



"2002" SEMINAR INFORMATION

"What's New for '2002' Technical Seminar"

INDEX **GM & Ford**

Video (General Motors)

Computer Flashing.....	4
------------------------	---

Slides (General Motors)

4L65-E.....	11
4L80-E.....	23
5L40-E.....	38
4T40-E.....	54
4T60-E.....	58
Performance Codes.....	68
4T65-E.....	73

Video (Ford)

F4E-III.....	99
AX4S/AX4N.....	116

Slide (Ford)

4R100.....	118
------------	-----

ADVERTISER'S

Raybestos.....	IFC	Zoom Technology.....	67
Lubegard.....	2	OTS.....	75
Bryco/SPX.....	10	Torrington.....	94
Transmission Digest.....	22	A-Z Tools.....	98
Trans-Go.....	32	WESCO.....	103
SeaTac.....	39	TransTec.....	IBC
Rostra Precision Controls.....	52	Life Automotive.....	BC
Sonnax.....	61		

AUTOMATIC TRANSMISSION SERVICE GROUP

9200 South Dadeland Boulevard Suite 720

Miami, Florida 33156

WWW.TRANSONLINE.COM

(305) 670-4161

WWW.ATSGMIAMI.COM

World's Finest Lubricants

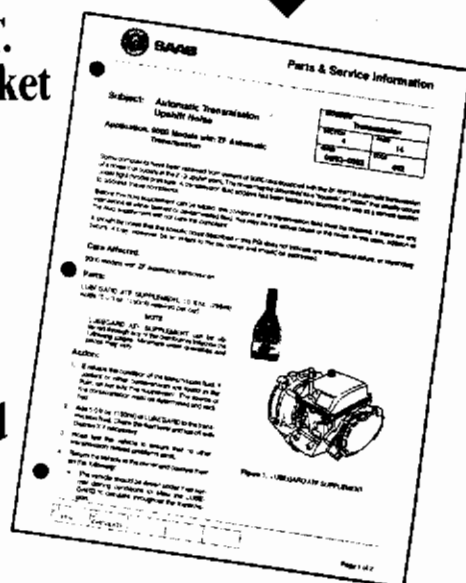


F: LUBEGARD is the only product of its kind to be Used, Endorsed, Designated and Approved by multiple car manufacturers (OEM's).

A: 9 out of 10 transmissions fail due to HEAT. LUBEGARD is the only product on the market that reduces HEAT up to 40°F!

C: LUBEGARD Takes The HEAT! Independent testing proves the thermal stability in LUBEGARD outperforms it's nearest competitor by over 100°F!

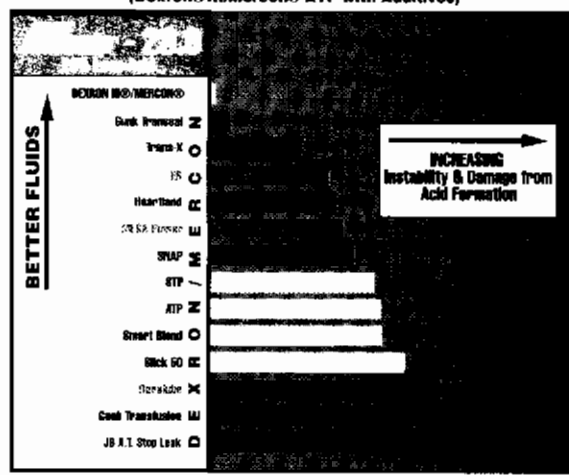
T: LUBEGARD's unique, patented LXE® (Liquid Wax Ester) Technology reduces acid formation which leads to sludge, and fluid degradation.



**Why Risk Customer "Comebacks"?
Use LUBEGARD Today!**



**Acid Formation Leads to Sludge
(Dexron® III/Mercon® ATF with Additives)**



■ LXE

■ Seal Swellers/Solvents
■ Zinc

■ Chlorinated

% Increase in Acid over Dexron® III/Mercon® ATF Alone

TEST DESCRIPTION: Samples of products were added in proper proportions in commercial ATF and were tested for the Total Acid number. They were placed in an oven at 225°F for 48 hours, then removed and tested for the Total Acid number again. The figures shown are changes of the Total Acid number of the samples in excess of variations of the Total Acid number of the Dexron.

All Trademarks are owned by their respective companies.



INTERNATIONAL LUBRICANTS, INC.

7930 Occidental South ■ Seattle, WA 98108 ■ PO Box 24743 ■ Seattle, WA 98124
206-762-5343 ■ 800-333-LUBE ■ Fax: 206-762-7989 ■ www.Lubegard.com



"2002" SEMINAR INFORMATION

"What's New for '2002' Technical Seminar"

1

INTRODUCTION

ATSG welcomes you to the "What's New for 2002" Technical Training Seminar. The ATSG Tech team is here in your town with another information packed seminar designed to keep you 'the transmission technician' on the cutting edge of today's ever-changing automotive technology. Today's seminar will be delivered with the use of video and power point presentations keeping the seminar exciting throughout the whole day. The valuable and useful information conveyed in this day long seminar is contained in three manuals for each technician which can be brought back to the shop to be used the very next business day. It's another DO NOT MISS seminar that ATSG is proud to present and we thank you for your attendance, you will be glad you came.

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

Copyright © 2002 ATSG

**ROBERT D. CHERRNAY
TECHNICAL DIRECTOR**

**DALE ENGLAND
FIELD SERVICE CONSULTANT**

**JIM DIAL
TECHNICAL CONSULTANT**

**JERRY GOTT
TECHNICAL CONSULTANT**

**DAVID CHALKER
TECHNICAL CONSULTANT**

**ED KRUSE
TECHNICAL CONSULTANT**

**GREGORY LIPNICK
TECHNICAL CONSULTANT**

**WAYNE COLONNA
TECHNICAL SUPERVISOR**

**PETER LUBAN
TECHNICAL CONSULTANT**

**GERALD CAMPBELL
TECHNICAL CONSULTANT**

**JON GLATSTEIN
ELECTRICAL CONSULTANT**

**ROLAND ALVAREZ
TECHNICAL CONSULTANT**

**STANTON ANDERSON
TECHNICAL CONSULTANT**

AUTOMATIC TRANSMISSION SERVICE GROUP

9200 South Dadeland Boulevard Suite 720

Miami, Florida 33156

WWW.TRANSONLINE.COM

(305) 670-4161

WWW.ATSGMIAMI.COM



AUTOMOTIVE COMPUTER REPROGRAMMING

GENERAL MOTORS REFLASH PROCEDURES

COMPLAINT: The complaints are far too varied to list individually, they could be driveability related or transmission related. Transmission related complaints could be line pressure concerns, shift scheduling concerns, shift adapt concerns, correct stalling or surging or TCC strategies.

CAUSE: Program parameters installed in the vehicle's computer at the time of manufacture may be set to be sensitive to various operations in order to meet certain government demands. Once the vehicle is "broken in", these parameters can cause customer complaints such as those listed above, at which time these parameters need to be desensitized in order to cure the customer complaints.

Another reason is, it is more cost effective to "reflash" the vehicle's computer to allow it to tolerate a sensor signal that would, in the past, require sensor replacement.

CORRECTION: There are a number of steps that are extremely important to follow if the reprogramming procedure is to be successfully accomplished:

- (1) Be sure to perform the necessary diagnostic procedures to insure that reprogramming will cure the complaint.
- (2) Gain access to complete information about the update revision by going to the GM website, <http://calid.gm.com/vci>, which explains what the revision does as well as any factory tsb's that relate to this revision.
- (3) It is critical to match the revision to the complaint because once the "reflash" is complete, *it can not be reversed*. This is due to the nature of the reprogramming procedure which begins by erasing the old program. Once a revision is chosen, all calibration changes in that revision will be downloaded, an individual calibration can not be selected.
- (4) Since some type of computer hardware is required, make certain all power saving and screen saver devices are **turned off** so as not to interrupt the "reflash" programming process.
- (5) There are two ways to reprogram, the "pass through" method, or the "download method". The "download method" requires the updated program be downloaded from the shop computer into the scan tool and the scan tool then taken to the vehicle and connected to the diagnostic connector, and then download the new program into the vehicle computer. The "pass through" method requires the updated program to be taken from the shop's computer and passed through the scan tool and into the vehicle computer. In each method the updated programs are provided by General Motors "Service Programming System" or "Expertec" CD program, supplied by Vetronix Corporation, makers of the Tech 2 and Mastertech scan tools. One of these scan tools will be required to perform the "reflash".



AUTOMOTIVE COMPUTER REPROGRAMMING

GENERAL MOTORS REFLASH PROCEDURES

CORRECTION

Continued: (6) It is strongly recommended that the computer to be reprogrammed has that done with the computer in the vehicle rather than "off board" which requires expensive equipment that even most dealers don't have.

- (7) System voltage **MUST** be maintained and held steady between 12 and 14 volts. This is accomplished through the use of a separate regulated voltage supply device. **DO NOT USE A BATTERY CHARGER!**

If voltage is allowed to drop or the scan tool connection at the diagnostic connector is broken during data transferral, the vehicle computer does not know what to do with an incomplete program and will keep trying to complete the download without success.

This constant loop of download attempts cannot be stopped and will require vehicle computer replacement.

REPROGRAMMING WITH THE VETRONIX MASTERTECH AND THE SERVICE PROGRAMMING SYSTEM (SPS):

Figure 1: This screen indicates that we are requesting information only about the revision and what complaints it is intended to cure.

Figure 2: This screen will require the correct Vehicle Identification Number (VIN).

Figure 3: This screen will explain which controllers are supported such as PCM, VCM, BCM, ABS, etc.

Figure 4: This screen gives the GM part number of the revision as well as an explanation of what the revision does.

Figure 5: The program automatically returns to the first screen where the method of reprogramming is selected, which in this case, will be "pass thru".

Figure 6: This screen is going to require certain pertinent information about the vehicle to be reprogrammed.

Figure 7: This screen contains last minute instructions to insure the "reflash" process is successfully completed. Next, the scan tool will indicate when the reprogramming has been completed.

Remember to turn the ignition off before disconnecting any thing.

Vetronix Corporation can be contacted at 800-321-4889 or www.vetronix.com

GENERAL MOTORS REFLASH PROCEDURES

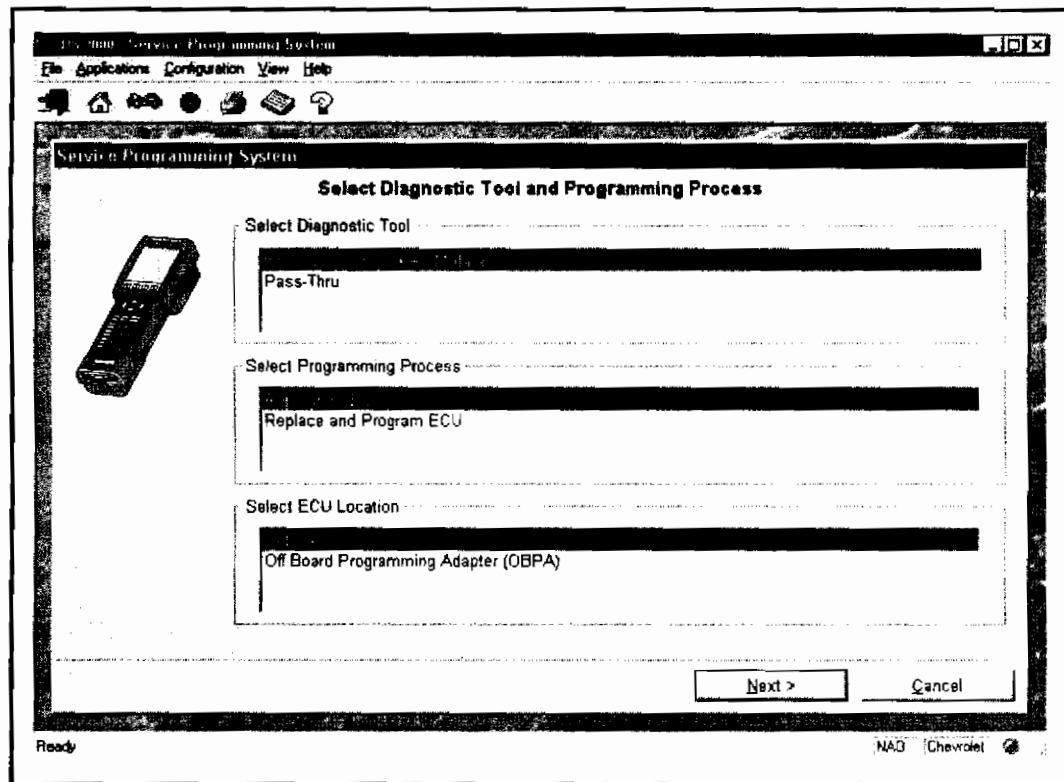


Figure 1

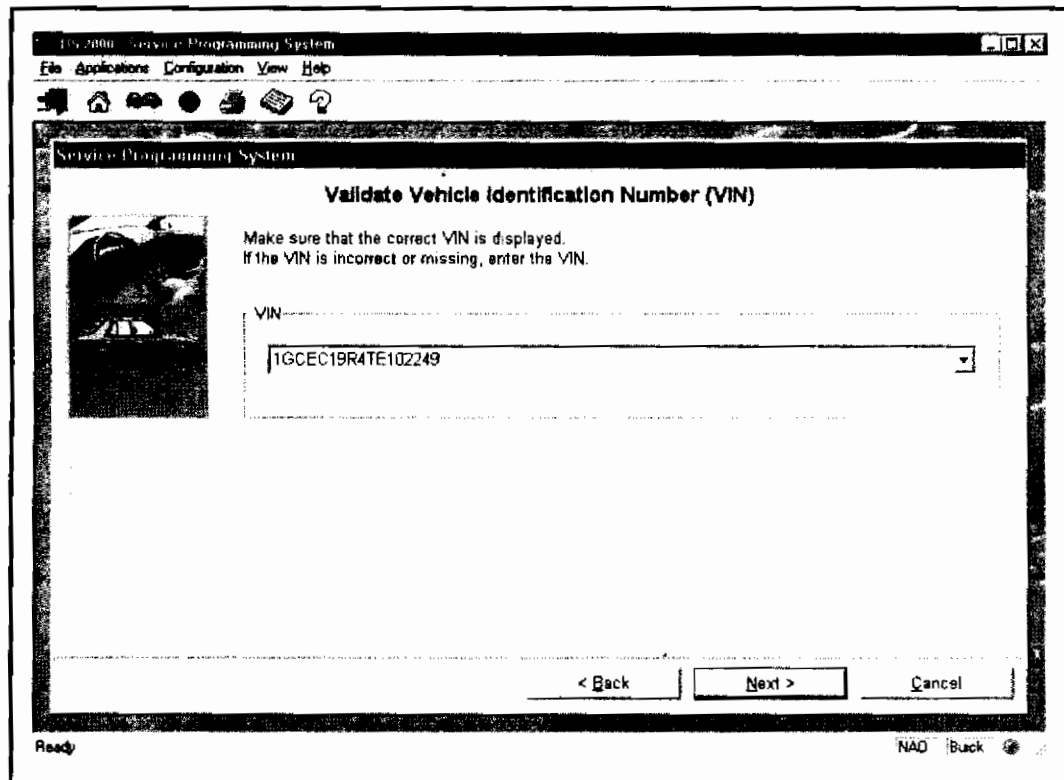


Figure 2

GENERAL MOTORS REFLASH PROCEDURES

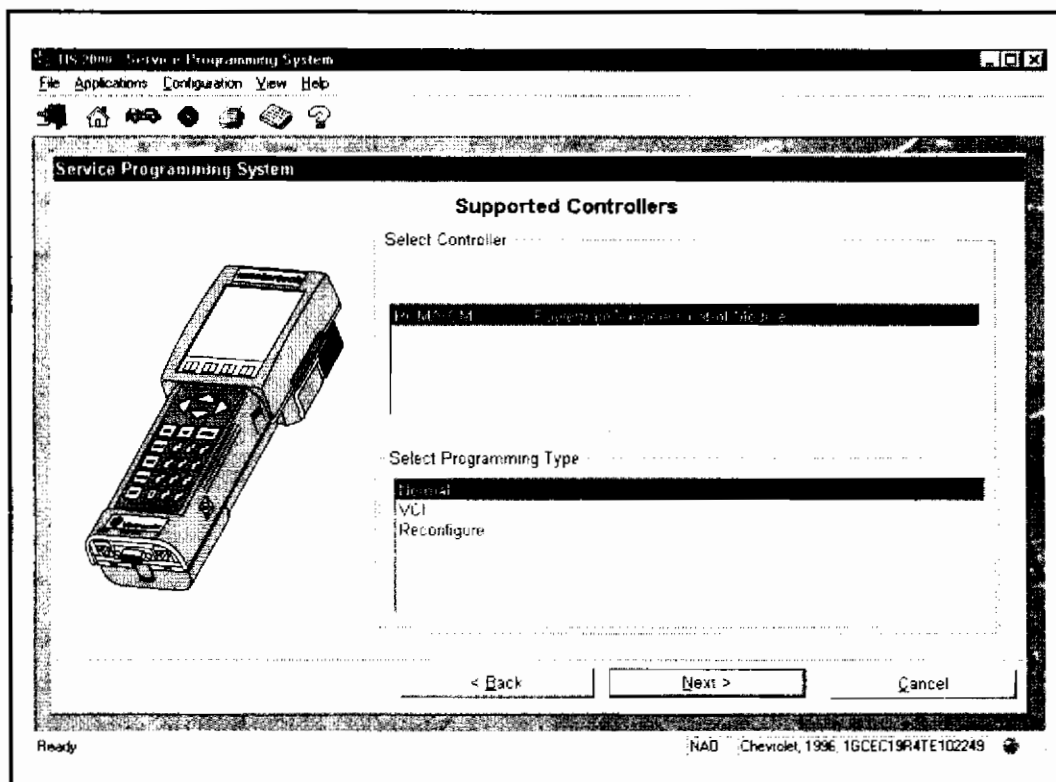


Figure 3

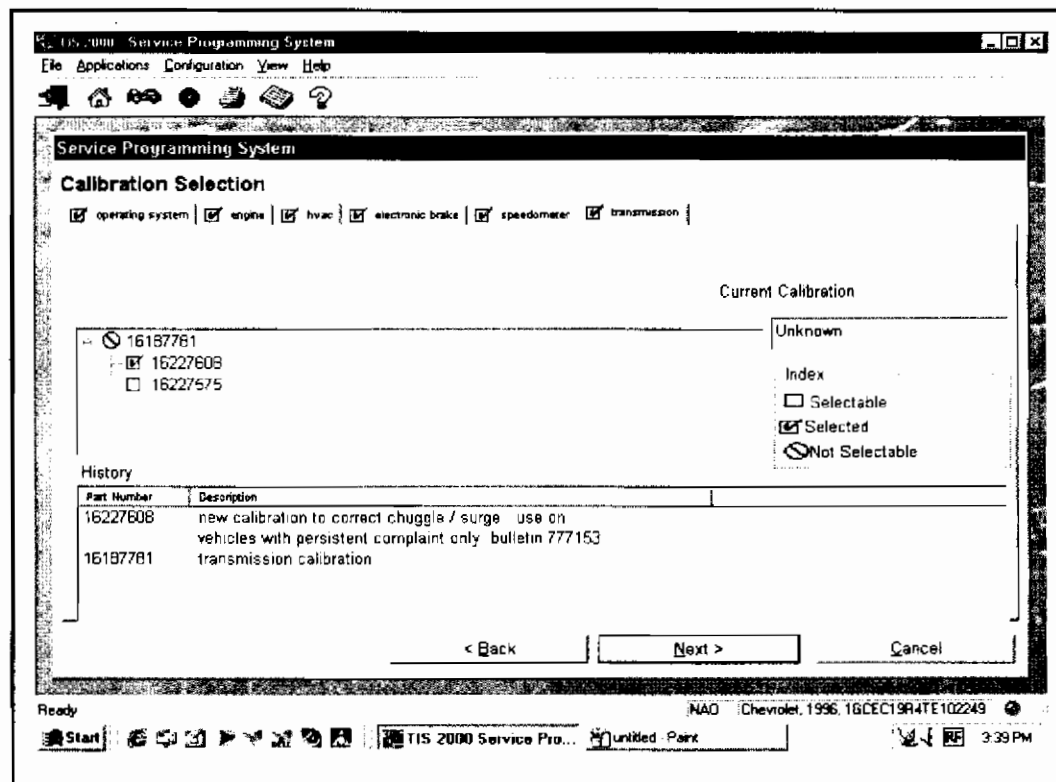


Figure 4

GENERAL MOTORS REFLASH PROCEDURES

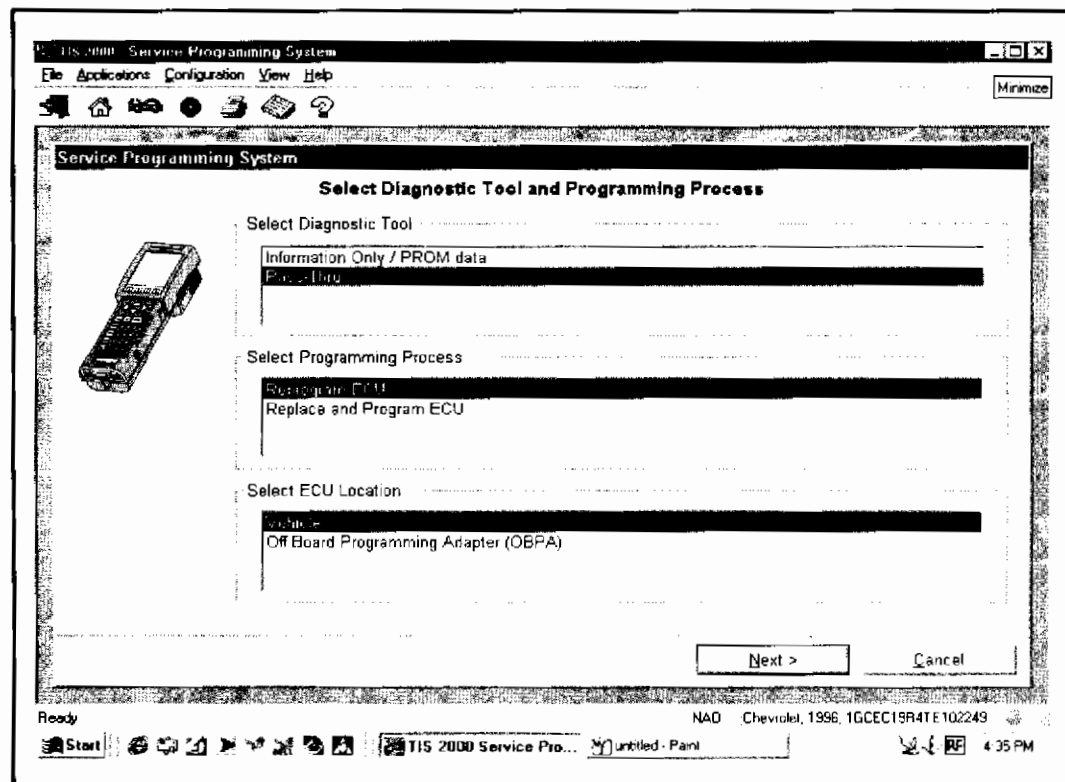


Figure 5

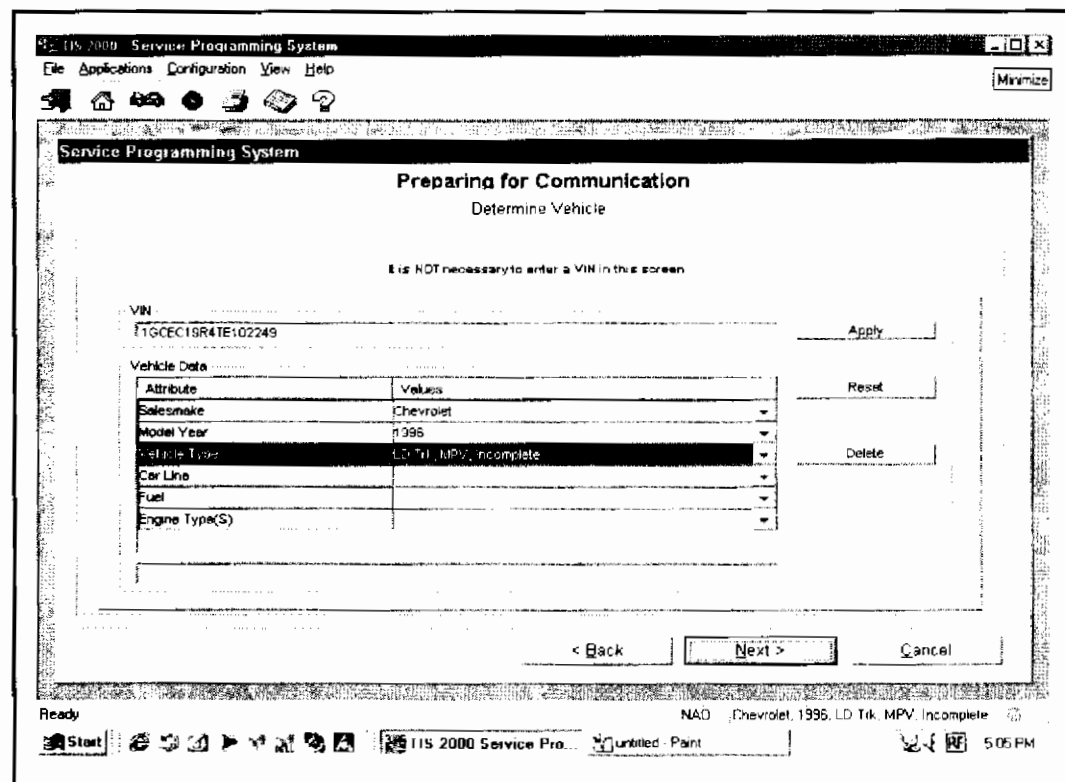


Figure 6

GENERAL MOTORS REFLASH PROCEDURES

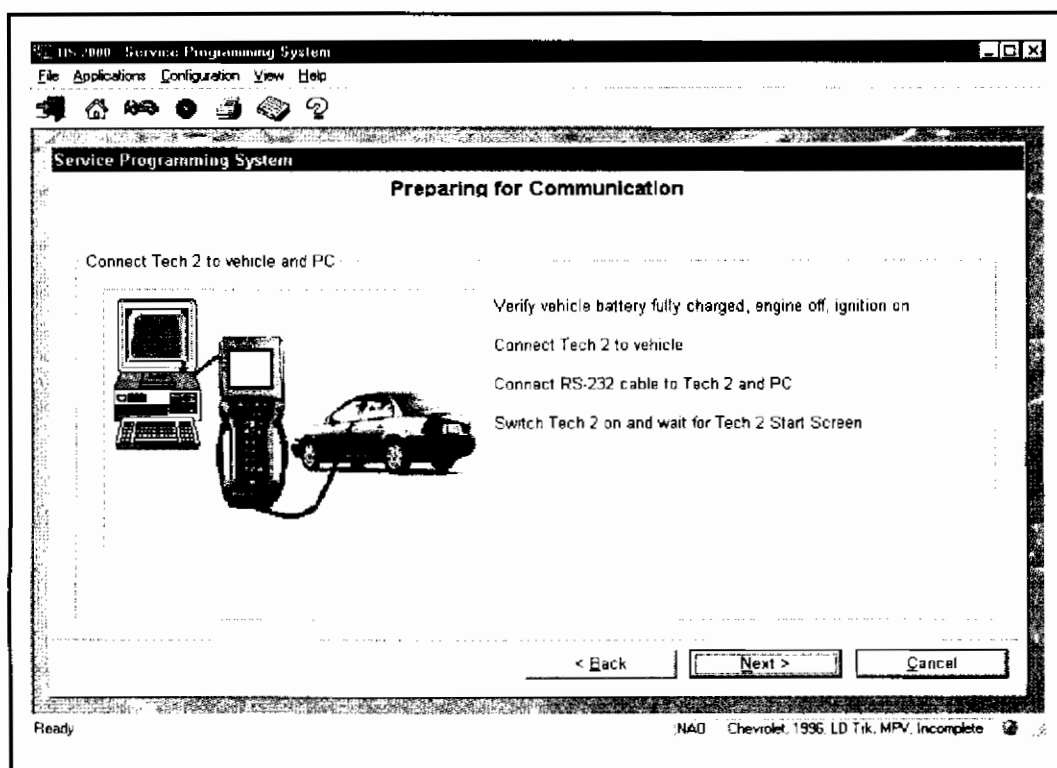
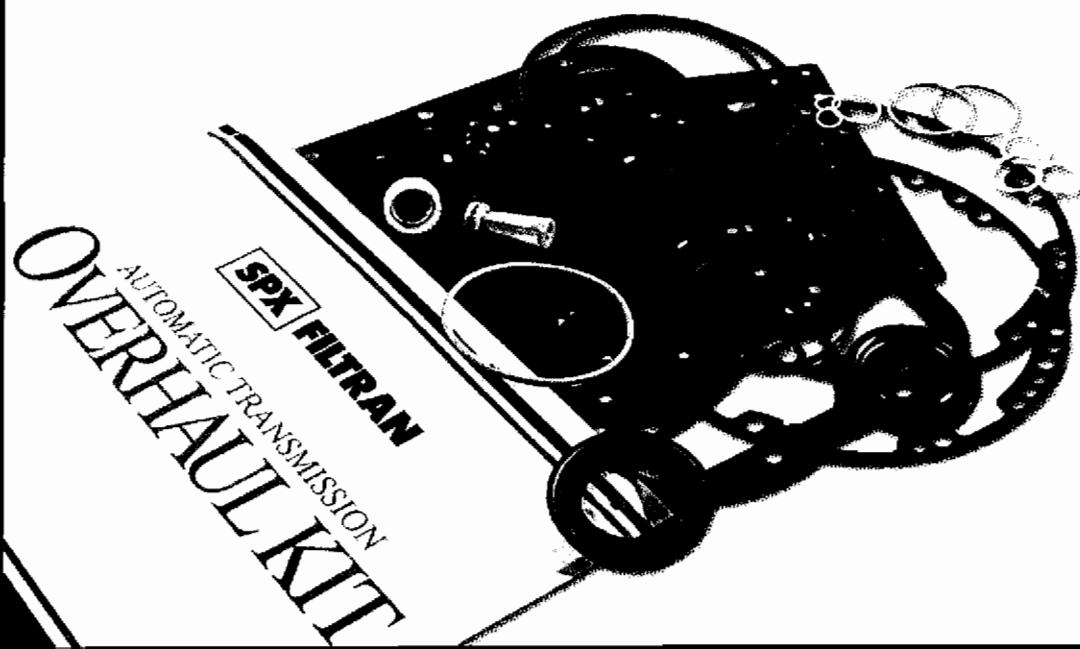


Figure 7



Not everyone would use
NationalTM seals in each rebuild.

But then again, not every kit
manufacturer includes them.



SPX Filtran Transmission Kits —
Engineered for Master Builders.

SPX FILTRAN

15750 N.W. 59th Avenue
Miami Lakes, FL 33014
Phone 305-592-2760
Fax 305-592-7543
www.spxfiltran.com



THM 4L65-E (M32) SEVEN CLUTCH 3-4 PACK

CHANGE: Beginning at the start of production for model year 2001, General Motors introduced a new transmission designated THM 4L65-E (M32) with many engineering changes. Currently this unit is found in all 2001 Cadillac Escalade and any vehicle with 6.0L engine or larger, that was previously equipped with the THM 4L60-E transmission. One of the changes includes adding a seventh lined plate to the 3-4 clutch pack, as shown in Figure 1, with no dimensional changes to the input housing. There is a "Kitted" Service Package available from OEM under part number 24220129, as shown in Figure 2.

REASON: New generation of higher horsepower engines and increased durability and reliability.

PARTS AFFECTED:

- (1) 3-4 CLUTCH APPLY PLATE - Required dimensional changes to accommodate the added friction and steel plate. The new design level is .218" thick and the previous design level thickness is .224", as shown in Figure 3.
- (2) 3-4 CLUTCH BACKING PLATE - Required dimensional changes to accommodate the added friction and steel plate, and to achieve the proper 3-4 clutch clearance. There are four new thickness backing plates and one of the previous backing plates, to ensure proper 3-4 clutch clearance, as shown in Figure 4.
- (3) 3-4 CLUTCH FRICTION PLATE - Required dimensional changes to accommodate the added friction and steel plate. The new design level friction plate is .065" thick and the previous design level thickness is .082", as shown in Figure 5.
- (4) 3-4 CLUTCH STEEL PLATE - Required dimensional changes to accommodate the added friction and steel plate. The new design level steel plate is .097" thick and the previous design level thickness is .106", as shown in Figure 5.

INTERCHANGEABILITY:

All of the new design parts listed above *will retro-fit back* to 1993 models, when used as a service package.

SERVICE INFORMATION:

3-4 Clutch Plates, "Kitted" (New Design)	24220129
3-4 Clutch Backing Plate (.144" Thick)	24217450
3-4 Clutch Backing Plate (.165" Thick)	24217453
3-4 Clutch Backing Plate (.194" Thick)	24212460
3-4 Clutch Backing Plate (.219" Thick)	24217516
3-4 Clutch Backing Plate (.241" Thick)	24217517

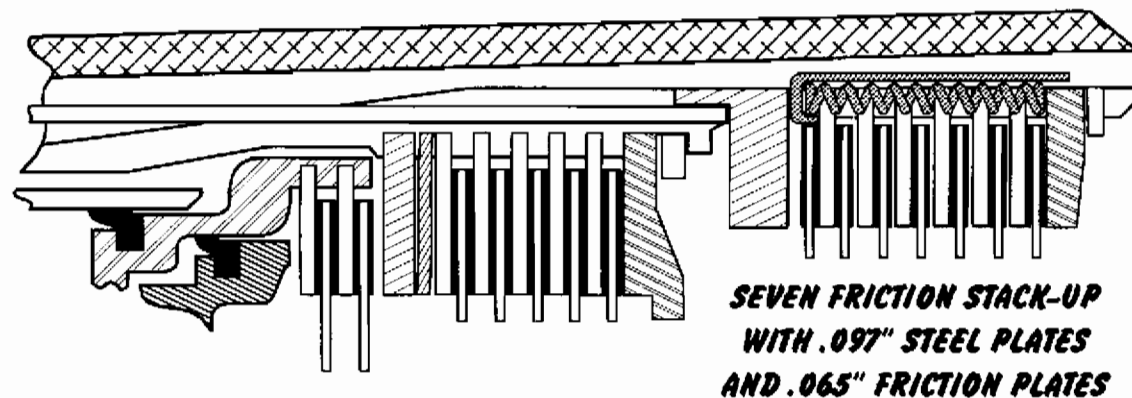
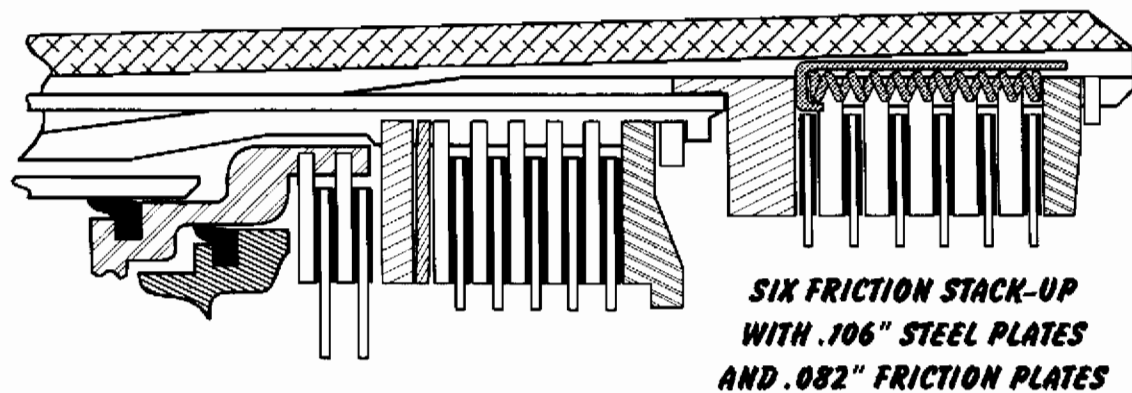
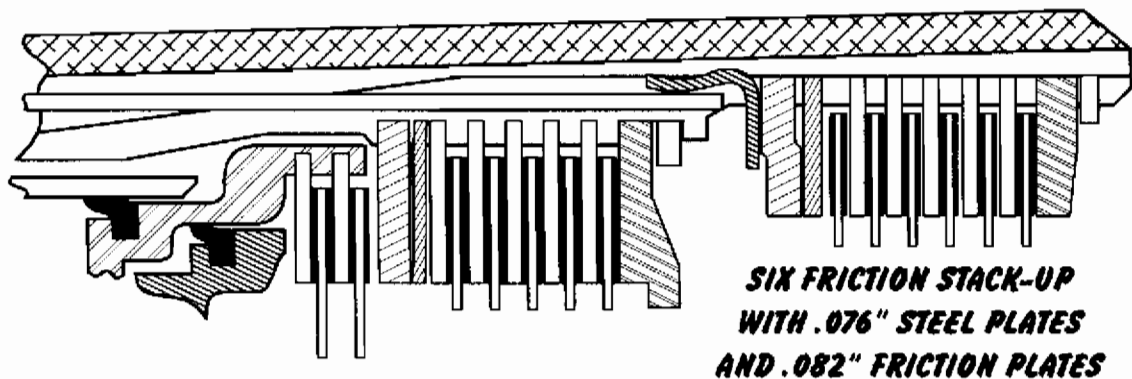
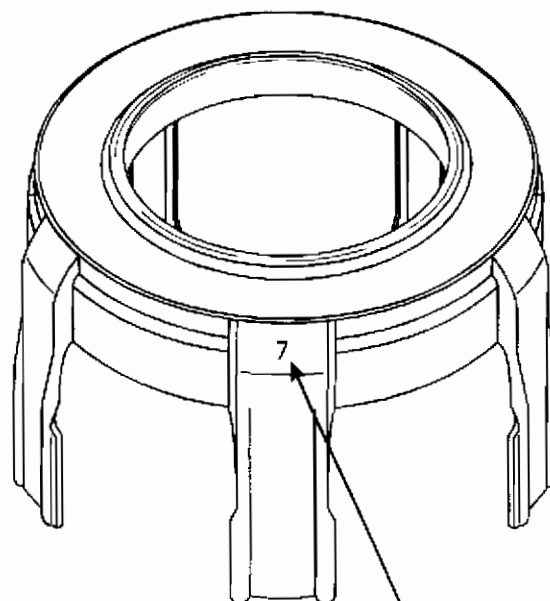
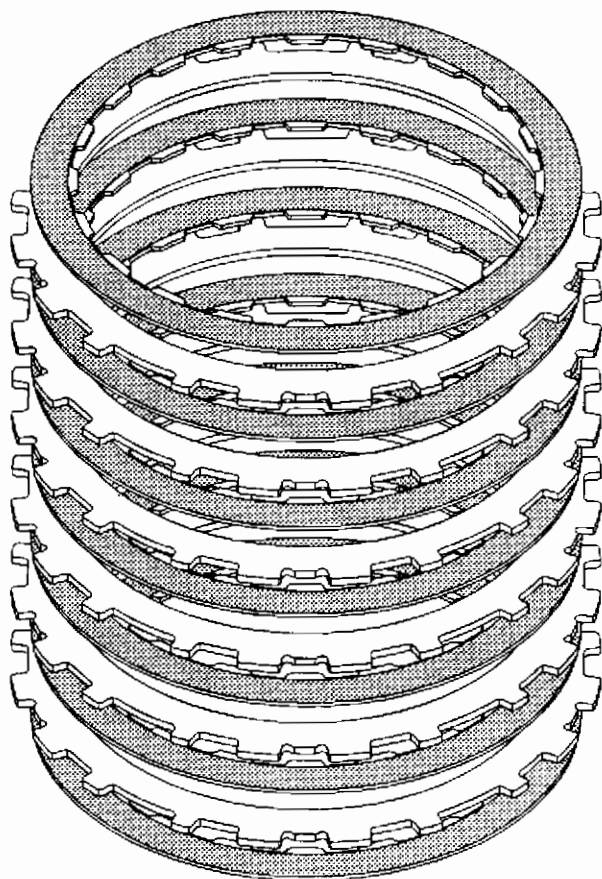
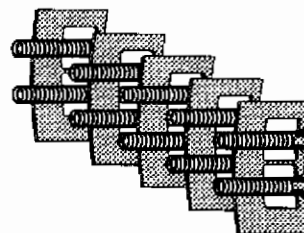


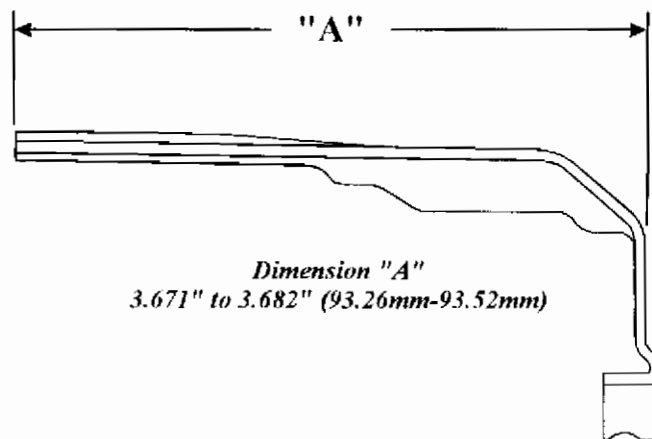
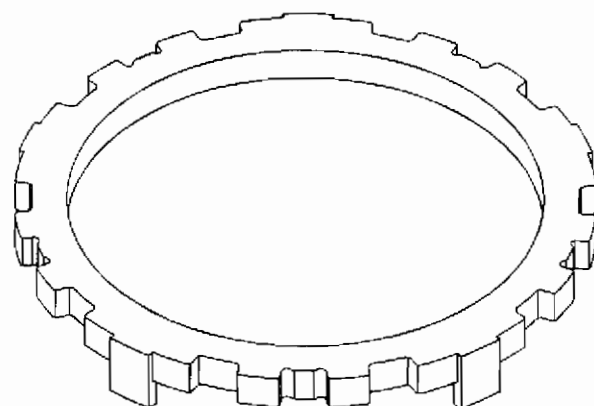
Figure 1

CONTENTS OF SERVICE PACKAGE PART NUMBER 24220129

- 7 .065" Thick High Energy Friction Plates
- 6 .097" Thick Steel Plates
- 1 .218" Thick 3-4 Apply Plate
- 1 3-4 Apply Ring (Same As Previous, Stamped "7")
- 5 3-4 Load Release Springs (Same As Previous)



Identification, Stamped "7"

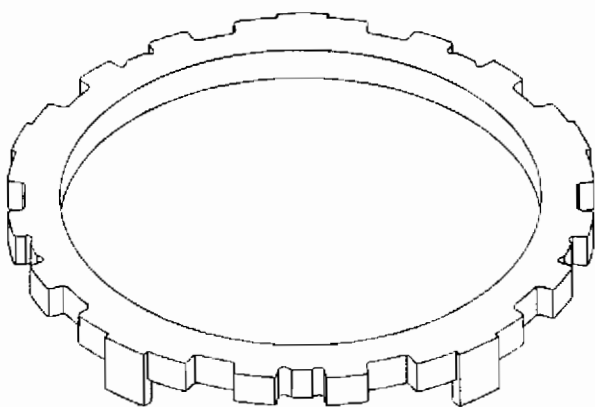


Dimension "A"
3.671" to 3.682" (93.26mm-93.52mm)

Copyright © 2001 ATSG

Figure 2

3-4 CLUTCH APPLY PLATE

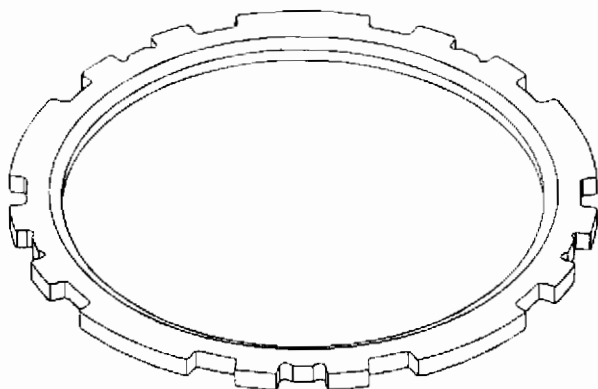


Thickness For Six Friction Plates = .224"
Thickness For Seven Friction Plates = .218"

Copyright © 2001 ATSG

Figure 3

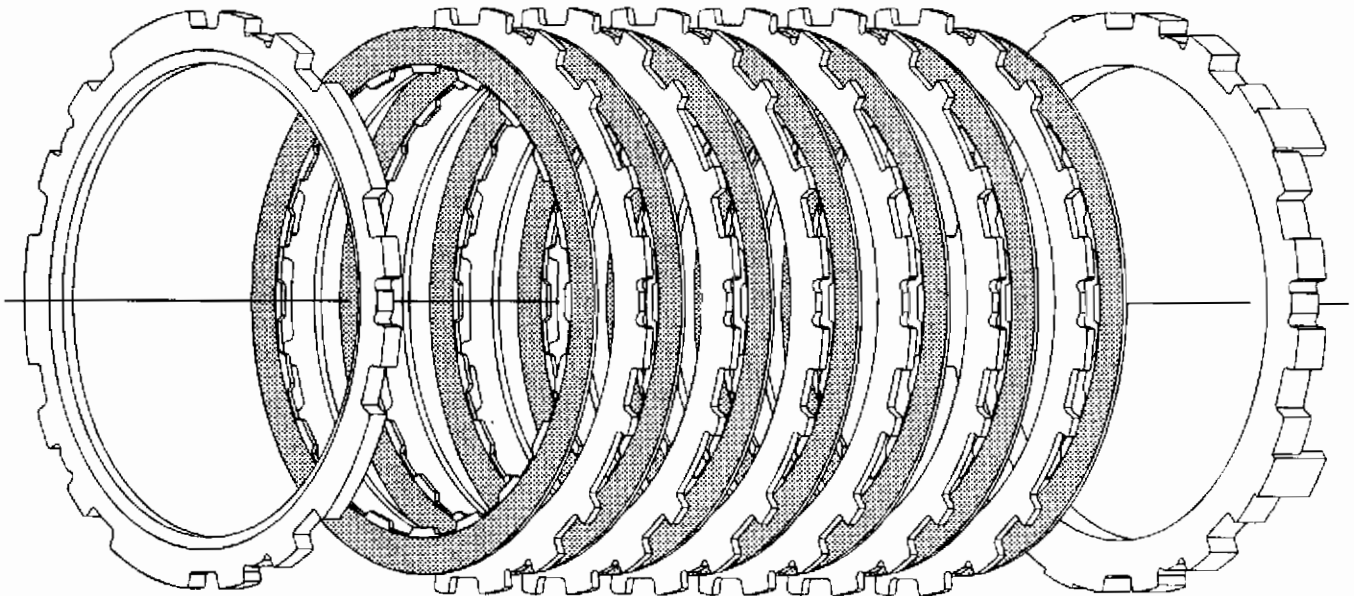
NEW 3-4 CLUTCH BACKING PLATES



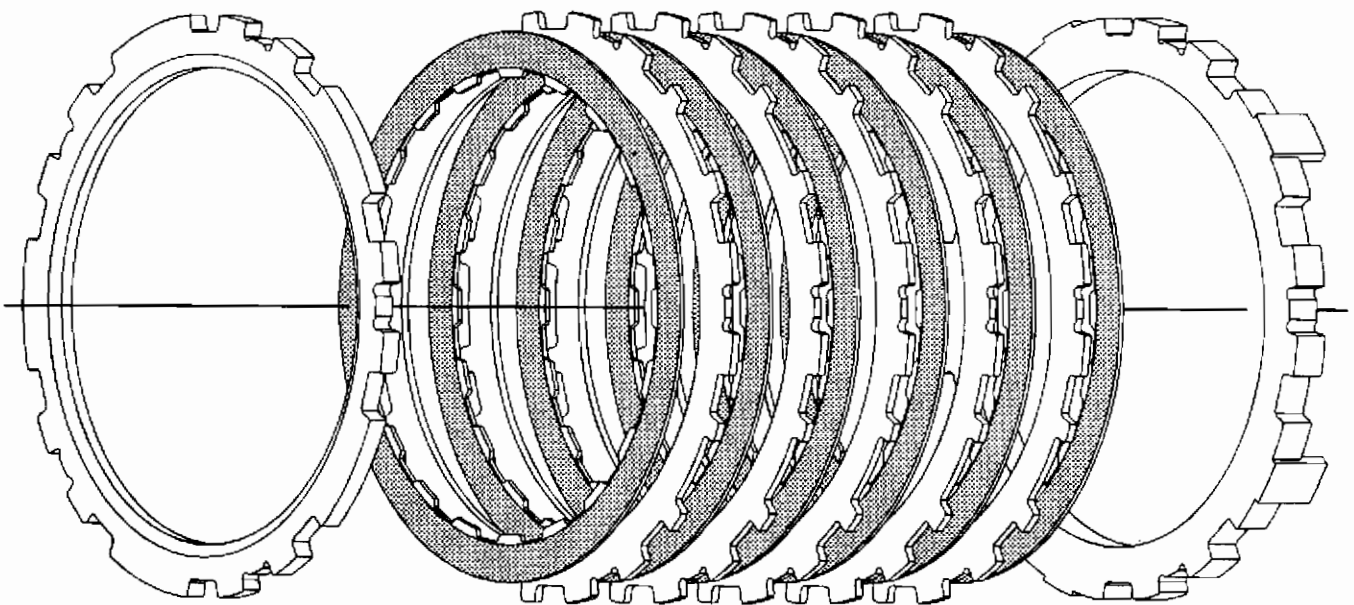
24217450 = .144" Thick (New)
24217453 = .165" Thick (New)
24212460 = .194" Thick (Same As Previous)
24217516 = .219" Thick (New)
24217517 = .241" Thick (New)

Copyright © 2001 ATSG

Figure 4

**THM 4L65-E (M32) 3-4 CLUTCH
SEVEN FRICTION STACK-UP**

*Friction Plates = .065" Thick, 7 Required
Steel Plates = .097" Thick, 6 Required*

**THM 4L60-E (M30) 3-4 CLUTCH
SIX FRICTION STACK-UP**

*Friction Plates = .082" Thick, 6 Required
Steel Plates = .106" Thick, 5 Required*

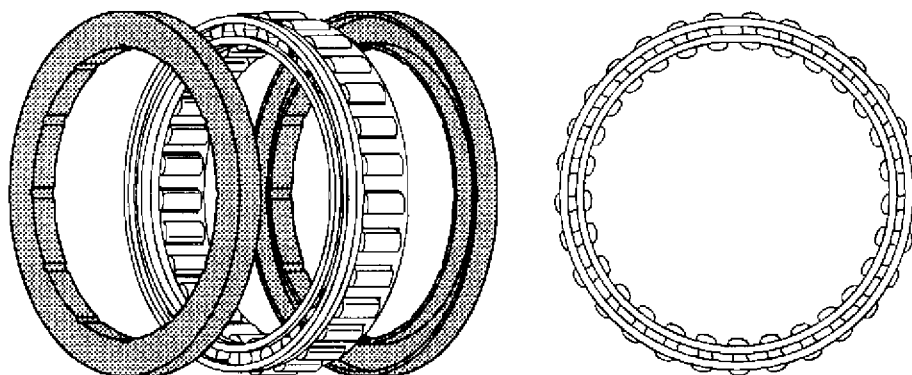
Copyright © 2001 ATSG

Figure 5

THM 4L60, 4L60-E, 4L65-E**NEW 29 ELEMENT SPRAG
WITH DUAL CAGE**

Borg-Warner Corporation has now released a new design 29 element input sprag with a dual cage, as shown in Figure 1. This new product will retro-fit back on all 4L60 (700-R4), all 4L60-E and the new 4L65-E transmissions. You will now have the extra load capacity of the 29 elements that replaces the previous 26 and 28 element sprags, and the extra stability of the dual cage over the current 29 element design from General Motors. This new design 29 element, dual cage input sprag is available under Borg-Warner part number 29236AM.

**29 ELEMENT, DUAL CAGE SPRAG
FROM BORG-WARNER CORP.
PART NUMBER 29236AM**



Copyright © 2001 ATSG



THM 4L65-E (M32)
5 PINION FRONT AND REAR
PLANETARY CARRIERS

CHANGE: Beginning at the start of production for model year 2001, General Motors introduced a new transmission designated THM 4L65-E (M32) with many engineering changes. Currently this unit is found in all 2001 Cadillac Escalade and any vehicle with 6.0L engine or larger, that was previously equipped with the THM 4L60-E transmission. One of the changes includes adding a 5 pinion reaction(rear) planetary carrier and a 5 pinion input (front) planetary carrier, as shown in Figures 1 and 2, with no dimensional changes to the related parts.

REASON: Increased durability and reliability.

PARTS AFFECTED:

- (1) REACTION (Rear) PLANETARY CARRIER - Now equipped with 5 planetary pinion gears, as shown in Figure 1.
- (2) INPUT (Front) PLANETARY CARRIER - Now equipped with 5 planetary pinion gears, as shown in Figure 2.

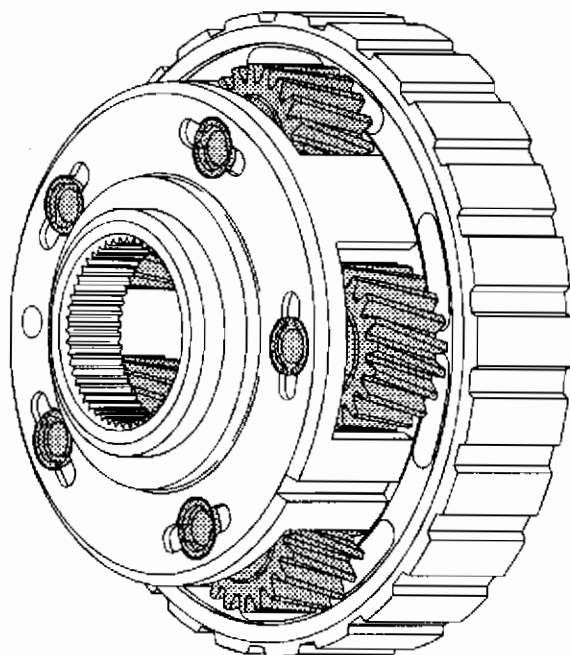
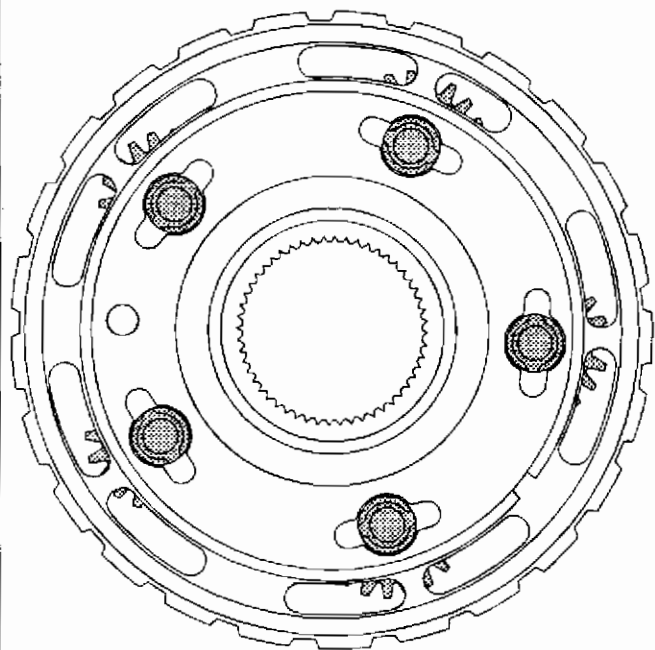
INTERCHANGEABILITY:

Both Input and Reaction 5 pinion planetary carriers can be used in any previous model 4L60-E transmission for increased durability.

SERVICE INFORMATION:

Input Planetary Carrier Assembly, 5 Pinion	24216399
Reaction Planetary Carrier Assembly, 5 Pinion	24218069

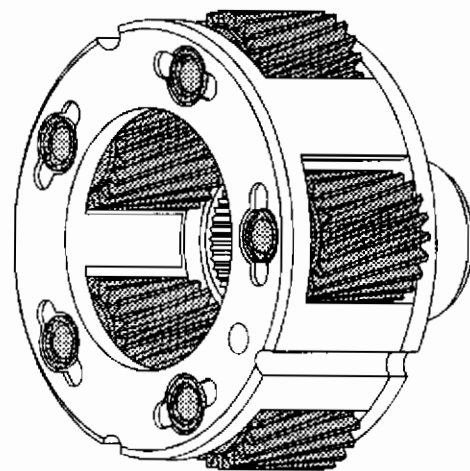
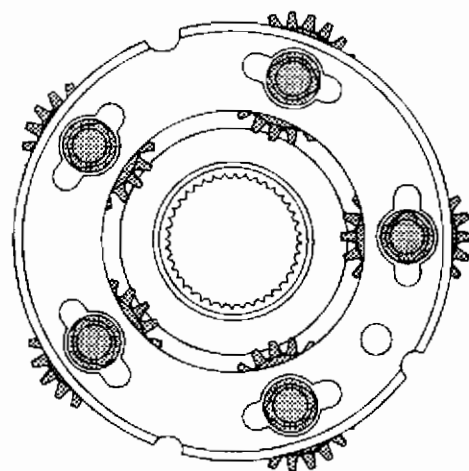
THM 4L65-E (M32)
5 PINION REAR CARRIER



Copyright © 2001 ATSG

Figure 1

THM 4L65-E (M32)
5 PINION FRONT CARRIER



Copyright © 2001 ATSG

Figure 2

THM 4L65-E (M32)
NEW SUN SHELL AND
THRUST BEARING

CHANGE: Beginning at the start of production for model year 2001, General Motors introduced a new transmission designated THM 4L65-E (M32) with many engineering changes. Currently this unit is found in all 2001 Cadillac Escalade and any vehicle with 6.0L engine or larger, that was previously equipped with the THM 4L60-E transmission. One of the changes includes a new design sun gear shell and thrust bearing to replace the previous design washer, as shown in Figures 1 and 2.

REASON: Increased durability and reliability.

PARTS AFFECTED:

- (1) **SUN GEAR SHELL** - The holes in the sun shell for the previous thrust washer have been eliminated, as shown in Figures 1 and 2, to accommodate the new thrust bearing.
- (2) **REACTION CARRIER SHAFT** - Modified on the rear surface to accommodate the added thrust bearing, as shown in Figures 3 and 4.
- (3) **THRUST BEARING** - Added for increased durability, as shown in Figures 3 and 4.

INTERCHANGEABILITY:

Will Not interchange with any previous design parts, but *Will* retro-fit back on any previous model 4L60-E transmission, *when used as a service package*.

SERVICE INFORMATION:

Sun Gear Shell (New Design)	24217145
Reaction Carrier Shaft (New Design)	24217157
Sun Shell Thrust Bearing (New Design)	24217328

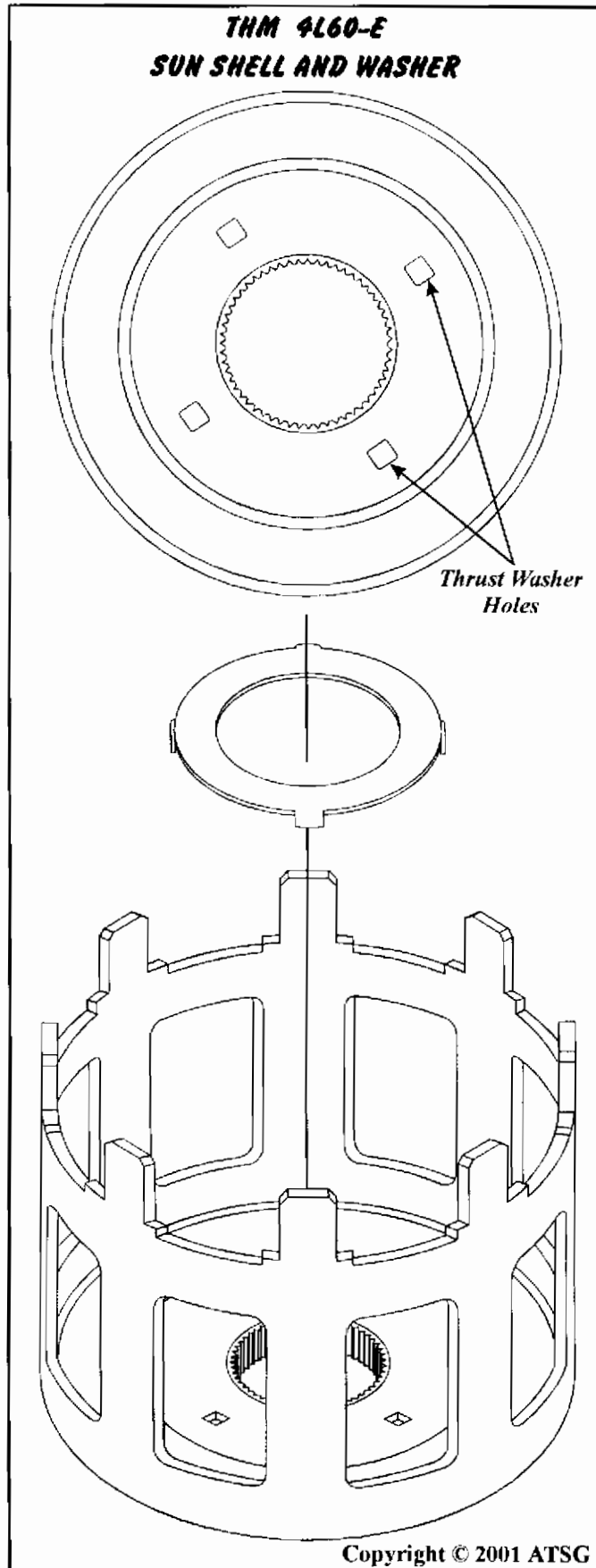


Figure 1

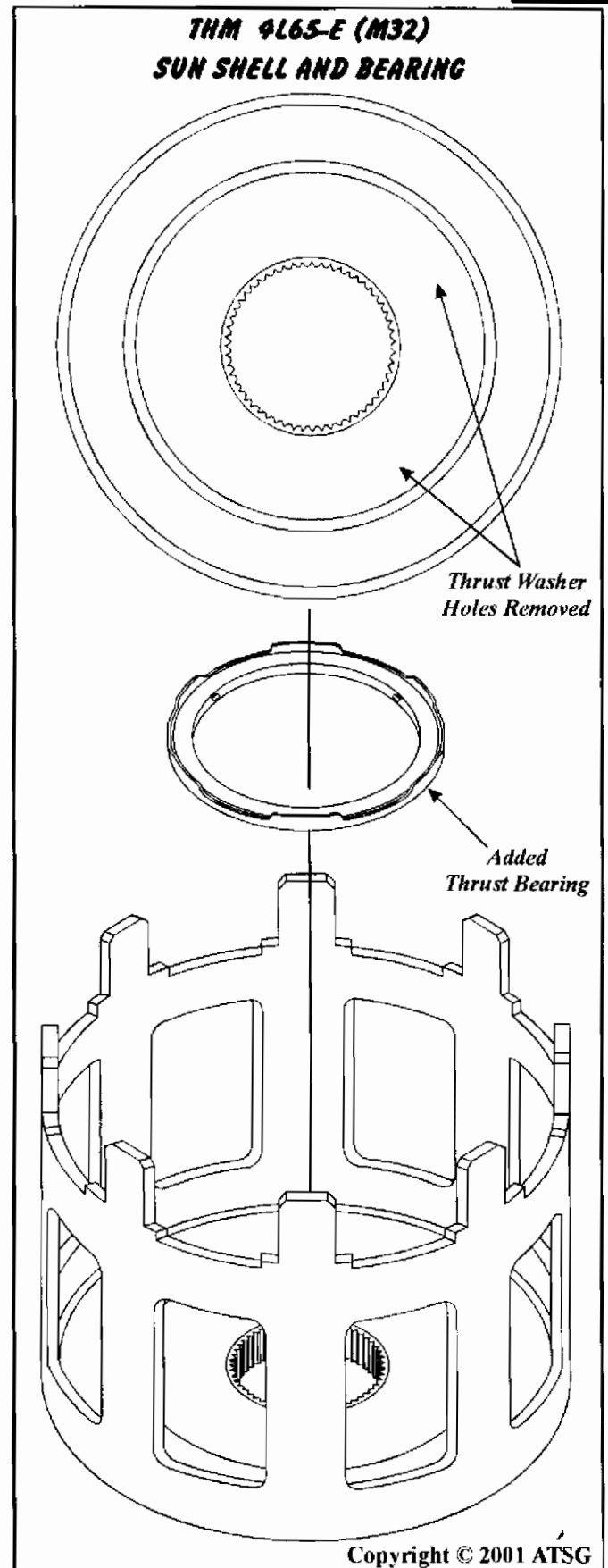
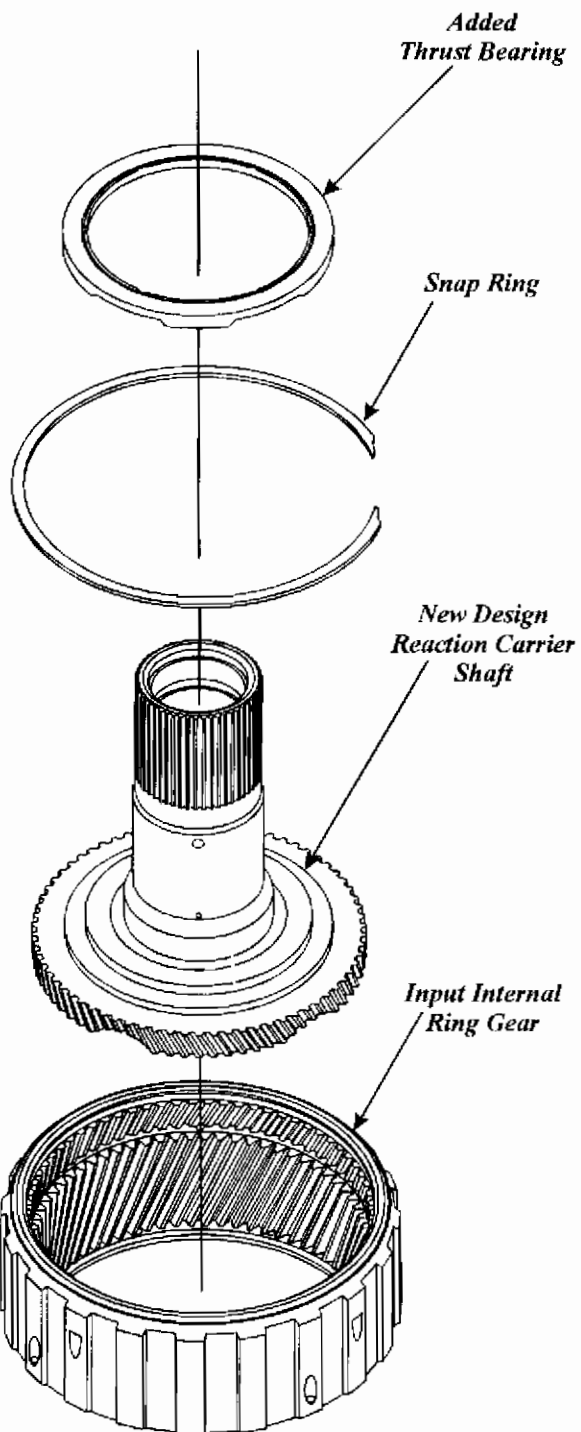


Figure 2

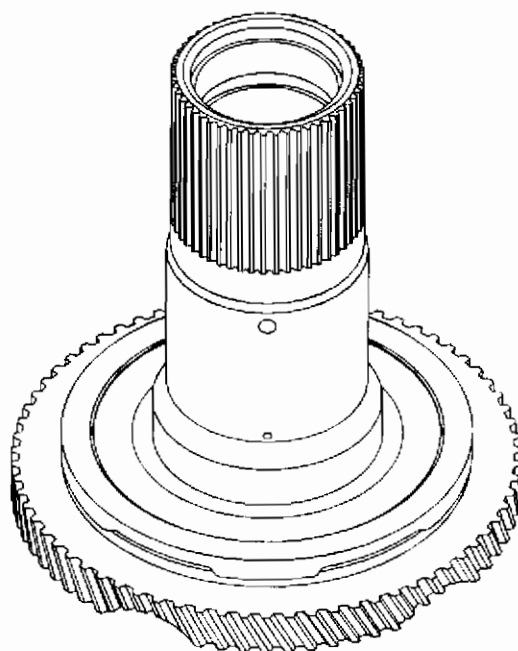
THM 4L65-E (M32) REACTION SHAFT AND NEW THRUST BEARING



Copyright © 2001 ATSG

Figure 3

THM 4L65-E (M32) REACTION SHAFT WITH BEARING INSTALLED



*Thrust Bearing Is Installed With "Lips"
Facing Down And Snaps Into Place
As Shown*

Copyright © 2001 ATSG

Figure 4

BLANK



**THM 4L80-E
CENTER GEAR BOX CHANGES
FOR 1999 MODELS**

CHANGE: Beginning at the start of production for all 1999 model THM 4L80E transmissions, the planetary pinions on both carriers were produced 10% thicker than the previous models, as shown in Figure 1. This engineering change required the addition of a .041" shim in the gear train to re-center the sun gear in the new planetary pinions and affected several internal parts, that may create some confusion, and thus some mis-assembly concerns.

REASON: Increased durability and reliability.

PARTS AFFECTED:

- (1) PLANETARY PINION GEARS - Were increased in length by approximately .075" in both front and rear carriers, as shown in Figure 1, for increased durability.
- (2) ADDED .041" SHIM - There was a .041" shim added between the thrust bearing and the rear internal ring gear, to re-center the sun gear in the revised planetary pinion gears, as shown in Figure 2.
- (3) CENTER SUPPORT - Required a .041" recess to be machined into the center support bearing surface, to accommodate the sun gear being re-centered in the revised planetary pinion gears, as shown in Figure 3.
- (4) SUN GEAR SHAFT - Required that .041" be removed from the bottom of the rear bushing journal, to accommodate the re-centering of the sun gear in the revised planetary pinion gears, as shown in Figure 4. Notice that revised sun gear shaft can be identified with a groove cut into the shaft splines, as shown in Figure 4.

INTERCHANGEABILITY:

None of the parts listed above will interchange with any of the previous design level parts, and none of the previous design level parts can be used in the 1999 and later units.

However, when all pieces listed above are used as a service package, they can be used to back service "Center Lube" model 4L80-E transmissions.

The Sun Gear, Main Shaft, Rear Internal Ring Gear and all Thrust Bearings remained the same, as shown in Figures 5, 6, and 7.

SPECIAL NOTE: Some mis-assembly examples are illustrated in Figure 8 with some dimensional checks to prevent this from happening to you.

SERVICE INFORMATION:

Reaction (Front) Carrier Assembly (99 Design Level)	24202051
Output (Rear) Carrier Assembly (99 Design Level)	24202052
Washer, .041" (99 Design Level)	24211821
Center Support Assembly (99 Design Level)	24217454
Sun Gear Shaft Assembly (99 Design Level)	24207264

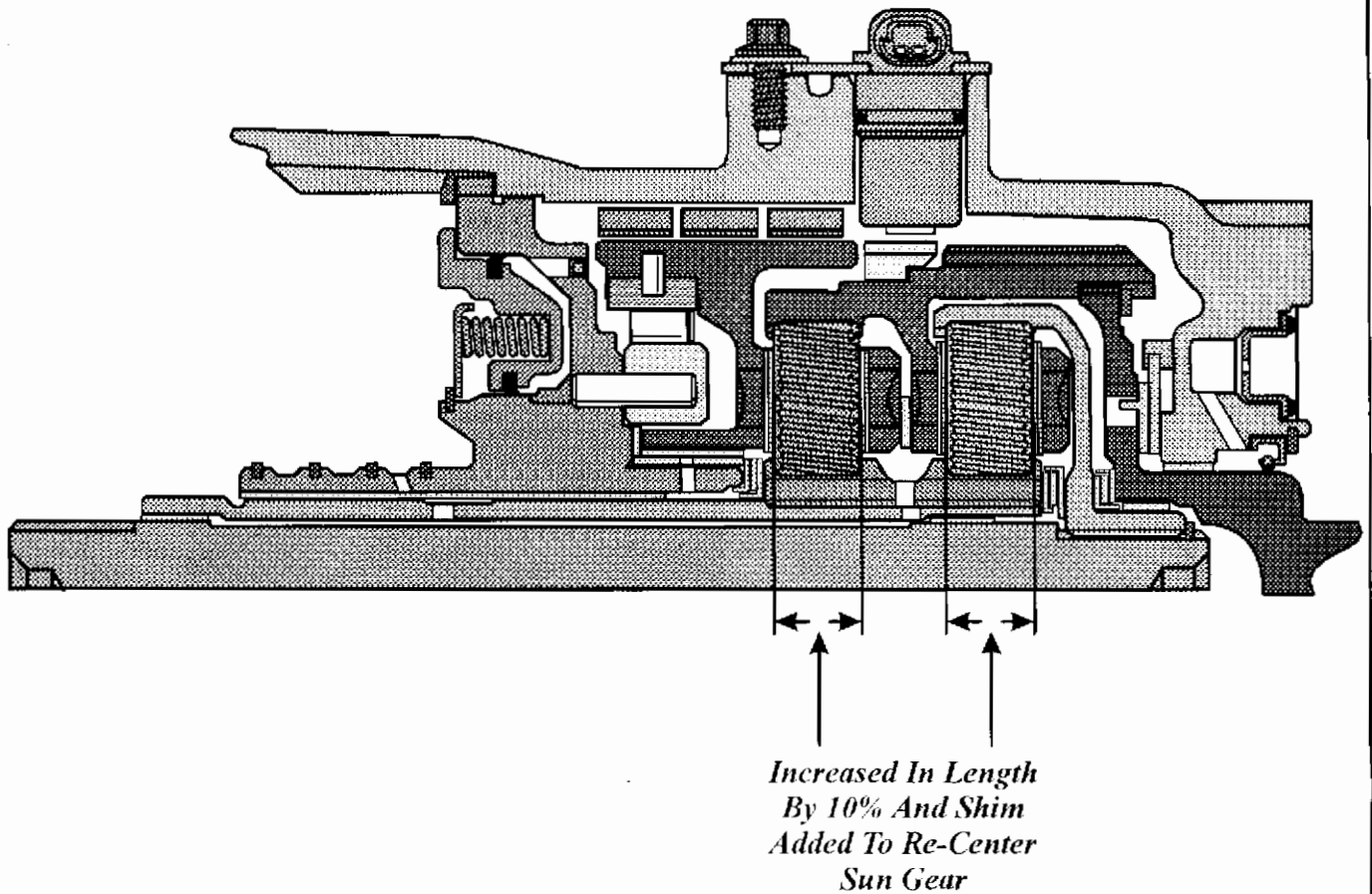
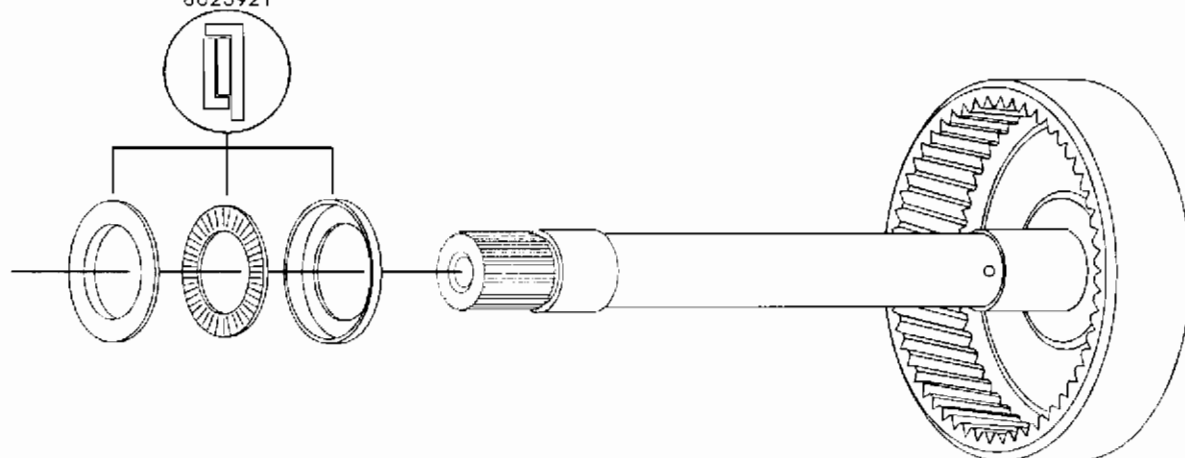


Figure 1

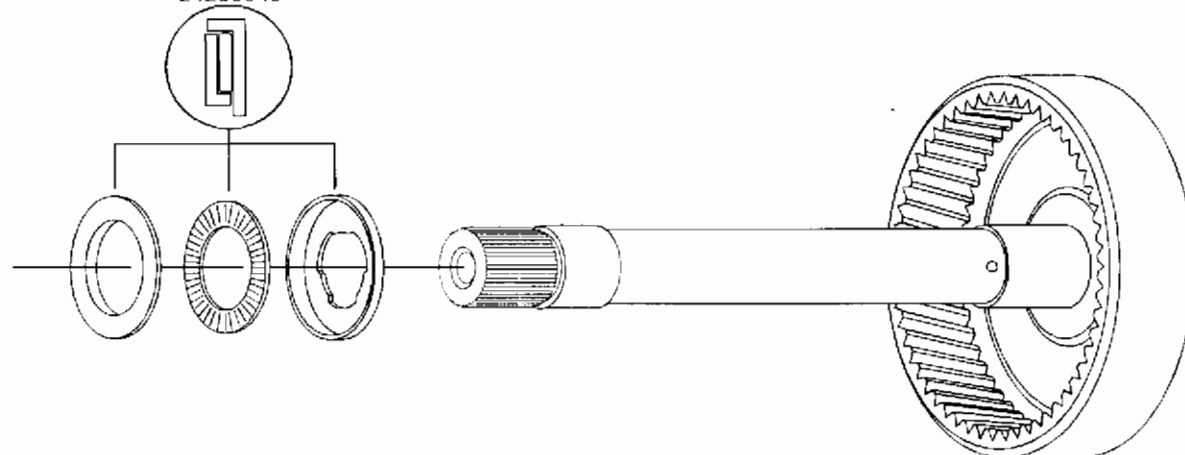
OEM PART NO.
8623921

1991-1996 MODELS



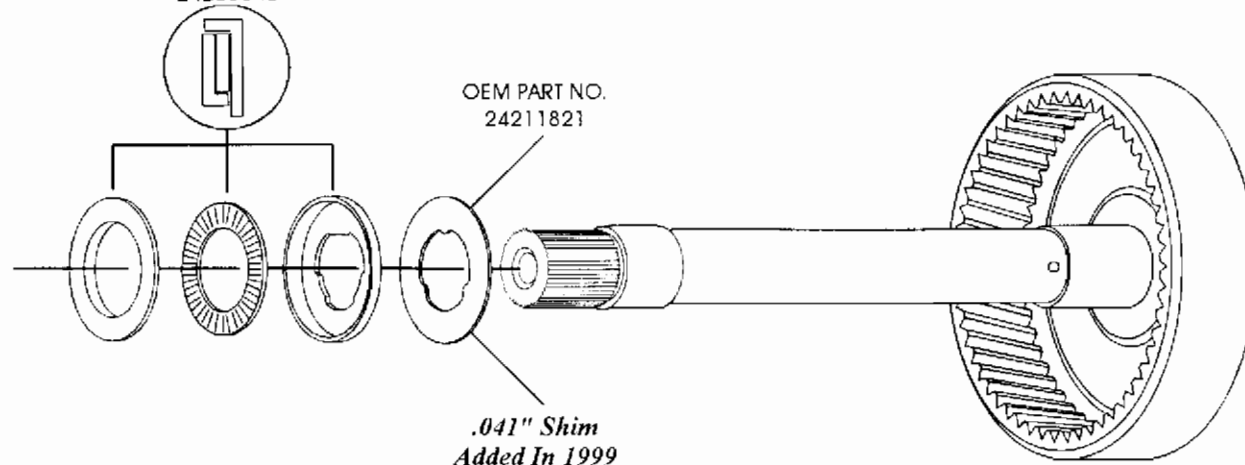
OEM PART NO.
24208848

1997-1998 MODELS



OEM PART NO.
24208848

1999-UP MODELS



Copyright © 2001 ATSG

Figure 2

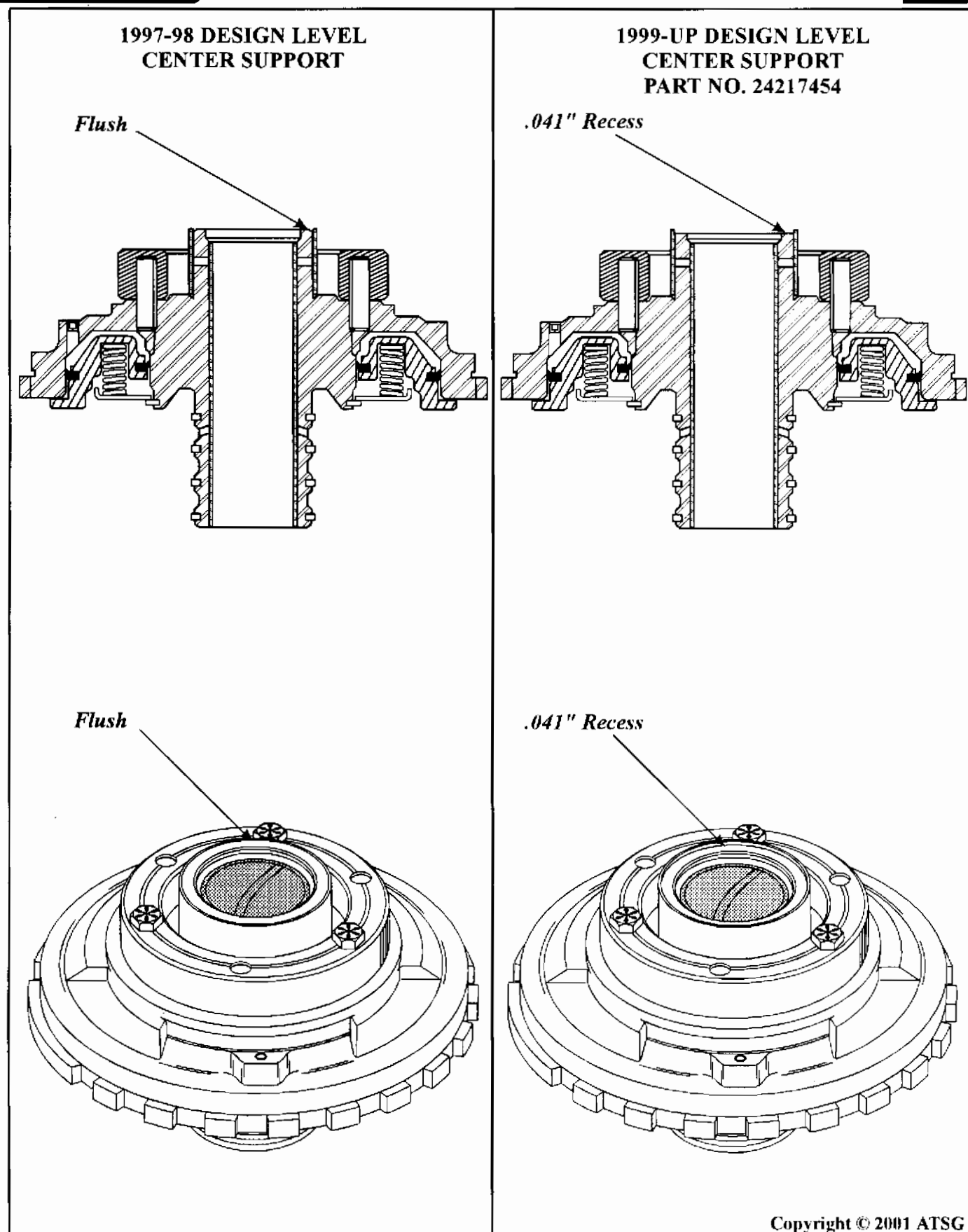
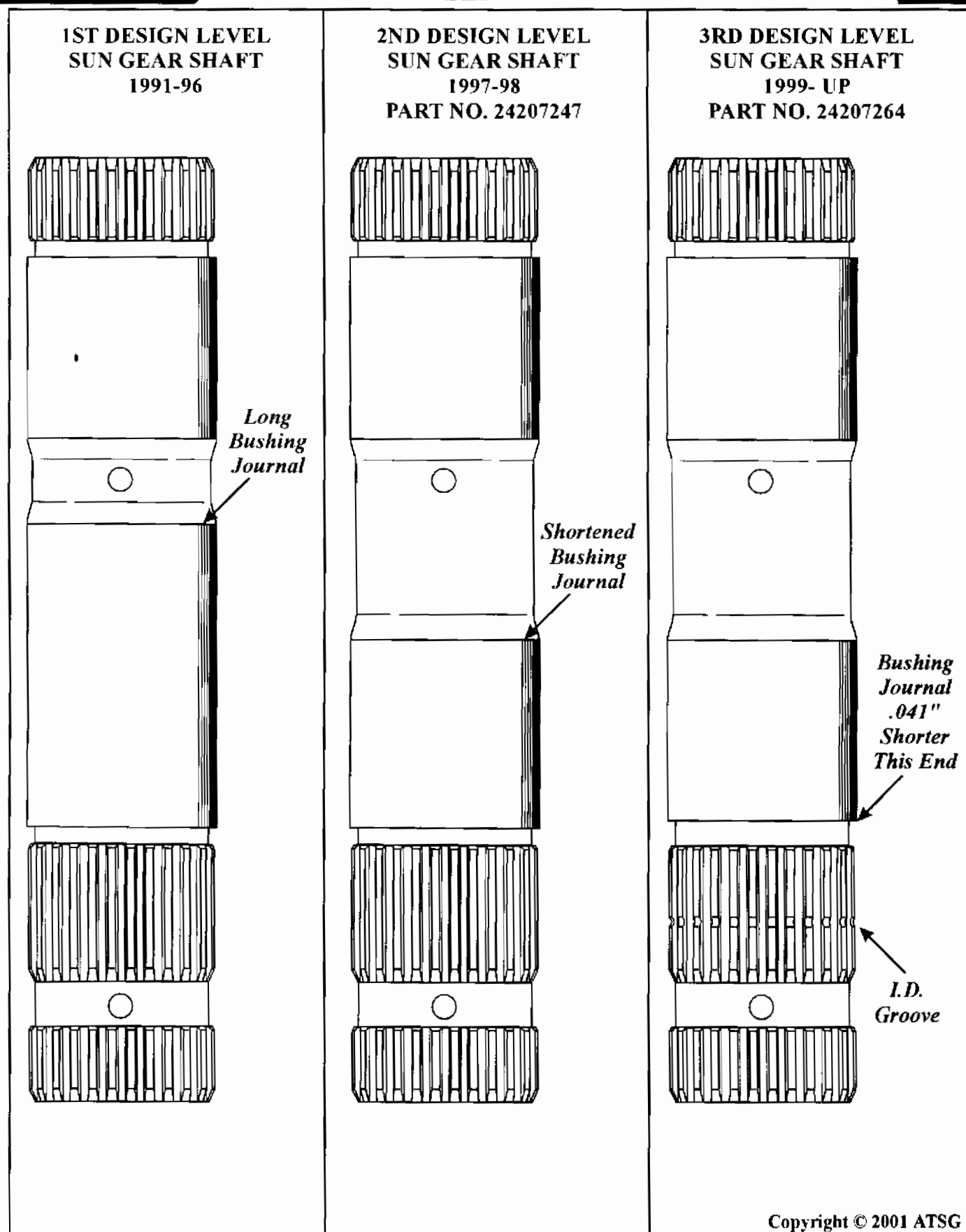


Figure 3



Copyright © 2001 ATSG

Figure 4

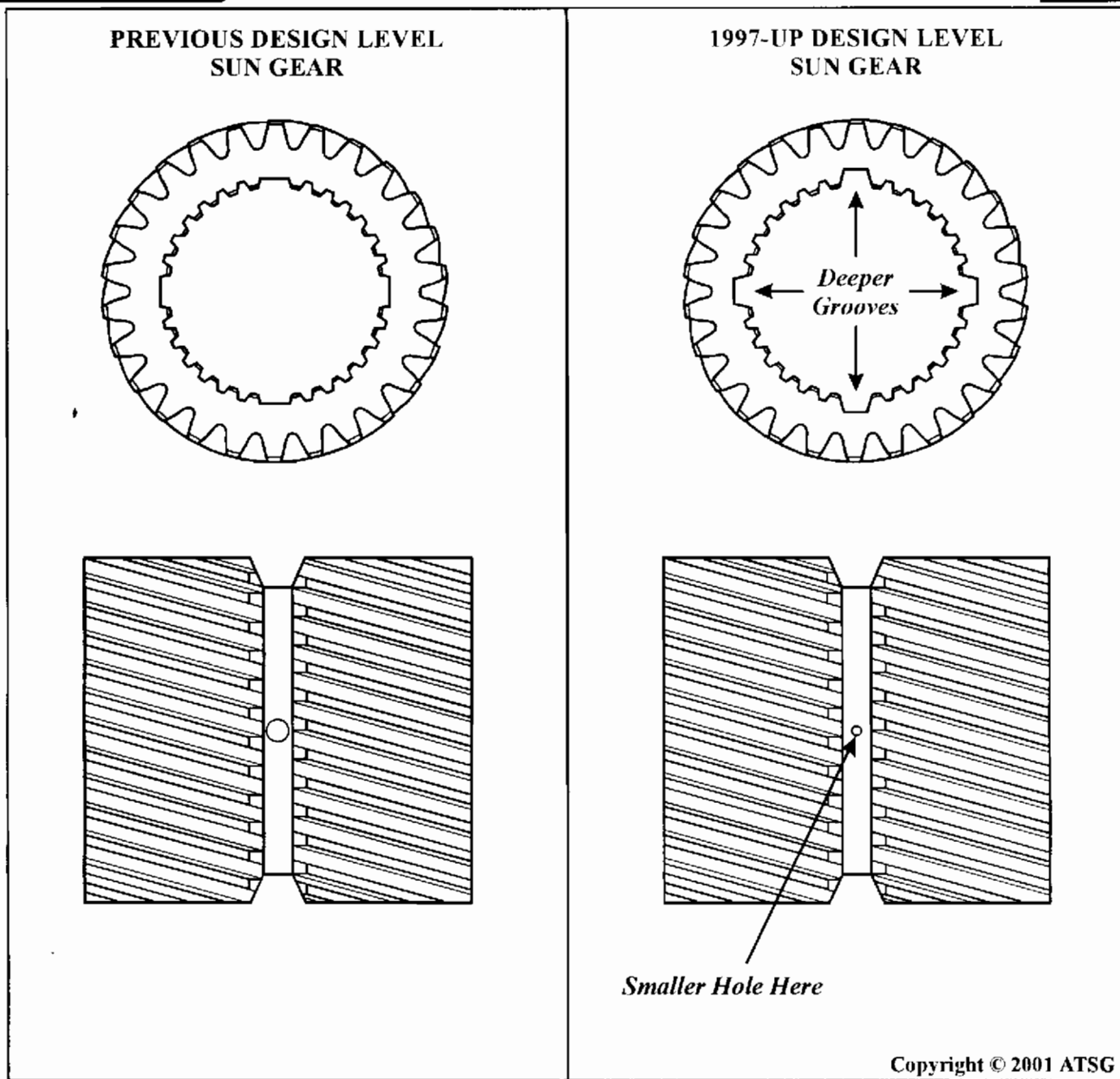


Figure 5

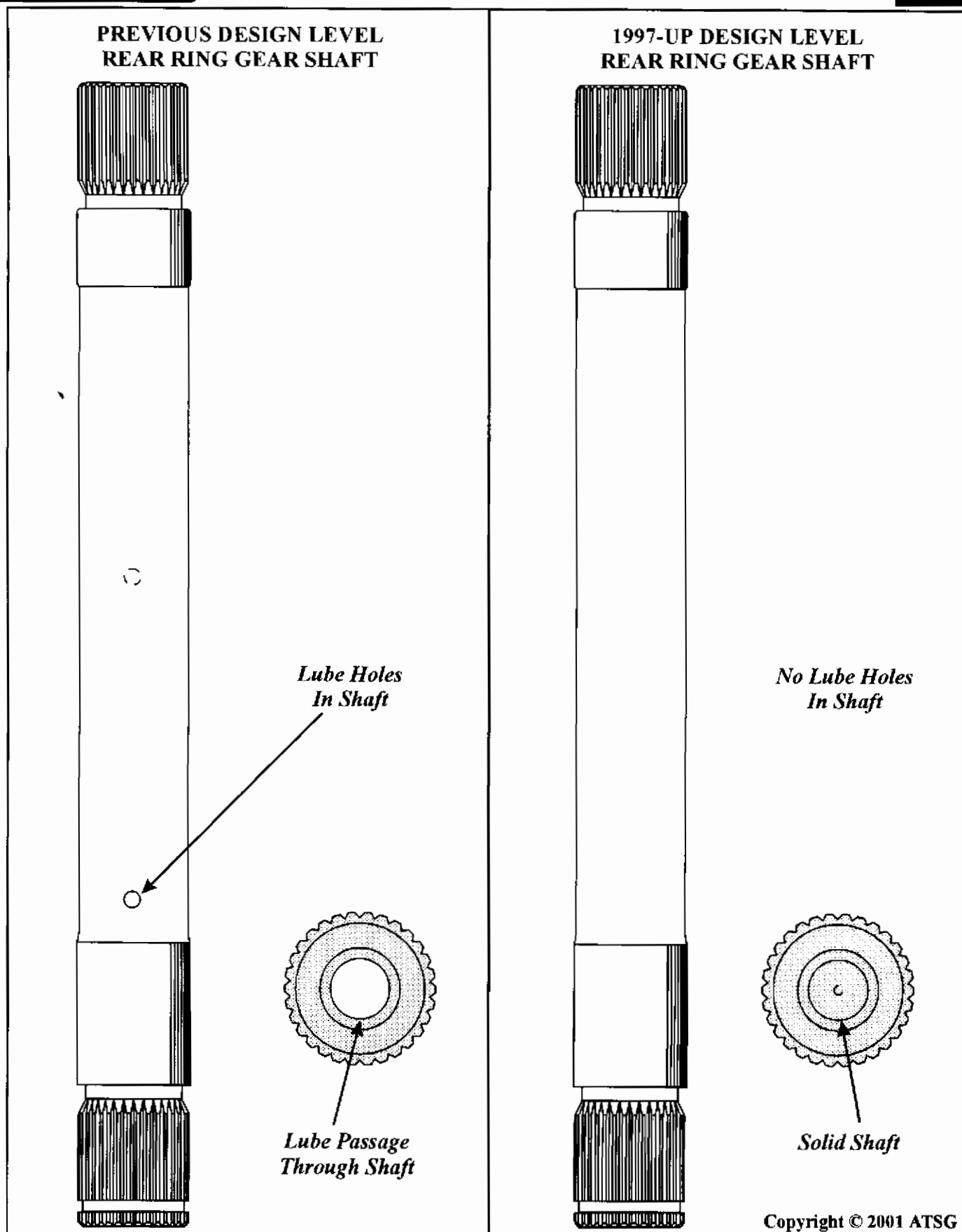
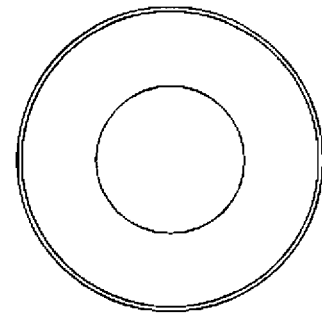
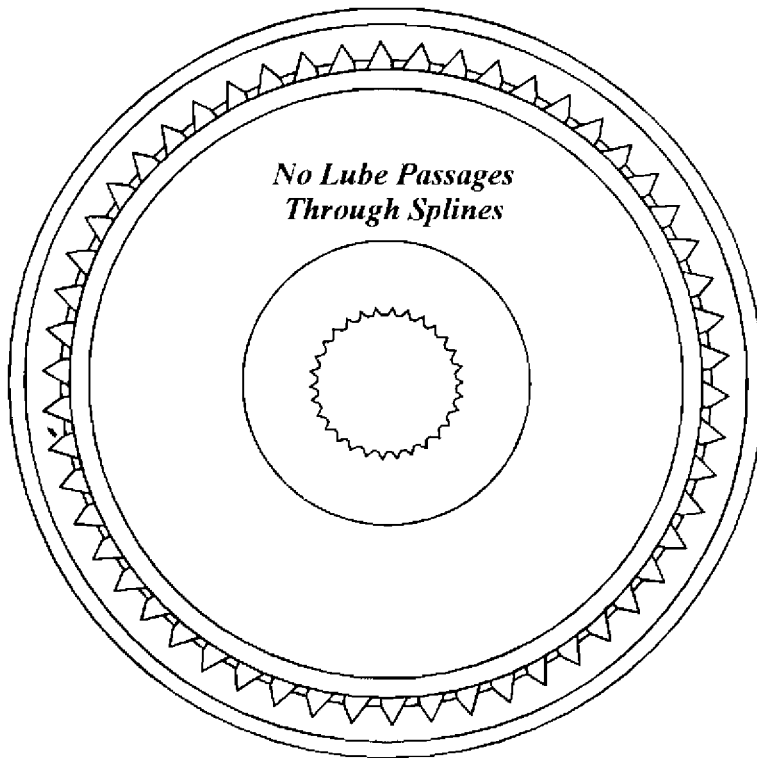


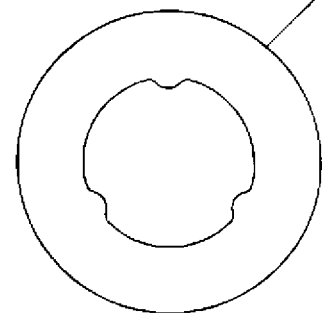
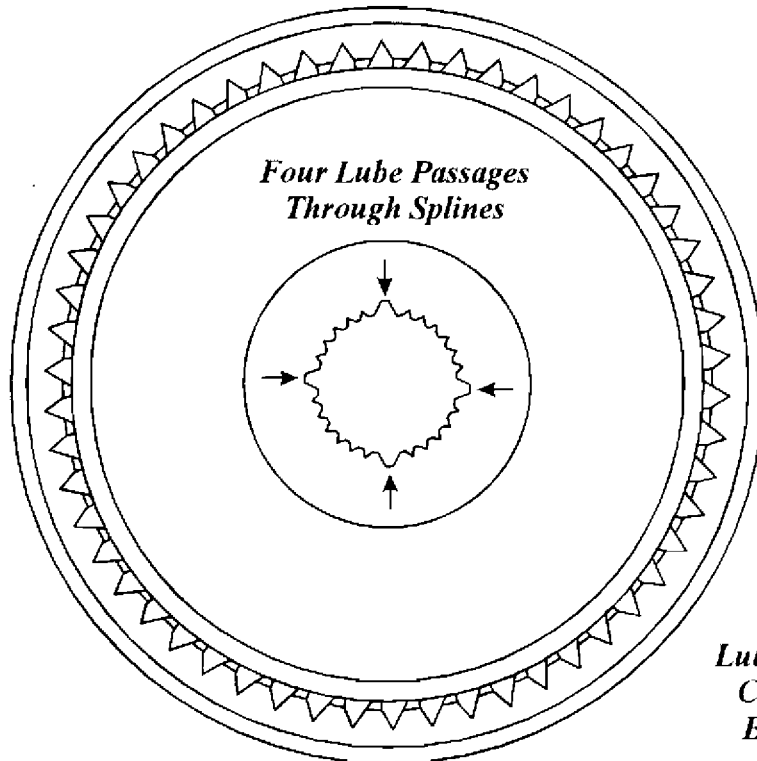
Figure 6

PREVIOUS DESIGN LEVEL REAR RING GEAR AND BEARING RACE

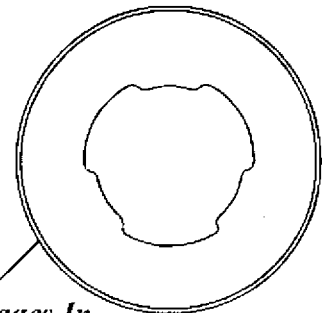


Round Hole In Center Of The Bearing Race

1997-UP DESIGN LEVEL REAR RING GEAR AND BEARING RACE



.041" Shim Added In 1999 Models



Lube Passages In Center Of The Bearing Race

Copyright © 2001 ATSG

Figure 7

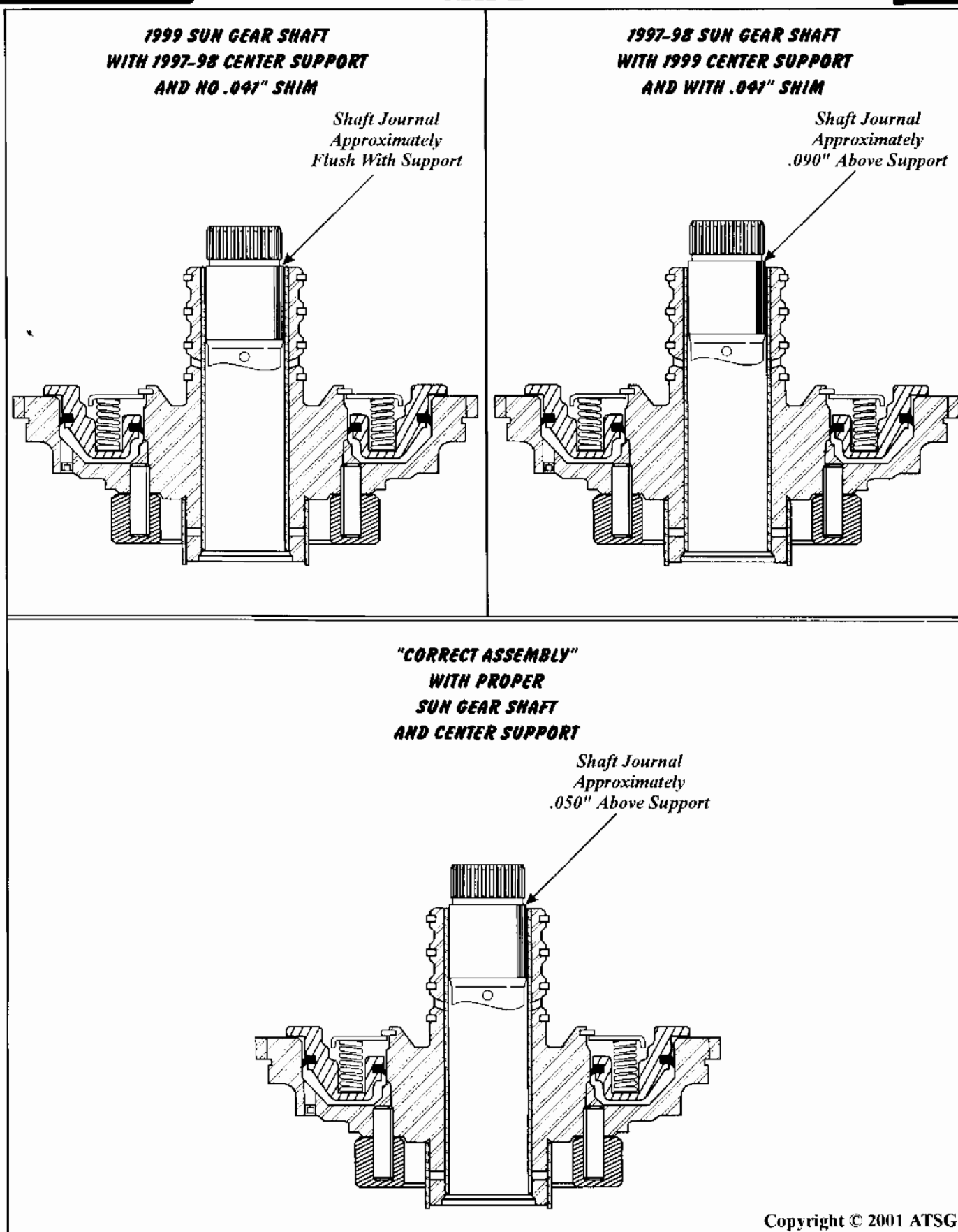


Figure 8

ELIMINATE

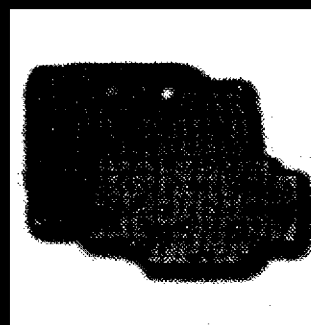
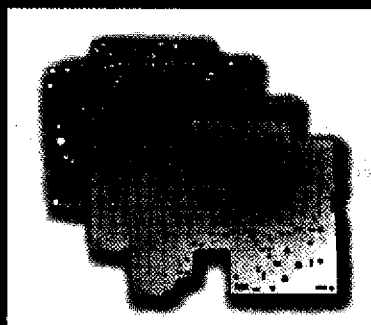
THE WARR

NEW TRANSGO® KITS THAT CORRECT, PREVENT, AND REDUCE TRANSMISSION COMEBACKS!



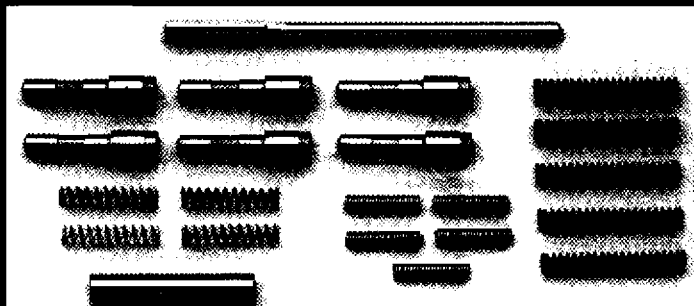
4L6-ISO-3 LOCKUP UPGRADE KIT

Includes the 4L60E patented isolator valve that is longer, oversize (0.472) and self cleaning. Fits SRTA transmissions and GM rebuilt valve bodies. The valve reaches beyond wear, which reduces tilting and future wear.



4L60E & 4L80E VALVE BODY PLATES

TransGo® has introduced 4L60E and 4L80E separator plates with a vastly improved design of Tempered steel for longer life at checkball locations, and all are plated to be rust proof. 3-4L60E plates fit 40 O.E. model numbers and 1-4L80E plate will fit 1991-2001 models. By stocking these 4-plates, a shop will have the plate needed to fit any model.



4L80E-ACTUATOR LIMIT VALVE REPAIR KIT

Correct low line pressure, clutch burnup and wrong gear starts using special valves that have 50% more linear support and less oscillation than the original design. This stops the wear and makes the valve body more durable. Kit includes Boring guide, boring tool and 6 longer oversized valves and springs.



4R100-LU-ON/OFF LOCKUP KIT

Converts long soft PWM controlled lockup to crisp on/off lockup, like the E40D. Installs into stator support. (Pump Cover)

FOR MORE INFORMATION OR A DISTRIBUTOR IN YOUR AREA CALL

TRANSGO

2621 Merced Ave.,
El Monte, Ca. 91733

(626) 440-7400



THM 4L80E/4L80EHD
NEW DESIGN OVERRUN
ROLLER CLUTCH

CHANGE: Beginning in March 2001, a new design Overrun Roller Clutch was introduced into the THM 4L80E, as a running change. This engineering change affected many other related parts.

REASON: Increased durability and reliability with the new design roller clutch, by reducing the ability of the rollers to "skew".

PARTS AFFECTED:

- (1) **OVERRUN ROLLER CLUTCH** - Entirely new design with smaller diameter rollers and the rollers are now trapped inside of a "Shoe" to help prevent skewing, and the springs put pressure on the "Shoe", as shown in Figure 1.
- (2) **OVERRUN CLUTCH HOUSING** - Requires a different ramp angle on the inner cam, to accommodate the new design roller clutch, as shown in Figure 1. The snap ring was also moved away from the back of the roller clutch which required a new snap ring groove that is lower in the housing, as shown in Figure 2.
- (3) **OVERRUN ROLLER CLUTCH RETURN SPRING** - Now requires a recess in the return spring retainer to accomodate the relocated snap ring groove, as shown in Figure 2.
- (4) **RETAINER SNAP RING** - New design has revised dimensions, as shown in Figure 2. The new design snap ring is thinner and narrower.
- (5) **OVERDRIVE PLANETARY CARRIER** - The new design has a smaller diameter roller clutch outer race incorporated in the overdrive carrier, as shown in Figure 3.

INTERCHANGEABILITY:

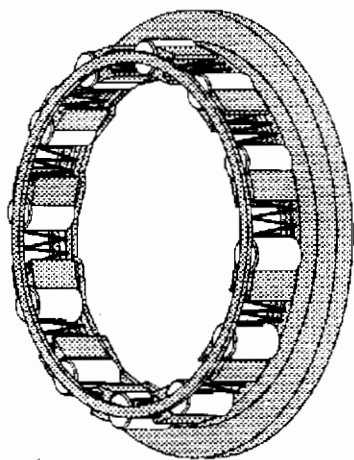
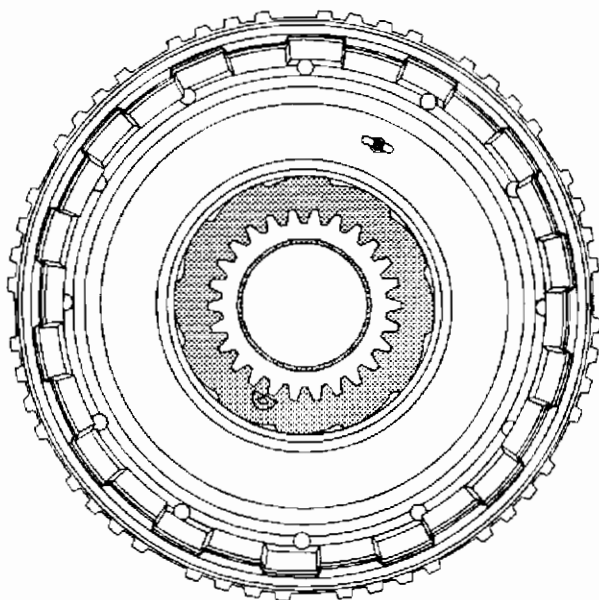
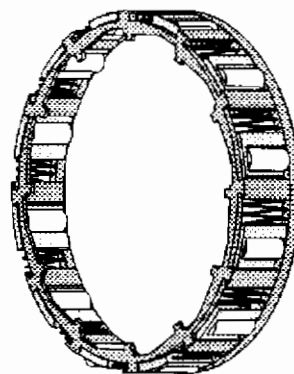
None of the current design parts listed above will interchange with the previous design level parts. They will however retro-fit back on all models, when used as a service package.

SERVICE INFORMATION:

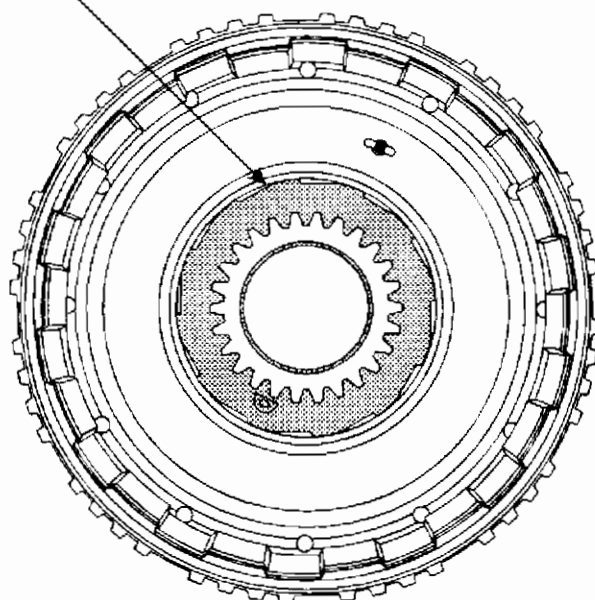
Overrun Roller Clutch Service Package (New Design) 24222160
Turbine Shaft Assembly (2nd Design) 24200128

SPECIAL NOTE:

If installing this service package into an early model, with the 1st design turbine shaft, you must also purchase the 2nd design turbine shaft, as shown in Figure 4. The changes included shot peening the area around the forward clutch feed hole, the feed hole diameter reduced and drilled through the turbine shaft (See Figure 4).

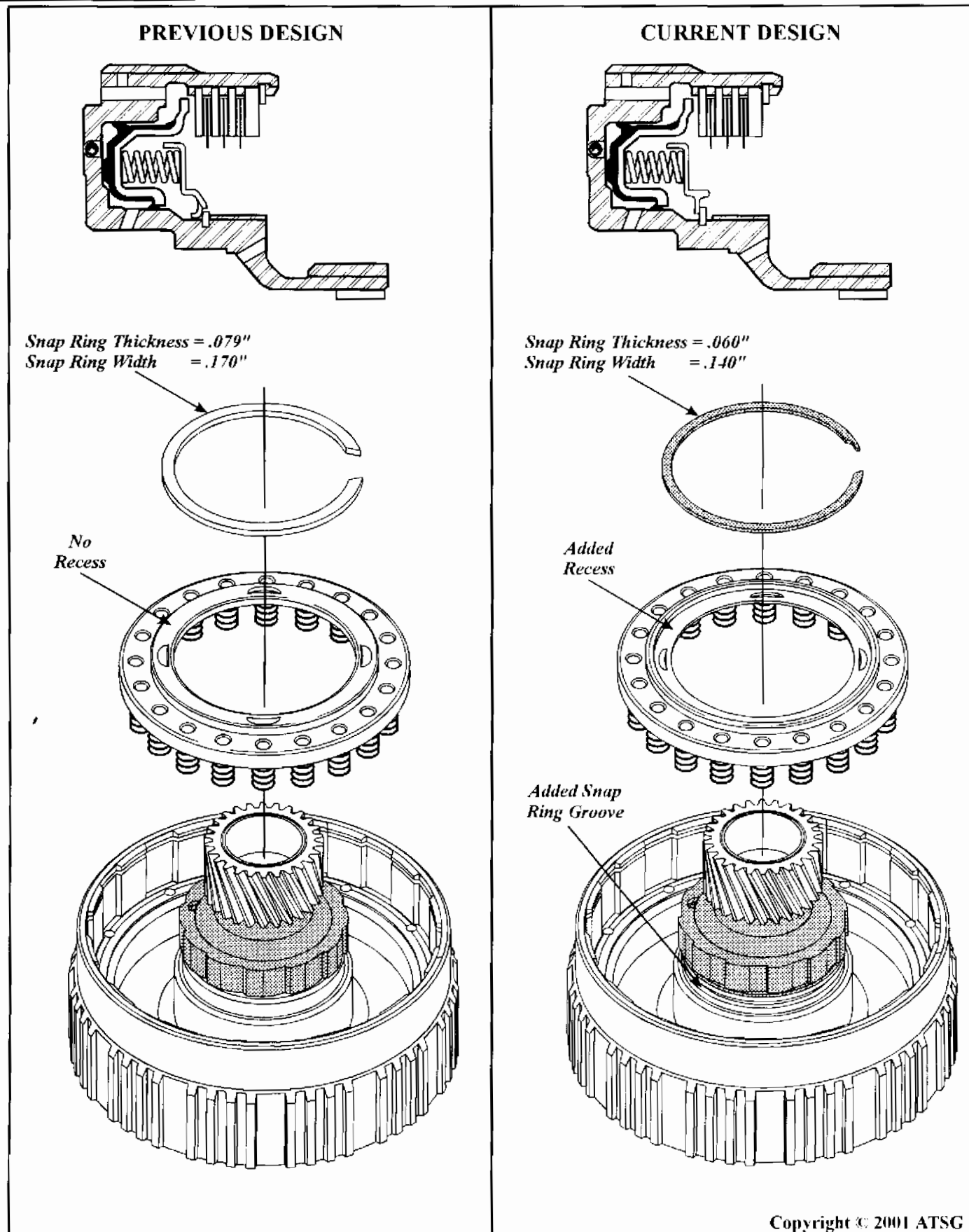
**PREVIOUS DESIGN
OVERRUN ROLLER CLUTCH****CURRENT DESIGN
OVERRUN ROLLER CLUTCH**

*Different Ramp Angle
On Inner Cam*



Copyright © 2001 ATSG

Figure 1



Copyright © 2001 ATSG

Figure 2

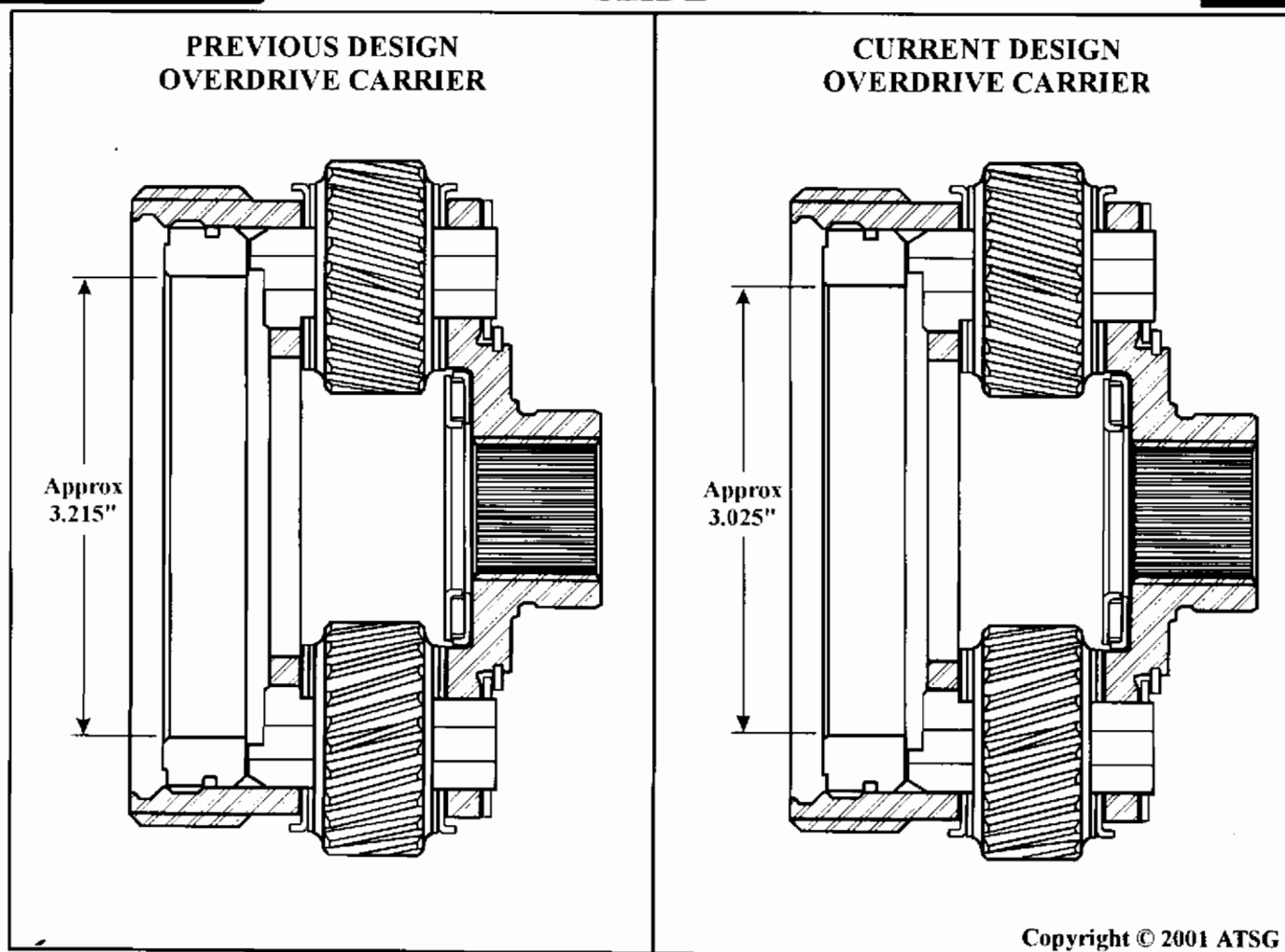
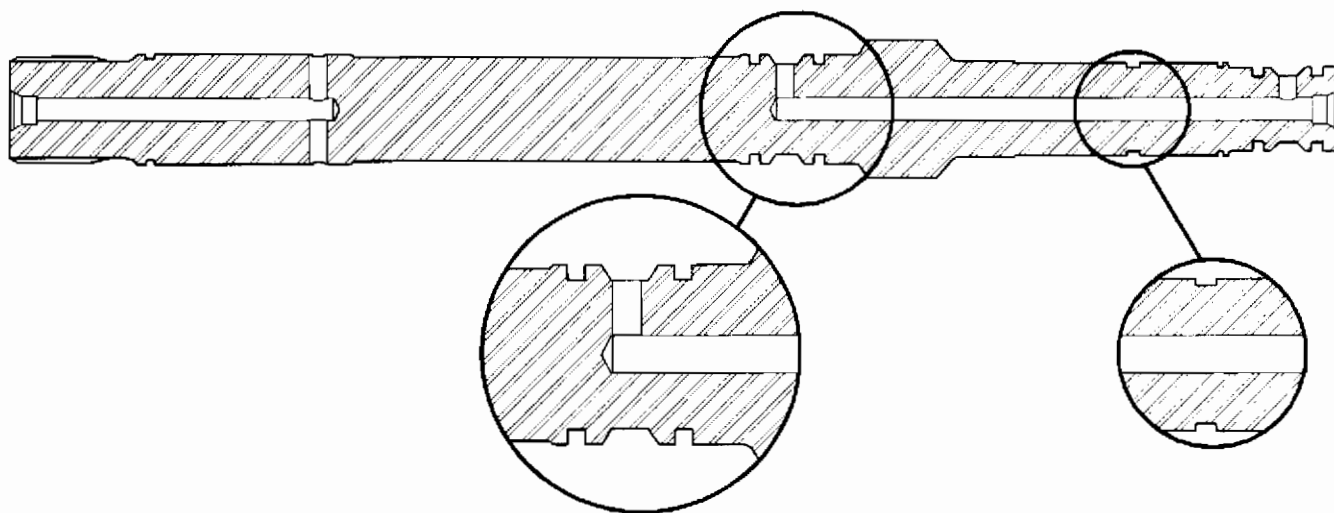
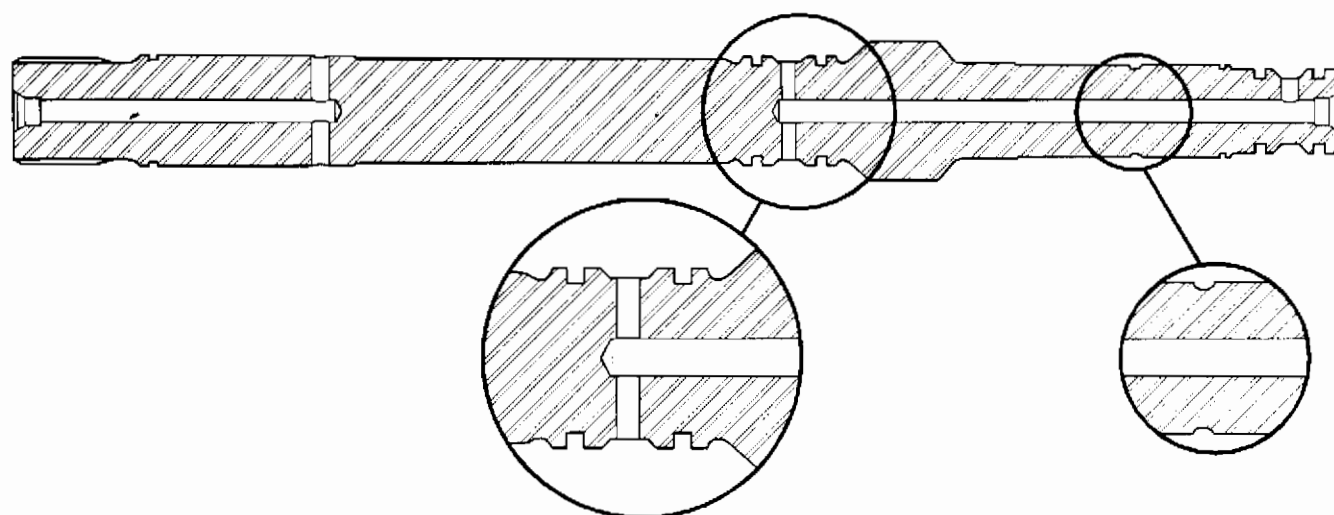


Figure 3

"1ST" DESIGN TURBINE SHAFT***"2ND" DESIGN TURBINE SHAFT***

***Forward Clutch Feed
Hole Drilled Through***

Copyright © 2001 ATSG

Figure 4

BMW 5L40-E (A5S 360R)
PRELIMINARY INFORMATION

Beginning at the start of production for some 1999 models, BMW has introduced a new 5 speed automatic transmission that is designed and manufactured by General Motors Powertrain division in Strasbourg, France and is illustrated in Figure 1. This new transmission is designated as follows:

GM Designation - 5L40-E

BMW Designation - A5S 360R

Model year 1999 applications are as follows:

3 Series BMW, with 2.5L Gasoline Engine, Used in USA and Japan.

3 Series BMW, with 2.8L Gasoline Engine, Used in USA and Japan.

5 Series BMW, with 3.0L Diesel Engine, Used Worldwide.

The 5L40-E transmission is a completely new design rear wheel drive unit and was designed to be a four or five speed transmission. The same case and components are used for both applications with the exclusion of the 2nd clutch and the 2nd sprag clutch, and the use of a smaller ravigneaux planetary carrier assembly in the 4 speed version.

The Hydra-matic 5L40-E is a fully automatic, five forward speed, rear wheel drive, fully electronic controlled transmission, with a maximum torque rating of 360 Nm. It consists primarily of a four element (Lock-Up) torque converter, one ravigneaux planetary gear set, nine multiple-disc friction clutch packs, four mechanical sprag clutches and a hydraulic pressurization and control system. We have provided you with an illustration to identify the location of the nine different clutch packs, the four mechanical sprag clutches and a component application chart in Figure 2.

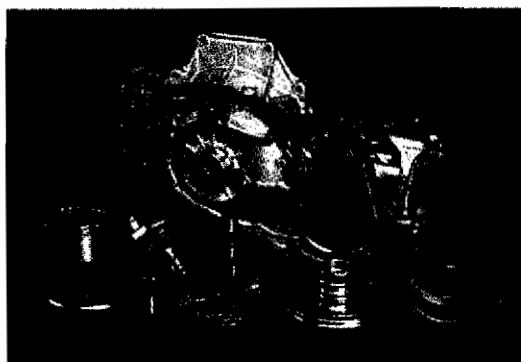
The ravigneaux planetary gear set provides the five forward speeds and reverse. Changing gear ratios is fully automatic and is accomplished through the use of a Transmission Control Module (TCM). The TCM receives and monitors various electronic sensor inputs and uses this information to shift the transmission at the optimum time, as illustrated in Figure 5.

The TCM commands three on/off Shift Solenoids to control shift timing. The TCM controls shift feel through the Pressure Control Solenoid. The TCM also controls the apply and release of the torque converter clutch through a TCC/PWM Solenoid. Refer to Figure 3 for the solenoid application chart for each gear, along with case connector pin identification and a resistance chart for the internal components. Refer to Figure 4 for the internal wiring schematic. Notice also in Figure 4 that this transmission uses an Internal Mode Switch (IMS). The IMS operation is illustrated and explained in Figure 6, and description of each gear range is explained in Figure 7.

The hydraulic system primarily consists of a 13 vane pump, two control valve bodies, two channel plates, converter housing and transmission case. The pump maintains the working pressures needed to stroke the clutch pistons that apply or release the friction components, and is illustrated in Figure 8. The two control valve bodies and two channel plates are illustrated in Figures 9, 10, and 11. Check ball locations for this transmission are illustrated in Figure 12.



The SEATAC Difference



SEATAC PARTS WAREHOUSE stocks the most intense coverage of AC DELCO transmission parts available. An extensive inventory on the shelf ready to ship to any place in the US or International. From Cases, Hard Parts, O-rings, plus an extensive line of electronics to small screws... all available at dealer cost.



Two generations of parts experience tells you our sales and technical service representatives have the knowledge to answer questions regarding installation or interchangeability.

For quick service and delivery, call the SEATAC "Hot Line". SEATAC also carries a broad range of Chrysler and Ford parts, and is a full service aftermarket warehouse.



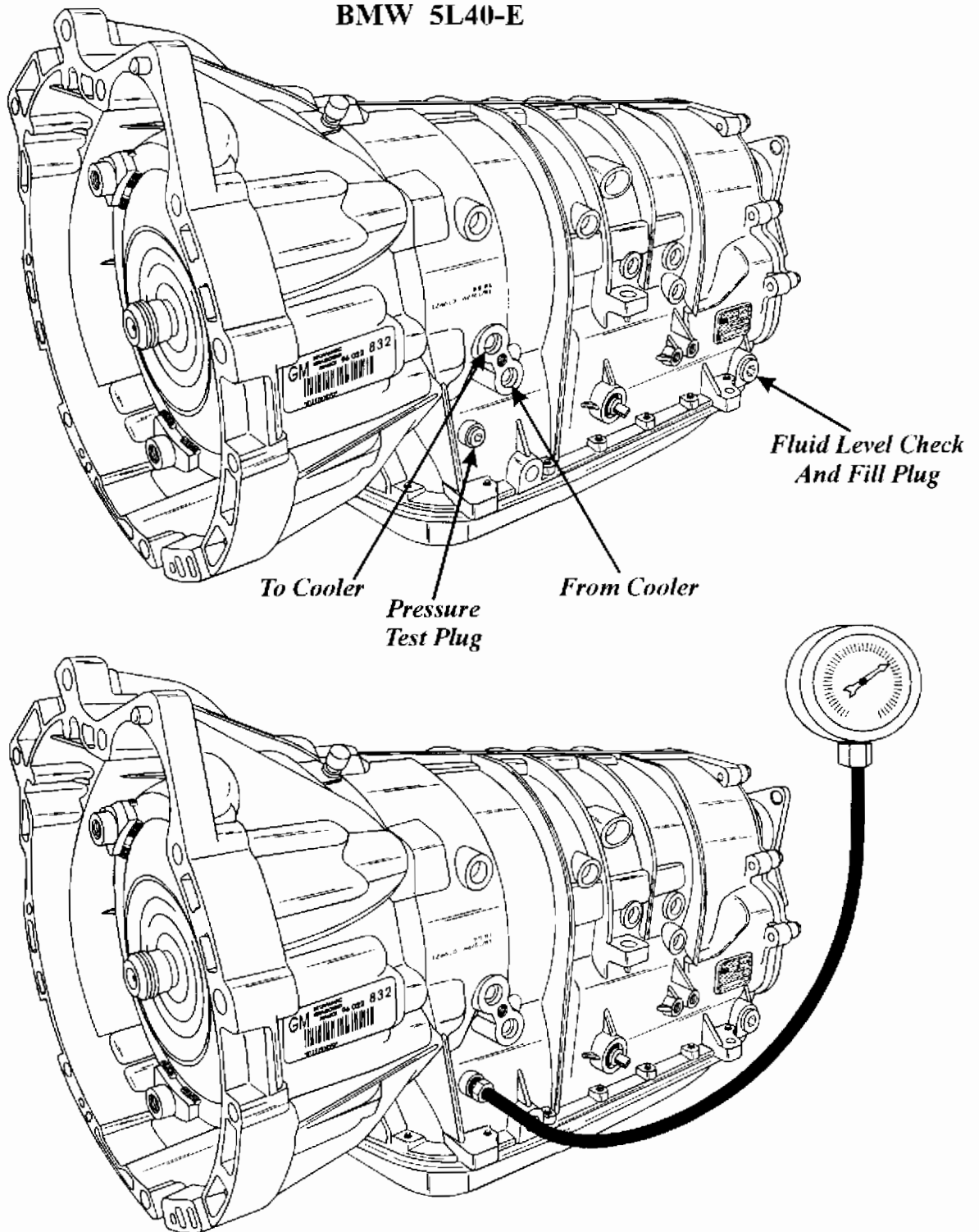
**SEATAC PARTS
WAREHOUSE, INC.**

1 • 800 • 735 • 7191

2627 S. 248th • Kent, WA. 98032

Fax: 253 • 946 • 0478

BMW 5L40-E

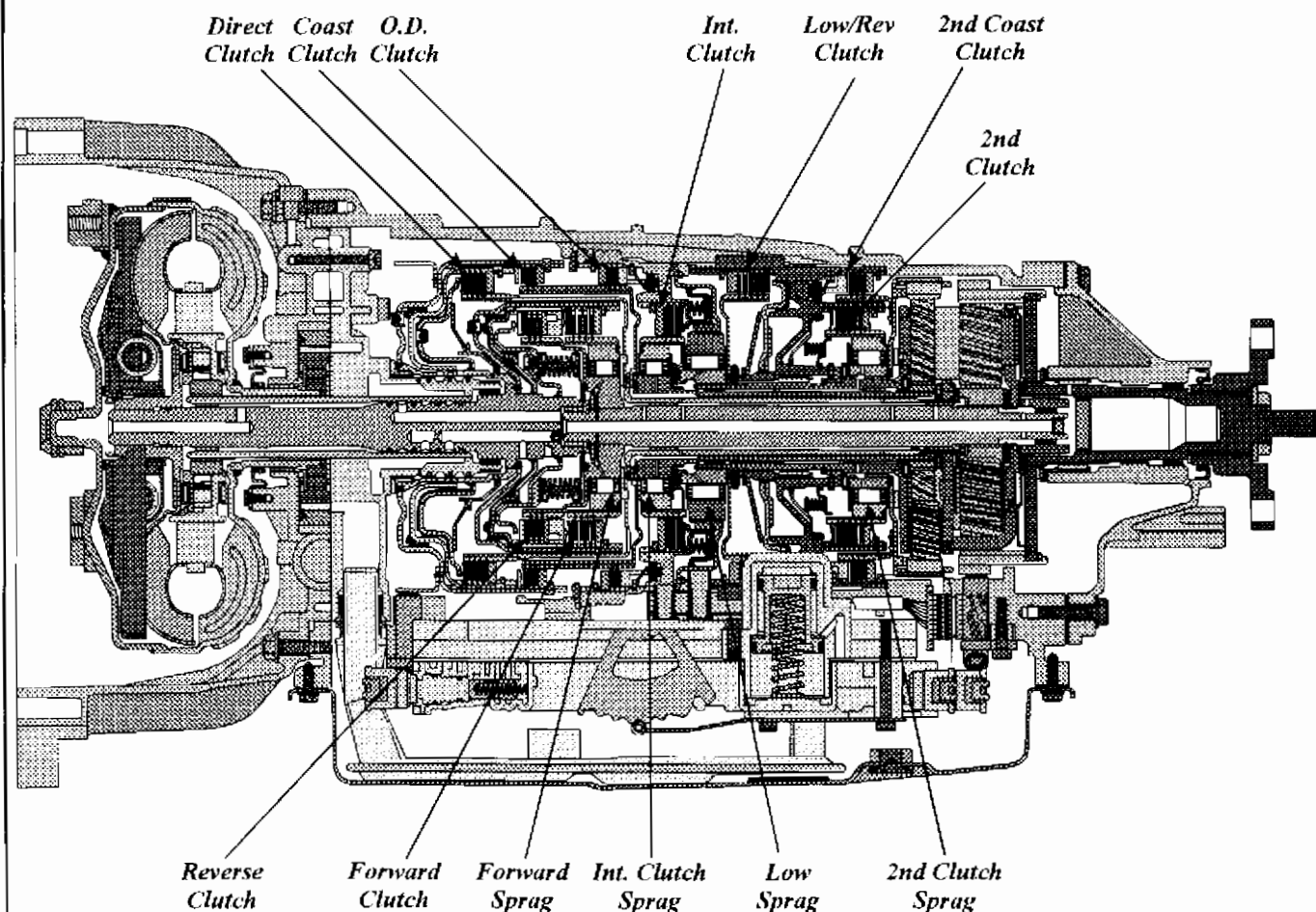


RANGE	LINE PRESSURE	
	Minimum	Maximum
P, N, D, M4, M3, M2	48 psi	180 psi
REVERSE	60 psi	232 psi

Copyright © 2001 ATSG

Figure 1

5L40-E COMPONENT APPLICATION CHART



5L40-E COMPONENT APPLICATION CHART

RANGE	GEAR	Engine Braking	Direct Clutch	Coast Clutch	Reverse Clutch	Fwd. Clutch	2nd Clutch	Int. Clutch	O.D. Clutch	Low/Reverse Clutch	2nd Coast Clutch	Fwd. Clutch Sprag	Low Clutch Sprag	2nd Clutch Sprag	Int. Clutch Sprag	Gear Ratio
Park/Neutral																
Reverse	R	Yes			On					On						3.03
D, 4, 3, 2,	1st	No*		On		On						Hold	Hold			3.42
	1st	Yes		On		On				On		Hold	Hold			3.42
	2nd	No*		On		On	On					Hold		Hold		2.21
	2nd	Yes		On		On	On				On	Hold		Hold		2.21
	3rd	No*		On		On	On	On				Hold			Hold	1.60
	3rd	Yes		On		On	On	On	On			Hold			Hold	1.60
	4th	Yes	On	On		On	On	On				Hold				1.00
	5th	Yes	On			On	On	On	On							0.75

* Engine braking is electronically controlled by the TCM, and is available as calibrated for each model and application.
On = Clutch Applied.

Copyright © 2001 ATSG

Figure 2

5L40-E SOLENOID APPLICATION CHART

RANGE	GEAR	Engine Braking	Direct Clutch	Coast Clutch	Reverse Clutch	Fwd. Clutch	2nd Clutch	Int. Clutch	O.D. Clutch	Low/Reverse Clutch	2nd Coast Clutch	1-2 Shift Sol.	2-3 Shift Sol.	4-5 Shift Sol.	TCC Sol.	Gear Ratio
Park/Neutral												***	***	***	Off	
Reverse	R	Yes			On					On		On			Off	3.03
D, 4, 3, 2,	1st	No*		On		On						Off	On	Off	Off	3.42
	1st	Yes		On		On				On		Off	On	On	Off	3.42
	2nd	No*		On		On	On					On	On	Off	On**	2.21
	2nd	Yes		On		On	On				On	On	On	On	On**	2.21
	3rd	No*		On		On	On	On				On	Off	Off	On**	1.60
	3rd	Yes		On		On	On	On	On			On	Off	On	On**	1.60
	4th	Yes	On	On		On	On	On				Off	Off	On	On**	1.00
	5th	Yes	On			On	On	On	On			Off	Off	Off	On**	0.75

* Engine braking is electronically controlled by the TCM, and is available as calibrated for each model and application.

** Dependant upon various sensors including vehicle speed and throttle position.

*** Calibrated for particular model and application.

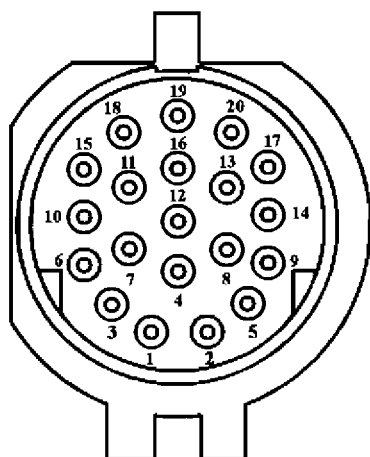
On = Clutch Applied.

On = Solenoid Energized.

Off = Solenoid De-Energized.

5L40-E COMPONENT RESISTANCE CHART

COMPONENT	CASE CONN TERMINALS	RESISTANCE @ 20°C (68°F)
1-2 Shift Solenoid "A" (On/Off - N/C)	14 And 17	15-17 Ohms
2-3 Shift Solenoid "B" (On/Off - N/C)	9 And 17	15-17 Ohms
4-5 Shift Solenoid "C" (On/Off - N/C)	5 And 17	15-17 Ohms
TCC Solenoid (PWM - N/C)	20 And 17	10.0-11.5 Ohms
Pressure Control Solenoid (PWM - N/C)	8 And 13	3.5-4.6 Ohms
Input Speed Sensor	18 And 15	325-485 Ohms
Output Speed Sensor	1 And 3	325-485 Ohms
Transmission Fluid Temperature Sensor	10 And 6	See Chart Below
Internal Mode Switch	See Wire Schematic	See Chart



View Looking Into Transmission Case Connector

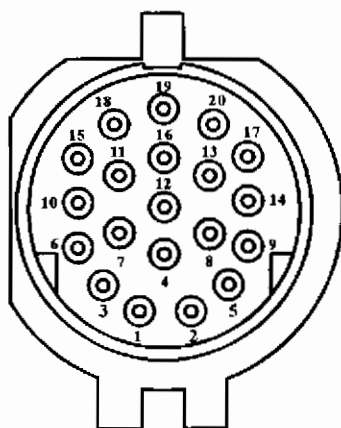
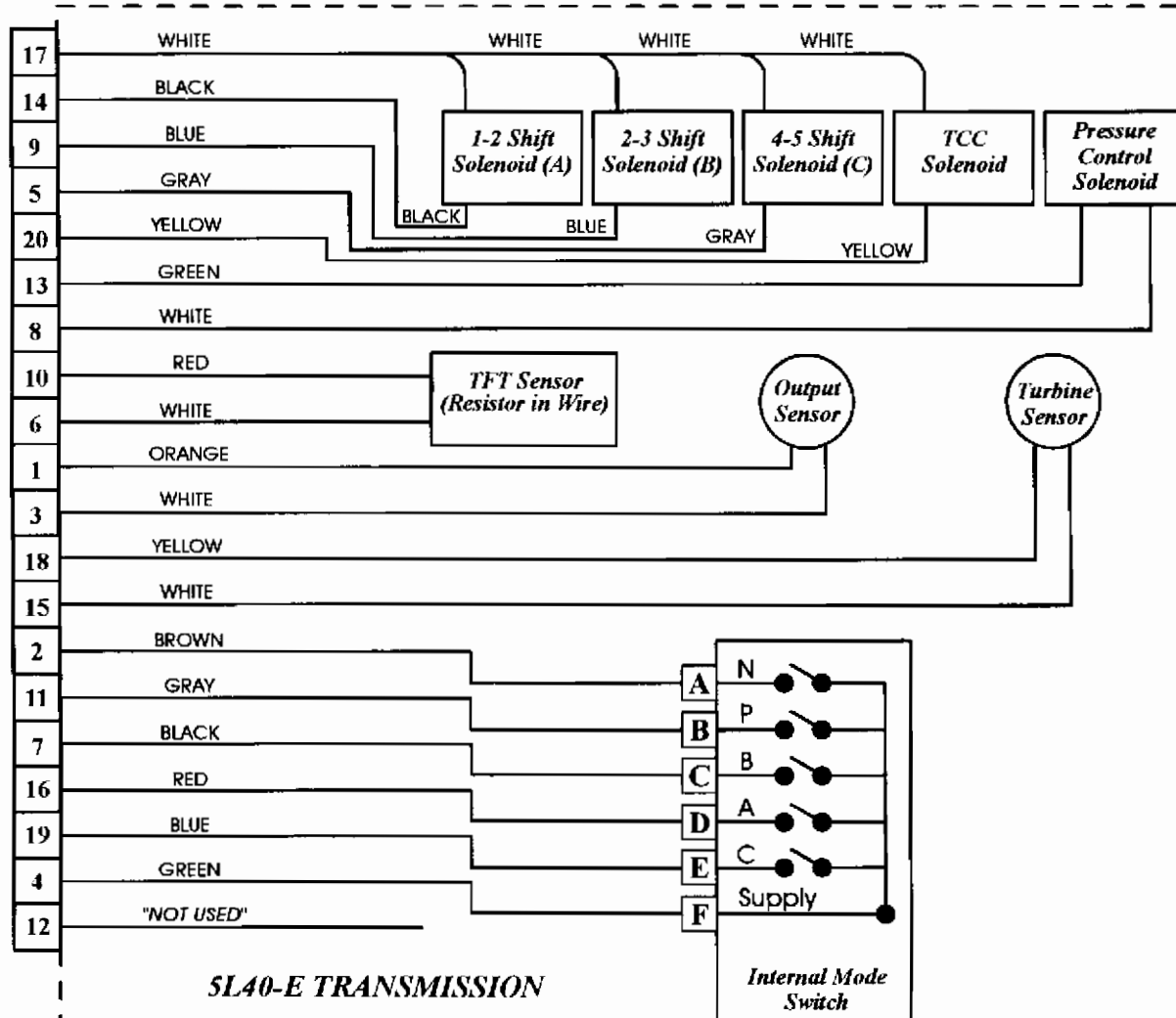
TFT Sensor Resistance Chart

Temperature C° (F°)	Resistance In Ohms		
	Minimum	Nominal	Maximum
-30C (-22F)	50264	52594	54924
-20C (-8F)	27439	28582	29725
-10C (14F)	15540	16120	16700
0C (32F)	9097	9399	9701
10C (50F)	5493	5658	5823
20C (68F)	3418	3511	3604
30C (86F)	2185	2240	2295
40C (104F)	1430	1465	1500
50C (122F)	958	980	1002
60C (140F)	656	671	686
70C (158F)	459	469	479
80C (176F)	327	334	341
90C (194F)	237	242	247
100C (212F)	174	178	182
110C (230F)	130	133	136
120C (248F)	98	101	104
130C (266F)	75	78	80

Copyright © 2001 ATSG

Figure 3

BMW INTERNAL WIRE SCHEMATIC



View Looking Into
Trans Case Connector

Case Connector Terminal Identification			
Pin No.	Description	Pin No.	Description
1	Output Speed Sensor (OSS)	11	Internal Mode Switch Signal "P"
2	Internal Mode Switch Signal "N"	12	"Not Used"
3	Output Speed Sensor (OSS)	13	Pressure Control Solenoid (+)
4	Internal Mode Switch Volts In	14	1-2 Shift Solenoid (A) Ground
5	4-5 Shift Solenoid (C) Ground	15	Input Speed Sensor (ISS)
6	Trans Fluid Temp (TFT) Sensor	16	Internal Mode Switch Signal "A"
7	Internal Mode Switch Signal "B"	17	Solenoid Power In
8	Pressure Control Solenoid (-)	18	Input Speed Sensor (ISS)
9	2-3 Shift Solenoid (B) Ground	19	Internal Mode Switch Signal "C"
10	Trans Fluid Temp (TFT) Sensor	20	TCC/PWM Solenoid Ground

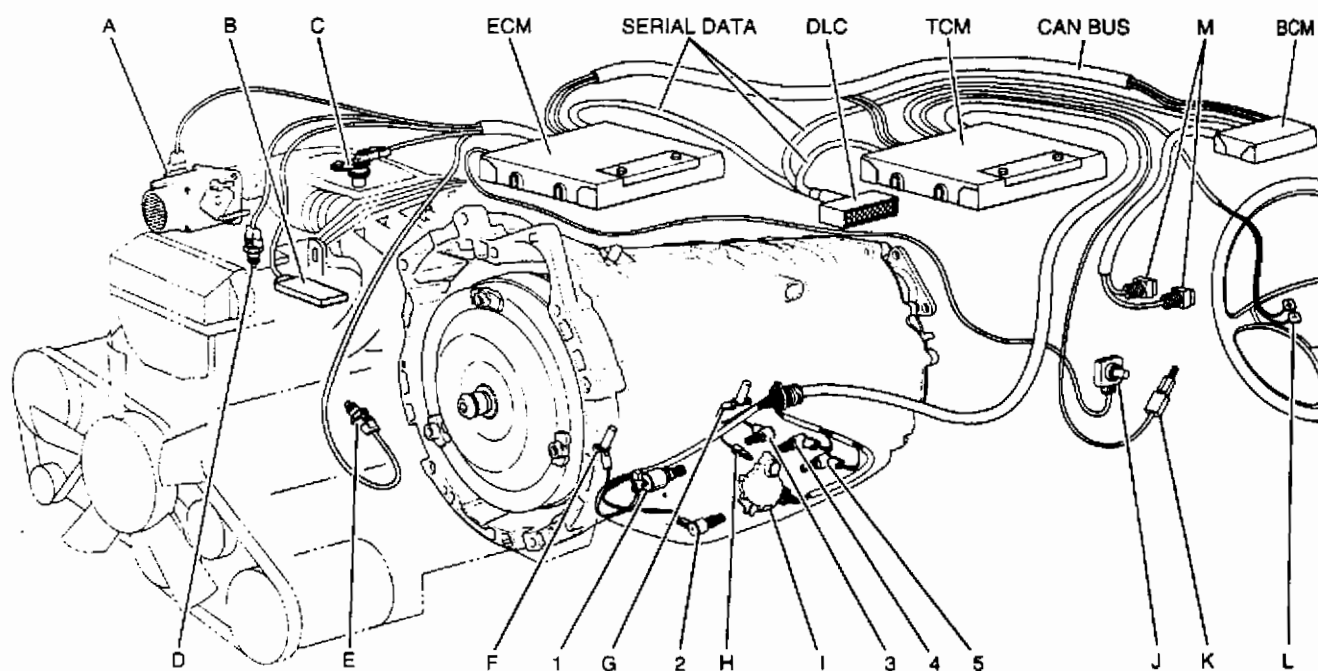
Figure 4

ELECTRICAL COMPONENTS

Electrical signals from various sensors provide information to the TCM or PCM, about vehicle speed, throttle position, engine coolant temp, range selector position, engine speed and converter turbine speed. The TCM or PCM uses this information to determine upshift and downshift speeds, apply or release of the TCC and what fluid pressure is needed to apply the clutch packs. This type of control provides consistent shift points and shift quality based on the operating conditions of the vehicle.

If for any reason the entire electronic control system of the transmission becomes disabled, all three shift solenoids will be turned off. This "Safety Mode" operating state forces the transmission to operate in 5th gear when the range selector is any forward range. Also, the pressure control solenoid is turned off which will increase line pressure to the maximum.

Note: Some models use an Engine Control Module (ECM) and a Transmission Control Module (TCM) and some models use a Powertrain Control Module (PCM) for both engine and transmission management.



INFORMATION SENSORS

- A. THROTTLE POSITION SENSOR (TPS)
- B. MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
- C. ENGINE SPEED SENSOR
- D. MANIFOLD AIR TEMPERATURE (MAT) SENSOR
- E. ENGINE COOLANT TEMPERATURE (ECT) SENSOR
- F. INPUT SPEED SENSOR (ISS)
- G. OUTPUT SPEED SENSOR (OSS)
- H. TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR
- I. INTERNAL MODE SWITCH (IMS)
- J. ACCELERATOR PEDAL POSITION (APP) SENSOR
- K. TCC BRAKE SWITCH

ELECTRONIC CONTROLLERS

- * TRANSMISSION CONTROL MODULE (TCM) SOME MODELS
- * POWERTRAIN CONTROL MODULE (PCM)
- * ENGINE CONTROL MODULE (ECM) SOME MODELS
- * BODY CONTROL MODULE (BCM)
- * DIAGNOSTIC LINK CONNECTOR (DLC)

TRANSMISSION COMPONENTS

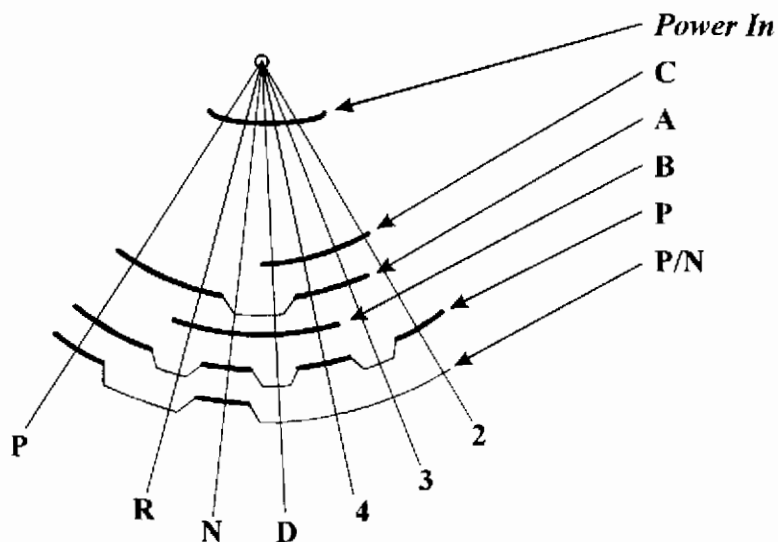
- 1. PRESSURE CONTROL SOLENOID
- 2. TCC/PWM SOLENOID
- 3. 1-2 SHIFT SOLENOID
- 4. 2-3 SHIFT SOLENOID
- 5. 4-5 SHIFT SOLENOID

Copyright © 2001 ATSG

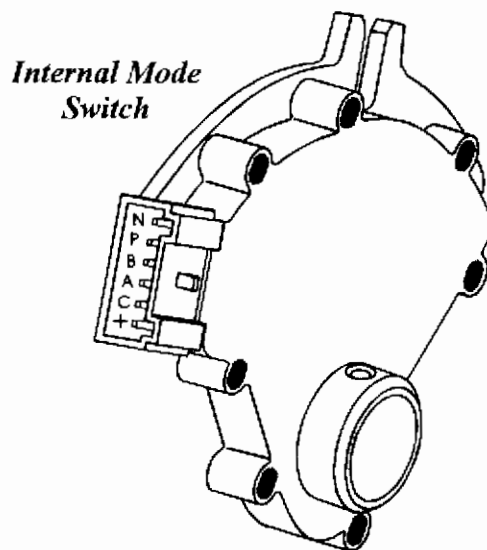
Figure 5

INTERNAL MODE SWITCH

The Internal Mode Switch supplies the Transmission Control Module or Powertrain Control Module with input regarding the selector lever position (P, R, N, D, 4, 3, 2). The selector position is indicated by the state of five different On/Off switches, as shown below. The mode switch is located inside the transmission, on the manual shaft and is fixed in rotation to the main case by the dentent lever spring and no adjustment is ever necessary.



RANGE SELECTED	CIRCUIT				
	A	B	C	P	P/N
Park	1	0	0	1	1
Reverse	1	1	0	0	0
Neutral	0	1	0	1	1
Overdrive	0	1	0	0	0
Manual 4	1	1	1	1	0
Manual 3	1	0	1	0	0
Manual 2	0	0	1	1	0
1 = Switch Closed 0 = Switch Open					



Copyright © 2001 ATSG

Figure 6

STANDARD SHIFT QUADRANT

With the "Standard" range indicator, as illustrated in Figure 5, the transmission may be operated in any one of the seven different positions shown on the shift quadrant as follows;

P - Park position enables the engine to be started while preventing the vehicle from rolling either forward or backward. Park position should not be selected until the vehicle has come to a complete stop. For safety reasons, the vehicles parking brake should always be used in addition to the "Park" position.

R - Reverse position enables the vehicle to be operated in a rearward direction.

N - Neutral position enables the engine to start and operate without driving the vehicle. If necessary, this position should be selected to restart the engine while the vehicle is moving.

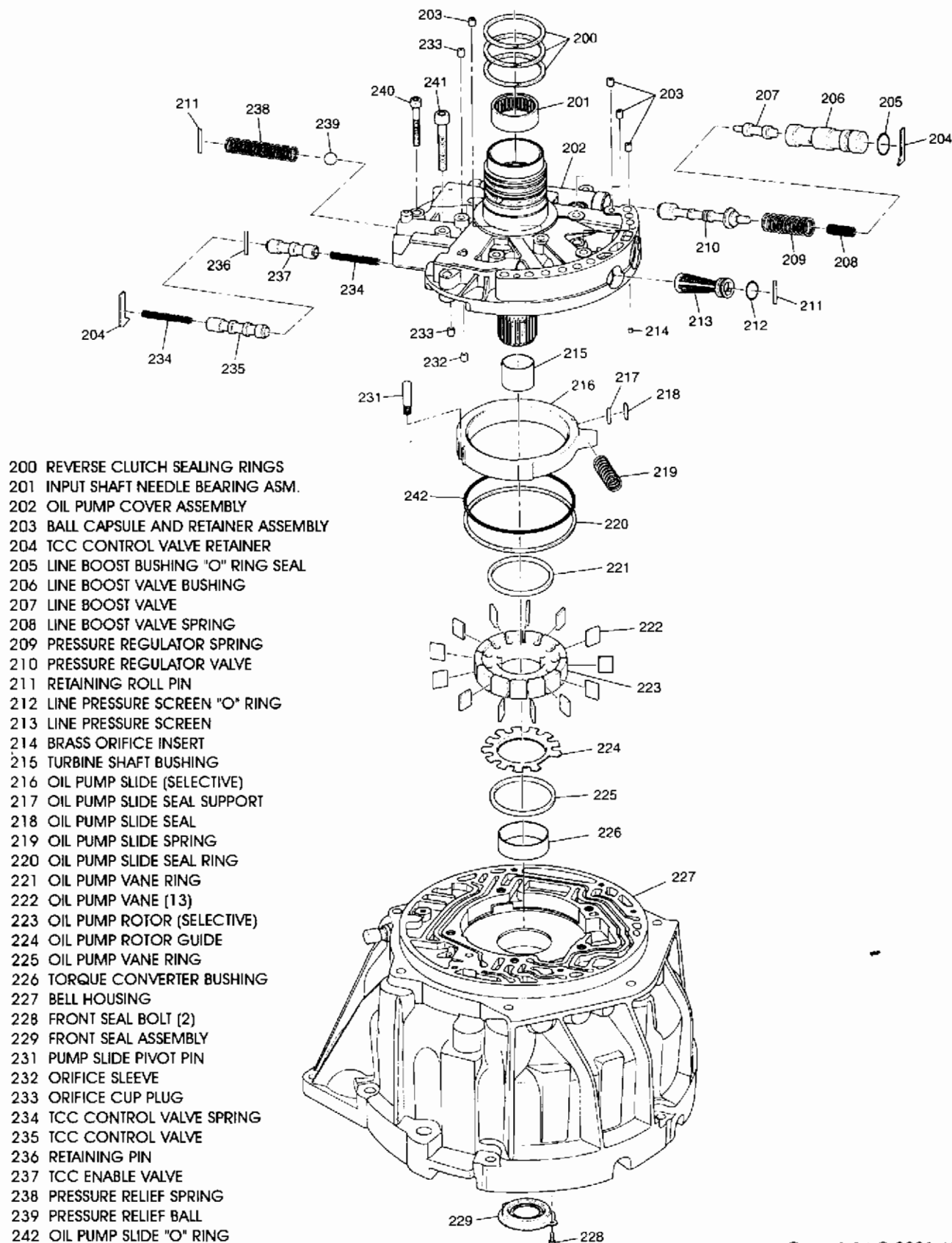
D - Overdrive range should be used for all normal driving conditions for maximum efficiency and fuel economy. Overdrive range allows the transmission to upshift automatically into each of the 5 forward gear ratios. Downshifts to a lower gear are possible for safe passing by depressing the accelerator, or by manually selecting a lower gear with the shift selector.

4 - Manual Fourth can be used for conditions where it may be desirable to use only 4 gear ratios, such as trailer towing or hilly terrain. This range is also helpful for engine braking when descending slight grades. Upshifts and downshifts all occur automatically, except 5th gear is prohibited. Manual Fourth can be selected at any vehicle speed but will downshift into 4th gear only if vehicle speed is low enough not to over-rev the engine. Manual downshifts are controlled by the TCM, not the manual valve location.

**"STANDARD"
RANGE INDICATOR**

3 - Manual Fourth can be used for conditions where it may be desirable to use only 4 gear ratios, such as trailer towing or hilly terrain. This range is also helpful for engine braking when descending slight grades. Upshifts and downshifts all occur automatically, except 5th gear is prohibited. Manual Fourth can be selected at any vehicle speed but will downshift into 4th gear only if vehicle speed is low enough not to over-rev the engine. Manual downshifts are controlled by the TCM, not the manual valve location.

Figure 7



Copyright © 2001 ATSG

Figure 8

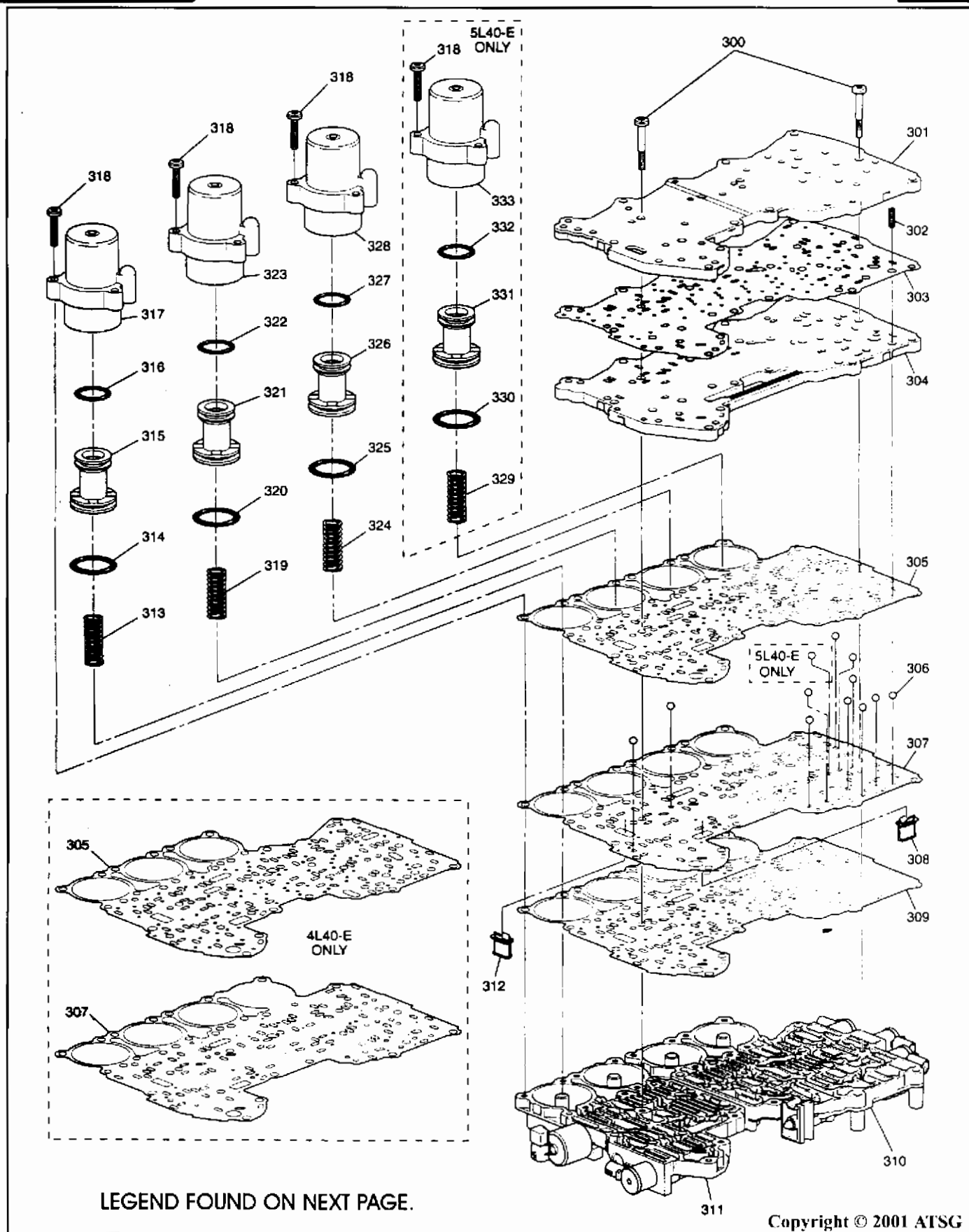
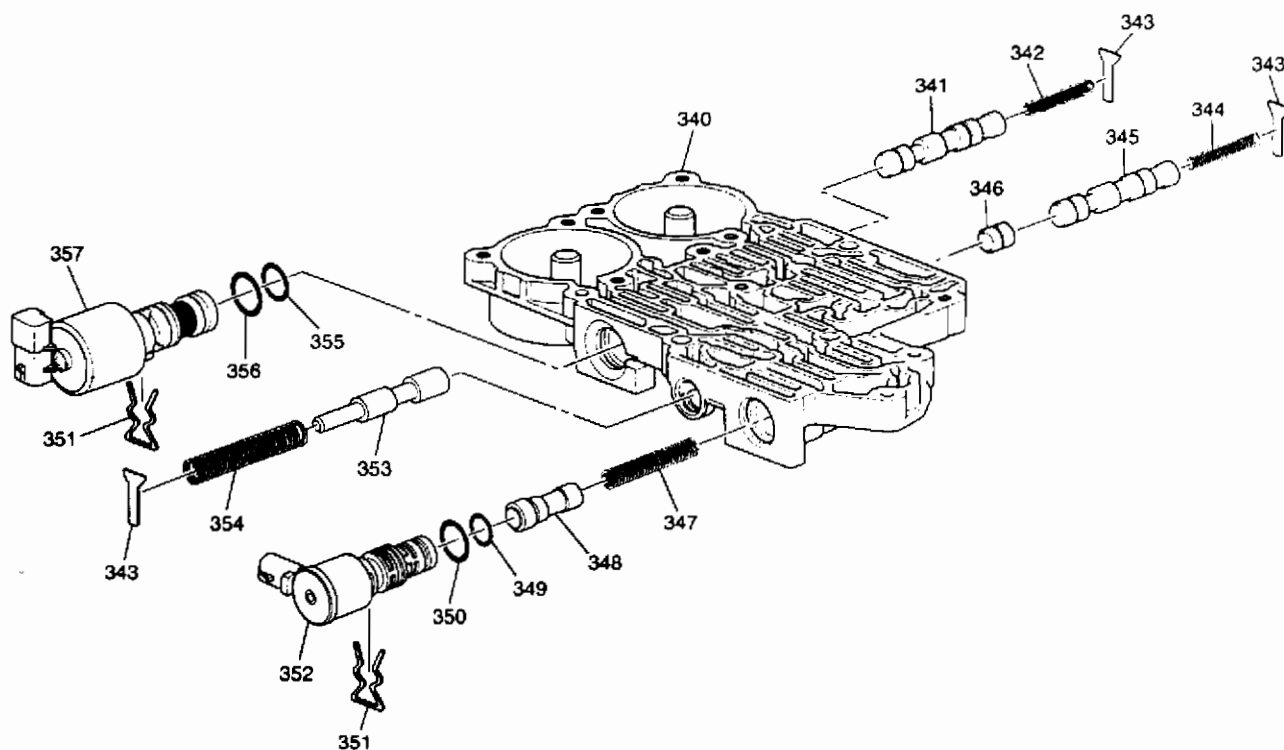


Figure 9

- 300 CONTROL VALVE BODY BOLT
- 301 CONTROL VALVE BODY "TOP" CHANNEL PLATE
- 302 NUMBER 7 CHECK BALL SPRING
- 303 CONTROL VALVE CHANNEL PLATE GASKET
- 304 CONTROL VALVE BODY "BOTTOM" CHANNEL PLATE
- 305 CONTROL VALVE BODY GASKET, UPPER
- 306 CHECK BALLS (12)
- 307 CONTROL VALVE BODY SPACER PLATE
- 308 TCC/PWM SOLENOID SCREEN
- 309 CONTROL VALVE BODY GASKET, LOWER
- 310 REAR CONTROL VALVE BODY ASSEMBLY
- 311 FRONT CONTROL VALVE BODY ASSEMBLY
- 312 PRESSURE CONTROL SOLENOID SCREEN
- 313 DIRECT CLUTCH ACCUMMULATOR SPRING
- 314 DIRECT CLUTCH ACCUMMULATOR PISTON LARGE SEAL RING
- 315 DIRECT CLUTCH ACCUMMULATOR PISTON
- 316 DIRECT CLUTCH ACCUMMULATOR PISTON SMALL SEAL RING
- 317 DIRECT CLUTCH ACCUMMULATOR HOUSING
- 318 ACCUMULATOR HOUSING BOLTS
- 319 O.D. CLUTCH ACCUMMULATOR SPRING
- 320 O.D. CLUTCH ACCUMMULATOR PISTON LARGE SEAL RING
- 321 O.D. CLUTCH ACCUMMULATOR PISTON
- 322 O.D. CLUTCH ACCUMMULATOR PISTON SMALL SEAL RING
- 323 O.D. CLUTCH ACCUMMULATOR HOUSING
- 324 INTERM. CLUTCH ACCUMMULATOR SPRING
- 325 INTERM. CLUTCH ACCUMMULATOR PISTON LARGE SEAL RING
- 326 INTERM. CLUTCH ACCUMMULATOR PISTON
- 327 INTERM. CLUTCH ACCUMMULATOR PISTON SMALL SEAL RING
- 328 INTERM. CLUTCH ACCUMMULATOR HOUSING
- 329 2ND CLUTCH ACCUMMULATOR SPRING
- 330 2ND CLUTCH ACCUMMULATOR PISTON LARGE SEAL RING
- 331 2ND CLUTCH ACCUMMULATOR PISTON
- 332 2ND CLUTCH ACCUMMULATOR PISTON SMALL SEAL RING
- 333 2ND CLUTCH ACCUMMULATOR HOUSING

FRONT CONTROL VALVE BODY EXPLODED VIEW

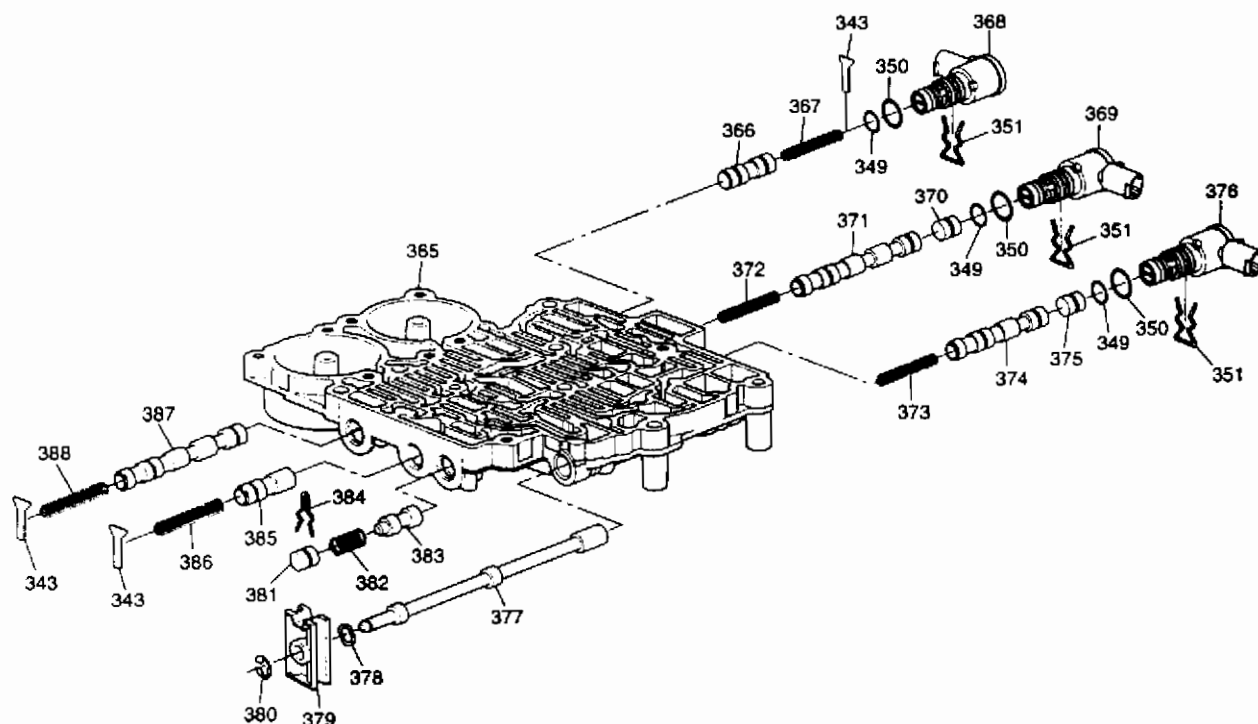


- 340 FRONT CONTROL VALVE BODY CASTING
- 341 SAFETY MODE VALVE
- 342 SAFETY MODE VALVE SPRING
- 343 VALVE SPRING RETAINER
- 344 3-4 SHIFT VALVE SPRING
- 345 3-4 SHIFT VALVE
- 346 3-4 SHIFT CONTROL VALVE
- 347 TCC REGULATOR APPLY VALVE SPRING
- 348 TCC REGULATOR APPLY VALVE
- 349 TCC/PWM SOLENOID SMALL "O" RING SEAL
- 350 TCC/PWM SOLENOID LARGE "O" RING SEAL
- 351 SOLENOID RETAINING CLIP
- 352 TCC/PWM SOLENOID ASSEMBLY
- 353 FEED LIMIT VALVE
- 354 FEED LIMIT VALVE SPRING
- 355 PRESSURE CONTROL SOLENOID SMALL "O" RING SEAL
- 356 PRESSURE CONTROL SOLENOID LARGE "O" RING SEAL
- 357 PRESSURE CONTROL SOLENOID ASSEMBLY

Copyright © 2001 ATSG

Figure 10

REAR CONTROL VALVE BODY EXPLODED VIEW



- 343 VALVE SPRING RETAINER
- 349 SHIFT SOLENOID SMALL "O" RING SEAL
- 350 SHIFT SOLENOID LARGE "O" RING SEAL
- 351 SHIFT SOLENOID RETAINER
- 365 REAR CONTROL VALVE BODY CASTING
- 366 1-2 SHIFT CONTROL VALVE
- 367 1-2 SHIFT CONTROL VALVE SPRING
- 368 1-2 (A) SHIFT SOLENOID ASSEMBLY
- 369 2-3 (B) SHIFT SOLENOID ASSEMBLY
- 370 2-3 SHIFT CONTROL VALVE
- 371 2-3 SHIFT VALVE
- 372 2-3 SHIFT VALVE SPRING
- 373 4-5 SHIFT VALVE SPRING
- 374 4-5 SHIFT VALVE
- 375 4-5 SHIFT CONTROL VALVE
- 376 4-5 (C) SHIFT SOLENOID ASSEMBLY
- 377 MANUAL VALVE
- 378 MANUAL VALVE LINK "WAVED" WASHER
- 379 MANUAL VALVE LINK
- 380 MANUAL VALVE LINK "E" CLIP RETAINER
- 381 LOW PRESSURE CONTROL VALVE PLUG
- 382 LOW PRESSURE CONTROL VALVE SPRING
- 383 LOW PRESSURE CONTROL VALVE
- 384 LOW PRESSURE CONTROL VALVE BORE PLUG RETAINER
- 385 REVERSE LOCK OUT VALVE
- 386 REVERSE LOCK OUT VALVE SPRING
- 387 1-2 SHIFT VALVE
- 388 1-2 SHIFT VALVE SPRING

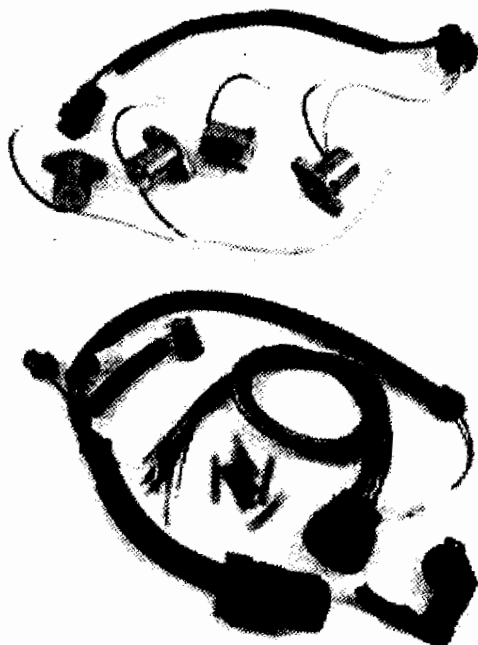
Copyright © 2001 ATSG

Figure 11

WE HAVE FREE STUFF FOR YOU.

(But, it's been said that people appreciate things more if they work for them, so we devised this little quiz. Good luck!)

For your free troubleshooting wall-chart, the latest Rostra catalog, and to be entered in multiple drawings for quality Rostra merchandise, simply send us a Rostra solenoid header card as proof of purchase. Include your name, the shop name, address and phone number along with the name of your distributor of Rostra products, and we'll take care of the rest.



- (1) Which solenoid manufacturer completely tests 100% for fit, form and function prior to delivery to insure perfect performance?
- (2) Which solenoid manufacturer offers the most complete range of replacement parts for GM, Ford, Daimler-Chrysler, Mazda, Nissan, Toyota, Mitsubishi and Honda?
- (3) Which solenoid manufacturer is a QS9000/ISO9001 certified supplier to GM, Ford, Chrysler, Eaton and ZF Meritor?
- (4) Which solenoid manufacturer saves you time and money by avoiding the dealer?
- (5) Which solenoid manufacturer also offers VSS Sensors, Pressure Switch Manifolds, Wire Harnesses, and Modulators?
- (6) Which solenoid manufacturer offers a shift solenoid for the Ford AODE that flows 27% more fluid than OE?
- (7) Which common solenoid has a life expectancy of over 500,000,000 cycles while opening & closing 62 times per second?
- (8) Which solenoid manufacturer is the only manufacturer to offer any warranty on solenoids - 12 months or 12,000 miles?
- (9) Which solenoid manufacturer have you trusted for over 30 years to supply only the best modulators?
- (10) Which solenoid manufacturer offers you the security of exact fit and plug-in connectors?
- (11) Which solenoid manufacturer has more than 150 distribution points in the US and Canada - no more than a day away?
- (12) Which solenoid manufacturer has an advisory board of transmission shops personnel?

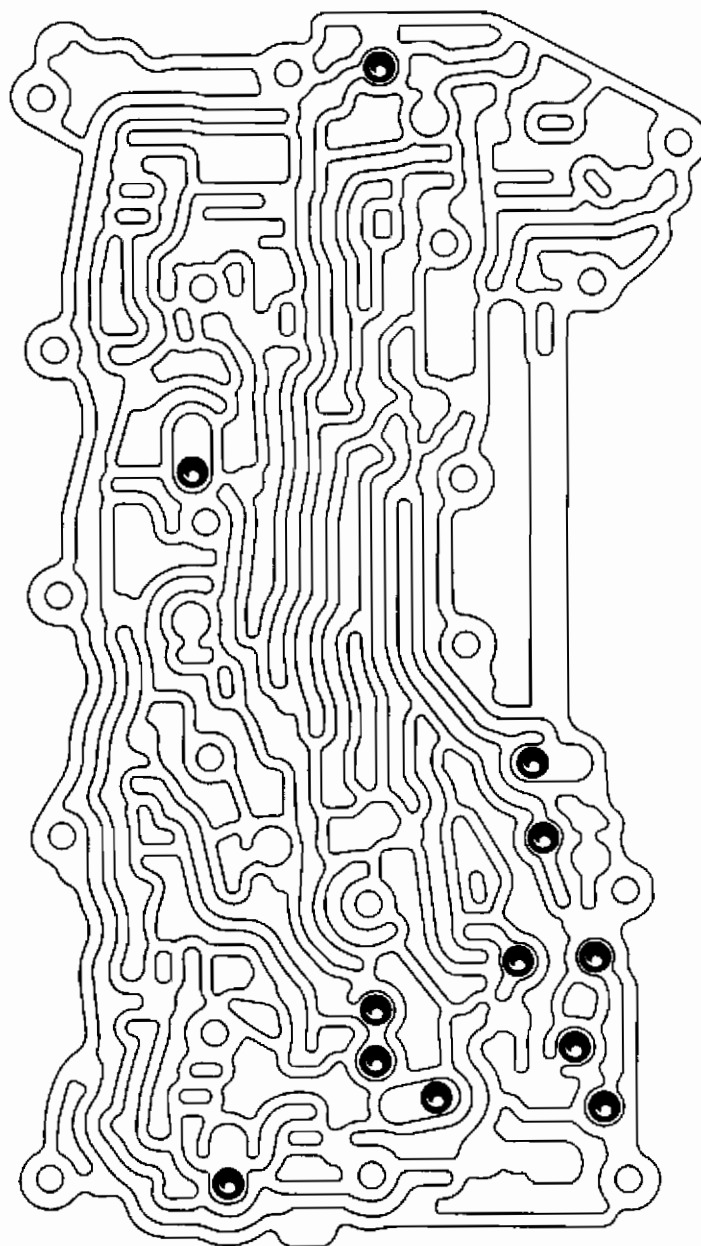
Answers: (1) Rostra (2) Rostra (3) Rostra (4) Rostra (5) Rostra (6) Rostra (7) 52-0218 (8) Rostra (9) Rostra (10) Rostra (11) Rostra (12) Rostra

R Rostra
Precision
Controls, Inc.

2519 Dana Drive, Laurinburg, NC 28352 • Phone 800-782-3379 • Fax 910-276-1354 • Email info@rostra.com

www.rostra.com

BOTTOM CHANNEL PLATE
(Control Valve Body Side)



Copyright © 2001 ATSG

Figure 12



THM 4T40E

MYSTERY METAL

COMPLAINT: The transmission has been overhauled and during the inspection, it was determined that the channel plate needed replacement.
The transmission now exhibits various problems at which time the diagnostic procedure seems to lead to the valve body.

When the valve body is inspected various valves are found to be stuck. What may happen next is, the valves are freed and the transmission is reassembled only to have this complaint repeat itself.

CAUSE: New channel plates **DO NOT** have threads (see figure 1) cut into the valve body to channel plate holes.
Bolts with self-tapping threads are used and cut threads into the bolt holes as the bolt is screwed into the channel plate.

If this is done with the channel plate bolted to the case the metal shavings generated by the bolts cutting into the channel plate is what produces the "**mystery metal**" that gets the valves stuck.

CORRECTION: Cut threads into the valve body to channel plate bolt holes before installing it onto the case.

SERVICE INFORMATION:

1995-96 Channel Plate.....24213174
1997-01 Channel Plate.....24213193

THM 4T40E

MYSTERY METAL

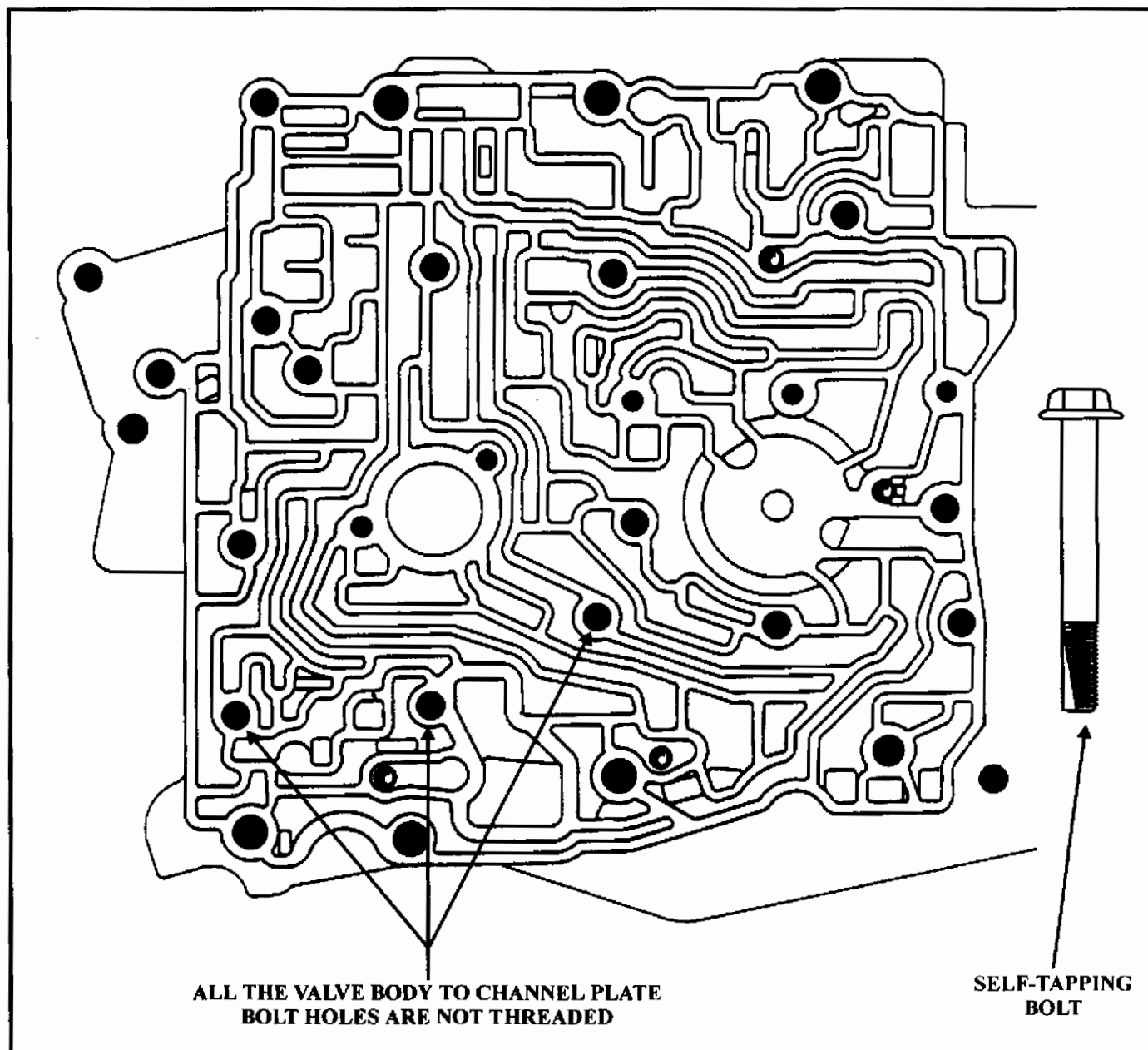


Figure 1



THM 4T40-E
TROUBLE CODE P1887 OR P0742

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

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

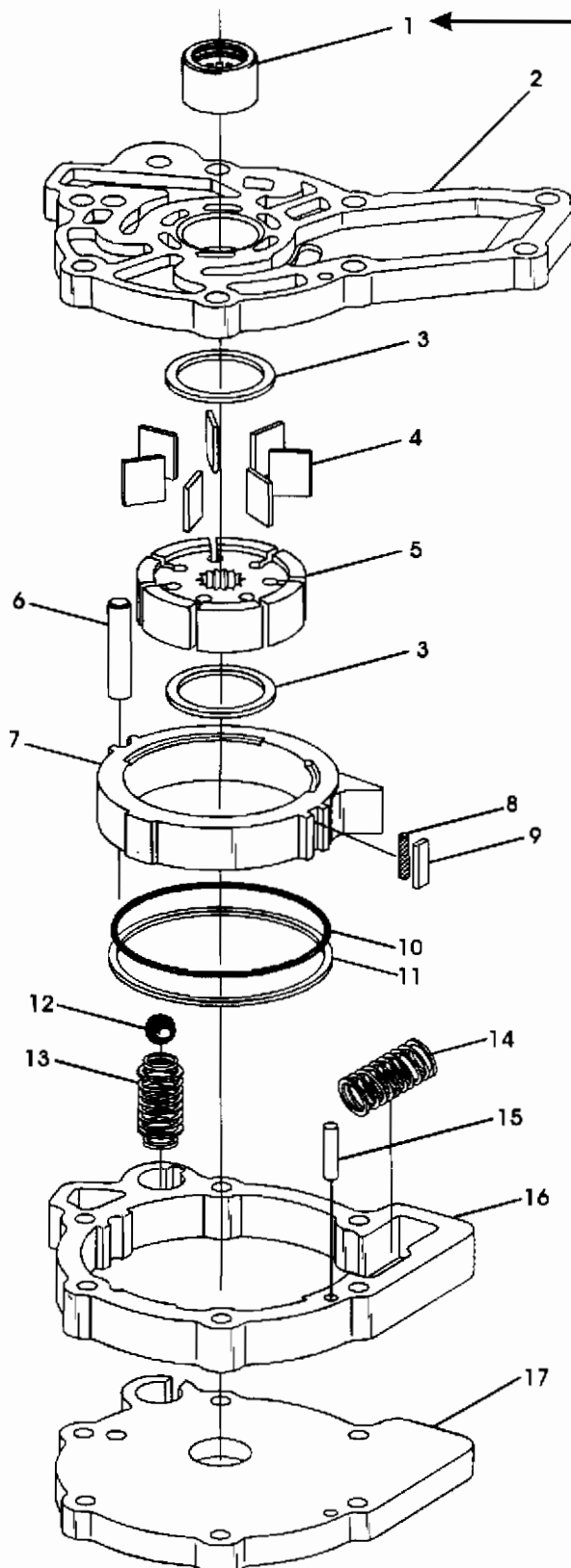
CORRECTION: This needle bearing and seal assembly is now available under TranStar part number 67922B, which is a 2000 and later AX4N pump bearing and seal assembly. The AX4N bearing is not available from Ford Motor Co. The bearing is also available from Sonnax® under part number 33000-01. In some instances, because of the bearing failure, the entire pump assembly will have to be replaced and is available under OEM part number 24208987.

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

SERVICE INFORMATION:

Needle Bearing And Seal Assembly (TranStar Number)	67922B
Needle Bearing And Seal Assembly (Sonnax® Number)	33000-01
Oil Pump Assembly Complete	24208987

THM 4T40-E OIL PUMP ASSEMBLY



*This Needle Bearing and Seal Assembly
Is Now Available Under:
TRANSTAR Part No. 67922B or
SONNAX® Part No. 33000-01*

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

Copyright © 2001 ATSG

Figure 1

THM 4T60E

PRESSURE SWITCH IDENTIFICATION

COMPLAINT: (1) The transaxle will not shift out of first gear, or a 1-2 shift occurs extremely late.

(2) The transaxle attempts to shift to fourth gear, but immediately falls back to third gear at which time the TCC signal is also lost.

CAUSE:

(1) The **"Lo Discrete Switch"** located on the oil pump body, as seen in figure 1, is a **Normally Open (N.O.)** pressure switch which is closed by fluid pressure from the 1-2 shift valve when the transaxle is in manual low. This prevents an upshift when the transaxle is in manual low.

When this switch is stuck closed or a Normally Closed (N.C.) switch is mistakenly installed, the PCM will think the transaxle is in manual low and will cause a "no shift" condition or an extremely late 1-2 shift only.

(2) During the overhaul process the **"Lo Discrete Switch"** and the **"4th Clutch Discrete Switch"** connectors were switched.
The **"4th Clutch Discrete Switch"** is a **Normally Open (N.O.)** switch that closes when the transaxle shifts into fourth gear, and opens when a 4-3 shift is made in order to disengage TCC.

When the connectors are switched and the transaxle shifts to fourth gear, the signal sent to the PCM will cause the PCM to think manual low has been selected and will immediately cause the transaxle to fall out of fourth gear followed by the loss of TCC engagement.

CORRECTION:

- (1) Make certain these switches are Normally Open and that they are not stuck. They can be checked on the bench with an ohmmeter and air pressure.
They can also be viewed on the scan tool data list. When the switches are open, the scan tool will display the switch state as **"P1"**.
When the switch closes, the scan tool will display the switch state as **"P2"**.
- (2) Make certain the pressure switch connectors are plugged into the correct pressure switch as illustrated in figure 1.

THM 4T60E

CODE P1870 - TRANSAXLE COMPONENT SLIPPING

COMPLAINT: The transmission has been overhauled and the torque converter has been replaced. The TCC regulator valve has also been addressed, but, during the road test code P1870 is stored which was the original complaint.
When data is read on the scan tool, TCC duty cycle is at maximum yet the TCC slip cannot be brought within specifications.

CAUSE: (1) The **TCC APPLY VALVE** located behind the TCC enable solenoid was not inspected for wear. It is not uncommon for this valve to wear causing converter clutch slippage or falling out of lock-up when hot.

(2) Sonnax has available a TCC apply valve repair kit as shown in figure 1. The kit contains a Teflon® sealing ring to compensate for the wear that occurs in the area of the outer most spool of the valve.
There are two (2) standard size valves, one for 1991-96, and one for 1997 and later units. The outer most spool of these valves are dimensionally different as shown in figures 2 and 3.
This complaint occurs when the 1991-96 valve is mistakenly installed in a 1997 or later valve body. The dimensions for both the late and early standard valves are shown in figures 2 and 3. Another means of identification is valve material, the 1991-96 valves are **STEEL** valves for both original equipment and the Sonnax replacement.
The 1997 and later valves are **ALUMINUM** valves for both original equipment and the Sonnax replacement.

If there is wear on the inner spools as well, Sonnax has available **oversize** valves for 1991-96 and 1997 and later. The dimensions for the late and early oversize valves are shown in figures 4 and 5.

As with the standard valves the 1991-96 original equipment valve and the Sonnax replacement valves are **STEEL** and the 1997 and later valves are **ALUMINUM**.
The oversize valves will require a drill jig and a reamer also available from Sonnax.

CORRECTION:

- (1) Be sure to check the TCC apply valve for wear as well as the TCC regulator valve. If wear is present use the appropriate Sonnax valve repair kit.
- (2) Use the dimensionally correct valve kit for the model year transaxle being repaired.

SERVICE INFORMATION:

1991-96 TCC Apply Valve; Standard Size.....	84754-22K
1997 & Later TCC Apply Valve; Standard Size.....	84754-98K
1991-96 TCC Apply Valve; Oversize.....	84754-16K
1997 & Later TCC Apply Valve; Oversize.....	84754-97K
Drill Jig Only.....	84754-DJ2
Reamer and Drill Jig.....	84754-TL



**THE SURE
CURE**

Sonnax

**TRANSMISSION
RECONDITIONING
KIT**

HELPS CURE:

Clash, rattle
Harsh shift
Failing out or lock up
Clutch and band failure
Poor 2-3-4-5 shifts
Wrong gear starts
Poor line rise
Excessive endplay



**THE SURE
CURE**

**TRANSMISSION
RECONDITIONING KIT**

A TASC FORCE™

IN EVERY BOX

With The Sure Cure™ kit, you get a full complement of quality engineered products for complete transmission repair. These kits will insure a complete valve body and pump remanufacture - not just a re-spring, recalibration or wear compensation package. Each kit is backed by hundreds of hours of diagnosis, design, development and testing by Sonnax and the TASC Force®. The Sure Cure™ offers:

- High quality materials
- Root cause repair
- Detailed instructions
- One stop shopping
- One part number
- Less inventory



Sure Cure™ kits are offered for the most common transmissions and additional kits will be developed in the future. Contact your nearest Transmission Specialties™ distributor for kit availability.

SONNAX
QUALITY ENGINEERED PRODUCTS

Automatic Drive • P.O. Box 440 • Bellows Falls, VT 05101-0440
800-843-2600 • 802-463-9722 • fax: 802-463-4059
www.sonnax.com • info@sonnax.com

THM 4T60E

CODE P1870 - TRANSAXLE COMPONENT SLIPPING

SONNAX 4T60E TCC APPLY VALVE KIT

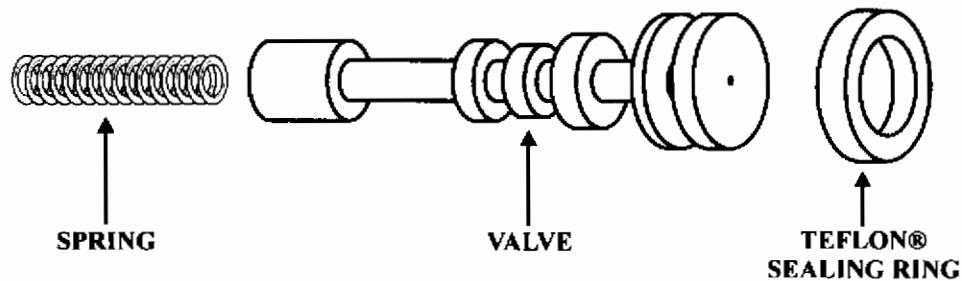


Figure 1

1991-96 STANDARD 4T60E TCC APPLY VALVE

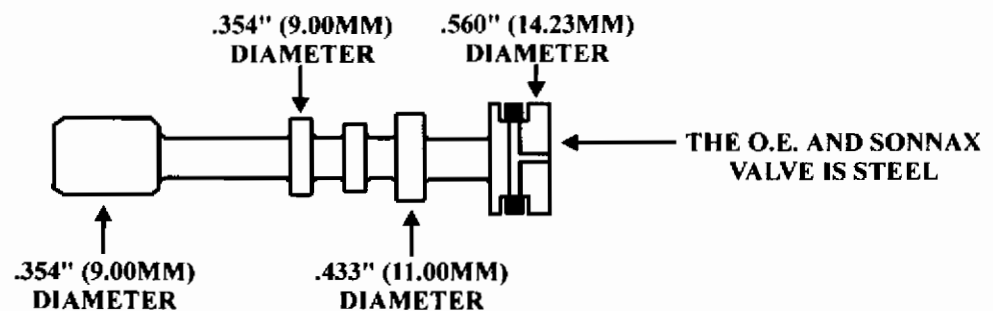


Figure 2

1997 & LATER STANDARD 4T60E TCC APPLY VALVE

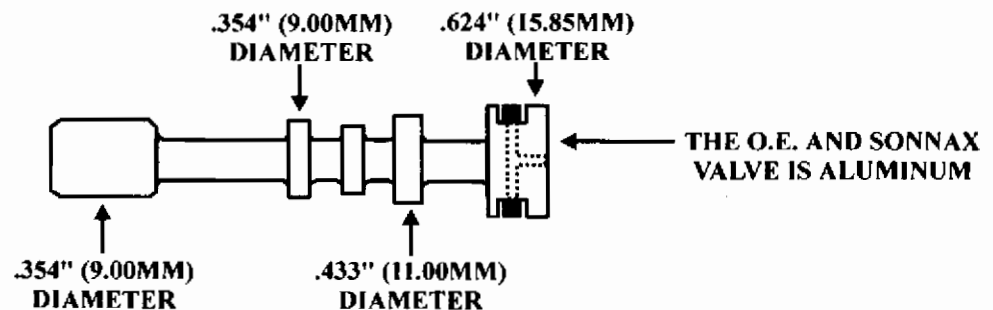


Figure 3

THM 4T60E

CODE P1870 - TRANSAXLE COMPONENT SLIPPING

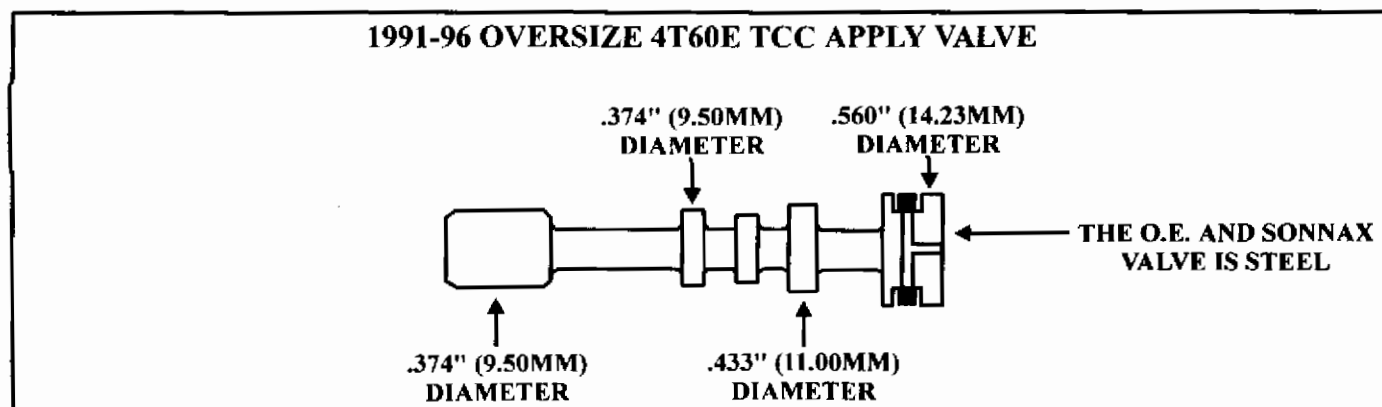


Figure 4

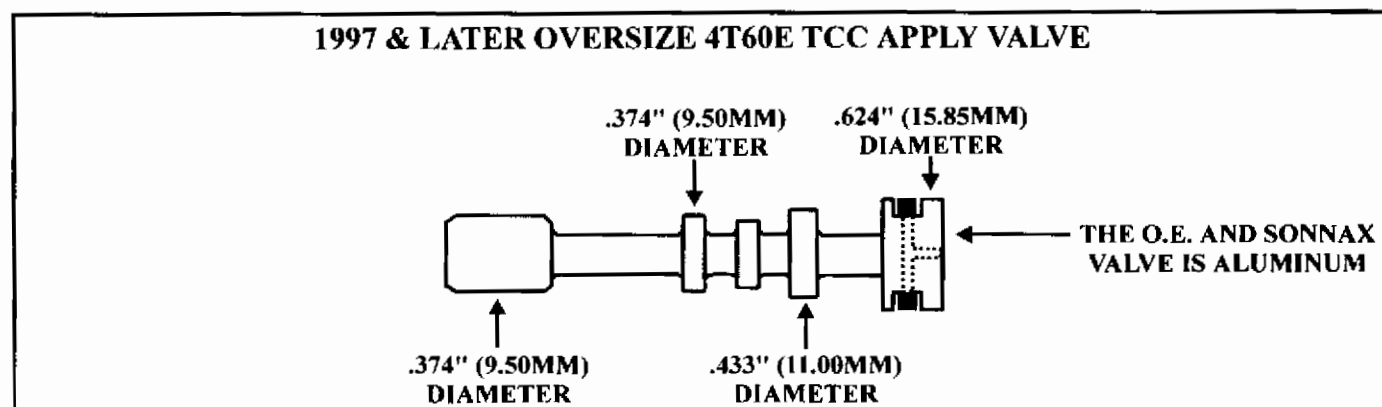


Figure 5

THM 4T60-E

3RD GEAR STARTS, NO A/C, NO VOLTAGE TO TRANSMISSION "E" TERMINAL

COMPLAINT: Some 1995-1996 Buick Century and Oldsmobile Ciera vehicles, equipped with the 3.1L (VIN "M") engine, may exhibit a 3rd gear start condition and the air conditioner not working. Since the vehicle came into a transmission shop we immediately check for voltage at terminal "E" at the case connector, and find 0 volts. After inspecting the fuse block, you discover that there are NO blown fuses even though there is a fuse identified as A/C as shown in figure 1.

CAUSE: The cause may be, a blown *"In-Line"* fuse behind the instrument panel as illustrated in Figure 2, that also controls voltage to terminal "E" at the transaxle.

CORRECTION: Remove the glove compartment for access to the "In-Line" fuses which are towards the passenger side of the main fuse block and are taped in a bundle which makes them hard to find. Remove some of the tape and replace the A/C fuse, as shown in Figure 2. A wire diagram is provided in figure 3 which shows why power to the transmission is lost when this in-line fuse is blown.

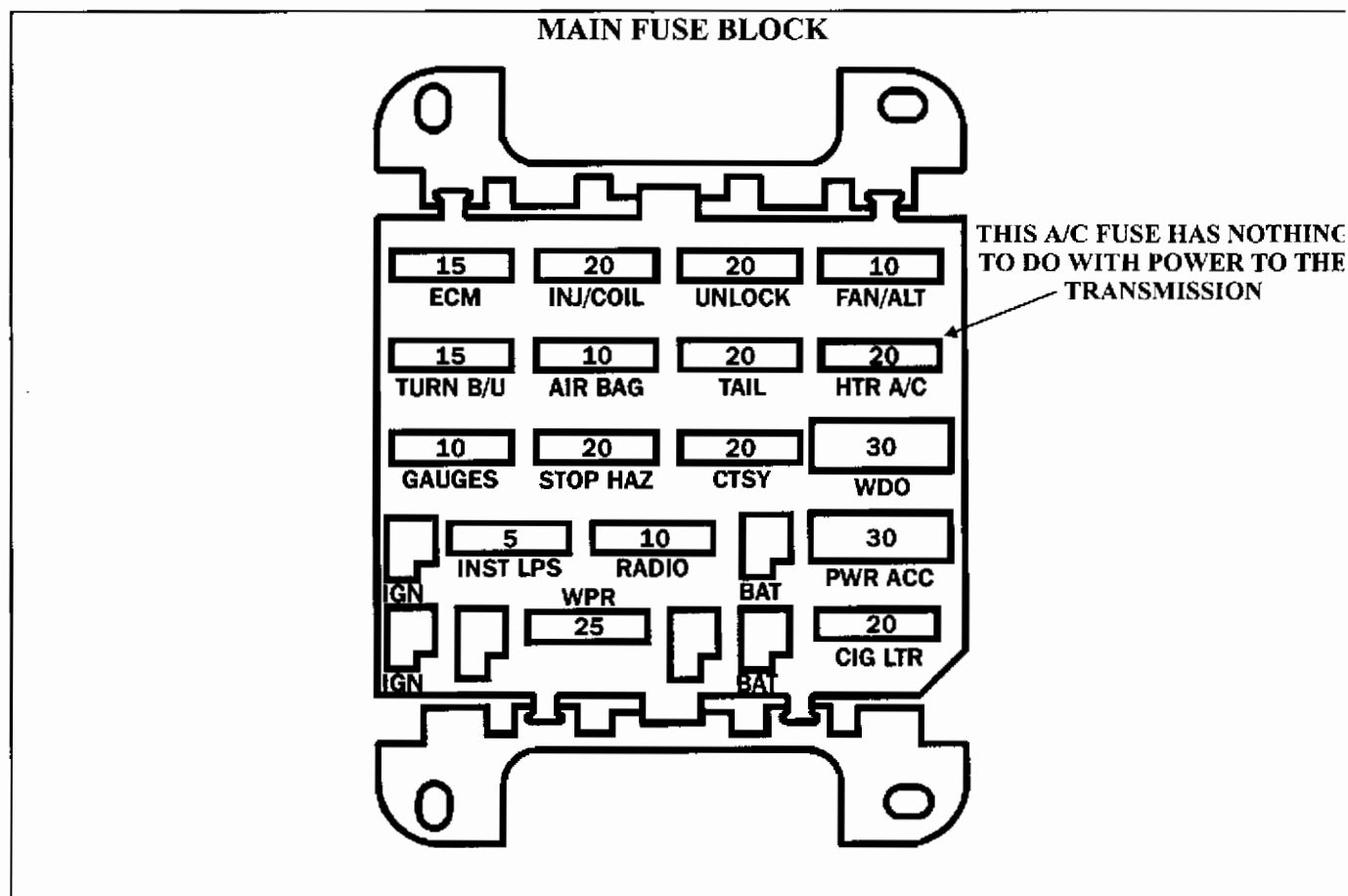


Figure 1

THM 4T60-E
3RD GEAR STARTS, NO A/C,
NO VOLTAGE TO "E" TERMINAL

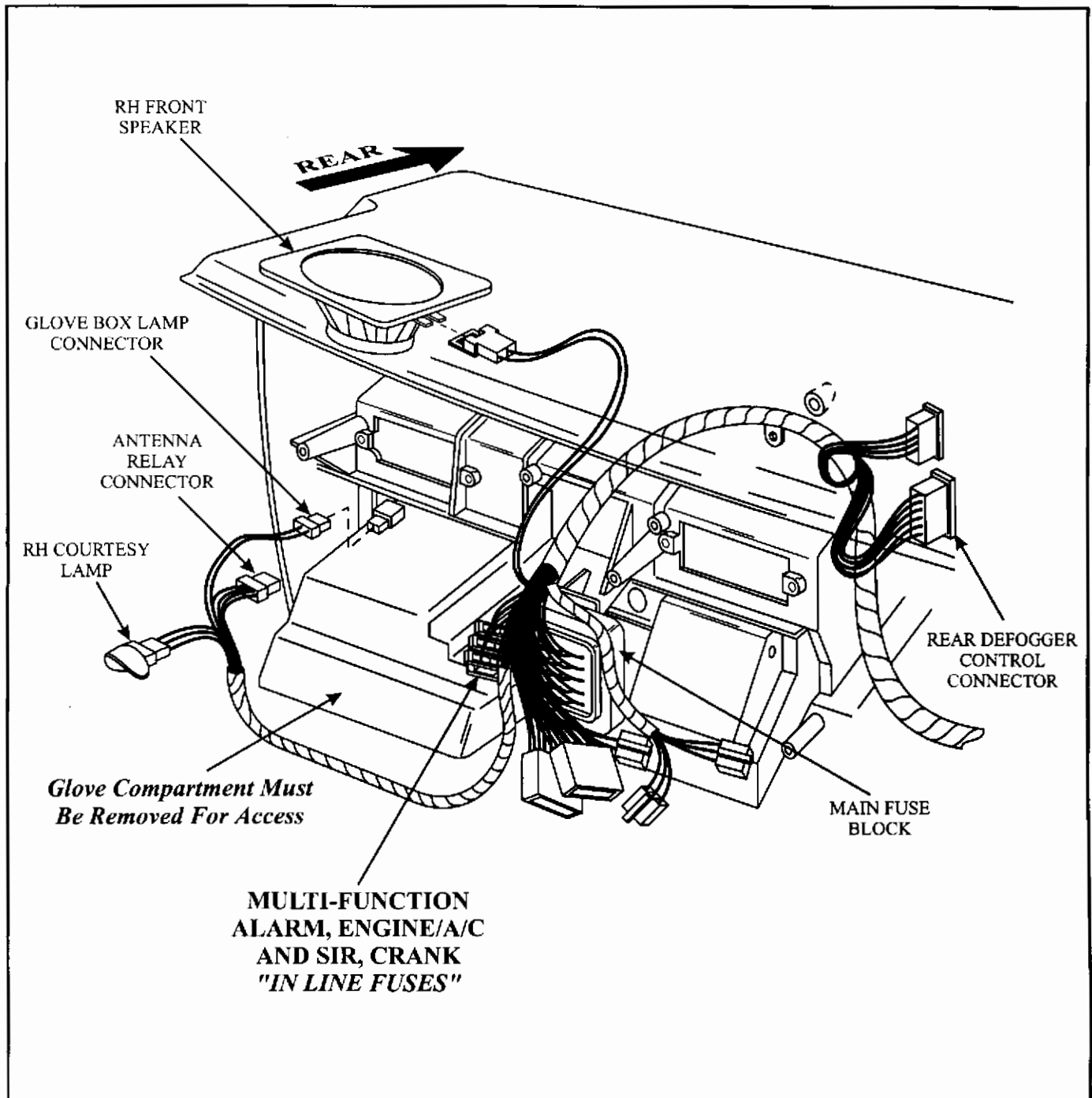


Figure 2

THM 4T60-E
3RD GEAR STARTS, NO A/C,
NO VOLTAGE TO "E" TERMINAL

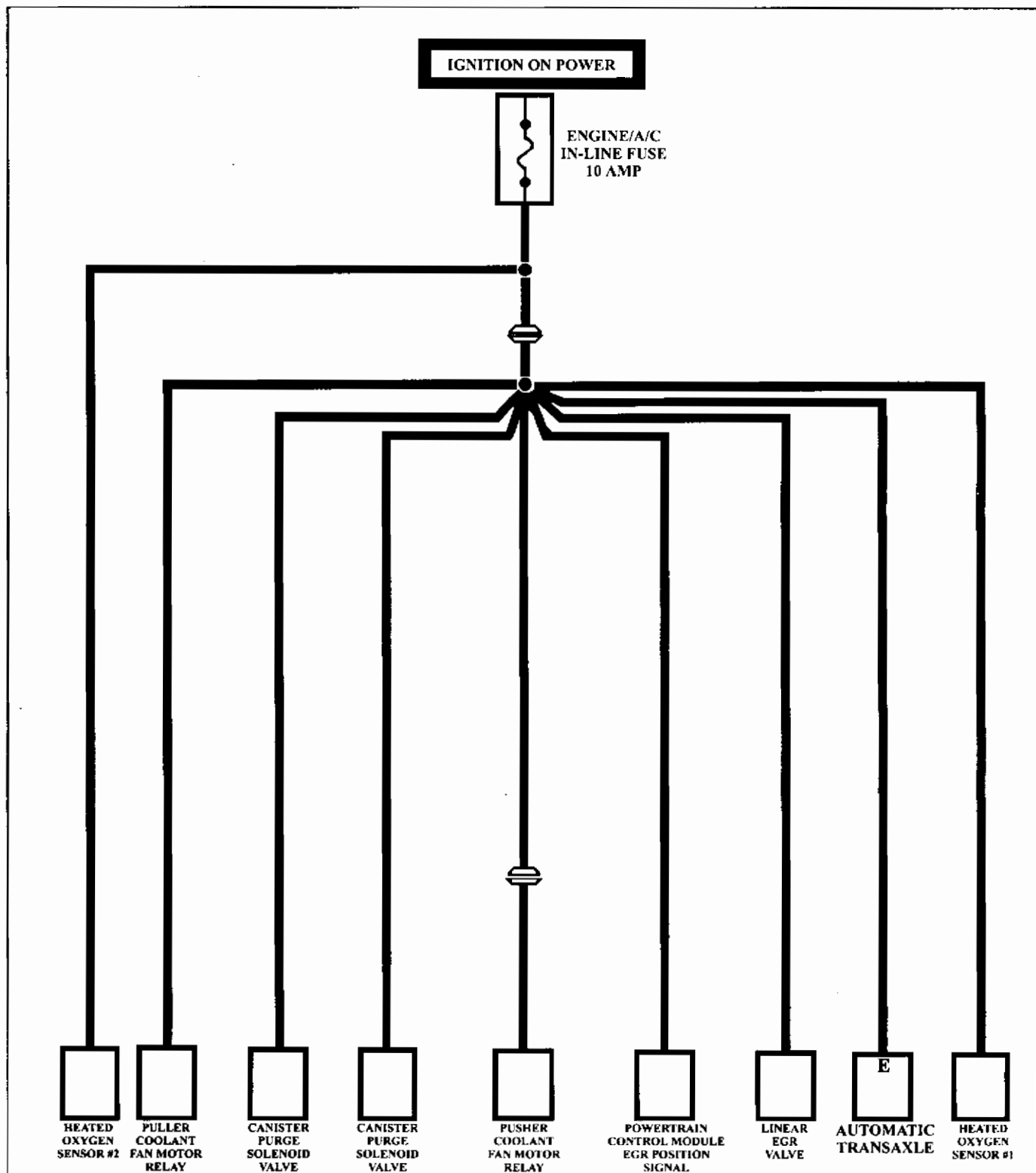


Figure 3

At Zoom we think our customers are the best form of advertisement!

AAA QUALITY TRANSMISSIONS

November 13, 2001

Gentlemen,

I am writing to thank you for such an invaluable piece of equipment that you have in the Sol-X Solenoid Tester. I was hesitant at first in making the purchase of the Sol-X, but I was also tired of spending so much money on new solenoids from the dealer.

The worst feeling was that most of the solenoids I was replacing were not really of replacement quality, but it was a precautionary measure to insure my rebuilt transmission was not filled with dirty or clogged solenoids. I really had no sure-fire method in testing solenoids until I bought the Sol-X Solenoid Tester.

In almost a year now since I bought the Sol-X and saved thousands of dollars by saving many solenoids from the trash, but also in saving time and comebacks. I no longer waste time hoping a solenoid would work when the dealer didn't have stock and the customer had to get on the road.

In the last year, I have tested approximately 85% of the solenoids and flushed the transmission. 75% were definitely bad. I also found that the Sol-X was a real life saver. Now before I buy a unit even new.

Since I bought the Sol-X, I have saved approximately \$2000.00 and most of the time I have saved the customer the cost of \$200.00. I did not want to risk my reputation by not testing the solenoids. My fellow shop owners would be very interested in this equipment.

Again thanks for this great equipment.

Don Stone
AAA Quality Transmissions

Ask us about the SolX It pays for itself!



TECHNOLOGY INC.

1003 Industrial Drive
West Berlin, New Jersey 08091
1.856.767.8840 ~ Fax 1.856.767.8839
1.800.322.0806
www.zoom-tech.com



Ask about our
ATSG discount

SOLENOID PERFORMANCE CODES

GEAR RATIO ERRORS

COMPLAINT: The vehicle comes in with the MIL lamp illuminated and maximum line pressure is commanded. The vehicle may make a wrong gear start, skip gears or slip. When the vehicle is scanned, a solenoid performance code is retrieved, there may or may not be a gear ratio error code stored as well.

NOTE: *Not all systems have the ability to store both solenoid performance and gear ratio error codes.*

The technician then replaces the solenoid for which the code refers to, and the MIL lamp is still illuminated and the same code and the above mentioned symptoms are still present. There are also times when the technician will pursue these problems by continuing to replace **unneeded** electrical components such as the computer in order to resolve this situation, but, this is usually unsuccessful.

CAUSE: There are times when wiring or voltage supply problems can cause an inadequate amount of electricity to the solenoid which can starve the solenoids hydraulic/mechanical performance resulting in similar complaints, or a faulty transmission range sensor or fluid pressure switch assembly, or even faulty speed sensors causing gear ratio error codes, but, in most cases these components will set a code or, when checked with a scanner or multi-meter, will check bad. In most cases, these solenoid performance codes are **mechanically** generated and, it is usually **NOT** the solenoid causing the problem.

The key to this is GEAR RATIO! The computer sees the incorrect engine rpm for the solenoid command given by the computer.

When the shift solenoids are commanded by the computer for a particular gear, the computer expects to see the target gear ratio (rpm change) for that commanded gear. For example, when a 4L60E is commanded to 2nd gear, the computer expects to see a 1.63:1 gear ratio and therefore the correct rpm. If the gear ratio is higher or lower than this, a solenoid performance code is stored and possibly a gear ratio error code.

If the problem vehicle has a transmission with an input and an output speed sensor, gear ratio is calculated by the computer comparing input and output rpm.

If the transmission has an output speed sensor only, the computer calculates gear ratio by comparing output rpm to engine rpm or, $n \div v$, which is engine rpm divided by output rpm, and then sets the code.

There are quite a few things that can cause these codes and complaints. It also depends on the make of vehicle and transmission that's in it. These problems can be caused by stuck valves, poor line pressure rise, slipping internal components, or incompatible internal components. Examples would be, the wrong final drive components in a 4T60E, a broken solenoid feed screen behind the manual valve in a 4L80E, a bad servo piston in a 4R55E, wrong sprocket tooth count on a AX4S, a cut shift solenoid o-ring on a 4L60E, or a broken snap ring in the input drum on a 41TE, **even something as simple as a band adjustment has fixed these complaints.**

SOLENOID PERFORMANCE CODES

GEAR RATIO ERRORS

CORRECTION: If the system you are scanning has shift time parameters available, which is shown in seconds, use this to determine if the shift took too long to occur. The average time for a shift is 0.03 to .64 seconds. If the shift timing takes longer than this, a gear ratio or solenoid performance code may be stored.

Make certain that you have proper solenoid command, if you do, **YOU DO NOT HAVE AN ELECTRICAL PROBLEM!**

Observe which solenoid performance or gear ratio error code the computer is storing as shown in the charts in figures 1 and 2, the items that control those gears are the suspected problem causing components.

When gear ratio is not available on the scan tool data list, engine rpm divided by output shaft rpm in a particular gear will give you approximate gear ratio.

For example: A 4R70W equipped vehicle in 1st gear at 9 mph has an engine rpm of 1200 rpm and an output shaft speed sensor reading of 425 rpm. $1200 \div 425 = 2.82$. The first gear ratio for a 4R70W is 2.84:1, close enough. Gear ratios can be found in the charts in figures 3 to 5.

SOLENOID PERFORMANCE CODE	COMPONENT AFFECTED
P0751, P1714, P1751	SHIFT SOLENOID 1 OR 1-2 OR A
P0756, P1715, P1756	SHIFT SOLENOID 2 OR 2-3 OR B
P0761, P1716, P1761	SHIFT SOLENOID 3 OR 3-4 OR C
P0765, P1717	SHIFT SOLENOID 4 OR 4-5 OR D
P1762	SHIFT SOLENOID 3 OR 4/OD SERVO FAILURE

Figure 1

GEAR RATIO ERROR CODE	GEAR AFFECTED
P0731	1ST GEAR RATIO ERROR
P0732	2ND GEAR RATIO ERROR
P0733	3RD GEAR RATIO ERROR
P0734	4TH GEAR RATIO ERROR
P0735	5TH GEAR RATIO ERROR
P0730	INCORRECT GEAR RATIO
P1871	UNDEFINED GEAR RATIO

Figure 2

TRANSMISSION GEARS RATIO CHARTS

4T40E	
GEAR	GEAR RATIO
FIRST	2.96:1
SECOND	1.63:1
THIRD	1.00:1
FOURTH	0.68:1
REVERSE	2.14:1

4T60E	
GEAR	GEAR RATIO
FIRST	2.92:1
SECOND	1.57:1
THIRD	1.00:1
FOURTH	0.70:1
REVERSE	2.38:1

4T65E	
GEAR	GEAR RATIO
FIRST	2.92:1
SECOND	1.57:1
THIRD	1.00:1
FOURTH	0.70:1
REVERSE	2.38:1

4T80E	
GEAR	GEAR RATIO
FIRST	2.96:1
SECOND	1.63:1
THIRD	1.00:1
FOURTH	0.68:1
REVERSE	2.13:1

4L60E	
GEAR	GEAR RATIO
FIRST	3.06:1
SECOND	1.62:1
THIRD	1.00:1
FOURTH	0.70:1
REVERSE	2.29:1

4L80E	
GEAR	GEAR RATIO
FIRST	2.48:1
SECOND	1.48:1
THIRD	1.00:1
FOURTH	0.75:1
REVERSE	2.08:1

4L30E		
GEAR	GEAR RATIO	
	STANDARD	OPTIONAL
FIRST	2.40:1	2.86:1
SECOND	1.48:1	1.62:1
THIRD	1.00:1	1.00:1
FOURTH	0.72:1	0.72:1
REVERSE	2.00:1	2.00:1

SATURN TAAT		
GEAR	GEAR RATIO	
	SOHC	DOHC
FIRST	2.24:1	2.53:1
SECOND	1.27:1	1.56:1
THIRD	0.81:1	1.03:1
FOURTH	0.60:1	0.70:1
REVERSE	2.39:1	2.39:1

5L40E	
GEAR	GEAR RATIO
FIRST	3.42:1
SECOND	2.21:1
THIRD	1.60:1
FOURTH	1.00:1
FIFTH	0.75:1
REVERSE	3.03:1

4L40E	
GEAR	GEAR RATIO
FIRST	2.82:1
SECOND	1.54:1
THIRD	1.00:1
FOURTH	0.70:1
REVERSE	2.38:1

Figure 3

TRANSMISSION GEARS RATIO CHARTS

ALLISON 1000	
GEAR	GEAR RATIO
FIRST	3.10:1
SECOND	1.81:1
THIRD	1.44:1
FOURTH	1.00:1
FIFTH	0.71:1
REVERSE	4.49:1

ALLISON 2000/2400	
GEAR	GEAR RATIO
FIRST	3.51:1
SECOND	1.90:1
THIRD	1.44:1
FOURTH	1.00:1
FIFTH	0.74:1
REVERSE	5.09:1

AXODE/AX4S	
GEAR	GEAR RATIO
FIRST	2.77:1
SECOND	1.54:1
THIRD	1.00:1
FOURTH	0.69:1
REVERSE	2.26:1

AX4N	
GEAR	GEAR RATIO
FIRST	2.77:1
SECOND	1.54:1
THIRD	1.00:1
FOURTH	0.69:1
REVERSE	2.26:1

CD4E	
GEAR	GEAR RATIO
FIRST	2.88:1
SECOND	1.57:1
THIRD	1.00:1
FOURTH	0.69:1
REVERSE	2.31:1

4F20E	
GEAR	GEAR RATIO
FIRST	2.78:1
SECOND	1.54:1
THIRD	1.00:1
FOURTH	0.69:1
REVERSE	2.27:1

4F27E	
GEAR	GEAR RATIO
FIRST	2.82:1
SECOND	1.50:1
THIRD	1.00:1
FOURTH	0.73:1
REVERSE	2.65:1

4F20E	
GEAR	GEAR RATIO
FIRST	2.78:1
SECOND	1.54:1
THIRD	1.00:1
FOURTH	0.69:1
REVERSE	2.27:1

AODE	
GEAR	GEAR RATIO
FIRST	2.40:1
SECOND	1.47:1
THIRD	1.00:1
FOURTH	0.67:1
REVERSE	2.00:1

4R70W	
GEAR	GEAR RATIO
FIRST	2.84:1
SECOND	1.55:1
THIRD	1.00:1
FOURTH	0.70:1
REVERSE	2.32:1

Figure 4

TRANSMISSION GEARS RATIO CHARTS

E4OD/4R100	
GEAR	GEAR RATIO
FIRST	2.71:1
SECOND	1.54:1
THIRD	1.00:1
FOURTH	0.71:1
REVERSE	2.18:1

4R44E/4R55E	
GEAR	GEAR RATIO
FIRST	2.47:1
SECOND	1.47:1
THIRD	1.00:1
FOURTH	0.75:1
REVERSE	2.10:1

5R55E	
GEAR	GEAR RATIO
FIRST	2.47:1
SECOND	1.87:1
THIRD	1.47:1
FOURTH	1.00:1
FIFTH	0.75:1
REVERSE	2.10:1

5R55N	
GEAR	GEAR RATIO
FIRST	3.25:1
SECOND	2.44:1
THIRD	1.55:1
FOURTH	1.00:1
FIFTH	0.75:1
REVERSE	3.07:1

41TE/42LE	
GEAR	GEAR RATIO
FIRST	2.84:1
SECOND	1.57:1
THIRD	1.00:1
FOURTH	0.69:1
REVERSE	2.21:1

45RFE	
GEAR	GEAR RATIO
FIRST	3.00:1
SECOND	1.67:1
2ND PRIME	1.50:1
THIRD	1.00:1
FOURTH	0.75:1
REVERSE	3.00:1

545RFE	
GEAR	GEAR RATIO
FIRST	3.00:1
SECOND	1.67:1
2ND PRIME	1.50:1
THIRD	1.00:1
FOURTH	0.75:1
FIFTH	0.67:1
REVERSE	3.00:1

Figure 5



"2002" SEMINAR INFORMATION SLIDE

73

THM 4T65E

STORES CODE P1811...MAXIMUM ADAPT LONG SHIFTS

COMPLAINT: The complaint may be harsh or soft shifts with shudders on hard acceleration and code P1811 is stored for maximum shift adapts and the 1-2, 2-3 or 3-4 shift times are out of range.

CAUSE: The scan tool movie in figure 1 indicates correct shift timing, while the movie in figure 2 indicates shift times that have taken too long to complete.

Shifts should never exceed 0.65 seconds. The "TAP CELL" parameters on the scan tool ranges from -30 to +30 psi., a high positive number indicates a shift that has taken too long to complete.

The factory installed pressure control solenoid does not have the ability to keep normal sediment accumulation from interfering with its mechanical function.

This causes line pressure to become inconsistent resulting in the above complaints and storage of the above mentioned code.

As a result of the erratic line pressure and the subsequent shift feel complaint, shift timing is forced out of range which can be seen on the scan tool.

The PCM has attempted to bring the shift timing into range, but is unable to resulting in the P1811 code.

CORRECTION: Replace the pressure control solenoid with the current solenoid available from the OEM using the part number listed below or repair the internal hydraulic circuit problem.

NOTE: The line pressure inconsistency caused by a faulty pressure control solenoid **CANNOT** be seen on a conventional pressure gauge.

If shift times and tap cells are out of range for **ALL** shifts, it usually means pressure is the problem.

If shift time and tap cell is out of range for **ONE** shift, this usually means there is a hydraulic problem in **THAT** hydraulic circuit.

SERVICE INFORMATION:

Pressure Control Solenoid.....10478146

TECHNICAL REFERENCE:

Factory TSB.....00-07-30-002



"2002" SEMINAR INFORMATION SLIDE

74

4T65E CODE P1811 - MAXIMUM SHIFT ADAPT

1997 BUICK		R/C	
3.8L V6 SFI		R/T	
CODES & DATA		OK TO DRIVE **	
P1811 LONG SHIFT ADAPT			
ENGINE RPM	2208	TP5(V)	1.02
TP5(%)	30		
-15 INPUT RPM	2208	OUTPUT RPM	1797
TCC DUTY CYCLE(%)	98		
TORQUE SIG (PSI)	59	VEH SPEED (MPH)	64
BRAKE REQUEST	NO	COOLANT (F)	196
TCC SLIP (RPM)	4	TCC RELEASE	NO
BATTERY (V)	13.8	TRANS FLUID (F)	176
PRESS CTRL AMP	0.41	GEAR RATIO	0.70
CURRENT GEAR	4TH	BRAKE SW	OPEN
IGNITION (V)	13.9	DES PCS AMP	0.43
IMS/B/C/P	HI/LOW/LOW/HI	2-3 TAP CELL (PSI)	+12
SHIFT MODE	NORMAL	3-4 TAP CELL (PSI)	+08
1-2 TAP CELL (PSI)	+10	PRNDL SW	4TH
1-2 SOLENOID	ON	2-3 SOLENOID	OFF
RANGE A	12	RANGE B	0
RANGE C	0	TORQ MGMT ACTIVE	NO
1-2 SHIFT (SEC)	0.38	2-3 SHIFT (SEC)	0.47
3-4 SHIFT (SEC)	0.03	R/C REQUEST	NO
R/C CLUTCH	OFF	CRUISE	OFF

Figure 1

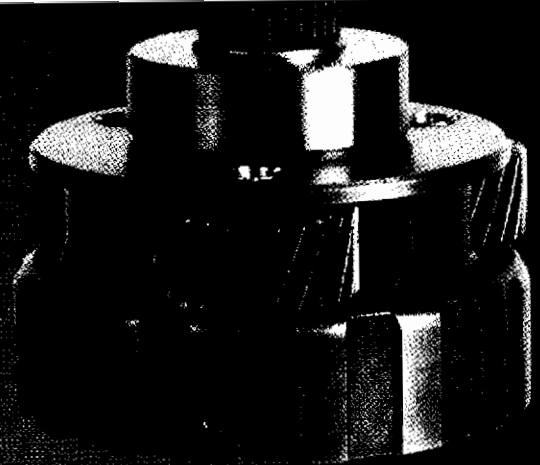
1997 BUICK		R/C	
3.8L V6 SFI		R/T	
CODES & DATA		OK TO DRIVE **	
P1811 LONG SHIFT ADAPT			
ENGINE RPM	2208	TP5(V)	1.02
TP5(%)	30		
-4 INPUT RPM	2208	OUTPUT RPM	1797
TCC DUTY CYCLE(%)	98		
TORQUE SIG (PSI)	59	VEH SPEED (MPH)	64
BRAKE REQUEST	NO	COOLANT (F)	196
TCC SLIP (RPM)	4	TCC RELEASE	NO
BATTERY (V)	13.8	TRANS FLUID (F)	176
PRESS CTRL AMP	0.41	GEAR RATIO	0.70
CURRENT GEAR	4TH	BRAKE SW	OPEN
IGNITION (V)	13.9	DES PCS AMP	0.43
IMS/B/C/P	HI/LOW/LOW/HI	2-3 TAP CELL (PSI)	+26
SHIFT MODE	NORMAL	3-4 TAP CELL (PSI)	+21
1-2 TAP CELL (PSI)	+28	PRNDL SW	4TH
1-2 SOLENOID	ON	2-3 SOLENOID	OFF
RANGE A	12	RANGE B	0
RANGE C	0	TORQ MGMT ACTIVE	NO
1-2 SHIFT (SEC)	0.86	2-3 SHIFT (SEC)	1.23
3-4 SHIFT (SEC)	1.13	R/C REQUEST	NO
R/C CLUTCH	OFF	CRUISE	OFF

NOTE: Shift times should never exceed 0.65 seconds!

Figure 2

Copyright © 2001 ATSG

Automatic Transmission Service Group



Of Course It's Tough We Built It!

**Complete Line of
Used and Rebuilt
Automatic Hard Parts**

- ▶ Link Clutches
- ▶ OTC Torque Converters
- ▶ Trans-Tec and Toledo Gearboxes
- ▶ Borg Warner Frictions and Shafts
- ▶ Sealed Power Filters and Valves
- ▶ OTC Electronics
- ▶ Automatic Transmission Parts
- ▶ Shop Equipment
- ▶ Transmission Mounts
- ▶ Transmission Coolers
- ▶ Flywheels
- ▶ Modular Diagnostic Systems
- ▶ Reconditioned Hard Parts

OTS Transmission Parts

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

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

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

www.otsparts.com

THM 4T65-E SOFT 1-2 SHIFT OR DELAY TO REVERSE (MAY STORE DTC 1811)

COMPLAINT: Some General Motors vehicles equipped with the THM 4T65-E transaxle, may exhibit a soft 1-2 upshift and/or a delay when the selector lever is placed into reverse. These conditions may also set Diagnostic Trouble Code 1811, which is "Maximum Adapt" and "Long Shift".

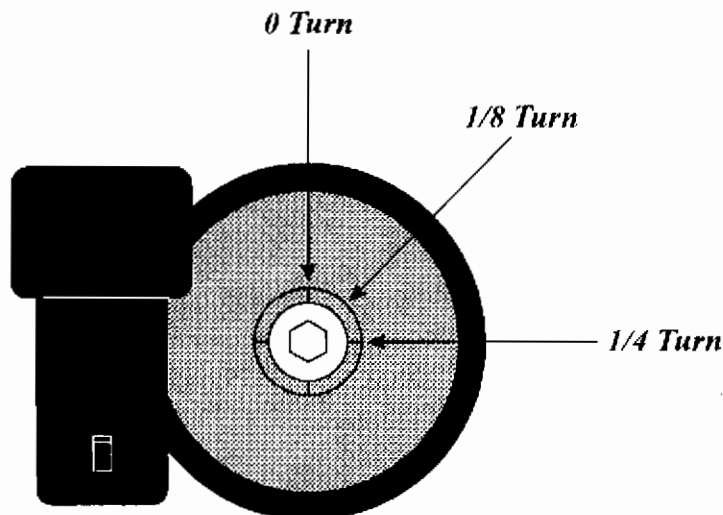
CAUSE: The cause may be, a defective Pressure Control Solenoid (PCS), and/or a worn line boost valve and sleeve assembly in the valve body, creating less than desired line pressure rise.

CORRECTION: Replace the Pressure Control Solenoid with the *updated* PCS, available from OEM under part number 10478146. Before installing the new PCS, turn the adjusting screw on the end of the solenoid in *exactly 1/8 turn*, as shown in Figure 1.
Inspect and replace as necessary, the boost valve and sleeve assembly located in the valve body, in the location shown in Figure 2. This valve train is available from Sonnax® under part number 84754-30K, and is not yet available from OEM except in a complete valve body assembly.

SERVICE INFORMATION:

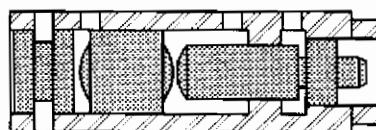
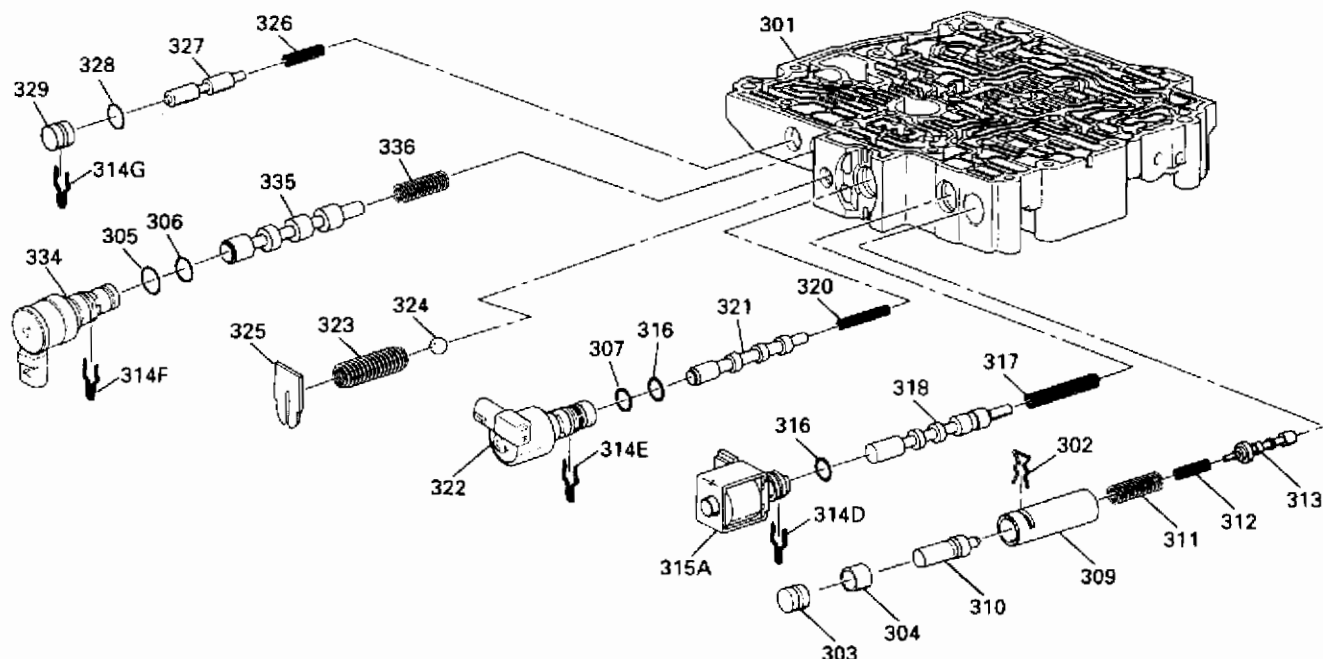
Pressure Control Solenoid (New Design From OEM)	10478146
Boost Valve and Sleeve Kit (Sonnax® Part No.)	847554-30K

TURN SCREW IN "EXACTLY" 1/8 TURN, NO MORE

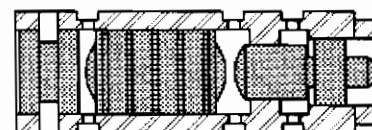


Copyright © 2001 ATSG

Figure 1



OEM Boost Valve And Sleeve Assembly



Sonnax® Boost Valve And Sleeve Assembly

- 301 CONTROL VALVE BODY
- 302 LINE BOOST VALVE AND BUSHING RETAINER
- 303 LINE BOOST VALVE BORE PLUG
- 304 LINE BOOST VALVE
- 305 TCC PWM SOLENOID "O" RING SEAL
- 306 TCC PWM SOLENOID "O" RING SEAL
- 307 PRESSURE CONTROL SOLENOID "O" RING SEAL
- 309 REVERSE BOOST VALVE BUSHING
- 310 REVERSE BOOST VALVE
- 311 PRESSURE REGULATOR VALVE OUTER SPRING
- 312 PRESSURE REGULATOR VALVE INNER SPRING
- 313 PRESSURE REGULATOR VALVE
- 314D 1-2, 3-4 SHIFT SOLENOID RETAINER
- 314E PRESSURE CONTROL SOLENOID RETAINER
- 314F TCC PWM SOLENOID RETAINER
- 314G TCC REGULATOR APPLY VALVE BORE PLUG RETAINER
- 315A 1-2, 3-4 SHIFT SOLENOID ASSEMBLY
- 316A 1-2, 3-4 SHIFT SOLENOID "O" RING SEAL
- 316B PRESSURE CONTROL SOLENOID "O" RING SEAL

- 317 1-2 SHIFT VALVE SPRING
- 318 1-2 SHIFT VALVE
- 320 TORQUE SIGNAL REGULATOR VALVE SPRING
- 321 TORQUE SIGNAL REGULATOR VALVE
- 322 PRESSURE CONTROL SOLENOID ASSEMBLY
- 323 LINE PRESSURE RELIEF VALVE SPRING
- 324 LINE PRESSURE RELIEF VALVE
- 325 LINE PRESSURE RELIEF VALVE SPRING RETAINER
- 326 TCC REGULATOR APPLY VALVE SPRING
- 327 TCC REGULATOR APPLY VALVE
- 328 TCC REGULATOR APPLY VALVE BORE PLUG "O" RING SEAL
- 329 TCC REGULATOR APPLY VALVE BORE PLUG
- 334 TCC PWM SOLENOID ASSEMBLY
- 335 TCC CONTROL VALVE
- 336 TCC CONTROL VALVE SPRING

Copyright © 2001 ATSG

Figure 2

THM 4T65E 1997-2002 GEAR RATIO IDENTIFICATION

This is the latest information that is available for the THM 4T65E transaxle to identify the transaxle as to which vehicle it is compatible with, and both sprocket ratios and final drive ratios are provided by model. Notice also that we have provided converter codes for both the 245mm and 258mm and the "K" factor for the converters, which determines stall speeds. We have also included which models have the Internal Mode Switch (IMS) and which models do not require the internal IMS.

SPECIAL NOTE:

Keep in mind that this information may change at any time.

Figure 1 gives you information on the 1997 models.

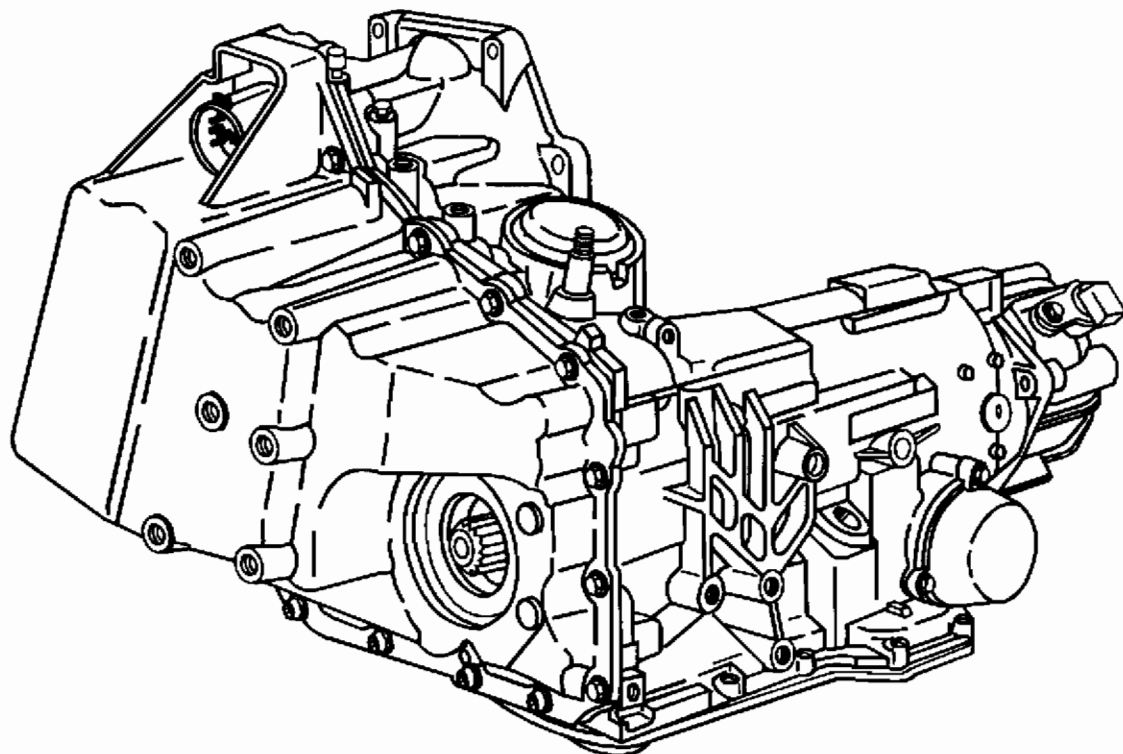
Figure 2 gives you information on the 1998 models.

Figure 3 gives you information on the 1999 models.

Figure 4 gives you information on the 2000 models.

Figure 5 gives you information on the 2001 models.

Figure 6 gives you information on the 2002 models.



1997 THM 4T65E MODELS

[illegible]

"C" Body = Park Avenue/Ultra

"G" Body = Aurora, Riviera

"H" Body = Bonneville, Eighty Eight, LeSabre

"W" Body = Grand Prix, Intrigue, Lumina, Century, Monte Carlo, Regal

Copyright © 2001 ATSG

Figure 1

[illegible]

"C" Body = Park Avenue/Ultra

"G" Body = Aurora, Riviera

"H" Body = Bonneville, Eighty Eight, LeSabre

"W" Body = Grand Prix, Intrigue, Lumina, Century, Monte Carlo, Regal



"2002" SEMINAR INFORMATION

SLIDE

81

1999 THM 4T65E MODELS									
MODEL CODE	BODY	ENGINE/CAR LINE	F/D RATIO	SPRKS DRIVE/DRVN	CONV CODE	CONV DIAM	"K" FCTR	IMS Y/N	
9APB	"W"	3.8L, /Buick	3.05	35/35	JZFM	258mm	???	N	
9BCB	"U"	3.4L, /Chev, Pont, Olds	3.29	35/35	FLQB	245mm	163	N	
9BCB	"W"	3.8L, /Pontiac	3.29	35/35	FLQB	245mm	163	N	
9CMB	"G"	3.8L - Supercharged /Buick	3.29	37/33	JSFM	258mm	133	N	
9CRB	"W"	3.8L, /Oldsmobile	3.05	35/35	FLQB	245mm	163	N	
9FAB	"W"	2.5L, /Buick (China)	3.29	33/37	FDHB	245mm	180	N	
9FCB	"C"	3.8L - Supercharged /Buick	3.29	37/33	JSFM	258mm	133	Y	
9FDB	"H"	3.8L - Supercharged /Olds, Pont	3.29	37/33	JSFM	258mm	133	N	
9FFB	"C"	3.8L, /Buick	3.05	35/35	JSFM	258mm	133	Y	
9FMB	"W"	3.0L, /Buick (China)	3.29	35/35	FDHB	245mm	180	N	
9KAB	"W"	3.8L, /Chevrolet, Police/Taxi	3.29	35/35	FLQB	245mm	163	N	
9THB	"W"	3.8L, /Chevrolet,	3.29	35/35	FLQB	245mm	163	N	
9TNB	"H"	3.8L, /Buick, Olds, Pont	3.05	35/35	FLQB	245mm	163	N	
9XAB	"W"	3.8L - Supercharged /Buick, Pont	3.29	37/33	JTFM	258mm	155	N	
9YCB	"W"	3.5L, /Oldsmobile	3.29	35/35	JSFM	258mm	133	N	
9YFB	"H"	3.8L, /Buick, Olds, Pont	2.86	35/35	FLQB	245mm	163	N	
"C" Body = Park Avenue/Ultra "G" Body = Aurora, Riviera "H" Body = Bonneville, Eighty Eight, LeSabre "U" Body = Venture, Silhouette, Trans Sport "W" Body = Grand Prix, Intrigue, Lumina, Century, Monte Carlo, Regal									

Copyright © 2001 ATSG

Figure 3



"2002" SEMINAR INFORMATION

SLIDE

8

2000 THM 4T65E MODELS

MODEL CODE	BODY	ENGINE/CAR LINE	F/D RATIO	SPRKS DRIVE/DRVN	CONV CODE	CONV DIAM	"K" FC TR	IMS Y/N
0APB, 0ARB	"W"	3.8L, /Buick	3.05	35/35	JZFM	258mm	R115	N
0BCB, 0BRB	"U"	3.4L, /Chev, Olds, Pont	3.29	35/35	FLQB	245mm	163	N
0BCB, 0BRB	"W"	3.8L, /Buick	3.29	35/35	FLQB	245mm	163	N
0FHB, 0CHB	"H"	3.8L, Supercharged /Pontiac	3.29	37/33	JZFM	258mm	R115	Y
0FCB, 0FDB	"C"	3.8L, Supercharged /Buick	3.29	37/33	JSFM	258mm	133	Y
0FFB, 0FKB	"C"	3.8L, /Buick	3.05	35/35	JSFM	258mm	133	Y
0LDB, 0LMB	"W"	3.8L, /Chevrolet	3.29	35/35	FLQB	245mm	163	Y
0LCB, 0LNB	"W"	3.8L, /Chevrolet - Police/Taxi	3.29	35/35	FLQB	245mm	163	Y
0LBB, 0LPB	"W"	3.8L, /Chevrolet	3.05	35/35	FLQB	245mm	163	Y
0PBB, 0PCB	"H"	3.8L, /Buick, Pont	3.05	35/35	JZFM	258mm	R115	Y
0PAB, 0PPB	"H"	3.8L, /Buick, Pont	2.86	35/35	JSFM	258mm	133	Y
0RDB, 0RLB	"W"	3.4L, /Chevrolet	2.86	35/35	FDQB	245mm	180	Y
0RNB, 0RWB	"W"	3.1L, /Buick, Chev, Pont	3.05	35/35	FDHB	245mm	180	N
0XAB, 0XBB	"W"	3.8L, Supercharged /Buick, Pont	3.29	37/33	JTFM	258mm	155	N
0YCB, 0YHB	"W"	3.5L, /Oldsmobile	3.29	35/35	JXFM	258mm	164	N
0YMB, 0YRB	"W"	3.5L, /Oldsmobile	3.05	35/35	JXFM	258mm	164	N

"C" Body = Park Avenue/Ultra

"G" Body = Aurora, Riviera

"H" Body = Bonneville, Eighty Eight, LeSabre

"U" Body = Venture, Silhouette, Trans Sport

"W" Body = Grand Prix, Intrigue, Lumina, Century, Monte Carlo, Regal

2001 THM 4T65E MODELS

MODEL CODE	BODY	ENGINE/CAR LINE	F/D RATIO	SPRKS DRIVE/DRVN	CONV CODE	CONV DIAM	"K" FCTR	IMS Y/N
1APB	"W"	3.8L, /Buick	3.05	35/35	JZFM	258mm	R115	N
1BCB	"U"	3.4L, /Chev, Olds, Pont	3.29	35/35	FLQB	245mm	163	N
1BCB	"W"	3.8L, /Pontiac	3.29	35/35	FLQB	245mm	163	N
1BCB	"B"	3.4L, /Pontiac (2WD)	3.29	35/35	FLQB	245mm	163	N
1CHB	"H"	3.8L, Supercharged /Pontiac	3.29	37/33	JZFM	258mm	R115	Y
1CXB	"B"	3.4L, /Pontiac (AWD)	3.29	35/35	FLQB	245mm	163	N
1DCB	"G"	3.5L, /Oldsmobile	3.29	35/35	JXFM	258mm	164	Y
1FCB	"C"	3.8L, Supercharged /Buick	3.29	37/33	JSFM	258mm	133	Y
1FCB	"H"	3.8L, Supercharged /Pontiac	3.29	37/33	JSFM	258mm	133	Y
1FFB	"C"	3.8L, /Buick	3.05	35/35	JSFM	258mm	133	Y
1LBB	"W"	3.8L, /Chevrolet	3.05	35/35	FLQB	245mm	163	Y
1LCB	"W"	3.8L, /Chevrolet - Police/Taxi	3.29	35/35	FLQB	245mm	163	Y
1LDB	"W"	3.8L, /Chevrolet	3.29	35/35	FLQB	245mm	163	Y
1PAB	"H"	3.8L, /Buick, Pont	2.86	35/35	JSFM	258mm	133	Y
1PBB	"H"	3.8L, /Buick, Pont	3.05	35/35	JZFM	258mm	R115	Y
1RDB	"W"	3.4L, /Chevrolet	2.86	35/35	FDHB	245mm	180	Y
1RNB	"W"	3.1L, /Buick, Pont	3.05	35/35	FDHB	245mm	180	N
1XAB	"W"	3.8L, Supercharged /Buick, Pont	3.29	37/33	JTFM	258mm	155	N
1YCB	"W"	3.5L, /Oldsmobile	3.29	35/35	JXFM	258mm	164	N
1YMB	"W"	3.5L, /Oldsmobile	3.05	35/35	JXFM	258mm	164	N

"C" Body = Park Avenue/Ultra

"G" Body = Aurora, Riviera

"H" Body = Bonneville, Eighty Eight, LeSabre

"U" Body = Venture, Silhouette, Trans Sport

"W" Body = Grand Prix, Intrigue, Lumina, Century, Monte Carlo, Regal

2002 THM 4T65E MODELS

MODEL CODE	BODY	ENGINE/CAR LINE	F/D RATIO	SPRKS DRIVE/DRVN	CONV CODE	CONV DIAM	"K" FCTR	IMS Y/N
2APB	"W"	3.8L, /Buick	3.05	35/35	JZFM	258mm	R115	N
2BCB	"U"	3.4L, /Chev, Olds, Pont	3.29	35/35	FLQB	245mm	163	N
2BCB	"W"	3.8L, /Pontiac	3.29	35/35	FLQB	245mm	163	N
2BCB	"B"	3.4L, /Buick, Pontiac (2WD)	3.29	35/35	FLQB	245mm	163	N
2CHB	"H"	3.8L, Supercharged /Pontiac	3.29	37/33	JZFM	258mm	R115	Y
2CXB	"B"	3.4L, /Buick, Pontiac (AWD)	3.29	35/35	FLQB	245mm	163	N
2CXB	"U"	3.4L, /Chev, Olds, Pont (AWD)	3.29	35/35	FLQB	245mm	163	N
2DCB	"G"	3.5L, /Oldsmobile	3.29	35/35	JXFM	258mm	164	Y
2FCB	"C"	3.8L, Supercharged /Buick	3.29	37/33	JSFM	258mm	133	Y
2FFB	"C"	3.8L, /Buick	3.05	35/35	JSFM	258mm	133	Y
2KLB	"W"	3.7L, /Chevrolet	3.29	33/37	N/A	258mm	179	Y
2LBB	"W"	3.8L, /Chevrolet	3.05	35/35	FLQB	245mm	163	Y
2LCB	"W"	3.8L, /Chevrolet - Police/Taxi	3.29	35/35	FLQB	245mm	163	Y
2PAB	"H"	3.8L, /Buick, Pont	2.86	35/35	JSFM	258mm	133	Y
2PBB	"H"	3.8L, /Pontiac	3.05	35/35	JZFM	258mm	R115	Y
2RDB	"W"	3.4L, /Chevrolet	2.86	35/35	FDHB	245mm	180	Y
2RNB	"W"	3.1L, /Buick, Pont	3.05	35/35	FDHB	245mm	180	N
2YCB	"W"	3.5L, /Oldsmobile	3.29	35/35	JXFM	258mm	164	N
2YMB	"W"	3.5L, /Oldsmobile	3.05	35/35	JXFM	258mm	164	N

"C" Body = Park Avenue/Ultra

"G" Body = Aurora, Riviera

"H" Body = Bonneville, Eighty Eight, LeSabre

"U" Body = Venture, Silhouette, Trans Sport

"Y" Body = Lumina, Impala, Firebird, Trans Am, Camaro, Corsica, Monte Carlo, Regal

THM 4T65E

INTERNAL MODE SWITCH ADDED IN SOME MODELS

CHANGE: Beginning at the start of production for 1999 some models of the THM 4T65E were produced with an "Internal Mode Switch" (IMS). The transaxle Internal Mode Switch (IMS) is a sliding contact switch attached to the selector detent inside the transmission side cover, as shown in Figure 1. The four inputs to the PCM from the IMS indicate which position is selected by the transmission selector lever. This information is used for ignition timing, EVAP canister purge, EGR and IAC valve operation, as well as for starting functions when the selector lever is in P or N and proper ground is made. The state of each input is available for display on the scan tool. The four input parameters represented are Mode P, Mode A, Mode B and Mode C (Refer to Figure 2).

REASON: Mounted internally for increased protection from the elements and engine compartment heat, for increased durability and reliability. This also eliminates the need for adjustments at the vehicle assembly plants.

PARTS AFFECTED:

- (1) **MODE SWITCH** - Now mounted internally instead of externally on the transaxle case, and applies to only *some* models (See Figure 1).
- (2) **INTERNAL WIRE HARNESS** - Five wires added to the internal harness to accommodate the new mode switch that now run through the transaxle case connector (See Figure 2).

DIAGNOSIS PROCEDURES:

- (1) *The new Internal Mode Switch fault can generate the following Diagnostic Trouble Codes:*
 - P1819 - Internal Mode Switch, No Start/Wrong Range*
 - P1820 - Internal Mode Switch, Circuit "A" Low*
 - P1822 - Internal Mode Switch, Circuit "B" High*
 - P1825 - Internal Mode Switch, Invalid Range*
 - P1826 - Internal Mode Switch, Circuit "C" High*

Note: None of the above DTC's will illuminate the Malfunction Indicator Lamp (MIL).

- (2) *Refer to Figure 2 for Internal Mode Switch (IMS) connector terminal identification, wire colors and circuit functions.*
- (3) *Refer to Figure 3 for a complete wiring schematic from the transaxle through the transaxle case connector and on to the Powertrain Control Module (PCM). This includes wire colors both inside and outside and terminal identification of transaxle components.*

Continued on next Page.

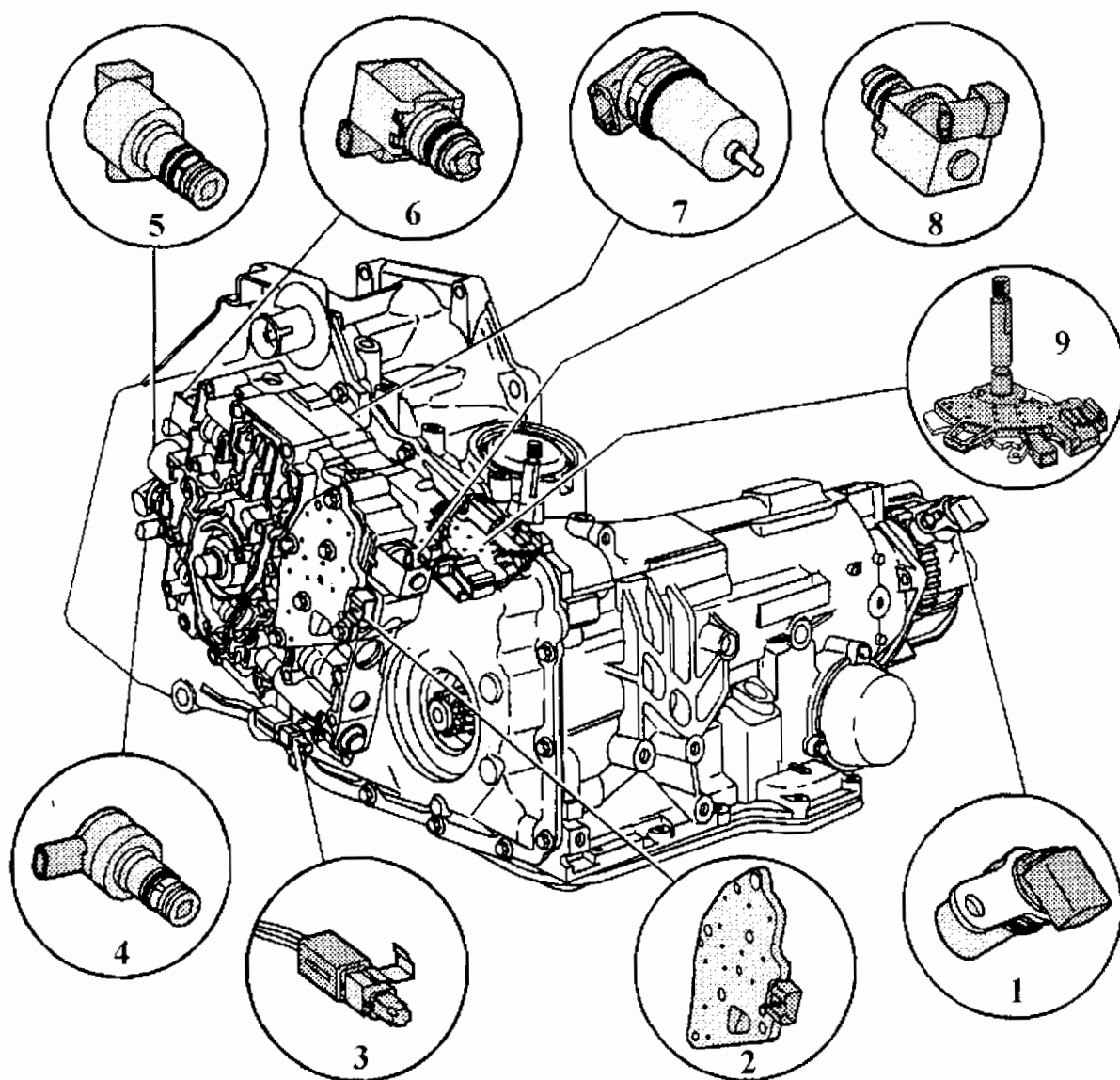


"2002" SEMINAR INFORMATION SLIDE

86

- (4) *Refer to Figure 4 for identification of the transaxle case connector terminals that were added to accommodate the new IMS, and the wire colors and functions. We have also included a resistance chart for the internal transaxle components.*
- (5) *Refer to Figure 5 for identification of the PCM connector terminals, both Blue and the Clear connectors for the transaxle related components.*
- (6) *Refer to Figure 6 for an Internal Mode Switch Logic chart that will provide you with the proper readings for all four input parameters for the IMS. These can be viewed from the appropriate scan tool.*
- (7) *Figure 7 provides you with the information to bench check the Internal Mode Switch for the proper continuity at the Internal Mode Switch connector, and Figure 8 provides you the same information to check the switch at the transaxle case connector terminals.*

THM 4T65E INTERNAL MODE SWITCH LOCATION



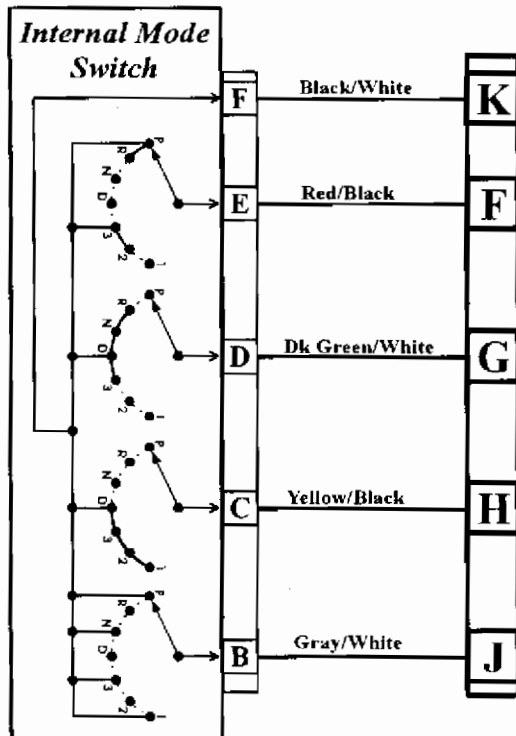
- 1. OUTPUT SPEED SENSOR
- 2. TRANSMISSION FLUID PRESSURE SWITCH ASSEMBLY
- 3. TRANSMISSION FLUID TEMPERATURE SENSOR
- 4. TCC PWM SOLENOID

- 5. PRESSURE CONTROL SOLENOID
- 6. 1-2/3-4 SHIFT SOLENOID
- 7. INPUT SPEED SENSOR
- 8. 2-3 SHIFT SOLENOID
- 9. INTERNAL MODE SWITCH

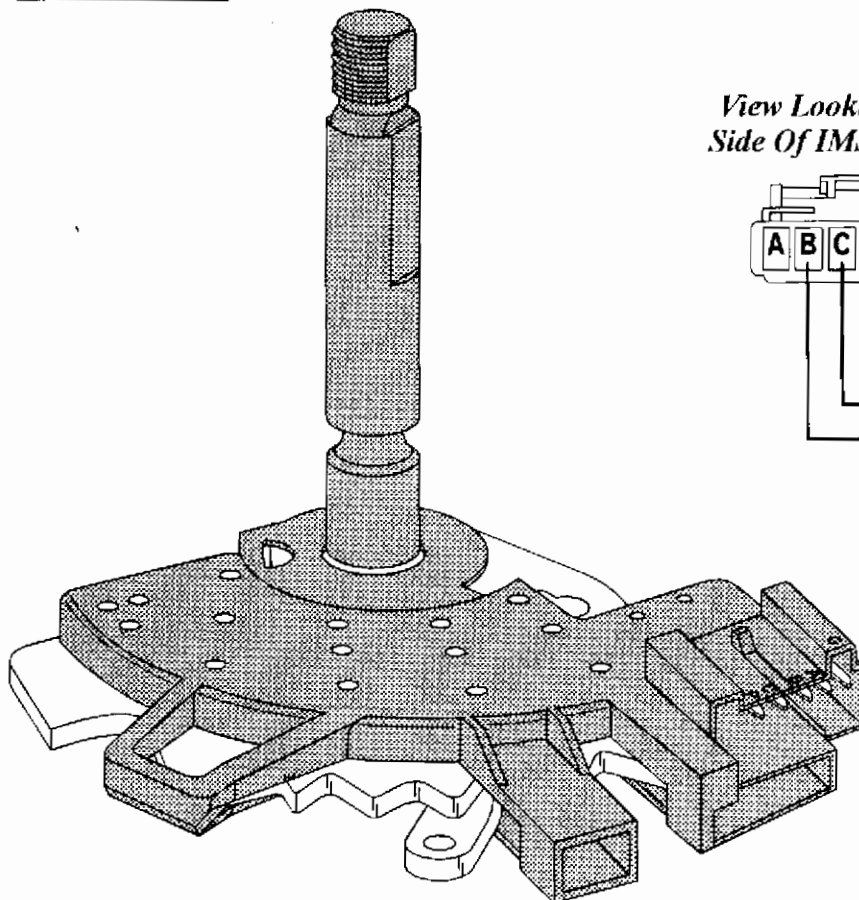
Copyright © 2001 ATSG

Figure 1

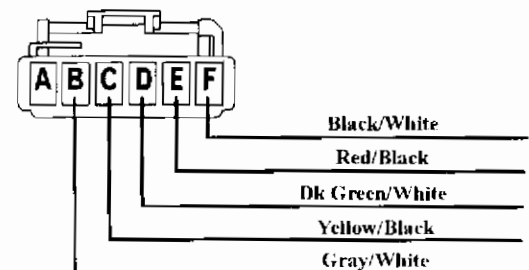
INTERNAL MODE SWITCH CONNECTOR TERMINAL IDENTIFICATION

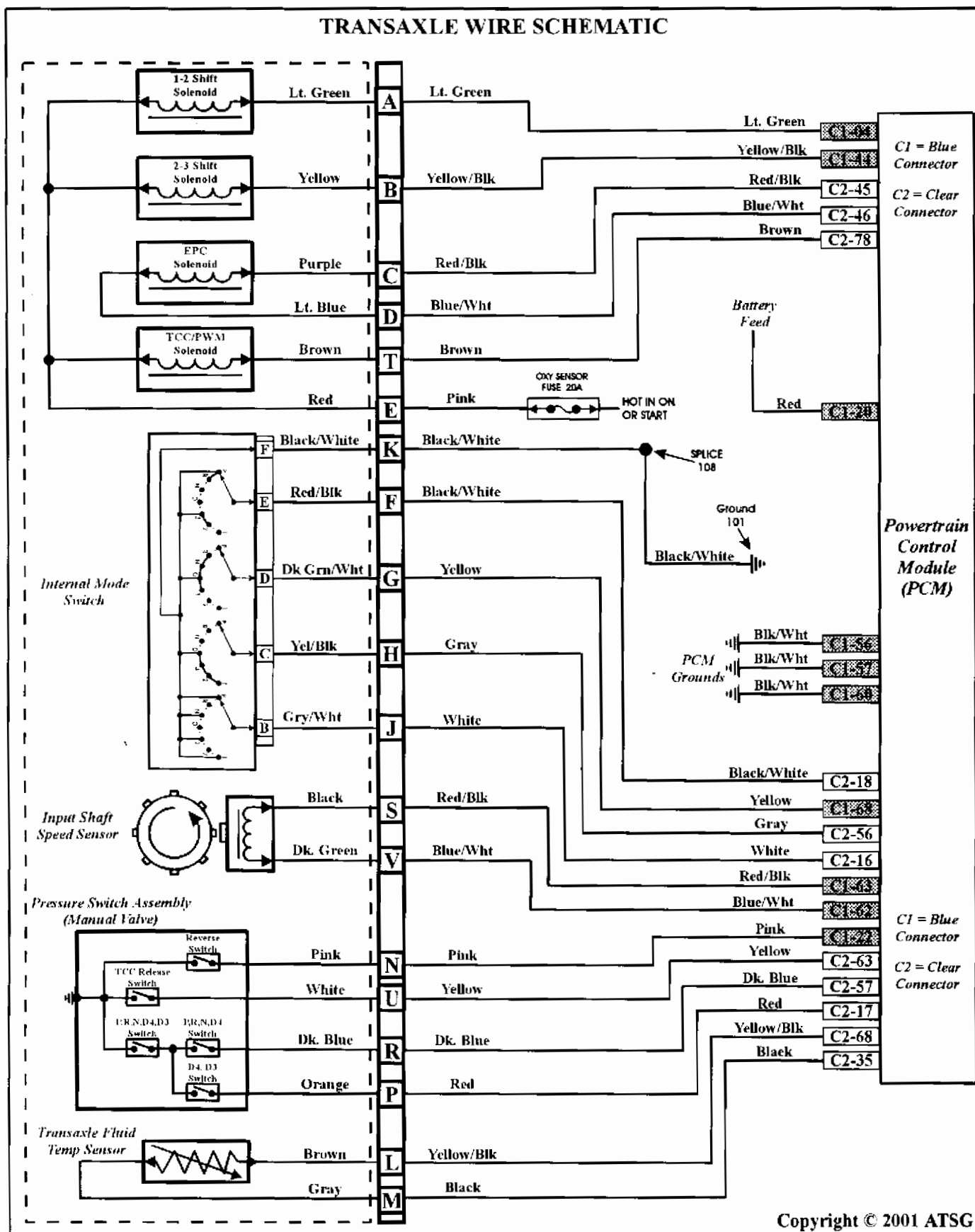


INTERNAL MODE SWITCH (IMS) CONNECTOR			
PIN	WIRE COLOR	CIRCUIT NO.	FUNCTION
A	—	—	NOT USED
B	GRAY/WHT	776	IMS MODE P
C	YEL/BLK	773	IMS MODE C
D	DK GRN/WHT	772	IMS MODE B
E	RED/BLK	771	IMS MODE A
F	BLK/WHT	1050	GROUND



View Looking At Wire
Side Of IMS Connector

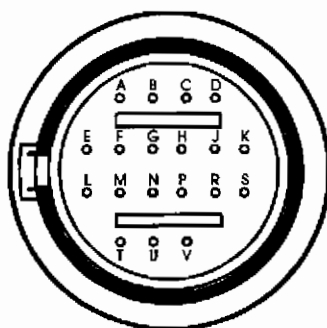




Copyright © 2001 ATSG

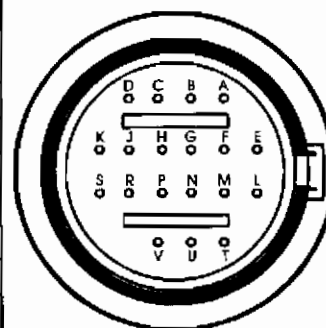
Figure 3

TRANSAXLE CASE CONNECTOR PIN IDENTIFICATION AND RESISTANCE CHART



View Looking Into
Transaxle Case Connector

Ohms Resistance Chart			
Cavities	Component	Resistance @ 68°F	Resistance @ 190°F
A-E	1-2 Shift Solenoid	19-24Ω	24-31Ω
B-E	2-3 Shift Solenoid	19-24Ω	24-31Ω
T-E	TCC/PWM Solenoid	10-12Ω	13-15Ω
C-D	EPC Solenoid	3-5Ω	5-6Ω
S-V	Input Speed Sensor	893-1127Ω	1132-1428Ω
M-L	TFT Sensor	3164-3867Ω	225-285Ω
	Output Speed Sensor	981-1864Ω	



View Looking Into
Vehicle Harness Connector

Copyright © 2001 ATSC

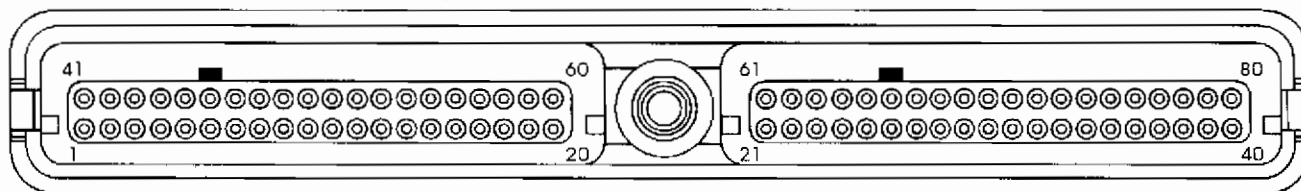
CASE CONNECTOR PIN FUNCTION

Pin	External 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	Red/Black	Electronic Pressure Control Solenoid, HIGH Control
D	Blue/White	Electronic Pressure Control Solenoid, LOW Control
E	Pink	Transaxle Solenoid 12V Power In
F	Black/White	Internal Mode Switch Range Signal "A"
G	Yellow	Internal Mode Switch Range Signal "B"
H	Gray	Internal Mode Switch Range Signal "C"
J	White	Internal Mode Switch Range Signal "P"
K	Black/White	Internal Mode Switch ground
L	Yellow/Black	Transaxle Fluid Temperature (TFT) Sensor HIGH
M	Black	Transaxle Fluid Temperature (TFT) Sensor LOW
N	Pink	Pressure Switch Assembly, Range Signal "A"
P	Red	Pressure Switch Assembly, Range Signal "C"
R	Dark Blue	Pressure Switch Assembly, Range Signal "B"
S	Red/Black	Input Speed Sensor (ISS) signal HIGH
T	Brown	Ground signal from PCM for the TCC/PWM Converter Clutch Solenoid
U	Yellow	TCC Release Switch signal to the PCM
V	Blue/White	Input Speed Sensor (ISS) signal LOW

Copyright © 2001 ATS

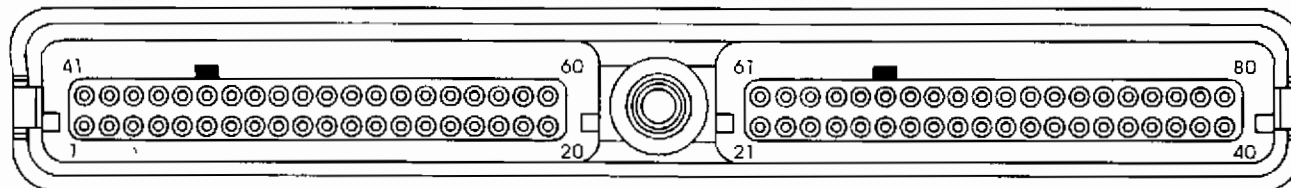
Figure 4

C1 "BLUE" PCM CONNECTOR



Pin No.	Wire Color	Circuit	Description
4	Lt Green	1222	Shift Solenoid "A" Ground Signal
20	Red	1642	Battery Feed
22	Pink	1224	Transaxle Fluid Pressure Switch "A" Input
44	Yellow/Black	1223	Shift Solenoid "B" Ground Signal
56	Black/White	451	PCM Ground
57	Black/White	451	PCM Ground
60	Black/White	451	PCM Ground
62	Dk Blue/White	1231	Input Shaft Speed Sensor, Low
63	Red/Black	1230	Input Shaft Speed Sensor, High
68	Yellow	772	Internal Mode Switch Signal "B"

C2 "WHITE" PCM CONNECTOR



Pin No.	Wire Color	Circuit	Description
16	White	776	Internal Mode Switch Signal "P"
17	Red	1225	Transaxle Fluid Pressure Switch "C" Input
18	Black/White	771	Internal Mode Switch Signal "A"
35	Black	808	Transaxle Fluid Temperature Sensor Ground
45	Red/Black	1228	Pressure Control Solenoid, High
46	Lt Blue/White	1229	Pressure Control Solenoid, Low
56	Gray	773	Internal Mode Switch Signal "C"
57	Dk Blue	1225	Transaxle Fluid Pressure Switch "B" Input
63	Yellow	657	TCC Release Switch
68	Yellow/Black	1227	Transaxle Fluid Temperature Sensor
78	Brown	418	TCC PWM Solenoid Control



"2002" SEMINAR INFORMATION SLIDE

92

INTERNAL MODE SWITCH LOGIC				
GEAR SELECTOR POSITION	SCAN TOOL IMS RANGE			
	A	B	C	P
PARK	LOW	HI	HI	LOW
PARK/REVERSE	LOW	LOW	HI	LOW
REVERSE	LOW	LOW	HI	HI
REVERSE/NEUTRAL	HI	LOW	HI	HI
NEUTRAL	HI	LOW	HI	LOW
NEUTRAL/DRIVE 4	HI	LOW	LOW	LOW
DRIVE 4	HI	LOW	LOW	HI
DRIVE 4/DRIVE 3	LOW	LOW	LOW	HI
DRIVE 3	LOW	LOW	LOW	LOW
DRIVE 3/DRIVE 2	LOW	HI	LOW	LOW
DRIVE 2	LOW	HI	LOW	HI
DRIVE 2/DRIVE 1	HI	HI	LOW	HI
DRIVE 1	HI	HI	LOW	LOW
ILLEGAL RANGES	HI	HI	HI	HI
	LOW	HI	HI	HI
	HI	HI	HI	LOW
HI = Ignition Voltage LOW = 0 Voltage				

Copyright © 2001 ATSG

Figure 6

INTERNAL MODE SWITCH CONTINUITY CHECKS AT IMS CONNECTOR													
IMS TERMINALS	MANUAL SHIFT DETENT LEVER POSITION												
	P	P/R	R	R/N	N	N/D4	D4	D4/D3	D3	D3/D2	D2	D2/D1	D1
F to B	C	C	O	O	C	C	O	O	C	C	O	O	C
F to C	O	O	O	O	O	C	C	C	C	C	C	C	C
F to D	O	C	C	C	C	C	C	C	C	O	O	O	O
F to E	C	C	C	O	O	O	O	C	C	C	C	O	O
E to B	C	C	O	O	O	O	O	O	C	C	O	O	O
E to C	O	O	O	O	O	O	O	C	C	C	C	O	O
E to D	O	C	C	O	O	O	O	C	C	O	O	O	O
D to B	O	C	O	O	C	C	O	O	C	O	O	O	O
D to C	O	O	O	O	O	C	C	C	C	O	O	O	O
C to B	O	O	O	O	O	C	O	O	C	C	O	O	C

C = CLOSED CIRCUIT
O = OPEN CIRCUIT

SPECIAL NOTE:
 Terminals B, C, D, E, and F must indicate an "OPEN" circuit when checked against the Internal Mode Switch shaft, through all ranges.

Copyright © 2001 ATSG

Figure 7

INTERNAL MODE SWITCH CONTINUITY CHECKS AT CASE CONNECTOR													
CASE CONNECTOR TERMINALS	MANUAL SHIFT DETENT LEVER POSITION												
	P	P/R	R	R/N	N	N/D4	D4	D4/D3	D3	D3/D2	D2	D2/D1	D1
K to J	C	C	O	O	C	C	O	O	C	C	O	O	C
K to H	O	O	O	O	O	C	C	C	C	C	C	C	C
K to G	O	C	C	C	C	C	C	C	C	O	O	O	O
K to F	C	C	C	O	O	O	O	C	C	C	C	O	O
F to J	C	C	O	O	O	O	O	O	C	C	O	O	O
F to H	O	O	O	O	O	O	O	C	C	C	C	O	O
F to G	O	C	C	O	O	O	O	C	C	O	O	O	O
G to J	O	C	O	O	C	C	O	O	C	O	O	O	O
G to H	O	O	O	O	O	C	C	C	C	O	O	O	O
H to J	O	O	O	O	O	C	O	O	C	C	O	O	C

C = CLOSED CIRCUIT
O = OPEN CIRCUIT

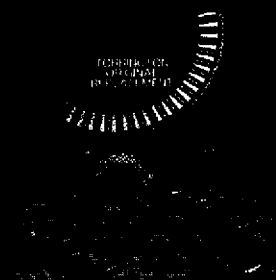
SPECIAL NOTE:
 Terminals B, C, D, E, and F must indicate an "OPEN" circuit when checked against the Internal Mode Switch shaft, through all ranges.

Copyright © 2001 ATSG

Figure 8



Winners Know How To Make Every Second Count.



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

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

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

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

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

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

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



"2002" SEMINAR INFORMATION

SLIDE

95

THM 4T65E

ASSEMBLY LINE VALVE CLIPS

- COMPLAINT:** When the transmission pan is removed, one or more of what appears to be broken valve retainer clips are found. Upon inspection of the valve body, everything seems to be in order as all valve and solenoid retainers are present.
- CAUSE:** These retainer clips are used to hold these valves in place as seen in figure 1, during the assembly line process. They serve no function concerning transmission operation. These clips are barely noticeable unless you know they are there or you are trying to remove one of these valves. The location of these retainer clips are shown in figure 2.
- CORRECTION:** Since these retainer clips have no functional purpose, they can be omitted and therefore need not be replaced.

**THM 4T65E
ASSEMBLY LINE VALVE CLIPS**

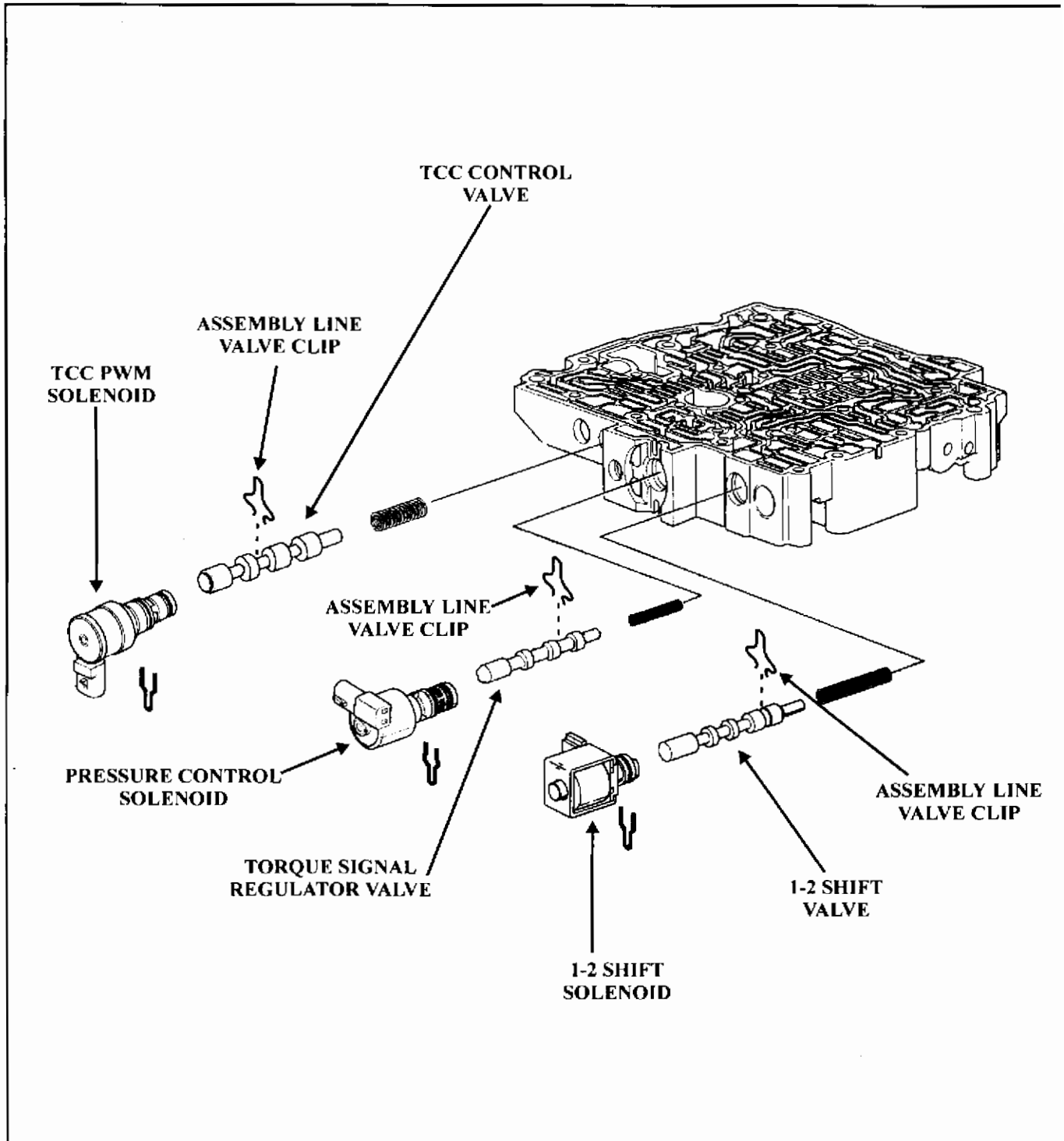


Figure 1

**THM 4T65E
ASSEMBLY LINE VALVE CLIPS**

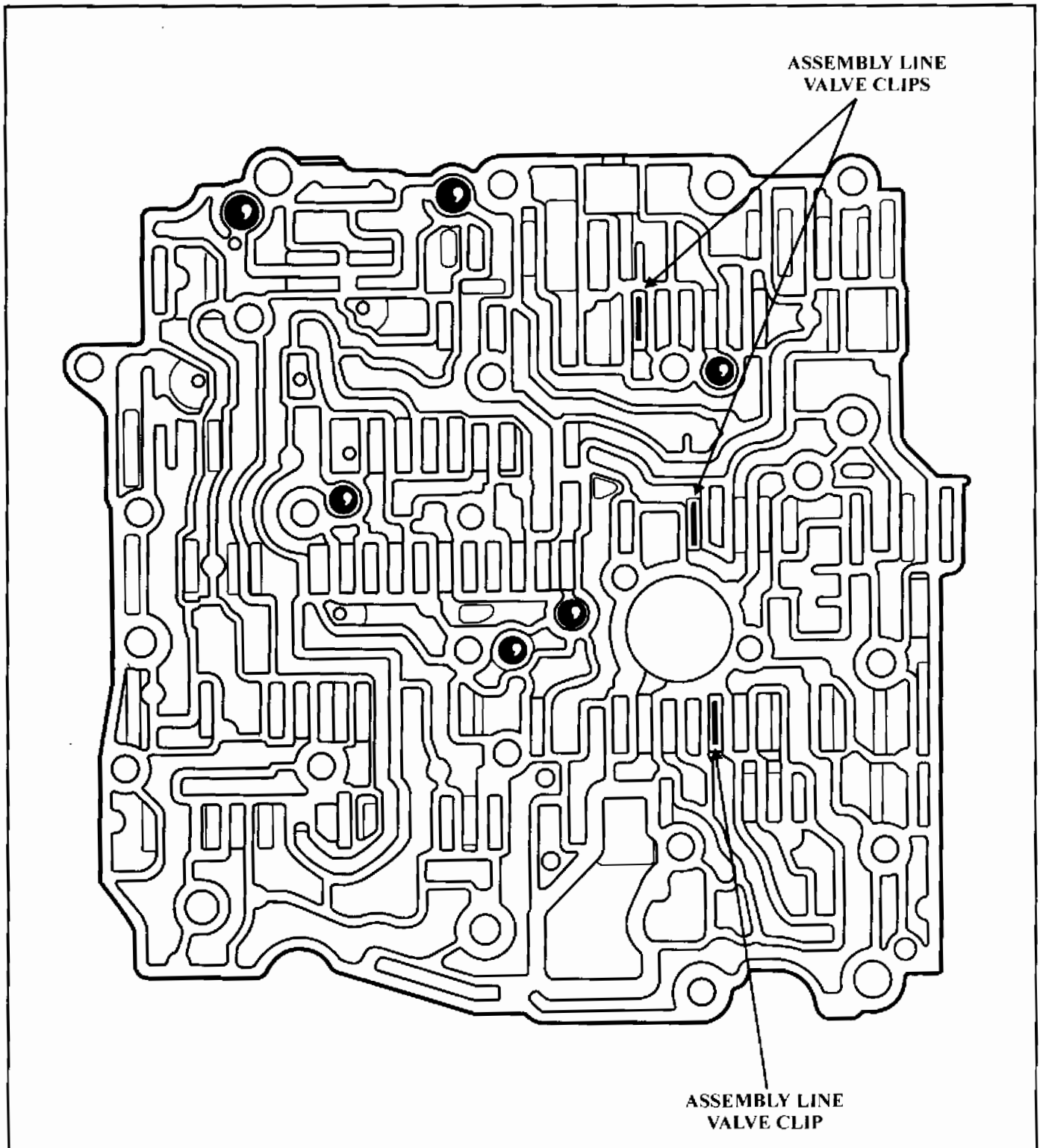


Figure 2

TIME SAVING TOOLS DESIGNED FOR YOU, THE TRANSMISSION TECHNICIAN

NEW

UNIVERSAL SPEEDOMETER DRIVEN
GEAR REMOVER



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

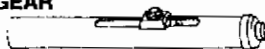


"Longer"

UNIVERSAL
END CLEARANCE
GAUGE



E-Z UNIVERSAL
SPEEDOMETER GEAR
INSTALLER



BIG 3

FRONT PUMP
PULLER

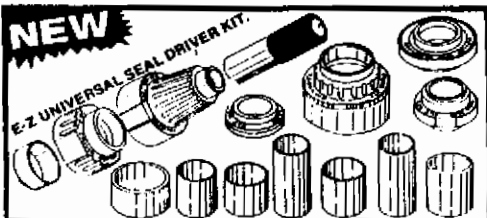


FORD, G.M., CHRYSLER

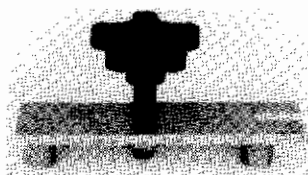
U.S. PAT 5,243,749

NEW

E-Z UNIVERSAL SEAL DRIVER KIT



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



NEW

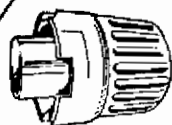
Universal Quick Lock
Clutch Spring Compressor
Model No: 2987A

Ideal for all clutches
even GM 350 and Chrysler
604 - in the case.



Ring Adapters for
Compressing Diaphragm Springs

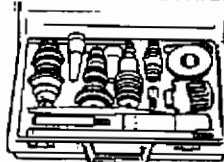
TOOLS FROM A TO Z



AXEL SEAL INSTALLER
#1250



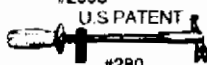
CLUTCH SPRING
COMPRESSOR KIT
#2987 U.S. PATENT



UNIVERSAL BUSHING
DRIVER SET
#1001

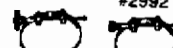


P.R. VALVE SNAP
RING INSTALLER
#2993



#280 SEAL PULLER

#2991



PUMP ALIGNMENT
TOOLS



BUSHING DRIVERS BY
TRANSMISSION TYPE

#200

#125

#350



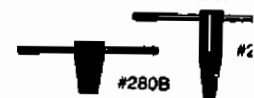
U.S. PATENT
TUFFY
#2994



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



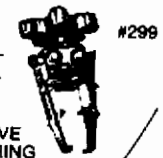
EXT. HOUSING BUSHING
TOOL #2200
U.S. PATENT



BUSHING EXTRACTOR



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



VALVE SPRING
COMPRESSOR

AOD-E SOLID RING INSTALLER

U.S. PATENT
#2997

New E40D



RACE DRIVER

GEAR & PUMP PULLER

CALL FOR
CATALOG



ALL TOOLS AND PARTS MADE IN USA

CALL US TODAY AND SAVE!

TAKE ADVANTAGE OF
A.T.S.G. PROMOTION PRICES!



COD Welcome

GUARANTEED

A to Z TOOL, INC.

• 446 W. ST. CHARLES ROAD •

VILLA PARK, ILLINOIS 60181 •

(630) 279-4118

AGAINST DEFECTS IN QUALITY AND WORKMANSHIP.

Fax: (630) 279-4134

CALL US TODAY

FORD F4E-III VALVE BODY CHANGES

CHANGE: Beginning at the start of production for the 1998 model year, Escort and Tracer vehicles equipped with the new F4E-III transaxle recieved a totally new valve body assembly, with many engineering changes that will affect service.

REASON: Improved line pressure and torque converter clutch control.

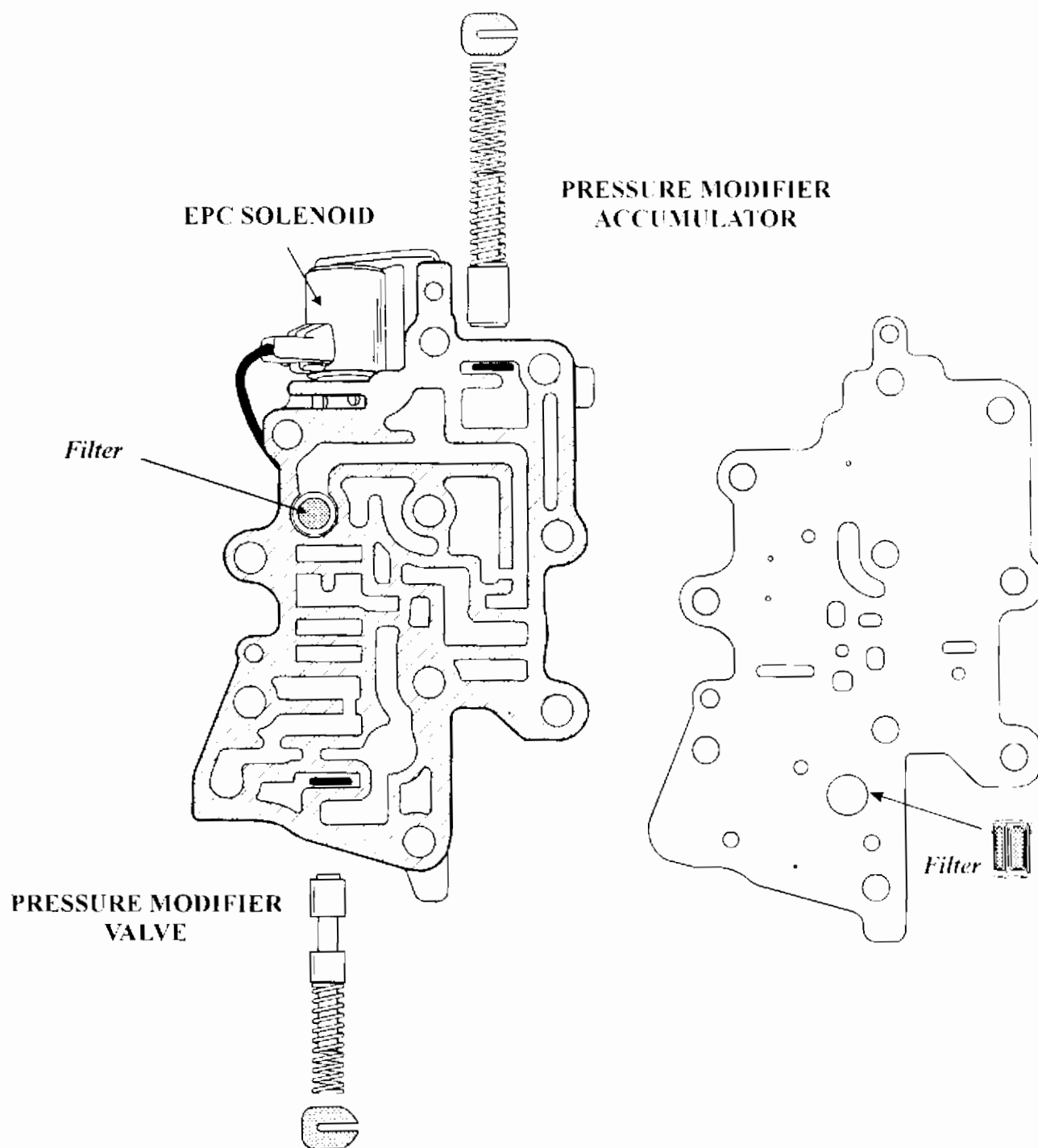
PARTS AFFECTED:

- *The pressure control solenoid, solenoid body, spacer plate and gaskets were changed . The pressure modifier valve was also changed and a spring was added to the end of the valve and an adjustable bore plug replaced the old retainer. Refer to Figure 1 for the previous design parts and Figure 2 for the new design parts as well as the new pressure modifier valve line-up.*
- *The main valve body upper side was changed to accomodate the new pressure control solenoid body and spacer plate. Refer to Figure 3.*
- *The main valve body lower side was changed to incorporate a new solenoid reducing valve. See Figure 4 for the previous design and Figure 5 for the new design.*
- *The main valve body spacer plate and gaskets were changed to accomodate the changes in the premain valve body. See Figure 6 for the previous design spacer plate and Figure 7 for the new design.*
- *The premain valve body upper side casting was changed and a screen was added in line pressure feed passage to the solenoid reducing valve. Refer to Figure 8 for previous design casting and Figure 9 for the casting change and the added screen.*
- *The premain valve body lower side and the lock-up control valve were changed. Refer to Figure 10 for the previous design lock-up control valve installation. Refer to Figure 11 for the new design lock-up control valve and its installation. NOTE: the valve is bored on the opposite side, to accomodate the new spring placement on the opposite side.*
- *The premain cover, spacer plate and gaskets were changed and the tube on the exterior was eliminated. Refer to Figure 12 to see the previous design. Refer to Figure 13 to see the new design.*
- *Refer to Figure 14 for an Oil Circuit diagram outlining the pressure control hydraulic circuit and the TCC Control Valve as well as the function of the exterior tube.*
- *Refer to Figure 15 for an Oil Circuit diagram outlining the pressure control hydraulic circuit, the added Solenoid Reducing valve and its function and the added line pressure passage to the TCC Control Valve.*

INTERCHANGEABILITY:

None of the parts listed above can be used in any previous models. However, when using the complete valve body as a service package, it will retro-fit back to previous models.

**"97" PRESSURE CONTROL SOLENOID BODY
AND SPACER PLATE**



Copyright © 2001 ATSG

Figure 1

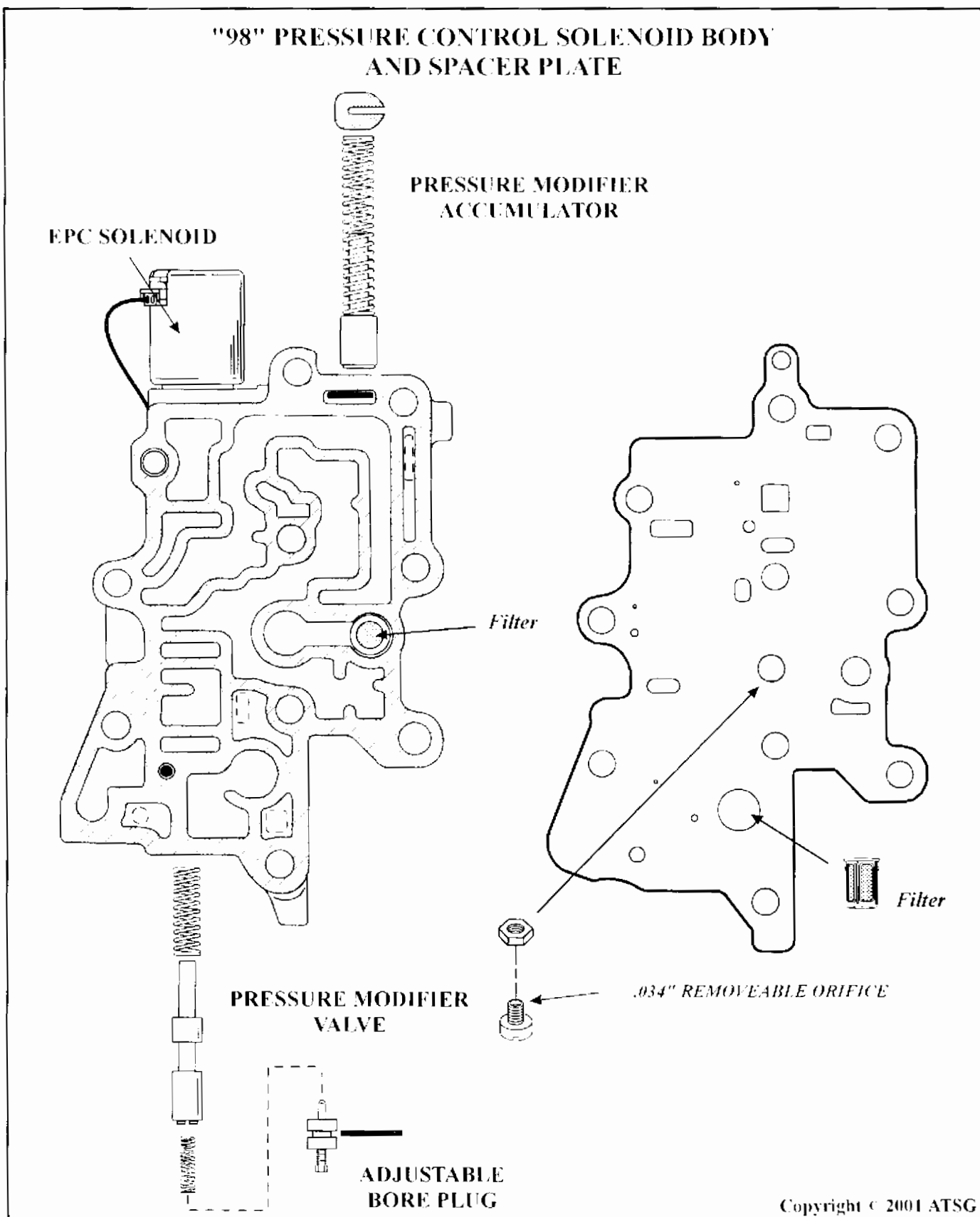
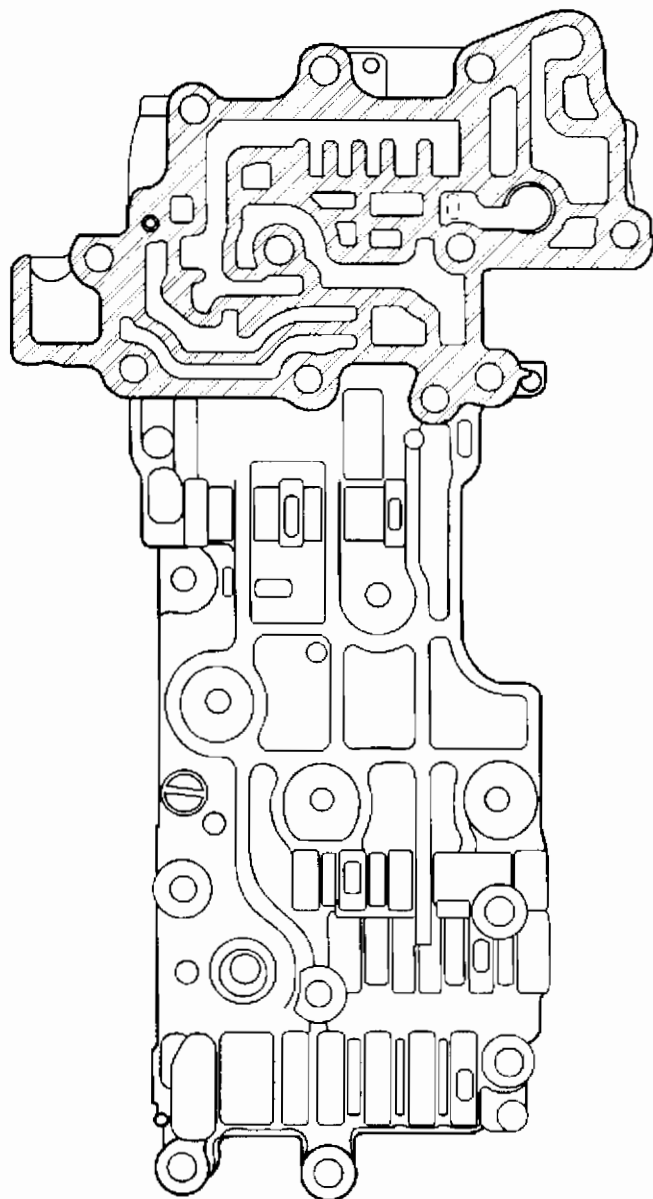
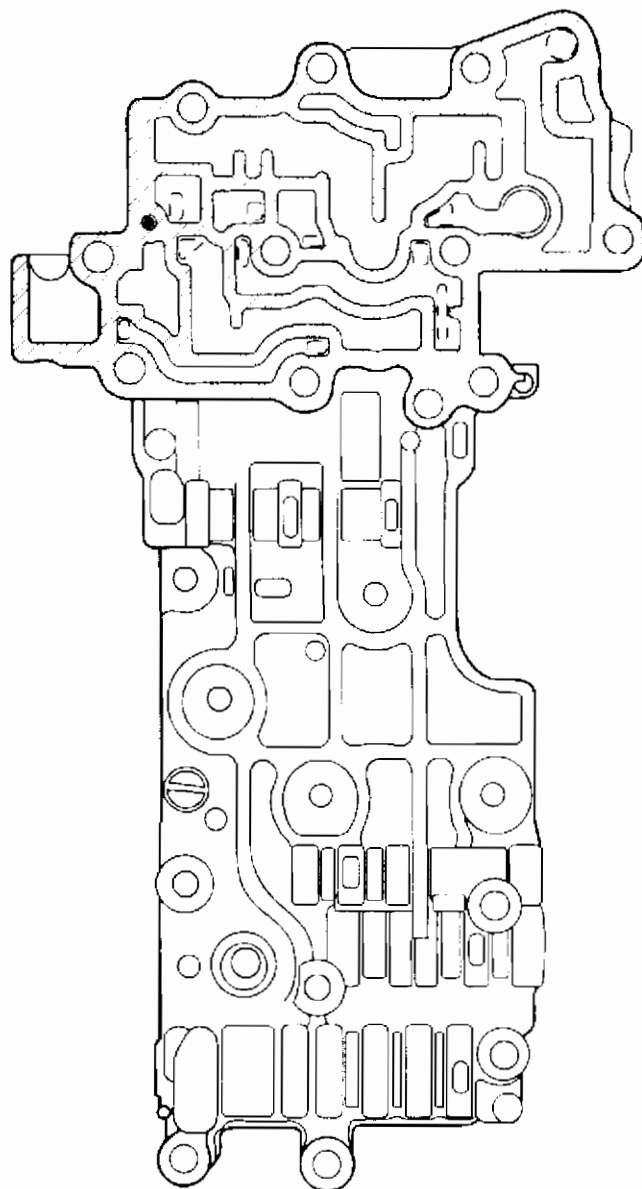


Figure 2

"97" MAIN VALVE BODY (UPPER)



"98" MAIN VALVE BODY (UPPER)



Copyright © 2001 ATSG

Figure 3



wesco

**AUTOMATIC
TRANSMISSION PARTS**

**AVE. LOMAS VERDES N-24 BAYAMON, PUERTO RICO 00956 USA
(787)785-4329 • 780-6643 • 798-2270 • Fax: 785-7623**

visit our web site at: www.wescotrans.com e-mail: wesco@tld.net

Distributors for:

**Alto Products
Toledo Trans-Kits
Sonnax
Norco
Teckpak
Transtec
Southeast/Craz-Soap
Lubegard
SPX/OTC
Interparts
Zoom Technology**

**High Performance Clutch Plates, Hard Parts, Torque Converter,
Flywheels, Lubricants, Mounts, CV-Joints, Shop Equipment,
Specialty Tools, Automatic Transmission Kits, Soft Parts, Oil Cooler, Electronic Equipments,
Power Steering & Rack Pinion Kits**

USED AND REBUILD TRANSMISSIONS

WE EXPORT

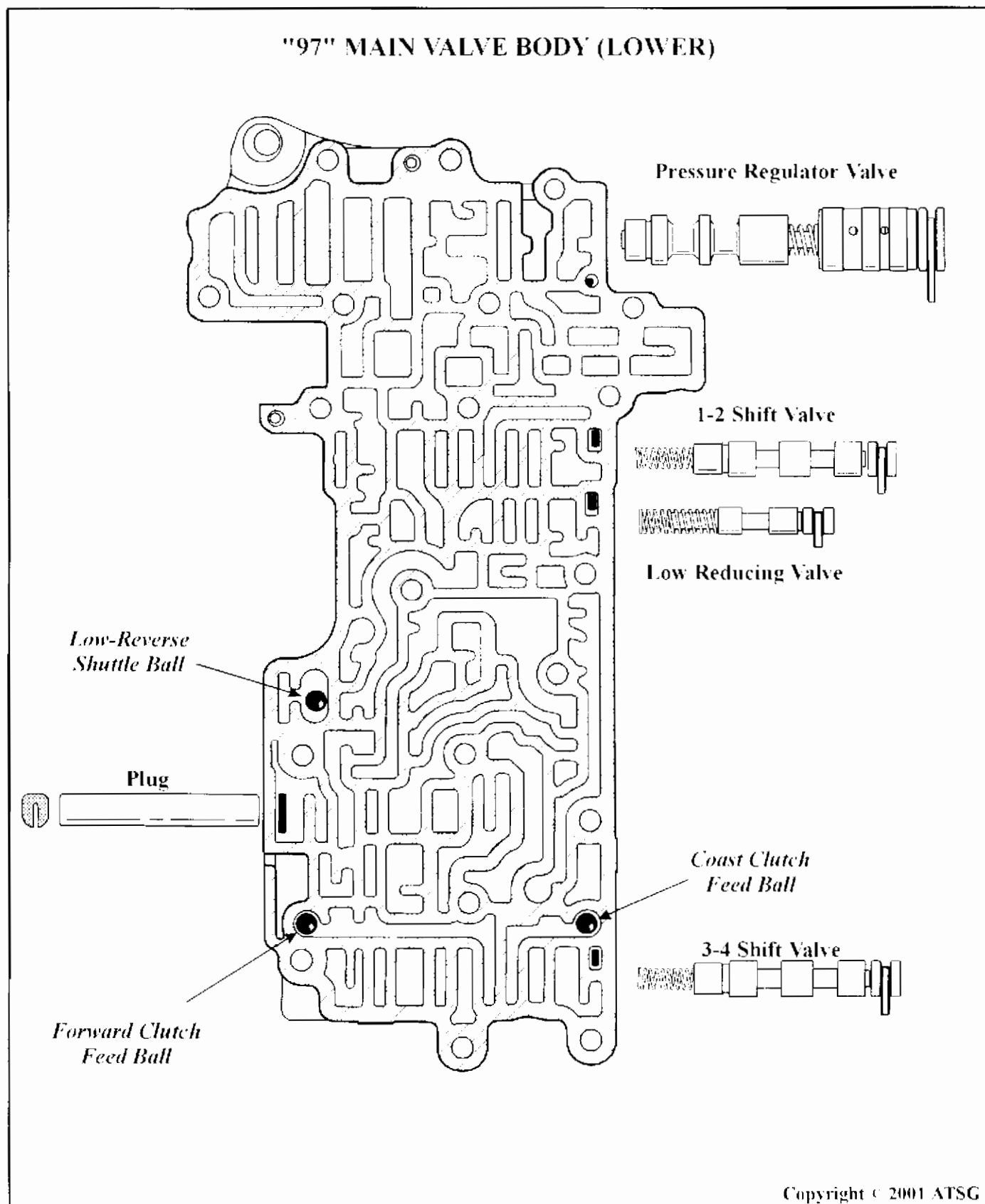
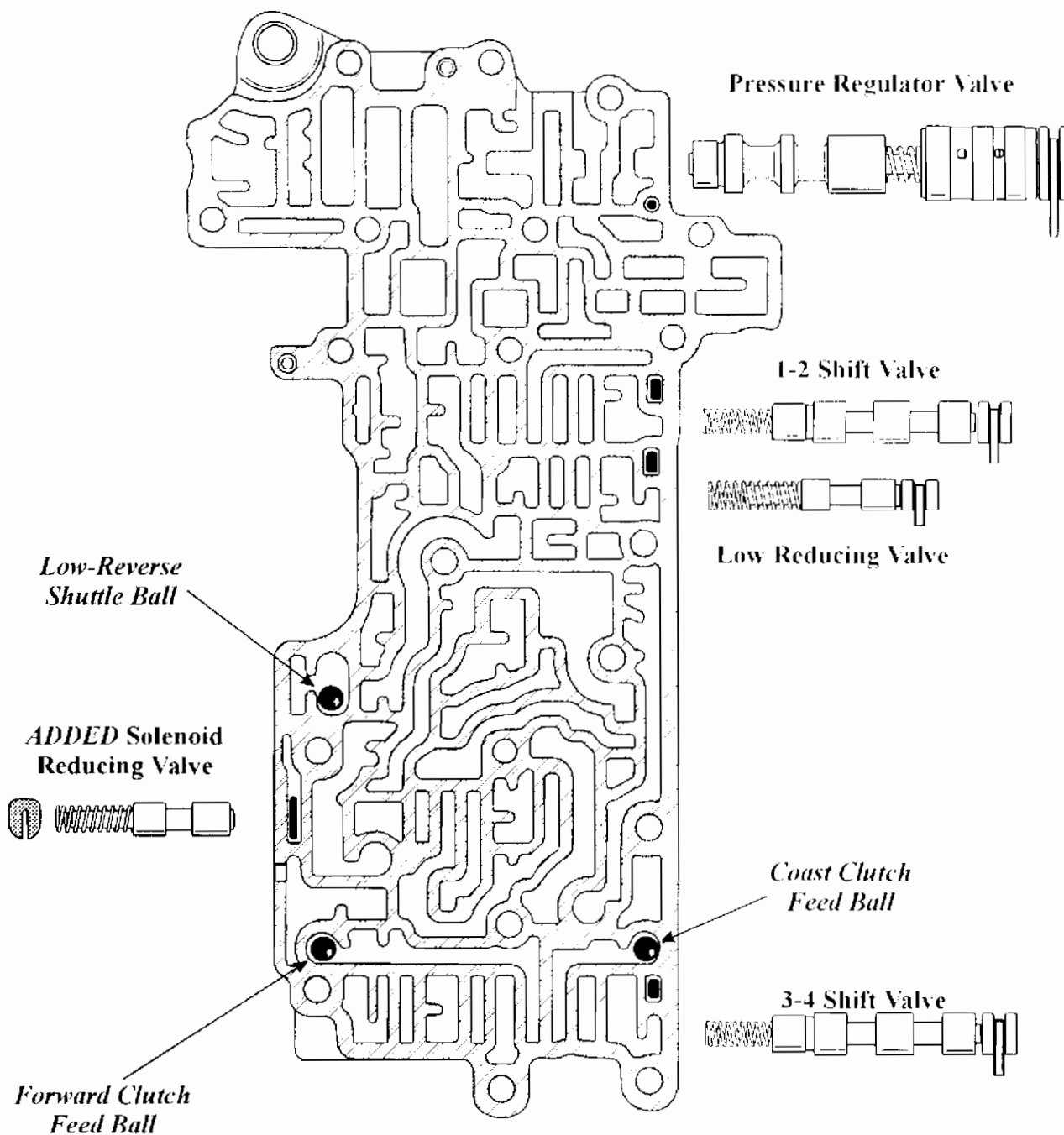


Figure 4

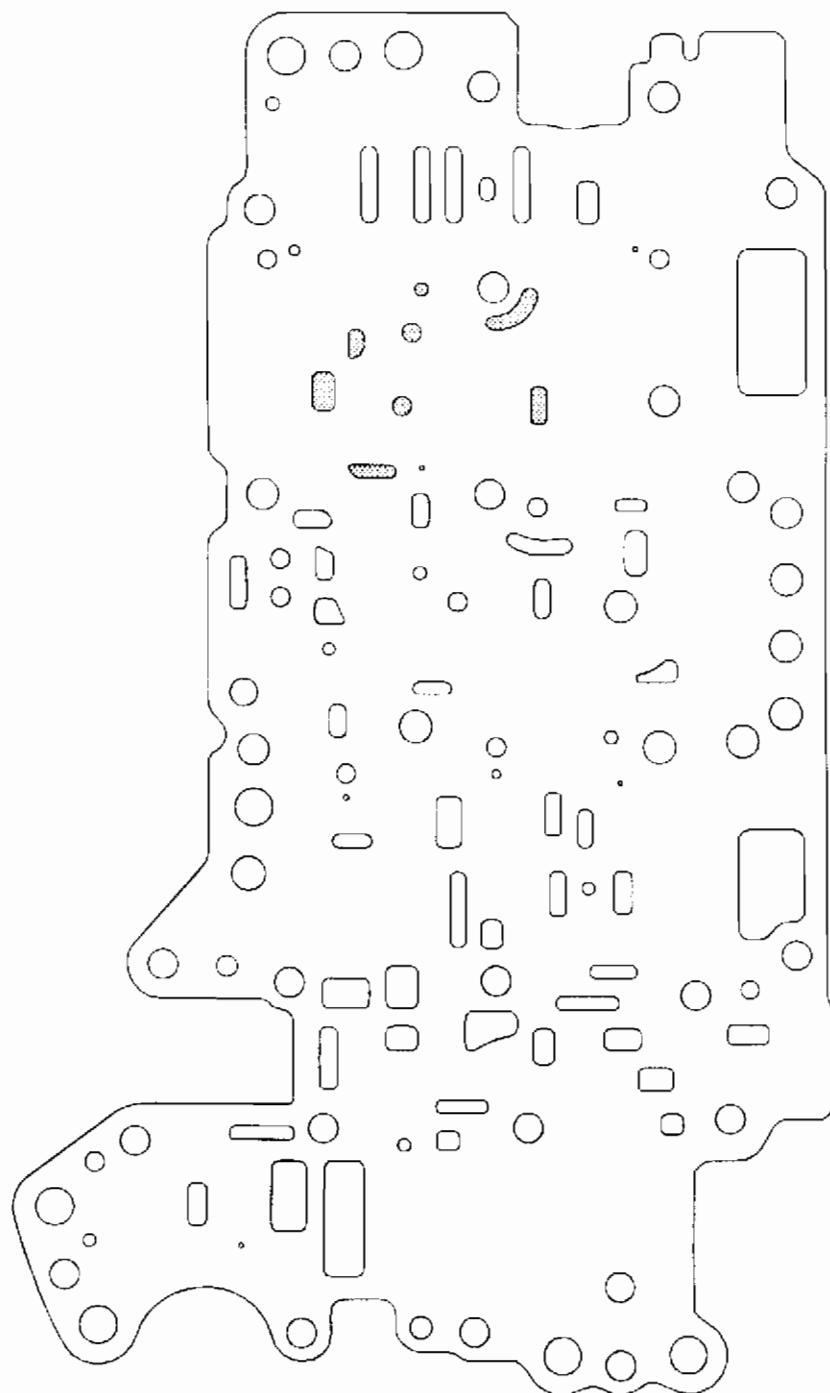
"98" MAIN VALVE BODY (LOWER)



Copyright © 2001 ATSG

Figure 5

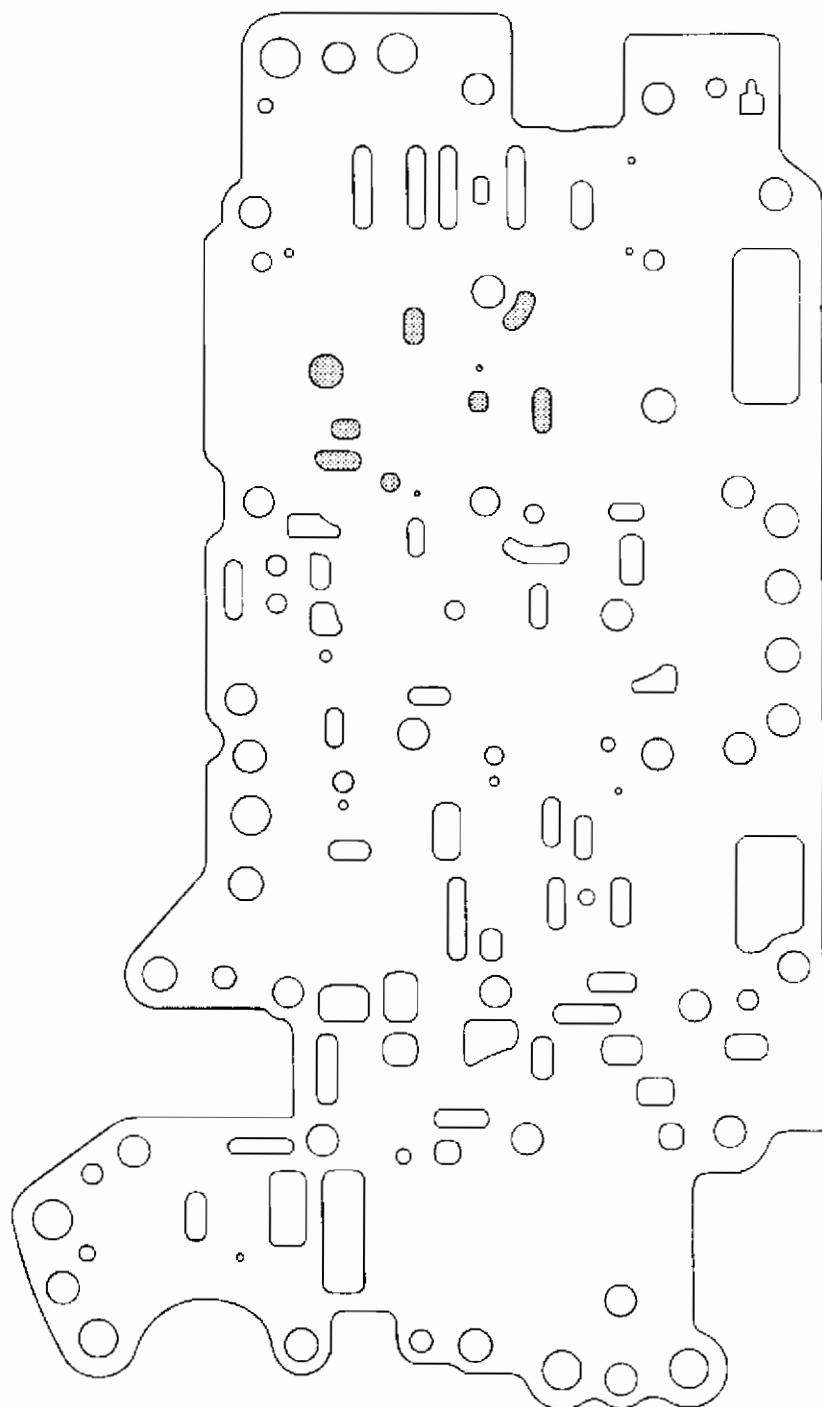
"97" MAIN VALVE BODY SPACER PLATE



Copyright © 2001 ATSG

Figure 6

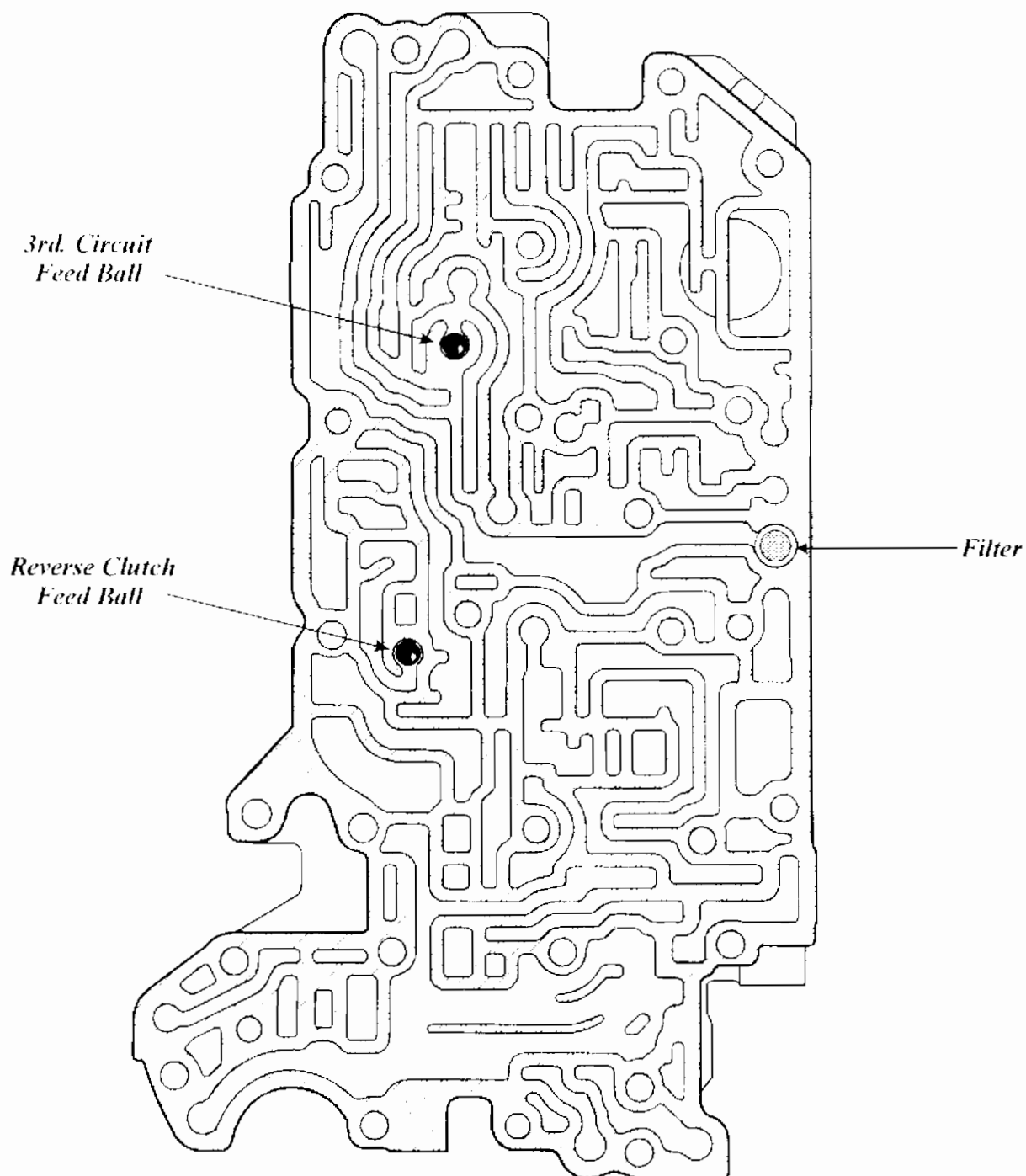
"98" MAIN VALVE BODY SPACER PLATE



Copyright © 2001 ATSG

Figure 7

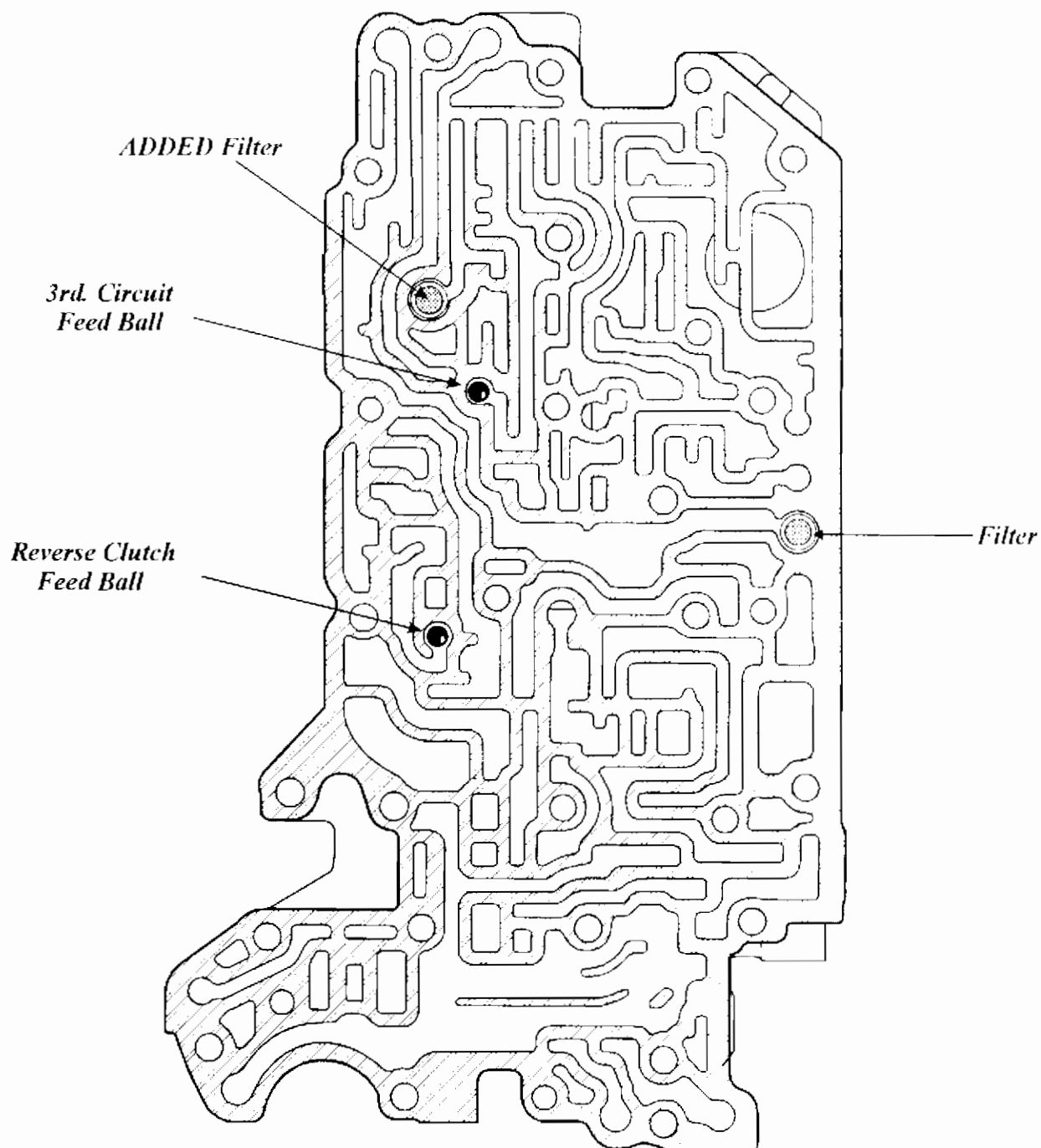
"97" PREMAIN VALVE BODY (UPPER)



Copyright © 2001 ATSG

Figure 8

"98" PREMAIN VALVE BODY (UPPER)



Copyright © 2001 ATSG

Figure 9

"97" PREMAIN VALVE BODY (LOWER)

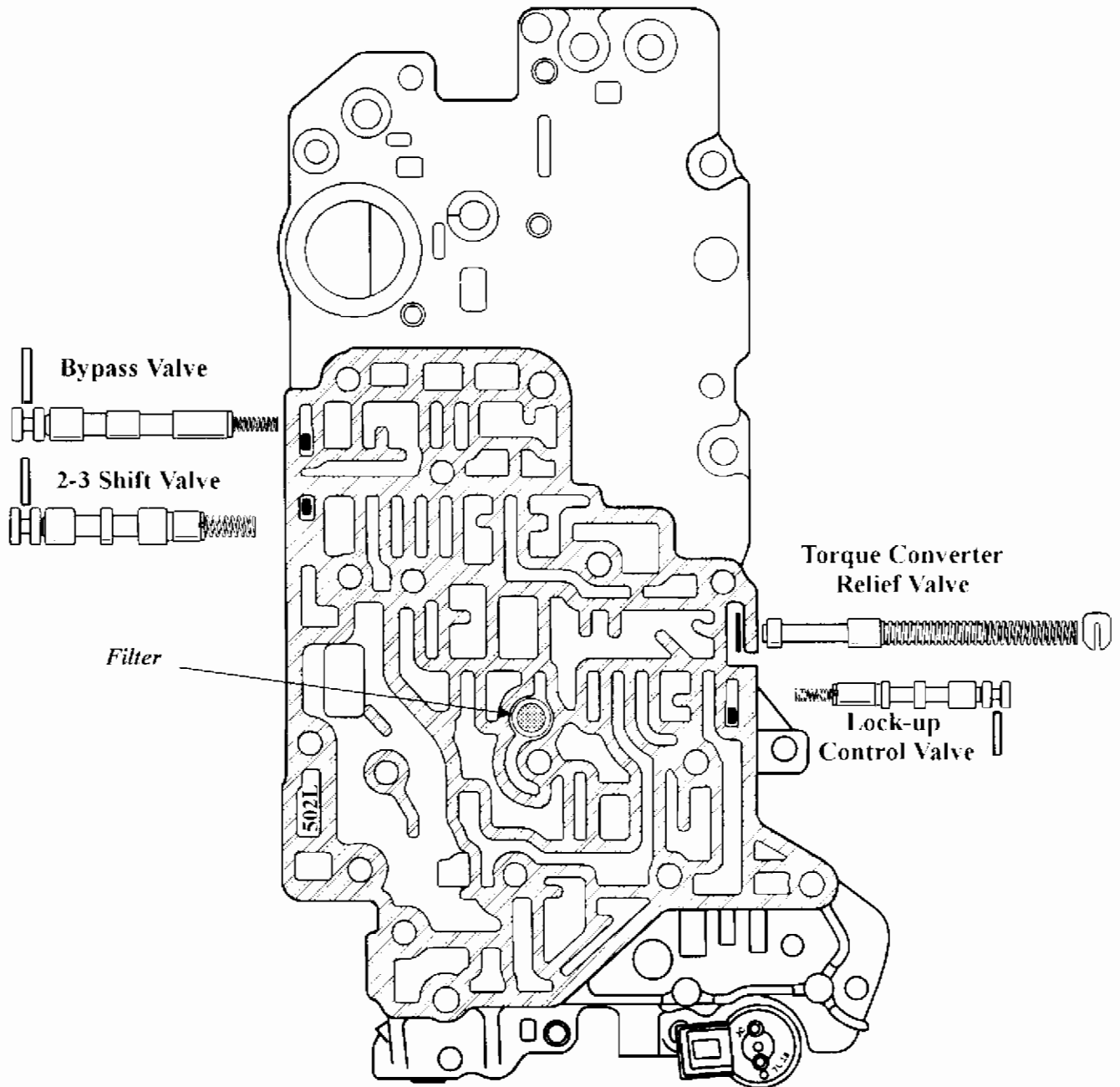
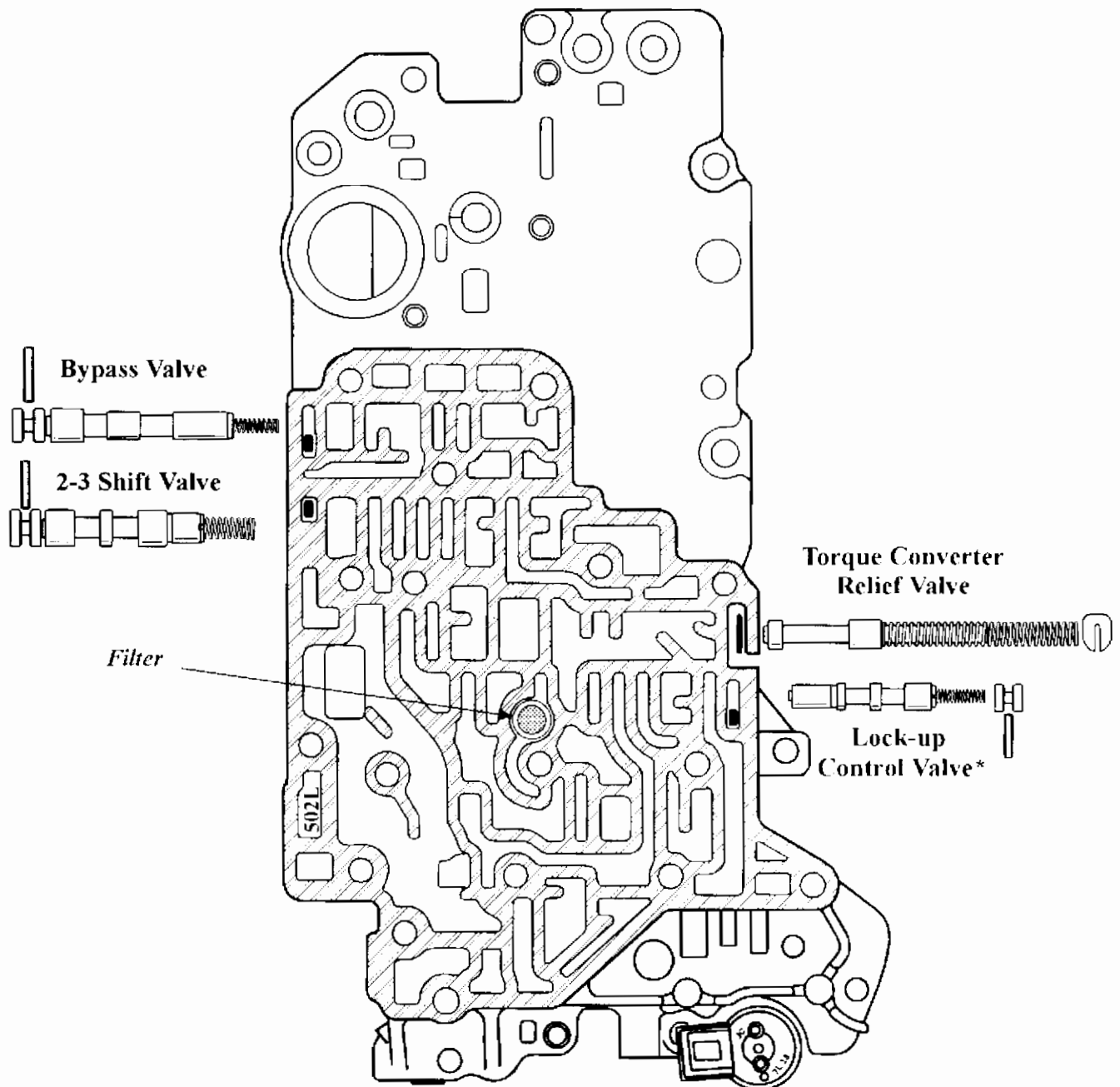


Figure 10

"98" PREMAIN VALVE BODY (LOWER)



*** NOTE: THE VALVE HAS THE HOLE AND THE SPRING
 AT THE OPPOSITE END OF THE VALVE**

Figure 11

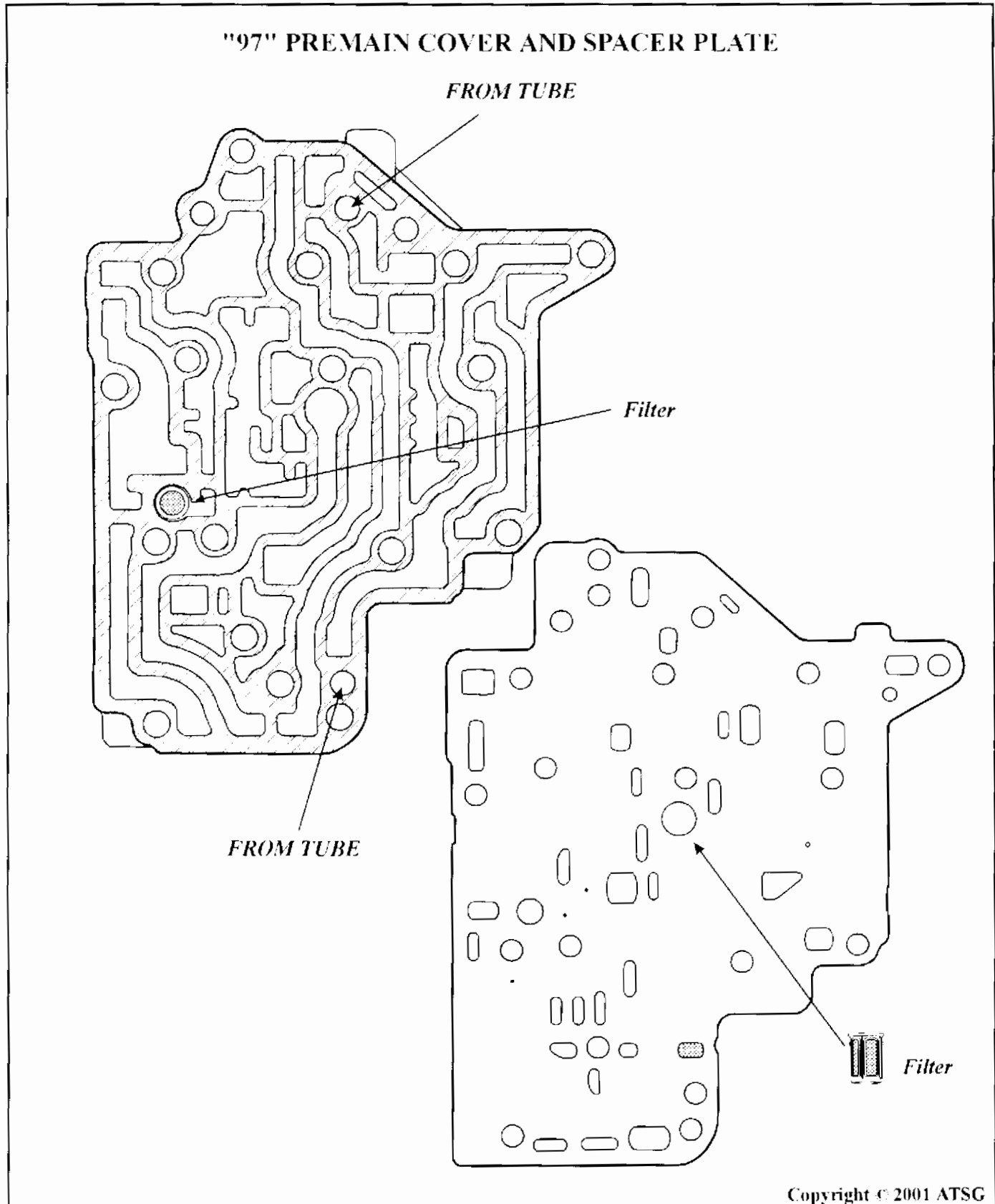
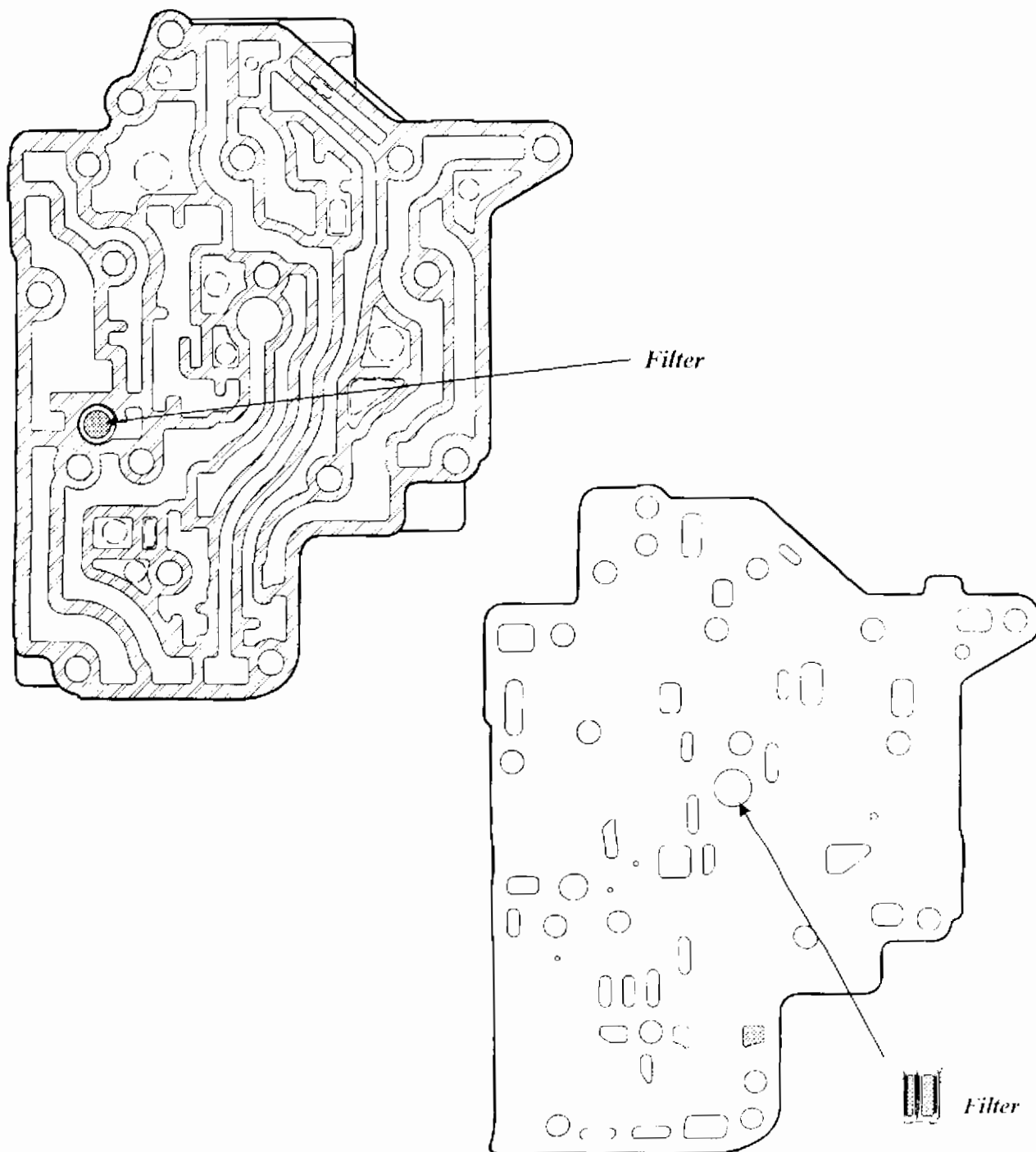


Figure 12

"98" PREMAIN COVER AND SPACER PLATE



Copyright © 2001 ATSG

Figure 13

"9" F4E-III ELECTRONIC PRESSURE CONTROL HYDRAULIC CIRCUIT

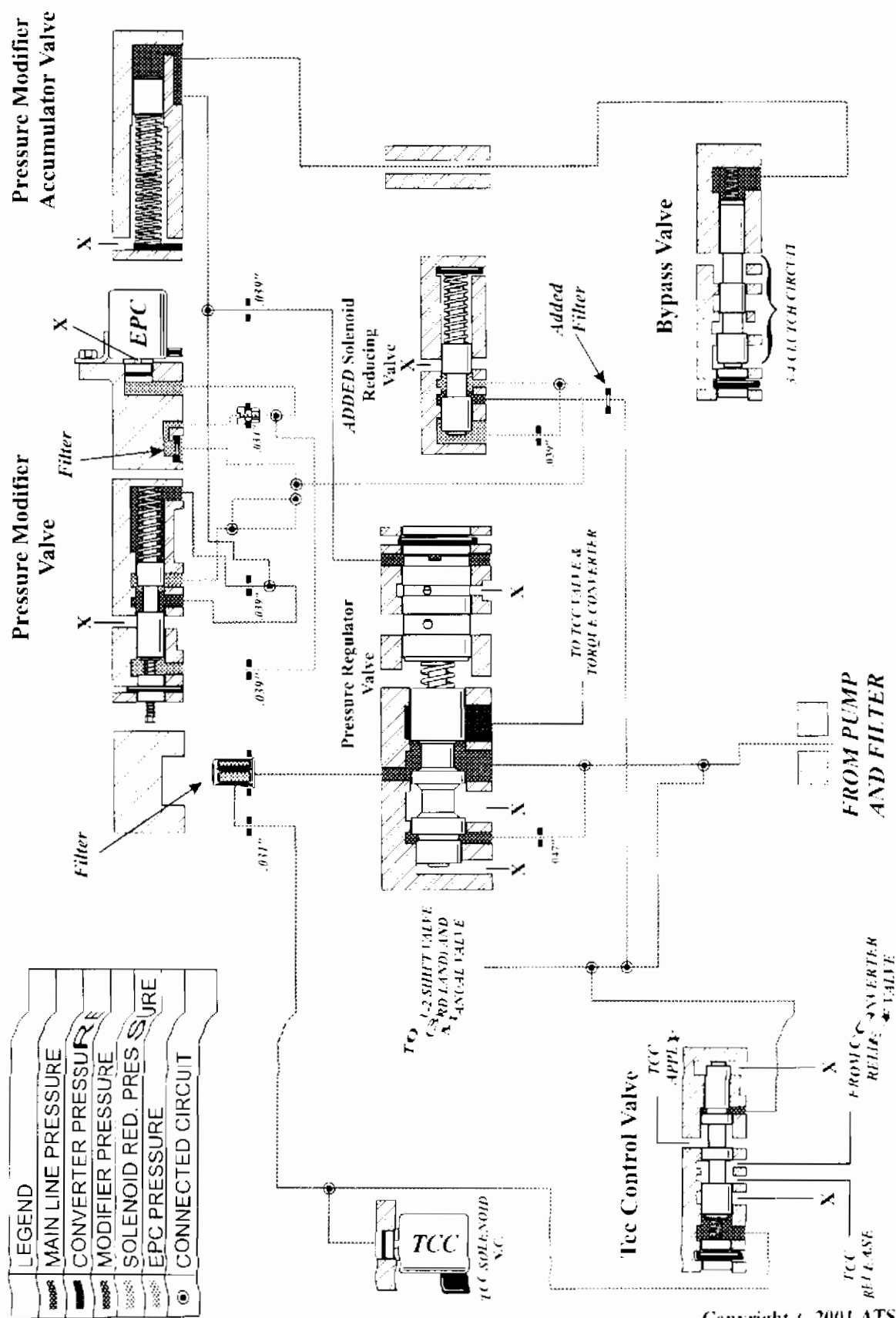


Figure 15

FORD AXODE (AX4S), AX4N (4F50N) EXPLODED VANE RINGS AND PUMP ROTORS PUMP BEARING CHANGES

CHANGE: Beginning at the start of production for 2000 on all AX4N transaxles and 2001 on all AX4S transaxles, Ford Motor Company introduced a new design pump bearing that includes an integrated seal, as shown in Figure 1. When this new design bearing and seal assembly went into production, it was installed with the seal on the valve body side of the pump instead of the rotor side. This change is what will greatly reduce the failed bearings, broken pump rotors and vane rings. This procedure is now recommended for all units of this family, even if you are using the previous design level bearing and "Nickel" seal, as shown in Figure 2.

REASON: As stated above, greatly reduced pump bearing, pump rotor and vane ring failure, for much improved durability and reliability.

INTSTALLATION PROCEDURE:

AXOD/AXODE (AX4S) - When using the 1st Design bearing with the "Nickel" Seal, install the seal on the valve body side, with the part number facing up, as shown in Figure 2.

When using the 2nd Design bearing with the integrated seal, install the bearing assembly with the integrated seal facing the valve body side, as shown in Figure 2. The 2nd Design Bearing and Seal assembly *will retro-fit back on all* AXOD, AXODE and the AX4N up through 1999.

AX4N (4F50N) - When using the 2nd Design AX4S bearing with the integrated seal on 95-99 models, install the bearing assembly with the integrated seal facing the valve body as shown in Figure 2. When using the 2nd Design AX4N bearing assembly with the integrated seal, install the bearing assembly with the integrated seal facing the valve body side, as shown in Figure 2. The 2nd Design AX4N bearing assembly will fit only 2000 models and later because of the increased diameter (See Figure 1).

Many thanks to "Transtar Industries" for providing us the information on this bearing.

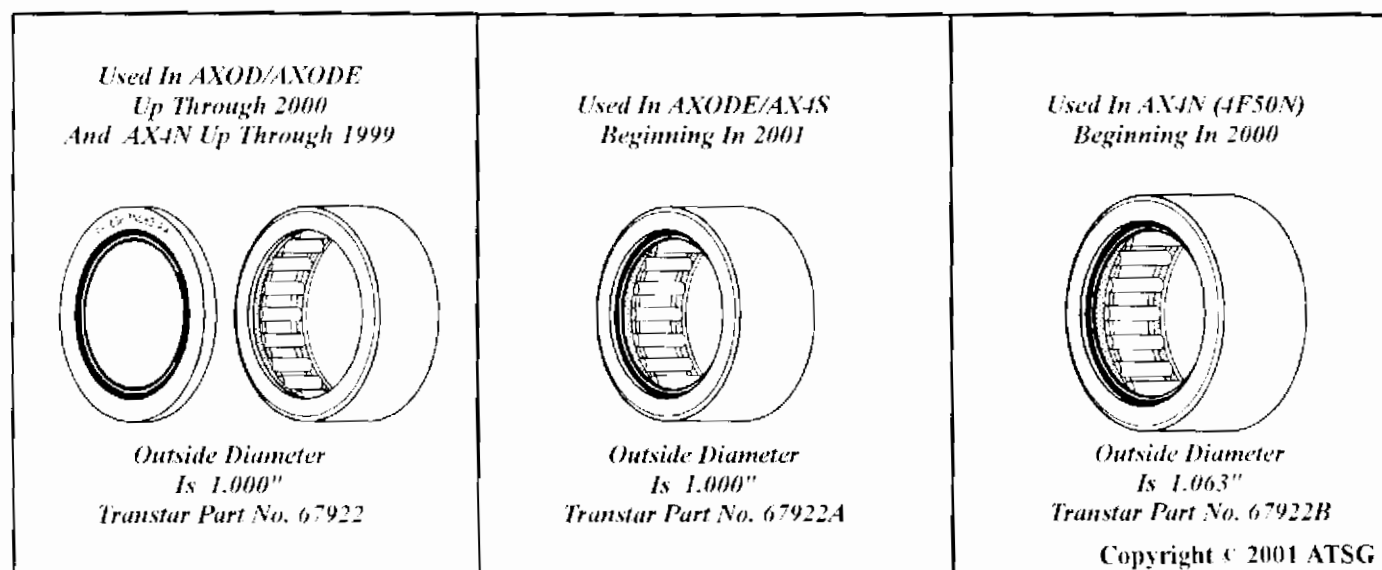


Figure 1

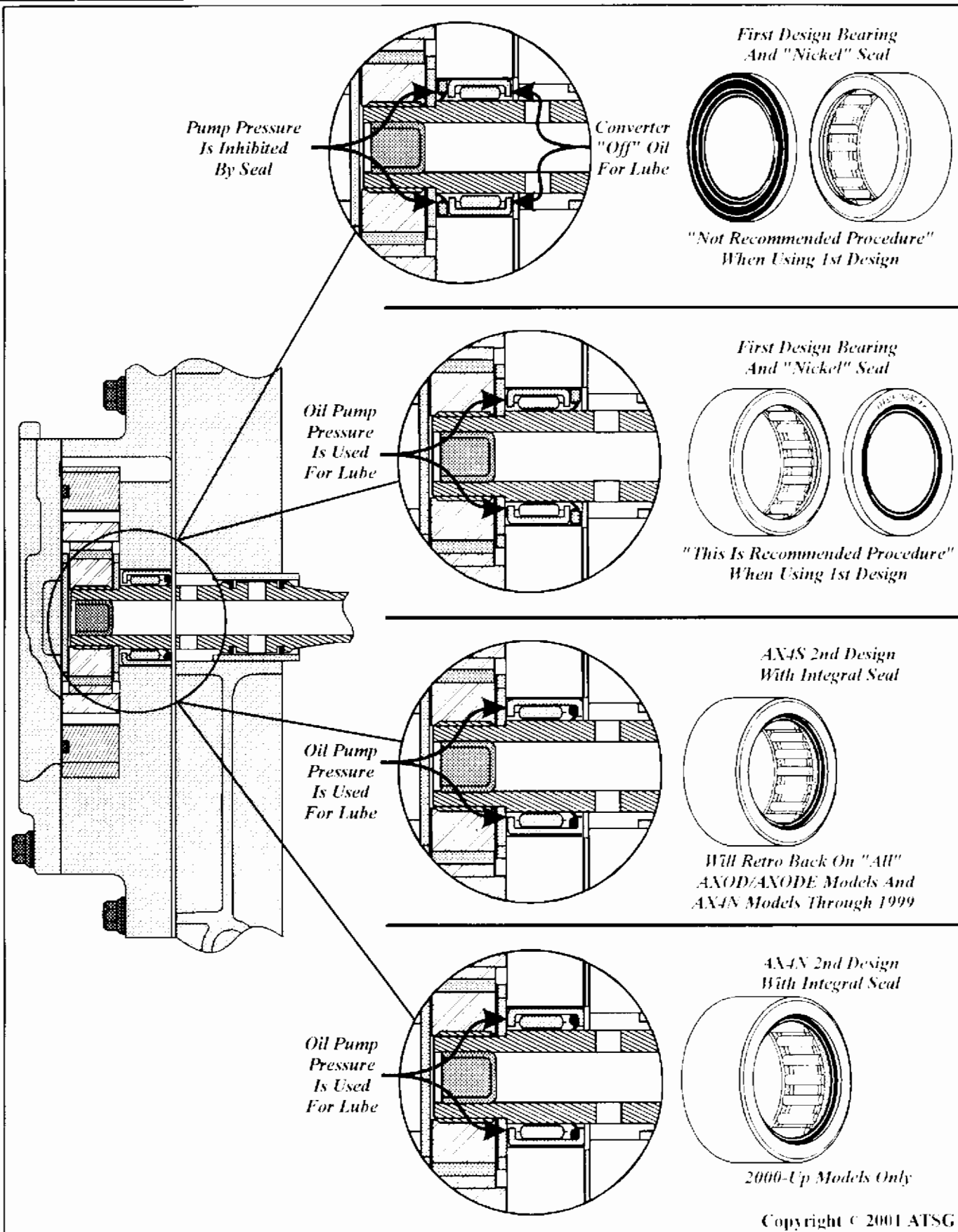


Figure 2

FORD 4R100
INTERMEDIATE "DIODE" FREEWHEEL

COMPLAINT: Some Ford Motor Company vehicles equipped with the 4R100 transmission may exhibit premature failure of the newly introduced Intermediate "Diode" Freewheel device that was installed in model year 2001 and illustrated in Figure 1.

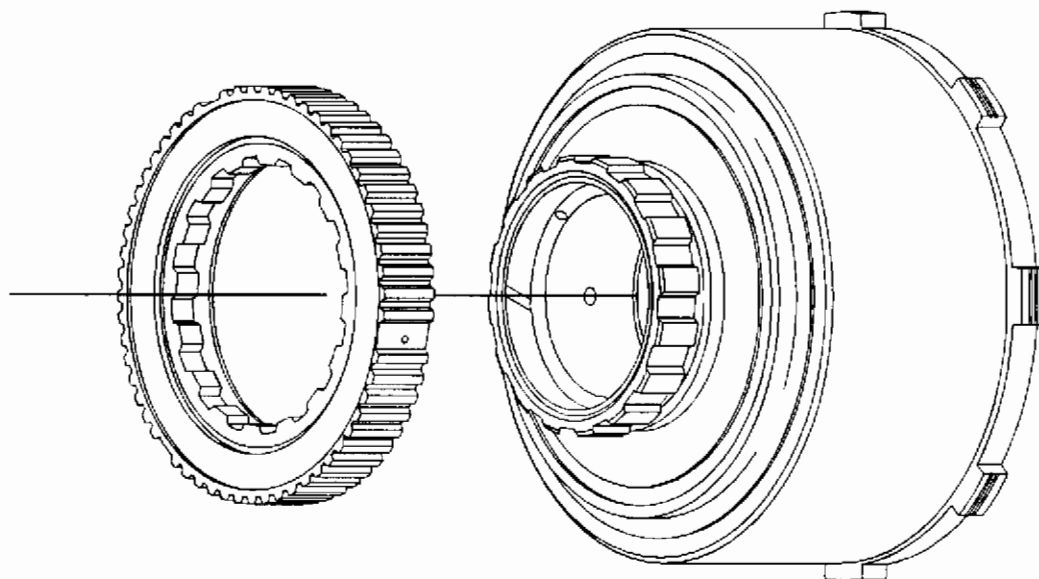
CAUSE: The cause may be, more than expected load factors.

CORRECTION: The Intermediate "Diode" is *no longer serviced* by Ford Motor Company. The part number now supersedes to all of the previous design level parts, which include the direct clutch housing, intermediate sprag assembly, outer race to direct drum thrust washer, and the intermediate friction plates. All of the previous design level parts are illustrated in Figure 2, along with the OEM part numbers. The intermediate frictions must be replaced because the tooth count on the outer race between the diode and the sprag are different.

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

SERVICE INFORMATION:

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

4R100 INTERMEDIATE "DIODE"*No Longer Available For Service*

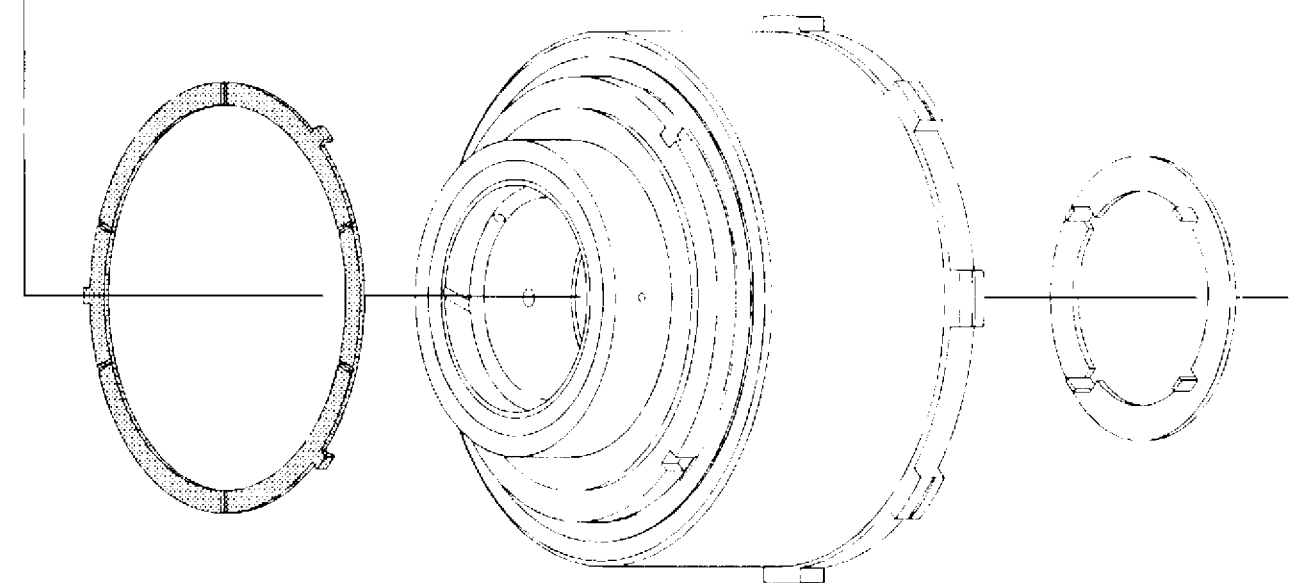
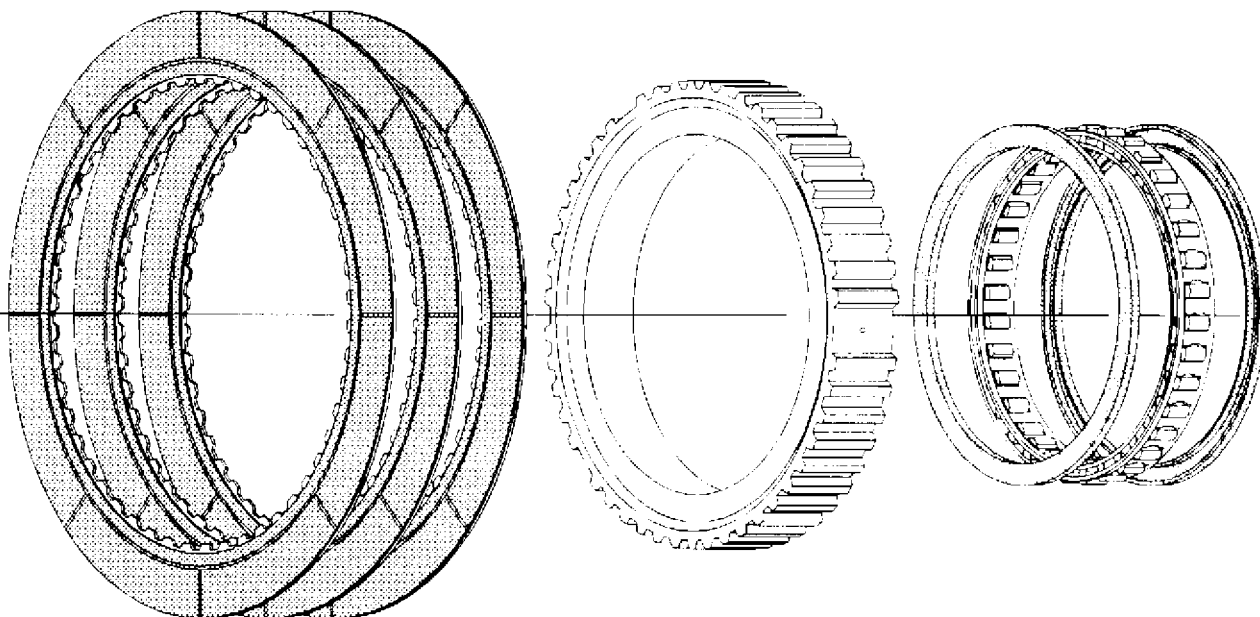
Copyright © 2001 ATSG

Figure 1

PARTS NEEDED TO REPLACE INTERMEDIATE DIODE

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

Intermediate Sprag Assembly
Part Number E91Z-7A089-B



Outer Race To Drum Thrust Washer
Part Number E91Z-7G401-A

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

4 Tab Thrust Washer
Part Number E91Z-7C096-A

Copyright © 2001 ATSG

Figure 2