INDEX

Automatic Transmission Service Group
9200 South Dadeland Blvd.
Suite 720
Miami, FL 33156
(305) 661-4161

AUTOMATIC TRANSMISSION SERVICE GROUP

TRANSMISSION SEMINAR 1993

In this years seminar we will continue to update you on the computer controlled transmissions and some of the diagnosing information that will help make the job a little easier. Some of the checks that will be reviewed are on the Jeep Cherokee, Toyota Camry and the Cadillac 4T60 and 4T60-E. this seminar book will cover information on the computer checks mentioned along with some of the E4OD, AXOD, and AXODE transmission updates and fixes. We have also listed many of the OEM part numbers.

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.

ROBERT D. CHERRNAY
TECHNICAL DIRECTOR

DALE ENGLAND
FIELD SERVICE CONSULTANT

FRANK MIETUS
TECHNICAL CONSULTANT

WAYNE COLONNA
TECHNICAL CONSULTANT

WELDON BARNETT
TECHNICAL CONSULTANT

ED KRUSE
LAY OUT

AUTOMATIC TRANSMISSION SERVICE GROUP
9200 SOUTH DADELAND BLVD.
SUITE 720
MIAMI, FLORIDA 33156
(305) 661-4161

BRYCO

TIMING COMPONENTS

AUTOMATIC
TRANSMISSION REPAIR KITS

STANDARD CLUTCH PRODUCTS

AUTOMATIC TRANSMISSION COMPONENTS

BRYCO

BRYCO has a complete line of [illegible]
clutches with bearings and covers, automatic [illegible]
All of our products are made with the highest [illegible]
strictest supervision [illegible]

INSIST ON "BRYCO" IT DOESN'T [illegible]

DARFEL INC.

EXPORT CUSTOMERS [illegible]

JUSTY ECVT

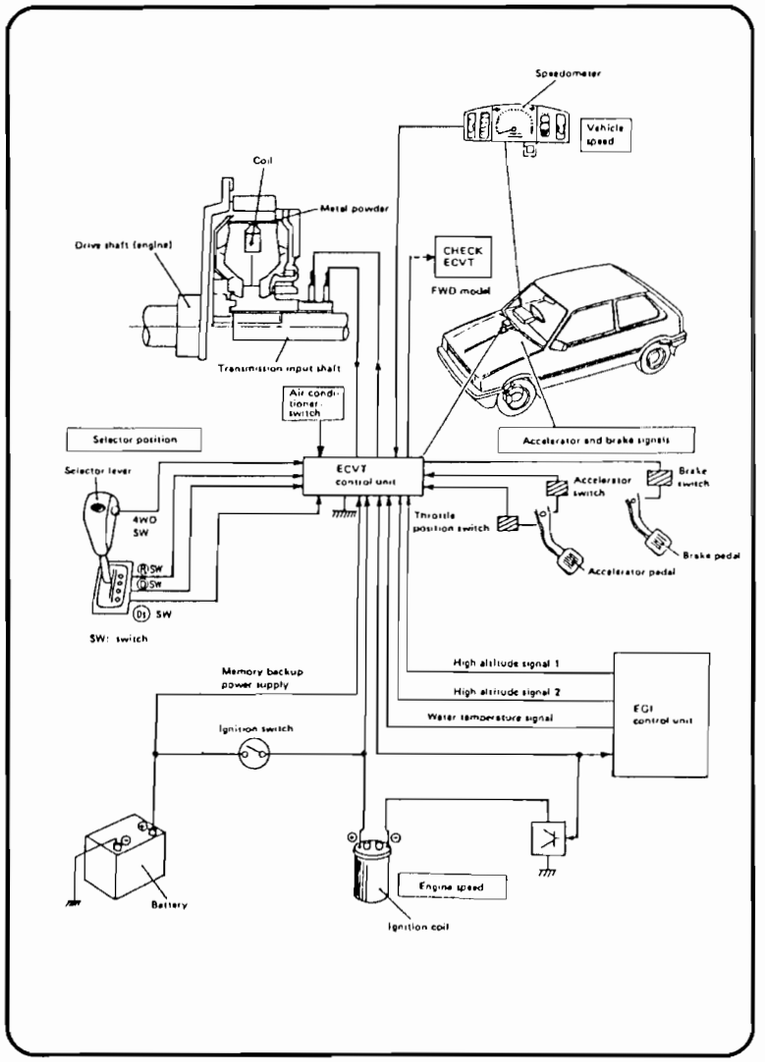
HOW IT WORKS

The ECVT combines an electronically controlled magnetic clutch with a variable transmission that is driven by steel belt pulleys to provide high running performance, low fuel consumption and ease of control.

Hydraulic line pressure can be changed from "high" to "low" or vice versa, in response to engine load and output. In addition, the ECU and the clutch are optimally controlled by microcomputer to enhance high transmitting efficiency and excellent driveability.

In the data communication between ECU and clutch control, rationalization of the system is accomplished by contolling the electromagnet clutch through coolant temperature and ignition advance signals which are emmited from the ECU while line pressure is regulated through a torque signal.

The magnetic clutch is designed for exclusive use with the ECVT. It is a "standing - start" clutch that utilizes magnetic powder and is controlled by a microcomputer which constantly evaluates engine-speed, car speed, and throttle-position signals.



The variable transmission consists of a steel belt and a set of pulleys. Groove width is controlled by hydraulic pressure to provide stepless speed changes from a standing start to maximum speed without a shifting "shock", thus enhancing high running performance.

SYSTEM CONSTRUCTION

The subaru ECVT consists of the following five systems: electromagnetic powder clutch, forward-and-reverse changeover, belt-and-pulley, hydraulic control, and final reduction systems.

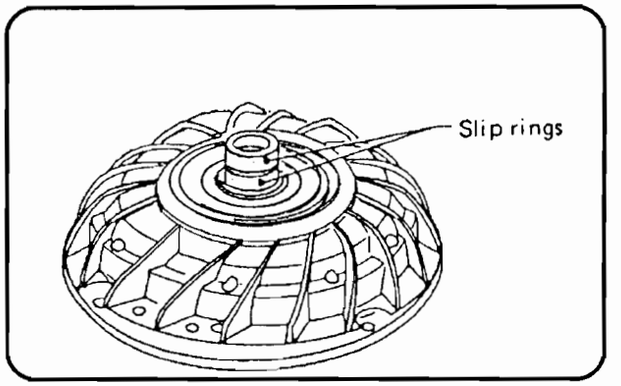
The electromagnetic powder clutch couples the engine to, or uncouples the engine from, the transmission, its operation is regulated by a control unit(microcomputer) which receives signals corresponding to engine speed, vehicle speed, accelerator pedal depression,etc.

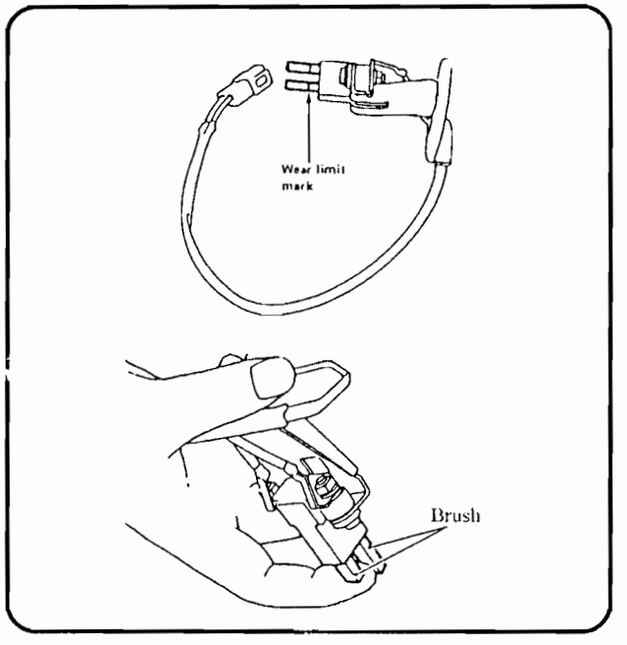
The forward and reverse changeover system utilizes a dog clutch provided with a synchromesh mechanism. It is linked with the selector lever via a push-pull cable.

The belt-and-pulley system provides an automatic and stepless speed change for the final reduction system in response topower transmitted from the electromagnetic powder clutch. Control of oil pressure applied to the input and output shafts of this system is accomplished depending upon engine torque, engine speed, accelerator pedal depression, pulley , ratio, etc.

2) PRINCIPLE OF THE ELECTROMAGNETIC POWDER CLUTCH.

When metal powder is brought near a magnet, the metal particles are linked in chain fashion and a transmission torque is generated.The Electromagnetic powder Clutch uses this principle. A small gap is provided between the inside edge of the drive member and the outside edge of the driven member of the clutch. This gap is filled with a magnetic powder and magnetic force is applied to this powder and the drive member and the driven member are coupled together. A coil provided at the driven member acts as the magnet. If current is passed through the coil, the coil becomes an electromagnet and generates a magnetic force. The magnetic powder linked in a chain fashion by this magnetic force transmits the power from the drive member to the driven member. The transmission torque is proportional to the strenght of the current. When current flow is cut off, the transmission torque disappears.





CLUTCH CONTROL

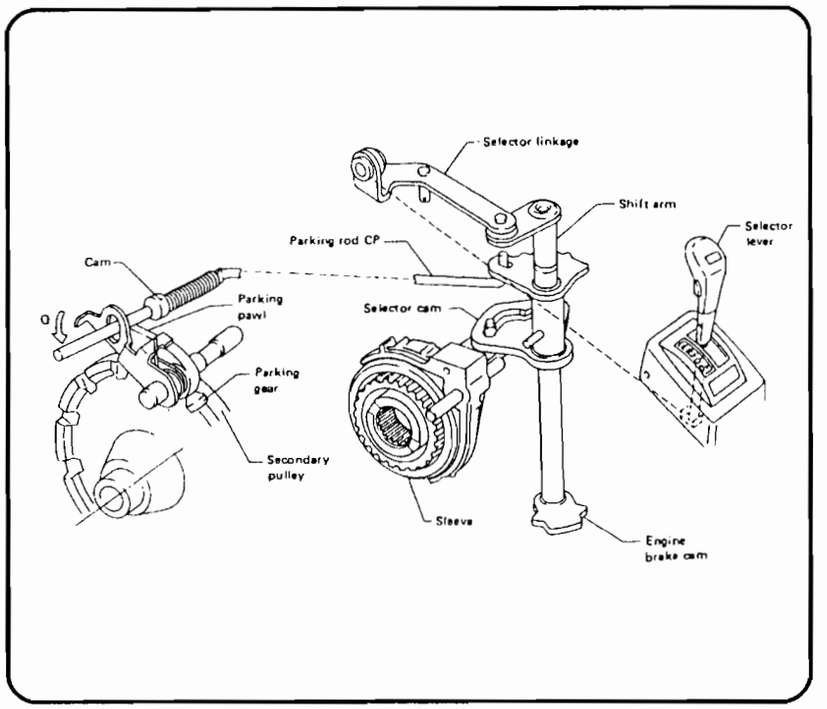
The clutch is applied and released and power is transmitted by controlling the current to the clutch electromagnetic coil. Signals are input to the clutch control unit and then the correct clutch current is output to control starting, stopping, and switching.The clutch control unit also controls dampening of the shock when the clutch is directly coupled and recoupled and when engine braking occurs in the Ds position.

FORWARD AND REVERSE SWITCHING MECHANISM

A synchromesh forward and reverse switching mechanism is installed between the electromagnetic powder clutch and the primary pulley. This mechanism helps prevent gear clash while shifting from "N" to "R" position. It also permits gears to be shifted fron the "N" to the "D" position and visa versa without gear clash.

(1) "N" Position

This is the neutral state. The shift fork and shift sleeve is in the center position and the main drive gear power is not transmitted to the hub.



(2) "D" Position

This is the state in which the shift fork and shift sleeve is shifted forward. This connects the main drive gear to the primary pulley through the hub.

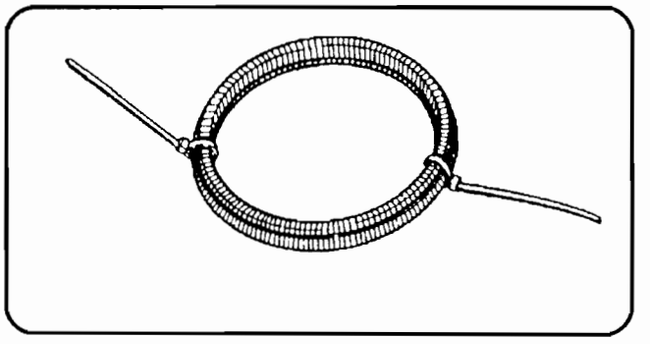
(3) "R" Position

This is the state in which the shift fork and shift sleeve is shifted to the rear for reverse operation. In this state the main drive gear power is transmitted from the counter gear to the primary pulley through through the reverse idler gear. This makes the direction of operation opposite that of normal forward operation.

BELT AND PULLEY MECHANISM

The belt and pulley mechanism consists of a pair of pulleys whose groove with can be changed freely in the axial direction and a steel belt consisting of steel blocks and a steel band. The speed is changed continually from a low pulley ratio (2.503) to an overdrive pulley ratio (.497) according to the steel belt and pulley contact radius. The pulley groove width is controlled by the hydraulic pressure of the input shaft and output shaft pulleys.

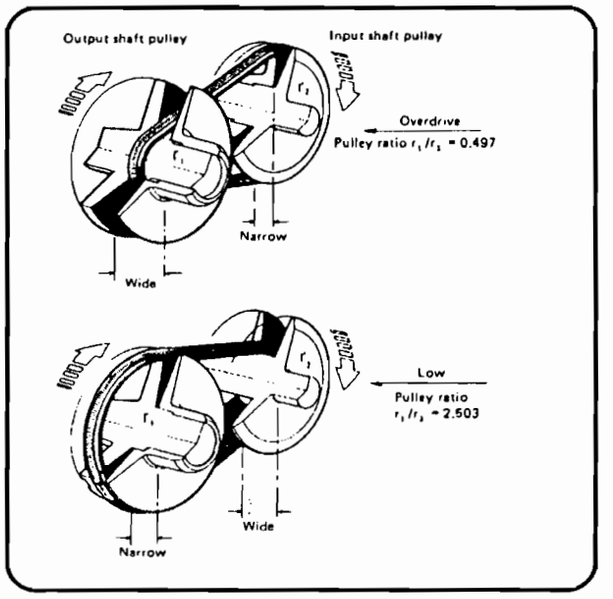
STEEL BELT



The steel belt consists of approximately 280 steel blocks and two steel bands made up of 10 laminated steel strips. The main feature of this steel band is that where conventional rubber style belts transmit power by tension, the steel belt transmits power by compression of the steel blocks. Each steel band consists of 10 laminated steel strips, thus divided into thin parts so that it can withstand small bending with less fatigue.
For the steel belts to trasmit power, there must be a friction force between the blocks and the sloped sides of the pulleys. This friction force is generated as follows; When hydraulic pressure is applied to the secondary pulley, the steel blocks are sqeezed between the sides of the pulley and forced outward. As a result, tension is generated at the band and friction force is generatedbetween the steel blocks and the primary pulley. In other words, the steel blocks transmit power by compression, and the steel bands maintain the friction force to do this.

PULLEYS

Both the primary pulley and the secondary pulley consist of a moving sheave with 11 degree sloping sides and a shaft. A hydraulic pressure chamber is provided for both parts at the back of the moving sheave. The pulley groove width is changed by sliding the moving sheave on the shaft by a ball spline.



FEATURES

1)Stepless speed changeover from a standing start to high speeds permits ready "high - performance" driving for any driver.

2)Unlike the "L" and "2" ranges of a conventional automatic transmission, the Ds range utilizes the engine's highspeed range which allows driving capabilities such as a standing start to achieve maximum speed.

It is also provided with an engine brake effect, as well as sporty driving pleasure.

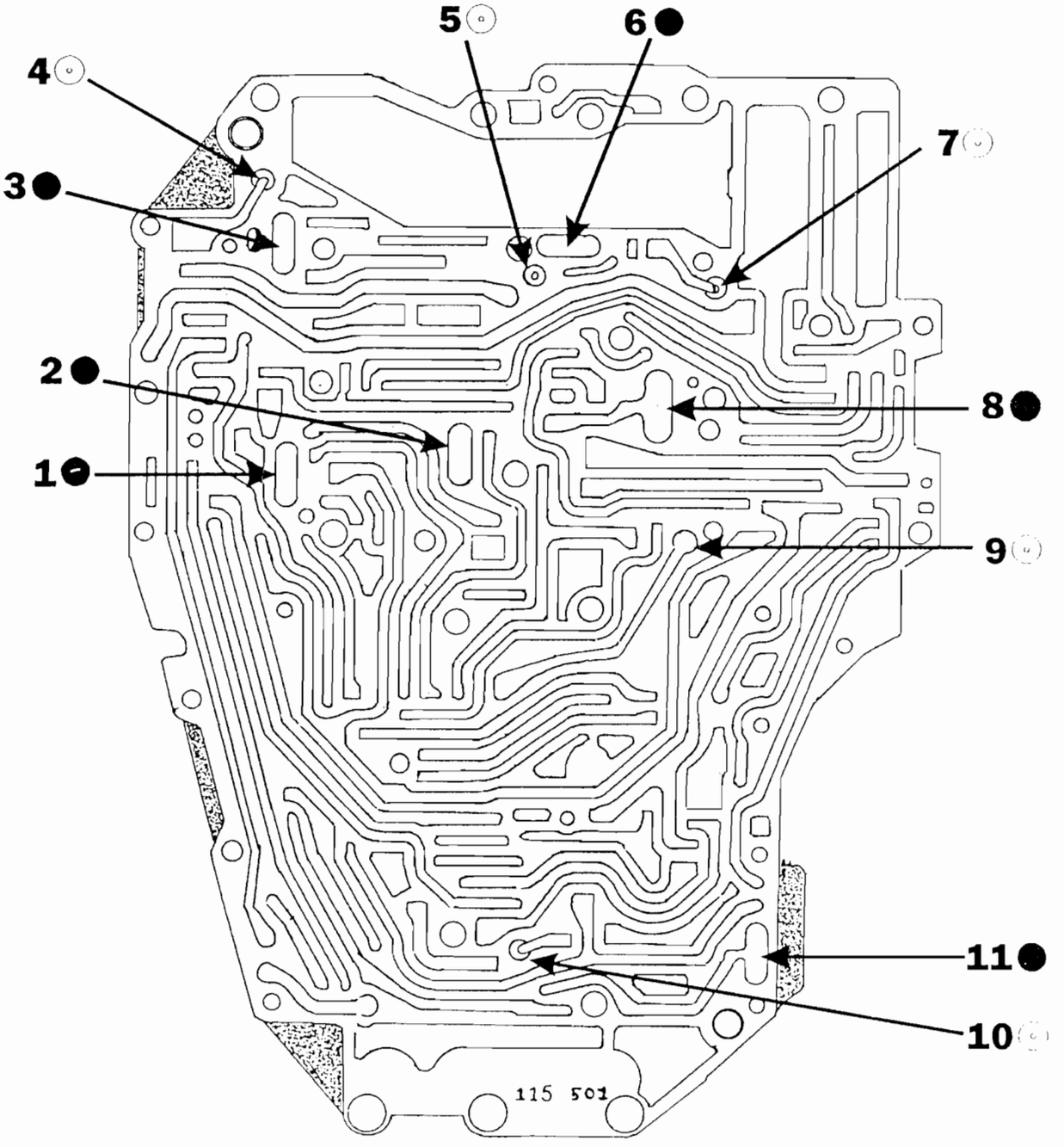
3)The electromagnetic powder clutch eliminates the slip loss which is encountered with a conventional torque converter, resulting in low fuel costs.

4)The electromagnetic powder clutch remains off during vehicle stop, eliminating an abrupt movement even when the brakes are released with the selector lever set to the "D", "Ds" or "R" range.

5)Shock-free shifting, combined with frequent use of overdrive, assures quiet operation and smooth driving.

6)Changeover from "FWD" to "4WD" or vice versa is accomplished simply by pressing a pushbutton switch that utilizes low line pressure. (4WD model only)

NON-ELECTRONIC ZF4HP-22

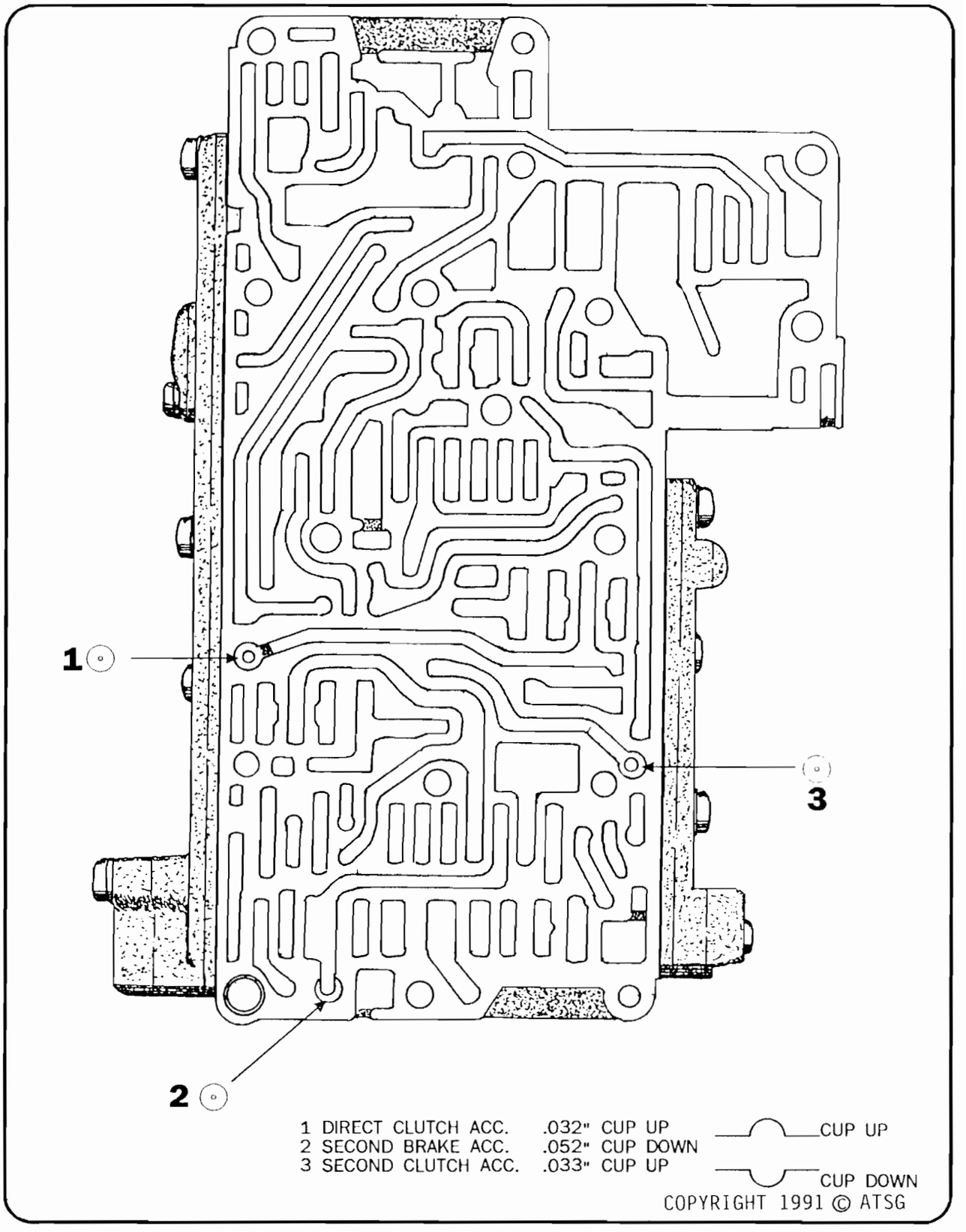


1	CHECK BALL	.175"	
2	CHECK BALL	.175"	
3	CHECK BALL	.175"	
4	LOCK-UP EXHAUST	.073"	CUP DOWN
5	DIRECT CLUTCH (SOME MODLES)	.073"	CUP DOWN
6	CHECK BALL	.175"	
7	FORWARD CLUTCH	.046" - .062"	CUP DOWN
8	CHECK BALL	.235"	
9	LOW/REVERSE CLUTCH	.032"	CUP DOWN
10	CHECK BALL	.175"	
11	OVERDRIVE CLUTCH	.046"	CUP DOWN

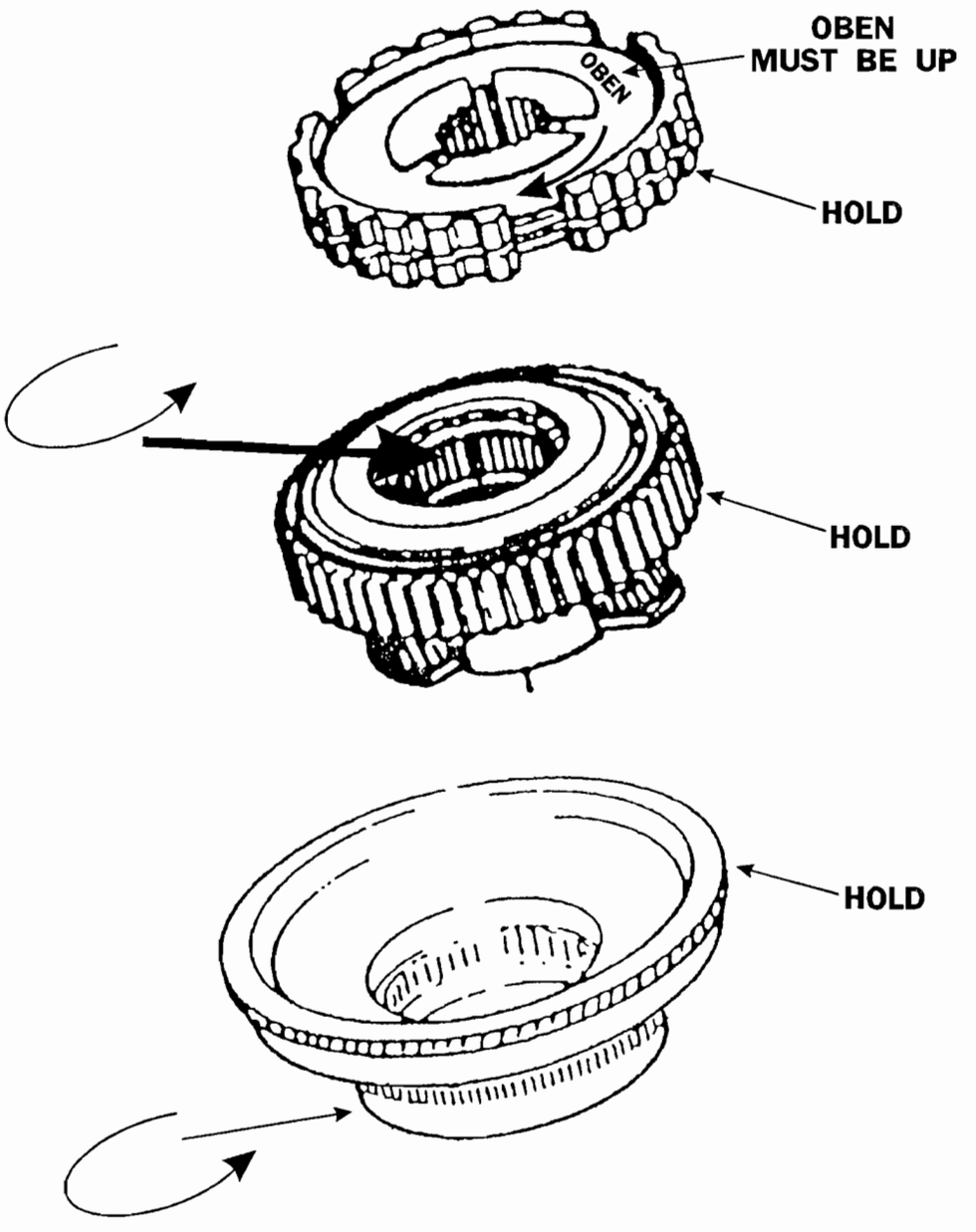
CUP UP

CUP DOWN

NON-ELECTRONIC ZF4HP-22



SPRAG ROTATION
4HP 22



MUST ROTATE IN DIRECTION OF ARROWS

ZF4HP22
PREMATURE FORWARD CLUTCH FAILURE

COMPLAINT: Some BMW's, Volvo's, Jaguars, Peugeots and Lincoln's with the ZF4 transmission may experience forward clutch failure for no apparent reason. Others may attempt to pull forward in neutral if the engine is accelerated above idle.

CAUSE: The turbine shaft has two sealing rings that direct oil to the converter. A worn stator support bore can cause a cross leak of converter oil into the forward clutch. Also the rear metal sealing ring on the turbine shaft can leak causing partial forward clutch apply.

CORRECTION: The turbine shaft must have a more positive seal to the stator support, and the forward clutch must be converted to a feed/bleed system. This correction can be accomplished by following the procedure below or by installing a ZF correction kit. This kit is manufactured by Independant Transmissions of South Miami, Florida and can be purchased through most transmission parts suppliers.

Step #1. Replace the stator shaft if the bore is worn.

STEP #2. Remove the rear metal turbine shaft ring and discard it. Replace the ring with one made of teflon. Make your own if neccessary.(See Figure 1.)

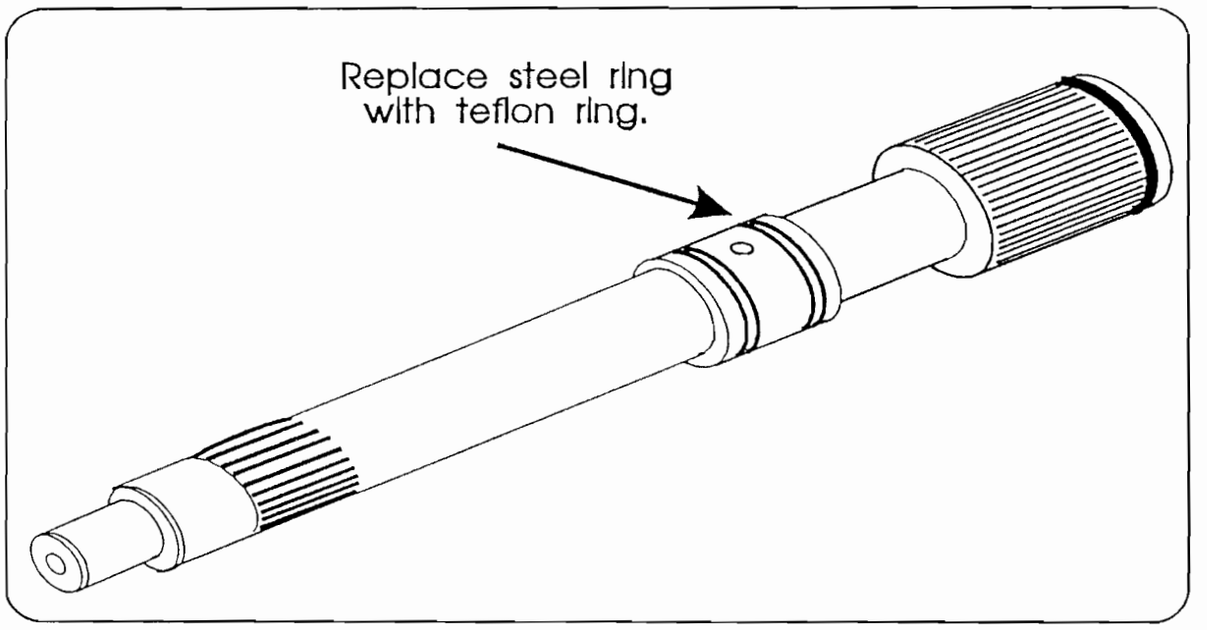


Figure 1.

STEP #3. Drill a .045" bleed hole in the forward clutch piston. See Figure 2.

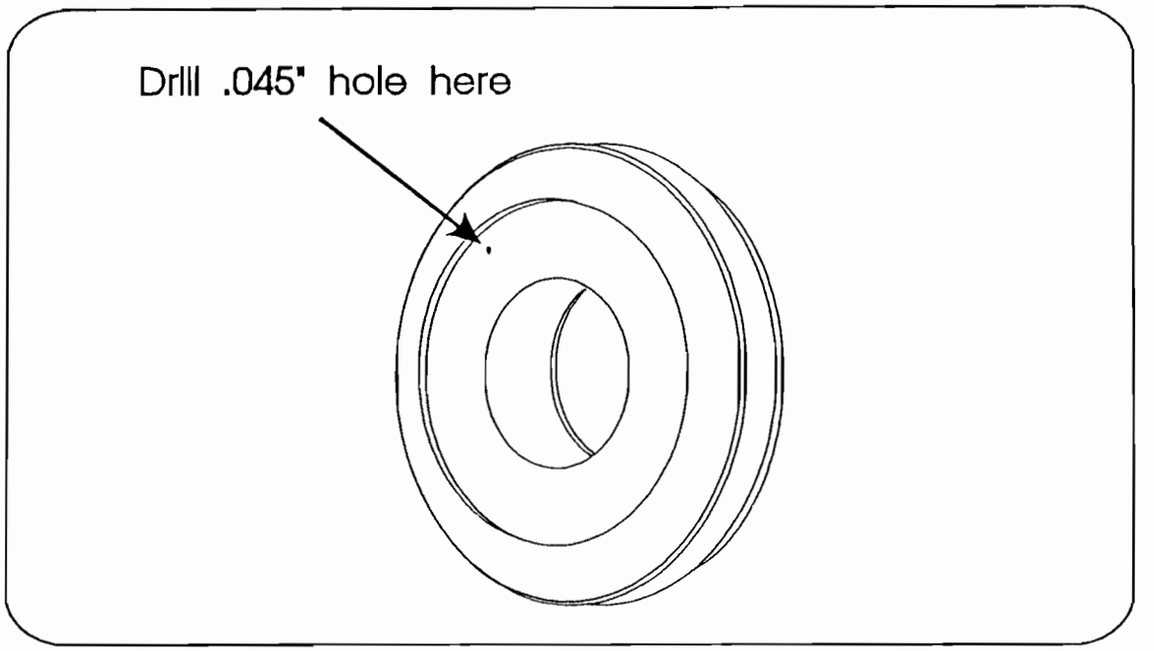


Figure 2.

Step #4. Replace the forward clutch orifice with the larger one found in the ZF correction kit, or drill out the existing one to .093"(3/32). See figure 3.

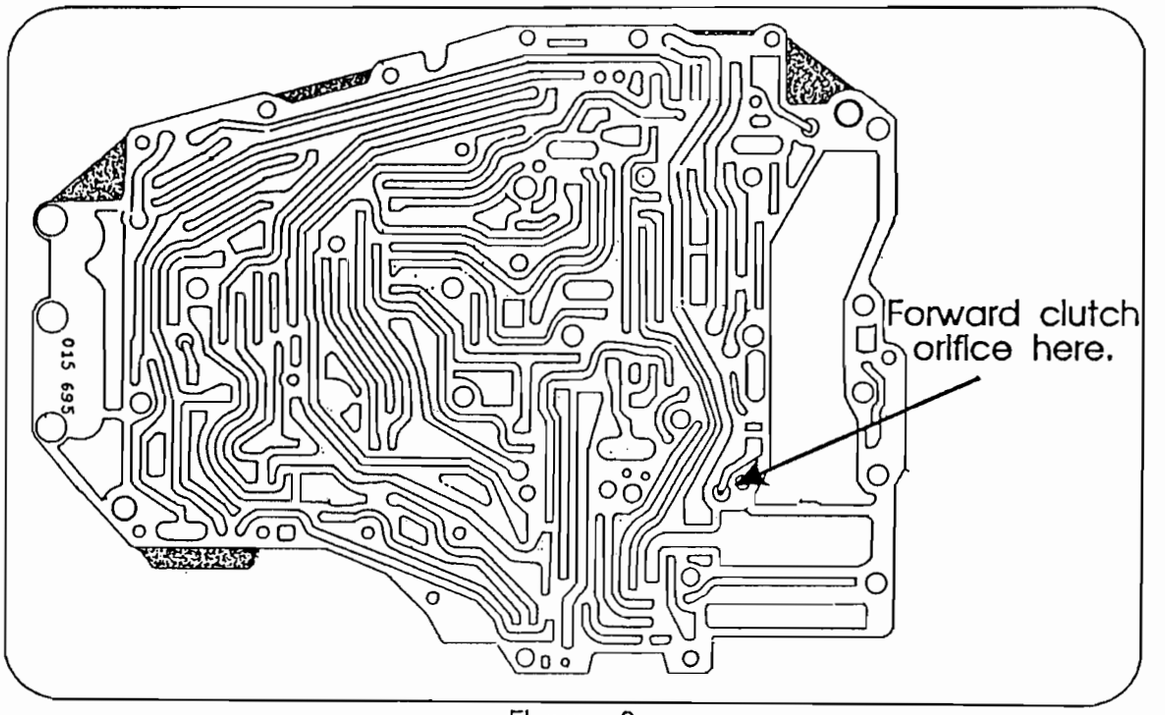


Figure 3.

Step #5. When Installing the forward clutches, waved steel plates must be installed at both ends of the clutch pack. Clutch clearance should be .060-.080 in. See Figure 4.

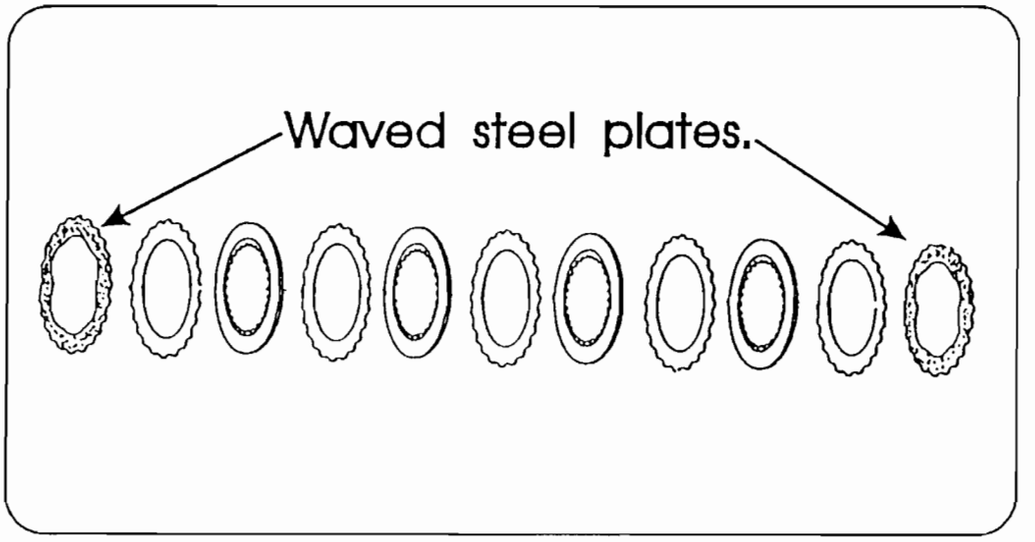


Figure 4.

Step #6. Care must be taken to insure that the snap ring retaining the forward clutch hub to the drum be fully seated in the snap ring grove. See Figure 5.

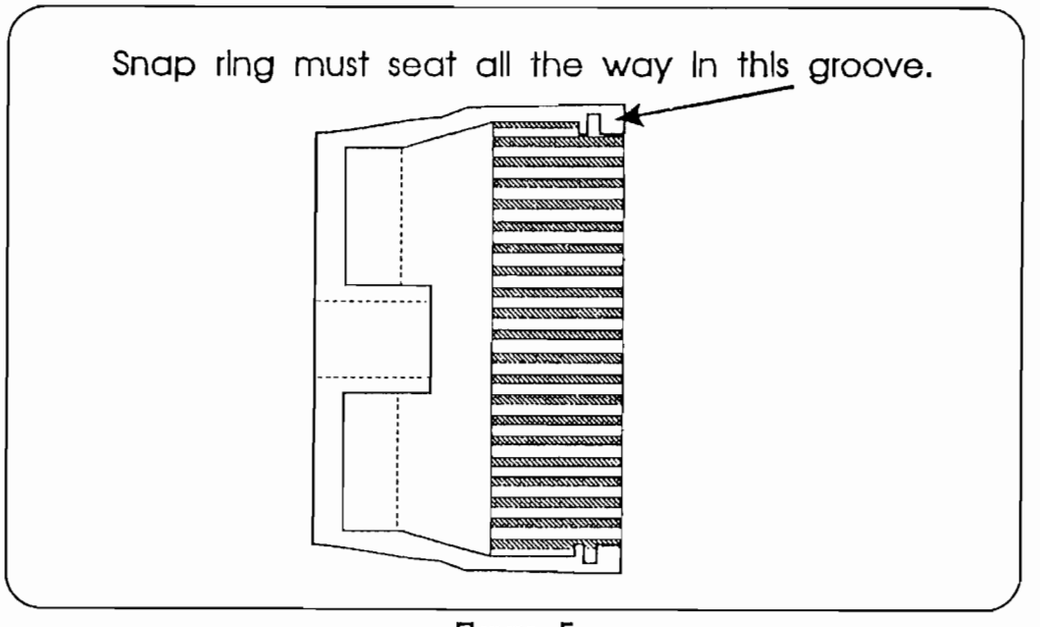


Figure 5.

ZF4HP22
ERRATIC OR NO UPSHIFT

COMPLAINT: Vehicles equipped with the ZF4HP22 transmission may come to the shop with no upshift or complaints of erratic shifting.

CAUSE: During an internal inspection, close examination of the (F) clutch cylinder that bolts into the case will be necessary. Abnormal ring groove wear on the drum where the governor rides will cause the loss of governor pressure (SEE FIGURE 1). With a new ring installed on the drum, side clearance should be .003-.006 in. (SEE FIGURE 2).

CORRECTION: A new (F) clutch cylinder must be installed if any wear or damage is found. New sealing rings must also be installed. Rubber sealing rings will work, but steel rings are the preferred choice. The part number for the (F) clutch cylinder is **24-23-1217-088.**

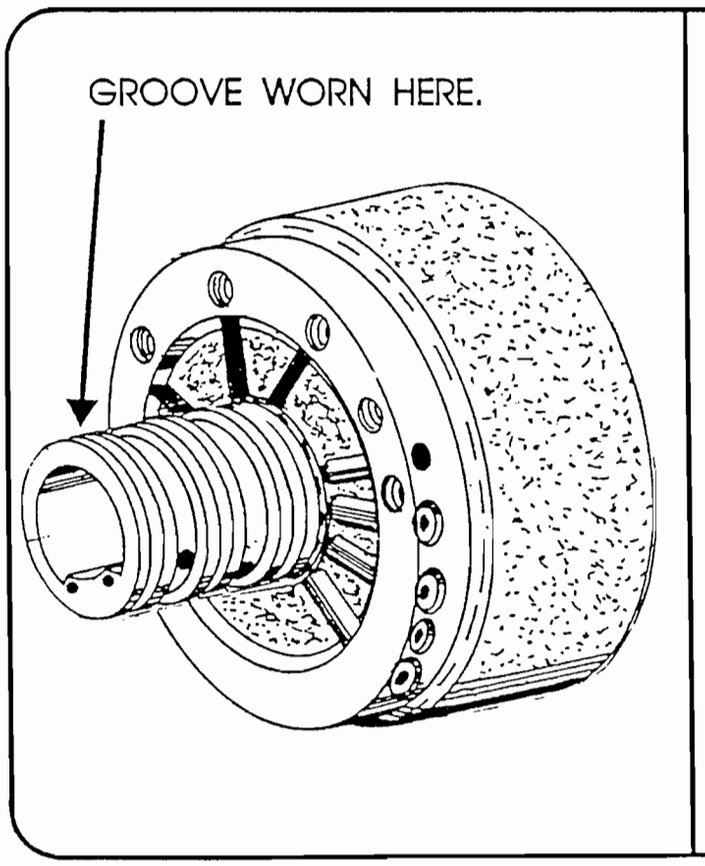


FIGURE 1.

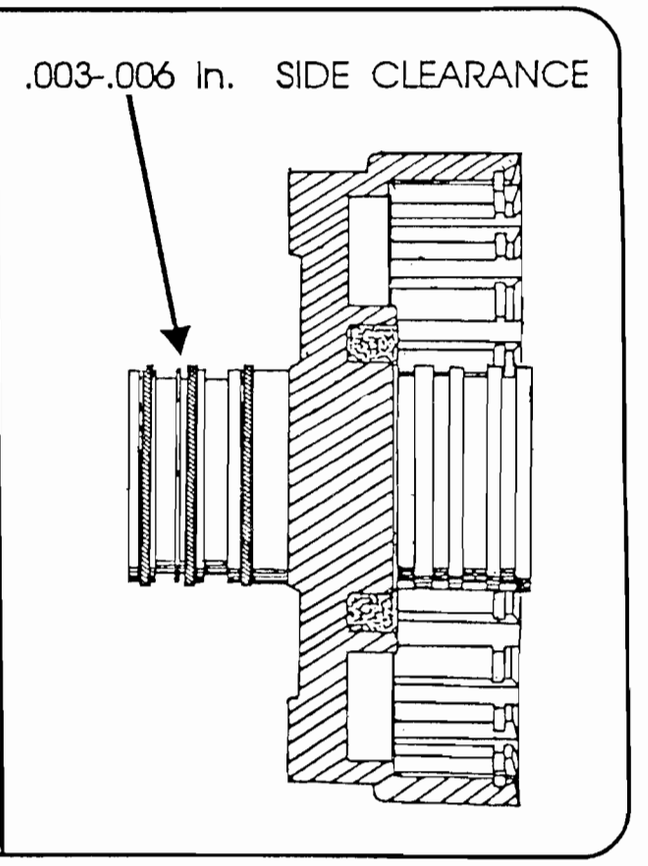


FIGURE 2.

ZF4HP22 NO REVERSE
(F CLUTCH CYLINDER FAILURE)

COMPLAINT: Vehicles equipped with the ZF4HP22 may come to the shop with a complaint of intermittent or no reverse. All of the other ranges may seem fine.

QUALIFICATION: During the road test it may be noted that there is no engine braking in manual first or second gear.

CAUSE: If an examination of the valve body fails to pin point the problem, an internal inspection will be necessary. Severe ring groove wear on the (F) clutch cylinder where the (E) clutch rides or even ring grooves missing because of wear is possible (SEE FIGURE 1). with a new ring installed on the drum, side clearance should be .003-.006 in.(SEE FIGURE 2).

CORRECTION: A new F clutch cylinder must be installed if any wear or damage is found. New sealing rings must also be installed. Steel rings mast be used for the E clutch sealing grooves. The part number for the F clutch cylinder is **24-23-1217-088.**

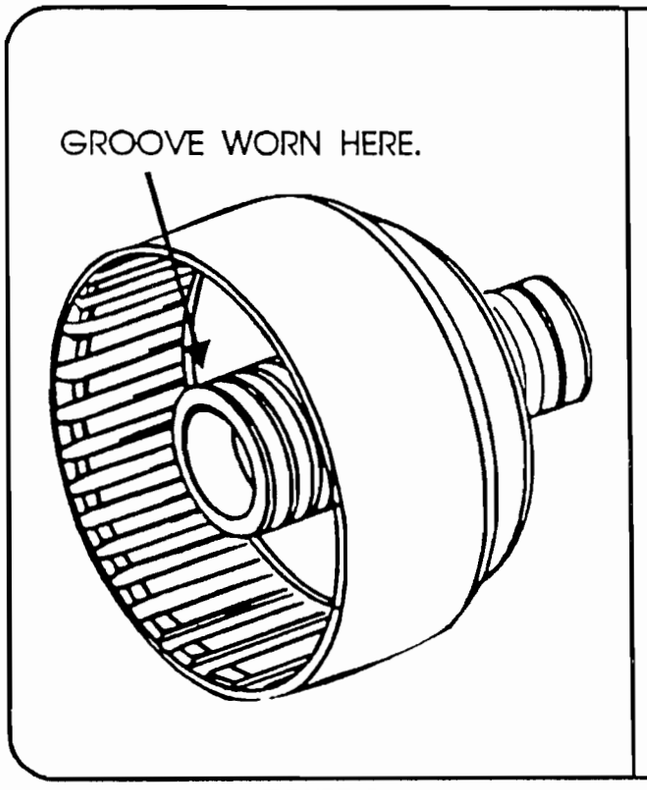


FIGURE 1.

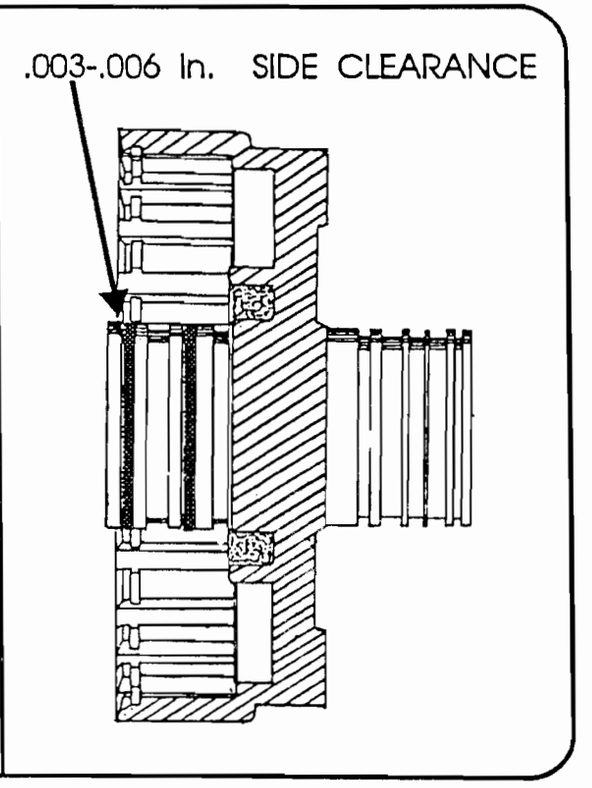
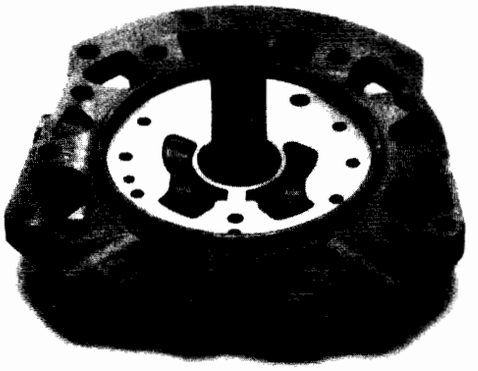
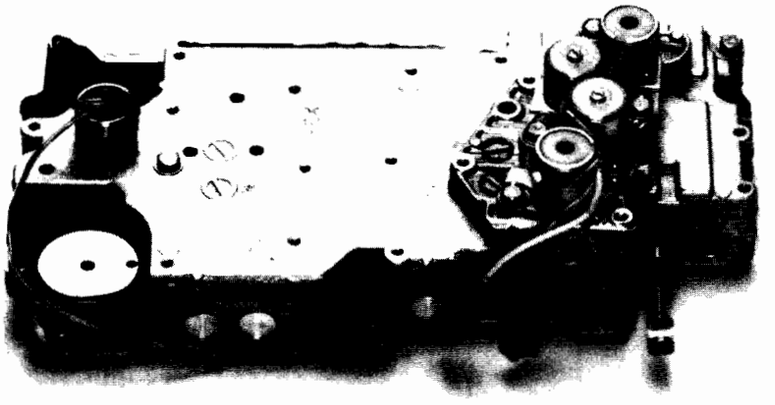


FIGURE 2.

WE DO HARD PARTS RIGHT!





IN FACT, HTP HAS THE MOST COMPLETE SUPPLY OF THOSE HARD TO FIND FOREIGN & DOMESTIC HARD PARTS.

LOCATING THE PART IS ONLY HALF THE STRUGGLE. GETTING IT RIGHT, AND TO YOUR SHOP IS THE OTHER HALF.

HOW MANY TIMES HAVE YOU LOCATED THE PART BUT HAD TO WAIT AN EXTRA DAY OR TWO BECAUSE IT WAS AFTER 2 OR 2:30 AND PAST THE SHIPPING DEADLINE?

DO THE RIGHT THING AND CALL HTP FIRST. NOT ONLY DO WE STOCK THE HARD TO FIND, BUT ALSO WE OFFER A FULL LINE OF SOFT PARTS.

PLUS WE SHIP SAME DAY, EVERYDAY UNTIL 4:30! (EASTERN)

HTP INC.

MICHIGAN
800-477-2487

HTP INC.

LOUISVILLE
800-289-1487

HTP INC.

CHARLOTTE
800-374-3487

4HP22EH
EXTREMELY HARSH SHIFTS

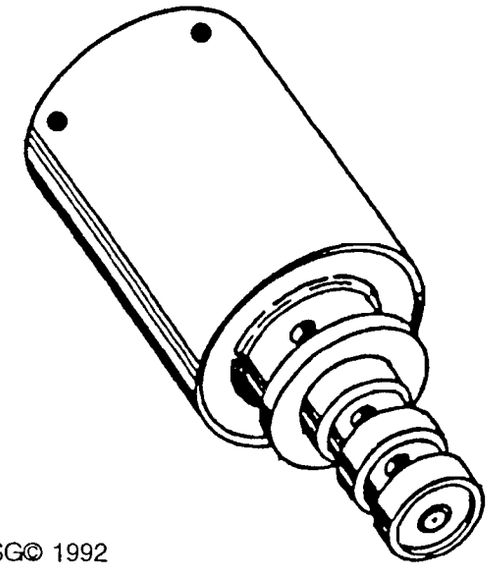
COMPLAINT: Harsh engagements and severe shifts while all shift speeds are okay.

CAUSE: Pressure Regulator "Force Motor" failure (See Figure 1). Extremely high pressure will result. This cannot always be diagnosed with an ohms test as the failure may be mechanical.

CORRECTION: Replace the Pressure Regulator "Force Motor".

Note: A new Pressure Regulator from BMW is just under $600.00 and is usually available in less than two weeks. There is, however, a suitable alternative that has proved most effective. The G.M. 4L80-E Force Motor is manufactured by the same company and aside from a few minor differences does the same job. Most of the overall dimensions are the same except that the G.M. 4L80-E Force Motor uses screens in the plunger and port areas (See Figure 2). Those differences are insignificant. A new 4L80-E Force Motor will cost you about $133.00. The G.M. part # is **8677314**.

Research by:
Steve Lavallee



PRESSURE REGULATOR "FORCE MOTOR"

Figure 1.

Pressure Regulator ohms test across both terminals should be 2.5 - 4.0 ohms resistance. This ohms test should be done near room temperature. Do not energize this force motor with full battery voltage as damage may result.

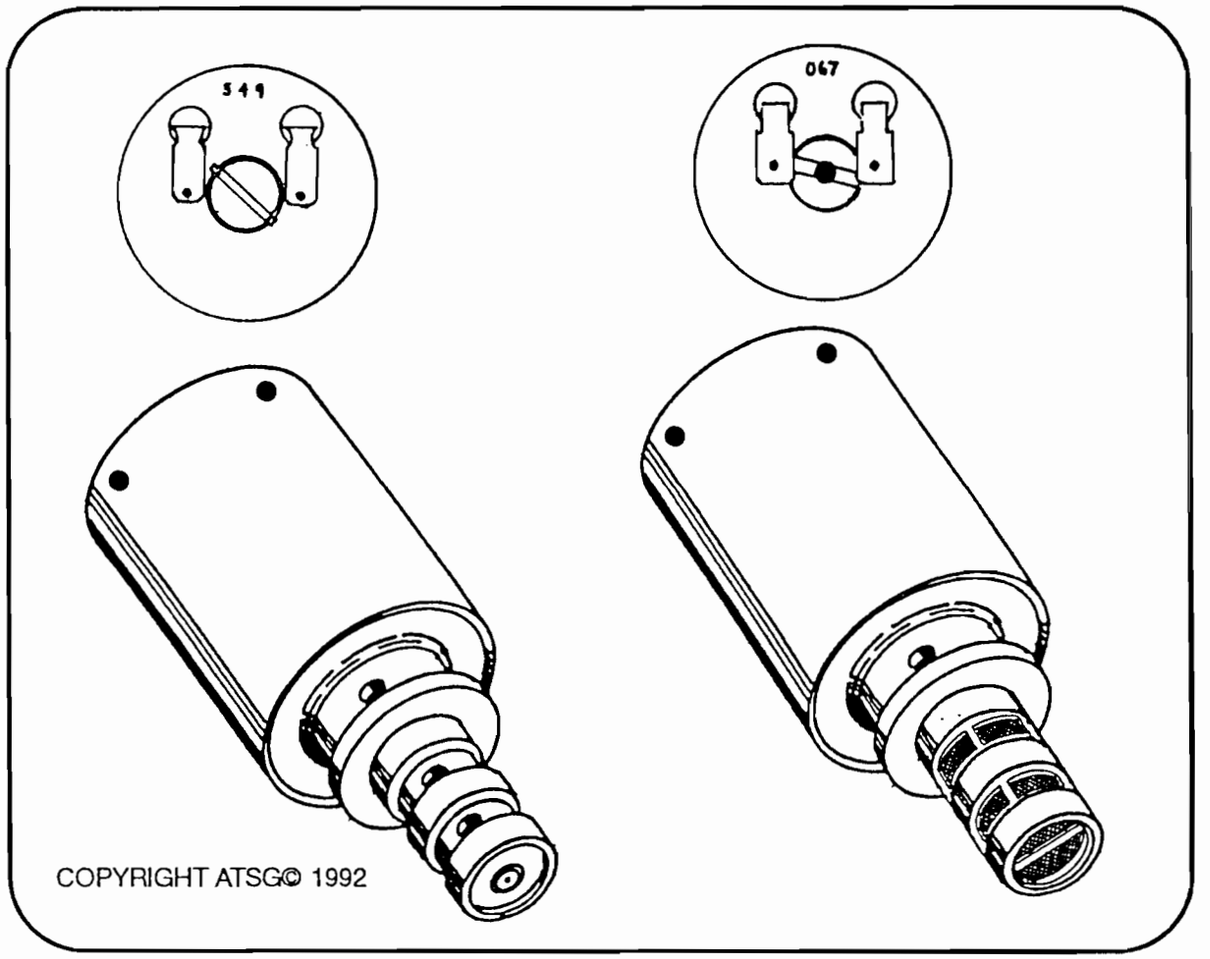


Figure 2.

The BMW Pressure Regulator on the left uses no screens. The G.M. 4L80-E Force Motor on the right has screened ports and a steel ball pressed into the screw head to prevent tampering.

Troubleshooting the Camry Automatic Transaxle

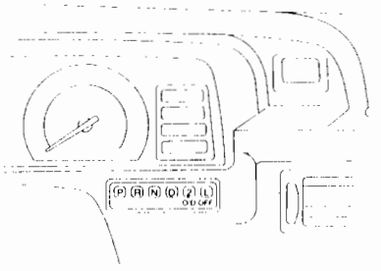
BASIC TROUBLESHOOTING

Before troubleshooting an ECT, you must first determine whether the problem is electrical or mechanical. If you know the cause, use the general troubleshooting procedure and refer to the appropriate pages of the repair manual.

DIAGNOSIS SYSTEM TROUBLESHOOTING

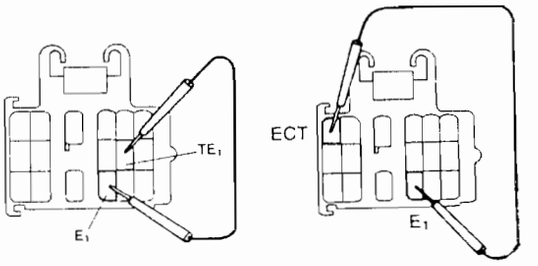
A self-diagnosis system is built into the electrical control system. If the problem is electrical, a code will be stored in the memory. A warning is indicated by the overdrive OFF indicator.

Warning and diagnostic codes can only be read when the overdrive switch is ON. If it is OFF, the overdrive OFF indicator will be lit continuously and will not blink.



• If a malfunction (short or open circuit) has occurred within the speed sensors (No. 1 or 2) circuit or solenoids (No. 1 or 2) circuit, the overdrive OFF light will blink to warn the driver. There is no warning if a malfunction occurs with the lock-up solenoid.

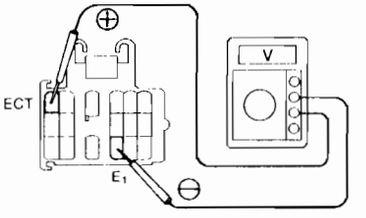
• The diagnostic code can be read by the number of blinks of the overdrive OFF indicator when terminals TE1 and E1 are short-circuited. (This procedure is detailed later).



• The throttle position sensor or brake signal are not indicated, but you can inspect them by checking the voltage at terminal ECT of the service connector.

• The signals to each gear can be checked by measuring the voltage at terminal ECT of the service connector while driving.

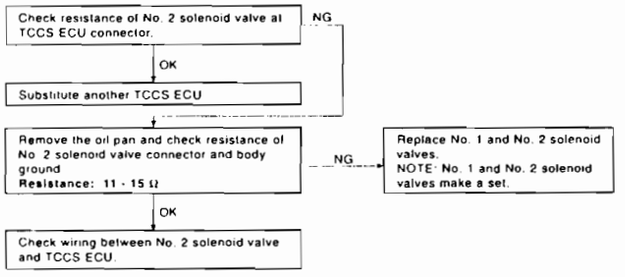
The diagnostic code is retained in the memory of the CPU and, due to back-up voltage, is not cancelled when the engine is turned off. After you make the repair, you must turn the ignition switch off and remove the fuse EFI (15A) or disconnect the TCCS ECU connector to cancel out the diagnostic codes.



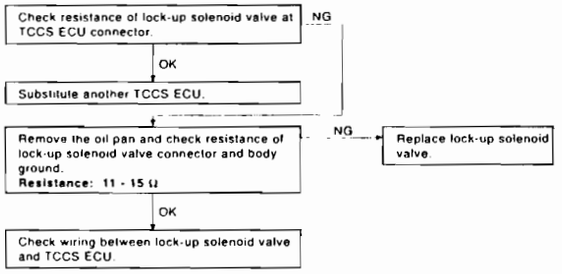
• Always check the battery before you begin. Low battery voltage can cause faulty operation of the diagnosis system.

• Use a voltmeter and ohmmeter that have an impedance of at least 10kΩ/V.

Follow this procedure for a code 63 (No. 2 solenoid valve):

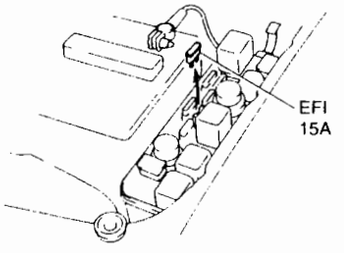


This is the procedure for a code 64 (lock-up solenoid valve):



CANCELLING DIAGNOSTIC CODES

After making your repair, the diagnostic codes retained in the TCCS ECU memory must be erased by removing the fuse EFI (15A) for 10 seconds or more, depending on the ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.



Note: You also can cancel the codes by removing the negative battery terminal, but in this case, other memory systems will be cancelled out.

- Diagnostic codes can be cancelled out by disconnecting the TCCS ECU connector.
- If the diagnostic code is not cancelled out, it will be retained in the TCCS ECU and appear with a new code in the event of future trouble.

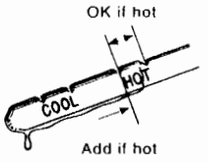
After you have cancelled the codes, perform a road test to confirm that a "normal code" is now read on the O/D OFF indicator.

MAKING A PRELIMINARY CHECK

If you find there are no problem codes stored in the TCCS ECU memory, you must conduct a preliminary check of the system.

1. Check fluid level. Before you check the fluid level, you must:

- Make sure that the vehicle has been driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70-80°C or 158-176°F)
- Use only the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



a. Park the vehicle on a level surface and set the parking brake.

b. While the engine is idling, shift the shift lever into all position from P to L, and return to P.

c. Pull out the transmission dipstick and wipe it clean.

d. Push the dipstick back into the tube.

e. Pull out the dipstick and check that the fluid level is in the HOT range.

DIAGNOSTIC CODES

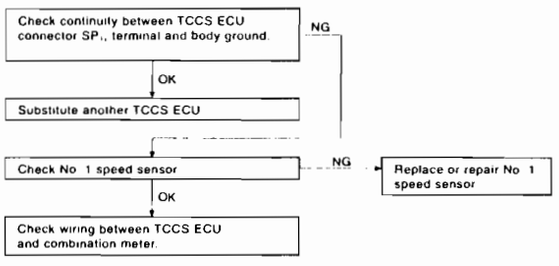
Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 Speed sensor (in combination meter) - Severed wire harness or short circuit.
61		Defective No. 2 Speed sensor (in ATM) - Severed wire harness or short circuit.
62		Severed No. 1 solenoid or short circuit - Severed wire harness or short circuit.
63		Severed No. 2 solenoid or short circuit - Severed wire harness or short circuit.
64		Severed lock-up solenoid or short circuit - Severed wire harness or short circuit.

If codes 42, 61, 62 or 63 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. An impact or shock can cause the blinking to stop, but the code will still remain in the TCCS ECU memory until it is cancelled. There is no warning for a diagnostic code 64.

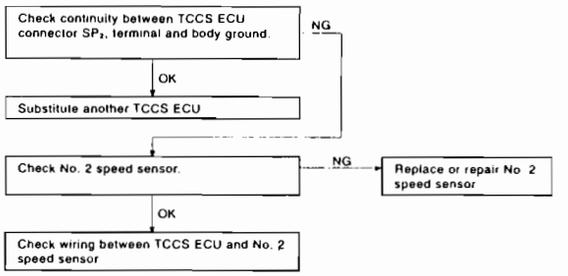
If codes 62, 63 or 64 appear, there is an electrical malfunction in the solenoid. Problems caused by mechanical failure will not appear.

If there is a simultaneous malfunction of both the No. 1 and 2 speed sensors, no diagnostic code will appear and the fail-safe system will not function. When driving in the D range, the transmission will not up-shift from first gear, regardless of vehicle speed.

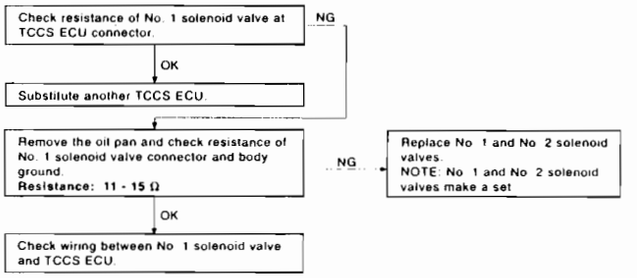
If a code 42 (No. 1 speed sensor) is output, follow this troubleshooting procedure:



If a code 61 (No. 2 speed sensor) is output, follow this procedure:



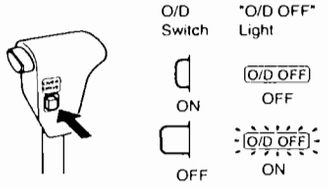
Follow this procedure for a code 62 (No. 1 solenoid valve circuitry):



Check the O/D OFF indicator light.

1. Turn the ignition switch ON.
2. The O/D OFF light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the O/D OFF light should go out.

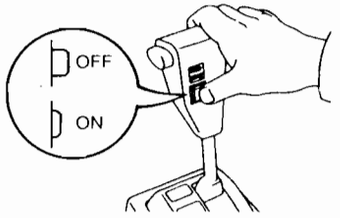
If the O/D OFF light flashes when the O/D switch is set to ON, the electronic control system is faulty.



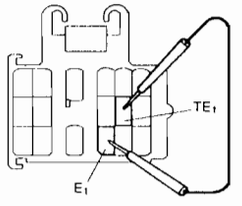
TO READ DIAGNOSTIC CODES:

1. Turn ignition switch and O/D switch to ON. Do NOT start the engine.

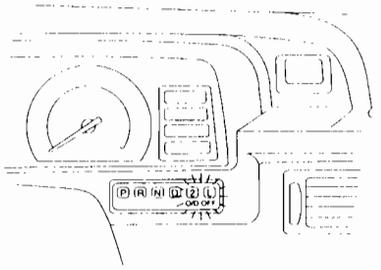
Note: Warning and diagnostic codes can be read only when the overdrive switch is ON. If it is OFF, the overdrive OFF light will light continuously and will not blink.



2. Short TE1, terminal circuit of service connector. Short terminals TE1 and E1 of the service connector, using a service wire.

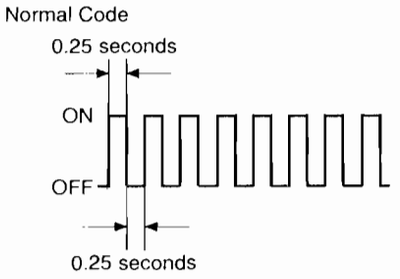


3. Read diagnostic codes. Read the diagnostic codes as indicated by the number of times the O/D OFF light flashes.

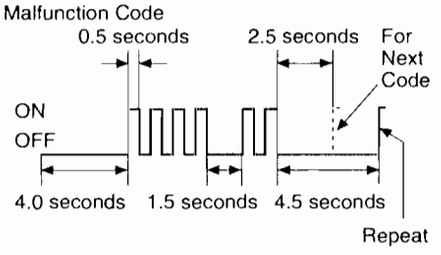


(Diagnostic Code Indication)

• The light will blink once every 0.25 seconds if the system is operating normally.



• If there is a malfunction, the light will blink once every 0.5 seconds. The number of blinks will equal the first number and, after a 1.5 second pause, the second number of the two digit diagnostic code. If there are two or more codes, there will be a 2.5 second pause between each code. If there are several trouble codes, the indication will begin from the smaller value and continue to the larger.



4. Remove service wire.

TOYOTA WITH ELECTRONIC CONTROLS

EARLY STACKED SHIFTS

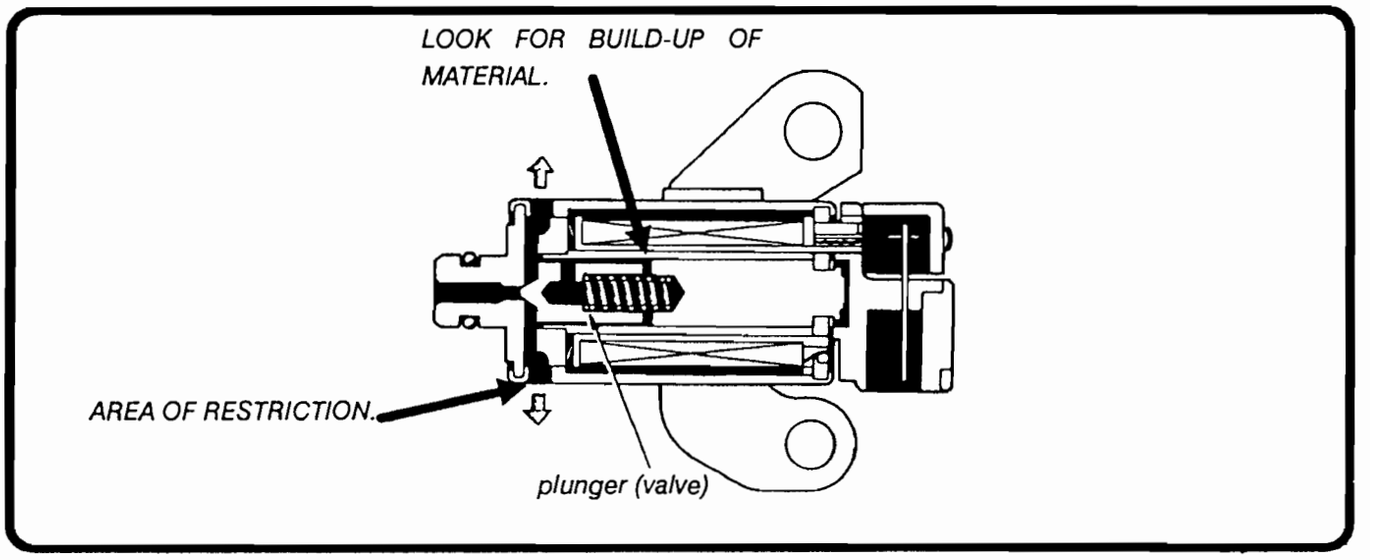
COMPLAINT: *Early stacked shifts at moderate to heavy throttle only, and normal operation at light throttle. The vehicle shifts properly with the cable disconnected.*

CAUSE: *Shifts solenoids may be partially restricted.*
USE THE FOLLOWING TEST PROCEDURE:

1. *Raise the wheels off the ground, and run the vehicle with the shift lever in 2nd ("2"), with the engine at 1200 RPM. Both shift solenoids will be energized (OPEN).*
2. *Then pull the cable all the way to maximum pressure.*
3. *If the transmission then shifts to 1st gear, the number 2 shift solenoid is restricted.*
4. *If the transmission then shifts to 2nd gear, the number 1 shift solenoid is restricted*
5. *If the transmission then shifts to 4th gear, both shift solenoids are restricted*

NOTE: The number 1 solenoid wire is white, and the number 2 solenoid wire is black.

CORRECTION: *Replace defective solenoid/solenoids.*

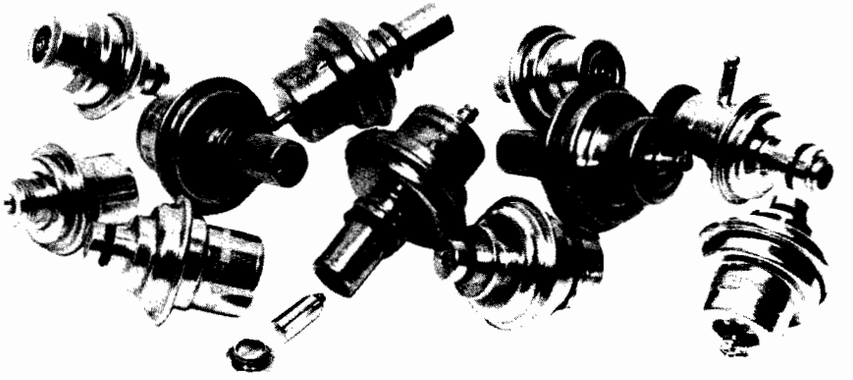


ROSTRA... PROVEN QUALITY

Rely on Rostra for quality, reliability, and versitility in modulators, solenoids, and transmission analysis equipment.

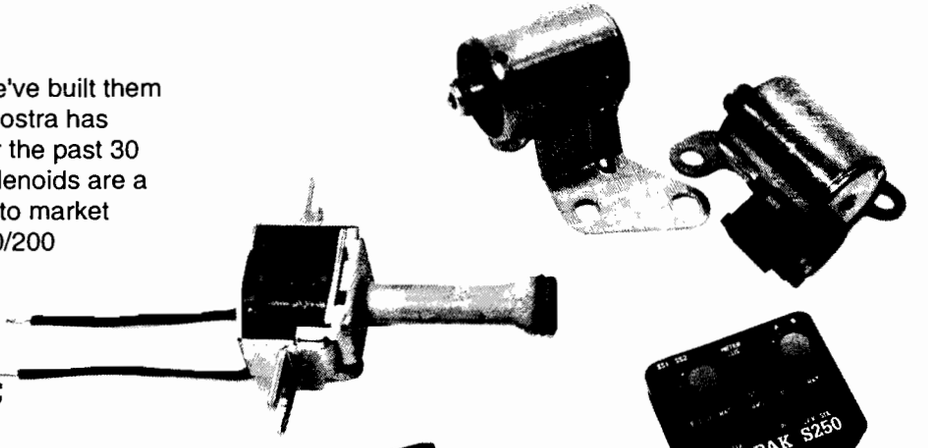
Rostra- your first...

Rostra Modulators are recognized as the highest quality in our industry. Complete and universal, problem solving designs,function perfectly first time... every time! When quality counts, no one matches Rostra!



your best...

Rostra Solenoids: Because we've built them longer, we make them better. Rostra has designed and built solenoids for the past 30 years. Rostra's transmission solenoids are a move to the future- a response to market demand! Ask for the Rostra 700/200 Universal.



your smartest choice

The Rostra RAT is the transmission tester/controller that's never obsolete! As transmission technology advances, easy-to-use, state-of-the-art RAT PAK modules keep you up to date. With the RAT, you manually control the transmission- monitor outputs from the ECU- pinpoint hydraulic and electronic problems without even dropping the pan. On the road or bench, the RAT saves time, gets work out faster, and does away with come-backs.

There's no substitute for quality... no replacement for Rostra. Our products represent the best in American engineering and manufacturing. Craftsmanship and pride unmatched. Performance and perfection are Rostra commitments- qualities you and your customer deserve. Rostra provides them- and backs you with a Technical Support Line: **1-919-276-8211**.

All Rostra quality products are sold only through authorized distributors. For a complete list of distributors, call **1-919-276-4853**.

ROSTRA PRECISION CONTROLS INC

2519 Dana Drive, Laurinburg, NC 28352

IN-VEHICLE SERVICE-TESTING-ADJUSTMENT

TRANSMISSION FLUID LEVEL AND CONDITION

The correct fluid level is to the Full mark on the dipstick (Fig. 1). The transmission fluid must be cool (85-125°F) when checking level. Check fluid level with the transmission in Park and the engine at curb idle speed. Shift the transmission Through all gear ranges and back to Park before checking fluid level. Use Mopar Mercon™ or an equivalent Dexron II™ fluid to refill or top off the fluid level.

When checking fluid level, also inspect condition and appearance of the fluid. The fluid should be clear and free of foreign material or particles. If the fluid is dark brown or black in color and smells burnt, the fluid has been overheated and should be replaced and transmission operation checked.

Transmission operation should also be checked if the fluid contains large quantities of metal particles or clutch disc friction material.

A small quantity of friction material or metal particles in the oil pan is normal. The particles are usually generated during the break-in period and indicate normal seating of the various transmission components.

TCU

Use the DRB II™ tester to diagnose TCU function whenever a fault is suspected. Replace the TCU only when the tester indicates a TCU fault.

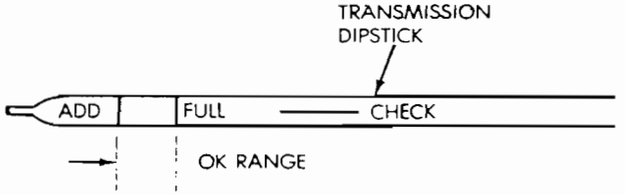


Fig. 1 Transmission Fluid Level

TCU Replacement

The TCU is located under the instrument panel on the passenger side of the vehicle (Fig. 2). Turn the ignition off. Remove the TCU by unsnapping the wire harness connector and removing the TCU from under the instrument panel. To install the replacement part, snap the wire harness connector into the new TCU and position it under the panel.

NEUTRAL SWITCH

Switch Testing

Test switch continuity with an ohmmeter. Disconnect the switch and check continuity at the connector terminal positions and in the gear ranges indicated in Figure 3. Switch continuity should be as follows:

- Continuity should exist between terminals B and C with the transmission in Park and Neutral only (Fig. 3).

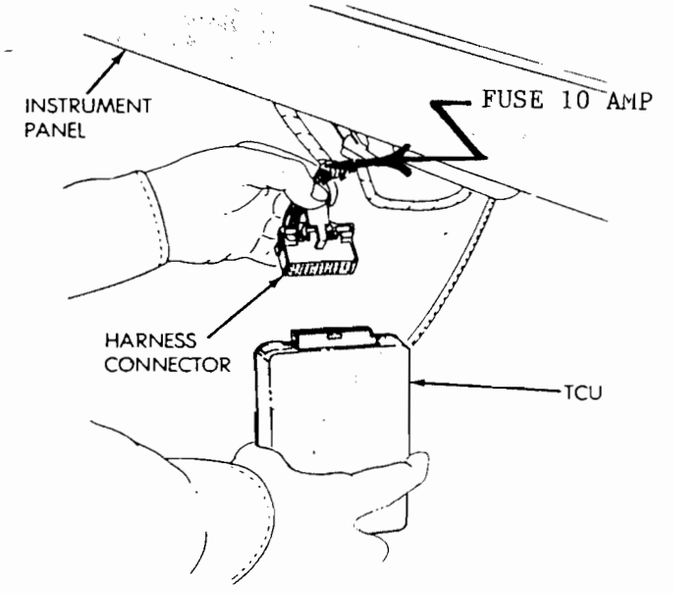


Fig. 2 TCU Removal/Installation

- Continuity should exist between terminals A and E with the transmission in Reverse (Fig. 3).
- Continuity should exist between terminals A and G with the the transmission in third gear (Fig. 3).
- Continuity should exist between terminals A and H with the transmission in first and/or second gear (Fig. 3).
- Continuity should not exist in D position.

Neutral Switch Removal

(1) Raise vehicle.

(2) Disconnect switch wire harness connector.

(3) Pry washer lock tabs upward and remove switch attaching nut and tabbed washer (Fig. 4).

(4) Remove switch adjusting bolt (Fig. 4).

(5) Slide switch off manual valve shaft.

Neutral Switch Installation And Adjustment

(1) Disconnect shift linkage rod from shift lever on left side of transmission.

(2) Rotate manual shift lever all the way rearward. Then rotate lever forward two detent positions to Neutral.

(3) Install switch on manual valve shaft and install switch adjusting bolt finger tight. Do not tighten bolt at this time.

(4) Install tabbed washer on manual valve shaft and install switch attaching nut. Tighten nut to 6.9 N•m (61 in-lbs) torque but do not bend washer lock tabs over nut at this time.

(5) Verify that transmission is in Neutral.

(6) Rotate switch to align neutral standard line with vertical groove on manual valve shaft (Fig. 5).

(7) Align switch standard line with groove or flat on manual valve shaft.

(8) Tighten switch adjusting bolt to 13 N•m (9 ft-lbs) torque.

(9) Bend at least two washer lock tabs over switch attaching nut to secure it.

(10) Connect shift linkage rod to shift lever on left side of case.

(11) Connect switch wires to harness and lower vehicle.

(12) Check switch operation. Engine should start in Park and Neutral only.

VALVE BODY SOLENOIDS

Solenoid Removal And Testing

(1) Remove transmission oil pan drain plug and drain fluid.

(2) Remove pan bolts and remove oil pan.

(3) Remove oil screen bolts and remove screen (Fig. 6) and gasket. Discard the gasket.

(4) Disconnect solenoid wire connector (Fig. 7).

(5) If all solenoids are being removed, mark or tag wires for assembly reference before disconnecting them.

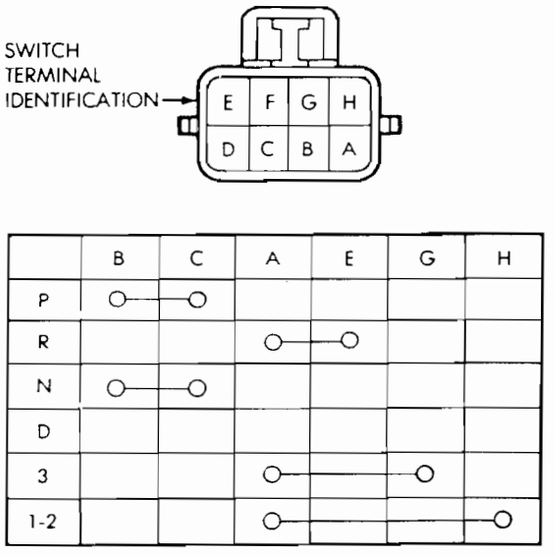
(6) Remove bolt attaching solenoids to valve body and remove solenoids (Fig. 8). Do not allow any valve body components to fall out when solenoids are removed.

(7) Clean oil filter and pan with solvent and dry with compressed air.

(8) Remove old gasket material from oil pan and transmission case.

Solenoid Testing

Test solenoid resistance with an ohmmeter.



	B	C	A	E	G	H
P	O	O				
R			O	O		
N	O	O				
D						
3			O		O	
1-2			O			O

Fig. 3 Neutral Switch Terminals And Testing

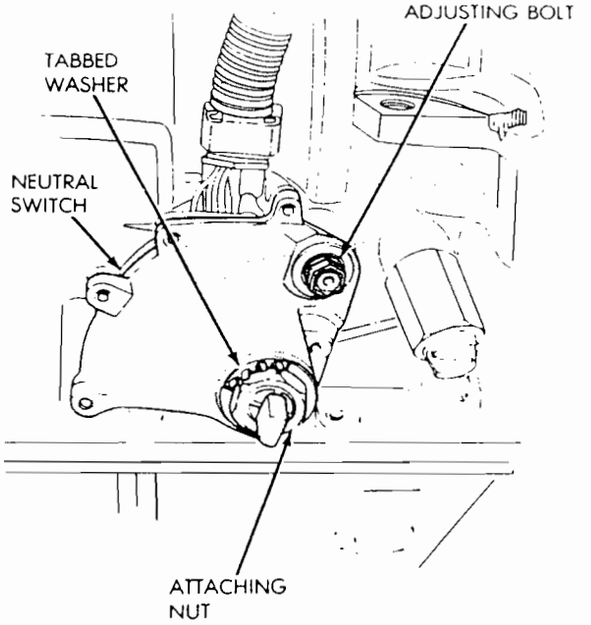


Fig. 4 Neutral Switch Removal/Installation

Connect the ohmmeter leads to the solenoid mounting bracket and to the solenoid wire terminal (Fig. 9).

Solenoid resistance should be 11-15 ohms.

Replace the solenoid if resistance is above or below the specified range.

Solenoid Installation

(1) Position solenoids on valve body and install solenoid bolts. Tighten bolts to 10 N•m (7 ft-lbs) torque.

(2) Connect feed wires to solenoids.

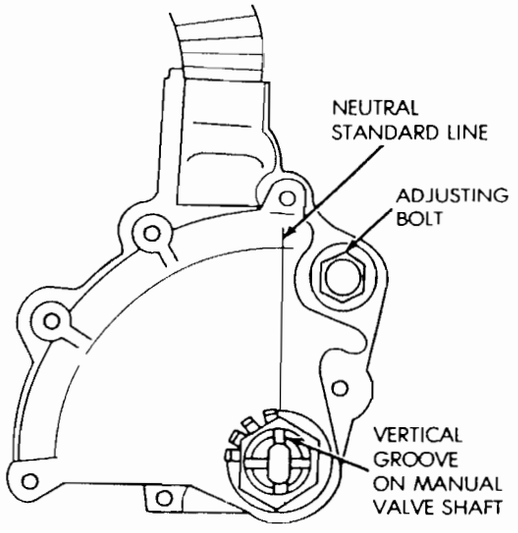


Fig. 5 Neutral Switch Adjustment

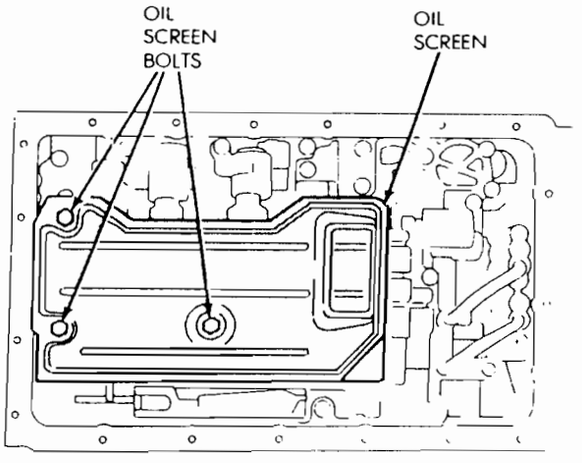


Fig. 6 Oil Screen Removal/Installation

(3) Install new gaskets on oil screen and install screen. Tighten screen bolts to 10 N•m (7 ft-lbs) torque.

(4) Apply bead of Three-Bond TB 1281 or equivalent RTV sealer to oil pan gasket surface.

(5) Install new gasket on oil pan and install pan on transmission. Tighten pan bolts to 7.4 N•m (65 in-lbs) torque.

(6) Install and tighten oil pan drain plug to 20 N•m (15 ft-lbs) torque.

(7) Fill transmission with Mopar Mercon™ or Dexron II™ transmission fluid.

Solenoid Harness Adapter Seal Replacement

(1) Remove oil pan and oil screen. Refer to Solenoid Removal procedure.

(2) Disconnect solenoid wire connectors (Fig. 7).

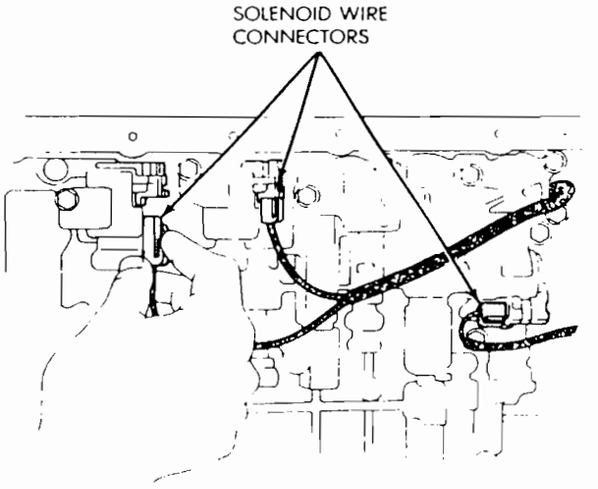


Fig. 7 Solenoid Wire Connectors

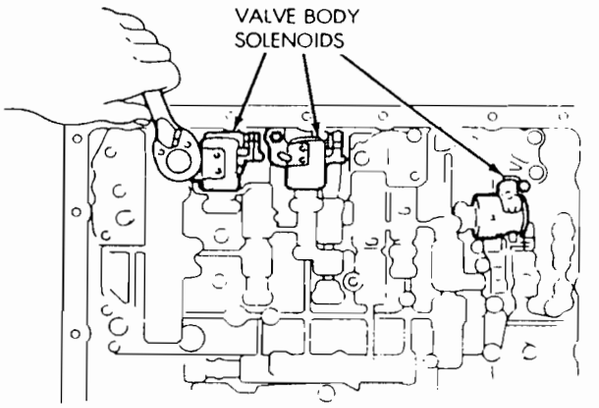


Fig. 8 Valve Body Solenoids

(3) Remove bracket securing solenoid harness adaptor (Fig. 10) to case.
(4) Pull harness adapter and wires out of case.
(5) Remove and discard adapter O-ring.
(6) Lubricate new O-ring and install it on adapter.
(7) Install solenoid wire harness and adapter in case.
(8) Install adapter bracket and bracket bolt.
(9) Connect wires to solenoids.
(10) Install oil screen and oil pan.

VALVE BODY

Removal and installation are the only valve body service procedures covered in this section. Refer to the transmission overhaul section for valve body disassembly, cleaning, inspection and reassembly.

Valve Body Removal

(1) Remove oil pan plug and drain transmission fluid.
(2) Remove oil pan and oil screen. Clean pan and screen in solvent and dry them with compressed air.

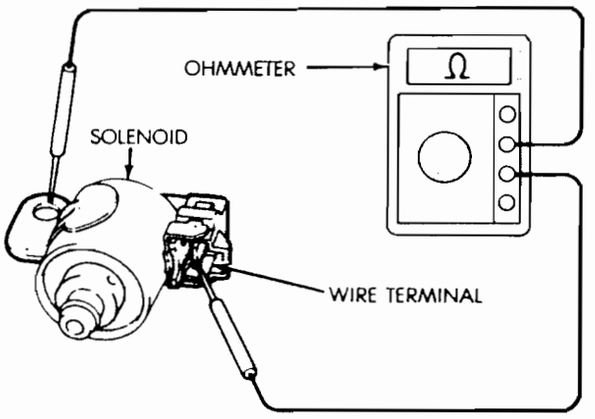


Fig. 9 Testing Valve Body Solenoid

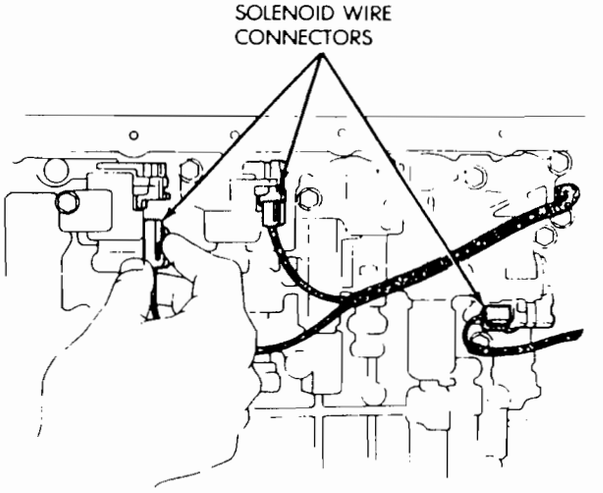


Fig. 11 Disconnect Solenoid Wires

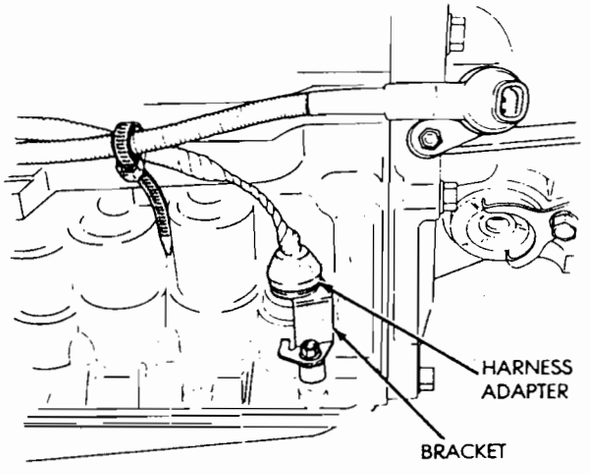


Fig. 10 Harness Adapter Removal/Installation

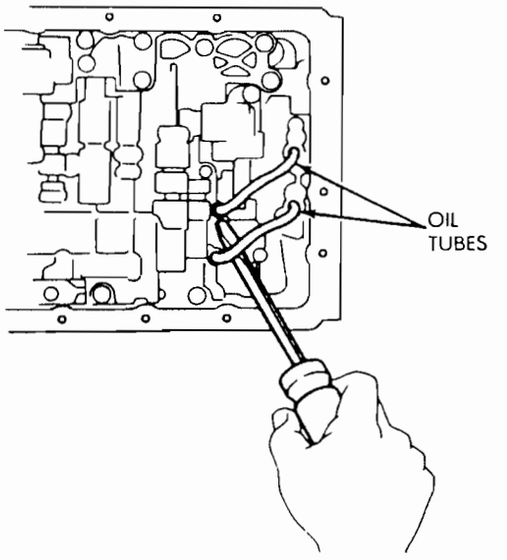


Fig. 12 Removing Valve Body Oil Tubes

THROTTLE CABLE REPLACEMENT-ADJUSTMENT

Throttle Cable Removal

(1) In engine compartment, disconnect cable from throttle linkage. Then compress cable mounting ears and remove cable from linkage bracket.

(2) Raise vehicle.

(3) Remove transmission oil pan.

(4) Disengage cable from throttle valve cam (Fig. 27).

(5) Remove cable bracket bolt and remove cable and bracket from case (Fig. 28).

(6) Remove and discard cable seal.

Throttle Cable Installation

(1) Lubricate and install new seal on cable.

(2) Insert cable in transmission case.

(3) Attach cable to throttle cam (Fig. 27).

(4) Install cable bracket on case and tighten attaching bolt to 10 N•m (7 ft-lbs) torque (Fig. 28).

(5) Remove old gasket material from oil pan and transmission case. Clean oil pan with solvent and dry it with compressed air.

(6) Install new gasket on oil pan and install pan. Tighten pan bolts to 7.4 N•m (65 in-lbs) torque.

(7) Install new gasket on oil pan drain plug. Install and tighten plug to 20 N•m (15 ft-lbs) torque.

(8) Connect cable to engine bracket and throttle linkage.

(9) Fill transmission with Mopar Mercon™ or Dexron ™ II ATF.

(10) Adjust the cable as outlined in the Line Pressure Cable Adjustment procedure.

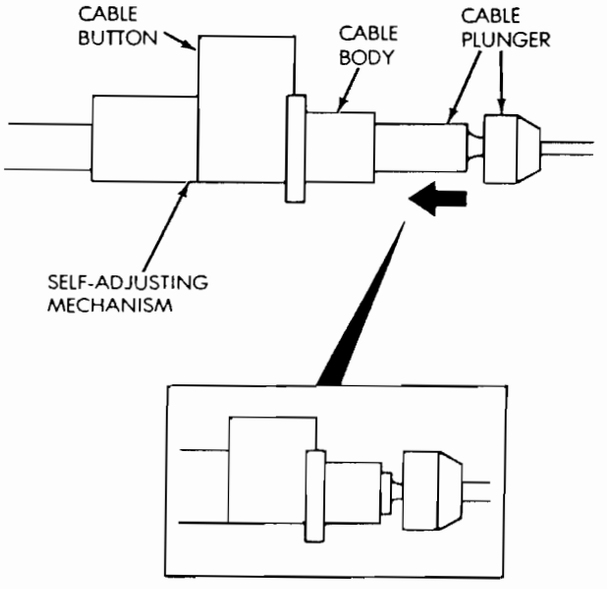


Fig. 29 Retract Throttle Cable Plunger

Throttle Cable Adjustment

(1) Turn ignition switch to Off position.

(2) Fully retract cable plunger. Press cable button all the way down. Then push cable plunger inward (Fig. 29).

(3) Rotate primary throttle lever to wide open throttle position (Fig. 30).

(4) Hold primary throttle lever in wide open position and let cable plunger extend. Release lever when plunger is fully extended. Cable is now adjusted.

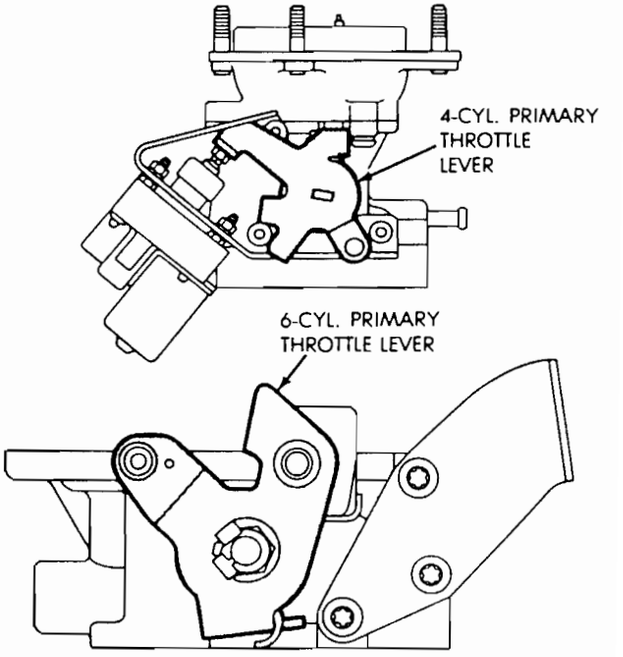


Fig. 30 Rotate Primary Throttle Lever To Wide Open Position

(3) Remove park rod from manual valve shaft sector (Fig. 37).

(4) Remove park rod.

(5) Remove park pawl, pin and spring (Fig. 38).

(6) Examine park rod, pawl, pin and spring. Replace any component that is worn or damaged.

(7) Install pawl in case. Insert pin and install spring. Be sure spring is positioned as shown in Figure 38.

(8) Install park rod and bracket (Fig. 36). Tighten bracket bolts to 10 N•m (7 ft-lbs) torque.

(9) Install valve body, oil screen and oil pan as outlined in this section.

EXTENSION/ADAPTOR HOUSING SEAL REPLACEMENT

(1) Raise vehicle.

(2) On 2WD or 4WD models, disconnect or remove components necessary to gain access to the seal (e.g. propeller shaft, crossmember, shift linkage, transfer case, exhaust components, hoses, wires).

(3) On 2WD models, remove seal from adaptor housing (Fig. 39).

(4) On 4WD model, remove dust shield and remove seal from extension housing (Fig. 39).

(5) Install new seal with appropriate size seal installer. On 4WD models, also install dust shield.

(6) Reinstall components removed to gain access to seal.

(7) Top off transmission fluid if necessary.

SPEED SENSOR

Speed Sensor Testing

Test the speed sensor with an ohmmeter. Place the ohmmeter leads on the two terminals in the sensor connector (Fig. 40).

Rotate the transmission output shaft and observe the ohmmeter needle. The needle should deflect indicating the switch is opening/closing as the output shaft rotor moves past the sensor (Fig. 40). Replace the sensor if the

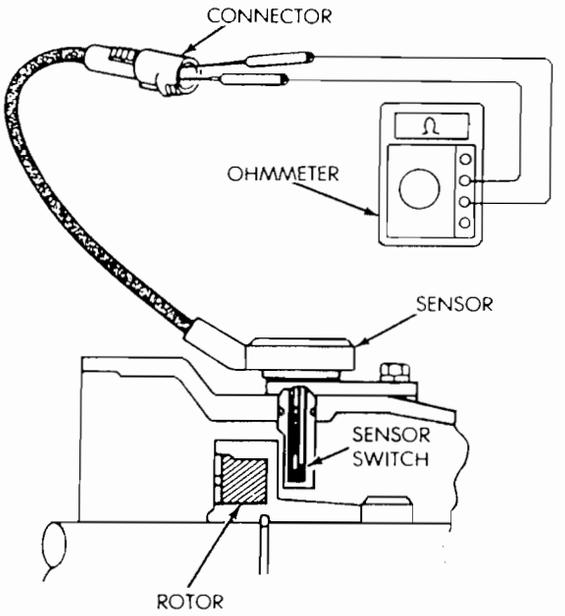


Fig. 40 Speed Sensor Testing

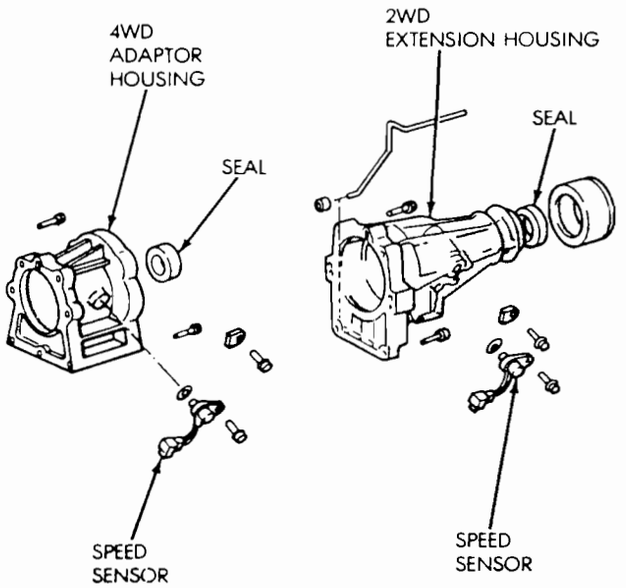


Fig. 39 Adaptor/Extension Housing Seals

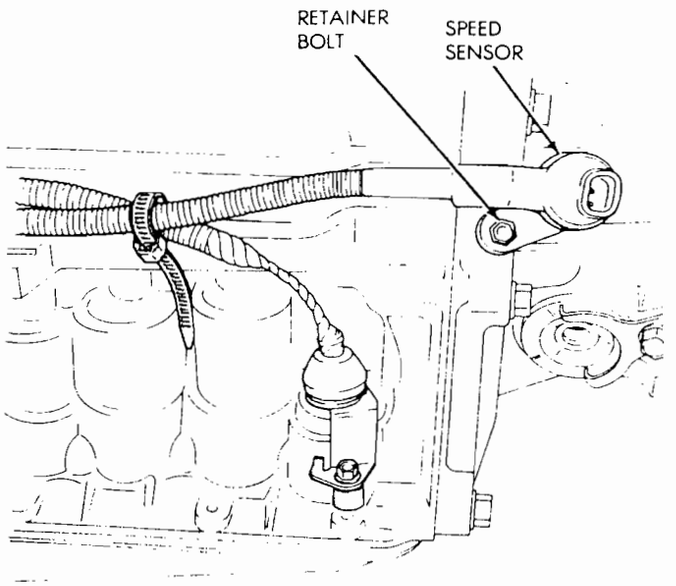


Fig. 41 Speed Sensor Removal/Installation

ohmmeter does not display any kind of reading.

If a digital ohmmeter is being used, the sensor should generate an ohmmeter readout each time the switch opens and closes.

Speed Sensor Replacement

(1) Disconnect sensor wire harness connector.

(2) Remove sensor retainer bolt and remove sensor (Fig. 41).

(3) Remove and discard speed sensor O-ring.

(4) Install new O-ring on speed sensor and install sensor in transmission case.

(5) Install sensor bracket and retainer bolt. Tighten bolt to 7.4 N•m (65 in-lbs) torque.

(6) Connect sensor wire harness connector.

SPEED SENSOR ROTOR-SPEEDOMETER DRIVE GEAR

Rotor-Drive Gear Removal

(1) Raise vehicle.

(2) Remove components necessary to gain access to rotor and drive gear (e.g. propeller shaft, transfer case, crossmember, shift linkage).

(3) Disconnect speedometer cable and/or speed sensor.

(4) Remove extension or adaptor housing.

(5) Remove speedometer drive gear snap ring (Fig. 42).

(6) Remove the speedometer drive gear and spacer (if equipped).

(7) Remove rotor by carefully prying it off output shaft with wood dowel or hammer handle (Fig. 43).

(8) Clean sealing surfaces of transmission case and extension/adaptor housing.

Rotor—Drive Gear Installation

(1) Install rotor, spacer (if equipped) and drive gear on output shaft. Then install drive gear snap ring (Fig. 42).

(2) Apply bead of Three-Bond TB 1281 or equivalent RTV sealer, to transmission case sealing surface and install extension/adaptor housing on case.

(3) Tighten extension/adaptor housing bolts to 34 N•m (25 ft-lbs) torque.

(4) Install components removed to gain access to rotor and drive gear.

THROTTLE POSITION SENSOR (TPS)

A separate throttle position sensor is used for automatic transmission applications. The transmission sensor is attached to the base of the throttle body. The 6-cyl. and 4-cyl. sensors are shown in Figure 44.

TPS input/output voltage is checked at the four-terminal, two-piece connector (Fig. 45).

If diagnosis indicates a loose or corroded connection, release the lock tab and separate the two halves of the connector. Inspect and clean the connector terminals if dirty or corroded.

Be sure the connector halves are fully seated before engaging the lock tab. This is necessary to ensure a good connection.

Testing TPS Operation

A voltmeter is used to test TPS operation. Operation is checked by measuring input and output voltage at the connector terminals.

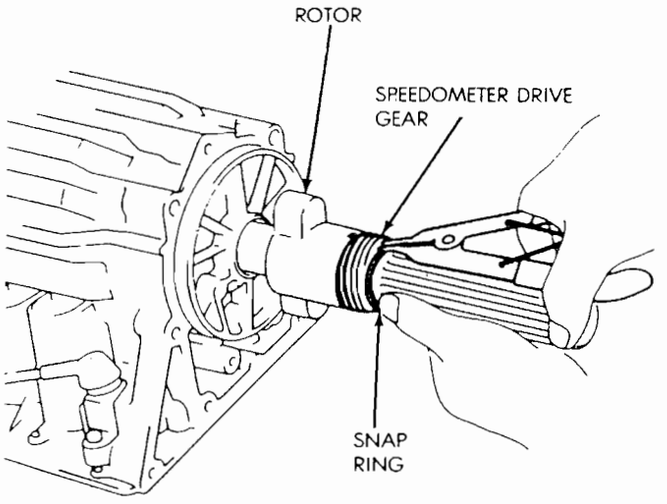


Fig. 42 Removing/Installation Speedometer Drive Gear

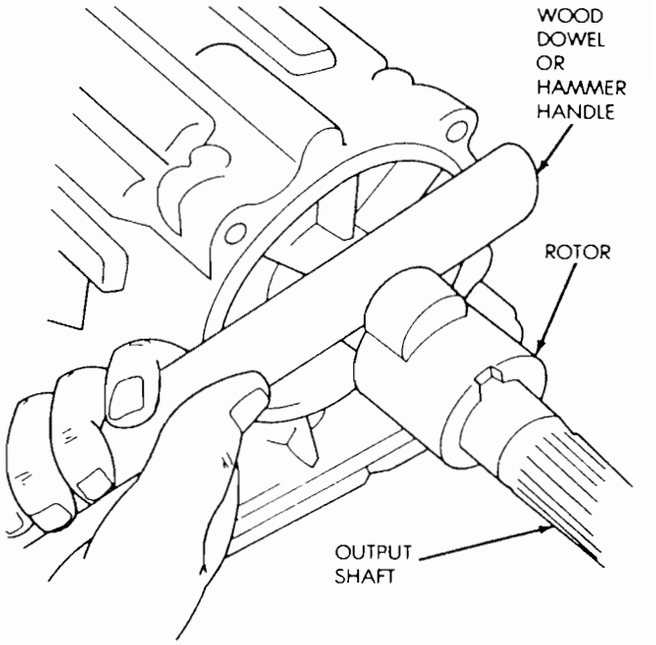


Fig. 43 Removing Speed Sensor Rotor

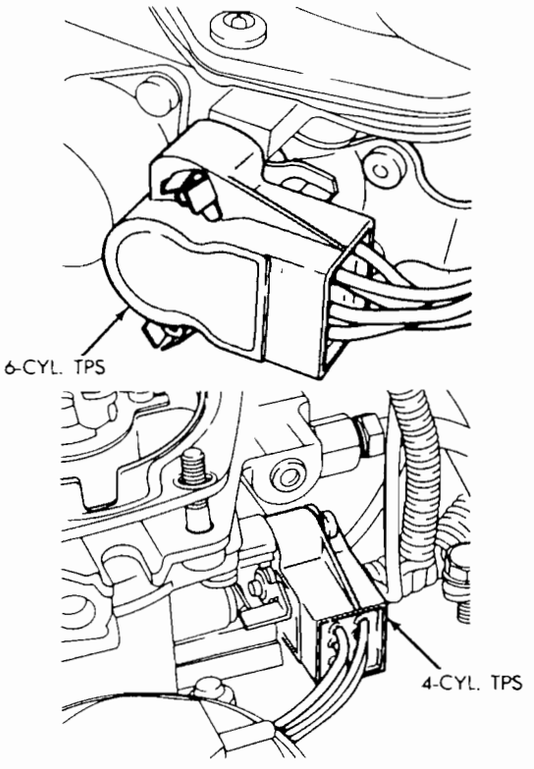


Fig. 44 Throttle Position Sensor (TPS) Identification

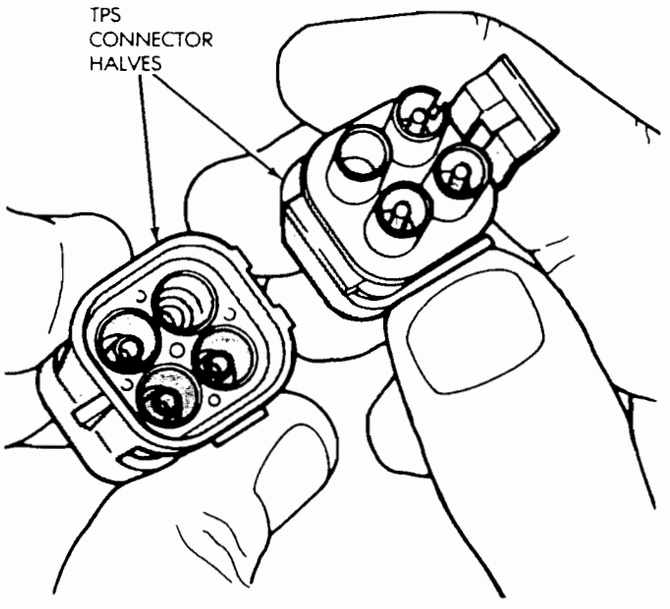


Fig. 45 TPS two-Piece Harness Connector

The connector terminals are identified by the letters A, B, C, D molded into the back of the connector (Fig. 46).

Testing Input Voltage

(1) Turn ignition key to On position.

(2) Do not disconnect the harness connectors to measure voltage in the following steps. Insert the voltmeter test leads through the back of each connector to make contact with the indicated wire terminals.

(3) Connect voltmeter negative lead to terminal D.

(4) Connect voltmeter positive lead to terminal A.

(5) Close throttle plate completely. Be sure throttle lever is seated against idle stop.

(6) Input voltage at terminals A and D should be approximately 5.0 volts on both 4-and 6-cyl. models.

(7) Leave both voltmeter leads in place and proceed to output voltage test.

Testing Output Voltage

(1) Remove voltmeter positive lead from terminal A and reconnect it to terminal B.

(2) On 4-cylinder models, move throttle plate to wide open position and note output voltage. Output voltage should be 4% of input voltage (approximately 0.2 volts).

(3) On 6-cylinder engines, hold throttle plate closed and note output voltage. Voltage should be 82% of input voltage (approximately 4.2 volts).

(4) If output voltage is not within specified range, leave voltmeter connected and proceed to TPS adjustment.

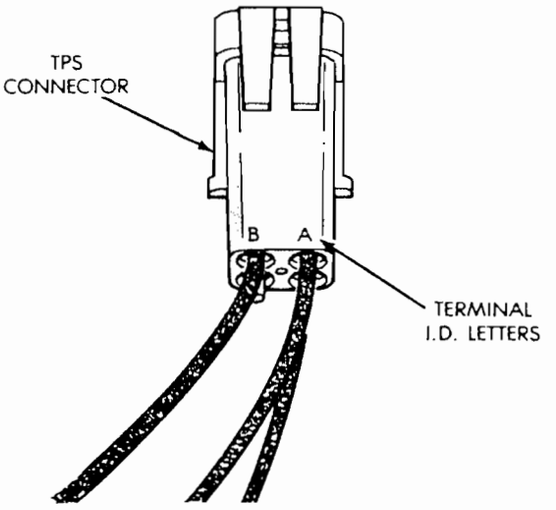


Fig. 46 TPS Connector Terminal Identification

TOYOTA A340 E-H

MULTIPLE SHIFT PROBLEMS

Complaint: *Harsh Shifting.*

Cause: *Large ball in valve body beats into separator plate.*

Correction: *Install new OEM separator plate # 35432-35010 from Toyota.*

Complaint: *Multiple shift problems including misses 2nd gear, misses 3rd gear, no downshift, no overdrive, or cannot cancel overdrive.*

Cause: *Broken or cracked end plugs. Problem may not be visible unless valves are removed*

Correction: *Install updated (stronger) end plugs, also replace retainers designed to accomodate the new end plugs (see figures 1 & 2).*

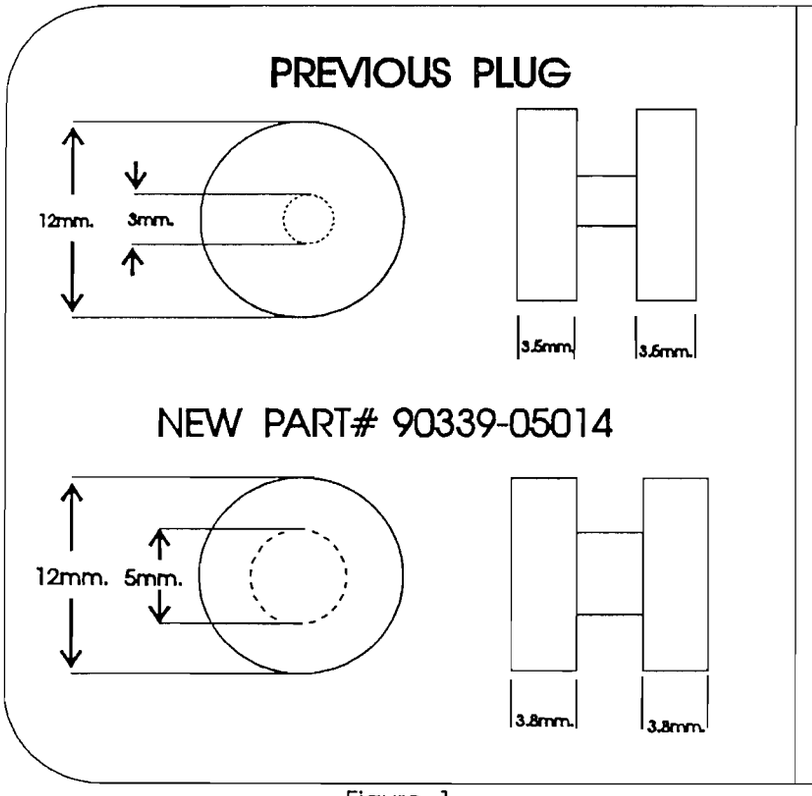


Figure 1

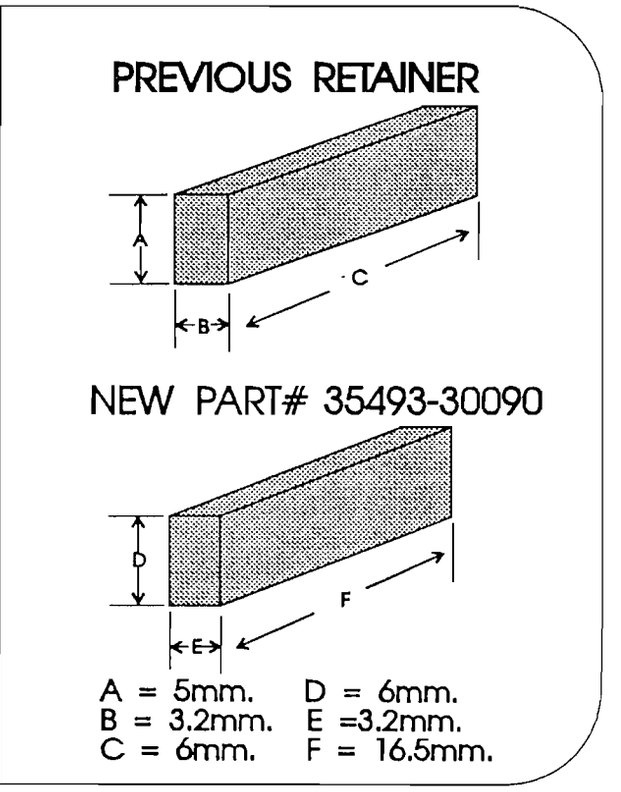


Figure 2

Cadillac STAR CARS

Cadillac has an on board computer system that gives the technician the capability to access trouble codes that may be stored in the vehicle computer memory. This system also has the capability to read sensor outputs. Readings of throttle angle position, Map, Coolant temperature, Battery Voltage, engine RPM, vehicle speed and Prom ID just to mention a few. The 1985 and up models with the 440 T4 (4T60) transmission have body parameters that can be called up. These cover readings of Command Blower voltage, Actual Air Mix Door position, actual fuel level and ECM Prom ID. These parameters are not needed during transmission diagnosis.

To access the computer on the 1990 Cadillac Deville press the OFF and WARMER buttons simultaneously. Hold them till the 1.88, Figure 1 illustrates the panel, reading appears. On the screen on the left side of the steering column,on the Electronic Climate Control panel. You will see what appears to be a double 88 on the Fuel Data Center screen. If there are any trouble codes in the system they will be displayed in the Fuel Data Center screen. First an E will appear then the code displayed E97, example. After the codes have been displayed . A .7.0 Display will appear. When this mode appears we can run the parameter checks. These parameter checks are readings for RPM, Miles Per Hour, Coolant Temperature, Prom ID. (The Prom ID is the identification of the programmable chip that is in the computer module in the event you would have to order a replacement chip.) We also want to mention that we will be checking the information that is in the PCM (Powertrain Computer Module) this is the same as what WAS called the ECM (Engine Computer Module) There was a name change. So as not to confuse you in the earlier modules we will refer to the ECM you will note that there is no difference.

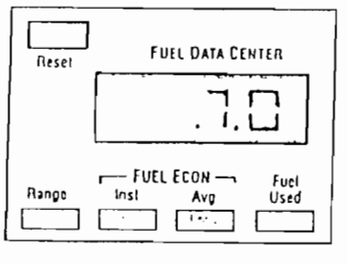


Figure 2

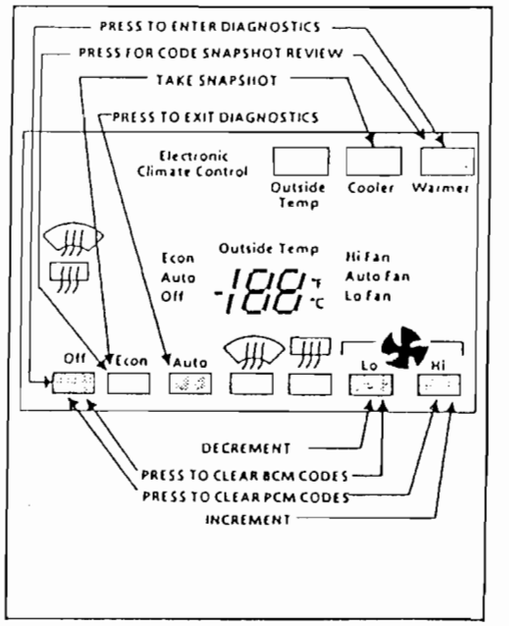


Figure 1

To run the parameter checks we press the Lo button on the ECC (Electronic Climate Control panel) and we will see the mode E.9.0 appear in the FDC (Fuel Data Center panel) Figure 2 Illustrates the PCM parameter Displays. If you wanted to perform a stall test and check the engine RPM it would be P.0.8 and the car speed would be P.0.9 as some examples. To pull up these parameters you would press the HIGH button on the ECC. In the same manner as pressing a door bell. Hold it in for a second. Each time you press the button you will advance to the next higher parameter. If you pass the parameter you wanted then press the low button and it will go back to the lower number. In this manner you will be able to make checks to the sensors that can affect trans mission operation. Now keep in mind that this on board computer system can check many sensors and operations. We will be specializing on the transmission applications.

IF BY CHANCE YOU FEEL YOU HAVE MADE ANY ERROR DURING THIS CHECK JUST PRESS THE AUTO BUTTON ON THE ELECTRONIC CLIMATE CONTROL PANEL. THEN RE-ENTER THE SYSTEM IN THE SAME MANNER AS DESCRIBED.

The graphic displays as shown on The ECC in Figure 3 can be used during a road test. For example when we test drive the vehicle and the transmission shifts into third and the converter clutch applies. VCC (Viscous Clutch Converter) The front windshield defroster graphic will appear. When the vehicle shifts into fourth, the rear window defroster graphic will appear. In most instances the converter clutch graphic will be displayed before the fourth gear switch display. But as transmission oil temperature rises converter clutch engagement will occur at a higher road speed.

Another check that can be used with the ECC panel is a override check of the TCC/VCC solenoid. That is we can manually energize the solenoid from this panel to check if it is working. Ready? Ok we have to press a couple of other buttons. So lets start from the beginning. First we press the OFF and WARMER BUTTONS. When we look over at the FDC and see the .7.0 reading. we then press the ECON and WARMER buttons . Then check the FDC for a E.5.0 display. Figure 4 shows the checks in this mode, we see that E.5.1 is the VCC solenoid check. This is actually an override of the system control. To energize this solenoid we depress the WARMER button this will energize the solenoid. If it is working we will see the front window defroster graphic illuminate on the ECC panel. And if we check with the FDC we will see a 99 which also means its working. If it is not working the will be no illumination of a graphic on the ECC and we will se a .0.0 reading in the FDC.

Figure 4 shows the flow of information that the onboard computer is capable of displaying. As previously mentioned we are primarily interested in the information pertaining to the transmission. But we want to make you aware of the other information available.

Figure 5 list the ECM (PCM) trouble codes. These codes may be similar to the ones listed in some earlier models, but always be sure to use the code charts for the model year covered for the vehicle you are working on. These codes are applicable for the 1988 thru 1990 Cadillac 4.5 liter engine vehicles.

NOTE: THE PARAMETERS P.0.8 IS THE RPM READING and THE P.O.9 IS VEHICLE SPEED. IN THE 1985 THRU 1987 THE RPM IS P.1.1 and THE VEHICLE SPEED P.1.2

NOTE; This model also has what is called the snapshot capability. This is a freeze frame of a reading from a sensor that has show up with a trouble code. We do not cover this capability.

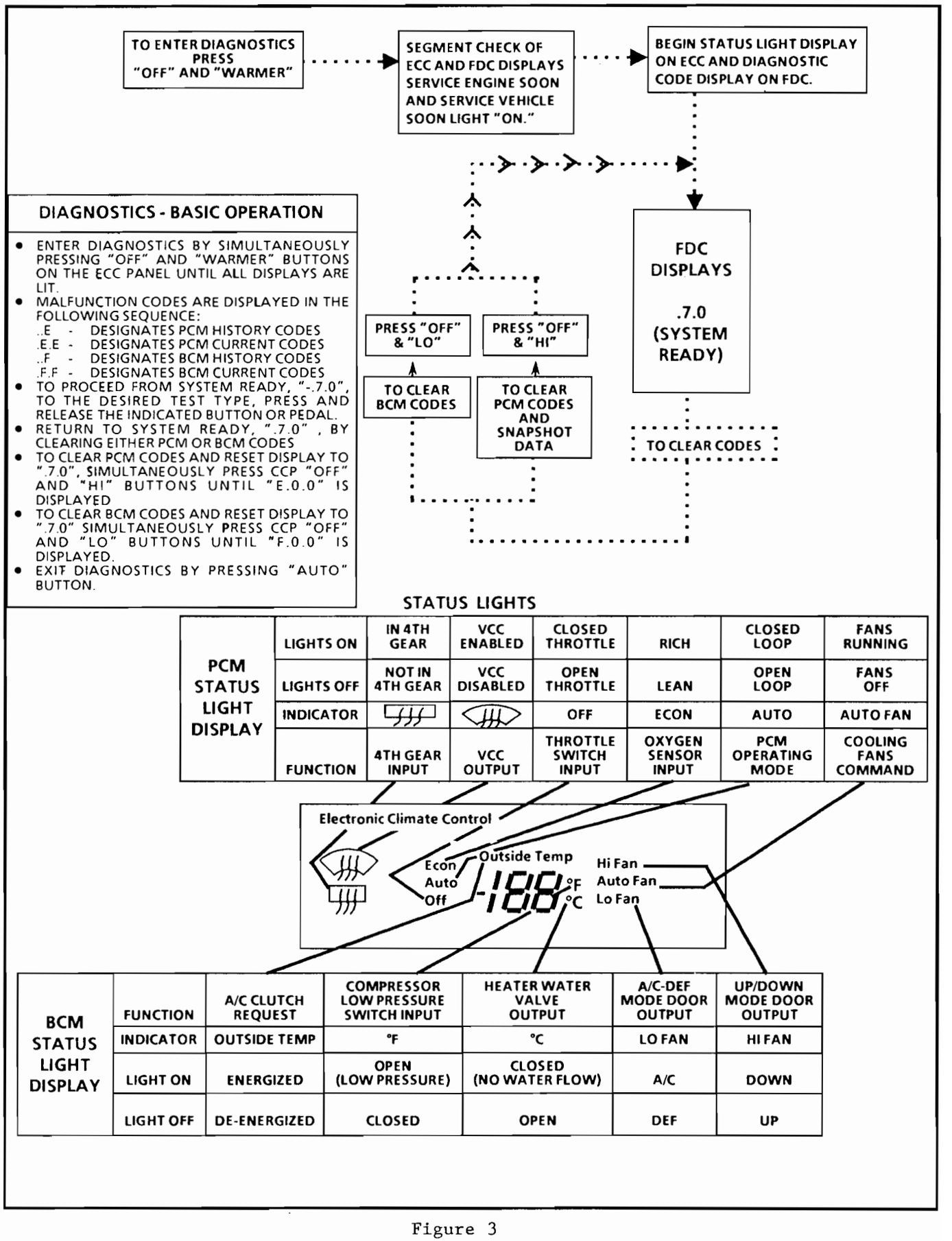
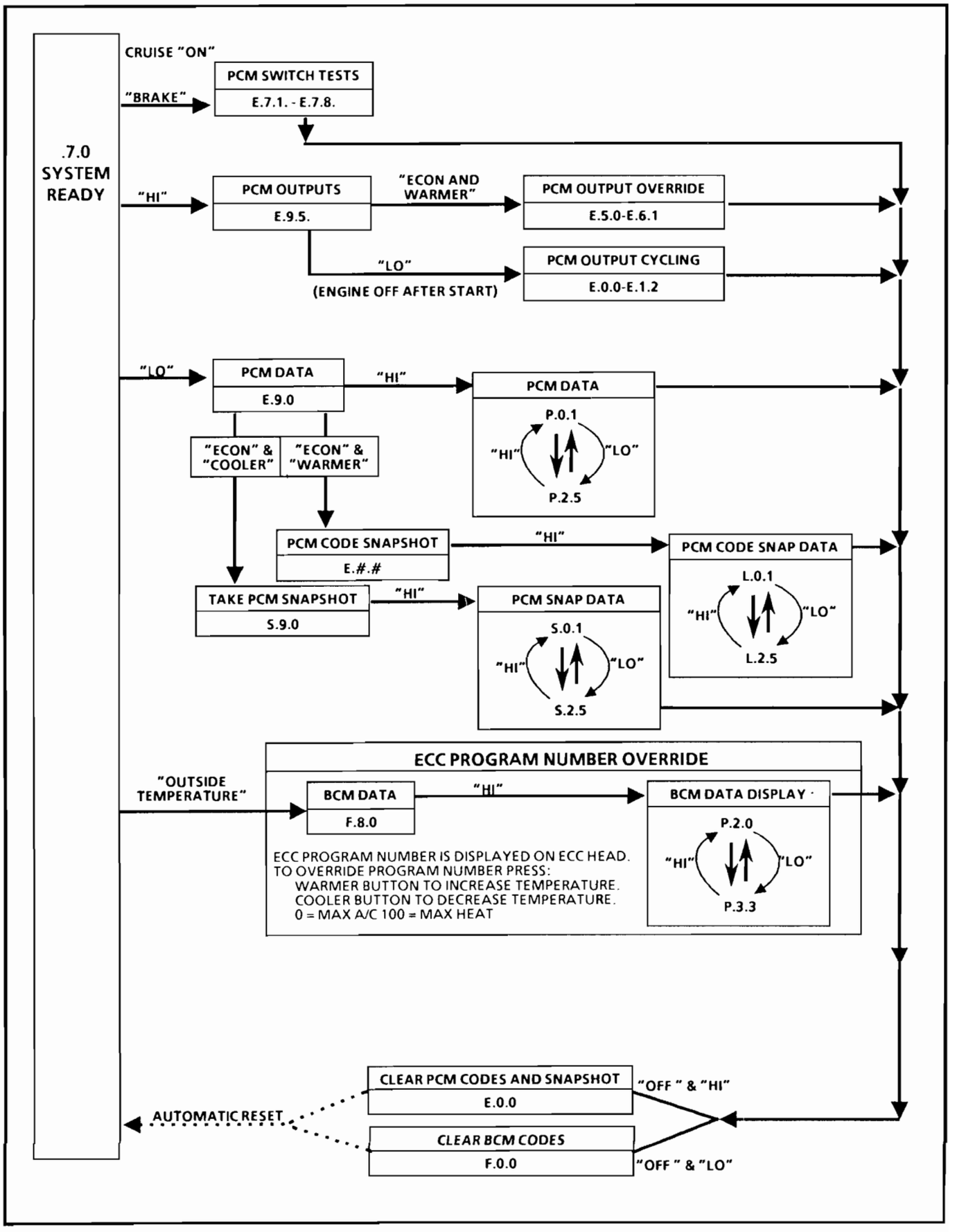

TO ENTER DIAGNOSTICS PRESS "OFF" AND "WARMER"
SEGMENT CHECK OF ECC AND FDC DISPLAYS SERVICE ENGINE SOON AND SERVICE VEHICLE SOON LIGHT "ON."
BEGIN STATUS LIGHT DISPLAY ON ECC AND DIAGNOSTIC CODE DISPLAY ON FDC.
FDC DISPLAYS .7.0 (SYSTEM READY)
PRESS "OFF" & "LO"
PRESS "OFF" & "HI"
TO CLEAR BCM CODES
TO CLEAR PCM CODES AND SNAPSHOT DATA
TO CLEAR CODES
DIAGNOSTICS - BASIC OPERATION
• ENTER DIAGNOSTICS BY SIMULTANEOUSLY PRESSING "OFF" AND "WARMER" BUTTONS ON THE ECC PANEL UNTIL ALL DISPLAYS ARE LIT.
• MALFUNCTION CODES ARE DISPLAYED IN THE FOLLOWING SEQUENCE:
..E - DESIGNATES PCM HISTORY CODES
.E.E - DESIGNATES PCM CURRENT CODES
..F - DESIGNATES BCM HISTORY CODES
.F.F - DESIGNATES BCM CURRENT CODES
• TO PROCEED FROM SYSTEM READY, "-.7.0", TO THE DESIRED TEST TYPE, PRESS AND RELEASE THE INDICATED BUTTON OR PEDAL.
• RETURN TO SYSTEM READY, ".7.0" , BY CLEARING EITHER PCM OR BCM CODES
• TO CLEAR PCM CODES AND RESET DISPLAY TO ".7.0", SIMULTANEOUSLY PRESS CCP "OFF" AND "HI" BUTTONS UNTIL "E.0.0" IS DISPLAYED
• TO CLEAR BCM CODES AND RESET DISPLAY TO ".7.0" SIMULTANEOUSLY PRESS CCP "OFF" AND "LO" BUTTONS UNTIL "F.0.0" IS DISPLAYED.
• EXIT DIAGNOSTICS BY PRESSING "AUTO" BUTTON.
STATUS LIGHTS
PCM STATUS LIGHT DISPLAY
LIGHTS ON | IN 4TH GEAR | VCC ENABLED | CLOSED THROTTLE | RICH | CLOSED LOOP | FANS RUNNING
LIGHTS OFF | NOT IN 4TH GEAR | VCC DISABLED | OPEN THROTTLE | LEAN | OPEN LOOP | FANS OFF
INDICATOR | | | OFF | ECON | AUTO | AUTO FAN
FUNCTION | 4TH GEAR INPUT | VCC OUTPUT | THROTTLE SWITCH INPUT | OXYGEN SENSOR INPUT | PCM OPERATING MODE | COOLING FANS COMMAND
Electronic Climate Control
Econ
Auto
Off
Outside Temp
-188
°F
°C
Hi Fan
Auto Fan
Lo Fan
BCM STATUS LIGHT DISPLAY
FUNCTION | A/C CLUTCH REQUEST | COMPRESSOR LOW PRESSURE SWITCH INPUT | HEATER WATER VALVE OUTPUT | A/C-DEF MODE DOOR OUTPUT | UP/DOWN MODE DOOR OUTPUT
INDICATOR | OUTSIDE TEMP | °F | °C | LO FAN | HI FAN
LIGHT ON | ENERGIZED | OPEN (LOW PRESSURE) | CLOSED (NO WATER FLOW) | A/C | DOWN
LIGHT OFF | DE-ENERGIZED | CLOSED | OPEN | DEF | UP

Figure 3


.7.0 SYSTEM READY
CRUISE "ON"
"BRAKE"
PCM SWITCH TESTS
E.7.1. - E.7.8.
"HI"
PCM OUTPUTS
E.9.5.
"ECON AND WARMER"
PCM OUTPUT OVERRIDE
E.5.0-E.6.1
"LO"
(ENGINE OFF AFTER START)
PCM OUTPUT CYCLING
E.0.0-E.1.2
"LO"
PCM DATA
E.9.0
"HI"
PCM DATA
P.0.1
"HI"
"LO"
P.2.5
"ECON" & "COOLER"
"ECON" & "WARMER"
PCM CODE SNAPSHOT
E.#.#
"HI"
PCM CODE SNAP DATA
L.0.1
"HI"
"LO"
L.2.5
TAKE PCM SNAPSHOT
S.9.0
"HI"
PCM SNAP DATA
S.0.1
"HI"
"LO"
S.2.5
ECC PROGRAM NUMBER OVERRIDE
"OUTSIDE TEMPERATURE"
BCM DATA
F.8.0
"HI"
BCM DATA DISPLAY
P.2.0
"HI"
"LO"
P.3.3
ECC PROGRAM NUMBER IS DISPLAYED ON ECC HEAD.
TO OVERRIDE PROGRAM NUMBER PRESS:
WARMER BUTTON TO INCREASE TEMPERATURE.
COOLER BUTTON TO DECREASE TEMPERATURE.
0 = MAX A/C 100 = MAX HEAT
CLEAR PCM CODES AND SNAPSHOT
E.0.0
"OFF " & "HI"
AUTOMATIC RESET
CLEAR BCM CODES
F.0.0
"OFF " & "LO"

P.0.1 The throttle angle is displayed in degrees, the parameter range is from -10.0 to +90.0. The throttle angle displayed is actual indicated angle, not the throttle angle corrected by the PCM adaptive learning routine. a decimal point will appear before the last digit.

P.0.2 The map value is displayed in kilopascals (kpa), the parameter range is from 14 to 109.

P.0.3 The computed BARO valve is displayed in kilopascals (kpa), the parameter range is from 61 to 103. BARO is calculated from MAP readings taken at wide open throttle (WOT).

P.0.4 The coolant temperature is displayed in degrees celsius (°C), the parameter display range is -40 to 151 °C.

P.0.5 The Manifold Air Temperature (MAT) is displayed in degrees celsius (°C), the parameter display range is -40 to 151 °C.

P.0.6 The spark advance value is displayed in degrees. This valve will agree with a timing light on the engine (+/- 2 degrees) if the base timing has been properly adjusted. the parameter display range is 0 to 90°.

P.0.7 The battery voltage is read in volts. A decimal point will appear before the last digit. The parameter display range is 0 to 25.5 volts.

P.0.8 The engine speed is displayed in rpm/10 (120 should be read as 1,200 rpm). The parameter display range is 0 to 637 multiply the parameter by 10 to get rpm.

P.0.9 The vehicle speed is displayed in miles per hour (mph). The parameter display range is 0 to 255 mph.

P.1.2 The injector pulse width is displayed in milliseconds. A decimal point will appear before the last digit, the parameter display range is 0 to 99.9 ms.

P.1.4 The Oxygen (O2) sensor voltage is displayed in volts, the displayed range is 0 to 1.4 volts. A decimal point will appear before the last two digits.

P.1.6 Oxygen (O2) sensor cross counts is a counter that's incremented by one (1) each time that the Oxygen (O2) sensor "crosses" the line from rich to lean to rich within a 1 second time period.

P.1.8 Fuel integrator is a record of how long the Oxygen (O2) sensor voltage has spent in the rich or lean voltage regions. Fuel integrator starts at 128 counts and is reset to 128 counts on acceleration, deceleration and at heavy engine loads. If the fuel system is running too rich for the current conditions, the integrator gets smaller to indicate less fuel is needed. If the fuel system is running too lean for the current conditions, the integrator gets larger to indicate more fuel is needed. The parameter display range is 0 (Fuel System too Rich, a Lean Command) to 255 (Fuel System too Lean, a Rich Command).

P.2.0 Block learning is derived from the fuel integrator value and is used for long term correction of fuel delivery. A value of 128 counts indicates that fuel delivery is at the proper rate to maintain a 14.7/1 air/fuel ratio and no correction is needed. A valve below 128 counts means that the fuel system is too rich and fuel delivery is being reduced (decreases injector pulsewidth). A value above 128 counts indicates a lean condition exists and the PCM is compensating by adding fuel (increased injector pulsewidth). A value is between 118 and 138 counts is generally considered normal. Display range is 0 to 255 counts.

P.2.1 The Cruise Control Servo Position is displayed in percent (%). A valve closed to 0% indicates that the cruise control servo has retracted to full stroke.

P.2.2 Third and fourth gear status is displayed as a code. "10" is displayed when third gear pressure switch is closed. With the 3rd and 4th gear pressure switch is closed "11" is displayed. When "00" is displayed that indicates that both switches are open.

P.2.3 Park/Neutral (P/N) switch status is displayed as a code. "10" is displayed with the switch closed (park or neutral selected) and "11" is displayed with the switch open (Rev, D1, D2, D3, or D4 selected).

P.2.4 The ignition cycle counter displays is the number of times that the ignition has been cycled to "OFF" since a PCM trouble code was last detected. After 50 ignition cycles without any malfunctions being detected, all stored PCM codes are cleared and the counter is reset to 0.

P.2.5 The PCM PROM I.D. is displayed as a number up to three digits long which can be used to verify that the proper PROM was installed in the PCM.

1988-1992

FDC DISPLAY OF PCM DATA			
PARAMETER NUMBER	PARAMETER	DISPLAY RANGE	DISPLAY UNITS
P.0.1	THROTTLE POSITION	-10.0 TO 90.0	DEGREES
P.0.2	MAP	14 TO 109	KPA
P.0.3	COMPUTED BARO	60 TO 102	KPA
P.0.4	COOLANT TEMPERATURE	-40 TO 151	°C
P.0.5	MAT	-40 TO 151	°C
P.0.6	SPARK ADVANCE	0 TO 90	DEGREES
P.0.7	BATTERY VOLTAGE	0 TO 25	VOLTS
P.0.8	ENGINE SPEED	0 TO 637	RPM/10
P.0.9	VEHICLE SPEED	0 TO 255	MPH
P.1.2	INJECTOR PULSE WIDTH	0 TO 99.6	MILLISECONDS
P.1.4	O_2 SENSOR VOLTAGE	0 TO .99	VOLTS
P.1.6	O_2 CROSS COUNTS	0 TO 255	COUNTS/SEC
P.1.8	FUEL INTEGRATOR	0 TO 255	COUNTS
P.2.0	BLOCK LEARN	0 TO 255	COUNTS
P.2.1	CRUISE SERVO POSITION	0 TO 100	PERCENT
P.2.2	PRNDL (CKT 772, 773)	00 TO 11	0 = SW. CLOSED
P.2.3	PRNDL (CKT 771, 776)	00 TO 11	0 = SW. CLOSED
P.2.4	IGNITION CYCLES	0 TO 255	KEY CYCLES
P.2.5	PROM ID	0 TO 999	•CODE

1985-1987

ECM DATA			
PARAMETER NUMBER	PARAMETER	DISPLAY RANGE	DISPLAY UNITS
P.0.1	Throttle Position	– 10.0 - 90.0	Degrees
P.0.2	MAP	14 - 109	kPa
P.0.3	Computed BARO	61 - 103	kPa
P.0.4	Coolant Temperature	– 40 - 151	°C
P.0.5	MAT	– 40 - 151	°C
P.0.6	Injector Pulse Width	0 - 99.9	ms
P.0.7	Oxygen Sensor Voltage	0 - 1.14	Volts
P.0.8	Spark Advance	– 30 - 60	Degrees
P.0.9	Ignition Cycle Counter	0 - 50	Key Cycles
P.1.0	Battery Voltage	0 - 25.5	Volts
P.1.1	Engine RPM	0 - 6370	RPM ÷ 10
P.1.2	Ca Speed	0 - 255	MPH
P.1.3	Oxygen Sensor Cross Cts.	0 - 255	Number
P.1.4	Fuel Integrator	0 - 255	Counts
P.1.5	VCC Volts	0 - 5.12	Volts
P.1.6	ECM PROM ID	0 - 999	Code •

Figure 5

PCM DIAGNOSTIC CODES

CODE	DESCRIPTION	TELLTALE STATUS
E012	No Distributor Signal	A
E013	Right Oxygen Sensor Not Read	A,P
E014	Shorted Coolant Sensor Circuit	A
E015	Open Coolant Sensor Circuit	A
E016	Voltage Out Of Range[ALL SOL.]	B
E017	Left Oxygen Sensor Not Ready	A
E019	Shorted Fuel Pump Circuit	B
E020	Open Fuel Pump Circuit	B
E021	Shorted TPS Circuit [VCC]	A
E022	Open TPS Circuit [VCC]	A
E023	EST Signal Problem [EGR]	A
E024	VSS Circuit Problem [C/C, VCC]	A,Q
E026	Shorted Throttle Switch Circuit [EGR]	A
E027	Open Throttle Switch Circuit [EGR]	A
E030	ISC RPM Out Of Range	A
E031	Shorted MAP Sensor Circuit	A
E032	Open MAP Sensor Circuit	A
E034	MAP Sensor Signal Out Of Range	A
E037	Shorted MAT Sensor Circuit	A
E038	Open MAT Sensor Circuit	A
E039	VCC Engagement Problem [VCC]	A,F
E040	Power Steering Pressure Switch	A
E041	Cam Sensor Circuit Problem	A
E042	Left Oxygen Sensor Lean	A,P
E043	Left Oxygen Sensor Rich	A,P
E044	Right Oxygen Sensor Signal Lean	A,P
E045	Right Oxygen Sensor Signal Rich	A,P
E046	Right To Left Bank Fueling Problem	A
E047	BCM—PCM Data Problem	A

CODE	DESCRIPTION	TELLTALE STATUS
E048	EGR Control Problem	A
E051	MEM-CAL Error	A
E052	PCM Memory Reset	C
E053	Distributor Signal Interrupt	C
E055	TPS Misadjusted	C
E058	PASS Control Problem	C
E060	Cruise-Transmission Not In Drive [C/C]	C
E061	Cruise-Vent Solenoid Problem [C/C]	C
E062	Cruise-Vacuum Solenoid Problem [C/C]	C
E063	Cruise-Speed vs Set Speed [C/C]	C
E064	Cruise-Vehicle Acceleration [C/C]	C
E065	Cruise-S P S Failure [C/C]	C
E066	Cruise-RPM Out Of Range [C/C]	C
E067	Cruise-Switch Shorted At Enable [C/C]	C
E068	Cruise Command Problem [C/C]	C,Q
E070	Intermittent TPS	C
E071	Intermittent MAP	C
E073	Intermittent Coolant Sensor	C
E074	Intermittent MAT	C
E075	Intermittent VSS	C
E080	Fuel System Rich	A
E085	Throttle Body Service Required	A
E090	VCC Brake Switch Input Problem [C/C]	B
E091	PRNDL Switch Problem [C/C]	B
E092	Heated Windshield Problem	B
E096	Torque Converter Overstress	A
E097	High RPM P/N to D/R Shift	C
E098	High RPM P/N To D/R Shift Under ISC	C
E099	Cruise Servo Apply Problem [C/C]	C

TELLTALE STATUS

A = "SERVICE ENGINE SOON" Light ON.
B = "SERVICE CAR SOON" Message On DIC.
C = NO TELLTALE or Message.
F = DISENGAGES VCC FOR IGNITION CYCLE
P = ENABLES CANISTER PURGE
Q = DISABLES CRUISE FOR IGNITION CYCLE
[ ] = BRACKETED SYSTEMS ARE DISABLED WHEN CODE IS CURRENT

M66001-8D1-C-I

PCM Output Overrides

DIAGNOSTIC DISPLAY	OVERRIDE
E.5.0	NO OVERRIDE
E.5.1	VCC
E.5.2	EGR
E.5.3	ISC
E.5.4	INJECTORS (1-8)
E.5.5	FUEL PUMP RELAY
E.5.7	CRUISE SERVO
E.5.8	COOLANT FANS
E.5.9	FIXED SPARK
E.6.0	INJECTOR FLOW
E.6.1	TRANSAXLE SHIFTING
PRESSING "WARMER" WILL INCREASE OR ACTIVATE. PRESSING "COOLER" WILL DECREASE OR DEACTIVATE.	

Figure 4

This mode can be initiated after E.9.5 is displayed on the Fuel Data Center (FDC). Depressing the "ECON" and "WARMER" buttons at this time will bring the display to E.5.0 and initiate this test. To advance the display, depress the "HI" button on the ECC. If the test conditions are not appropriate for performing the test, the FDC will display "8.8.8." until test conditions are correct or test is bypassed. To return to a lower number parameter, depress the "LO" button on the ECC. The test selections available are the following:

- E.5.0 - No Override
- E.5.1 - VCC Override
- E.5.2 - EGR Override
- E.5.3 - ISC Override
- E.5.4 - Injectors (1 - 8) Override
- E.5.5 - Fuel Pump Relay Override
- E.5.7 - Cruise Servo Override
- E.5.8 - Coolant Fans Override
- E.5.9 - Fixed Spark Override
- E.6.0 - Injector Flow Override
- E.6.1 - Transmission Shift Override

A brief summary is provided below:

E.5.1 While in this mode, the PCM will transmit the commanded state of the VCC to the BCM for display. This is done at all times when the VCC solenoid override mode is active. If the "WARMER" button is depressed, the VCC solenoid is commanded "ON" as long as the "warmer" button is depressed. If the "COOLER" button is depressed, the VCC solenoid is commanded "OFF" as long as the "COOLER" button is depressed. If no button is depressed, the PCM controls the VCC solenoid normally.

E.5.2 While in this mode, the PCM will transmit the commanded state of the EGR flow to the BCM for display. The indication "99" reflects full EGR flow and "00" reflects no EGR flow. This is done at all times when the EGR solenoid override mode is active. If the "WARMER" button is depressed, the EGR solenoid is commanded "ON" as long as the button is depressed. If the "COOLER" button is depressed, the EGR solenoid is commanded "OFF" as long as the button is depressed. If no button is depressed, the PCM controls the EGR solenoid normally.

NOTE: Due to the use of a positive backpressure type EGR valve, this test will have no significance at idle.

E.5.3 While in this mode, the ISC motor can be commanded and held to a fully retracted position through the use of the ECC "COOLER" and "WARMER" buttons. For this function to be enabled, the vehicle must be standing still and the transmission placed in park or neutral. If the "COOLER" button is depressed, the ISC retracts and is held to its low position.

The PCM will transmit a "00" to the BCM for display on the CCP when this button has been depressed. Depressing the warmer button issues an "extend" command to the ISC motor until the throttle switch closes. The PCM will transmit a "99" to the BCM for display on the CCP when this button is depressed. When the throttle switch closes, normal control of the ISC is restored. During this test, the A/C compressor clutch is commanded "OFF," the EGR is commanded "OFF" and the spark advance is fixed.

E.5.4 While in this mode, each of the eight fuel injectors can be individually selected and turned "OFF" using the ECC "WARMER" and "COOLER" buttons. For this test to be enabled, the vehicle must be at rest and the transmission placed in Park or Neutral. With the "COOLER" button depressed, the selected injector is turned "OFF" and "00" transmitted to the BCM for display on the FDC. The selected injector will remain "OFF" for as long as the "COOLER" button is depressed and held. Depressing the "WARMER" button selects the injector number to be tested. With the "WARMER" button depressed and held, the selected injector number is incremented at a rate of one per second and transmitted to the BCM for display on the FDC.

E.5.5 While in this mode, the fuel pump relay is commanded "OFF" using the ECC "COOLER" button. For this test to be enabled, the vehicle must be at rest and the transmission placed in Park or Neutral. With the "COOLER" button depressed and held, the FDC will display "00", indicating that the fuel pump relay has been de-energized. Releasing the "COOLER" button causes "99" to be displayed and normal control of the fuel pump relay is resumed.

E.5.7 While in this mode, the cruise control servo position can be changed using the ECC "WARMER" and "COOLER" buttons. Depressing the "WARMER" button will retract the cruise servo and increase commanded servo position 1% at a time to a maximum of 100%. Depressing the "COOLER" button will command a decrease in servo position and extend the cruise servo 1% at a time to a minimum of 0%. The FDC will display the current commanded cruise control servo position in percent.

NOTE: The engine should be run and then shut "OFF" immediately prior to using the cruise control override to ensure that sufficient vacuum is available to operate the cruise control servo. The cruise servo position override test cannot be performed with the engine running.

E.5.8 While in this mode, the "COOLER" button is depressed to invert the state of the low-speed fan relay "00" will be displayed with the fans not running. With the fans running at low speed and the low speed relay energized, the FDC will display "10". The "WARMER" button is depressed to invert the high speed fans operation. With the fans running at high speed, "11" will be displayed on the FDC to indicate that the high and low-speed fan relays are energized.

E.5.9 While in this mode, spark advance is controlled manually and displayed on the FDC in degrees. The first time the "COOLER" button is depressed and released, spark angle is fixed at 10° BTDC. The second and subsequent time "COOLER" is depressed, spark is retarded 1° to 2° until 0° (TDC) is reached. Each time the "WARMER" button is depressed, spark is advanced 1° to 2° until the PCM controlled spark advance commanded when the override was initiated is reached. Spark cannot be advanced beyond this point and the FDC will display "8.8.8".

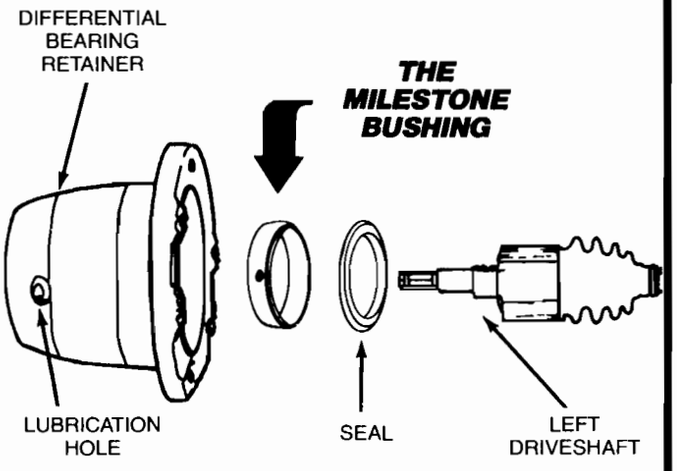
E.6.0 While in this mode, each of the fuel injectors can be individually selected and energized once per engine run cycle. The injector to be tested is selected by depressing and holding in the "COOLER" button. The FDC will display the injector number, which will be incremented at a rate of 1 per second. Depressing the "WARMER" button energizes the displayed injector for 500 milliseconds. Each injector can be energized only once per engine run cycle to avoid possible engine flooding. "8.8.8" will be displayed and the override disabled if an injector has been energized and an attempt is made to energize the same injector during the same run cycle.

E.6.1 In this mode, the transaxle can be down shifted by depressing the cooler button and upshifted by depressing the warmer button. The transaxle will not down shift from 2nd to 1st above 30 mph or from 3rd to 2nd above 60 mph.

NEW INVENTION!

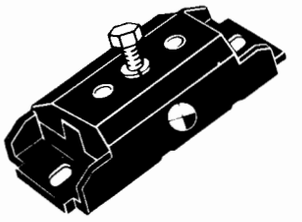
The Milestone "Trans-Axle Fix-it Bushing"

Now, it's **EASY TO FIX** that Vibrating, Leaking and Self Destructive Chrysler Trans-Axle, and at the same time eliminate the wear on it's Spider gear, Carrier and Differential Bearing. And, you can fix-it without removing the trans-axle.



Fits: **A413 • A470 • A465 • A525 • A520**

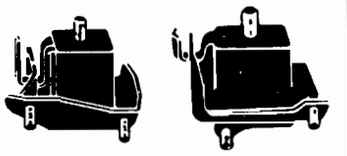
Chrysler 4/5 Speed and Automatic Trans-Axles for the 1978 to 1993 New Yorker, LeBaron, Caravelle, Omni, Horizon, GTS, Turisimo, Voyager, Caravan, Charger, Daytona, Aries, Lancer, Mini Van, Reliant, Laser and 600.



multi-fit™

MOUNTS

The Patented 2000 Universal GM
Replaces 6 OE Transmission Mounts that fit 85% of all RWD 1958 to 1992.



The NEW MT133-2 & MT134-2
Replaces 5 THM125 GM FWD Mounts 1980 to 1992.

MT130 now with modified long bolt
Replaces 4 GM car & truck THM200 & 700 series mounts.

The MT146 Insert
Replaces 5 GM FWD THM325 & 4 L Transmission Mounts

JUST OUT! MO214 & MO216 Universal
Replace 5 GM TH125 Troque Strut Mounts. (Cover 90% of the 125's on the road!)

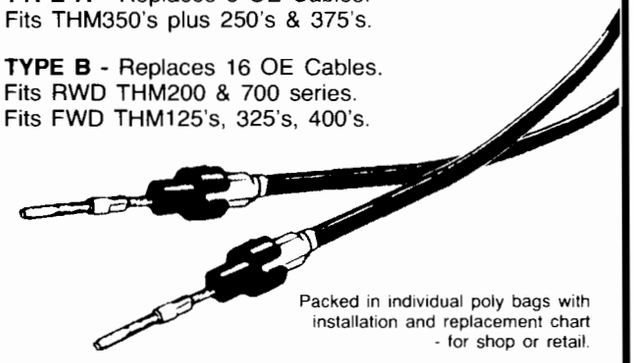
Giant Mount Wall Chart Available.
Send $2.00 M&H cost to Southeast.

multi-fit™ **Adjustable**

DETENT CABLES

TYPE A - Replaces 6 OE Cables.
Fits THM350's plus 250's & 375's.

TYPE B - Replaces 16 OE Cables.
Fits RWD THM200 & 700 series.
Fits FWD THM125's, 325's, 400's.



Packed in individual poly bags with installation and replacement chart - for shop or retail.

Southeast
Worldwide Manufacturers
A Division of Consulier Engineering

CORPORATE HEADQUARTERS:
7500 N.W. 77th Terrace, Miami, FL 33166

(305) 885-8689
Fax (305) 888-8215
1-800-888-5489

Southeastools
TRANSMISSION REBUILDER TOOLS

We manufacture Solutions for the Transmission Industry

- FLYWHEEL ASSEMBLIES
- SPRINGS
- SPEEDOGEARS
- PLASTIC GROMMETS
- BUSHINGS
- SOUTHEAST REBUILDER TOOLS

MAZDA G4A-EL / FORD PROBE

LOW PUMP PRESSURE

COMPLAINT: *Low pump pressure.*

CAUSE: *The spool valve in the pump did not have a seat for the spring. The spring will hang the valve and cause low line pressure (figure 1).*

CORRECTION: *Order updated valve from Ford. It has a seat formed on the valve for the spring and will work on both units (figure 2) part # FO2Z-7Z306-A.*

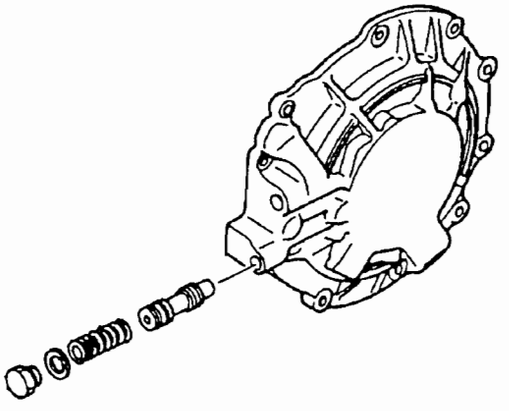


FIGURE 1

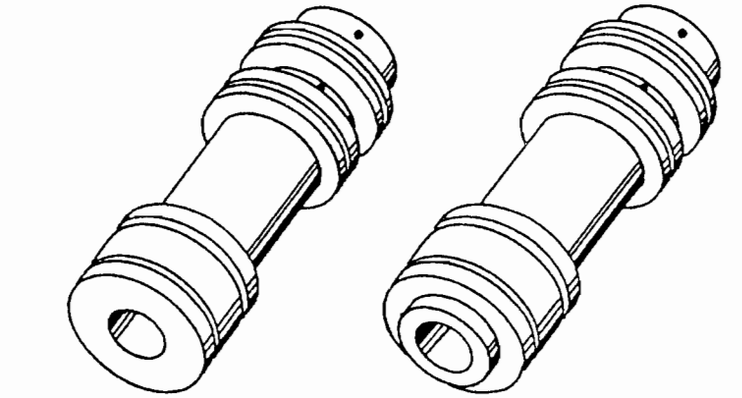


FIGURE 2

MAZDA N4AEL
SOFT OR FLARED SHIFTS WHEN WARM

Complaint: Shifts seem fine when cold, but become increasingly drawn out as the transmission warms up.

Cause: Valve body calibration problems related to fluid temperature.

Correction:
1. Check all accumulator piston teflon rings for fit.
2. Replace the 1-2 accumulator piston teflon rings with suitable "O" rings. Replace the 1-2 accumulator spring with a stronger spring(A 700-R4 throttle plunger spring is sufficient if it is shimmed 1/4 in. on the piston side). **SEE FIGURE 1.**
3. Move orifice **B** (servo release orifice) to the orifice **D** (direct clutch orifice) location and move the orifice **D** to the orifice **B** location. **SEE FIGURE 2.**
4. Replace the intermediate band servo spring with a weaker one. The L4N71B servo spring is weaker or a blue accumulator spring from an AXOD.

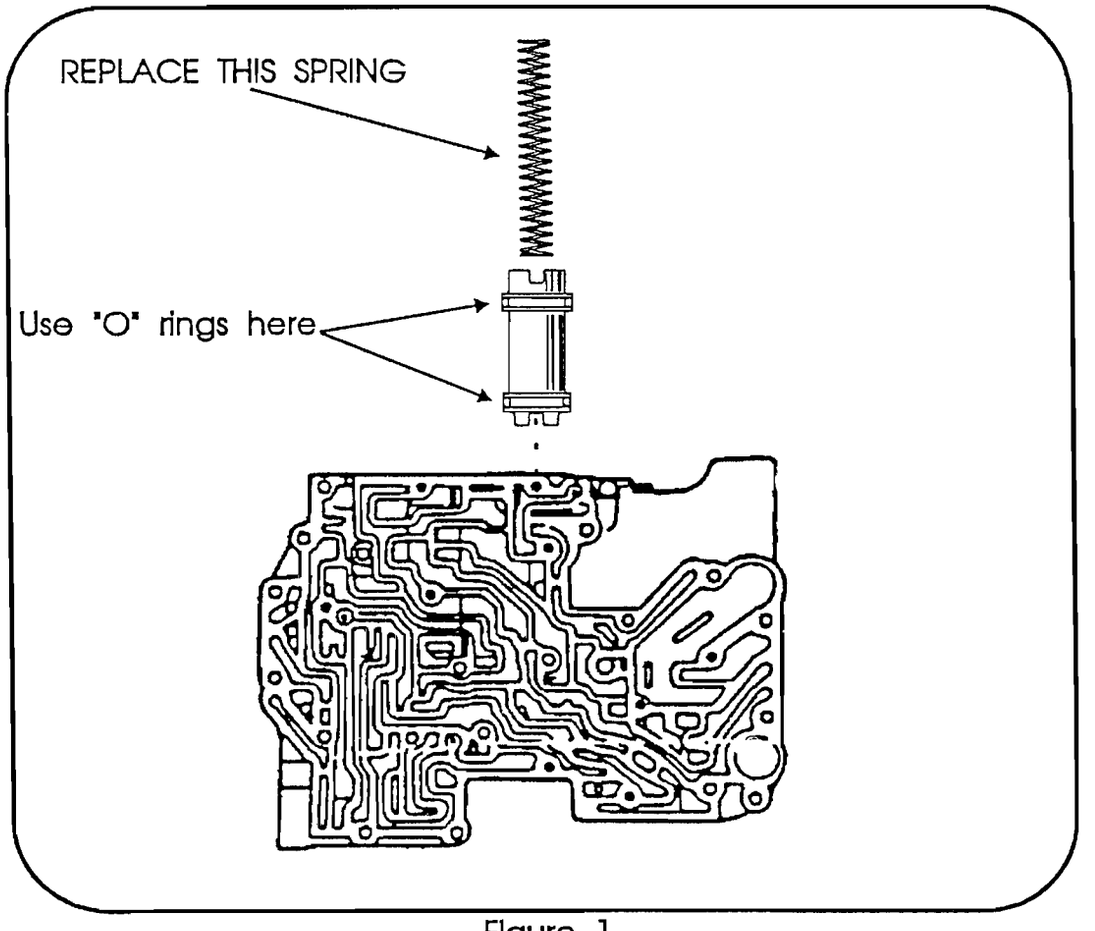
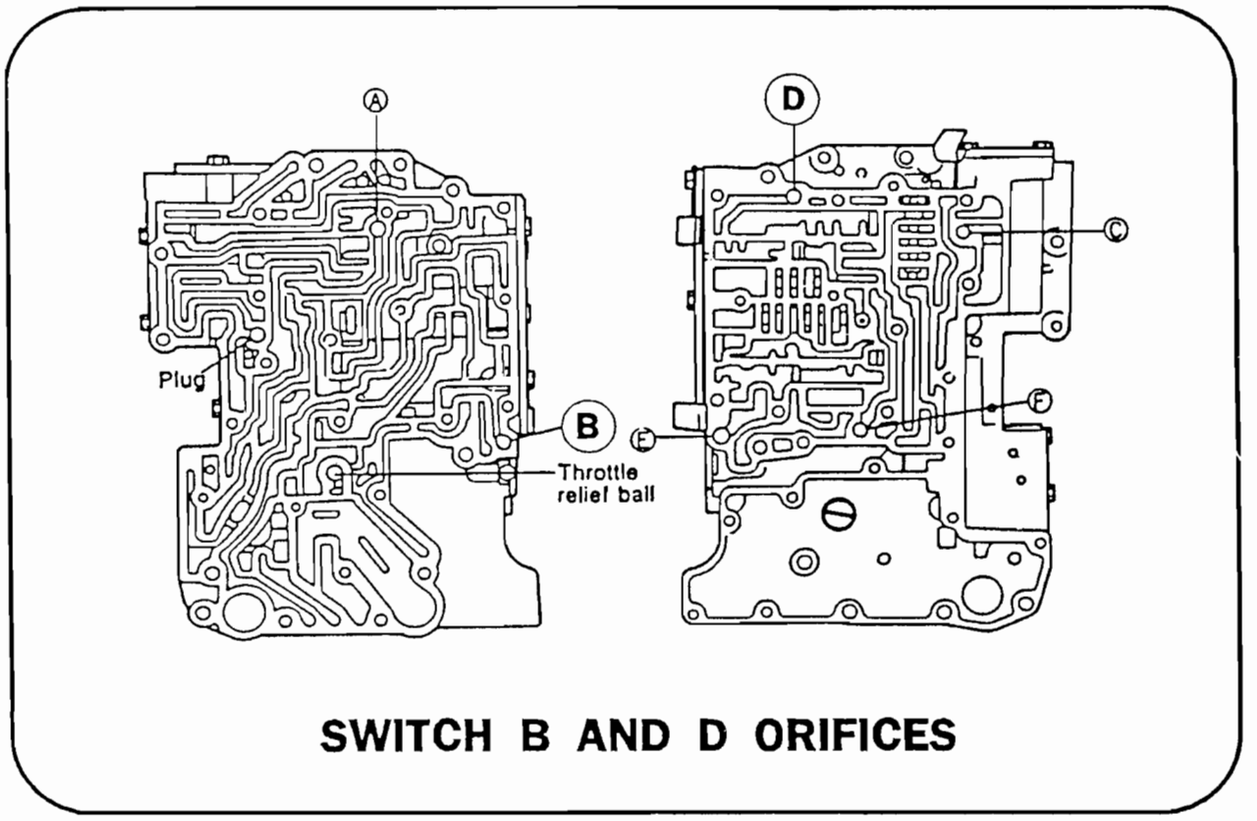


Figure 1.



SWITCH B AND D ORIFICES

Figure 2.

ZF 4HP-18
2 - 3 FLARE

COMPLAINT: INTERMITANT FLARE ON A 2-3 SHIFT. THE FLUID IS CLEAN AND DOES NOT HAVE A BURNT ODER TO IT.

CAUSE: THE INTERMEDIATE SPRAG IS FAILING TO HOLD THE INTERMEDIATE CLUTCHES CAUSING A FLARE UNTIL THE 3-4 CLUTCHES APPLY.

CORRECTION: REPLACE THE INTERMEDIATE SPRAG ASSEMBLY, REFER TO FIGURE 1 BELOW.

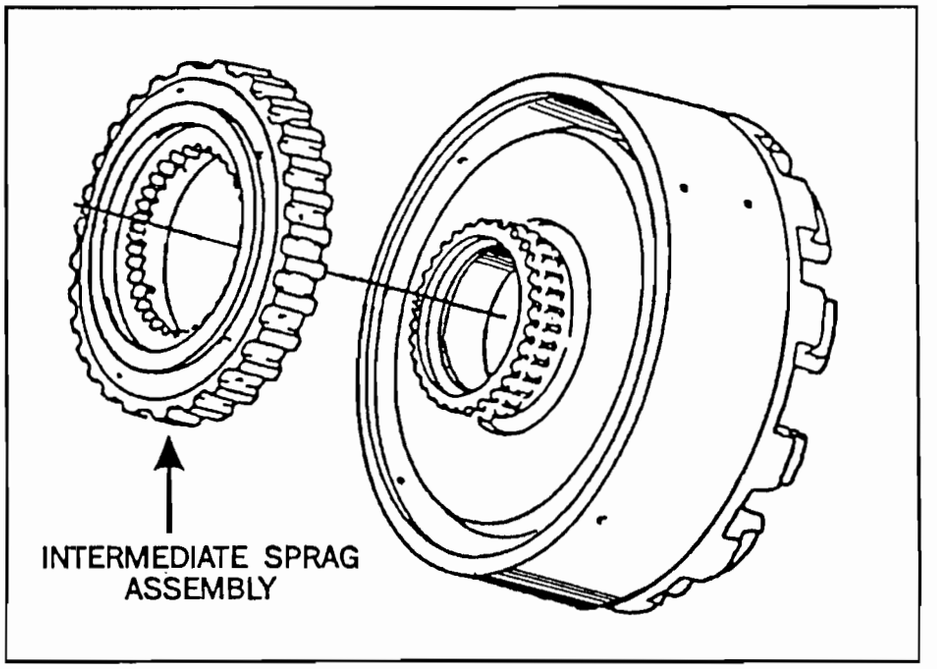


FIGURE 1

SAAB 9000 / EAGLE PREMIER (ZF4HP-18)
DELAYED OR NO REVERSE

COMPLAINT: Transaxle may exhibit a long delay into reverse or no reverse range at all. The forward gears are fine.

CAUSE: The reverse drum sleeve has moved forward in the drum and blocks the two oil feed holes (see figure 1). The normal position of the sleeve is about .060 in. above the drum surface and covers 50% of the feed holes (see figure 2).

CORRECTION: Replace the reverse drum.

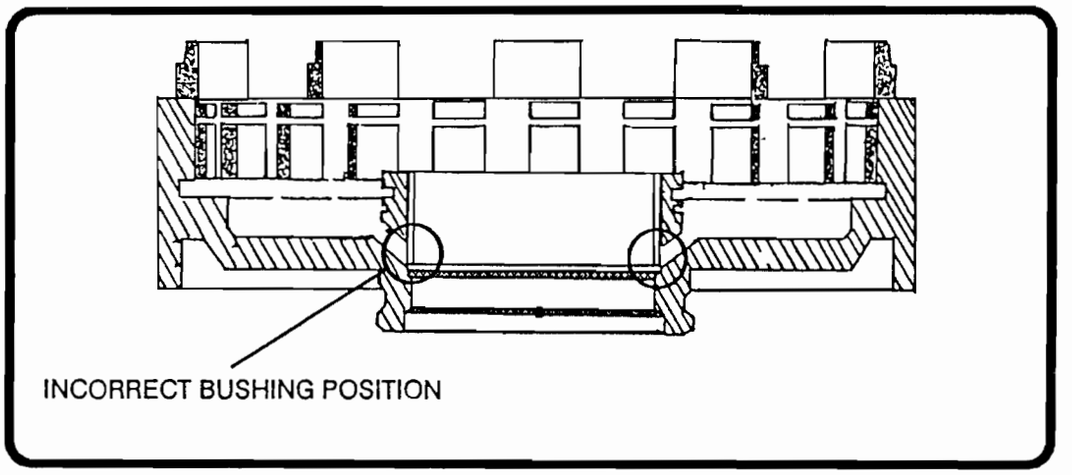


FIGURE 1

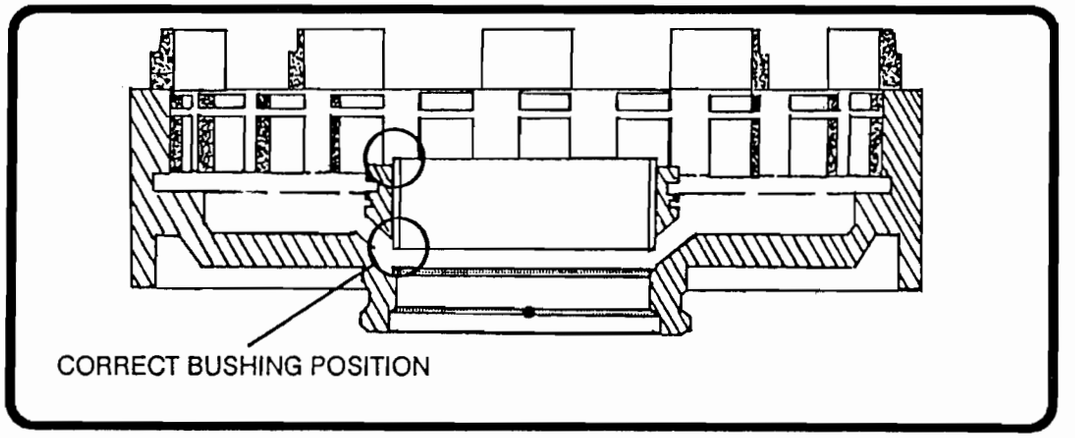


FIGURE 2

HONDA - ACURA 3 & 4 SPEED
ALL T.V. CABLE CONTROLLED TRANSXALES

COMPLAINT: Slipping, shudders, hard up or down shifts and trans failure

CAUSE: Improper T.V. cable timing.

CORRECTION: The #1 cause of transaxle problems can be corrected by properly adjusting the T.V. cable with a pressure gauge. Adjust the T.V. cable using the following procedure.

Step 1 Connect a pressure gauge to the T.V.B. pressure tap (check service manual exact model location).
Step 2 Warm up engine, it must be off of high idle.
Step 3 Apply the brake and place the vehicle into D4 or S4.
Step 4 From the drivers seat check the pressure gauge. At idle the gauge should read 0 psi, if the gauge reads more than 0 adjust the locking nut as necessary to read 0 psi.
Step 5 With the breaks applied, gently press the accelerator untill you hear the slightest engine rpm change. At that moment the needle of the gauge must start to rise, if you don't get a pressure rise at that moment adjust as necessary.
Step 6 Press the accelerator quickly to the floor, The pressure should rise to 100 psi then to 250 psi.

HONDA - ACURA 4 SPEED
HIGH LINE PRESSURE

COMPLAINT: Harsh engagement, harsh shifts, high line pressure.

CAUSE: Pressure regulator retaining bolt jamming spring retainer (figure 1).

CORRECTION: When installing retainer and bolt make sure that the slot on the retainer lines up with the bolt hole before installing the bolt (figure 2).

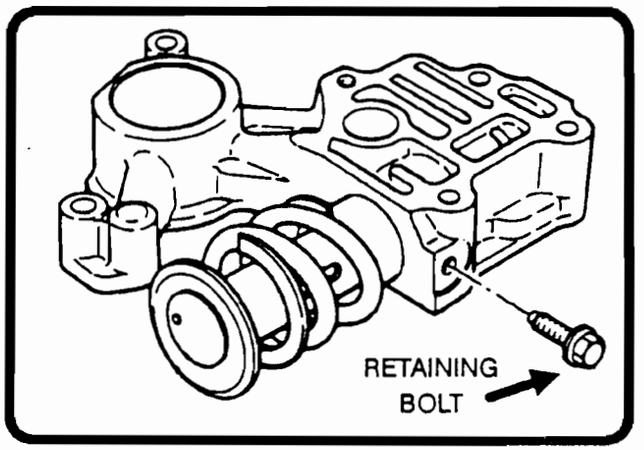


FIGURE 1

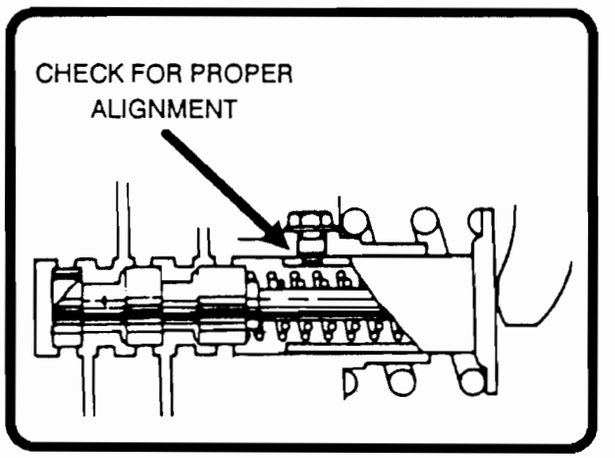


FIGURE 2

ACURA COMPUTER CONTROLLED 4 SPEED ERRATIC 4-2 DOWNSHIFTS

COMPLAINT: *Good up shifts to fourth gear but drops to second gear unexpectedly.*

CAUSE: *Filter located in main portion of valve body damaged or restricted with foreign materal causing pressure loss to the shift solenoids.*

CORRECTION: *Clean or replace filter (see figure 1).*

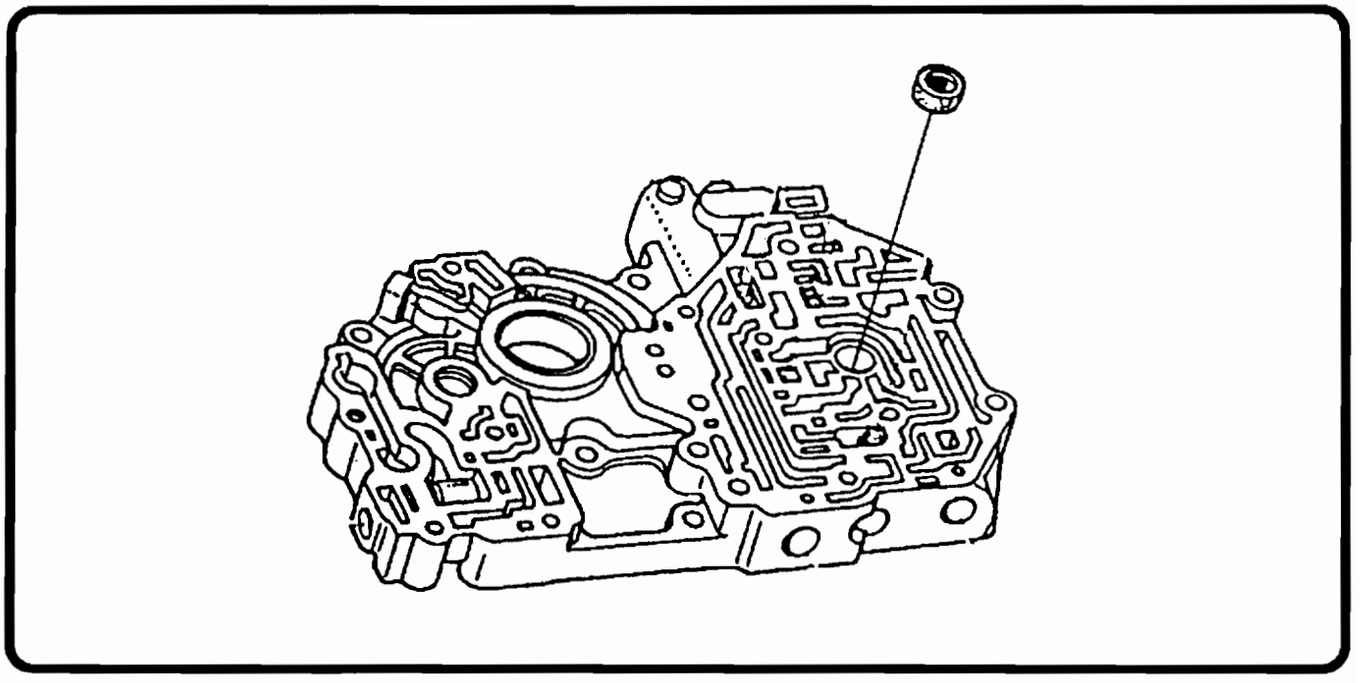


Figure 1

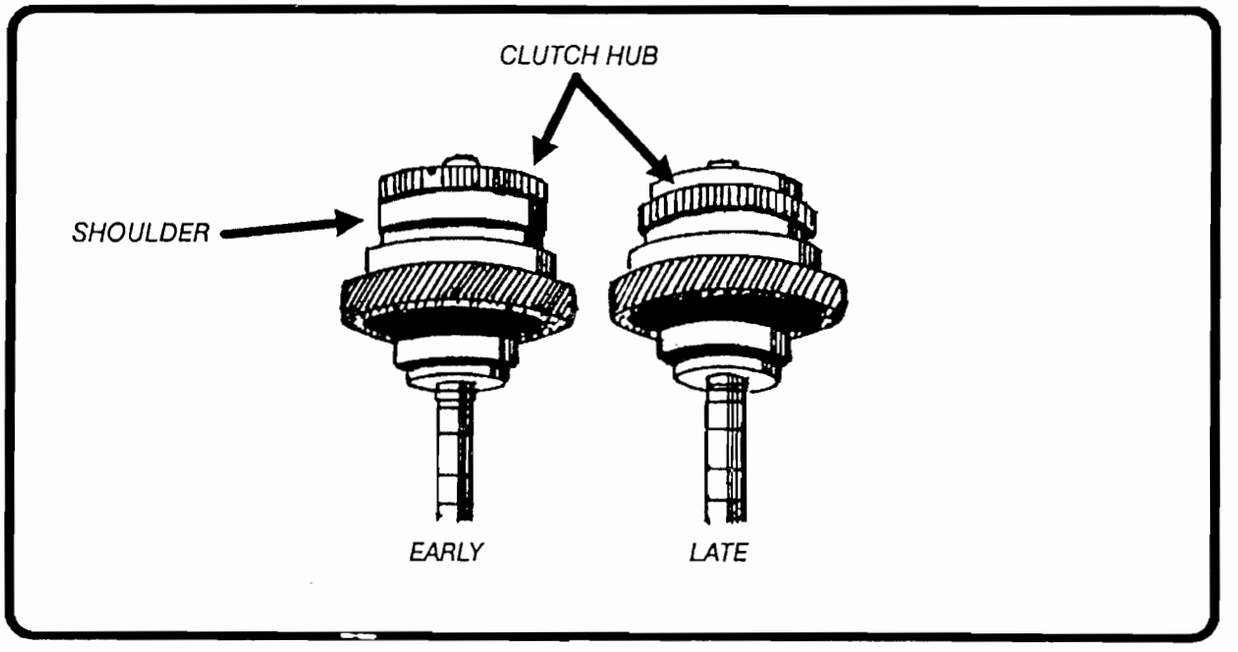
TOYOTA A-140

NO REVERSE AFTER OVERHAUL

COMPLAINT: *No reverse all forward ranges good. (Overdrive planetary assembly changed during rebuild).*

CAUSE: *One cause may be a late planetary assembly installed in an early transaxle. The over-run clutches can no longer hold the planetary assembly as the hub for the clutches are in different location.*

CORRECTION: *Install the correct planetary assembly.*

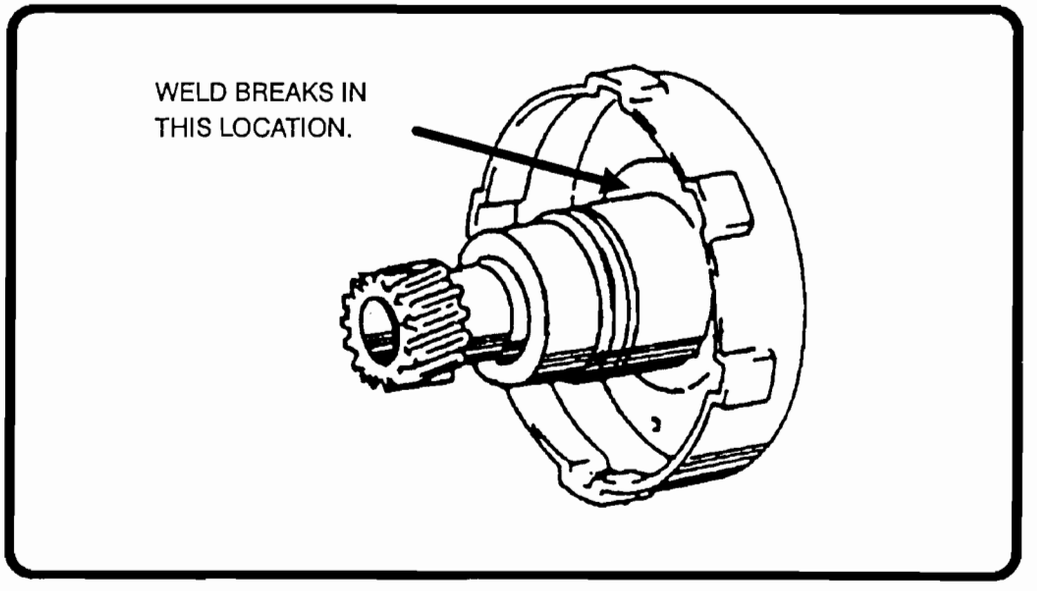


TOYOTA A-140
NO REVERSE

COMPLAINT: *Up shifts 1-2, 2-3, 3-4 good but has no reverse.*

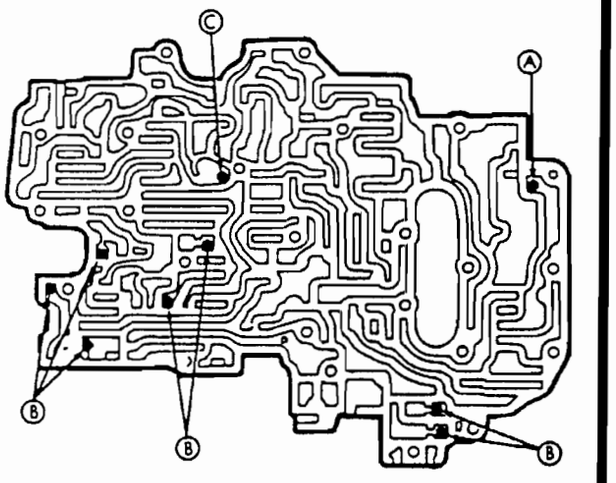
CAUSE: *Weld for sun gear in overdrive drum broken. Piston must be removed in order to be checked properly .*

CORRECTION: *Replace drum.*



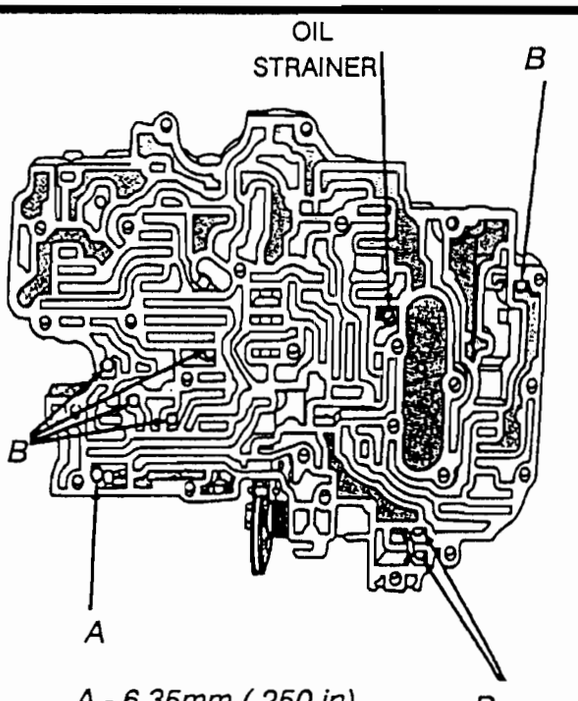
AW-4 CHECK BALL LOCATION

Prior to 1991 the AW-4 modles used 9 check balls with three different sizes and had a combination of both steel and rubber balls (figure 1). In 1991, they went to 8 checkballs all being rubber with two different sizes. The location of these balls are changed and they added an oil strainer (figure 2).



A - RUBBER BALL 3.35mm (.250 in)
B - STEEL BALL 5.56mm (.2189 in)
C - STEEL BALL 7.14mm (.2811 in)

Figure 1



A - 6.35mm (.250 in)
B - 5.535mm (.218 in)

Figure 2

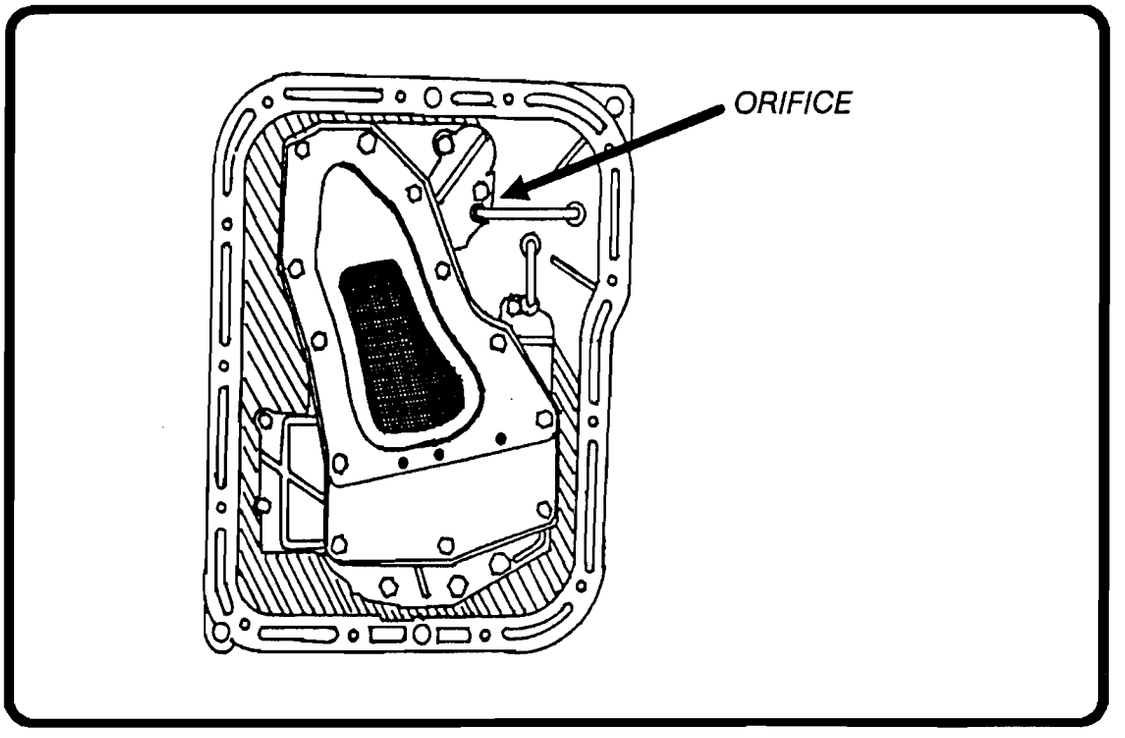
SUBARU 3 SPEED

HARSH 1-2 / 3-2 SHIFT

COMPLAINT: *Harsh 1-2 and 3-2 shift.*

CAUSE: *Servo apply orifice missing.*

CORRECTION: *Install orifice in the apply servo tube on valve body end.*



SUBARU 3 SPEED

SLUGGISH AFTER SITTING OVERNIGHT

COMPLAINT: *Transmission works fine until it sits, with the engine off, for a period of an hour or more. When started you have a slip and/or extreme sluggishness.*

CAUSE: *Oil pump drive shaft bushing has been installed on the wrong end of the shaft, or is missing, creating converter drain back and requiring fill time for the pump to refill torque converter.*

CORRECTION: *Install the oil pump drive shaft bushing into "Converter End" of turbine shaft, between turbine shaft and oil pump drive shaft (Refer to figure 1).*

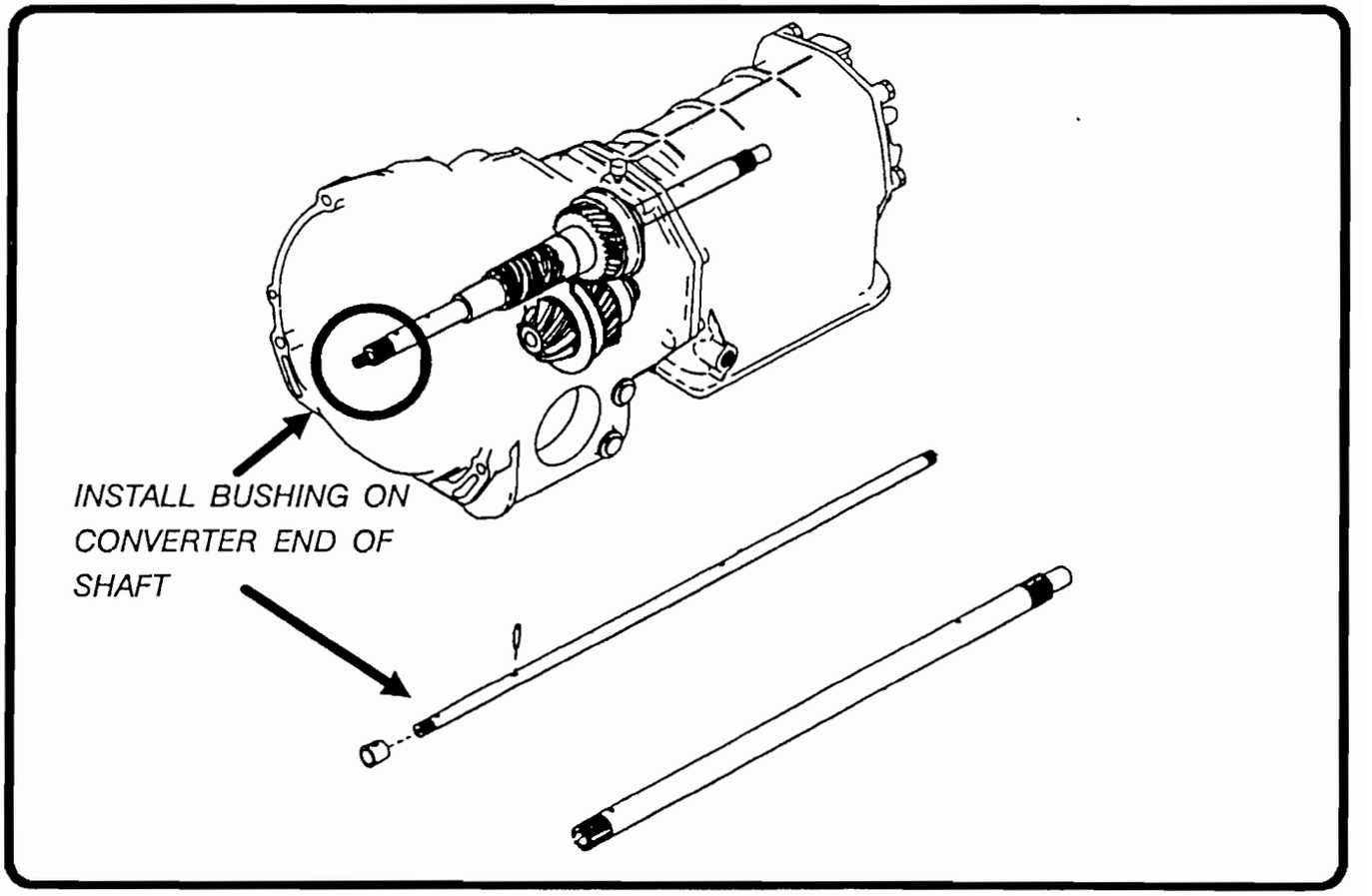
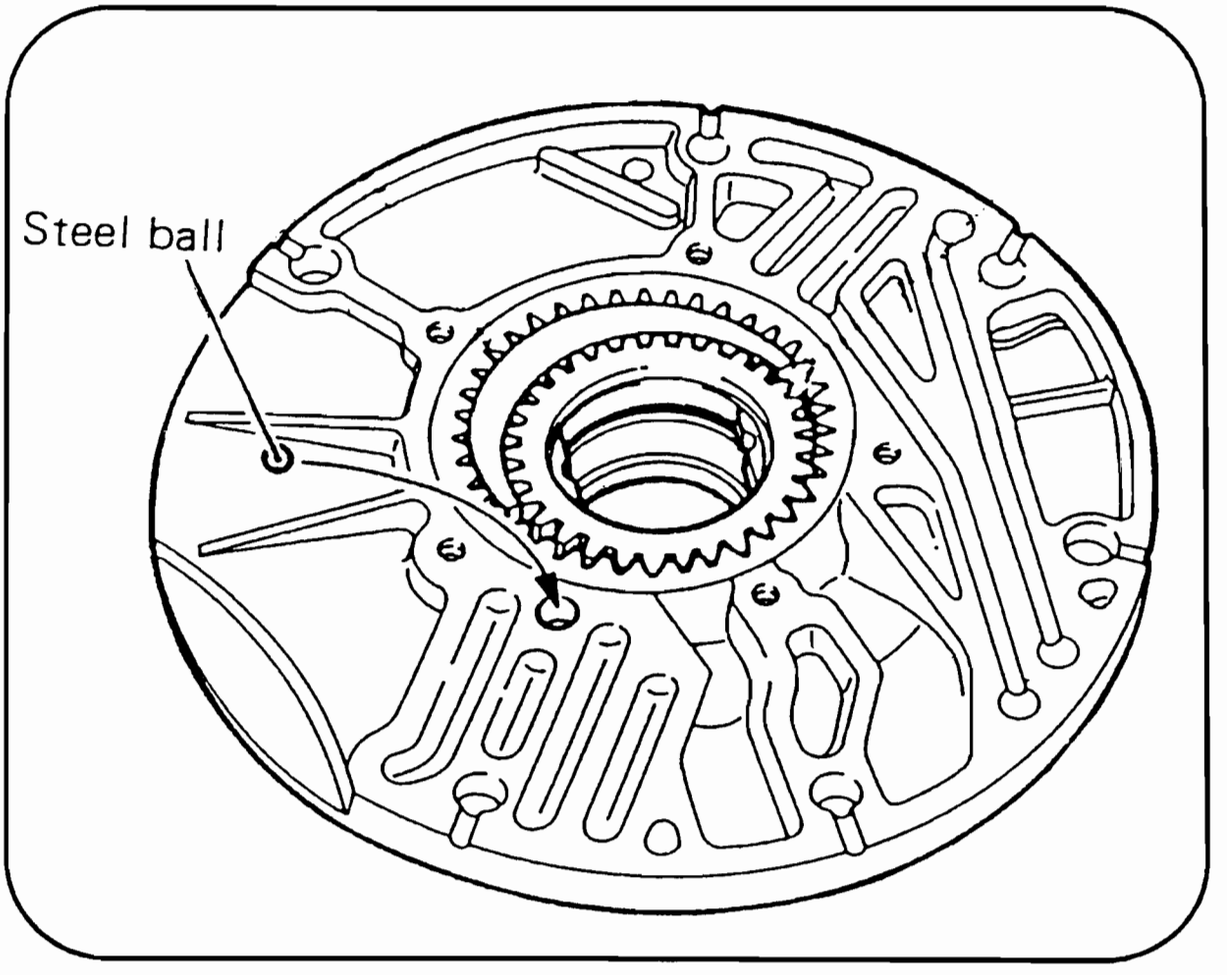


FIGURE 1

MITSUBISHI KM175

IF THE STEEL BALL IS LEFT OUT, VEHICLE WILL HAVE NO FORWARD MOVEMENT.

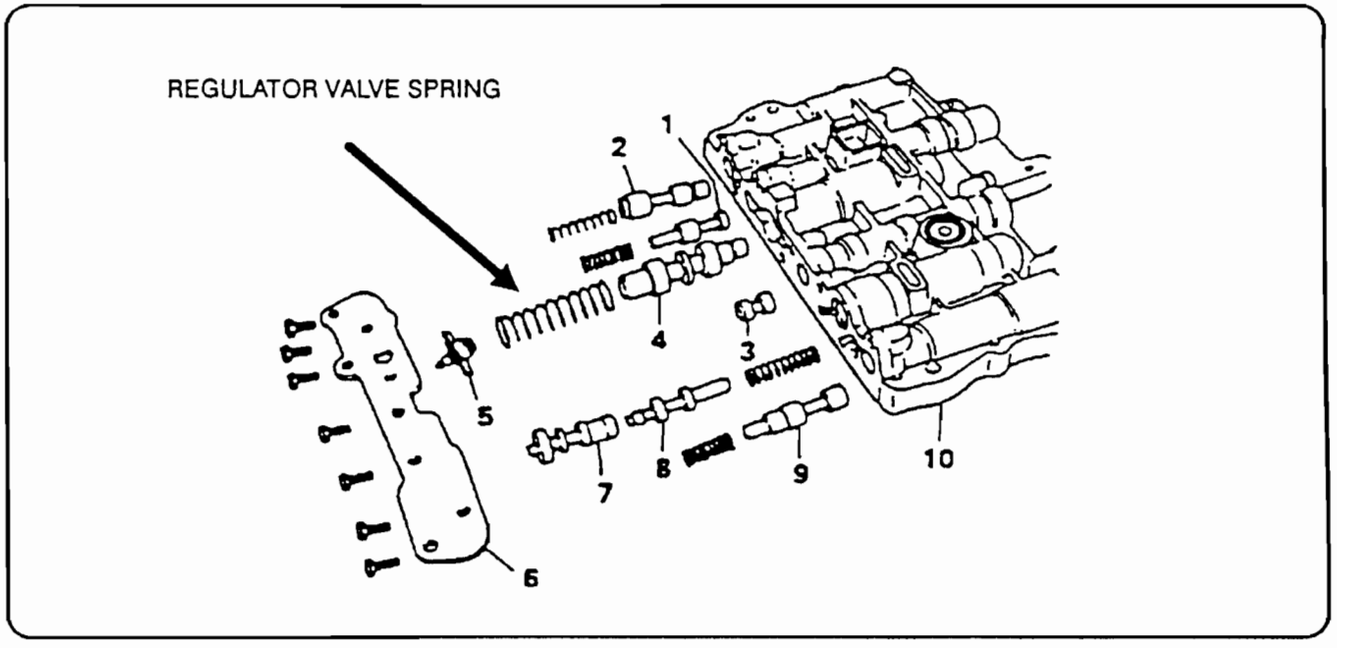


MITSUBISHI KM175

COMPLAINT: HARSH SHIFTING

CORRECTION: CHANGE THE REGULATOR VALVE SPRING TO AN 8 POUND SPRING

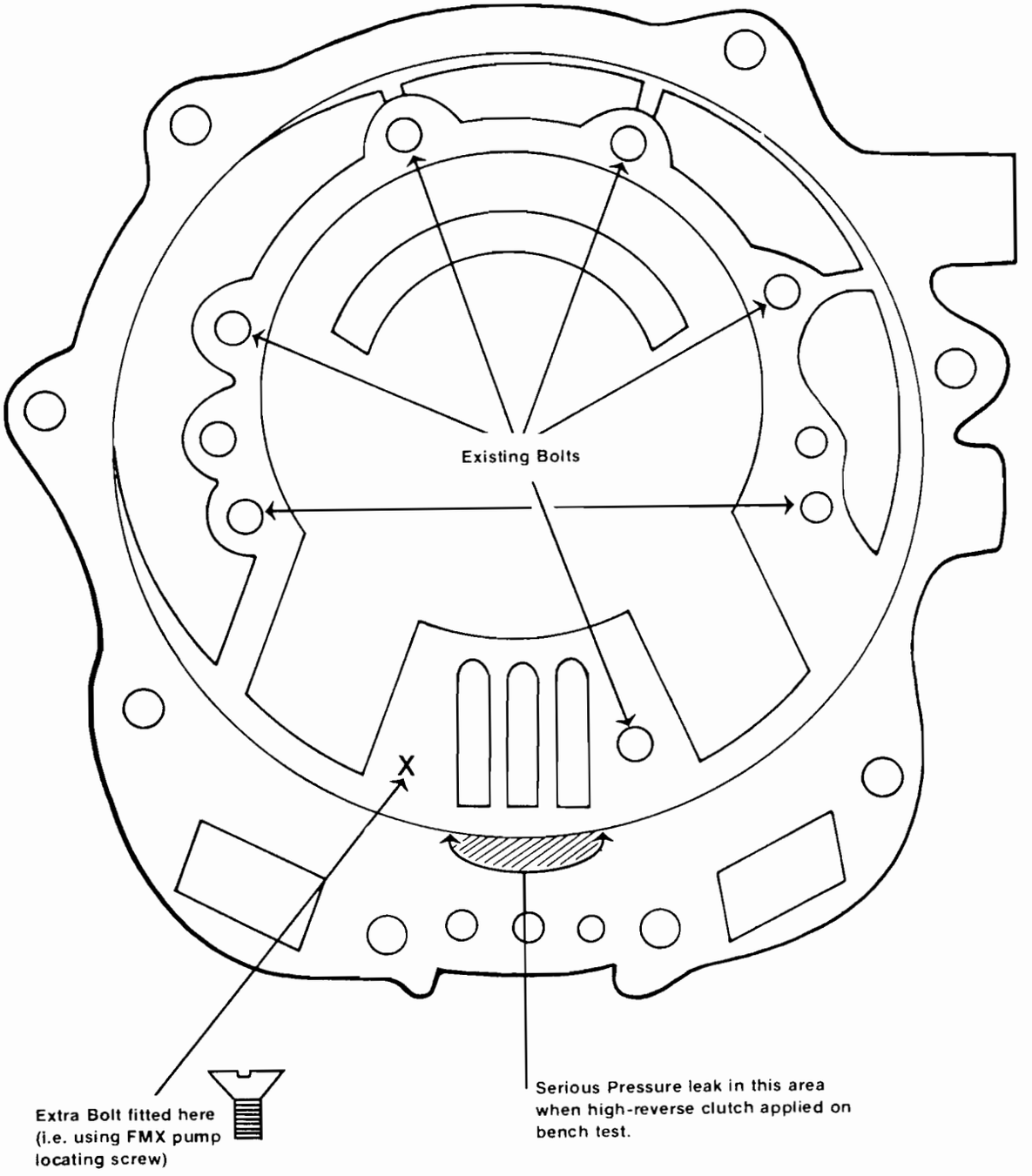
1. TORQUE CONVERTER CONTROL VALVE
2. PRESSURE CONTROL VALVE
3. SHIFT CONTROL VALVE
4. REGULATOR VALVE
5. ADJUSTING SCREW
6. FRONT END COVER
7. REAR CLUTCH EXHAUST VALVE A
8. REAR CLUTCH EXHAUST VALVE B
9. 2-3 / 3-4 SHIFT VALVE
10. UPPER VALVE BODY



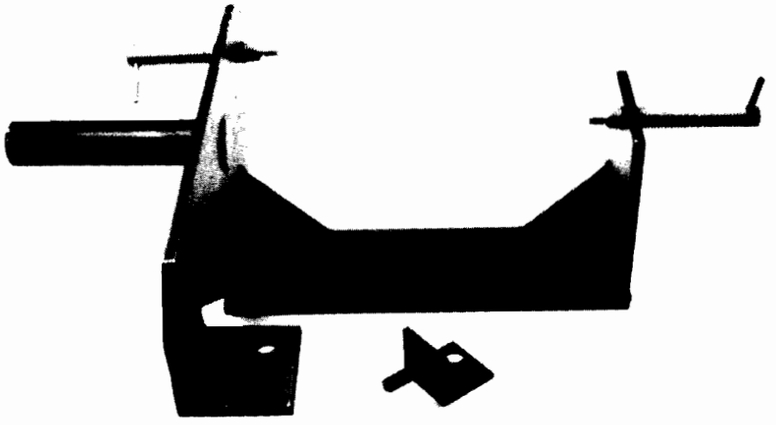
F 3A JATCO

Attached is a diagram of Jatco F3A transmission pump, showing area of leakage of clutch circuit caused by distortion of pump body (inner) during application of high-reverse clutch.

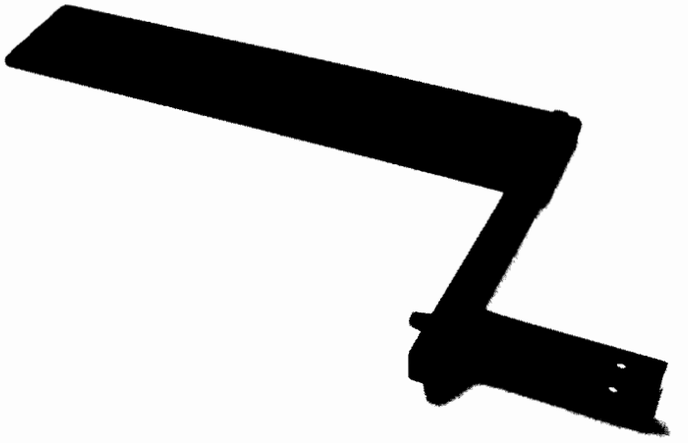
This problem was overcome by drilling and tapping of pump housing to take a 3/16" counter sunk screw, at point indicated on diagram.



Can you afford not to have the right tools for today's transmissions?



E4OD
T-2800-F
Holding Fixture



AXOD
T-2409-F
Holding Fixture

The answer is no! Professional rebuilders require professional tools.

Hayden — Trans-Tool is your #1 source for over 450 specialty tools for GM, Ford, Chrysler, AMC and most foreign automatic transmissions, plus shop equipment and accessories.

To receive a Hayden — Trans-Tool catalog contact your preferred parts distributor, or call us toll FREE 1-800-531-5978

HAYDEN – Trans-Tool
110 Connelly•San Antonio, TX 78203•(512) 225-6745

FORD E4OD

HARSH 3-4 SHIFT

COMPLAINT: Harsh 3-4 shift, and/or upon transmission dis-assembly the O.D. clutch retaining ring is dislodged from groove (See Figure 1).

CAUSE: Insufficient snap ring tension.

CORRECTION: Replace snap ring with updated (More Tension) snap ring available under OEM part number F0TZ-7A527-A.

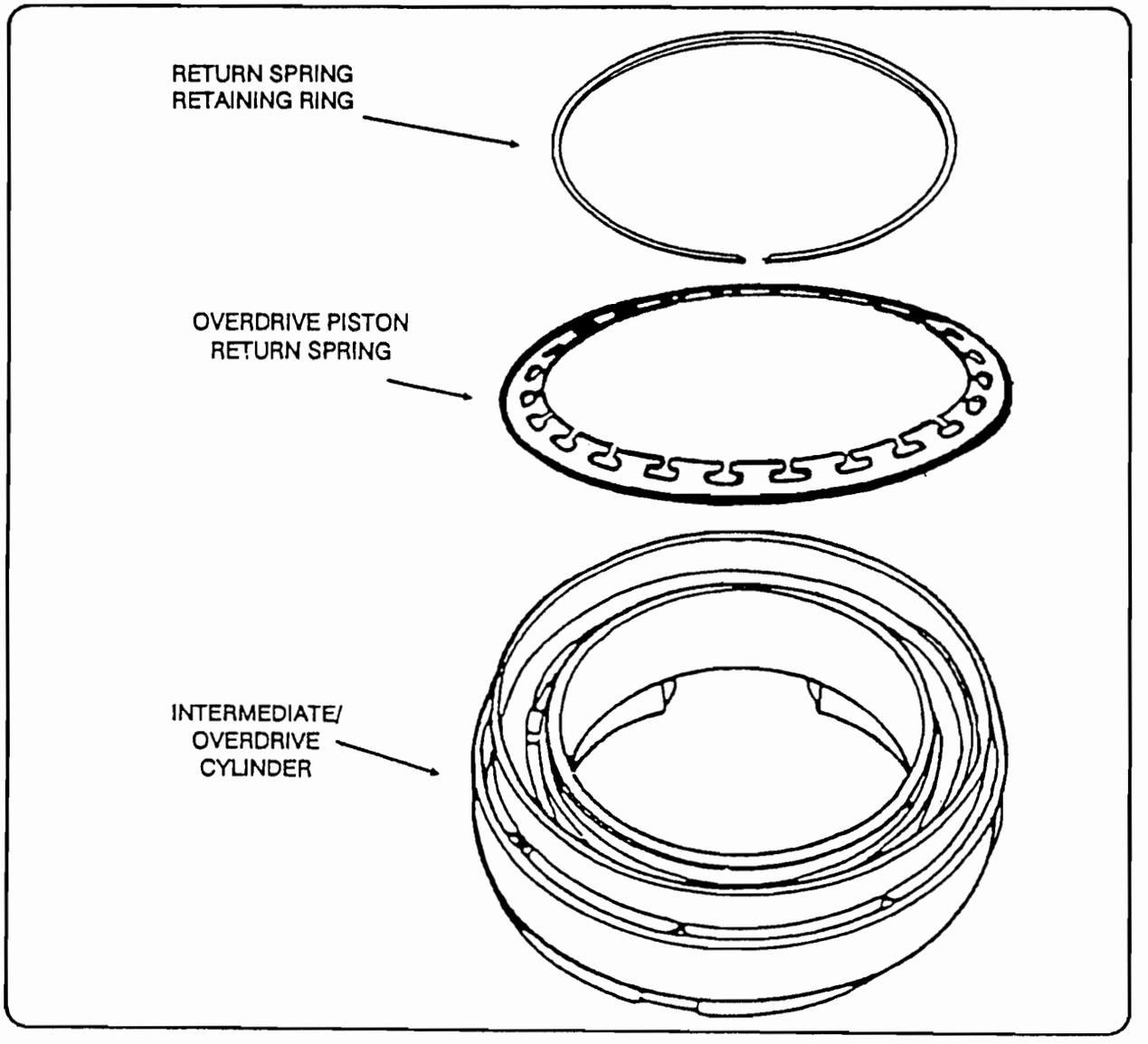


Figure 1

FORD E4OD
CONVERTER CLUTCH SHUDDER

COMPLAINT: Soft converter clutch engagement or shudder on hard acceleration

CAUSE: Low converter pressure and/or limited ability of the converter exhaust orifice to control converter clutch apply.

CORRECTION: Replace the converter regulator valve spring in the pump cover with a "SGSF E4OD" shudder fix spring (see figure 1), Drill the converter clutch exhaust orifice to .076 in. (see figure 1).

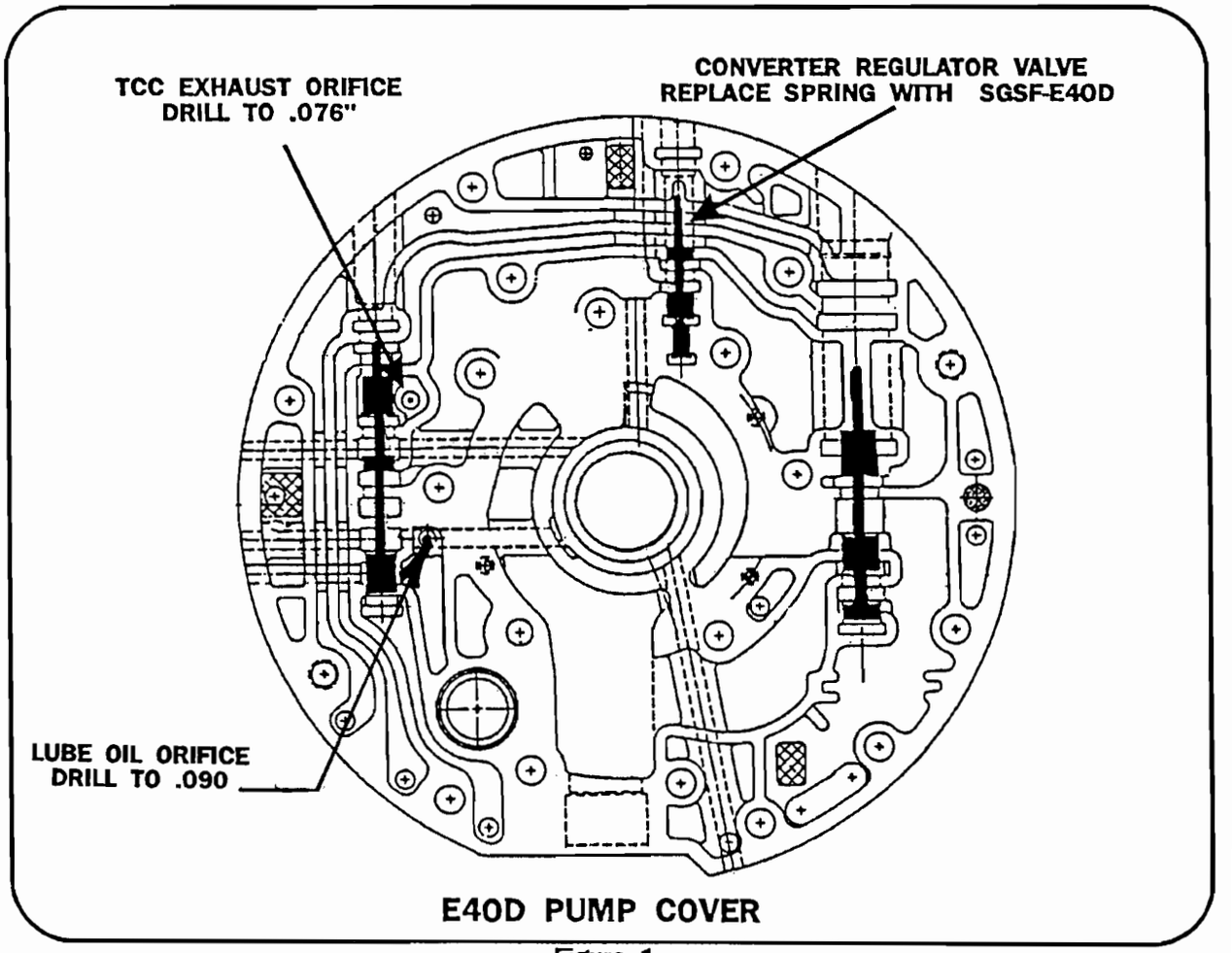


Figure 1

FORD - E4OD
OVERDRIVE SECTION FAILURE

COMPLAINT : Overdrive planetary and overdrive sprag failure due to lack of lube.

CAUSE : The cause may be a plugged or restricted lube passage in pump cover. There is a ball and spring under the orificed cup plug making this passage prone to clogging up.

CORRECTION: Clean out the lube passage.

To check for restricition blow into hole in pump cover (See Figure 15). Air should exit from hole in rear of stator shaft as shown in (Figure 16).

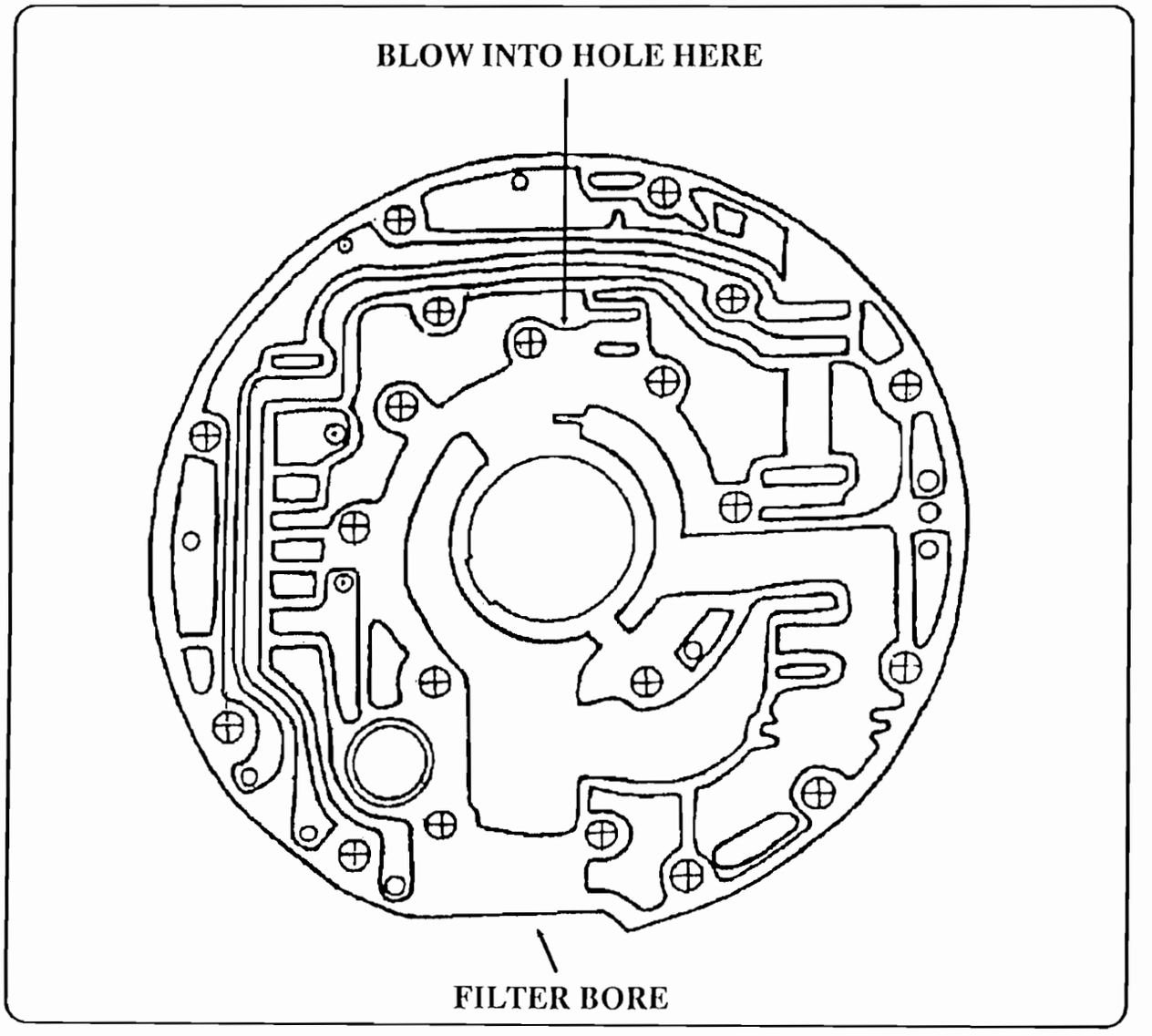


Figure 15

E4OD PUMP COVER

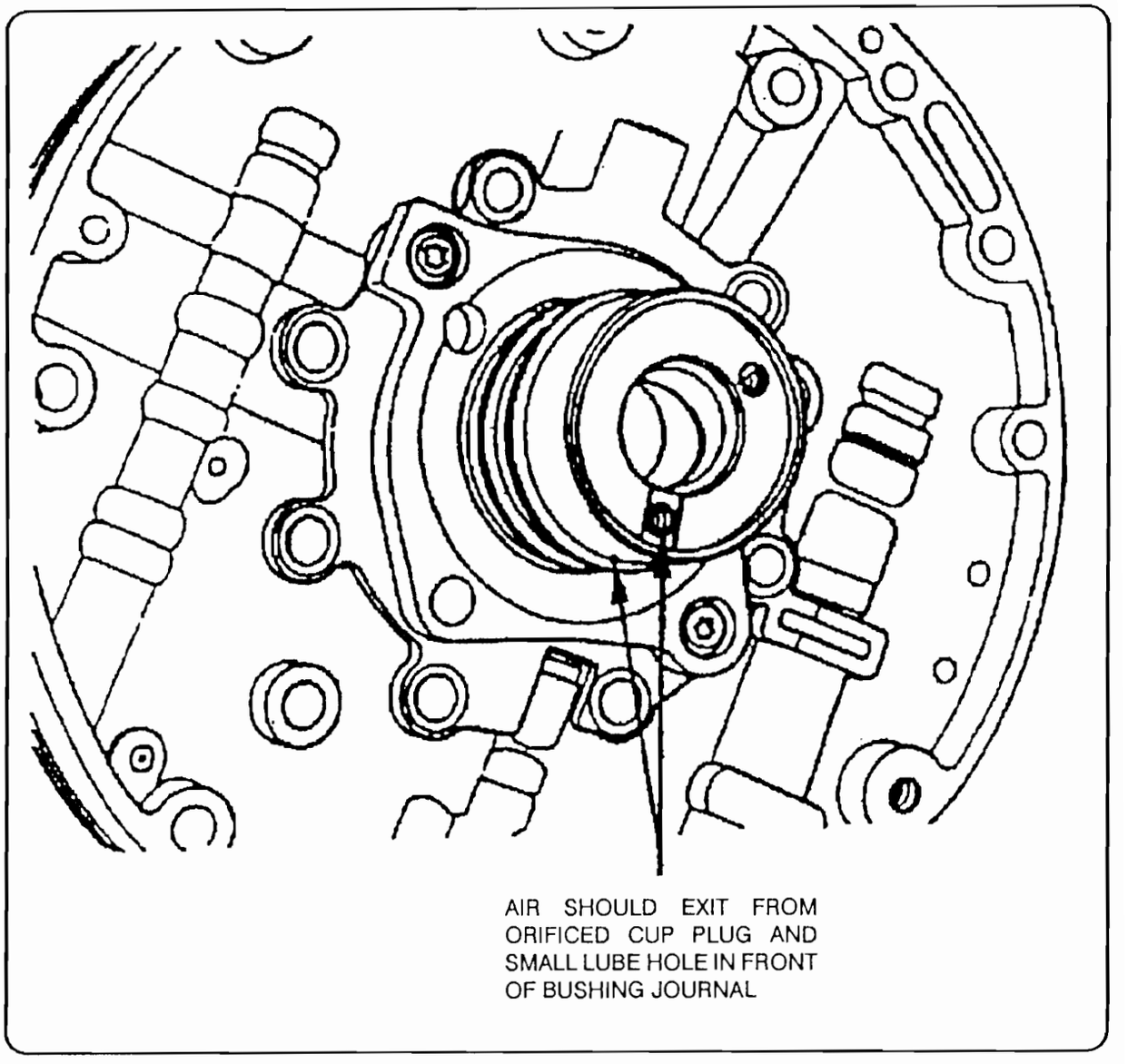


Figure 16

FORD E4OD
DELAYED ENGAGEMENT

COMPLAINT: A delayed engagement of 10 to 30 seconds, after setting for an extended period of time.

CAUSE: The cause may be, converter drainback through the cooler.

CORRECTION: Install an in-line check valve, OEM part number F0TZ-7D174-A, in the "COOLER RETURN LINE" going to the REAR case fitting. (See Figure 1).

NOTE: MAKE SURE THAT THE FLOW DIRECTION ARROW STAMPED ON THE CHECK VALVE POINTS TOWARDS THE REAR COOLER FITTING, OR A TRANSMISSION FAILURE WILL RESULT.

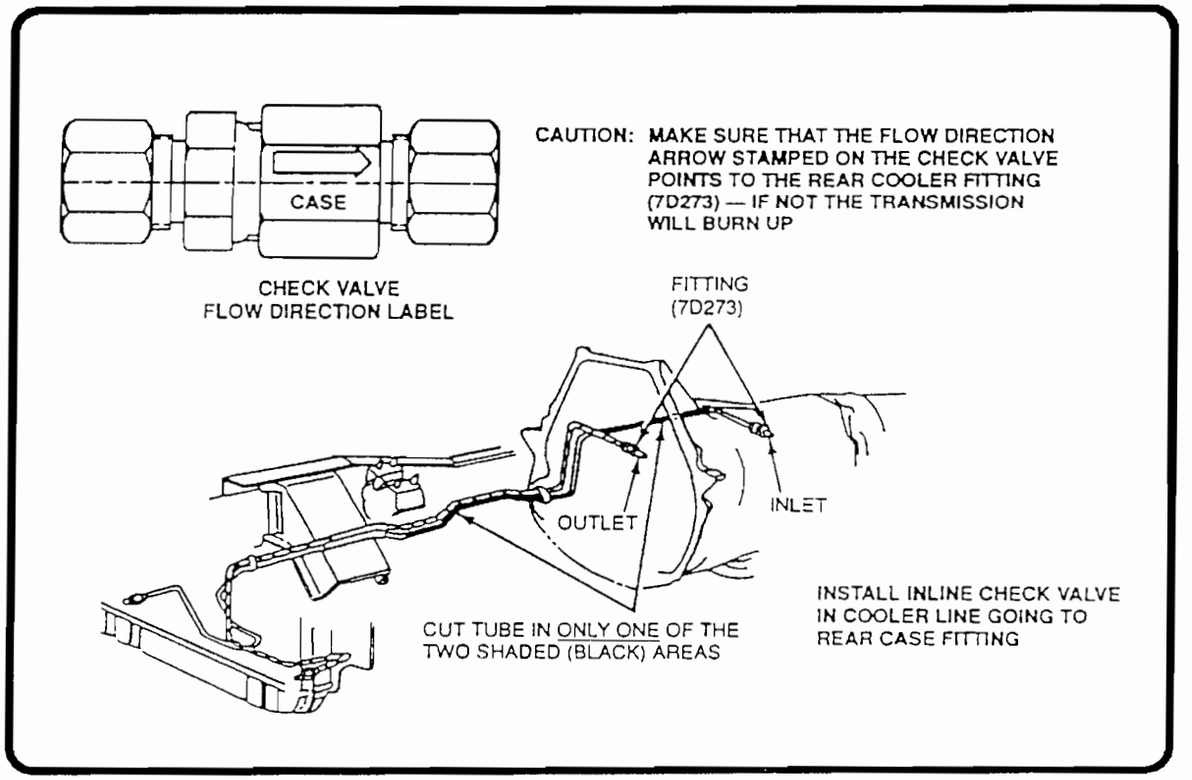


Figure 1

Ford E40D
Manual Lever Detent Spring Bent

COMPLAINT: Manual lever detent spring bent or manual valve is misaligned.

CAUSE: While removing the 22mm. nut from the manual lever in order to replace the linkage seal, the rooster cone gets caught under the spring and bends it rearward.

CORRECTION: Follow seal replcement procedure shown below.

1. Remove manual lever detent bolt and spring (See Figure 1).
2. Using side cutters or suitable tool remove manual lever roll-pin from the case (See Figure 2).
3. Remove lever nut while holding lever with suitable tool. (See Figure 3).
4. Remove detent rooster cone and park actuating rod (See Figure 4).
5. Remove manual lever position sensor bolts and lever.
6. Replace seal.
7. Reverse steps 1-4.

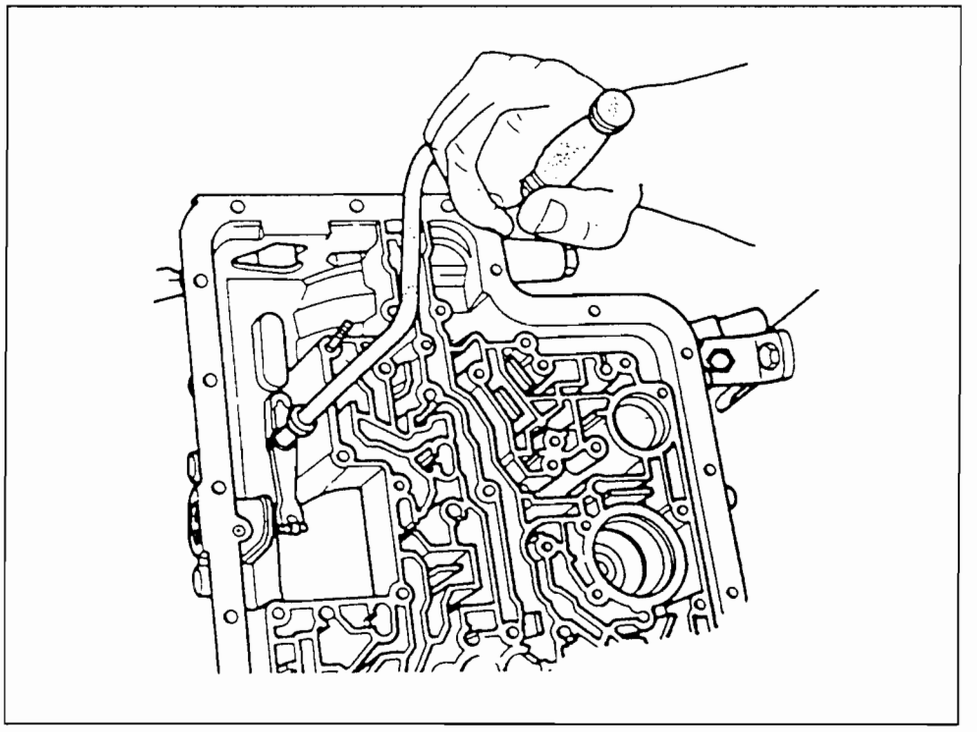


FIGURE 1

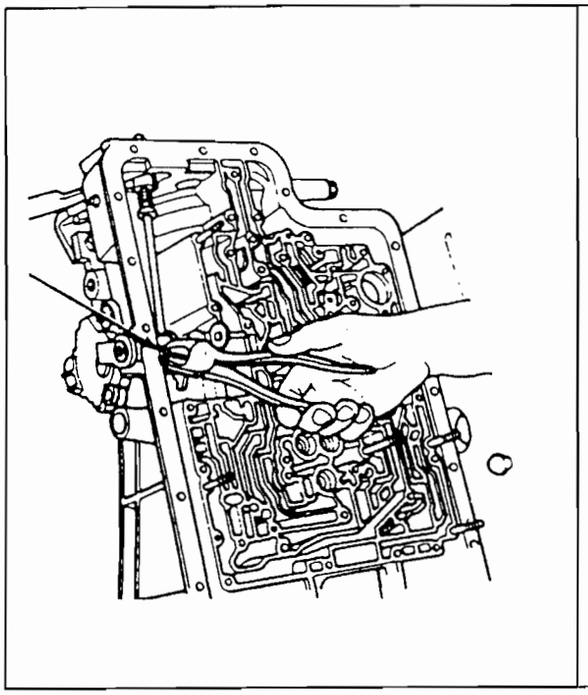


FIGURE 2

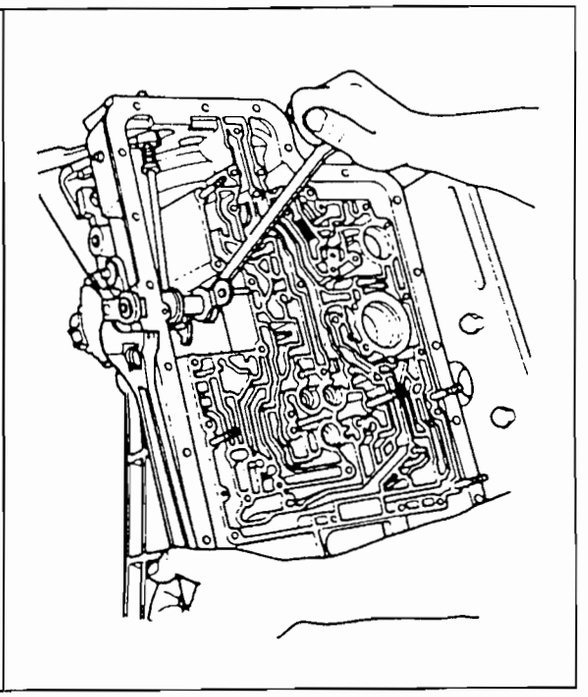


FIGURE 3

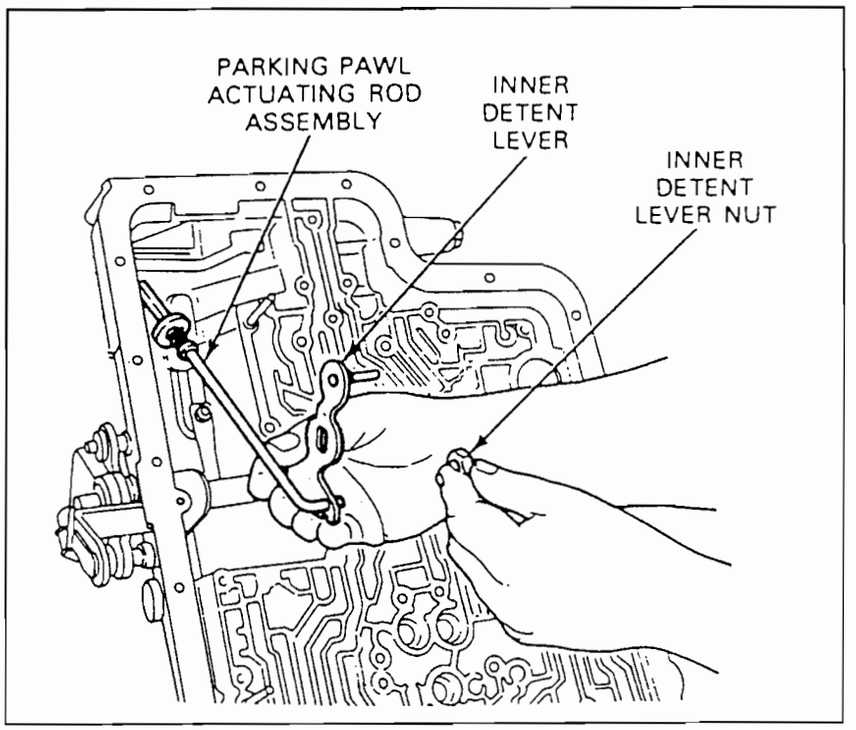


FIGURE 4

"My passion for quality led me to Toledo Trans-Kit Gasket and Seal or Overhaul kits."

Bill Anthony, President
Wood Dale Transmission

"When Toledo Trans-Kit came on the scene I wouldn't even talk to them. I was afriad they'd give me cheap generic parts."

"Then, I met Fred Burkhart, their President, at a seminar. We talked and his obvious sincerity about quality and service impressed me enough to try them. I've never regretted it and now we use only Toledo Trans-Kit kits. Here's why:

OEM quality parts

When we sell a job, it's a "one time deal". If the transmission comes back it's my loss. With Toledo Trans-Kit they don't come back due to failure of their parts. The parts are all OEM quality and perform like it."

The right parts for the right job

"A missing part, or the wrong part brings the job to a halt. That costs me. With Trans-Kit that never happens."

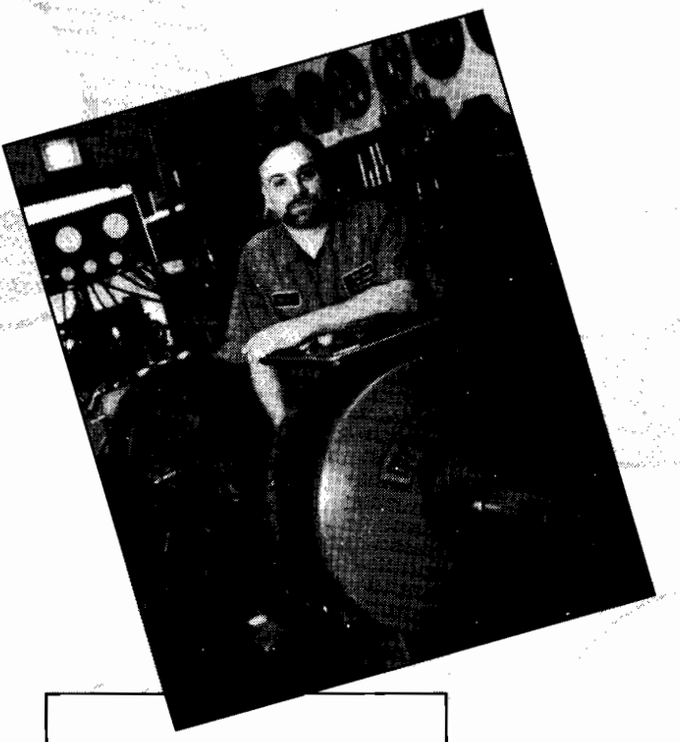
Trans-Kit Listens

"Some kit manufacturers think they know it all. Not Toledo Trans-Kit. They listen to suggestions, evaluate them and if they make sense, incorporate them. Constant improvement makes their kits superior."

For the ultimate in quality in Gasket and Seal or Overhaul Kits, specify Toledo Trans-Kit.

TOLEDO TRANS-KIT

1235 Expressway Drive North
Toledo, Ohio 43608
(419) 726-8200 Fax: (419) 726-2560



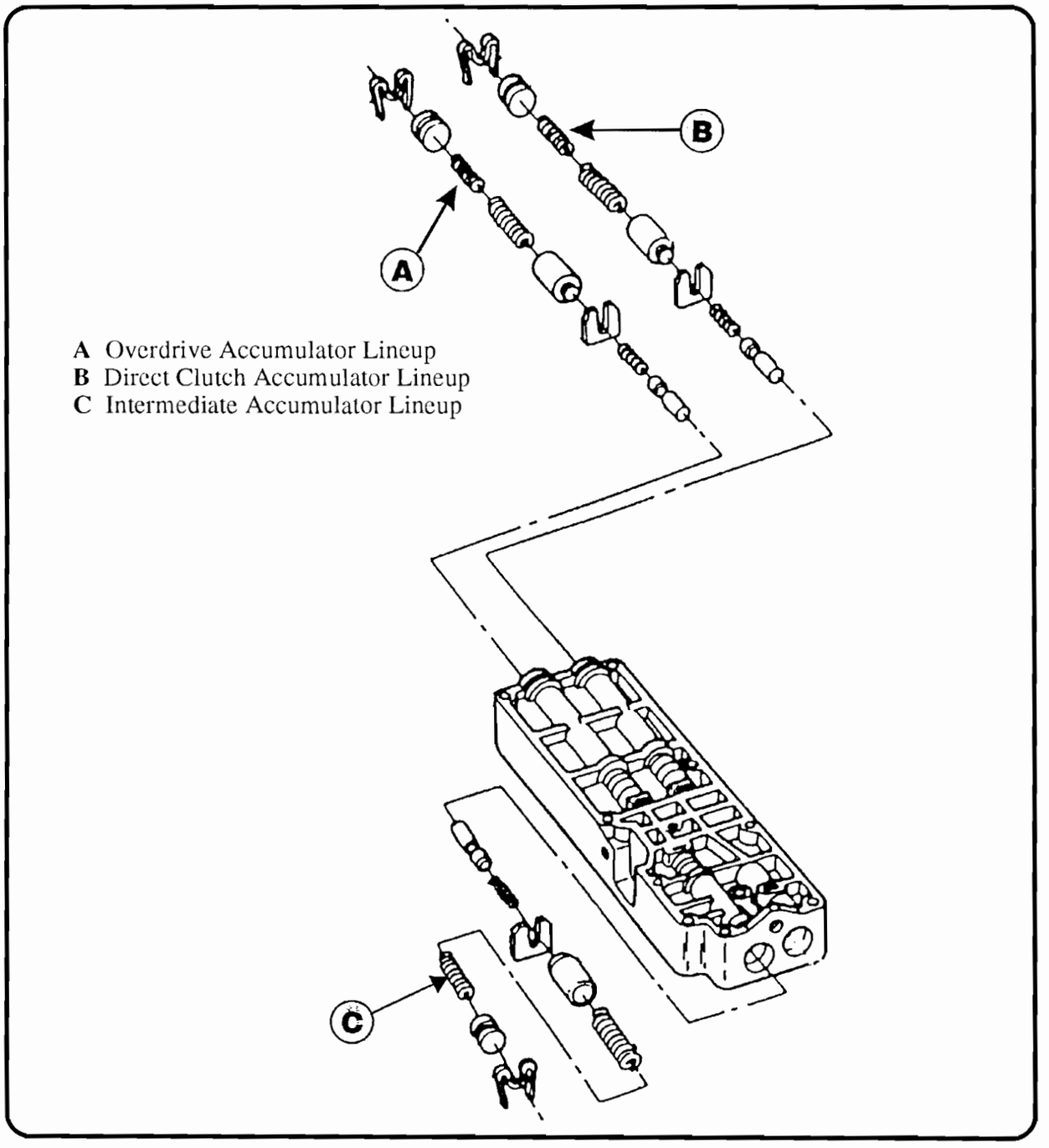
Bill Anthony started repairing transmissions as a 13-year old apprentice. For four years he has operated Wood Dale Transmission in suburban Chicago. Both he and his partner are rebuilders. They are fanatic about quality and test every transmission they repair on a Dynamometer to be sure it's right. Wood Dale works on antique, domestic and import vehicles with the same quality results.

Call for the distributor in your area.
(800) 345-8548

FORD E4OD

FIRMING UPSHIFTS

REPLACE ACCUMULATOR SPRINGS A-B-C



FORD E4OD

WILL NOT HOLD IN PARK

COMPLAINT: Vehicle will still move, or roll, after shift lever is placed in the PARK position.

CAUSE: The cause may be a broken snap ring on the output shaft, allowing the parking gear to move rearward, and then the parking pawl cannot engage into the parking gear (See Figure 1).

Action must be taken based on the build date as identified on the transmission I.D. tag. Refer to Figure 2 for build date identification.

Ford Safety Recall Number 90S10.

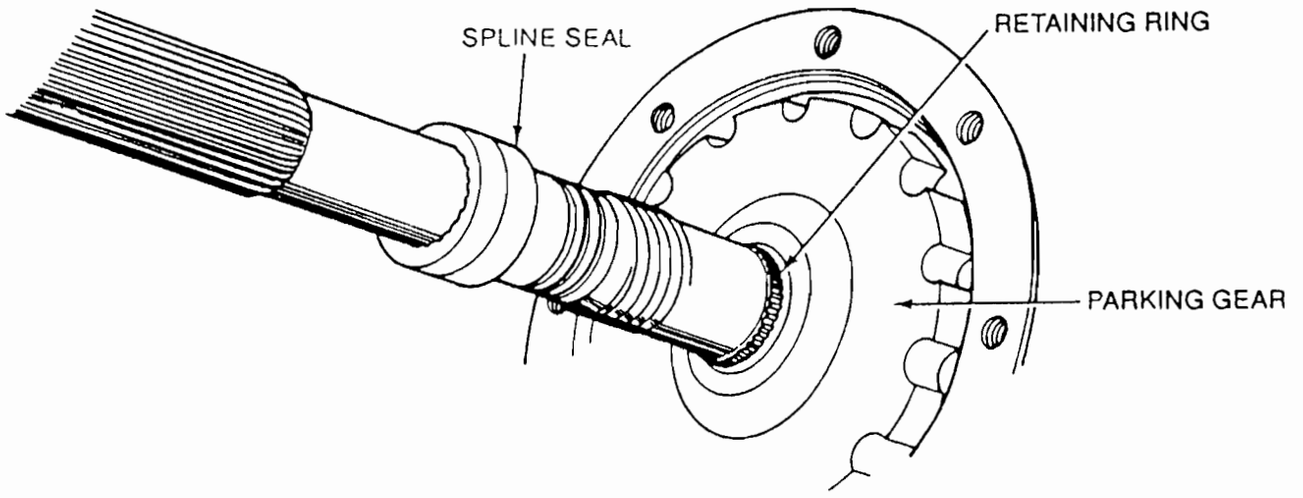
CORRECTION: There is now available a new service package, under OEM Part Number F0TZ-7A040-A, that includes a new design extension housing with a new "Boss" cast into it to prevent the parking gear from moving rearward in case the snap ring breaks (See Figure 3). The service package also includes a new "High Strength" snap ring and a snap ring installation aid (See Figure 4).

The output shaft has also been re-designed, and has the splines removed from behind the parking gear snap ring groove, which creates an increased shoulder for the snap ring, and helps prevent the snap ring from breaking (See Figure 5). Refer to "Service Information" OEM output shaft part numbers.

SERVICE INFORMATION:

E40D Extension Housing Service Package F0TZ-7A040-A
Includes the following:
1. 2nd design extension housing with added boss.
2. New design "High Strength" snap ring.
3. Snap ring installation aid.

1989 Output Shaft, 2WD, 7T Speedo E9TZ-7060-A
1989 Output Shaft, 2WD, 8T Speedo E9TZ-7060-C
1989 Output Shaft, 4WD E9TZ-7060-B
1990 Output Shaft, 2WD, 7T Speedo F0TZ-7060-E
1990 Output Shaft, 2WD, 8T Speedo F0TZ-7060-F
1990 Output Shaft, 4WD F0TZ-7060-G


SPLINE SEAL
RETAINING RING
PARKING GEAR

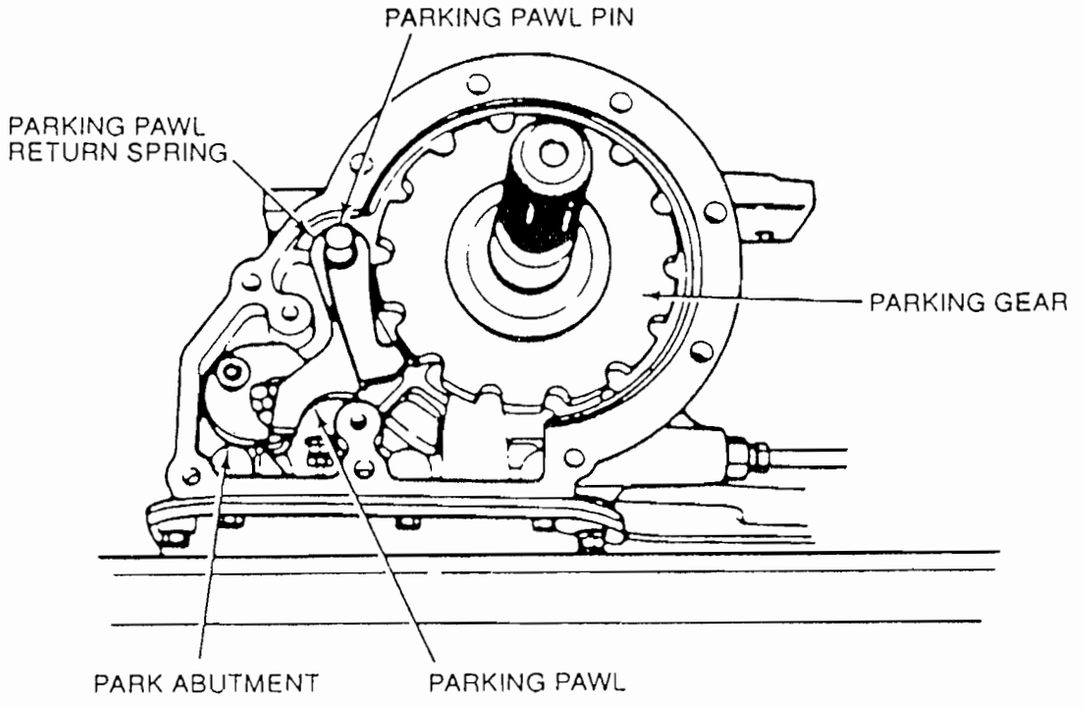

PARKING PAWL PIN
PARKING PAWL
RETURN SPRING
PARKING GEAR
PARK ABUTMENT
PARKING PAWL

Figure 1

E40D SNAP RING CONCERN
SOME 4 x 2's WITH 1 PIECE DRIVESHAFTS

- The following actions must be taken based on the build date as identified on the transmission I.D. Tag:

- E250-E350 7.3L Diesel
  - Any transmission built in 1988 must be repaired
  - Any transmission built in 1989 prior to Oct. 27, 1989 (9K27) must be repaired

- All Other Applications (except 5.0L)
  - Any transmission built in 1988 must be repaired
  - Any transmission built in 1989 prior to Dec. 1, 1989 (9M01) must be repaired

- Any transmission built in 1990 does not need repair

- BUILD DATE IDENTIFICATION IS AS FOLLOWS:

- 1988 — 8 before the letter
  REPAIR ALL

- 1989 — 9 before the letter

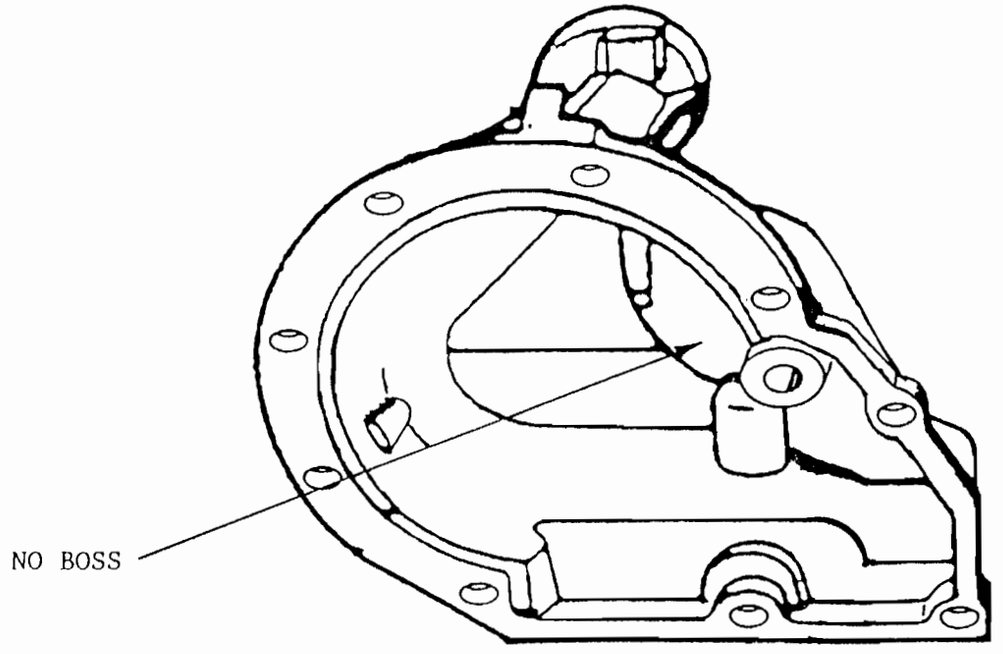
E250-E350 7.3L Diesel —
A01 thru K26 • REPAIR

All Other — (except 5.0L)
A01 thru L30 • REPAIR

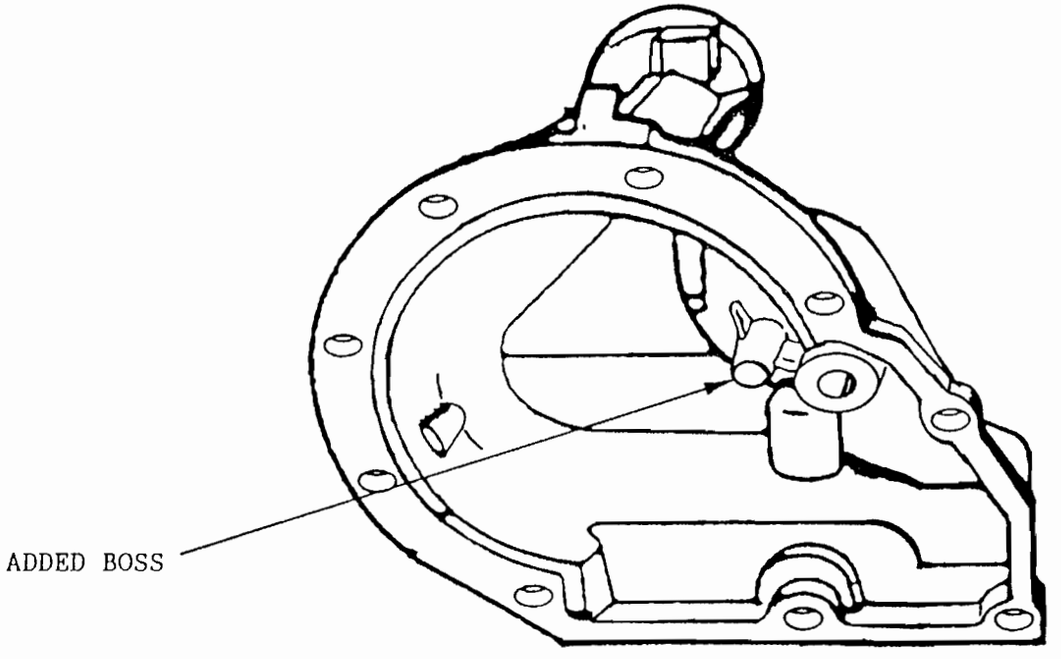
- 1990 — 0 before the letter
  Does Not Need Repair

If the identification tag is missing or does not conform to the above guidelines, then unit must be repaired.

Figure 2



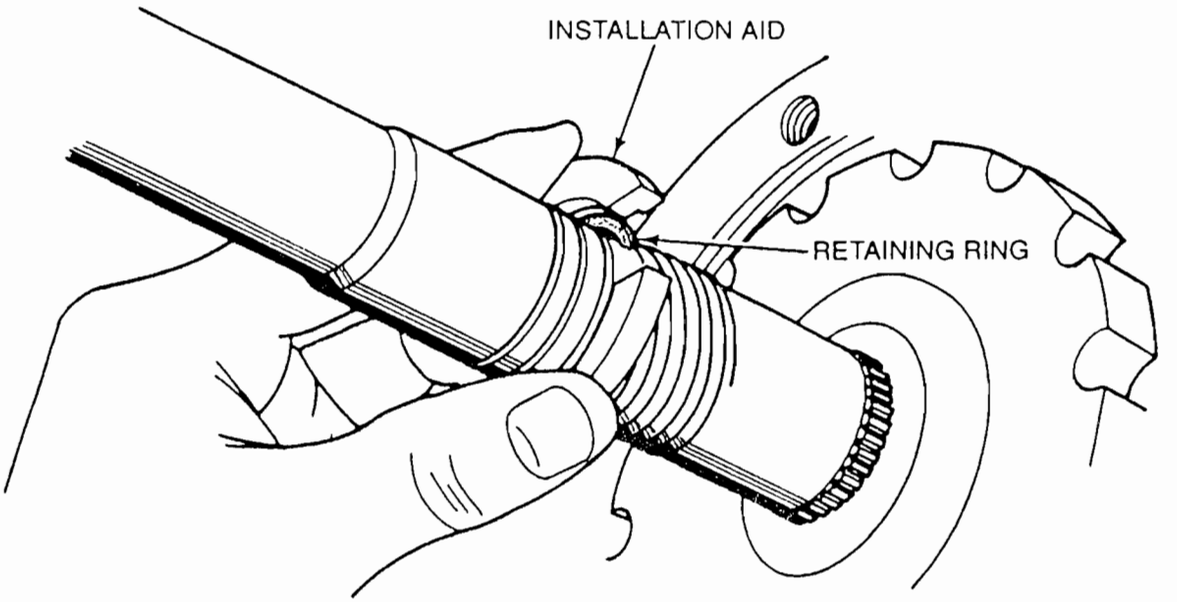
PREVIOUS DESIGN



NEW DESIGN

Figure 3

1. Remove installation aid with retaining ring from package. Hold ring in the installation aid opposite opening and place installation aid on the output shaft, just before speedo teeth, with ring facing transmission. (Retaining ring ends must be in installation aid opening). Installation aid is to prevent the ring from being spread too far apart.



2. Hold snap ring pliers parallel to output shaft and expand snap ring within the installation aid.
3. Slide snap ring over the speedo teeth and release the snap ring when the installation aid is against the parking gear.

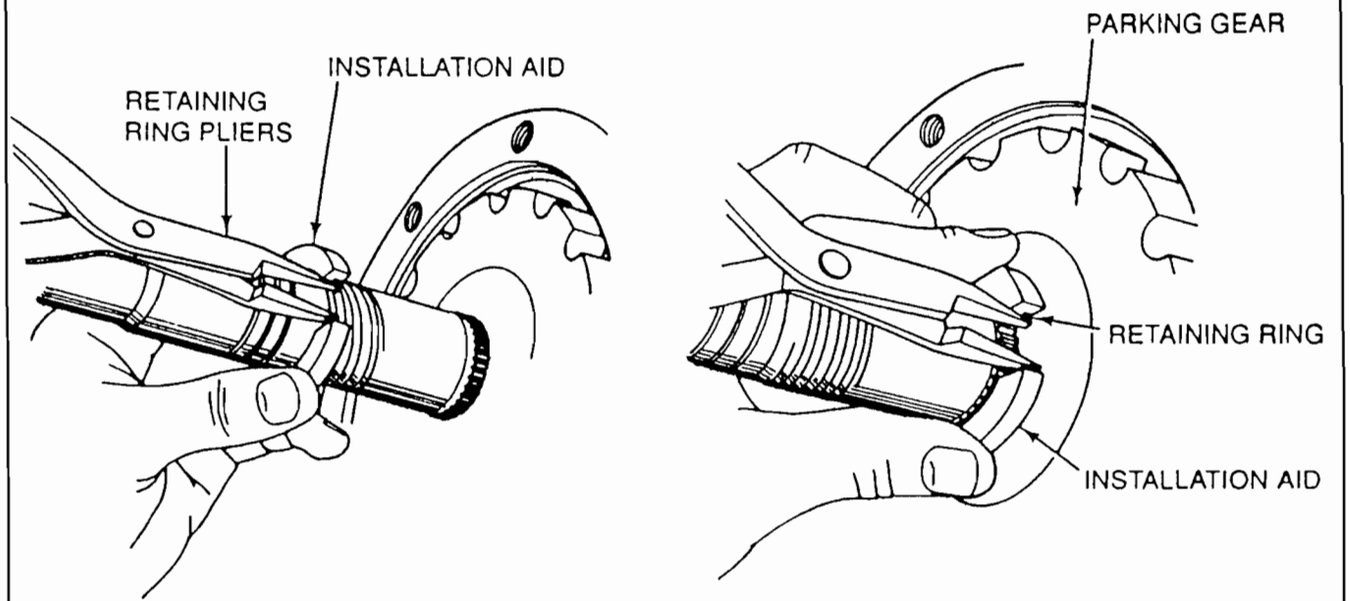


Figure 4

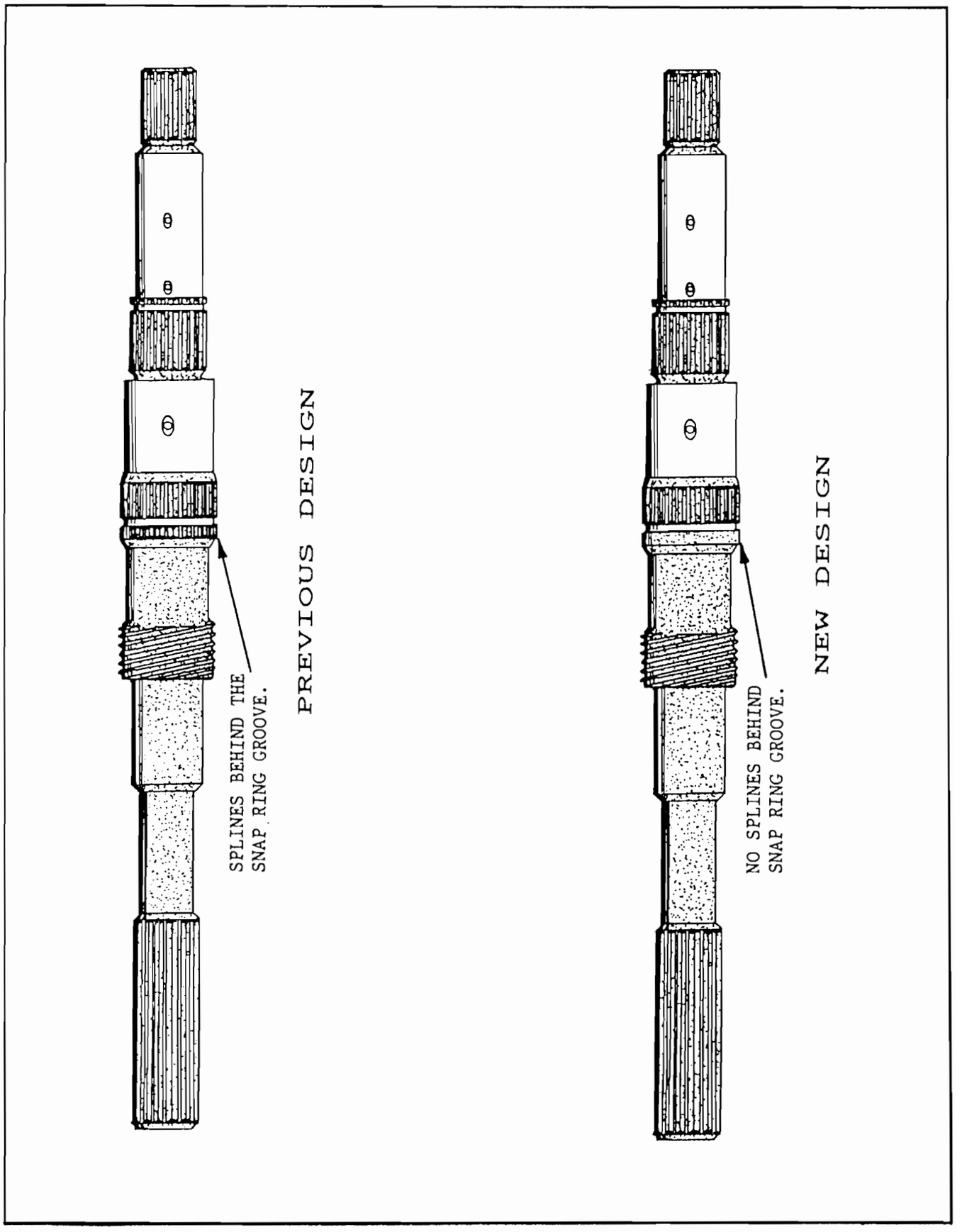

PREVIOUS DESIGN
SPLINES BEHIND THE SNAP RING GROOVE.
NEW DESIGN
NO SPLINES BEHIND SNAP RING GROOVE.

Figure 5

FORD AXOD

PREMATURE PLANETARY FAILURE

SEVERAL MODIFICATIONS CAN BE MADE IN AN EFFORT TO HELP IMPROVE LUBE OIL FLOW TO THE PLANETARY SYSTEM AND THEY ARE AS FOLLOWS:

1. Drill the torque converter fill hole in the valve body spacer plate out to .062" (1/16 Inch). This is the hole marked "D" as shown in Figure 1.
   Drill the rear lube orifice in the valve body spacer plate out to .078" (5/64 Inch). This is the hole marked "I" as shown in Figure 1.

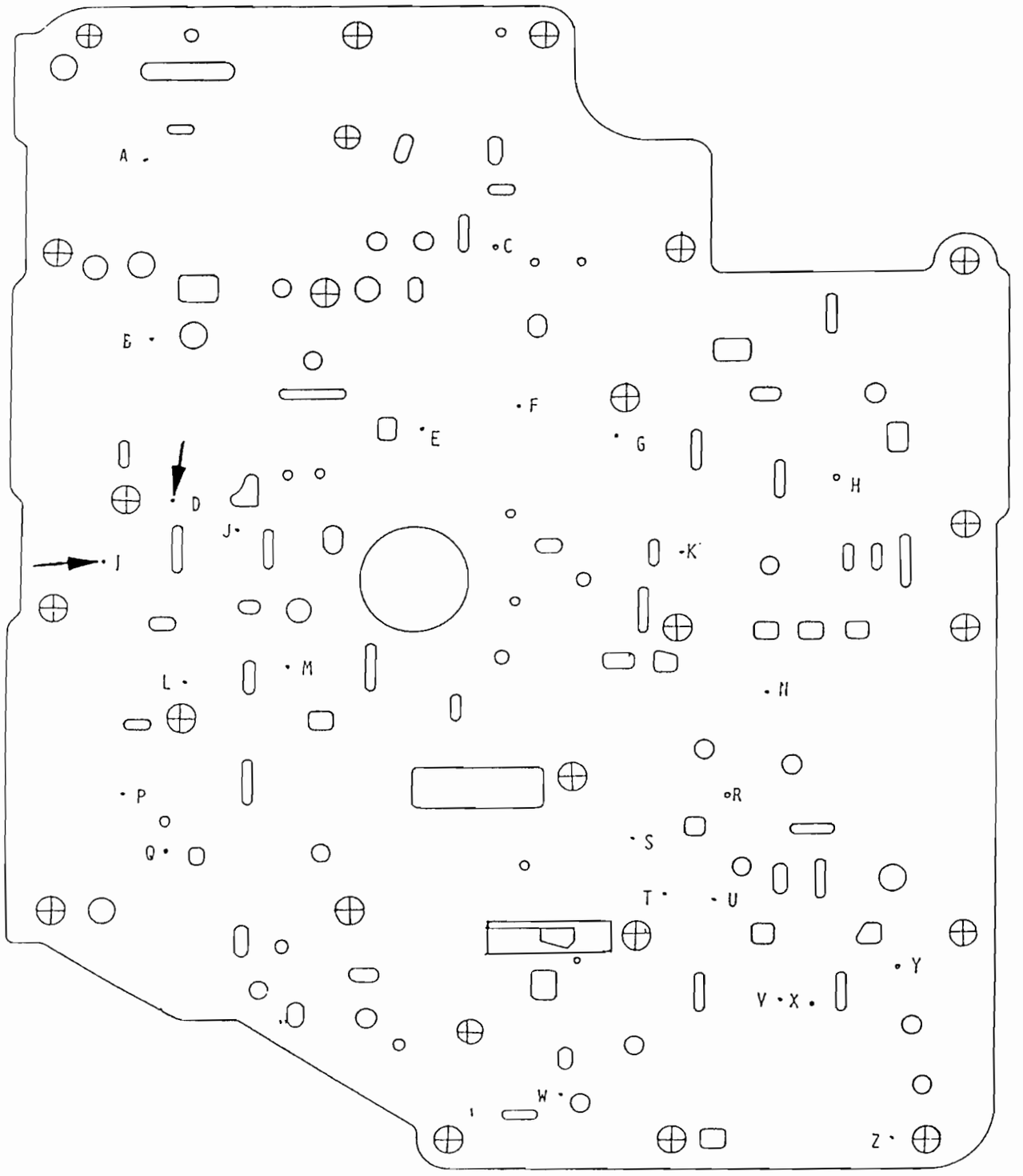
2. Trim the rear lube check valve spring, which is located in the valve body, until the check valve sits approximately 1/16" above the machined surface of the valve body (See Figure 2). This will require approximately 3 coils be removed from the spring, and always install the cut end of the spring back into the valve body first.

3. Inspect the bushings in the rear planetary support, as these bushings can move out of position and block the lube hole located in the support between them. The 1988 and later rear planetary support has a new second design, wider, one piece bushing with a groove and lube hole in the center. This will provide more surface area to prevent the bushing from moving. Refer to Figure 3.
   The later rear planetary support, with the 2nd design bushing, will retro fit back to ALL previous models and is highly recommended. The new design rear planetary support is available under OEM part number E6DZ-7A130-A.

4. Replace the rear lube tube seal with the early design THM 200 (2 Piece) low/reverse support seal. Refer to Figure 4 for installation. The THM 200 two piece seal will now provide additional flexibility and still retain its ability to seal against the rear planetary support. The support CAN rotate in the case lugs, and when the support rotates it WILL damage the one piece seal.
   This tip compliments of:
   Kelleys Transmission
   Albuquerque, NM.
   NOTE: WHENEVER THE REAR SUPPORT HAS BEEN REMOVED FOR ANY REASON, THE REAR LUBE TUBE SEAL MUST BE REPLACED.

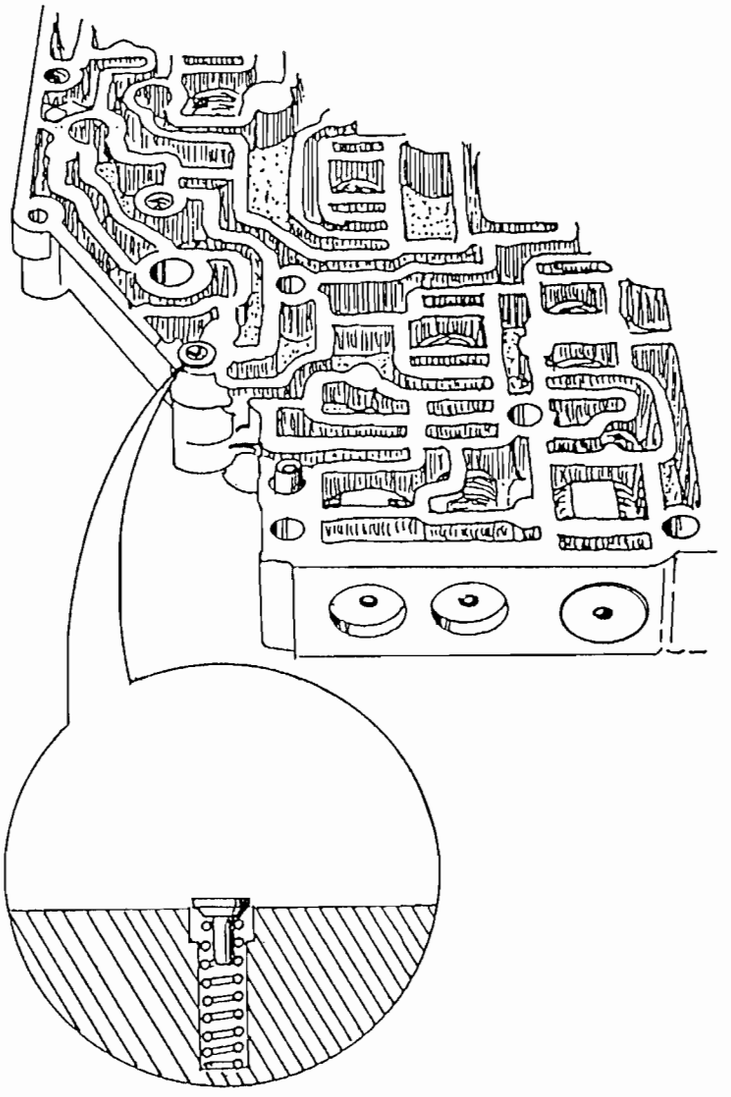
5. Install "Double Bushings" at the rear of sun gear as shown in Figure 5. After both bushings are in place, ensure that lube oil hole in the sun gear is not blocked.

AXOD VALVE BODY PLATE



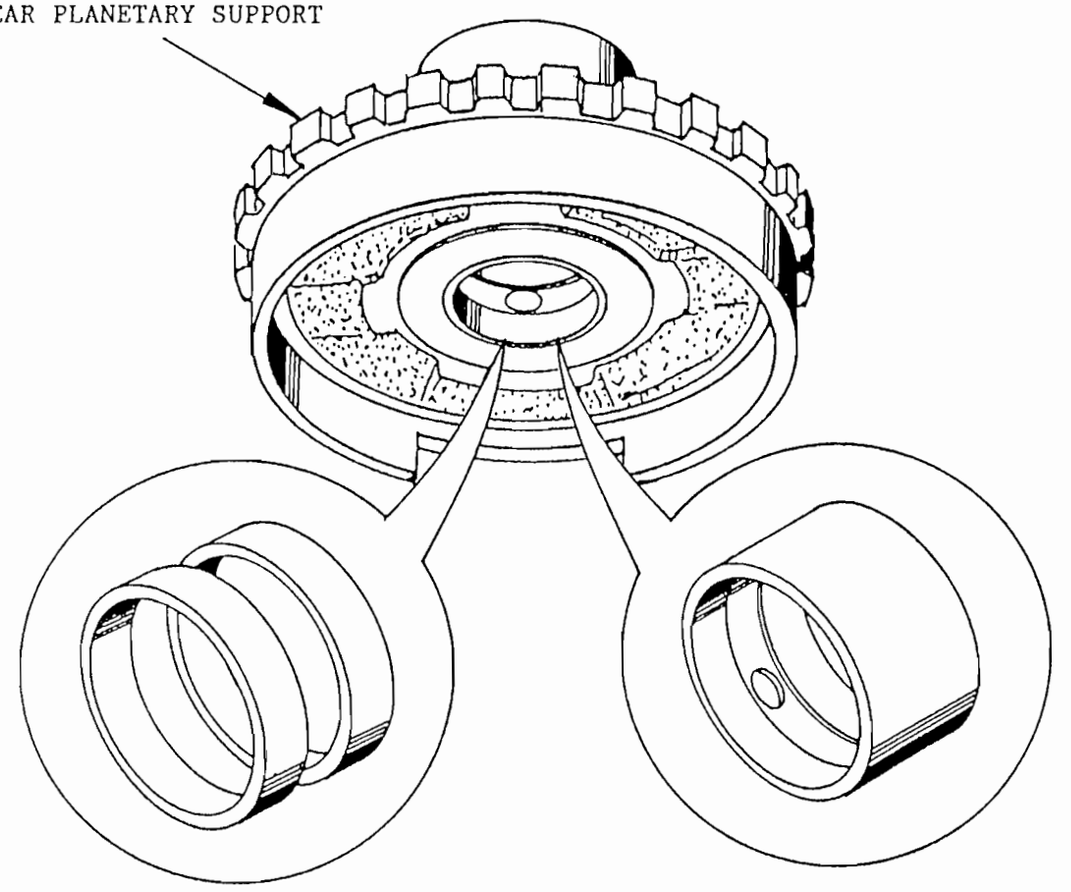
HOLE MARKED "D" - DRILL OUT TO .062" (1/16 INCH).
HOLE MARKED "I" - DRILL OUT TO .078" (5/64 INCH).

Figure 1



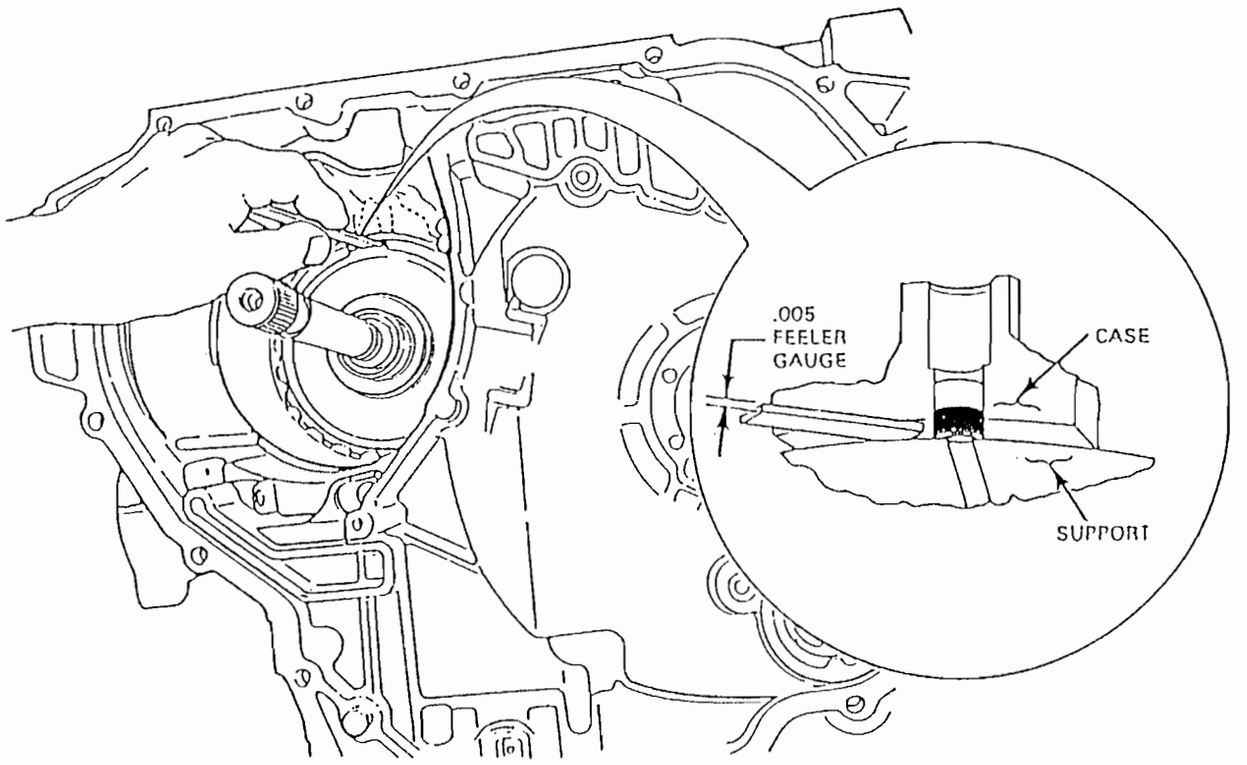
TRIM THE REAR LUBE CHECK VALVE SPRING, UNTIL THE CHECK VALVE SITS ABOUT 1/16" ABOVE THE MACHINED SURFACE OF VALVE BODY.

Figure 2



THE LATER REAR PLANETARY SUPPORT, WITH THE 2ND DESIGN BUSHING, WILL RETRO FIT BACK TO ALL MODELS AND IS HIGHLY RECOMMENDED.

Figure 3



SLIDE A FEELER GAUGE (.005" OR LESS) BETWEEN THE CASE AND REAR SUPPORT, THROUGH THE OPENING IN THE SNAP RING TO MAKE SURE THE SEAL IS FULLY SEATED. THE SEAL MUST CONTACT AND BE FLUSH AGAINST THE REAR SUPPORT. IF THE FEELER GAUGE PASSES BETWEEN THE SEAL AND THE SUPPORT, DRIVE THE CUP PLUG FURTHER INTO THE CASE BORE AND CHECK AGAIN.

Figure 4

DOUBLE BUSHINGS IN SUN GEAR

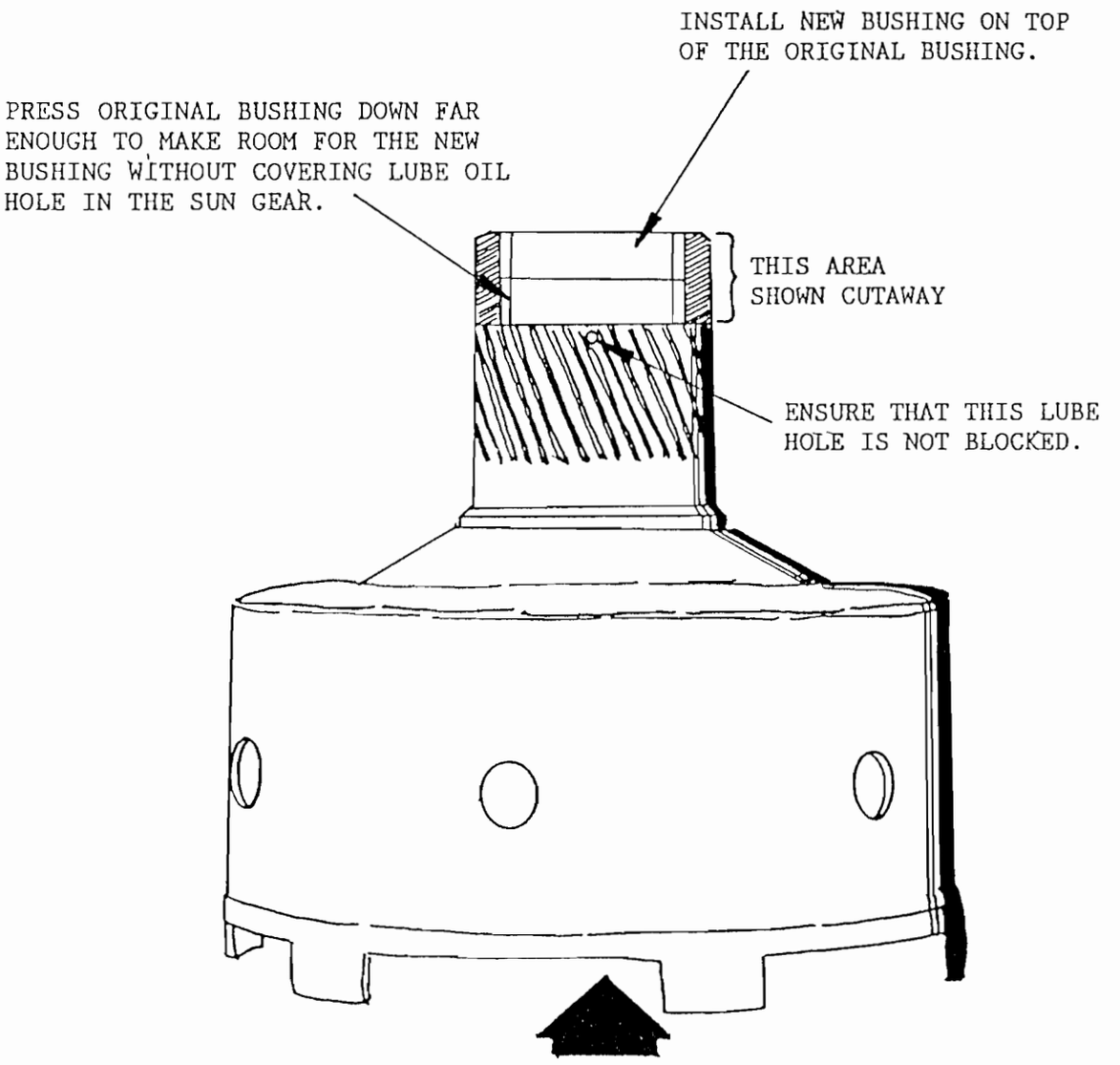


Figure 5

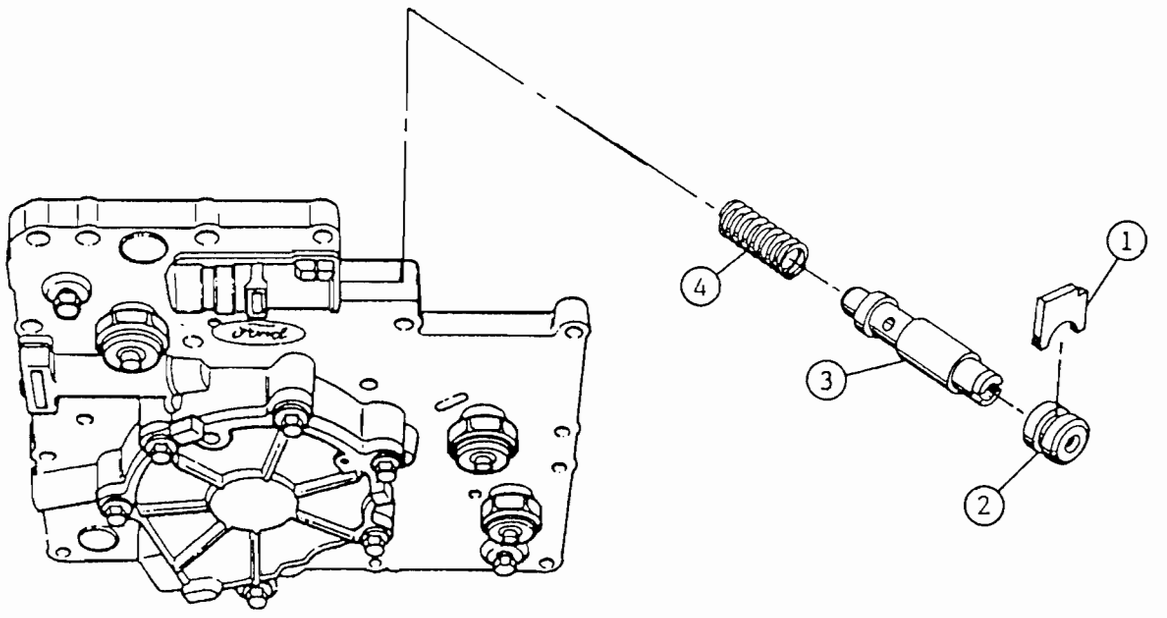
FORD AXOD
SOFT 1-2 AND 2-3 SHIFTS

COMPLAINT: Soft or mushy 1-2 shift and/or 2-3 shift.

CAUSE: The cause may be a lack of oil volume to the intermediate and/or direct clutch packs.

CORRECTION: FOR SOFT 1-2 SHIFT:
Replace the 1-2 capacity modulator valve spring with the Red spring manufactured by Shift Technology Products (Part # K006). The kit also comes with a new style bore plug retaining clip. Assemble into the oil pump as shown in Figure 1.

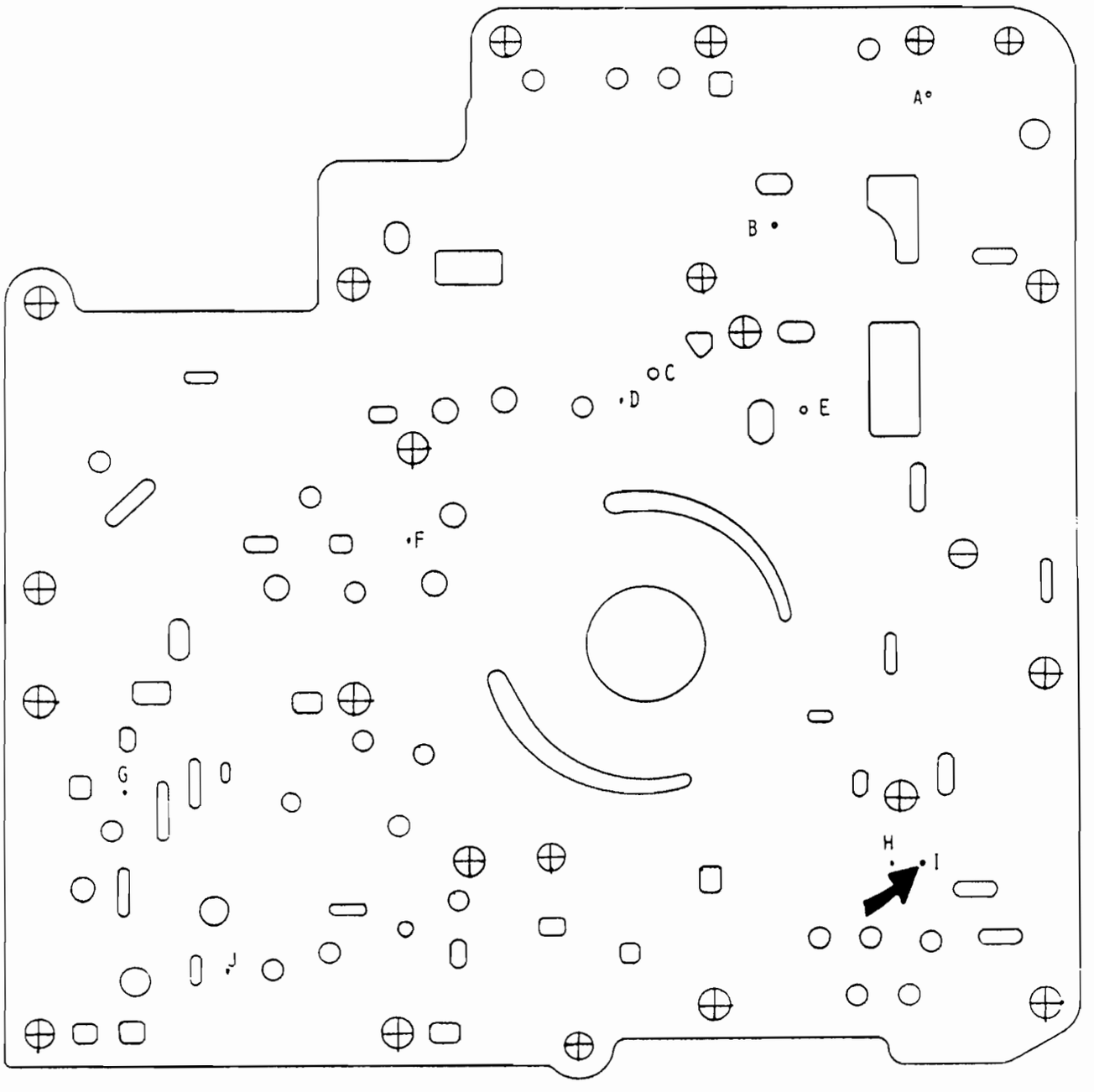
FOR SOFT 2-3 SHIFT:
Drill the direct clutch feed passage in the oil pump spacer plate, hole marked "I", out to .093" as shown in Figure 2.



1 NEW STYLE RETAINING CLIP.
2 1-2 CAPACITY MODULATOR VALVE BORE PLUG.
3 1-2 CAPACITY MODULATOR VALVE.
4 1-2 CAPACITY MODULATOR VALVE SPRING.

Figure 1

AXOD PUMP PLATE



ENLARGE HOLE INDICATED BY ARROW TO .093" FOR FIRMER 2-3 SHIFT.

Figure 2

FORD - AXOD
FLARE ON 2-3 SHIFT

COMPLAINT: Flare or slip on 2-3 shift, or premature failure of direct clutches.

CAUSE: The cause may be cracked direct clutch piston. For procedure to check the piston, (see figure 33).

CORRECTION: Replaced the direct clutch piston.

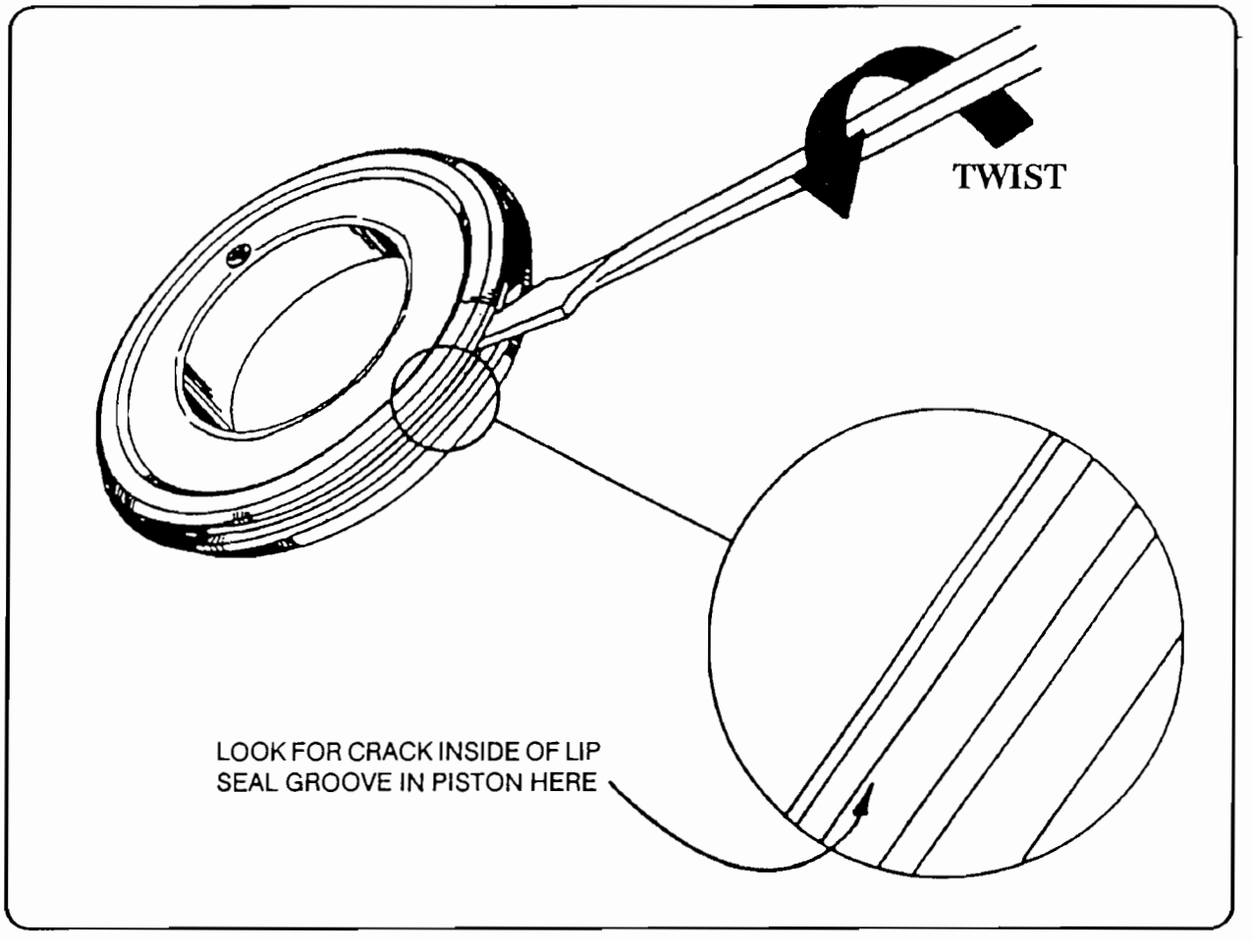


Figure 33

FORD AXOD-E

COMPLAINT: NO MOVEMENT OR SLIPS FORWARD & REVERSE WHEN HOT.

CAUSE: CRACKED FORWARD CLUTCH PISTON. PROCEDURE FOR CHECKING PISTON IS SHOWN IN FIGURE 1.

CORRECTION: REPLACE PISTON WITH PART NUMBER F1DZ-7A262-A.

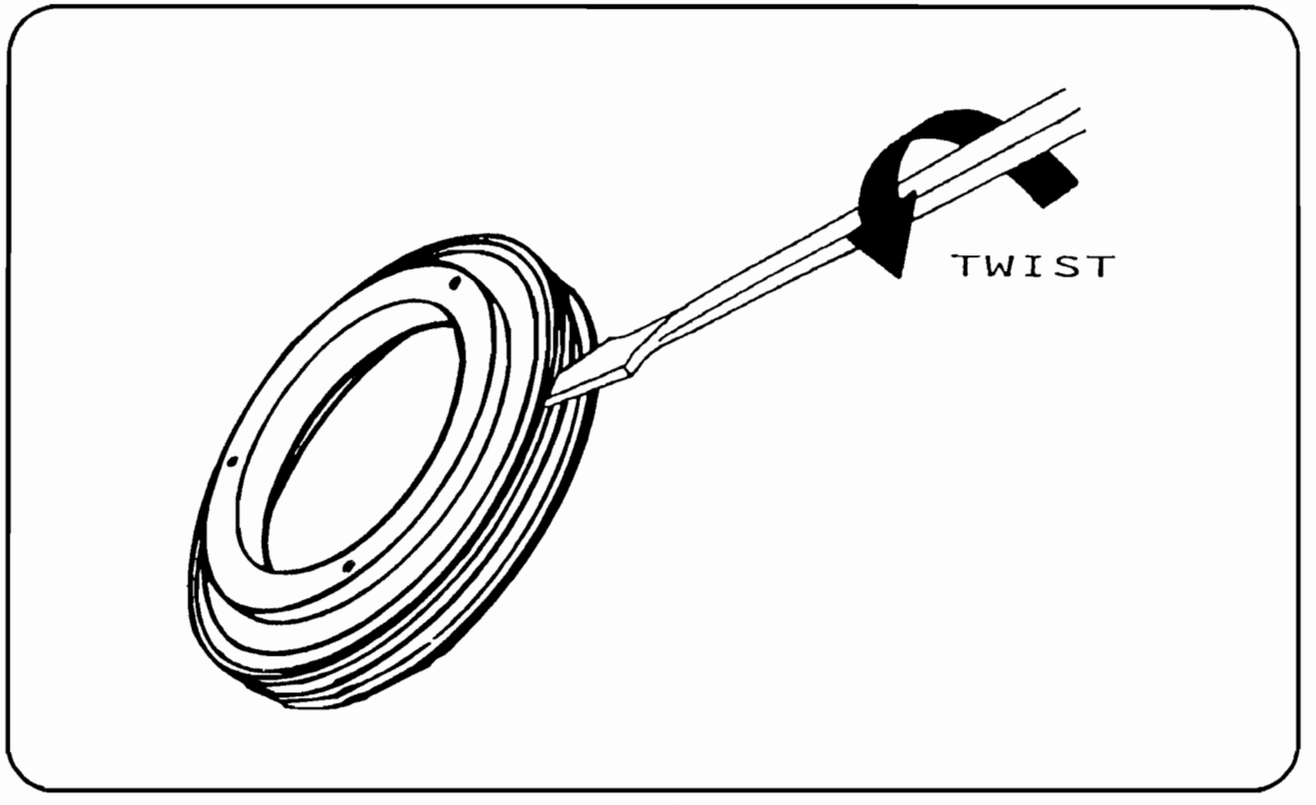


FIGURE 1

FORD AXOD

HARSH COAST DOWNSHIFT

COMPLAINT: Harsh downshift when coasting to a stop at closed throttle.

CAUSE: Insufficient travel of the 1-2 piston against the cushion spring.

CORRECTION: Remove 1/16" to 3/32" from the boss on the inside of the 1-2 servo piston as shown in Figure 1. We have shaded the area to be machined.

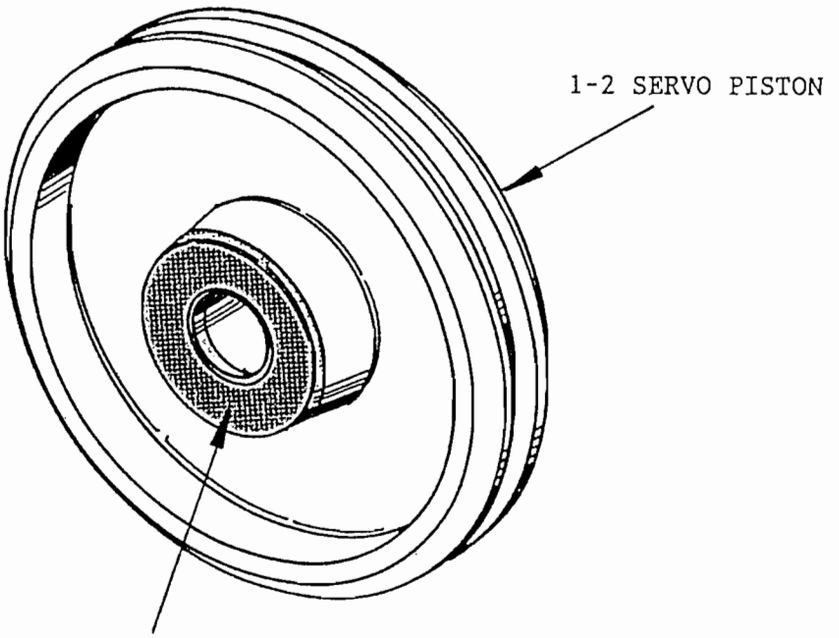


Figure 1

FORD - AXOD

INTERMEDIATE CLUTCH PACK CHANGE

CHANGE: Beginning in model year 1988, a "Wave Plate" was added to the intermediate clutch pack on 3.8L models, and a flat "Spacer Plate" was added on 3.0L models.

REASON: To help cushion the 1-2 shift on 3.8L models.

PARTS AFFECTED:

(1) WAVE PLATE/SPACER PLATE - Either a wave plate or a flat spacer plate was added, depending on engine size. 3.8L models recieved a wave plate, and 3.0L models recieved a flat spacer plate.
The wave plate used in the forward and intermediate clutch packs are very similar. To identify them measure the thickness of each. The forward wave plate will measure approximately .075" thick, and the intermediate wave plate will measure approximately .062" thick, as shown in Figure 3.
The flat spacer plate for the 3.0L models measures .118" thick, as shown in Figure 5.
Refer to Figure 5 for proper position in the clutch pack, of the wave plate or the spacer plate, as some manuals are wrong.

(2) INTERMEDIATE CLUTCH HUB - Overall height was made shorter by approximately .060" with no identifying marks. The hub MUST be measured with a dial caliper or depth gage.
The 1st design hub will measure 1.627"-1.640", and the 2nd design hub will measure 1.568"-1.580" as shown in Figure 1.

(3) INTERMEDIATE CLUTCH STEEL PLATES - Thickness was reduced by .020" to help accomodate the added wave plate on 3.8L models, or the added spacer plate on 3.0L models.
The 1st design steel plates are .090" thick, and the 2nd design steel plates are .070" thick as shown in Figure 2.

(4) INTERMEDIATE CLUTCH PRESSURE PLATE - Thickness was reduced by .065" to help accomodate the added wave plate on 3.8L models, or the added spacer plate on 3.0L models.
The 1st design pressure plate is .190" thick, and the 2nd design pressure plate is .125" thick as shown in Figure 4.

INTERCHANGEABILITY:

YOU CANNOT INTERCHANGE THE INTERMEDIATE CLUTCH COMPONENTS LISTED ABOVE WITH THOSE OF ANY PREVIOUS DESIGN LEVEL.

For model years 1986, 1987, and 1989 transaxles built BEFORE 04/18/89, the intermediate clutch WILL NOT have a wave plate nor spacer plate, and all use 1st design components.

For all 1988 models and 1989 model transaxles built AFTER 04/17/89, the intermediate clutch MUST have a wave plate or spacer plate, and all use 2nd design components.

Refer to Page 3 to determine which transaxles use 1st design components and which use 2nd design components.

SERVICE INFORMATION:

INTERMEDIATE CLUTCH WAVE PLATE (3.8L ENGINE)	E8DZ-7E085-A
INTERMEDIATE CLUTCH SPACER PLATE (3.0L ENGINE)	E8DZ-7B437-A
INTERMEDIATE CLUTCH STEEL PLATE (1ST DESIGN .090")	E6DZ-7B442-B
INTERMEDIATE CLUTCH STEEL PLATE (2ND DESIGN .070")	E6DZ-7B442-A
INTERMEDIATE CLUTCH HUB (1ST DESIGN 1.627"-1.640")	E6DZ-7B067-A
INTERMEDIATE CLUTCH HUB (2ND DESIGN 1.568"-1.580")	E8DZ-7B067-A
INTERMEDIATE CLUTCH PRESSURE PLATE (1ST DESIGN .190")	E6DZ-7B066-B
INTERMEDIATE CLUTCH PRESSURE PLATE (2ND DESIGN .125")	E8DZ-7B066-A
INTERMEDIATE CLUTCH FRICTION PLATE (ALL MODELS)	E8DZ- 7B164-A

NOTE: CLUTCH PACK CLEARANCE;
NON WAVE PLATE (1ST DESIGN ..... .044"-.111"
WAVE PLATE/SPACER PLATE (2ND DESIGN) .. .049"-.119"

86-87 INTERMEDIATE CLUTCH COMPONENTS, ALL MODELS
- 5 Steel Plates (.090" Thick) E6DZ-7B442-B
- 5 Friction Plates E8DZ-7B164-A
- 1 Clutch Hub, 1st Design (1.627"-1.640" Overall Height) E6DZ-7B067-A
- 1 Pressure Plate, 1st Design (.190" Thick) E6DZ-7B066-A

1988 INTERMEDIATE CLUTCH COMPONENTS, 3.8L ENGINE ONLY
- 1 Wave Plate (.157" Thick) E8DZ-7E085-A
- 5 Steel Plates (.070" Thick) E6DZ-7B442-A
- 5 Friction Plates E8DZ-7B164-A
- 1 Clutch Hub, 2nd Design (1.568"-1.580" Overall Height) E8DZ-7B067-A
- 1 Pressure Plate, 2nd Design (.125" Thick) E8DZ-7B066-A

1988 INTERMEDIATE CLUTCH COMPONENTS, 3.0L ENGINE ONLY
- 1 Flat Spacer Plate E8DZ-7B437-A
- 5 Steel Plates (.070" Thick) E6DZ-7B442-A
- 5 Friction Plates E8DZ-7B164-A
- 1 Clutch Hub, 2nd Design (1.568"-1.580" Overall Height) E8DZ-7B067-A
- 1 Pressure Plate, 2nd Design (.125" Thick) E8DZ-7B066-A

1989 INTERMEDIATE CLUTCH COMPONENTS (BEFORE 04/18/89), ALL MODELS
- 5 Steel Plates (.090" Thick) E6DZ-7B442-B
- 5 Friction Plates E8DZ-7B164-A
- 1 Clutch Hub, 1st Design (1.627"-1.640" Overall Height) E6DZ-7B067-A
- 1 Pressure Plate, 1st Design (.190" Thick) E6DZ-7B066-A

1989 INTERMEDIATE CLUTCH COMPONENTS (AFTER 04/17/89), 3.8L ENGINE ONLY
- 1 Wave Plate (.157" Thick) E8DZ-7E085-A
- 5 Steel Plates (.070" Thick) E6DZ-7B442-A
- 5 Friction Plates E8DZ-7B164-A
- 1 Clutch Hub, 2nd Design (1.568"-1.580" Overall Height) E8DZ-7B067-A
- 1 Pressure Plate, 2nd Design (.125" Thick) E8DZ-7B066-A

1989 INTERMEDIATE CLUTCH COMPONENTS (AFTER 04/17/89), 3.0L ENGINE ONLY
- 1 Flat Spacer Plate E8DZ-7B437-A
- 5 Steel Plates (.070" Thick) E6DZ-7B442-A
- 5 Friction Plates E8DZ-7B164-A
- 1 Clutch Hub, 2nd Design (1.568"-1.580" Overall Height) E8DZ-7B067-A
- 1 Pressure PLate, 2nd Design (.125" Thick) E8DZ-7B066-A

1990 INTERMEDIATE CLUTCH COMPONENTS, 3.8L ENGINE ONLY
- 1 Wave Plate (.157" Thick) E8DZ-7E085-A
- 5 Steel Plates (.070" Thick) E6DZ-7B442-A
- 5 Friction Plates E8DZ-7B164-A
- 1 Clutch Hub, 2nd Design (1.568"-1.580" Overall Height) E8DZ-7B067-A
- 1 Pressure Plate, 2nd Design (.125" Thick) E8DZ-7B066-A

1990 INTERMEDIATE CLUTCH COMPONENTS, 3.0L ENGINE ONLY
- 1 Flat Spacer Plate E8DZ-7B437-A
- 5 Steel Plates (.070" Thick) E6DZ-7B442-A
- 5 Friction Plates E8DZ-7B164-A
- 1 Clutch Hub, 2nd Design (1.568"-1.580" Overall Height) E8DZ-7B067-A
- 1 Pressure Plate, 2nd Design (.125" Thick) E8DZ-7B066-A

91-92 INTERMEDIATE CLUTCH COMPONENTS, ALL ENGINES, ALL MODELS
- 1 Wave Plate (.157" Thick) E8DZ-7E085-A
- 5 Steel Plates (.070" Thick) E6DZ-7B442-A
- 5 Friction Plates E8DZ-7B164-A
- 1 Clutch Hub, 2nd Design (1.568"-1.580" Overall Height) E8DZ-7B067-A
- 1 Pressure Plate, 2nd Design (.125" Thick) E8DZ-7B066-A

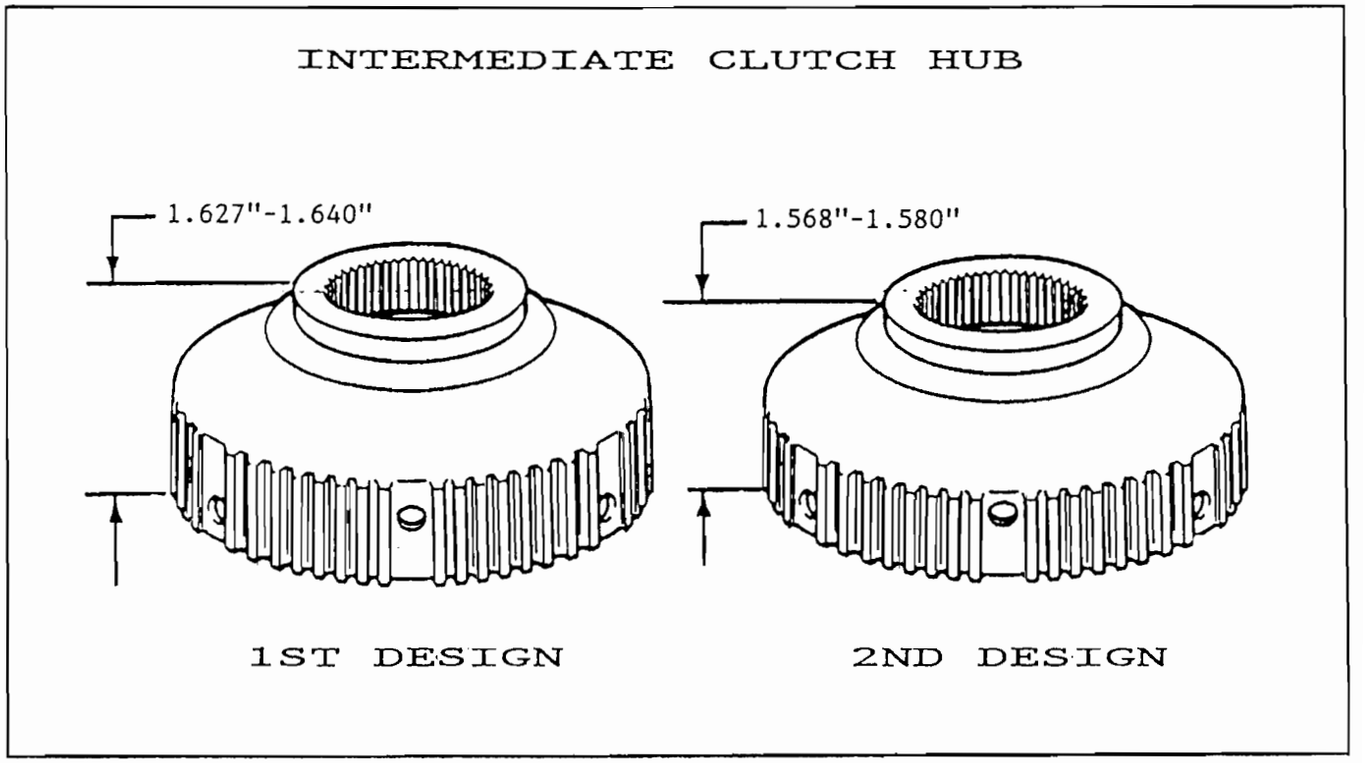


Figure 1

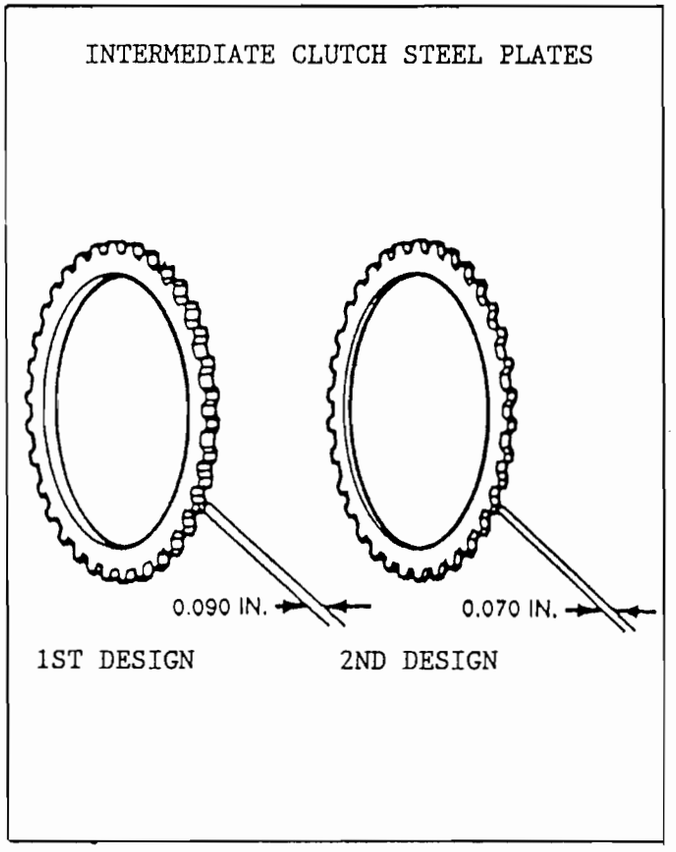


Figure 2

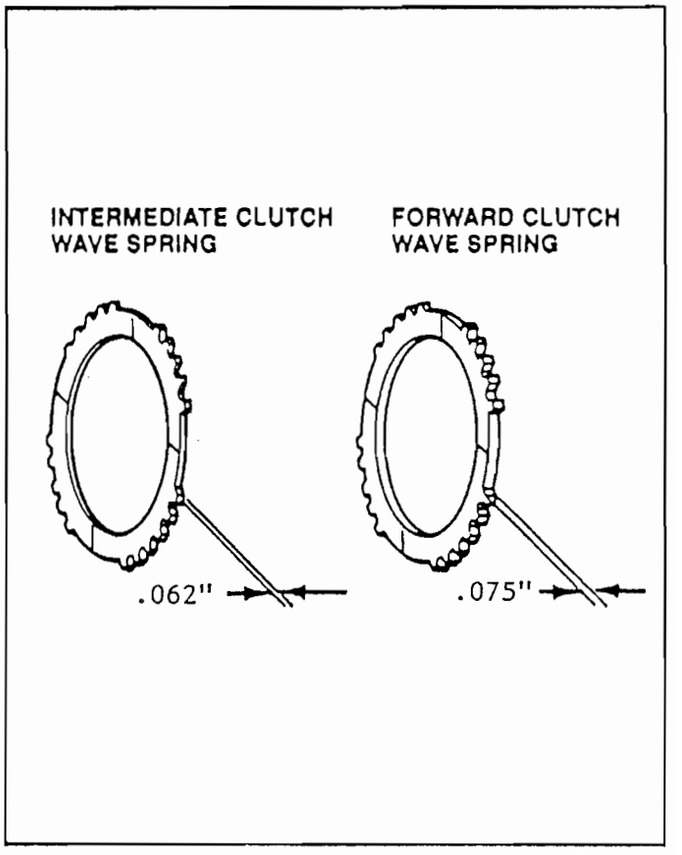


Figure 3

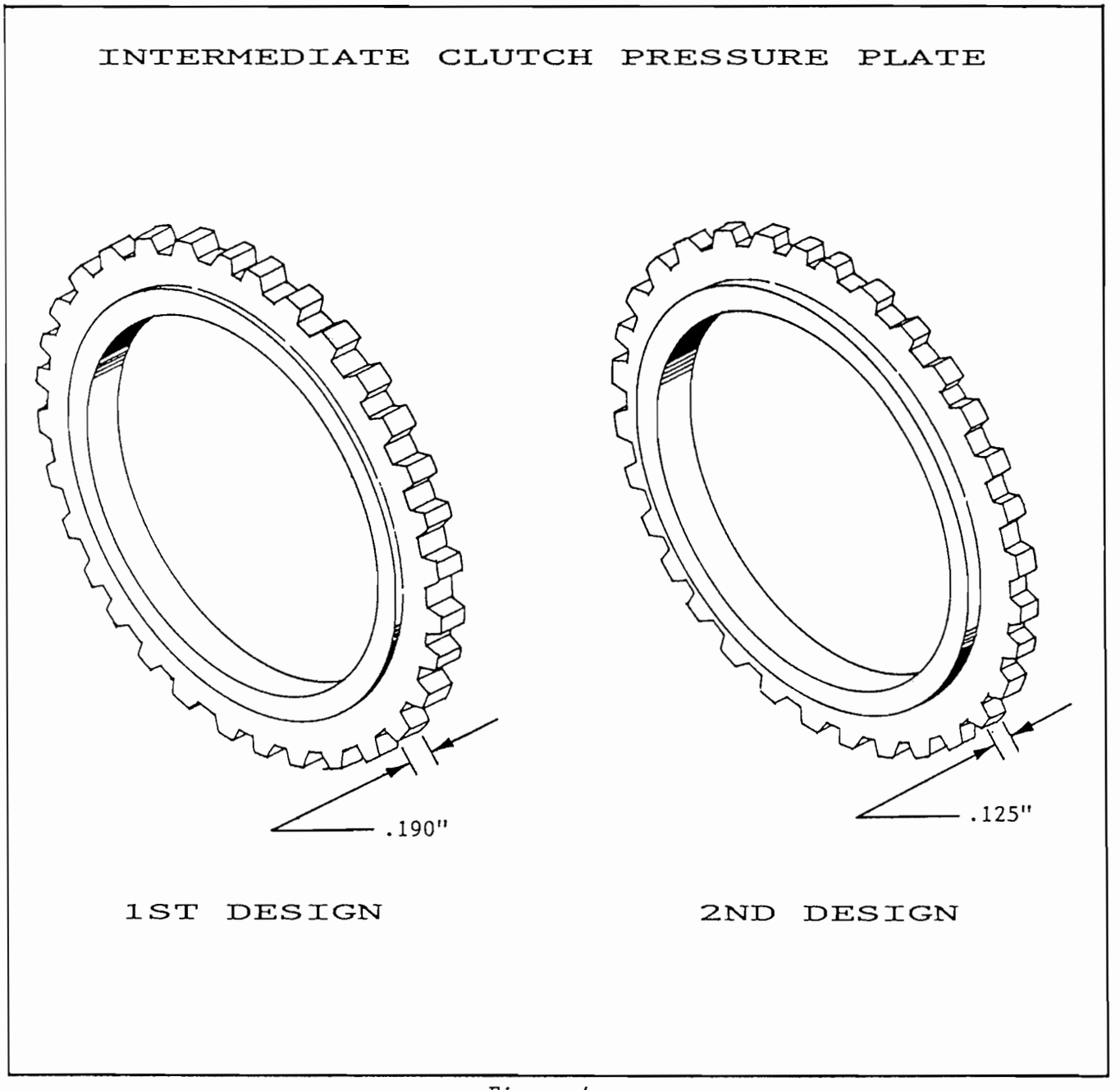

INTERMEDIATE CLUTCH PRESSURE PLATE
.190"
.125"
1ST DESIGN
2ND DESIGN

Figure 4

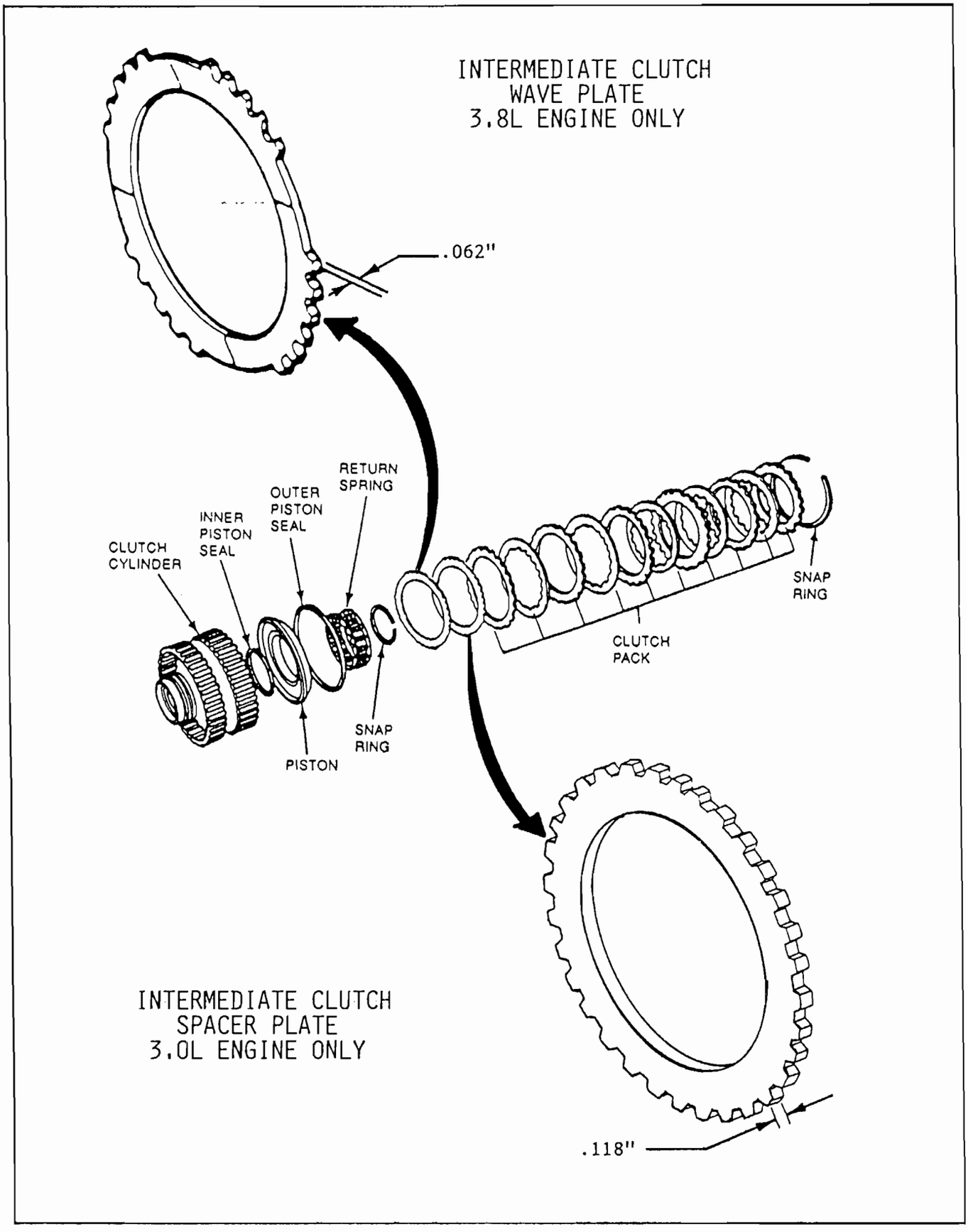

INTERMEDIATE CLUTCH
WAVE PLATE
3.8L ENGINE ONLY
.062"
RETURN SPRING
OUTER PISTON SEAL
INNER PISTON SEAL
CLUTCH CYLINDER
SNAP RING
CLUTCH PACK
SNAP RING
PISTON
INTERMEDIATE CLUTCH
SPACER PLATE
3.0L ENGINE ONLY
.118"

Figure 5

FORD - AXOD-E

PREMATURE PLANETARY FAILURE

COMPLAINT: Front planetary and gear train failure with no visible reason.

CAUSE: The cause may be, a limited volume of lube oil to the front planetary due to hydraulic control system demands.

CORRECTION: Install a new crossover rear lube tube, OEM number F2DZ-7G084-A, and a new differential/speedo lube tube, OEM number F2DZ-7G086-A, that will increase the volume of lube to the front planetary.

The rear lube tube and the differential/speedo lube tube, Figure 1, have been reversed in the transaxle case. This requires the rear lube tube to "Cross-Over" the differential/speedo lube tube. This crossover will allow for a larger volume of uninterrupted lube to the front planetary.

This change has been incorporated in mid-year 1992 for ALL AXOD-E transaxles.

SERVICE INFORMATION:

Crossover Rear Lube Tube F2DZ-7G084-A
Differential/Speedo Lube Tube F2DZ-7G086-A

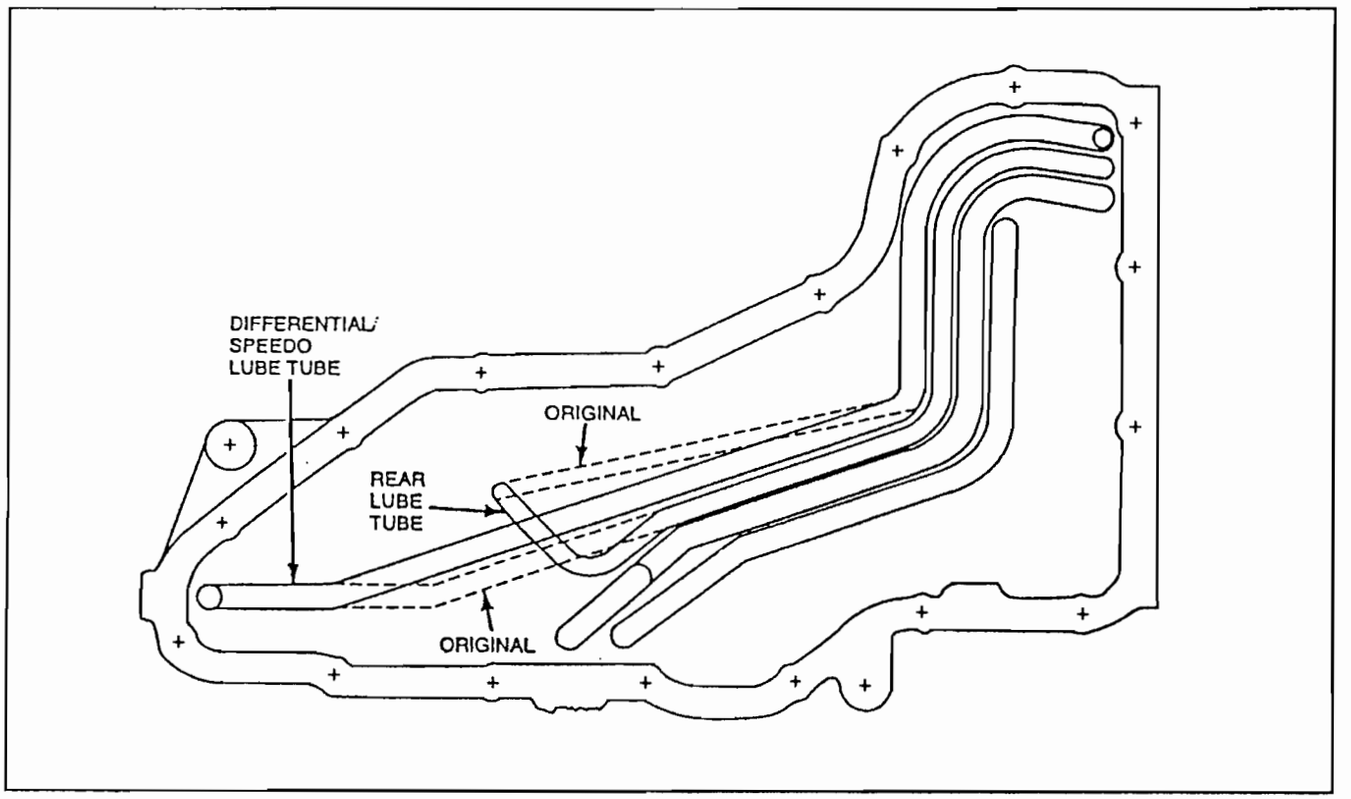


Figure 1

THE ANSWER TO YOUR TRANSMISSION PROBLEMS IS ANSWERMATIC.

Losing valuable time due to superficially worn hard parts or non-sealing soft parts? The original Answermatic, or our new Unit Tester II, is the answer.

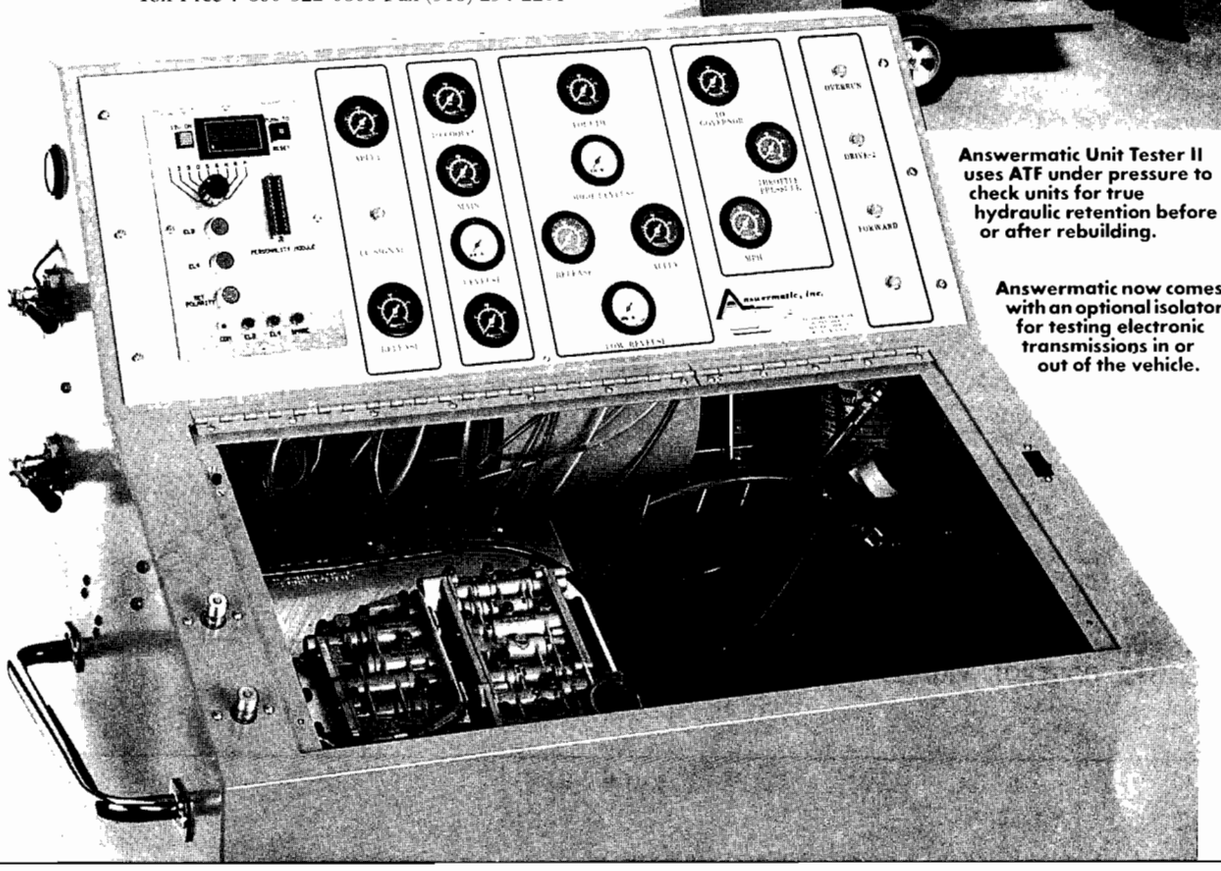
- *Eliminate no-goes and come-backs*
- *Locate small cracks and imperfections in seconds*
- *Custom calibrate your transmissions*
- *Adapts to electronic transmissions*
- *Very affordable.*
- *Easy-to-learn and easy-to-use*
- *Fits virtually all foreign and domestic front and rear wheel cars and trucks*

Answermatic, Inc. ™

Patent #4809544. Other patents pending.

70-K Corbin Avenue, Bay Shore, NY 11706
Toll Free 1-800-322-0806 Fax (516) 254-2201

Let Answermatic answer all your questions about transmission repair. Call toll free **1-800-322-0806** or Fax (516) 254-2201 for our **free brochure**.



Answermatic Unit Tester II uses ATF under pressure to check units for true hydraulic retention before or after rebuilding.

Answermatic now comes with an optional isolator for testing electronic transmissions in or out of the vehicle.

FORD - AXOD-E
3-NEUTRAL KICKDOWN SHIFT

COMPLAINT: A delayed shift may occur during 3-2 forced downshifts, or "Kickdown", and/or the transaxle will shift to neutral during the 3-2 kickdown.

CAUSE: The cause may be, a broken spring retainer clip between the pull-in control valve spring and the 3-2 control valve spring, as shown in Figure 1.

CORRECTION: Replace the spring retainer clip with OEM part number F1DZ-7F194-A.

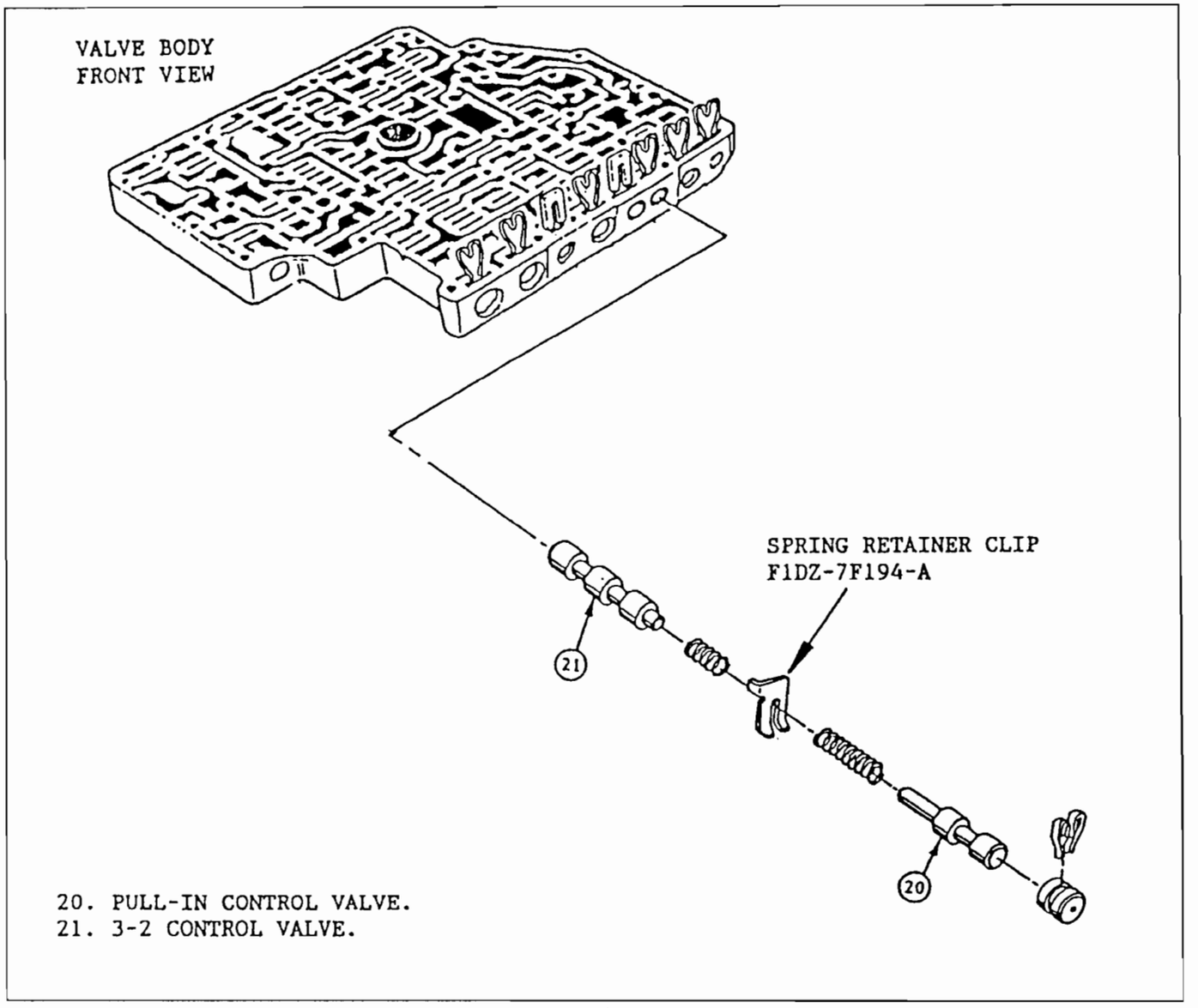


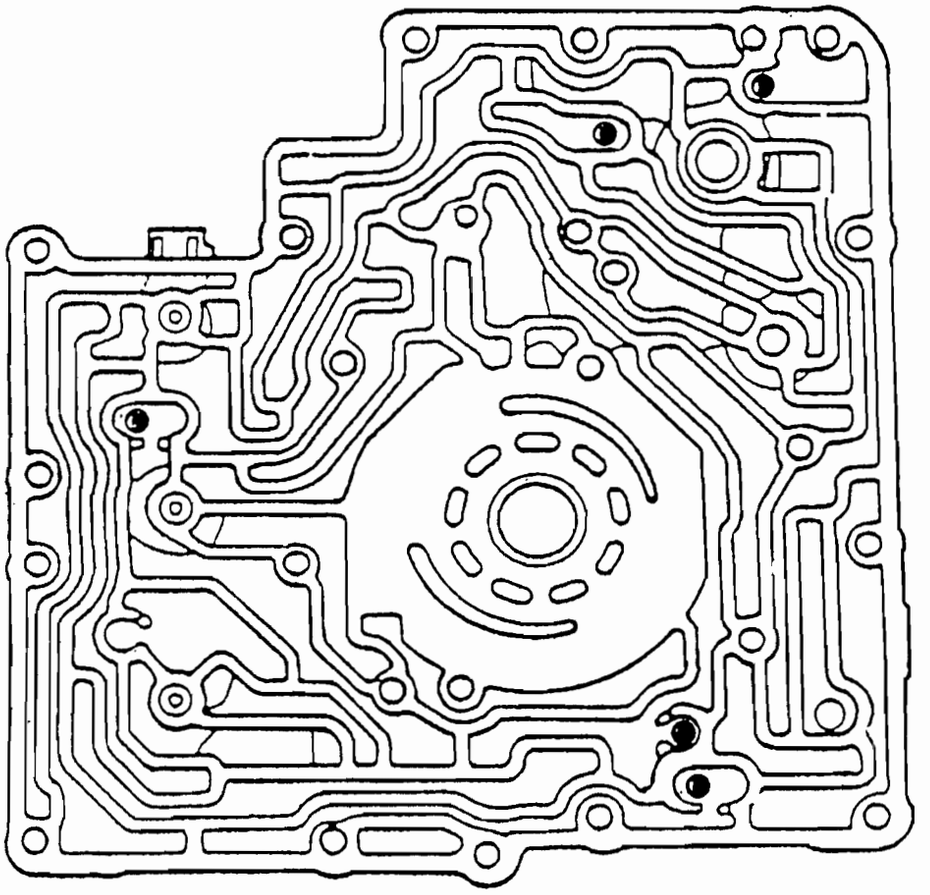
Figure 1

FORD AXOD-E

PUMP CHECKBALL LOCATION CHANGES

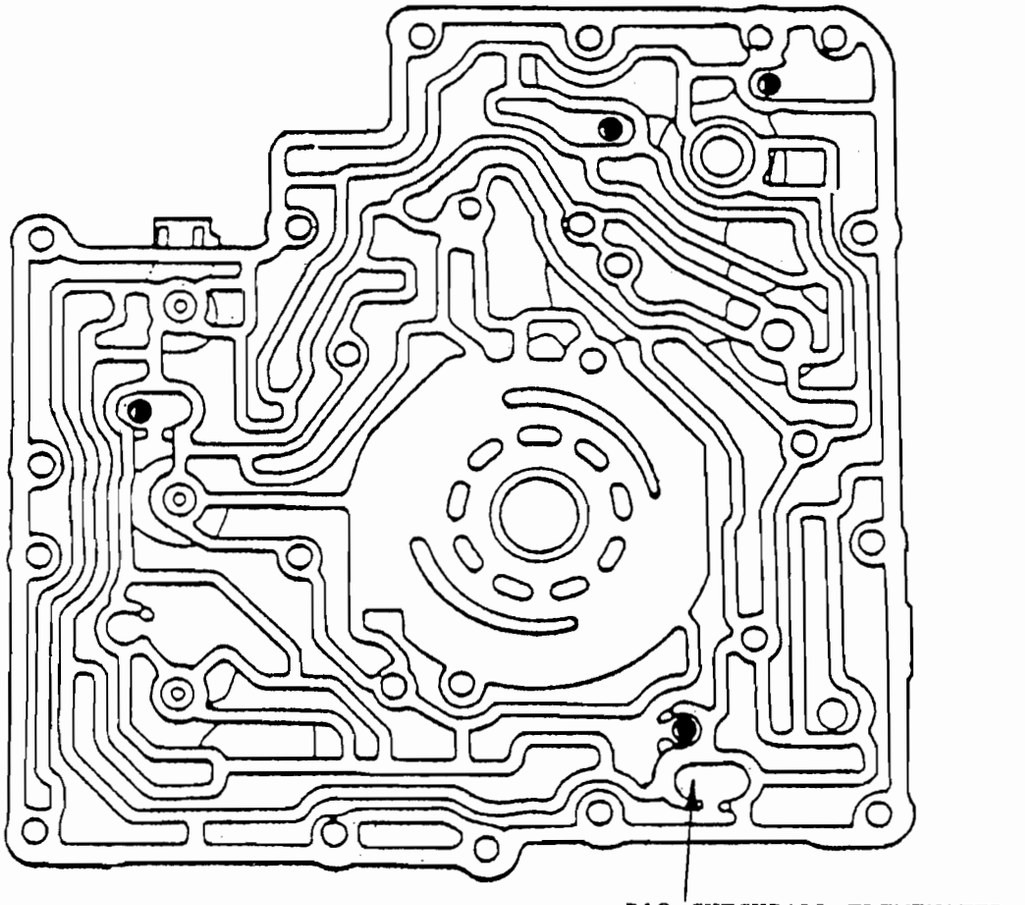
1. EARLY 1991 ONLY: USES 5 CHECKBALLS IN THE LOCATIONS SHOWN IN FIGURE 1.
2. LATE 1991 ONLY: THE B12 CHECKBALL THAT SEPERATED TV/L234 WAS ELIMINATED, AS SHOWN IN FIGURE 2. THIS REQUIRED A SPACER PLATE CHANGE.
3. 1992 MODEL ONLY: THE B13 CHECKBALL WAS ELIMINATED, ALLOWING FORWARD CLUTCH OIL TO EXHAUST UNORIFICED IN OVERDRIVE.

   THE B2 CHECKBALL WAS ADDED FORCING FORWARD CLUTCH OIL THRU THE "K" ORIFICE. REFER TO FIGURE 3.



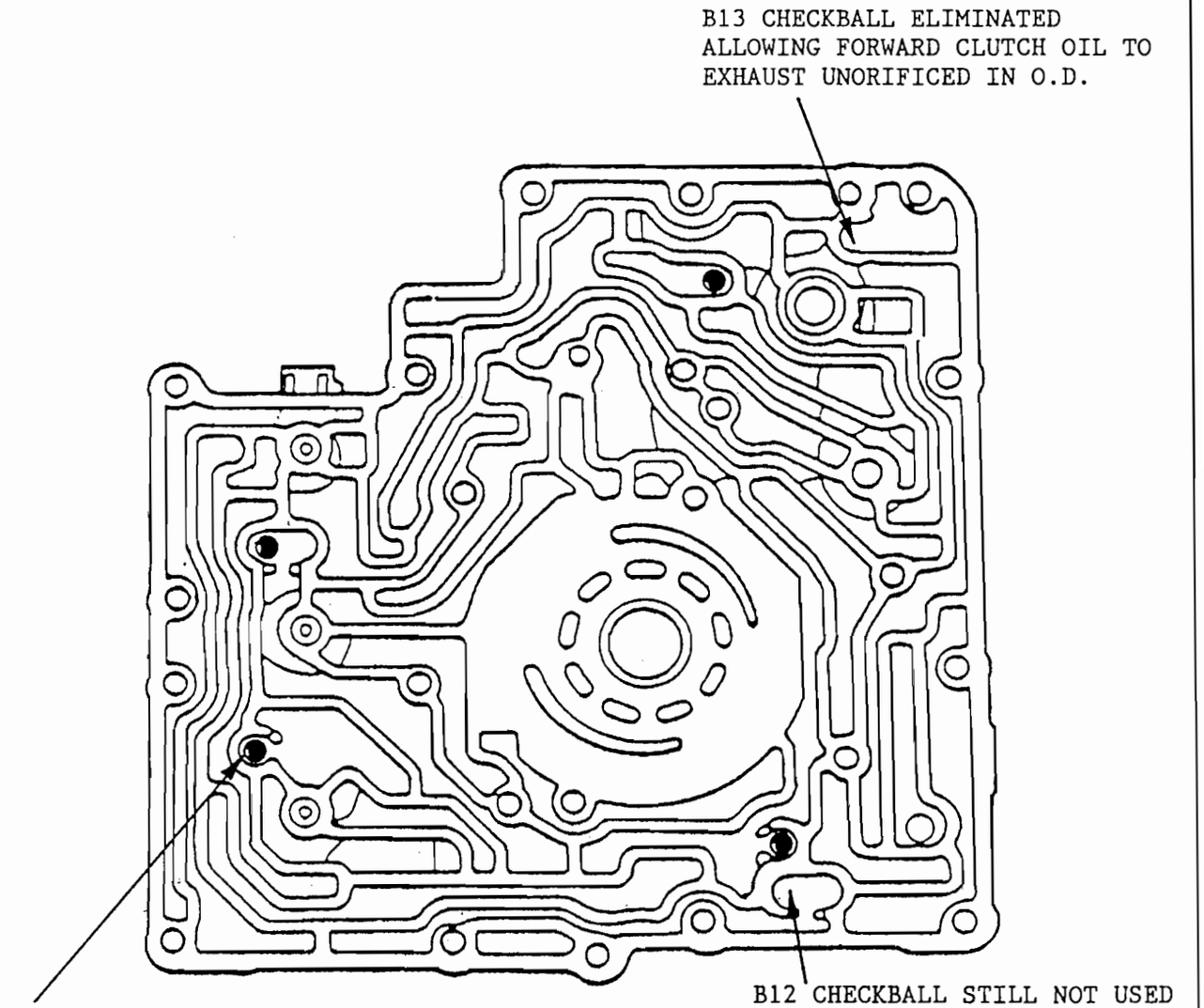
CHECKBALL LOCATIONS
"EARLY" 1991 ONLY

Figure 1



CHECKBALL LOCATIONS
"LATE" 1991 ONLY

Figure 2



CHECKBALL LOCATIONS
1992 MODELS ONLY

Figure 3

FORD AXOD-E
LOSS OF LUBE

COMPLAINT: Loss of lube oil and planetary gear failure.

CAUSE: Particles of gasket material from the pump gasket block the lube oil passage. If you look at Figure 1, old style gasket, you will notice the area by the inlet is solid and the new style has a large cut out. the old style gasket had no support of the plate and would tear and the pieces would travel through the lube passage. The new style gasket removed the area of the gasket that was not supported.

CORRECTION: Install new gasket located between the oil pump plate and the valve body.

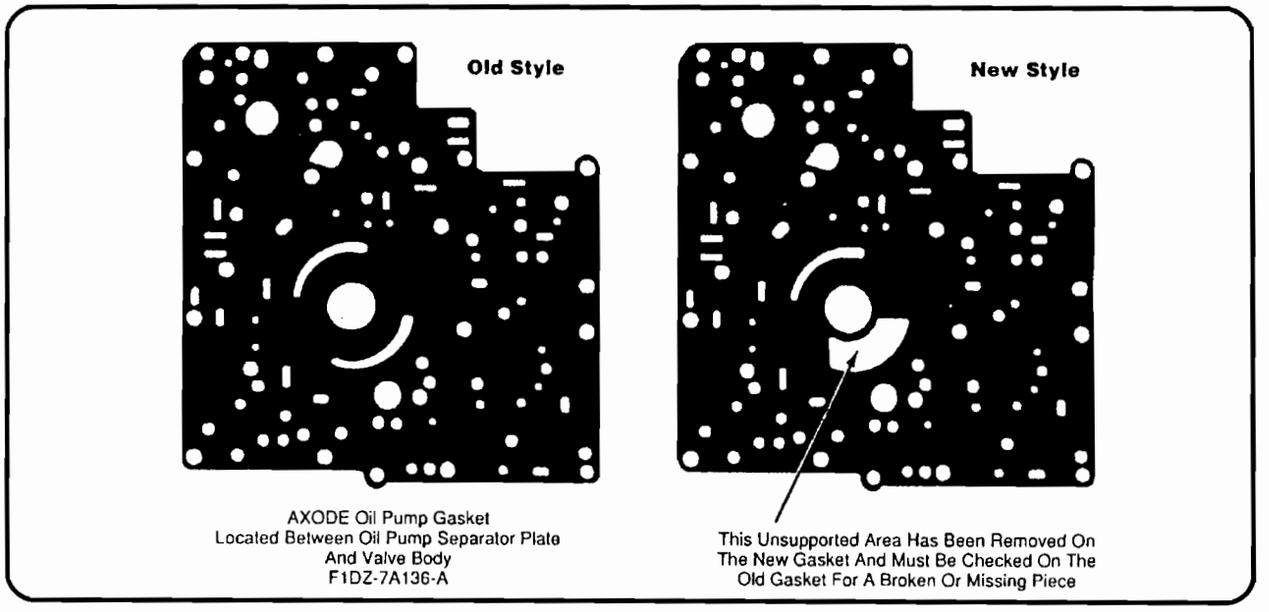


Figure 1

FORD AXOD-E

LOW SPRAG OUTER RACE CHANGE
FORWARD CLUTCH PACK CHANGE

CHANGE: There has been a new low sprag outer race introduced on 1992 model AXOD-E transaxles that requires new forward clutches, both lined and steel, a new waved plate, and a new pressure plate.

REASON: Improved durability of the low sprag outer race.

PARTS AFFECTED:

(1) LOW SPRAG OUTER RACE - The outer diameter of the race was increased from 4.575" to 4.825", and the width of the race was increased from .600" to .725". THE INSIDE DIAMETER OF THE SPRAG OUTER RACE DID NOT CHANGE. Refer to Figure 1.

(2) FORWARD CLUTCH LINED PLATES - Have an increased inside diameter to accomodate the increased sprag outer race diameter.

(3) FORWARD CLUTCH STEEL PLATES - Have an increased inside diameter to accomodate the increased sprag outer race diameter.

(4) FORWARD CLUTCH WAVE PLATE - Has an increased inside diameter to accomodate the increased sprag outer race diameter.

(5) FORWARD CLUTCH PRESSURE PLATE - Has an increased inside diameter to accomodate the increased sprag outer race diameter.

INTERCHANGEABILITY:

None of the parts listed above are interchangeable with previous model parts. When the sprag outer race is changed, the forward clutch components must also be changed.

When ALL of the above parts are changed as a package, they WILL retro fit back to ALL previous models. There is now available a new service package that includes all of the above listed parts, and is available under OEM part number F2DZ-7D171-A.

SERVICE INFORMATION:

Low Clutch Overhaul Kit F2DZ-7D171-A

INCLUDES THE FOLLOWING:
- 1 Low Sprag Outer Race
- 3 Forward Clutch Steel Plates
- 3 Forward Clutch Lined Plates
- 1 Forward Clutch Wave Plate
- 1 Forward Clutch Pressure Plate

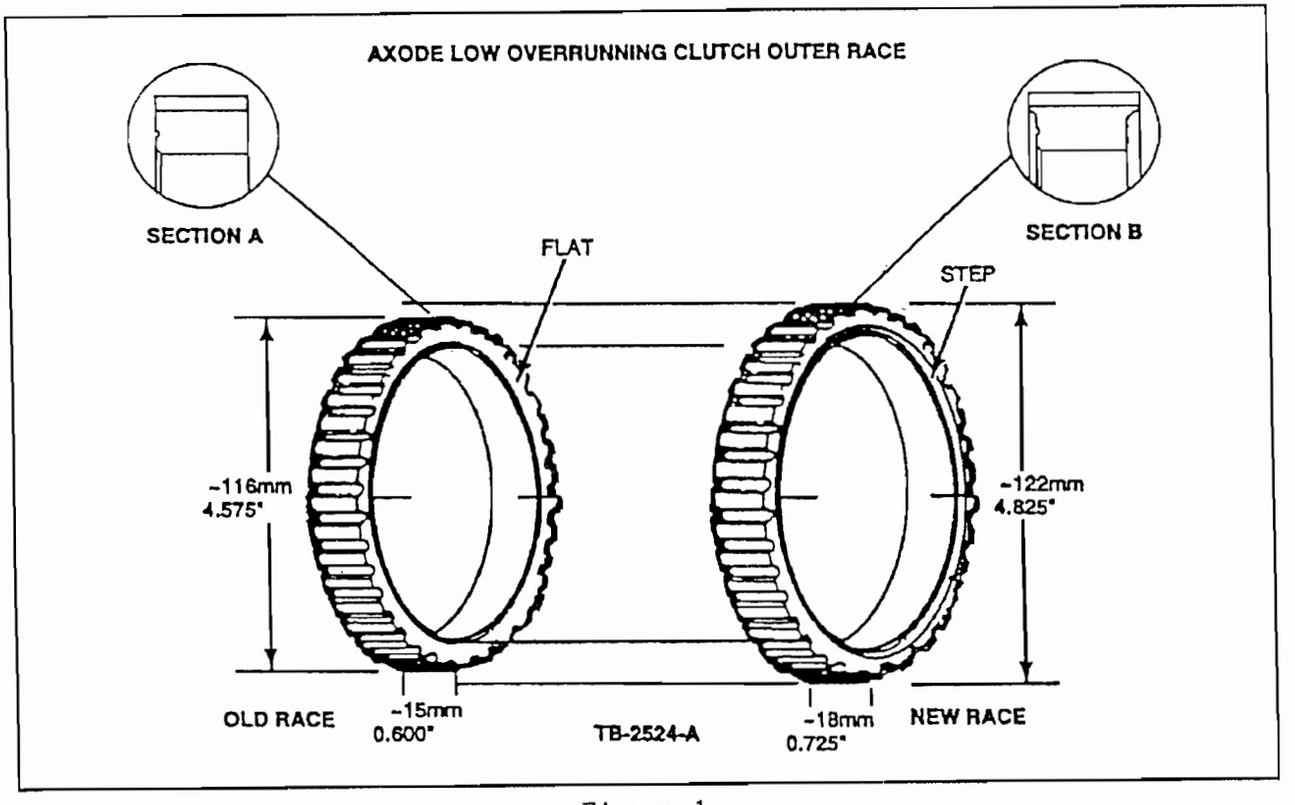

AXODE LOW OVERRUNNING CLUTCH OUTER RACE
SECTION A
SECTION B
FLAT
STEP
~116mm
4.575"
~122mm
4.825"
OLD RACE
~15mm
0.600"
TB-2524-A
~18mm
0.725"
NEW RACE

Figure 1

FORD - AXOD/AXOD-E

FORWARD CLUTCH WAVE PLATE CHANGE

CHANGE: The forward clutch wave plate has changed 3 times since the transaxle was introduced in model year 1986.

REASON: To help improve garage shift engagement and to help improve 4-2 and 3-2 forced downshifts.

PARTS AFFECTED:

(1) FORWARD CLUTCH WAVE PLATE:

1ST DESIGN - Has 4 external teeth, an inside diameter of 4.715", material thickness of .062", and was used from 1986-1988. Refer to Figure 1.

2ND DESIGN - Has 21 external teeth, an inside diameter of 4.730", material thickness of .075", identified with the letter "X" stamped on 1 tooth, and was used from 1989-1991 (See Figure 2).

3RD DESIGN - Has 21 external teeth, an inside diameter of 4.930", material thickness of .083", identified with the letter "A" stamped on 1 tooth, and was used in 1992 and later models (See Figure 3).

INTERCHANGEABILITY:

The 2nd design forward clutch wave plate will retro-fit back to previous models and is the recommended wave plate for the AXOD.

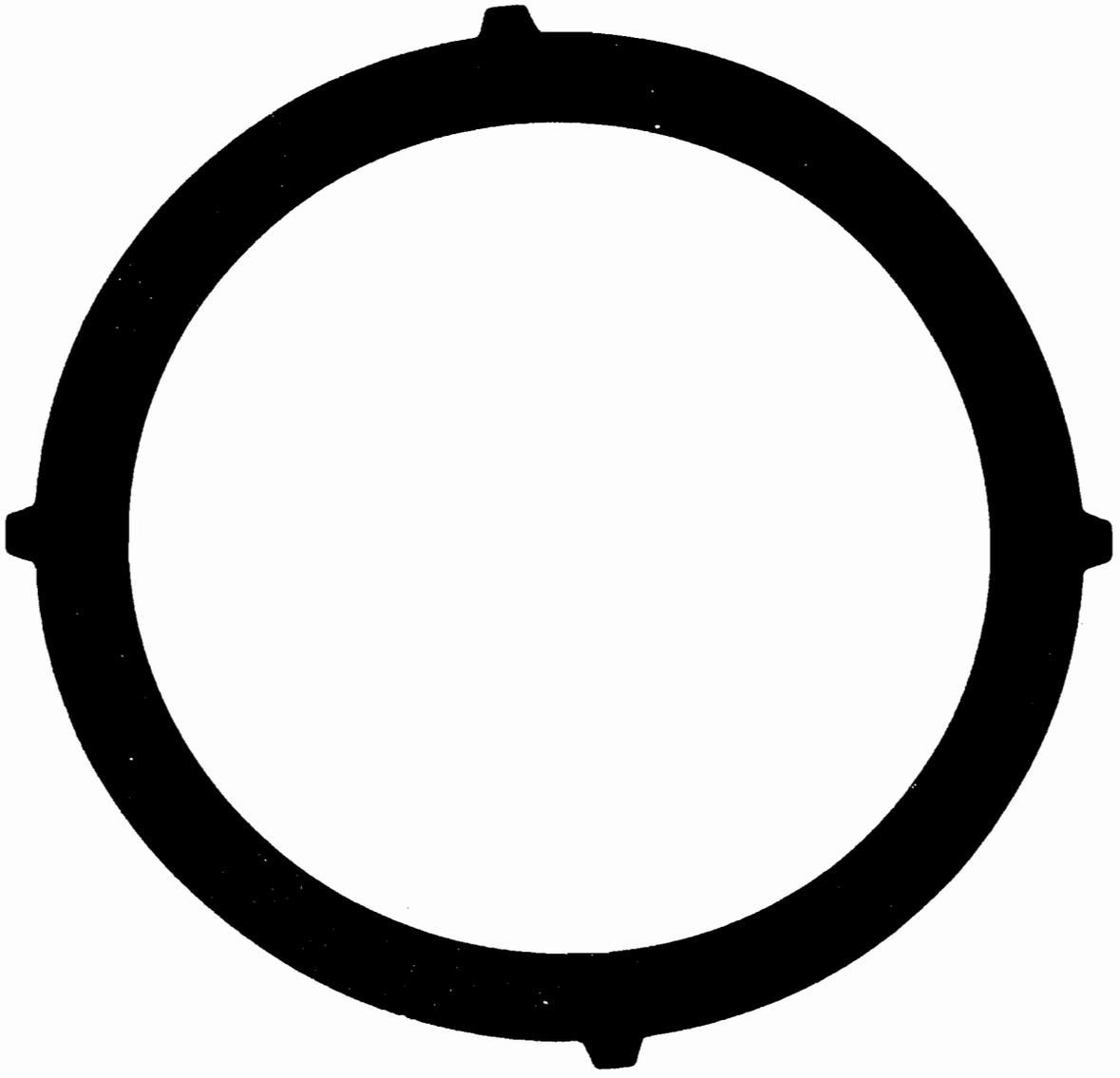
The 3rd design forward clutch wave plate was associated with a change in the entire forward clutch pack and should be used ONLY on these models.

SERVICE INFORMATION:

Forward Clutch Wave Plate (1st Design) E6DZ-7E085-B
Forward Clutch Wave Plate (2nd Design) F0DZ-7E085-A
Forward Clutch Wave Plate (3rd Design) F2DZ-7E085-A

FORD - AXOD

FORWARD CLUTCH WAVE PLATE
USED 1986-1988



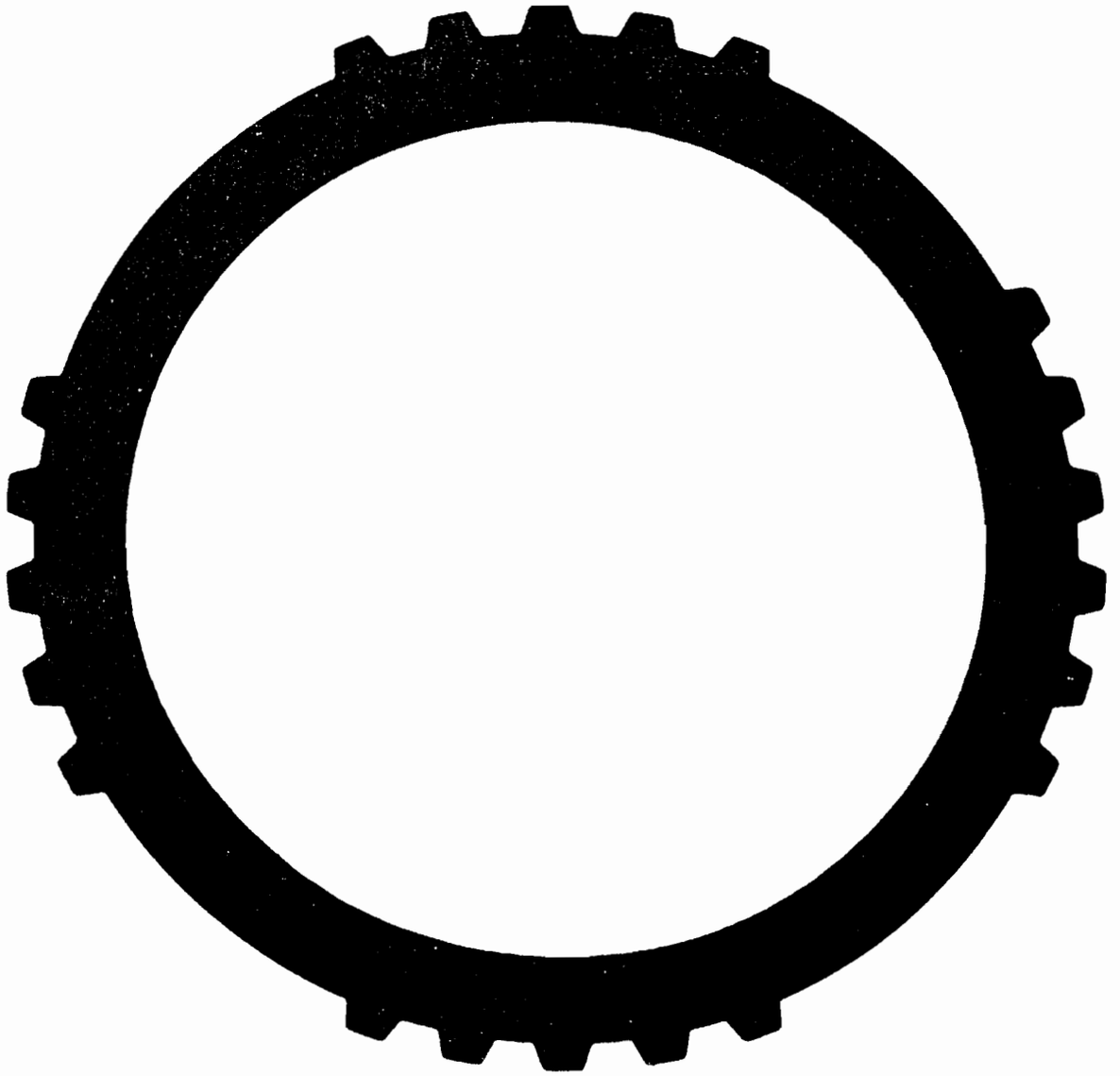
1ST DESIGN

4 EXTERNAL TEETH.
INSIDE DIAMETER 4.715".
MATERIAL IS .062" THICK.
PART NUMBER E6DZ-7E085-B

Figure 1

FORD - AXOD

FORWARD CLUTCH WAVE PLATE
USED 1989-1991



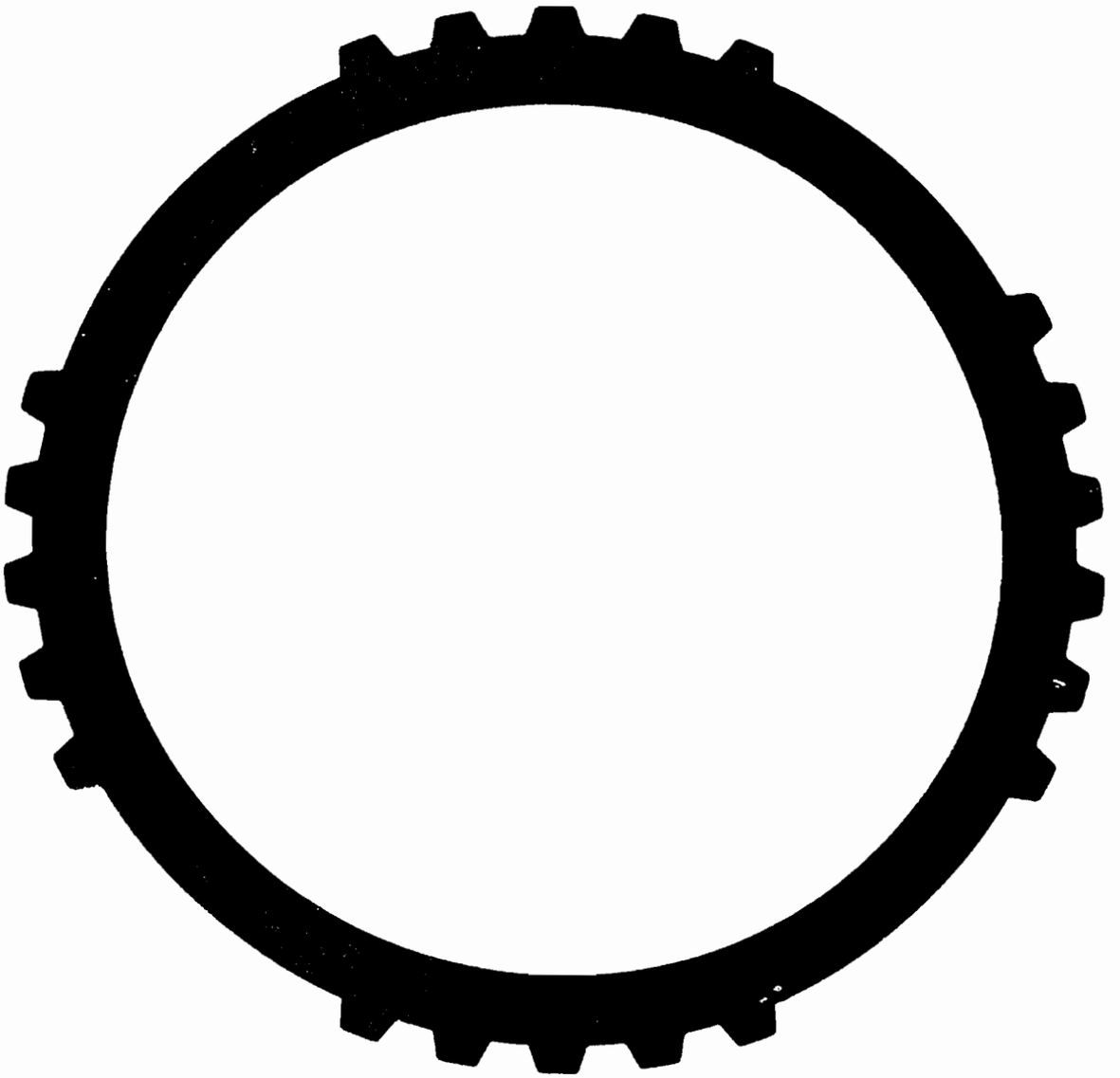
2ND DESIGN

21 EXTERNAL TEETH.
INSIDE DIAMETER 4.730".
MATERIAL IS .075" THICK.
I.D. STAMPED "X" ON 1 TOOTH.
PART NUMBER F0DZ-7E085-A.

Figure 2

FORD - AXOD-E

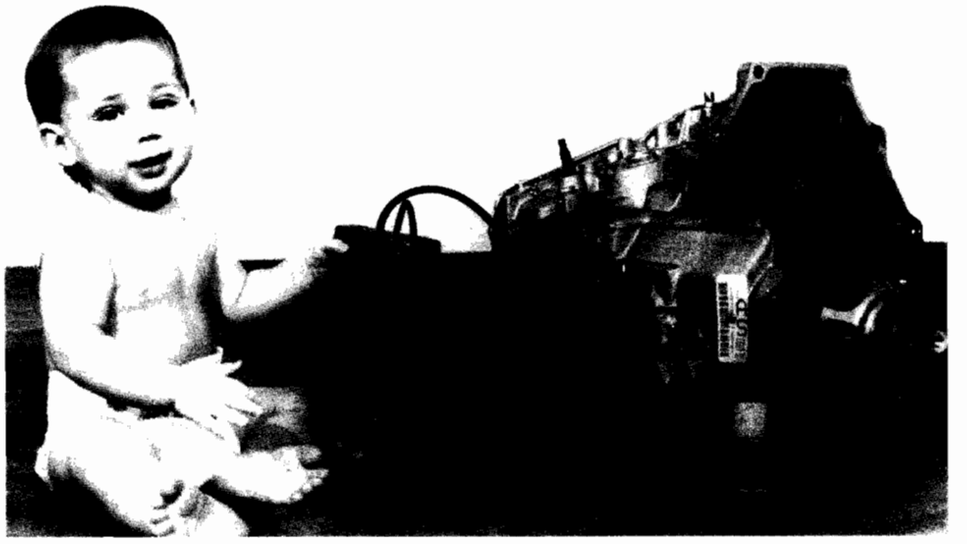
FORWARD CLUTCH WAVE PLATE
USED 1992-UP



3RD DESIGN

21 EXTERNAL TEETH.
INSIDE DIAMETER 4.930".
MATERIAL IS .083" THICK.
I.D. STAMPED "A" ON 1 TOOTH.
PART NUMBER F2DZ-7E085-A.

Figure 3



HE HAS PLENTY OF TIME TO LEARN COMPUTER SCANNERS AND COMPUTERIZED TRANSMISSIONS. *YOU DON'T!!!*

With all the running changes in transmissions, sometimes it feels like you don't even have time to breathe!!!
Well, ATSG will feel like a breath of fresh air. We mean it...

- *Subscribership with benefits.*
- *A hotline with answers.*
- *Manuals and videotapes to keep you updated.*
- *Live seminars "Whats new for '92".*
- *Training course: Hands-on computer vehicle.*
- *Training course: Hands-on new model transmissions.*
- *Nationwide warranty.*
- *Technical bulletin service.*
- *Computer diagnostic software.*

Remember the four letters that spell help

ATSG
AUTOMATIC TRANSMISSION SERVICE GROUP

INVEST IN YOURSELF Call: 1-800-245-7722
9200 South Dadeland Blvd. Ste. 720
Miami. FL 33156

FORD AXOD-E

ELECTRICAL DIAGNOSIS (UPDATED)

EPC SOLENOID

1. Volt/Ohmmeter set to Ohms, with leads terminal to terminal on EPC Solenoid, Ohmmeter should read 2.5-6.5 ohms resistance.
2. 0-100 PSI gauge installed in TV port:
   EPC energized = 10-20 PSI TV pressure.
   EPC de-energized = 75-85 PSI TV pressure.
3. Wires for the EPC Solenoid are fed through pins 1 and 6, of the "Black" case connector, located on top of the transaxle (See Figures 2 and 3).
4. Could store service codes 624, 625, 649, 651.

MODULATED LOCK-UP SOLENOID (MLUS)

1. Volt/Ohmmeter set to Ohms, with leads terminal to terminal on MLUS, Ohmmeter should read 0.75-2.0 ohms resistance.
2. Wires for the MLUS are fed through pins 4 and 5, of the "Black" case connector, located on top of the transaxle (See Figures 2 and 3).
3. The Modulated Lock-up Solenoid (MLUS) is found on the Lincoln only.

LOCK-UP SOLENOID (LUS)

1. Volt/Ohmmeter set to Ohms, with leads terminal to terminal on the LUS, Ohmmeter should read 16-40 ohms resistance.
2. Wires for the LUS are fed through pins 4 and 5, of the "Black" case connector, located on top of the transaxle (See Figures 2 and 3).
3. Either Lock-up Solenoid could store service codes 628, 629, 652.

TRANSMISSION OIL TEMPERATURE SENSOR (TOT)

1. Volt/Ohmmeter set to Ohms, with leads terminal to terminal on TOT Sensor, Ohmmeter should read resistance approximately as shown in chart below.

FLUID TEMPERATURE DEGREES °C	FLUID TEMPERATURE DEGREES °F	OHMS RESISTANCE
0-20	32-58	33.5K-107K
21-40	59-104	14.5K-33.5K
41-70	105-158	5.0K-14.5K
71-90	159-194	2.5K-5.0K
91-110	195-230	1.5K-2.5K
111-130	231-266	0.8K-1.5K

2. Resistance should decrease if transaxle is heated, and should increase if transaxle is allowed to cool. Oil pan that is warm to the touch is about 105°F-158°F.

TURBINE SPEED SENSOR

1. Volt/Ohmmeter set to Ohms, with leads terminal to terminal on Turbine Speed Sensor, Ohmmeter should read 80-220 ohms resistance.
2. Depth of exciter wheel tooth from outer edge of chain cover should not exceed 20.62mm (.810").
3. Could store service code 639.

VEHICLE SPEED SENSOR

1. Volt/Ohmmeter set to Ohms, with leads terminal to terminal on Vehicle Speed Sensor, Ohmmeter should read 190-240 ohms resistance.
2. Could store service code 452.

SHIFT SOLENOID 1 (SS1)

1. Volt/Ohmmeter set to Ohms, with leads terminal to terminal on SS1, Ohmmeter should read 12-30 ohms resistance.
2. Wires for SS1 are fed through pins 5 and 6, of the "White" case connector, located on the side of the transaxle (See Figures 2 and 3).
3. Could store service code 621.

SHIFT SOLENOID 2 (SS2)

1. Volt/Ohmmeter set to Ohms, with leads terminal to terminal on SS2, Ohmmeter should read 12-30 ohms resistance.
2. Wires for SS2 are fed through pins 1 and 2, of the "White" case connector, located on the side of the transaxle (See Figures 2 and 3).
3. Could store service code 622.

SHIFT SOLENOID 3 (SS3)

1. Volt/Ohmmeter set to Ohms, with leads terminal to terminal on SS3, Ohmmeter should read 12-30 ohms resistance.
2. Wires for SS3 are fed through pins 3 and 4, of the "White" case connector, located on the side of the transaxle (See Figures 2 and 3).
3. Could store service code 641.

MANUAL LEVER POSITION SWITCH (MLPS)

1. Volt/Ohmmeter set to Ohms, with leads to pins 2 and 3 of the Manual Lever Position Switch (See Figure 1), and refer to the chart below for the proper resistance value in each gear selector position.

LEVER POSITION	OHMS RESISTANCE
P	3769-4608
R	1303-1594
N	660-807
D	361-442
2	190-232
1	80-95

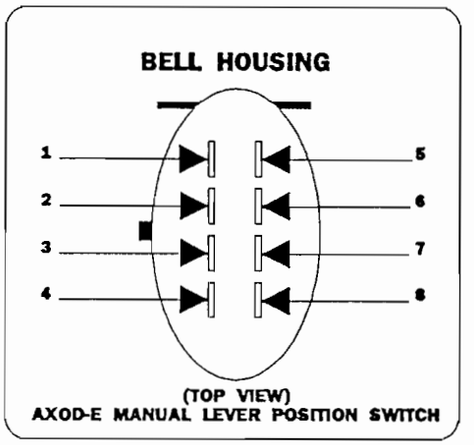
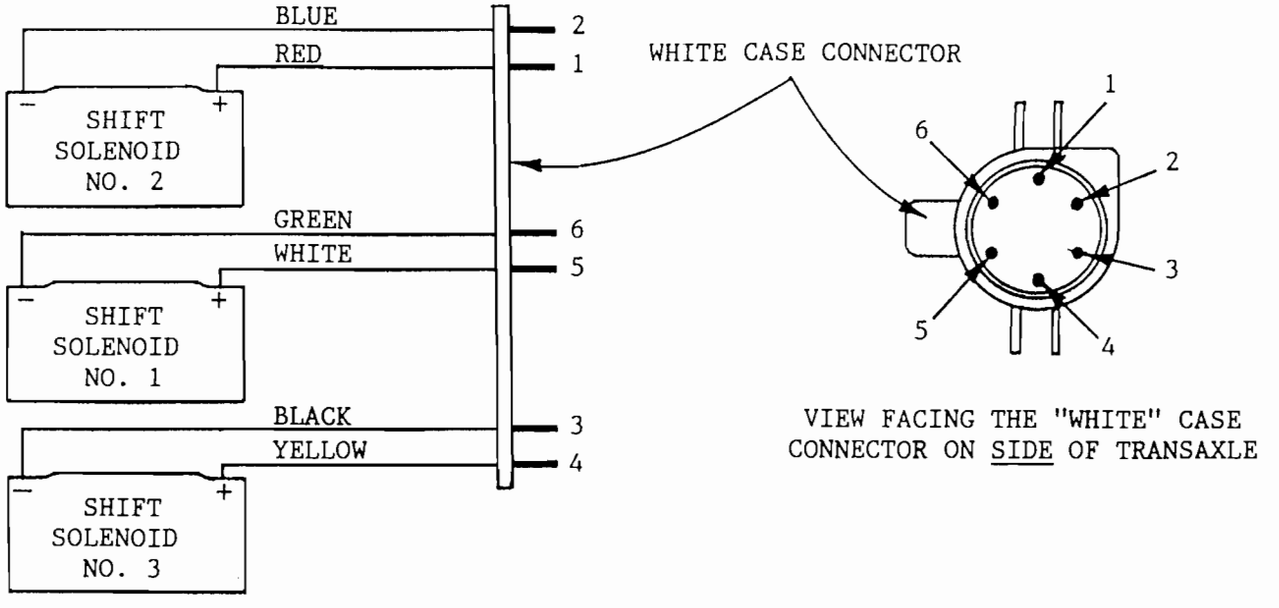


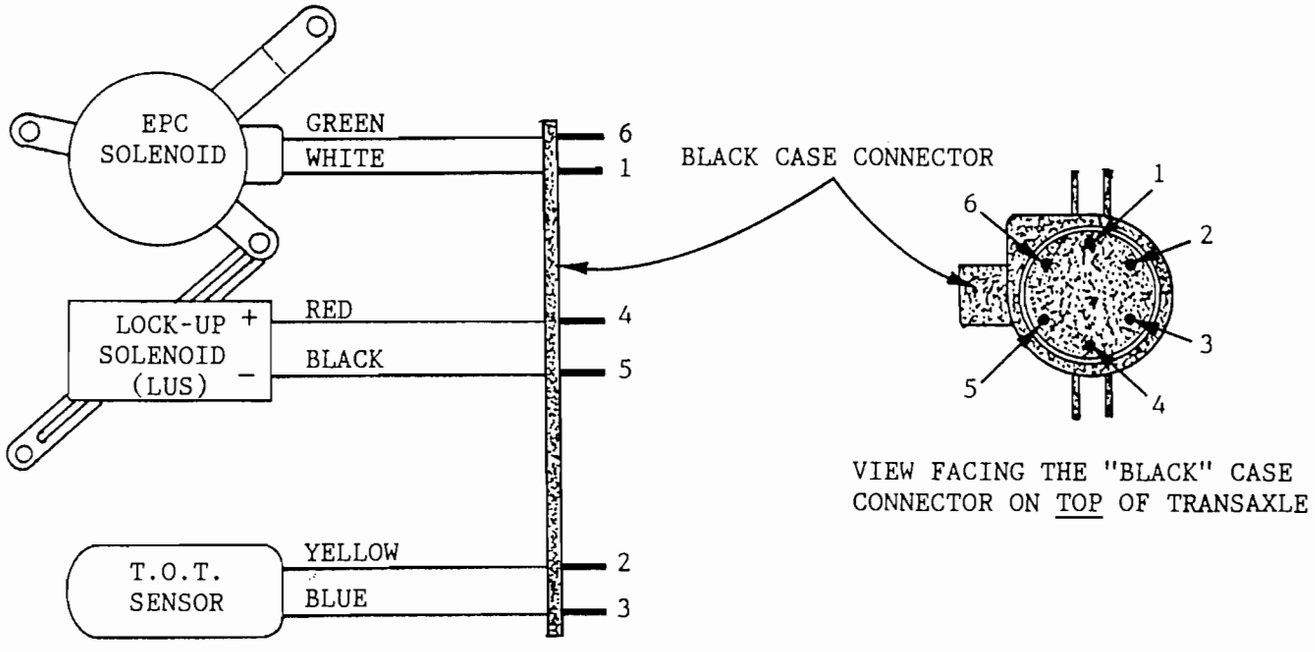
Figure 1

AXOD-E CASE CONNECTOR IDENTIFICATION



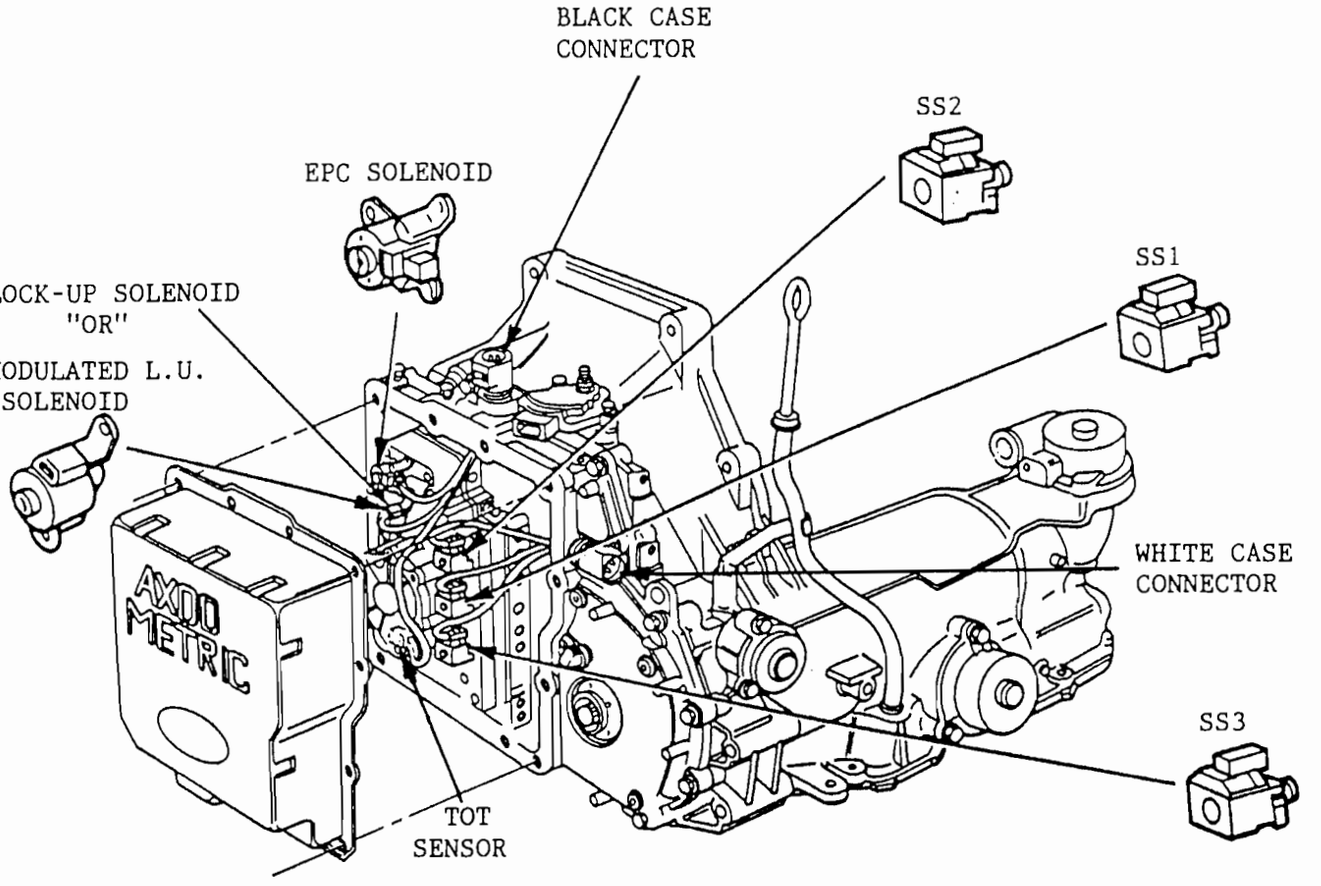
VIEW FACING THE "WHITE" CASE CONNECTOR ON SIDE OF TRANSAXLE

THE AXOD-E TRANSAXLE HAS 2 CASE CONNECTORS, 1 WHITE ONE ON THE SIDE OF TRANSAXLE, AND 1 BLACK ONE ON THE TOP OF TRANSAXLE.



VIEW FACING THE "BLACK" CASE CONNECTOR ON TOP OF TRANSAXLE

Figure 2



EPC = ELECTRONIC PRESSURE CONTROL SOLENOID
LUS = LOCK-UP SOLENOID (ALL EXCEPT LINCOLN)
MLUS = MODULATED LOCK-UP SOLENOID (LINCOLN ONLY)
SS1 = SHIFT SOLENOID NO. 1
SS2 = SHIFT SOLENOID NO. 2
SS3 = SHIFT SOLENOID NO. 3
TOT = TRANSMISSION OIL TEMPERATURE SENSOR
TSS = TURBINE SPEED SENSOR
VSS = VEHICLE SPEED SENSOR
MLPS = MANUAL LEVER POSITION SWITCH

AXOD-E CASE CONNECTOR AND SOLENOID LOCATION

Figure 3

FORD - A4LD

3-4 SHIFT SOLENOID CHANGE

There has been a design change on the 3-4 shift solenoid on the Ford A4LD, and the new design level solenoid is still available under the old OEM number E8TZ-7M107-A.

The 1st design 3-4 shift solenoid had a sleeve that incorporated a screen for the solenoid as shown in Figure 1.

The 2nd design eliminates the screen, has dimensional changes on the solenoid itself, and includes a new plug with a boss machined on one end. The plug must be installed with the machined boss facing the solenoid as shown in Figure 1.

The 2nd design 3-4 shift solenoid WILL retro-fit back to all previous models, if it is required.

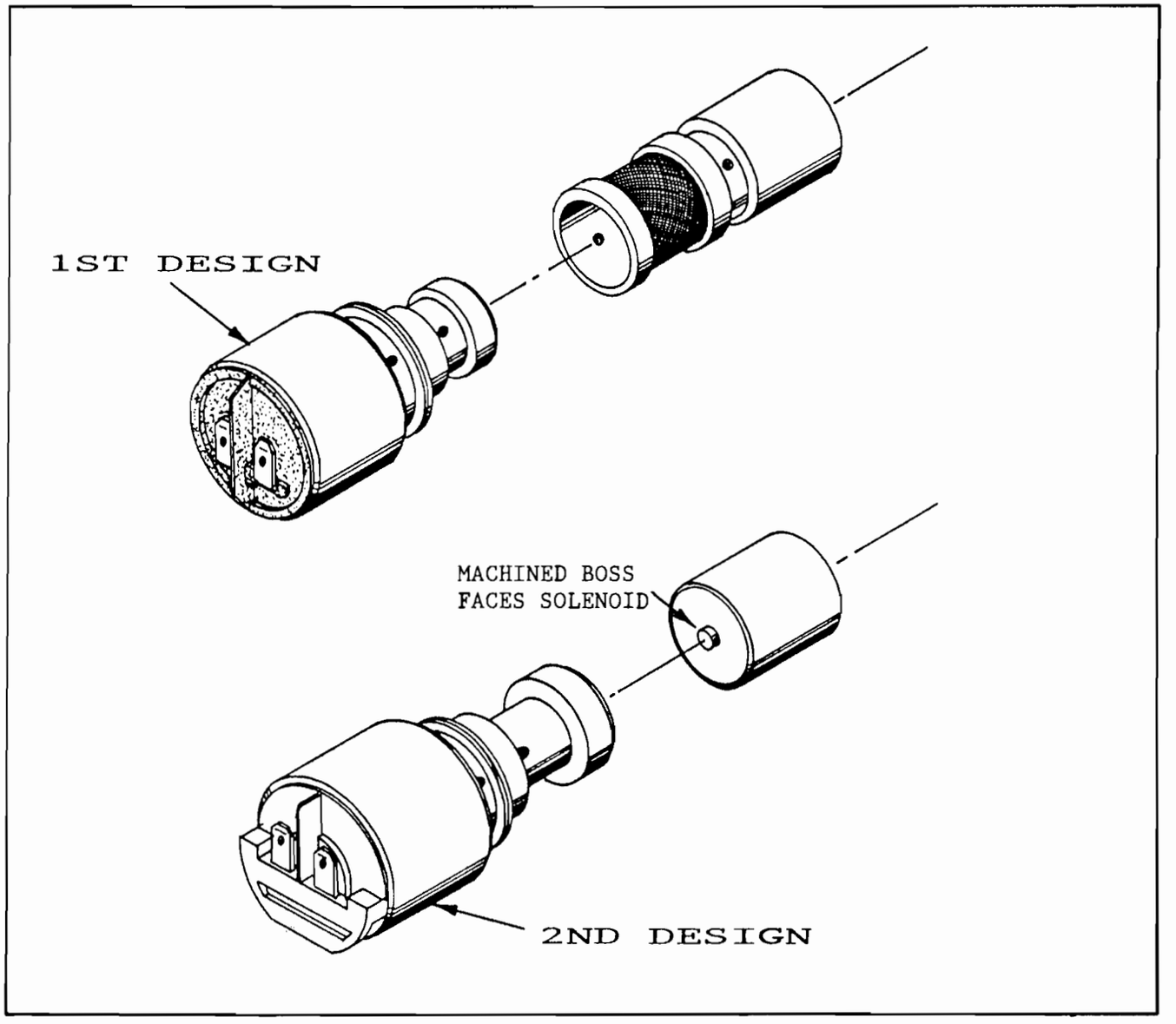


FIGURE 1