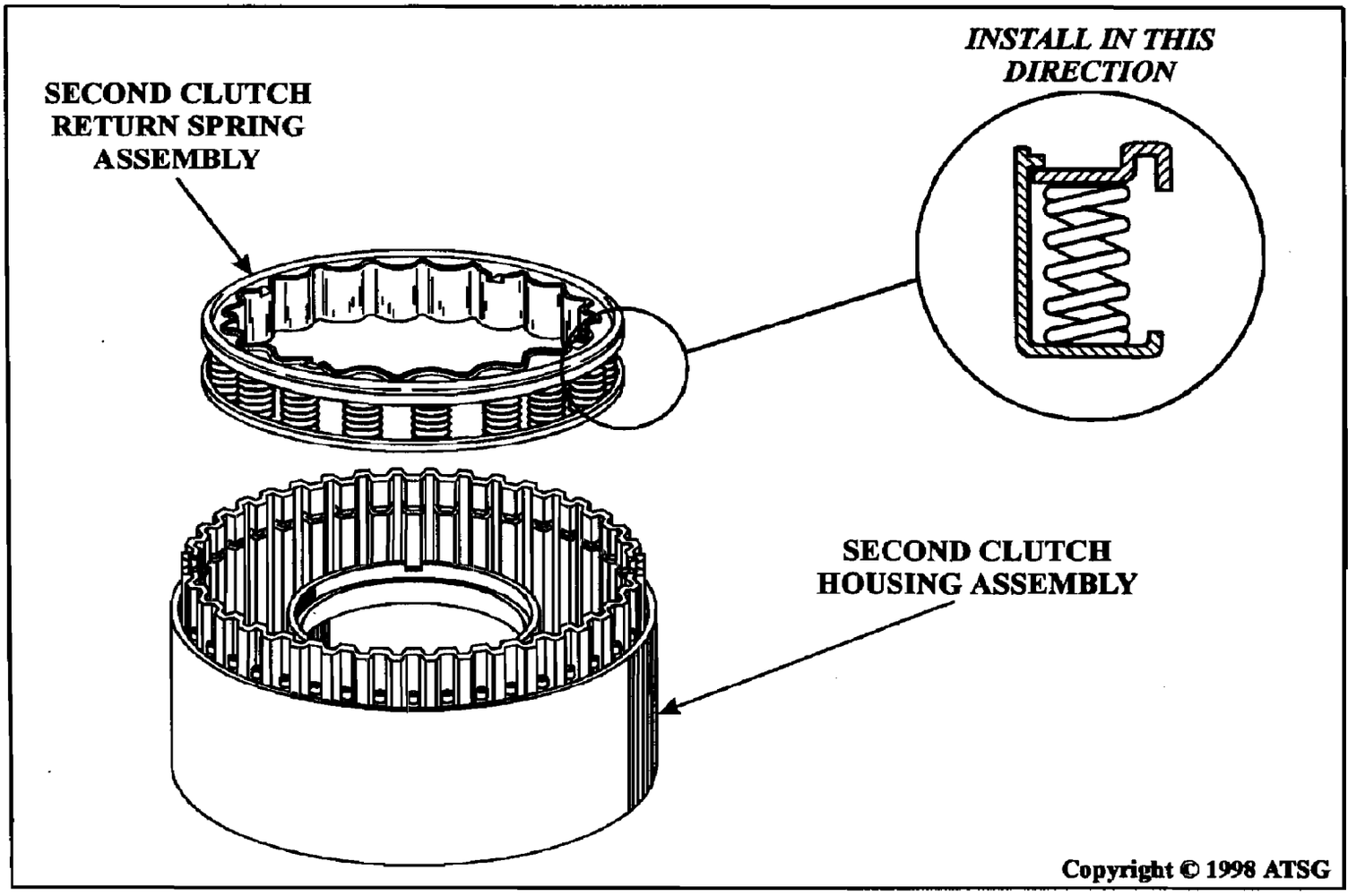


Figure 1

THM 4T60-E
PREMATURE 2ND CLUTCH FAILURE

COMPLAINT: After rebuild, you experience a condition of premature 2nd clutch failure, and after inspecting the unit you can find no root cause for the failure.

CAUSE: The cause may be, the 2nd Clutch Housing Inner Liner is cracked. When this inner liner, that is "TIG" welded into the housing, is cracked it is impossible to detect with an air check of the 2nd clutch housing. The inner liner is cracked because of second clutch pressure applying force against the pressure plate snap ring. With the weld point being much inboard of the pressure point the inner liner will crack just outside of the weld, as illustrated in Figure 1.
The only successfull way to determine if the drum is cracked, is to pry upward on the inner liner using a screwdriver, with a ***very small*** amount of oil left in the bottom of the housing.

CORRECTION: There ***must*** be a new 2nd Clutch Housing installed into the unit, as the cracked one cannot be successfully repaired. To prevent this from occuring again, spot weld the inner liner to the on the new second clutch housing with a "TIG" welder every sixth tooth around the housing, as illustrated in Figure 1.

Compliments Of,
Ed Lee at Deltrans
Newark, Delaware

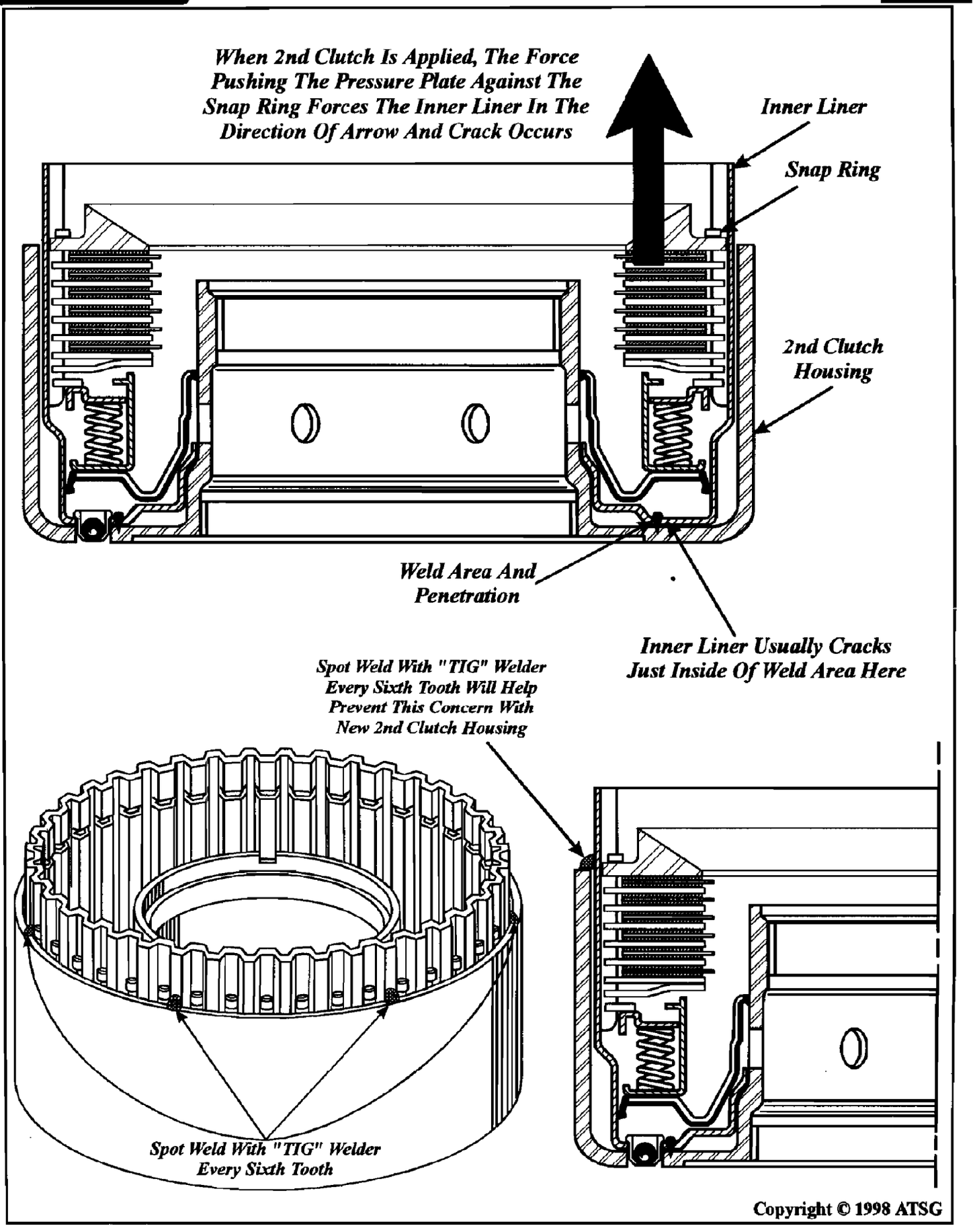

When 2nd Clutch Is Applied, The Force Pushing The Pressure Plate Against The Snap Ring Forces The Inner Liner In The Direction Of Arrow And Crack Occurs
Inner Liner
Snap Ring
2nd Clutch Housing
Weld Area And Penetration
Inner Liner Usually Cracks Just Inside Of Weld Area Here
Spot Weld With "TIG" Welder Every Sixth Tooth Will Help Prevent This Concern With New 2nd Clutch Housing
Spot Weld With "TIG" Welder Every Sixth Tooth
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Figure 1

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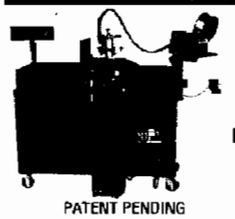
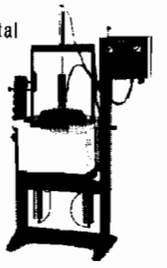


PATENT PENDING

Welds Vertical or Horizontal



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- Operator friendly and safe
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- Air adjusted regulators
- Torque converter locks in place at 90° Angle - In the event of a leak, flip to lock position and tack leak fast and easy

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- Easy as 1-2-3
- Bonds a piston every 5 min.
- Adjustable heat & timer controls
- Aluminum bonder dies provide even heat distribution
- Compact & efficient
- No wait-no freight
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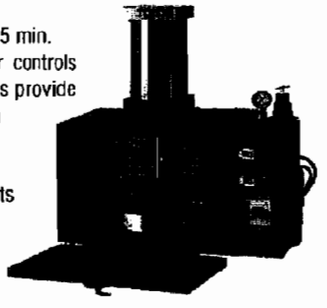
- Pat. # 5.141.586



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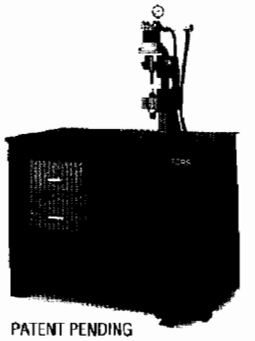

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SATURN
NEW ACTUATORS FOR 1998

CHANGE: During the 1998 model year, a running change was made by Saturn to the control actuators used for the 2nd/Rev Clutch, the 3rd Clutch and the 4th Clutch. This change involves added screens on the new actuator, and now creates three different actuators depending on the model year that you are working on, as illustrated in Figure 1. 1st Design actuators, identified with the Black/Blue Tops are to be used in 1991-1992 model vehicles only. 2nd Design actuators identified with the Red Tops, are to be used in 1993-1996 model vehicles, and in 1997-1999 model vehicles in the Torque Converter Clutch (TCC) and Transaxle Fluid Pressure (TFP) positions only. The 3rd Design actuators identified with the White Tops, are to be used in 1997-1999 model vehicles in the 2nd/Rev Clutch, the 3rd Clutch and the 4th Clutch positions only in the valve body, as illustrated in Figure 2.

REASON: Reduces the possibility for debris to stick a control actuator valve.

PARTS AFFECTED:

(1) ACTUATORS - 3rd Design now has screens added to the control pressure side of the actuators as illustrated in Figure 1, has the same resistance values as the 2nd Design actuators, and is identified with the White Plastic Tops. The 2nd Design actuator is identified by the Red Tops as shown in Figure 1. The 1st Design actuator is identified by the Black/Blue Tops as shown in Figure 1.

INTERCHANGEABILITY:

Since there is now three different actuators that will not all interchange and are model dependent, we have provided you with a chart in Figure 2 that shows which actuators fit in the various model years.

SERVICE INFORMATION:

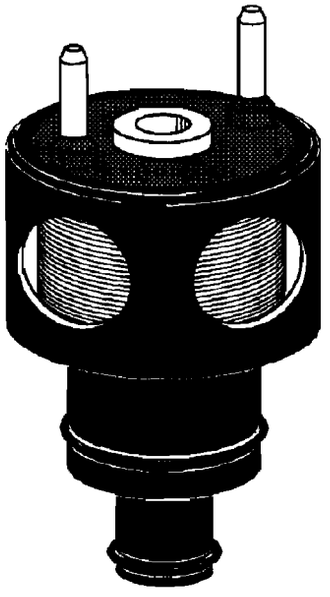
Actuator, 91-92 Model Only (Black/Blue Tops)	21002248
Actuator, 93-96 All and 97-99 Model TCC & TFP (Red Tops)	21002509
Actuator, 97-99 Model 2nd/Rev, 3rd, and 4th Clutch (White Tops)	21003289

SPECIAL NOTE:

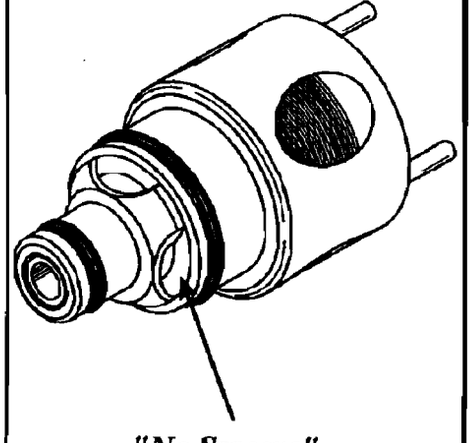
3rd Design actuators (White Top) should be used only in the 2nd/Rev Clutch, 3rd Clutch and 4th Clutch positions in the valve body. Poor shifts may occur if the 3rd Design actuator is used in the TCC and/or TFP positions in the valve body (See Figure 2).

1ST DESIGN CONTROL ACTUATOR SOLENOIDS FITS 1991-1992 ONLY

Black or Blue Plastic Tops For Identification



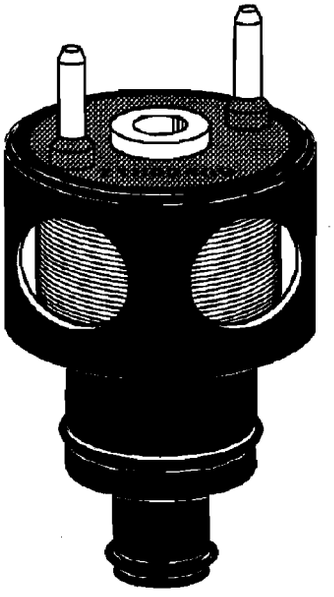
Measures 2.5 to 4.5 Ohms Resistance



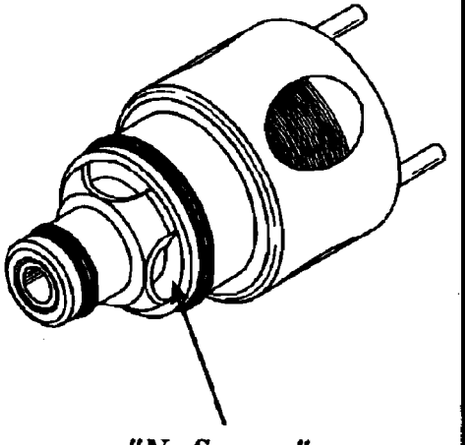
"No Screens" Part Number 21002248

2ND DESIGN CONTROL ACTUATOR SOLENOIDS FITS ALL 1993-1996 AND 1997-1999 TCC AND TFP

Red Plastic Tops For Identification



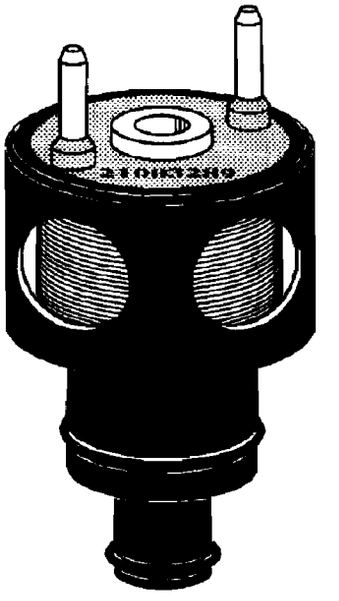
Measures 4.0 to 6.0 Ohms Resistance



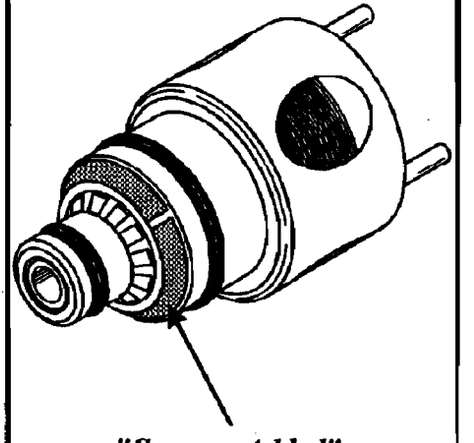
"No Screens" Part Number 21002509

3RD DESIGN CONTROL ACTUATOR SOLENOIDS FITS 1997-1999 2ND/REV, 3RD AND 4TH POSITIONS ONLY

White Plastic Tops For Identification



Measures 4.0 to 6.0 Ohms Resistance



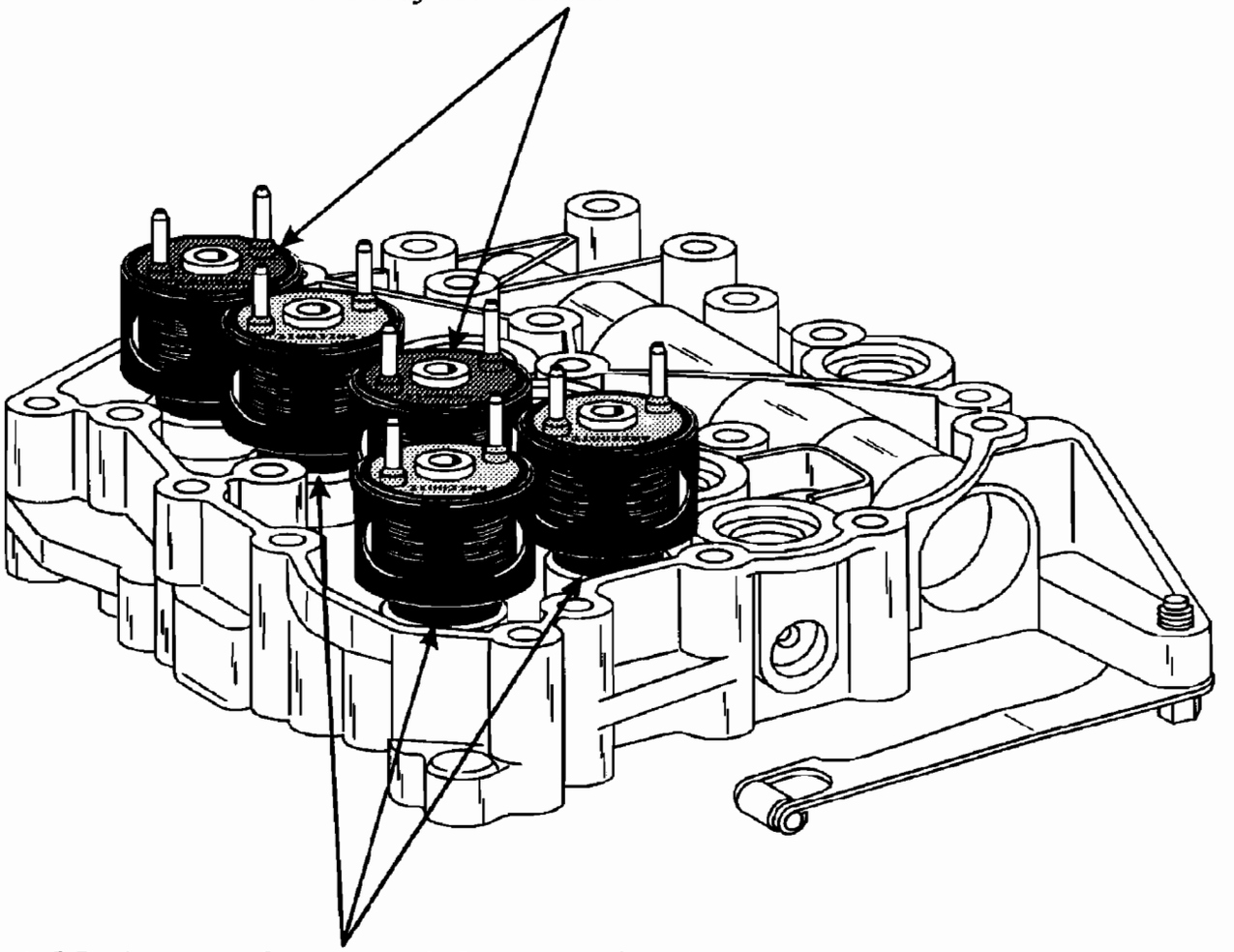
"Screens Added" Part Number 21003289

Figure 1

SLIDE

1997-1999 SATURN VALVE BODY

2nd Design control actuators (Red Tops) should be used in the Torque Converter Clutch (TCC) and the Transaxle Fluid Pressure (TFP) positions in the valve body as illustrated below.



3rd Design control actuators (White Tops) should be used "Only" in the 2nd/Reverse, 3rd and 4th Clutch positions in the valve body as illustrated .

SOLENOID CHART BY MODEL YEAR

YEAR	TCC	TFP	2ND/REV	3RD	4TH
1991-1992	*21002248*	*21002248*	*21002248*	*21002248*	*21002248*
1993-1996	*21002509*	*21002509*	*21002509*	*21002509*	*21002509*
1997-1999	*21002509*	*21002509*	*21003289*	*21003289*	*21003289*
Refer To Figure One For Identification Of Each Part Number Actuator.					

Figure 2

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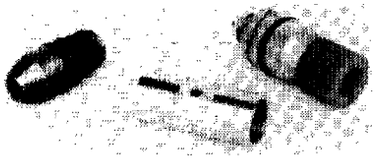
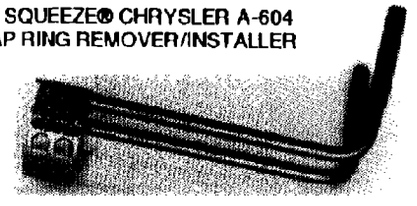
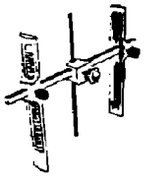
UNIVERSAL SPEEDOMETER DRIVEN GEAR REMOVER



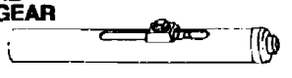
E-Z SQUEEZE® CHRYSLER A-604 SNAP RING REMOVER/INSTALLER



"Longer" UNIVERSAL END CLEARANCE GAUGE

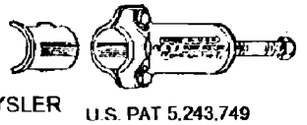


E-Z UNIVERSAL SPEEDOMETER GEAR INSTALLER



BIG 3 FRONT PUMP PULLER

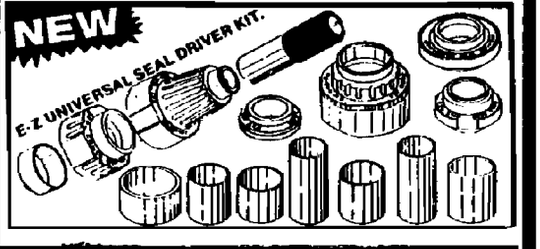
FORD, G.M., CHRYSLER



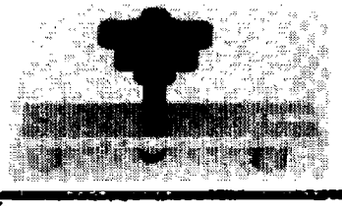
U.S. PAT 5,243,749

NEW

E-Z UNIVERSAL SEAL DRIVER KIT.



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



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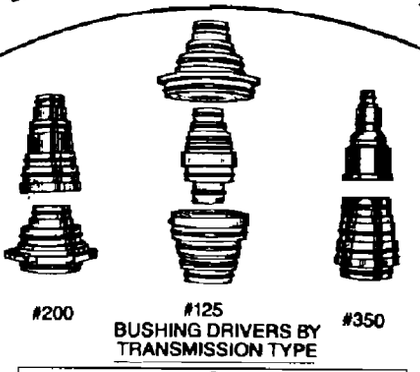
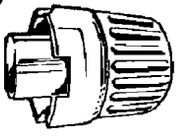


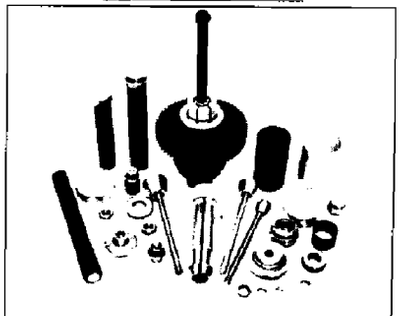
#200 #125 BUSHING DRIVERS BY TRANSMISSION TYPE #350

U.S. PATENT TUFFY #2994

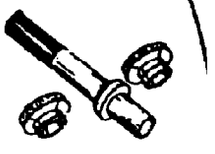


AXEL SEAL INSTALLER #1250

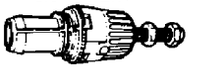
CLUTCH SPRING COMPRESSOR KIT #2987 U.S PATENT



CHRYSLER BEARING CUP & CONE SERVICE TOOLS U.S. PATENT NO. 4339865

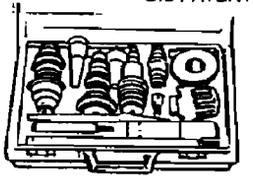


LO/REV. CLUTCH TOOLS #125-200 U.S. PATENT



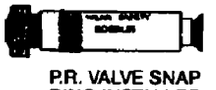
EXT. HOUSING BUSHING TOOL #2200 U.S. PATENT

#280A #280B BUSHING EXTRACTORS

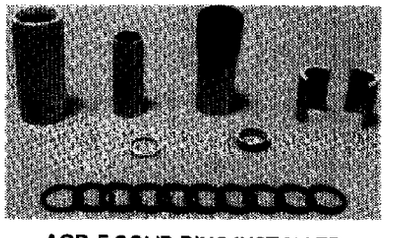


UNIVERSAL BUSHING DRIVER SET #1001

#280C BUSHING & SEAL CUTTER U.S. PATENT



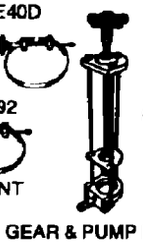
P.R. VALVE SNAP RING INSTALLER #2993



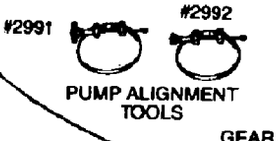
AOD-E SOLID RING INSTALLER

#2995 U.S. PATENT #2997 VALVE SPRING COMPRESSOR

U.S PATENT #280 SEAL PULLER



New E40D #2996 GEAR & PUMP PULLER



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VALVE BODY IDENTIFICATION AND PRESSURE SWITCH IDENTIFICATION

VALVE BODY NUMBER ONE:

Valve Body Number One and the auxiliary valve body that goes with it, are illustrated in Figure 1, and were used in 1982-1983 models. Most models used only the two terminal 3rd clutch switch and it was not used in all models. Refer to Figure 8 for 3rd clutch switch usage by model. Some of these models also used a governor switch screwed into the auxiliary valve body to control the converter clutch application, which requires a governor pressure passage drilled in the main valve body and the auxiliary valve body. This model auxiliary valve body also used an orificed cup plug in the channel behind the lock-up solenoid, to orifice line pressure down to a value that the solenoid could exhaust. This auxiliary valve body also has shift TV oil routed to the converter clutch regulator valve, which requires a shift TV pressure passage drilled in the main valve body. This valve body and auxiliary valve body combination is recommended for use only on 1982-1983 model vehicles. Refer to Figure One.

VALVE BODY NUMBER TWO:

Valve Body Number Two and the auxiliary valve body that goes with it, are illustrated in Figure 2, and were used in 1984-1986 and partial 1987 models. Most models used only the two terminal 3rd clutch switch and it was not used in all models. Refer to Figure 8 for 3rd clutch switch usage by model. Some of these models also used a governor switch screwed into the auxiliary valve body to control the converter clutch application, which requires a governor pressure passage drilled into the main valve body and the auxiliary valve body. The only difference between this valve body and auxiliary valve body combination, and the 1982-1983 version, is the orificed cup plug was removed from behind the lock-up solenoid. This combination requires a different auxiliary valve body cover gasket with a slot to orifice the oil to the solenoid. This valve body and auxiliary valve body combination can be used on 1982-1986 models and any 1987 model that still has the converter clutch regulator valve line-up and shift TV oil fed to the auxiliary valve body. Refer to Figure Two.

VALVE BODY NUMBER THREE:

Valve Body Number Three and the auxiliary valve body that goes with it, are illustrated in Figure 3, and were used in 1988-1989 models and partial 1987 models. Notice that the auxiliary valve body worm track configuration changes drastically, as the previous converter clutch regulator valve was removed and in its place goes a 3-2 Orifice Control Valve line-up. Notice also that the governor passage is now gone in both the main valve body and auxiliary valve body, and in its place is 2nd clutch oil to accommodate the addition of a 2nd clutch switch on some models. These models can use any one of three different 3rd clutch switches. Refer to Figure 8 for 3rd clutch switch and 2nd clutch switch usage by model, and Figures 10 and 11 for switch identification. This combination also requires a different auxiliary valve body cover gasket than number 1 or number 2. Notice also that this was the first year for the screen in the auxiliary valve body for the lock-up solenoid. 1988 was also the first year for a different case connector. Some models used a round case connector instead of the square one. Refer to Figure 8 for case connector usage by model and Figure 12 for case connector identification. This valve body and auxiliary valve body combination can be used on 1988-1989 models and any 1987 model that uses the 3-2 orifice control valve line-up and 2nd clutch pressure fed to the auxiliary valve body. Refer to Figure Three.

VALVE BODY NUMBER FOUR:

Valve Body Number Four and the auxiliary valve body that goes with it, are illustrated in Figure 4, and used in 1988-1989 models and partial 1987 models. The only difference between this combination and valve body number 3 is the orifice cup plug installed in the 2nd clutch oil passage in the main valve body, as shown in Figure 4. This valve body and auxiliary valve body combination should interchange with valve body number 3 without any functional problems. Refer to Figure Four.

VALVE BODY NUMBER FIVE:

Valve Body Number Five and the auxiliary valve body that goes with it, are illustrated in Figure 5, and used in 1990-1993 models. These models use a "Push-In" 3rd clutch switch instead of the screw-in and is a single terminal normally closed switch, which requires a different auxiliary valve body to accommodate the new 3rd clutch switch. Also notice that the auxiliary valve body has an extra passage drilled that the other 1990-Up auxiliary valve bodies that use the screw-in 3rd clutch switch do not have, directly above the round 3rd clutch feed passage. Even with these differences, the 1990-Up valve bodies and auxiliary valve bodies will interchange as long as the correct 3rd clutch switch and 2nd clutch switch are used for the model you are working on. Refer to Figures 8 and 9 for 2nd and 3rd clutch switch usage by model and Figures 10 and 11 for switch identification. Refer to Figures 8 and 9 for case connector usage and Figure 12 for case connector identification. This valve body and auxiliary valve body combination can be used on 1990-Up models as long as proper switch configurations are met. Refer to Figure Five.

VALVE BODY NUMBER SIX:

Valve Body Number Six and the auxiliary valve body that goes with it, are illustrated in Figure 6, and used in 1990-Up models. These models use a "Screw-In" 3rd clutch switch and 2nd clutch switch that are model sensitive. Refer to Figures 8 and 9 for 2nd and 3rd clutch switch usage by model and Figures 10 and 11 for switch identification. This valve body and auxiliary valve body combination can be used on 1990-Up models as long as proper switch configurations are met. Refer to Figure Six.

VALVE BODY NUMBER SEVEN:

Valve Body Number Seven and the auxiliary valve body that goes with it, are illustrated in Figure 7, and used in 1990-Up models. These models use a "Screw-In" 3rd clutch switch and 2nd clutch switch that are model sensitive. Also notice that the passage next to the 2nd clutch passage in the main valve body that normally carries 3rd clutch oil has not been drilled into the direct clutch passage, however we still have 3rd clutch oil fed to the auxiliary valve body through the small round hole. Refer to Figures 8 and 9 for 2nd and 3rd clutch switch usage by model and Figures 10 and 11 for switch identification. This valve body and auxiliary valve body combination can be used on 1990-Up models as long as proper switch configurations are met. Refer to Figure Seven.

INTERCHANGE CHART

	Auxiliary V.B. No. 1	*Auxiliary V.B. No. 2*	*Auxiliary V.B. No. 3*	*Auxiliary V.B. No. 4*	*Auxiliary V.B. No. 5*	*Auxiliary V.B. No. 6*	*Auxiliary V.B. No. 7*
Valve Body No. 1	*YES*	*YES*	*NO*	*NO*	*NO*	*NO*	*NO*
Valve Body No. 2	*NO*	*YES*	*NO*	*NO*	*NO*	*NO*	*NO*
Valve Body No. 3	*NO*	*NO*	*YES*	*YES*	*NO*	*NO*	*NO*
Valve Body No. 4	*NO*	*NO*	*YES*	*YES*	*NO*	*NO*	*NO*
Valve Body No. 5	*NO*	*NO*	*NO*	*NO*	*YES*	*YES*	*YES*
Valve Body No. 6	*NO*	*NO*	*NO*	*NO*	*YES*	*YES*	*YES*
Valve Body No. 7	*NO*	*NO*	*YES*	*YES*	*YES*	*YES*	*YES*

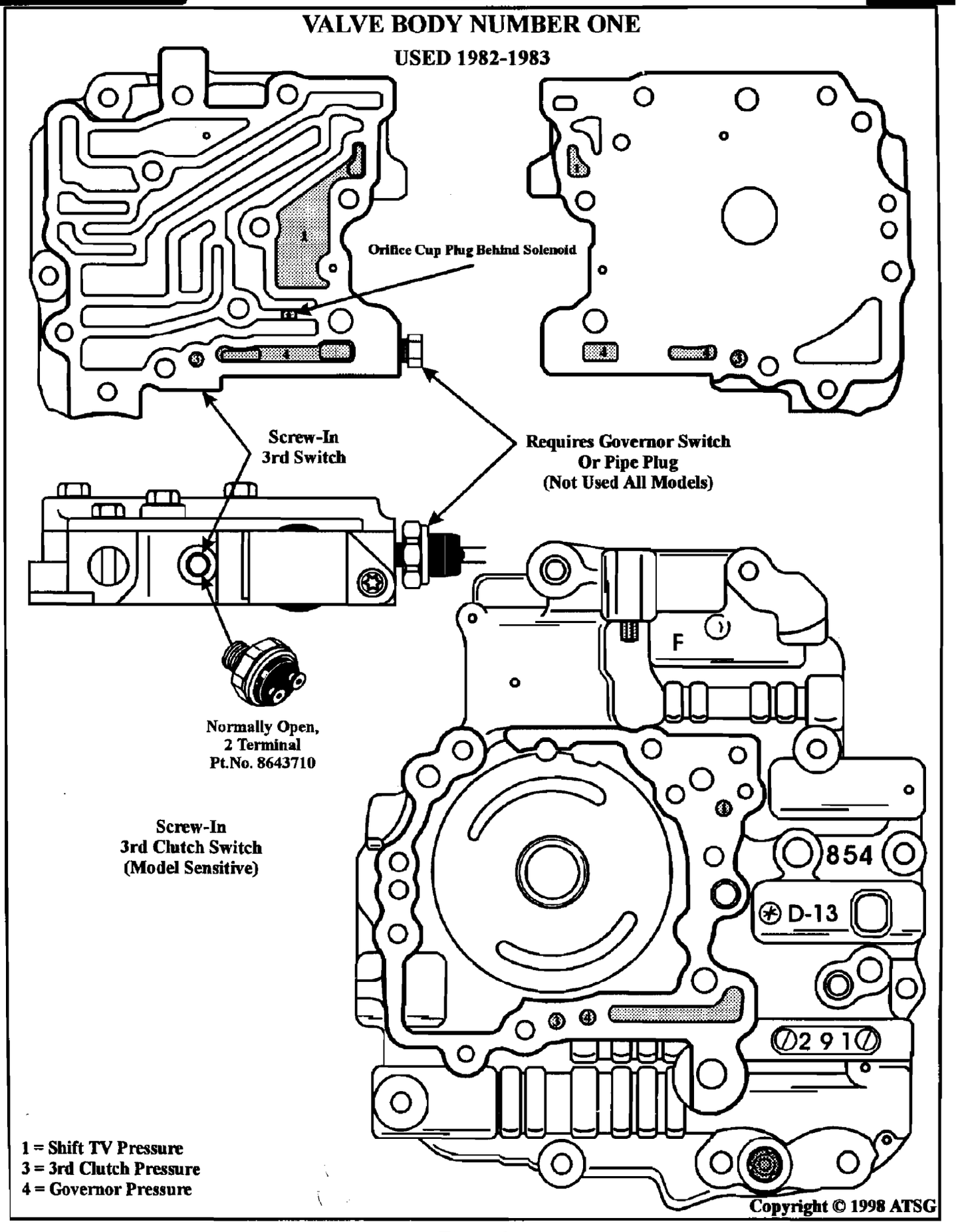

Figure 1

Automatic Transmission Service Group

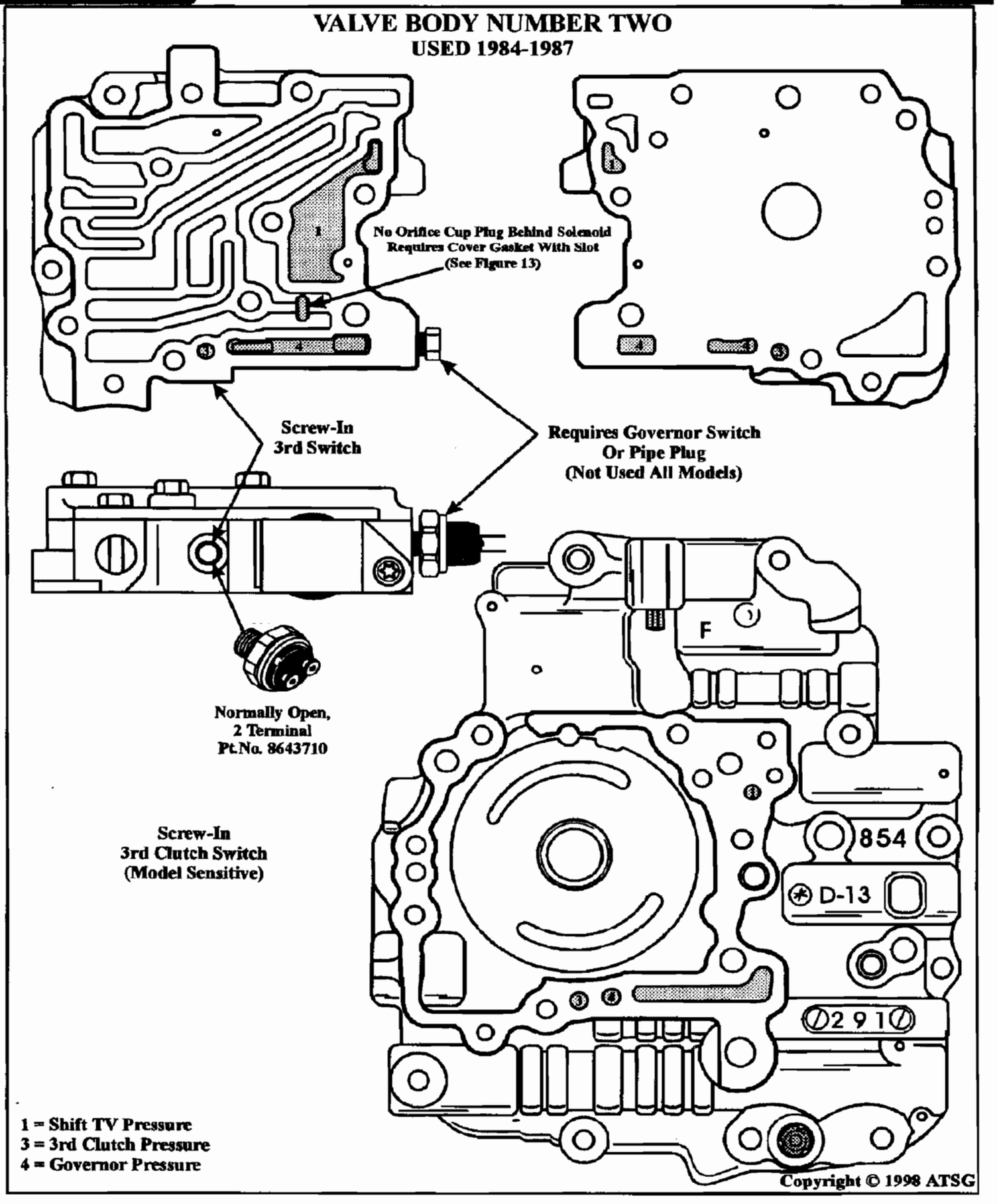
VALVE BODY NUMBER TWO
USED 1984-1987
No Orifice Cup Plug Behind Solenoid
Requires Cover Gasket With Slot
(See Figure 13)
Screw-In
3rd Switch
Requires Governor Switch
Or Pipe Plug
(Not Used All Models)
Normally Open,
2 Terminal
Pt.No. 8643710
Screw-In
3rd Clutch Switch
(Model Sensitive)
F
854
D-13
2 9 1
1 = Shift TV Pressure
3 = 3rd Clutch Pressure
4 = Governor Pressure
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Figure 2

SLIDE

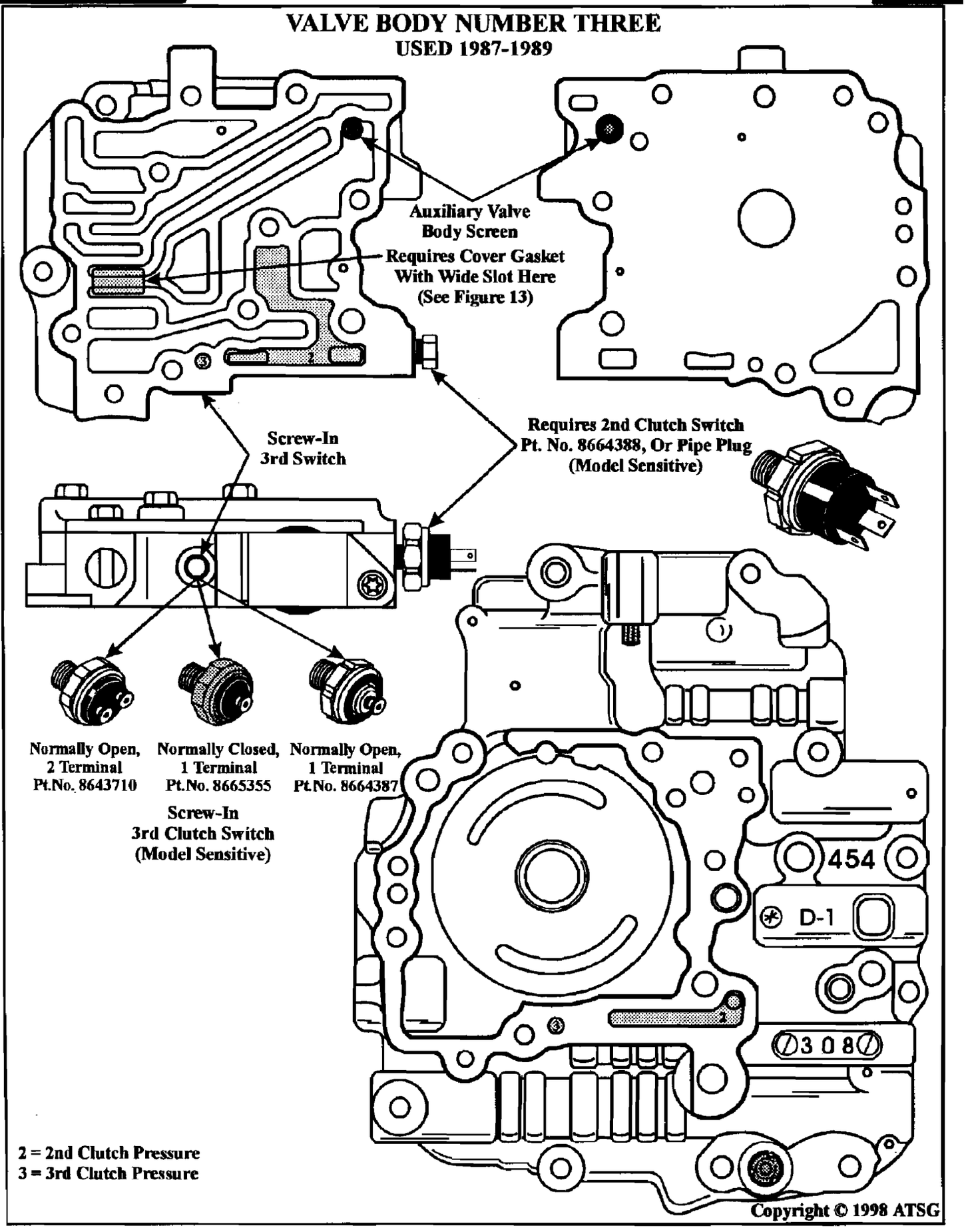


Figure 3

Automatic Transmission Service Group

VALVE BODY NUMBER FOUR

USED 1987-1989

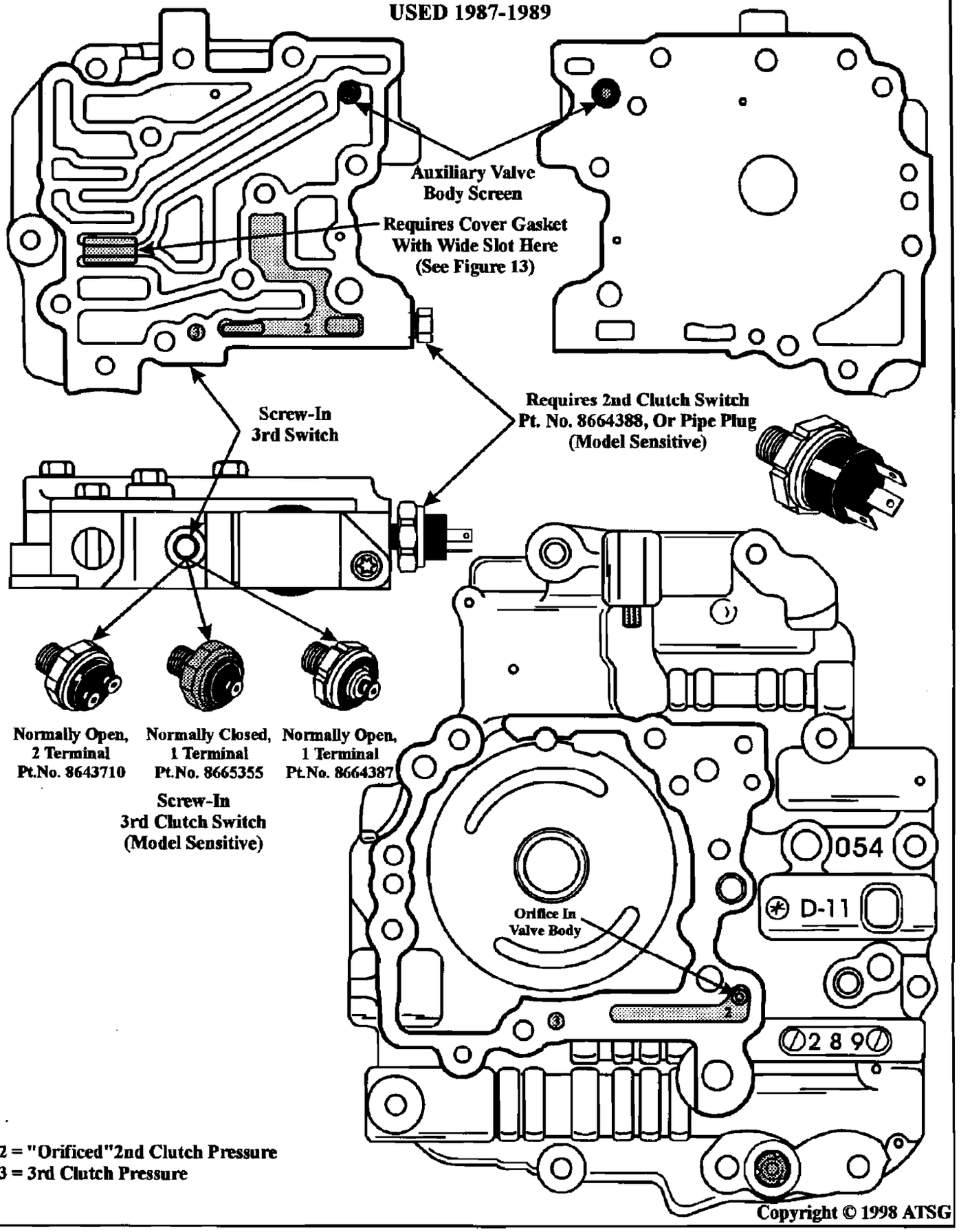


Figure 4

SLIDE

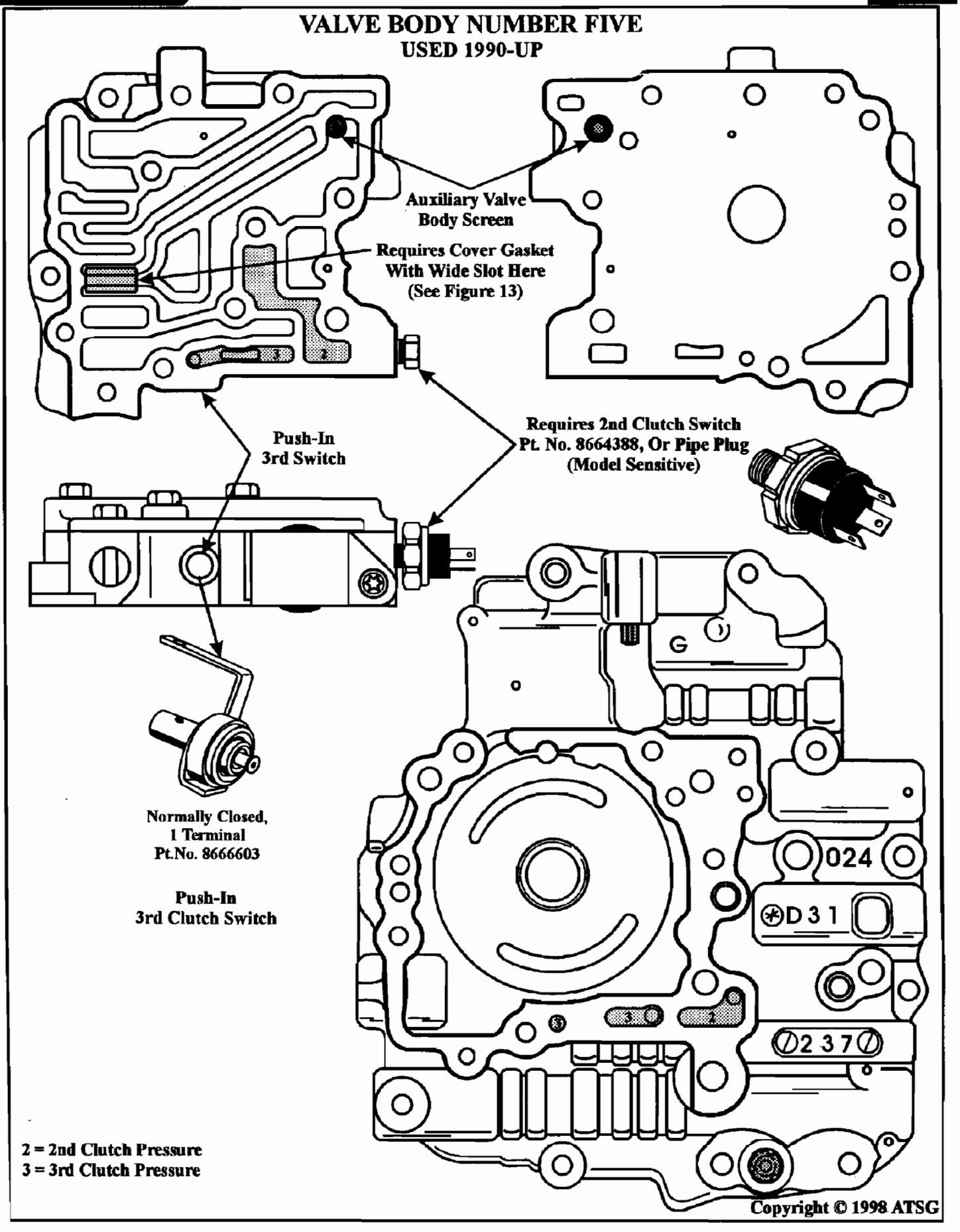


Figure 5

Automatic Transmission Service Group

SLIDE

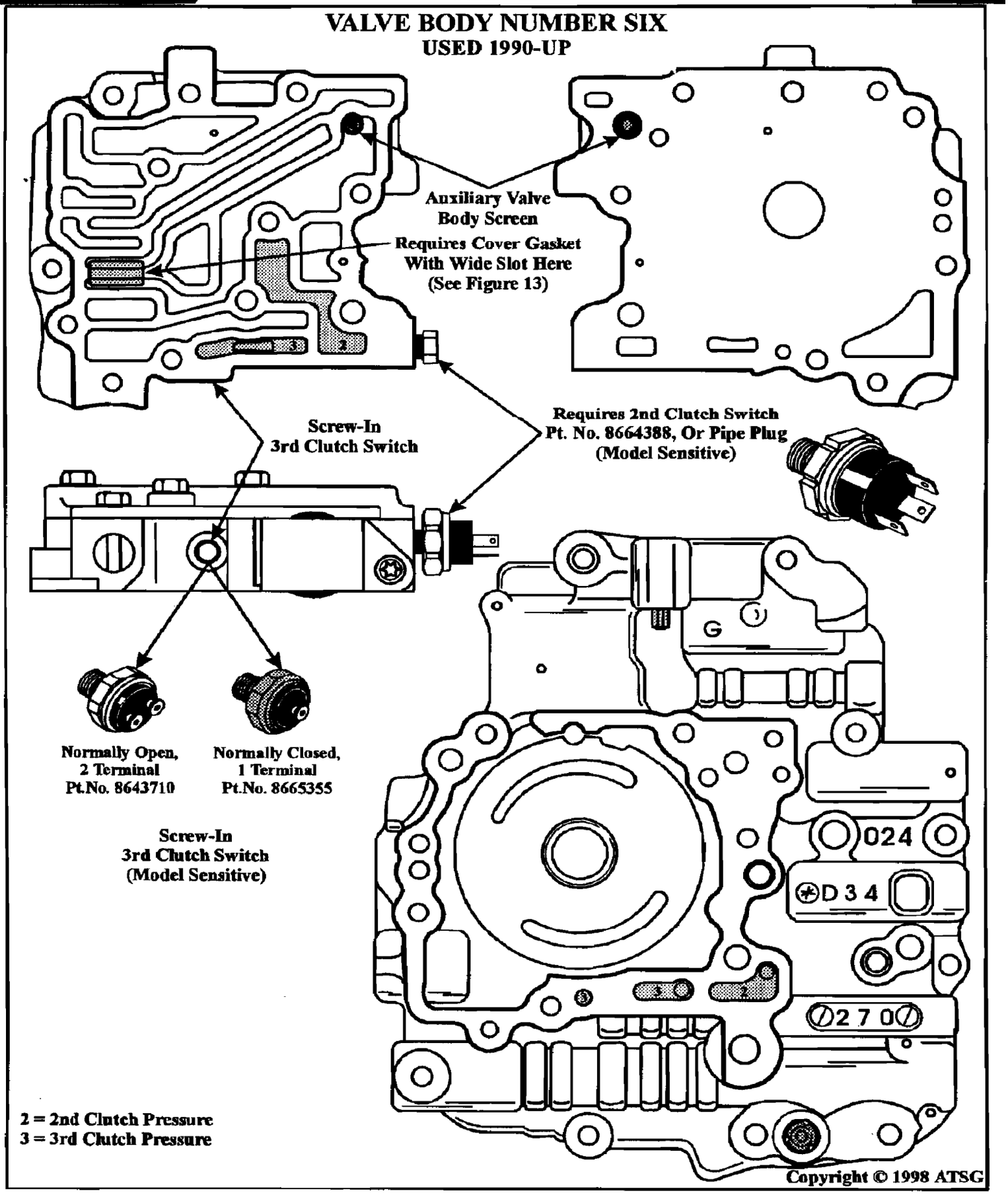


Figure 6

SLIDE

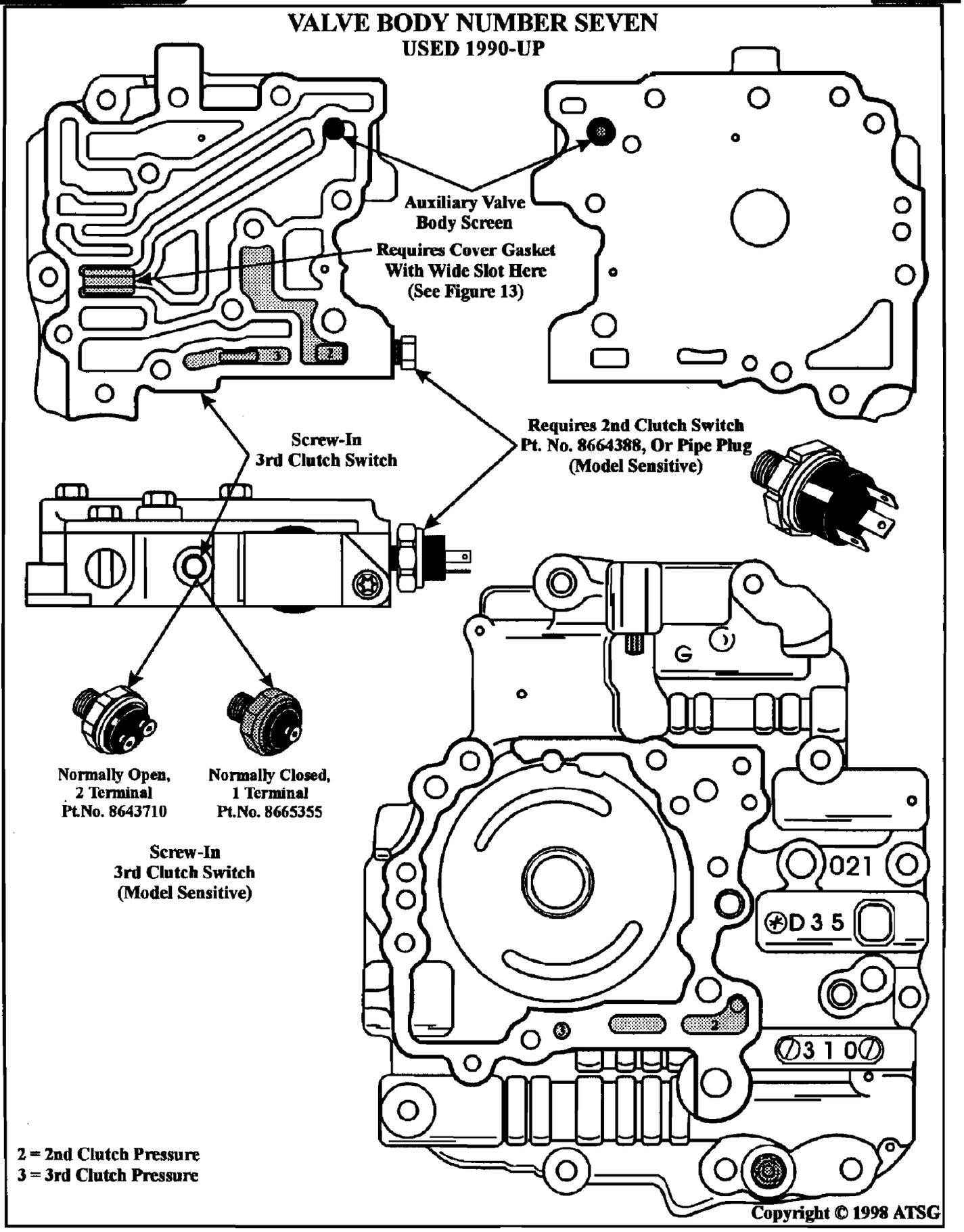


Figure 7

Automatic Transmission Service Group

1982-1985 MODELS

Transaxle Models	*3rd Clutch Switch (If Used)*	*T.C.C. Solenoid*	*Case Connector*	*Governor Switch (If Used)*
BF, BL, BP, CA, CB, CC, CD, CE, CI, CJ, CK, CL, CT, CU, CX, C2, C3, C4, H3, H4, PD, PE, PF, PG, PJ, PN, PW	8643710	8689901	8634383	8643370
HS, HV	8643710	8652378	8634383	8643370
OP	8652693	8652376	8634383	8643370

1986-1987 MODELS

Transaxle Models	*3rd Clutch Switch (If Used)*	*T.C.C. Solenoid*	*Case Connector*	*Governor Switch (If Used)*
ALL	8643710	8689901	8634383	8643370

1988 MODELS

Transaxle Models	*2nd Clutch Switch*	*3rd Clutch Switch (If Used)*	*T.C.C. Solenoid*	*Case Connector*	*Governor Switch (If Used)*
BHC, BJC, CBC, CJC, CMC, CPC, CRC, CTC, CUC, LSC, PDC, PKC, PMC, PNC, POC, PPC, PRC, PSC, PTC, PUC, PZC, TNC, TRC	NONE	8643710	8689901	8634383	NONE
8KDC	8664388	8664387	8665016	8665015	NONE

1989 MODELS

Transaxle Models	*2nd Clutch Switch*	*3rd Clutch Switch (If Used)*	*T.C.C. Solenoid*	*Case Connector*	*Governor Switch (If Used)*
CBC, CJC, CRC, CTC, CUC, PDC, PMC, PNC, PPC, PRC, PTC, RTC, RUC, TRC	NONE	8643710	8689901	8634383	NONE
KCC, KDC, KRC	8664388	8664387	8665016	8665015	NONE
BUC, BYC, BZC	8664388	8665355	8689902	8662395	NONE

1990-1991 MODELS

Transaxle Models	*2nd Clutch Switch*	*3rd Clutch Switch (If Used)*	*T.C.C. Solenoid*	*Case Connector*	*Governor Switch (If Used)*
AYC, HSC, LUC, LYC, PDC, PJC, PNC, PPC, PRC, PTC, RTC, RUC, TRC	NONE	8643710	8689901	8634383	NONE
CHC, KDC, KKC, KXC, LAC, LJC, LKC, LLC	8664388	8665355	8689902	8662395	NONE
BUC, BYC, BXC	8664388	8666603	8689902	8662395	NONE

Figure 8

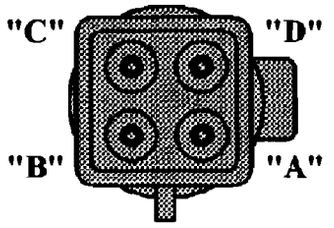
1992 MODELS					
Transaxle Models	*2nd Clutch Switch*	*3rd Clutch Switch (If Used)*	*T.C.C. Solenoid*	*Case Connector*	*Governor Switch (If Used)*
AJC, AKC, KSC, LUC, PDC, PJC, PRC, PTC, PXC	NONE	8643710	8689901	8634383	NONE
CHC, KDC, KKC, LFC, LJC, LKC, LLC	8664388	8665355	8689902	8662395	NONE
BUC, BYC	8664388	8666603	8689902	8662395	NONE

1993 MODELS					
Transaxle Models	*2nd Clutch Switch*	*3rd Clutch Switch (If Used)*	*T.C.C. Solenoid*	*Case Connector*	*Governor Switch (If Used)*
AJC, AKC, CWC, CYC, LUC, PTC PXC, SWC	NONE	8643710	8689901	8634383*	NONE
CHC, KLC, KNC, LFC, LJC, LKC, LLC	8664388	8665355	8689902	8662395	NONE
ARC, BYC	8664388	8666603	8689902	8662395	NONE

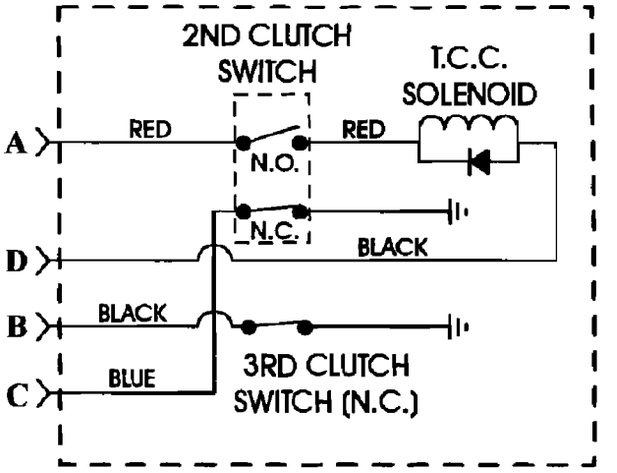
** CWC Model uses 8679106*

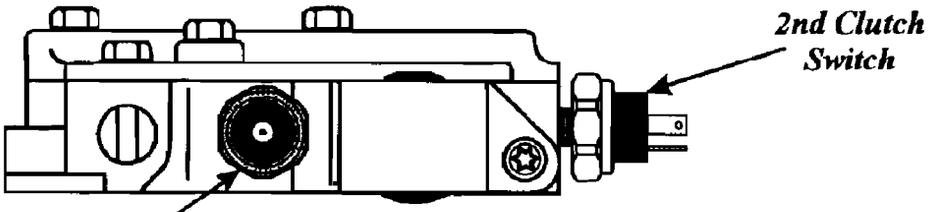
Figure 9

TYPICAL 2ND CLUTCH SWITCH WIRING SCHEMATIC

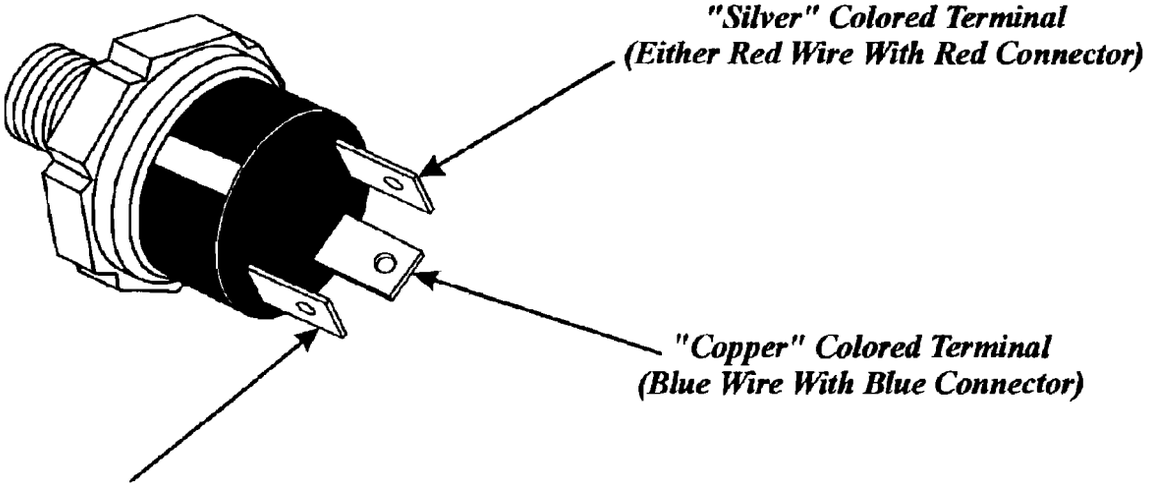


Square, Black Color
Four Terminal
OEM Part Number 8662395





2ND CLUTCH SWITCH

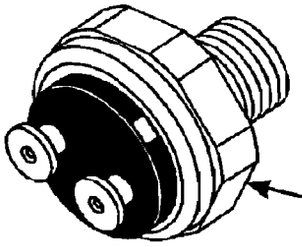


NOTE: If The Wires Are Connected Improperly:
1. *May create a no lock-up condition.*
2. *May send 12V signal to ECM, which may destroy ECM.*
3. *May blow a fuse the instant the key is turned on.*

Figure 10

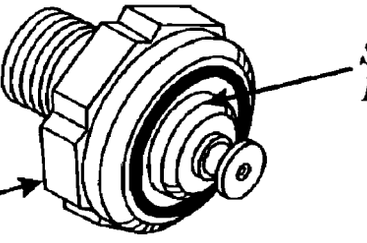
3RD CLUTCH SWITCHES
DESCRIPTION AND IDENTIFICATION

SWITCH "A"



"Normally Open", Two Terminal
OEM Part Number 8643710

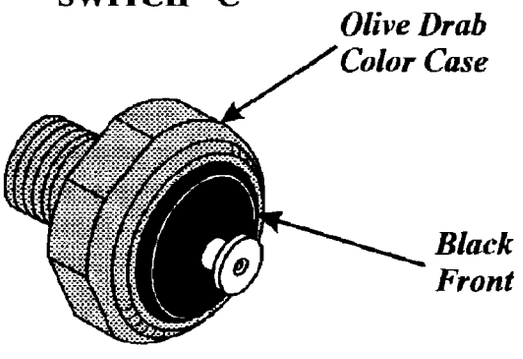
SWITCH "B"



Silver Case

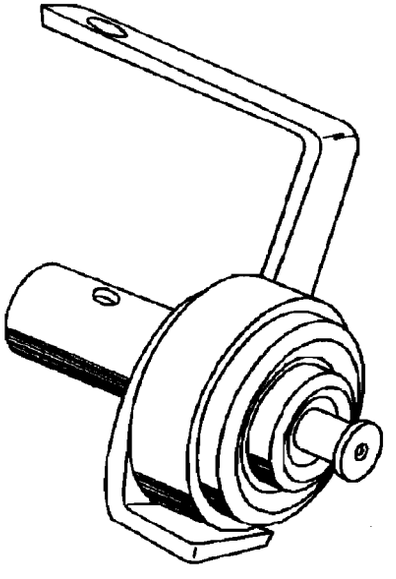
"Normally Open", Single Terminal
OEM Part Number 8664387

SWITCH "C"



"Normally Closed", Single Terminal
OEM Part Number 8665355

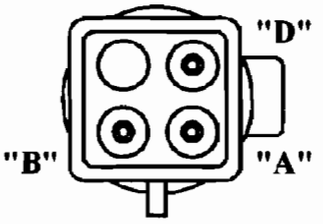
SWITCH "D"



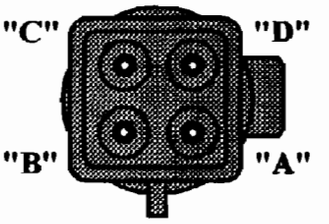
"Normally Closed", Single Terminal
OEM Part Number 8666603

Figure 11

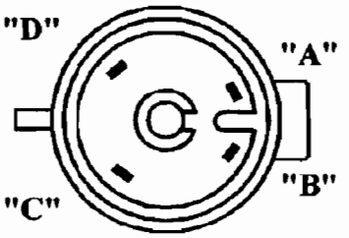
CASE CONNECTOR IDENTIFICATION



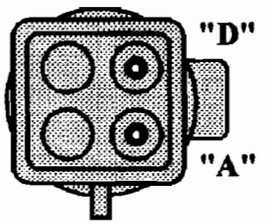
Square, Natural Color
Three Terminal
OEM Part Number 8634383



Square, Black Color
Four Terminal
OEM Part Number 8662395



Round, Natural Color
Four Terminal
OEM Part Number 8665015

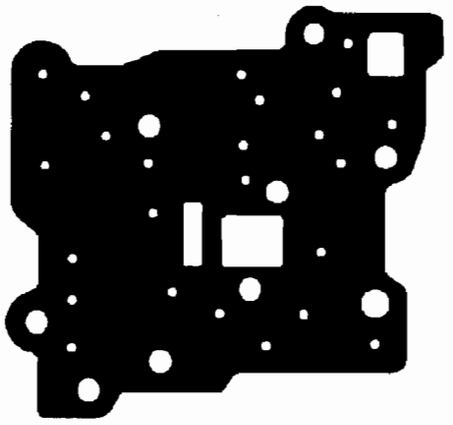


Square, Blue Color
Two Terminal
OEM Part Number 8670106

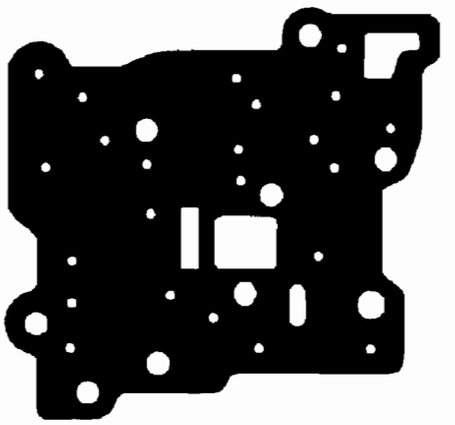
Figure 12

AUXILIARY VALVE BODY COVER GASKETS

OEM Part Number 8653947
Used Only With Auxiliary
Valve Body No. 1



OEM Part Number 8643863
Used Only With Auxiliary
Valve Body No. 2



OEM Part Number 8666381
Used Only With Auxiliary
Valve Body No,s 3, 4, 5, 6, 7

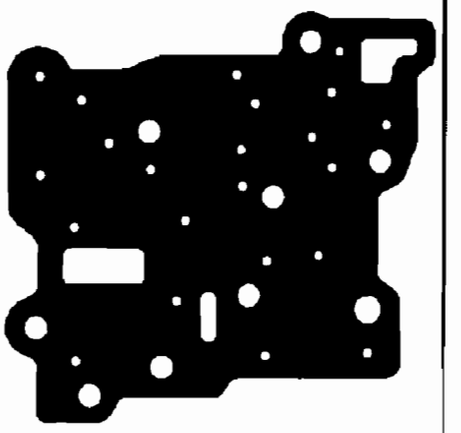


Figure 13