



Technical Service Information

INTRODUCTION

CHRYSLER A-500

The Chrysler A-500 automatic overdrive transmission was first introduced in the 1988 Dakota trucks. This transmission is a spin-off of the A-998 A-999 three speed Torqueflight (Loadflight) transmission. As you will see the front section of the transmission is similar to these three speed units.

This manual combines the powerflow and parts changes that will be found in the front section along with the parts changes and assembly of the overdrive section. The basic assembly of the front (A-998) section of the transmission is also covered.

Since this transmission is a basic truck unit and is found in 4x4 vehicles we have included information on the New Process 231 transfer case.

We thank Chrysler Corp. for the illustrations and information that made this booklet possible.

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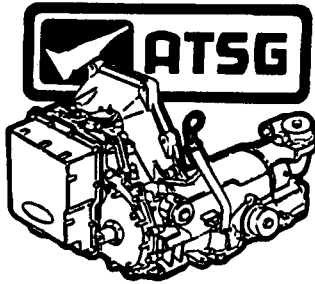
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UPDATE INFORMATION

The A-500 and the A-518 have the same overdrive unit. The basic differences between these two units is the front section of the transmissions. The A-500 has a 904 999 three speed section whereas the A-518 has the 727 three speed section. The A-500 has a converter clutch. The A-518 is scheduled for the converter clutch in the 1992 model year. One difference that the technician can see in the overdrive section is the number of direct clutch plates used. This clutch pack will vary according to engine size/vehicle application. The direct clutch pack will consist of five or six lined plates. If the unit had six clutch plates and only five are replaced, the measurement of the overdrive shim will be off by more than .250". This can cause a complaint of a slip in reverse. We have supplied the dimensions (page 88) of the two tools required when measuring for the selective spacers in the overdrive section. This measurement check is found on pages 69 and 70 in this manual. This transmission is not a computer controlled unit in the sense that the computer controls the shift pattern. What is controlled by the computer is the 3-4 shift after the engine has reached operating temperature. When operating temperature is reached, the coolant temperature sensor inputs to the computer, then the computer energizes the overdrive solenoid allowing governor pressure to stroke the 3-4 shift valve. The shift is a hydraulic function of the governor. Pages 86 and 87 contain tech bulletins for correcting overdrive clutch failure and overdrive planetary failure. When rebuilding one of these units be SURE to check the oil cooler for blockage by performing a flow check. This is done by disconnecting the rear (return) line, add a piece of hose so that the oil can drain into a bucket. The rate at 700-1000 rpm should be a minimum of 1qt in 20 seconds. Less than that will cause a lube oil problem.



REVISED 10/92

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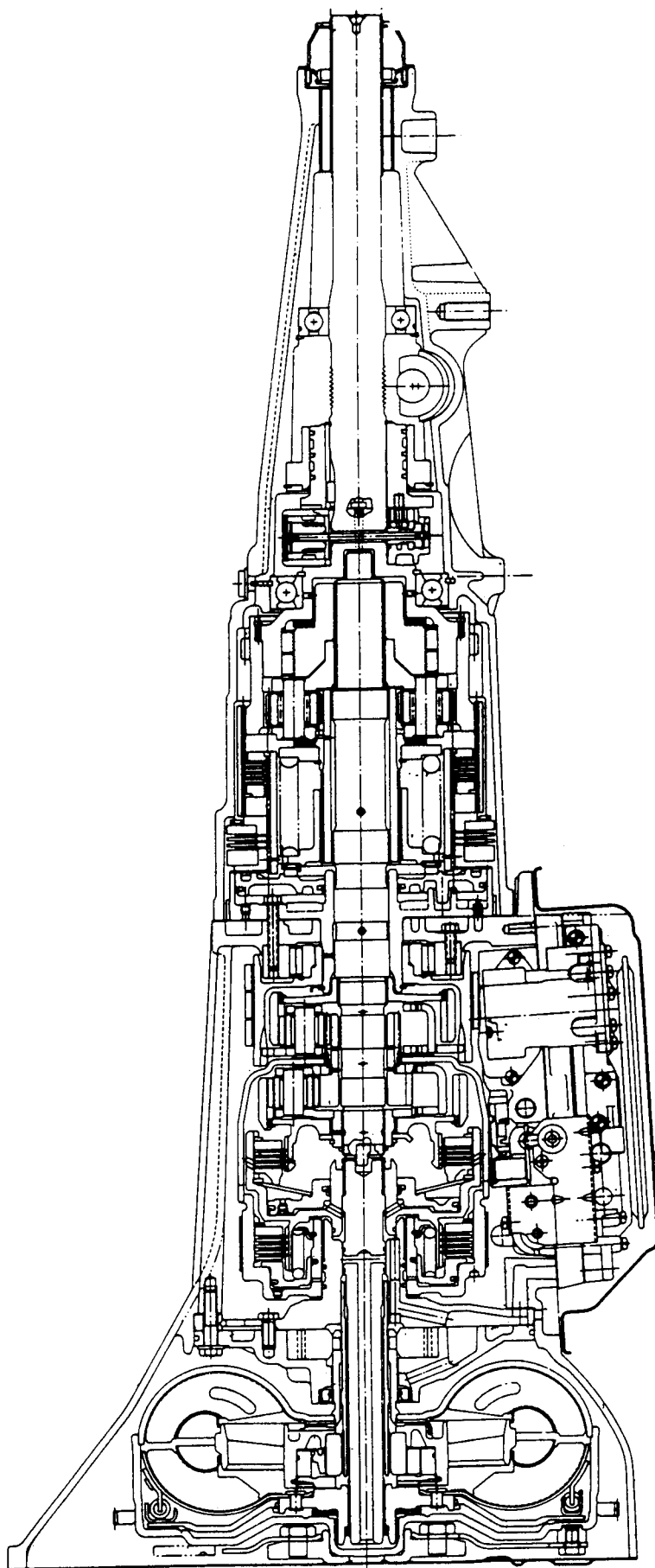
CHRYSLER A-500

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Technical Service Information



A-500 4-SPEED OVERDRIVE

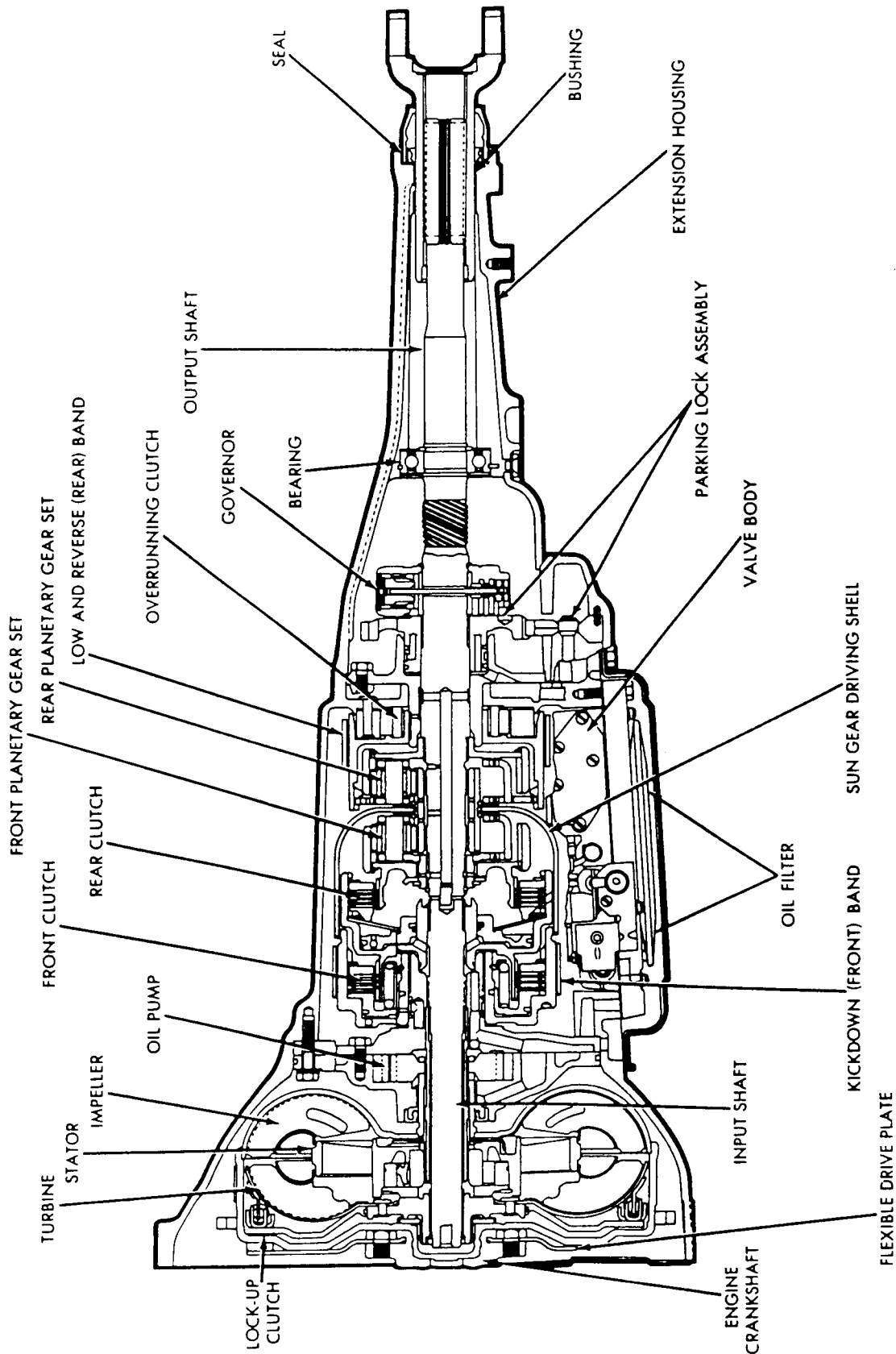
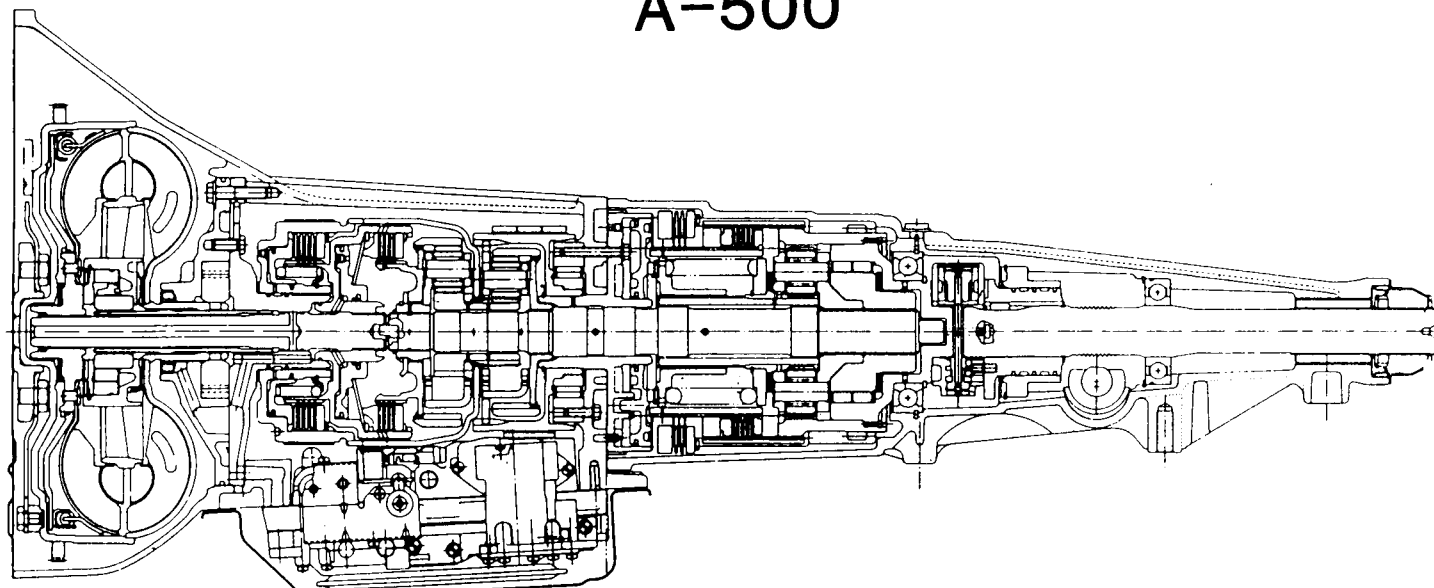


Fig. 1—LoadFlite Transmission and Torque Converter (A-904T and A-999)



A-500



The A-500 four speed overdrive automatic transmission is used exclusively in three of the Dodge truck lines. It will go in the mid-size Dakota pick-up, the full-size Ram pick-up and, the full size Ram Van/Wagon. It will be offered in both two wheel drive and four wheel drive versions, although, only Dakota will use the 4X4 version.

The first three gear ratio's of the A-500 give the same gear ratio's and torque capacity that was offered in the three-speed LOADFLITE transmission. The addition of the fourth gear overdrive to the LOADFLITE gives the added features of increased fuel economy, prolonged engine life and, less engine noise at cruising speed. When in overdrive the transmission input to output ratio is .69 to 1.

The A-500 transmission will be coupled with the 3.9 liter V-6 and 5.2 liter V-8 engines. The overdrive unit is designed to withstand up to 400 foot-pounds of torque. Because of the high loads and the long periods of time that can be spent in overdrive, all the thrust bearings are needle bearings. The overdrive has added approximately 50 pounds of weight and, 6 and one half inches of length to the A-999 transmission.

Fourth gear overdrive is electronically controlled and hydraulically activated. A variety of sensor inputs are fed to the SMEC (single module engine controller) which controls a solenoid mounted on the valve body. The solenoid will energize and close a vent, allowing a 3-4 upshift. The SMEC also controls the operation of the lock-up torque converter using many of the same sensor inputs.

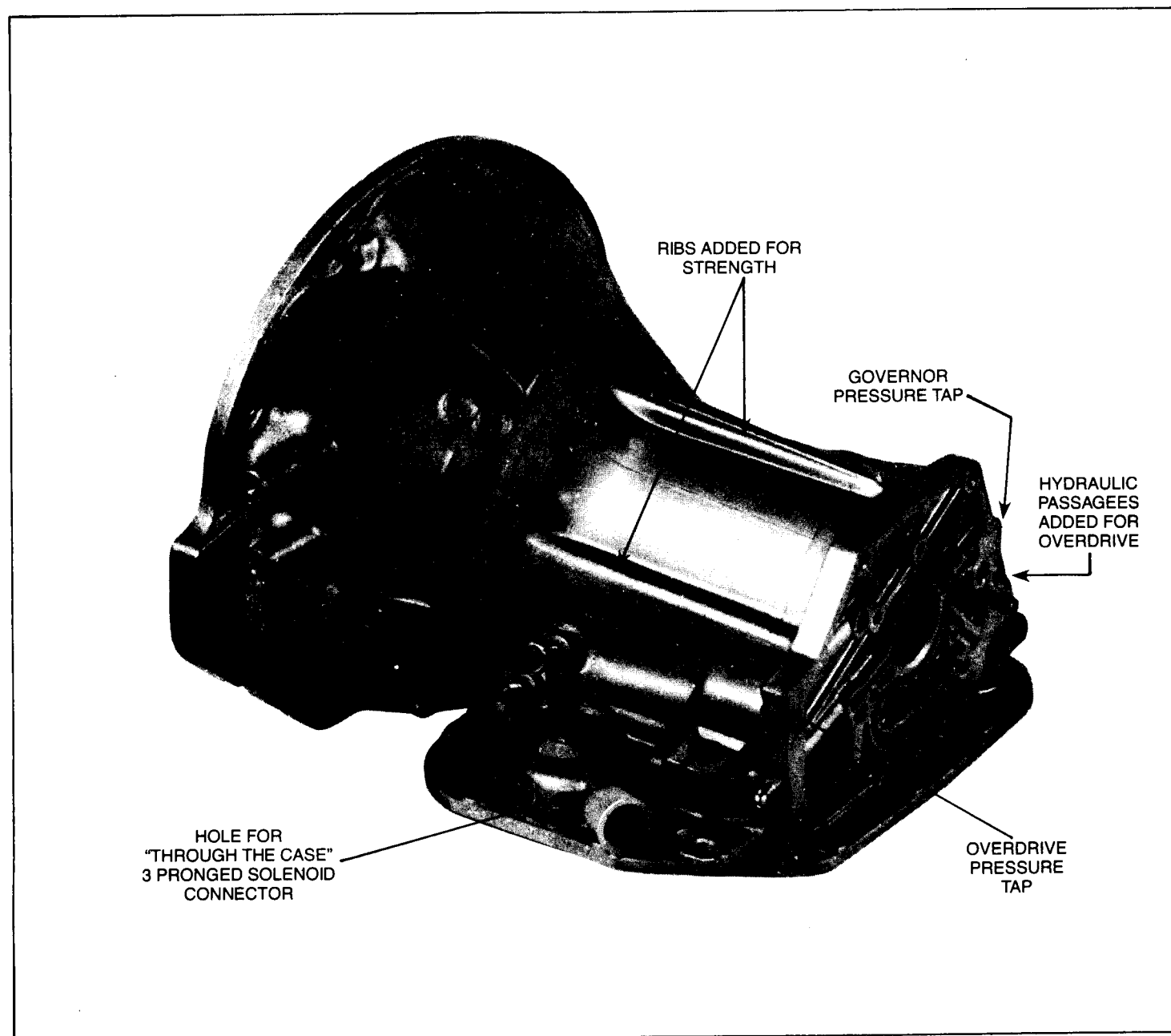
The steering column shift selector remains at 6 positions. Overdrive will be engaged automatically in Drive. A separate Overdrive OFF switch will be located on the instrument panel. This switch will override the SMEC and shift out of overdrive and prevent further shifts into overdrive. If the Overdrive OFF switch is activated again the automatic operation is restored. The switch has an indicator light when the overdrive is turned off. The switch also resets on key-off so that the automatic overdrive feature is restored.

The use of fault codes helps to diagnose the electronic components used to operate the overdrive and lock-up torque converter.

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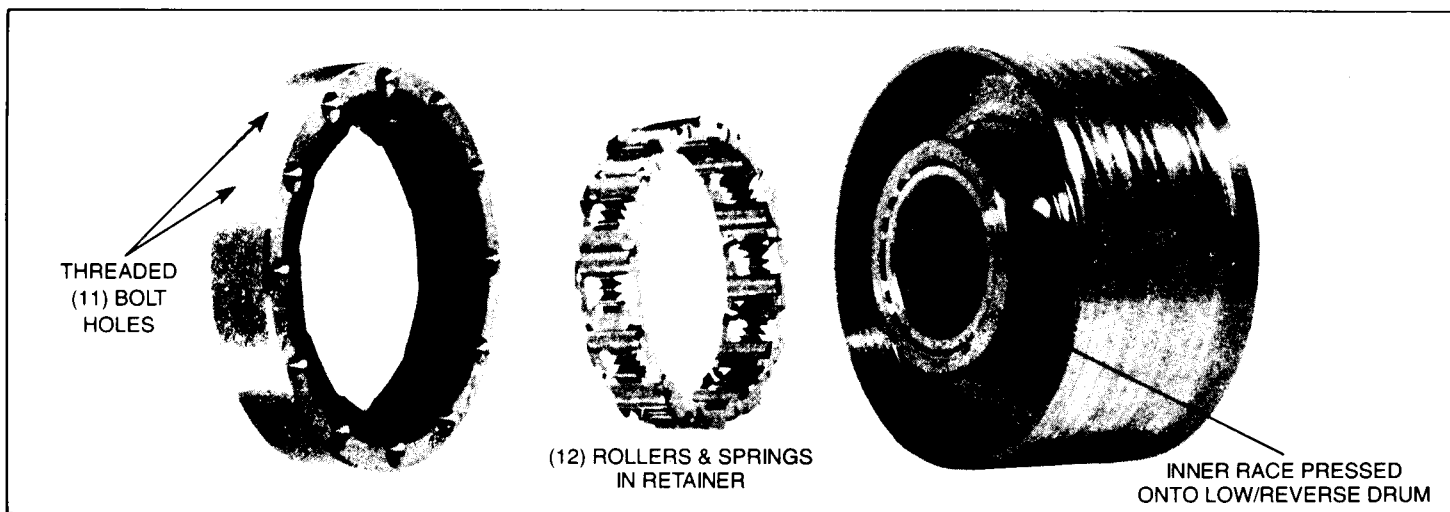
ALTERED TRANSMISSION COMPONENTS

This section will cover the components in the basic transmission that were changed to accommodate the overdrive unit.



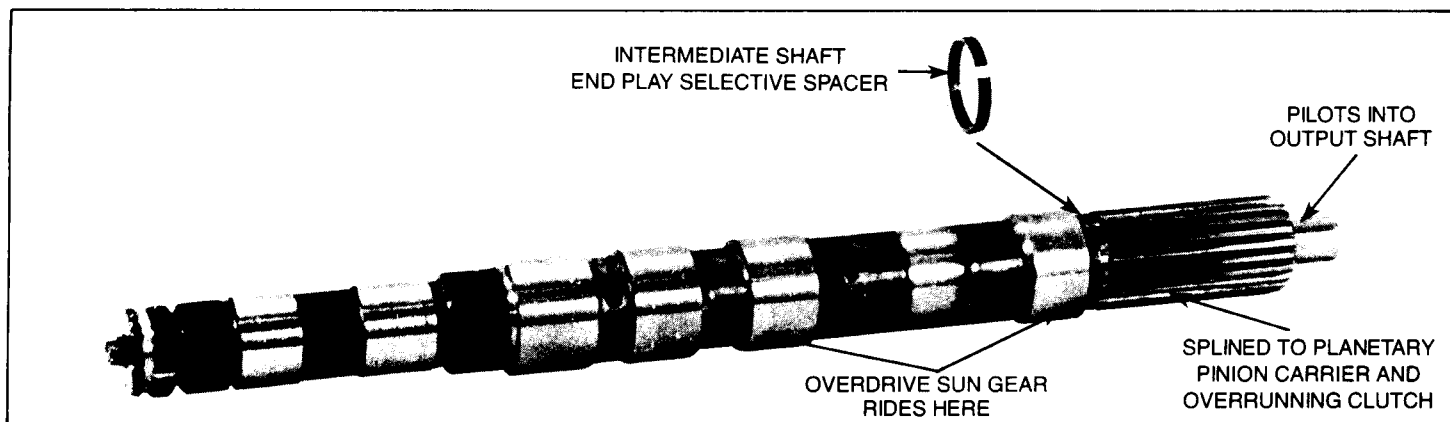
CASE: The transmission case has been increased in strength in several areas. The case now has ribs on the top and both sides to improve its rigidity. The back face of the case has changed because of the hydraulic circuits needed to operate the overdrive clutch piston. The mounting

surface for the overdrive housing is larger and has a different bolt hole configuration. Overdrive and governor pressure taps are located in the rear of the case for diagnostic purposes. There is a hole on the left side of the case for the valve body, three pronged, solenoid connector to mount.



OVERRUNNING CLUTCH: A new overrunning clutch incorporates a spring and roller assembly with 12 rollers instead of 10. The new overrunning clutch cam has a feature that prevents the rollers from crushing the springs in the event of roller spit-back. Eleven bolts retain the cam into the

case. Five bolts are short and pass only through the case. The other six bolts pass through the overdrive piston retainer and the case. The overrunning clutch inner race is pressed onto the reverse drum and then machined to better control run-out. The unthreaded hole in the cam is located at the 7 o'clock position, looking from the rear.

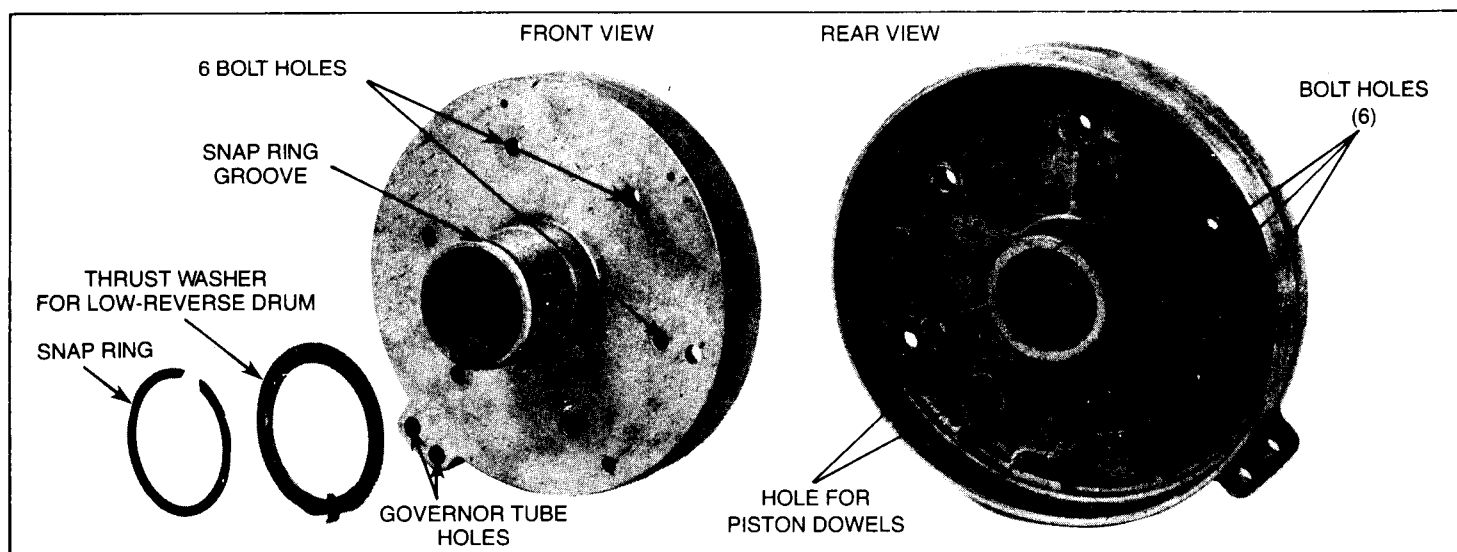


OUTPUT SHAFT: The output shaft is referred to as the intermediate shaft in the A-500. The back end has been modified so it splines with the overdrive planetary pinion carrier and overrunning clutch inner race. The shaft has been shortened, and no longer has the governor mounted on it. Other modifications include removal of the speedometer pinion gear drive, and the mounting surface for the output shaft bearing. The rear part of the intermediate shaft pilots in the output shaft.

The center of the intermediate shaft is drilled for lubrication. The lubrication is fed through the

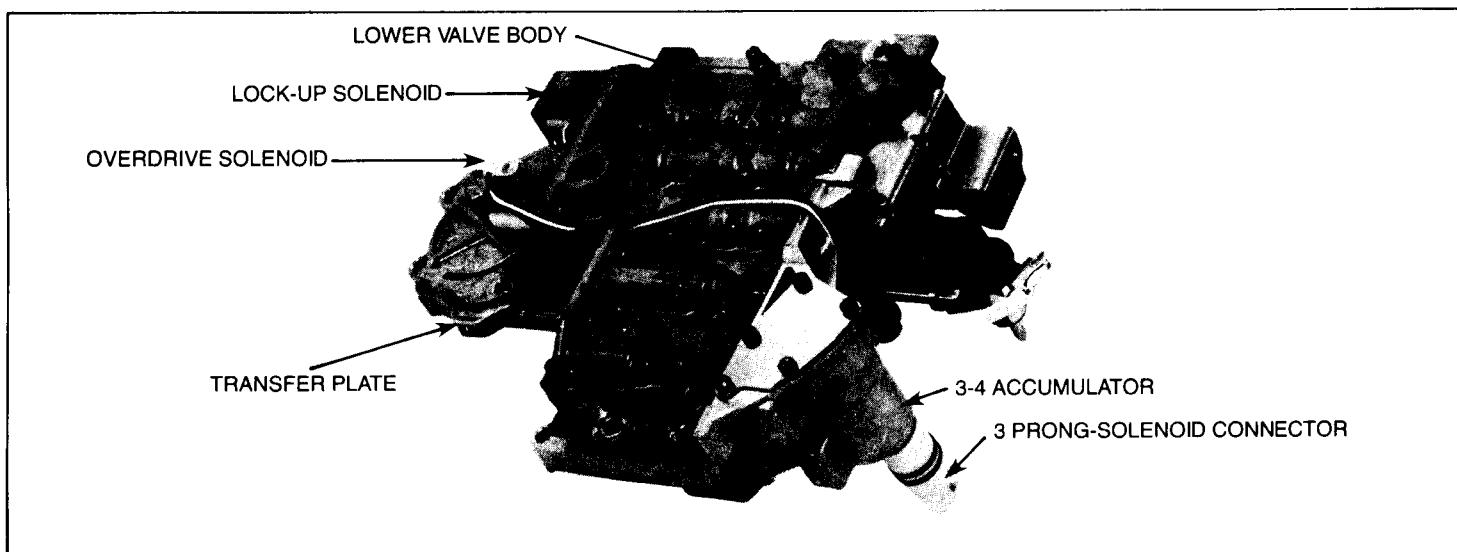
intermediate shaft support, through cross drilled holes to the center of the shaft. From there the oil goes forward and lubricates the transmission planetary gear set. The oil that flows rearward lubricates the overdrive sun gear and the **output shaft** bushing the intermediate shaft pilots in. An orifice is pressed into the rear of the intermediate shaft to control oil flow.

Intermediate shaft end play is adjusted with one of four selective spacers. The selective spacer fits over the rear splines of the intermediate shaft and up against a shoulder.



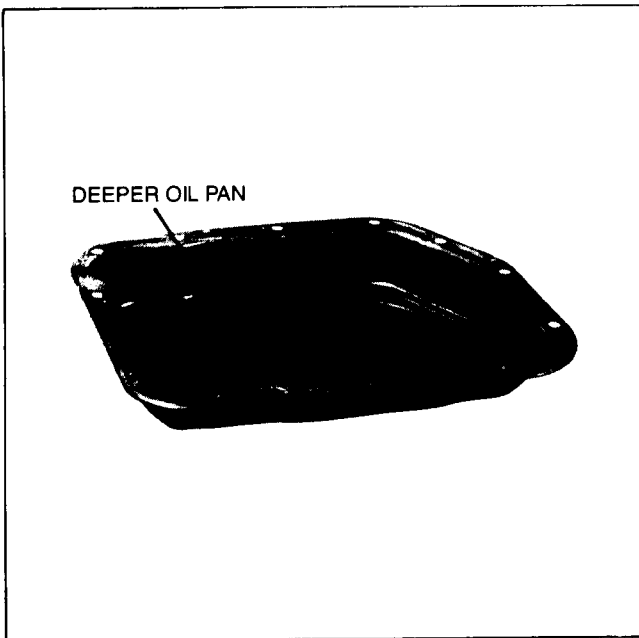
OUTPUT SHAFT SUPPORT: The most noticeable change of the output shaft support (now called the **OVERDRIVE PISTON RETAINER**) is the size. Where the governor assembly used to be located is now a piston bore for the overrunning clutch piston. The front end of the support has a groove that retains a snap ring that holds a thrust

washer and the low-reverse drum in place. This was done to prevent any fore and aft movement of the low and reverse drum with the redesigned overrunning clutch. On the back, lower right side of retainer is a support for the governor pressure tubes.

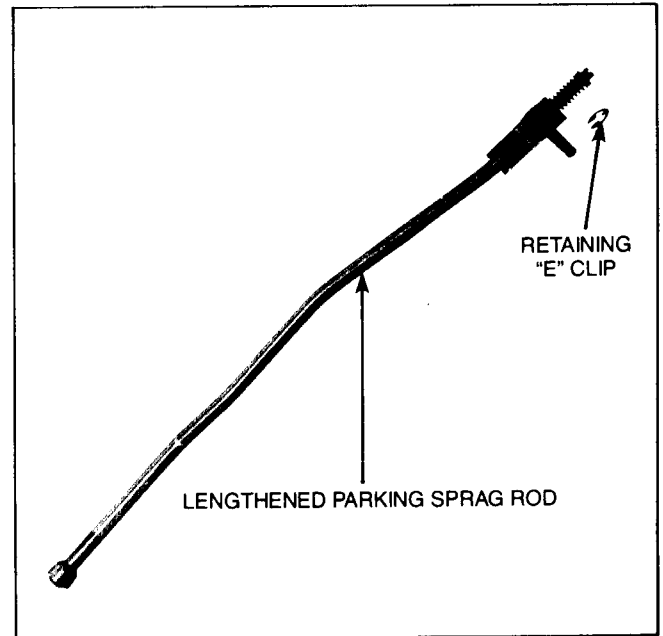


VALVE BODY: The valve body transfer plate has been modified so the lower valve body housing can be mounted to it. The lower valve body includes five valves and, an attaching accumulator assembly. Two, SMEC controlled, solenoids are mounted on the lower valve body. One solenoid controls the lock-up torque converter, while the

second solenoid operates the overdrive unit. A, through the case, three pin connector connects the solenoids to the SMEC. The center pin is battery feed, the forward pin is the overdrive solenoid, and the rear pin is the torque converter lock-up solenoid. The SMEC controls the solenoid ground for operation.



OIL PAN: A new deeper oil pan was required to provide room for the added valve body controls.

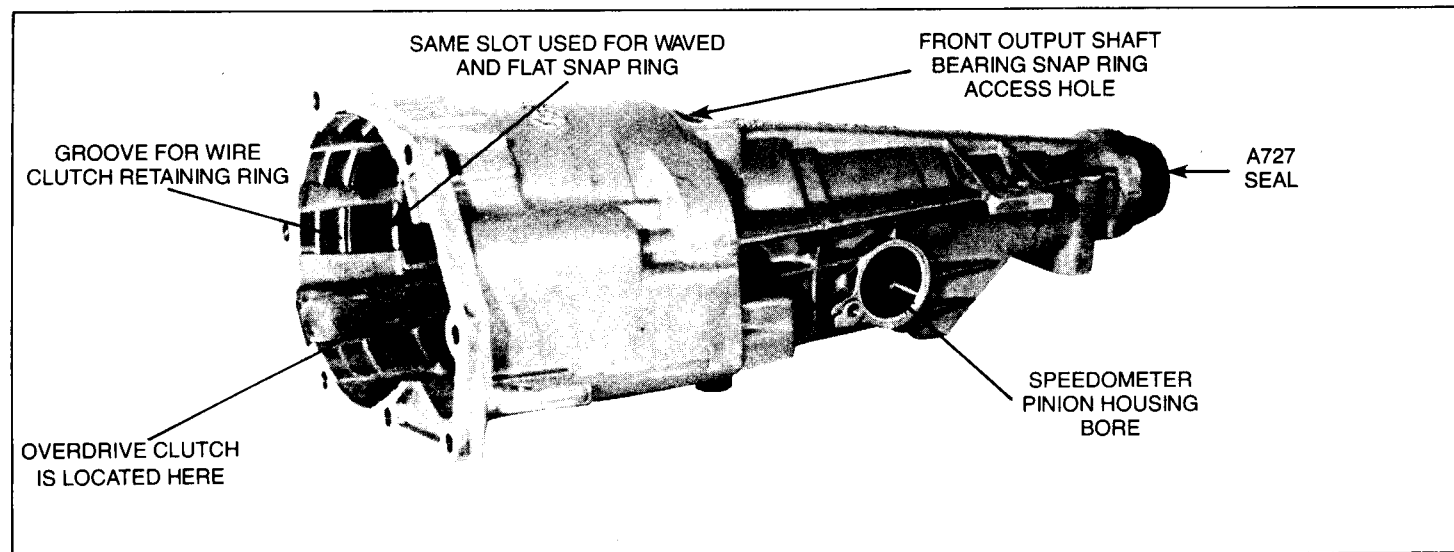


PARKING SPRAG ROD: The park mechanism has been moved rearward in the overdrive housing. As a result, the parking sprag rod assembly has been lengthened. The park gear is integral with the annulus gear.

OVERDRIVE COMPONENTS

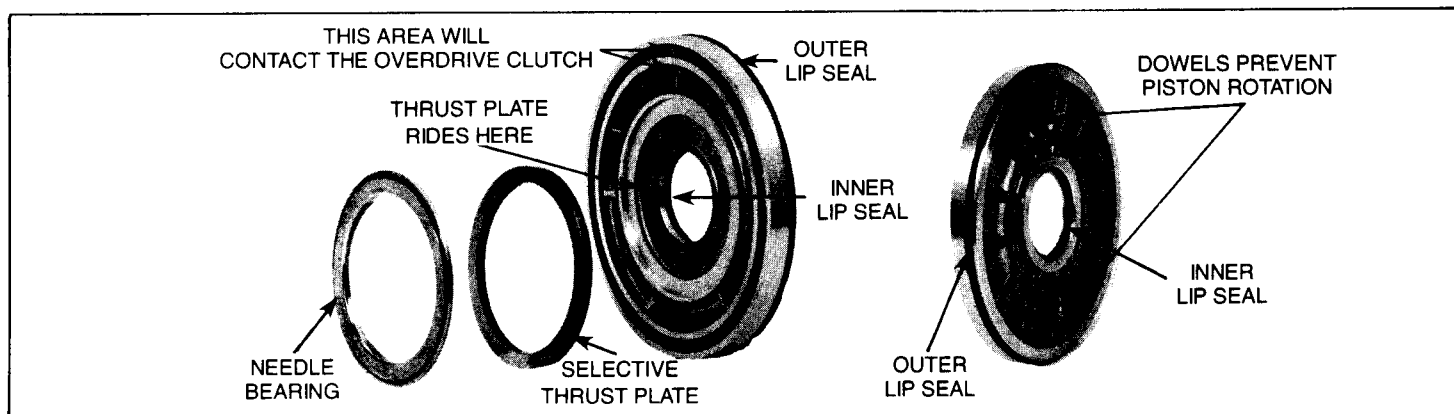
The overdrive component section is intended to familiarize you with all the new overdrive compo-

nents. A brief explanation of the component's purpose, and how it operates, should help you understand how the parts interrelate.



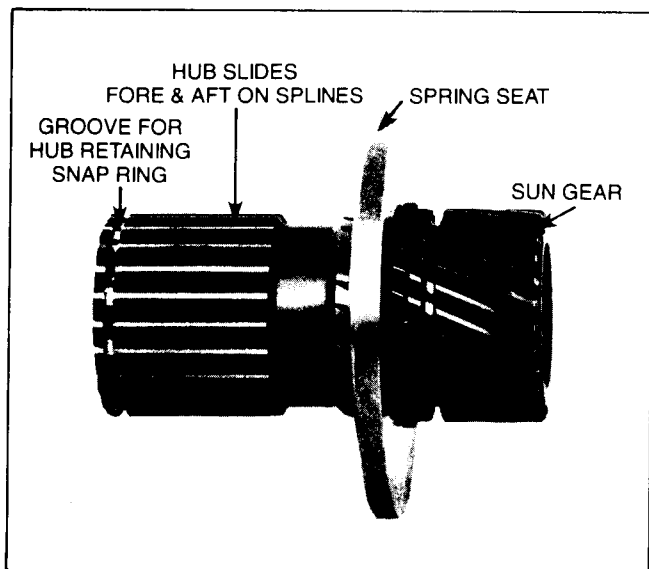
OVERDRIVE CASE: The overdrive case is a lightweight cast aluminum, one piece housing. The rear most part of the housing retains an oil seal and bushing, both seal and bushing are from the A-727 transmission. The left side of the hous-

ing has a bore to mount the speedometer pinion housing assembly. The parking pawl, reaction plug, etc. is located in the housing slightly forward of where the governor will be located.

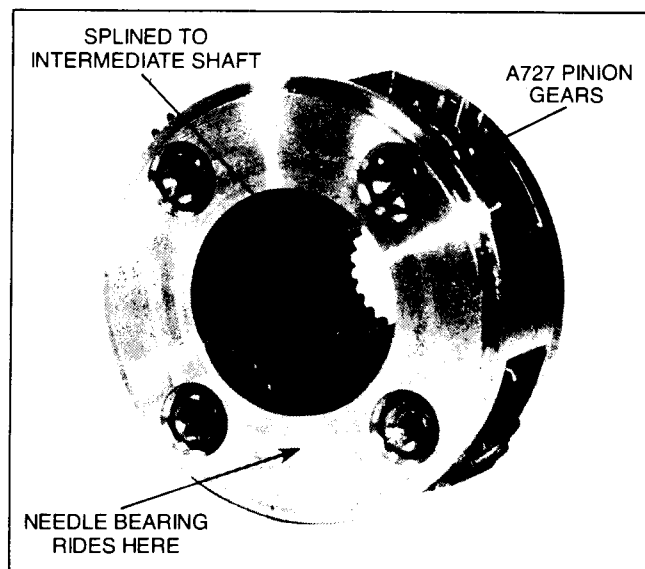


OVERDRIVE PISTON: The overdrive piston is located inside the O/D piston retainer. The piston seals to the retainer using two lip seals. There are no rotating seal rings and, there is no pressurized oil in the overdrive housing for the clutches. Two anti-rotating dowels on the piston prevent the piston from turning in the retainer.

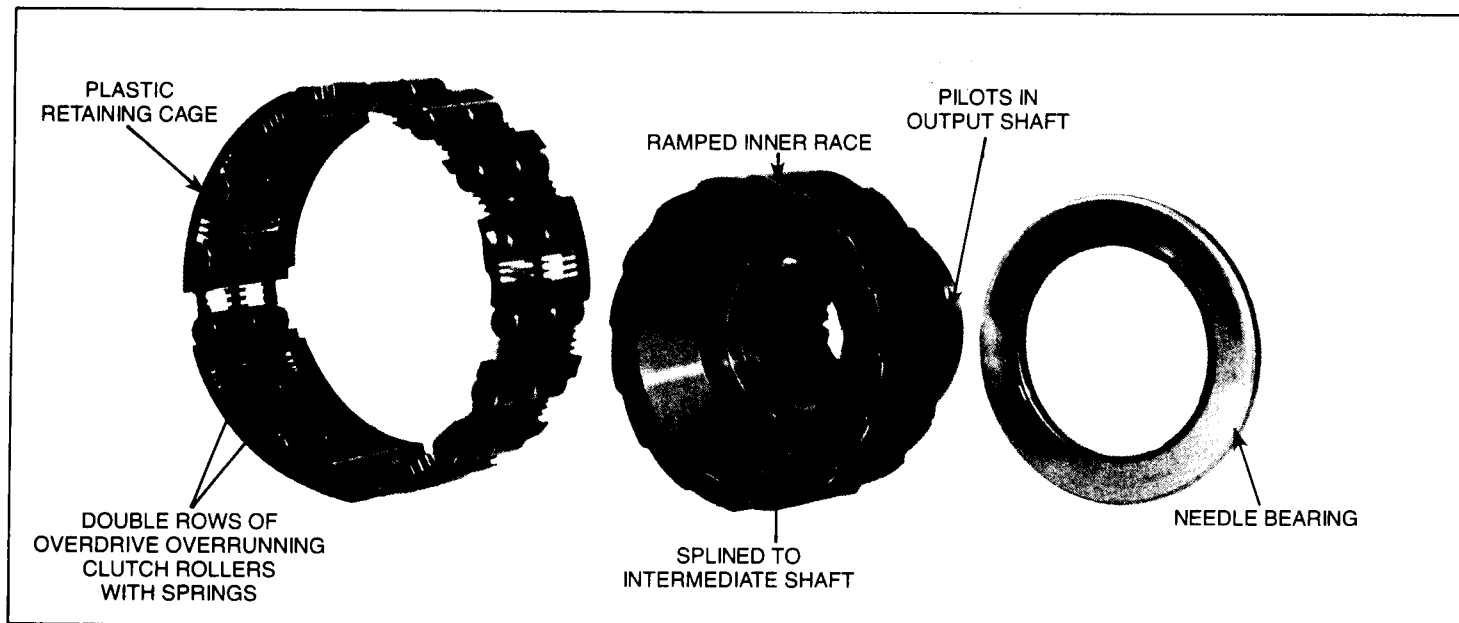
When the piston is hydraulically pressurized it releases the spring applied direct clutch and, applies the overdrive clutch. A selective thrust plate is located on the back side of the piston to insure proper clutch release/apply timing. A needle bearing is located between the spacer and direct clutch spring sliding hub to prevent damage from occurring between the stationary piston, and the rotating hub.



OVERDRIVE SUN GEAR: The sun gear rides on the intermediate shaft with the rear most part of the gear meshing with the planetary gears. The forward portion of the sun gear is splined to the sliding hub. The sun gear will be turned for direct drive and held for overdrive.

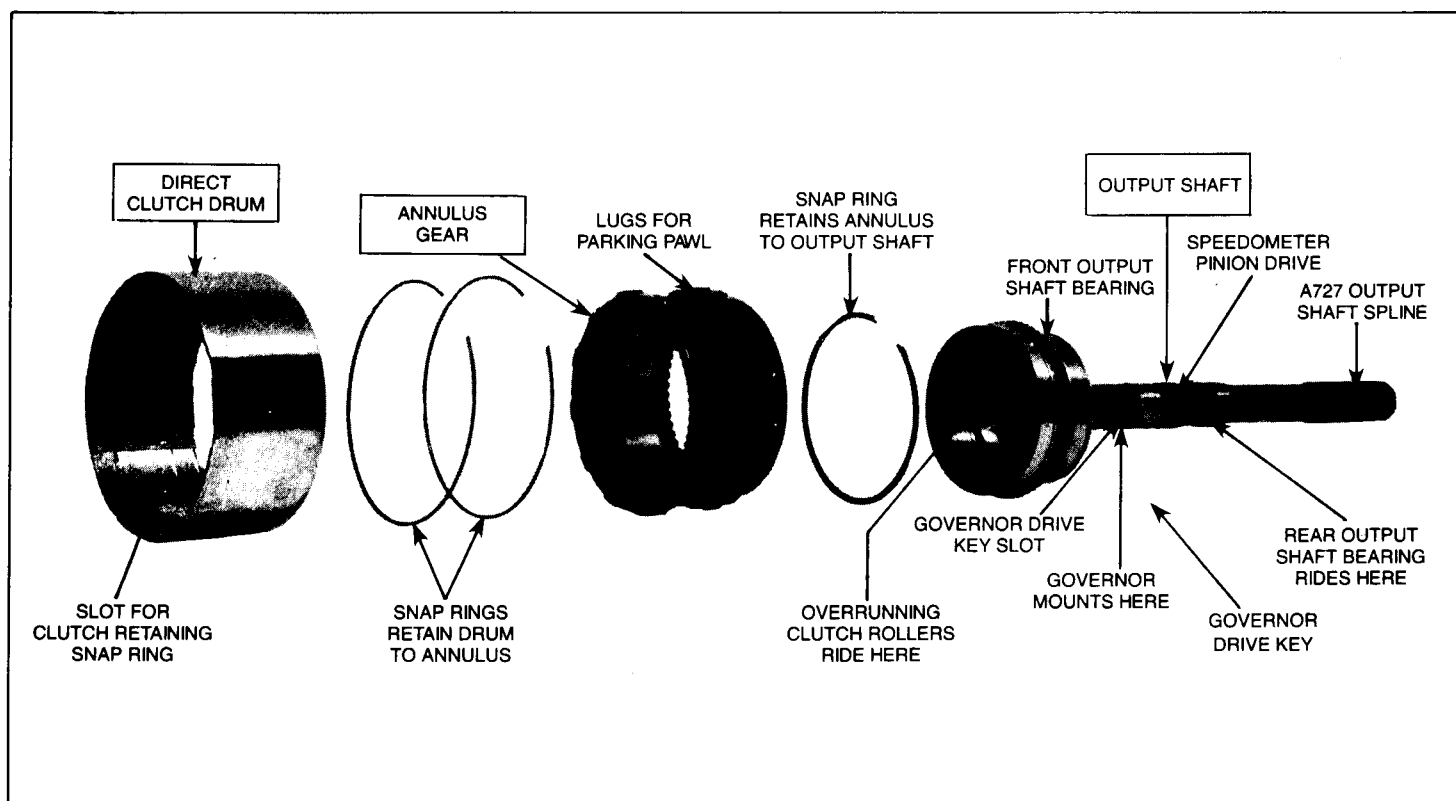


OVERDRIVE PLANETARY PINION ASSEMBLY: The planet carrier is splined to the intermediate shaft. The planetary gears utilize A727 pinions and produce an overdrive ratio of .69 to 1.



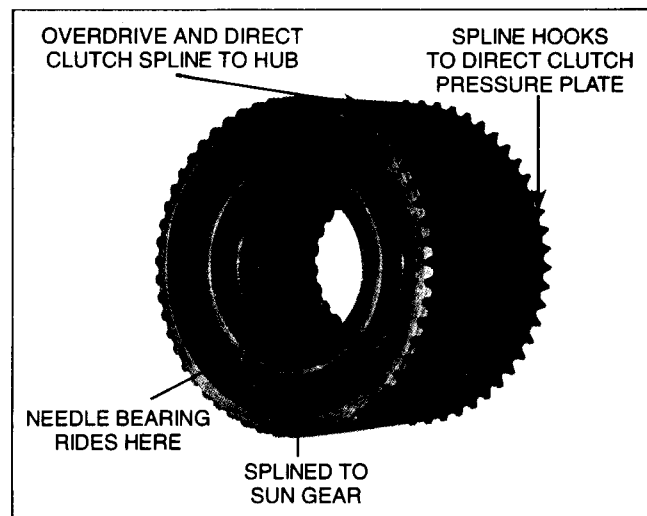
OVERDRIVE OVERRUNNING CLUTCH INNER RACE AND ROLLER ASSEMBLY: The inner race of the overrunning clutch is splined to the intermediate shaft. Around the outside of the inner race rides a double set of rollers for a one-way mechanical clutch. The overrunning clutch is used to allow a smooth shift from direct to overdrive.

The rollers ride on small ramps on the inner race of the overrunning clutch assembly. When the inner race turns in the counter clockwise direction the rollers climb the ramped surface and lock the inner race to the output shaft. If the inner race turns in the clockwise direction the rollers will roll off the ramp and free-wheel.



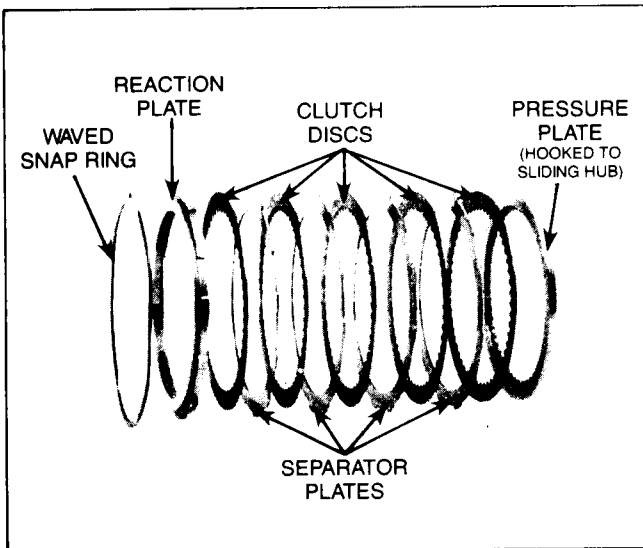
DIRECT CLUTCH DRUM: The direct clutch drum is splined to the annulus gear and held in place using two snap rings. The direct clutch plates are splined to the inside of the drum, and held in place with a snap ring.

OVERDRIVE ANNULUS GEAR: The annulus gear is an internal gear that will mesh with the gears of the planetary carrier. The annulus is splined to the output shaft and held in place using a snap ring. Lugs around the outside of the annulus are used to lock the output shaft in park.

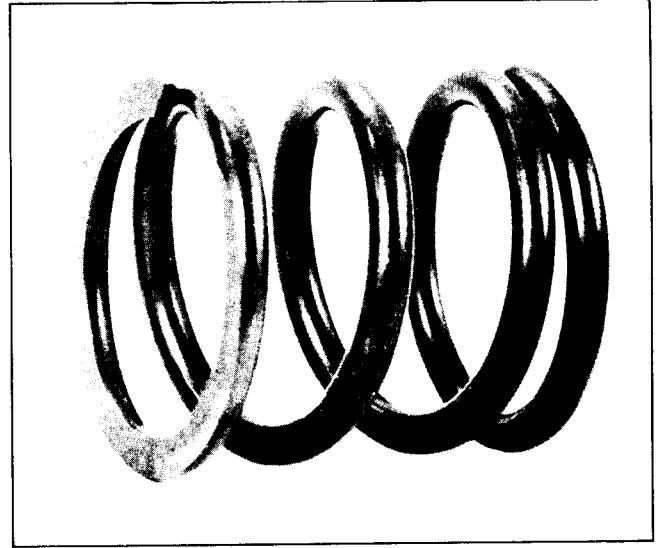


SLIDING HUB: This sliding hub is splined to the front of the sun gear, and held in place with a snap ring. The hub is used to apply the direct clutch using spring tension, and it will release the clutch using hydraulic force from the overdrive piston. The direct clutch and, the overdrive clutch are both splined to the hub. When the direct clutch is applied it will turn the hub for direct drive. When the overdrive clutch is applied it will hold the hub from turning, causing overdrive.

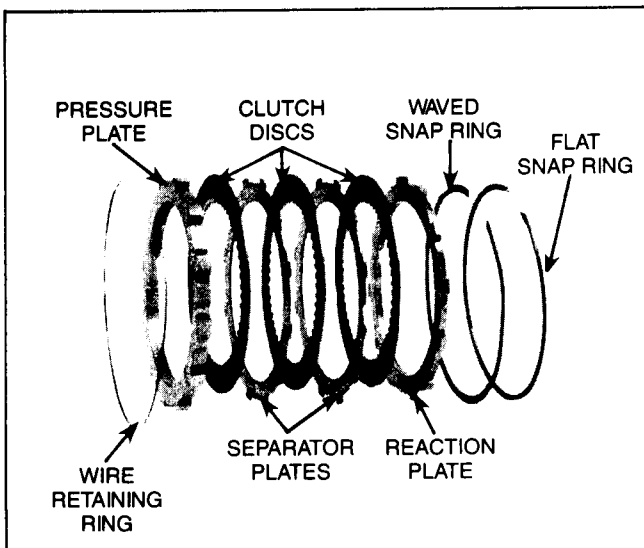
OUTPUT SHAFT: The output shaft rides in two ball bearings. The forward ball bearing will control the output shaft end play and, handle the axial loads from the drive train. The output shaft yoke spline is the same as an A727. The output shaft uses a key to prevent the governor from spinning on the output shaft.



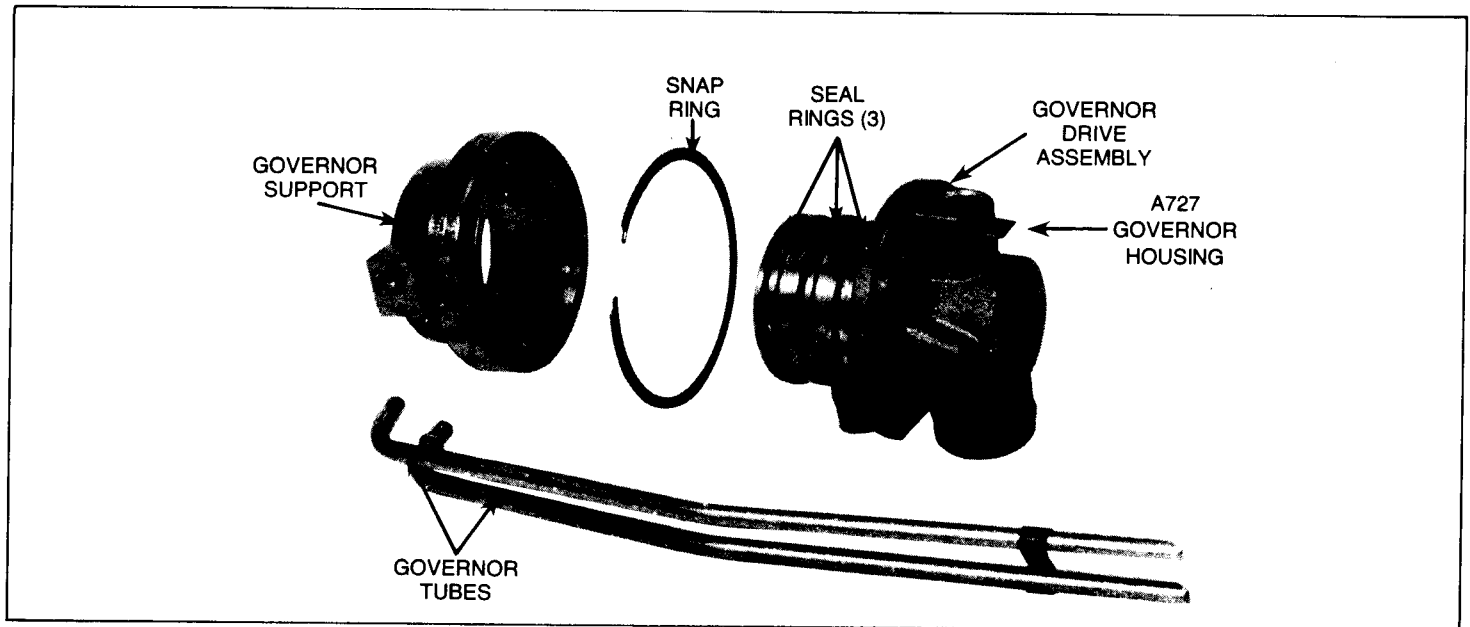
DIRECT CLUTCH: The direct clutch pack is splined internally to the sliding hub, and externally to the direct clutch drum. As mentioned earlier, this clutch is applied with spring tension, and released with hydraulic force.



DIRECT CLUTCH SPRING: This heavy duty spring is located inside the sliding hub and its primary purpose is to apply the direct clutch through the sliding hub. Caution must be used when compressing this spring while removing or installing it in the gear train assembly. The direct clutch spring has a load of 800 pounds when installed.



OVERDRIVE CLUTCH: The overdrive clutch is splined externally to the overdrive case, and internally to the sliding hub. A wire ring retains the overdrive clutch pack in the housing. This clutch is applied with the overdrive piston. When applied, the clutch holds the sliding hub from turning, as mentioned earlier.



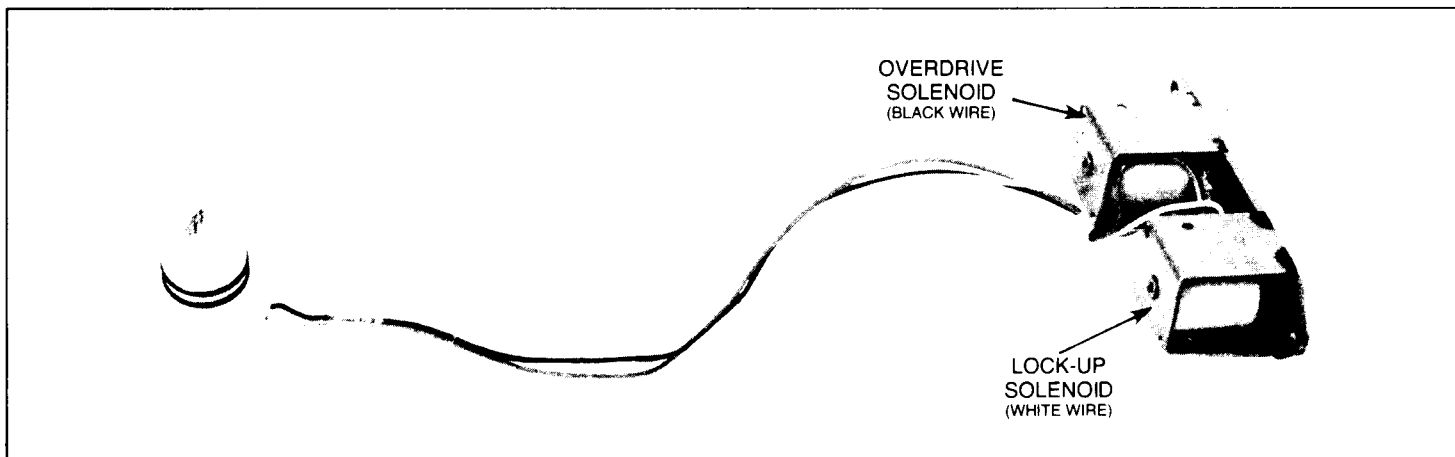
GOVERNOR DRIVE ASSEMBLY: The governor is located on the overdrive output shaft, as previously mentioned. The cast aluminum housing, governor valve, and weights are from the A727 transmission. There are now three seal rings on the governor drive.

GOVERNOR SUPPORT: The governor support is connected to the transmission case by two slip fit tubes. Line pressure is fed through one tube and, governor pressure is returned through the other tube. The governor support is held in the overdrive housing with a snap ring.

ELECTRONIC CONTROL COMPONENTS

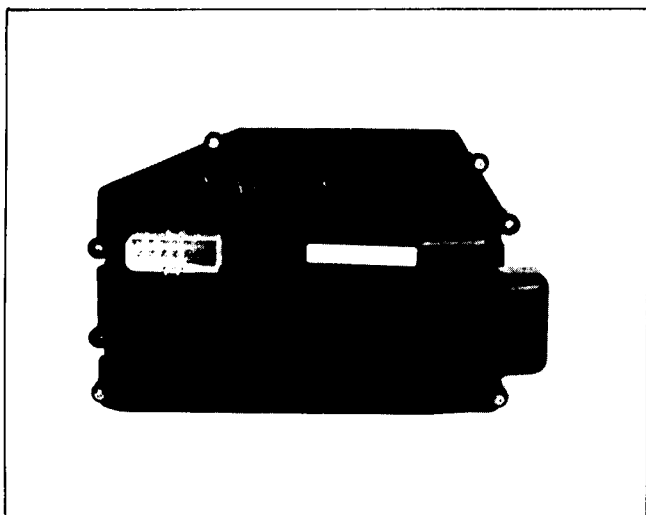
The shifting of the overdrive unit is controlled by the SMEC (engine computer). In this next part all

the electronic components and their operation will be explained.

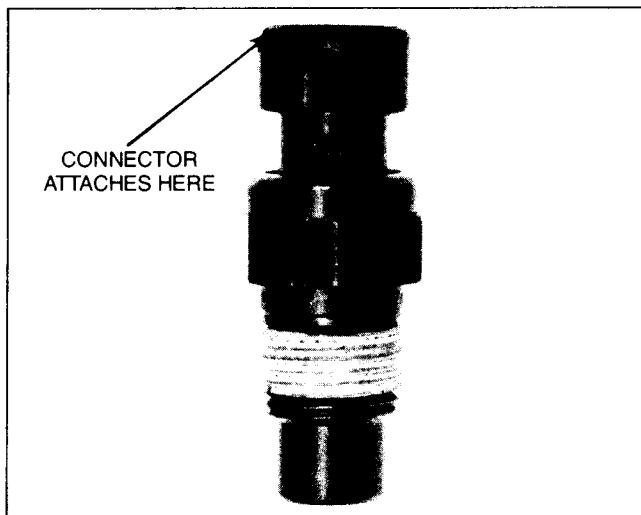


OVERDRIVE SOLENOID: The overdrive solenoid is coupled with the torque converter solenoid and mounted to the lower valve body. The two solenoids share a common three pin connector that is mounted so it passes through the case. The overdrive solenoid is designed to control third

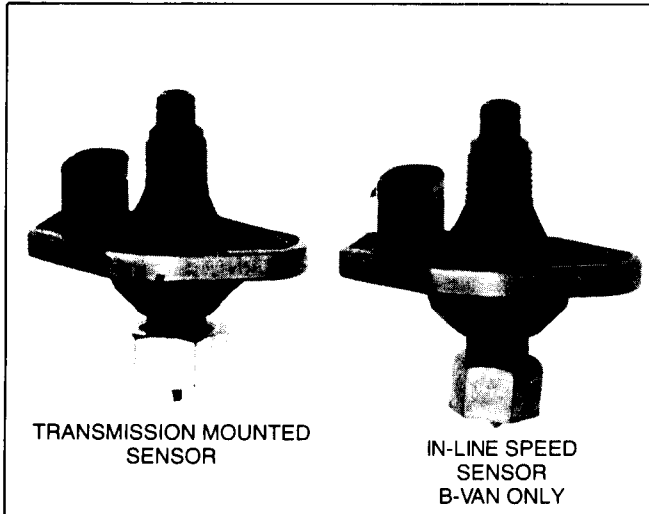
gear line pressure in the overdrive circuit. The solenoid is normally open, when not energized, to vent line pressure at the end of the 3-4 shift valve. After the criteria for overdrive has been met the solenoid is energized closed, causing overdrive to occur.



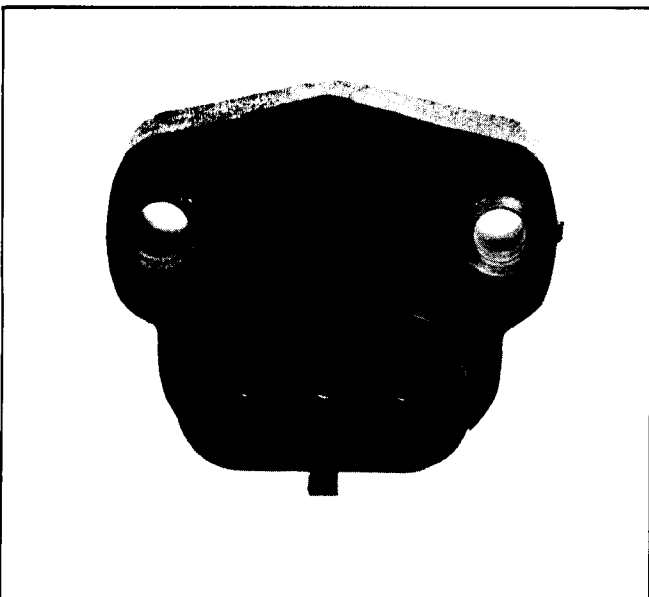
SMEC (ENGINE CONTROLLER): The SMEC has the added responsibility of controlling the ground circuit to activate, or deactivate, the overdrive solenoid. The SMEC uses already existing engine and vehicle sensors to determine the proper overdrive up-shift and down-shift points.



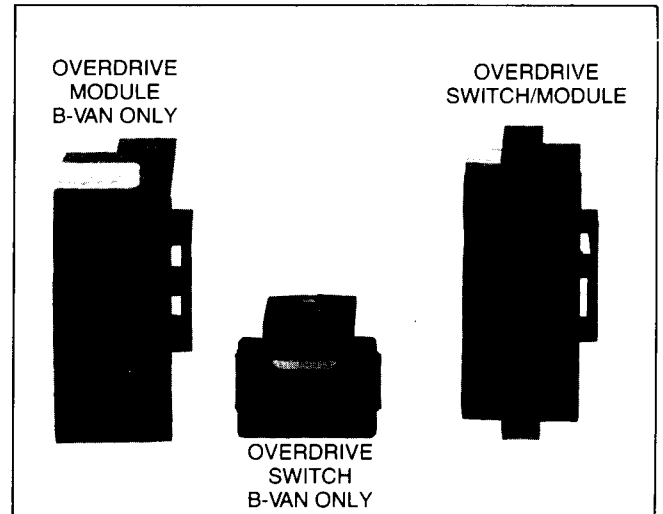
COOLANT TEMPERATURE SENSOR: One of the criteria for overdrive is the engine temperature must be at least 65°F. The temperature sensor is located in the intake manifold.



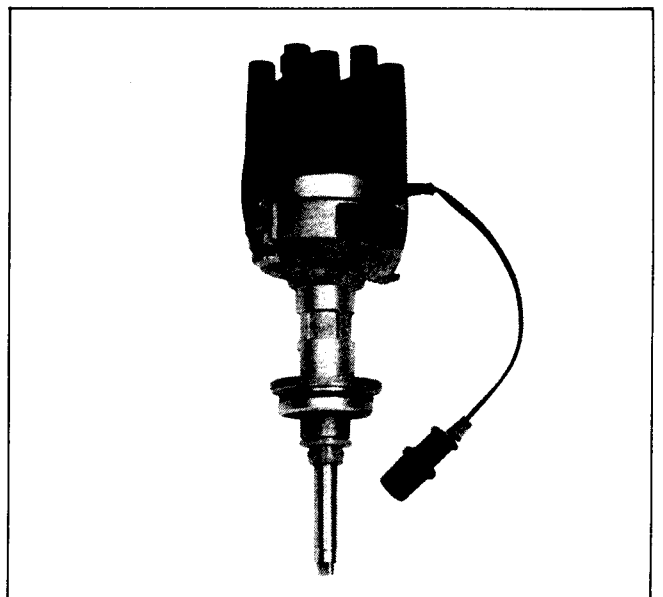
VEHICLE SPEED/DISTANCE SENSOR: The vehicle must be traveling a minimum speed of approximately 25 m.p.h. before the transmission can upshift to overdrive. The vehicle speed sensor is located on the speedometer pinion housing, or in the case of our B-van's, in-line.



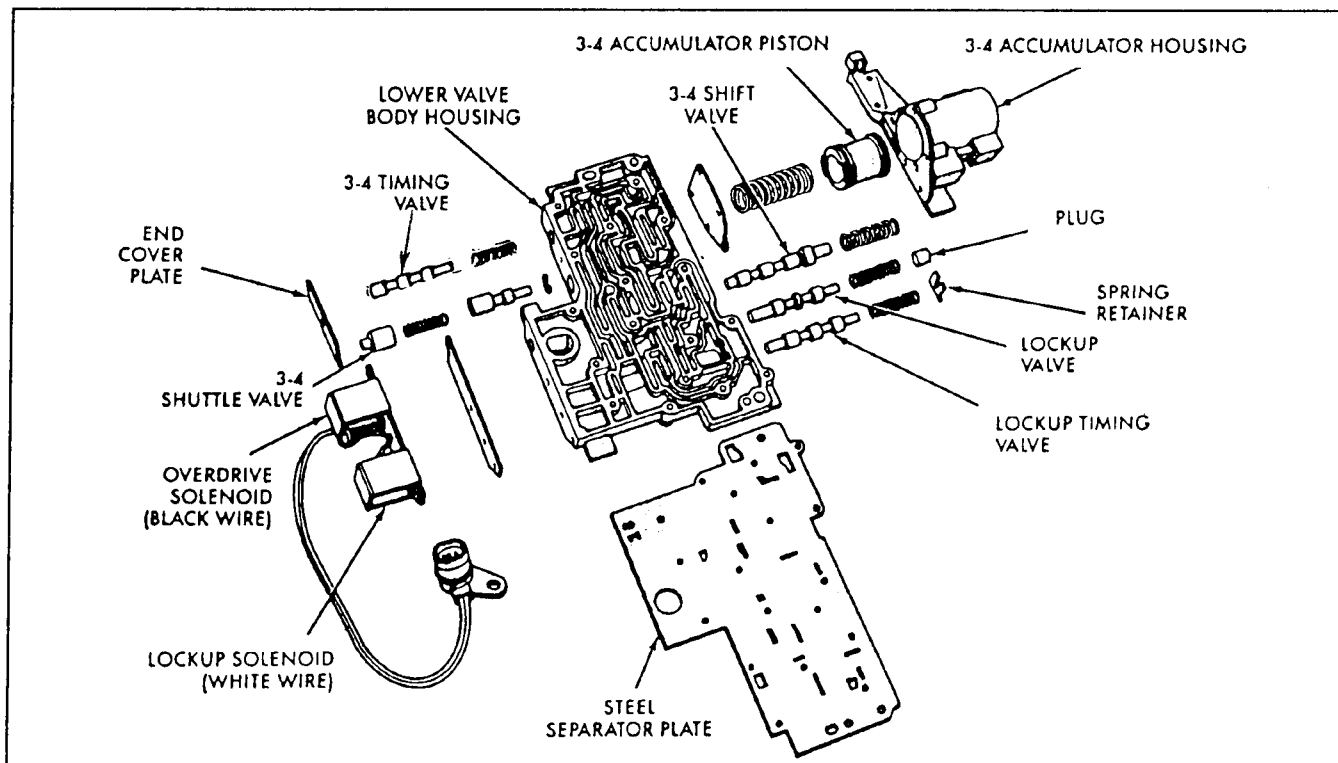
THROTTLE POSITION SENSOR (TPS): The input from this sensor is compared against the engine speed to help determine when to engage, and disengage the overdrive. This sensor is located on the throttle body.



OVERDRIVE SWITCH: The SMEC electronically looks at the overdrive switch to see if it's on, or off. If the switch is turned on to override the overdrive function, the upshift will not take place. The switch is located on the instrument panel, and has an indicator light to indicate when the overdrive is turned off. The B-van overdrive module is located on the steer column support bracket.



ENGINE SPEED SIGNAL: The engine speed signal comes from the distributor pick-up in the distributor. The engine speed signal is compared to the TPS signal to determine engagement and disengagement of the overdrive, as was mentioned earlier. This signal is also compared to the vehicle speed sensor to verify the transmission is in third gear before shifting to overdrive.



HYDRAULIC CONTROL COMPONENTS

It was necessary to add hydraulic controls to operate the overdrive unit. This was accomplished by using a Lower Valve Body and a separate Accumulator assembly. The lockup body on the top side of the valve body has been eliminated along with its slip fit tube. The lock-up valve was moved to the lower valve housing, and the fail-safe was eliminated. A lock-up timing valve replaces the fail-safe, and is located in the lower housing.

LOWER VALVE BODY: The lower valve body houses five valves and, as previously mentioned, is attached to the bottom side of the existing valve body assembly. The valves located in the lower valve body housing are;

3-4 Shift Valve - this valve is held in the downshifted position by a spring. When the overdrive solenoid is energized, it closes and allows third gear line pressure to build up on the end of the valve, causing it to upshift.

3-4 Timing Valve - this valve prevents a 4-2 downshift from occurring. The 3-4 timing valve

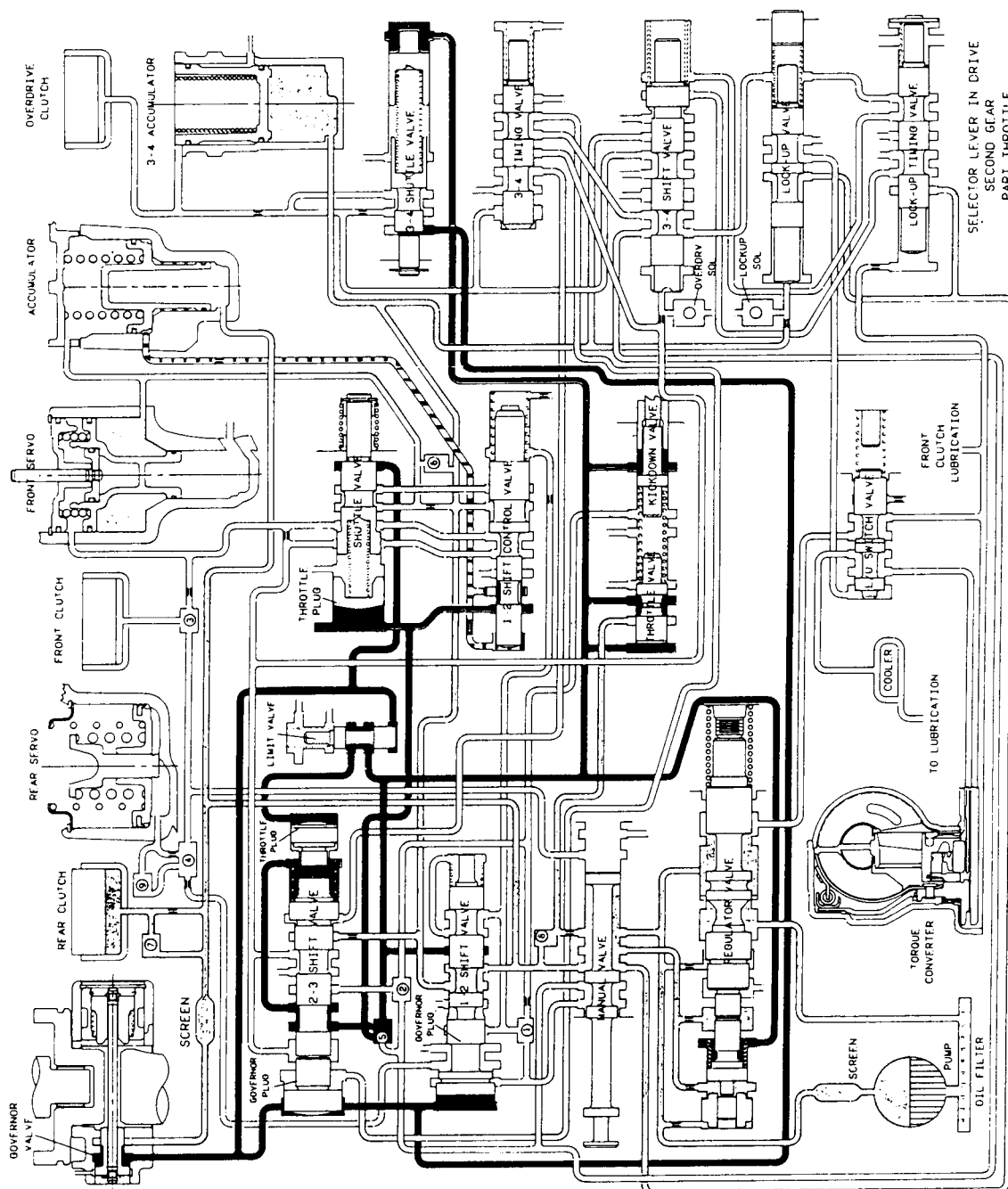
causes any 4-2 downshift to occur sequentially. The 4-3 downshift will be followed by the 3-2 downshift.

3-4 Shuttle Valve - this valve operates much like the 2-3 shuttle valve. It controls the overdrive clutch capacity during downshifts and lift-foot upshifts.

Lockup Valve - this valve operates similar to the 3-4 shift valve, a spring holds the valve downshifted until the lock-up solenoid is energized. The lock-up solenoid is supplied with **2nd** gear line pressure. The SMEC allows lockup only in overdrive gear.

Lockup Timing Valve - this valve insures that the lockup torque converter is disengaged before any 4-3 downshift occurs. This valve does the job the fail-safe use to do.

3-4 ACCUMULATOR: The 3-4 accumulator is attached to the side of the lower valve body. The accumulator provides a balance pressure to control application of the overdrive clutch for better shift quality.



OIL PRESSURES	
	LINE 57-94 PSI
	PUMP SUCTION
	GOVERNOR 0-57 PSI
	CONVERTER/LUBE 5-57 PSI
	THROTTLE 0-94 PSI
	1-2 SHIFT CONTROL 25-70 PSI

The hydraulic controls are set up to pressurize the overdrive clutch. Three valves and an accumulator are used to accomplish this task. Let's see how it's done.

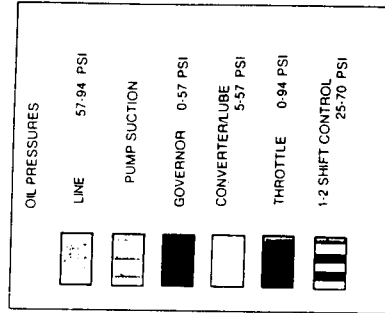
The first bit of action takes place just after the 1-2 upshift. What happens is that 2nd gear line pressure is sent to two separate places in the lower valve body, and to the bottom side of the 3-4 accumulator.

First, the line pressure will stroke the 3-4 accumulator against a spring. The accumulator will be used to cushion the shift into 4th gear.

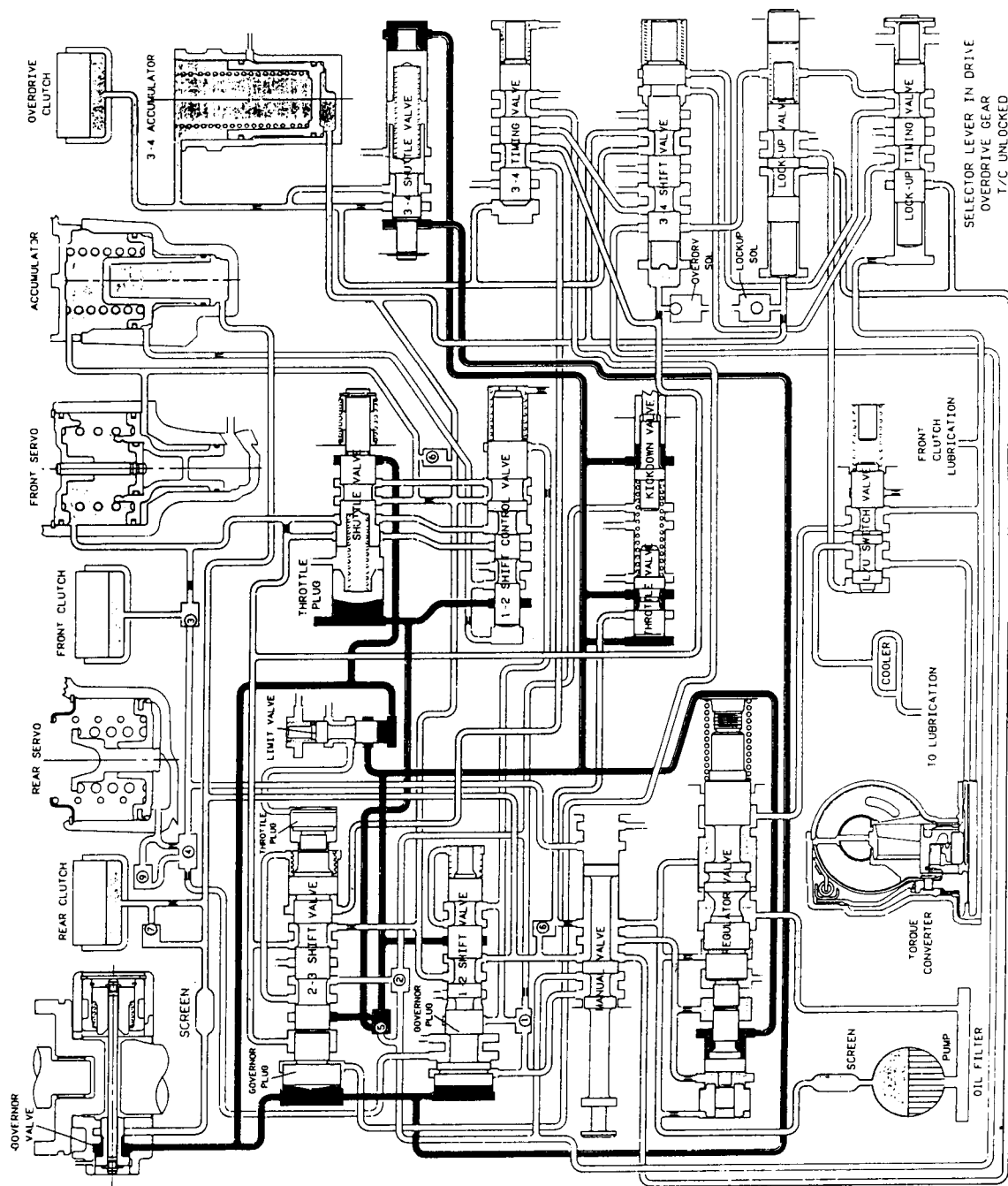
Secondly, line pressure is fed to the torque converter lock-up solenoid where it will be vented.

Finally, line pressure will be fed to the 3-4 shift valve and be dead ended.

At this point nothing has happened, except for the 3-4 accumulator stroking, it's basically been just preparation for the upcoming 3-4 shift.



The next event that takes place comes after the 2-3 upshift. What happens is that 3rd gear line pressure is led to the 3-4 timing valve where it dead ends. The same line pressure is also fed to the 3-4 overdrive solenoid where it is vented. Again, nothing has happened except more preparation.

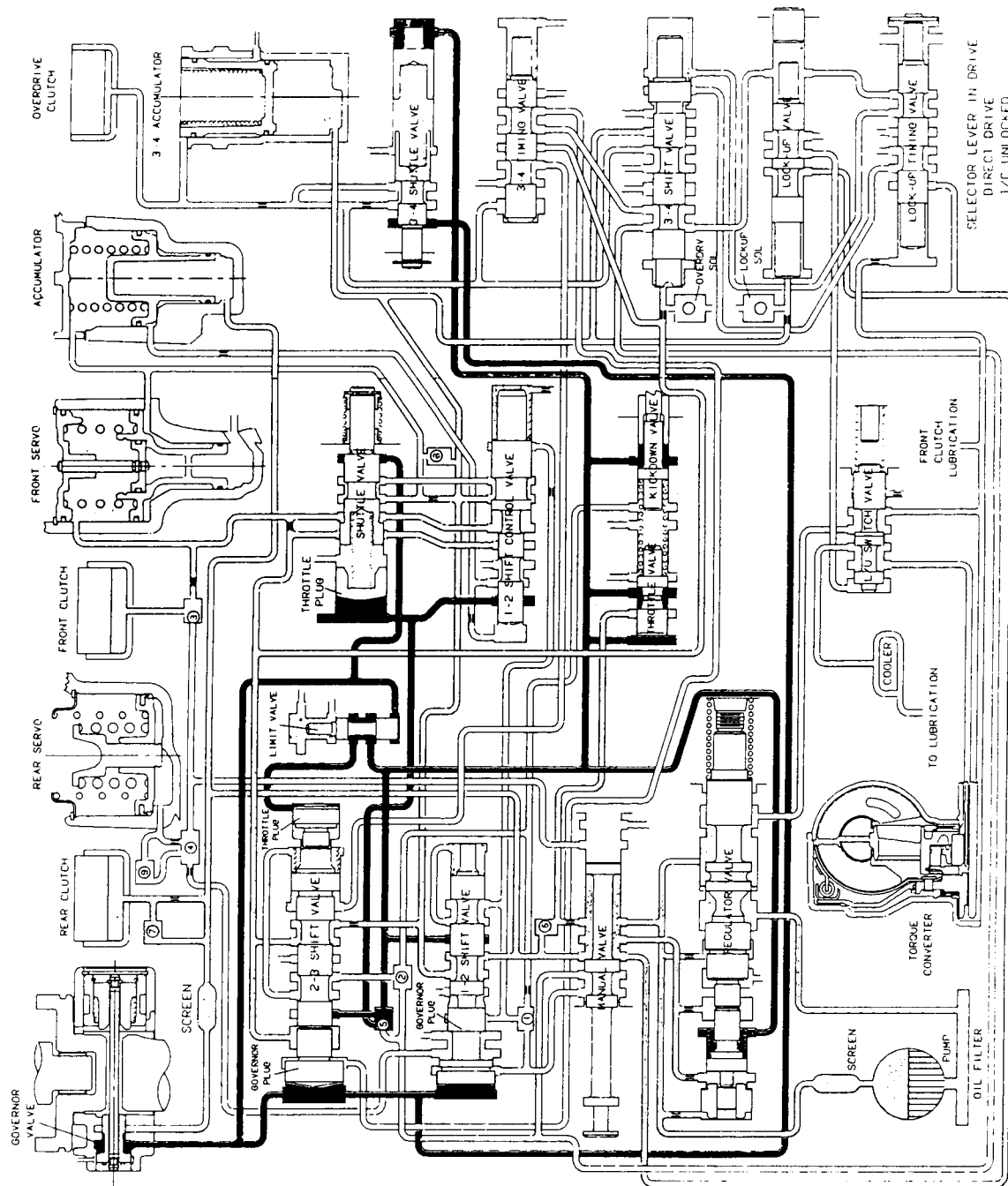


OIL PRESSURES	
	LINE 57-94 PSI
	PUMP SUCTION
	GOVERNOR 0-57 PSI
	CONVERTER/LUBE 5-57 PSI
	THROTTLE 0-94 PSI
	1-2 SHIFT CONTROL 25-70 PSI

This next event is where all the action takes place. The transmission is in third gear all that is needed is the command from the SMEC to energize the overdrive solenoid. When the overdrive solenoid is energized it will close its vent and allow pressure to build up. This build up of pressure will shift the 3-4 shift valve. When the 3-4 shift valve moves it will allow the 2nd gear line pressure to pressurize the overdrive piston. This 2nd gear line pressure will also go to the top of the 3-4 accumulator and stroke the accumulator down, which will improve shift quality.

The 2nd gear line pressure will also go to the end of the 3-4 timing valve and shift it. When the 3-4 timing valve shifts, it will allow the dead ended 3rd gear line pressure to be directed to the 2-3 shift valve. The purpose for this is to hold the 2-3 shift valve in the up shifted position, preventing the 2-3 shift valve from downshifting before the 3-4 shift valve.

The 3-4 shuttle valve uses governor pressure and throttle pressure to adjust the rate of apply, and release, of the overdrive clutch piston. This is done to control shift quality at different vehicle speeds and throttle openings.



OIL PRESSURES	
LINE	57-94 PSI
PUMP SUCTION	
GOVERNOR	0-57 PSI
CONVERTER/LUBE	5-57 PSI
THROTTLE	0-94 PSI
1-2 SHIFT CONTROL	25-70 PSI

For a 4-3 downshift to occur, the overdrive solenoid must be de-energized by the SMEC. When de-energized, the overdrive solenoid will vent the 3rd gear line pressure and, the 3-4 shift valve will downshift. The downshifted 3-4 shift valve will vent the 2nd gear line pressure that was sent to the overdrive clutch, the top of the accumulator, and the end of the 3-4 timing valve.

With the 2nd gear line pressure being vented from the end of the 3-4 timing valve, it will cause the 3-4 timing valve to downshift and vent the 3rd gear line pressure that was holding the 2-3 shift valve in the upshifted position.

The three torque converter lock-up valves are used to control the torque converter and, for that reason will not be covered in this text. The valves have the same responsibilities in the three speed LOAD-FLIGHT as they will in this new four speed transmission. The only significant change will be the lock-up timing valve, which replaced the fail-safe valve. The lock-up timing valve's job is to make sure the torque converter is un-locked before the 4-3 downshift takes place.



OVERDRIVE OPERATION

This section will explain the events that take place for the overdrive unit to engage. The sequence of events start with the electronic controls that operate the hydraulic controls. The hydraulic controls, in turn, operate the hydraulic piston that engages, and disengages, the overdrive and direct clutches. The clutches will control the power flow through the overdrive gear train.

The governor assembly will not be covered in the following explanations since it is not directly responsible for the shifting to overdrive. The only place governor pressure is used in the overdrive unit is on the 3-4 shuttle valve, to help control shift quality, of the overdrive clutch.

ELECTRONIC CONTROLS OPERATION

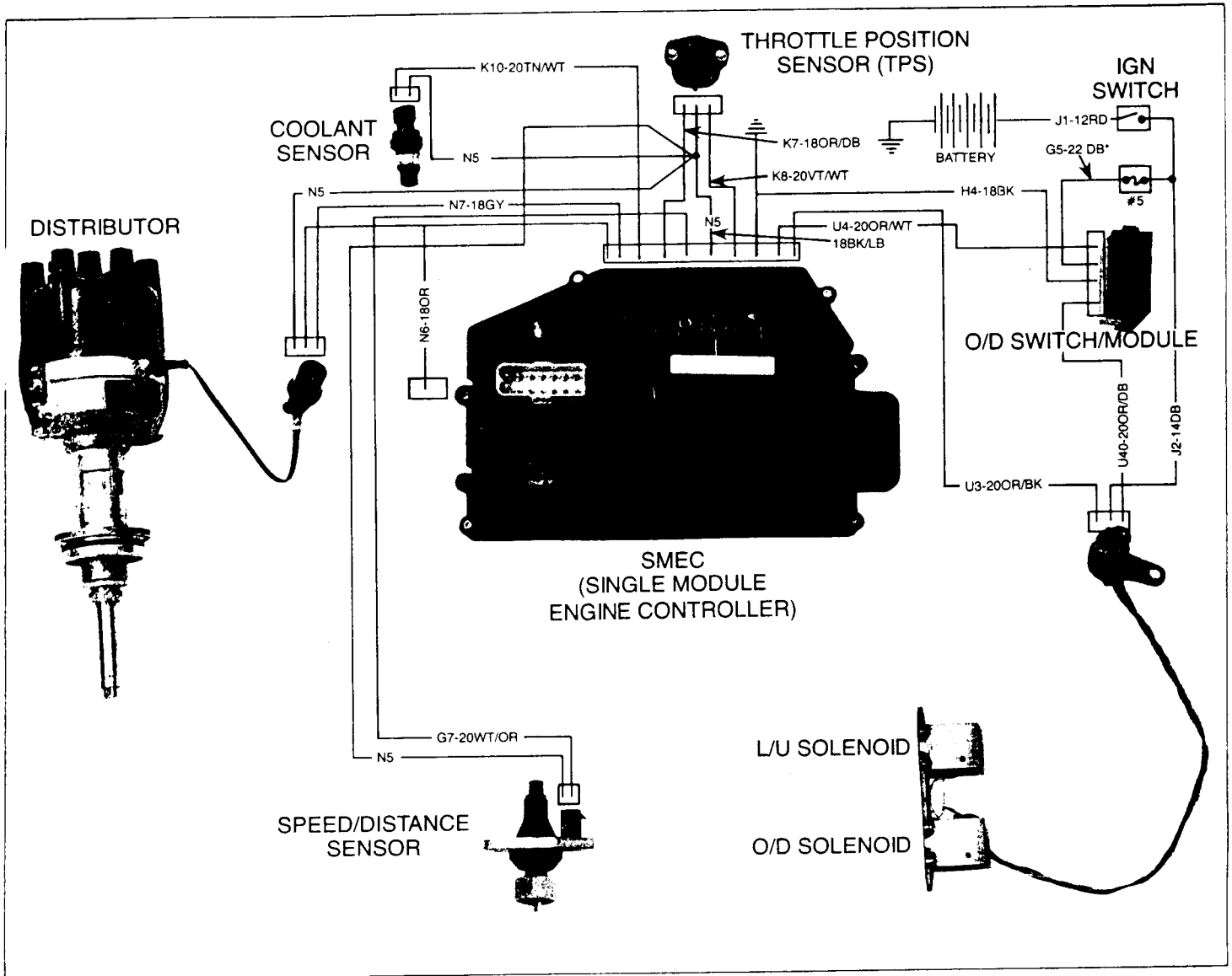
The electronic controls are set up to simply leave the overdrive solenoid de-energized, to vent third gear line pressure at the end of the 3-4 shift valve, which prevents the upshift to overdrive. Or, to energize the overdrive solenoid at the appropriate time, and cause overdrive to engage. It's that simple!

The SMEC is responsible for controlling the operation of the overdrive solenoid. The SMEC uses input from a variety of sensors to determine exactly when to energize, or de-energize the solenoid.

Here is a list of the criteria that must be met before the transmission will shift to overdrive.

- 1) The engine coolant temperature must be a minimum of 65° F. This signal comes from the engine coolant sensor.
- 2) The overdrive override switch must be in the on position. (The switch indicator light must be off.) The SMEC checks this instrument panel switch to see if it's on, or off.
- 3) The vehicle speed limit is typically a minimum of 25 mph. This signal comes from the vehicle speed/distance sensor. The 25 mph limit is actually the lowest speed the transmission will stay in overdrive, during a coast-down. The upshift into overdrive will be somewhat higher than 25 mph.
- 4) The engine speed is compared to the vehicle speed so the SMEC can determine if the transmission is in third gear. The SMEC must know this before it will allow the 3-4 shift to take place. This also prevents the possibility of a 2-4 downshift taking place. This signal comes from the ignition distributor.
- 5) The throttle position signal is compared to the engine speed signal to determine when to engage, or disengage overdrive. This signal comes from the throttle position sensor (TPS).

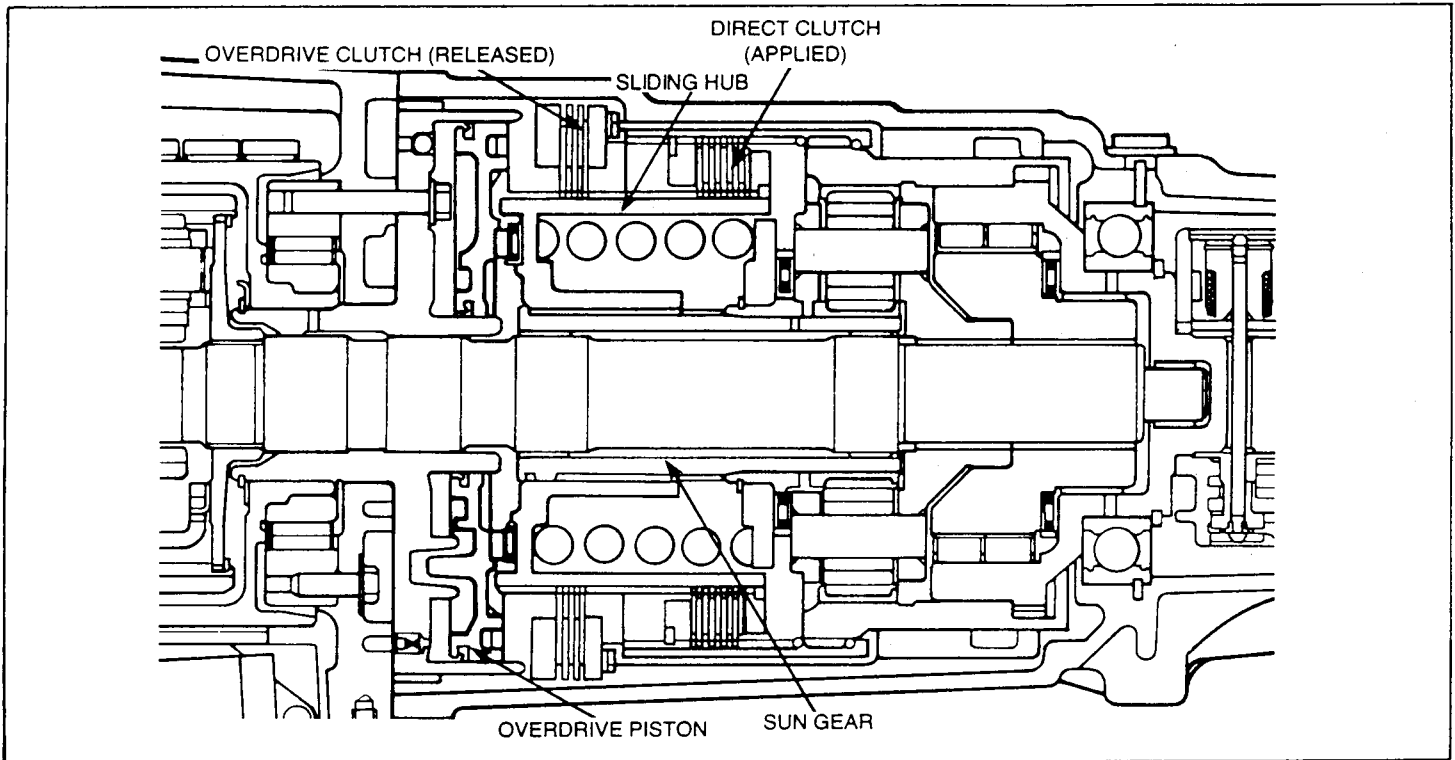
The SMEC must see all of the criteria stated above before it will energize the overdrive solenoid and go into overdrive.



CLUTCH OPERATION

Two multiple disc clutches and an overrunning clutch is used in the overdrive unit. The multiple disc clutches are the direct clutch, which is spring

applied, and the overdrive clutch which is hydraulically applied. A single piston is used to control both the multiple disc clutches.



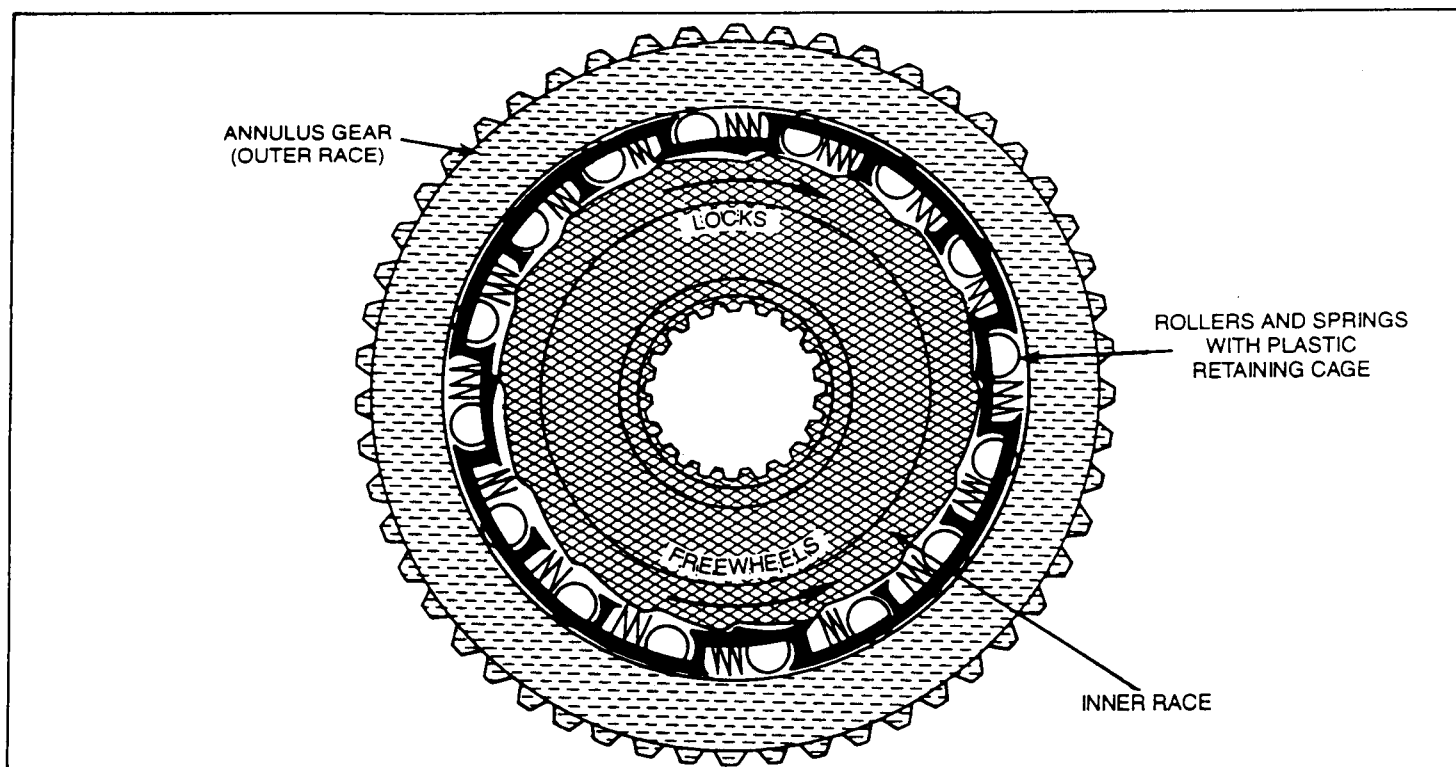
THE DIRECT CLUTCH is normally applied, even when the vehicle is turned off! This is done using a large spring. Looking at the illustration you will notice the spring is seated on a thrust plate. The spring is constantly pushing forward on the sliding hub, which is splined to the overdrive sun gear. Keep in mind that the hub and sun gear are splined together, so if the hub is turned the sun gear must turn, and, if the hub is held stationary the sun gear is stationary.

The outside, rear most part of the hub hooks to the rear pressure plate of the direct clutch. The hub will constantly push forward compressing, or applying the clutch. The direct clutch is held in

place with a snap ring on the inside of the direct clutch drum. With this clutch applied, it forces the overdrive sun gear and, the clutch drum, to turn at the same speed causing direct drive.

To release the direct clutch, the pressurized overdrive piston must push against the hub, overcoming the spring tension. When this happens the hub will slide rearward and disengage the direct clutch. With the direct clutch disengaged the overdrive sun gear and the clutch drum are allowed to turn at different speeds.

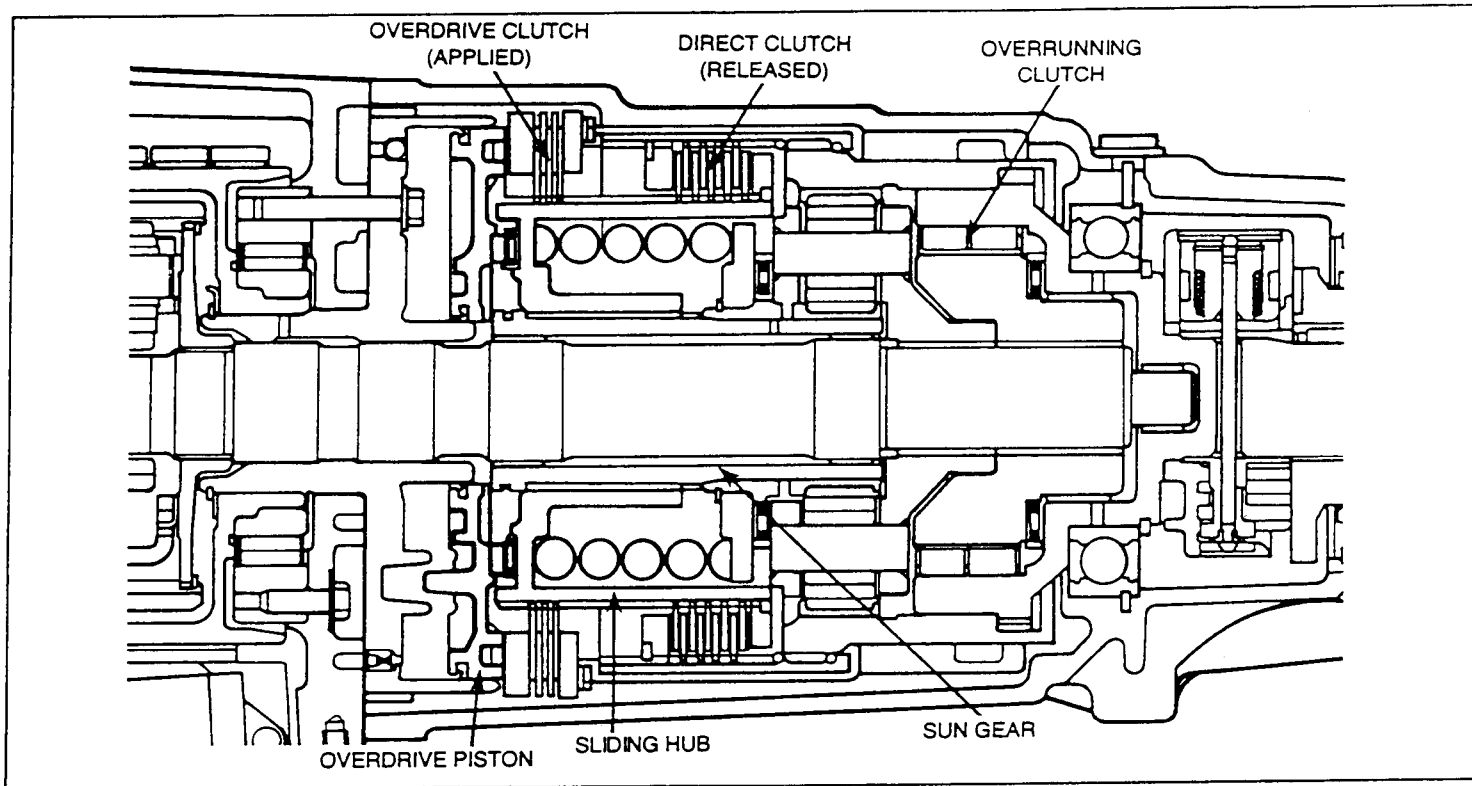
The direct clutch is used for 1st, 2nd, 3rd, and reverse gears.



THE OVERDRIVE OVERRUNNING CLUTCH acts as a coupler between the intermediate shaft and the output shaft.

There is a short span of time when the direct clutch is released and the overdrive clutch is not yet engaged. This span of time is called underlap. During this underlap time, when neither of the clutches are applied, the engine speed would normally flare-up before the overdrive clutch en-

gaged. To avoid this, the overrunning clutch remains engaged until the overdrive clutch is applied. When the overdrive clutch is applied, the overrunning clutch, automatically, starts to over-run and freewheel. The moment the overdrive clutch disengages during a downshift, the overrunning clutch will instantly engage again. This overrunning clutch is engaged only in 1st, 2nd, and 3rd gears. It will freewheel in overdrive and reverse.



THE OVERDRIVE CLUTCH is normally not applied. The clutch is splined to the overdrive housing and the sliding hub. The purpose of the clutch is to hold the sun gear, through the sliding hub, when it's applied. That's all it does! The only time this clutch is engaged is in overdrive.

The overdrive clutch is applied hydraulically through the overdrive piston. When the apply pressure is released the piston is returned using the spring tension behind the sliding hub.

ELEMENTS IN USE AT EACH POSITION OF THE SELECTOR LEVER

LEVER POSITION	A500 OVER-DRIVE	START SAFETY	PARKING SPRAG	TRANSMISSION						OVERDRIVE		
				CLUTCHES				BANDS		CLUTCHES		
				FRONT	REAR	O'RUNNING	LOCKUP	K/D FRONT	REVERSE/REAR	O/D	O'RUNNING	DIRECT
P-Park		X	X									
R-Reverse	2.21			X					X			X
O-Drive												
First	2.74				X	X					X	X
Second	1.54				X			X			X	X
Third	1.00			X	X		X				X	X
O/D	.69			X	X		X			X		X
2-Second												
First	2.74				X	X					X	X
Second	1.54				X			X			X	X
1-Low	2.74				X	X			X		X	X

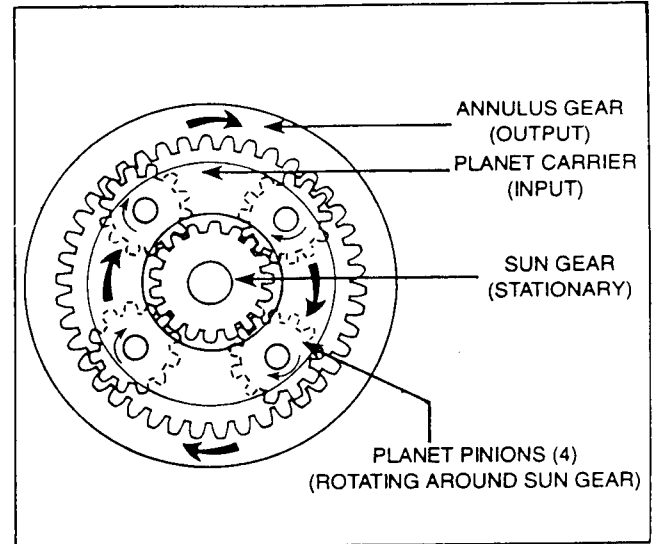
GEARTRAIN OPERATION

The overdrive geartrain consists of a sun gear, planetary gear set, and an annulus gear. The key to the operation of this geartrain is what is done with the sun gear.

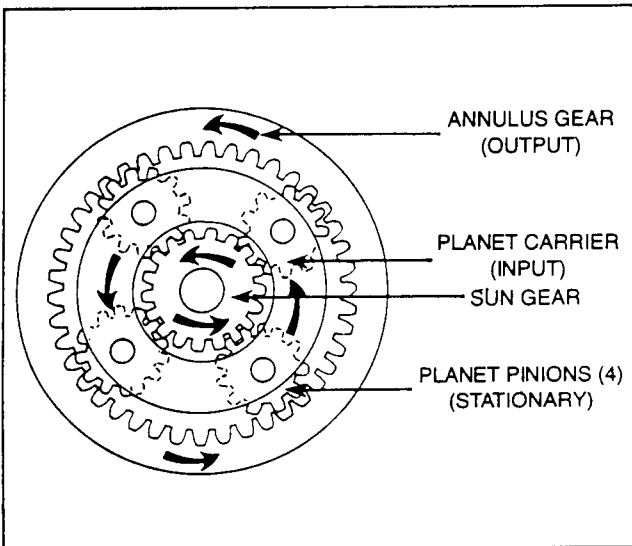
Three things you should keep in mind about the geartrain are;

- 1) The sun gear is splined to the sliding hub and will either be held or turned, depending on which clutch is applied.
- 2) The planetary gear set is splined to the intermediate shaft. All the input power to the overdrive unit will come through the planetary gears.
- 3) The annulus gear is splined to the output shaft. All output power must pass through the annulus gear.

The geartrain is used in two different ways to give direct drive and overdrive ratios.



OVERDRIVE- This second condition shows the sun gear being held stationary. The planetary carrier is being turned by the intermediate shaft, causing the planetary pinions to walk around the stationary sun gear. The rotating planet pinions will drive the annulus gear at a faster rate of speed than the input speed. This ratio is .69 to 1, and is referred to as overdrive.

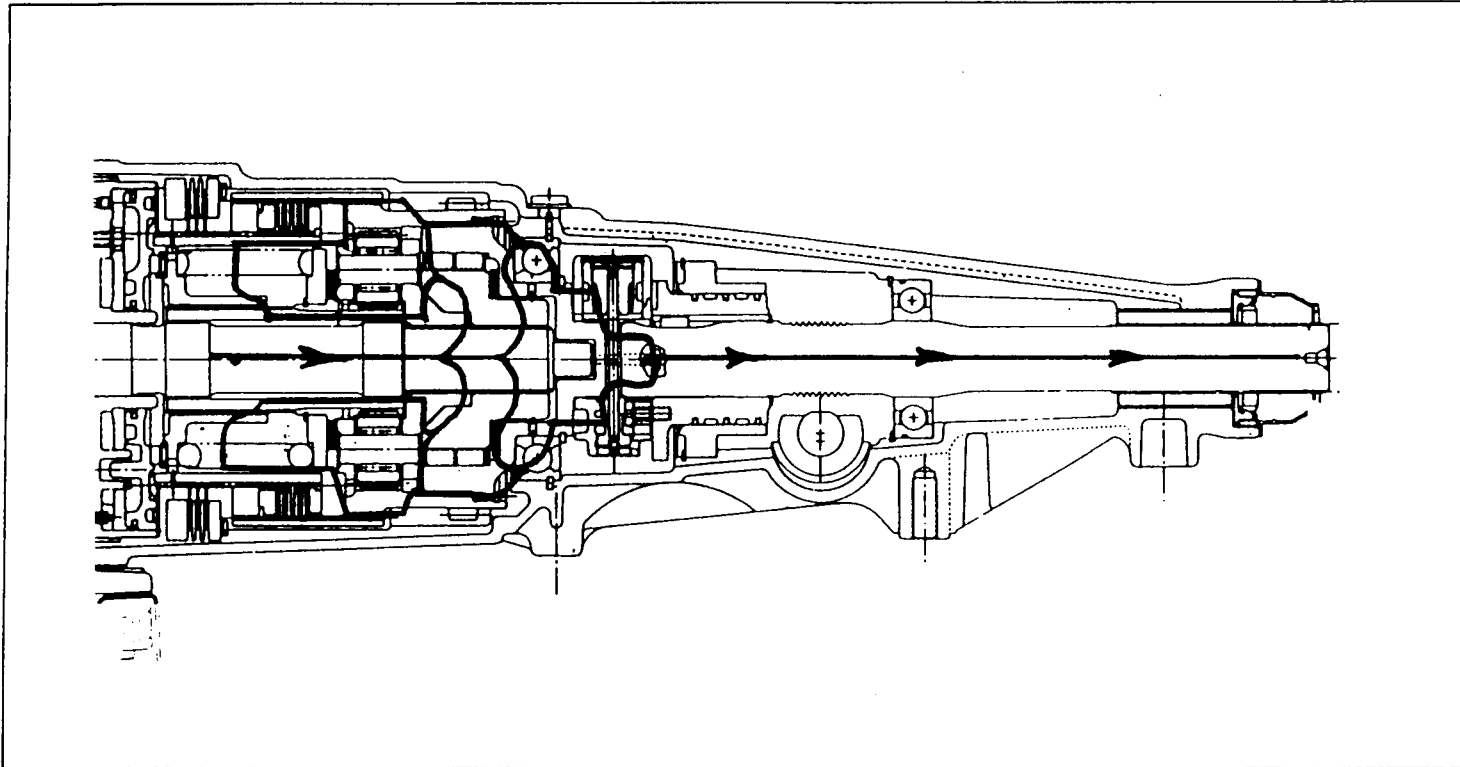


DIRECT- This first condition shows the sun gear, planetary gears, and the annulus gears all rotating as one unit. This is accomplished by locking the sun gear and the annulus gear together, through the sliding hub and direct clutch.

POWER FLOW

There will be three different power flows through the overdrive assembly. Direct power flow is used while in 1st, 2nd, and 3rd gear. Overdrive power

flow is used while in 4th gear, and another direct power flow in reverse. The power flow for reverse is slightly different than the one used in 1st, 2nd, and 3rd.

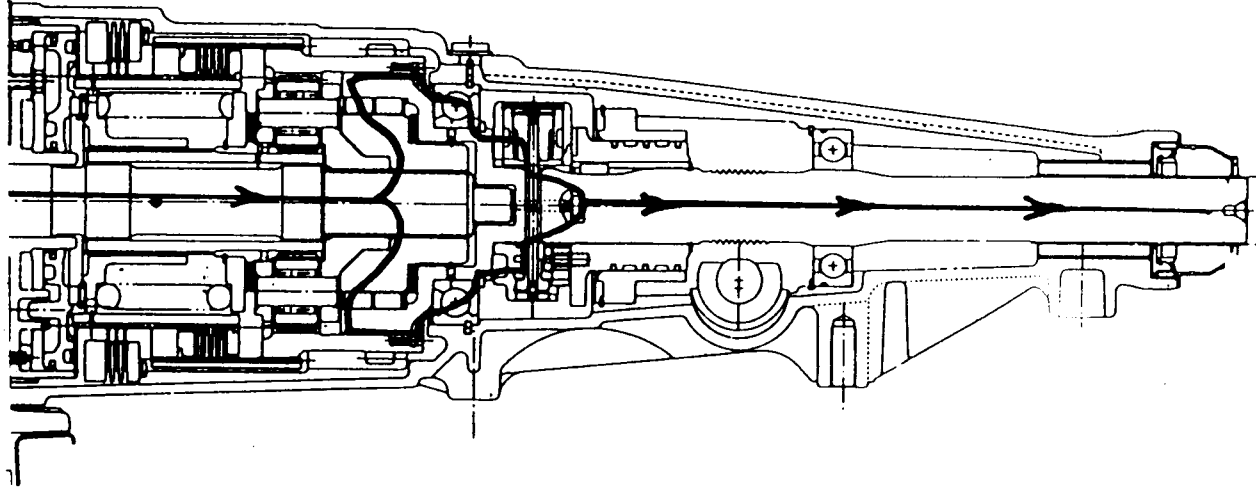


DIRECT (FORWARD)- The transmission must be in a forward gear, and the overdrive unit will have the overdrive clutch disengaged. Both the direct clutch and the overdrive overrunning clutch will be engaged.

Input power will come through the intermediate shaft and split, going into the overrunning clutch and the planetary carrier. The power goes through the overrunning clutch inner race, rollers, and directly into the output shaft.

The power flow that goes into the planetary carrier splits again at the pinion. One path goes outward and into the annulus gear which is splined to the output shaft. The other path it takes through the pinion, goes inward into the sun gear, through the hub, and the direct clutch. It will continue into direct clutch drum, the annulus gear, and into the output shaft.

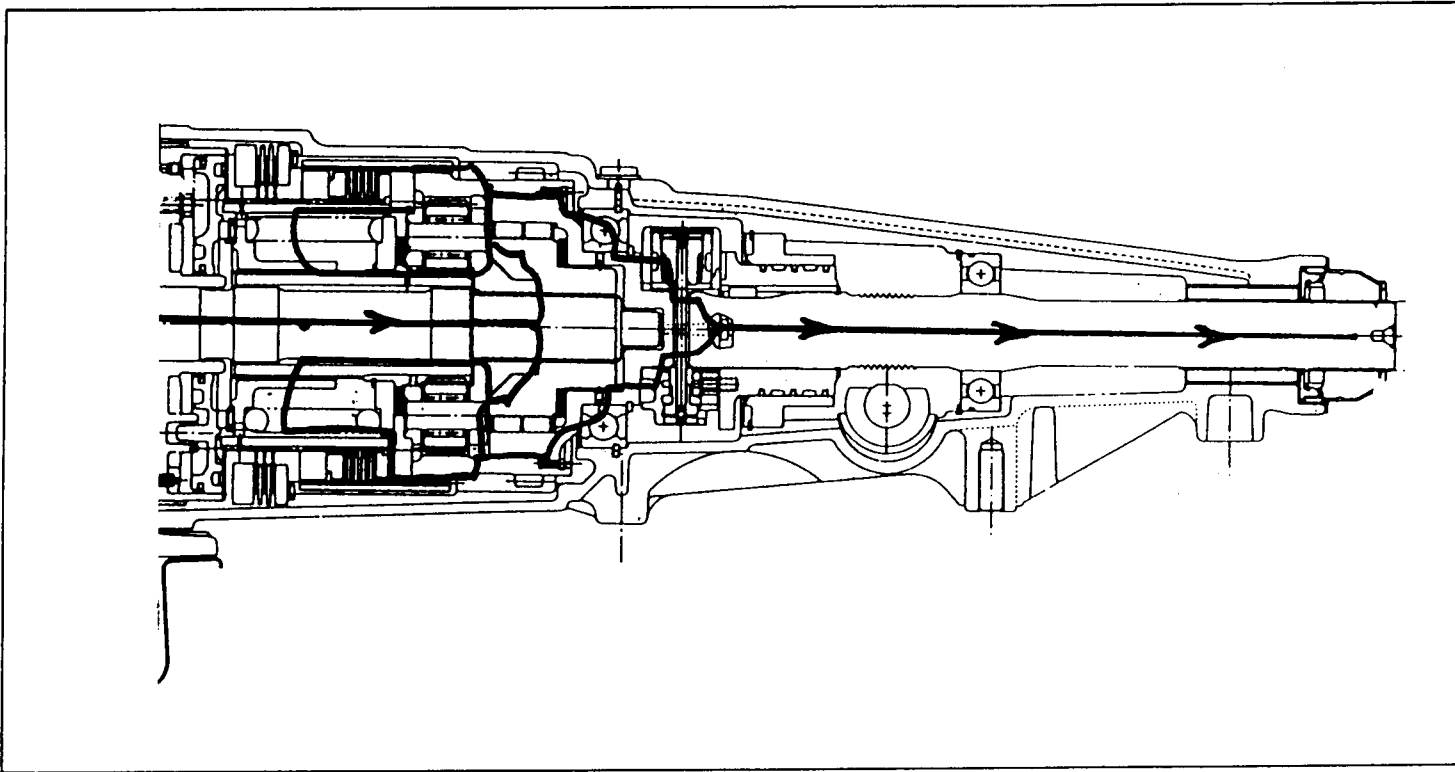
During the 3-4 upshift there is a moment when the direct clutch is released and the overdrive clutch is not yet engaged. The power flow during this brief period goes through the overdrive overrunning clutch.



OVERDRIVE- The transmission must be in third gear, and the overdrive unit will have the overdrive clutch engaged. The direct clutch and the overrunning clutch will both be disengaged.

Input power coming through the intermediate shaft will go into the planetary carrier. Because the sun gear is being held by the overdrive clutch, through

the hub, the planetary pinion gears will walk around the sun gear. The planetary pinions will then drive the annulus gear at a faster rate of speed than what the intermediate shaft is turning. The power flow went from the planetary pinions, through the annulus gear, and into the output shaft.



REVERSE - The power flow for reverse will be similar to the direct power flow explained earlier. The only difference will be that there is no power flow through the overrunning clutch. The overrunning clutch will freewheel in the reverse direction.

The overdrive clutch is disengaged, while the direct clutch is engaged.

The power coming through the intermediate shaft will go through the planetary carrier and split at the planetary pinion gears. Some of the power will go through the sun gear, the sliding hub, and into the direct clutch. From the direct clutch it will go through the direct clutch drum, the annulus gear, and into the output shaft. The other route the power will take goes through the planetary pinion, the annulus gear, and into the output shaft.



DIAGNOSTIC TIPS

The following information is intended to be used only as helpful information to help the technician diagnose the A500 overdrive unit. Refer to the Service Manual for detailed diagnostic procedures.

In this section a part will be listed and then what the symptoms of the parts are, when they fail. The list will start with clutches, then gear train components, hydraulic components, and end with electronic components.

DIRECT CLUTCH: If the direct clutch failed, the transmission would not have reverse. In drive the overdrive overrunning clutch would engage so forward could be obtained. One problem with this would be that every time the driver let off the gas while the transmission selector was in D2, and upshifted to 2nd, the vehicle would coast freely. The driver would not experience engine braking.

OVERDRIVE CLUTCH: When the overdrive clutch fails it will either slip when shifting into fourth gear or it will not go into fourth gear at all. If there is no shift into fourth gear you can verify if the transmission has attempted the shift to fourth by doing the following check. Drive the vehicle under the conditions that should allow the transmission to be in fourth. While driving take your foot off the gas. If the vehicle has no engine braking and coasts freely, the overdrive clutch has failed.

OVERDRIVE OVERRUNNING CLUTCH: About the only time a technician will be able to tell if the overrunning clutch is failed is when the transmission shifts from 3rd to 4th, the engine speed will flair. If the overrunning clutch failed so it was always locked, the transmission would lock up and stop the vehicle when it attempted a 3-4 upshift. The transmission would also lock in reverse.

SLIDING HUB: A failed sliding hub could act like a Direct Clutch failure. See Direct Clutch.

OVERDRIVE PISTON SELECTIVE THRUST PLATE: If the selective thrust plate is too thick it could delay the 3-4 upshift. If the selective thrust plate is too thin it will cause a condition where the

direct clutch is not fully disengaged before the overdrive clutch starts to engage. This condition will actually slow the vehicle down somewhat, during this shift period, and cause premature clutch failure.

OVERDRIVE SUN GEAR: The only time the sun gear would make noise, if it was failed, would be in 4th gear overdrive. It's the only time the gears are rotating within each other.

PLANETARY GEAR SET: See Overdrive Sun Gear.

ANNULUS GEAR: See Overdrive Sun Gear.

OUTPUT SHAFT BALL BEARINGS: Both the front and rear ball bearings turn anytime the output shaft turns. If either of the bearings are bad they will get louder with vehicle speed.

OVERDRIVE NEEDLE BEARINGS: The three needle bearings in the overdrive unit turn only when the transmission is in 4th gear. If the bearings fail, they will only make noise in 4th.

OVERDRIVE PISTON AND LIP SEALS: If the piston or lip seals failed, causing hydraulic pressure loss, it could cause the direct and overdrive clutches to fail. The first place it would show up would be during the shift into 4th gear. Third gear would appear to be operating properly because of the overrunning clutch.

OVERDRIVE SOLENOID: If the solenoid fails so it stays open, the transmission will never upshift into 4th gear. If it fails closed, the transmission will upshift from 2nd directly into 4th gear. Check for fault code.

ENGINE SPEED SIGNAL: If there is no engine speed signal, the transmission will not shift into 4th gear. Then again the engine will not run without this signal. Check for fault code.

SPEED/DISTANCE SENSOR: If the speed/distance signal is lost, the transmission will not shift to 4th gear. Check for fault code.



Technical Service Information

COOLANT SENSOR: If the coolant sensor fails, the SMEC automatically puts in a bogus temperature signal of 100 degrees. Since the SMEC thinks it's seeing 100 degrees engine temperature, the transmission will upshift to 4th gear. If the coolant sensor failed to where it was telling the SMEC the engine temperature was below 65 degrees (the SMEC may not recognize a partial failure) then the upshift to 4th would not take place. Check for fault code.

THROTTLE POSITION SENSOR (TPS): If the TPS failed, the SMEC would use the signal from the MAP sensor in it's place. The overdrive operation would be very erratic because of this. Check for fault code.

O/D SWITCH/MODULE: The switch could fail in two different ways. First it could fail so it gives the SMEC the signal to override overdrive and it would not upshift to 4th gear. Secondly it could fail so the transmission would always upshift to 4th gear regardless of the switch position.

SMEC: There is the possibility the SMEC could fail and never allow 4th gear to engage. Check for fault codes.

NOTICE: Many of the electronic component failures will store a fault code in the SMEC and can be observed with the use of a DRB II. Use the POWERTRAIN DIAGNOSTIC TEST PROCEDURES BOOK to properly diagnose the electronic operation of the A500 transmission.



A-500 4-SPEED OVERDRIVE AUTOMATIC TRANSMISSION

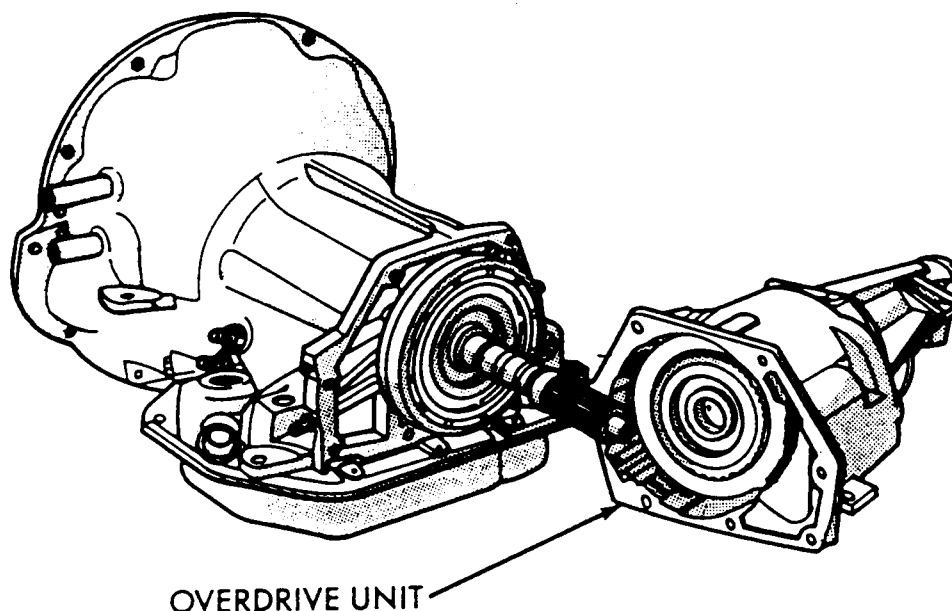


Fig. 1—A-500-4-Speed Overdrive Transmission

The front portion of this unit is a modified A999 three-speed loadflite automatic transmission. The rear unit, or overdrive, replaces the extension housing and provides a fourth gear with an economy gear ratio (.69 to 1.0) (Figure 1).

A lockup torque converter which is electronically controlled and hydraulically activated, will also be used with this transmission. Fourth gear (overdrive) and lockup will only occur during certain conditions determined by the SMEC (Single Module Engine Controller).

When the vehicle is traveling in third gear over 25 miles per hour, the SMEC uses the following information to allow the shift: The SMEC checks the coolant sensor signal for a 60-degree fahrenheit minimum temperature. It also checks the engine speed sensor, the vehicle speed sensor, the throttle position sensor, and the map sensor.

AUTOMATIC TRANSMISSION SERVICE GROUP



Technical Service Information

There is an overdrive off switch located on the instrument panel. The switch is marked O/D OFF and incorporates a pilot light to indicate when the switch has been activated. When activated, the switch will prevent shifts into overdrive and lockup. This is desirable when towing, driving in hilly terrain, or any other driving conditions that make overdrive unsuitable. Activating the switch again will restore the automatic overdrive operation. The switch will reset for operation when the key is turned off.

Other features in conjunction with this unit include:

- The output shaft of the three-speed section will now be referred to as the intermediate shaft.
- The three-speed section rear drum is retained on the support with a snap ring.
- The governor and speedometer drive have been relocated to the rear of the output shaft.
- The overdrive case now contains two output shaft bearings. One is the output shaft front bearing, and the other is the output shaft rear bearing.
- There are no rotating seal rings or pressurized oil for the overdrive and direct clutches in the overdrive housing. The governor is the only component receiving pressurized oil through slip-fit tubes. Pressurized oil for the overdrive lubrication circuit is supplied through the intermediate shaft.
- Governor pressure and overdrive pressure taps are provided in the rear of the main case for in-vehicle transmission pressure testing.
- The valve body has been modified by adding several new valves. There's an overdrive solenoid, a 3-4 shift valve, a 3-4 timing valve, a 3-4 accumulator, and a 3-4 shuttle valve. Once in fourth gear, the lockup solenoid, lockup valve, and lockup timing valve accomplish the hydraulics to lock the converter turbine to the torque converter housing.
- The direct drive and overdrive gear ratios are supplied by a third planetary gear set, a direct clutch, an overdrive clutch, and an overrunning clutch. A very strong spring, rated at up to 800 pounds (5,516 KPA), holds the sun gear to the annulus for direct drive. For coasting or reverse gear, power flows only through the direct clutch.

A500 Power Flow

In third gear, the power flow comes off the intermediate shaft simultaneously into the planet carrier and the overrunning clutch. From the carrier, the power flows into the sun gear, then to the inner sliding hub splines. The direct clutch holds the sliding hub to the direct clutch drum under spring pressure. The drum engages directly with the annulus for a one-to-one ratio. The annulus is splined directly to the output shaft (Figure 2).

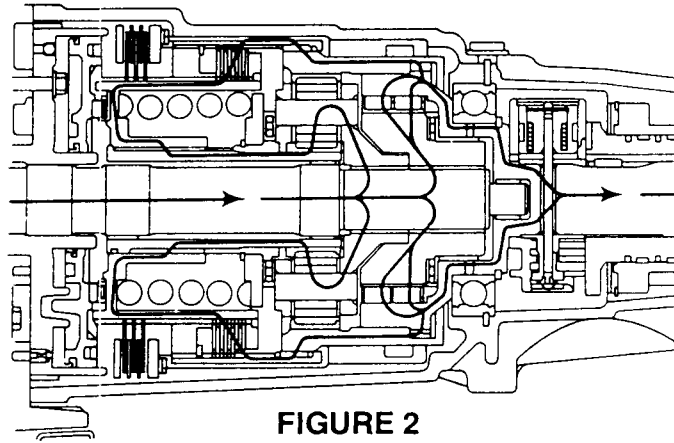


FIGURE 2

The overrunning clutch carries the power flow during the shift into fourth gear. When the SMEC energizes the overdrive solenoid, the third gear line pressure starts to move the overdrive piston rearward. The piston pushes the sliding hub and begins to compress the direct clutch spring. Now, with spring pressure relieved, the direct clutch is disengaged. Power flows only through the overrunning clutch (Figure 3).

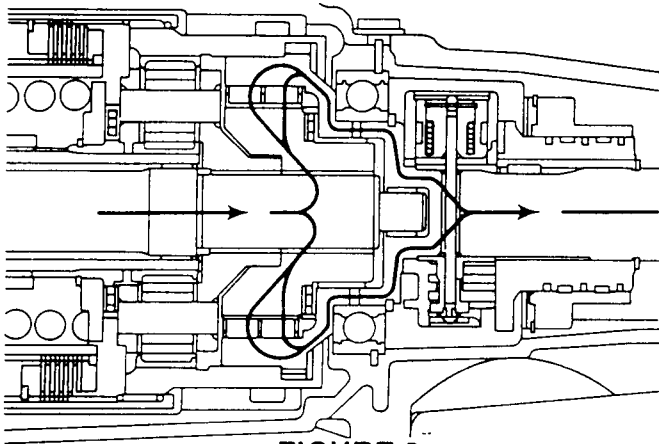


FIGURE 3

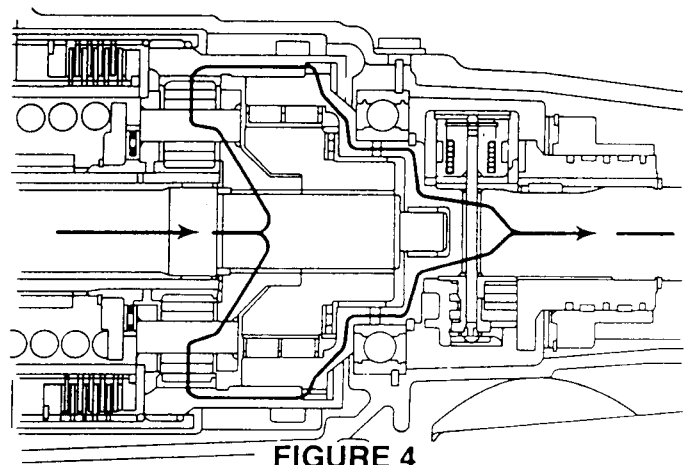


FIGURE 4

As the sliding hub is forced further rearward, the overdrive clutch engages, stopping the sliding hub and sun gear and hold them to the overdrive case. As power enters the planet carrier, its gears move around the stationary sun gear and the engine can now turn less for one revolution of the output shaft (Figure 4).

The lockup torque converter is also controlled by the SMEC. Once in fourth gear, the SMEC signals the lockup solenoid to close where the existing pressure builds to move the lockup valve. The lockup valve directs pressure to the torque converter where the turbine is clamped to the spinning torque converter housing. This eliminates any slipping normally attributed to automatic transmissions.



Technical Service Information

The lockup timing valve releases the torque converter to normal operation prior to the 4-3 downshift.

Additional A-500 Information

- All closed throttle 3-4 upshifts will occur at 25-28 mph, regardless of axle ratio.
- All closed throttle 4-3 downshifts will occur at 25 mph, regardless of axle ratio.
- No 3-4 upshift can be achieved, regardless of vehicle speed, if throttle opening is greater than 70% approximately.

ELEMENTS IN USE AT EACH POSITION OF THE SELECTOR LEVER

LEVER POSITION	A500 OVER-DRIVE	START SAFETY	PARKING SPRAG	TRANSMISSION						OVERDRIVE		
				CLUTCHES				BANDS		CLUTCHES		
				FRONT	REAR	O'RUNNING	LOCKUP	K/D FRONT	REVERSE/REAR	O/D	O'RUNNING	DIRECT
P-Park		X	X									
R-Reverse	2.21			X					X			X
O-Drive												
First	2.74				X	X					X	X
Second	1.54				X			X			X	X
Third	1.00			X	X		X				X	X
O/D	.69			X	X		X			X		X
2-Second												
First	2.74				X	X					X	X
Second	1.54				X			X			X	X
1-Low	2.74				X	X			X		X	X



Technical Service Information

OVERDRIVE DIAGNOSIS

<u>Condition</u>	<u>Possible Cause</u>
● No Reverse or Slips in "R".	● Failed Direct Clutch - Overdrive Spring Lost Load - Wrong Overdrive Piston Bearing Spacer Selected
● No Overdrive Shift	● Blown Fuse
	● Faulty Overdrive Solenoid
	● Faulty Wiring or Connectors
	● Faulty Overdrive Off Switch
	● Faulty SMEC
	● Failed Overdrive Clutch - Wrong Overdrive Piston Bearing Spacer Selected - Low Overdrive Pressure
	● Lower Valve Body Malfunction
● Runaway Overdrive Shift	● Failed Overdrive Overrunning Clutch
● Overdrive Shift Occurs Immediately Every 2-3 Shift	● Faulty Overdrive Solenoid - Not Venting
	● Lower Valve Body Malfunction
	● Faulty Wiring
	● Faulty SMEC
● Excessively Delayed Overdrive Shift	● Incorrect Overdrive Piston Bearing Spacer
	● Faulty Sensor
● No 4-3 Downshift	● Faulty Lockup Solenoid - Not Venting
	● Lower Valve Body Malfunction
	● Faulty Wiring
	● Faulty SMEC
● No 4-3 Downshift With Overdrive Off Switch	● Faulty Overdrive Off Switch
	● Faulty SMEC
	● Faulty Lockup Solenoid - Not Venting
	● Faulty Wiring
● Torque Converter Locks Up In 2nd and 3rd Gears	● Faulty Lockup Solenoid - Not Venting
● Harsh Shifts 1-2, 2-3, & 3-2	● Faulty Lockup Solenoid - Not Venting
● Low Governor Pressure	● Leaking Governor Tubes - Bent - Loose Fit
	● Governor Seal Rings Broken or Worn



Technical Service Information

OVERDRIVE DIAGNOSIS - CONT'D.

Condition

- Noisy

Possible Cause

- Failed Overdrive Piston Bearing
- Failed Gear Train Needle Thrust Bearings
- Failed Overdrive Planetary
- Failed Overdrive Overrunning Clutch

AUTOMATIC TRANSMISSION SERVICE GROUP

A-500 4-SPEED OVERDRIVE AUTOMATIC TRANSMISSION

GENERAL INFORMATION

The front portion of the A-500 4-speed overdrive automatic transmission is a modified A-998 three-speed LoadFlite automatic transmission. The rear unit, or overdrive unit, replaces the extension housing and provides an overdrive gear with a gear ratio of .69 to 1 (Fig. 1).

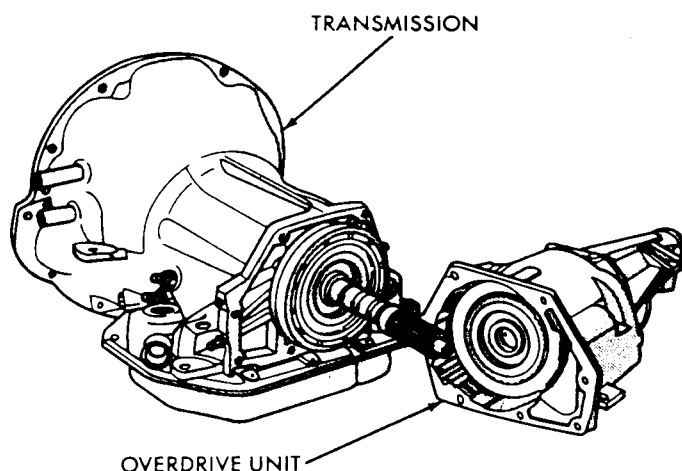


Fig. 1—A-500-4-Speed Overdrive Transmission

The first three gear ratios of the A-500 give the same gear ratios and torque capacity that was offered in the three-speed LoadFlite transmission. The addition of the fourth gear overdrive to the LoadFlite gives the added features of increased fuel economy, prolonged engine life and, less engine noise at cruising speed.

The overdrive unit is designed to withstand up to 400 foot-pounds of torque. Because of the high loads and the long periods of time that can be spent in overdrive, all the thrust bearings are needle bearings. The overdrive has added approximately 50 pounds of weight and 6 1/2 inches of length to the A-999 transmission.

Fourth gear (overdrive) is electronically controlled and hydraulically activated. A variety of sensor inputs are fed to the SMEC (single module engine controller) which controls a solenoid mounted on the valve body. The solenoid will energize and close a vent, allowing a 3-4 upshift. The SMEC also controls the operation of the lockup torque converter using many of the same sensor inputs.

A lockup torque converter, which is electronically controlled and hydraulically activated, will also be used with this transmission. Fourth gear

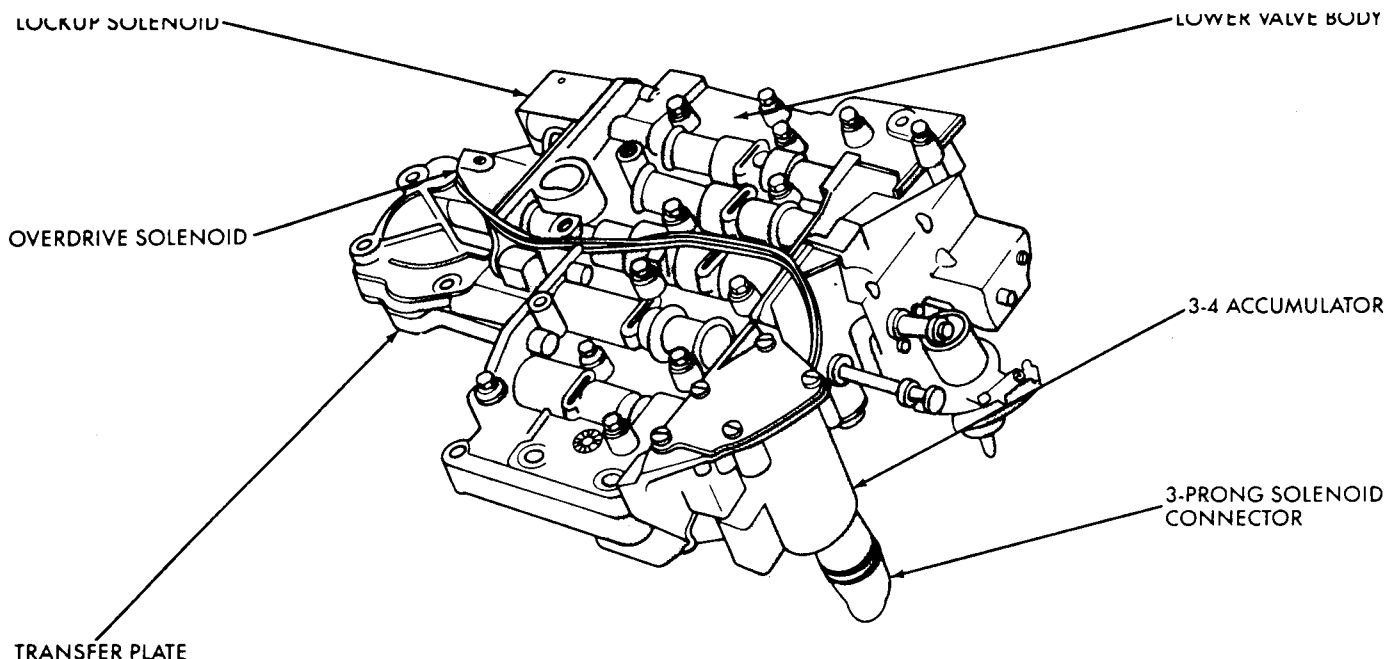


Fig. 2—A-500 Valve Body

(overdrive) and lockup will only occur during certain conditions determined by the SMEC (Single Module Engine Controller).

When the vehicle is traveling in third gear over 25 miles per hour, the SMEC uses the following information to allow the shift: The SMEC checks the coolant sensor signal for a 60-degree fahrenheit minimum temperature. It also checks the engine speed sensor, the vehicle speed sensor, the throttle position sensor, and the map sensor.

The steering column shift selector remains at 6 positions. Overdrive will be engaged automatically in Drive. A separate Overdrive OFF switch will be located on the instrument panel. This switch will override the SMEC and shift out of overdrive and prevent further shifts into overdrive. If the Overdrive OFF switch is activated again the automatic operation is restored. The switch has an indicator light when the overdrive is turned off. The switch also resets on key-off so that the automatic overdrive feature is restored.

The use of fault codes helps to diagnose the electronic components used to operate the overdrive and lockup torque converter.

Other features in conjunction with this unit include:

- (1) The output shaft of the three-speed section is now the intermediate shaft.
- (2) The three-speed section rear drum is retained on the support with a snap ring.
- (3) The governor and speedometer drive have been relocated to the rear of the output shaft.
- (4) The overdrive case now contains two output shaft bearings.
- (5) There are no rotating seal rings or pressur-

ized oil for the overdrive and direct clutches in the overdrive housing. The governor is the only component receiving pressurized oil through slip-fit tubes. Pressurized oil for the overdrive lubrication circuit is supplied through the intermediate shaft.

(6) Governor pressure and overdrive pressure taps are provided in the rear of the transmission case for in-vehicle transmission pressure testing.

(7) The valve body is modified by adding several new valves. There's an overdrive solenoid, a 3-4 shift valve, a 3-4 timing valve, a 3-4 accumulator, and a 3-4 shuttle valve. Once in fourth (overdrive) gear, the lockup solenoid, lockup valve, and lockup timing valve accomplish the hydraulics to lock the converter turbine to the torque converter housing.

(8) The direct drive and overdrive gear ratios are supplied by a third planetary gear set, a direct clutch, an overdrive clutch, and an overrunning clutch. A very strong spring, rated at up to 800 pounds (5,516 kPa), holds the sun gear to the annulus for direct drive. For coasting or reverse gear, power flows only through the direct clutch.

(9) The lockup timing valve releases the torque converter to normal operation prior to the 4-3 downshift.

(10) All closed throttle 3-4 upshifts will occur at 25-28 mph, regardless of axle ratio.

(11) All closed throttle 4-3 downshifts will occur at 25 mph, regardless of axle ratio.

(12) No 3-4 upshift can be achieved, regardless of vehicle speed, if throttle opening is greater than 70% approximately.



Technical Service Information

DIAGNOSIS

Condition

- (1) No reverse or slips in reverse.
- (2) No overdrive shift.
- (3) Runaway overdrive shift.
- (4) Overdrive shift occurs immediately after 2-3 shift.
- (5) Excessively delayed overdrive shift.
- (6) No 4-3 downshift.
- (7) No 4-3 downshift with overdrive off switch.
- (8) Torque converter locks up in 2nd and 3rd gears.
- (9) Harsh shifts 1-2, 2-3, & 3-2.
- (10) Low governor pressure.
- (11) Noisy.

Possible Cause

- (1) Failed direct clutch
 - (a) Overdrive spring lost load.
 - (b) Wrong overdrive piston bearing spacer selected.
- (2) Blown fuse
 - (a) Faulty overdrive solenoid.
 - (b) Faulty wiring or connectors.
 - (c) Faulty overdrive off switch.
 - (d) Faulty SMEC.
 - (e) Failed Overdrive Clutch.
 - Wrong overdrive piston bearing spacer selected.
 - Low overdrive pressure.
 - (f) Lower valve body malfunction.
- (3) Failed overdrive overrunning clutch.
- (4) Faulty overdrive solenoid - not venting.
 - (a) Lower valve body malfunction.
 - (b) Faulty wiring.
 - (c) Faulty SMEC.
- (5) Incorrect overdrive piston bearing spacer.
 - (a) Faulty sensor.
- (6) Faulty lockup solenoid - not venting.
 - (a) Lower valve body malfunction.
 - (b) Faulty wiring.
 - (c) Faulty SMEC.
- (7) Faulty overdrive off switch.
 - (a) Faulty SMEC.
 - (b) Faulty lockup solenoid - not venting.
 - (c) Faulty wiring.
- (8) Faulty lockup solenoid - not venting.
- (9) Faulty lockup solenoid - not venting.
- (10) Leaking governor tubes:
 - (a) Bent.
 - (b) Loose fit.
 - (c) Governor seal rings broken or worn.
- (11) Failed overdrive piston bearing.
 - (a) Failed gear train needle thrust bearings.
 - (b) Failed overdrive planetary.
 - (c) Failed overdrive overrunning clutch.



Teardown Front Section (A-998)

TRANSMISSION AND CONVERTER REMOVAL

Remove Transfer Case (if so equipped). Refer to "Transfer Case Removal" for procedure.

(1) The transmission and torque converter must be removed as an assembly; otherwise, the torque converter drive plate, pump bushing, or oil seal may be damaged. The drive plate will not support a load; therefore, none of the weight of the transmission should be allowed to rest on the plate during removal.

(2) Disconnect negative (ground) cable from the battery for safety.

(3) Some models require that the exhaust system be dropped for clearance, (see Group 11).

(4) Remove engine to transmission struts, if so equipped.

(5) Remove cooler lines at Transmission.

(6) Remove starter motor and cooler line bracket.

(7) Remove torque converter access cover.

(8) Loosen oil pan bolts, tap the pan to break it loose allowing fluid to drain.

(9) Reinstall pan.

(10) Mark torque converter and drive plate to aid in reassembly. The crankshaft flange bolt circle, inner and outer circle of holes in the drive plate, and the four tapped holes in front face of the torque converter all have one hole offset so these parts will be installed in the original position. This maintains balance of the engine and torque converter.

(11) Rotate engine clockwise with socket wrench on vibration dampener bolt to position the bolts attaching torque converter to drive plate, and remove bolts.

(12) Mark parts for reassembly then disconnect propeller shaft at rear universal joint. Carefully pull shaft assembly out of the extension housing.

(13) Disconnect wire connector from the back-up lamp and neutral starting switch and lockup solenoid wiring connector.

(14) Disconnect gearshift rod and torque shaft assembly from transmission.

When it is necessary to disassemble linkage rods from levers that use plastic grommets as retainers, the grommets should be replaced with new ones. Use a prying tool to force rod from grommet in lever, then cut away old grommet. Use pliers to snap new grommet into lever and rod into grommet.

(15) Disconnect throttle rod from lever at the left side of transmission. Remove linkage bell-crank from transmission, if so equipped.

(16) Remove oil filler tube and speedometer cable.

(17) Install engine support fixture, Tool C-3487-A with frame hooks or a suitable substitute, that will support rear of the engine (Fig. 1).

(18) Raise transmission slightly with service jack to relieve load on the supports.

(19) Remove bolts securing transmission mount to crossmember and crossmember to frame, then remove crossmember.

(20) Remove all bell housing bolts.

(21) Carefully work transmission and torque converter assembly rearward off engine block dowels and disengage torque converter hub from end of crankshaft. **Attach a small C-clamp to edge of bell housing to hold torque converter in place during transmission removal.**

(22) Lower transmission and remove assembly from under the vehicle.

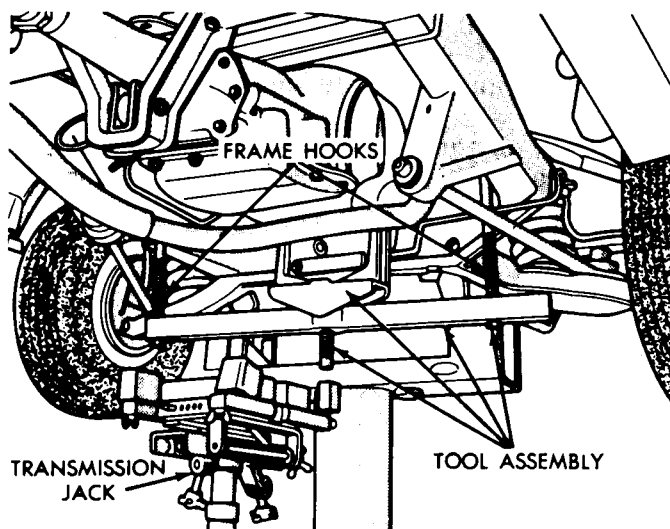


Fig. 1—Engine Support Fixture (Typical)

(23) To remove torque converter assembly; remove C-clamp from edge of bell housing, then carefully slide assembly out of the transmission.

OIL COOLER AND TUBES FLUSHING (See "Diagnosis and Tests")

PUMP OIL SEAL

Replacement

The pump oil seal can be replaced without removing pump and reaction shaft support assembly from the transmission case.

(1) Screw seal remover Tool C-3981 into seal (Fig. 2), then tighten screw portion of tool to withdraw the seal.

(2) To install a new seal, place seal in opening of the pump housing (lip side facing inward). Using Tool C-4193 and handle Tool C-4171, drive seal into housing until tool bottoms (Fig. 3).

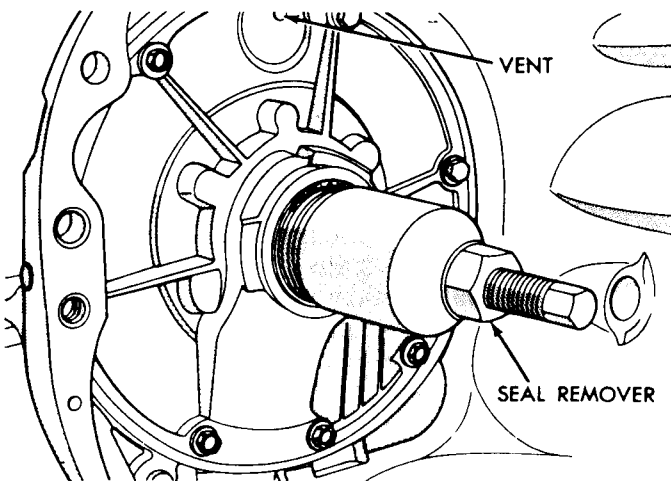


Fig. 2—Remove Pump Oil Seal

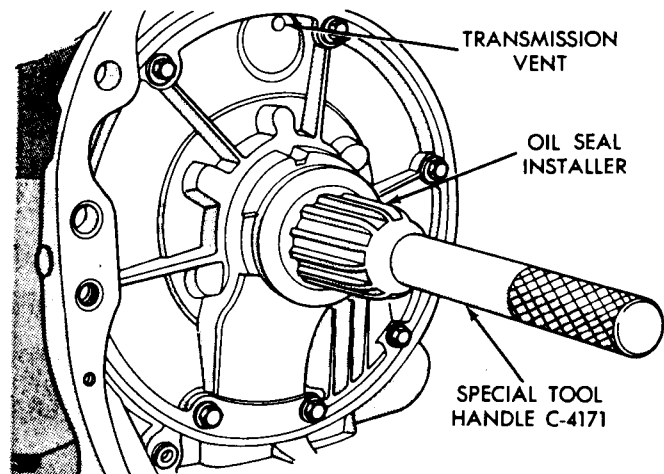


Fig. 3—Install Pump Seal

DISASSEMBLY—SUBASSEMBLY REMOVAL

Prior to removing any transmission subassemblies, plug all openings and thoroughly clean exterior of the unit, preferably by steam. Cleanliness through entire disassembly and assembly cannot be overemphasized. When disassembling, each part should be washed in a suitable solvent, then dried by compressed air. **Do not wipe parts with shop towels.** All mating surfaces in the transmission are accurately machined; therefore, careful handling of parts must be exercised to avoid nicks or burrs.

Input Shaft End Play

Measuring input shaft end play before disassembly will usually indicate when a thrust washer change is required, (except when major parts are replaced). The thrust washer is located between input and output shafts on A-998 transmissions.

(1) Attach a dial indicator to transmission bell housing with its plunger seated against end of input shaft (Fig. 4).

Move input shaft in and out to obtain end play reading. End play specifications are .022 to .091 inch.

(2) Record indicator reading for reference when reassembling the transmission.

Oil Pan

(1) Place transmission assembly in repair stand, Tool C-3750-A (Fig. 5).

(2) Remove oil pan bolts and remove oil pan and gasket.

Valve Body Assembly

(1) Loosen clamp bolts and remove throttle and gearshift levers from the transmission.

(2) Remove back-up lamp/neutral start switch.

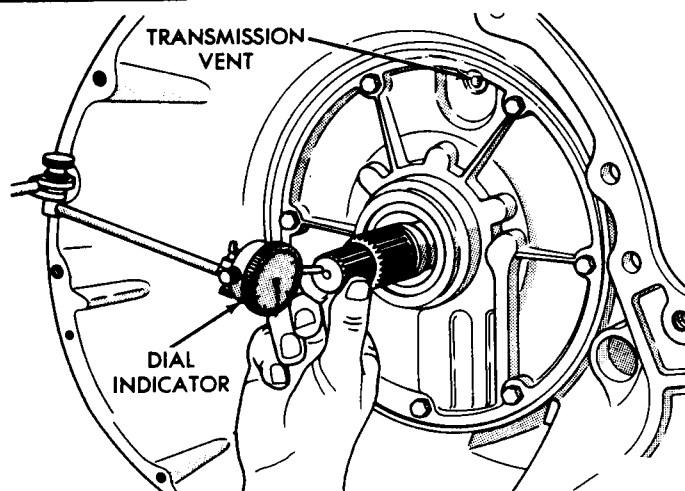


Fig. 4—Measuring Input Shaft End Play

- (3) Disconnect lockup solenoid wire from wiring connector at rear of transmission case.
- (4) Remove the 10 hex-head valve body to transmission bolts. Remove E-clip securing parking lock rod to the valve body manual lever.
- (5) While lifting valve body upward out of transmission case, disconnect parking lock rod from the lever.

Accumulator Piston and Spring

- (1) Lift spring off accumulator piston and withdraw piston from the case.

Extension Housing (or Adapter on 4WD)

Before removing extension housing, pull parking lock rod forward out of the case. Rotate out-

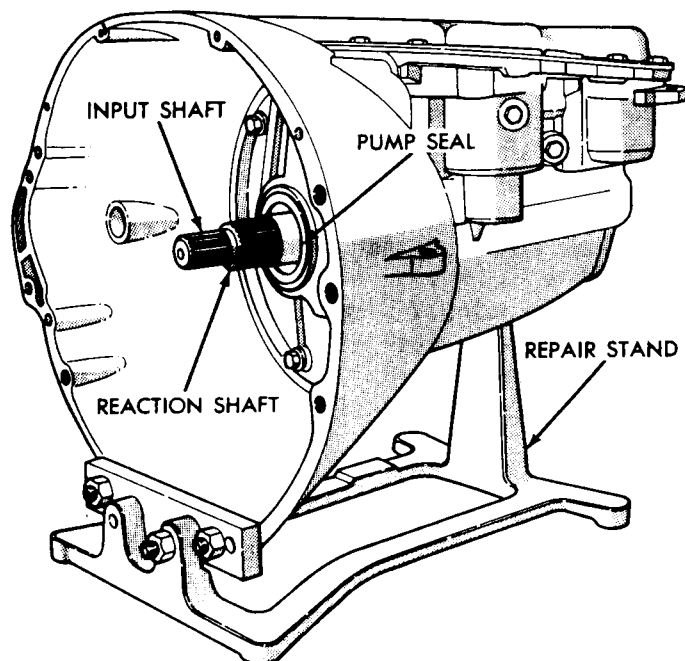


Fig. 5—Transmission in Repair Stand

put shaft, if necessary, to align parking gear and sprag to permit knob on end of control rod to pass the sprag.

- (1) Remove speedometer pinion and adapter assembly.
- (2) Remove extension housing to transmission bolts.
- (3) Remove screws, plate, and gasket from bottom of extension housing mounting pad. Spread large snap ring from output shaft bearing. With snap ring spread as far as possible carefully tap extension housing off the output shaft and bearing.
- (4) Using snap ring pliers, remove output shaft bearing rear snap ring. Remove bearing from shaft.
- (5) On 4WD vehicles, use Tool L-4450 inverted with Handle C-4171 to drive out bearing from adapter, if necessary.

Governor and Support

- (1) Carefully pry snap ring from weight end of governor valve shaft. Slide valve and shaft assembly out of the governor body.
- (2) Remove snap ring from behind governor body, then slide governor body and support assembly off the output shaft.

Oil Pump and Reaction Shaft Support

- (1) Tighten front band adjusting screw until band is tight on front clutch retainer. This prevents clutch retainer from coming out with pump which might cause unnecessary damage to the clutches.
- (2) Remove oil pump housing retaining bolts.
- (3) Attach Tool C-3752 to pump housing flange, (Fig. 6), in threaded holes in the flange.
- (4) Bump outward evenly with the two "knocker weights" to withdraw pump and reaction shaft support assembly from the case.

Front Band and Front Clutch

- (1) Loosen front band adjuster, remove band strut and slide band out of the case.
- (2) Slide front clutch assembly out of the case.

Input Shaft and Rear Clutch

- (1) Grasp input shaft, and slide input shaft and rear clutch assembly out of the case.
- Be careful not to lose thrust washer located between rear end of input shaft and forward end of the output shaft.

Planetary Gear Assemblies, Sun Gear, and Driving Shell

- (1) While supporting output shaft and driving shell, carefully slide assembly forward and out through the case.

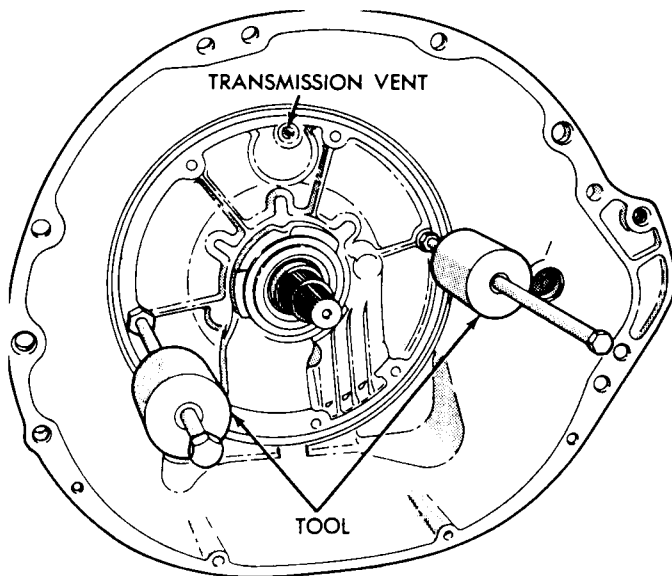


Fig. 6—Remove Oil Pump

Be very careful not to damage ground surfaces on output shaft during removal.

Rear Band and Low-Reverse Drum

(1) Loosen band adjusting screw, then remove band and low-reverse drum.

Overrunning Clutch

(1) Note position of overrunning clutch rollers and springs before disassembly, to assist in re-assembly.

(2) Carefully slide out clutch hub and remove rollers and springs.

Kickdown Servo (Front)

(1) Compress kickdown servo spring by using engine valve spring compressor Tool C-3422A, remove snap ring (Fig. 7).

(2) Remove rod guide, spring and piston assembly from the case. Be careful not to damage piston rod or guide during removal.

(3) Withdraw piston from the transmission case.

Low-Reverse Servo (Rear)

(1) Compress low and reverse servo piston spring by using engine valve spring compressor Tool C-3422A, then remove the snap ring.

(2) Remove spring retainer, spring, and servo piston and plug assembly from the case.

RECONDITION SUBASSEMBLIES

The following procedures cover disassembly, inspection, repair, and assembly of each subassembly as removed from the transmission.

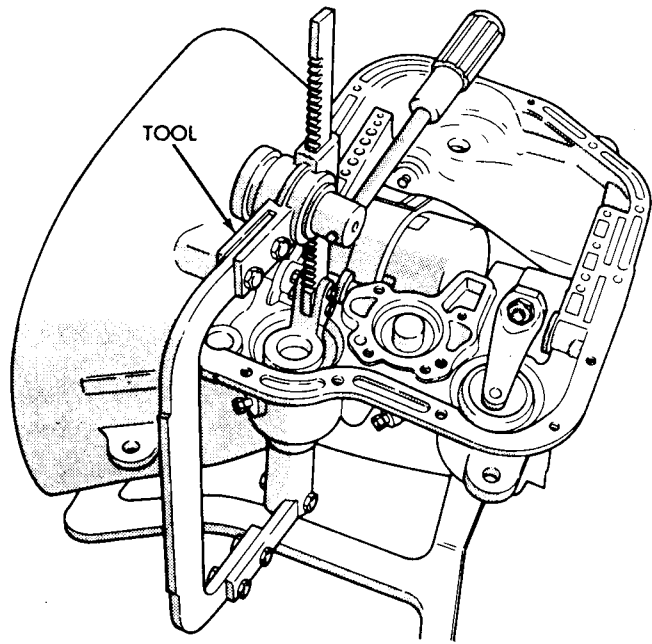


Fig. 7—Compress Kickdown Servo Spring

Heli-Coil inserts are recommended for repairing damaged, stripped or worn threads in aluminum parts.

Presized service bushings are available for replacement for most all bushings in the Load-Flite transmissions. The two bushings in sun gear are not serviced because of the low cost of sun gear assembly. If bushings are found worn or scored, they should be replaced as outlined in the following reconditioning procedures.

The bushing replacement tools listed by "SP" numbers are part of Tool Kit C-3887B.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on valves, use extreme care to avoid rounding off the sharp edges. The sharp edge is vitally important to this type of valve. Sharp edges prevent dirt and foreign matter from getting between the valve and body, thus reducing possibility of sticking. When it becomes necessary to recondition transmission, and vehicle has accumulated considerable mileage, install new seal rings on parts requiring their usage. Coat each part with automatic transmission fluid during assembly.

OIL PUMP AND REACTION SHAFT SUPPORT

Due to the lockup torque converter, it is important that the oil pump be within the clearance limits as specified. Also note that the oil pump bushing should be replaced in any overhaul.

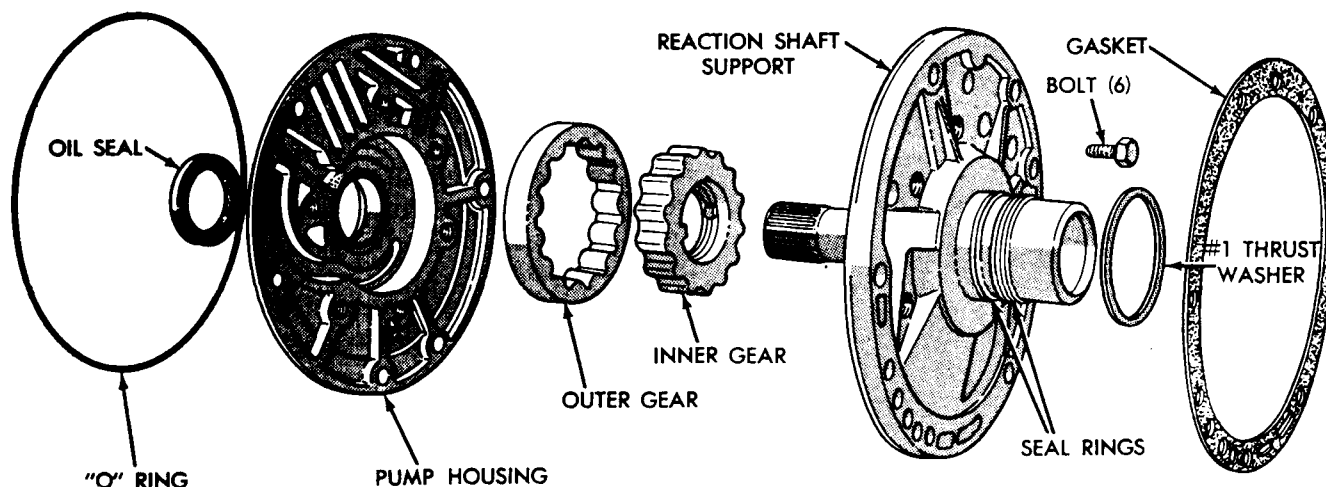


Fig. 8—Oil Pump and Reaction Shaft Support

Disassembly

Figure 9 shows the oil pump and reaction shaft support disassembled.

- (1) Remove bolts from rear side of reaction shaft support and lift support off the pump.
- (2) Remove rubber seal ring from pump body flange.
- (3) Drive out oil seal with a blunt punch.

Inspection

Inspect interlocking seal rings (Fig. 8) on reaction shaft support for wear or broken locks, make sure they turn freely in the grooves. Seal rings have to be removed to allow clearance for #1 thrust washer removal or installation. Inspect front clutch piston retainer to reaction shaft support thrust washer for wear. Washer thickness should be .061 to .063 inch, replace if necessary. Inspect machined surfaces on pump body and reaction shaft support for nicks and burrs. Inspect pump body and reaction shaft support bushings for wear or scores. Inspect pump gears for scoring or pitting. With gears cleaned and installed in pump body, place a straightedge across face of gears and pump body. Use a feeler gauge to measure clearance between straightedge and face of gears. Clearance limits are from .001 to .0025 inch. Also, measure rotor tip clearance between inner and outer rotor teeth. Clearance limits are from .0045 to .0095 inch. Clearance between outer gears and its bore in oil pump body should be .0035 to .0075 inch.

Pump Bushing Replacement

- (1) Place pump housing (seal face down) on a smooth, firm surface.
- (2) Place removing head, Tool SP-3551 in bushing and install handle Tool C-4171 in the removing head (Fig. 10).

- (3) Drive bushing straight down and out of pump housing bore. Be careful not to cock tool in the bore.

- (4) Position new bushing on installing head Tool SP-5117.

- (5) With pump housing on a smooth, clean surface, start bushing and installing head in the bushing bore. Install handle in the installing head (Fig. 10).

- (6) Drive bushing into housing until tool bottoms in the pump cavity. Be careful not to cock tool during installation.

- (7) Stake bushing in place by using a blunt punch or similar tool (Fig. 10). A gentle tap at each stake slot location will suffice.

- (8) Using a narrow-bladed knife or similar tool, remove high points or burrs around staked area

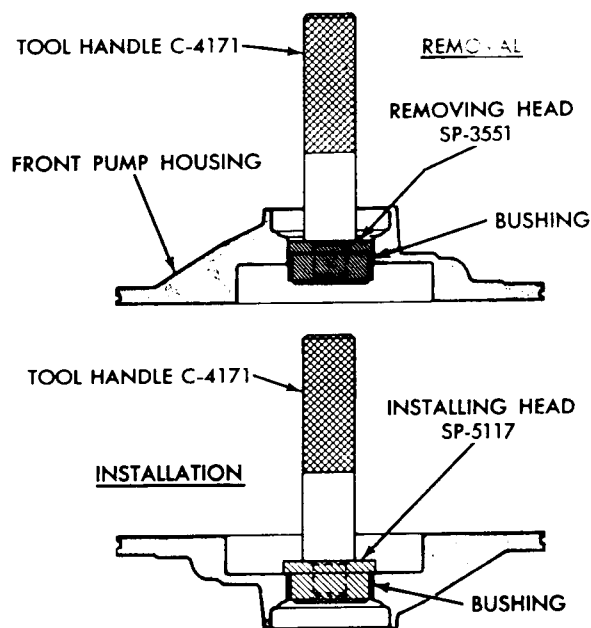


Fig. 9—Replacing Pump Bushing

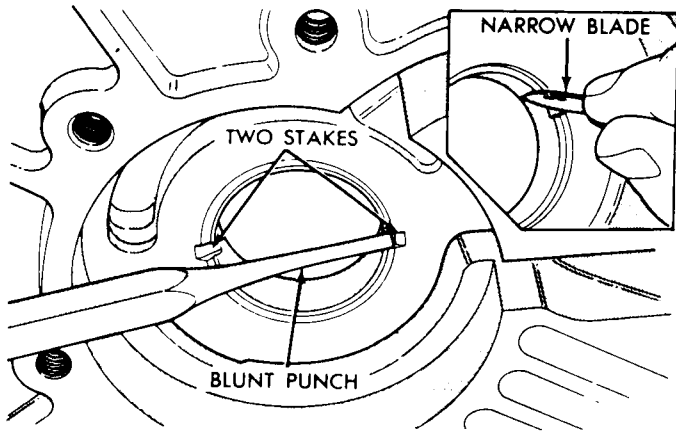


Fig. 10—Stake Pump Bushing

(Fig. 10). Do not use a file or similar tool that will remove more metal than is necessary.

Reaction Shaft Bushing Replacement

In case of a reaction shaft bushing failure, always inspect the support for wear from the input shaft seal ring lands. If worn or grooved, replace support assembly.

(1) Assemble remover Tool SP-5324, cup Tool SP-3633, and hex-nut Tool SP-1191 (Fig. 11).

Do not clamp any part of reaction shaft or support in a vise.

(2) With cup held firmly against reaction shaft, thread remover into bushing as far as possible by hand.

(3) Using a wrench, screw remover into bushing 3 to 4 additional turns to firmly engage threads in the bushing.

(4) Turn hex nut down against cup to pull bushing from reaction shaft. Thoroughly clean reaction shaft to remove chips made by remover threads.

(5) Lightly grip bushing in a vise or with pliers

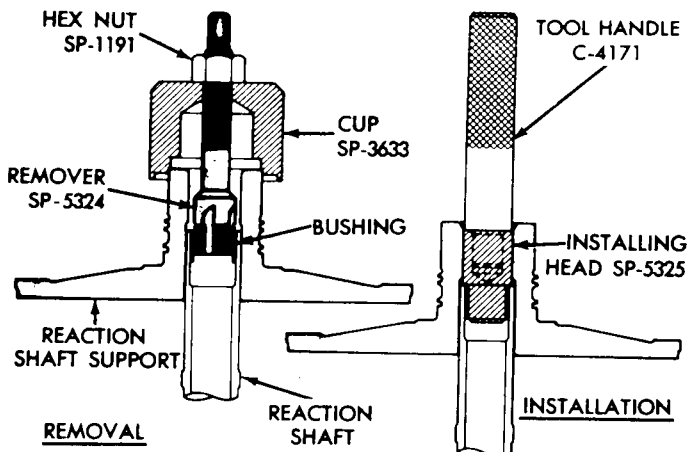


Fig. 11—Replacing Reaction Shaft Bushing

and back tool out of the bushing. Be careful not to damage threads on bushing remover.

(6) Slide a new bushing on installing head Tool SP-5325, and start them in the bore of reaction shaft (Fig. 11).

(7) Support reaction shaft upright on a clean smooth surface and install handle Tool C-4171 in installing head. Drive bushing into the shaft until tool bottoms.

(8) Thoroughly clean reaction shaft support assembly before installation.

Assembly

(1) Place reaction shaft support in assembling Tool C-3759, with hub of support and tool resting on a smooth, flat surface bench (Fig. 12). Screw two pilot studs Tool C-3283A into threaded holes of reaction shaft support flange.

(2) Assemble and place pump gears in center of the support.

(3) Lower pump body over the pilot studs, insert Tool C-3756 through pump body and engage pump inner gear. Rotate the pump gears with tool to center gears in pump body, then with pump body firm against reaction shaft support, tighten clamping tool securely.

(4) Invert pump and reaction shaft support assembly with clamping tool intact. Install support to pump body bolts and tighten to 175 in. lbs. (20 N·m). Remove clamping tool, pilot studs, and gear alignment tool.

(5) Place a new oil seal in opening of pump housing (lip of seal facing inward). Using Tool C-4193 and Tool C-4171, drive seal into housing until tool bottoms.

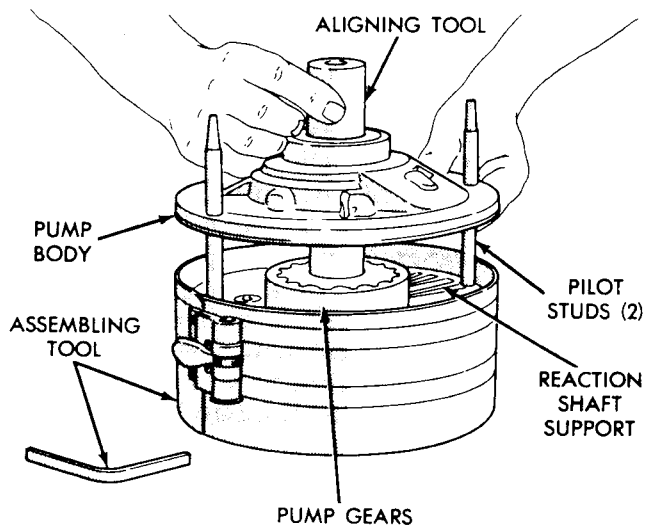


Fig. 12—Assemble Pump and Reaction Shaft Support

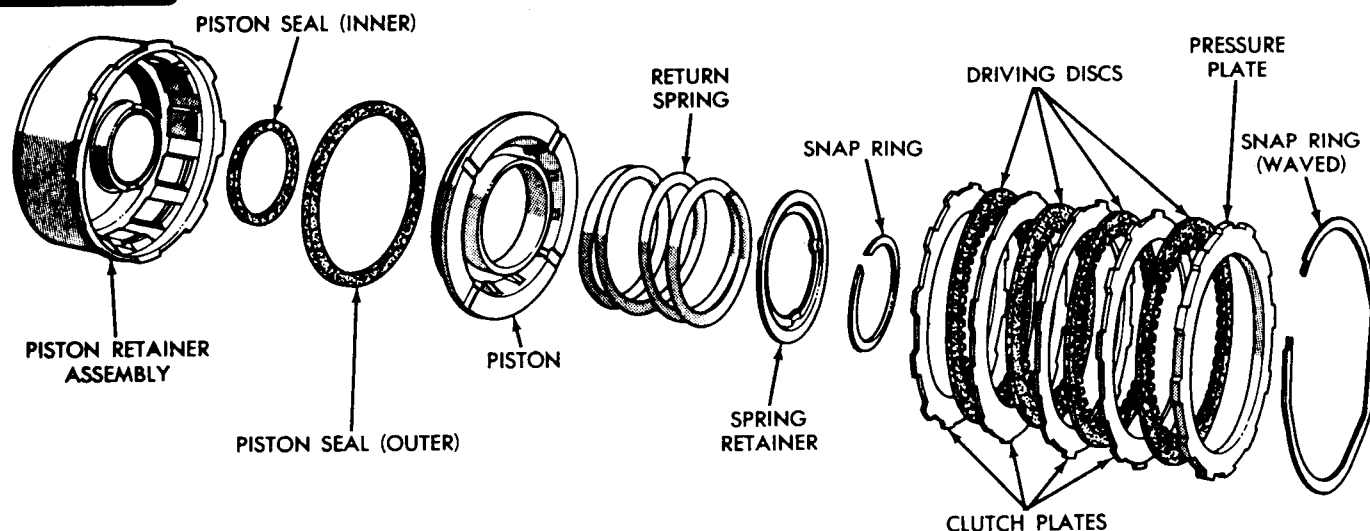


Fig. 13—Front Clutch

FRONT CLUTCH

Disassembly

Figure 13 shows a disassembled view of the front clutch assembly.

(1) Remove large waved snap ring that secures pressure plate in the clutch piston retainer. Lift pressure plate and clutch plates out of the retainer.

(2) Install compressor Tool C-3575A, over piston spring retainer (Fig. 14). Compress spring and remove snap ring, then slowly release tool until spring retainer is free of the hub. Remove tool, retainer, and spring.

(3) Invert clutch retainer assembly and bump it on a wooden block to remove the piston. Remove seals from the piston and clutch retainer hub.

Inspection

Inspect plates and discs for flatness. They must not be warped or cone shaped.

Inspect facing material on all driving discs. Replace discs that are charred, glazed or heavily pitted. Discs should also be replaced if they show evidence of material flaking off or if facing material can be scraped off easily. Inspect driving disc splines for wear or other damage. Inspect steel plate and pressure plate surfaces for burning, scoring or damaged driving lugs. Replace if necessary.

Inspect steel plate lug grooves in clutch retainer for smooth surfaces; plates must travel freely in grooves. Inspect band contacting sur-

face on clutch retainer for scores, the contact surface should be protected from damage during disassembly and handling. Note ball check in clutch retainer, make sure ball moves freely. Inspect piston seal surfaces in clutch retainer for nicks or deep scratches. Light scratches will not interfere with sealing of seals. Inspect clutch retainer inner bore surface for wear from reaction shaft support seal rings. Inspect clutch retainer bushing for wear or scores.

Inspect inside bore of piston for score marks, if light, remove with crocus cloth. Inspect seal grooves for nicks and burrs. Inspect seals for deterioration, wear, and hardness. Inspect piston spring, retainer and snap ring for distortion.

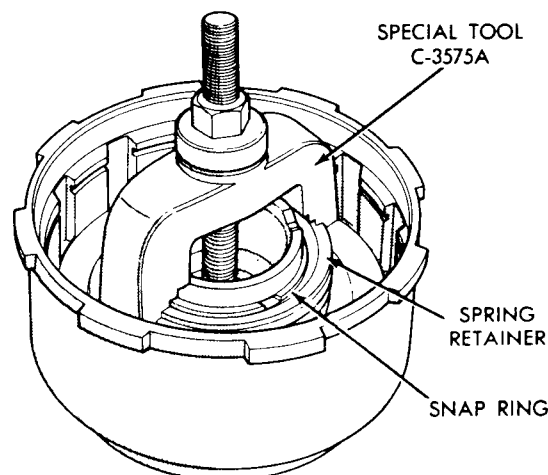


Fig. 14—Front Clutch Spring Retaining Snap Ring

Front Clutch Retainer Bushing Replacement

(1) Lay clutch retainer (open end down) on a clean, smooth surface and place removing head Tool SP-3627 in the bushing (Fig. 15). Install handle Tool C-4171 in removing head.

(2) Drive bushing straight down and out of clutch retainer bore. Be careful not to cock tool in the bore.

(3) Lay clutch retainer (open end up) on a clean, smooth surface. Slide a new bushing on installing head Tool SP-3626, and start them in clutch retainer bore.

(4) Install handle in installing head. Drive bushing into clutch retainer until tool bottoms.

(5) Thoroughly clean clutch retainer before assembly and installation.

Assembly

(1) Lubricate and install inner seal on hub of clutch retainer. Make sure lip of seal faces down and is properly seated in the groove (Fig. 13).

(2) Install outer seal on the clutch piston, with lip of seal toward bottom of clutch retainer. Apply a coating of wax type lubricant or Door Ease to outer edge of seals and press seal to bottom of its groove around piston diameter for easier installation of piston assembly. Place piston assembly in retainer and carefully seat piston in bottom of retainer.

(3) Place spring on piston hub and position spring retainer and snap ring on the spring. Compress spring with Tool C-3575A (Fig. 14), and seat snap ring in hub groove. Remove compressor tool.

(4) Lubricate all clutch plates, install one steel plate followed by a lined plate (disc) until the number given in specifications is installed. Install pressure plate and snap ring. Make sure snap ring is properly seated.

(5) Insert a feeler gauge between pressure plate and waved snap ring to measure maximum clearance where snap ring is waved away from pressure plate (Fig. 16). See "Specifications" for allowed clearance.

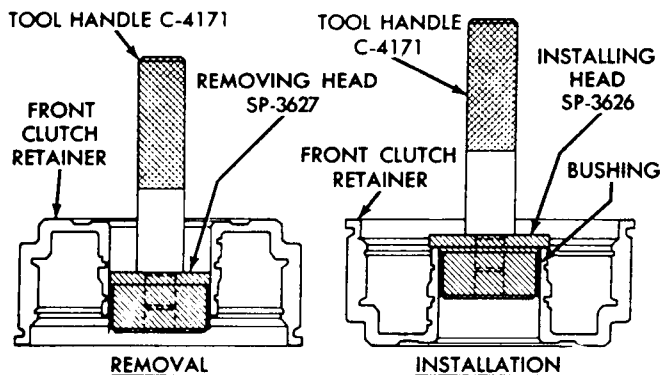


Fig. 15—Replace Front Clutch Retainer Bushing

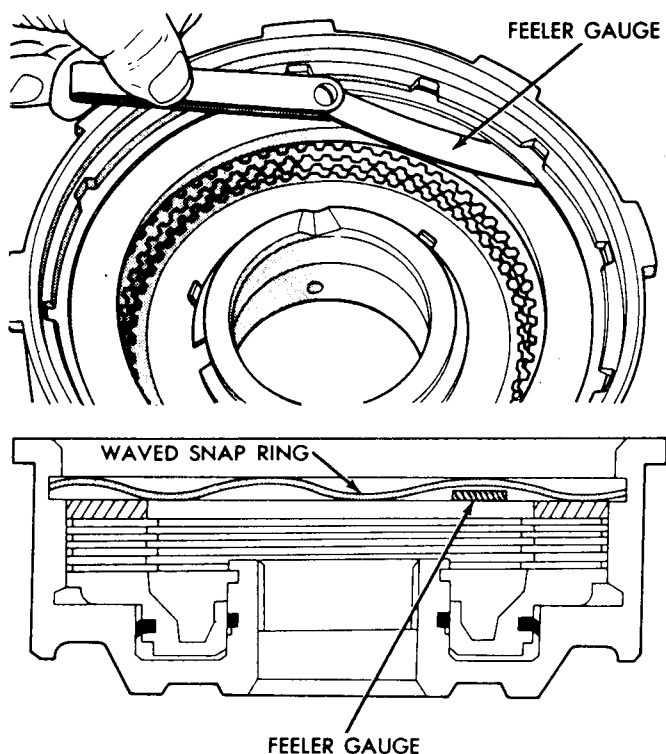


Fig. 16—Measure Front Clutch Plate Clearance

REAR CLUTCH

Disassembly

Figure 17 shows a disassembled view of the rear clutch assembly.

(1) Remove large selective snap ring that secures pressure plate in clutch piston retainer. Lift pressure plate, clutch plates, and inner pressure plate out of the retainer.

(2) Carefully pry one end of wave spring out of its groove in clutch retainer, then remove wave spring and clutch piston spring.

(3) Invert clutch piston retainer assembly and bump it on a wooden block to remove piston. Remove seals from piston.

(4) If necessary, remove snap ring and press input shaft from piston retainer.

Inspection

Inspect facing material on all driving discs. Replace discs that are charred, glazed or heavily pitted. Discs should also be replaced if they show evidence of material flaking off or if facing material can be scraped off easily. Inspect driving disc splines for wear or other damage. Inspect steel plate and pressure plate surface for burning, scoring or damaged driving lugs. Replace if necessary. Inspect plates and discs for flatness, they must not be warped or cone-shaped.

Inspect steel plate lug grooves in clutch retainer for smooth surfaces; plates must travel

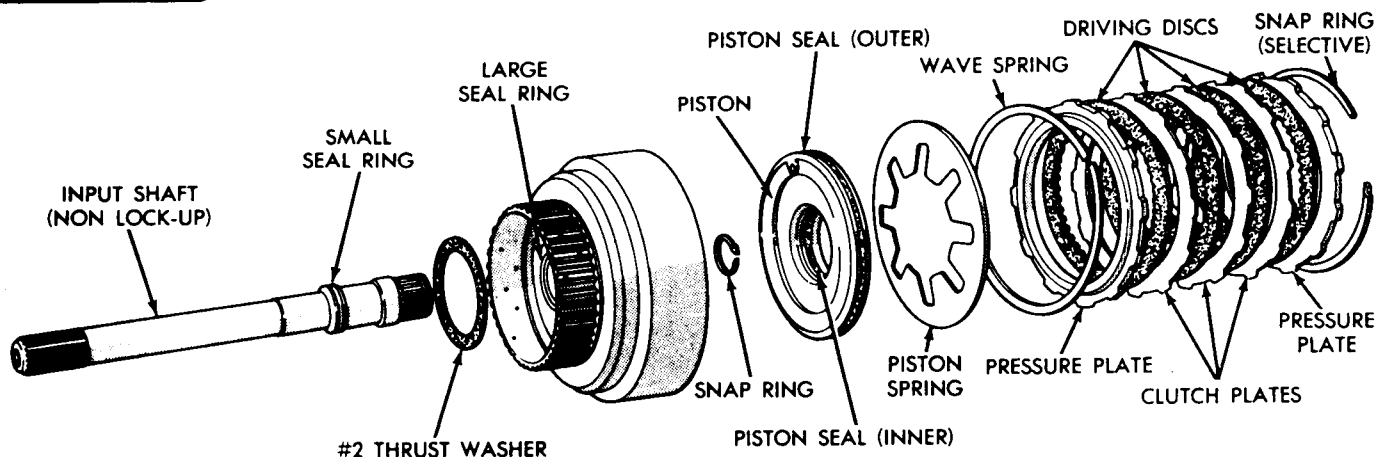


Fig. 17—Rear Clutch

freely in the grooves. Note ball check in clutch retainer, make sure ball moves freely. Inspect seal rings surfaces in clutch retainer for nicks or deep scratches. Light scratches will not interfere with sealing of the seals. Inspect neoprene seal rings for deterioration, wear and hardness. Inspect piston spring and wave spring for distortion or breakage.

Inspect teflon and/or cast iron seal rings on input shaft for wear (Fig. 17). If required, replacement rings will be cast iron hooked-joint type. Do not remove rings unless conditions warrant. Inspect rear clutch to front clutch #2 thrust washer for wear. Washer thickness should be .061 to .063 inch, replace if necessary.

Assembly

(1) If removed, press input shaft into piston retainer and install snap ring.

(2) Lubricate and install inner and outer seals

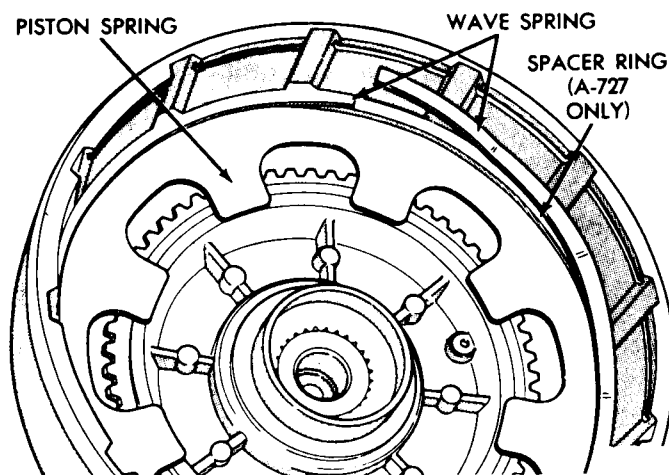


Fig. 18—Installing Rear Clutch Spring

on clutch piston. Make sure seal lips face toward input shaft, and seals are properly seated in piston grooves (Fig. 17).

(3) Place piston assembly in retainer and, with a twisting motion, seat piston in bottom of retainer.

(4) Place clutch piston spring on top of piston in clutch retainer. Start one end of wave spring in retainer groove (Fig. 18), then progressively push or tap spring into place making sure it is fully seated in the groove.

(5) Install inner pressure plate in clutch retainer with raised portion of plate resting on the spring.

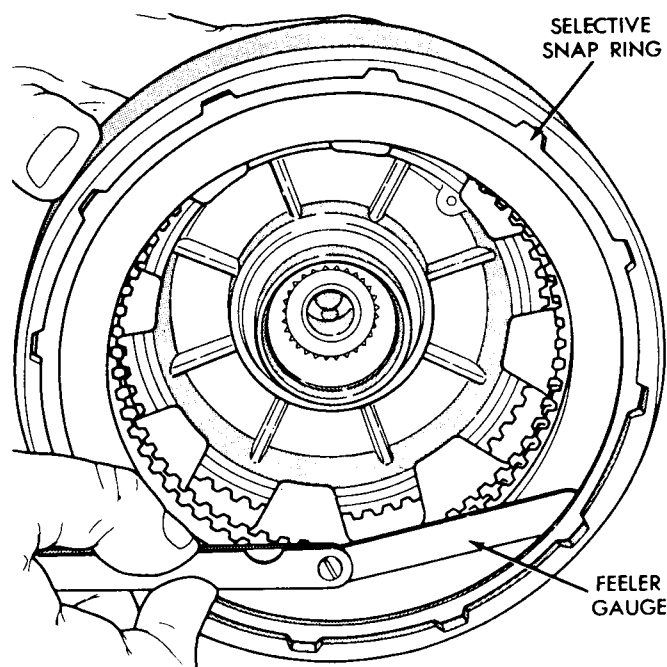


Fig. 19—Measure Rear Clutch Plate Clearance

(6) Lubricate all clutch plates, install one lined disc followed by a steel plate until all plates are installed. Install outer pressure plate and selective snap ring.

(7) Measure rear clutch plate clearance by having an assistant press down firmly on outer pressure plate, then insert a feeler gauge between the plate and snap ring (Fig. 19).

See "Specifications" for allowed clearance. If necessary, install a new snap ring of proper thickness to obtain specified clearance. Low limit clearance is desirable. **Rear clutch plate clearance is very important in obtaining proper clutch operation. Clearance can be adjusted by the use of various thickness outer snap rings. Snap rings are available in .060, .076, and .098 inch thickness.**

(8) Grease cupped side of #3 thrust plate and install cupped side over input shaft.

PLANETARY GEAR TRAIN

End Play

Measure end play of planetary gear assemblies, sun gear and driving shell before removing these parts from output shaft. Stand assembly upright with forward end of output shaft on a wooden block, so that all parts will move forward against selective snap ring at front of shaft. Insert a feeler gauge between rear annulus gear support hub and shoulder on output shaft. (Fig. 20). The clearance should be .005 to .048 inch. If clearance exceeds specifications, replace thrust washers and/or necessary parts.

Disassembly (Fig. 21)

(1) Remove selective #3 thrust washer from forward end of output shaft.

(2) Remove selective snap ring from forward

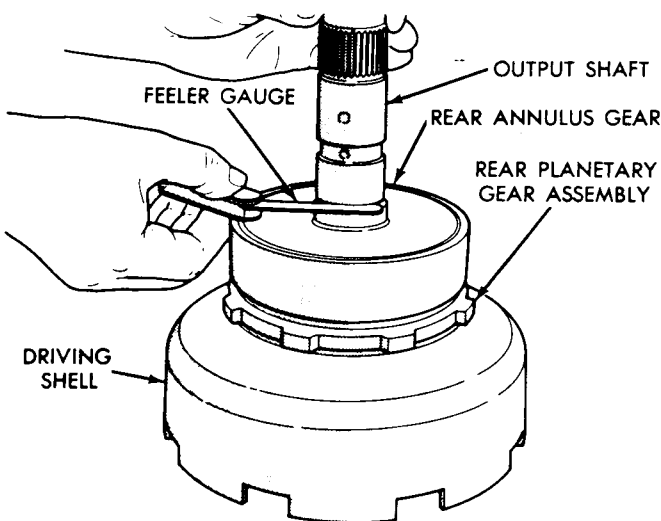


Fig. 20—Measure End Play of Planetary Gear Train

end of output shaft, then slide front planetary assembly off the shaft.

(3) Remove snap ring and #4 thrust washer from forward hub of front planetary gear assembly, slide front annulus gear and support off planetary gear assembly. Remove #5 thrust washer from front side of planetary gear assembly. Remove #6 thrust washer from rear side of planetary gear assembly. If necessary, remove snap ring from front of annulus gear to separate support from annulus gear.

(4) Slide sun gear, driving shell, and rear planetary assembly off the output shaft.

(5) Lift sun gear and driving shell off rear planetary assembly. Remove snap ring and #8 thrust plate from sun gear (rear side of driving shell). Slide sun gear out of driving shell, and remove spacer (Fig. 21), and #7 thrust plate from opposite end of sun gear, if necessary.

(6) Remove #9 thrust washer from forward side of rear planetary assembly and remove planetary gear assembly from rear annulus gear. Remove #10 thrust washer from rear side of planetary assembly. If necessary, remove snap ring from rear of annulus gear to separate support from annulus gear.

Inspection

Inspect bearing surfaces on output shaft for nicks, burrs, scores or other damage. Light scratches, small nicks or burrs can be removed with crocus cloth or a fine stone. Inspect speedometer drive gear for any nicks or burrs, and remove with a sharp-edged stone. Make sure all oil passages in shaft are open and clean.

Inspect bushings in sun gear for wear or scores, replace sun gear assembly if bushings are damaged. Inspect all thrust washers for wear and scores, replace if damaged or worn below specifications. Inspect thrust faces of planetary gear carriers for wear, scores or other damage, replace as required. Inspect planetary gear carrier for cracks and pinions for broken or worn gear teeth, and for broken pinion shaft welds. Inspect annulus gear and driving gear teeth for damage. Replace distorted lock rings.

Assembly

Refer to Figure 21 for parts reference.

(1) Place rear annulus gear support in annulus gear and install snap ring.

(2) Position #10 thrust washer on rear side of rear planetary gear assembly and install in rear annulus gear. Install #9 thrust washer on front side of rear planetary gear assembly.

(3) Insert output shaft in rear opening of rear annulus gear. Carefully work shaft through an-

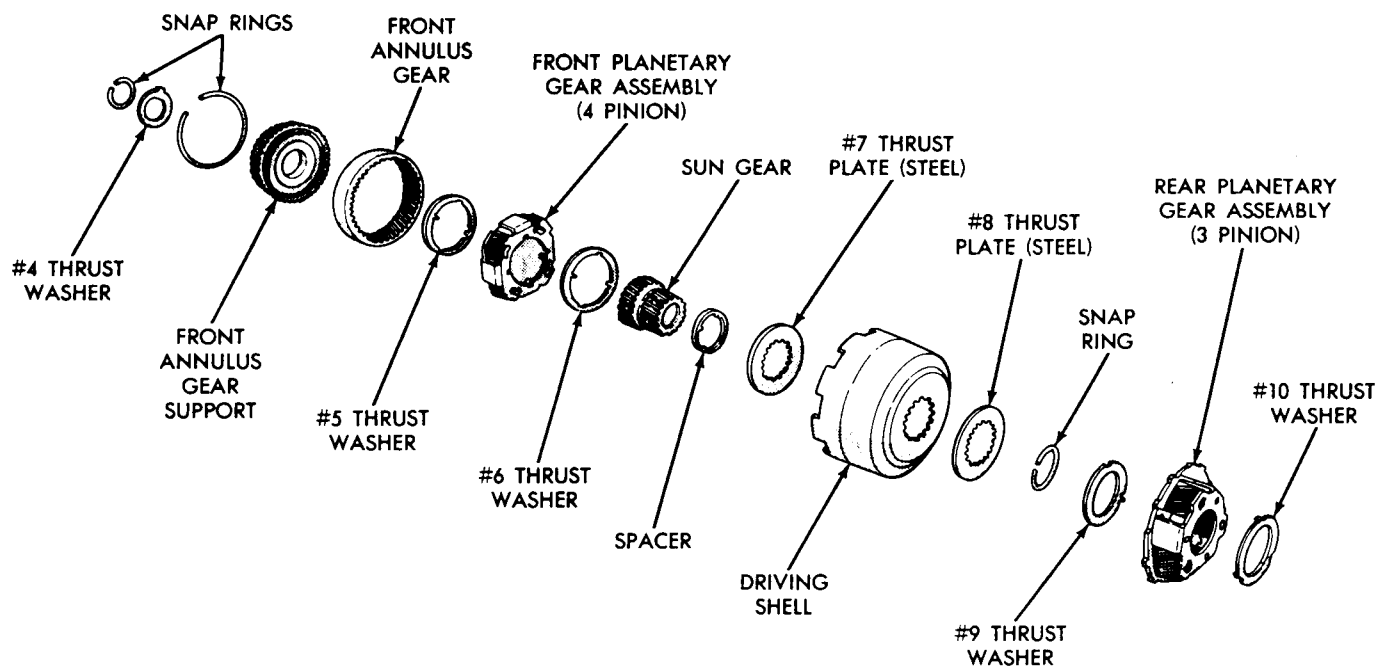


Fig. 21—Planetary Gear Train

nulus gear support and planetary gear assembly. Make sure shaft splines are fully engaged in splines of annulus gear support.

(4) Install #7 thrust plate and spacer on wide-ratio transmissions (Fig. 21) on one end of sun gear. Insert sun gear through front side of driving shell, install #8 thrust plate and snap ring.

(5) Carefully slide driving shell and sun gear assembly on the output shaft, engaging sun gear teeth with rear planetary pinion teeth.

(6) Place front annulus gear support in the annulus gear and install snap ring.

(7) Position #5 thrust washer on front side of front planetary gear assembly. Position front planetary gear assembly in front annulus gear, place #4 thrust washer over planetary gear assembly hub and install snap ring. Position #6 thrust washer on rear side of planetary gear assembly.

(8) Carefully work front planetary and annulus gear assembly on output shaft, meshing planetary pinions with sun gear teeth.

(9) With all components properly positioned, install selective snap ring on front end of output shaft. Remeasure end play of the assembly. **The clearance can be adjusted by the use of various thickness snap rings. Snap rings are available in .042, .064, and .084 inch thickness.**

OVERRUNNING CLUTCH

Inspection

Inspect clutch rollers for smooth, round surfaces, they must be free of flat spots and chipped

edges. Inspect roller contacting surfaces in the cam and race for brinelling. Inspect roller springs for distortion, wear or other damage.

Overrunning Clutch Cam Replacement

If overrunning clutch cam or spring retainer are found damaged, they can be replaced with a service replacement cam, spring retainer, and retaining bolts (Fig. 22).

The service parts are retained in the case with bolts instead of rivets. To install, proceed as follows:

(1) Remove four bolts securing output shaft support to rear of the transmission case. Tap support rearward out of the case with a soft-faced hammer.

(2) Center punch the rivets exactly in center of

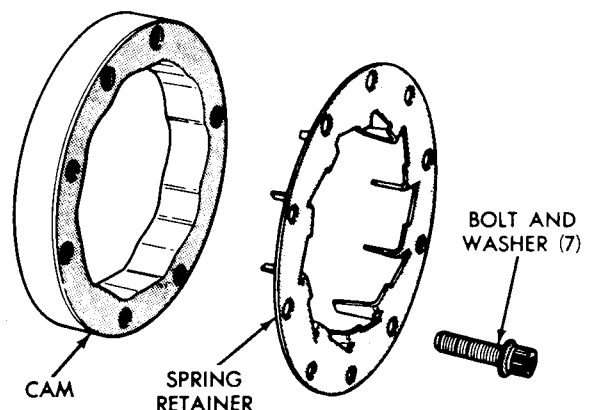


Fig. 22—Overrunning Clutch Service Replacement

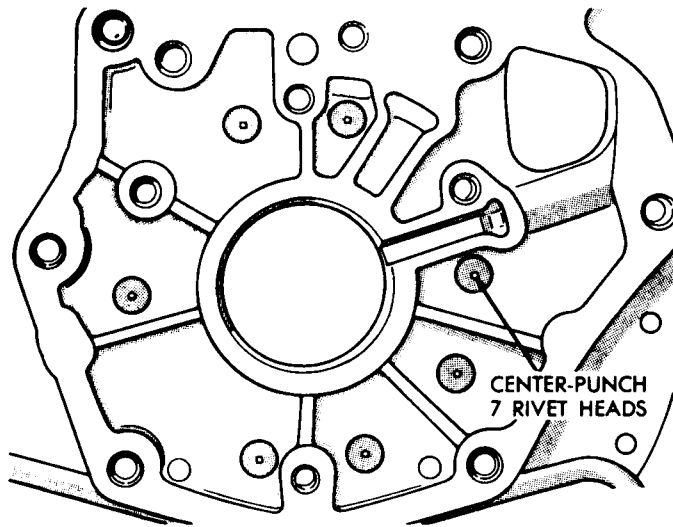


Fig. 23—Center Punch Rivet Heads

each rivet head (Fig. 23).

(3) Drill through each rivet head with a 3/8 inch drill. Be careful not to drill into the transmission case. Chip off rivet heads with a small chisel, then drive rivets and cam from the case with a blunt punch of proper size.

(4) Carefully enlarge rivet holes in the case with a 17/64 inch drill. Remove all chips and foreign matter from the case, make sure cam area is free of chips and burrs.

(5) To install, position cam and roller spring retainer in the case. Align cam bolt holes with holes in the case, then thread all seven retaining bolt and washer assemblies into cam a few turns. The cone washers must be installed so inner diameter is coned toward the bolt head (Fig. 24).

(6) Tap cam firmly into the case if necessary. Draw retaining bolts down evenly, then tighten to 100 in. lbs. (11 N·m).

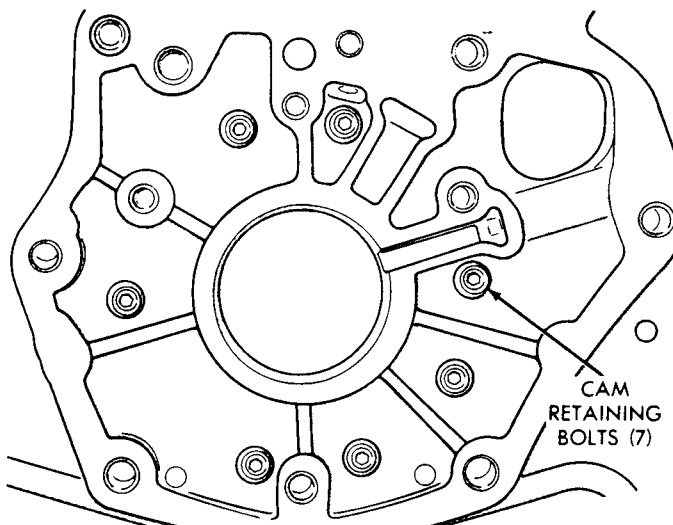


Fig. 24—Cam Retaining Bolts

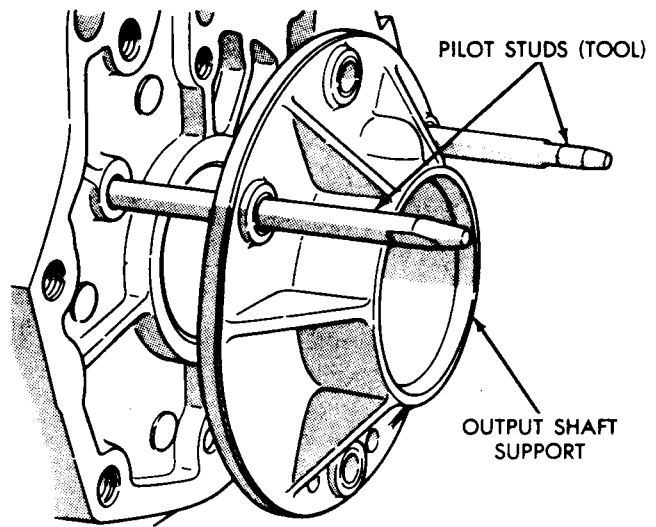


Fig. 25—Install Output Shaft Support

(7) Screw two pilot studs Tool C-3288-B into the case (Fig. 25). Position support over the pilot studs, and tap it firmly into the case with a soft-faced hammer.

(8) Remove pilot studs, install bolts and tighten to 150 in. lbs. (17 N·m).

KICKDOWN SERVO AND BAND

Disassembly

Disassemble controlled load servo piston by removing small snap ring from servo piston. Then remove washer, spring and piston rod assembly from servo piston.

Inspection

Inspect piston and guide seal rings for wear, and make sure they turn freely in the grooves. It is not necessary to remove seal rings unless conditions warrant. Inspect piston for cracks, burrs, scores and wear. Inspect piston bore in the case for scores or other damage. Inspect fit of guide on piston rod. Inspect piston spring for distortion.

For controlled load servo, inspect bore in piston and O-ring on piston rod.

Inspect band lining for wear and bond of lining to the band. Inspect lining for black burn marks, glazing, non-uniform wear pattern and flaking. If lining is worn so grooves are not visible at ends or any portion of the bands, replace the band. Inspect band for distortion or cracked ends.

Assembly

Assemble controlled load servo piston as follows (Fig. 26).

- (1) Grease O-ring and install piston rod.
- (2) Install piston rod into servo piston.



Technical Service Information

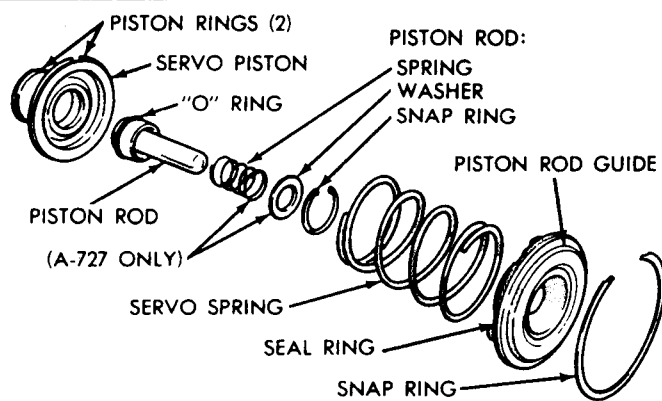


Fig. 26—Kickdown Servo

(3) Install spring, flat washer and snap ring to complete the assembly.

LOW-REVERSE SERVO AND BAND

Disassembly

(1) Remove snap ring from piston and remove the piston plug and cushion spring (Fig. 27).

Inspection

Inspect seal for deterioration, wear and hardness. Inspect piston and piston plug for cracks, burrs, scores and wear; piston plug must operate freely in the piston. Inspect piston bore in the case for scores or other damage. Inspect springs for distortion.

Inspect band lining for wear and bond of lining to the band. If lining is worn so grooves are not visible at ends or any portion of the band, replace the band. Inspect band for distortion or cracked ends.

Assembly

(1) Lubricate and insert piston plug and cushion spring in the piston, and secure with snap ring.

ASSEMBLY—SUBASSEMBLY INSTALLATION

The assembly procedures given here include installation of subassemblies in the transmission

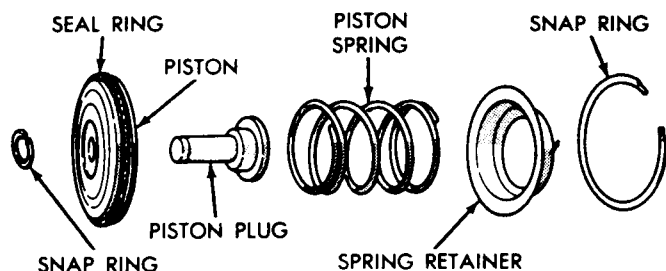


Fig. 27—Low-Reverse Servo

case and adjusting input shaft end play. **Do not use force to assemble mating parts.** If parts do not assemble freely, investigate the cause, and correct the trouble before proceeding with assembly procedures. Always use new gaskets during assembly operations.

Use only automatic transmission fluid to lubricate transmission parts during assembly.

Overrunning Clutch

(1) With transmission case in an upright position, insert clutch hub inside the cam. Install overrunning clutch rollers and springs.

Double-wrap Low-Reverse Band (Figs. 28 and 29)

(1) Push band reaction pin (with new O-ring) into case flush with gasket surface.

(2) Place band into case resting two lugs against band reaction pin.

(3) Install low-reverse drum into overrunning clutch and band.

(4) Install operating lever with pivot pin flush in case and adjusting screw touching center lug on band.

Kickdown Servo (Fig. 26)

(1) Carefully push servo piston assembly into the case bore. Install spring, guide, and snap ring.

(2) Compress kickdown servo spring by using engine valve spring compressor Tool C-3422-A, then install snap ring.

Planetary Gear Assemblies, Sun Gear, and Driving Shell

(1) While supporting assembly in the case, insert output shaft through rear support. Carefully work assembly rearward engaging rear planetary carrier lugs into low-reverse drum slots.

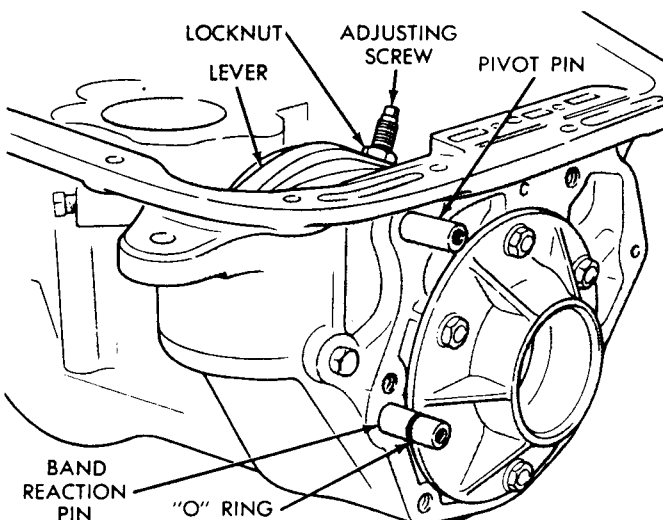


Fig. 28—Double-Wrap Band Linkage

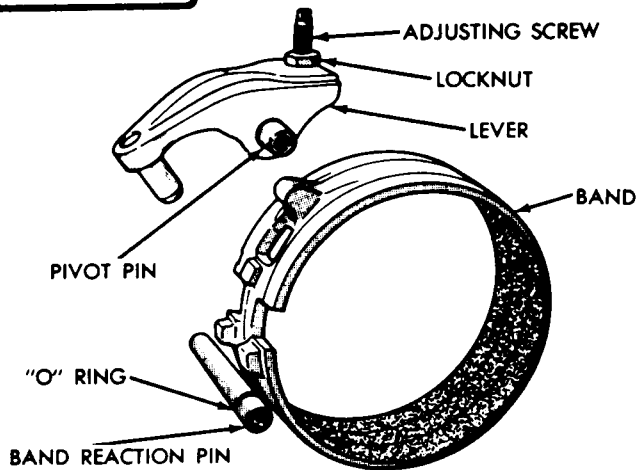


Fig. 29—Double-Wrap Band and Linkage

Be very careful not to damage ground surfaces on output shaft during installation.

Front and Rear Clutch Assemblies

The front and rear clutches, front band, oil pump and reaction shaft support are more easily installed with transmission in an upright position.

One method to support transmission, is outlined in Steps (1) and (2).

(1) Cut a 3-1/2 inch (89 mm) diameter hole in a bench, in the end of a small oil drum, or a large wooden box strong enough to support transmission. Cut or file notches at edge of the 3-1/2 inch (89 mm) hole so output shaft support will fit and lay flat in the hole.

(2) Carefully insert output shaft into hole to support the transmission upright, with its weight resting on flange of the output shaft support.

(3) Apply a light coat of grease to selective thrust washer and install washer on front end of the output shaft. Apply a light coat of grease to input shaft thrust plate and install over input shaft. If input shaft end play was not within specifications (.022 to .091 inch), when tested before disassembly, replace thrust washer with one of proper thickness. Refer to thrust washer number 3 in "Specifications" for sizes available.

(4) Align front clutch plate inner splines, and place assembly in position on the rear clutch. Make sure front clutch plate splines are fully engaged on rear clutch splines.

(5) Align rear clutch plate inner splines, grasp input shaft and lower the two clutch assemblies into the transmission case.

(6) Carefully work clutch assemblies in a circular motion to engage rear clutch splines over splines of front annulus gear. Make sure front clutch drive lugs are fully engaged in slots in the driving shell.

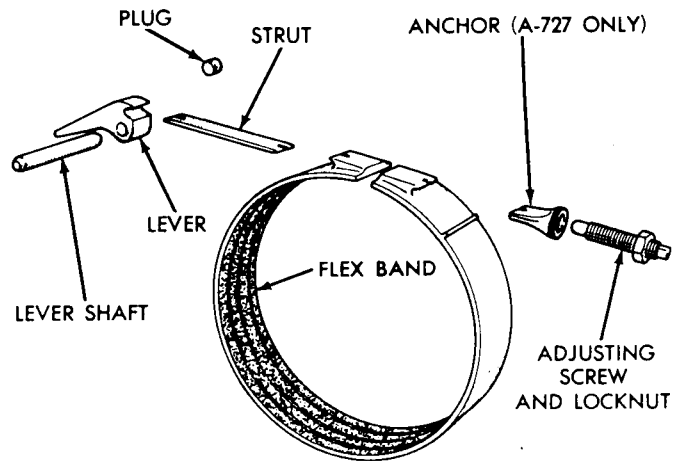


Fig. 30—Kickdown Band and Linkage

Kickdown Band (Fig. 30)

- (1) Slide band over front clutch assembly.
- (2) Install band strut, screw in adjuster just enough to hold strut and anchor in place.

Oil Pump and Reaction Shaft Support

If difficulty was encountered in removing pump assembly due to an exceptionally tight fit in the case, it may be necessary to expand the case with heat during pump installation. Using a suitable heat lamp, heat the case in area of pump for a few minutes prior to installing pump and reaction shaft support assembly.

Install number one thrust washer on reaction shaft support hub (Fig. 8).

- (1) Screw two pilot studs Tool C-3288-B in pump opening in the case (Fig. 31). Install a new gasket over the pilot studs.

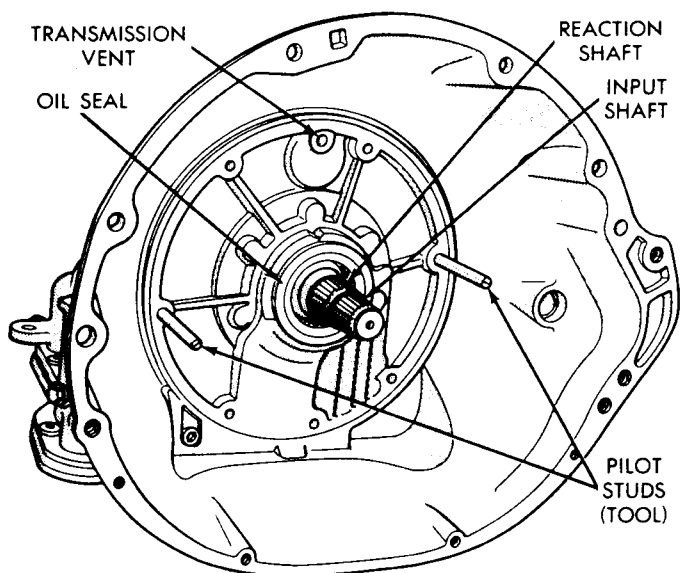


Fig. 31—Installing Oil Pump

(2) Place a new rubber seal ring in the groove on outer flange of pump housing. Make sure seal ring is not twisted. Coat seal ring with grease for easy installation.

(3) Install pump assembly in the case; tap it lightly with a soft mallet, if necessary. Remove pilot studs, install bolts and snug down evenly.

Rotate input and output shafts to see if any binding exists, then tighten bolts to 175 in. lbs. (20 N·m). Check shafts again for free rotation.

(4) Adjust both bands as described in "Maintenance and Adjustments" Section.

Governor and Support

(1) Position support and governor body assembly on the output shaft. Align assembly so governor valve shaft hole in governor body aligns with hole in output shaft, then slide assembly into place. Install snap ring behind the governor body. Tighten body to support self-locking bolts to 95 in. lbs. (11 N·m).

(2) Place governor valve on valve shaft, insert assembly into body and through governor weights. Install valve shaft retaining snap ring.

Output Shaft Bearing and Extension Housing (or Adapter on 4WD Vehicles)

(1) Install bearing on shaft with its outer race ring groove toward front. Press or tap bearing tight against shoulder, then install rear snap ring.

(2) On 4WD vehicles, use door-ease lubricant on output shaft bearing O-ring. Drive the bearing into adapter using Tool C-4203 inverted with Handle C-4171.

(3) Place a new extension housing gasket on the transmission case. Position output shaft bearing retaining snap ring as far as possible then carefully tap extension housing (or adapter) into place. Make sure snap ring is fully seated in the bearing groove.

(4) Install and tighten extension housing (or adapter) bolts to 32 ft. lbs. (43 N·m).

(5) Install gasket, plate, and two screws on bottom of extension housing mounting pad.

Measure input shaft end play as described under "Disassembly—Subassembly Removal." Correct if necessary (Fig. 4).

Valve Body Assembly and Accumulator Piston

(1) Make sure combination back-up lamp/neutral start switch is not installed in transmission case.

(2) Place valve body manual lever in low position to move parking rod to rear position.

(3) Use a screwdriver to push park sprag into engagement with parking gear, turning output shaft to verify engagement. This will allow "knob"

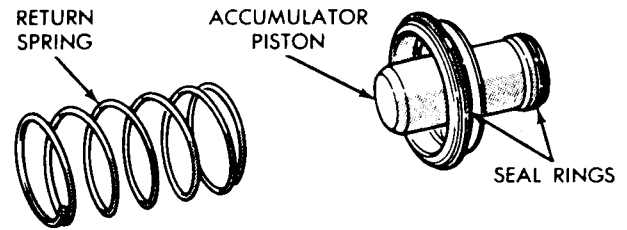


Fig. 32—Accumulator Piston and Spring

on end of parking rod to move past the sprag as valve body is installed.

(4) Install accumulator piston in the transmission case (Fig. 32).

(5) Place valve body in position, working park rod through opening and past sprag. Install retaining bolts finger tight.

(6) With neutral starting switch installed, place manual lever in the neutral position. Shift valve body, if necessary, to center neutral finger over the neutral switch plunger. Snug bolts down evenly, then tighten to 105 in. lbs. (12 N·m).

(7) Connect lockup solenoid wire to wiring connector at rear of transmission case.

(8) Install gearshift lever and tighten clamp bolt. Check lever shaft for binding in the case by moving lever through all detent positions. If binding exists, loosen valve body bolts and realign.

(9) Make sure throttle shaft seal is in place, then install flat washer and throttle lever and tighten the clamp bolt.

(10) Position the round magnet over the bump in the front, right hand corner of the oil pan.

(11) Install oil pan, and a new gasket.

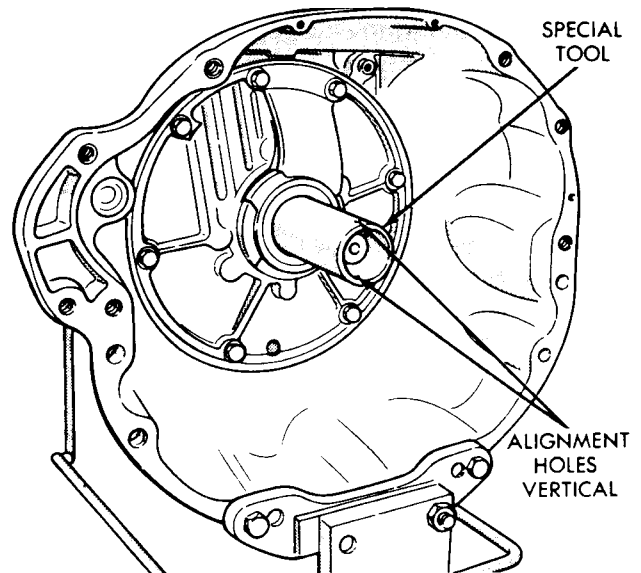


Fig. 33—Align Pump Inner Gear Lugs

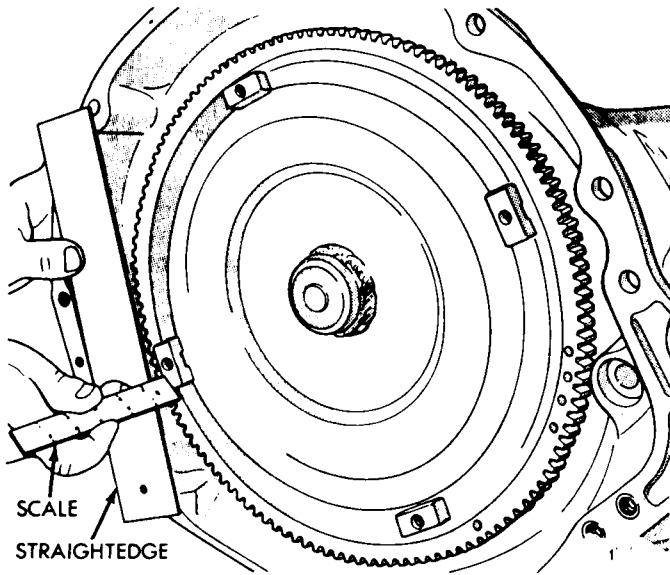


Fig. 34—Measure Torque Converter for Full Engagement into Transmission

TRANSMISSION, TORQUE CONVERTER, AND DRIVE PLATE INSTALLATION

The transmission and torque converter must be installed as an assembly; otherwise, the torque converter drive plate, pump bushing, and oil seal will be damaged. None of the weight of transmission should be allowed to rest on the plate during installation.

(1) Rotate pump gears with Tool C-3756 until the two small holes in handle are vertical (Fig. 33).

(2) Carefully slide torque converter assembly over input shaft and reaction shaft. Make sure torque converter hub slots are also vertical and fully engage pump inner gear lugs.

Test for full engagement by placing a straightedge on face of the case (Fig. 34). The surface of torque converter front cover lug should be at least 1/2 inch to rear of straightedge when torque converter is pushed all the way into transmission.

(3) Attach a small C-clamp to edge of torque converter housing to hold torque converter in place during transmission installation.

(4) Inspect torque converter drive plate for distortion or cracks and replace if necessary. Torque the drive plate to crankshaft bolts to 55 ft. lbs. (75 N·m). When drive plate replacement has been necessary, make sure both transmission dowel pins are in engine block and they are protruding far enough to hold transmission in alignment.

(5) Coat torque converter hub hole in crankshaft with Multipurpose grease. Place transmission and torque converter assembly on a service jack and position assembly under vehicle for in-

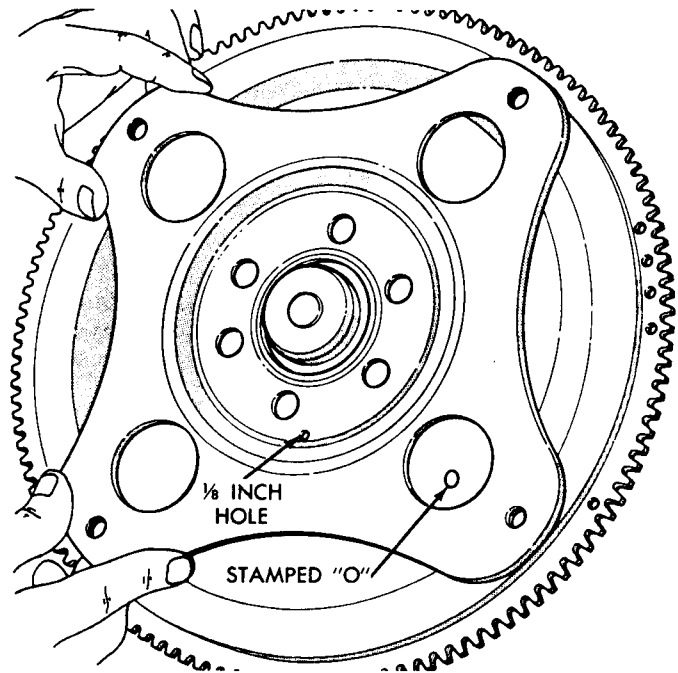


Fig. 35—Torque Converter and Drive Plate Markings

stallation. Raise or tilt as necessary until transmission is aligned with engine.

(6) Rotate torque converter so mark on torque converter (made during removal) will align with mark on drive plate. The offset holes in plate are located next to 1/8 inch hole in the inner circle of plate. Carefully work transmission assembly forward over engine block dowels with torque converter hub entering the crankshaft opening.

(7) After transmission is in position, install torque converter housing bolts and tighten to 30 ft. lbs. (41 N·m).

(8) Install crossmember to frame and lower transmission to install mount on extension to the crossmember. Tighten all bolts.

(9) Remove engine support fixture (Fig. 1).

(10) Install oil filler tube and speedometer cable.

(11) Connect throttle rod to transmission lever.

(12) Connect gearshift rod and torque shaft assembly to transmission lever and frame.

When it is necessary to disassemble linkage rods from levers which use plastic grommets as retainers, the grommets should be replaced with new ones. Use a prying tool to force rod from grommet in lever, then cut away old grommet. Use pliers to snap new grommet into lever and rod into grommet.

(13) Place wire connector on the combination back-up lamp and neutral/park starter switch.

(14) Connect wiring to lockup solenoid wiring connector at rear of transmission case.

(15) Rotate engine clockwise with socket wrench



Teardown (A-500) Overdrive Section

This procedure involves removal, disassembly, and assembly of the A500 transmission overdrive unit.

Before raising the vehicle, place the gearshift selector in park.

(1) To start the overdrive removal, remove transmission oil pan, remove gasket, drain oil and, using a new gasket, reinstall pan. If there is a failure within the overdrive unit or if the fluid is contaminated, remove the entire transmission. If diagnosis indicates clutch or governor problems only, remove overdrive unit.

(2) Index propeller shaft universal joint to pinion yoke for proper orientation during reassembly. Remove propeller shaft (Fig. 1).

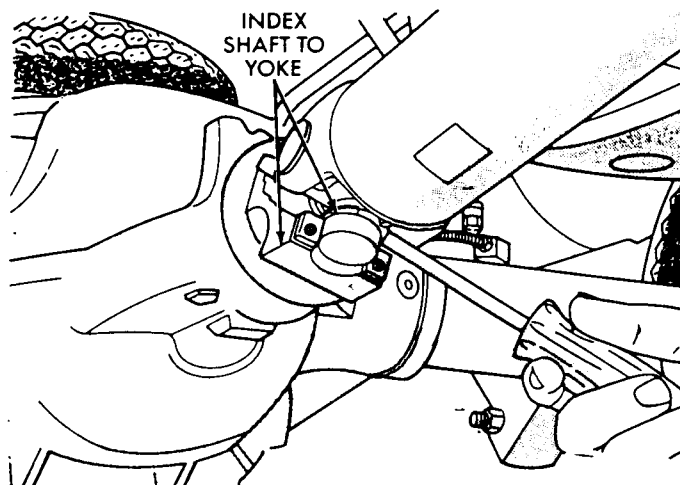


Fig. 1—Index Propeller Shaft

(3) Using a transmission jack, support transmission and raise it enough to remove crossmember. Mark position of crossmember for reassembly.

(4) Remove speedometer cable.

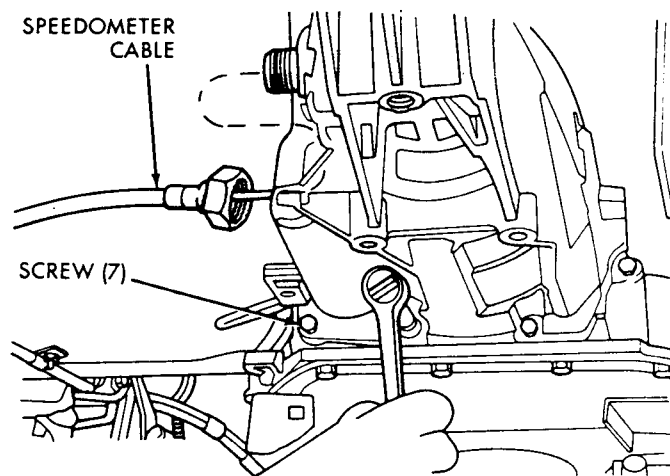


Fig. 2—Attaching Bolts

(5) Remove seven bolts securing overdrive unit to transmission (Fig. 2).

WARNING: ONCE OVERDRIVE UNIT IS PULLED BACK APPROXIMATELY 1 INCH IT IS FREE TO FALL, IF IT IS UNSUPPORTED.

(6) Very carefully pull overdrive unit off of intermediate shaft. A bearing and a select spacer may be either on the overdrive piston on the rear of the transmission case, on sliding hub, or intermediate shaft.

(7) Place several clean shop towels on a bench.

Tip overdrive unit so that any excess oil drains. Watch for any sign of abnormal wear, such as clutch material or metal fragments in the oil.

DISASSEMBLY AND REPAIR

(1) Remove overdrive clutch wire retaining ring, then pull out the alternating plates and discs. Note that the heaviest metal plate is placed in the front of the clutch pack. This is the pressure plate (Fig. 3).

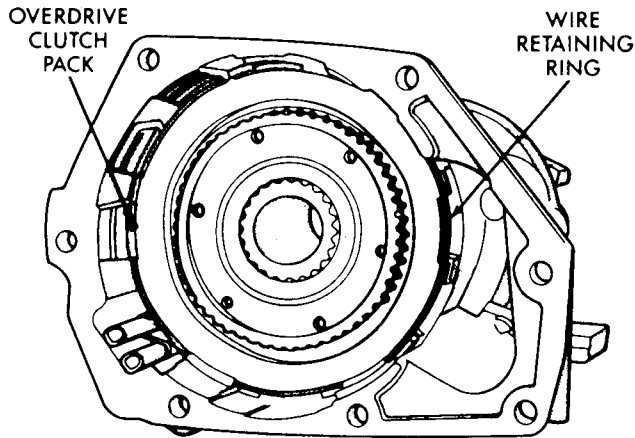


Fig. 3—Overdrive Unit Removed

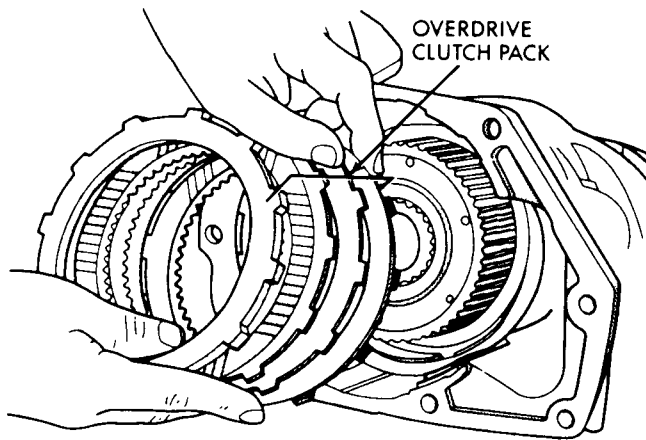


Fig. 4—Overdrive Clutch

(2) Take a close look at each overdrive clutch component for signs of wear. Replace if necessary (Fig. 4).

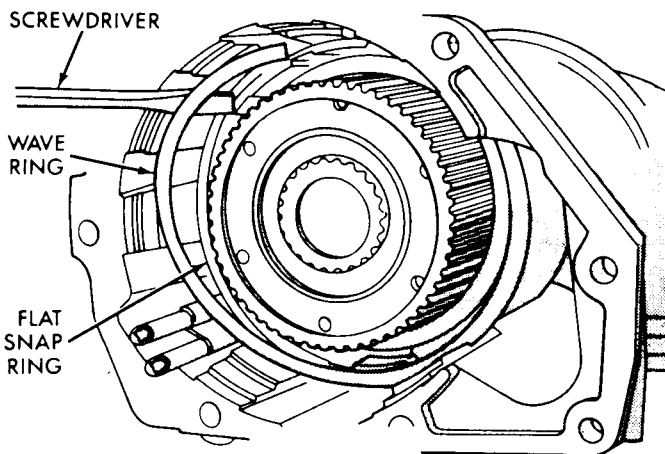


Fig. 5—Wave Ring

(3) Remove wave ring. This special ring acts as a cushion to absorb shock when the overdrive clutch engages (Fig. 5).

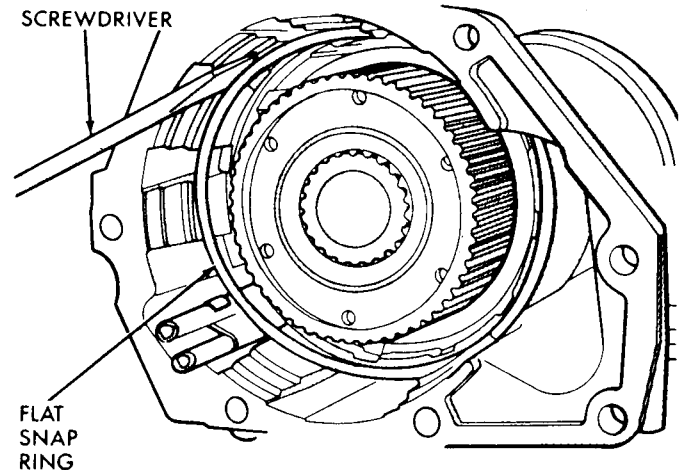


Fig. 6—Flat Snap Ring

(4) In the same groove, remove large flat snap ring. (Fig. 6).

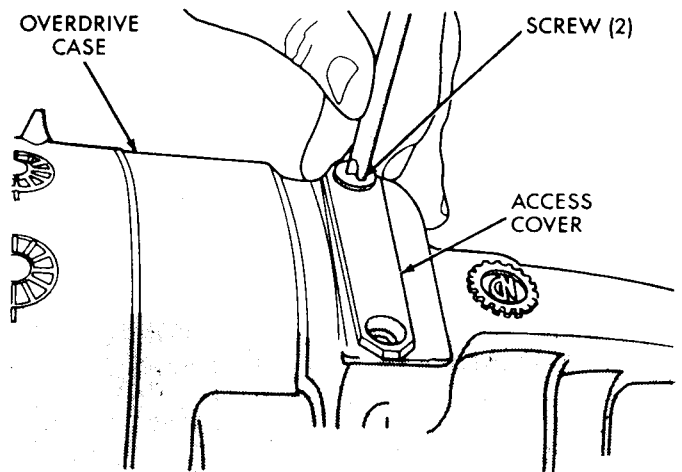


Fig. 7—Access Cover

(5) Remove access cover (Fig. 7). The snap ring holds the output shaft front bearing in place.

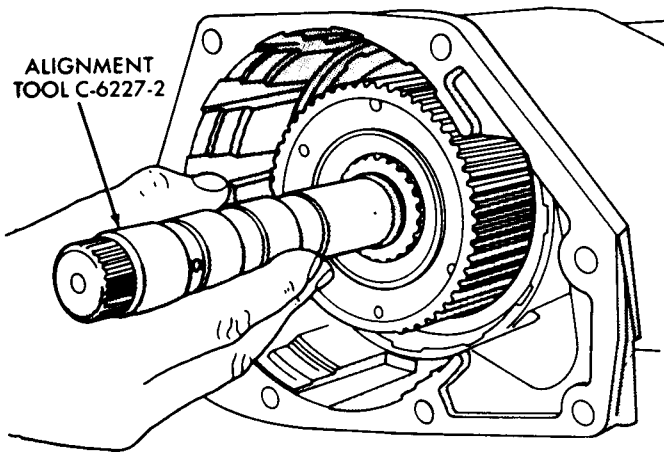


Fig. 8—Alignment Tool

(6) Because the entire case must be inverted to remove the gear train, insert alignment Tool C-6277-2 into sun gear. After seating it (Fig. 8), invert case on alignment tool (Fig. 9). Use expanding snap ring pliers to expand output shaft front bearing snap ring and carefully lift case off gear train.

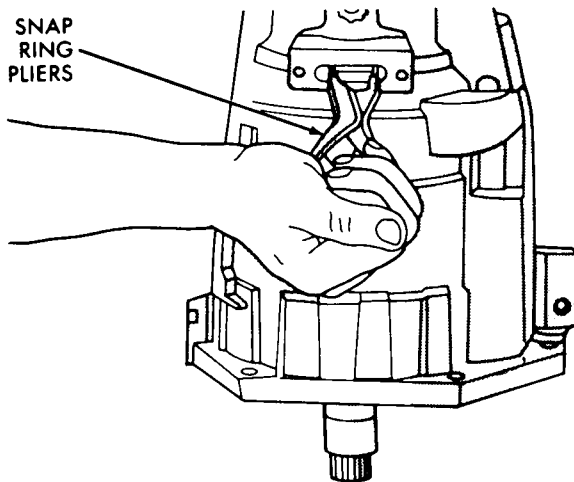


Fig. 9—Expand Snap Ring

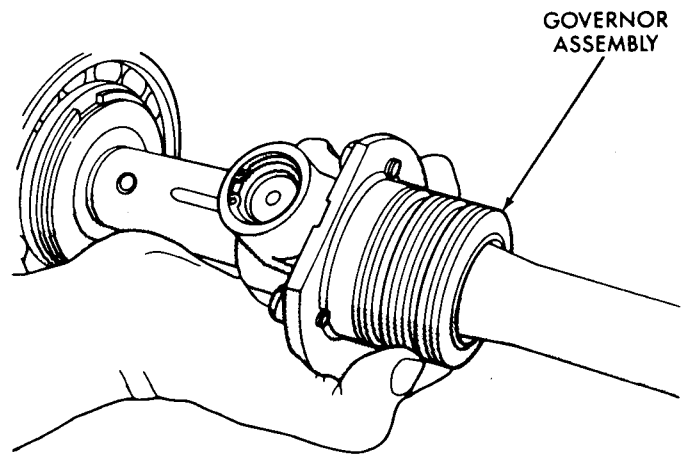


Fig. 10—Governor Assembly

(7) Remove governor retaining snap ring. Remove governor and shaft key (Fig. 10). This will prevent damaging governor when the direct clutch spring is compressed in an arbor press. Set gear train aside and continue disassembly of case components.

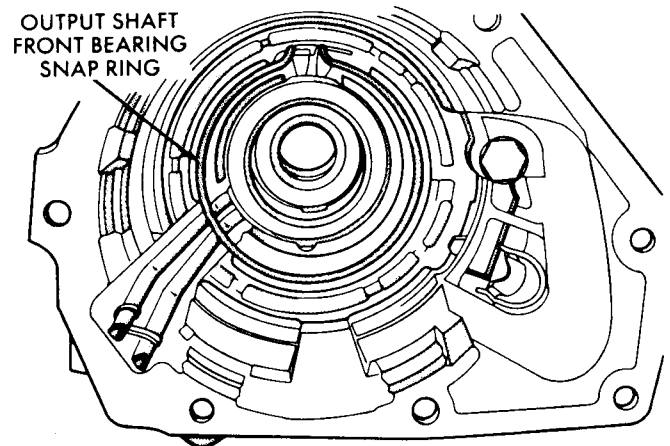


Fig. 11—Front Bearing Snap Ring

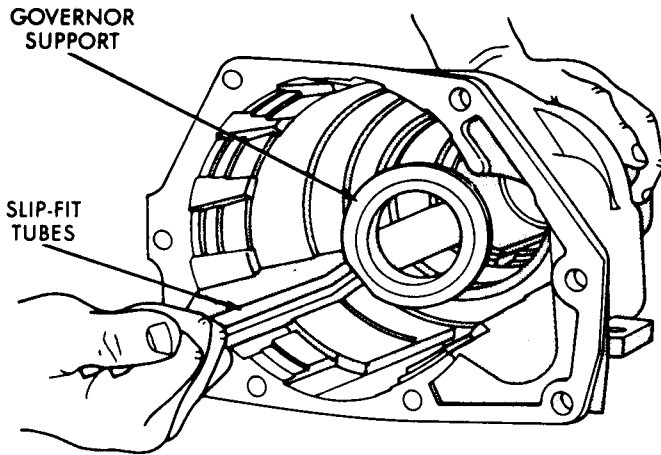


Fig. 12—Governor Pressure Tubes

(8) Remove the output shaft front bearing snap ring (Fig. 11), then remove governor support snap ring. Take governor support with slip-fit (pressure) tubes out of the case (Fig. 12).

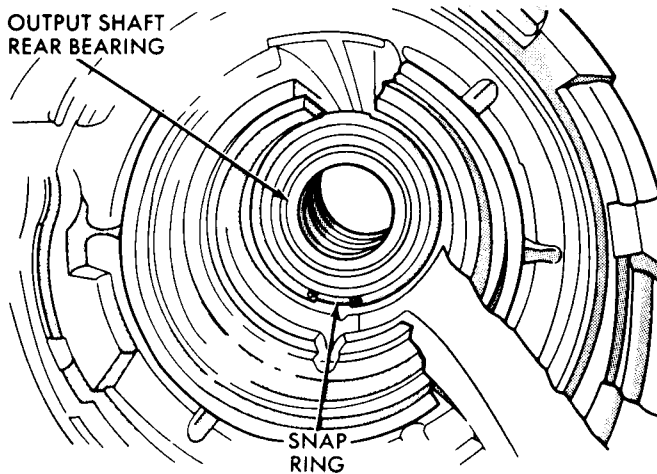


Fig. 13—Output Shaft Rear Bearing Snap Ring

(9) Using locking snap ring pliers, remove output shaft rear bearing snap ring (Fig. 13). Tap overdrive case downward on bench to remove rear bearing.

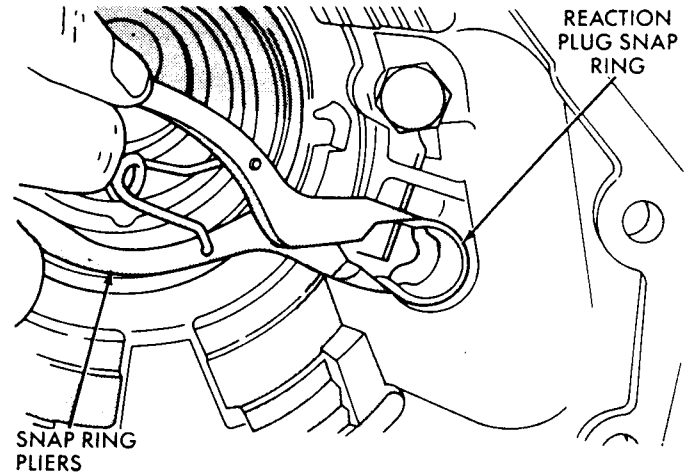


Fig. 14—Reaction Plug Snap Ring

(10) To remove parking mechanism, first remove reaction plug snap ring (Fig. 14). **Compress snap ring just enough to allow its removal.**

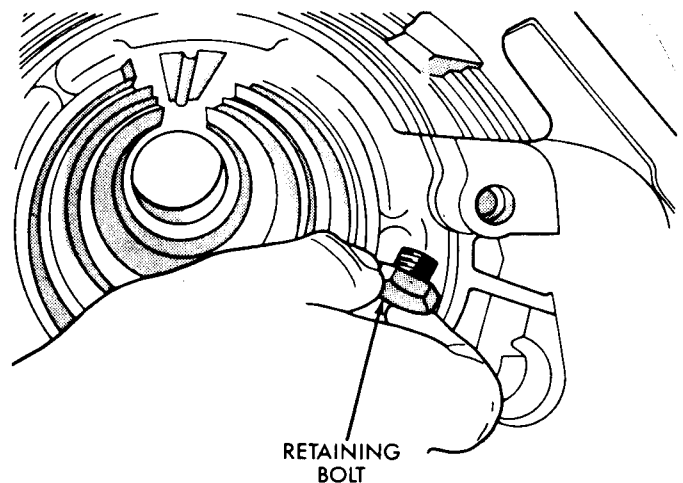


Fig. 15—Dowel Retainer Bolt

(11) Unscrew the bolt securing dowel and parking pawl (Fig. 15). Now, another light tap to the case on the bench will cause the dowel, the parking pawl components to drop out on the bench (Fig. 16).

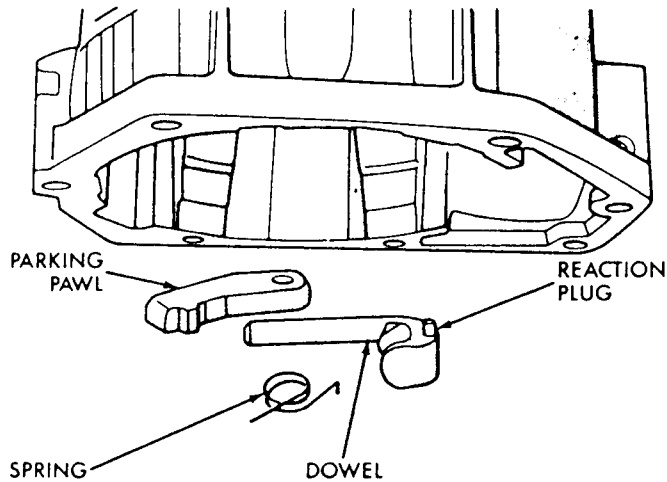


Fig. 16—Parking Pawl Components

(12) At the rear of the case, a standard A-727 rear transmission bushing and seal are used at the output shaft. Now that the case is disassembled you may continue disassembly of the gear train, if necessary.

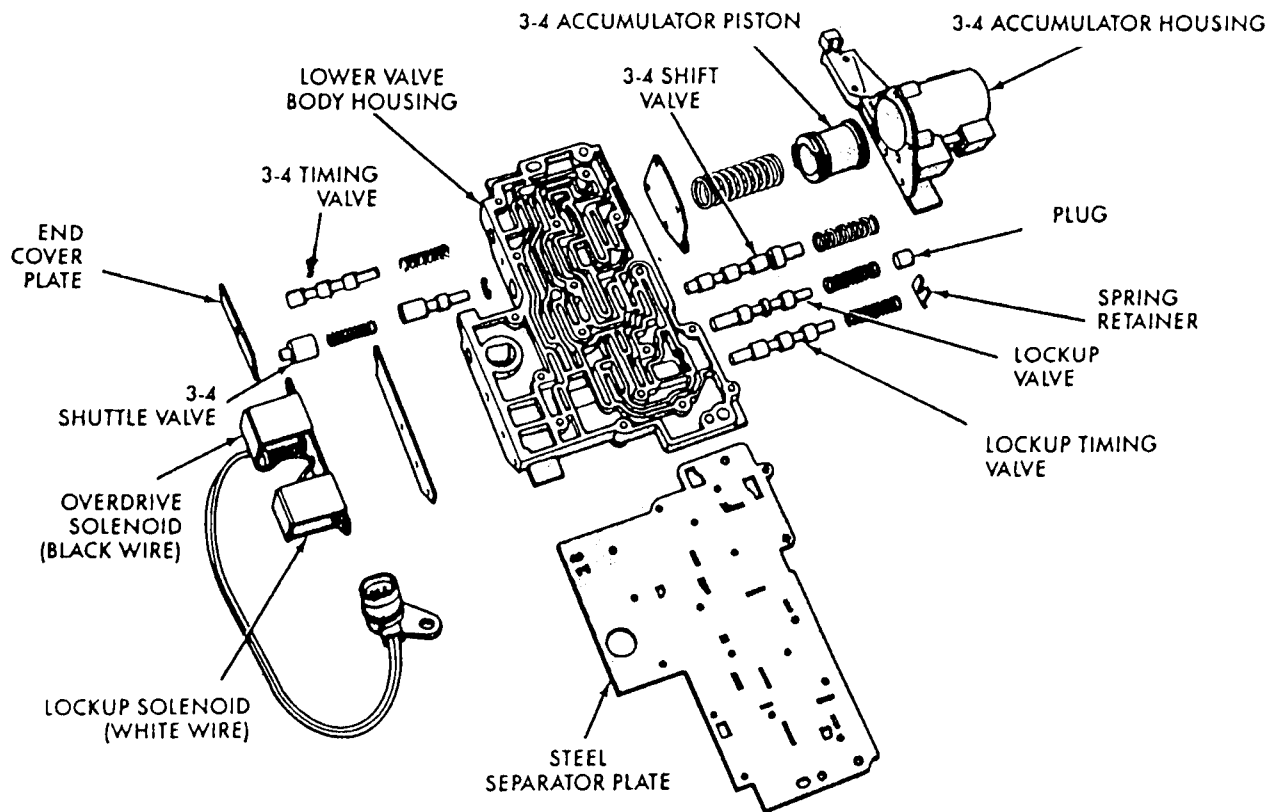


Fig. 17—Valve Body Components

SUBASSEMBLY RECONDITION

Disassembly

It is of utmost importance that you use a press capable of three inches of travel to compress the direct clutch spring. A press must have the three-inch travel required to perform this critical step safely.

WARNING: THE DIRECT CLUTCH SPRING EXERTS OVER 800 POUNDS OF FORCE ON THE SLIDING HUB. SPRING TENSION MUST BE RELEASED SLOWLY AND COMPLETELY TO AVOID PERSONAL INJURY.

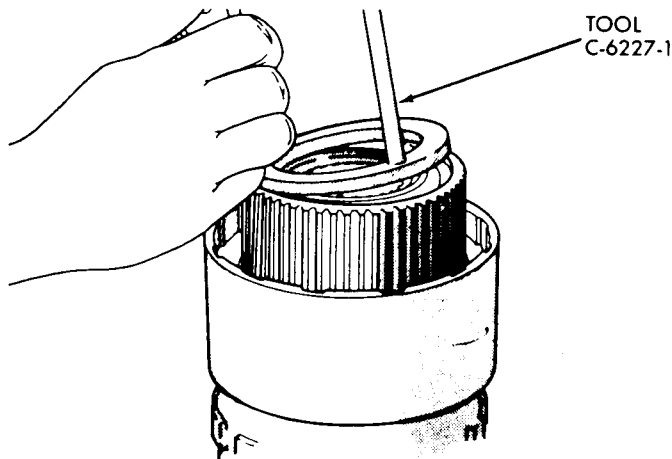


Fig. 1—Compress Direct Clutch Spring

(1) Place the output shaft in a fixture that will support the output shaft flange. With the assembly properly supported in the press, place the Tool C-6227-1 in place (Fig. 1). Have a helper operate the press to compress the direct clutch spring.

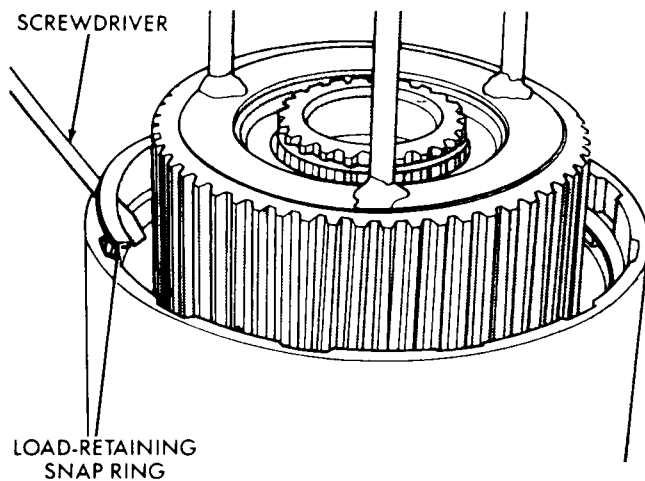


Fig. 2—Load-Retaining Snap Ring

(2) When the hub is compressed, you will now be able to safely remove the large load-retaining ring (Fig. 2), and the small load-retaining safety

ring (Fig. 3). When your helper unloads the press, the direct clutch spring tension is relieved. The rest of the unit can be disassembled.

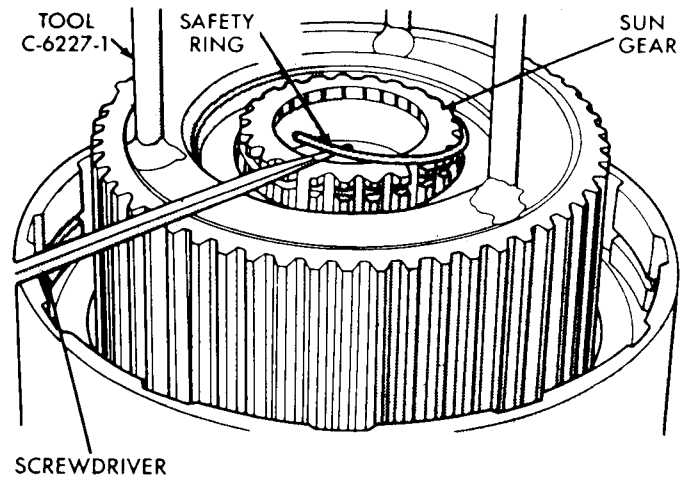


Fig. 3—Safety Ring

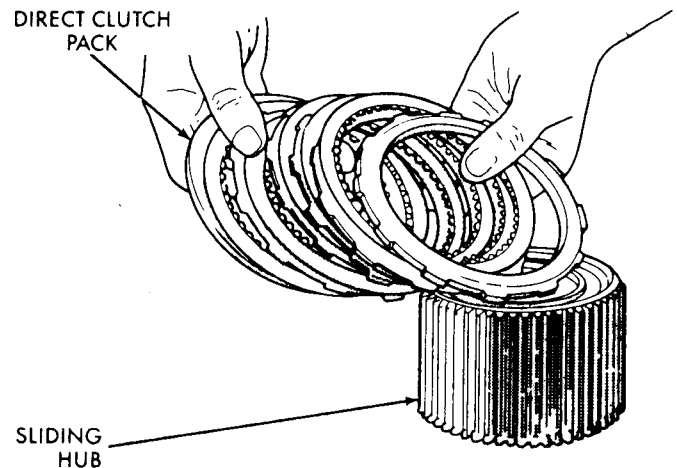


Fig. 4—Direct Clutch Components

(3) Remove sliding hub with direct clutch on it. Remove components of the clutch from the hub and inspect them one at a time (Fig. 4).

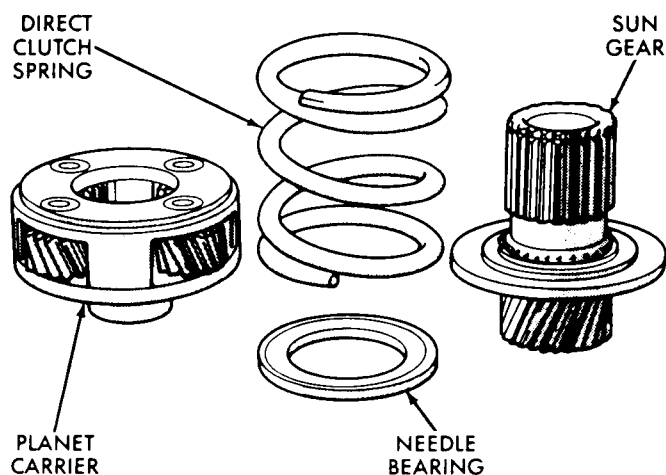


Fig. 5—Planet Carrier and Sun Gear

(4) Remove direct clutch spring, sun gear, needle bearing, and planet carrier (Fig. 5).

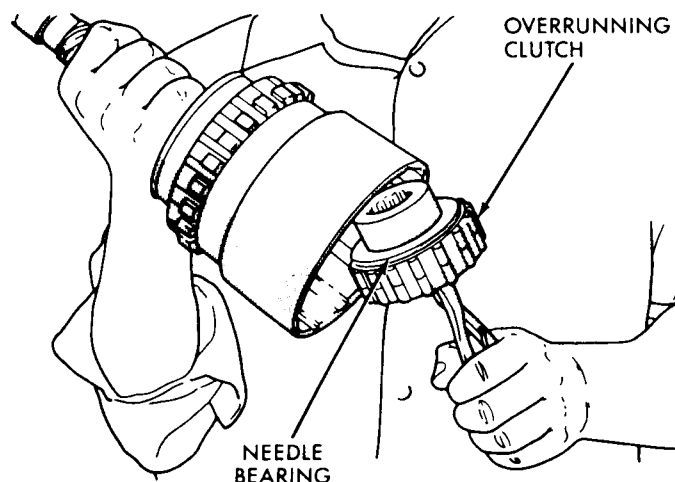


Fig. 6—Overrunning Clutch

(5) To remove the overrunning clutch, invert assembly and, with expanding snap ring pliers, reach into the inner splines of the clutch. Remove the overrunning clutch intact with a quick counterclockwise twist (Fig. 6). Also, remove the needle bearing.

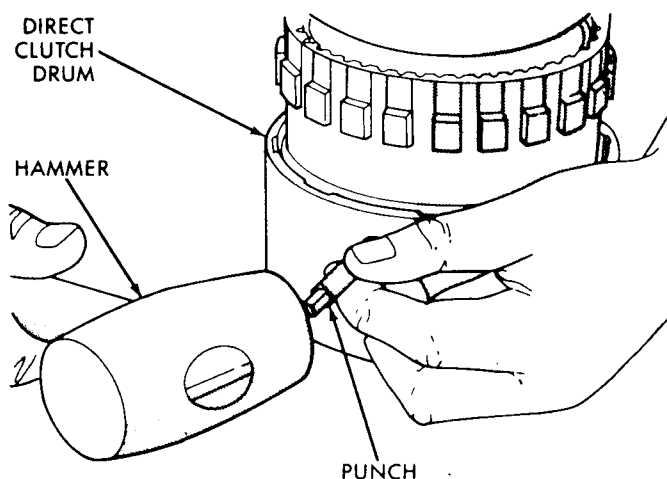


Fig. 7—Mark Unit for Reassembly

(6) Mark the direct clutch drum and annulus for reassembly (Fig. 7).

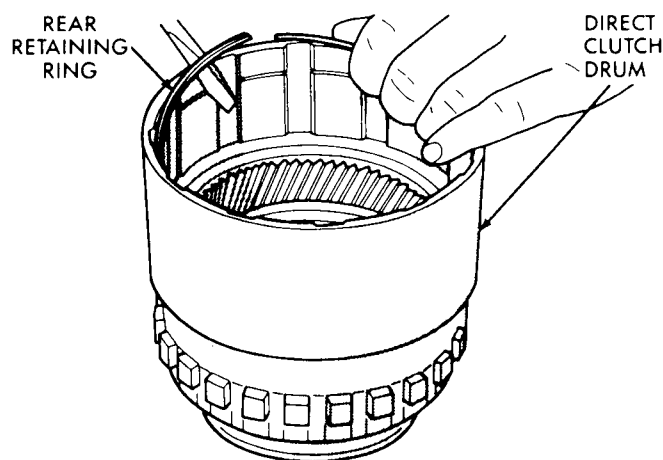


Fig. 8—Inner Retaining Ring

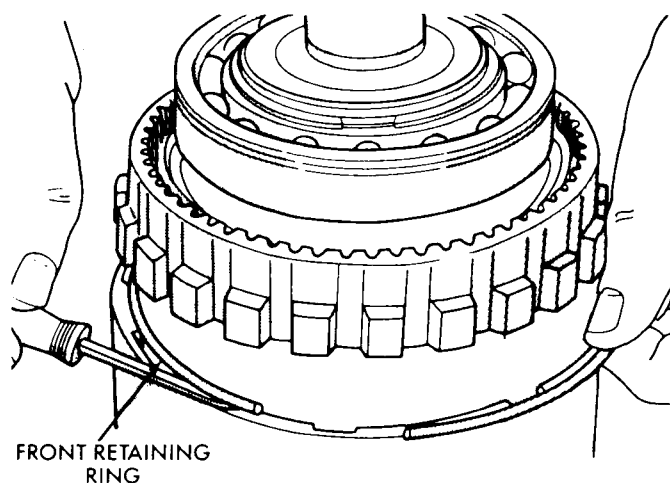


Fig. 9—Outer Retaining Ring

(7) Two wire retaining rings secure the direct clutch drum to the annulus. Remove the inner one first (Fig. 8), then the one behind the rear of the drum (Fig. 9). Slide the drum from the annulus.

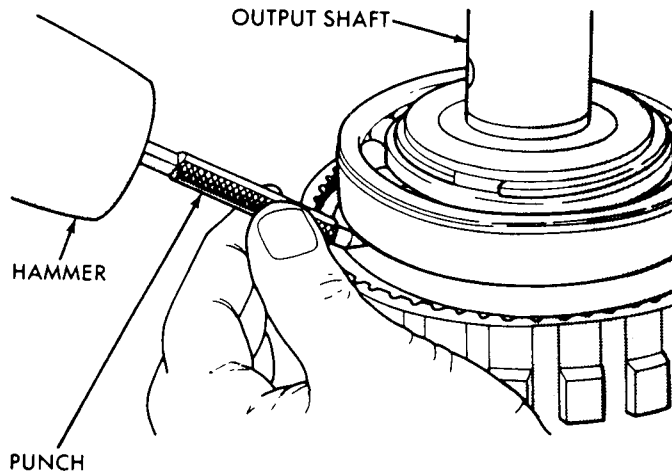


Fig. 10—Mark Annulus for Reassembly

(8) Mark annulus and output shaft for exact reassembly.

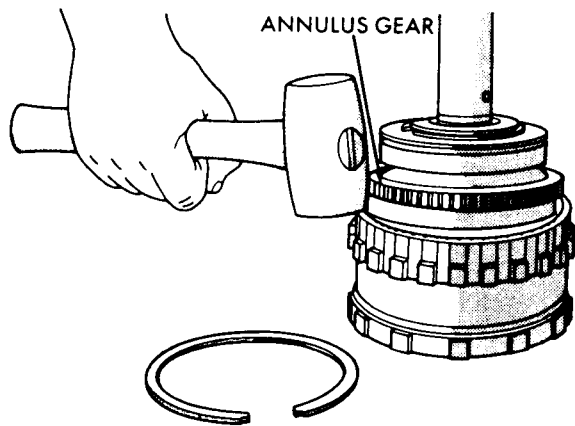


Fig. 11—Remove Annulus Gear

(9) To remove annulus gear (one snap ring secures it to the output shaft), a light tap with a soft mallet will pop it off the shaft (Fig. 11). Also, remove output shaft front bearing.

Assembly

Before assembling, clean all parts and dry with compressed air. **Do not clean or dry parts with shop towels as lint deposits could plug oil filter.**

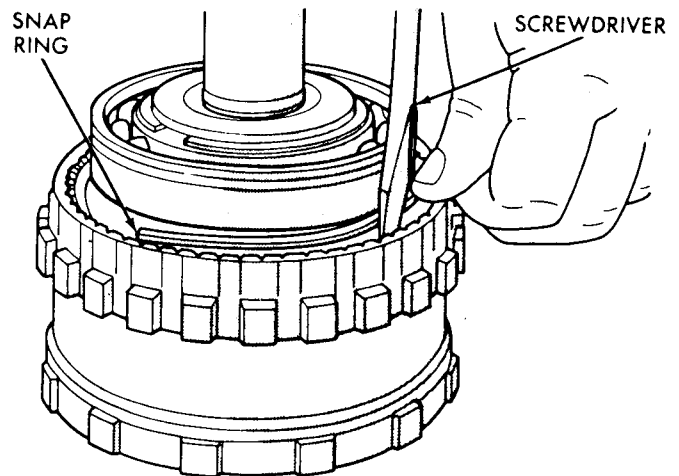


Fig. 1—Install Snap Ring

(1) To assemble overdrive unit, align mating marks, and insert shaft through the back of the annulus and secure it with the snap ring (Fig. 1).

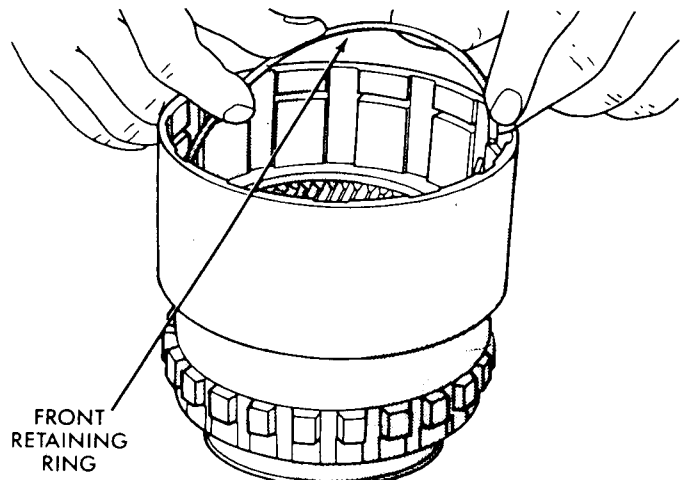


Fig. 2—Install Rear Retaining Ring

(2) Set direct clutch drum face down and align mating marks. Insert annulus lugs into slots inside drum. Install rear retaining ring first. Invert the assembly. Slide drum forward to expose retaining ring groove. Install front wire retaining ring to secure drum (Fig. 2).

(a) Hold the overrunning clutch upside down with expanding snap ring pliers. Place the needle bearing against back face of clutch. Hold the shaft assembly upside down, and with an upward, counterclockwise twisting motion, install the overrunning clutch.

PLANET
CARRIER
ASSEMBLY

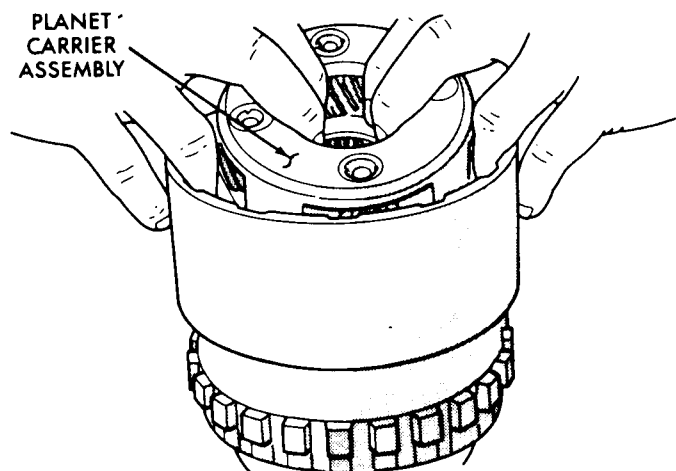


Fig. 3—Install Planet Carrier

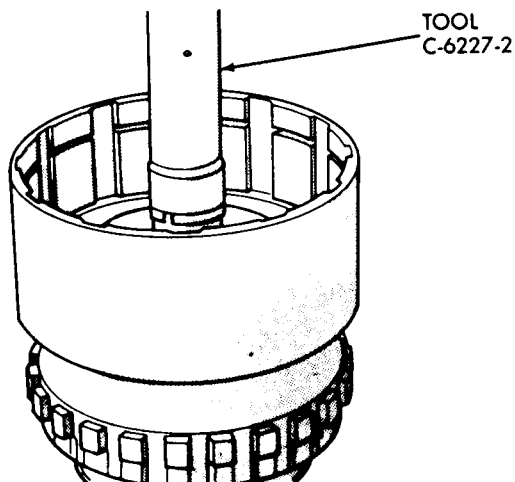


Fig. 4—Align Splines

(3) Carefully set carrier assembly into annulus (Fig. 3) and align the splines using Tool C-6227-2 (Fig. 4).

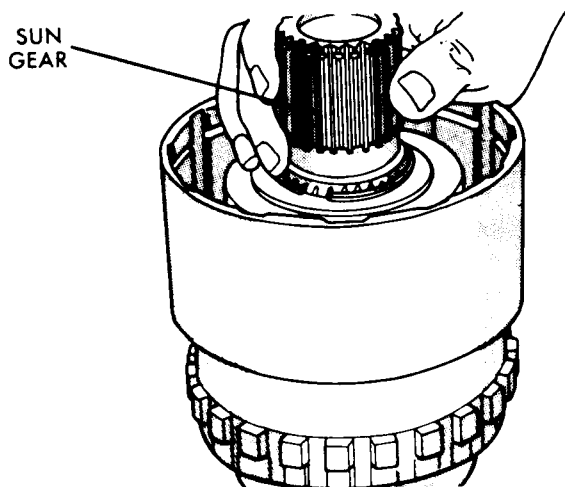


Fig. 5—Install Sun Gear

(4) Set needle bearing in place, remove tool, and install sun gear (Fig. 5). Set spring on sun

gear, and place the sliding hub on spring. Reinstall alignment tool and install direct clutch plates and discs, one at a time, on hub.

(5) Figures 6, 7, and 8 involves compressing the direct clutch spring with the arbor press. Set Tool C-6227-1 on the hub and compress the spring. Have a helper operate the press. As the spring is compressed, slide clutch plates into their grooves and down the hub (Fig. 6). Then install the large load-retaining snap ring, seating it firmly with a large screwdriver (Fig. 7). Install safety ring (Fig. 8). Slowly release the press, ensuring that the load-retaining rings are properly seated. Install governor and snap ring.

WARNING: THE DIRECT CLUTCH SPRING EXERTS OVER 800 POUNDS OF FORCE ON THE SLIDING HUB. SPRING TENSION MUST BE RELEASED SLOWLY TO AVOID PERSONAL INJURY.

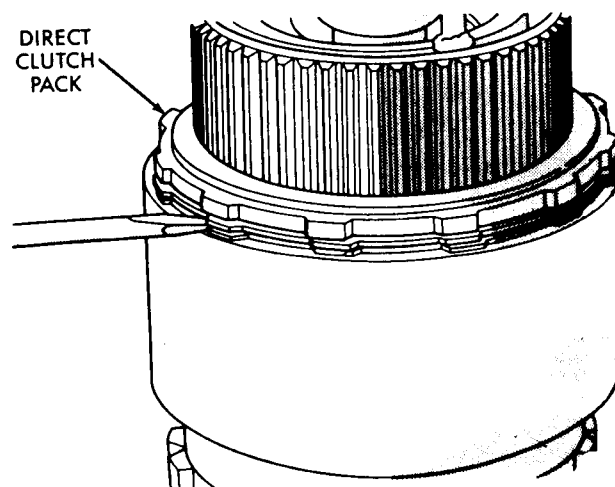


Fig. 6—Install Direct Clutch

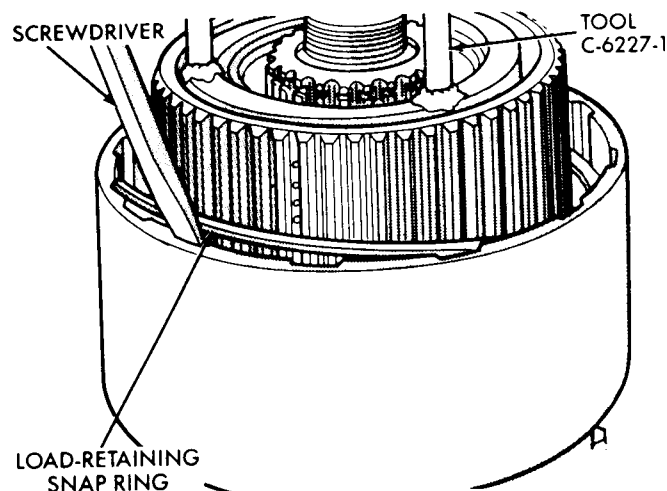


Fig. 7—Install Load-Retaining Snap Ring

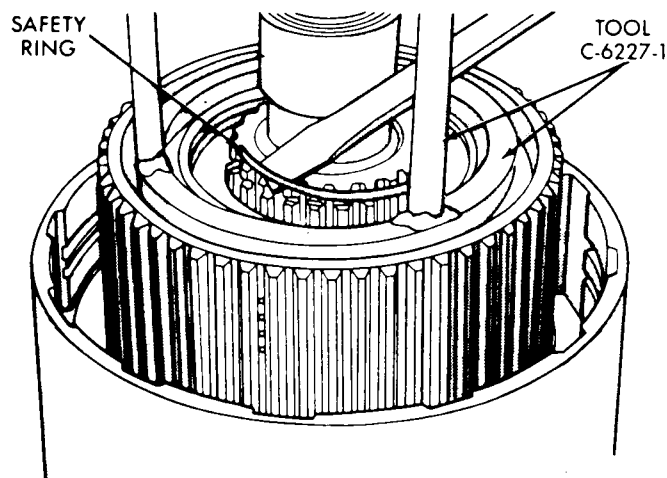


Fig. 8—Install Safety Ring

(6) Set the gear train aside, with special alignment tool still in place.

REASSEMBLY

(1) Install dowel, parking pawl, and spring back into overdrive case (Fig. 1). Then reinstall retaining bolt. Torque to 20 ft. lbs (27 N·m). Position reaction plug in place and install snap ring. Use care to squeeze the snap ring only enough to install it.

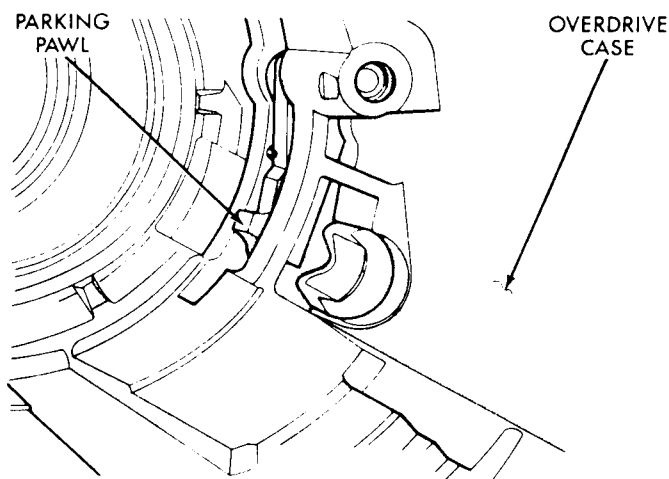


Fig. 1—Install Parking Pawl

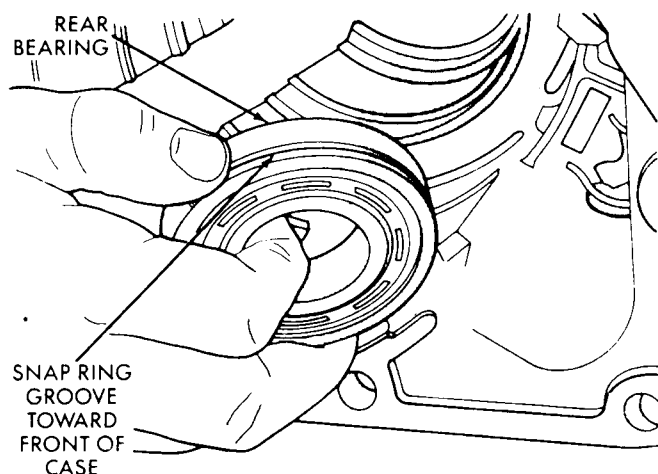


Fig. 2—Install Output Shaft Rear Bearing

(2) Install output shaft rear bearing in the case. Snap ring groove is toward front of case (Fig. 2).

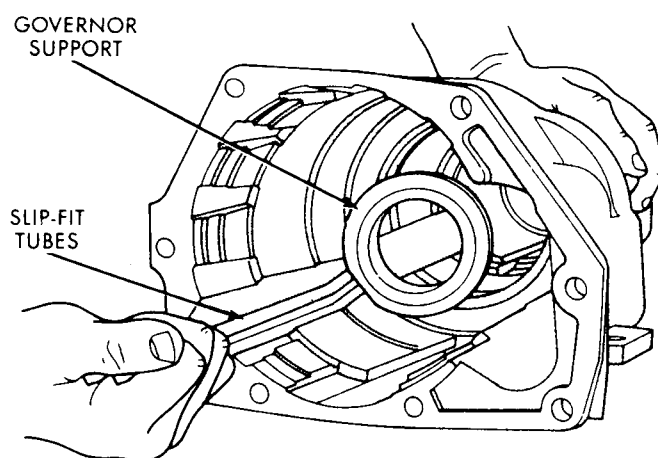


Fig. 3—Install Governor Support

(3) Install governor support (Fig. 3).

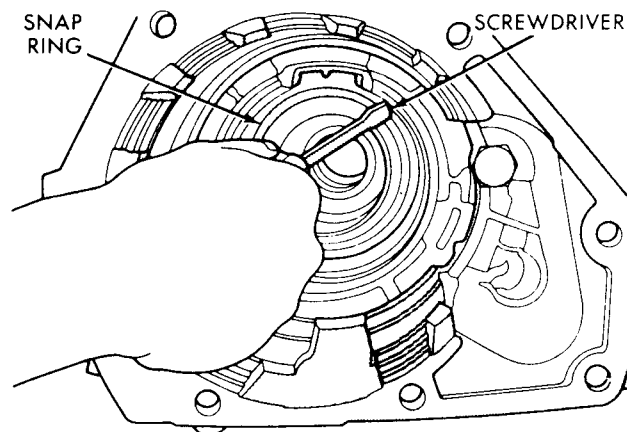


Fig. 4—Snap Ring

(4) Install Governor Support Snap Ring (Fig. 4).

(5) Install output shaft front bearing snap ring in the case. Make sure alignment tool is installed in the gear train. Invert gear train and slip case over shaft.

(6) Expand snap ring and slip case down until snap ring locks in the bearing groove. Release the snap ring.

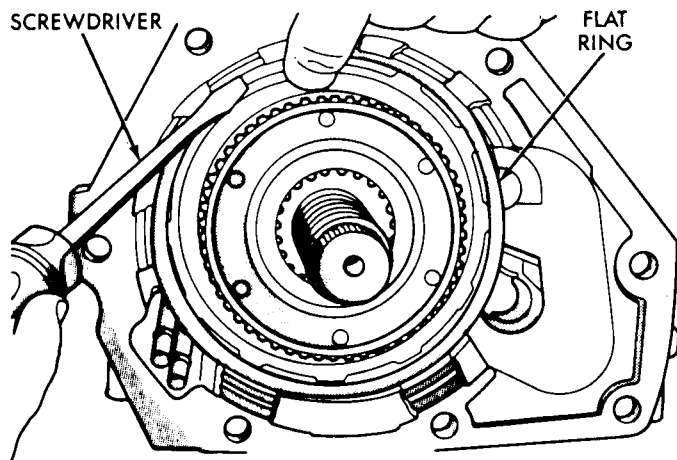


Fig. 5—Install Flat and Wave Ring

(7) After reinstalling the access plate and gasket, install the flat snap ring. Use a large screwdriver to be sure that it's seated properly. Then reinstall the wave ring (Fig. 5) using the same seating technique.

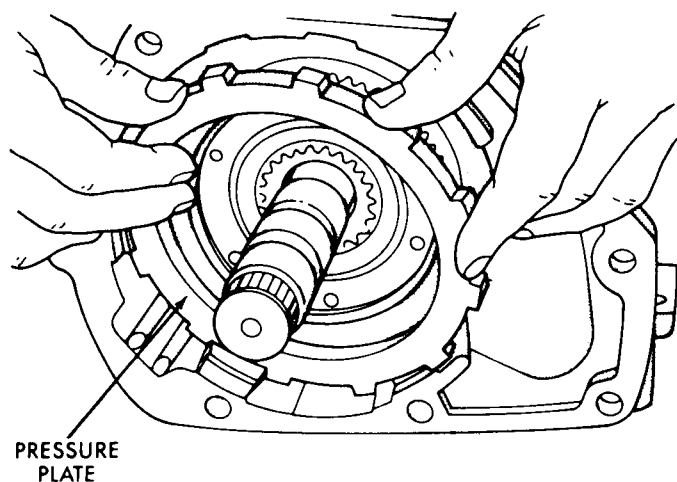


Fig. 6—Install Overdrive Clutch Pack

(8) One by one, install overdrive clutch plates and discs, be certain to put the thickest plate in last (Fig. 6).

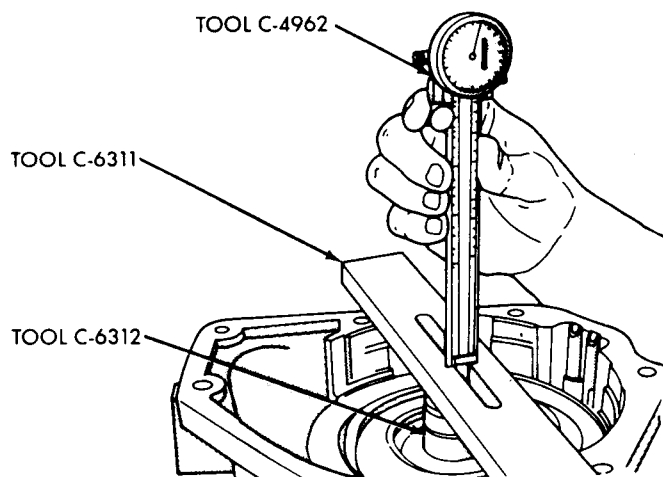


Fig. 7—Measure for Intermediate Shaft Spacer

(9) Position overdrive unit vertically in a large vise. To determine the proper intermediate shaft spacer thickness, insert Tool C-6312 through the sun gear. Be sure tool bottoms against carrier spline shoulder. Position Tool C-6311 across overdrive case face. Using dial caliper Tool C-4962, positioned over Tool C-6311, measure distance to the top of Tool C-6312 (Fig. 7).

(10) Using this measurement, select the proper thickness spacer from the chart below:

Intermediate Shaft Spacer Chart

Measurement (Inches)	Spacer Part Number	Spacer Thickness (Inches)
.7336-.7505	4431916	.159-.158
.7506-.7675	4431917	.176-.175
.7676-.7855	4431918	.194-.193
.7856-.8011	4431919	.212-.211

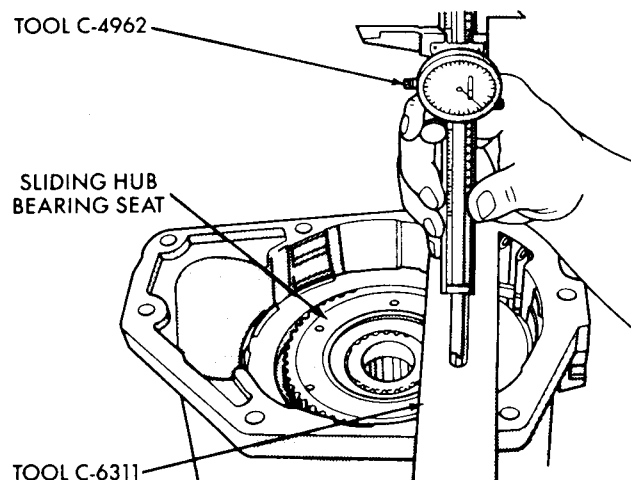


Fig. 8—Measure for Overdrive Piston Shim

(11) To determine the proper shim thickness for the overdrive piston: Position Tool C-6311 across overdrive case face. Using dial caliper Tool C-4962 positioned over Tool C-6311, measure distance to the sliding hub bearing seat (Fig. 8).

(12) This measurement should be taken at four locations 90° apart. Add all measurements together and divide by four (4). Using this measurement, select the proper thickness shim from the chart below:

Overdrive Piston Shim Chart

Measurement (Inches)	Spacer Part Number	Spacer Thickness (Inches)
1.7500-1.7649	4431730	.108-.110
1.7650-1.7799	4431585	.123-.125
1.7800-1.7949	4431731	.138-.140
1.7950-1.8099	4431586	.153-.155
1.8100-1.8249	4431732	.168-.170
1.8250-1.8399	4431587	.183-.185
1.8400-1.8549	4431733	.198-.200
1.8550-1.8699	4431588	.213-.215
1.8700-1.8849	4431734	.228-.230
1.8850-1.8999	4431590	.243-.245

Installation

(1) Before installing overdrive unit, it will be necessary to cut out the old gasket. Using a sharp knife, cut out the old gasket around the piston (Fig. 1). Place the old gasket on the new gasket for a template, and trim the new gasket to fit.

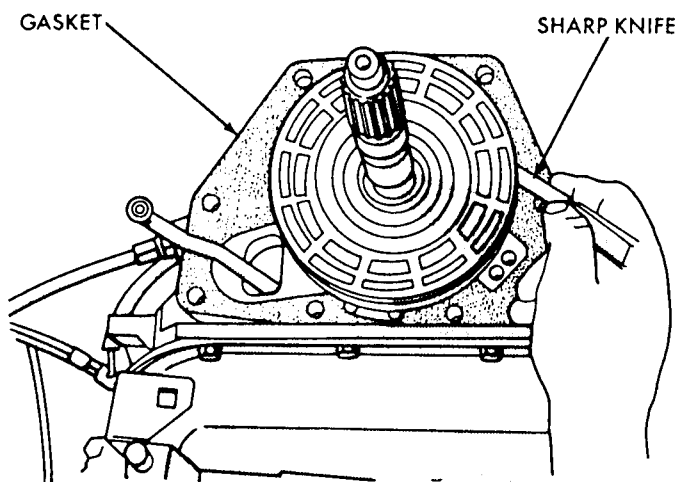


Fig. 1—Carefully Cut out Old Gasket

(2) Place the new gasket in place on rear of overdrive case. Install spacer, selected in Steps (9) and (10) of the Reassembly Procedure, on intermediate shaft.

(3) Place shim selected in Steps (11) and (12) of the Reassembly Procedure in position over the piston on the main portion of the transmission. Install sliding hub bearing over intermediate shaft, against sliding hub.

CAUTION: The shoulder on the inside diameter of the bearing must face forward.

A small amount of petroleum jelly should be used to hold the shim and bearing in position.

(4) Carefully lift overdrive unit and slide it onto the intermediate shaft. Insert parking rod into reaction plug.

CAUTION: Extreme care must be used not to tilt the unit as this could cause the carrier and overrunning clutch splines to rotate out of alignment. If this happens, it will be necessary to remove the overdrive unit and align them with Tool C-6227-2.

Align the slip-fit governor tubes and push the unit forward until it touches the transmission case.

(5) Install seven attaching bolts. Tighten in a crisscross pattern to 25 foot-pounds (34 N-m).

(6) Install crossmember, speedometer cable and propeller shaft using marks made at disassembly.

(7) Refill to proper level with Mopar ATF Plus (Automatic Transmission Fluid - Type 7176) or equivalent.

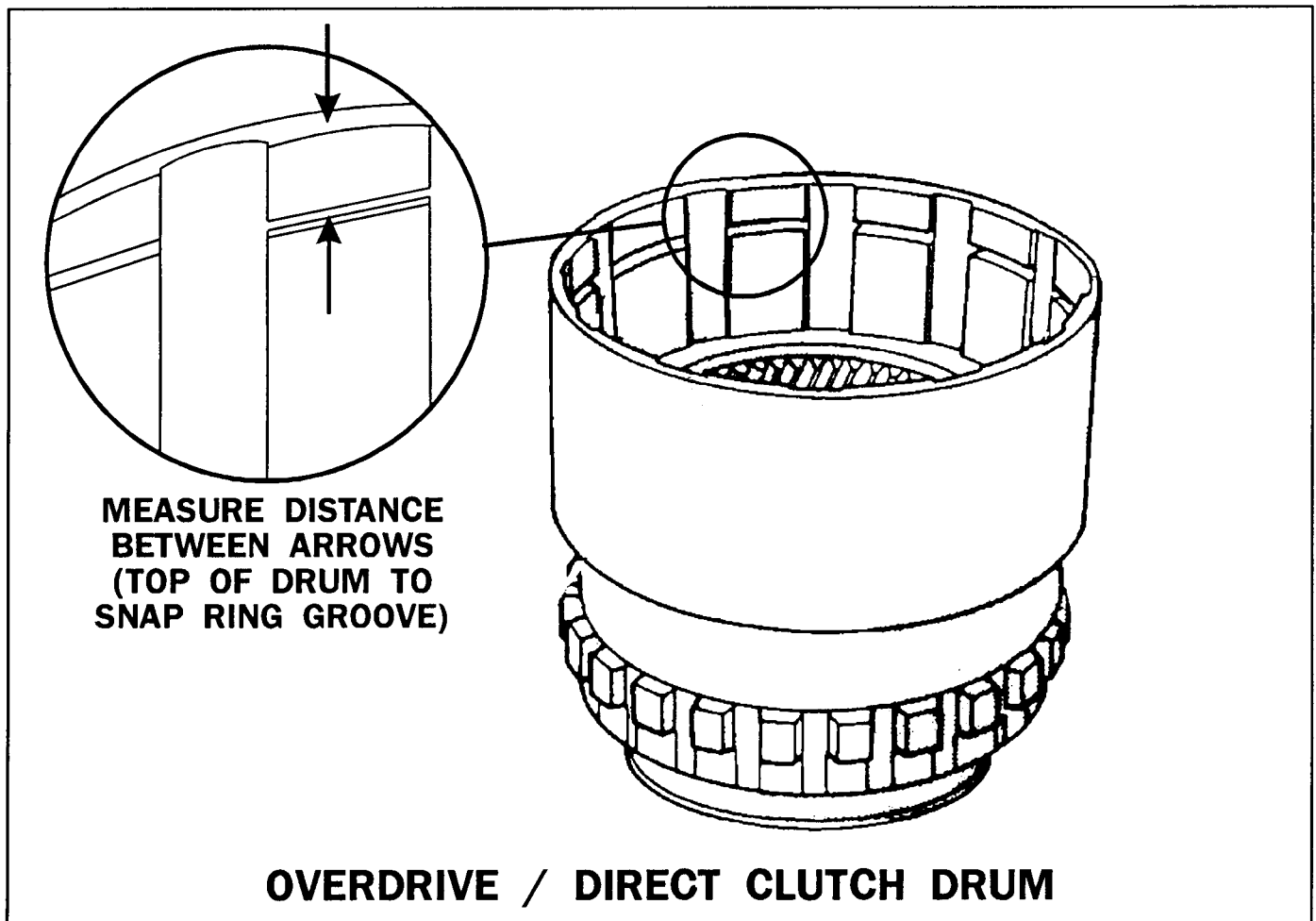
Note

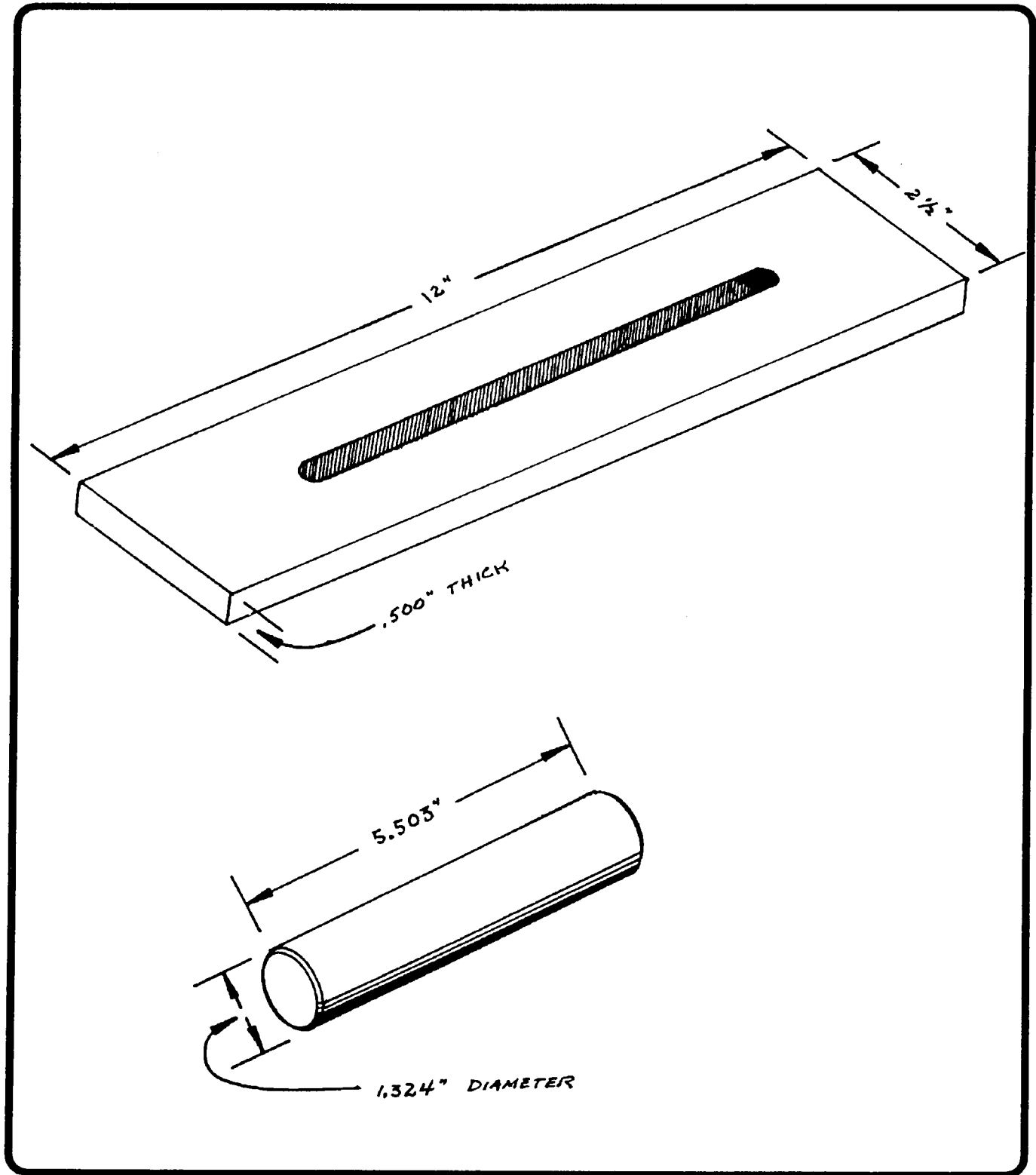
During overhaul, the overdrive piston retainer must be removed to replace the case gasket and check the screen and orifice assembly. The gasket cutting procedure just described is for in the car repairs only.

A-998/A500 Automatic (LoadFlite)	Ft. Lbs.	N-m		Ft. Lbs.	N-m
Cooler Line Fitting	155*	18	Neutral Starter Switch	25	34
Converter Drive Plate to			Oil Pan Bolt	150*	17
Crankshaft Bolt	55	75	Oil Pump Housing to		
Converter Drive Plate to Torque			Transmission Case Bolt	175	20
Converter Bolt	270*	31	Output Shaft Support Bolt	150*	17
Extension Housing to			Pressure Test Take-Off Plug	120*	14
Transmission Case Bolt	32	43	Reaction Shaft Support to Oil		
Extension Housing to Insulator			Pump Bolt	175*	20
Mounting Bolt	50	68	Reverse Band Adjusting		
Governor Body to Support Bolt	95	11	Screw Locknut	25	34
Kickdown Band Adjusting			Speedometer Drive Clamp Screw ...	100*	11
Screw Locknut	30	41	Transmission to Engine Bolt	30	41
Kickdown Lever Shaft Plug	150*	17	Valve Body Screw	35*	4
Lock-up Solenoid Wiring			Valve Body to Transmission		
Connector	150*	17	Case Bolt	105*	12
	*Inch Pounds			*Inch Pounds	

A500 - 518 CLUTCH PACK IDENTIFICATION CHART

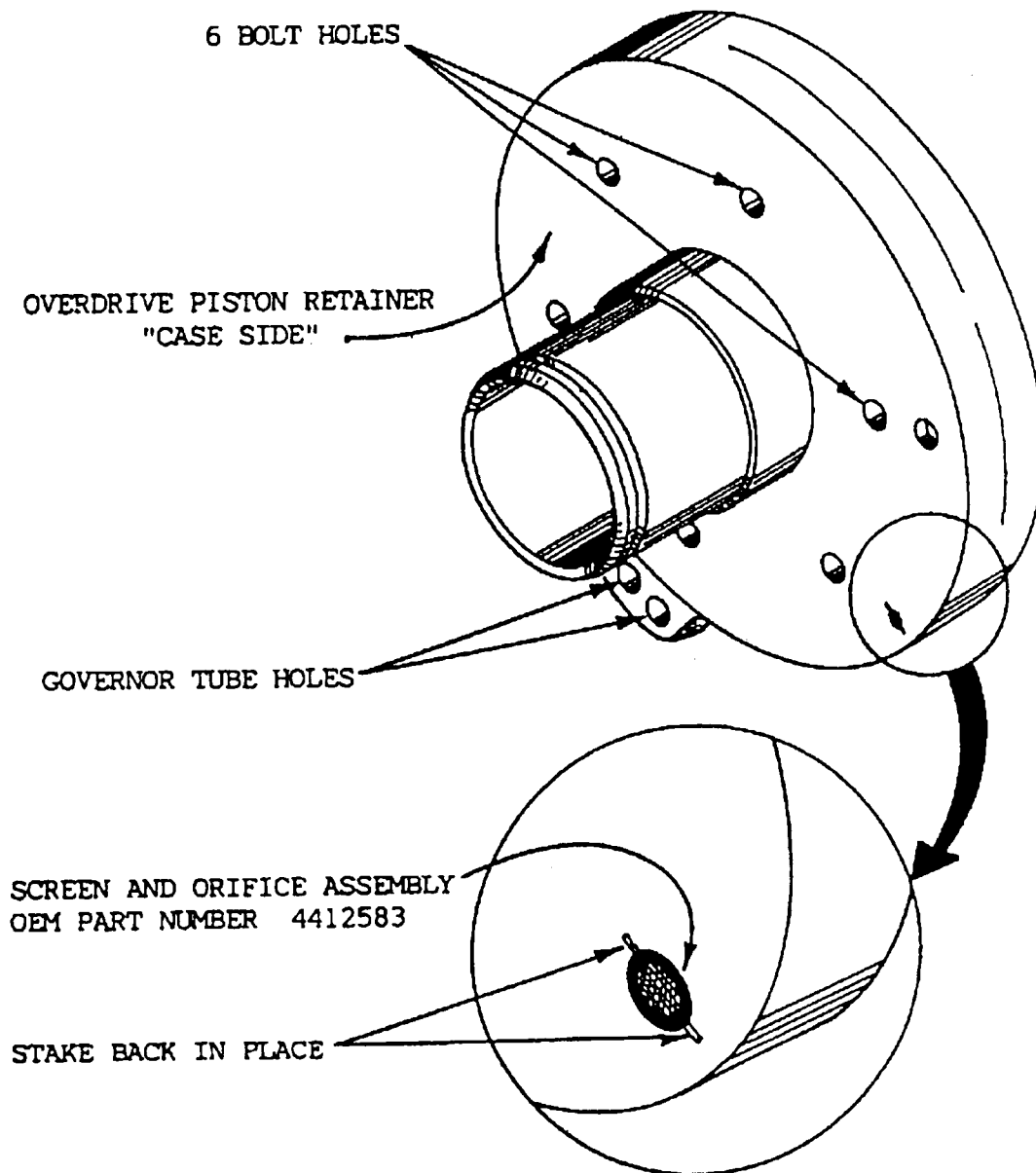
TRANSMISSION	LINED	STEEL	MEASUREMENT
A500 (40RH) 3.9L	5	4	.485
A500 (42RH) 5.2L	6	5	.350
A518 (46RH)	8	7	.100





AUTOMATIC TRANSMISSION SERVICE GROUP

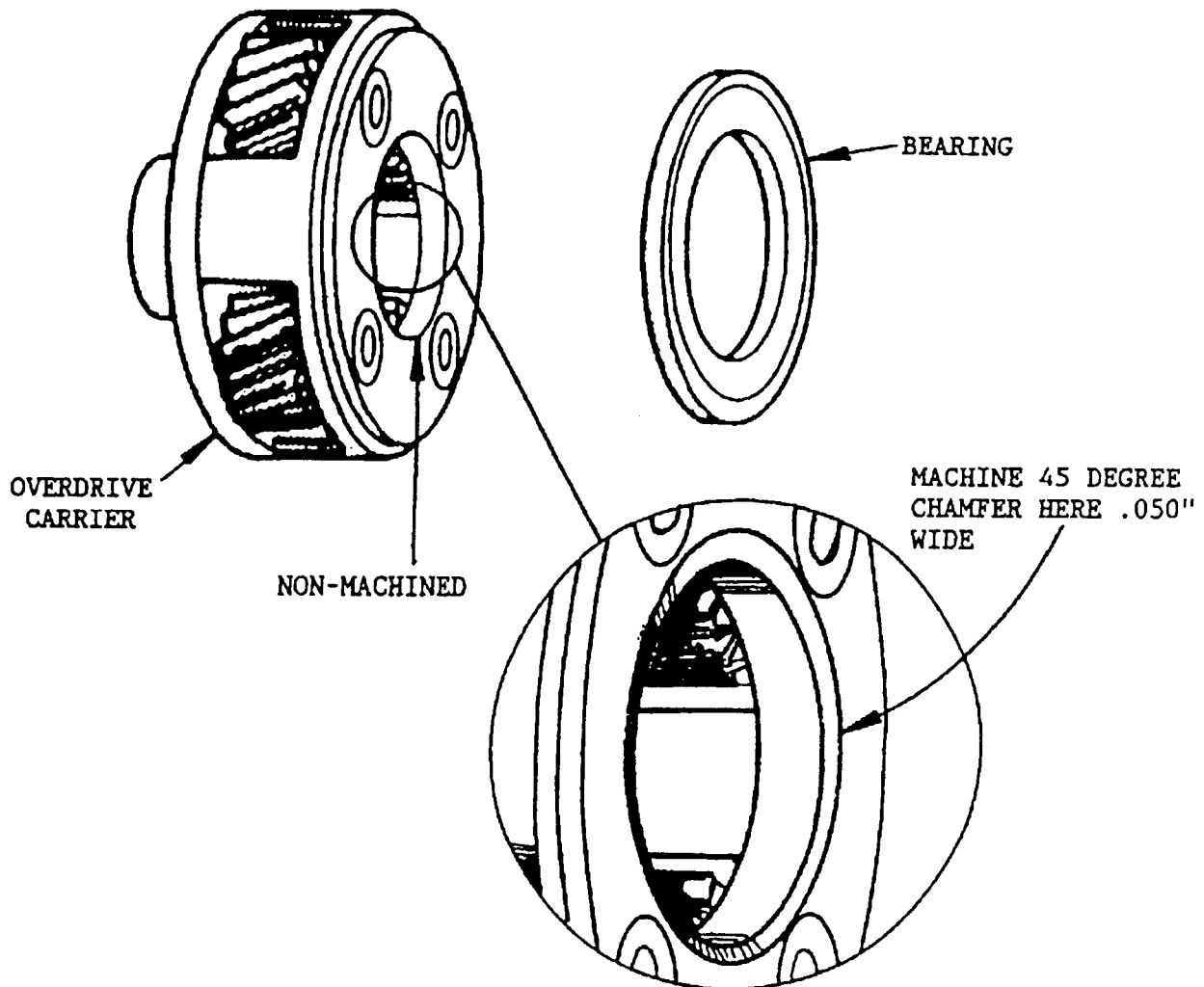
A500 OVERDRIVE PISTON RETAINER



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CHRYSLER A500 PREMATURE O.D. CARRIER FAILURE

- COMPLAINT:** Premature failure of the overdrive carrier and bearing. The bearing is actually destroyed first and the bearing takes out the overdrive carrier.
- CAUSE:** The cause is lack of lube to the overdrive carrier bearing.
- CORRECTION:** Replace the bearing and carrier. BEFORE installing the new carrier, machine a chamfer on the inside diameter that is .050" wide as shown in figure below. This will provide more lube oil for the carrier bearing.





NP 231 Transfer Case

GENERAL INFORMATION

The NP231 is a part-time transfer case with a built-in low-range reduction gear system. It has three operating ranges plus a Neutral position. The low-range system provides a 2.72:1 gear reduction ratio for increased low-speed torque capability.

The NP231 has three operating ranges which are: Two-wheel-drive high, four-wheel-drive high and four-wheel-drive low. The four-wheel-drive operating ranges are undifferentiated.

Two-wheel-drive range is used for on-road, highway operation. The four-wheel-drive ranges are for off-road operation or when the vehicle is driven on paved road surfaces covered by snow, ice or similar low-traction elements.

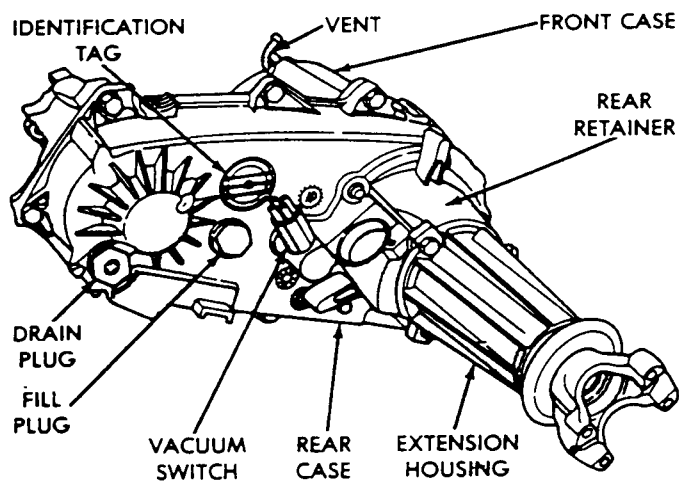


Fig. 1—NP231 Transfer Case

Identification

A circular identification tag (Fig. 1) is attached to the rear case of each Model 231 transfer case. The identification tag provides the transfer case model number, assembly number, serial number, and low-range ratio.

The transfer case serial number also represents the date of build. For example, a serial number of 10-7-88 would represent October 7, 1988.

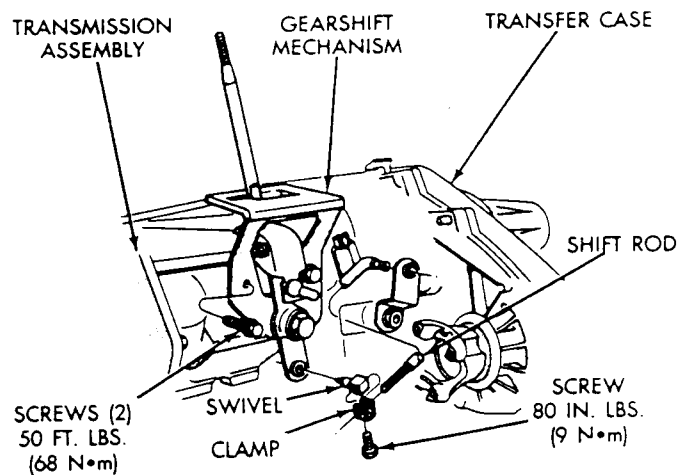


Fig. 2—Transfer Case Controls

Transfer case operating ranges are selected with a floor-mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable linkage rod (Fig. 2). A straight line shift pattern is used. Range positions are marked on the gearshift lever knob.

A synchronizer assembly in the transfer case allows the unit to be shifted between the two- and four-wheel-high ranges while the vehicle is in motion.

Linkage Adjustment

- (1) Place the shift lever in the 4H position.
- (2) Remove the screws attaching the shift lever boot to the floorpan. Slide the boot upward to provide access to the shift gate.
- (3) Insert a 3 mm (1/8 in.) spacer between the shift lever and the forward edge of the shift lever gate. Secure the lever and spacer in position.
- (4) Loosen adjusting link enough to allow linkage rod to slide freely in the link.
- (5) Move the transfer case range lever to the 4H position.
- (6) Position linkage rod so it is a "free" fit in range lever. Then tighten the setscrew, in adjusting link, securely.

(7) Remove the spacer from the shift gate and install the shift lever boot.

LUBRICATION

The NP231 transfer case lubricant should be changed at the intervals specified in the Maintenance Schedule. When adding lubricant to or

refilling the transfer case after service, use MOPAR ATF PLUS (type 7176) or DEXRON II automatic transmission fluid. Do not use any type of antifriction type additives or similar substance. Use the specified oil only. Refer to the Service-In-Vehicle section for lubricant change procedures and fill level. NP231 transfer case lubricant capacity is 2.5 pints (1.2 liters).

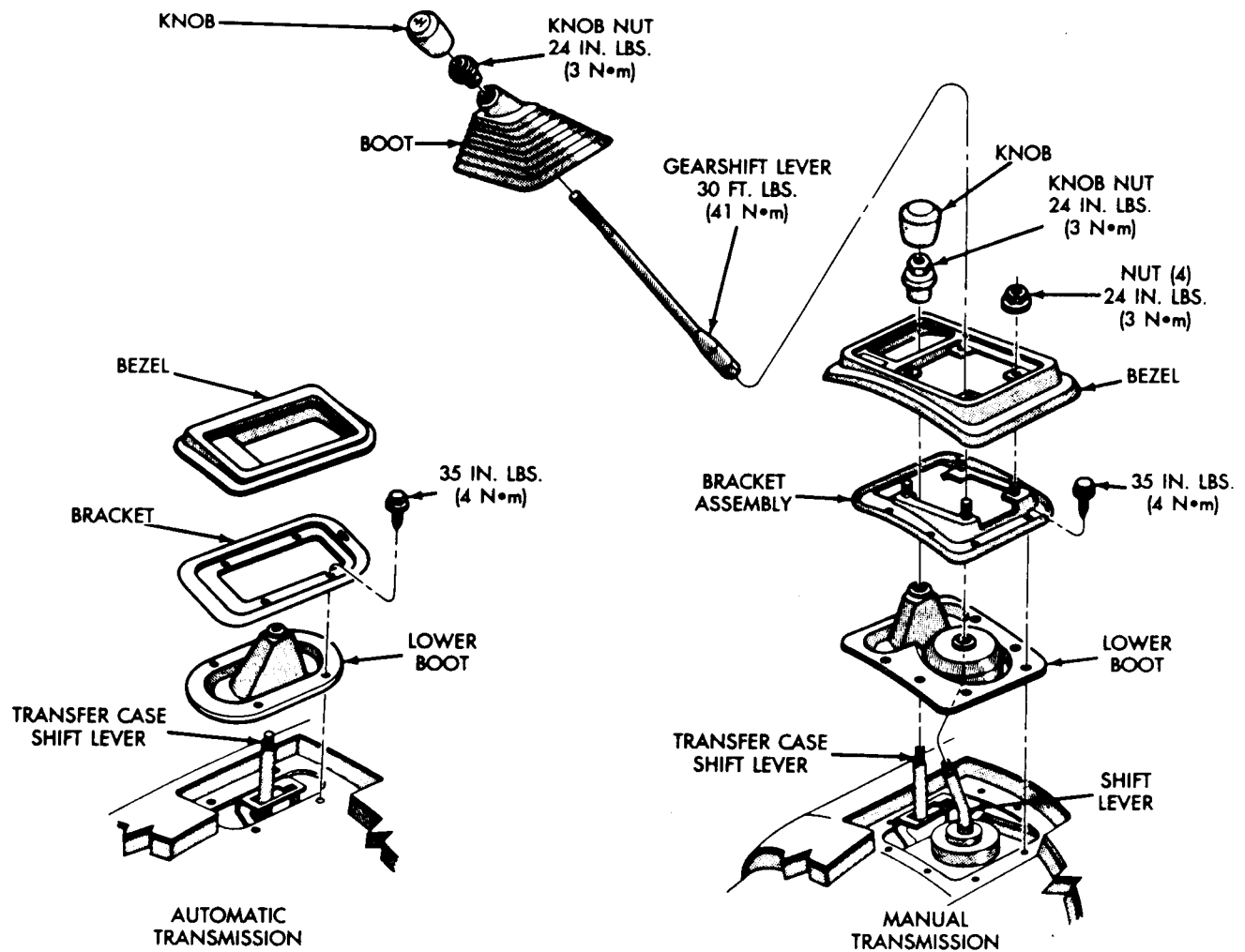


Fig. 3—Shift Linkage



SERVICE DIAGNOSIS

Before attempting to repair a suspected transfer case malfunction, check all other driveline components beforehand. The actual cause of a problem may be related to such items as the front axle disconnect, axles, propeller shafts, wheels and tires, transmission, or clutch instead. If all other driveline components are in good condition and operating properly, refer to the Service Diagnosis chart for further information.

SERVICE IN VEHICLE

Changing Lubricant

- (1) Raise vehicle.
- (2) Position drain pan under transfer case.
- (3) Remove drain and fill plugs and drain lubricant completely.
- (4) Install drain plug. Tighten plug to 35 ft. lbs. (47 N·m).
- (5) Remove drain pan.
- (6) Fill transfer case to bottom edge of fill plug opening with MOPAR ATF PLUS (type 7176) or DEXRON II automatic transmission fluid.
- (7) Install fill plug. Tighten plug to 35 ft. lbs. (47 N·m).
- (8) Lower vehicle.

Speedometer Gear, Shaft Seal, Rear Bearing and Retainer Replacement

The front and rear output shaft seals, extension, rear retainer and bearing, and speedometer drive gear can all be serviced with the transfer case in the vehicle. The following combined procedure outlines removal and installation of these components:

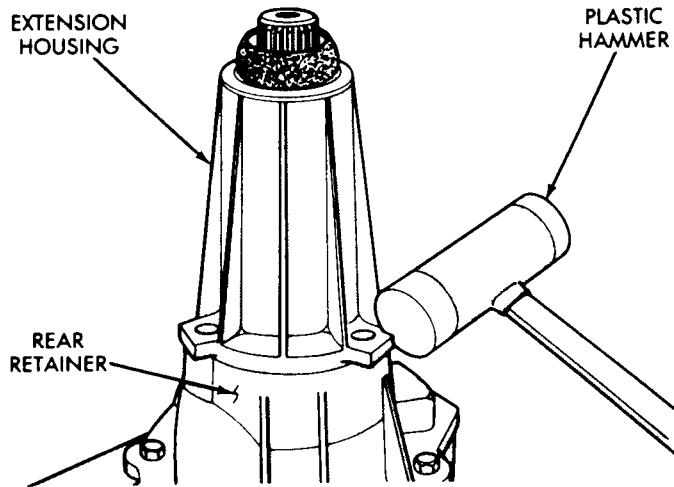


Fig. 1—Remove Extension Housing

Removal

- (1) Raise vehicle.
- (2) Remove fill and drain plugs and drain oil from transfer case.
- (3) Mark propeller shaft and transfer case yoke for assembly alignment reference.
- (4) Disconnect propeller shaft. Secure shaft to the underside of vehicle.
- (5) Remove extension seal (if seal or bushing is to be replaced) using suitable tool.
- (6) Install a new seal, if old seal was removed.
- (7) Remove extension housing (Fig. 1).
- (8) Remove speedometer gear from rear retainer.
- (9) Mark rear retainer for assembly alignment reference.
- (10) Remove retainer attaching bolts and remove retainer. Pry retainer with screwdrivers to remove it (Fig. 3).

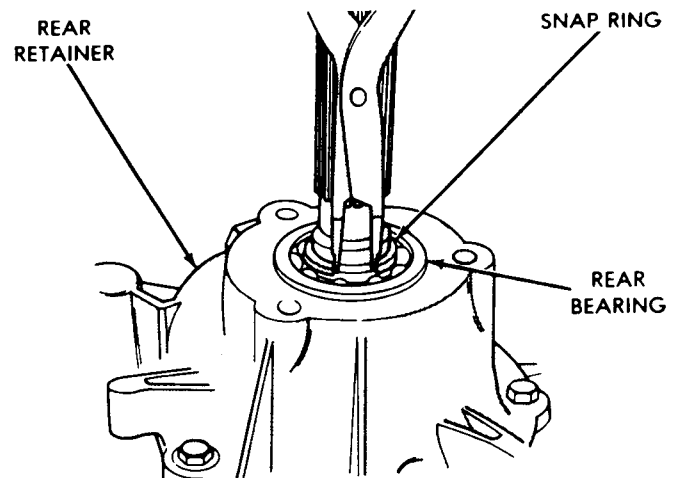


Fig. 2—Remove Snap Ring

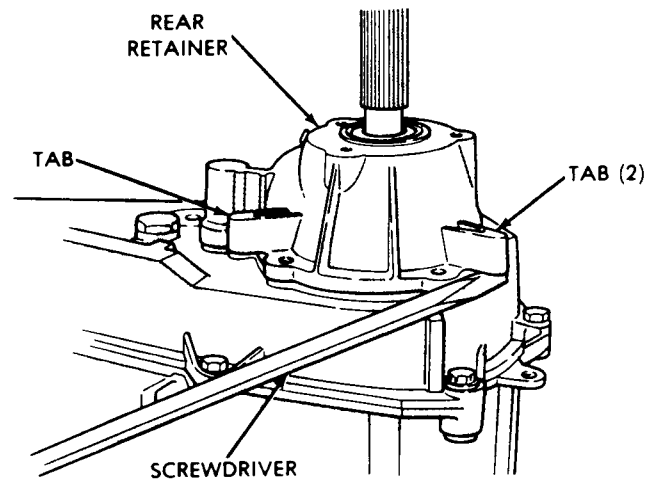


Fig. 3—Remove Rear Retainer



Technical Service Information

- (11) Completely clean off old RTV sealant.
- (12) If the retainer or bearing are to be replaced, remove bearing retaining snap ring from rear retainer and remove bearing (See "Extension Housing" at end of this group).

Installation

- (1) Install rear output bearing in rear retainer.
- (2) Apply a 1/8 inch bead of RTV sealant or equivalent to mating surface of rear retainer.
- (3) Align retainer case reference marks and install rear retainer on case.
- (4) Install and tighten rear retainer attaching bolts to 18 ft. lbs. (24 N·m).

- (5) Install output shaft seal (if required).
- (6) Install speedometer driven gear.
- (7) Install drain plug. Tighten plug to 35 ft. lbs. (47 N·m).
- (8) Install extension using a bead of RTV sealant. Tighten bolts to 22 ft. lbs. (30 N·m).
- (9) Fill transfer case to edge of fill plug opening with MOPAR ATF PLUS (type 7176) or DEXRON II automatic transmission fluid.
- (10) Install fill plug. Tighten plug to 35 ft. lbs. (47 N·m).
- (11) Install propellor shaft. Tighten clamp strap bolts to 170 in. lbs. (19 N·m).
- (12) Lower vehicle.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	(a) Vehicle speed too great to permit shifting. (b) If vehicle was operated for extended period in 4H mode on dry paved surface, driveline torque load may cause difficulty. (c) Transfer case external shift linkage binding. (d) Insufficient or incorrect lubricant. (e) Internal components binding, worn or damaged.	(a) Stop vehicle and shift into desired range. Or reduce speed to 3-4 km/h (2-3 mph) before attempting to shift. (b) Stop vehicle, shift transmission to neutral, shift transfer case to 2H mode and operate vehicle on 2H on dry paved surfaces. (c) Lubricate, repair or replace linkage, or tighten loose components as necessary. (d) Drain and refill to edge of fill hole with MOPAR ATF PLUS (Type 7176) or DEXRON II Automatic Transmission Fluid. (e) Disassemble unit and replace worn or damaged components as necessary.
TRANSFER CASE NOISY IN ALL DRIVE MODES	(a) Insufficient or incorrect lubricant.	(a) Drain and refill to edge of fill hole with MOPAR ATF PLUS (Type 7176) or DEXRON II Automatic Transmission Fluid. Check for leaks and repair if necessary. If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise.
NOISY IN—OR JUMPS OUT OF FOUR-WHEEL-DRIVE LOW RANGE	(a) Transfer case not completely engaged in 4L position. (b) Shift linkage loose or binding. (c) Range fork cracked, inserts worn, or fork is binding on shift rail.	(a) Stop vehicle, shift transfer case to Neutral, then shift back into 4L position. (b) Tighten, lubricate, or repair linkage as necessary. (c) Disassemble unit and repair as necessary.
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	(a) Transfer case overfilled. (b) Vent closed or restricted. (c) Output shaft seals damaged or installed correctly.	(a) Drain to correct level. (b) Clear or replace vent if necessary. (c) Replace seals. Be sure seal lip faces interior of case when installed. Also be sure yoke seal surfaces are not scored or nicked. Remove scores and nicks with fine sandpaper or replace yoke(s) if necessary.
ABNORMAL TIRE WEAR	(a) Extended operation on dry hard surface (paved) roads in 4H range.	(a) Operate in 2H on hard surface (paved) roads.



TRANSFER CASE REMOVAL

- (1) Raise vehicle.
- (2) Drain lubricant from transfer case.
- (3) Mark transfer case and propeller shafts for assembly alignment reference.
- (4) Disconnect speedometer cable and vacuum switch hoses.
- (5) Disconnect shift lever link from operating lever.
- (6) Place support stand under transmission and remove rear crossmember.
- (7) Disconnect front and rear propeller shafts at transfer case yokes. Secure shafts to frame rails with wire. **DO not allow shafts to hang.**
- (8) Remove transfer case-to-transmission nuts.
- (9) Move transfer case assembly rearward until free of transmission output shaft and remove assembly.

TRANSFER CASE INSTALLATION

(1) Apply Permatex No. 3 sealer, or equivalent to both sides of transfer case-to-transmission gasket and position gasket on transmission.

(2) Align and install transfer case assembly on transmission. Be sure transfer case input gear splines are aligned with transmission output shaft. Align splines by rotating transfer case rear output shaft yoke if necessary.

Do not install any transfer case attaching nuts until the transfer case is completely seated against the transmission.

(3) Align and install transfer case attaching nuts. Tighten nuts to 35 ft. lbs. (47 N·m).

(4) Install rear crossmember and remove transmission support stand.

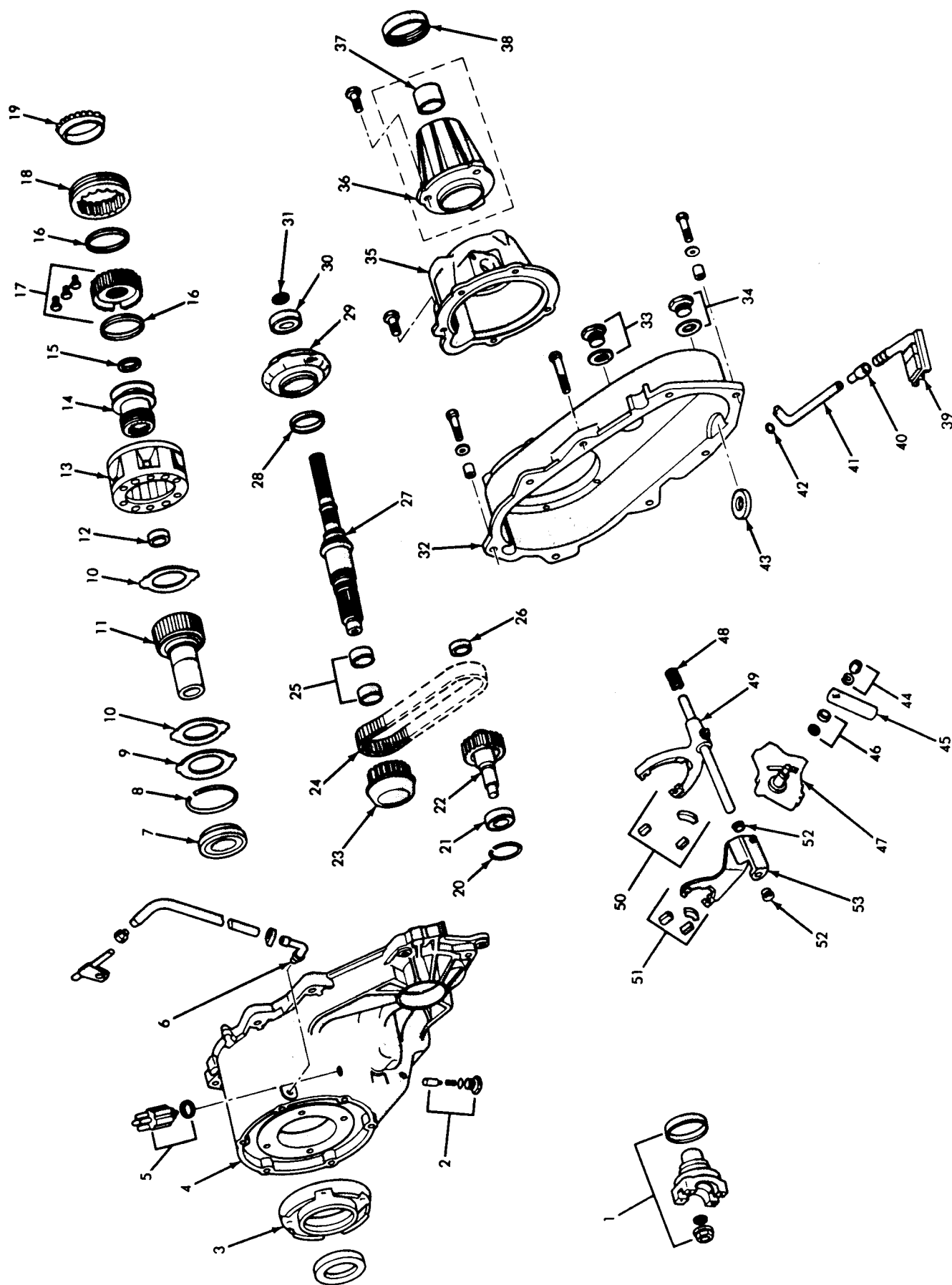
(5) Align and connect propeller shafts.

(6) Connect speedometer cable and vacuum switch hoses.

(7) Connect shift lever to operating lever. Tighten locknut to 90 in. lbs. (10 N·m).

(8) Fill transfer case with MOPAR ATF PLUS (type 7176) or DEXRON II type oil.

(9) Lower vehicle.



LEGEND FOR NP231 TRANSFER CASE

- | | | |
|--|--------------------------------|--------------------------------|
| 1. Front yoke nut, seal washer, yoke, and oil seal | 18. Synchronizer sleeve | 36. Extension housing |
| 2. Shift detent plug, spring, and pin | 19. Synchronizer stop ring | 37. Bushing |
| 3. Front retainer and seal | 20. Snap ring | 38. Oil seal |
| 4. Front case | 21. Output shaft front bearing | 39. Oil pickup screen |
| 5. Vacuum switch and seal | 22. Output shaft (front) | 40. Tube connector |
| 6. Vent assembly | 23. Drive sprocket | 41. Oil pickup tube |
| 7. Input gear bearing and snap ring | 24. Drive chain | 42. Pickup tube O-ring |
| 8. Low range gear snap ring | 25. Drive sprocket bearings | 43. Magnet |
| 9. Input gear retainer | 26. Output shaft rear bearing | 44. Range lever nut and washer |
| 10. Low range gear thrust washers | 27. Mainshaft | 45. Range lever |
| 11. Input gear | 28. Oil seal | 46. O-ring and seal |
| 12. Input gear pilot bearing | 29. Oil pump assembly | 47. Sector |
| 13. Low range gear | 30. Rear bearing | 48. Mode spring |
| 14. Range fork shift hub | 31. Snap ring | 49. Mode fork |
| 15. Synchronizer hub snap ring | 32. Rear case | 50. Mode fork inserts |
| 16. Synchronizer hub springs | 33. Fill plug and gasket | 51. Range fork inserts |
| 17. Synchronizer hub and inserts | 34. Drain plug and gasket | 52. Range fork bushings |
| | 35. Rear retainer | 53. Range fork |

DISASSEMBLY AND ASSEMBLY

(1) Disassemble transfer case in the following sequence as shown:

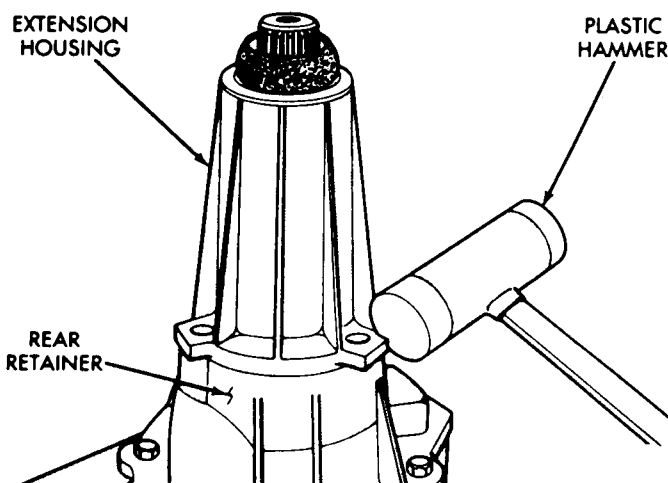


Fig. 1—Extension Housing

Apply a 1/8 inch bead of RTV sealant to extension housing for gasket

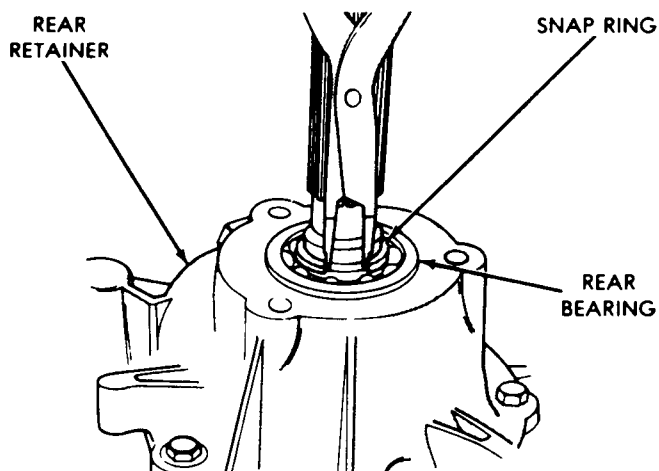


Fig. 2—Ball Bearing Snap Ring

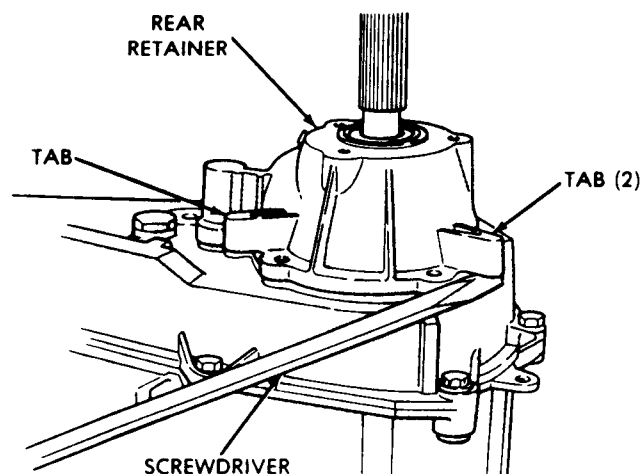


Fig. 3—Rear Retainer

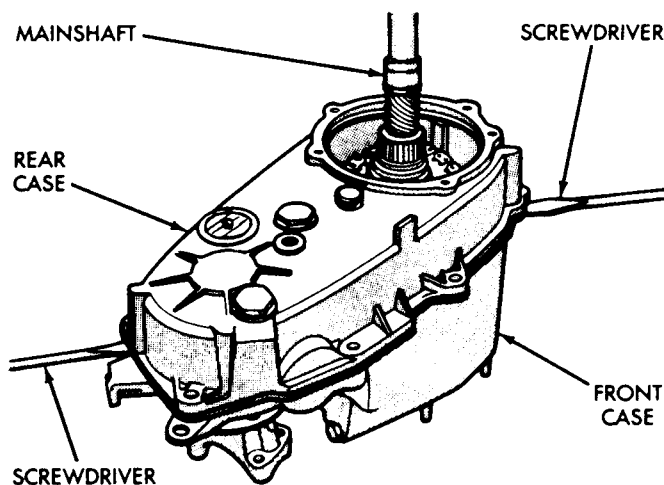


Fig. 4—Pry Rear Case

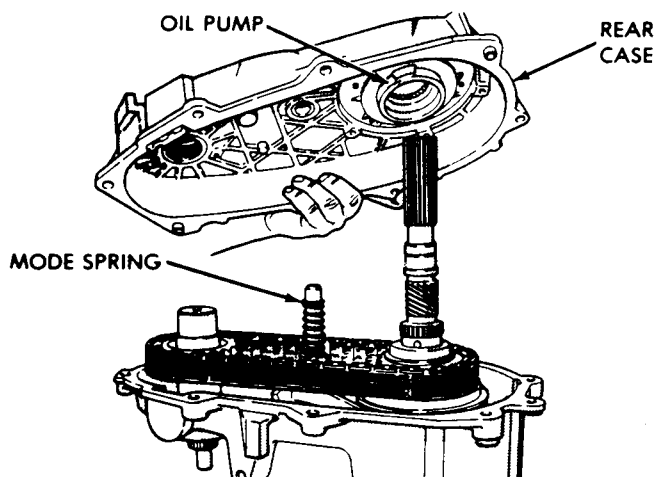


Fig. 5—Rear Case

Apply a 1/8 inch bead of RTV sealant to rear retainer for gasket.

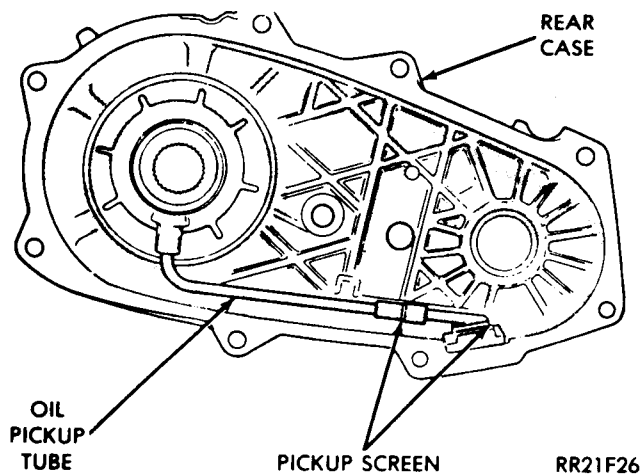


Fig. 6—Oil Pump and Pickup Tube

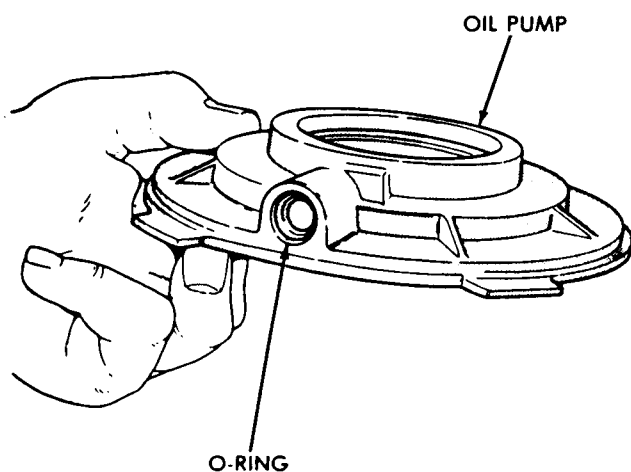


Fig. 7—Oil Pump Tube O-ring

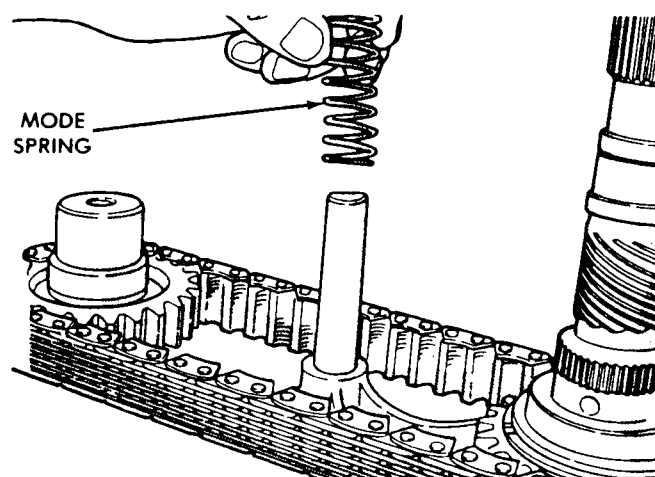


Fig. 8—Mode Spring

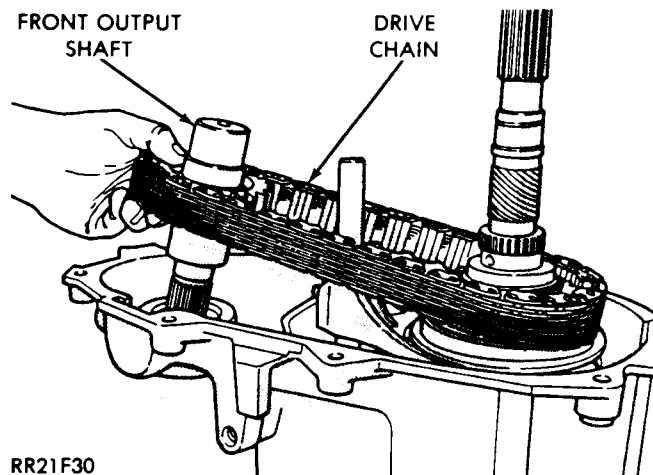


Fig. 9—Drive Chain

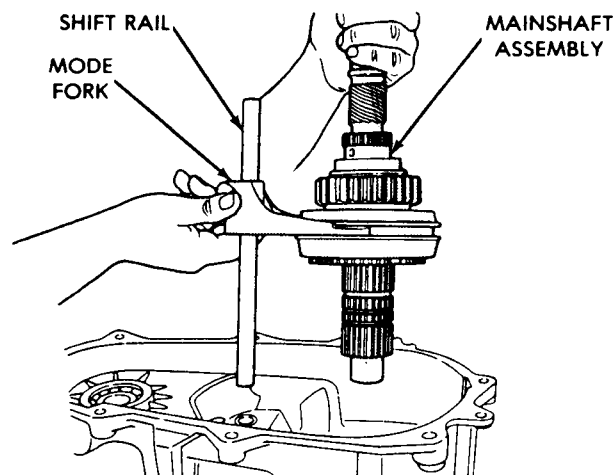


Fig. 10—Mainshaft Assembly

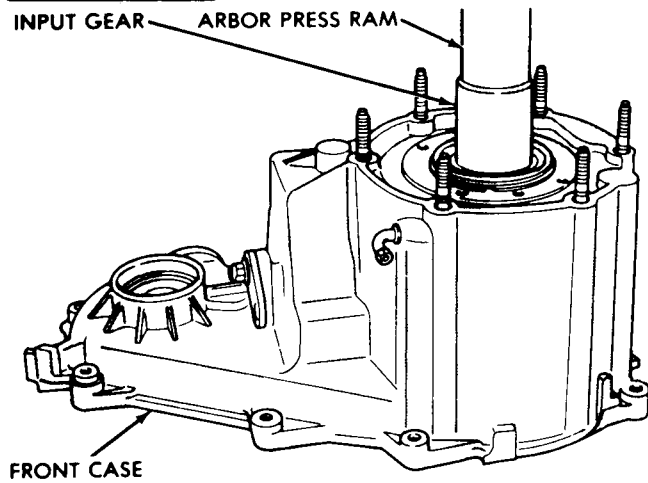


Fig. 11—Remove Input Gear

To assemble, reverse the above procedure.

SUBASSEMBLY OVERHAUL

Input Gear

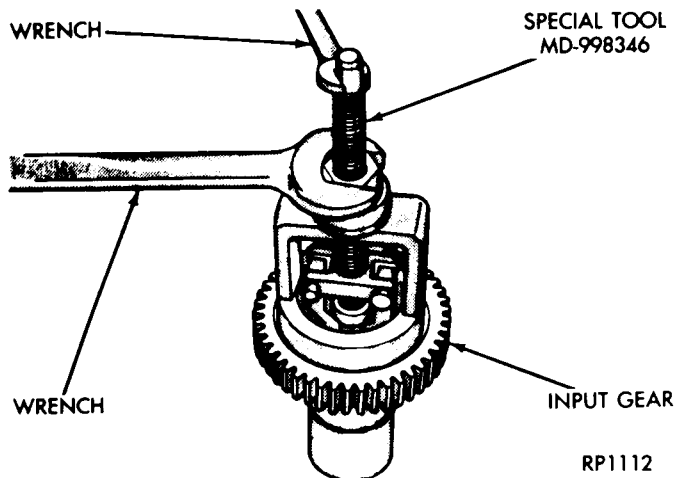


Fig. 1—Remove Mainshaft Pilot Bearing

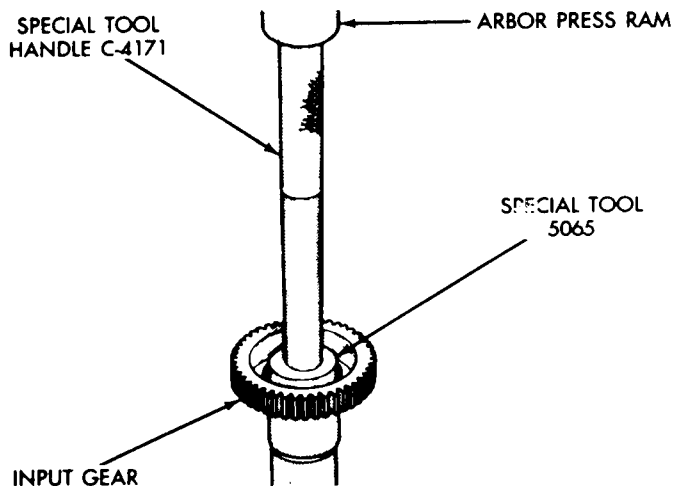


Fig. 2—Install Mainshaft Pilot Bearing

Mainshaft Assembly

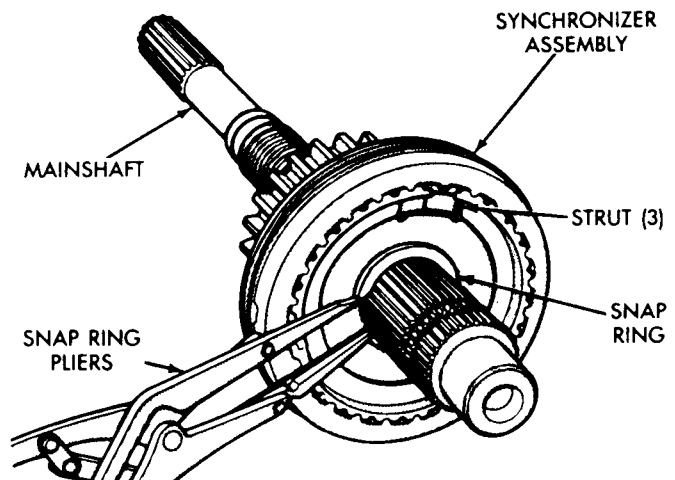


Fig. 1—Synchronizer Snap Ring

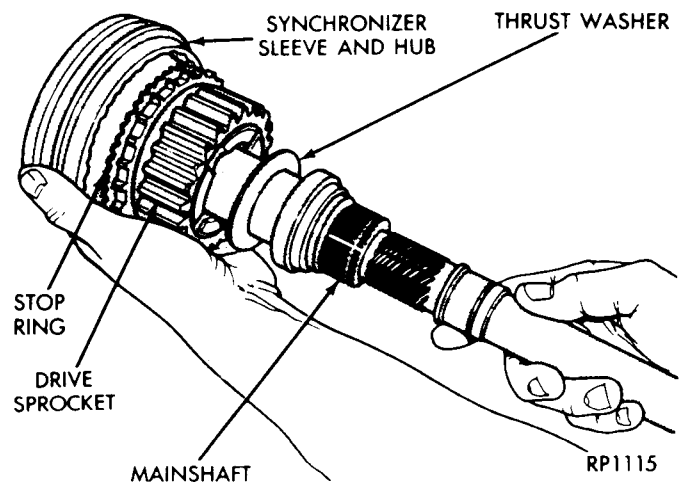


Fig. 2—Synchronizer Assembly and Drive Sprocket

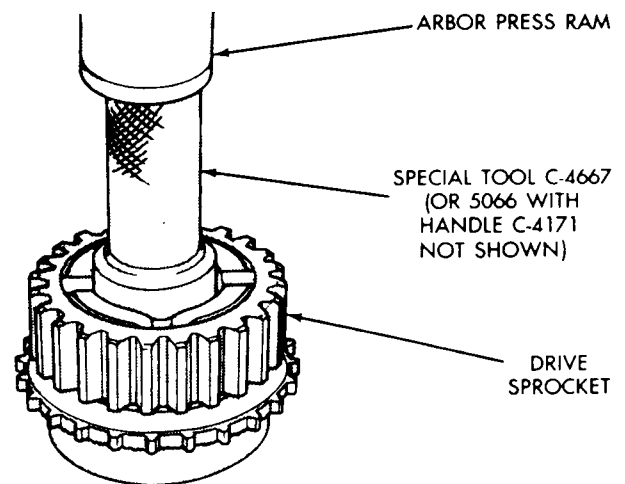


Fig. 3—Remove Both Drive Sprocket Bearings

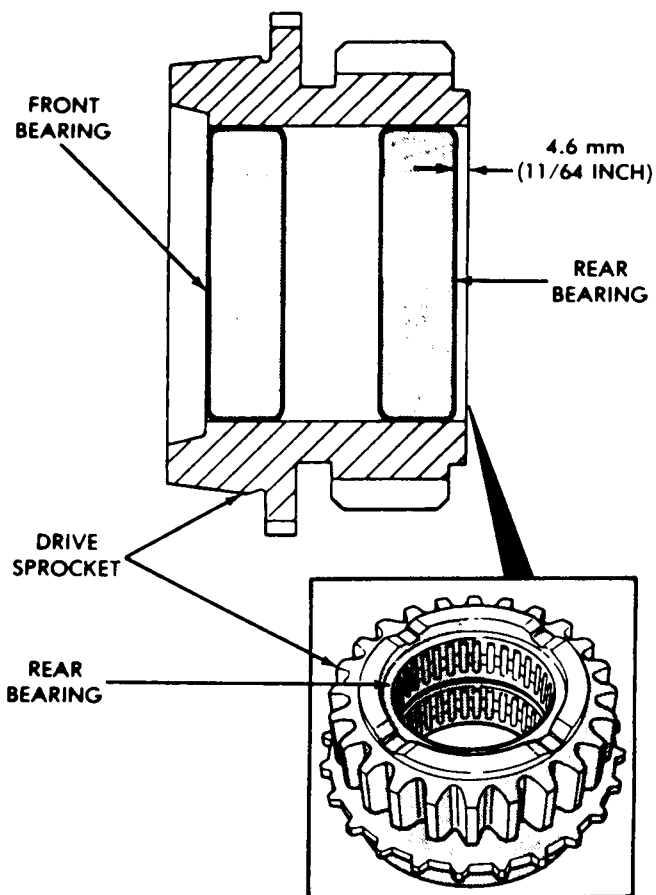


Fig. 4—Front and Rear Bearing Position

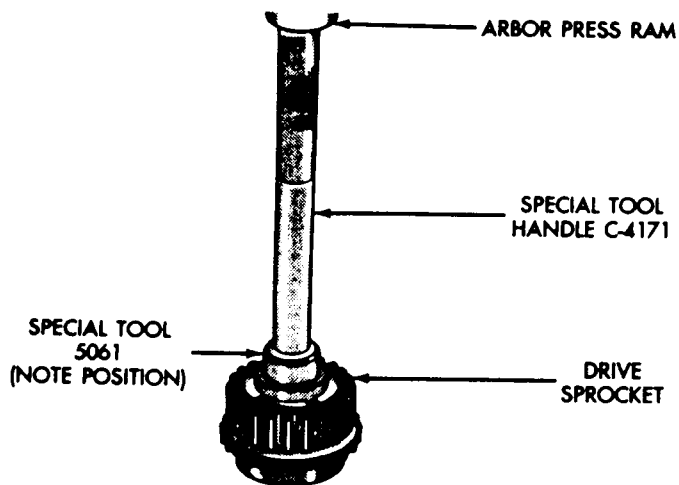


Fig. 5—Install Front Bearing

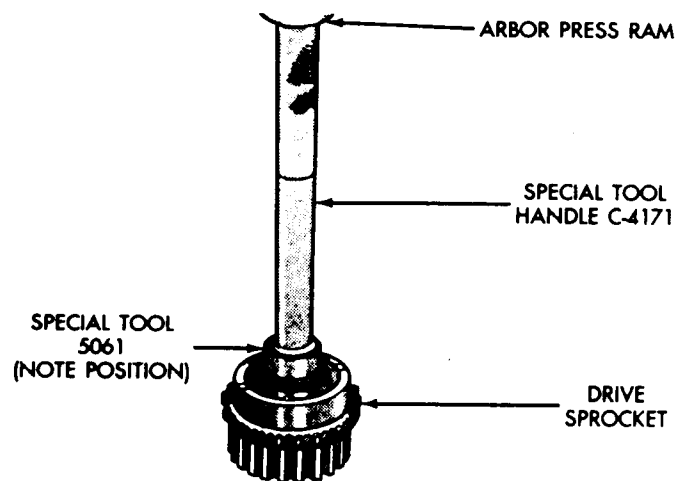


Fig. 6—Install Rear Bearing

Front Case

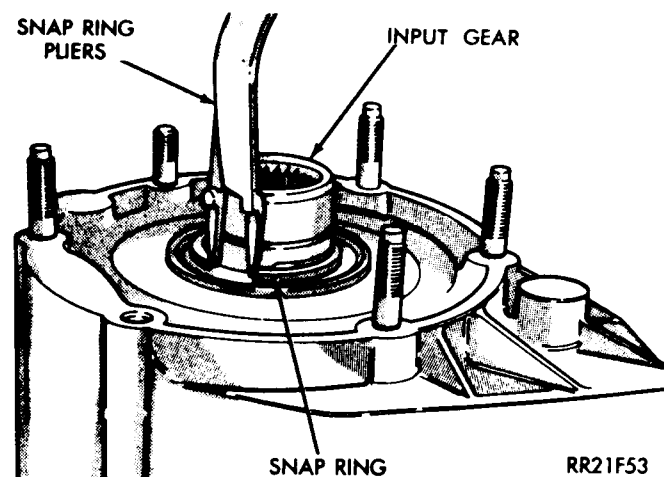


Fig. 1—Input Gear Snap Ring

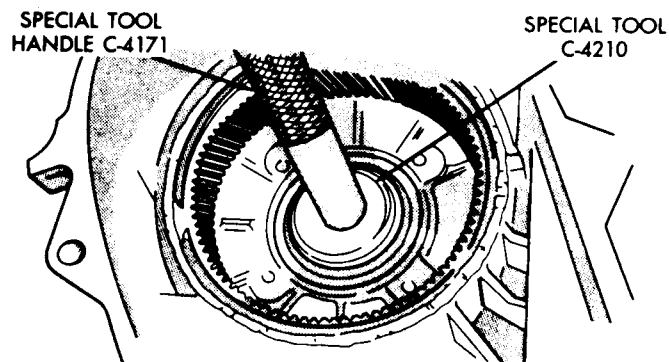


Fig. 2—Remove or Install Input Gear Bearing

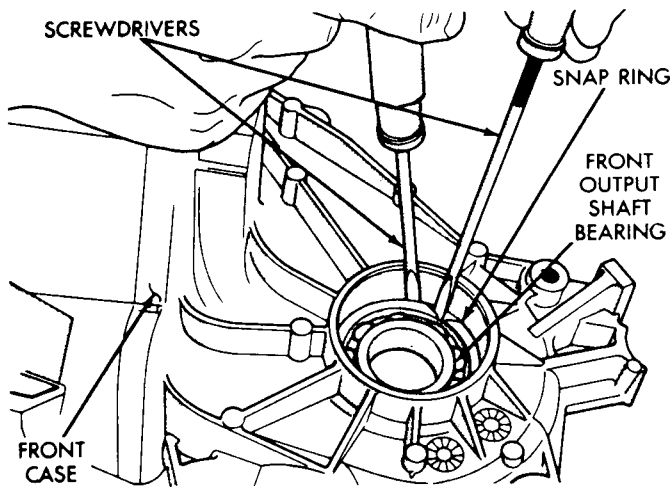


Fig. 3—Front Output Shaft Bearing Snap Ring

Remove front output shaft ball bearing using a suitable tool.

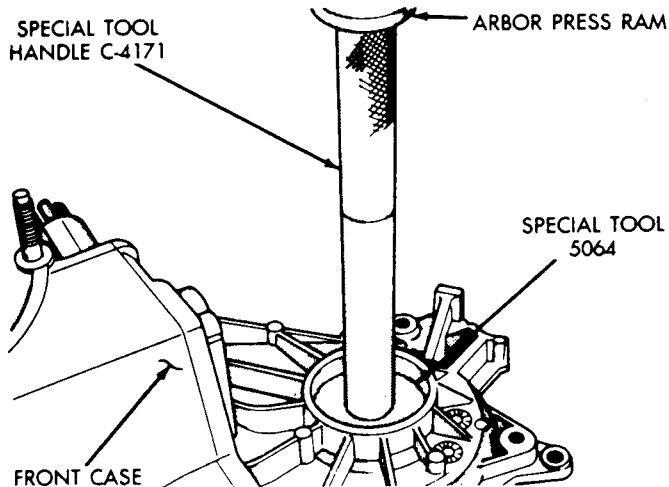


Fig. 4—Install Front Output Shaft Bearing

Install snap ring. Be sure snap ring is seated in its groove.

Rear Case

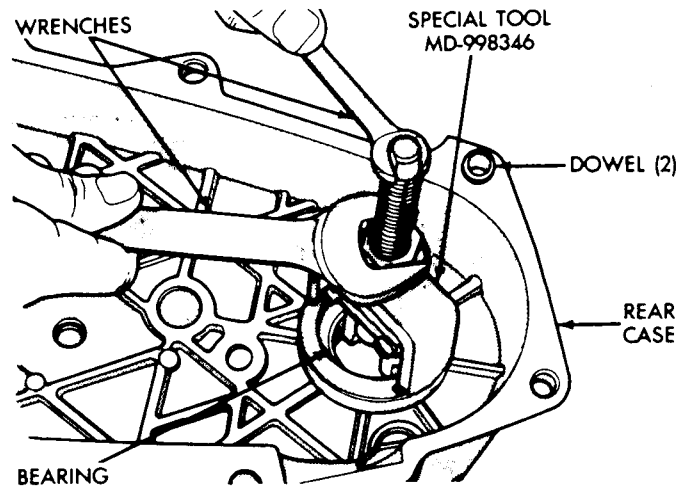


Fig. 1—Remove Front Output Shaft Rear Bearing

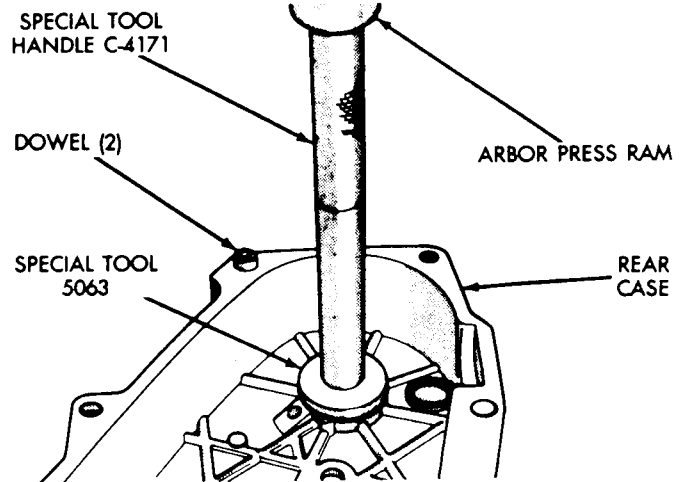


Fig. 2—Install Front Output Shaft Rear Bearing

Rear Retainer

Remove mainshaft rear bearing using a suitable tool.

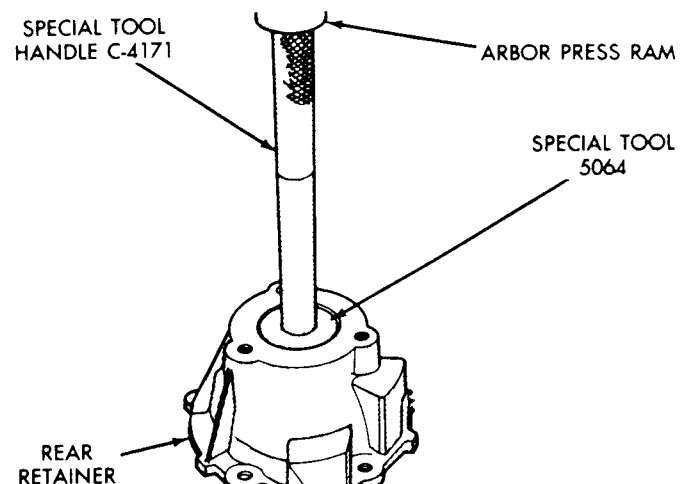


Fig. 1—Install Mainshaft Rear Bearing

Extension Housing

Remove extension housing seal using a suitable tool.

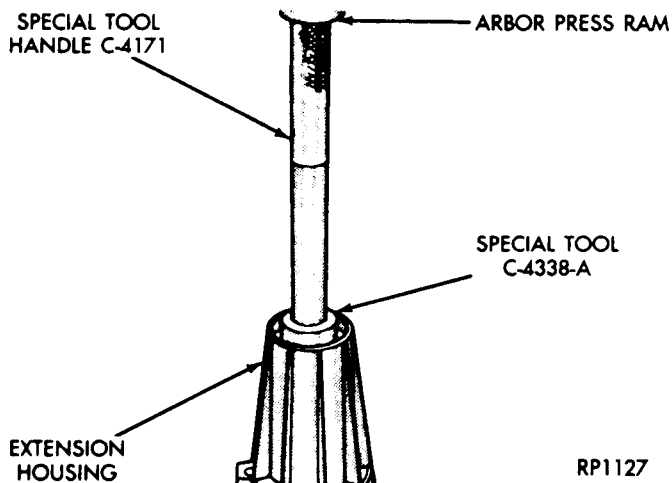


Fig. 1—Remove Extension Bushing

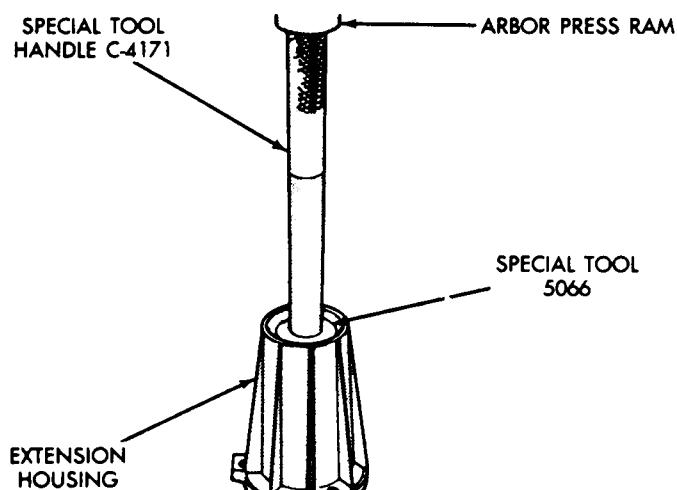


Fig. 2—Install Extension Bushing

Install extension housing seal using a suitable tool.

CLEANING AND INSPECTION

Wash all parts thoroughly in clean solvent. Be sure all old lubricant, RTV sealant, metallic particles, dirt, or foreign material are removed from the surfaces of every part. Apply compressed air to each oil feed port and channel in each case half to remove any obstructions or cleaning solvent residue.

Inspect spline teeth on synchronizer sleeve, hub, and stop ring. If there is evidence of chipping or excessively worn teeth, install new parts at reassembly. Be sure clutch sleeve slides easily on the clutch hub.

Synchronizer springs should be in place with the tang inside the cavity of one strut and should not show signs of interference with the polished gear cone or inside diameters of the clutch hub.

Inspect stop ring for cracks and wear. If ring is cracked or shows signs of extreme wear on threaded bore, install new ring at reassembly. Test new rings for good fit on cone with minimum wobble. Check synchronizer struts for wear or breakage.

Inspect all gear teeth for signs of excessive wear or damage and check all gear splines for burrs, nicks, wear or damage. Remove minor nicks or scratches on oil stone. Replace any part exhibiting excessive wear or damage.

Inspect all snap rings and thrust washers for evidence of excessive wear, distortion or damage. Replace any of these parts if they exhibit these conditions.

Inspect the two case halves for cracks, porosity, damaged mating surfaces, stripped bolt threads, or distortion. Replace any part that exhibits these conditions.

Inspect the condition of all needle, roller, ball, and thrust bearings in the front and rear case halves and the input gear. Also check the condition of the bearing bores in both cases and in the input gear, rear output shaft, side gear, and rear retainer. Replace any part that exhibits signs of excessive wear or damage. If the case or input gear bearings require replacement, refer to Bearing Replacement in the Subassembly Overhaul section.



Technical Service Information

SPECIFICATIONS

NP2500 OVERDRIVE 5-SPEED

Gear Ratio:	
First	3.79
Second	2.29
Third	1.48
Fourth	1.00
Overdrive	0.79
Reverse	3.90
Gear Type	Helical
Tolerances:	
Clutch Housing Face Squareness	.006 inch Max.
Clutch Housing Bore Runout	.008 inch Max.
Countershaft Gear End Play	.001 to .005 inch
Lubricant—Capacity:	
U.S. Pints	4
Metric Liters	1.9
Type	SAE 10W-30 Engine Oil

LOADFLITE TRANSMISSION

Transmission Model:	A-998		A-500	
TYPE	Automatic 3-Speed		Automatic 4-Speed Overdrive	
TORQUE CONVERTER DIAMETER (Standard)	10-3/4 inches		10-3/4 inches	
	U.S.A. Measure	Metric Measure	U.S.A. Measure	Metric Measure
OIL CAPACITY—TRANSMISSION AND TORQUE CONVERTER	17.1 pts.	8.1 Liter	20.4 pts.	9.6 Liter
Use "MOPAR ATF PLUS" (Automatic Transmission Fluid) Type 7176				
COOLING METHOD	Water-Heat Exchanger Pump (Gear Type)			
LUBRICATION	First	Second	Third	Reverse
GEAR RATIOS:	2.74	1.54	1 to 1	2.21
PUMP CLEARANCES:				Overdrive
Outer Gear to Case Bore				0.69 to 1
End Clearance—Gears				
GEAR TRAIN END PLAY				.0035 to .0075 inch
INPUT SHAFT END PLAY				.0004 to .0025 inch
SNAP RINGS:				.005 to .048 inch
Rear Clutch Snap Ring				.022 to .091 inch
(Selective)				
Output Shaft (Forward End)				.060 to .062 inch
				.068 to .070 inch
				.076 to .078 inch
				.098 to .100 inch
				.040 to .044 inch
				.062 to .066 inch
				.082 to .086 inch
CLUTCH PLATE CLEARANCE:				
Front Clutch				5 Disc. .075 to .152 inch
Rear Clutch				4 Disc .032 to .055 inch
CLUTCHES:				
Number of Front Clutch Discs	5			5
Number of Rear Clutch Discs	4			4
Number of Direct Clutch Discs	—			5
Number of Overdrive Clutch Discs	—			3
BAND ADJUSTMENTS:				
Kickdown (Front) Turns*	2-1/2			2-1/2
Low-Reverse (Internal) Turns*	4			4

*Backed off from 72 inch-pounds (8 N·m).



Technical Service Information

THRUST WASHERS:

A-998/A-500

Reaction Shaft Support	
Thrust Washer	#1 .061 to .063 inch
Rear Clutch Retainer	
Thrust Washer	#2 .061 to .063 inch
Input Shaft Thrust Plate	.024 to .026 inch
Output Shaft	
Thrust Washer	#3 Selective .052 to .054 inch (Tin) .068 to .070 inch (Red) .083 to .086 inch (Green)
Front Annulus	
Thrust Washer	#4 .121 to .125 inch
Front Carrier (To Annulus)	
Thrust Washer	#5 .048 to .050 inch
Front Carrier (To Drive Shell)	
Thrust Washer	#6 .048 to .050 inch
Sun Gear Drive Shell	
Thrust Plate	#7 .050 to .052 inch #8 .050 to .052 inch
Rear Carrier (To Drive Shell)	
Thrust Washer	#9 .048 to .050 inch
Rear Carrier (To Annulus)	
Thrust Washer	#10 .048 to .050 inch

NP231 TRANSFER CASE

Transfer Case Type	Dual-range, part-time 4-wheel-drive unit with integral low range.	Drive positions and shift controls	2H, 4H, 4L, Neutral—Ranges selected via floor-mounted shift lever.
Torque Transmittal Mode	Drive sprocket and output shaft driven by interconnecting drive chain.	Case Configuration	Two-piece aluminum casting with removable extension and rear retainer.
Low Range and Reduction Ratio and Mode	2.72:1 through annulus gear and planetary carrier assembly.	Lubricant Capacity and Type	2.5 pints (1.2 liters) MOPAR ATF PLUS (type 7176) or DEXRON II oil.

NP231 Transfer Case

	Ft. Lbs.	N·m
Bolt, Yoke to Front prop. shaft	25	34
Nut, Front Yoke	110	149
Vacuum Switch	20	27
Nut, Linkage adjusting	7	9
Bolt, Front Case-to-Rear Case	22	30
Bolt, Rear Retainer	22	30
Bolt, Extension Housing	22	30
Plug, Drain/Fill	35	47
Nut, Transfer Case-to-Adapter	35	47
Screw, Shift Popet	15	20
Shift Sector Nut	22	30
U-Joint Clamp Strap Bolts	14	19