

# TECUMSEH

## TECHNICIAN'S HANDBOOK

This manual covers all Peerless® Gear models as follows:  
Right Angle and T Drives (P-91), 100, 600, 601, 700, 800, 801,  
820, 900, 910, 915, 920, 930, 940, 1000, 1100, 1200, 1300, 1800,  
2300, 2400, 2500, 2600, 2800, MST, VST.

# TECUMSEH / PEERLESS MOTION DRIVE SYSTEM

TRANSMISSIONS / TR  
DIFFERENTIALS / RIGI



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**NOTE:** The VST Series is not addressed in this issue with the exception of the brake.

# CHAPTER 1.

## SECTION 1. MODEL OVERVIEW AND TERMS USED

### A. TECUMSEH / PEERLESS UNITS

#### 1. GENERAL

Tecumseh/Peerless makes power transmission gear drives for use in all types of lawn and garden equipment.

#### 2. IDENTIFICATION OF MODELS

Since acquisition by Tecumseh Products Co. in 1964, all Peerless assemblies have a model number identification tag, or stamping. On units containing axles (transaxles, or reduction gear and differential units) the identification should be visible by viewing the case/cover unit from below and behind as it is mounted in the driven equipment. If the area is dirt or oil covered, however, some cleaning may be necessary. Write down any numbers found in locations pointed out, then compare with the Master Parts Manual Div. 8 index. For right angle and "T" drives, the identification number is stamped into the housing under the input shaft boss opposite the cover. On transmissions the identification number is stamped on the cover back of the output drive sprocket. On the 100 series differential, the number is stamped either on cast housing diameter or on the housing end near axle bushing.

#### 3. TRANSAXLES

A combination of transmission and differential axle are in one compact unit. Peerless transaxles are manufactured in many different gear ratio combinations and from 1 to 7 forward speeds with one reverse.

**A. 600 Series.** The 600 series is a lightweight unit usually used in riding mower or similar application. The 600 series has a vertical input shaft at the top of the case. The case is aluminum, contributing to a considerable weight saving. Variations in the series (which determines the specific model number such as 603, 603A, 609, etc.) includes:

1. Shift lever shape.
2. Axle lengths.
3. Axle machining for wheel hub attachment.
4. Axle housing variations.
5. Size of the brake shaft.

There may be other slight differences, however, these are present as a result of product improvement which are not options to an O.E.M. (Original Equipment Manufacturer).

**B. 800 Series.** This unit has 3 to 6 speeds forward and 1 reverse. The bearings are oil impregnated bushings with needle bearings or ball bearings on axles, input and output shaft.

**C. 820 Series.** This unit is a heavy duty unit with 2 to 6 speeds forward and 1 reverse which can be used with ground engagement attachments. Sleeved needle bearings are used in place of oil impregnated bushings on all shaft ends and ball bearings are standard on axles.

**D. 900 Series.** The unit is like the 800 series transaxle except that the 900 can be 2, 3, or 4 speeds forward and 1 reverse.

**E. 910 Series.** This transaxle will offer a forward and reverse unit. The speed will change with the use of a vari-drive pulley arrangement.

**F. 915 Series.** This unit has 3 to 5 speeds forward and 1 reverse. This unit has a gear driven reverse instead of chain driven and the case is sculpted around the gears.

**G. 920 Series.** This series of 900 transaxle offers 3 to 7 speeds forward and 1 reverse.

**H. 930 Series.** This unit has 3 to 7 speeds forward and 1 reverse. The transaxle is very similar to the 920 series except for the differential and shifter/brake shaft.

**I. The MST Series, (Manual Shift Transaxle)** 200 is a sealed unit which uses 16 oz. of 80W90 gear lube (part #730229A). The MST series is available with up to 6 speeds forward and one reverse. It has a sculptured case and cover.

**J. VST/1800 Series.** This transaxle incorporates a hydrostatic pump and motor built into the unit. The prefix letters stand for Variable Speed Transaxle (VST). This unit contains two separate oil reservoirs, one for the pump and motor containing airless synthetic oil and the other contains EP90 gear oil for the differential gears. This unit sealed for life and not serviceable at this time.

**K. 1200 Series.** The distinguishing feature of the 1200 series transaxles is that the axle support housings are pressed from the inside of the case and cover, therefore, are not readily removable until the unit is completely disassembled. The casing is cast iron for rugged, longtime wear.

- L. **2300 Series.** Generally similar to the 1200 series transaxle. The distinguishing features are a more massive casing, and a larger shift lever opening machined area. The obvious difference from the standpoint of application is that these units have four speeds forward and will be found on equipment that can be used with ground engagement operations.

**NOTE: The transaxles described in paragraphs K and L, are fairly similar in appearance, but do have specific recognizable characteristics. Both these units have cast iron bodies for rugged application, although the 2300 series is the only unit that can be used in ground engaging equipment applications.**

### 3. REDUCTION GEAR AND DIFFERENTIAL UNITS

#### GENERAL

These units do not have a transmission function characteristic of transaxles, but rather, are units to reduce input speed and torque to a suitable axle speed and torque. The hydrostatic units which match to these units perform the transmission function.

- a. **1300 Series.** This unit is the hydrostatic counterpart of the three-speed forward unit (1200). It has an aluminum casing and pressed through axle support housings, characteristic of the 1200 series. The hydrostatic unit is of Eaton manufacture and is not serviced by Tecumseh Service Dealers.
- b. **2400, 2500 & 2600 Series.** This series of hydrostatically driven reduction gear and differential units can be used in ground engaging operations such as plowing. The hydrostatic unit is manufactured by Sundstrand Corp. in LaSalle, Ill.

### 3. TRANSMISSIONS

These units as manufactured by Peerless consist of the shifting mechanism to take a constant input shaft speed and reduce it to the desired output speed. The differential or axle unit is connected through a chain drive.

- a. **700 Series.** This unit can be 3, 4 or 5 speeds forward and 1 reverse. The brake system can be mounted on either side of the unit.
- b. **700 "H" Series.** This unit is built with almost all interchangeable parts with in it's two cases except that this will be a "H" shift pattern. This unit has 3 or 4 speeds forward and 1 reverse.
- c. **2800 Series.** This unit is built to work on the 2600 series. It is used as a P.T.O. transmission to run external equipment.

### 4. DIFFERENTIALS

The only self contained differential/axle unit built by Peerless is the 100 series. It features hardened axle shafts of various length and machined for various methods of hub attachment. The case is cast

aluminum and the differential gears are sintered metal or cut steel. The differential pin is held in place by the four retaining capscrews. Oil Lite bushings reduce friction during differential operation. The drive sprocket is part of the unit, which depending upon application, can be in any of several diameters in size, thus having a different number of gear teeth. This sprocket is often supplied by the O.E.M.

### 5. ANGLE DRIVES

These units are used primarily to change the direction of drive at the point where the working equipment attaches.

They can be assembled for right or left hand rotation so that they can be used in various combinations for synchronous operation.

- a. **Right Angle Drive.** These units consist of input shafts, output shafts, and the beveled gearing necessary to change the direction of power transmission at right angles. By positioning the drive bevel gear on the input shaft nearest the input end, opposite rotation will be attained from that of switching the beveled gear around to the side away from the input end of the shaft.

Casing and bearings are identical. A cover identifies each unit as being either a left hand (LH) or a right hand (RH) right angle drive.

- b. **"T" Drives.** The "T" drive is essentially the same as the right angle drive except that the input shaft extends out the other side of the case to transmit power in the same line to additional right angle drives or other equipment.
- c. **Shafts, Couplings, Pulleys, etc.** These items are part of the total transmission unit and are used to connect angle drives, and other attachments. The serrated couplings match the serrations on the shafts of the angle drives or on connecting shafts.

### 6. TERMS USED

**AXLE** - The shaft which connects the wheel or hub to the differential unit and transmits force back to the wheels. Sometimes axle refers to the differential and axle combination as in the term TRANSAXLE.

**AXLE HOUSING (or AXLE SUPPORT)** - An extension of the case and cover to support the outer ends of the axles. Because the housing is visible, it is often the best means of distinguishing the series in question.

**BEARING BLOCK (Strip)** - Used to support the ring gear of the differential.

**BEVEL** (on a gear - different from bevel gear) - Roundness of the meshing sides of gear teeth allow easy shifting. Because this is about the only allowance made to make easier shifting, the unit should be stopped before the shift to keep these spur gears from getting chewed up.

**BEVEL GEAR** - A gear with teeth ground on a diagonal so that when it meshes with a second bevel gear, power is transmitted at an angle. If the angle is 90°, the gear is known as a MITER GEAR.

**BEVEL PINION** - The smaller of two meshed bevel gears in a gear train.

**BRAKE (or BRAKESHAFT)** - The shaft on a Peerless unit (Transaxles and Transmission) to which a braking system may be attached. It is in the gear train with the differential to stop it when the operator "brakes". It is usually larger in diameter than the input shaft due to its function of taking shock loads experienced in braking.

**CASE** - That part of the unit "casing half" which contains the shift lever and input shaft openings. The other "half" is the COVER because the reassembly must be done into one or the other depending upon the series.

**CHAMFER** - Diagonal milling at the corners of gear teeth to remove sharp edges. The usual reason for chamfer is to eliminate the possibility of hardened gears chewing softer metal.

**COUNTERSHAFT** - Splined shaft which holds gears that are in constant mesh with shift gears and transfer power flow from input to shift gears.

**COUPLING** - A sleeve to connect two serrated shafts in the same axial plane. Used in right angle drive systems or in connecting the hydrostatic drive to the input shaft on 2400 series transaxles.

**COVER** - That part of the unit "casing half" which contains the brake shaft opening (except the 600 series in which all openings are in the CASE as described in CASE above). The case and the cover switch sides depending upon whether the transaxle is right or left hand drive.

**DIFFERENTIAL GEAR BOLTS** - Through bolts holding the differential parts together. The heads of these bolts must be opposite the output shaft gear (except in the 2400 series). This is an early check to see that the unit is being assembled correctly.

**DOWEL PIN** - Alignment pin is used to align the case and cover and other parts in a transmission or transaxle. The dowel should be tapped in to hold the parts in alignment before tightening the retaining screws. Failure to install dowel pins first will usually lead to a unit that binds after assembly.

**DUO-TRAK\* DIFFERENTIAL (\*Trademark -Illinois Tool Works)** - A type of differential which increases torque to the tractive wheel to keep it turning, however in situations where differentiation is necessary (as in turning) the unit acts much like a regular differential.

**EQUIPMENT** - The complete assembly (riding mower, tractor, etc.) is built by a manufacturer, a part of which is the Peerless unit. A check of the equipment manual is recommended prior to servicing the Peerless unit.

**HEAD ASSEMBLY** - A complete unit containing all parts of one right angle or "T" drive assembly of a right angle drive system. The head assembly is permanently lubricated and sealed.

**IDENTIFICATION NUMBER** - See **MODEL NUMBER**

**IDLER** - A gear used in a gear train to transfer motion or direction. The gear rotates independently of the shaft upon which it is located.

**INPUT OR INPUT SHAFT** - The part of a Peerless unit which is always connected to the drive. Its rotational speed is dependent on the driving mechanism. All parts of the input system are always in mesh with input shaft and turn whenever it turns.

**LIMITED SLIP DIFFERENTIAL** - See **DUO-TRAK\* DIFFERENTIAL**.

**MITER GEAR** - One of a pair of interchangeable bevel gears with axles at right angles. Since all bevel gears are miter gears in Peerless units, the terms can be the same.

**MODEL NUMBER** - The identifying number of a Peerless unit which will permit selection of the proper parts to repair that unit.

**NEUTRAL SPACER** - Single or split collar between forward gears and reverse that shift keys engage when unit is in neutral.

**OIL SEAL, DOUBLE LIP** - An oil seal with two sealing surfaces to prevent entrance of foreign matter, and leakage of lubricant.

**OIL SEAL, QUAD RING** - A seal with two external and two internal sealing lips. Used in the shifter housing.

**OIL SEAL, SINGLE LIP** - An oil seal with one sealing surface to either prevent entrance of foreign matter or prevent leakage of lubricant.

**OUTPUT, OR OUTPUT SHAFT** - On a transaxle, the shaft that contains the output pinion which is in direct mesh with and drives the differential. In a transmission, the exposed shaft which contains the sprocket for driving the axles. The output shaft is driven by the large **OUTPUT GEAR**.

**OUTPUT SHAFT GEAR** - The importance of defining this gear is to point out that it must be opposite the differential bolts in Peerless units (except the 2400 series). The output gear assembles into transaxle cover.

**PEERLESS UNIT OR UNITS** - The complete Peerless assembly which is part of the **EQUIPMENT**. The Peerless unit is that assembly being described.

**REDUCTION GEAR AND DIFFERENTIAL UNIT** - A Peerless unit that reduces a high RPM input speed to a suitable axle speed without the use of a transmission. Since there is a single gear train, there is a single input speed to output speed ratio, however, axle speeds are infinite, depending upon input speed.

**REVERSE IDLER (915 Series)** - Gear between reverse gear of countershaft and reverse gear of shifter/brake shaft that allows unit to operate in opposite direction.

**REVERSE IDLER** - A gear added to the gear train so when in mesh, reverses the direction of all gears driven after it. Its number of teeth also affects the reverse gear ratio. The center gear of the three gear cluster always is in mesh with the **REVERSE IDLER**, and the large shifter gear always shifts into it.

**RIGHT ANGLE DRIVE** - Interchangeable with **HEAD ASSEMBLY**. The major operating parts are a pair of miter gears. A system consists of other right angle or "T" drive head assemblies and connecting hardware.

**SEAL** - A mechanism which stops leakage. It can be a rubber ring, as in an "O" ring or "Quad" ring, a sealing type ball bearing, or most commonly, a rubber-like sealing surface encased in a metal form.

**SEAL RETAINER** - Found on some models of transaxles and on right angle drives. The center of the retainer is bored to the size of the outer diameter of the seal. On transaxles the retainer acts to position the differential. In the casing on right angle drives, it acts as the end cap of the case and is secured with four capscrews.

**SHIFT COLLAR** - Round collar which retains shift keys onto the shifter/brake shaft. The shifter assembly pin (or pins) slide into the groove on the collar to activate the shift keys.

**SHIFT GEARS** - Gears on shifter/brake shaft that are in constant mesh with spur gears of counter shaft. The shift gear in which the shift keys engage determines the speed of a transaxle.

**SHIFT KEY** - One of either two or four metal spring steel keys, which are held in the keyways of the shifter/brake shaft, by a shift collar. The shift keys are used to slide through the shift gears and engage the desired gear or speed.

**SHIFT KEYWAY** - One of either two or four slots in the shifter/brake shaft for the shift keys to slide through for gear selection.

**SHIFT WASHER** - Washer on which one side has a 45° inner diameter chamfer or rounded inner diameter. Shift washers depress keys for shifting from one gear to another.

**SHIFTER ASSEMBLY** - Consists of shift rod, shift fan, shift arms and shift pin or pins.

**SHIFT LEVER** - The lever by which the operator manually changes the shifter gears to vary reduction speed ratios in the transmission. The configuration of the lever is variable and is often the only reason for a unit being given a new model number.

**SHIFTER FORK** - A mechanical arm which moves on rod to position the shifter gear at an exact spot axially along the shifter shaft.

**SHIFTER GEAR, LARGE** - This gear transmits 1st (low) and reverse (1st, 2nd and reverse in 4-speed units) gear ratio force to the output shaft. It is beveled on both sides.

**SHIFTER GEAR, SMALL** - This gear transmits 2nd and 3rd (3rd and 4th in a 4-speed unit) gear ratio force to the output shaft. It can have two different tooth diameters and be beveled on the outside of each, or it can have a beveled spline to engage 3rd (or 4th) gear through a splined shaft.

**SHIFTER HOUSING** - This housing contains the shift lever and must be reinstalled in the proper position to function correctly. If housing does not already have guide marks, scribe the shifter housing and transmission case before removal.

**SHIFTER ROD** - One of two similar smooth rods of equal length with grooves which match the fork position to meshed positions of the shifter gears and gears of the three gear cluster. Each rod has a snap ring to act as a fork stop, but can also be used to determine how the fork is assembled to it.

**SHIFTER SHAFT** - A splined shaft which meshes with the internal splines of the shifter gears, to transmit force to the output shaft gear.

**SHIFTER STOP** - A stamped metal plate which separates the shifter forks. The stop has a notch cut in it which corresponds to the neutral position on the shifter forks and rod. The shifter lever must return the engaged fork back to neutral before it can cross to actuate the other fork.

**SPROCKET** - A geared wheel designed to turn a link chain drive. Various numbers of teeth (hence, sprocket diameter) are available to change output ratios.

**SPUR GEAR** - A gear having the shaft bore and teeth in a parallel plane.

**"T" DRIVE** - A right angle drive with an input shaft extending thru the case to transmit power axially in a second direction to the right angle output. On "T" drive with dissimilar input and out end of the input shaft, care must be taken to insure that the parts do not run in reverse when reassembled.

**THREE GEAR CLUSTER** - A 3 gear assembly in mesh with the input shaft. The gears are of different sizes to change gear ratios when meshing with the two shifter gears.

**THRUSTER RACE** - A thrust washer in which the outer edge is cupped to fit the outer diameter of a thrust bearing. This fit positions the thrust race concentric with the axle diameter. It further acts as a thrust washer.

**THRUST WASHER** - A flat polished surface separating metals of different hardness. It also acts as a spacer between shafts and the case and cover.

**TRANSMISSION** - A system of varying sized gears in a case, some of which can be slid along a shaft to vary gear ratio in the gear train. The net effect is to change speeds to the rear wheel according to the type of work being done.

**UNIT** - See **PEERLESS UNIT**.

## 8. GENERAL SERVICING PROCEDURES

### 1. Introduction:

The following service procedures should be understood and practiced whenever service must be performed on a Peerless unit.

### 2. Before removal of unit from equipment, look for:

- a. Loose drive belts.
- b. Improperly adjusted or badly worn clutch.
- c. Loose or lost set screws and/or sheared keys in drive and driven pulleys.
- d. Oil saturated drive belts and clutches.
- e. Bad operating habits, such as clutch riding.
- f. Oil leaks. If found, refer to paragraph F.
- g. Any trouble, which might be pointed up by operating the unit and equipment, IF POSSIBLE.
- h. Review Service Bulletin 304.

### 3. Removal of the Peerless unit from the equipment:

- a. Jack up equipment so that transaxle is accessible. Use wood blocks to prevent equipment movement. Do not use bricks, cement or cinder blocks.
- b. Visually inspect Peerless unit for oil leaks, cracked housing, binding or rubbing of parts, or other symptoms of malfunction.
- c. Use a jack under the Peerless unit to support it's weight when attachments are removed.
- d. Remove wheels, drive belts, pulleys, chains and other associated equipment from Peerless unit. Be aware of positioning of parts. Scribe mark, if in doubt, to be able to reassemble parts quickly.
- e. If shifter lever will interfere with unit in any way, remove it before unit is removed.
- f. Remove attaching hardware holding Peerless unit to equipment at case, cover, axle supports, shifter or by other means.
- g. With Peerless unit free and supported, remove it from the area of equipment to the work bench.

### 4. Preparing for disassembly:

- a. Visually inspect for evidence of oil seepage, tampering, misalignment, freedom of rotating shafts, etc.
- b. Clean unit thoroughly of dirt, oil, debris.
- c. Remove shift housing and drain oil from unit. Observe oil to see if metal particles are present.
- d. Check axle shafts carefully for smoothness. Use a stone or suitable abrasive to rub down high spots and eliminate rust or paint.
- e. Check model number at appropriate spot. It is advisable to have the exploded parts view handy.

- f. Have seal sleeves, driver, tools, shop cloths and informational material at hand.

## 9. OIL LEAKS, SEAL AND GASKET SERVICE

Peerless units contain various styles and sizes of oil seals. The function of any oil seal can be:

1. To seal inward (single lip) to prevent lubricant leaks.
2. To seal outward (single lip) to prevent lubricant leaks.
3. To seal both inward and outward (double lip).

Some seals are spring loaded. That is a spring creates a positive light compressing action to insure that the seal lip will make a 100 contact around the shaft. All Peerless seals, seal on the inner diameter.

1. Other than leaking seals, gaskets and "O" rings, leakage can occur due to a cracked case or cover, flats on shafts, porosity (rarely, if ever), and worn bushings and shafts.
2. Single lip inward sealing can be salvaged by the use of the proper seal protector when pulling the seal over a shaft. Outward sealing seal (both single and double lip) must be replaced since there is no assurance that the initial sealing surface can be protected.
3. If you can't protect the sealing lip, replace the entire seal. The cost of the seal is small in comparison to a return repair due to reuse for seals.
4. Check seals for cracks, scuffs, cuts and distortion. Check seal areas for evidence of oil leak both at sealing surface and between metal-to-metal contact surface areas.
5. Some seals have a "Redicoat" sealant applied, while others may need a thin coat of this or a similar sealant.
6. The surface over which the seal lips must slide must be free of all cuts, scratches, high spots, or rust. The shafts should be smooth, shiny and a thin film of light oil applied. Sleeves should be used to clear keyways, splines, or other sharp edges machined into shafts.

## 10. TORQUE VALUES TROUBLE SHOOTING

1. All torque values must be applied. The torque value for any fastener will be found in the assembly instruction where that fastener is used. All torque specs. will be found in Section 4.
2. Overtightening can strip threads, compress the gasket excessively, and possibly cause binding.
3. Cross tightening sequence to half the torque then finally to full torque value.
4. Under tightening Oil leakage, loosening of attaching parts, and possible shifting of the internal parts causing complete failure.

5. Since all bolts are readily accessible there is no reason that a torque wrench cannot be used for all bolt and screw tightening.

## 11. TESTING

The absence of binding and oil leakage are the best indications that the unit has been properly reassembled. Though other, more elaborate tests can be done, this would be the prerogative of the servicing agency, since the following checks are considered adequate.

With the shift forks in neutral, rotate both axle ends in the same direction. They should turn smoothly although a little effort may be necessary. The brake shaft should rotate whenever the axles turn together, but in neutral, the input shaft should not turn. By moving any shifter gear into mesh, a greater drag should be felt on the axles, and both the input and brakshaft should turn. For ease in turning of the various shafts, insert a tool (such as a punch or a socket head screw key) into the keyway, however, do not force if shaft is binding. Reason for unit binding:

1. Re-used or lack of gasket.
2. Oil seal retainers installed backward.
3. Mis-installed thrust washers.
4. Differential installed backwards.
5. Mis-assembly of shifting parts.
6. Mis-placement of spacers.
7. Foreign matter blocking gear teeth mesh.
8. Shifter stop installed backwards.
9. Input shaft not completely in case.
10. Mis-alignment of case and cover. Align with dowels before tightening cap screws.

## SECTION 2. LUBRICATION CHART

Check the Peerless unit model number before filling with lubricant. There may be a difference in the quantity recommended. This is dictated by the design of the vehicle and the position of the Peerless unit in it.

TRANSAXLES		TRANSMISSIONS		RIGHT ANGLE AND T DRIVES		
Model No.	Quantity	Model No.	Quantity	Model No.	Quantity	
600	24 oz./710 ml Oil	700	12 oz./355 ml Grease	All Models	4 oz./118 ml Grease	
800	30 oz./887 ml Grease	700H	12 oz./355 ml Grease	Except *		
801	36 oz./1065 ml Grease	2800	†	*1408-P91	3 oz./89 ml Grease	
820	36 oz./1065 ml Grease			*1409-P91		
900	26 oz./769 ml Grease			*1410-P91		
910	18 oz./532 ml Grease			*3002		
915	10 oz./296 ml Grease			*3003		
920	30 oz./887 ml Grease			*3028		
930	30 oz./887 ml Grease			*3029		
1200	48 oz./1420 ml Oil ††			*3035		
1305	32 oz./946 ml Oil			1000 Series		6 oz. / 180 ml SAE E.P. 80W90Oil
1309				1100		16 oz./473 ml Oil
1313						
1301						
1302	44 oz./1301 ml Oil			<b>DIFFERENTIALS</b>		
1303				All Models	3 oz./89 ml Grease	
1304				<b>TWO SPEED AXLE</b>		
1306				All Models	2 oz./59 ml Grease	
1307				<b>THREE SPEED AXLE</b>		
1308				All Models	2 oz./59 ml Grease	
1310						
1311						
1312						
1314						
1315						
1316						
1317						
1318						
1320						
1321						
1322						
1325						
1328						
1329						
1319	24 oz./710 ml Oil					
1323						
1326						
1327						
MST	16 oz./473 ml Oil					
2300	64 oz./1892 ml Oil					
2400	32 oz./946 ml Oil					
2500	†					
2600	†					

### NOTICE

Grease: Bentonite Grease  
Part Number 788067B

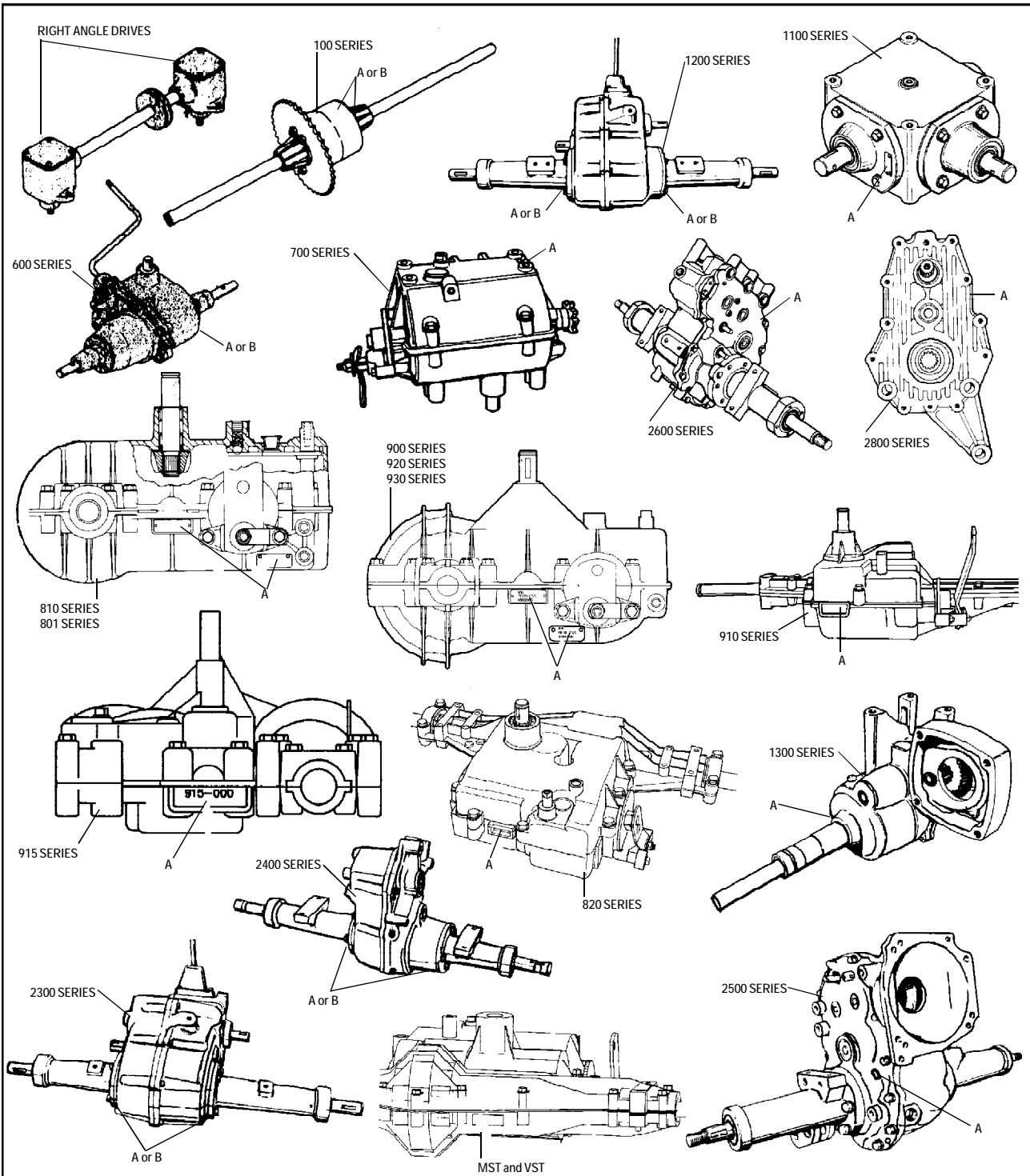
Oil: SAE E.P. 80W90 Oil  
Part Number 730229A

† Refer to O.E.M. Mechanic's Manual for type of lubricant

†† To be filled through shift lever opening

# SECTION 3. IDENTIFICATION

another free manual from www.searstractormanuals.com



SAMPLE (OLD STYLE)	SAMPLE (NEW STYLE)
<div style="border: 1px solid black; padding: 5px; width: fit-content;">                     MOD 506                      PEERLESS                      1 275 1374                 </div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;">                     MST205-   SERIAL 6 0 0 2                 </div>
<p>Individual Serial Number                      Manufactured on the 275th Day                      Manufactured in 1991</p>	<p>Specification Number                      Manufacturers                      Requested Features                      Serial Number Julian Date</p>

Early Models were not identified with a model number on the unit.  
 THE MODEL NUMBER WILL BE FOUND ON: A. Metal tag or decal attached to unit as illustrated.  
 B. Stamped on unit as illustrated.

Identification Number Locations

## SECTION 4. TORQUE CHART

TORQUE VALUE				
PART	MODELS AFFECTED	IN-LBS	FT-LBS	NM
Bolt 5/16-18 (Housing)	100 Series	228-264	19-22	25.8 - 29.9
Nut 5/16-18 (Housing)	100 Series	120-156	10-13	13.6 - 17.7
Bolt 1/4-20 (Case to Cover)	600 Series	84-108	7-9	9.5 - 12.2
Bolt 5/16-18 (Axle Support Housing)	600 Series	156-180	13-15	17.7 - 20.4
Bolt 1/4-20 (Shift Lever Housing)	600 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Brake-Disc)	600 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Case to Cover)	800 & 900 Series (Except 820)	90-100	7.5-8.3	10.2 - 11.3
Bolt 1/4-20 (Brake-Disc)	800, 900 & MST Series	85-110	7.1-9.2	9.7 - 12.5
Bolt 5/16-18 (Case to Cover)	820 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Bearing Cap)	820 Series	90-100	7.5-8.3	10.2 - 11.3
Bolt 1/4-20 (Differential)	820 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Brake Disc)	820 Series	85-110	7.1-9.2	9.7 - 12.5
Bolt 5/16 x 18	1100 Series	180-216	15-18	20.4 - 24.5
Bolt 5/16 x 18	2800 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Case to Cover)	1200 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Shift Lever Housing)	1200 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Differential)	1200 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Case to Cover)	1300 Series	90-110	7.5-9.2	10.2 - 12.5
Bolt 1/4-20 (Differential)	1300 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Case to Cover)	1400 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Shift Lever Housing)	1400 Series	84-108	7-9	9.5 - 12.2
Bolt 1/4-20 (Differential)	1400 Series	84-120	7-10	9.5 - 13.6
Bolt 1/4-20 (Case to Cover)	2300 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Shift Lever Housing)	2300 Series	96-120	8-10	10.9 - 13.6
Bolt 5/16-18 (Axle Support Housing)	2300 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Differential)	2300 Series	84-120	7-10	9.5 - 13.6
Bolt 3/8-16 (Axle Support Housing)	2300 Series	240-312	20-26	27.2 - 35.4
Bolt 1/4-20 (Case to Cover)	2400 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Axle Support Housing)	2400 Series	96-120	8-10	10.9 - 13.6
Bolt 1/4-20 (Differential)	2400 Series	84-120	7-10	9.5 - 13.6
Bolt 5-16/18 (Case to Cover)	2500 Series	180-216	15-18	20.4 - 24.5
Bolt 3/8-16 (Differential)	2500 & 2600 Series	420-480	35-40	47.6 - 54.4
Bolt 1/2-13 (Axle Support Housing)	2500 & 2600 Series	720-780	60-65	81.6 - 88.4
Screws No. 10-24 (Cover)	R.A.D.	20-24	1.6-2	2.2 - 2.7
Bolts 1/4-20 (Retainer Cap)	R.A.D.	90-110	7.5-9.2	10.2 - 12.5

**NOTE:** On all units containing two jam nuts securing brake lever, Hold bottom nut and torque top nut to 100 in. lbs.

Differential Bolts	7 ft. lbs. - 9.5 NM
"T" Drive Bolt	8-11 ft. lbs. - 10.9 - 15.0 NM
"T" Drive Cover Screw	20-24 in. lbs. - 2.24 - 3.7 NM

## SECTION 5. TROUBLE SHOOTING TABLE

**THE FIRST RULE IN TRANSAXLE TROUBLE SHOOTING IS TO ISOLATE THE PROBLEM TO THE TRANSAXLE. CHECK FOR PROPER ADJUSTMENT OF BELTS, BRAKE, CLUTCH, SHIFTER AND LINKAGES. CHECK PULLEYS FOR SHEARED RETAINERS AND PROPER BELT DISENGAGEMENT. IF PROBLEM IS RELATED TO SHIFT DIFFICULTIES REMOVE DRIVE BELT AND RECHECK SHIFTING TO ASSURE PROBLEM IS NOT WITH ASSOCIATED EQUIPMENT.**

### All In-Line Shift Models 700, 800, 900, or MST Series

**Shifting force or effort should be the same with the engine running or not running. If not equal, check the following area's: clutch adjustment, brake adjustment, belt release and belt guide positioning.**

The transaxle and transmission models listed above are in-line shift mechanical gear drive models that use shift keys to engage a desired gear to lock and rotate with the shaft. This type of unit requires the transaxle or transmission to be in a no load condition (de-clutched) when gear selection occurs. De-clutching allows the unit to have the input and brake forces removed from the gears and shift keys, which allows the unit to turn freely. Improper shifting (shifting while on an incline, shifting while towing any type of load, or shifting without de-clutching) forces the shift keys to engage into a gear that is in a loaded condition. Improper shifting is considered abuse because it leads to pre-mature wear and failure of the shift keys and drive gears. Tecumseh's limited warranty covers only transaxle or transmission failures that are the result of a defect in the material or workmanship of the unit, not failures caused by abuse or wear.

Some Original Equipment Manufacturers (OEMs) use these transaxles and transmissions in lawn tractors that do not use a foot operated clutch. These lawn tractors combine the clutch release mechanism with the hand operated gear shift lever. When the gear shift lever is moved through the shift gate from the gear engagement position toward the neutral position, the attached clutch linkage moves the idler pulley to release all input drive belt tension from the transaxle input pulley. With the drive belt released from the transaxle input pulley (de-clutched), the transaxle is free to turn under a no arrangement include: shifting while on an incline, shifting the unit while towing any type of load, or shifting is considered abuse that results in pre-mature shift key and gear wear and failure, not a defect in the material or workmanship of the Peerless unit and is not covered under Tecumseh's limited warranty.

The following illustrations show gear, shaft and key damage caused by improper shift and / or linkage out of adjustment. These examples show evidence of wear or damage that is not considered a defect. Use the following procedure to determine if a hard shifting condition is caused by the shifter/clutch linkage or an internal problem in transaxle or transmission.

On level ground, start the engine and allow the engine to run. Using the OEM supplied linkage, de-clutch the foot operated clutch and shift the gear shifter, or on units equipped with a hand operated gear/clutch shift lever, shift the transaxle or transmission. If shifting is difficult, try shifting the unit with the engine shut off.

**If the unit shifts freely through each gear with the engine shut off, the cause of the shifting problem is external to the unit. DO NOT REMOVE THE TRANSAXLE.** Check the clutch, shifter, and brake linkage for the proper adjustment. Use the guidelines provided by the OEM to check for the correct linkage positioning. Hard shifting with the engine shut off can be caused by:

1. Bent or binding shift lever or linkage
2. Shift linkage out of adjustment
3. Corrosion in the transaxle or transmission
4. Damaged shift keys, gears, or shifter brake shaft
5. Belt guides missing or improperly adjusted to close or to far away (see equipment manufacturer specs)

**NOTE: DO NOT REMOVE TRANSAXLE UNTIL YOU HAVE CHECKED ITEMS 1 AND 2.**

If the cause is internal, remove the unit from the tractor, disassemble, and determine the cause of the failure.

CAUSE	REMEDY
<b>UNIT CANNOT BE SHIFTED (OR DIFFICULT TO SHIFT)</b>	
<p>Gears improperly installed</p> <p>Forks and Rod assembly incorrectly installed</p> <p>Axle Housing not installed or not tightened</p> <p>Same items covered under heading, Axles cannot be turned (same direction) while unit in Neutral gear".</p> <p>Shifting lever improperly positioned</p> <p>Shifting keys broken or damaged</p> <p>Shifting washers in backwards</p> <p>Shifter/Brake shaft keyways damaged</p> <p>Shift lever housing misaligned to case</p> <p>Parts missing</p> <p>Equipment clutch not disengaging</p> <p>Shifter stop assembled backwards</p> <p>Chamfer on shift gears on wrong side</p> <p>Improper fit of case to cover</p> <p>Dowel pins not installed</p> <p>Gears improperly installed</p> <p>Input shaft not properly installed</p> <p>Differential installed improperly</p> <p>Seal retainers improperly positioned</p>	<p>Review positioning of gearing.</p> <p>Remove assembly. Recheck and correctly position parts.</p> <p>Seal retainers are not properly sealed. Tighten axle housing bolts.</p> <p>Review remedy listed</p> <p>Determine if finger of shifting lever is correct for the unit and is correctly installed. Make sure shift lever housing has required gasket.</p> <p>Replace keys and check unit for other damage.</p> <p>Chamfered or rounded side of washer must be toward keys.</p> <p>Remove nicks and burrs from keyway.</p> <p>Check if alignment marks on unit are correctly positioned. Also, determine if bend on shaft is in correct position.</p> <p>Install missing parts.</p> <p>Adjust clutch according to equipment instruction.</p> <p>Determine that notch in STOP aligns with shifter forks in NEUTRAL position.</p> <p>Check that bevels on shifter gears are correct (fork flanges should be toward each other). On 3 gear cluster, small gear and medium gear chamfers go down toward big gear.</p> <p>Recheck positioning of thrust washers. A misplacement or omission of washer can cause binding.</p> <p>Check unit for correct assembly of parts.</p> <p>Check unit for correct assembly of parts.</p> <p>Input shaft spline must be fitted into gear and must be tapped completely into the case.</p> <p>Re-check positioning of bolts in differential must be opposite output shaft gear (except 2400).</p> <p>Check that seals are correctly installed.</p>
<b>UNIT IS NOISY</b>	
<p>Gearing is overly noisy chatter, etc.</p> <p>Metallic pieces and/or other foreign objects in unit</p> <p>Worn gears</p> <p>Worn bearings mainly input shaft ball bearing</p>	<p>Check oil level.</p> <p>Remove bits of broken metal, loose washers, etc.</p> <p>Remove and replace with new gears.</p> <p>Replace bearing.</p>

**TROUBLE SHOOTING TABLE (Continued)**

CAUSE	REMEDY
<b>UNIT JUMPS OUT OF GEAR</b>	
Shifting lever improperly assembled in housing Teeth of gears are worn beyond tolerances Spring in shifter fork weak or broken Attaching screws for shift lever and housing assembly not properly torqued Shifter/Brake shaft improperly assembled Keys weak or worn Shift gears damaged. Shift lever bent and hitting unit frame Shift rod grooves worn Shift rod of improper length or grooving installed Constant mesh gears improperly installed on counter shaft.	Disassemble shifting lever and check for proper assembly. Replace worn gears. Replace spring. Torque screws to 10 ft. lbs. Reassemble properly Replace keys/Shift gears. Replace shift lever. Replace shift rods. Check rod length. Replace with correct part. Reposition gears.
<b>AXLES CANNOT BE TURNED (SAME DIRECTION) WITH UNIT IN NEUTRAL GEAR</b>	
Axle housing not installed (or not tightened) Burrs on gearing Parts missing Broken shifter stop allowing unit to be shifted into two speeds at the same time Thrust washers in wrong position Bearings not pressed in deep enough	Seal retainers are not properly seated. Tighten axle housing bolts. Remove gear and hone with a stone. Install missing parts Replace snap rings on shift rod out of groove. Recheck thrust washer and reposition, if wrong. Use the proper bearing tool to seat the bearing.
<b>UNIT DOES NOT DRIVE</b>	
Differential bevel gears broken 3 gear cluster countershaft key sheared in Model 600 Stripped teeth on gears Keys sheared in drive pulleys Broken input gear Shift keys broken Reverse chain broken (reverse only unless chain becomes wedged)	Replace Replace. Replace. Replace. Replace. Replace keys/check keyways and shift gears. Replace chain.

# CHAPTER 2. TRANSMISSIONS

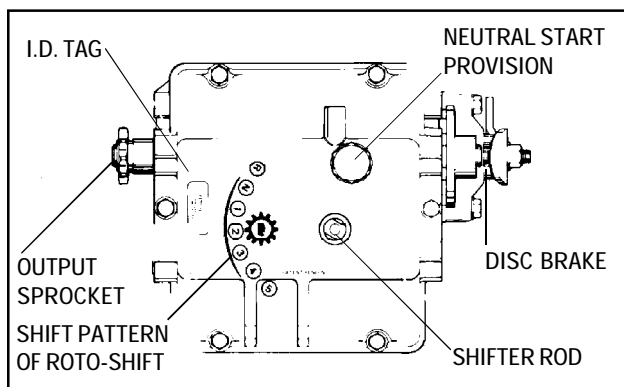
## SECTION 1. TRANSMISSIONS 700 SERIES

### CAUTION

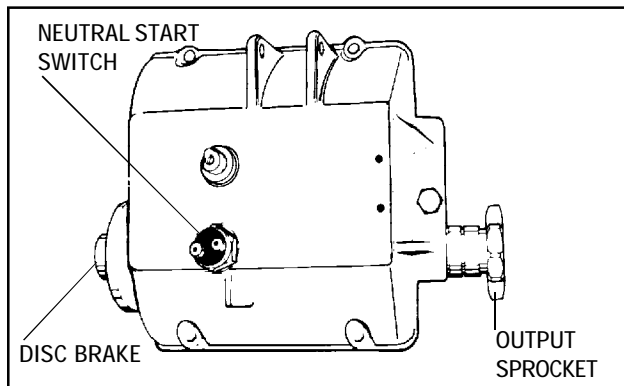
TO AVOID PREMATURE TRANSMISSION FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE, FROM ANY FORWARD TO REVERSE GEAR, FROM REVERSE TO ANY FORWARD GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.

### A. GENERAL

The 700 Series in-line transmission is available in 2, 3, 4 or 5 speeds forward depending on equipment manufacturer's specifications.



The two speed unit is not covered here but can be disassembled and reassembled using the same information for the 700 described in this section. Optional features include right or left hand output and disk brake, for either in-line or "H" pattern unit.



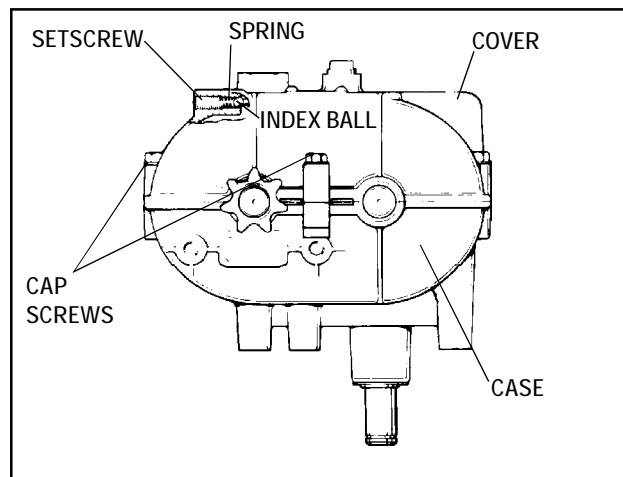
**NOTE:** Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.

If installed, (optional equipment), remove neutral start switch.

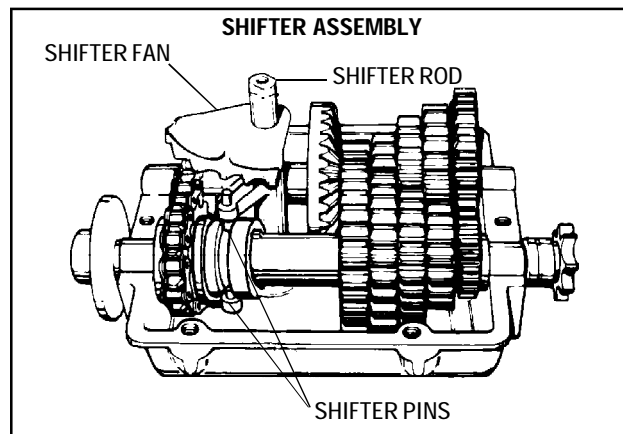
### B. DISASSEMBLY OF SHIFTER MECHANISM

Clean outside surface of transmission. Position shift lever in neutral position as indicated by the shift pattern.

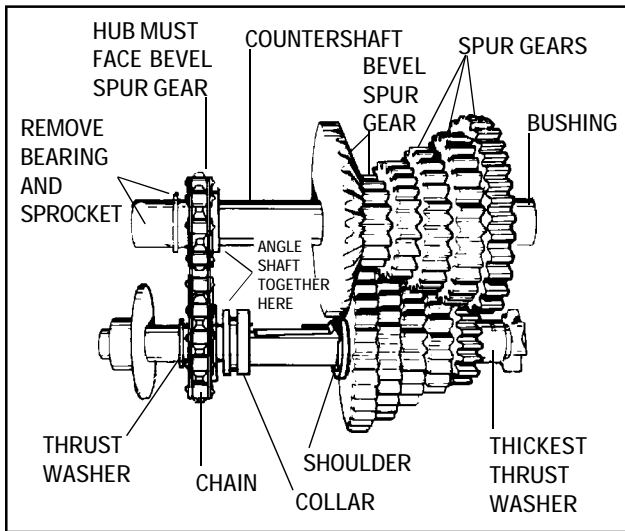
### FOR IN-LINE SERIES TRANSMISSION



1. Remove setscrew, spring and index ball from transmission cover.
2. Remove six cap screws that maintain cover to case.

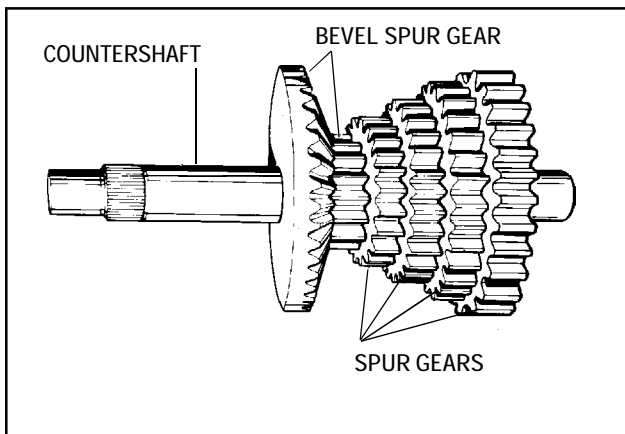


3. Remove cover. Remove shifter assembly (includes shafts, pins and fan from transmission by lifting shaft out of case).

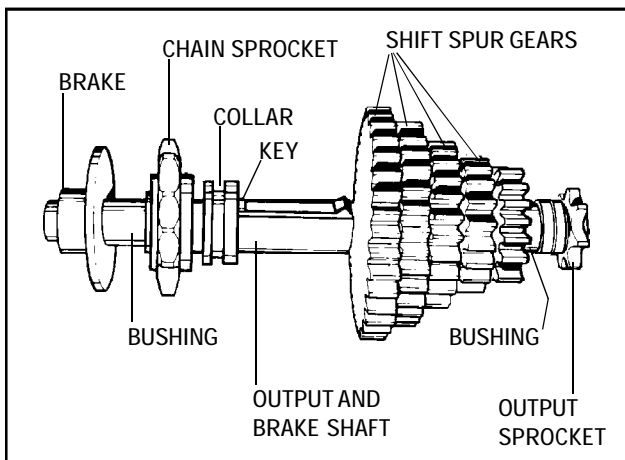


**C. DISASSEMBLY OF UNIT**

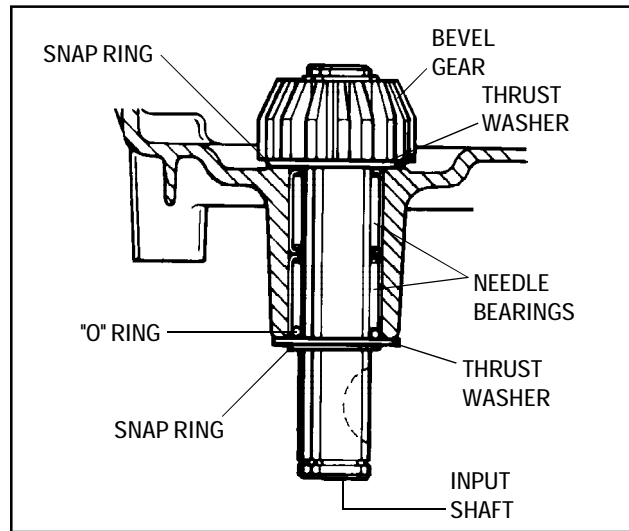
1. Remove gear and shaft assemblies from case half of the transmission by lifting the two shafts out of the bearing supports taking care not to disturb drive chain relationship with hubs on sprockets.



2. Remove bevel spur gear combination and spur gears from the countershaft; these gears are splined to the countershaft.



3. Remove the output sprocket and brake disc from the output shaft. Remove the bushings, shift spur gears, chain sprocket, collar and keys.



Input shaft removal for 700 series in-line transmission.

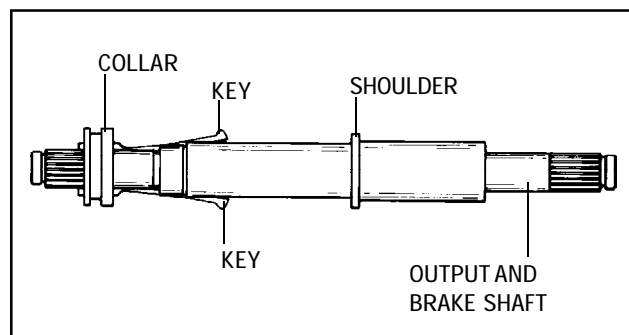
4. Remove snap ring from input shaft; remove bevel gear and pull shaft through case.
5. Input shaft needle bearings should be installed flush to .005 below bearing bore surfaces from inside and outside case.

**D. INSPECTION AND REPAIR**

Examine all parts after removing grease with cleaning solvent. Replace damaged parts.

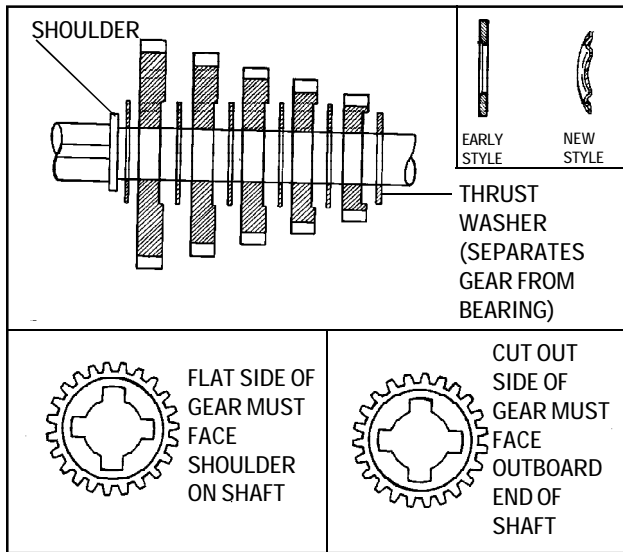
**E. ASSEMBLY OF 700 SERIES IN-LINE TRANSMISSION**

1. Install and secure the input shaft and bevel gear in the case. See Paragraphs 4 & 5 under "Disassembly Instructions" and reverse the order.



2. Install collar and keys on output shaft. Thick side of collar MUST face shoulder on shaft.

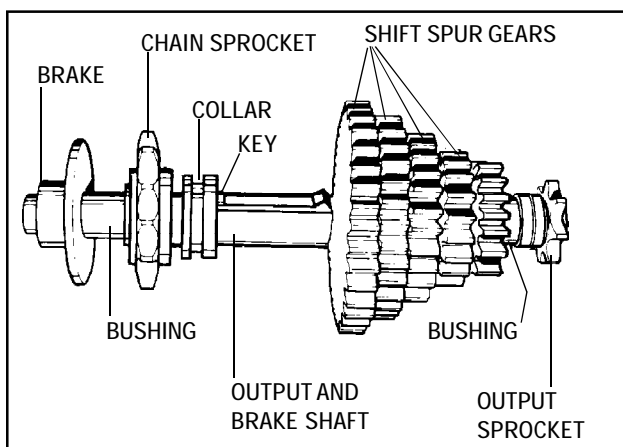
**NOTE:** All Needle bearings are lubricated with E.P. Grease. DO NOT USE BENTONITE on needle bearings. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067B.



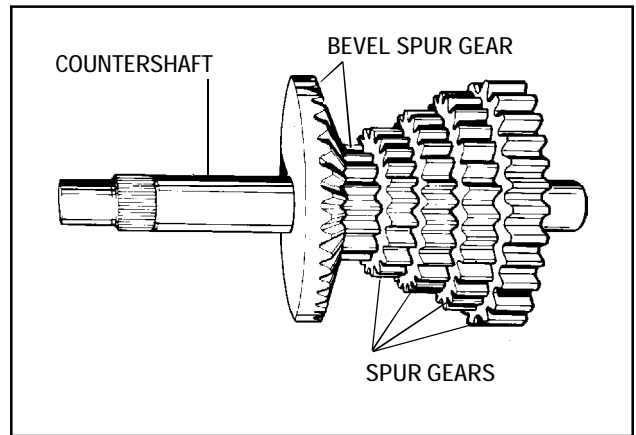
3. Install the thrust washers and shifting gears onto the shifter/brake shaft. The number of gears and/or spacers will be determined by the number of speeds in the transmission.

**WASHERS.** A running change has been made to the shifting washers. Many models have used the thrust washer with a 45° chamfer on the inside diameter. The latest style washer has a curved or rounded side. The purpose of both washers is to compress the shifting keys as they slide into the gears. Therefore, the chamfered or rounded side of these washers must face the shoulder of the shaft or towards the shifting keys. The washers are interchangeable.

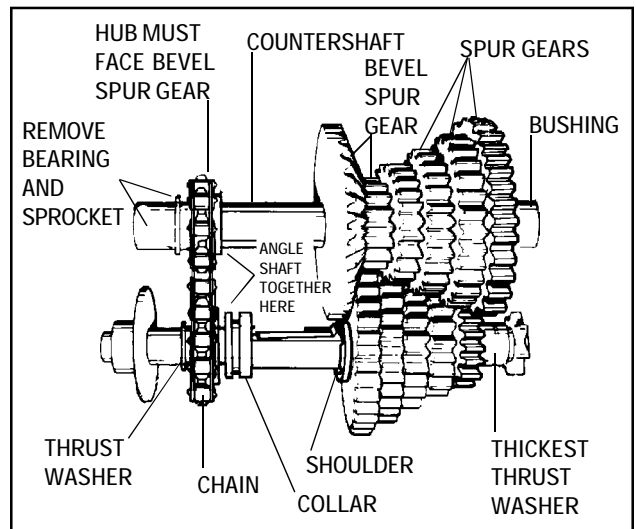
**SHIFTING GEARS.** The 2 sides of the shifting gears are different. One side is flat and the other side is cut out. The flat side of the gear is placed onto the shaft towards the shoulder of the shaft or towards the shifting keys.



4. When correctly assembled the output shaft should appear as shown.

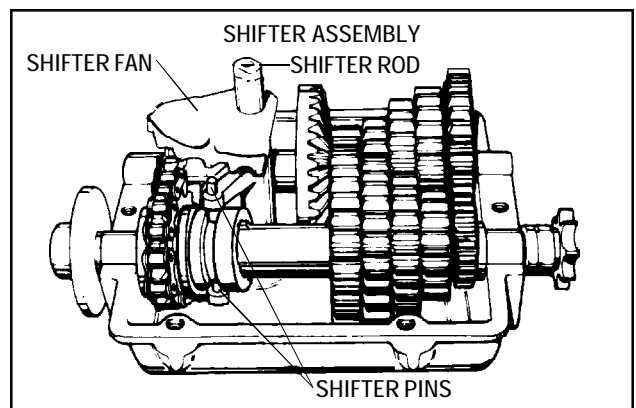


5. Install bevel spur gear and smallest to largest spur gears to the splined end of the countershaft.



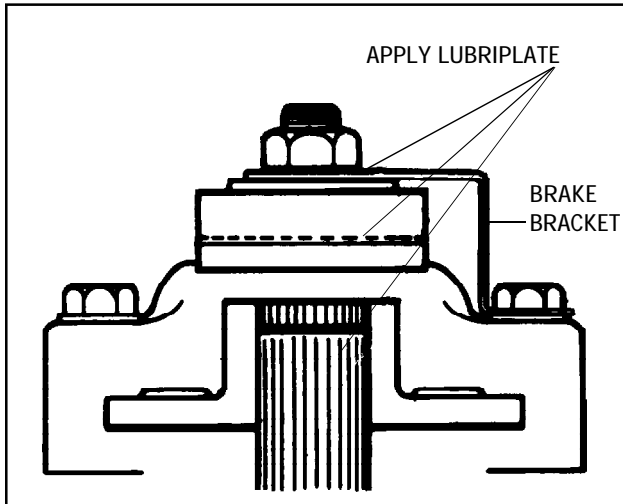
6. Install chain over two shafts registering chain on output shaft sprocket and in-line with serrations on countershaft. Be sure collar on sprocket faces shifting keys and collar.
7. Install shaft assemblies into case utilizing piloting locators on bearings to properly align notches in case.

**CAUTION:** Be sure bearing locators are seated in transmission case.



8. Install shifter assembly (shaft, pins and fan) 12 oz. Bentonite grease around gearing, and reinstall cover on case. Torque cap screws 90-110 in. lbs.

9. For "in-line transmission", install index ball, spring, and setscrew, in that order, into cover and slowly tighten the screw from flush to two turns below flush, depending on personal preference.
10. Check for binding by turning input shaft. Install transmission on equipment. Install brake and linkage and adjust to disengage when clutch is engaged. Consult equipment Owner's Manual.



11. Apply a light film of lubriplate to the inside of lever portion which contacts pins, also to outside of lever which contacts flat washer and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil.

Brake and linkages may vary.

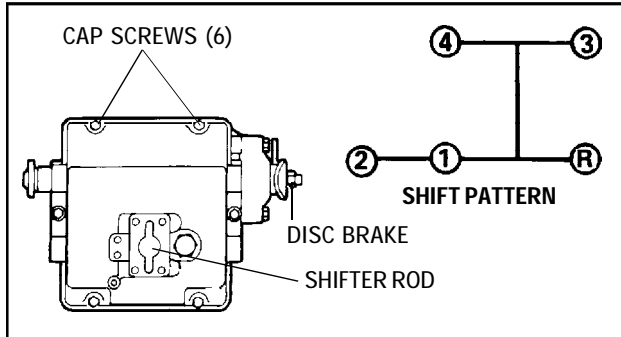
**NOTE:** If adjusted incorrectly, the brake will do one of two things;

- a. It will not brake (stop) the vehicle when the brake is applied, or
- b. If adjusted too tightly, a drag or continued braking effect will be evident until the brake wears out.

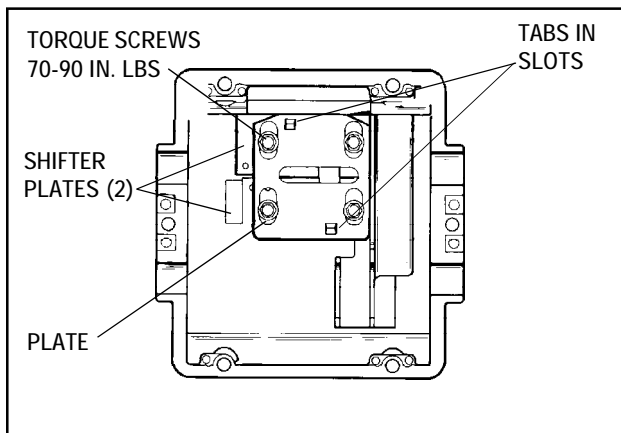
## SECTION 2. 700H SERIES

### CAUTION

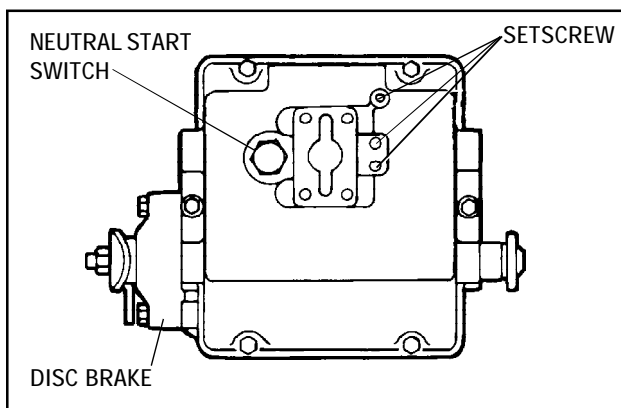
**TO AVOID PREMATURE TRANSMISSION FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE GEAR, FROM ANY FORWARD TO REVERSE GEAR, FROM REVERSE TO ANY FORWARD GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.**



The "H" pattern transmission described here is a 4-speed forward, 1 reverse unit.



The 700 series "H" pattern transmission gear arrangement is the same as the in-line transmission except for the shifting portion and an additional collar on the out put and brake shaft and an additional spacer on the countershaft and spacer on the output and brakeshaft.



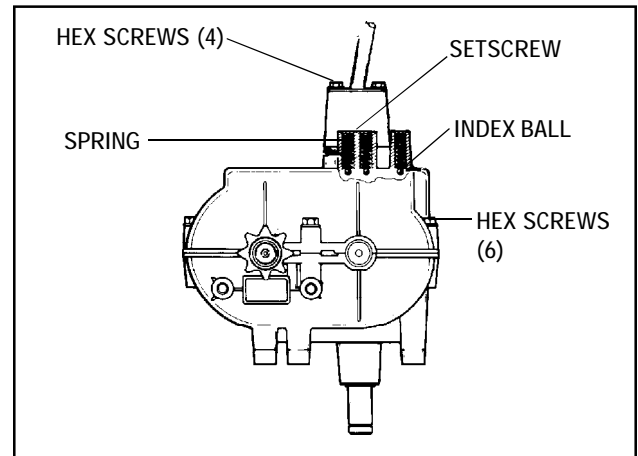
If installed, (optional equipment), remove neutral start switch.

**NOTE:** Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.

### A. DISASSEMBLY OF SHIFTER MECHANISM

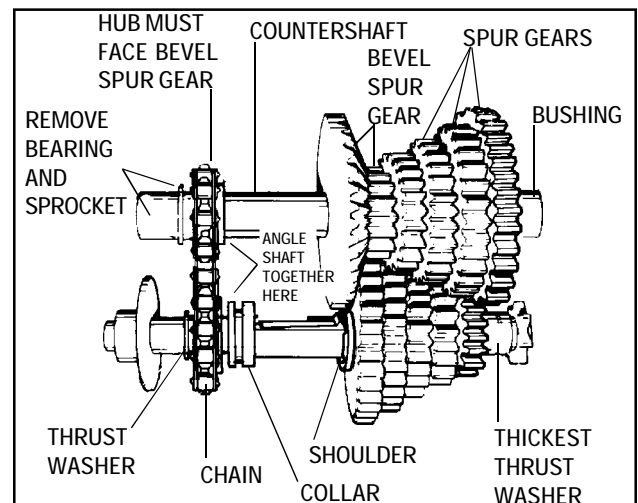
Clean outside of transmission. Position shift lever in neutral position as indicated by the shift pattern.

### FOR THE "H" SHIFT PATTERN 700 SERIES TRANSMISSION.

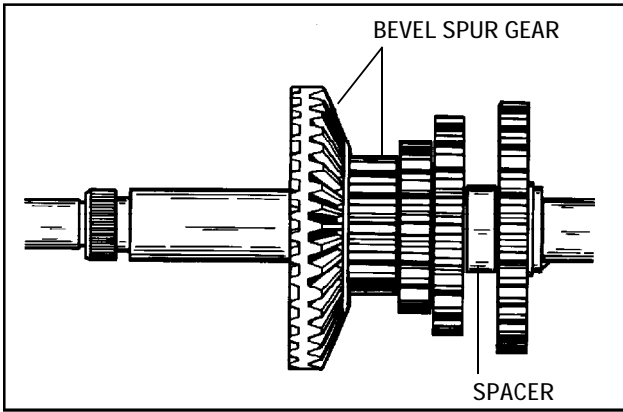


1. Remove shift lever by removing four hex screws on shift lever cover.
2. With a 3/32 inch Allen wrench, remove screw, spring and index ball in three places (balls will roll out once spring is removed).
3. Remove six cap screws that maintain cover to case. Remove cover.

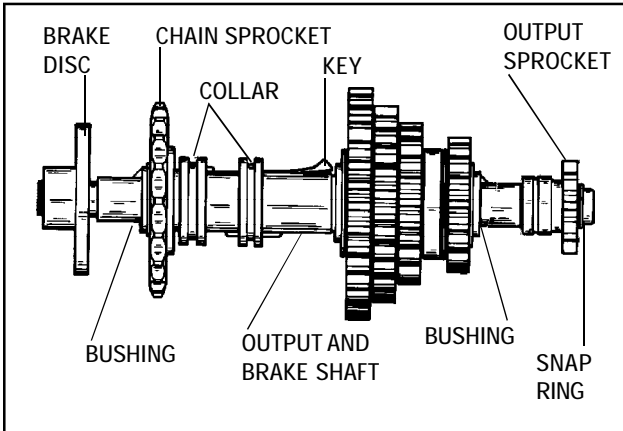
### B. DISASSEMBLY OF UNIT



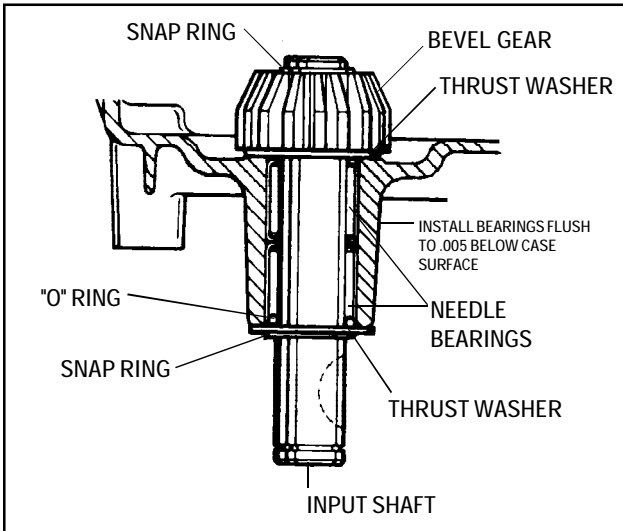
1. Remove gear and shaft assemblies from case half of the transmission by lifting the two shafts out of the bearing supports taking care not to disturb drive chain relationship with sprockets.
2. Angle chain and sprocket ends of shaft toward each other, removing the bearing and sprocket from the countershaft. Note the collar on the sprocket faces the bevel spur gear. Remove chain.



Disassembly of the 700 series "H" shift pattern includes spacer.



Disassembly of the 700 series "H" shift pattern includes a second collar and a spacer.



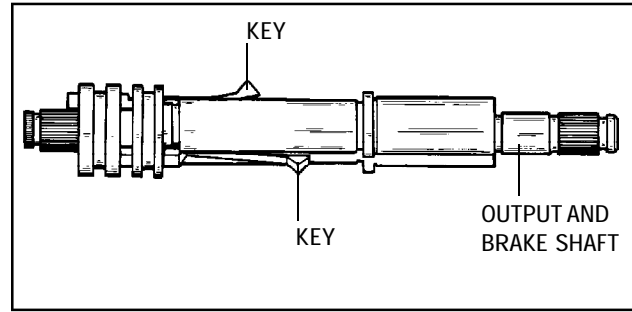
Input shaft removal same for 700 series in-line and "H" shift pattern transmissions.

3. Remove snap ring from input shaft; remove bevel gear and pull shaft through case.
4. Input shaft needle bearings should be installed flush to .005 below bearing bore surfaces from inside and outside case.

**C. INSPECTION AND REPAIR**

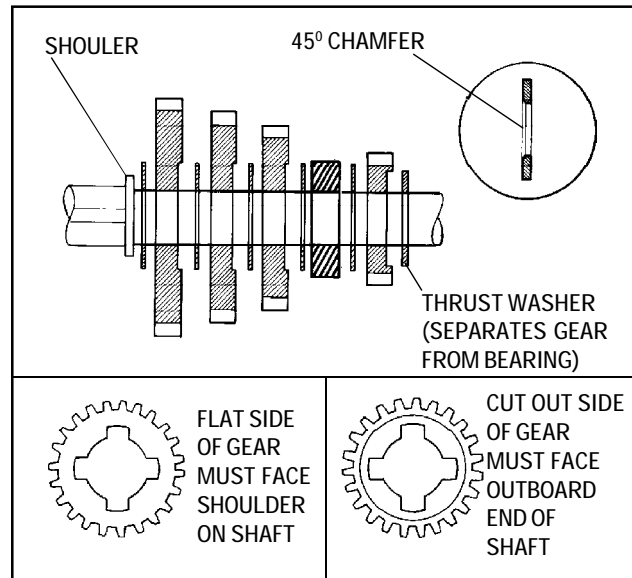
Examine all parts after removing grease with cleaning solvent. Replace damaged parts.

**D. ASSEMBLY OF 700 SERIES "H" SHIFT PATTERN.**



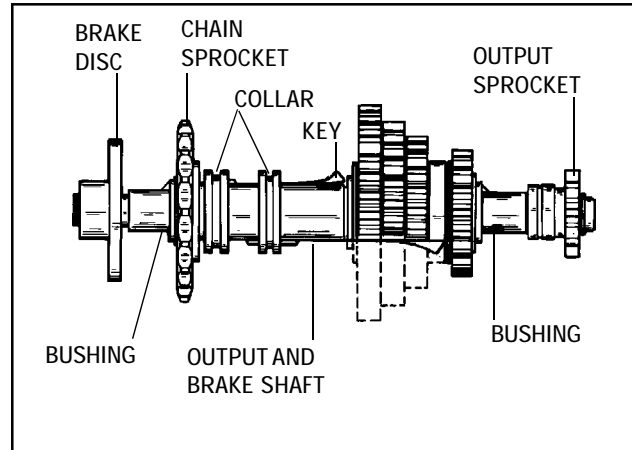
Same as 700 series in-line except for additional collar and spacer.

**ASSEMBLY OF 700 SERIES "H" SHIFT PATTERN**



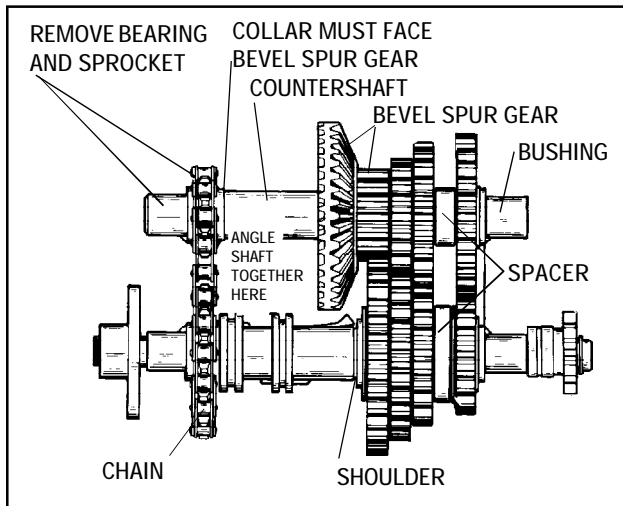
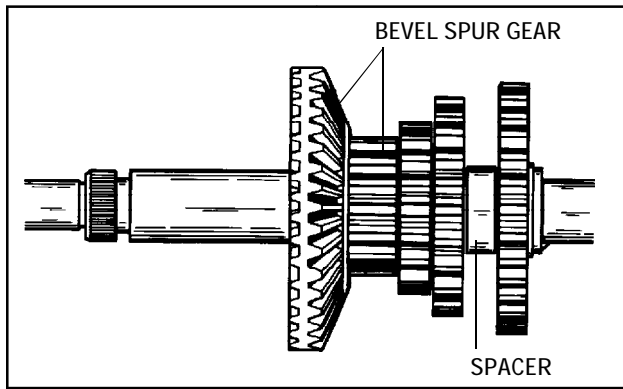
Same as for 700 series in-line transmission except for additional spacer.

**NOTE:** The thrust washer on the shift gear end of the output shaft does not have a chamfer on the inside diameter and must be positioned as shown. It is thicker than the other thrust washers separating the gearworks from the bearings.

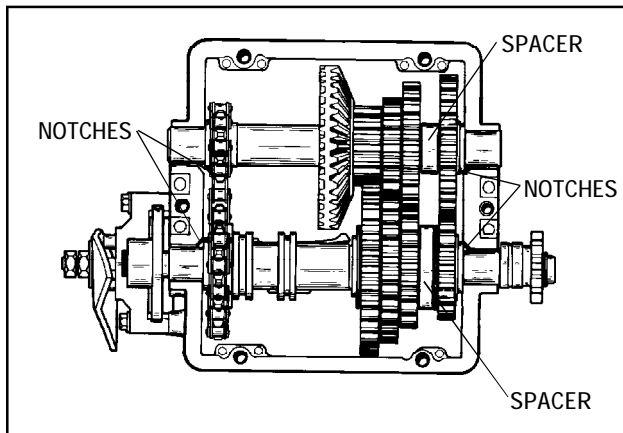


Correct assembly for 700 Model "H" shift pattern.

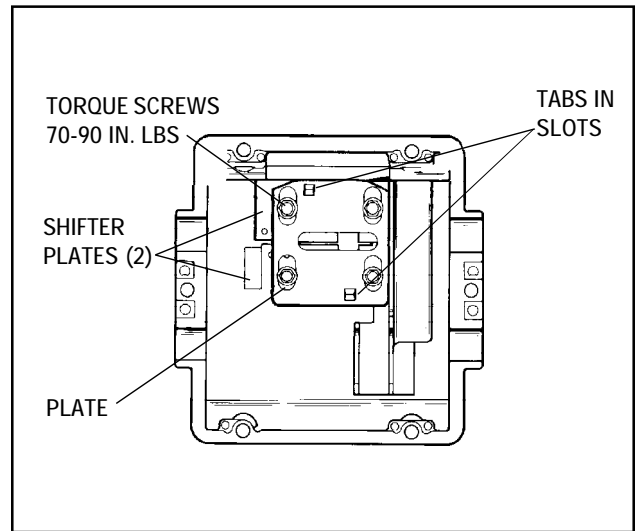
First, second and third gears have to be forced over the key, when assembling.



With collar on countershaft sprocket facing the bevel spur gear, install sprocket onto serration and install chain. Install all (4) thrust washers, **MUST** be positioned on the shifting gear of the output shaft.



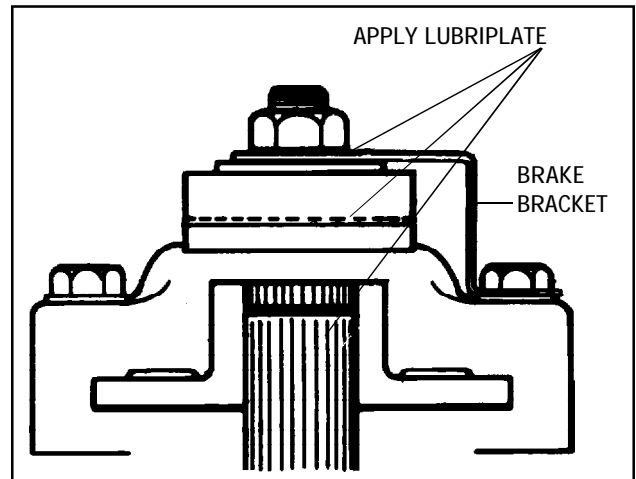
Install bronze bearings and disc and sprocket. Install shaft assemblies into case utilizing piloting locators on bearings to properly align notches in case. **CAUTION:** Be sure bearing locators are seated in transmission case.



Install shifter assembly, 12 oz. Bentonite grease around gearing, and reinstall cover on case. Torque cap screws 90-110 in. lbs.

To put tension on the index ball, spring and set screw. Tighten down to flush then two (2) turns in below flush.

Check for binding by turning input shaft. Install transmission on equipment. Install brake and linkage and adjust to disengage when clutch is engaged. Consult equipment Owner's Manual.



Apply a light film of lubriplate to the inside of lever portion which contacts pins, also to outside of lever which contacts flat washer and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil.

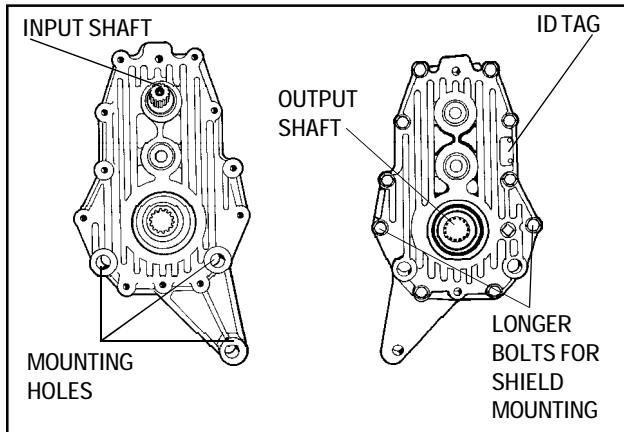
Brake and linkages may vary.

**NOTE:** If adjusted incorrectly, the brake will do one of two things;

- It will not brake (stop) the vehicle when the brake is applied, or
- If adjusted too tightly, a drag or continued braking effect will be evident until the brake wears out.

## SECTION 3. 2800 SERIES TRANSMISSION

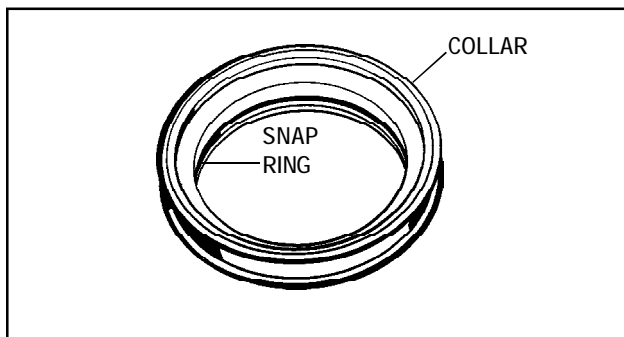
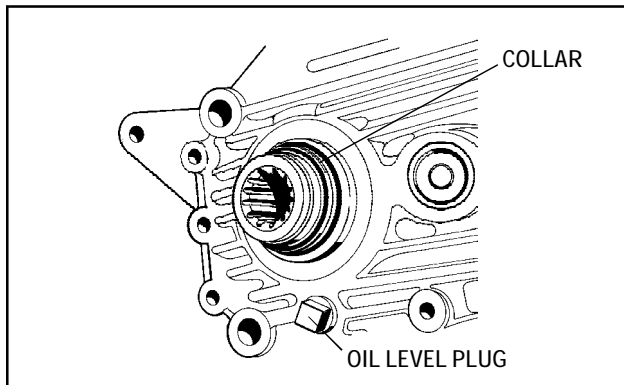
### A. GENERAL



The Model 2800 series transmission is the first of its kind produced by Peerless. It's known as a P.T.O. (Power Take Off) unit. This unit mounts on the back side of the Model 2600 series transaxle. Some O.E.M.'s are using this unit to run auxiliary attachments such as large tillers, mower decks, or any attachments that need power to make them operate.

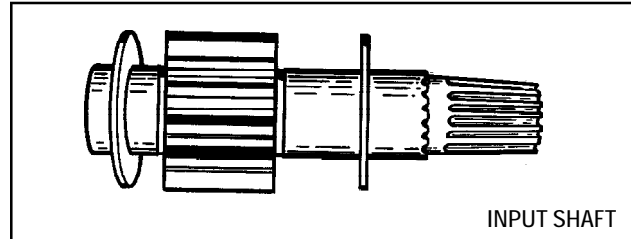
### B. DISASSEMBLY

1. Clean outside surface of transmission.
2. To remove small outer snap ring, located on the output shaft, use a small ice pick or similar tool.

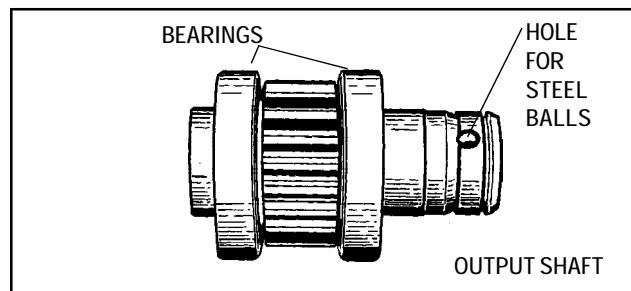


3. The collar has to be removed next. Place a jaw type puller around the collar and pull off. This will expose 3 steel balls equally spaced in holes around output shaft. There will be a snap ring in the inside of the collar. After the collar is pulled off discard snap ring.

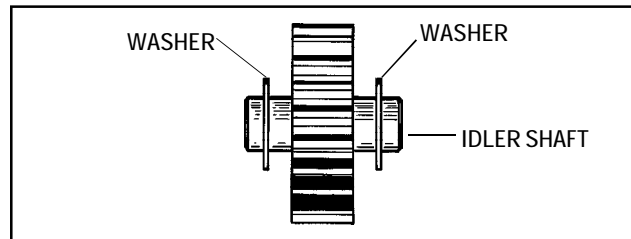
4. Using a punch, remove dowel pins that align case & cover together.
5. Remove the cap screws that maintain the cover to case. Remove cover.
6. Remove gasket and discard. Inspect gears and bearing surfaces.



7. Remove the input shaft and two washers. The input shaft and gear are one piece.



8. Remove output shaft. Output shaft bearings can be removed by using a bearing splitter and puller.



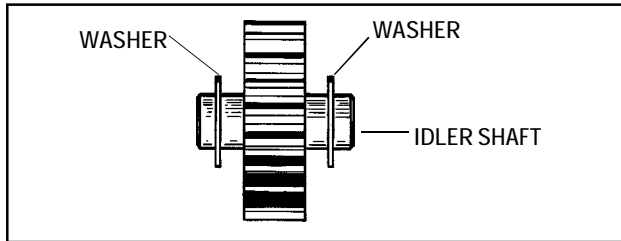
9. Remove the idler shaft and two washers.

### C. INSPECTION AND REPAIR

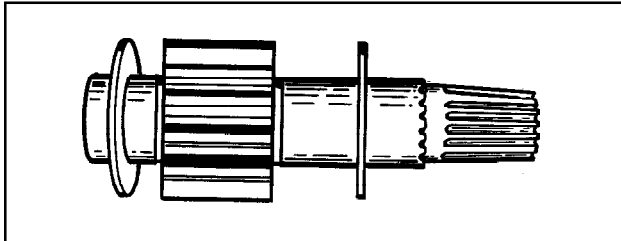
1. Inspect both the case and cover bearing surfaces. For bearing maintenance, refer to Chapter 11. Examine all parts after removing oil with cleaning solvent. Check for any wear and replace any damaged parts.

### D. REASSEMBLY

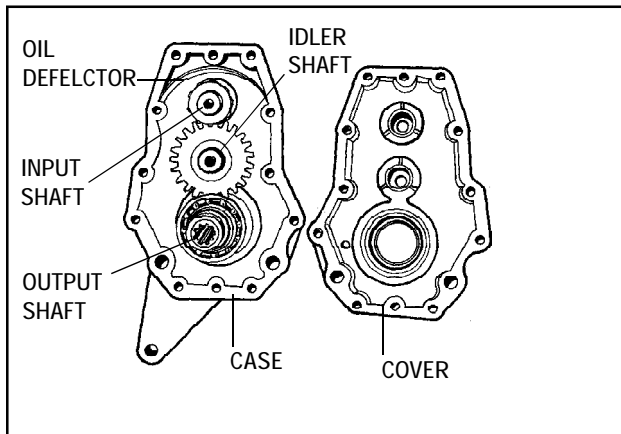
1. Press new bearings onto output shaft.
2. Install the two large oil seals for output shaft in the case and cover first.



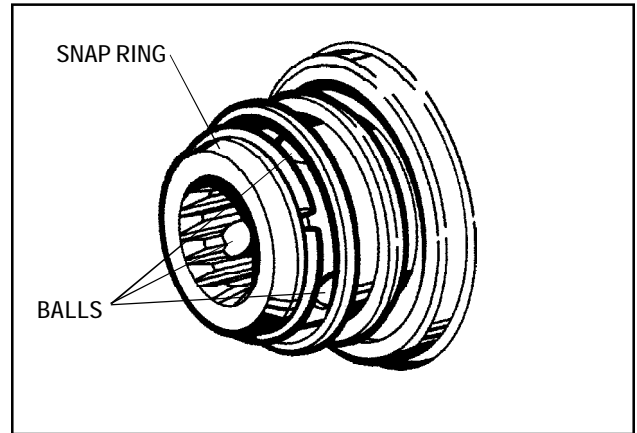
3. Place idler gear into case with washers on both sides along with output shaft at the same time.



4. Place one input shaft washer on bearing boss next to idler gear. Place proper seal protector for input shaft in seal and insert shaft and second washer.



5. Before closing case and cover together, inspect to make sure all parts are present. Now place new gasket between case and cover.
6. **NOTE:** Make sure oil deflector is in place before case/cover is put together.
7. Put case and cover together and before installing bolts, push dowel pins in place so that both halves line up.
8. Tighten and torque bolts to 15 to 18 ft. lbs.



9. Install 3 steel balls in holes with a little grease to hold them in place.
10. Place larger ring into collar and force over output shaft.
11. Place smaller ring over output shaft after collar is in place.
12. Fill with proper lubricant according to O.E.M. specs.
13. If everything is properly installed, unit should spin freely.

# CHAPTER 3. TRANSAXLES

## SECTION 1. 600 SERIES

### CAUTION

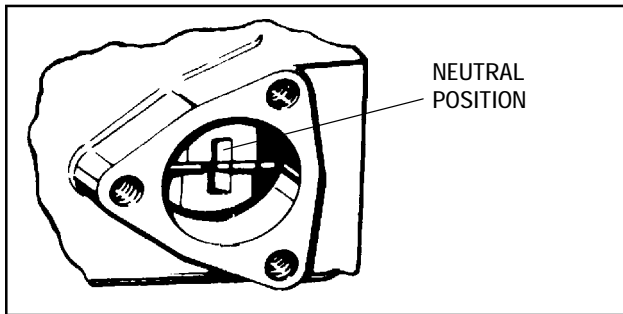
**TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE, FROM ANY FORWARD TO REVERSE GEAR, FROM REVERSE TO ANY FORWARD GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.**

### A. GENERAL

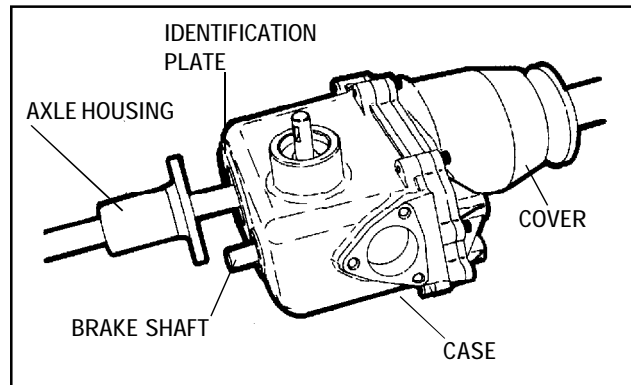
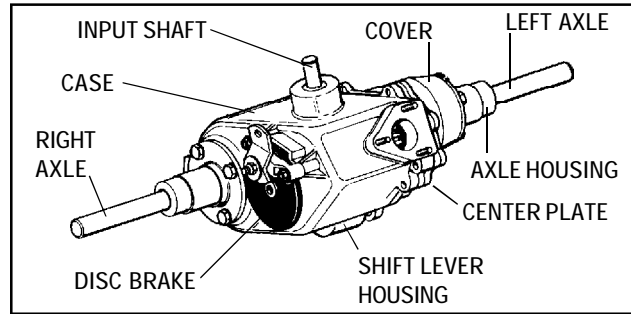
There are two (2) types of 600 series transaxles. One is the 600 standard series transaxle. The other is the 601-001, 002, 003 etc. slow speed series transaxle. This first section will deal with the standard 600 series. Please refer to the next section on the differences of the 601 slow speed transaxle.

The 600 Series transaxle has an aluminum case and cover. The input shaft is on the top of the case. Some 600 series transaxles are equipped with optional disc brakes. Due to the many variations of equipment braking systems, adjustments and repair to these components and linkage are not considered warranty.

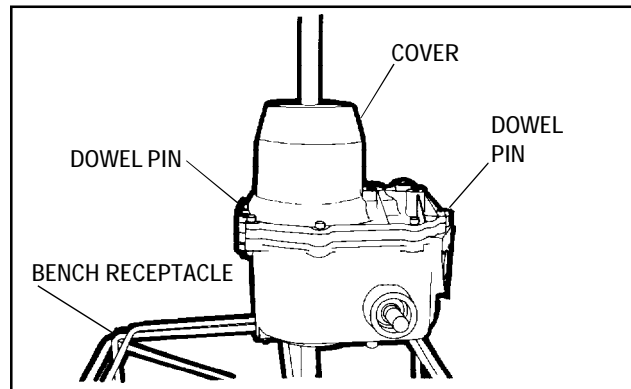
### B. TRANSAXLE DISASSEMBLY



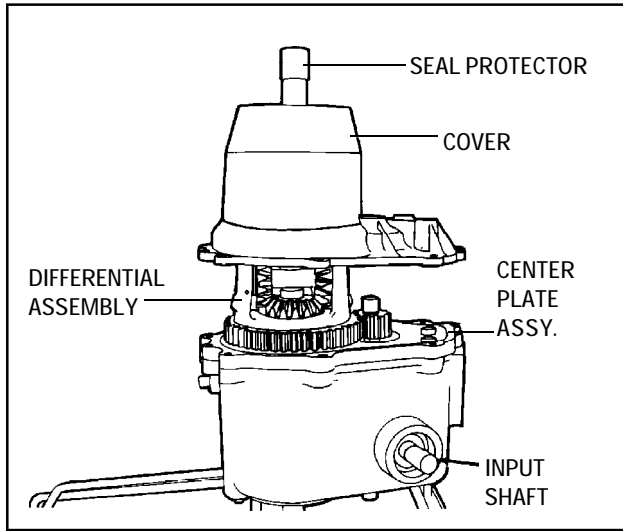
1. Clean the outside surface of the transaxle, away from the area where disassembly will take place. Position shift lever in neutral position to help disassembly. Remove screws (3) holding shift lever. Remove all keys from keyways, remove all burrs and dirt from shafts. On hardened shafts, use a stone to remove burrs. All seals should be replaced whenever a shaft is pulled through a seal. Always use a new gasket whenever the gasket surfaces have been separated.



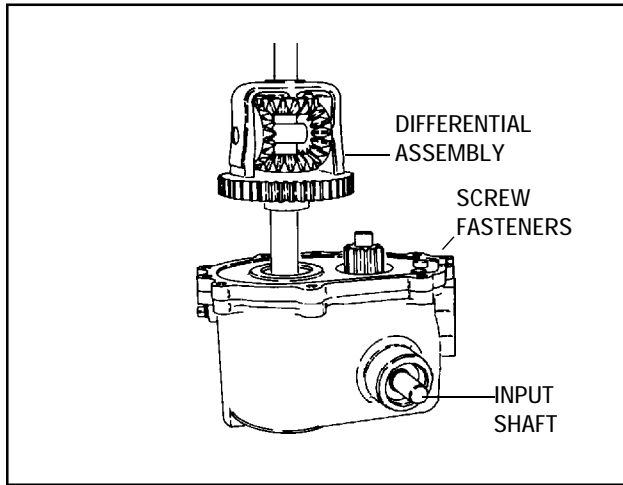
2. After removing axle housings, place the unit in a receptacle, bench or clamp the transaxle in a soft jaw vise. Position the transaxle so that the socket head cap screws are facing up.



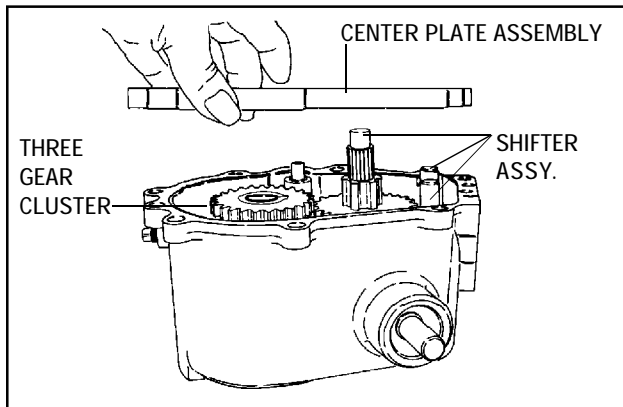
3. Remove the socket head cap screws holding the case and cover together. Drive out the dowel pins used for alignment of the case and cover.



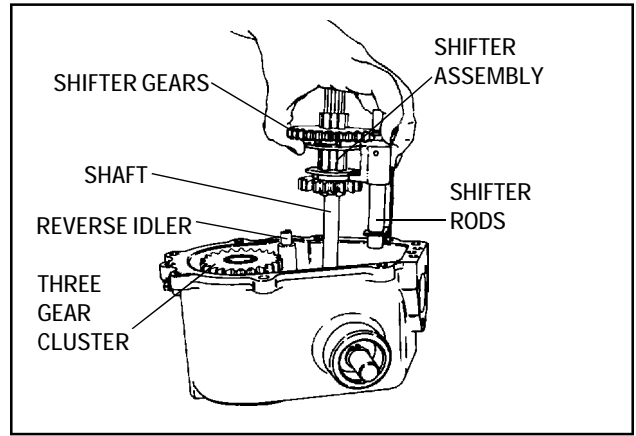
4. Use a seal protector on axle shaft and lift off transaxle cover assembly. Because this seal is a single lip type, it may be reused, if care is taken to see that it isn't cut or scratched. Discard gasket.



5. To remove differential assembly, it may be necessary to replace two or three screws to hold center plate assembly down. Pull assembly straight up. If tight, tap on lower axle with soft mallet. **CAUTION: DO NOT USE STEEL HAMMER.** Refer to the chapter on differential assembly service. Remove gear on top of shifter shaft.

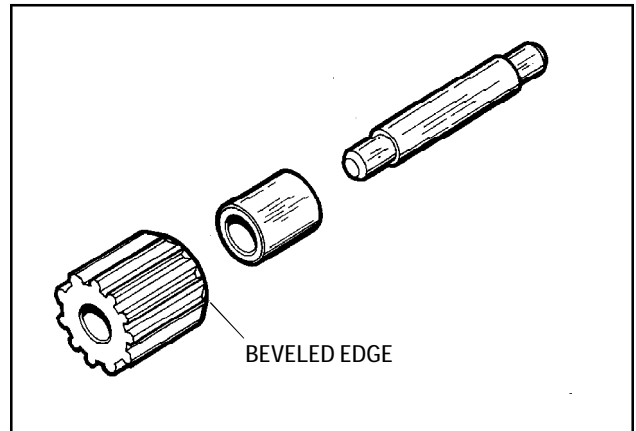


6. Remove temporary holding screws, if used and lift off center plate assembly. Discard gasket.

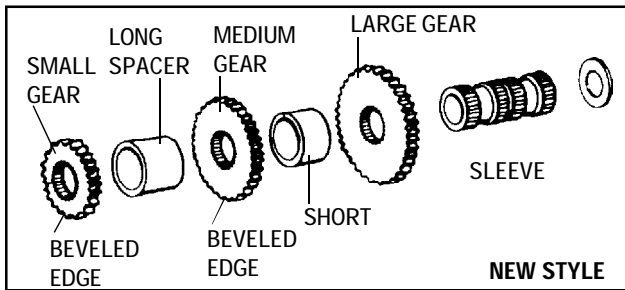
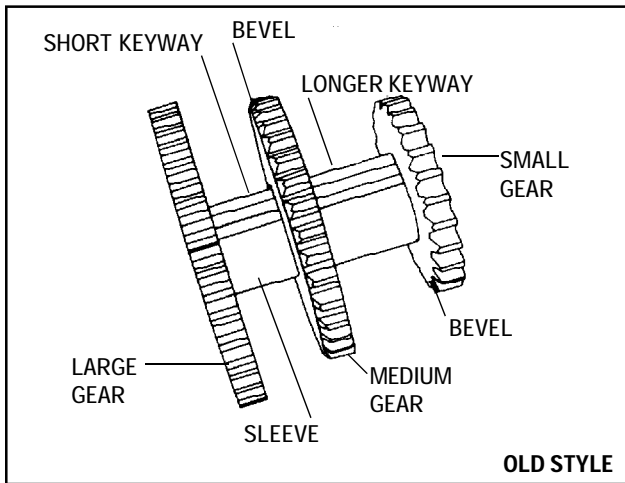


7. Remove complete shifter assembly by grasping shifting gears, shaft and both shifter rods as a unit.

**NOTE:** Examine assembly carefully; if no service is required, retain assembly as a unit for easy reassembly. If service is necessary refer to the Chapter on shifting assemblies.

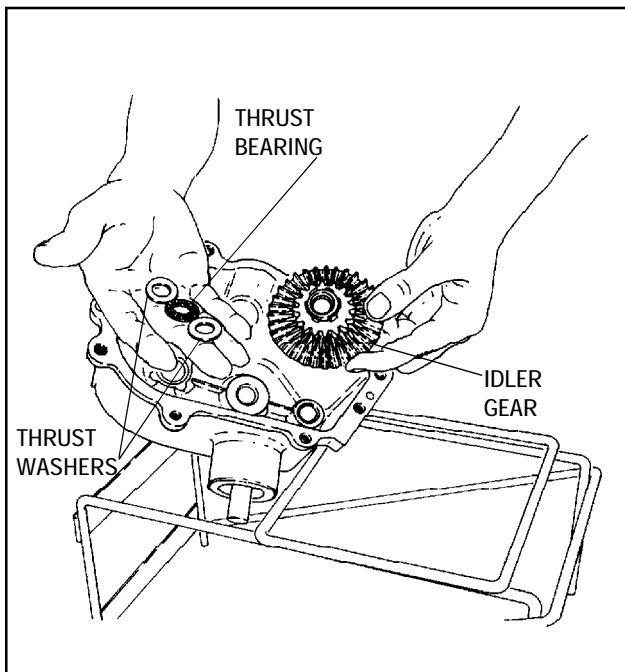


8. Remove reverse idler shaft, spacer and gear.
9. Remove cluster gear sub assembly and thrust washer.

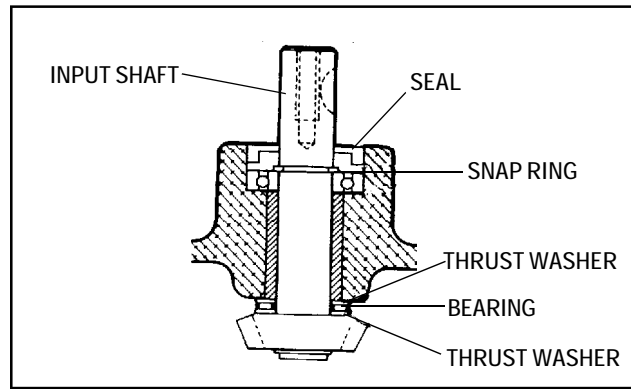


10. Cluster Gear Sub-Assembly

- a. The cluster gear can be disassembled. All worn gears are replaceable if damaged or worn. Preferably use a press to drive the shaft squarely.
- b. The small and middle gear bevel faces down, there is no beveled edge on large gear. Shorter section between middle and large gear.
- c. Key edge ends must align with shaft ends.

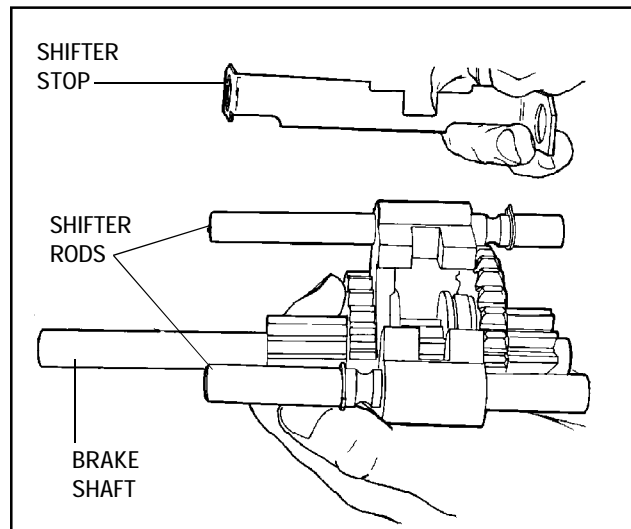
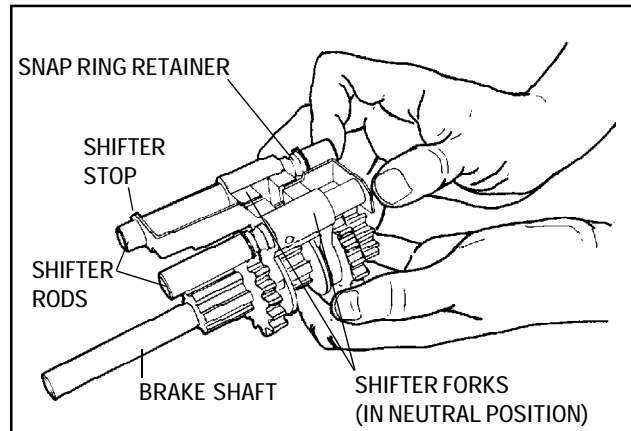


11. Remove the idler gear, thrust washers and thrust bearing.



12. Remove input shaft oil seal to allow access to snap ring. Remove snap ring and input shaft will slide out. A removed seal must be replaced by a new seal.

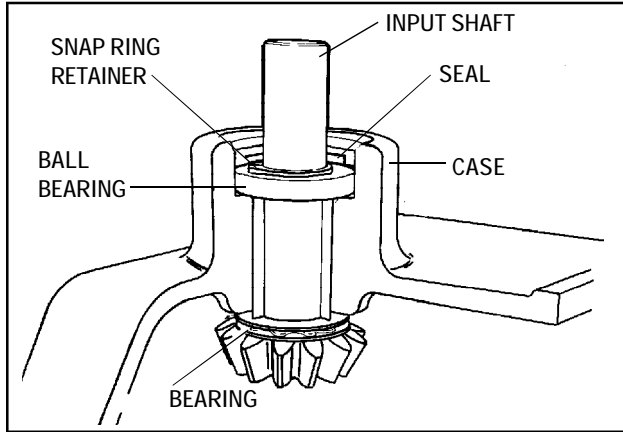
**NOTE:** One model (612) has a sealed ball bearing instead of an oil seal. To remove this unit, remove snap ring inside the case and drive out. On model 612-A, remove the oil seal in the normal manner.



**SHIFTING ASSEMBLY**

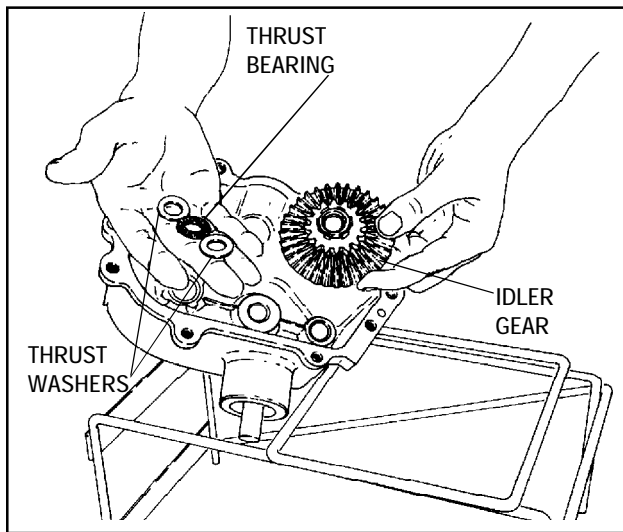
The shifting assembly is usually removed from and installed into the transaxle as a unit. The assembly is removed and replaced by grasping the shifting rods firmly. This will cause the binding necessary to hold the assembly together. Before removal or installation of the shifting assembly,

notches in the shifter forks should be aligned with notches in the shifter stop. This indicates that shifting assembly is in a neutral position. The shifter stop must be so positioned so that the notch aligns with notches in shifter forks. For service of the shifting assembly, refer to Chapter 10.



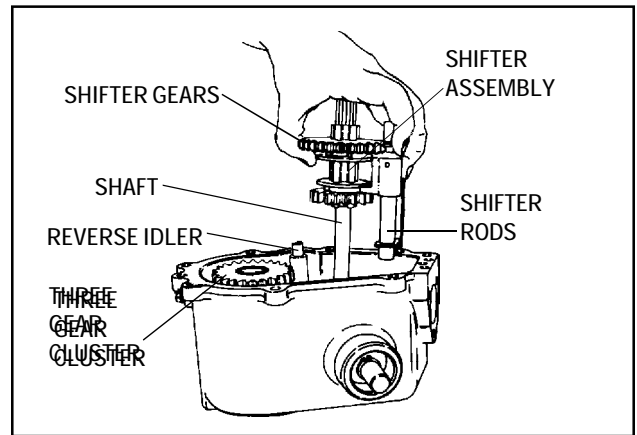
### 13. Transaxle Assembly

- a. Install new seal thrust washers and bearing on input shaft. Note sequence, and install into case, using seal protector.

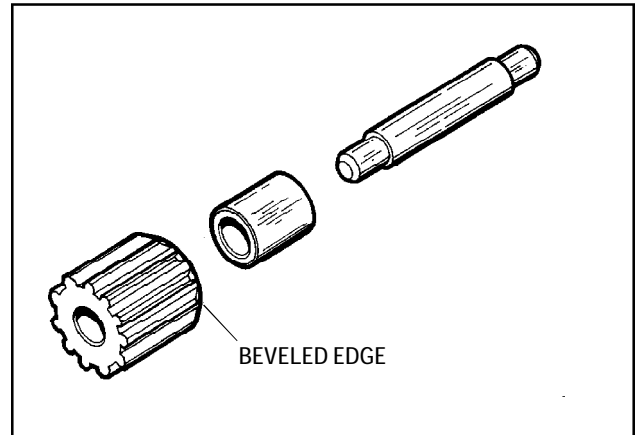


- b. Set case assembly open side up. Insert the idler gear assembly, thrust washers and bearing. Note sequence of washer and bearings from case, thick washer, thrust bearing thin washer, idler gear.

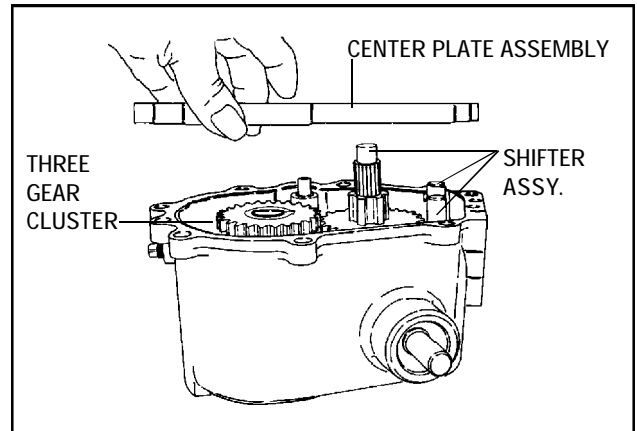
**CAUTION:** Make sure that bearing and thrust washers remain in place while assembling idler gear, shifter and brake shaft.



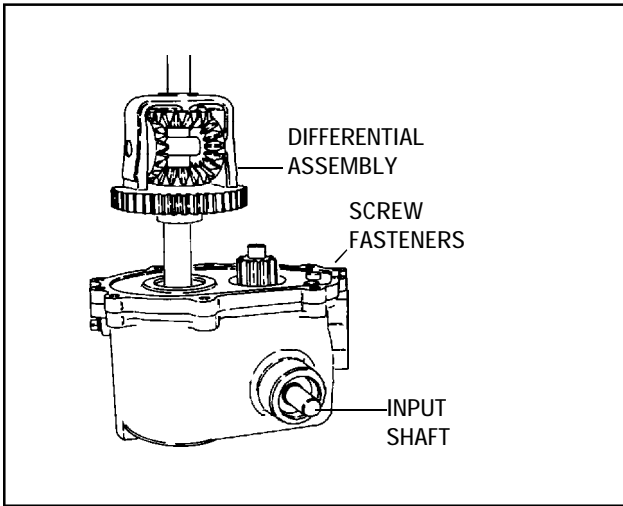
- c. Insert the washer and then the three gear cluster assembly. Making sure that the bevels on the two shifting gears are facing down.
- d. Insert shifter assembly. Check that rods are seated properly.



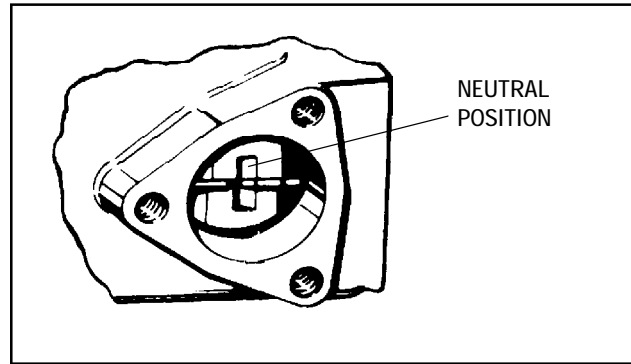
- e. Install reverse idler. Make sure beveled edge is up. Spacer on top of gear.



- f. Place new gasket on case and install center plate.



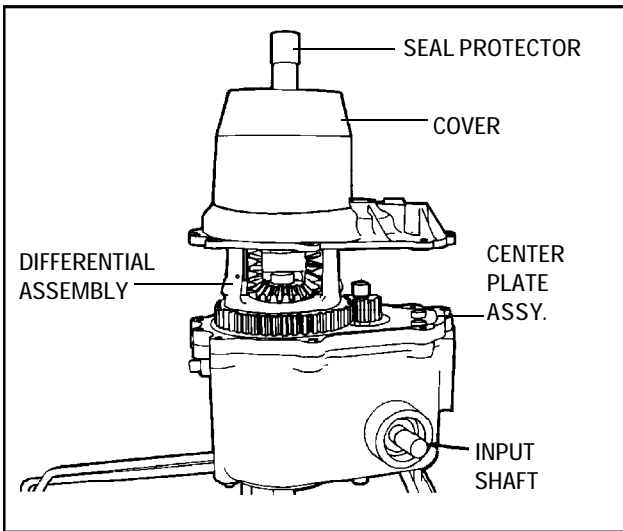
g. Place new gasket on center plate and install differential assembly, longer axle in down position. Be sure gear on shifter shaft is on shaft.



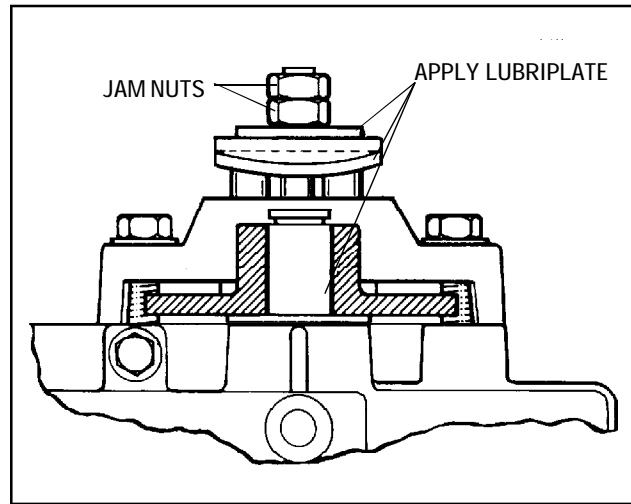
k. Inspection Note: For a neutral position, shift notches in forks and notch in stop must be aligned and centrally located.

14. Brake Lever Assembly

The brake lever type is determined by the original equipment manufacturer's selection of this option.



- h. Install gear case dowel pins. Leave dowel pins slightly exposed on top to locate cover assembly. Install cover assembly and Torque the cap screws to 7-9 ft. lbs. or 84-108 in. lbs.
- i. If unit needs bearings or bushings installed, consult the Chapter for bearing and bushing service for proper procedures.
- j. Install axle supports and fill with S.A.E. 80W90 part number 730229A gear lube. Fill through shifter housing.



When assembling, apply a light film of lubriplate to the inside lever portion which contacts the pins, also to outside of lever, which contacts flat washer, and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil.

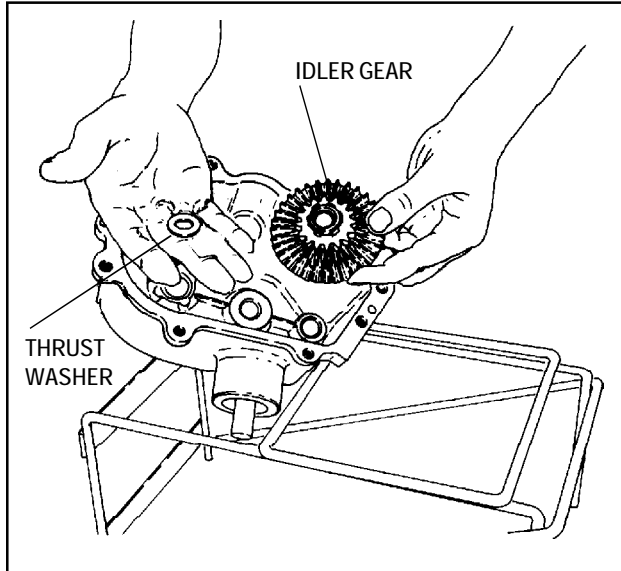
**NOTE:** To secure brake lever, hold bottom nut and torque top nut to 100 in. lbs.

<u>PART LOCATION</u>	<u>600 SERIES BEARING TOOLS</u> <u>TOOL REMOVE &amp; REPLACE</u>	<u>BEARING SIZER</u>
Brake Shaft	670210	(27 needles)
Axle	670204	
*Input Shaft	*670207A	
Center Plate	670205	
Brake Shaft	670213	(30 needles)
Differential	670204	
Cluster Gear	670204	
Idler Gear	670210	
Axle Housing	670204	
Reverse Idler		
*Bearing must be flush with top of case. Secure with Loctite.		

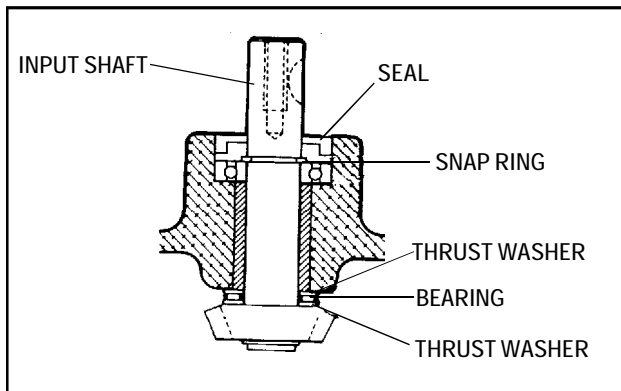
## SECTION 2. 601 SLOW SPEED SERIES

### GENERAL

A. The outside appearance is exactly the same as the 600 Standard. The following is just the difference between the two series. Everything else is exactly the same.



1. Underneath the idler gear is one (1) washer in stead of a thrust bearing and two (2) thrust washers.
2. The idler gear is different than the standard.



3. The input shaft has one (1) thrust washer only, instead of a thrust bearing and two (2) thrust washers.
4. The input shaft and bevel gear are also different than on the standard 600 transaxle.

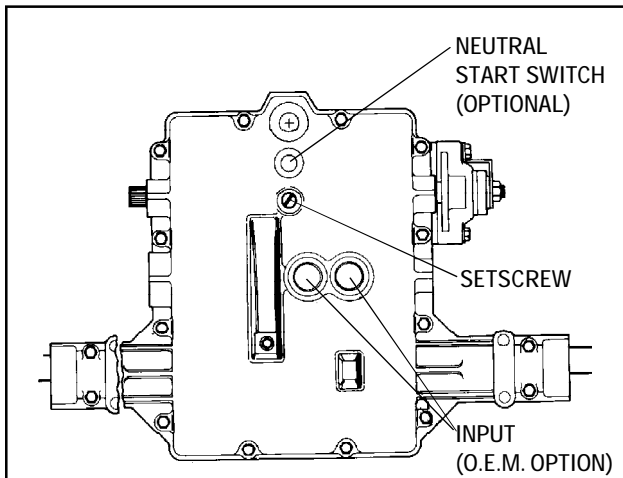
Everything else is the same.

## SECTION 3. 800/801 SERIES

### CAUTION

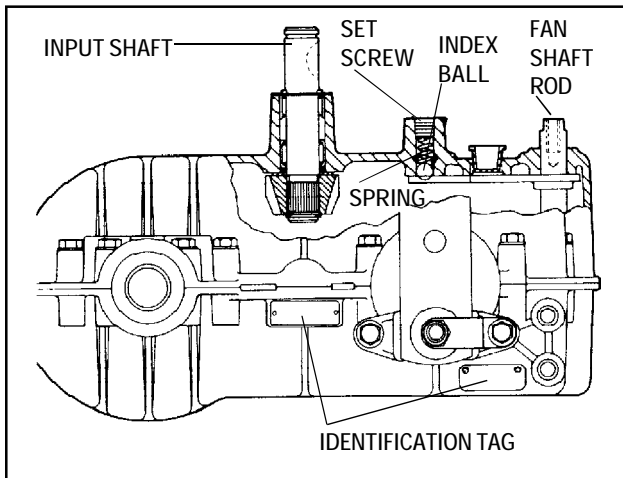
**TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE, FROM ANY FORWARD TO REVERSE GEAR, FROM REVERSE TO ANY FORWARD GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.**

**NOTE:** Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty. The brake may be either a left-hand or right-hand per the O.E.M. option.



### A. GENERAL

The 800/801 series transaxle is basically a combination of the 700 series transmission with a 600 series transaxle differential. The position of the input shaft varies with a particular model. Because of the option of input shaft and gear positioning on either side of the bevel gear, the axle output will vary. The model described in this section is a five speed forward, single reverse. The input shaft for the model described in this section is located to the left of the bevel gear.

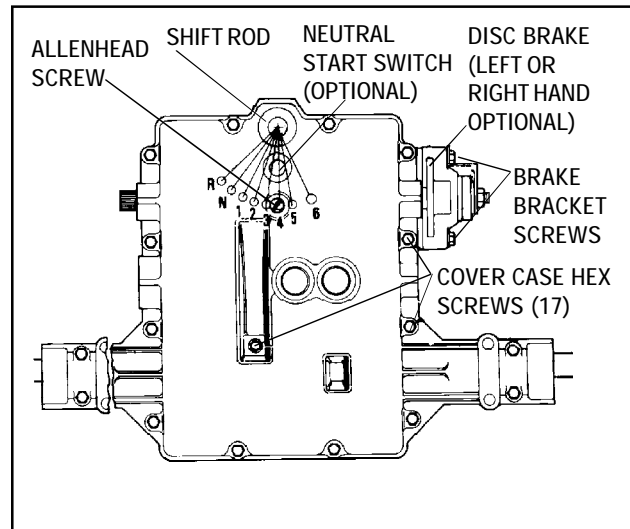


### B. IDENTIFICATION

The unit contains an aluminum tag at location A or B showing the model number.

### C. PRE-DISASSEMBLY

1. Clean outside surface of transaxle.
2. Position shift lever in neutral position as indicated by the shift pattern. Remove Allen head screw, washer(s), and the shift lever.
3. If installed, (O.E.M. Option) remove neutral start switch.
4. Remove setscrew, spring and index ball.



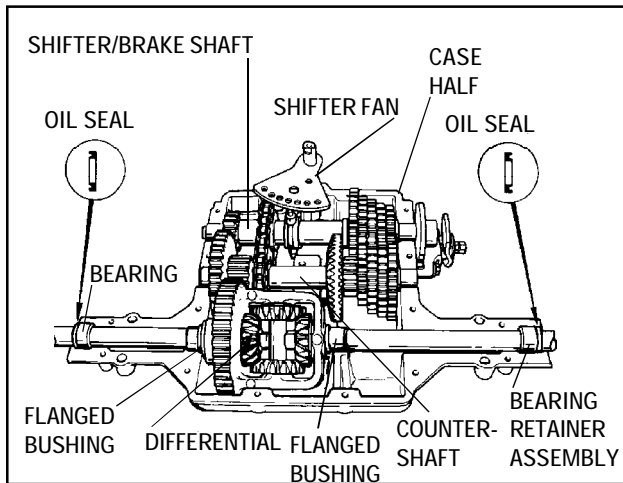
### D. DISASSEMBLY

1. Remove Hex screws that hold cover to case.
2. Push shift lever rod in while pulling cover off of case. Shifting assembly may temporarily remain in case. Remove cover.

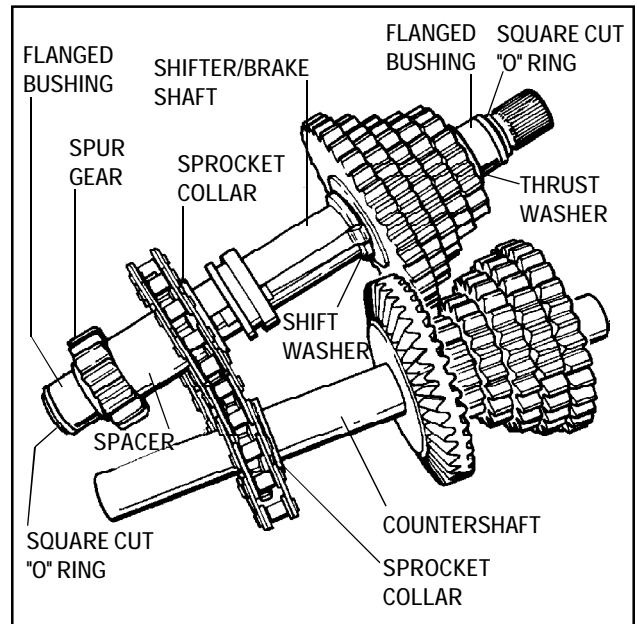
**NOTE:** Remove grease from the unit as parts are removed.

3. Remove two brake bracket screws, and remove brake assembly.

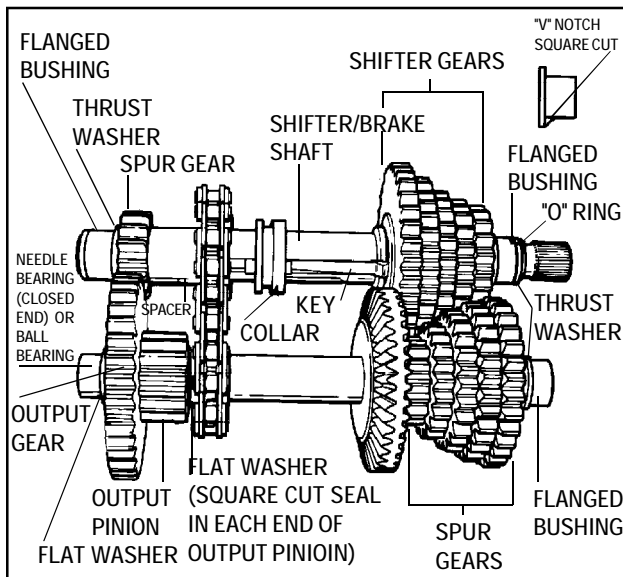
**NOTE:** Prior to removal of gear shaft assemblies from the case, the shifter fan may be removed. It will be difficult to keep parts from falling off the assemblies. Note position of parts before removal.



- Remove gear and shaft assemblies from case half by lifting the two shafts out of the bearing supports taking care not to disturb drive chain relationship with hubs on sprockets.



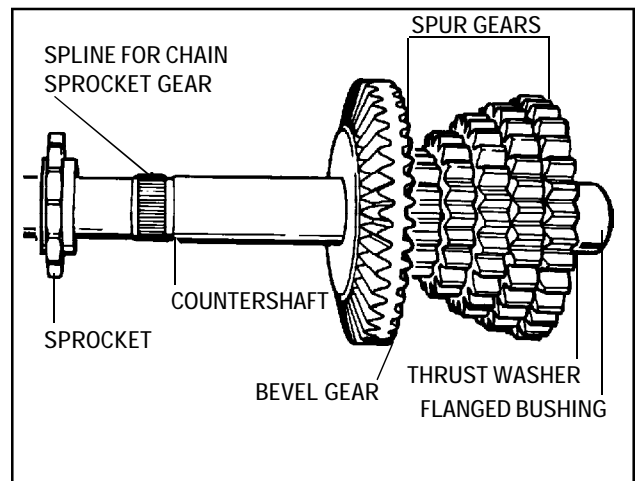
- Angle the shifter/brake shaft and countershaft chain sprocket ends toward each other. Note the collar on the sprockets face the bevel gear. Remove chain.



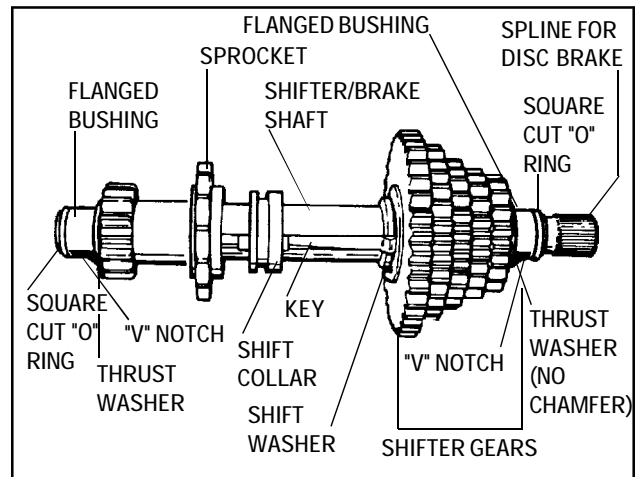
**NOTE:** Before disassembly, observe how "V" notches on the flanged bushings fit into recess "V" of case.

**NOTE:** The square cut black rubber "O" ring, acts as a lubrication seal.

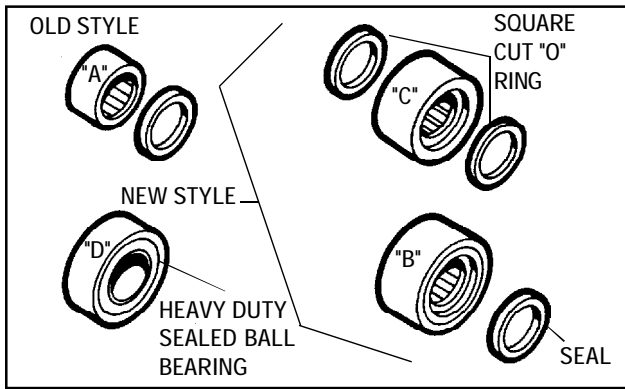
- Remove the needle bearing (closed end) flat washers (2), output gear and output pinion, and 3 square cut seals from the countershaft. (2 seals in output pinion 1 in needle bearing cap). "O" rings on countershaft are larger than those on brake shaft ends. Always replace with new seals whenever removed.



- Remove the sprocket, bevel gear, spur gears, thrust washer, and flanged bushing. The spur gears are splined to the countershaft.

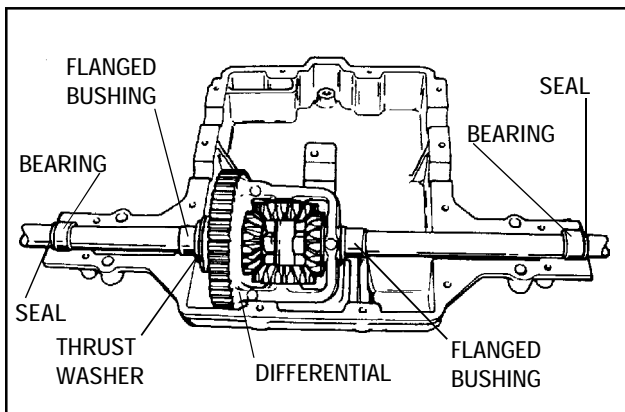


- Remove the square cut seals (2) and flanged bushings (2), thrust washers (2) on shaft ends, spur gear, spacer, sprocket, shift collar with keys, thrust washers and shifter gears.

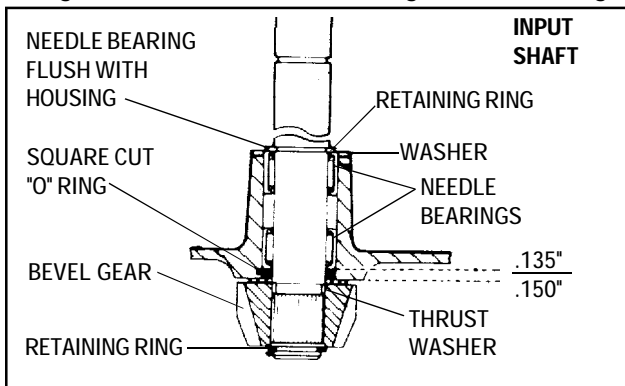


- Remove differential from case. Remove seals (2), needle bearings or ball bearings (2), flanged bushings (2) and thrust washer.

Teardown and reassembly procedures for this unit may be found in the Chapter on differentials.



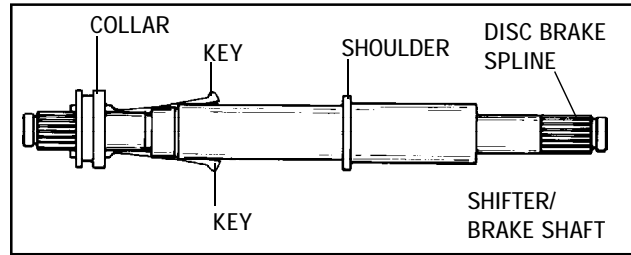
The 800 Series has used 4 styles of bearings on the axles. The earliest style "A" was a smaller loose cage needle bearing and must have the seal to the outside of that bearing. Style "B" must have the seal to the outside of the bearing. When bearing style "C" is used, a square cut "O" ring must be used on each side of the bearing. Bearing style "D" is a sealed ball bearing used in H.D. application. Styles "B", "C" and "D" are interchangeable. All needle bearings must be repacked with grease. Do not use Bentonite grease in bearings.



- Remove retaining ring on bevel gear side from the input shaft, remove bevel gear and pull shaft through case. The square cut "O" ring must be replaced, if removed. Tool Part No. 670251 is used for removal and installation of needle bearings for the input shaft. The needle bearing on inboard side is installed .135/.150" below flush.

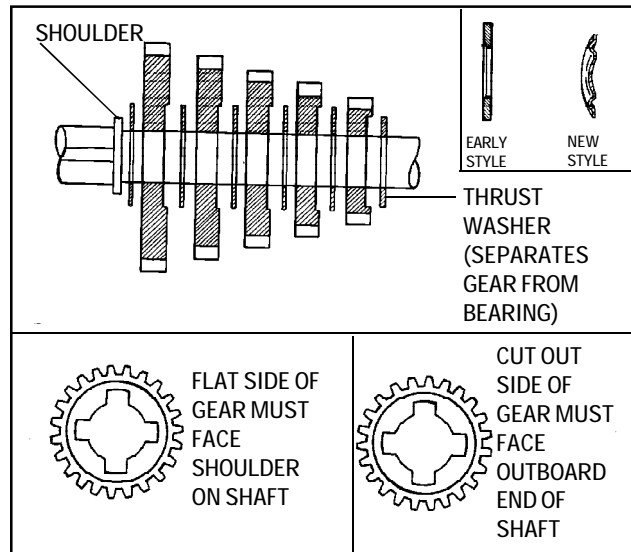
### E. REASSEMBLY

- Apply E. P. grease between bearings and install and secure the input shaft and bevel gear in the cover. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067B.



- Grease the keyways and slide keys and collar on output and brakeshaft. Thick side of collar MUST face shoulder on shaft. Service replacement shifter/brake shafts will come with 4 keyways in the shaft instead of 2.

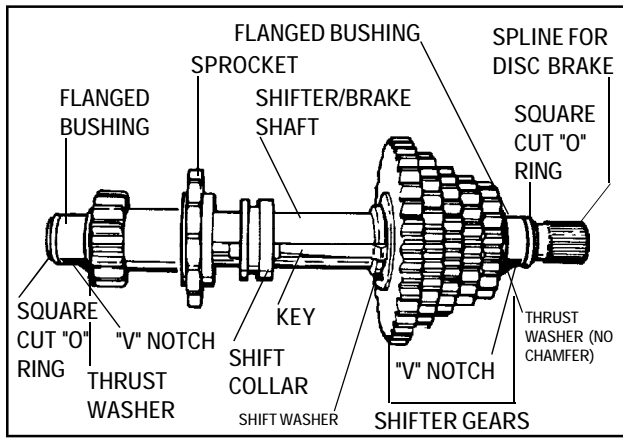
**NOTE:** When repairing the unit used the same number of keys removed. Do not increase or decrease.



- Install the thrust washers and shifting gears onto the shifter/brake shaft. The number of gears and/or spacer will be determined by the number of speeds in the transmission.

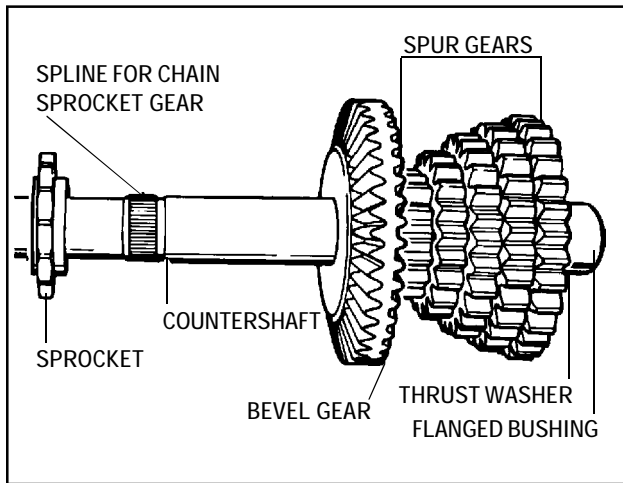
**WASHERS.** A running change has been made to the shifting washers. Many models have used the thrust washer with a 45° chamfer on the inside diameter. The latest style washer has a curved or rounded side. The purpose of both washers is to compress the shifting keys as they slide into the gears. Therefore, the chamfered or rounded side of these washers must face the shoulder of the shaft or towards the shifting keys. The washers are interchangeable.

**SHIFTING GEARS.** The 2 sides of the shifting gears are different. One side is flat and the other side is cut out. The flat side of the gear is placed onto the shaft towards the shoulder of the shaft or towards the shifting keys.

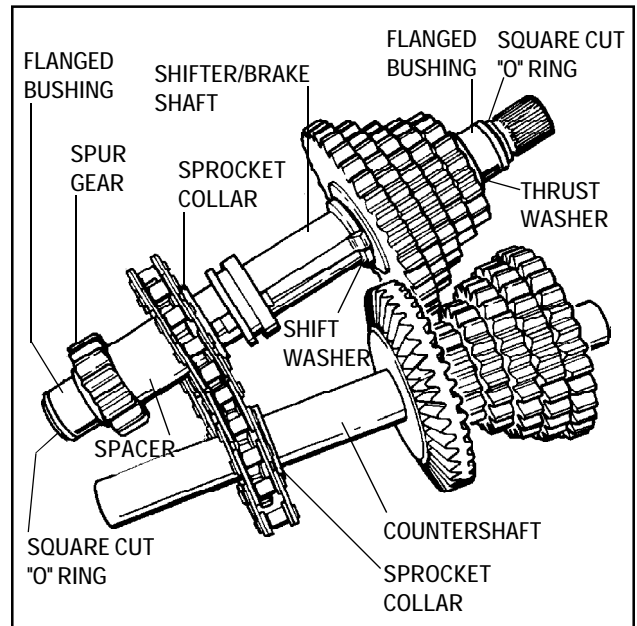


4. **NOTE:** The thrust washer on the shift gear end, of the shifter and brake shaft, does not have a chamfer on the inside diameter. Install sprocket, spacer, spur gear, and thrust washer on output shaft. Be sure collar on sprocket faces the shift collar. Install bushings on both ends of shifter/brake shaft, install square cut "O" rings on end of flanged bushings.

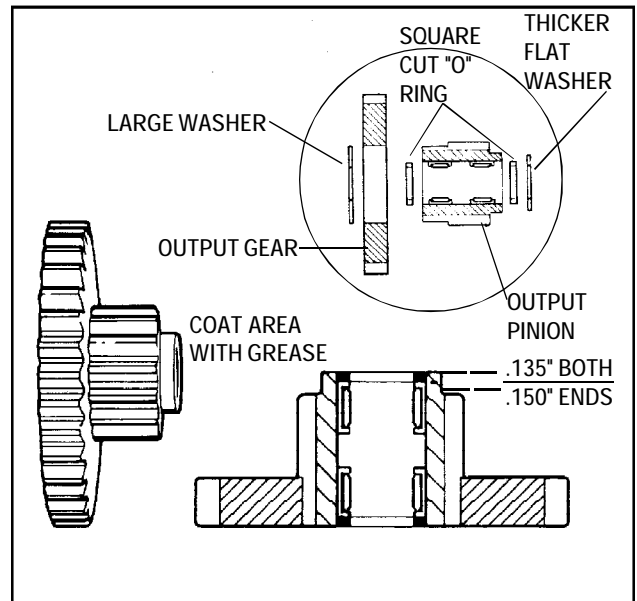
**NOTE:** Depending on model, the bevel gear may be installed one of two ways. For description purposes, in this section, the model used has the wide angle of the bevel gear facing the left.



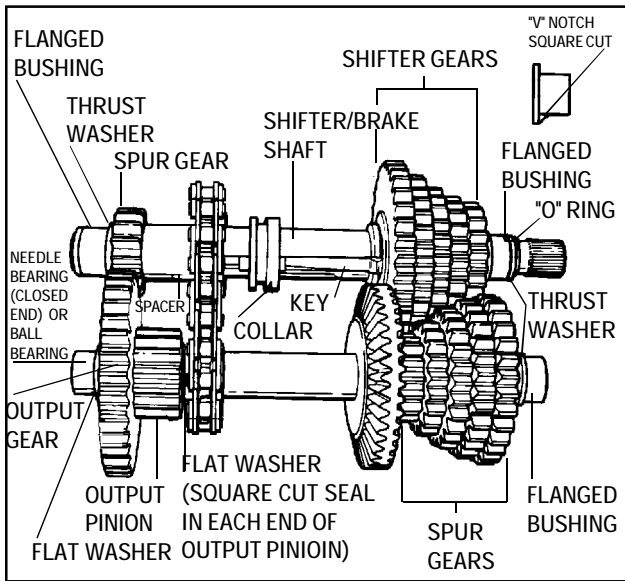
5. Install bevel gear and smallest to largest spur gears, thrust washer and bushing to the countershaft. Install the sprocket.



6. With the shifter/brake shaft and countershaft ends angled together, install the chain on the sprockets.

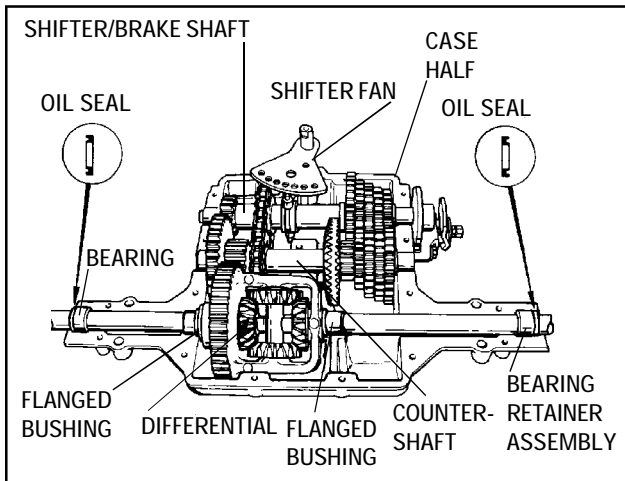


7. For correct positioning of the needle bearings use removal and installation Tool Part No. 670252. Fill the area between the needle bearings with grease before installing on the countershaft.



8. Install the output and pinion gears, the flat washer, square cut rings, needle bearing (closed end), and spacer on one end and thrust washer and flanged bushing on the other end. Note that the "V" notch on the bushing fits into recess "V" in case.

A square cut seal fits in each recessed end of output pinion. Also one square cut ring fits into recessed end of needle bearings (closed end).



**9. DIFFERENTIAL ASSEMBLY**

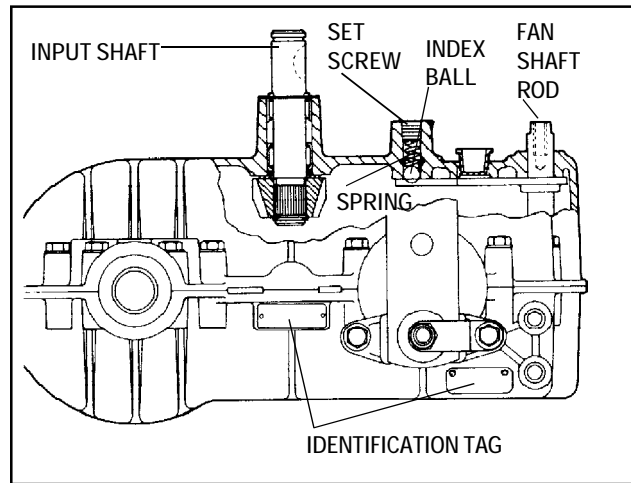
Install the flanged bushings (2), flat washer, needle bearings or ball bearings (2), and oil seals (2), with seal grooves facing out.

For teardown and reassembly of the differential, see the Chapter on differentials.

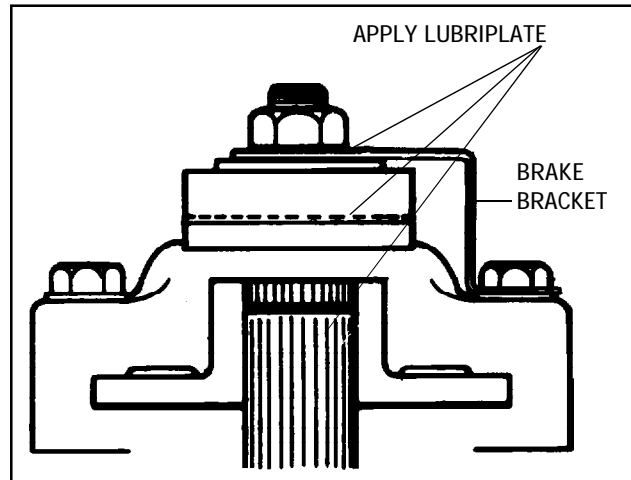
Install differential in case.

10. Install shifter assembly, and pack 30 oz. (36 oz. 801 Series) of Bentonite grease around bearings and gearing, then reinstall cover on case. Torque cap screws 90-100 inch pounds.

11. **NOTE:** On reassembly use either gasket eliminator Loctite 515 (part number 510334) or silicone RTV Loctite 598 (part number 788093).



12. Install index ball, spring and setscrew in that order into cover, and slowly tighten the screw 1 turn below flush. If unit contained a neutral start switch install. Check for binding by turning input shaft.



13. Prior to installing the brake assembly, apply a light film of lubriplate to the inside of lever portion which contact pins, also to outside of lever which contacts flat washer and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil. Install brake assembly.

Install transaxle on equipment. Adjust brake linkage to disengage when clutch is engaged. Brake and linkage may vary. Consult equipment owner's manual.

**NOTE:** If adjusted incorrectly, the brake will do one of two things:

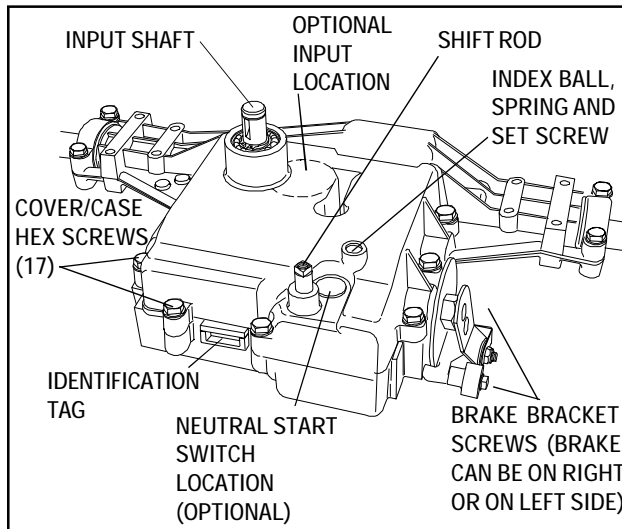
- a. It will not brake (stop) the vehicle when the brake is applied or,
- b. If adjusted too tightly, a drag or continued braking effect will be evident until the brake wears out.

## SECTION 4. 820 SERIES

### CAUTION:

**TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE; FROM ANY FORWARD TO REVERSE GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.**

**NOTE:** Due to the many variations of equipment braking systems, adjustment and repair to the components and linkages are not considered warranty.



### A. GENERAL

The 820 series is similar to the 920 series transaxle in basic operation. It has up to 6 speeds forward and 1 reverse. The 820 series is a heavy duty unit which is suited for ground engaging attachments.

### B. IDENTIFICATION

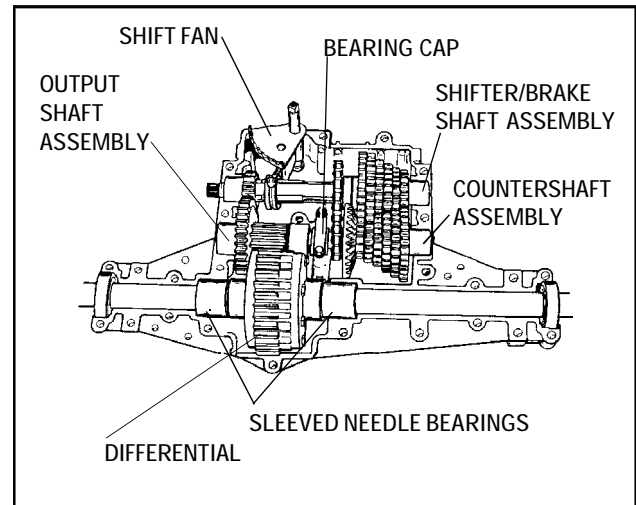
This unit contains an aluminum tag showing the model number.

### C. PRE-DISASSEMBLY

1. Clean the outside surface of the transaxle.
2. Position the shift lever in the neutral position.
3. Remove set screw, spring and index ball.
4. If installed (O.E.M. option), remove neutral start switch.

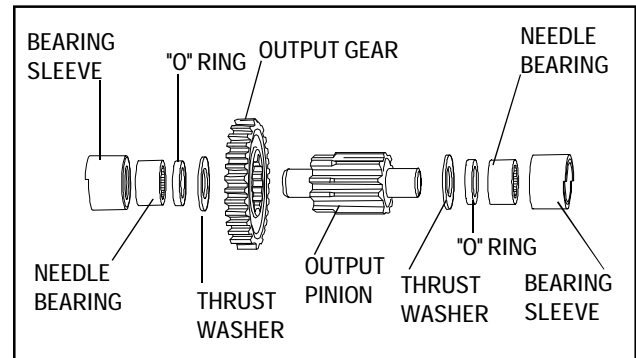
### D. DISASSEMBLY

1. Remove hex screws that hold cover to case.
2. Push the shift lever rod in while pulling cover off of the case. Shifting assembly may temporarily remain in case. Remove cover.
3. Remove two brake bracket screws and remove brake assembly.

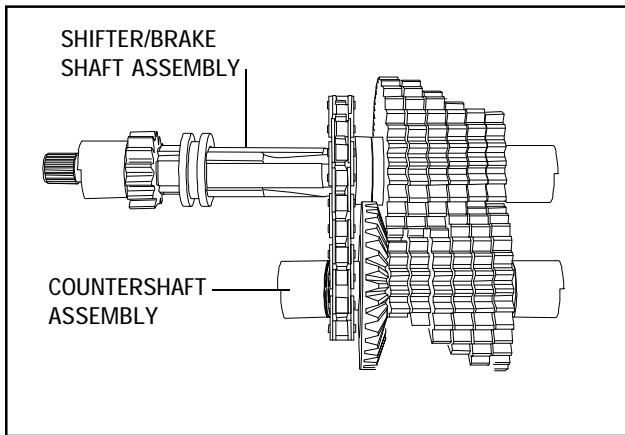


**NOTE:** Remove grease from the unit as parts are removed. Remove the shift fan prior to removal of the gear shaft assemblies from the case. It will be difficult to keep parts from falling off the assemblies, note position of parts before removal.

4. Remove bearing cap, differential, shift fan, output shaft assembly and then both the shifter/brake shaft and countershaft simultaneously.

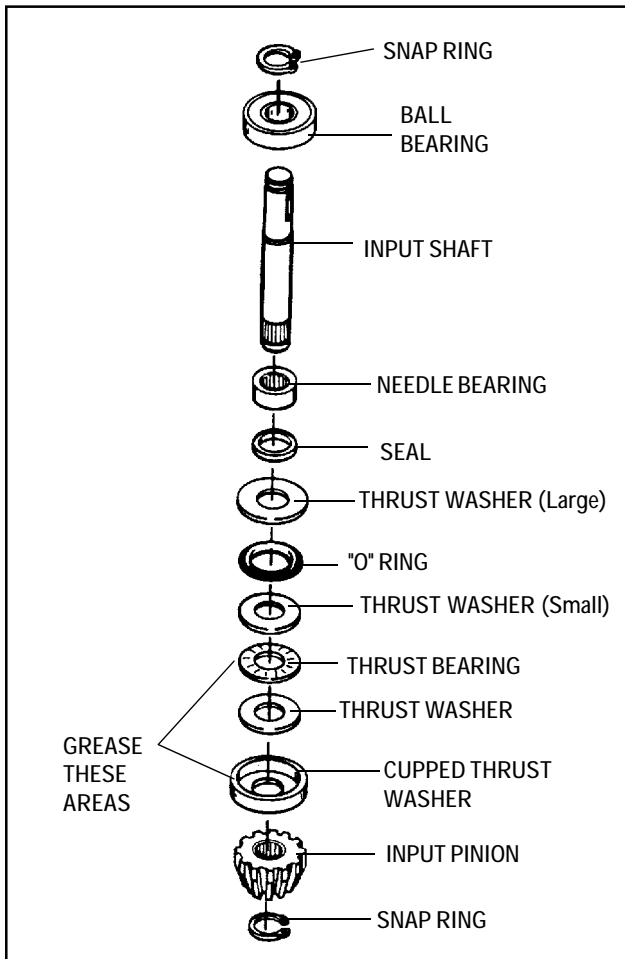


5. **OUTPUT PINION AND SHAFT.**  
Remove sleeved needle bearings. Remove large thrust washers and large output gear. The output pinion gear is machined directly onto the output shaft in most models. There is at least one model in which the output shaft is splined to accept a splined output pinion gear and a splined output gear.



### 6. COUNTERSHAFT AND SHIFTER/BRAKE SHAFT

As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly easier and inspection of all parts possible. Clean each part of grease as the parts are laid out.



### 7. INPUT SHAFT

The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the cover. The seal must be replaced if the shaft is removed.

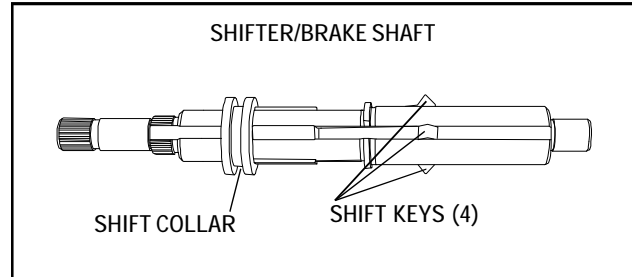
### 8. DIFFERENTIAL

Refer to the Chapter on differentials for service. Should disassembly of the differential be necessary, 2 oz. of bentonite grease should be placed around the gears on reassembly.

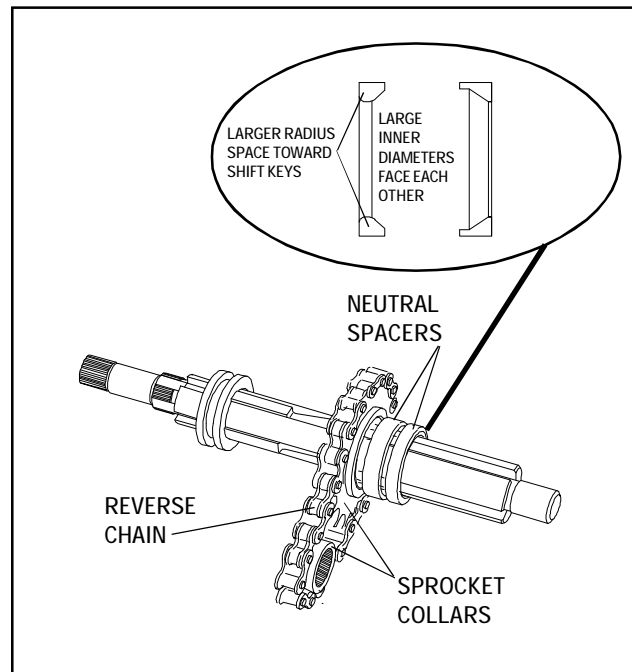
## E. REASSEMBLY

**NOTE:** Do not apply Bentonite grease to needle bearings. Use any type of axle grease or its equivalent. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067B.

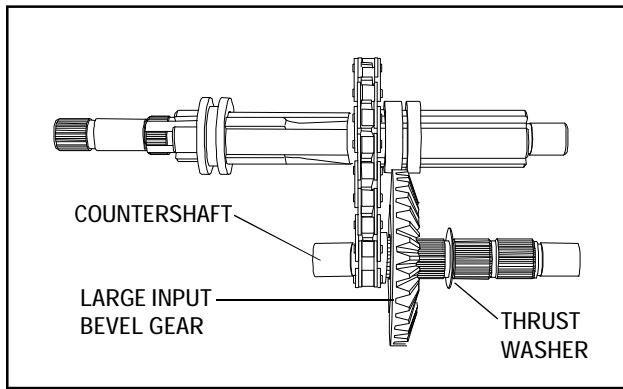
1. Install the input shaft, and all the associated parts in the order shown on the input shaft breakdown.



2. Grease all four keyways, insert keys into collar and keyways and slide onto the shifter/brake shaft.

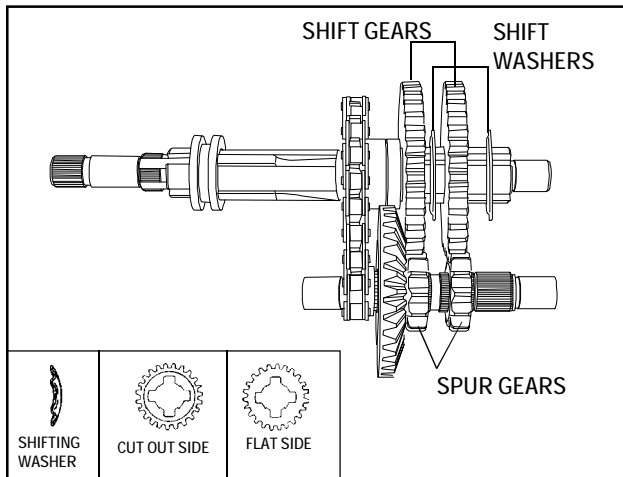


3. It is easier to assemble this transaxle if the countershaft and the shifter/brake shaft are assembled at the same time. Start by placing the reverse chain over the reverse sprockets. Make sure that the collars on the sprockets are on the same side of the chain and install the larger sprocket onto the shifter/brake shaft with the collar away from the shifting keys. Place the neutral spacers onto the shifter/brake shaft with larger inner diameter sides facing together, and the spacer with the largest inner diameter radius toward the shift keys. Push the shifting keys through the reverse sprocket and the first neutral spacer, pull the neutral spacers and the reverse sprocket up against the shoulder of the shifter/brake shaft.



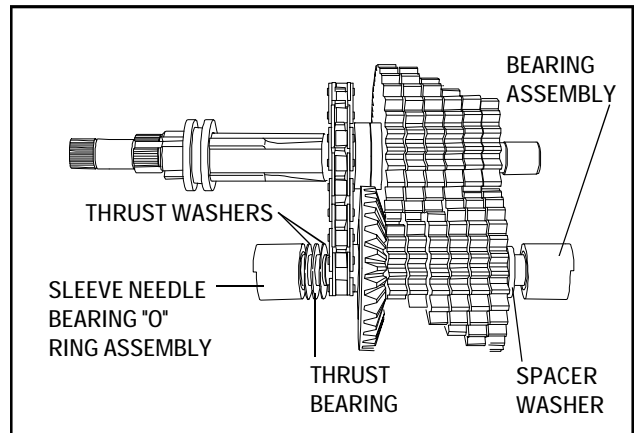
4. Insert the countershaft into the smaller reverse sprocket. Then install the large bevel gear, with the bevel facing away from the reverse sprocket. Place thin thrust washer on the countershaft next to the bevel gear.

**NOTE:** Depending on model, the bevel may be installed one of two ways. For description purposes, in this section, the model used has the bevel side of the large bevel gear facing away from the reverse sprocket; in other models the bevel may face toward the reverse sprocket. In either case there is a thrust washer placed on the counter shaft after the large bevel gear. Some models may also have the smallest spur gear machined onto the countershaft in this case the large bevel gear must be placed onto the countershaft prior to inserting shaft into the reverse sprocket. These models will not have a thrust washer placed next to the large bevel gear.



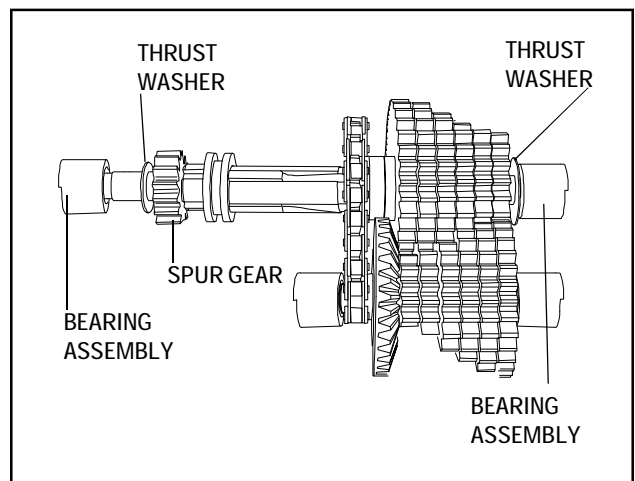
5. Build the gears on the countershaft and shifter/brake shaft alternately, meshing each gear with its mating gear on the other shaft. The first gear on the shifter/brake shaft would be the largest of the shifting gears. Place this gear next to the neutral spacer with the flat side of the gear next to the spacer. Place a shifting washer onto the shifter/brake shaft with the rounded edge towards the shifting keys. Continue this procedure until all the gears on both shafts have been added.

**NOTE:** It is not only important that gears match up diameter-wise, but must match up according to thickness. As all the gears are placed back into the assembly, each should be packed with Bentonite grease.



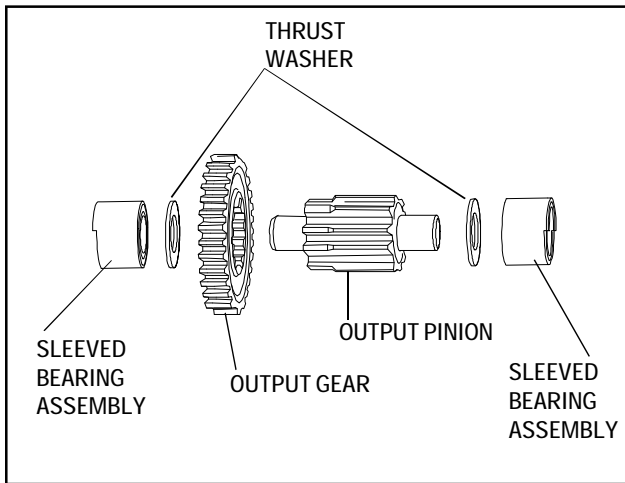
6. In the model pictured, a thrust washer, thrust bearing, thrust washer and sleeved needle bearing with "O" ring are placed on the countershaft next to the reverse sprocket. Place a spacer washer and sleeved needle bearing with "O" ring next to largest spur gear. The sleeved needle bearing installation will have the step facing outward and the wider portion of the bearing sleeve toward the cover. This will be true for all future sleeve bearing installations.

**NOTE:** On models with the large bevel gear facing in the opposite direction the thrust washer, bearing and thrust washer will be placed next to the largest spur gear and the spacer washer will be placed next to the reverse sprocket.

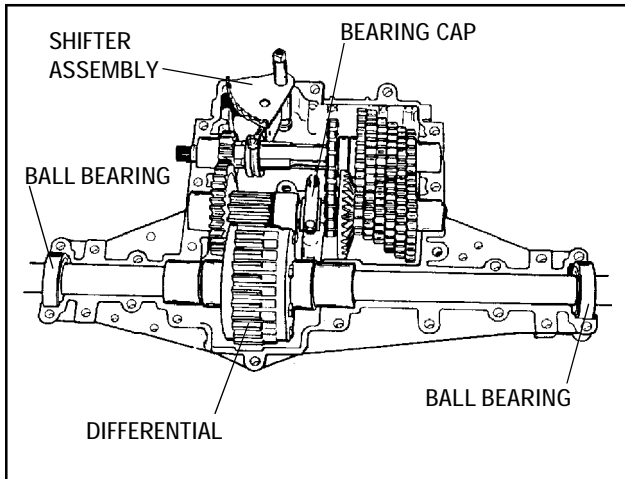


7. Place large thrust washer next to the last shifting gear (this may be a step washer on some models) then a sleeved needle bearing with "O" ring. Place the spur gear, small thrust washer and sleeved needle bearing with "O" rings on the opposite end of the shifter/brake shaft.

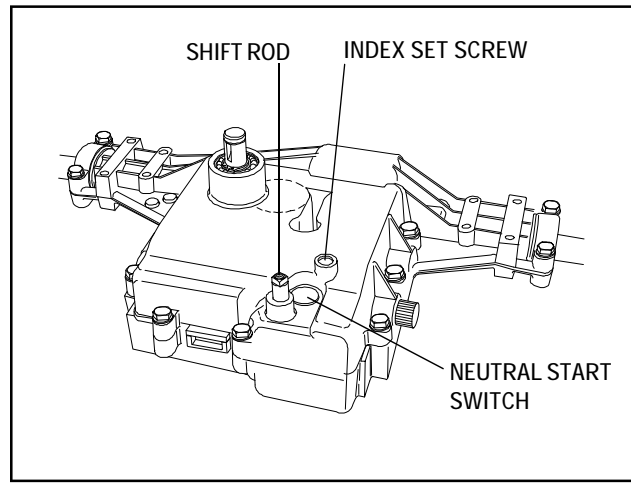
**NOTE:** Dependent on whether the brake is on the right or on the left, will determine which end uses a capped sleeved needle bearing.



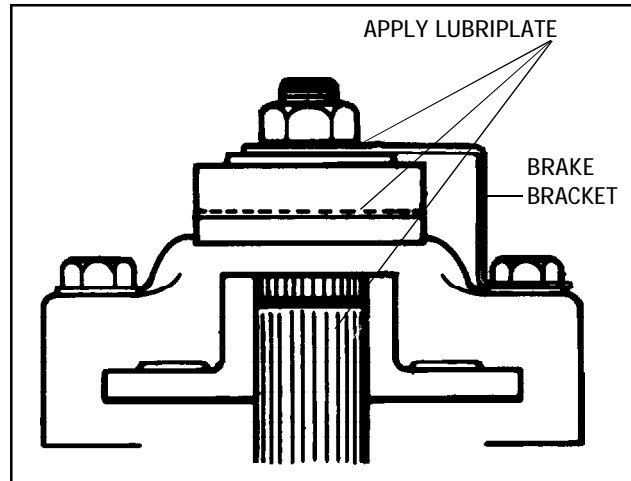
8. Place the output gear on the stepped end of the output pinion. Place thrust washers on each end and then the large sleeved needle bearings. Install the three shaft assemblies into the case.



9. Insert differential into case, position the caged ball bearings on the axle ends into the recessed areas of the case. Place the bearing cap over the sleeved needle bearing of the countershaft and torque bolts 90-100 inch pounds. Install shift fan and pack transaxle with remaining Bentonite grease. (36 oz. total)
10. Clean mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator #515, Tecumseh Part No. 510334 or the Loctite Silicone RTV 598, Tecumseh Part No. 788093.



11. Guide cover over shift rod and position onto case. Torque cover screws 180-216 inch pounds. Replace index ball, spring and set screw and turn set screw one (1) turn below flush. Install the neutral start sensing switch if applicable. Check for binding by turning input shaft.



12. Prior to installing the brake assembly, apply a light film of lubriplate to the inside of lever portion which contact pins, also to outside of lever which contacts flat washer and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil. Install brake assembly.

Install transaxle on equipment. Adjust brake linkage to disengage when clutch is engaged. Brake and linkages may vary. Consult equipment owner's manual.

**NOTE:** If adjusted incorrectly, the brake will do one of two things:

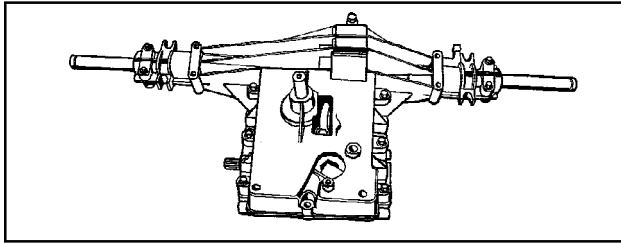
- It will not brake (stop) the vehicle when the brake is applied, or,
- If adjusted too tightly, a drag or continued braking effect will be evident until the brake wears out.

## SECTION 5. 900 SERIES

### CAUTION

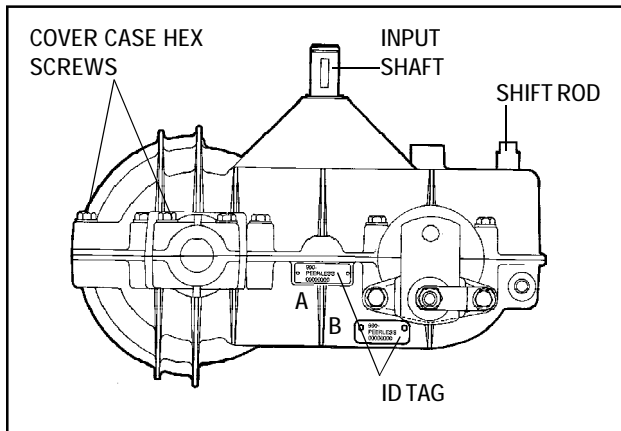
**TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE, FROM ANY FORWARD TO REVERSE GEAR, FROM REVERSE TO ANY FORWARD GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.**

**NOTE:** Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.



### A. GENERAL

The 900 series is like the 800 series transaxle. It has 1, 2, 3 or 4 speeds forward and 1 reverse.

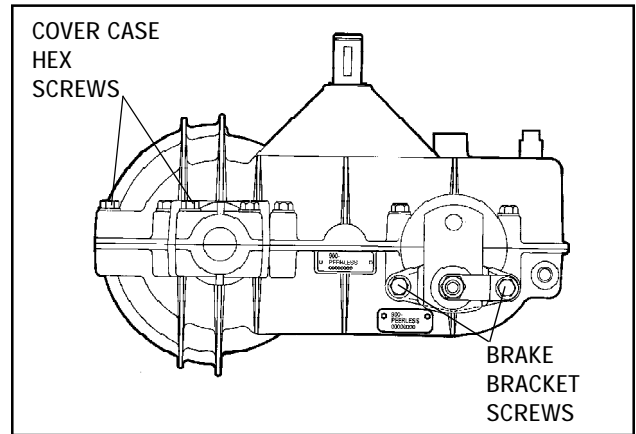


### B. IDENTIFICATION

This unit contains an aluminum tag at location A or B, showing the model number.

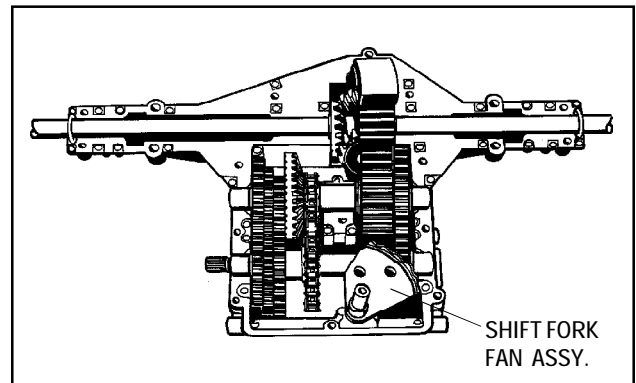
### C. PRE-DISASSEMBLY

1. Clean outside surface of transaxle.
2. Position shift lever in neutral position.
3. Remove set screw, spring and index ball.
4. If installed (O.E.M. option), remove neutral start switch.

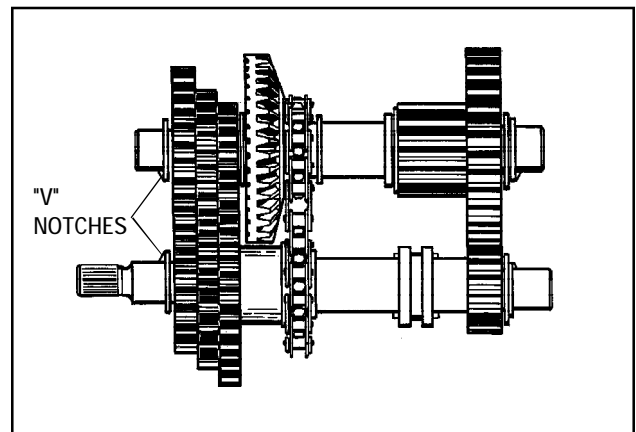


### D. DISASSEMBLY

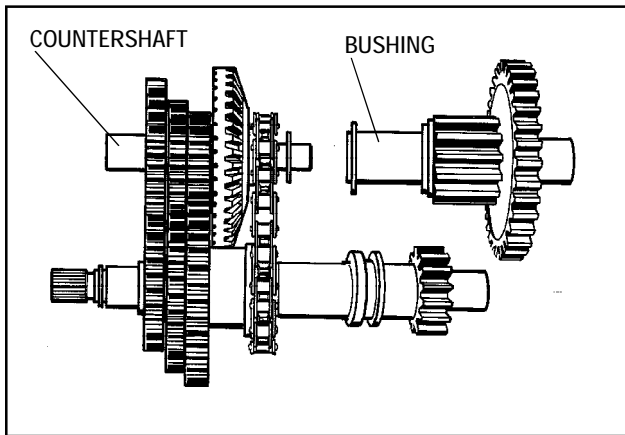
1. Remove hex screws that hold cover to case.
2. Push shift lever rod in while pulling cover off of case. Shifting assembly may temporarily remain in case. Remove cover.
3. Remove two brake bracket screws and remove brake assembly.



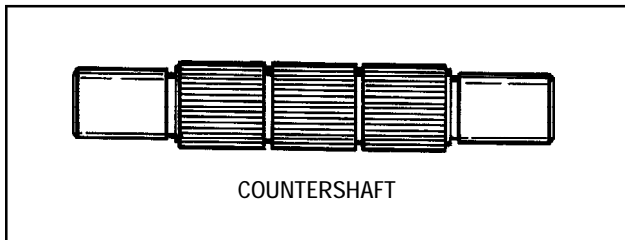
**NOTE:** Remove grease from the unit as parts are removed. Prior to removal of gear shaft assemblies from the case, the shifter fan may be removed. It will be difficult to keep parts from falling off the assemblies. Note position of parts before removal.



4. Remove gear and shaft assemblies from case half. **NOTE:** Before disassembly, observe how "V" notches on the flange bushings fit into recess "V" of case.

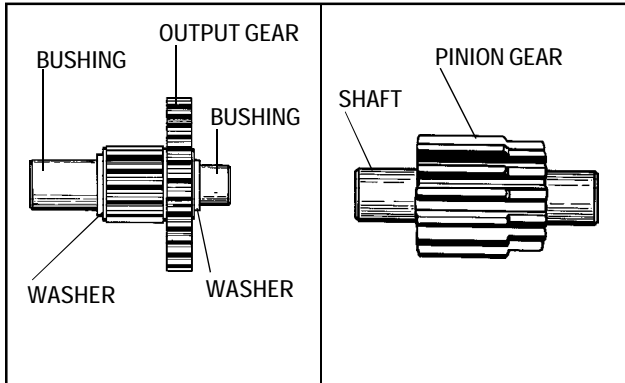


5. To disassemble countershaft, output pinion and shaft assembly, simply pull apart.



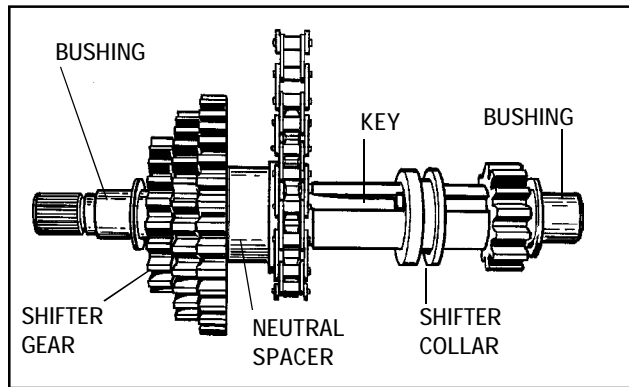
6. **COUNTERSHAFT**

Remove the two (2) thrust washers, sprocket, bevel gear, spur gears and flanged bushing. The sprocket, bevel gear and spur gears are splined to the countershaft.



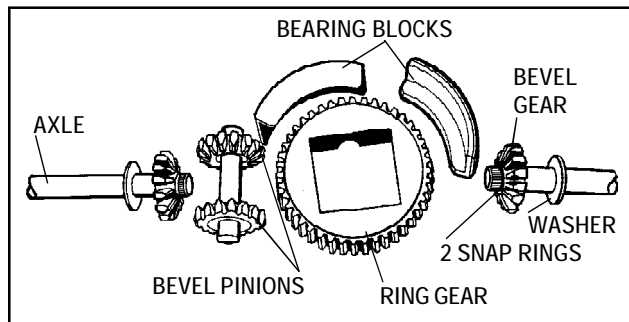
7. **OUTPUT PINION AND SHAFT**

Remove the large brass bushing, large washer, large output gear, washer and bushing. The shaft and output pinion gear come as an assembly.



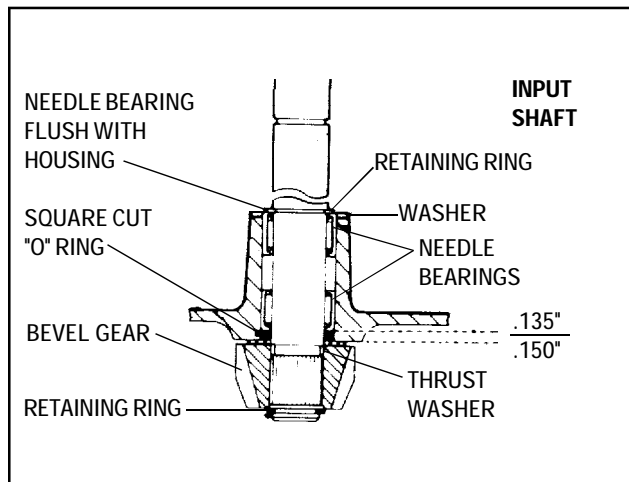
8. **SHIFTER SHAFT**

Remove the square cut "O" ring (1) and flanged bushings (2), thrust washers (2) on shaft ends, shift collar with keys, sprocket, spacer, shifter gears and thrust washers.



9. **DIFFERENTIAL**

Remove the top bearing block on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft and the axles. Grasp the axle bevel gears between your thumb and fingers, hold together while lifting differential from case. Remove bottom bearing block from case.



10. **INPUT SHAFT**

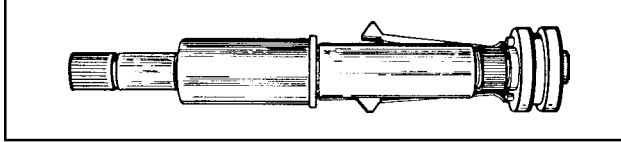
Remove retaining ring on bevel gear end from the input shaft, remove bevel gear and pull shaft through case. The square cut "O" ring must be replaced, if removed.

Tool part no. 670251 is used for removal and installation of needle bearings for the input shaft. The needle bearing on inboard side is installed .135/.150" below flush.

## E. REASSEMBLY

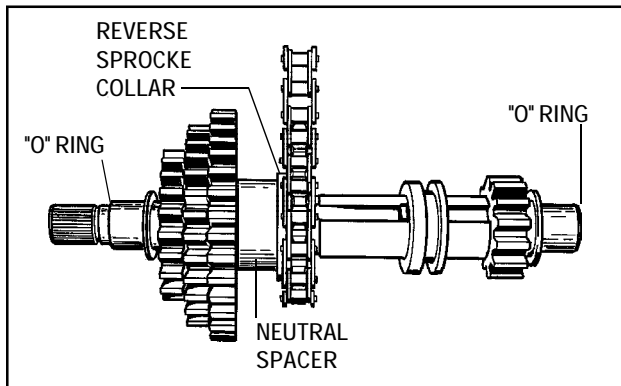
1. Apply E.P. grease between bearings in the cover and install the input shaft, square cut seal, thrust washers, bevel gear and snap ring.

**NOTE:** Needle bearings are lubricated with E.P. Grease. Do not use Bentonite on any needle bearing. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067B.

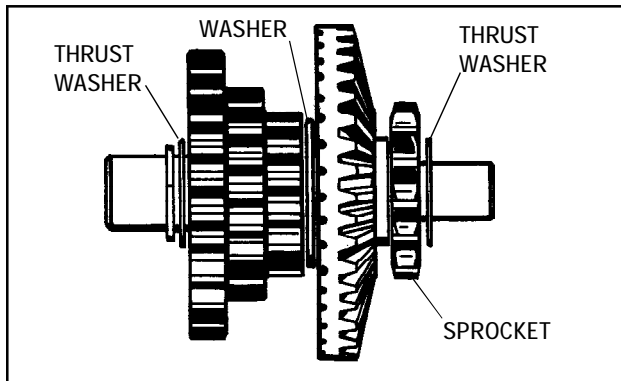


2. Grease both keyways and slide keys and collar on shifter/brake shaft.

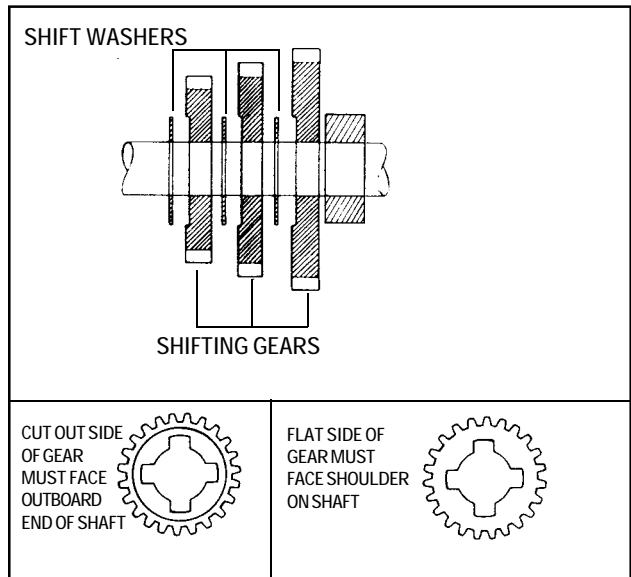
When reassembling the 900 series it is easier to assemble the shifter/brake shaft and the countershaft at the same time.



3. Place the reverse chain on the reverse sprockets. The collars of the reverse sprockets should be on the same side of the chain. Slide the larger sprocket onto the shifter/brake shaft with the collar away from the shifting keys and shoulder on the shifter/brake shaft. Slide the keys through the sprocket and install the neutral spacer over the ends of the shifting keys and pull them back until the sprocket touches the shoulder of the shaft.

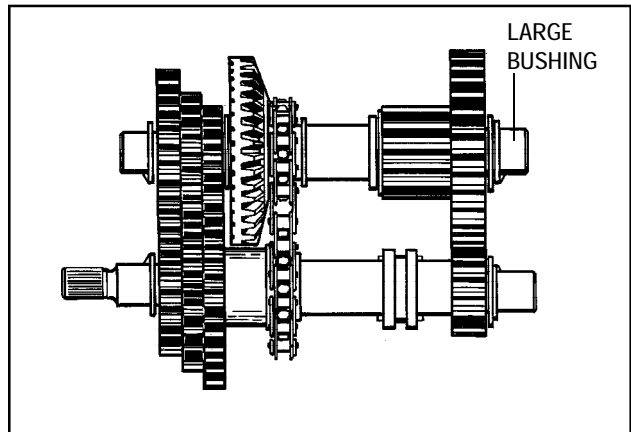


4. Insert the splined countershaft into the smaller reverse sprocket. Then place the large beveled gear on the countershaft with the beveled side of the gear towards the reverse sprocket. If the 900 series is a 1, 2, or 3 speed forward unit, place a washer over the shaft and next to the backside of the large bevel gear. If the unit is a 4 speed forward there will not be a washer in this location. Then begin to place the spur gears onto the countershaft, alternating with its mating gear on the shifter/brake shaft.



5. Place the largest of the shifting gears with the flat side of the gear next to the neutral spacer. Then place a shifting washer with the chamfer on the inside diameter of the washer next to the gear. The chamfer or rounded side must face towards the shifting keys.

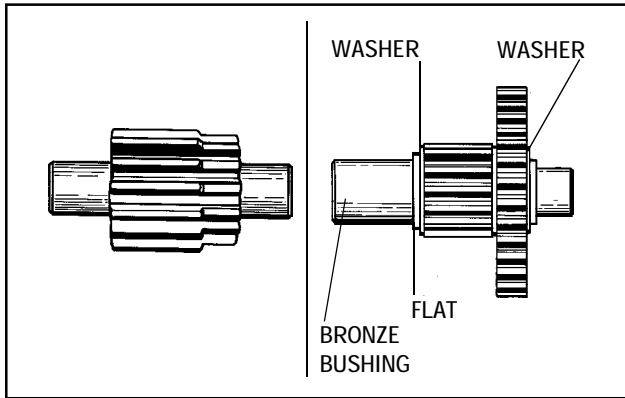
**NOTE:** As all the gears are placed back into the assembly, each should be packed with Bentonite grease.



6. Then place a thrust washer on each end of the countershaft and a bushing on the end with the largest gear.
7. Place a larger thrust washer next to the smallest shifting gear, then the bronze bushing and then an "O" ring.

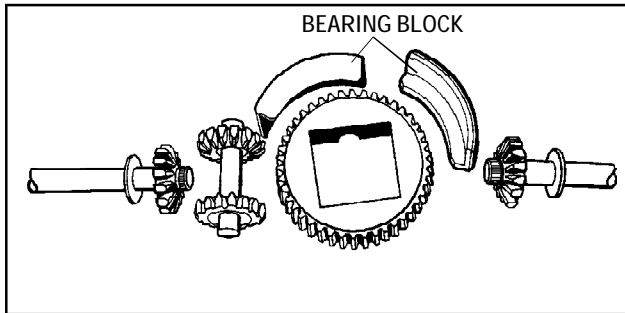
**NOTE:** Some units will use a stepped thrust washer; place the washer onto the shaft so that the step in the washer is out and away from the shifting gears.

8. The end of the shifter/brake shaft (end opposite the shifting gears) has a spline. Install the spur gear that drives the output gear onto this spline. Then the thrust washer, bushing and "O" ring.



9. To assemble the output shaft assembly, place a washer and then the bronze bushing with collar, (flat down), next to the pinion. Place output gear over pinion as in picture. There is a washer on outside of gear.
10. After both shafts are completed, place the flanged bushings on each end. Notice one is larger than the other.

**NOTE:** That the "V" notch on the bushing fits into recess "V" in case.

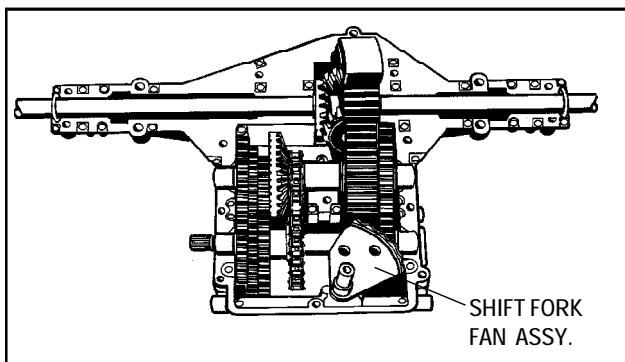


**11. DIFFERENTIAL ASSEMBLY**

When assembling this unit, make sure all parts are there first, because the unit is put together in your hands and placed in the case at the same time. Axles and gears must be on center line of ring gear.

Bearing block in case must have flange to the left hand side. Block in cover must have flange to the right hand side.

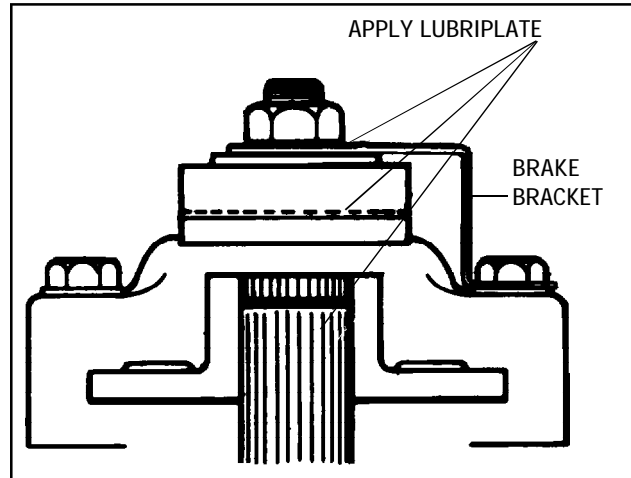
12. Before installing the differential into the case, apply Bentonite grease to the axle bearing areas.



13. Install shifter assembly and pack 26 oz. Bentonite grease around bearings, gearing, and top of shift fan then reinstall cover on case. Torque cap screws 90-100 inch pounds.

14. Clean the mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator #515, Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh Part number 788093.
15. Install index ball, spring, and set screw in that order into cover, and slowly tighten the screw one (1) turn below flush. If unit contains a neutral start switch install.

Check for binding by turning input shaft.



16. Prior to installing the brake assembly, apply a light film of lubriplate to the inside of lever portion which contact pins, also to outside of lever which contacts flat washer and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil. Install brake assembly.

Install transaxle on equipment. Adjust brake linkage to disengage when clutch is engaged. Brake and linkage may vary. Consult equipment owner's manual.

**NOTE:** If adjusted incorrectly, the brake will do one of two things:

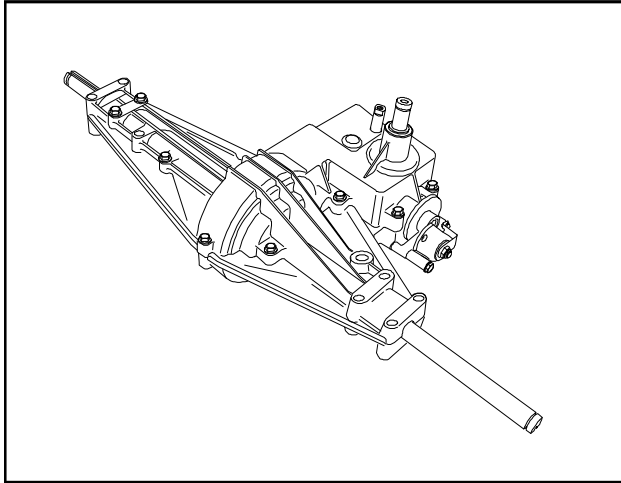
- a. It will not brake (stop) the vehicle when the brake is applied, or,
- b. If adjusted too tightly, a drag or continued braking effect will be evident until the brake wears out.

## SECTION 6. 910 SERIES

### CAUTION

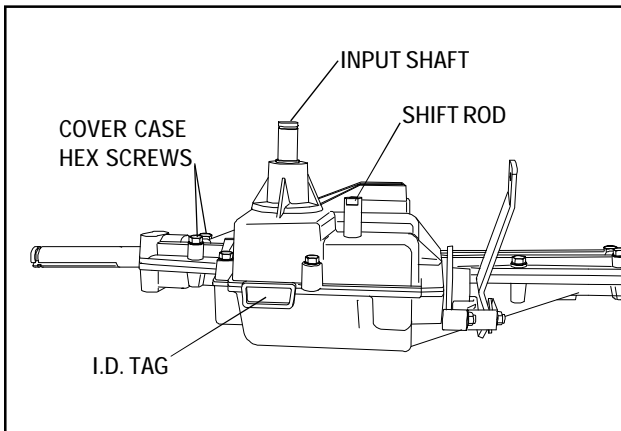
**TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FORWARD OR REVERSE; FROM FORWARD TO REVERSE GEAR.**

**NOTE:** Due to the many variations of equipment braking systems, adjustment and repair to the components and linkages are not considered warranty.



### A. GENERAL

The 910 series is available in 1 speed forward and 1 reverse.



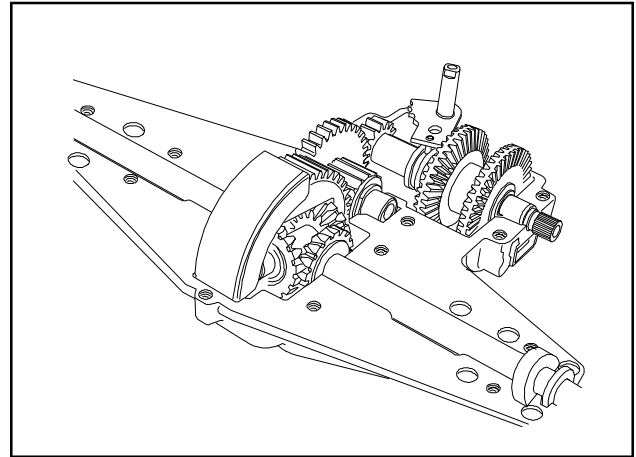
### B. IDENTIFICATION

This unit contains an aluminum tag showing the model number.

### C. STEPS TO TAKE BEFORE DISASSEMBLY.

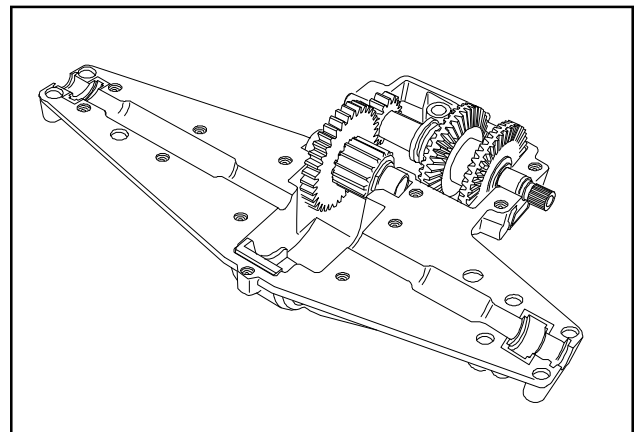
1. Clean the outside surface of the transaxle.
2. Position the shift lever in the neutral position.
3. If installed (O.E.M. option), remove the neutral start switch.
4. Some 910 models will have a detent ball and spring. Remove the set screw, spring and ball.

### D. DISASSEMBLY

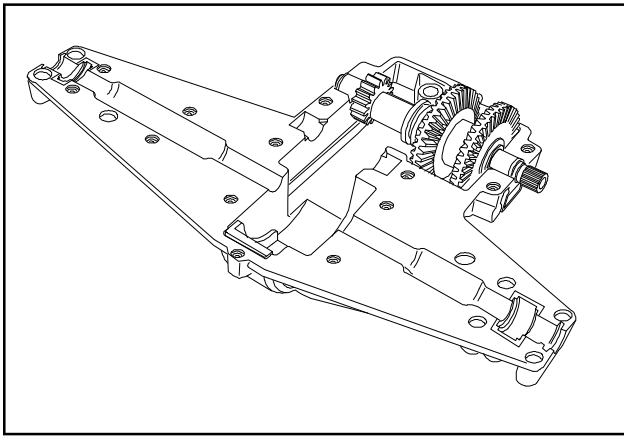


1. Remove the hex head screws that hold the cover to the case.
2. Push the shift lever rod while pulling cover off the case. The shifting lever may temporarily remain in the case. Lift off cover.
3. Remove the two brake bracket screws and remove brake assembly.
4. Remove the grease from the unit as the parts are removed. Prior to removal of gear shaft assemblies from the case, the shifter fan may be removed. Note the position of the parts before removal. Some parts may come off the shafts upon removal.

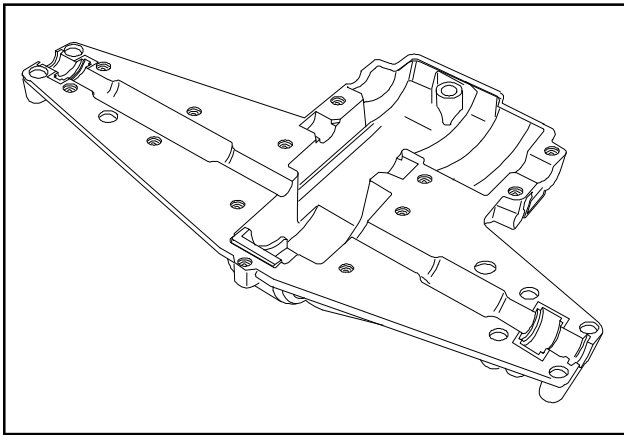
**NOTE: BENTONITE GREASE MAY STAIN CLOTHES. CARE SHOULD BE USED WHEN HANDLING.**



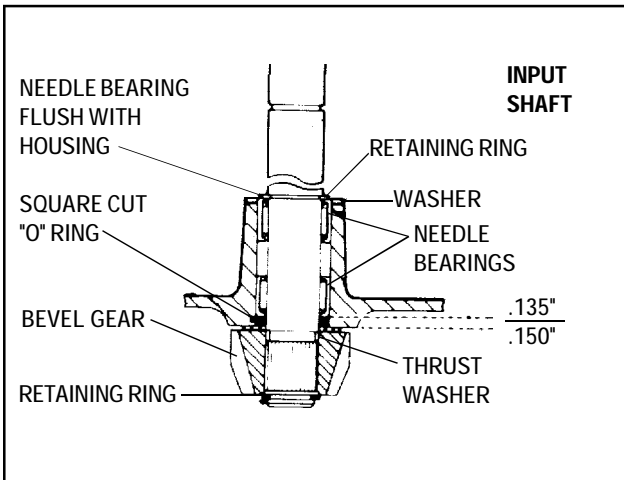
5. Remove the top bearing block on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft and the axles.



6. Remove the output shaft assembly.



7. Remove the shifter/brake shaft assembly.



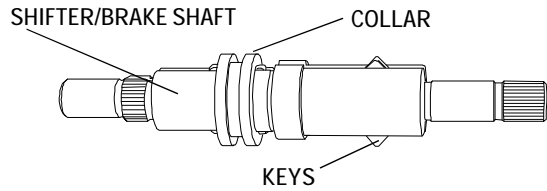
8. The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut "O" ring must be replaced if the shaft is removed.

Tool part No. 670251, is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135 .150" below flush.

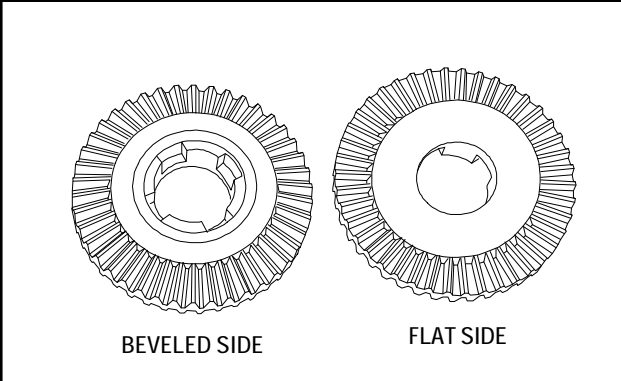
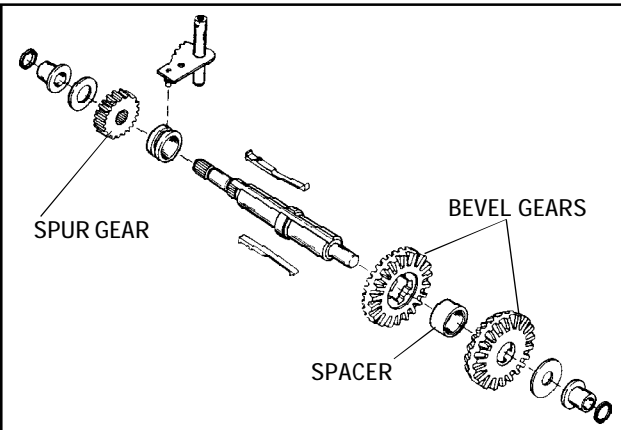
**NOTE:** Needle bearings are lubricated with E.P. grease. **DO NOT USE BENTONITE ON NEEDLE BEARINGS.** For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067B.

**E. REASSEMBLY**

1. Apply grease between the bearings in the cover and install the input shaft, bevel gear and snap ring.



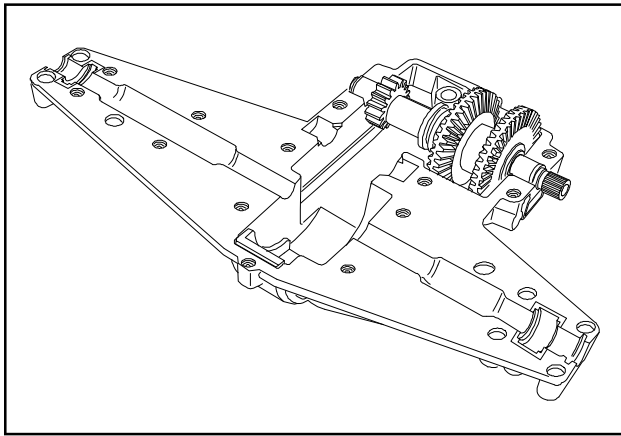
2. Grease both keyways and slide keys and collar on shifter/brake shaft.



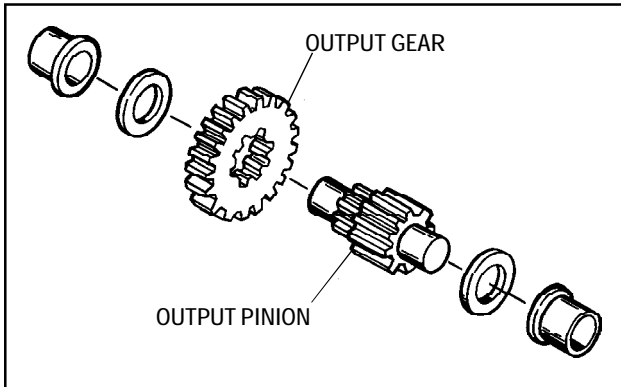
3. The large beveled shifting gears can be placed onto the shifter/brake shaft. The bevels on the gears face each other and are separated with a neutral spacer. Push shifting keys into the neutral spacer.

A thrust washer, a bronze bushing, and an "O" ring are then placed on the shaft.

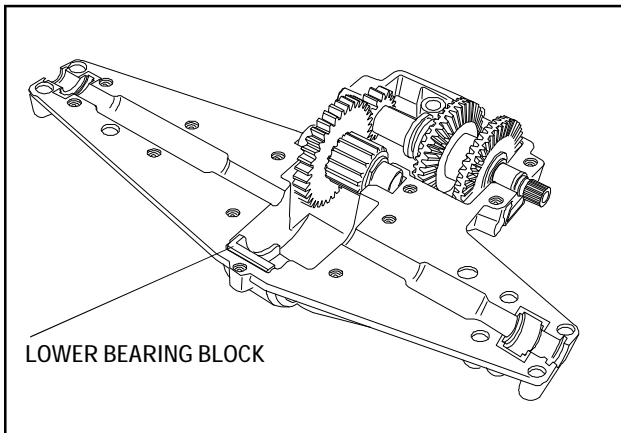
The spur gear, washer, bushing and "O" ring are assembled to the other end of the shaft.



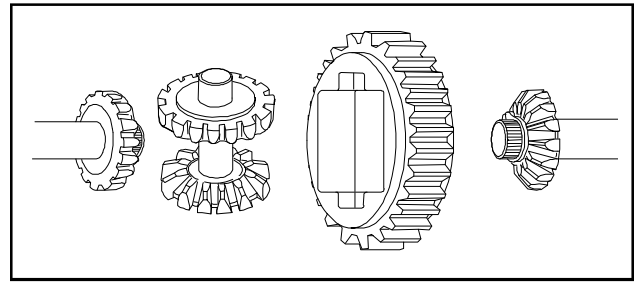
- Place the shifter/brake shaft assembly in the case.



- Place the output gear onto the output pinion. Install the thrust washers and bushings.



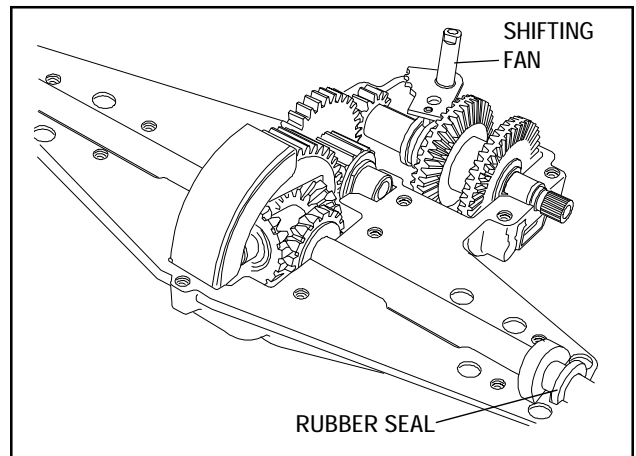
- Insert the output shaft assembly into the case.
- Prior to installing differential into case, apply Bentonite grease to axle bearing surfaces.



**NOTE:** The differential must be assembled out of the case and then placed in the case.

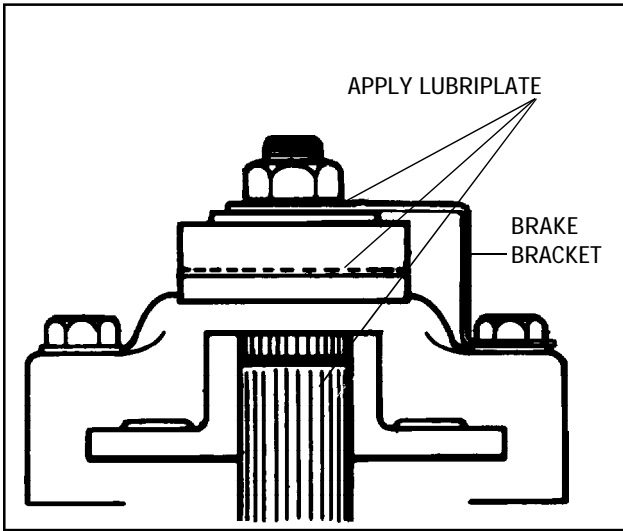
- Insert the lower bearing block into the case with the flange to the left. Place the center shaft with the bevel pinion gears into the bull gear of the differential. Center the bevel gear on the longest axle with the pinion gears of the differential. This axle goes up to the side of the bull gear where the center shaft slipped in. Center the bevel gear on the other axle to the other side. Pick up the entire unit and place it in the case as an assembly. Reposition the rubber seals on the ends of the axles. (If damaged, or old replace them).

**NOTE:** Some models will have an offset input in those units the differential assembly begins with the shortest axle.



- Install the shifting fan with the pin in the groove of the shifting collar. Grease top of shift fan. Fill the unit with 18 oz. of Bentonite grease. Install top bearing block with flange to the right.
- Clean the mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator #515, Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh part number 788093.
- Make sure that the tabs of all the bushings are in their "V" notches, install the cover and torque the cap screws to 90-100 inch pounds.
- Reinstall the ball, spring and set screw on the models that have them. The setting for the screw is flush to the cover.

Check for binding by turning input shaft.



13. Prior to installing the brake assembly, apply a light film of lubriplate to the inside of lever portion which contact pins, also to outside of lever which contacts flat washer and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil. Install brake assembly.

Install transaxle on equipment. Adjust brake linkage to disengage when clutch is engaged. Brake and linkages may vary. Consult equipment owner's manual.

**NOTE:** If adjusted incorrectly, the brake will do one of two things:

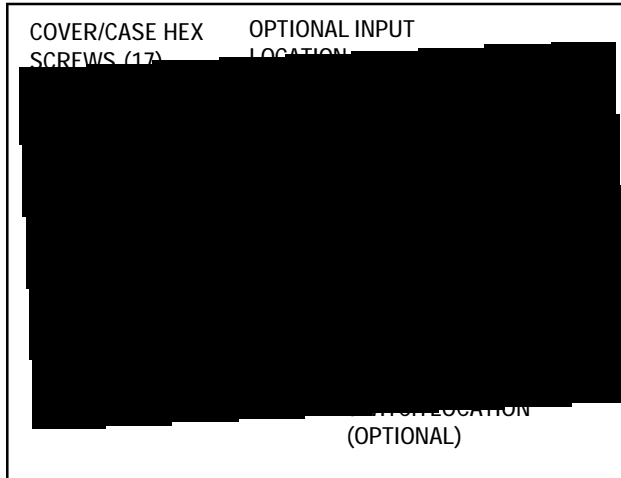
- A. It will not brake (Stop) the vehicle when the brake is applied, or,
- B. If adjusted too tightly, a drag or continued braking effect will be evident until the brake wears out.

## SECTION 7. 915 SERIES / 940 SERIES

### CAUTION:

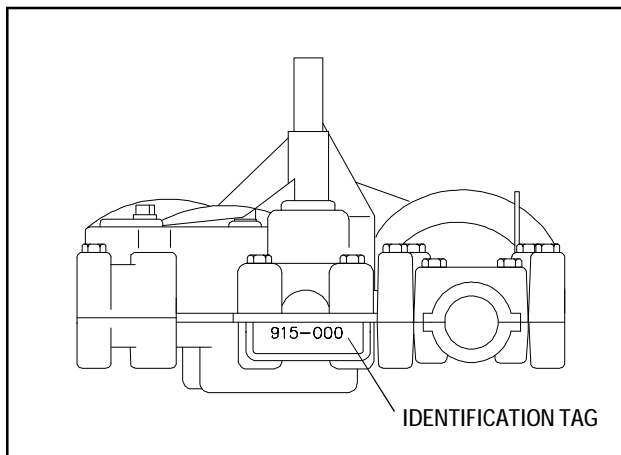
**TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE; FROM ANY FORWARD TO REVERSE GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.**

**NOTE:** Due to the many variations of equipment braking systems, adjustment and repair to the components and linkages are not considered warranty.



### A. GENERAL

The 915 series transaxle has a sculptured case, gear driven reverse and a unique power flow. The 915 series has 3, 4, 5 or 6 speeds forward and 1 speed reverse. The model pictured throughout this section utilizes an A input, assembly variations for models with a B input or reverse input will be explained in the appropriate segment.



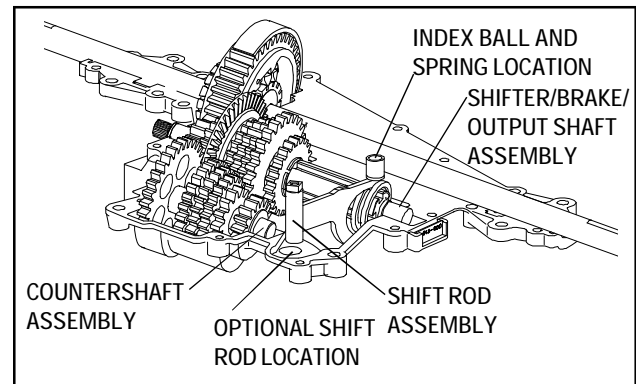
### B. IDENTIFICATION

This unit has an aluminum tag showing the model number, make sure tag is not misplaced during disassembly.

### C. STEPS TO TAKE BEFORE DISASSEMBLY.

1. Clean the outside surface of the transaxle.
2. Position the shift lever in the neutral position.
3. If installed (O.E.M. option), remove the neutral start switch.
4. Remove the "O" ring from the shift rod.

### D. DISASSEMBLY

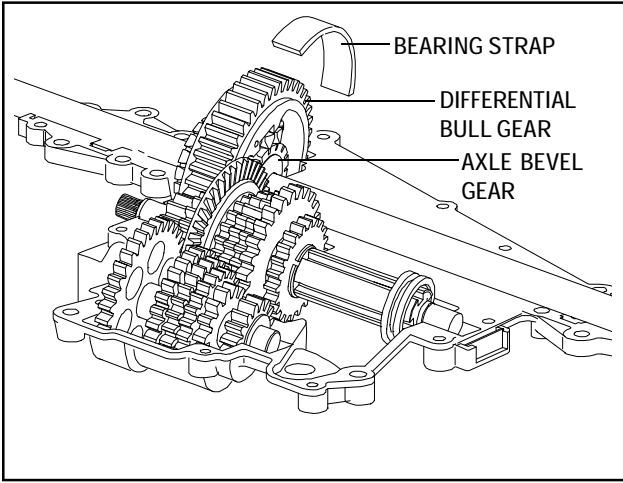


1. Remove the hex head screws that hold the cover to the case.
  2. Push down on the shift lever rod while pulling cover off of the case.
  3. Remove the index ball and spring from the shift rod assembly. Rotate shift rod assembly upward to remove from shift collar.
- NOTE:** Some models will have the index ball and spring on the case end of the shift rod, be careful not to lose parts when removing shift rod assembly.
4. Remove the two brake bracket screws and remove brake assembly.
  5. Remove the grease from the unit as the parts are removed.

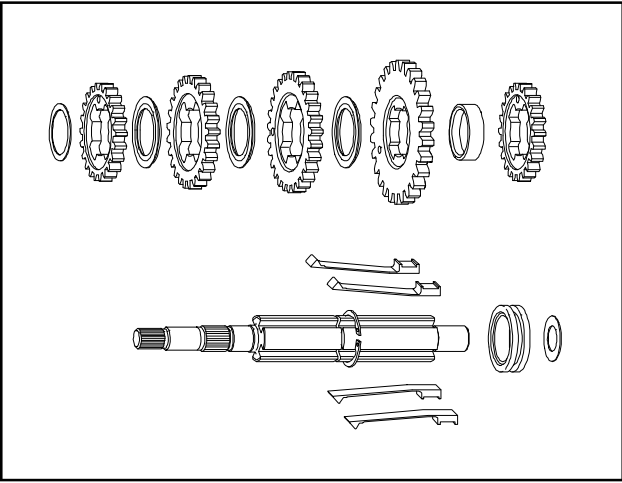
**NOTE: BENTONITE GREASE MAY STAIN CLOTHES. CARE SHOULD BE USED WHEN HANDLING.**

### 940 SERIES

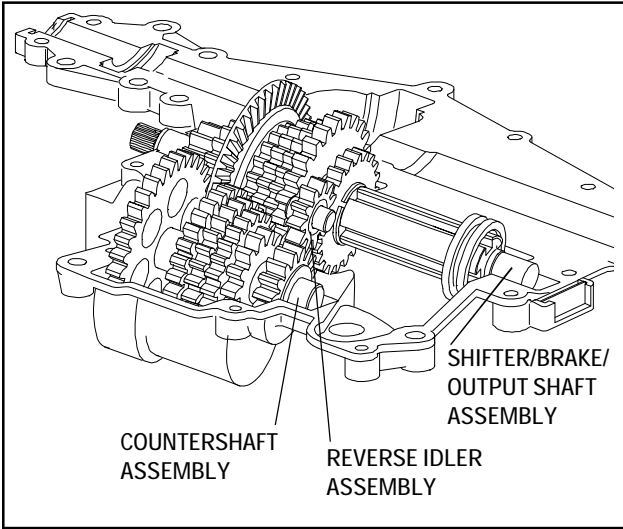
The 940 Series is identical to the 915 Series with the exception of 3 added bronze bushings. These bushings are located on the shifter brake shaft (1) opposite the brake rotor end. The other (2) are located on the spur gear shaft, one on each end.



6. Remove the bearing strap on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft and the axles. Grasp the axle bevel gears between your thumb and fingers, hold together while lifting differential from case.

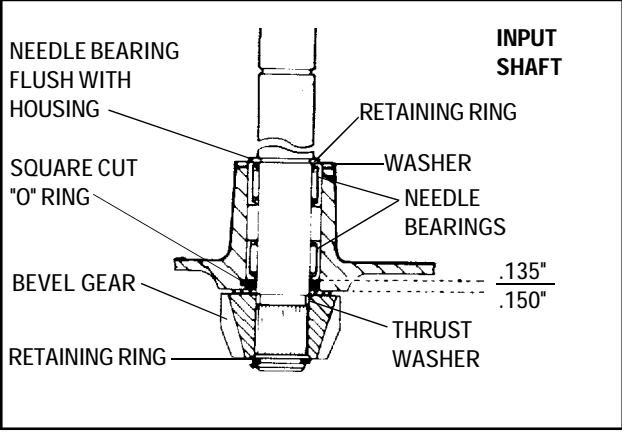


8. As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly easier and inspection of all parts possible. Clean grease from each part as the parts are laid out. To remove keys from the shifter/brake/output shaft you must remove the large snap ring from its groove. Be careful not to stretch or twist snap ring, it is not necessary to remove snap ring from shaft.



7. There are 2 shaft assemblies in this transaxle; the countershaft and the shifter/brake/output shaft assembly. Remove these assemblies as complete as possible from the case.

**NOTE:** Dependent on the rotation of the countershaft gears the reverse idler assembly will be located either above the reverse gears and held in place by bosses in the cover or below the reverse gears and held in place by bosses in the case. The reverse idler assembly will always be located against the thrust of the countershaft reverse gear.



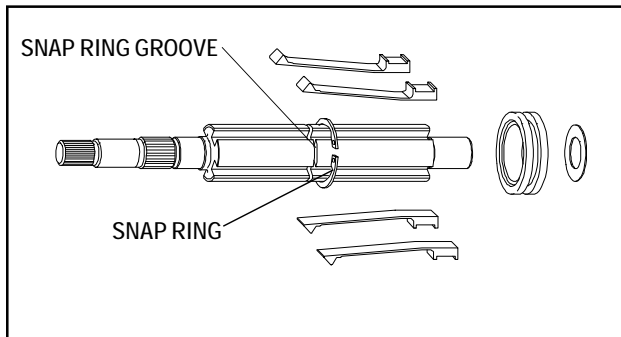
9. The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut "O" ring must be replaced if the shaft is removed.

Tool part No. 670251, is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135 .150" below flush.

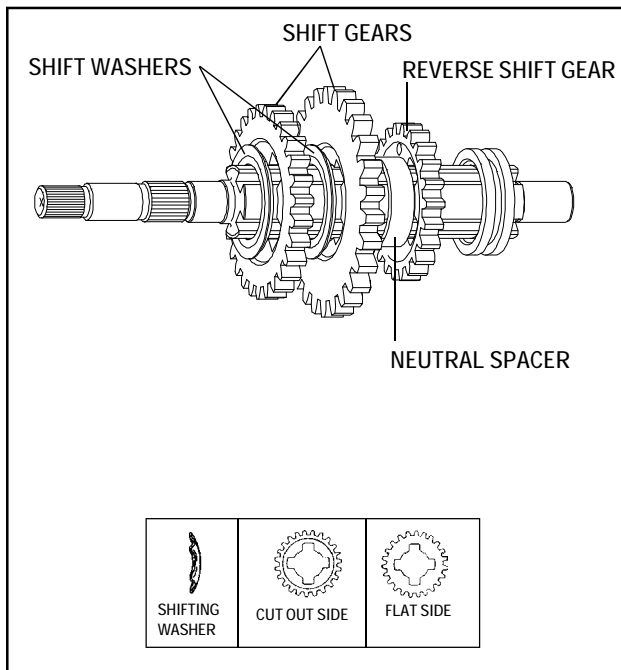
**NOTE:** Needle bearings are lubricated with EP grease. DO NOT USE BENTONITE GREASE. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067B.

## E. REASSEMBLY

1. Apply grease between the bearings in the cover and install the input shaft, square cut seal, thrust washers, bevel gear and snap ring.



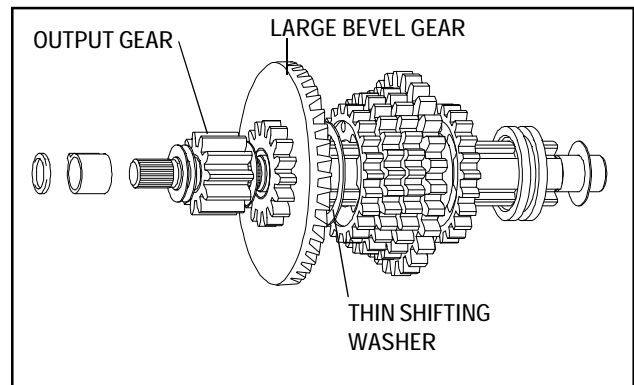
2. Grease all keyways and slide keys and collar onto the shifter/brake/output shaft. On models which have a inner diameter recess cut into one side of the shift collar, the recess side must face towards the gears and snap ring for proper gear selection. Place large snap ring back into the snap ring groove. On five speed models that do not use the large bevel gear for the highest speed an additional neutral spacer will be placed between the snap ring and the shift collar.



**NOTE:** As all the gears are placed back into the assembly, each should be packed with Bentonite grease.

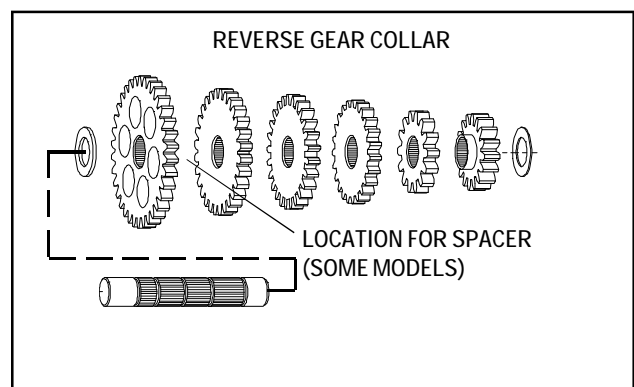
3. The shafts in this transaxle can be assembled separately. After replacing the snap ring into its' groove, place the reverse shifter gear onto the shaft with the flat side next to the snap ring. Push the shifting keys through the reverse gear and push the neutral spacer over the end of the keys and pull the neutral spacer and reverse gear up against the snap ring. Next place the shifting gear up against the snap ring with the flat side next to the neutral collar.

Then place a shifting washer onto the shaft with the rounded edge towards the shifting keys. Continue this procedure until all the gears and washers have been added in their proper sequence.



4. The last shifting washer will be a thin flat washer installed prior to the large bevel gear. The style of input will determine how the large bevel gear will be installed. In the model pictured input "A" is used and the bevel is inward towards the keys. On models with a "B" input the bevel will be outward or away from the keys.

In both instances the gear cut directly onto the large bevel gear will be toward the outside of the case. Install a washer and then the output gear. The output gear has an inner diameter recess on one end, this recess must face toward the large bevel gear. Two washers are installed next to the out put gear followed by a bronze bushing and rubber "O" ring. Then place a washer on the opposite end of shaft to complete the assembly of the shifter/brake/output shaft.



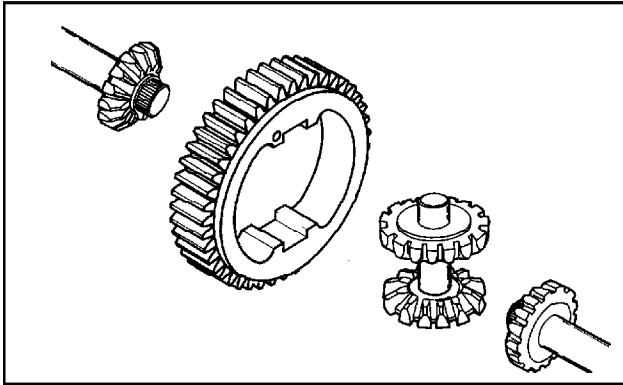
5. The countershaft must have the longer unsplined end toward the outside or brake side of the case and the shorter unsplined end toward the shifter assembly. The wide washer or spacer is placed on the longer unsplined end followed by the largest spur gear.

If assembling a six speed or some five speeds a spacer will be placed next to the largest spur gear, on all other models leave a space the width of the large bevel gear and then assemble the remainder of the spur gears with the reverse spur gear assembled with the collar side inward. The small washer is placed next to the reverse spur gear to complete the counter shaft assembly.

The two assembled shafts can now be placed into the transaxle case. If model has the reverse idler held in place by the case insert reverse idler into the case prior to inserting shafts.

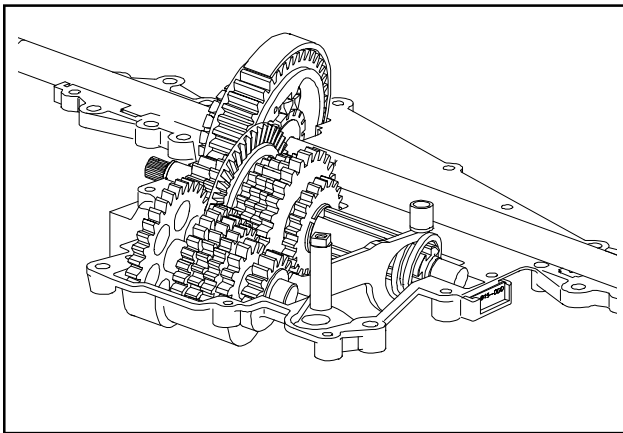
**NOTE:** Dependent on the rotation of the countershaft gears the reverse idler assembly will be located either above the reverse gears and held in place by bosses in the cover or below the reverse gears and held in place by bosses in the case. The reverse idler assembly will always be located against the thrust of the countershaft reverse gear.

Make sure that the tab on the bronze bushing is located into the recess provided in the case.



**NOTE:** The differential must be assembled out of the case and then placed in the case. Apply Bentonite grease to axle contact areas of case.

- Place the center shaft with the bevel pinion gears into the bull gear of the differential. Center the bevel gear of one axle with the pinion gears of the differential. Center the bevel gear of the other axle to the pinion gears of the differential. Pick up the entire unit and place it in the case as an assembly. Reposition the rubber seals on the ends of the axles in their bosses. (If damaged or old replace them).

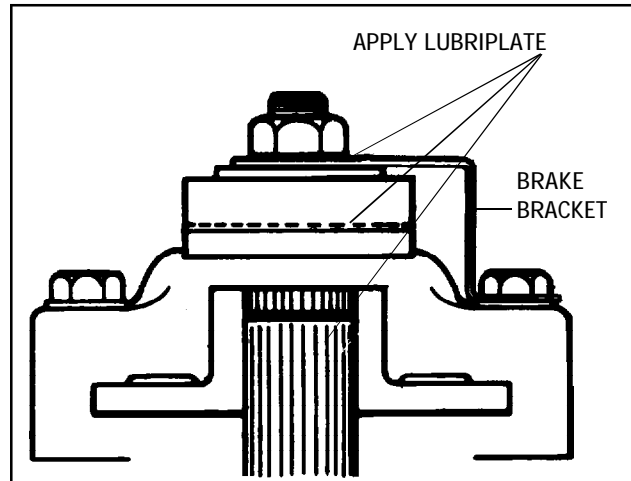


- Install the shifter assembly, bearing strap and reverse idler assembly (if applicable). Pack the transaxle with the remaining Bentonite grease (10 ounces total). Replace index spring and ball.

Clean the mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator #515, Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh part number 788093.

- Guide cover over shift rod and position onto case. Install the cover cap screws and torque 90-100 inch pounds. Install the neutral start sensing switch if applicable. Replace "O" ring on shift rod.

Check for binding by turning input shaft.



- Prior to installing the brake assembly, apply a light film of lubriplate to the inside of lever portion which contact pins, also to outside of lever which contacts flat washer and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil. Install brake assembly.

Install transaxle on equipment. Adjust brake linkage to disengage when clutch is engaged. Brake and linkages may vary. Consult equipment owner's manual.

**NOTE:** If adjusted incorrectly, the brake will do one of two things:

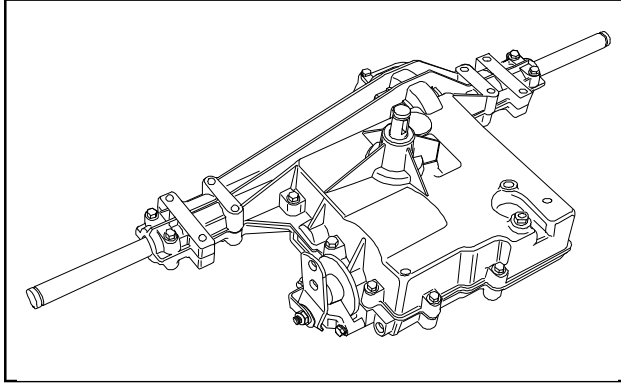
- It will not brake (stop) the vehicle when the brake is applied, or,
- If adjusted too tightly, a drag or continued braking effect will be evident until the brake wears out.

## SECTION 8. 920 SERIES

### CAUTION:

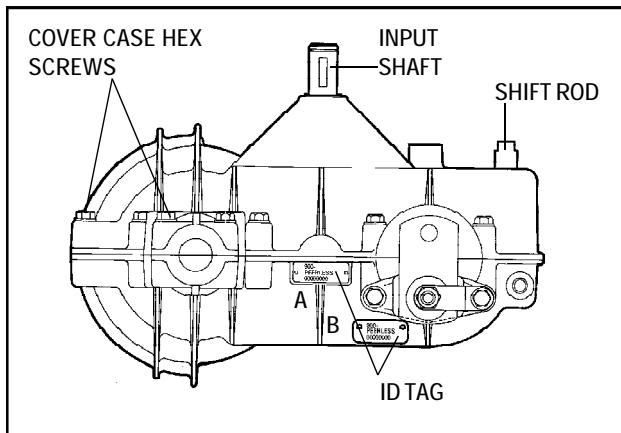
**TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE; FROM ANY FORWARD TO REVERSE GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.**

**NOTE:** Due to the many variations of equipment braking systems, adjustment and repair to the components and linkages are not considered warranty.



### A. GENERAL

The 920 series transaxle is very similar to the 900 series. The 920 series will be available in 5, 6, or 7 speeds forward and 1 speed reverse. The 7 speed transaxle will be shown in the teardown portion of this manual.



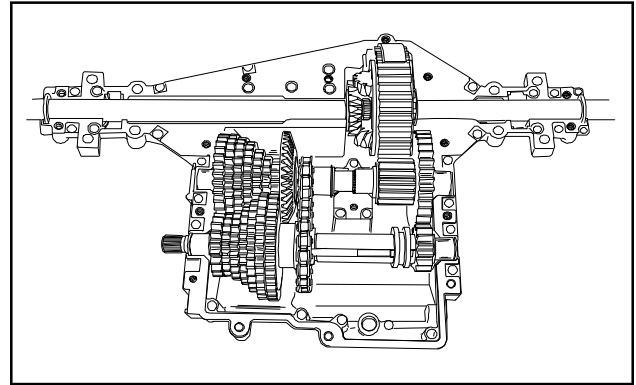
### B. IDENTIFICATION

This unit contains an aluminum tag at location A or B, showing the model number.

### C. STEPS TO TAKE BEFORE DISASSEMBLY.

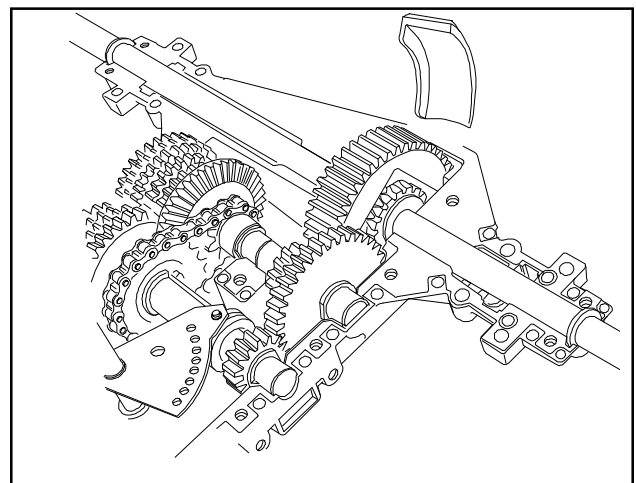
1. Clean the outside surface of the transaxle.
2. Position the shift lever in the neutral position.
3. Remove the set screw, spring and index ball.
4. If installed (O.E.M. option), remove the neutral start switch.

### D. DISASSEMBLY

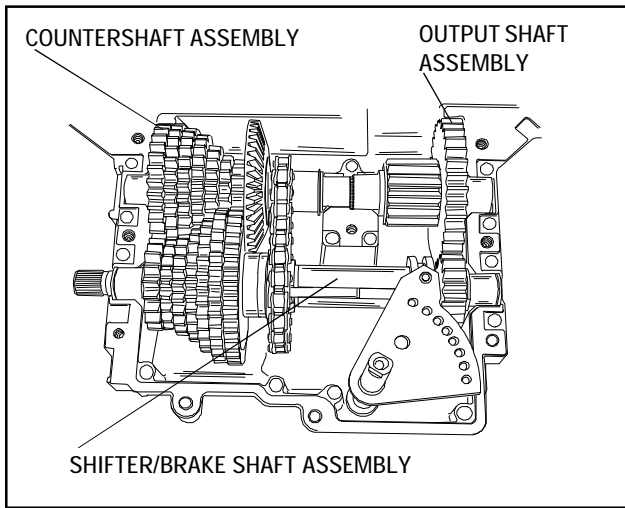


1. Remove the hex head screws that hold the cover to the case.
2. Push down on the shift lever rod while pulling cover off of the case. The shifting lever may temporarily remain in the case. Lift off cover.
3. Remove the two brake bracket screws and remove brake assembly.
4. Remove the grease from the unit as the parts are removed. Prior to removal of gear shaft assemblies from the case, the shifter fan may be removed. Note the position of the parts before removal. Some parts may fall off the shafts upon removal.

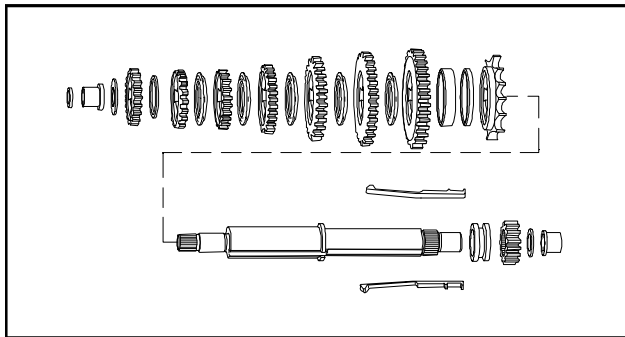
**NOTE: BENTONITE GREASE MAY STAIN CLOTHES. CARE SHOULD BE USED WHEN HANDLING.**



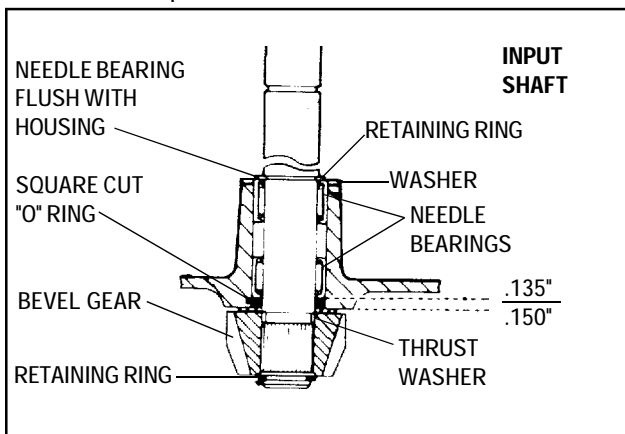
5. Remove the top bearing block on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft and the axles.



6. There are 3 shaft assemblies in this transaxle; the output shaft, the countershaft, and the shifter/brake shaft assembly. Remove these assemblies as complete as possible from the case.



7. As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly easier and inspection of all parts possible. Clean each part of grease as the parts are laid out.



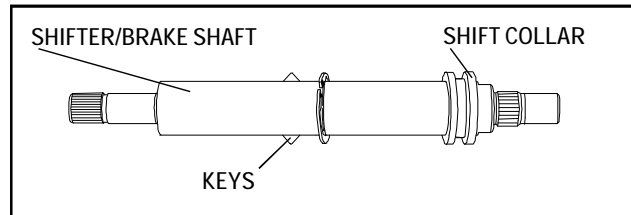
8. The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut "O" ring must be replaced if the shaft is removed.

Tool part No. 670251, is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135 .150" below flush.

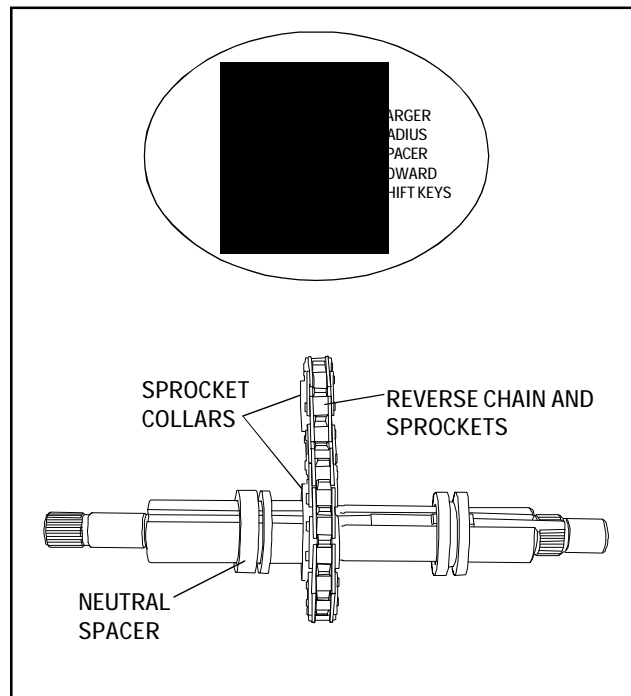
**NOTE:** Needle bearings are lubricated with E.P. grease. DO NOT USE BENTONITE on needle bearings. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067B.

**E. REASSEMBLY**

1. Apply grease between the bearings in the cover and install the input shaft, square cut seal, thrust washers, bevel gear and snap ring.



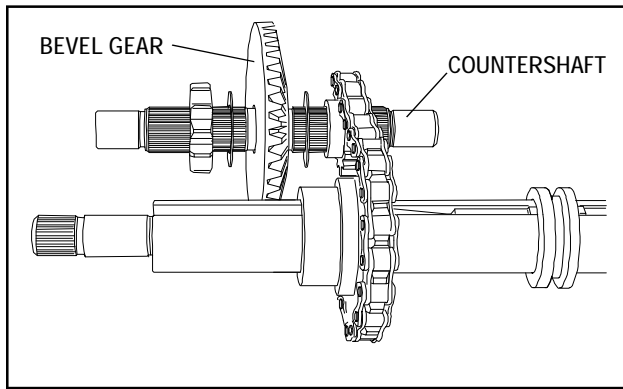
2. Grease both keyways and slide keys and collar on shifter/brake shaft.



3. To assemble this transaxle the countershaft and the shifter/brake shaft should be assembled at the same time. Start by placing the reverse chain over the reverse sprockets. Make sure that the collars on the sprockets are on the same side of the chain and install the larger sprocket onto the shifter/brake shaft with the collar away from the shifting keys.

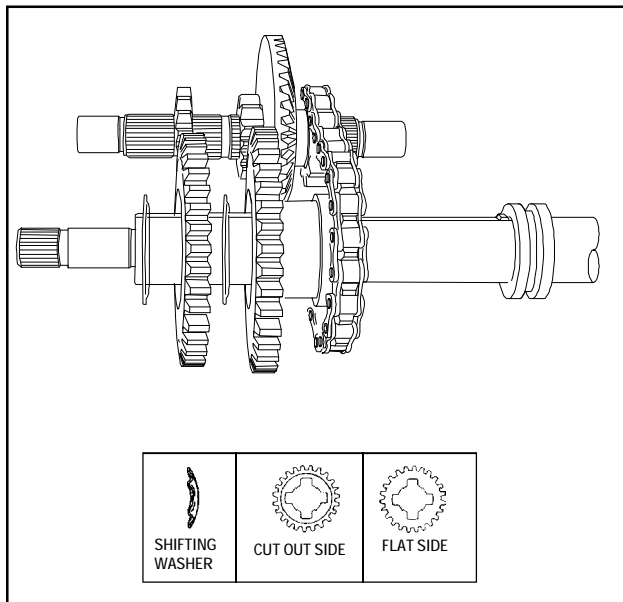
Next place the neutral spacers onto the shifter/brake shaft with larger inner diameter sides facing together, and the spacer with the largest inner diameter radius toward the shift keys. Push the shifting keys through the reverse sprocket and the first neutral spacer, pull the neutral spacers and the reverse sprocket up against the shoulder of the shifter/brake shaft.

**NOTE:** There have been a few 900 models built with identical neutral collar halves. These can be installed either direction.



- \*4. Insert the countershaft into the smaller reverse sprocket. Insert a thin thrust washer next to the sprocket (collar side) and then install the large bevel gear, with the bevel towards the reverse sprocket. Place another thin thrust washer on the back side of the bevel gear.

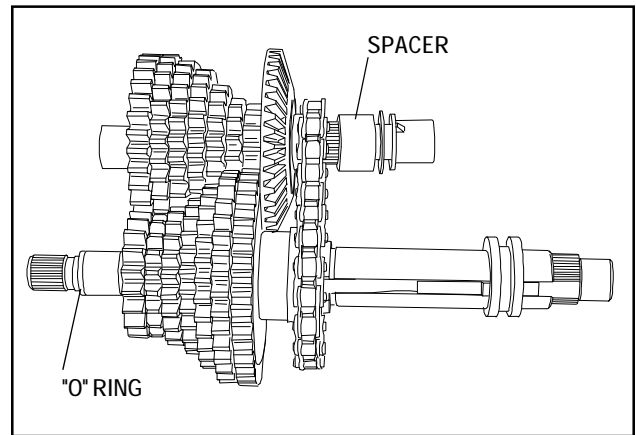
**NOTE:** As all the gears are placed back into the assembly, each should be packed with Bentonite grease.



5. Build the gears on the countershaft and shifter/brake shaft alternately, meshing each gear with its mating gear on the other shaft. The first gear on the shifter/brake shaft would be the largest of the shifting gears. Place this gear next to the neutral collar with the flat side of the gear next to the collar.

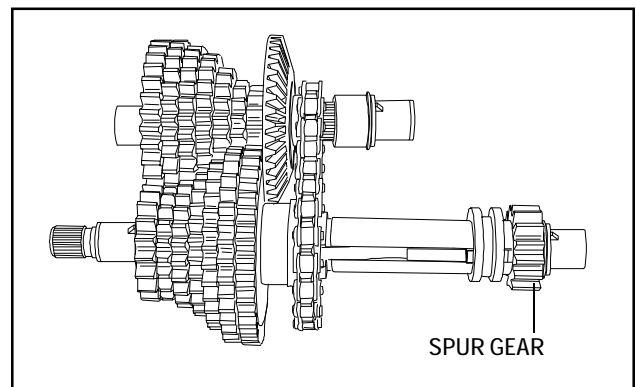
Then place a shifting washer onto the shifter/brake shaft with the rounded edge towards the shifting keys. Continue this procedure until all the gears on both shafts have been added.

**NOTE:** It is not only important that gears match up diameter-wise, but must match up according to thickness.

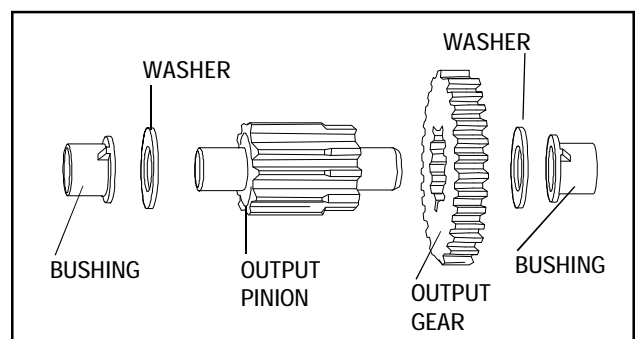


6. Place the spacer on the countershaft next to the reverse sprocket. Then place a thrust washer on each end of the countershaft and insert the bronze bushings.

Place the large washer on the end of the shifter/brake shaft, the bronze bushing and the "O" ring.

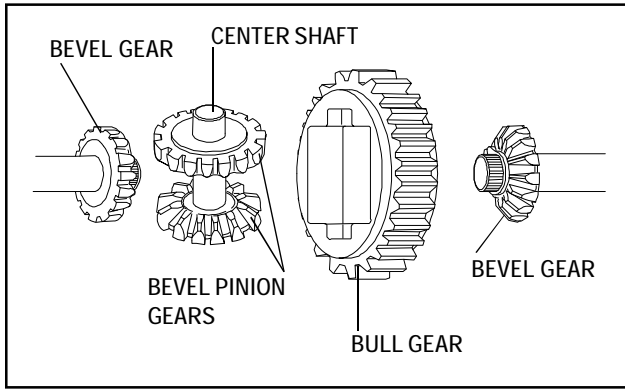


7. Place the spur gear onto the splines on the other end of the shifter/brake shaft. The thin washer, bushing, and "O" ring conclude the assembly of these 2 shafts.



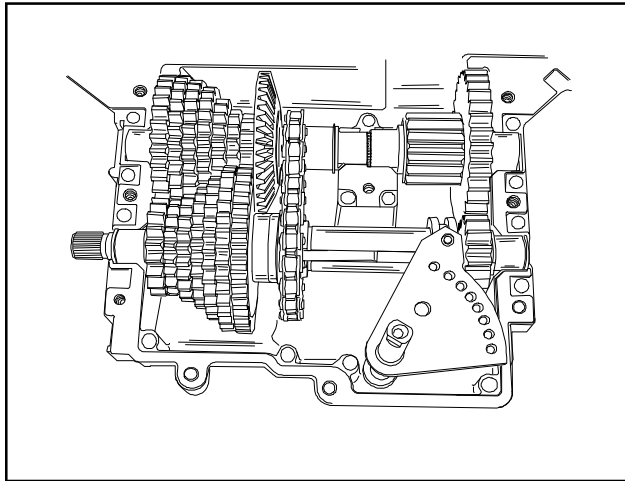
8. Place the output gear on the stepped end of the output pinion. Place the thrust washers on each end and then the bronze bushings. Install these 3 shaft assemblies back into the case. Make sure that the tabs of all the bushings are in their "V" notches in the case.

\*Models with the large bevel gear turned 180° and placed on the opposite side of the reverse sprocket will be explained under assembly variations sub-section F.

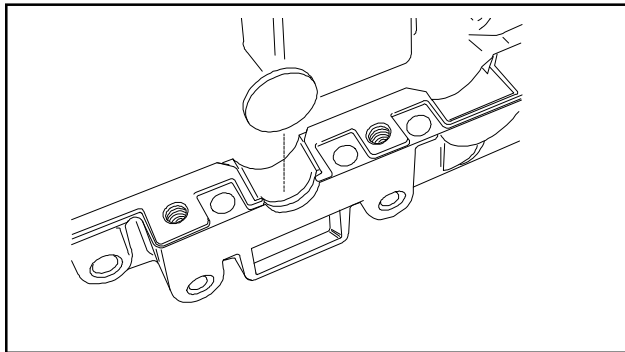


**NOTE:** The differential must be assembled out of the case and then placed in the case. Apply Bentonite grease to axle contact areas of case.

9. Place the center shaft with the bevel pinion gears into the bull gear of the differential. Center the bevel gear on the longest axle with the pinion gears of the differential. Center the bevel gear on the other axle to the other side. Pick up the entire unit and place it in the case as an assembly. Reposition the rubber seals on the ends of the axles in their bosses. (If damaged or old replace them).



10. Install the shifter assembly and bearing strap, pack the transaxle with the remaining Bentonite grease (30 ounces total). Apply grease to top of shift fan.

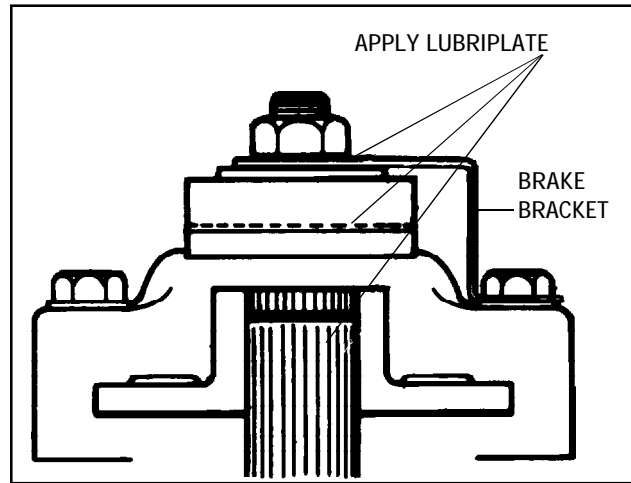


11. To seal the case and cover at the end of the shifter/brake shaft, a flat plug is placed there (end opposite the brake assembly). Clean the mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator #515, Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh part number 788093.

Install the cover screws and torque to 90-100 inch pounds.

Replace index ball, spring and set screw and turn set screw one (1) turn below flush. Install the neutral start sensing switch if applicable.

Check for binding by turning input shaft.



12. Prior to installing the brake assembly, apply a light film of lubriplate to the inside of lever portion which contact pins, also to outside of lever which contacts flat washer and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil. Install brake assembly.

Install transaxle on equipment. Adjust brake linkage to disengage when clutch is engaged. Brake and linkages may vary. Consult equipment owner's manual.

**NOTE:** If adjusted incorrectly, the brake will do one of two things:

- a. It will not brake (stop) the vehicle when the brake is applied, or,
- b. If adjusted too tightly, a drag or continued braking effect will be evident until the brake wears out.

**\*F. ASSEMBLY VARIATIONS**

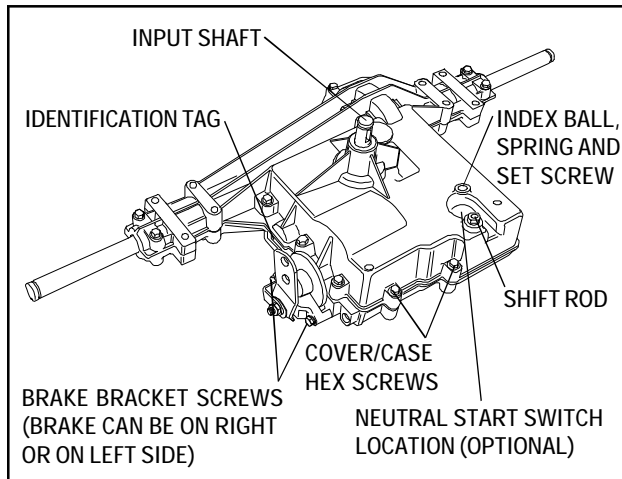
On models which are driven from the opposite side of the input bevel gear the following changes take place. A slightly thicker large bevel gear is placed on the countershaft with the bevel facing the spur gears and in the previous location of the spacer. The thickness of the gear eliminates the need for the washers on each side of the large bevel gear. The reverse chain and sprocket is also turned 180°, which places sprocket collars away from shifting gears and spur gears. The spacer is then placed in the previous location of the large bevel gear next to the reverse sprocket.

## SECTION 9. 930 SERIES

### CAUTION:

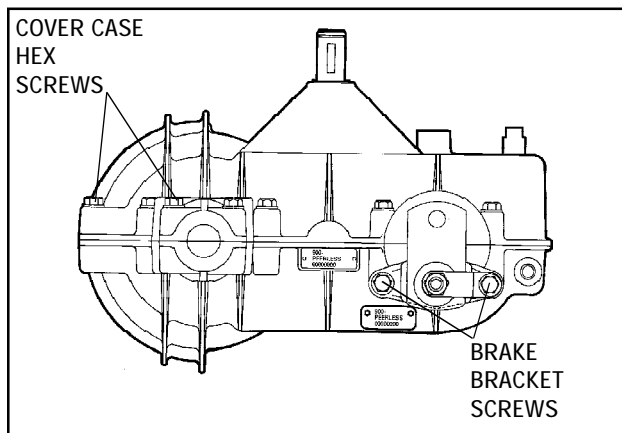
**TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE; FROM ANY FORWARD TO REVERSE GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.**

**NOTE:** Due to the many variations of equipment braking systems, adjustment and repair to the components and linkages are not considered warranty.



### A. GENERAL

The 930 series transaxle is very similar to the 920 series. The 930 series will be available in 3 through 7 speeds forward and 1 speed reverse. The model pictured throughout this section is the most popular type, there are models which operate in the opposite direction without changing the input location. Throughout this section an asterik (\*) will direct the reader to the end of the section where the differences between these models will be explained.



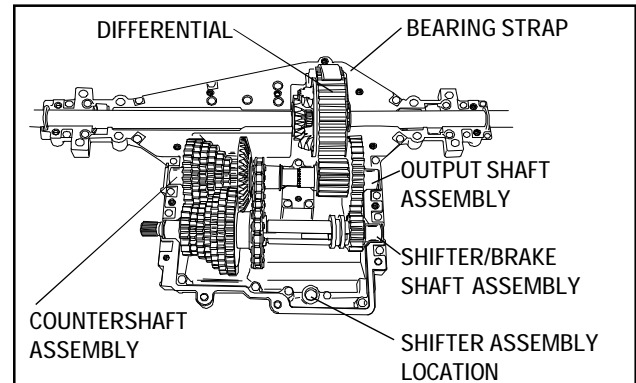
### B. IDENTIFICATION

This unit has an aluminum tag showing the model number, make sure tag is not misplaced during disassembly.

### C. STEPS TO TAKE BEFORE DISASSEMBLY.

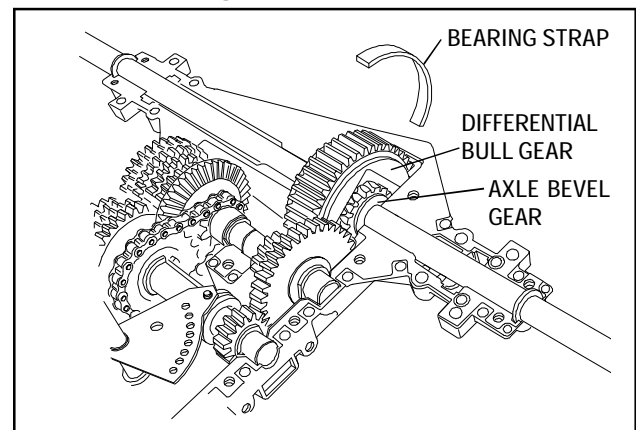
1. Clean the outside surface of the transaxle.
2. Position the shift lever in the neutral position.
3. Remove the set screw, spring and index ball.
4. If installed (O.E.M. option), remove the neutral start switch.

### D. DISASSEMBLY

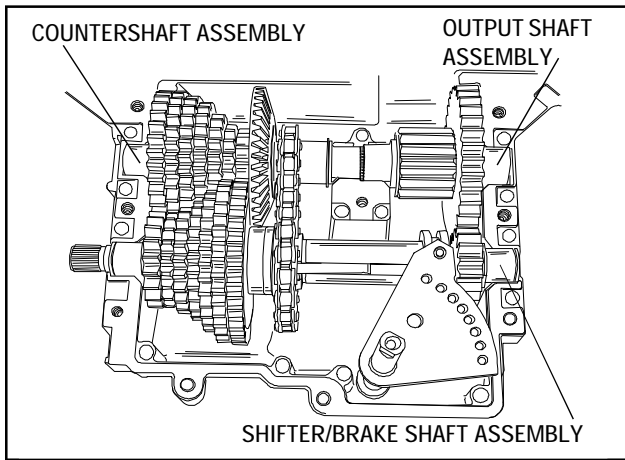


1. Remove the hex head screws that hold the cover to the case.
2. Push down on the shift lever rod while pulling cover off of the case. The shifting lever may temporarily remain in the case. Lift off cover.
3. Remove the two brake bracket screws and remove brake assembly.
4. Remove the grease from the unit as the parts are removed. Prior to removal of gear shaft assemblies from the case, the shifter fan may be removed. Note the position of the parts before removal. Some parts may fall off the shafts upon removal.

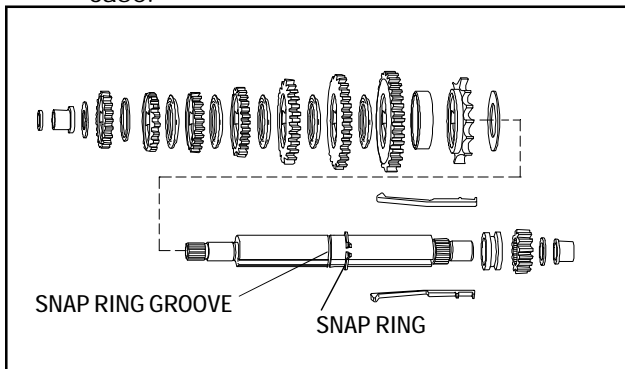
**NOTE: BENTONITE GREASE MAY STAIN CLOTHES. CARE SHOULD BE USED WHEN HANDLING.**



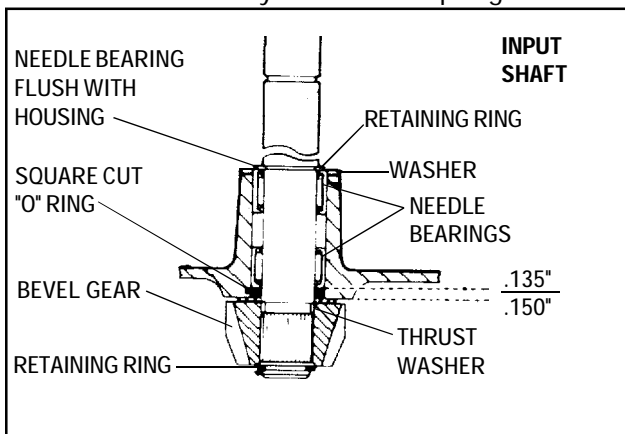
5. Remove the bearing strap on the bull gear of the differential. Some models do not use a bearing strap. Remove the bull gear, bevel pinion gears with center shaft and the axles. Grasp the axle bevel gears between your thumb and fingers, hold together while lifting differential from case.



6. There are 3 shaft assemblies in this transaxle; the output shaft, the countershaft, and the shifter/brake shaft assembly. Remove these assemblies as complete as possible from the case.



7. As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly easier and inspection of all parts possible. Clean each part of grease as the parts are laid out. To remove keys from the shifter/brake shaft you must first remove the large snap ring from the snap ring groove. Be careful not to stretch or twist snap ring, it is not necessary to remove snap ring from shaft.



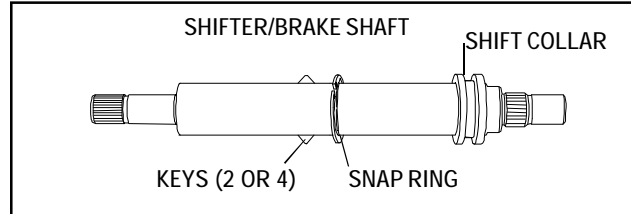
8. The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut "O" ring must be replaced if the shaft is removed.

**NOTE:** Needle bearings are lubricated with E.P. grease. DO NOT USE BENTONITE on needle bearings. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067B.

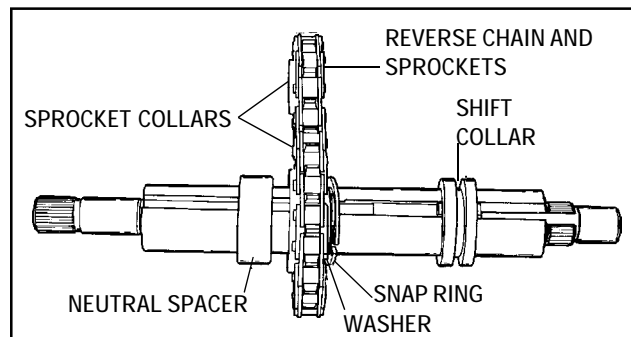
Tool part No. 670251, is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135 .150" below flush.

**E. REASSEMBLY**

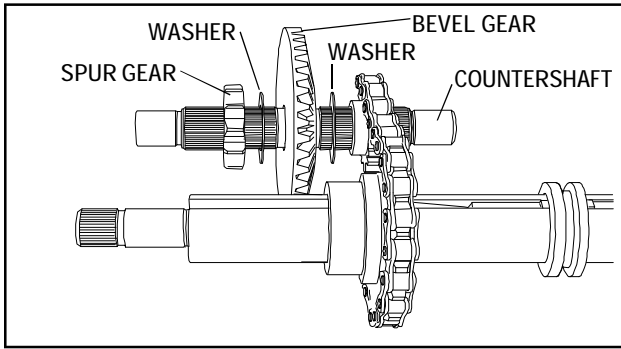
1. Apply grease between the bearings in the cover and install the input shaft, square cut seal, thrust washers, bevel gear and snap ring.



2. Grease all keyways and slide keys and collar onto the shifter/brake shaft. (There are both 2 and 4 key models). Place large snap ring back into the snap ring groove. On models which have a inner diameter recess cut into one side of the shift collar, the recess side must face towards the gears and snap ring for proper gear selection.

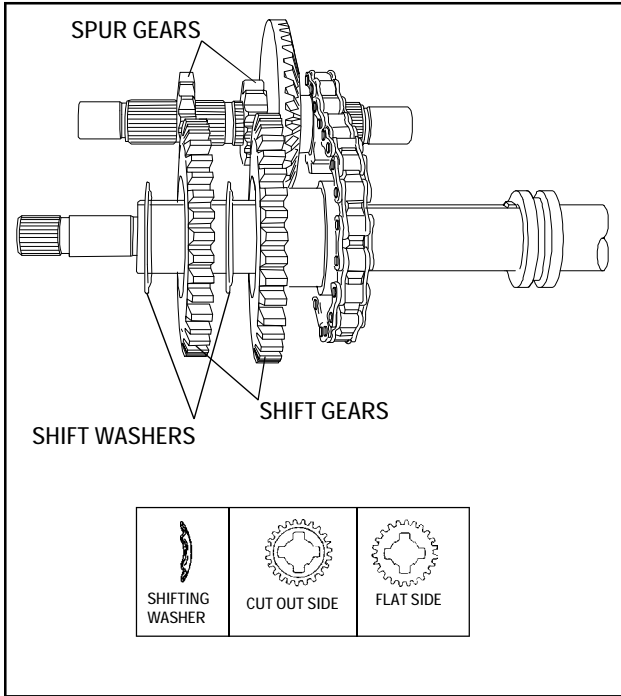


\* 3. To assemble this transaxle the countershaft and the shifter/brake shaft should be assembled at the same time. Start by placing the reverse chain over the reverse sprockets. Make sure that the collars on the sprockets are on the same side of the chain. Install a large washer onto the shifter/brake shaft next to the snap ring and then the large sprocket with the collar away from the shifting keys. Push the shifting keys through the reverse sprocket and push the neutral spacer over the end of the keys and pull the neutral spacer and reverse sprocket up against the snap ring on the shifter/brake shaft.



- \*4. Insert the countershaft into the smaller reverse sprocket. Insert a thin thrust washer next to the sprocket (collar side) and then install the large bevel gear, with the bevel towards the reverse sprocket. Place another thin thrust washer on the back side of the bevel gear.

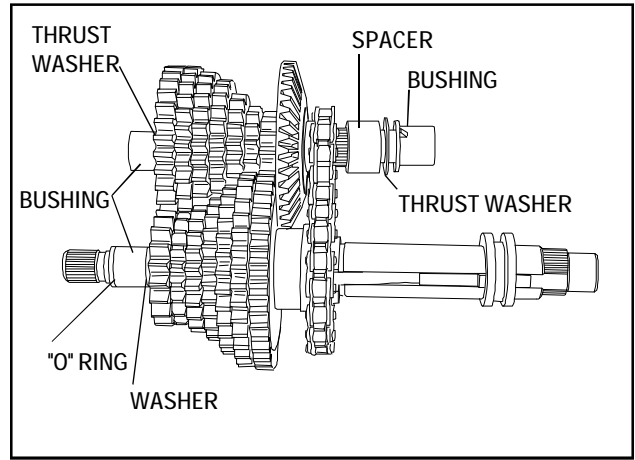
**NOTE:** As all the gears are placed back into the assembly, each should be packed with Bentonite grease.



5. Build the gears on the countershaft and shifter/brake shaft alternately, meshing each gear with its mating gear on the other shaft. The first gear on the shifter/brake shaft would be the largest of the shifting gears. Place this gear next to the neutral spacer with the flat side of the gear next to the spacer.

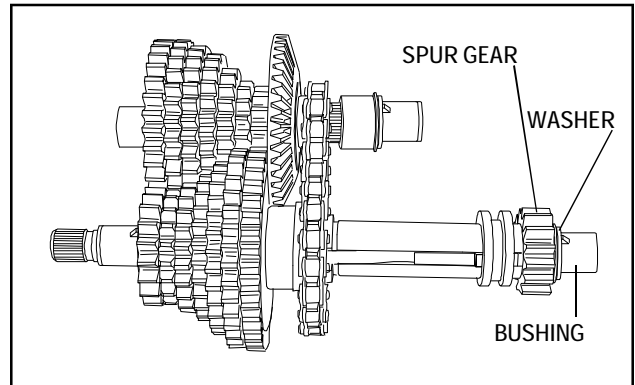
Then place a shifting washer onto the shifter/brake shaft with the rounded edge towards the shifting keys. Continue this procedure until all the gears on both shafts have been added.

**NOTE:** It is not only important that gears match up diameter-wise, but must match up according to thickness.

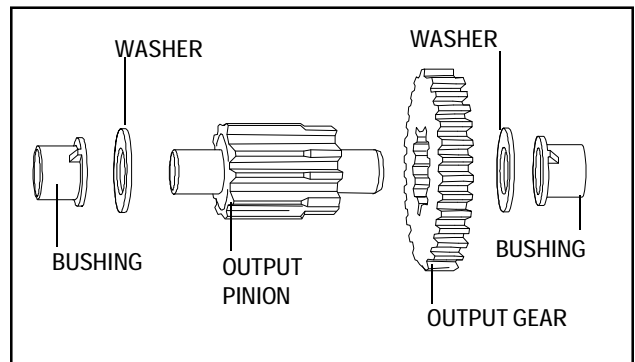


- \*6. Place the spacer on the countershaft next to the reverse sprocket. Then place a thrust washer on each end of the countershaft and insert the bronze bushings.

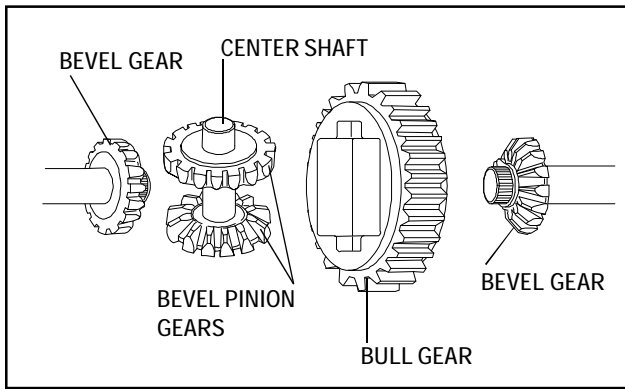
Place the large washer on the end of the shifter/brake shaft, the bronze bushing and the "O" ring.



7. Place the spur gear onto the splines on the other end of the shifter/brake shaft. The thin washer and bushing conclude the assembly of these 2 shafts.

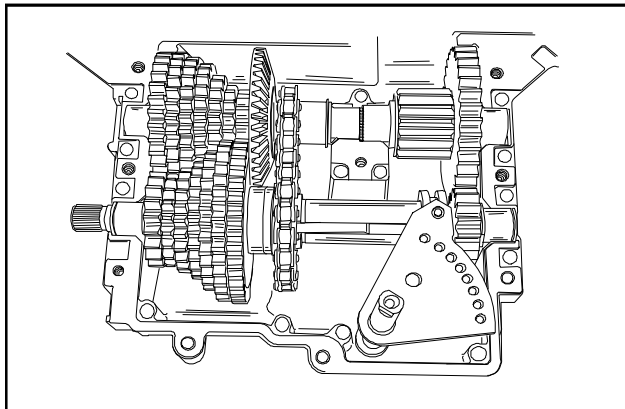


8. Place the output gear on the stepped end of the output pinion. Place the thrust washers on each end and then the bronze bushings. Install these 3 shaft assemblies back into the case. Make sure that the tabs of all the bushings are in their "V" notches in the case.

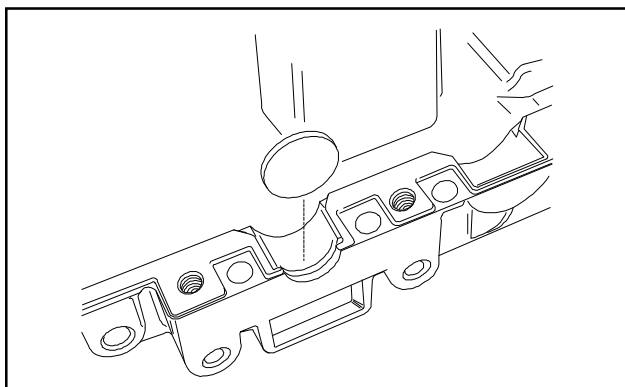


**NOTE:** The differential must be assembled out of the case and then placed in the case. Apply Bentonite grease to axle contact areas of case.

9. Place the center shaft with the bevel pinion gears into the bull gear of the differential. Center the bevel gear on the longest axle with the pinion gears of the differential. Center the bevel gear on the other axle to the other side. Pick up the entire unit and place it in the case as an assembly. Reposition the rubber seals on the ends of the axles in their bosses. (If damaged or old replace them).



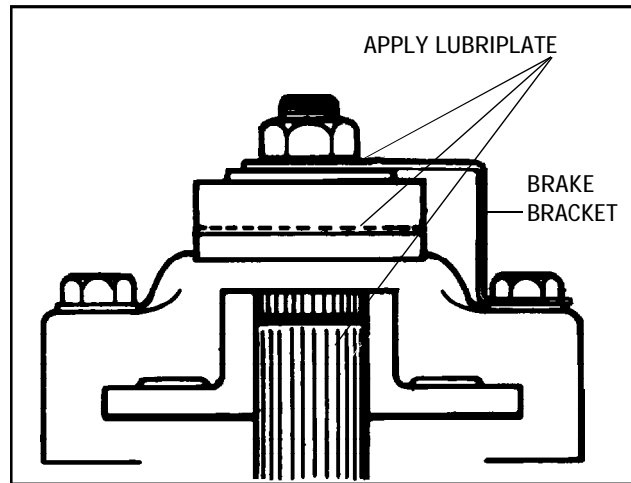
10. Install the shifter assembly and bearing strap, pack the transaxle with the remaining Bentonite grease (30 ounces total). Apply grease to top of shift fan.



11. To seal the case and cover at the end of the shifter/brake shaft, a flat plug is placed there (end opposite the brake assembly). Clean the mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator #515, Tecumseh part number 510334 or the Loctite Silicone RTV 598, Tecumseh part number 788093. Install cover screws and torque to 90-100 inch pounds.

Replace index ball, spring and set screw and turn set screw one (1) turn below flush. Install the neutral start sensing switch if applicable.

Check for binding by turning input shaft.



12. Prior to installing the brake assembly, apply a light film of lubriplate to the inside of lever portion which contact pins, also to outside of lever which contacts flat washer and between shaft O.D. and bore of brake disc. Brake pads and brake disc must be free of grease and oil. Install brake assembly.

Install transaxle on equipment. Adjust brake linkage to disengage when clutch is engaged. Brake and linkages may vary. Consult equipment owner's manual.

**NOTE:** If adjusted incorrectly, the brake will do one of two things:

- a. It will not brake (stop) the vehicle when the brake is applied, or,
- b. If adjusted too tightly, a drag or continued braking effect will be evident until the brake wears out.

**\*F. ASSEMBLY VARIATIONS**

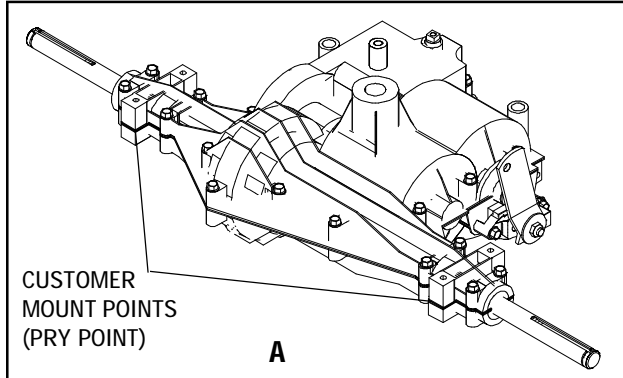
On models which are driven from the opposite side of the input bevel gear the following changes take place. A slightly thicker large bevel gear is placed on the countershaft with the bevel facing the spur gears and in the previous location of the spacer. The thickness of the gear eliminates the need for the washers on each side of the large bevel gear, which places the sprocket collars away from the shifting gears and spur gears. The reverse chain and sprocket is also turned 180°. The spacer is then placed in the previous location of the large bevel gear next to the reverse sprocket.

## SECTION 10. MST200

### CAUTION:

**TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE; FROM ANY FORWARD TO REVERSE GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.**

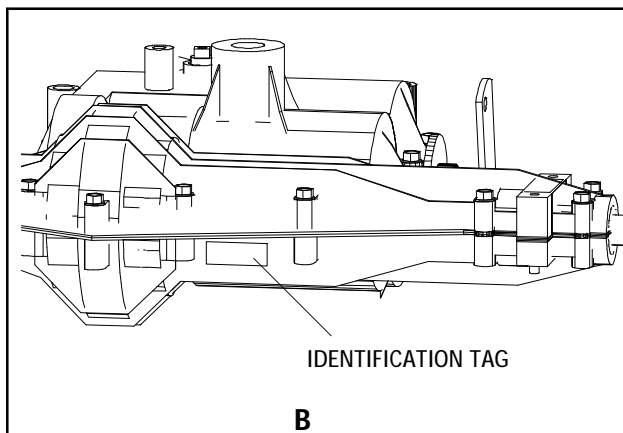
**NOTE:** Due to many variations of the equipment braking systems, adjustment and repair to the components and linkages are not considered warranty.



### A. GENERAL

The MST (Manual Shift Transaxle) 200 is a sealed unit which uses 16 oz. of 80W90 gear lube (part #730229A). The MST series is available with up to 6 speeds forward and one reverse. It has a sculptured case and cover. Its unique gear design system uses the input gear to drive both the forward and reverse motion. It also eliminates the recess previously found on shifter brake shaft spur gears.

The thrust washers on all transaxles are used to protect stationary surfaces from rotating surfaces. To determine the location of the thrust washer, check its inside diameter and compare it to the outside diameter of the shaft. If the fit is loose, it is out of position. The flat washer used on the shifter shaft (brake end) must have a diameter large enough to stop the keys from going past the end of the gear slots.

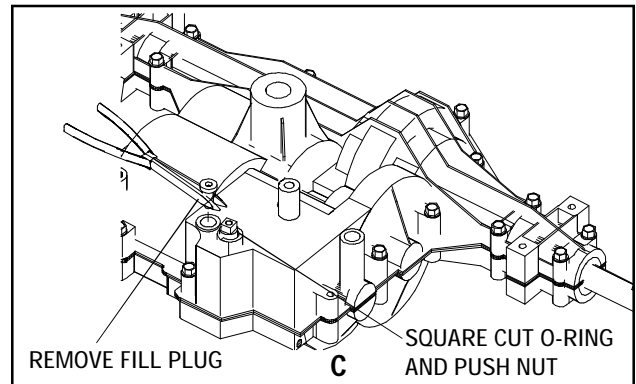


### B. IDENTIFICATION

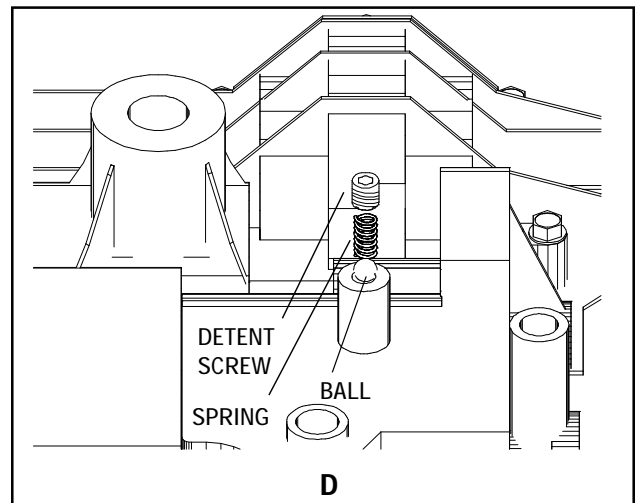
The MST has a decal placed at the rear of the unit and to the right of the differential gear section. This makes it easily visible without having to remove any obstructions to view it. (See Illustration B).

### C. STEPS TO TAKE BEFORE DISASSEMBLY.

1. Clean the outside surface of the transaxle.
2. Position the shift lever in the neutral position.



3. Remove the oil drain / fill plug located on top of the unit. This can be done by using a needle nose pliers to pull the plug out. Drain all of the oil from the unit. (See Illustration C)
4. Remove the neutral start switch, if installed (O.E.M. option).
5. Remove the push nut (if equipped) and square cut "O" ring, from the top of the shift fork shaft. (See Illustration C).



6. Remove the set screw, spring and index ball (See Illustration D).

**D. DISASSEMBLY.**

1. Remove the self-tapping hex head screws that hold the cover to the case and the two center screws located on the bottom (case side) of the transaxle.



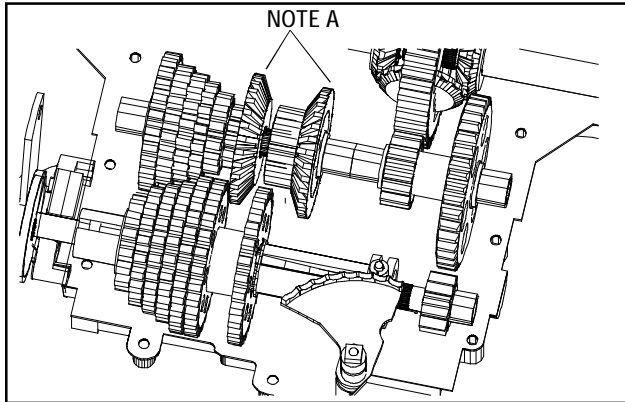
**CAUTION:** With the new sealant between the case and cover, it may be necessary to pry them apart. If you find this necessary **ONLY PRY IN THE MOUNTING FOOT AREA.** See Illustration A, page 57.

2. With a rubber or leather mallet tap down on the shift lever rod while removing the cover from the case.



If rust has occurred on the shaft, remove it with emery cloth before removing the shaft to prevent damage.

3. Remove the two brake bracket screws and remove the brake assembly.
4. Remove the differential ring gear, and bevel pinion gears with the center shaft drive pin and the axles. Grasp the axle bevel gears between your thumb and fingers. Hold the entire assembly together while lifting the differential from the case.



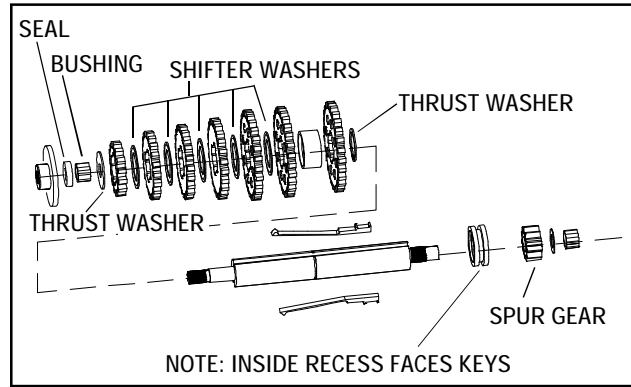
5. There are 3 shaft assemblies in this transaxle. The countershaft, shifter/brake shaft and output shaft. Remove shifter fork assembly and then remove these assemblies from the case.

**NOTE:** Before you begin disassembly, ask the customer if the unit has been serviced previously by a technician or perhaps himself. They may have misassembled it.

6. As these assemblies are taken apart, lay the parts out in a systematic order. This should help to make the reassembly easier.

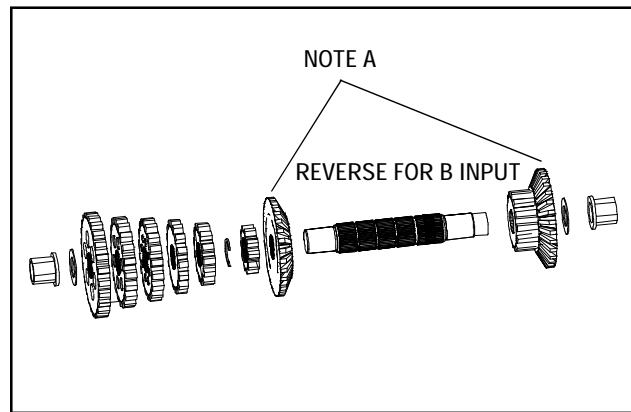


**CAUTION:** The keyways can be extremely sharp use care in this area.



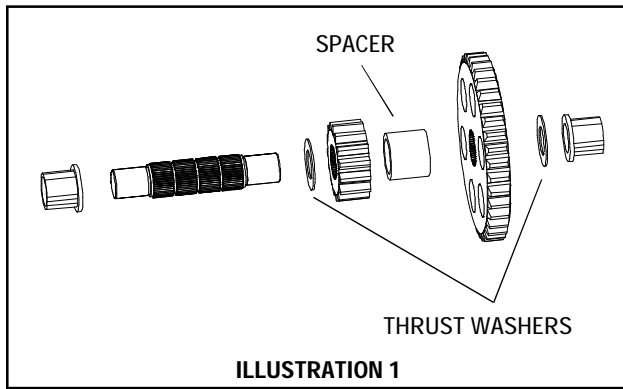
7. To disassemble the shifter/brake shaft, start on the spur gear side. Remove the oil seal, the bronze bushing and thrust washer. Remove all of the shifter spur gears (or spacers if used) and shift washers. Remove the neutral collar, reverse gear and thrust washer. On the output side of the shifter/brake shaft remove the bronze bushing, thrust washer, and output spur gear.

To remove the shift keys from the shifter/brake shaft, you must first expand the large snap ring from the snap ring groove. Be careful not to stretch or twist the snap ring, it is not necessary to remove the snap ring from the shaft. Place the expanded snap ring onto the shifter/brake shaft and slide the shift keys and shift collar off the shifter/brake shaft.



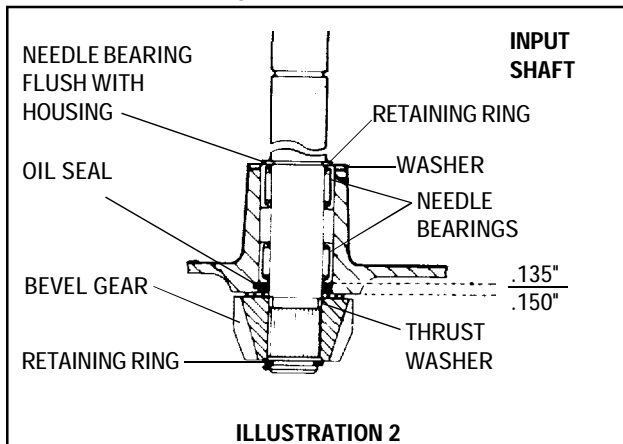
8. To disassemble the counter spur gear shaft, remove the bushing, thrust washer and spur gears (or spacers if used) the last spur gear is held in place by a retaining ring. Remove the retaining ring and slide the spur gear and forward drive bevel gear off the splined end of the shaft. The bushing, thrust washer and reverse drive bevel gear can be removed from the unsplined end of the shaft.

**NOTE A:** When a "B" input is used the input bevel gears will be in opposite of picture. The drive spline on this shaft also moves.



**ILLUSTRATION 1**

- To disassemble the output shaft, remove the bushing, thrust washer, large output spur gear, spacer, small output spur gear, thrust washer, and bushing. (Illustration 1)



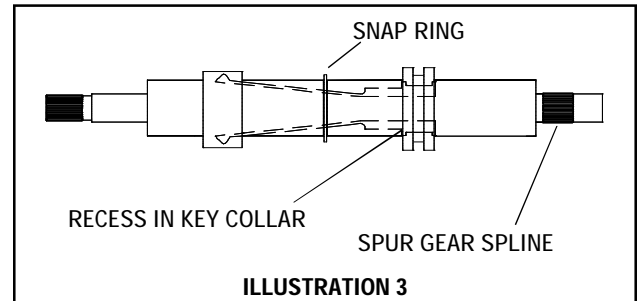
**ILLUSTRATION 2**

- The input shaft can also be removed and inspected or serviced. Remove the snap ring and thrust washer on the input shaft, pull the shaft through the cover. The oil seal located on the inboard side of the cover should be replaced when reassembled. Be sure to reinstall the upper and lower thrust washers. (Illustration 2)
- Tool part number 670251 is used for removal of needle bearings for the input shaft.
- After clean up of all parts, a complete inspection should be done. Check for chipping or damage to teeth, keys or the 4 key slots in the shifter gears. You also should inspect the 2 keyways in the shifter shaft for damage, chipping or knicking. Worn or damaged parts must be replaced.

**E. REASSEMBLY**

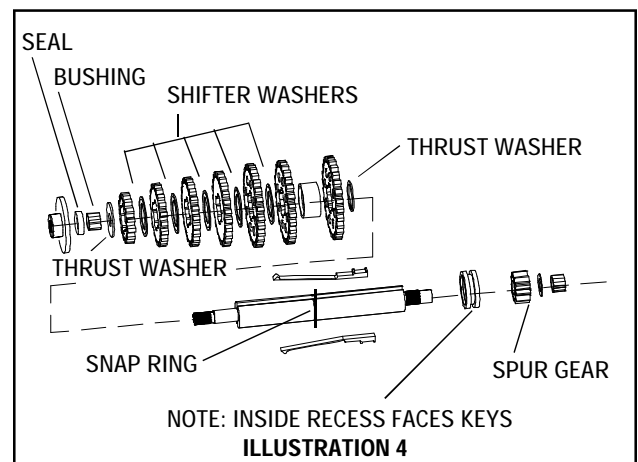
The tool, part number 670251 can also be used for installation of the needle bearings for the input shaft. The needle bearing on the inboard side is installed .135" - .150" below flush. The top bearing is installed flush to the casting.

- Use an EP bearing grease and apply it to the bearings in the cover. Place the seal into the cover with the grooved side of seal visible and facing the installer. Place the snap ring and thrust washer on the input shaft and slide the shaft through the cover and seal. Place the square cut o-ring, thrust washer and input bevel gear on the shaft on the inboard side and secure them by placing a snap ring in snap ring groove.



**ILLUSTRATION 3**

- Next assemble the shifter brake shaft by placing the shift keys in the keyway on the shaft with the tip of the keys facing the shifter spur gear side of the shaft. Extend the collar end of the key slightly beyond shaft. Place the shift collar in the notch provided on the shift key with the inside diameter recess on the collar facing toward the tips of the key. Place the notch from the second key on the inside diameter of the collar and position the key in the slot on the shifter brake shaft. Slide the keys and the collar onto the shaft under the snap ring. Place the snap ring back into the groove on the shaft. (Illustration 3)



**ILLUSTRATION 4**

- Place the plain large thrust washer over the key tips on the spur gear side of the shaft next to the snap ring. The sequence that follows is reverse gear then the neutral collar and 1st thru the amount of gears the unit is equipped with up to 6 gears (largest to smallest). Between each gear place a shift washer. Bevel facing keys. (Illustration 4)

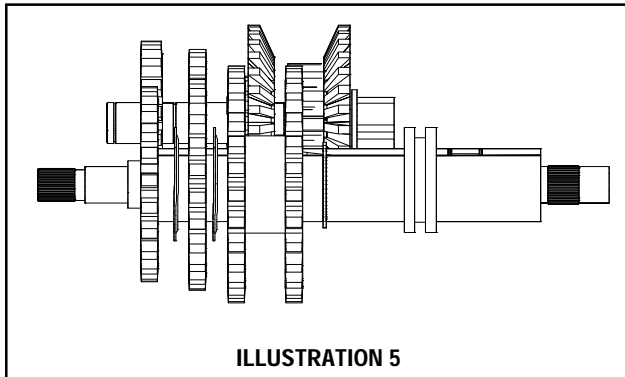
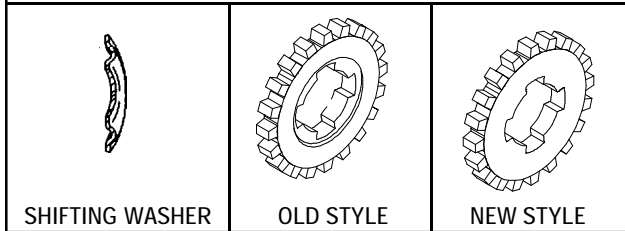


ILLUSTRATION 5



**NOTE:** Reverse and first gear do not have a shift washer, the neutral collar compresses the key here. Shift washers have one side where the inside diameter is rounded, this rounded edge must face the shift keys. The shifter spur gears no longer have a recess on one side of the gears and do not require that the gear to be positioned in any particular direction. Units that have less than six speeds will use a spacer in place of a gear. When this occurs it is not required to have a shift washer between the spacer and the preceding gear. (Illustration 5)

When the final spur gear or spacer is in place, a thrust washer is positioned on the shaft to protect the case from the rotating gear. This washer is slightly larger than the diameter of the spacer and large enough to cover the inside diameter of the key slot portion of the shifter spur gear. Next place the bronze bushing and the oil seal on the shaft (the open side of the seal must face inward) this completes the spur gear side of the shifter brake shaft. The output side only requires the output spur gear, washer and bushing.

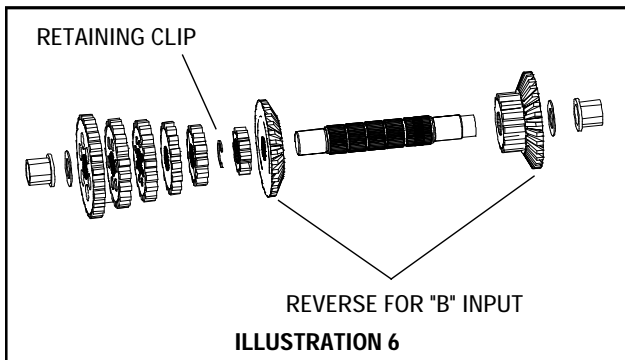


ILLUSTRATION 6

4. To assemble the countershaft place the reverse input bevel gear on the unsplined end of the shaft with a washer and a bronze bushing to complete the reverse drive side of the countershaft. The forward drive side requires

the forward input bevel gear and smallest spur gear to be placed on the splined shaft with the bevel facing the reverse drive gear. A retaining ring is put on the shaft next to the spur gear between the splined section to prevent the bevel gears from spreading. (Illustration 6)

The countershaft is then completed by placing the remaining spur gears on the shaft (smallest to largest). If spacers are used they will be placed between the final spur gear and the washer and bushing. **NOTE:** The spur gears on the countershaft can be installed in either direction.

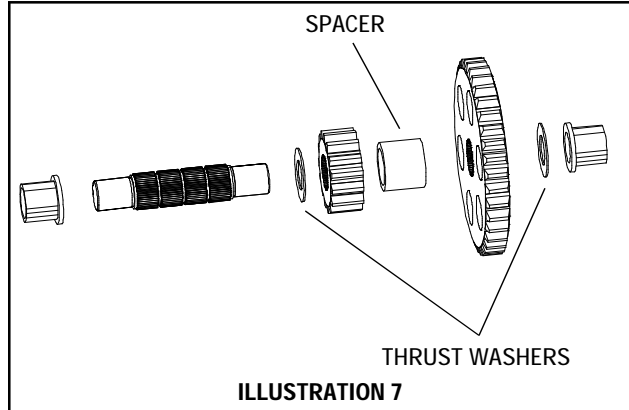


ILLUSTRATION 7

5. The output shaft is completely splined and consists of a bronze bushing, thrust washer, a large output gear, spacer, small output gear, thrust washer and bronze bushing. (Illustration 7)

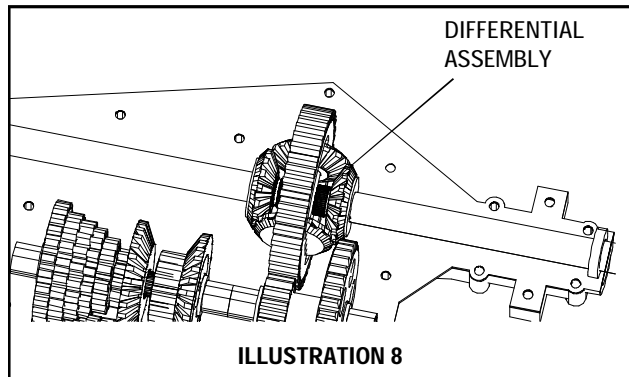
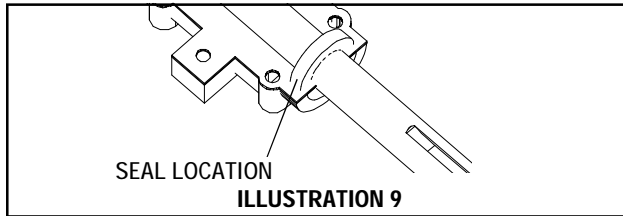


ILLUSTRATION 8

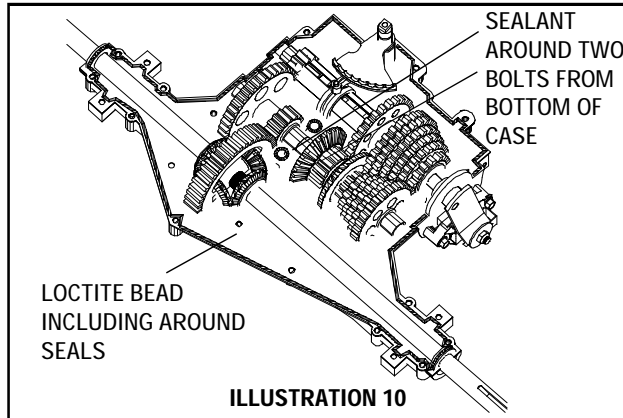
6. To reassemble the differential, first inspect the axle bevel gears for damage or wear. If it is necessary to replace a gear, the mating gears must also be replaced. The differential must be assembled outside of the case and placed into the case as an assembly (Illustration 8).

Using seal protector (part # 670262A) place a seal on each shaft with the open side facing in. Hold the longest shaft with the bevel gear and washer on it in your hand. Place the bull gear and the bevel pinion gears and shaft, on top of the axle shaft and bevel gear. Center the pinion gear shaft on the axle shaft and place the short axle so that it is also centered on the pinion shaft.



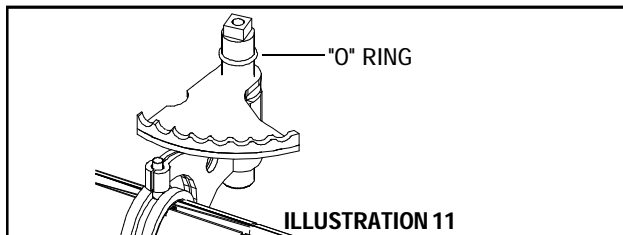
Pick up the entire assembly and place it into the case positioning the seals in the seal pocket. When properly installed the axle shaft should turn freely without any binding. (Illustration 9)

**NOTE:** Before closing up the case make sure the case and cover fit together evenly and all bushings are properly installed. With the flat sides of the bushings matching the pockets of the case and cover.



- To seal the case and cover. Clean the mating surfaces and place a continuous thin bead (1/16") of Loctite 598 Silicone RTV (part # 788093) around the entire perimeter of the cover to prevent oil from leaking **INCLUDING CASE AND COVER SEAL POCKETS. Caution must be used when locating this bead so that oil passages that lead to the axle shafts don't become blocked and prevent lubrication in these critical areas.** Don't forget the two bottom bolts (Illustration 10).

**NOTE:** The axle and brake shaft seals on later production MST's have been redesigned to eliminate the need for sealant in the seal/bearing pocket area. These new seals are identified by external ribs that hold the seal in place and prevent leakage. **DO NOT** put sealant in the seal/bearing pockets with this new type seal.



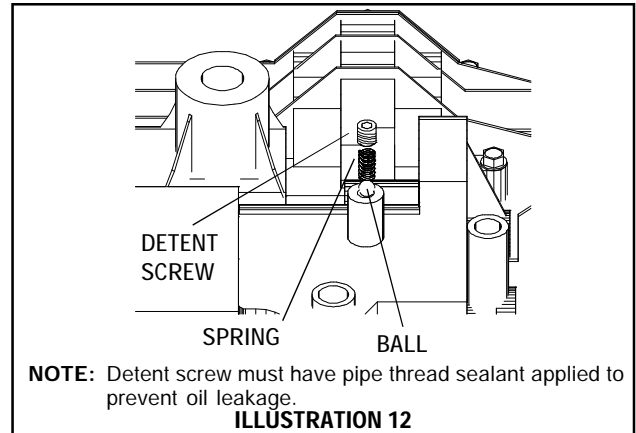
Before placing the cover on the case, place the shift rod and fork pins into the shift collar and shaft into the boss in the case. Inspect the shaft on the rod and fork for rust and burrs. (Illustration 11)

- Place a coating of grease on the shaft for easy assembly and corrosion protection. Replace

the "O" ring if needed. With the cover in position over the shaft, place it onto the case and rotate the input shaft to allow the gears to mesh and drop the cover into place.

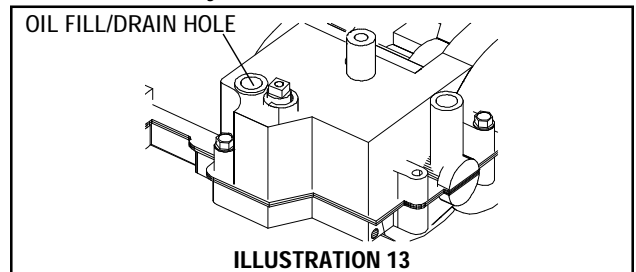
Install the cover screws and torque them to 90-100 inch pounds. Replace the index ball, spring and set screw. Turn the set screw down to the flush position. Install the neutral start sensing switch if applicable (Illustration 12).

**NOTE:** Do not forget to re-install the bottom two bolts.



**NOTE:** Detent screw must have pipe thread sealant applied to prevent oil leakage.

- Prior to installing the brake assembly apply a light film of lubriplate to the inside of the lever portion which contacts the pins. The outside lever which contacts the flat washer and between the shaft O.D. and bore of the brake disc. Brake pads and the brake disc must be free of grease and oil. Install the brake assembly.



- Refill the transaxle through the fill hole located in the cover. This unit requires 16 oz. of 80W90 gear lube (part #730229A). When completed lubricate the plug lightly on the outside with oil. Use a 3/16" wood dowel placed in the recess of plug and push it into the plug hole (Illustration 13).

- Install the transaxle on the equipment. Make any clutch and brake adjustments in accordance with the equipment manufacturers owners manual.

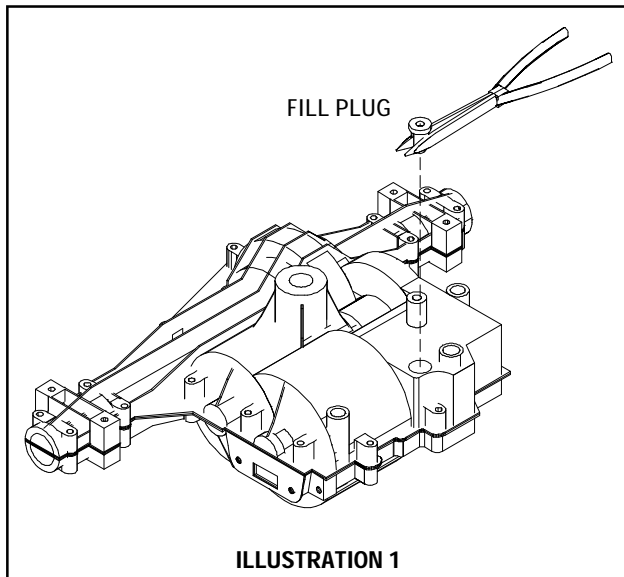
**NOTE:** If adjusted improperly, the unit will exhibit these conditions.

- Will not stop — adjusted to loose
- Continued braking affect or dragging — adjusted to tight
- Hard to shift — Brake applied before clutch releases belt
- Belt guides missing or misadjusted see Bulletin 304.

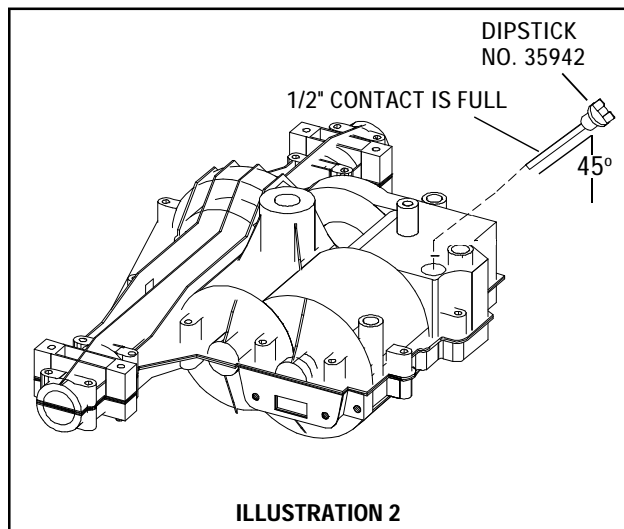
## CHECKING OIL LEVEL

### PROCEDURE:

1. Locate tractor on a level surface.
2. Depress clutch/brake pedal, engage parking brake and place deck in lowest cutting position.
3. Locate the rubber fill plug next to the shift rod as it enters the transaxle cover.

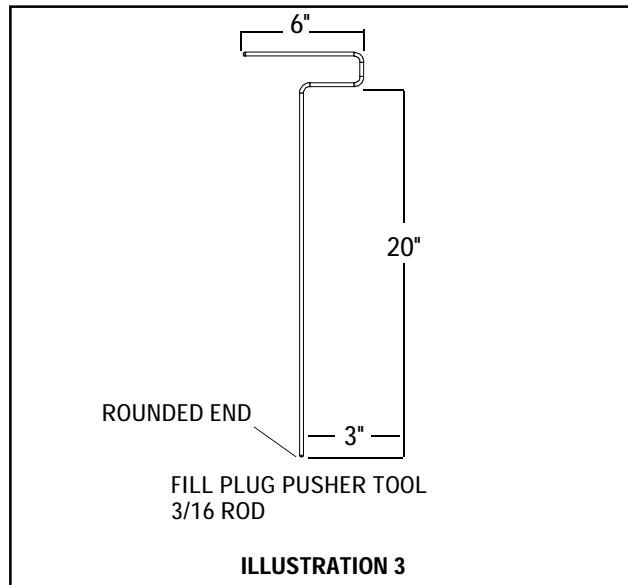


4. With a needle nose pliers or needle nose vise grip, work under the lip of the plug, rocking from side to side until plug is removed (Illustration 1).

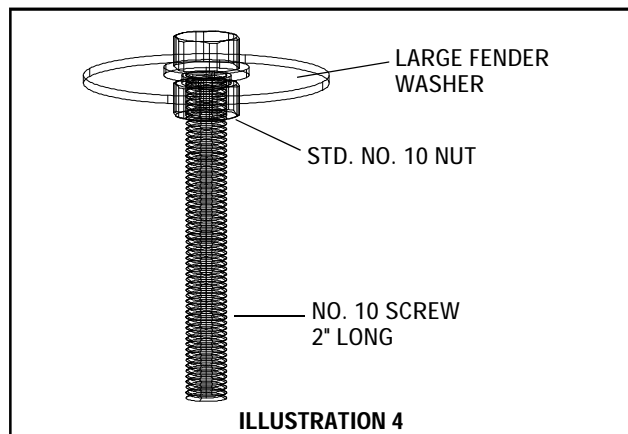


5. Insert dipstick Part Number 35942. Insert the gauge at a 45° angle. Check for approximately 1/2 inch of oil when inserted. This is 16 ounces of EP90 gear oil (Illustration 2).

6. If oil is needed, we recommend using a goose neck **16 ounce** mechanics oil can. (These are readily available at any hardware store.) Fill the unit with all **16 ounces** of the 90 wt. gear oil to level indicated.
7. Reinstall the plug by lubricating it with WD40 oil or spray lubricant. An installation tool can be made by using one of the following procedures.



- A. When the plug is accessible from the battery box area, make an installation tool from 3/16 cold rolled steel rod as shown (Illustration 3).



- B. If working from the bottom or side, use a No. 10 screw approximately 2 inches long with full threads. Then find a large fender washer and nut for the screw. The washer will give your fingers a large surface area to push down on for re-installation of the plug (Illustration 4).

## SECTION 11. VST TROUBLESHOOTING

The information on the following pages has been provided to help understand the internal operation of the VST. Do not use this information to attempt any internal repairs. Tecumseh's current policy on hydrostatic transaxles that have internal failures is to replace the complete unit. This has not changed. However, Tecumseh would like to provide a failure checklist to assist in making an accurate evaluation of the complete tractor to eliminate any unnecessary replacements. Here is a list of items to check and corrective actions to take.

To properly test the unit for power loss.

1. Allow the unit to cool before trying the following steps.
2. Put the shift lever in a position that is 1/2 of the travel distance from neutral to forward.
3. Place the tractor on a 17 degree grade.
4. Drive the tractor up the grade (without the mower deck engaged). The loss of power experienced should be approximately 20%. This is considered normal. If the loss of power is approximately 50%, this would be considered excessive.
5. Bring the unit to neutral, shift into forward and note the response. Care should be taken to move the lever slowly to avoid an abrupt wheel lift.

To determine if the problem is with the hydro unit, all external problem possibilities must be eliminated. Here are some potential problem areas.

1. **Overheating:** Heat can cause a breakdown in the viscosity of the oil which reduces the pressure used to move the motor. Remove any grass, debris, or dirt buildup on the transaxle cover and / or between the cooling fins and fan. Buildup of material will reduce the cooling efficiency.
2. **Belt slippage:** A belt that is worn, stretched, or the wrong belt (too large or wide) can cause belt slippage. This condition may have the same loss of power symptom as overheating. Typically, the unit which has a slipping belt will exhibit a pulsating type motion of the mower. This can be verified visually by watching the belt and pulley relationship. If the belt is slipping, the belt will chatter or jump on the pulley. If the belt is good, a smooth rotation will be seen. Replace the belt and inspect the pulley for damage.

- Leakage:** The VST and 1800 Series have two oil reservoirs which can be checked for diagnostic purposes. The first is the pump and motor expansion bellows, With a small diameter blunt or round nose probe, check the bellows depth through the center vent hole. Proper depth from the edge of that hole is 3-1/4 - 3-1/2 inches (8.25 - 8.9 cm).

The second chamber is for the output gears including the differential. **FIRST** make sure the tractor is level, then remove the drain/fill plug. **NOTE:** Some units that do not have differential disconnect will have two plugs. We recommend using only the primary plug. With a small pocket rule insert until you touch bottom of case. You can then remove it and check for 1/4 - 3/8 inches (6.5 - 9.5 mm) contact this is full at its 8 oz. capacity.

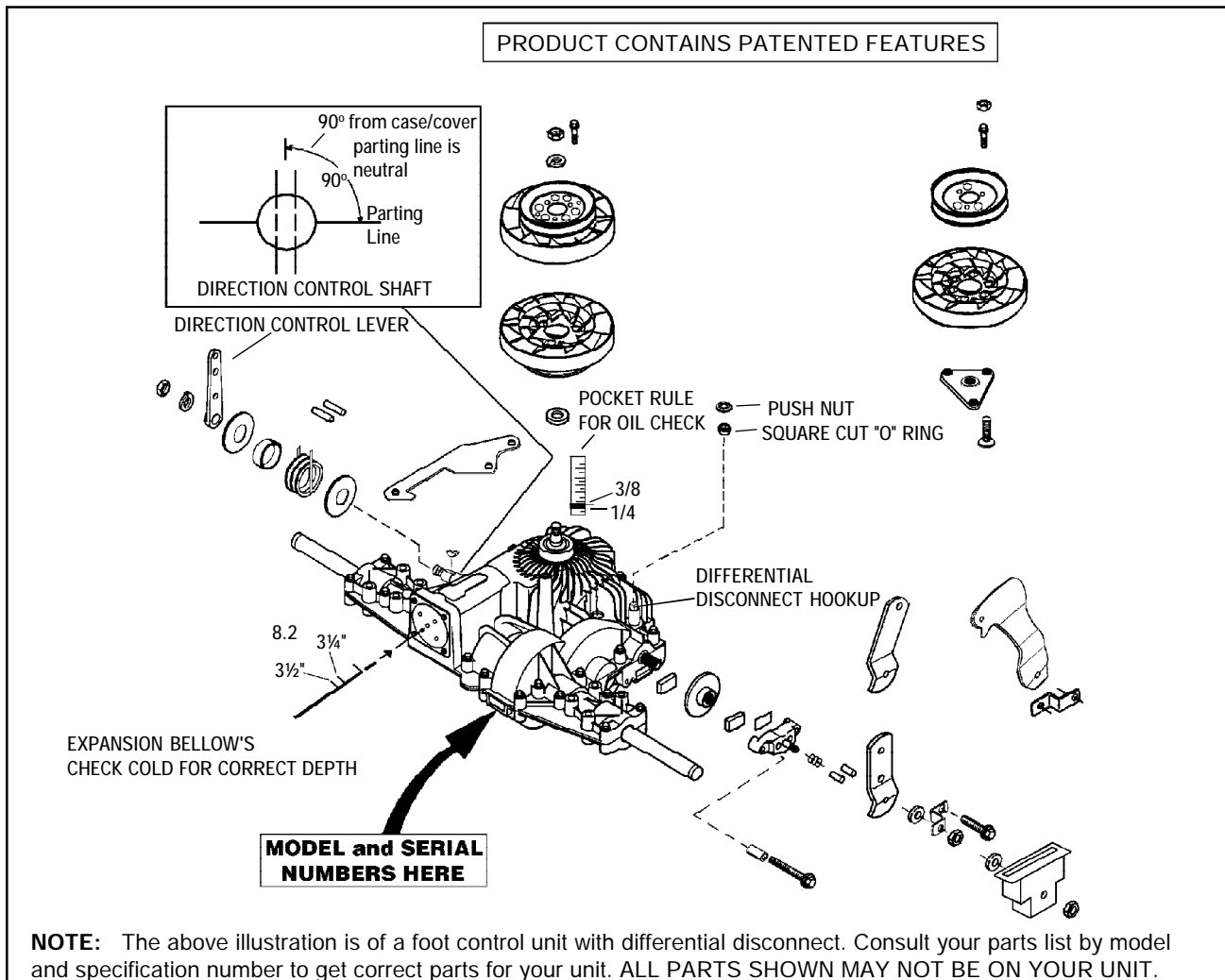
- Low ground speed:** If the linkage is not synchronized to absolute neutral, or the shift lever is not properly fastened to the tapered control shaft, full forward travel may not be achieved. This may cause a false reading and be misdiagnosed as a low power condition. This also could be caused by the brake not releasing.

To determine absolute neutral, the hole in the tapered control shaft must face straight up and down, at this point make sure the OEM linkage is in neutral. To properly fasten the control lever to the shaft, torque the nut to 25-35 ft. lbs. (34 - 48.3 NM) of torque with the shaft and the lever in neutral.

When attaching the shifter arm to the shaft you must prevent any rotation during torquing. This can be done by placing a long 5/16 bolt in the hole as shown in Illustration. Hold the bolt until the tapers are locked and the nut torque is correct.

To make sure that the brake is not binding, drive the unit up a slight grade. Position the speed control lever into neutral. The unit should coast backwards. If the unit does not coast back slowly, the brake is not released from the brake disk. Adjust the brake linkage to release the brake completely when the foot pedal is released.

- Hard to shift:** Typically hard to shift symptoms are not caused by the hydrostatic unit. The shift arm should move with relative ease. Approximately 40-50 inch lbs. (4.48 - 5.6 NM) at the transaxle for foot pedal units or 150-200 inch lbs. (16.8 - 22.4 NM) for hand operated units. This varies depending on the type of linkage. Binding may occur in the linkage connections due to rust or moisture. Lubricating these connections and checking for bent or damaged parts should resolve hard shifting.



# CHAPTER 4. THREE-SPEED TRANSAXLES

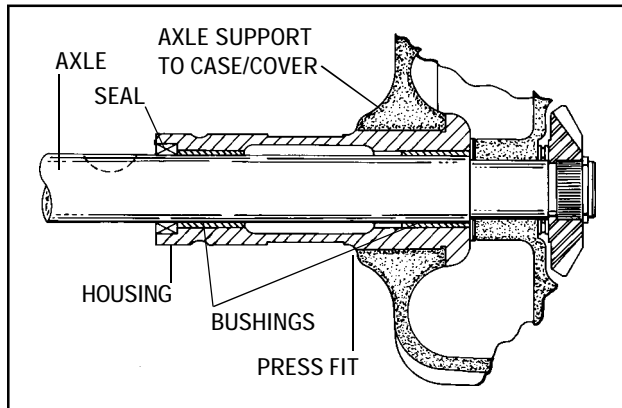
## SECTION 1. 1200

### CAUTION

TO AVOID PREMATURE TRANSAXLE FAILURE, DECLUTCHING IS REQUIRED WHEN SHIFTING FROM NEUTRAL TO FIRST OR REVERSE, FROM ANY FORWARD TO REVERSE GEAR, FROM REVERSE TO ANY FORWARD GEAR OR WHEN OPERATING EQUIPMENT ON A HILL OR UNDER HEAVY LOAD.

### A. GENERAL

1. The 1200 series transaxles has three forward speeds and one reverse.
2. This series is not intended for use with ground engaging equipment. That is, it should not be used to pull plows or similar equipment which are pulled through the soil to over turn it. Also, judicious use is expected in any situation where a severe strain will be placed on the axles.

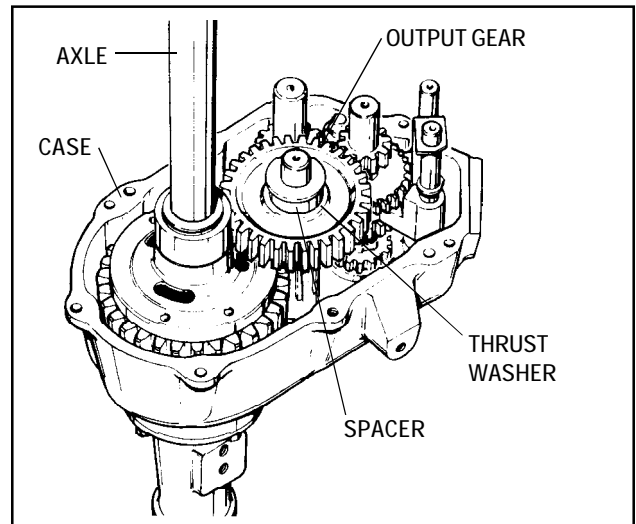


1200 Housing, Bushing and Seal Assy.

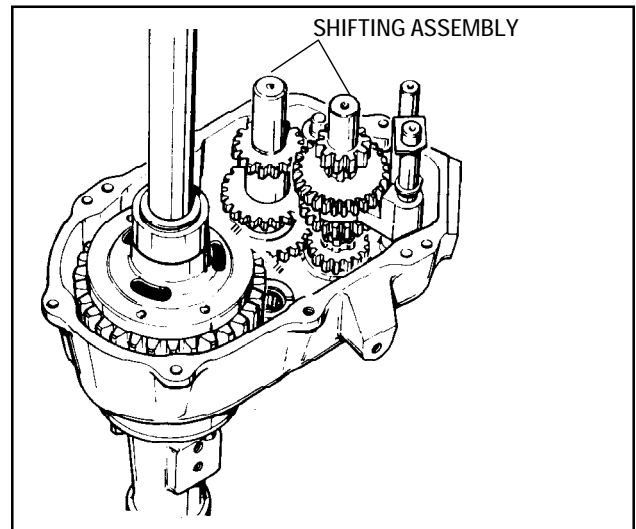
On the 1200 series, replace the seals after complete reassembly.

### B. DISASSEMBLY

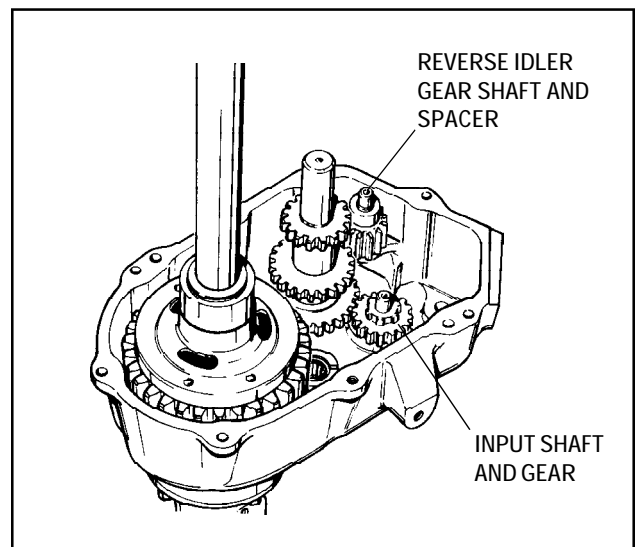
1. Position the shifter forks in neutral.
2. When disassembling the unit, it should be held so that:
  - a. It lies on the case, properly blocked so that no weight rests on the input shaft or differential, yet the case is rigid.
  - b. It can be worked on without the chance of falling, or causing injury.
3. Oil seals have a double lip so seal sleeves do not offer much protection during removal. Upon reassembly new seals should be used.
4. Tap dowel pins into the case and remove socket head cap screws.



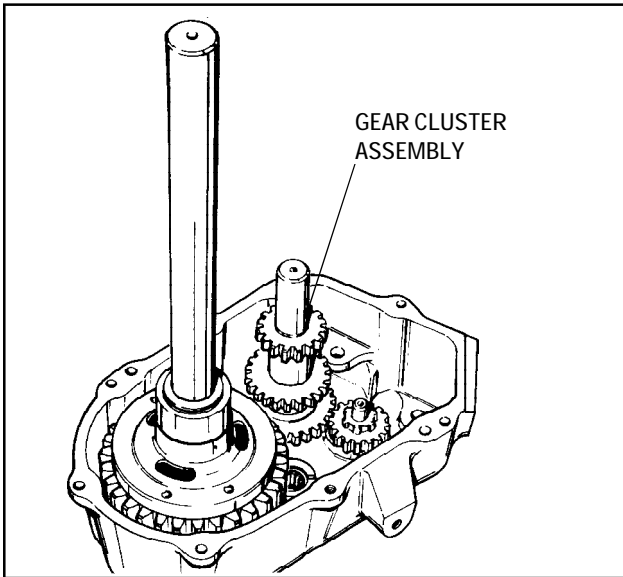
5. Lift the cover off from the case. Discard gasket. Remove output gear and shaft.



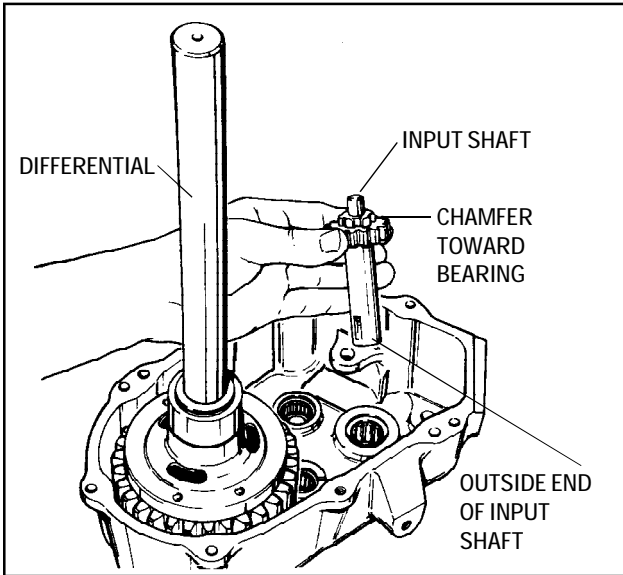
6. Remove the shifting assembly as one unit.



7. Remove the reverse idler shaft, spacer and gear.



8. Lift out the three gear cluster.



9. Remove the input shaft.
10. Remove the differential.

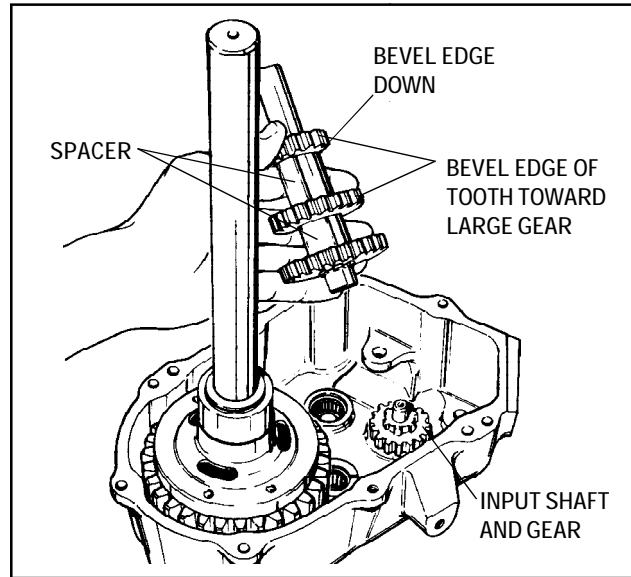
**NOTE:** Notice what the relationship of the bolt heads are to the removal of the assembly.

### C. INSPECTION AND REPAIR

Inspection of the case and cover on the 1200 series may indicate the need for replacement of the axle housings. Use an arbor press to drive out the housing, and a protective piece of bar stock between the housing and press when replacing the housing. Press the housing in squarely until the flange seats against the case and cover.

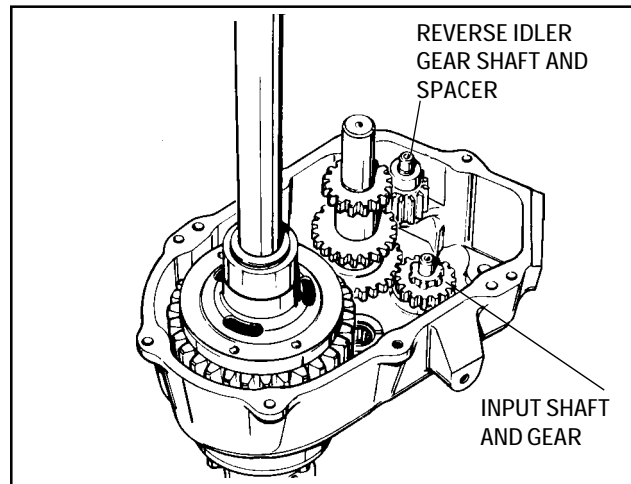
### D. ASSEMBLY

1. Install input shaft in case. Use a soft mallet to seat shaft and gear completely. Binding can occur if the shaft is driven in only part way.
2. Install the differential assembly. The four cap screw heads should go away from output gear or downward.

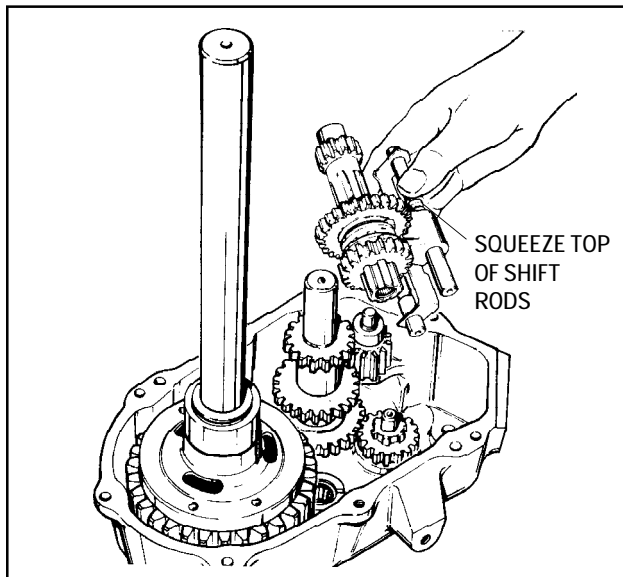


3. Install the three gear cluster, with the smallest gear up.

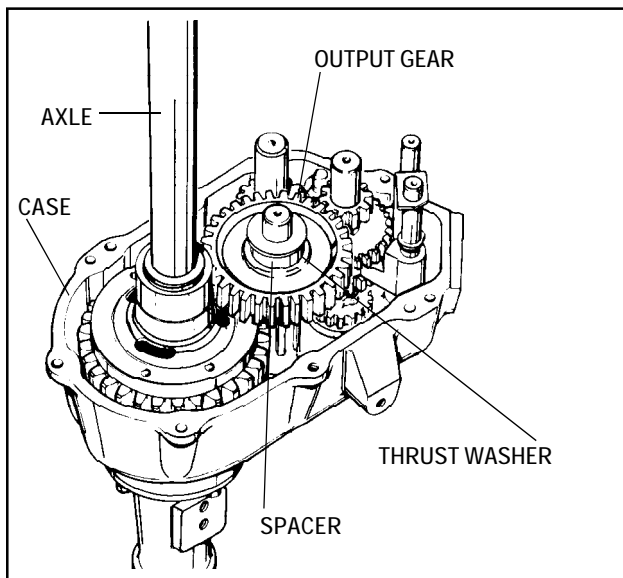
**NOTE:** Bevels of small and middle gears go down toward large gear. Large gear bevel is up. The short spacer goes between the large and middle gears.



4. Position the reverse idler shaft in the unit, then install gear and spacer.



5. Install the shifter assembly as a unit into the case. When installed correctly, the neutral square formed by the shifting forks should appear through the case opening for attaching the shift housing. Both shift gears should be out of mesh.



6. Install the output shaft, gear, spacer and thrust washer.
7. Position a new gasket on the cover mounting surface, then install cover.
8. Align cover with the dowel pin and secure with the socket head cap screw. Torque to 10 ft. lbs.
9. Install axle seals using sleeve and driver.
10. Install axle supports. Be sure that the mounting pad position is correct before tightening down cap screws to 13 ft. lbs.
11. Install a new gasket and shift lever housing. Torque screws to 10 ft. lbs. Be sure the shift lever is in the proper position to allow shifting.

## E. LUBRICATION

Use S.A.E. 90 E.P. oil in the transaxle.

Fill units 1203, 1204, 1204-A, and 1205 thru 1208 with 3 pints oil. All other units, fill with 2 pints oil.

# CHAPTER 5. FOUR-SPEED TRANSAXLES

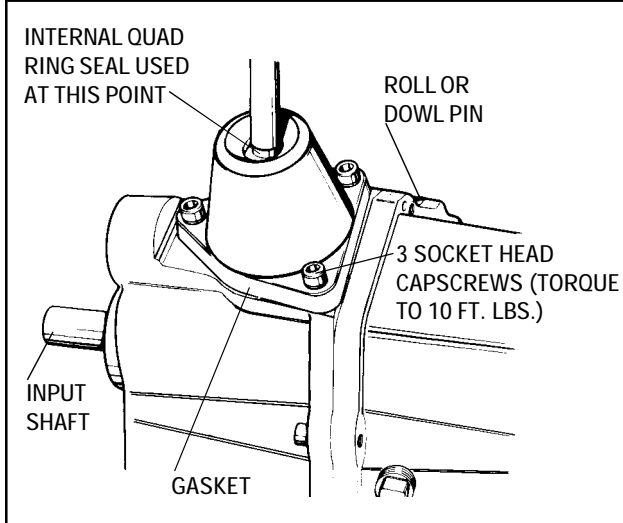
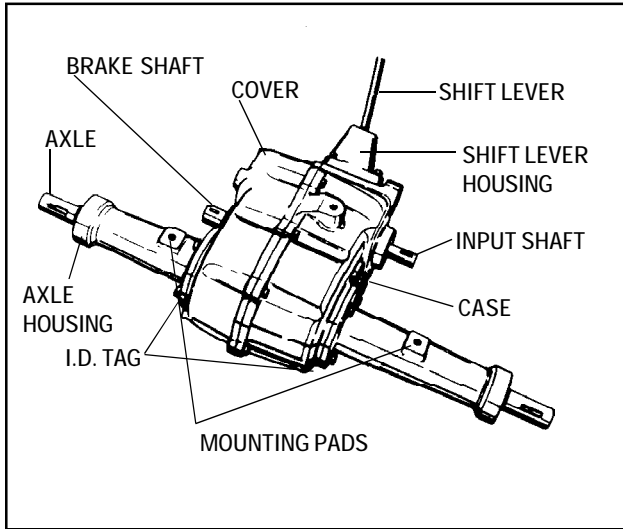
## SECTION 1. 2300 SERIES

### CAUTION

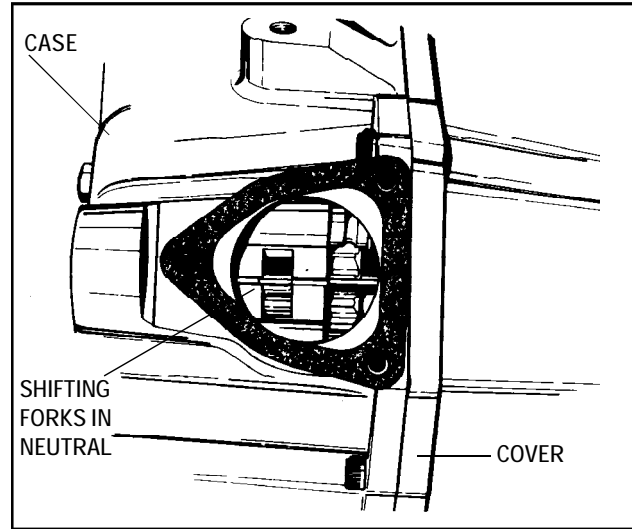
DECLUTCHING IS REQUIRED WHEN SHIFTING TO AVOID GEAR CLASHING AND DAMAGE.

### A. GENERAL

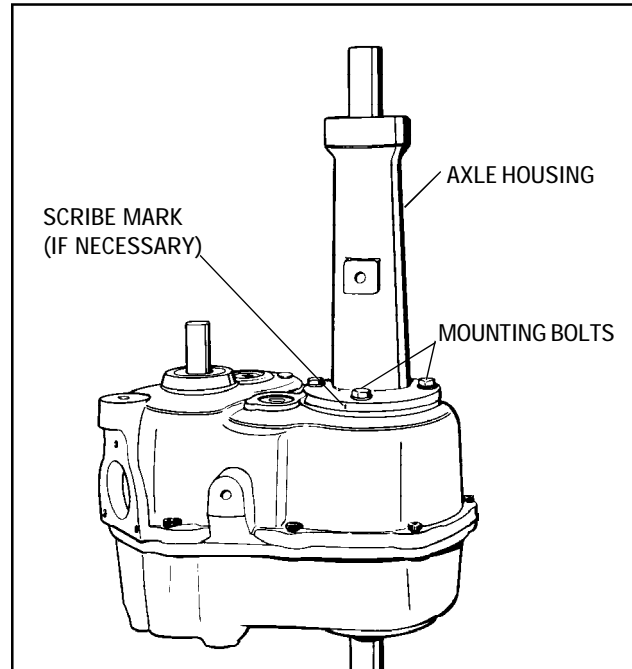
The 2300 series transaxles have a four speed forward and one reverse transmission.



### B. DISASSEMBLY

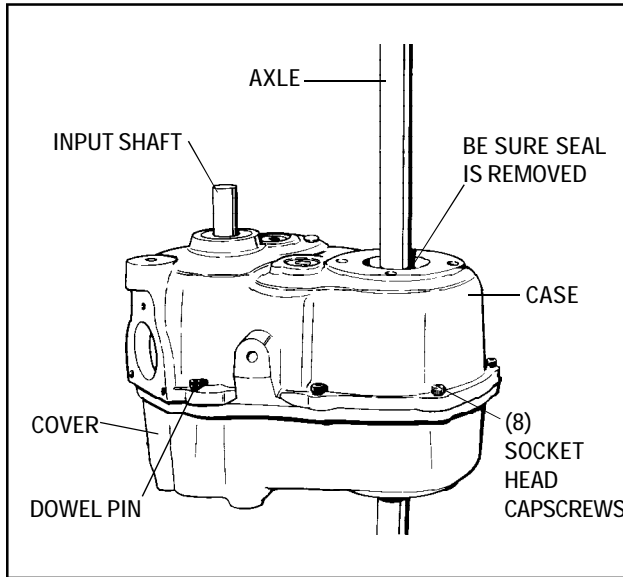


1. Position the shifter forks in neutral before disassembly.

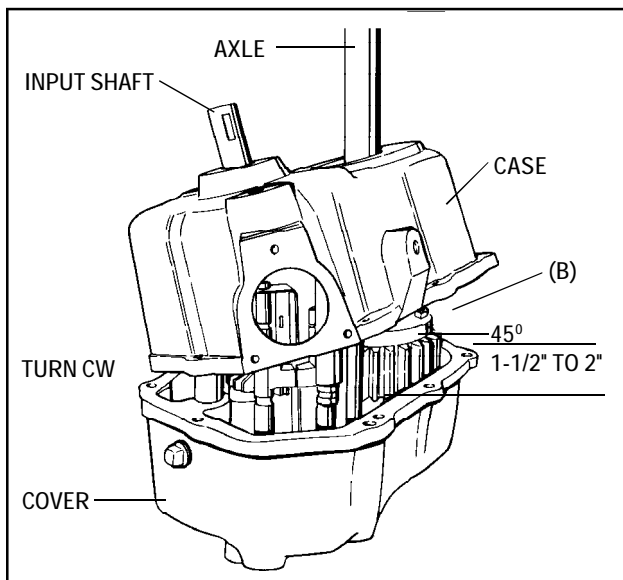


2. Remove both axle housings, and use the exposed axle as a ram to separate the seal retainers from the case and cover.
3. When disassembling the rest of the unit, it should be held so that;
  - a. It lies on the cover, properly blocked up, so that no weight rests on the brake shaft.
  - b. The cover should sit rigidly so that the removal of parts can be done in a systematic step by step procedure.
  - c. It will not fall causing an accident or injury.

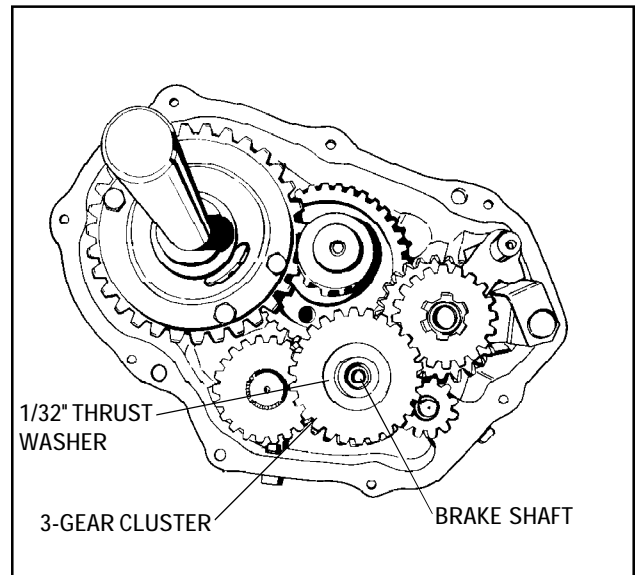
4. Oil seals are of the double lip type so sleeve protectors do not offer much protection when removing them. Upon replacement, new seals should be used.



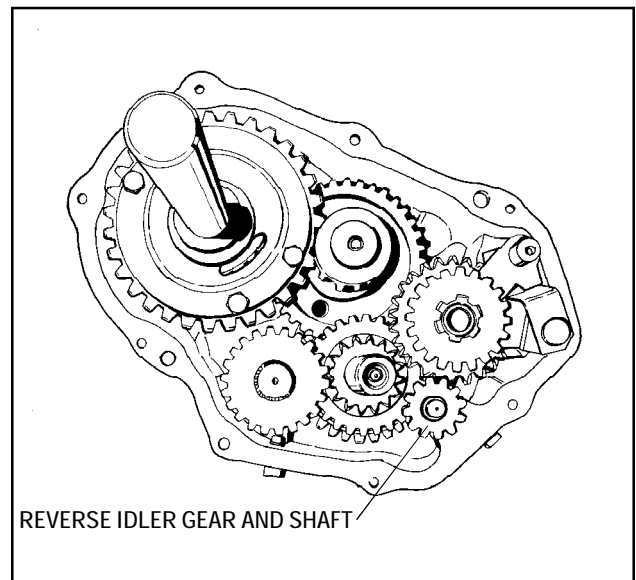
5. Tap dowel pins into the cover and remove the socket head cap screws.



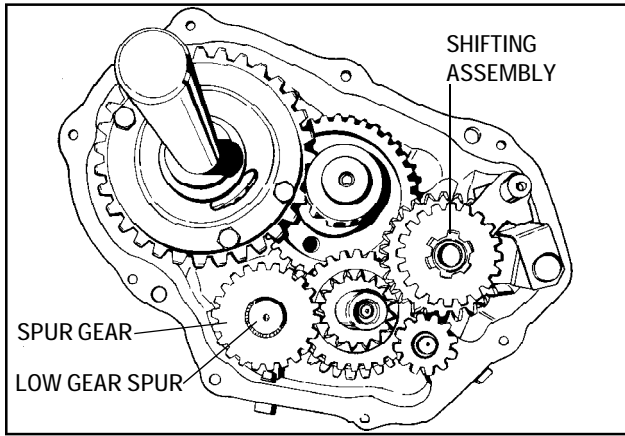
6. To separate the case from the cover:
- Lift the case 1-1/2 to 2" above the cover.
  - Tilt the case so that the shift rods will clear edge.
  - Rotate the case so that boss hidden inside will clear gears, then lift free of the differential.



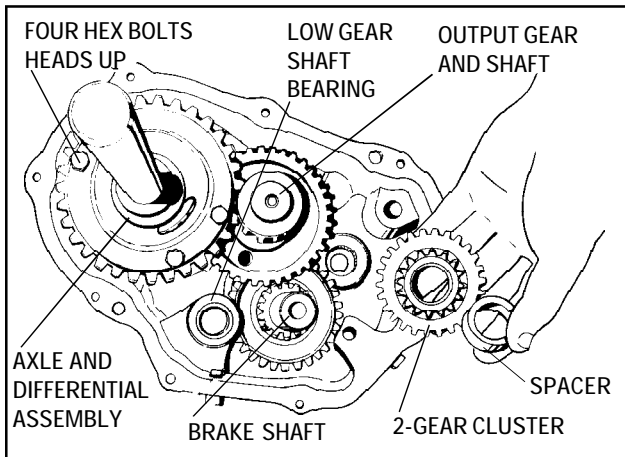
7. Remove thrust washer and three gear cluster from brake shaft, noting whether the cluster has a sloppy fit.
- To service the cluster bushings, refer to the Chapter on bearing and bushing service.
  - Inspect gear teeth for wearing, chipping or breaks. Wear or chipping on the bevel area only, indicates shifting while the equipment is in motion.



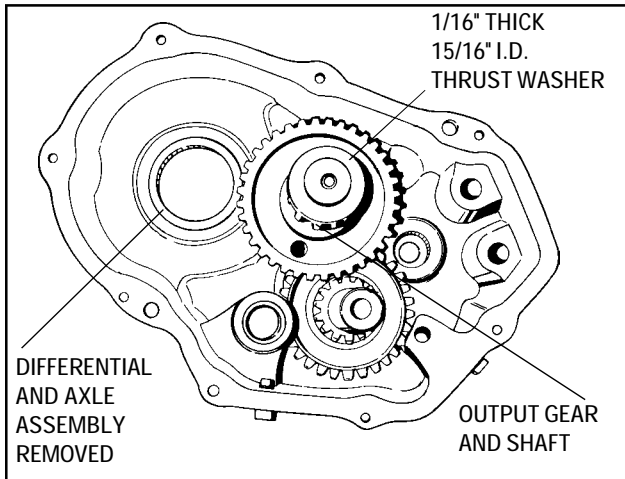
8. Remove the reverse idler gear, spacer and shaft from boss in cover. Note that the spacer goes between the gear and the cover, and that the gear bevels go down. Excessive wear on teeth bevels indicates improper shifting technique.



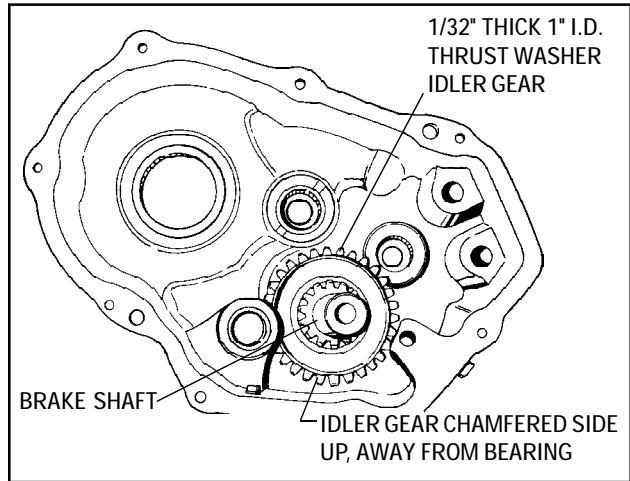
9. Lift out the shifter assembly. Service of this unit is described in the Chapter on shifting assemblies. If it is evident that the shifter assembly needs no further teardown, place it aside in a clean place, intact, for easy reassembly.
10. Remove the low gear and shaft, and splined spur gear. Separate gear and shaft. Note that NO thrust washer is between the gear and case.



11. Remove the two gear cluster and spacer from the brake shaft.
12. Lift the differential unit out of the cover. Service information appears in the Chapter on differentials.

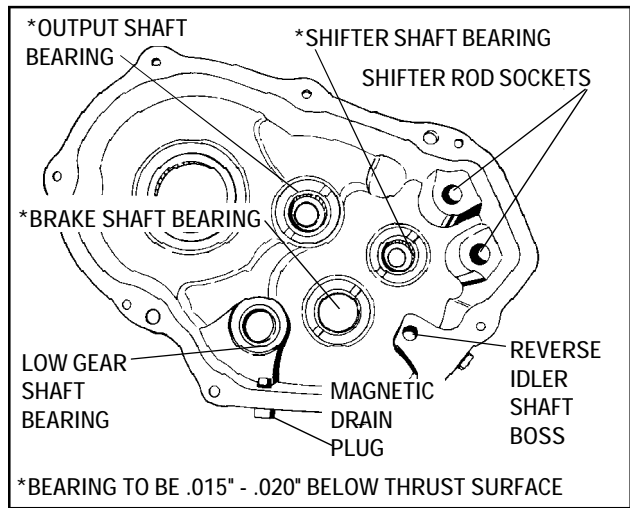
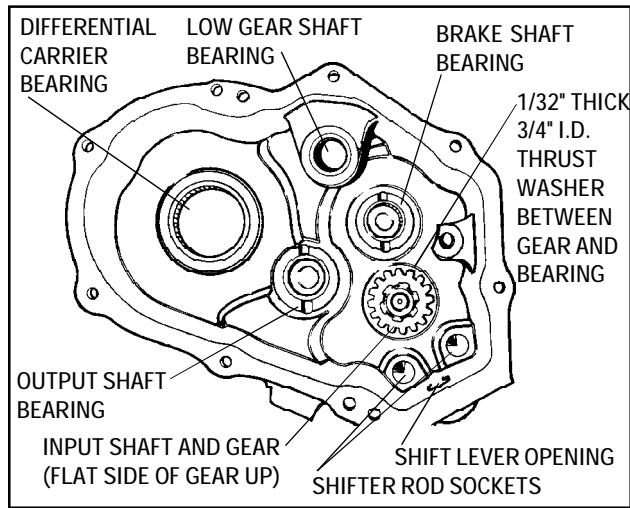


13. Remove the output shaft and gear and thrust washer from each end of the shaft.



14. Remove the brake shaft.

Note that the brake shaft idler separates from the shaft. If separated, be sure that when reassembled, the idler gear chamfers are away from the cover.



\*BEARING TO BE .015" - .020" BELOW THRUST SURFACE

15. Remove input shaft from case by tapping with a non-metallic hammer.

## C. INSPECTION AND REPAIR

1. Gears.
  - a. Check bevels for evidence of galling due to improper shifting.

**NOTE:** Peerless Transaxles must be stopped for shifting.
  - b. Check face of teeth for wear. Large shiny areas indicate too much tooth contact and possible excessive wear. Replace gears indicating damage or excessive wear.
2. Shafts and Axles.
  - a. Check surface for rust, pitting, scratches or wear.
  - b. Check keyways, splines, threads, and grooves for wear. Replace parts if worn or damaged beyond a refinishable state.

3. Case and Cover.

Check for cracks, stripped threads, metal chips, flat sealing surfaces and rust. Clean out any rust. Replace parts if any damage is found that cannot be repaired.

4. Thrust Washers and Spacers.

Check for shininess indicating wear. Replace if wear is evident. Try to determine cause of thrust washer wear such as: lack of end play due to reuse of gasket, or use of wrong thrust washer.

5. Shifting Assembly.

Refer to the Chapter on shifting assemblies.

6. Gaskets.

Replace all gaskets.

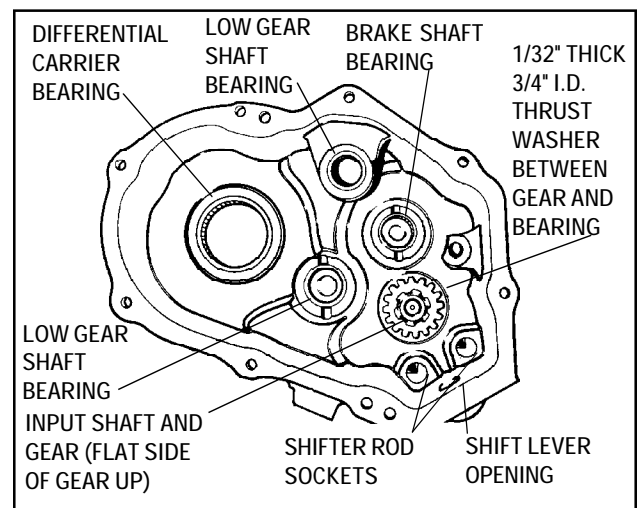
7. Oil Seals.

It is a good habit to replace all seals. It is necessary to replace all double lip seals. See Chapter 1, paragraph F, "OIL LEAKS, SEAL AND GASKET SERVICE".

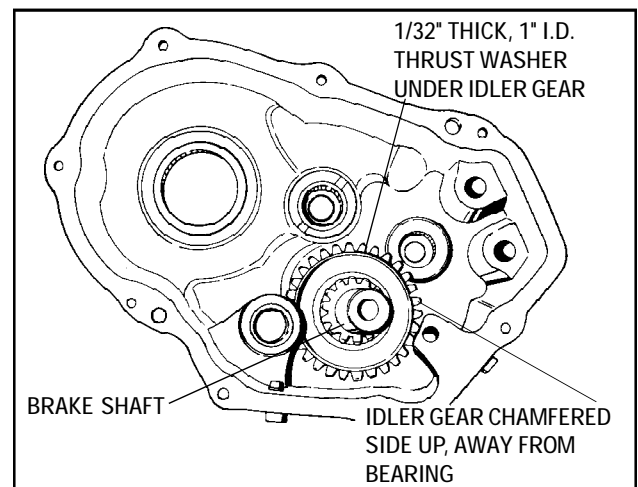
8. Bearings and Bushings.

Refer to the Chapter on bearings and bushings.

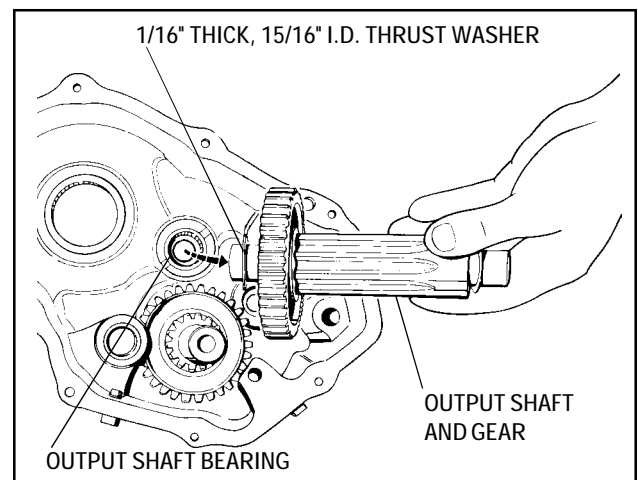
## D. ASSEMBLY



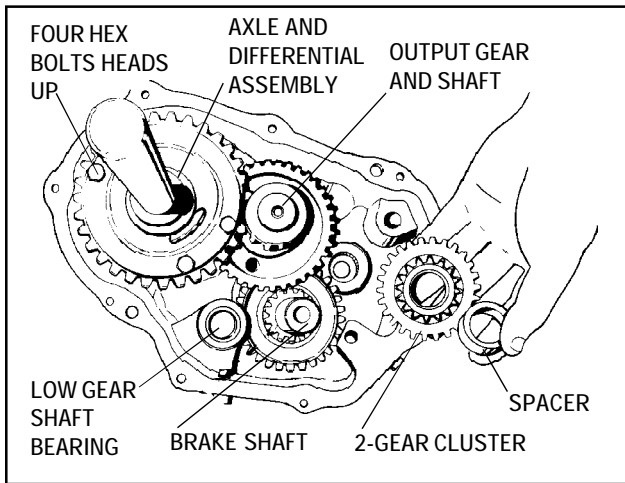
1. Install input shaft in case. Use a soft mallet to seat shaft and gear completely. Often, binding in the assembled unit can be traced to a partially installed input shaft.



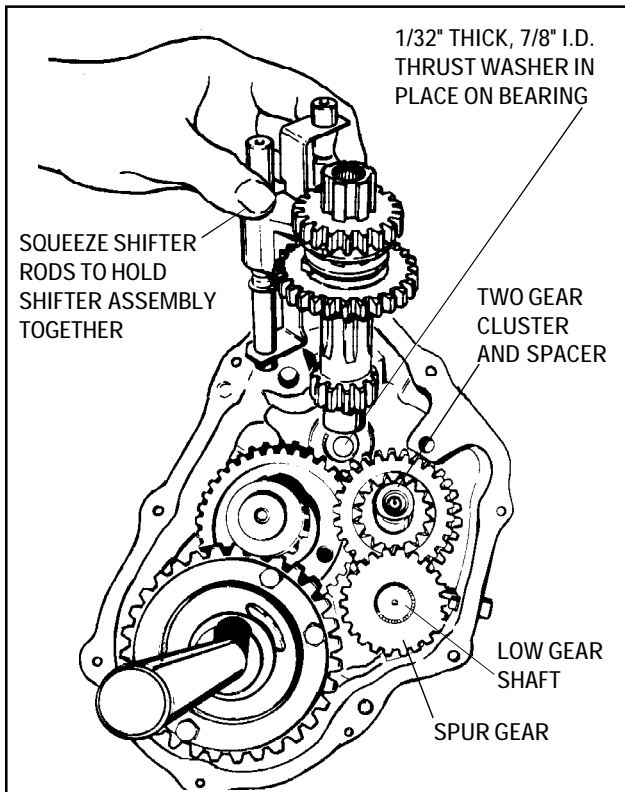
2. Center one 1/32" thick by 1" I.D. thrust washer on the cover brake shaft needle bearing, then install the brake shaft and gear, (chamfer side away from cover).



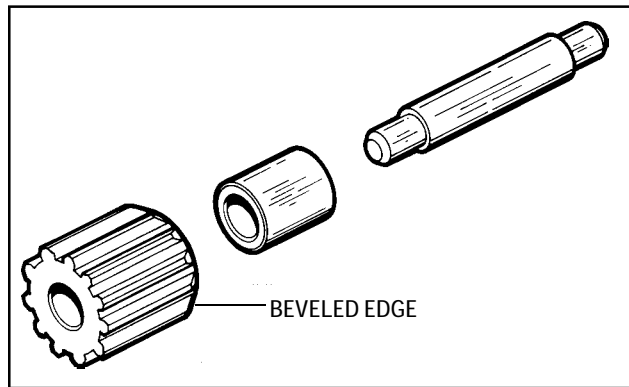
3. Install the output shaft and gear after centering a 1/16" thick by 15/16" I.D. thrust washer on each end of the shaft.



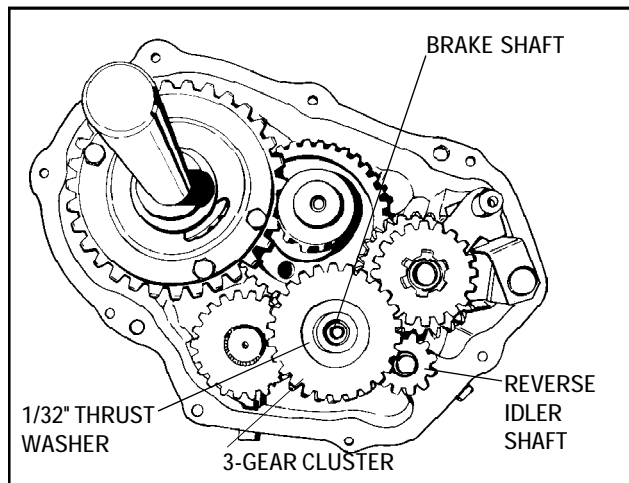
4. Insert the differential assembly into the cover. Note that the four bolt heads should be out away from the output gear.
5. Install the two gear cluster and spacer on the brake shaft.



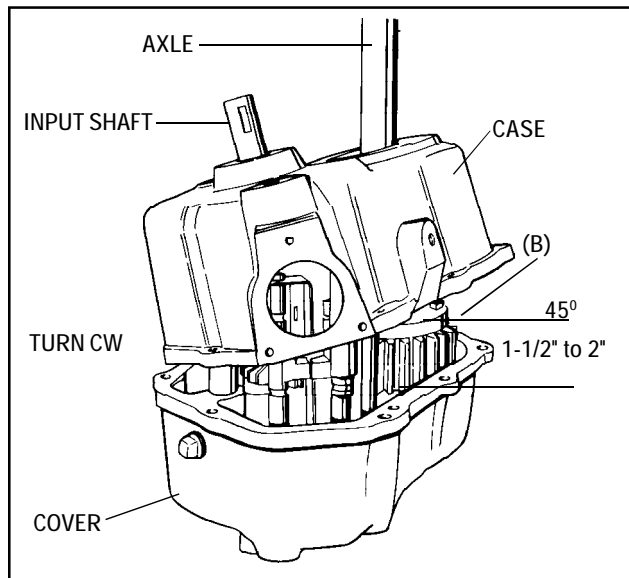
6. Install a 1/16" thick by 3/4" I.D. thrust washer, gear and low gear idler shaft in cover. Do not put a thrust washer on the exposed end of this shaft. Be sure the small gear meshes with the larger gear of the two gear cluster.
7. Center one 1/32" thick by 7/8" I.D. thrust washer on cover shifter shaft bearing.
8. Install shifter assembly as a unit into the cover.



9. Install the reverse idler shaft, spacer and gear in to the cover. The beveled side of the idler gear should be down into the cover.

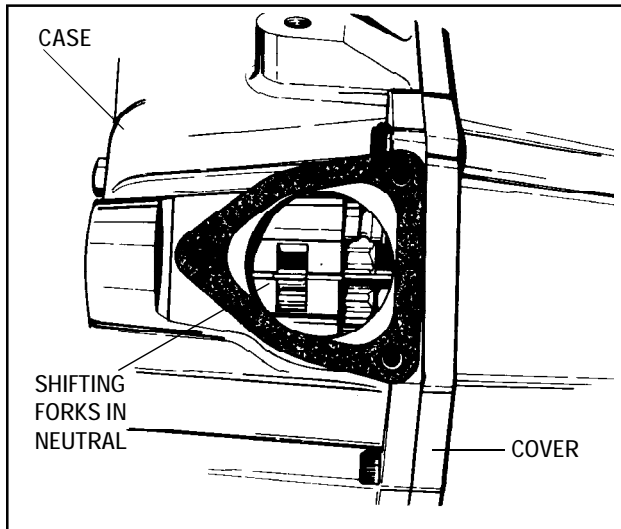


10. With the small gear of the three gear cluster toward the spacer, install the three gear cluster and other 1/32" thick by 7/8" I.D. thrust washer on the brake shaft.



11. Position the gasket on the cover sealing surface, then install case over the differential shaft. Be sure the boss goes under gears and that edge of the case goes over the shaft rods in the opposite manner from which it was removed.

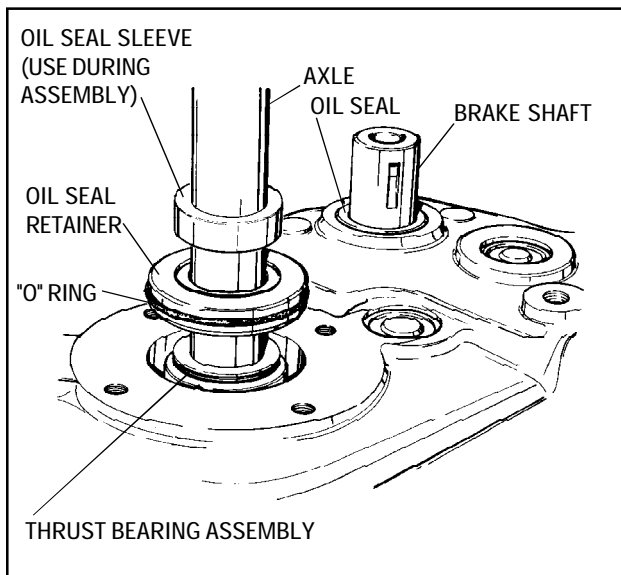
12. Once in position, if case hangs 1/2 to 1" high, turn the input shaft to get gears to mesh. The case should drop about 1/4" from closing.



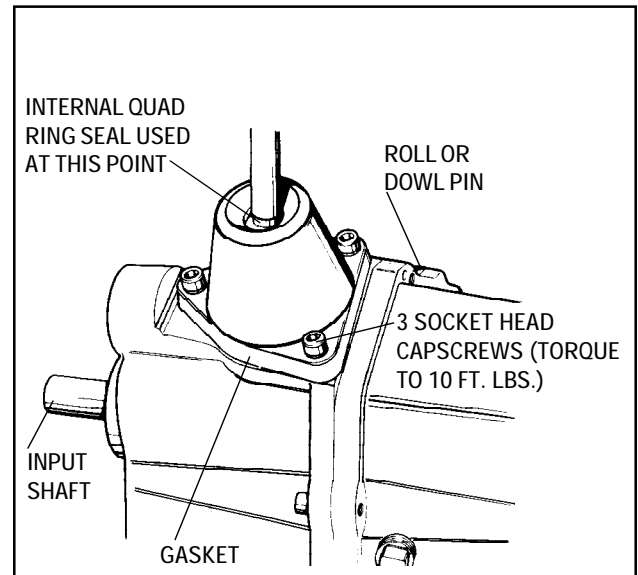
13. Use a pair of needle nose pliers on the shifter stop on each shifter fork to agitate the shifter rod ends into their machined recesses in the case.
14. Align the case and cover with the two dowels, then install and tighten the eight socket head cap screws. Torque screws to 10 ft. lbs. Unit can now be placed flat on the work bench.

Place seal retainers and new seals in position.

**CAUTION:** Sleeves must be used to protect seals, especially axle ends or where wheels attach.



15. Install new "O" rings on seal retainers and position axle supports to case and cover. Be sure mounting pads face in the same direction as when removed. Install cap screws and torque to 13 ft. lbs.



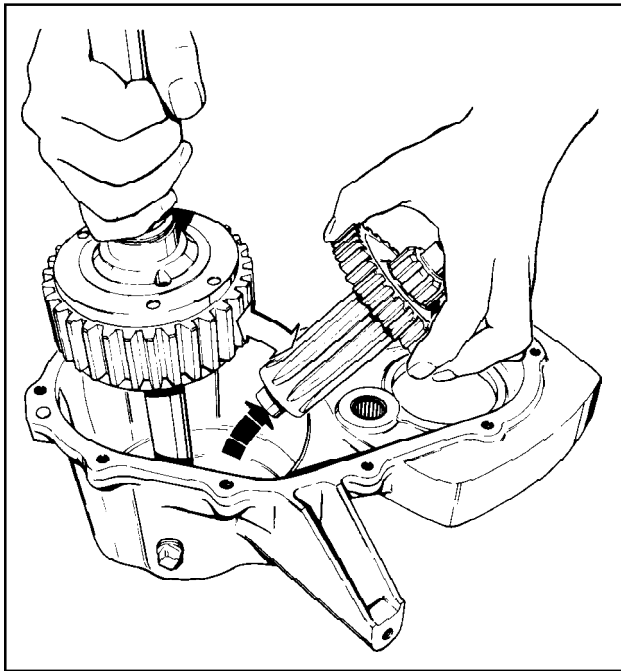
16. Install shift lever housing and new gasket.

### E. TESTING AND LUBRICATION

1. For testing, refer to Chapter 1, Paragraph H.
2. For proper lubrication type and amount, refer to Chapter 1, Section 2.



### C. DISASSEMBLY

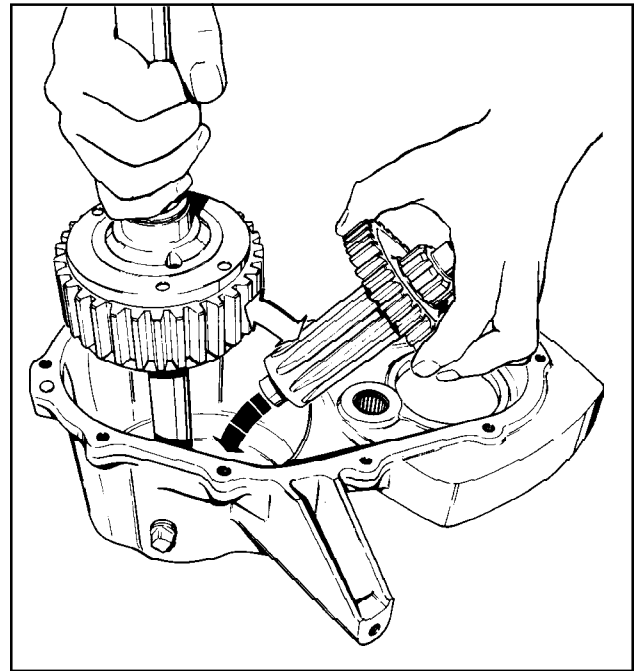


1. Remove the lockscrews and tap dowel pins out of cover. Lift off cover and discard gasket.
  2. Lift out brake shaft, gear, and thrust washers on each side of gears.
  3. Lift output shaft, gear, spacer, and thrust washer from case. At the same time, lift out the differential assembly.
- NOTE:** No thrust washer is located between the output shaft and case.
4. To service differential, refer to the Chapter on differentials.
  5. To service bearings, refer to the Chapter on bearing service.
  6. To separate axle supports from the case and cover, use an arbor or hydraulic press. A piece of bar stock should be used to protect the support from the press ram.

### D. INSPECTION AND REPAIR

1. Inspect case and cover for cracks, stripped threads, marred sealing surfaces, and bearing condition. Cause of any oil leakage should be corrected. If parts cannot be repaired, replace them.
2. Check shafts and gears for worn or chipped teeth. Check bearing surfaces for scratches which might affect oil seal performance. Check for wear.
3. Check needle bearing for presence, seal and smoothness. Also, be sure bearings are not corroded or rusty. Replace bearings of doubtful condition.
4. Check differential for rigidity. Wobble indicates wear. Refer to the Chapter on differentials for service.

### E. REASSEMBLY



1. When installing axle support, be sure case and cover alignment is true with the press. Press support in until flanged surfaces contact case and cover.
2. Install differential and output shaft simultaneously. Position gear 3/4" I.D. spacer and thrust washer on shaft.
3. Center one 3/4" I.D. thrust washer over case needle bearing then install brakeshaft gear, and other 1-1/8" I.D. thrust washer.
4. Position a new gasket on the mounting surface of the case, then install cover. Align cover and case by tapping dowel pins into cover and secure with lockscrews torqued to 10 ft. lbs.
5. Install new brakeshaft oil seal using sleeve number 670179.
6. Install new axle support oil seals using sleeve number 670179.
7. Add 2-3/4 pints (44 oz.) Oil (S.A.E. EP 90) before securing hydrostatic drive to the 1300 series unit. Clean mounting surfaces and use a new gasket between the units. Torque 4 mounting bolts to 90 to 100 inch pounds.

# CHAPTER 7. REDUCTION GEAR AND DIFFERENTIAL UNITS

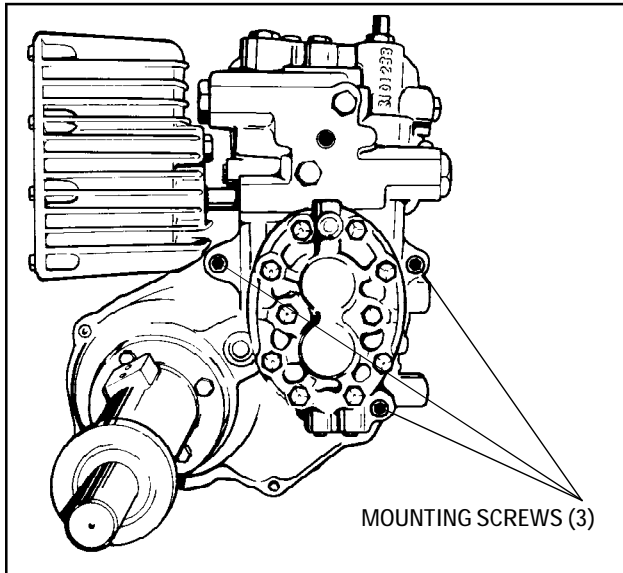
## SECTION 1. 2400 SERIES

### A. 2400 SERIES

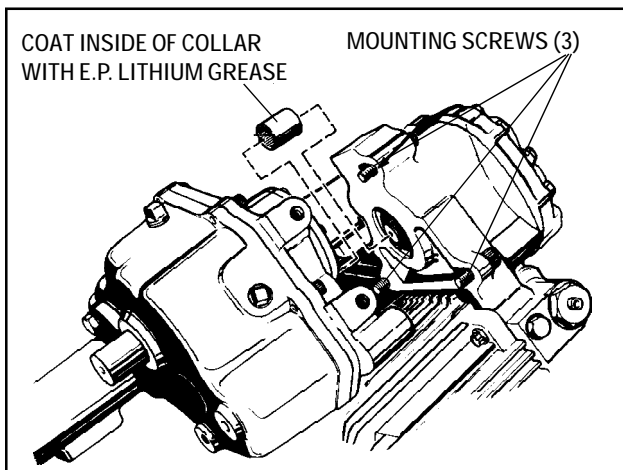
The 2400 Series transaxle is a gear reduction unit which is powered by a hydrostatic pump.

#### SEPARATING AND COMBINING HYDROSTATIC UNIT AND 2400.

The two parts should be removed from the vehicle together.



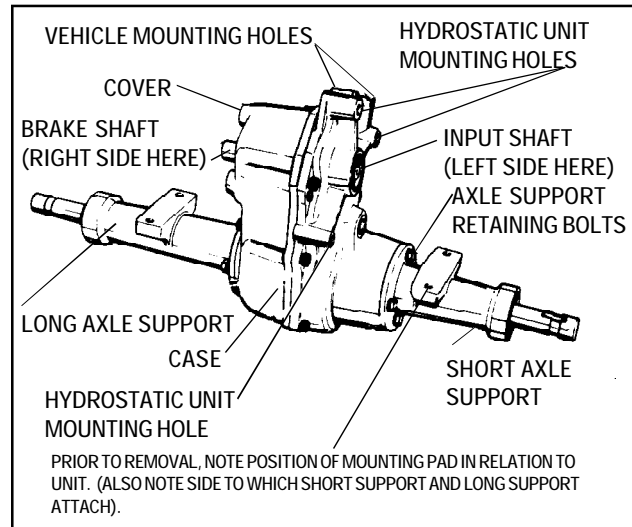
- To separate the units, block the assembly to prevent falling, then remove the three hydrostatic mounting screws. Lift either unit from the other. If any binding occurs, remember that the drive shafts are held in common rotation by a splined coupling and the coupling may have a slight bind on the driveshafts.



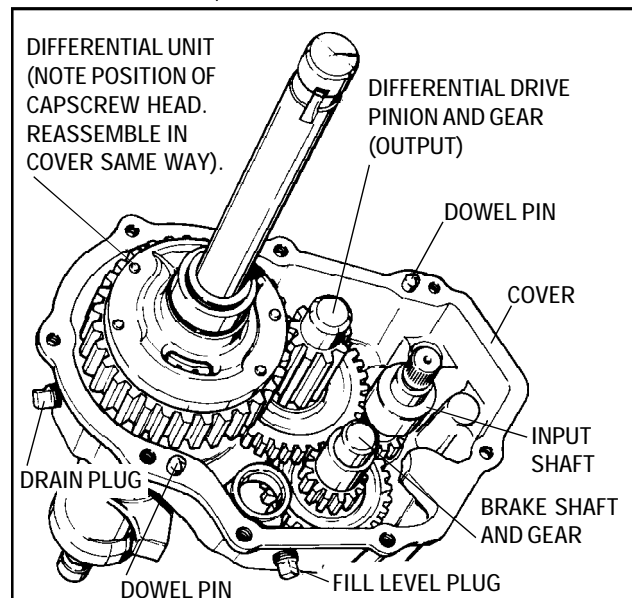
- Once separated, to make any further repair to the hydrostatic unit, it must be returned to the brand unit dealer who sold the vehicle for his service arrangement.
- To combine the hydrostatic drive and the 2400 unit, coat the splined coupling with E.P. Lithium grease, or install it on the 2400 input driveshaft.

- Align the driveshaft of the hydrostatic unit to the coupling and press the units together. Secure the units in assembly with three socket head capscrews, torqued to the standard for the bolt being used.

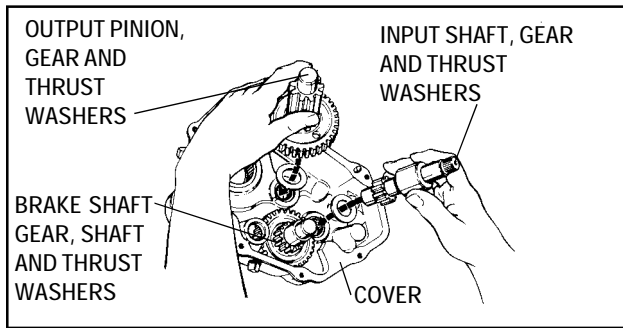
### 1. DISASSEMBLY



- Clean axles of burrs, rust and sharp edges.
- Remove axle supports. Be sure to note in which position and to which side they attach.
- Drain oil from unit.
- Remove seal retainers and "O" rings.
- Remove eight socket head cap screws securing case to cover. Drive dowel pins out of case into cover, then lift case off of the cover.



- Before removing differential unit, note the position of the cap screw heads. Replace the unit in the same way to insure that axle lengths will be correct when installing axle supports.



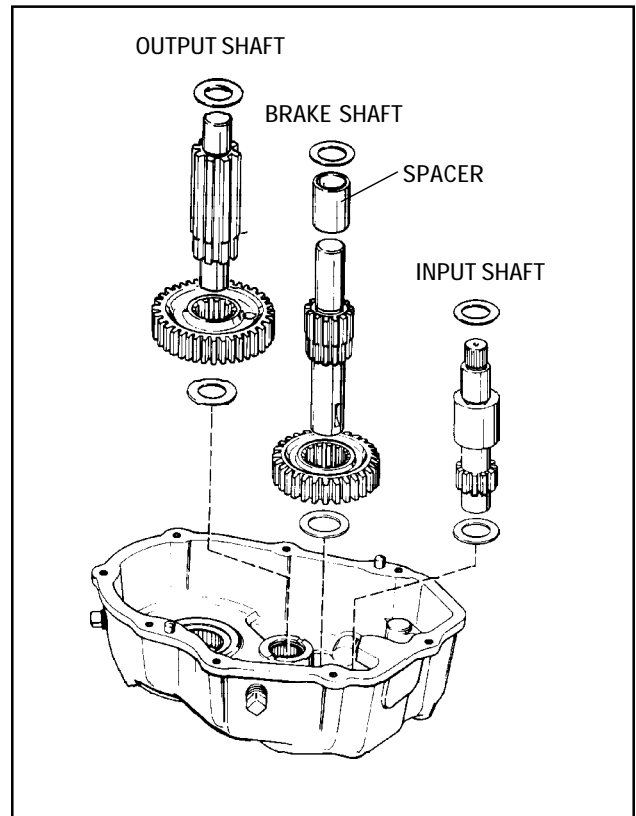
- g. Remove the input shaft and gear assembly. Note that thrust washers are on both ends of shaft.
- h. Remove output pinion and gear splined to it. Note position of thrust washers on each end of pinion.
- i. To remove the brake shaft, the shaft must be tapped from the gear splined to it. Use a soft hammer. Note that both ends of the shaft have thrust washers.

## 2. INSPECTION AND REPAIR

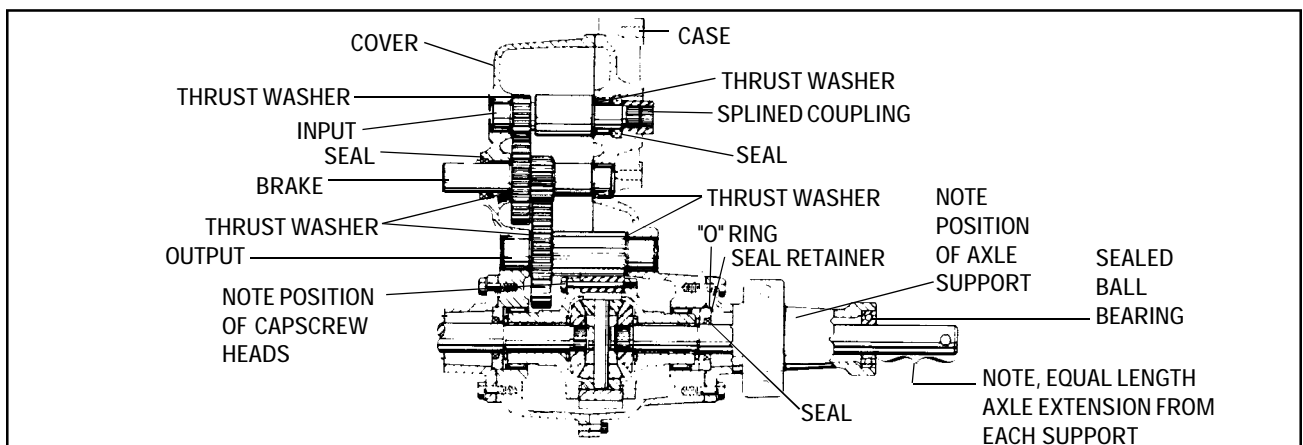
- a. Clean all parts and examine for wear or damage.
- b. Refer to the Chapter on differentials for service when working on differentials. Refer to the Chapter on bushing and bearing service to replace any loose or worn bearings.
- c. Remove and discard oil seals from input and brake shafts. Check axle seals and replace if any evidence of leaking exists. If protective seal sleeves were not used when removing seals and retainer assemblies, replace seals. Replace seals after assembly. Use seal sleeves and correct drivers. See Chapter 1, Paragraph F "OIL LEAKS, SEAL AND GASKET SERVICE" for service.
- d. Clean the case and cover. Protect bearings from dirt. Lubricate bearings to prevent rusting.

## 3. ASSEMBLY

- a. Install thrust washer in cover for input, output and brake shafts.
- b. Install brake shaft into gear in cover.
- c. Install input and output shaft (with gear) and position spacers on brake shaft. Install thrust washers on all shafts.



- d. Install differential unit with cap screw, facing down.
- e. Position new gasket on slightly raised dowels and install case. Turn down eight socket head cap screws lightly. Tap dowel pins in and tighten cap screws to 10 ft. lbs.
- f. Use seal sleeve and install seal and retainer assemblies. Position new "O" ring on seal retainer. Be sure the mounting pad is in correct position. Install each axle support and bolt down. Torque the cap screws to 13 ft. lbs.
- g. Use the proper seal sleeve and driver, replace input and brake shaft seals.
- h. Rotate shafts to check for binding or noise.
- i. Add lubricant (2 pints S.A.E. EP90 oil) to level of fill plug with unit in normal mounted position.



## SECTION 2. 2500 SERIES

### B. 2500 SERIES REDUCTION GEAR AND DIFFERENTIAL UNIT

#### 1. GENERAL

Most 2500 Series two speed gear boxes are run by an Eaton Model 10 hydrostatic unit. Power for the hydrostat is supplied by (as presently approved) an engine up to an 18 H.P. rating. The unit has infinite forward and reverse speeds in both a high and low range. The 2500 series are shipped without lubrication from Peerless. Original equipment manufacturers fill each gear case with lubricant when installing the 2500 in the equipment. Lubrication for the 2500 is 7 to 8 pts. SAE Type A automatic transmission fluid.

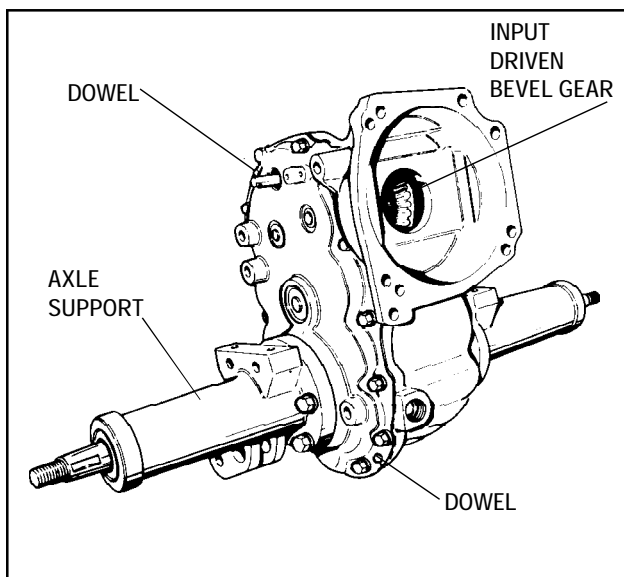
#### 2. PREPARATION FOR DISASSEMBLY

- Remove piping and hydrostatic unit as necessary to allow repair.
- Although the unit should have been drained of lubrication, be aware that the axle support removal will allow trapped oil to spill.

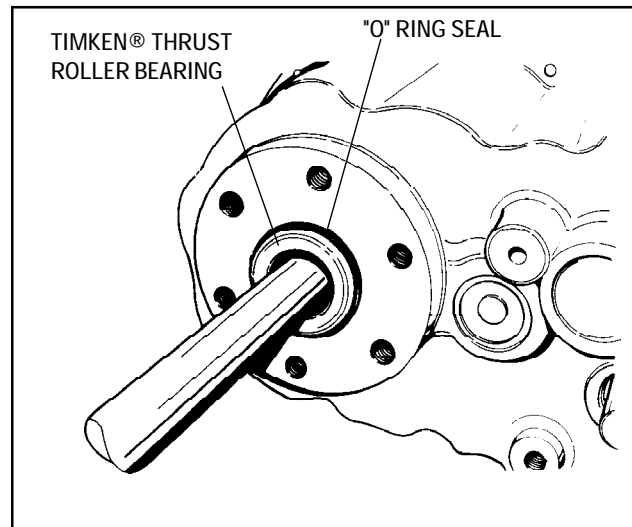
**NOTE:** An oil supply is blocked in the hydrostatic pump when not running so upon reassembly, hydrostatic charging is not necessary.

- Any attempt to service the hydrostatic pump will be done so only upon the authorization of Eaton or the equipment manufacturer. Tecumseh does not authorize repair or adjustment of the unit.
- Clean all exterior surfaces in preparation for disassembly.

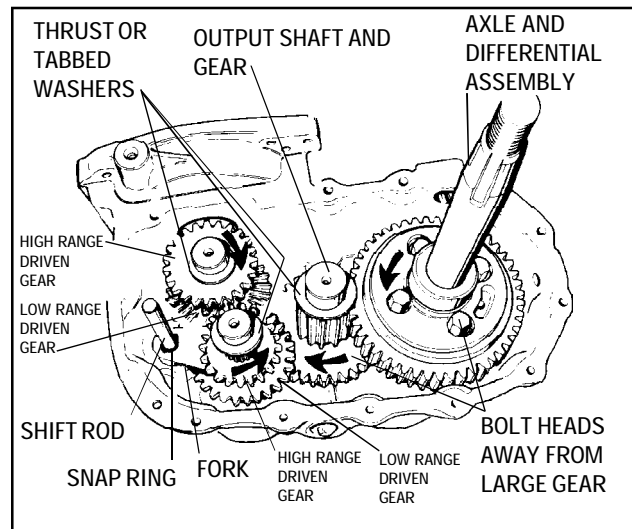
#### 3. DISASSEMBLY



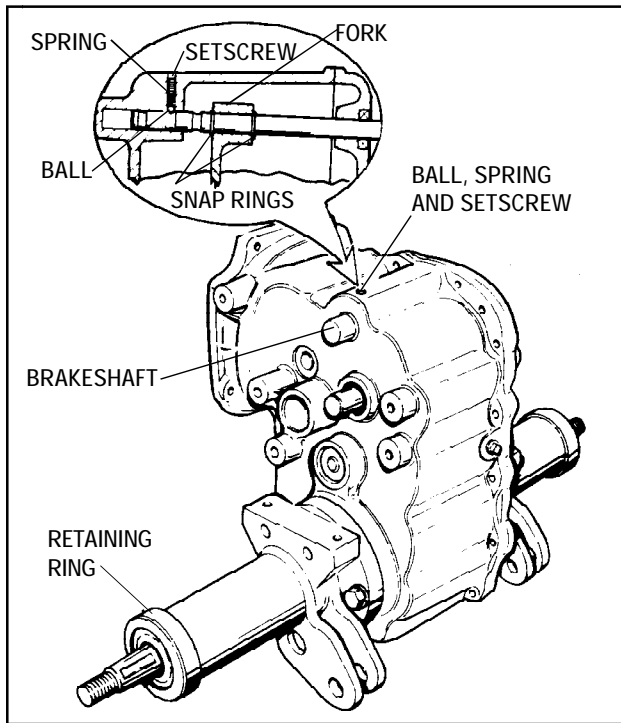
- Remove the axle supports. If supports are different or if there is a chance for confused reassembly, scribe alignment marks.



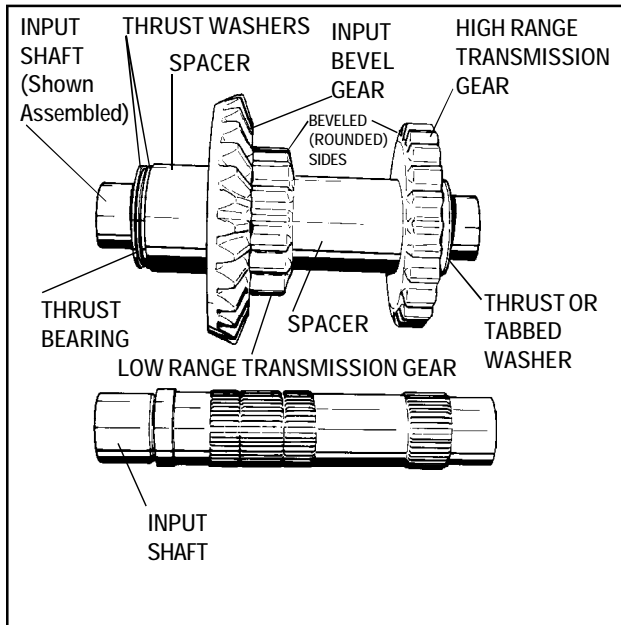
- Remove and discard square "O" ring seal.
- If the tapered roller bearings are loose, remove them.
- Position the unit on the "cover up" side, then remove the dowels and screws. Lift off the cover and discard the gasket.



- To remove the inside components, remove in the following order:
  - Remove the differential and thrust washers.



- To remove the shifter rod and fork, the set screw, spring and ball should be removed at the outside of the case.



- Remove both the input and shifter gear and shaft assemblies, along with the shifter rod and fork.
- Remove the input shaft and gear assembly.
- Remove the output shaft and gear.

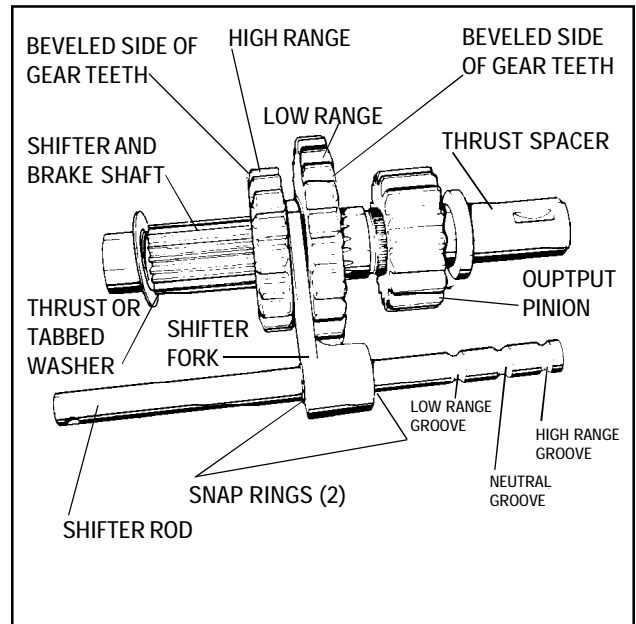
#### 4. INSPECTION AND REPAIR

##### a. Axle Supports

- Check ball bearings and bearing races for wear, rust and ease of rotation. Clean interior of the support if necessary.
- Replace oil seals in axle supports.
- Check for cracks.

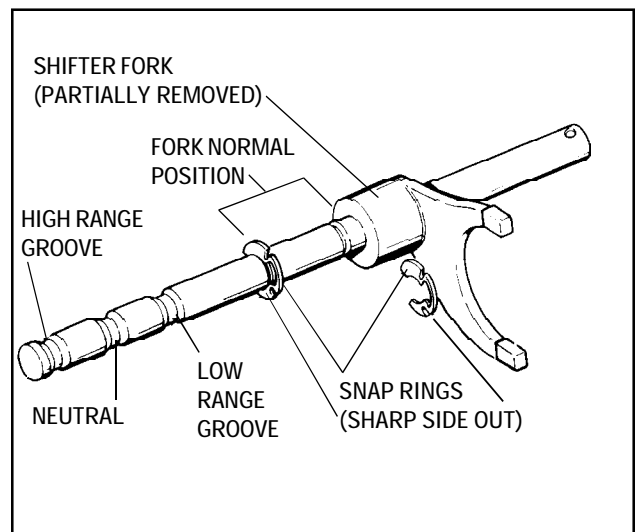
##### b. Case and Cover

- Check for leaks or cracks.
- As necessary, replace needle bearings as described in Chapter 8.
- Do not replace brake shaft and shifter rod seals until the unit is reassembled.



##### c. Shafts and Gears

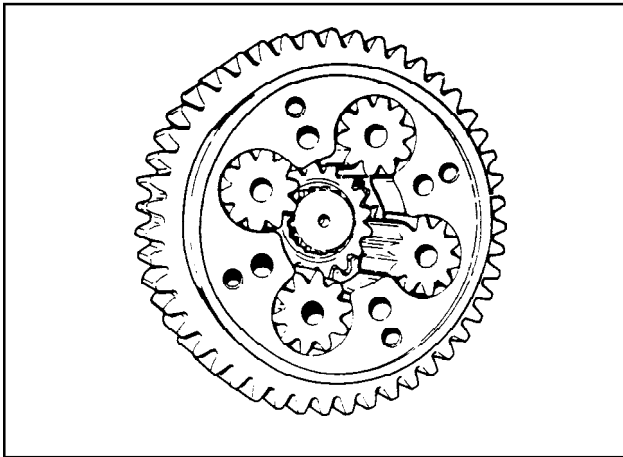
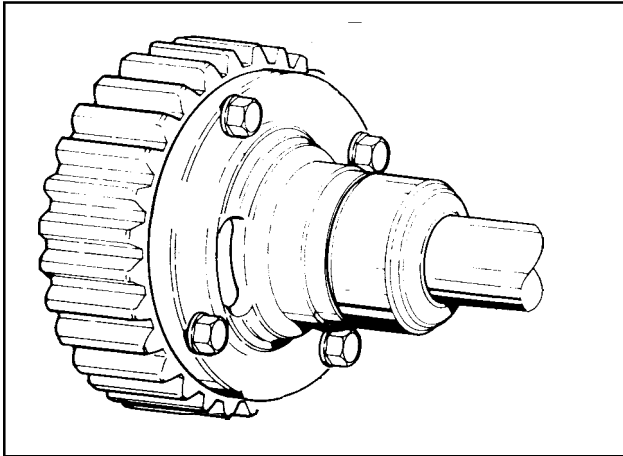
- Check teeth for wear, pitting or breakage.
- Inspect bearing surfaces for smoothness.
- Inspect gears and shafts for out of round.
- Splines should allow a smooth fit. Rotate meshing parts for a better fit if binding seems excessive.



##### d. Shifter Mechanism

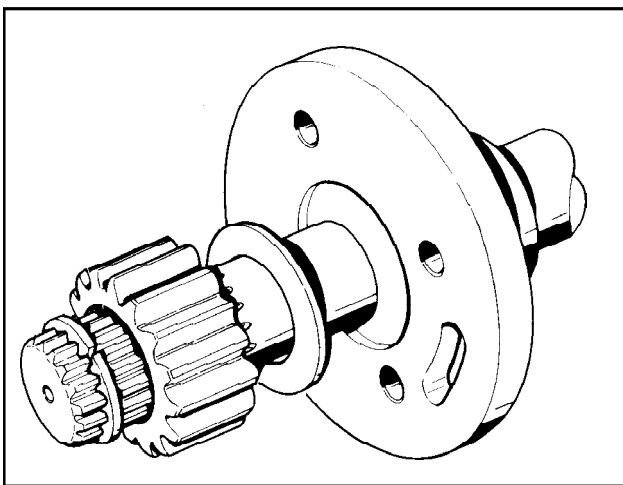
- Check spring for tension and ball for wear.
- Check shifter rod grooves for wear. Be sure snap ring sharp edge goes away from shifter fork.
- Inspect shifter fork for straightness and wear.

e. Differential



1. Check security of parts.
2. Check snap rings for condition and presence.

f. Other

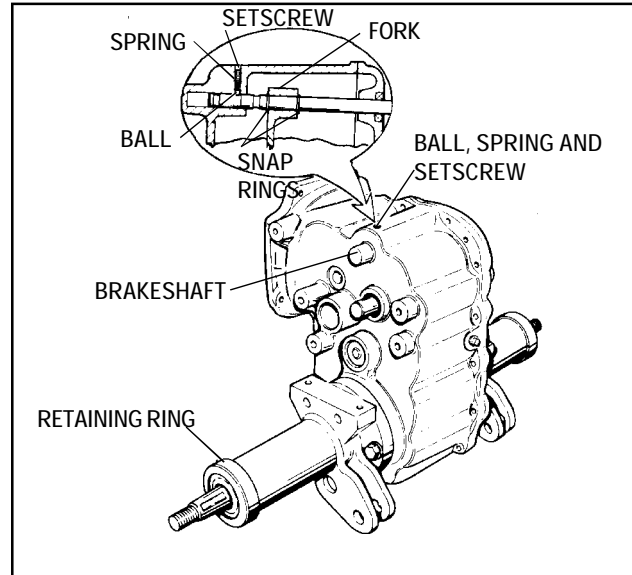


1. Check thrust washers for wear.
2. Check tapered roller bearings for wear and ease of rotation.
3. Replace shifter rod oil seal after assembly of all parts.
4. Check thrust bearing for wear and presence of rollers.

g. Replace any parts necessary.

5. ASSEMBLY

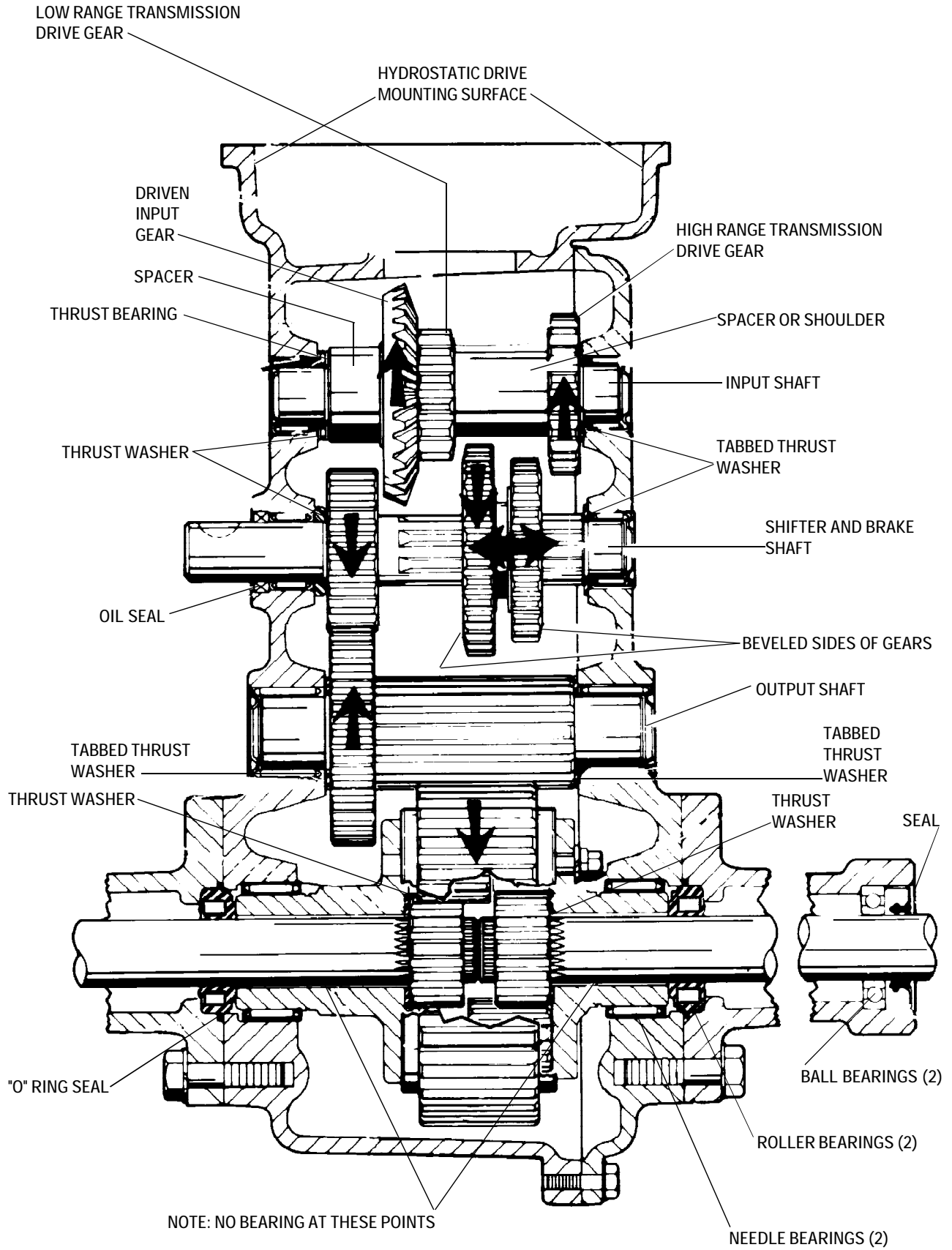
Install parts reversing the disassembly procedure, watching out for the following:



- a. After shifter rod is positioned, install ball, then spring and setscrew. Turn setscrew in slowly while raising and lowering rod, until ball stops rod movement.
- b. Be sure that thrust washers and spacers are between every shaft and case and cover.
- c. Threads of differential bolts must be coated with standard stud Loctite. The bolt heads on differential are up when installed.
- d. Install new gasket. It may be helpful to dampen the gasket with oil to get it to lie flat.
- e. Use seal sleeve to protect axle support oil seals during installation
- f. Install axle supports correctly. Do not rotate the support to a new position when pressed tight against the square "O" ring seal or the seal may be cut.

6. AFTER ASSEMBLY

- a. To install brake shaft oil seal, use seal sleeve 670179.
- b. To install shifter rod oil seal, use seal sleeve 670206 and driver 670211.
- c. Lubrication for all models is 7 to 8 pints of S.A.E. Type A automatic transmission fluid. When filling with fluid allow fluid to settle behind the tapered bearings into the axle supports. This may necessitate filling, checking and adding. The lubrication fill and check hole is located in the case. If the shrouding on the vehicle does not allow access to the fill and check hole when the 2500 is installed in the chassis, lubrication should be filled prior to installation on vehicle. If filling takes place before installing the 2500 in vehicle, the unit must be oriented, or at a 90° angle to the axles. There should be no fluid leak.
- d. Install drive assembly according to manufacturer's instructions.



# SECTION 3. 2600 SERIES REDUCTION GEAR AND DIFFERENTIAL UNIT

## 1. GENERAL

The 2600 series has infinite forward and reverse speeds. It is powered by a Sundstrand unit. Power to the hydrostat is an engine up to 20 H.P. rating. The 2600 series are shipped without lubrication from Peerless. Original equipment manufacturers fill each gear case with lubricant when installing the 2600 in the equipment. Lubrication for the 2600 is 7 to 8 pts. SAE Type A automatic transmission fluid.

## 2. PREPARATION FOR DISASSEMBLY

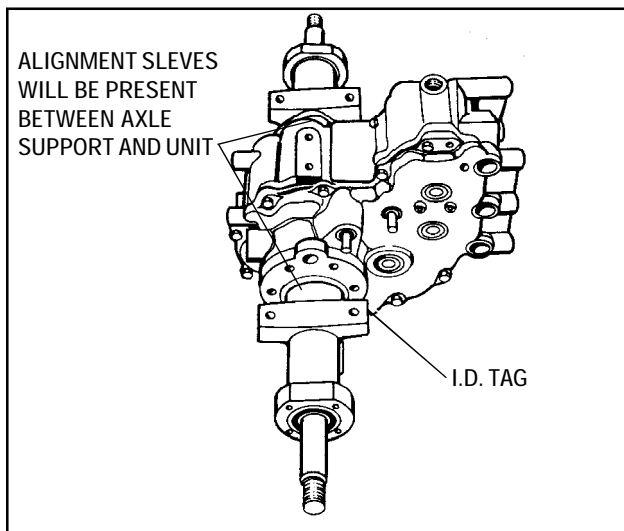
- a. Remove piping and hydrostatic unit as necessary to allow repair.

**NOTE:** An oil supply is blocked in the hydrostatic pump when not running so upon reassembly, hydrostatic charging is not necessary.

- b. Although the unit should have been drained of lubrication, be aware that the support removal will also remove the axle along with it. This will allow trapped oil to spill.
- c. Any attempt to service the hydrostatic pump will be done only upon the authorization of Sundstrand or the equipment manufacturer. Tecumseh does not authorize repair or adjustments of that unit.
- d. Clean all exterior surfaces in preparation for disassembly.

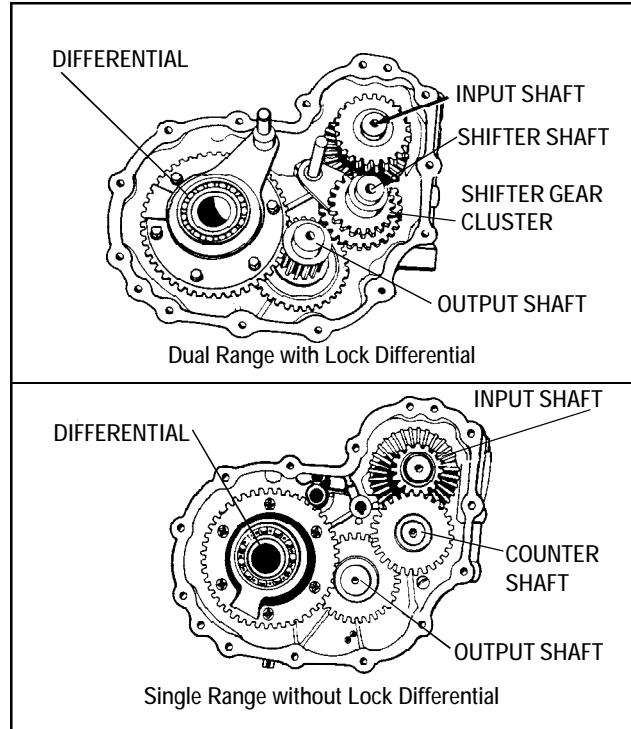
## 3. DISASSEMBLY

- a. Remove the axle supports. If supports are different or a chance for confused reassembly, scribe alignment marks.

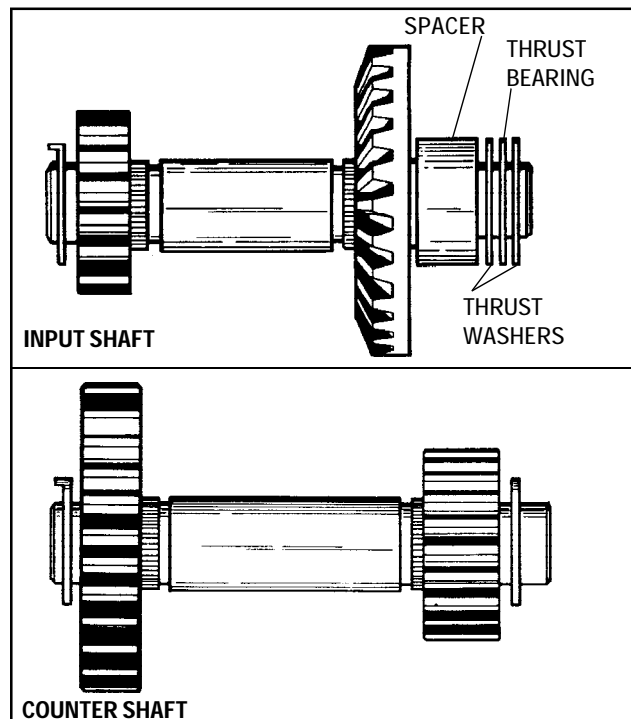


- b. To remove axle out of support, tap lightly with a mallet from inside out. A pressed on sealed bearing will be on the end of axle.

- c. Position the unit with cover side up. Then remove dowels and screws. Lift cover off, discard gasket.
- d. To remove the inside components, remove them in the following order.

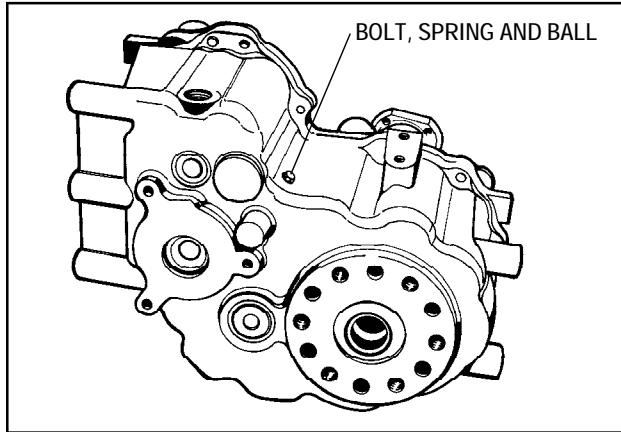


1. There are two different 2600 models, shown above -

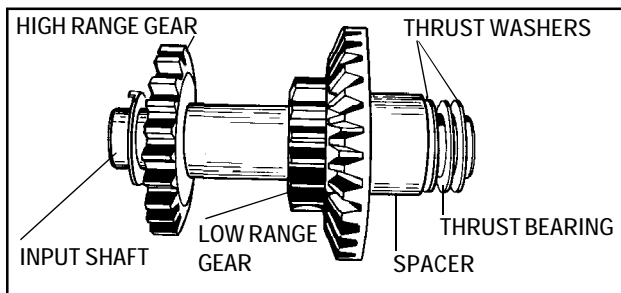


2. To remove components in the single speed, first remove the differential, thrust washers, drive gear, input shaft, countershaft, output gear and shaft.

3. To remove components in the 2 speed with locking differential, remove in following order.



- a. To remove the shifter rod and fork, remove the outside bolt, spring and ball. Remove high range gear then shifter gear cluster and fork assembly together.



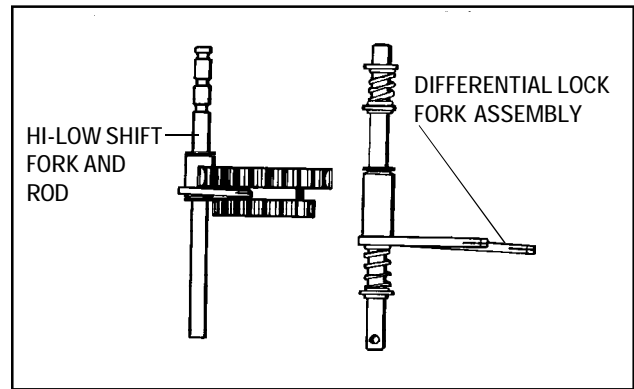
- b. Remove input shaft assembly.
- c. Remove shifter shaft, output shaft and out put gear in this order.
- d. Remove differential and lock fork assembly together.

#### 4. INSPECTION AND REPAIR

- a. Axle Supports.
  1. Check roller bearings on the axles, remove any rust and clean.
  2. Clean axle supports and inspect.
- b. Case and Cover.
  1. Check for leaks or cracks.
  2. Replace oil seals.
  3. As necessary, replace needle bearings as described in the Chapter on bearing service.
  4. Do not replace brake shaft seal, brake shaft, shifter rod and shifter differential lock seals, until the unit is reassembled.
- c. Shafts and Gears.
  1. Check teeth for wear, pitting or breakage.
  2. Inspect bearing surfaces for smoothness.
  3. Inspect gears and shafts for out of round.

4. Splines should allow a smooth fit. Rotate meshing parts for a better fit if binding seems excessive.

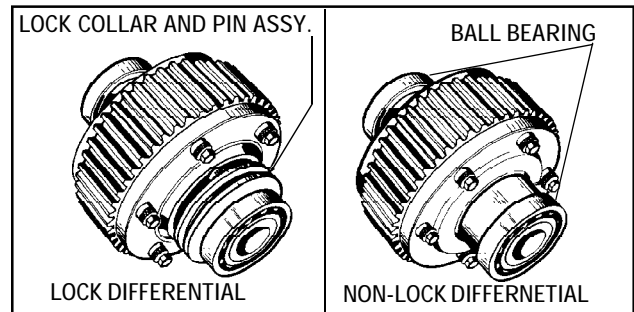
#### d. Shifter Mechanism (Dual Range).



1. Check spring for tension and ball for wear.
2. Check shifter rod grooves for wear. Be sure snap ring sharp edges goes away from shifter fork, on both shifter shafts.
3. Inspect shifter fork for straightness and wear.

#### e. Differential.

1. Check security of parts.
2. Check thrust washers for wear.



3. Check differential lock collar for fork slop or pin wear.
4. Check ball bearings for ease of rotation.

#### f. Replace any parts if necessary.

#### 5. ASSEMBLY

Install parts reversing the disassembly procedure, watching out for the following:

- a. After shifter rod is positioned, install ball, then spring and setscrew. Turn set screw in. (Dual speed) until head or screw contacts case.
- b. Be sure that thrust washers and spacers are between every shaft and case and cover.
- c. Threads of differential bolts must be coated with standard stud Loctite. The bolt heads installed are up. Refer to the differential Chapter.
- d. Install new gasket. It may be helpful to dampen the gasket with oil to get it to lie flat.

- e. To place axle assemblies into case and/or cover, grease axle spline ends heavily. Push axle through seal, use extreme caution when axle splines are going through seal.

## 6. AFTER ASSEMBLY

- a. To install brake shaft oil seal, use seal sleeve 670179 and seal driver.
- b. To install shifter rod oil seal, use seal sleeve 670206 and driver 670211.
- c. To install locking differential shifter rod oil seal, use seal sleeve 670206 and drive 670211.
- d. Lubrication for all models is 7 to 8 pints of SAE Type A automatic transmission fluid.

# CHAPTER 8. DIFFERENTIALS

## A. GENERAL

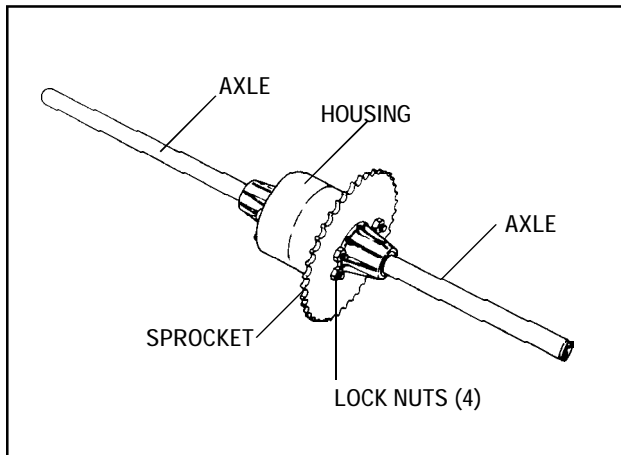
The differential assemblies, of all Peerless units utilizing them, are grouped together in this section. Though there is little similarity between the 100, 600, 800 and remaining series units, they are grouped here because their function is the same.

The differential assemblies for the 820, 1200, 1300, 2300 and 2400 series Peerless units are very similar. However, each must be assembled in its own way. By grouping them together, you will become more aware of differences in each unit, therefore less apt to allow these differences to cause mistakes in assembly.

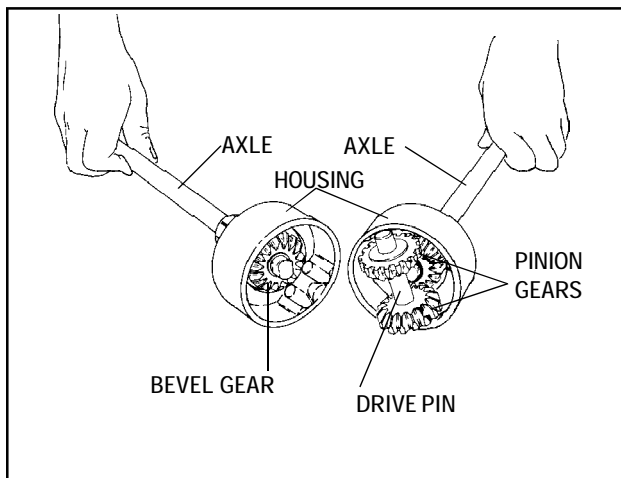
## B. MODEL 100 DIFFERENTIAL

### 1. DISASSEMBLY

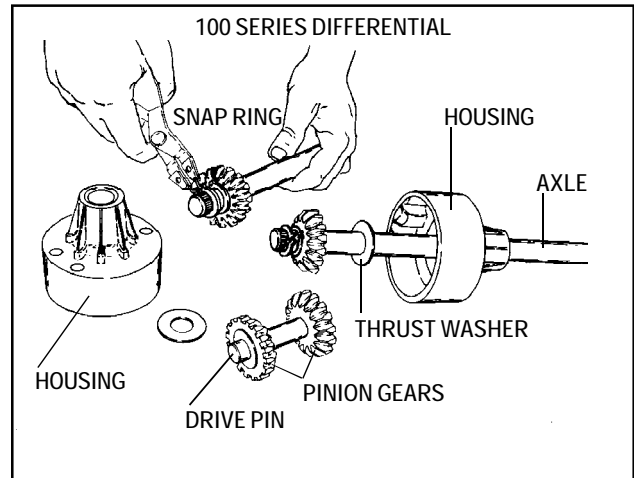
- a. Clean outside of differential. Remove all keys, pins, etc. Remove all burrs from keyways and holes. Use a stone on hardened shafts.



- b. Remove 4 locknuts, bolts and sprocket. Separate differential carrier housings.



- c. Remove drive pin, pinion gears and thrust washers as a unit.



- d. Remove snap ring, bevel gear and thrust washer. Slide axle from differential carrier housing.

**NOTE:** Bushings are replaceable in the differential carrier housing. To replace bushing, use bushing tool 670204.

### 2. ASSEMBLY

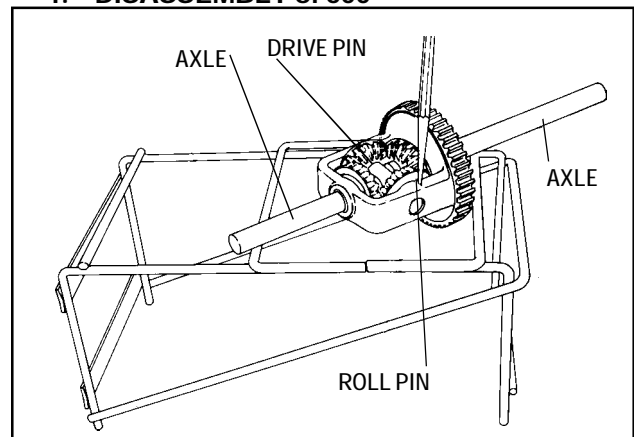
- a. Slip axle in differential housing carrier. Place thrust washer and bevel gear on axle and secure with snap ring. Make sure flat side of snap ring is away from gear.
- b. Place pinion gears and thrust washers on drive pin and insert assembly into either differential housing carrier.
- c. Use 3 oz. Bentonite grease as lubricant.
- d. Assemble differential carrier housings and sprocket with 4 bolts and locknuts.

**NOTE:** No oil seals or gaskets are required in this unit. A few units use a gasket between the two housings.

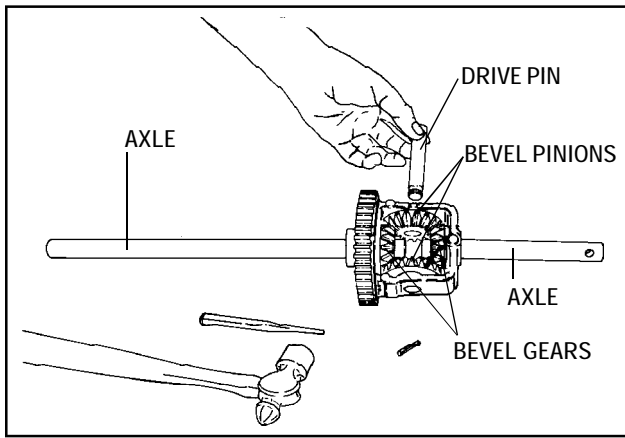
If no gasket is present, seal the housing with Loctite 598 part number 788093 using a 1/8" bead.

## C. MODELS 600, 800, 900, 910, 915, 920 and 930

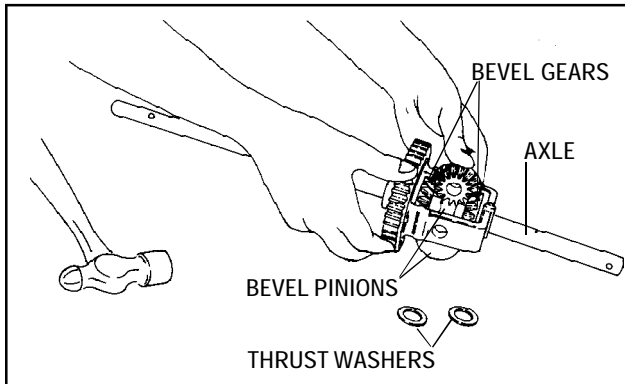
### 1. DISASSEMBLY of 600



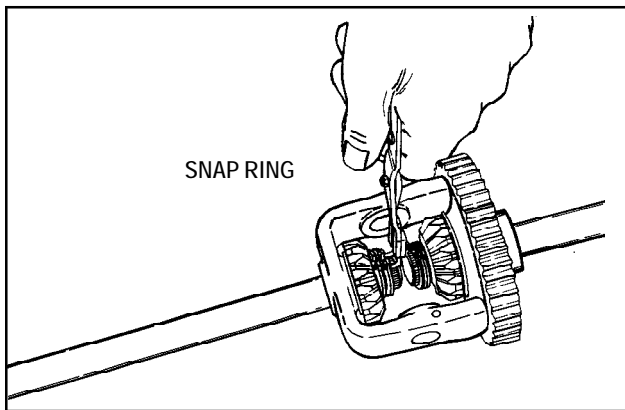
- a. Drive out roll pin that secures drive pin with suitable driver.



b. Remove drive pin.



c. Thrust washers must be removed before attempting to remove the pinions. Remove bevel pinions simultaneously by rotating the gears in opposite directions; gears will move out of position.



d. Remove snap ring, bevel gear and thrust washer. Slide axle out.  
e. Inspect bushings and gears for wear and replace when necessary.

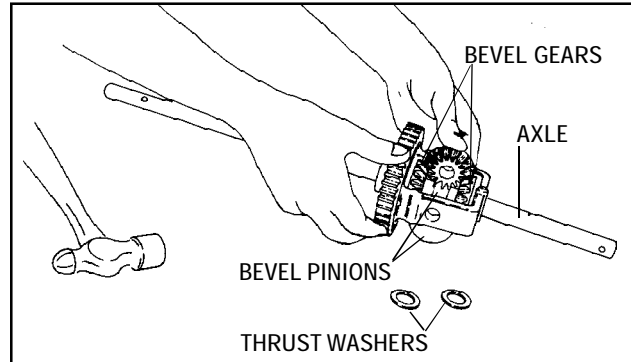
**2. REASSEMBLY OF DIFFERENTIAL ASSEMBLY**

a. Place axles (left and right) into differential gear assembly. Install thrust washers.

**NOTE:** The axles differ in length so select the proper axle.

b. Place bevel gears on the shaft and install snap ring in groove on the shaft.

c. Install bevel pinions **SIMULTANEOUSLY FROM OPPOSITE SIDES** by rotating pinions in opposite directions while sliding into position in gear assembly. Check alignment by inserting fingers into drive pin holes. If not aligned, drive pin cannot be inserted. Remove and replace bevel pinions as only one tooth out of position will cause misalignment.



d. After aligning, insert thrust washers behind each pinion. Insert drive pin and secure with roll pin.

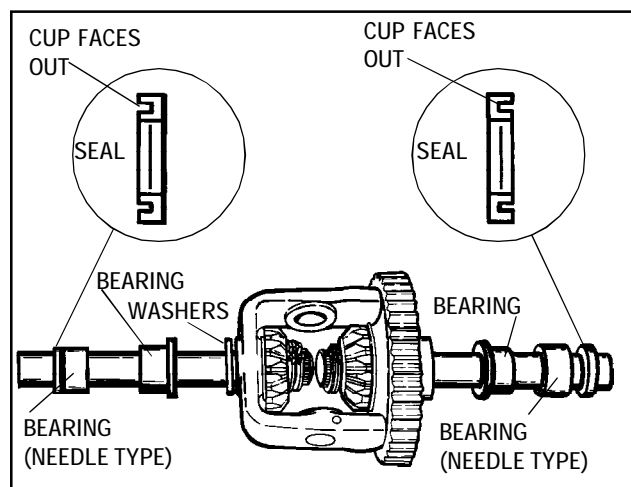
**C-1. MODEL of 800**

**1. DISASSEMBLY**

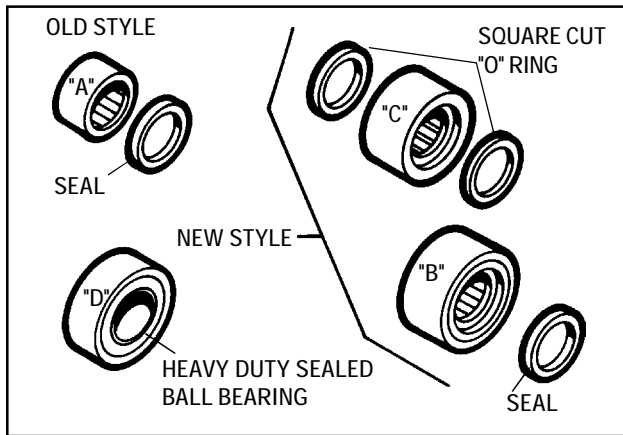
- a. Same as disassembly for model 600, except for additional parts on the axle.
- b. Remove and inspect seals, bearings and washers for wear replace if required.
- c. If differential was disassembled note positioning of differing length axles so correct reassembly may be performed.

**2. REASSEMBLY**

a. Reassemble in reverse order of disassembly.



b. Install seal cup end out from the center of differential to prevent dirt entry.



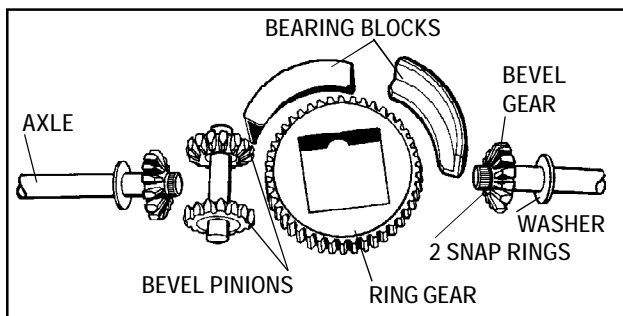
The 800 Series has used 4 styles of bearings on the axles. The earliest style "A" was a smaller loose cage needle bearing and must have the seal to the outside of that bearing. Style "B" must have the seal to the out side of the bearing. When bearing style "C" is used, a square cut "O" ring must be used on each side of the bearing. Bearing style "D" is a sealed ball bearing used in H.D. application. Styles "B", "C" and "D" are inter changeable. All needle bearings must be repacked with grease.

## C-2. MODEL of 900, 910, 915, 920 and 930

### 1. DIFFERENTIAL

Remove differential from case. The differential is one of the first of its kind in that the unit rides and is held together in the case and cover. Also remove the flat washers off the axle ends. Some models will have a slightly different ring gear and use a single bearing strap in place of bearing blocks.

### 2. DIFFERENTIAL ASSEMBLY

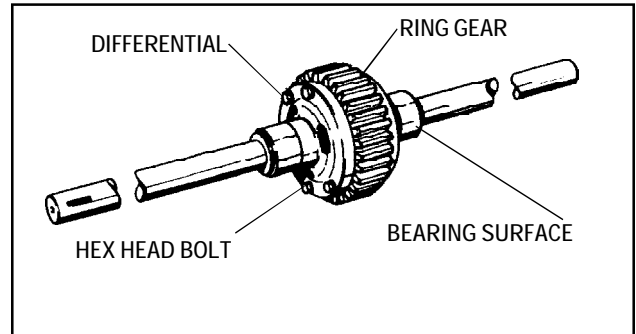


When assembling this unit, make sure all parts are there first, because the unit is put together in your hands and placed in the case at the same time.

### 3. MST SERIES DIFFERENTIAL

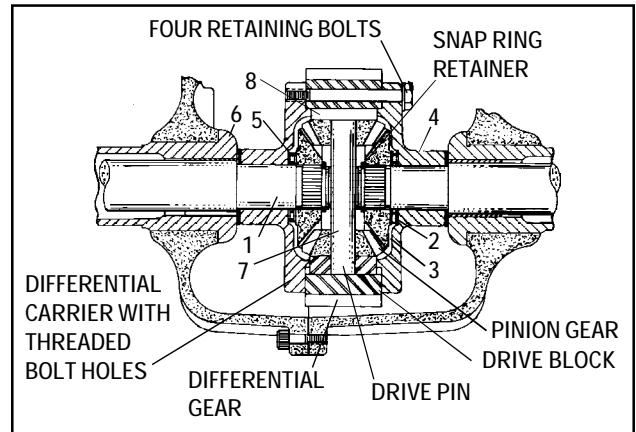
This unit is similar to the 900, except it uses no bearing blocks. The differential is supported by the shoulders on the ring gear.

## D. DIFFERENTIAL USED IN PEERLESS CAST IRON CASING UNITS

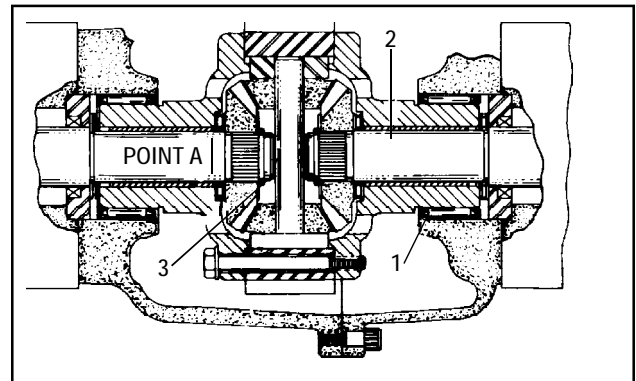


**NOTE:** The models covered are the 820, 1200, 1300, 1700, 2000, 2300 and 2400 series.

1. The differential construction may vary from the illustrations but is basically similar.



2. The 1200 series differential carrier is supported directly on the axle (1). Roller thrust bearings (2) are used between the bevel gear (3) and the differential carrier (4). This illustration shows axles with snap ring (5) retainers, some earlier production had rolled over axle ends to secure the assembly. Thrust washers (6) are used at the ends of the differential carriers and case/cover thrust face. The drive pin (7) and drive blocks (8) are similar to those used on the 1700 series. Replace the differential carrier if worn in excess of .078 at point A.

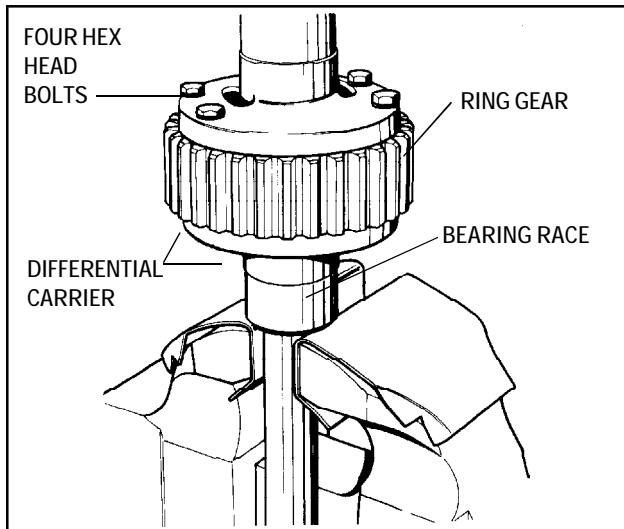


3. The 2000 series, three speed and the 2300 series, four speed differential. Examine the external bearing race on the differential carriers (1) for wear or pitting. Replace if evident. The differential carriers in this assembly have replaceable bushings (2). Replace if worn in

excess of .878 at point A. See the Chapter on Bushing and Bearing Service. These differentials have been built with rolled axle ends and also snap rings (3), as illustrated.

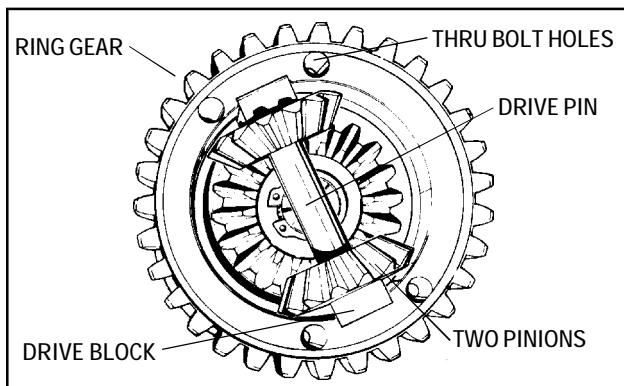
## 1. DISASSEMBLY

- a. Clean the differential assembly, then check and note the axle lengths and their relation to the heads of the four hex screw bolts.
- b. If the unit will not turn freely, note where the unit binds. Check and replace those parts.

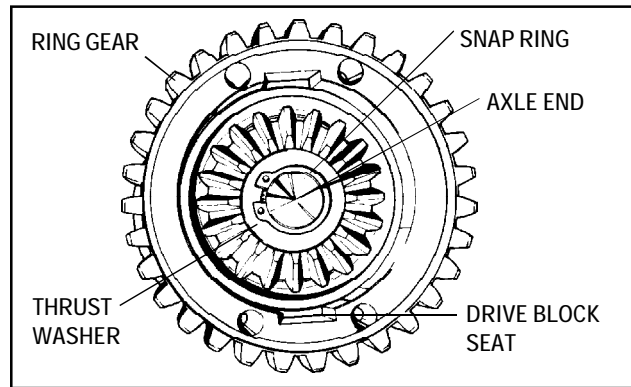


- c. Place the differential in a large vise with soft jaws (hex head bolts up). Do not clamp the vise on the bearing race of a differential carrier.

1. Remove the four hex head bolts and the upper axle and differential carrier. Remove the drive blocks, pinions, drive pin and thrust spacer if used, by lifting out of the ring gear. Tap the ring gear lightly with a mallet to loosen from the differential carrier.



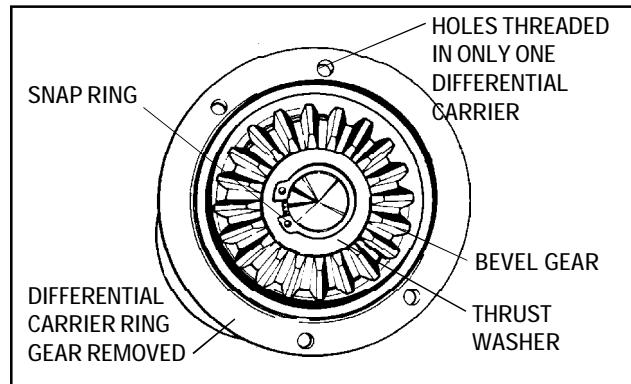
2. If a snap ring is used, the axle assembly may be disassembled. If the axle end has been rolled, do not attempt to break the rolled retaining edge. The parts are to be replaced as an assembly.



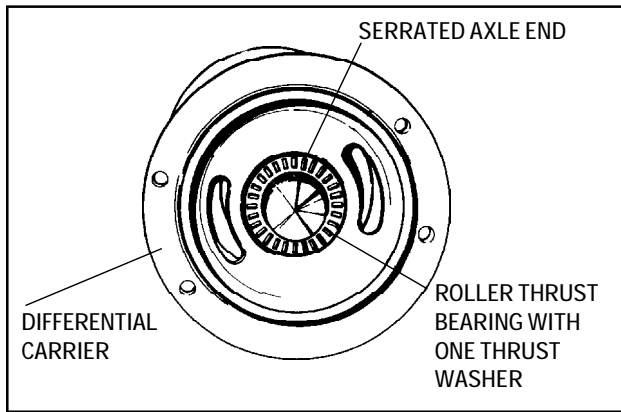
3. Remove the snap ring and the thrust washer, if used. Separate the bevel gear and the differential carrier from the axle.

## 2. INSPECTION

- a. See the Chapter on Bushing and Bearing Service.
- b. Examine gears for wear, cracked or chipped teeth. Check the internal splines of the gears and axle if the gear is removable. If excess play is noted, it may be necessary to replace the individual parts or both the gear and axle.
- c. Examine drive pinions, drive pins and drive blocks for wear and damage. Replace excessively worn pinion or the drive pin.



- d. Examine the differential carriers. One has threaded holes and the other has larger holes so that the bolts will pass through. Be sure to order the correct replacement parts.
- e. Examine the internal bearing diameter of the differential carriers.



- f. When assembling thrust bearings, always place a hardened thrust washer on each side of the caged thrust rollers. Never use the caged thrust rollers without the thrust washers.

### 3. REASSEMBLY

- a. Oil all parts during reassembly.
  1. Select the correct axle for the side of the differential opposite the hex head bolts. If the wrong axle is used it will require complete teardown of the differential, or possibly the entire transaxle, if the error is not detected until later.
  2. Clamp the axle, in a soft jaw vise (not bearing or oil seal surfaces). The differential carrier with threaded holes is assembled to this axle.
  3. Torque the four hex head bolts to 7 ft. lbs.

### 4. TESTING

- a. Test differential action by holding the upper axle vertically, and spinning the differential. The unit should spin and rotate freely. Place the assembly on the bench and rotate both axles in different directions. If any binding is noted in either test, check retaining bolt torque, gear meshing, or bearing surfaces in the differential carriers. Little or no play should be apparent between the axles and carriers.

## E. DUO-TRAK\* DIFFERENTIAL

### 1. OPERATION

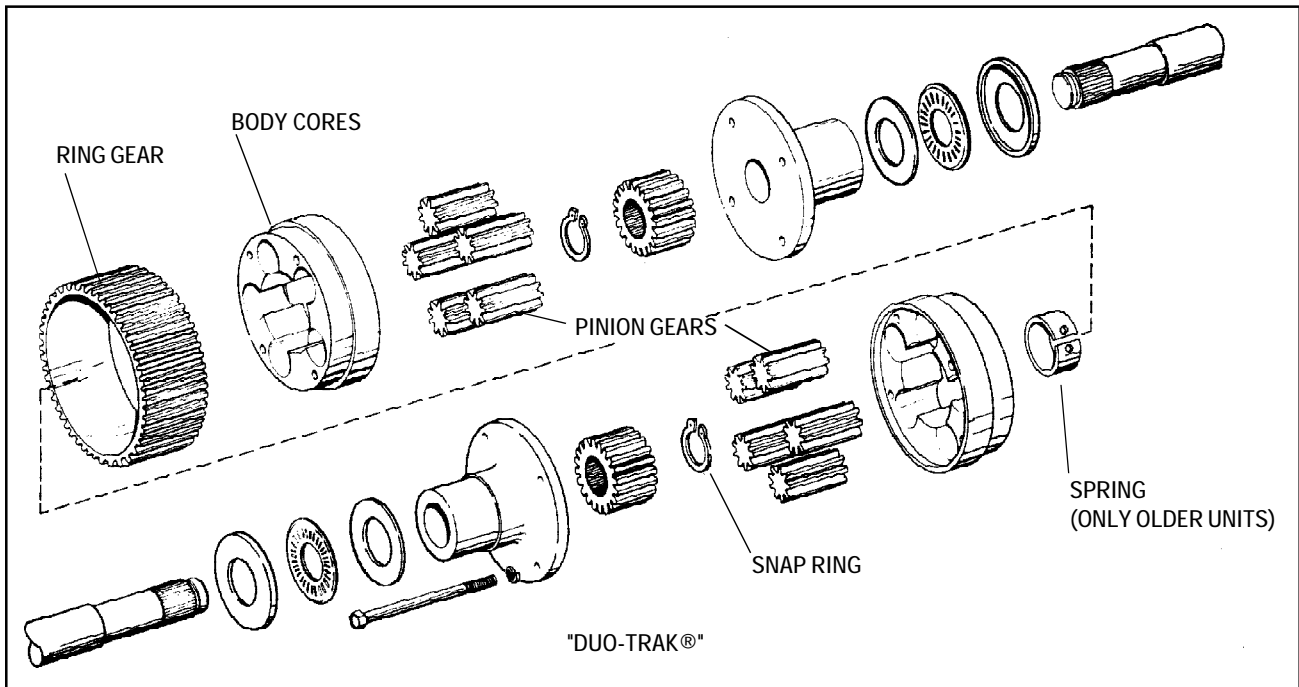
A cylindrical spring in the center of the unit presses the ten pinion gears against their pockets setting up a resistance to rotation among them. This resistance serves to lock up the gears in the differential until a moderate tractive difference in the wheels causes the resistance to be overcome. At this time the unit will act similar to a regular differential. The break away occurs when the equipment is turning, but under different tractive effort situations, as operation on wet grass or snow. The spring acts to transmit torque to the nontractive wheel to move the equipment.

### 2. DISASSEMBLY, INSPECTION AND REPAIR

Parts breakdown will be found on next page. Remove four through-bolts. Separate axle assemblies from body cores. To disassemble axles, remove snap ring and retained parts. Be sure that flanged thrust washer goes toward hub end of axle upon reassembly. Use a pair of large 90° tip snap ring pliers and remove the cylindrical spring putting tension on the ten pinion gears. Once the spring is removed, the gears can be removed. Separate the two body cores from the ring gear.

### 3. ASSEMBLY

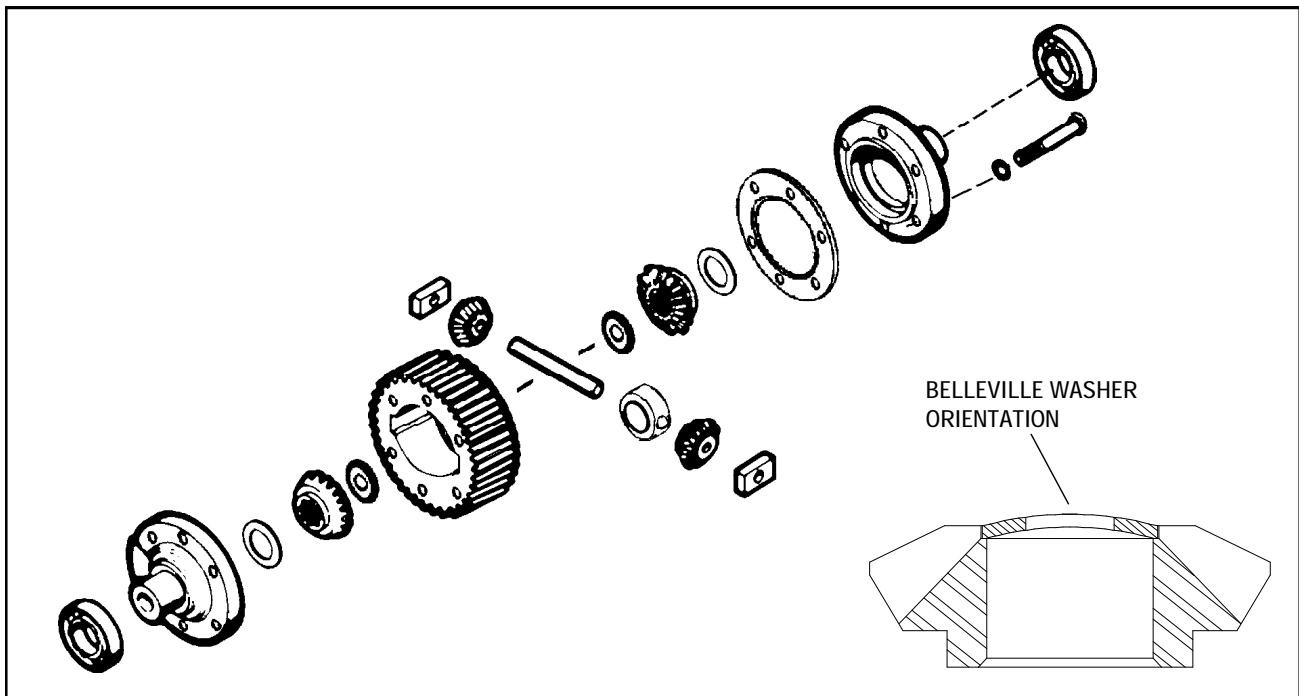
Install body cores to ring gear so that pockets in one core are out of alignment with pockets in other core. Reassemble thrust washers, bearing, carrier and side gear to axle and secure with the snap ring. Install pinion gears on one side, then use the differential carrier and axle to hold them from falling out when the unit is turned over. The side gear must mesh with the flat pinion. Install pinions in other side to mesh with previously installed pinions. Insert the cylindrical spring with a pair of large 90° tipped snap ring pliers so that it bottoms on the side gear. All ten pinions should be in contact with the spring. Install other axle and secure assembly with four through bolts. Torque to 7-10 ft. lbs.



\*DUO-TRAK is the trademark of a patented limited slip differential designed by Illinois Tool Works.

The Model 2600 transaxle has the unique customer option of a semi-locked differential. This system acts like a locked differential until the torque at the axle exceeds 50-70 ft./lbs. At this point it acts like a regular differential. Using the following procedure, you can check for proper condition of this optional unit used on a few 2600 models not all units.

1. Lift the rear of the tractor up so both tires are off the ground. Rotate one tire while in neutral the other tire should rotate the same direction. If not, disassemble the unit. If it does proceed to step 2.
2. Lock one axle or wheel assembly so it can not turn.
3. Using a torque wrench and socket on the other axle, turn in a clockwise rotation noting the break away point. It should be between 50-70 ft. lbs. (68 - 95.2 NM).
4. If the torque is low, you will need to split the ring gear and carrier. Remove any shim between the two halves. If you do not find a shim, you will need to replace the spacer block. (see Illustration)
5. Re-assemble and check for proper break away torque as listed above. Breakaway should not exceed 70 ft./lbs (95.2 NM).



# CHAPTER 9. DRIVES

This section relates to service of all Right Angle and T-box drives ACCEPT 1100 Series IN NEXT SECTION.

## A. GENERAL

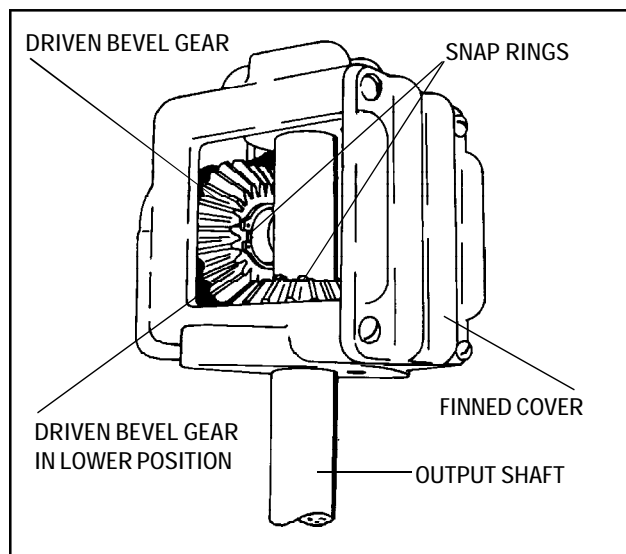
1. Prior to removing the assemblies, examine the following items that may have failed causing the right angle drives to appear inoperative.
2. Drive belts: Inspect for breaks, tension, oil or grease saturation and inoperative tightening devices.
3. Pulleys: Tighten retaining screws. Examine for sheared keys.
4. Mower blade clutches and breakaway devices; Some blades have slip type clutches that may slip during operation and appear to be damaged right angle drives. Shearing devices are also used to absorb a damaging impact load if encountered. Replace the clutch members or shearing devices prior to removal of the right angle drive if failure is noted.
5. Loose blade retaining nuts; Check torque and tighten if required.

## B. FINNED COVER RIGHT ANGLE DRIVE

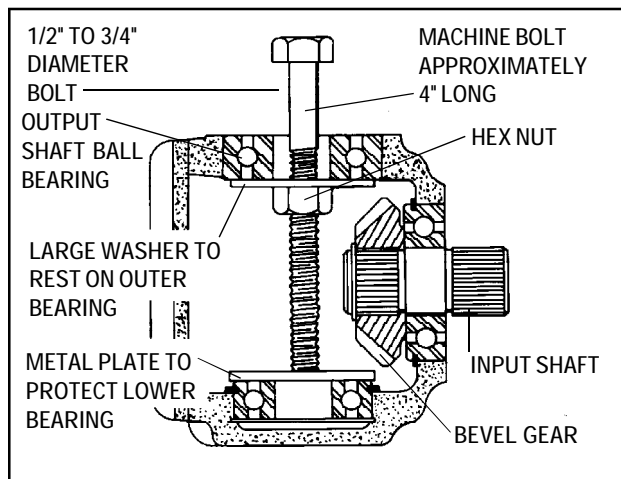
1. Leaking lubricant. These drives do not have oil seals or sealed ball bearings. If the unit is to be serviced because of lubricant leakage, it will be necessary to replace the ball bearings.

### DISASSEMBLY

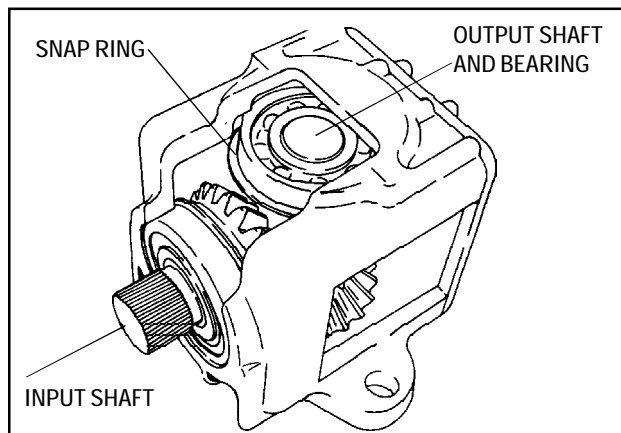
2. Remove the cover and gasket and remove the lubricant.
3. Different output shafts achieve a different rotation by mounting a gear at the top or bottom of the shaft.



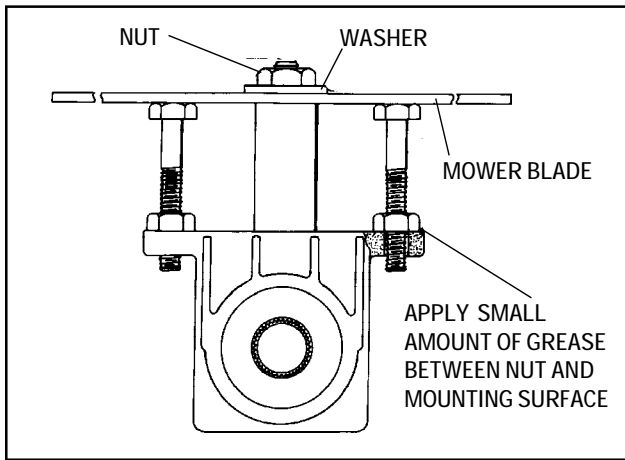
- a. If the driven bevel gear is on the bottom, remove the snap ring on the output shaft and pull out the output shaft.



- b. Remove the output shaft bearing by using a large machine bolt, washer and nut.
- c. The input shaft bearing, input shaft and bevel gear may now be driven out of the housing. Use tool 670220. Press bearing into housing to remove.



- d. The top ball bearing in the blind end of the housing, is removed by either heating the housing on a hot plate or tapping the housing on the outside with a mallet.



- e. Right angle units with the driven bevel gear at the top will have to be disassembled as illustrated above. The output shaft is larger in diameter inside than outside. When the output shaft is pulled out the bearing will also be removed.

**INSPECTION**

Clean all parts in cleaning solvent. Examine for wear or damage and replace as needed. Use care when handling ball bearings. See Chapter 11, Bushing and Bearing Service.

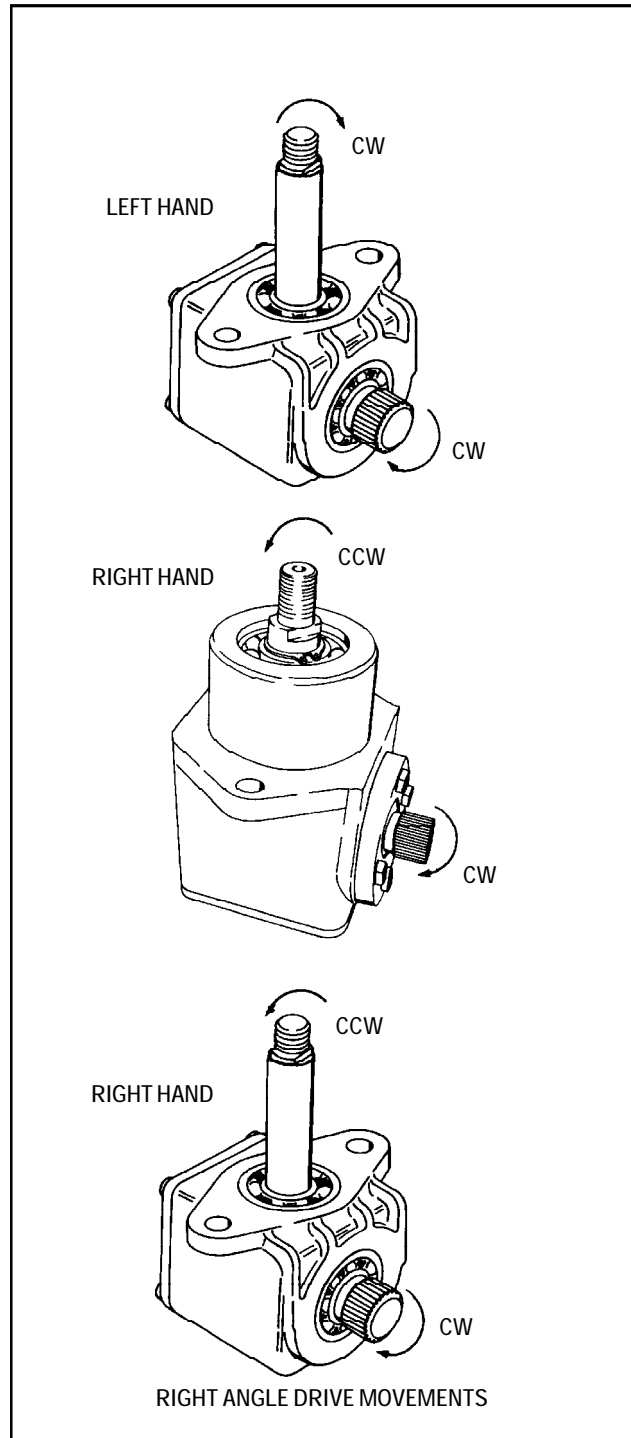
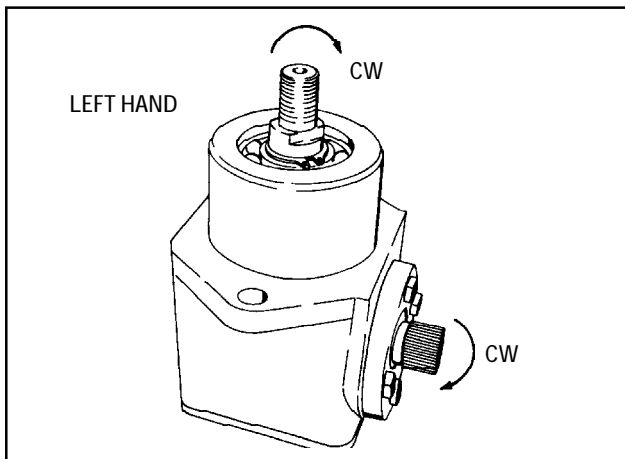
**REASSEMBLY**

Assemble in reverse of the disassembly instructions. It is important that only ball bearings with snap rings, be used for the input shaft and top output shaft bearing. Use tool for driving in bearings. In the event bearing bore is tight in housing, heat housing on a hot plate. Place a steel plate on the hot plate and rest housing on steel plate. DO NOT OVERHEAT. Work rapidly after removing housing from hot plate. Use care to prevent burns.

**LUBRICATION**

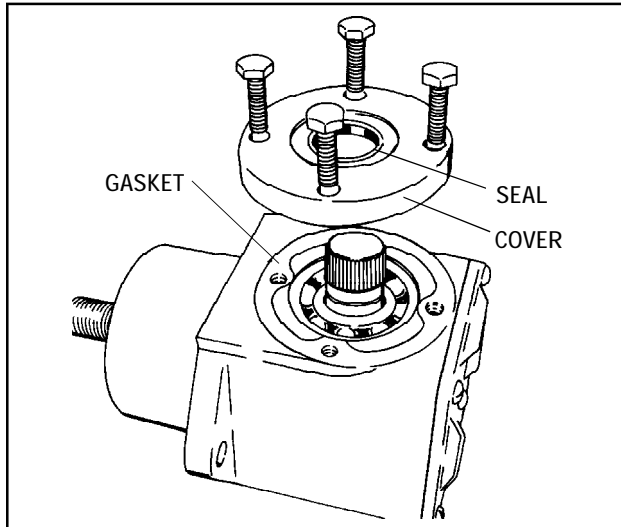
See Section 2. Lubrication Chart.

These are examples of directions of drive units.



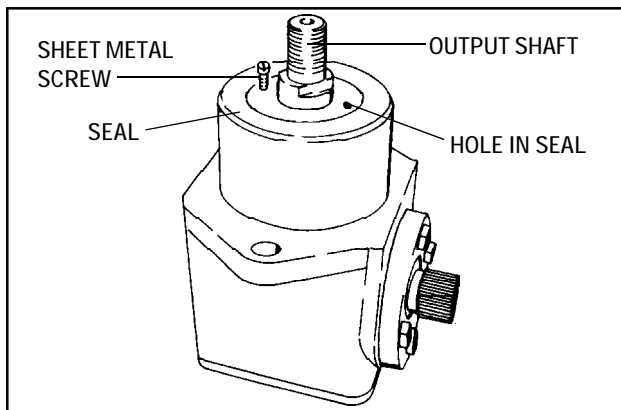
## C. SMOOTH COVER RIGHT ANGLE DRIVES

### SERVICE



Leaking lubricant: Correct lubricant leakage by replacing the seals at the input and output shaft as described above.

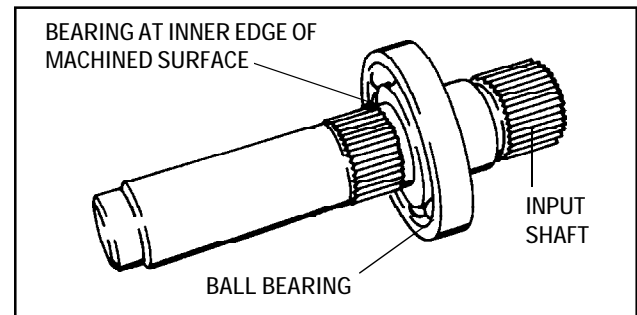
1. Input shaft seal replacement: Remove four screws and the cover. Replace the seal by driving in squarely so that it is .040" to .050" below flush. Use tool 670293 to protect the seal when replacing the cover and seal assembly over the input shaft. Place the seal sleeves on the shaft and coat with oil. Slide the sealed retainer over the sleeve. Tighten the seal retainer screws and remove the sleeve.



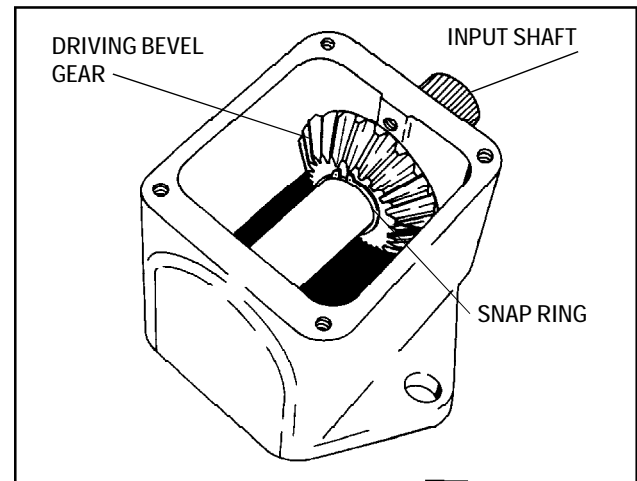
2. Output shaft seal replacement. Remove the seal by punching two small holes in the seal with an awl, as close to the outer edge of the seal as possible and opposite each other. Use care when making holes in seal so that ball bearing underneath is not damaged. Do not use a drill. Insert sheet metal screws into the holes and pull on the screws to remove the seal. Long screws may be turned in until they contact the outer race of the ball bearing and turned to lift out the seal. Place seal sleeve 670293 on the shaft, lubricate generously with oil and slide on the seal. Drive the seal into the housing until it is flush with the bottom of the housing. Use driver.

### DISASSEMBLY

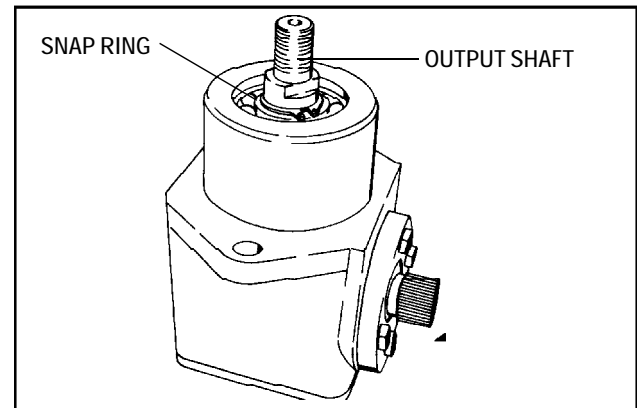
1. Remove the cover, gasket and lubricant.



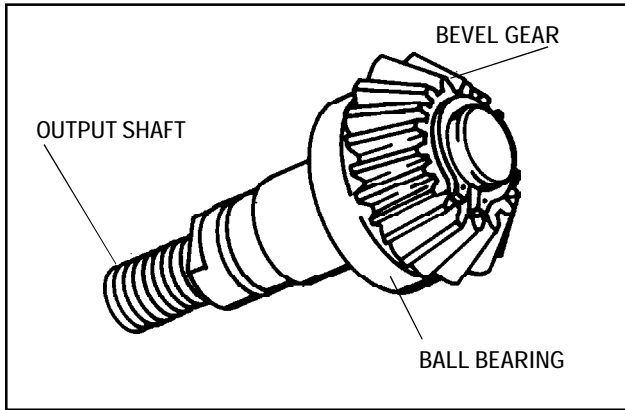
2. If the unit is built with the bevel gear on the input shaft toward the cover, remove the snap ring on the input shaft from the groove.



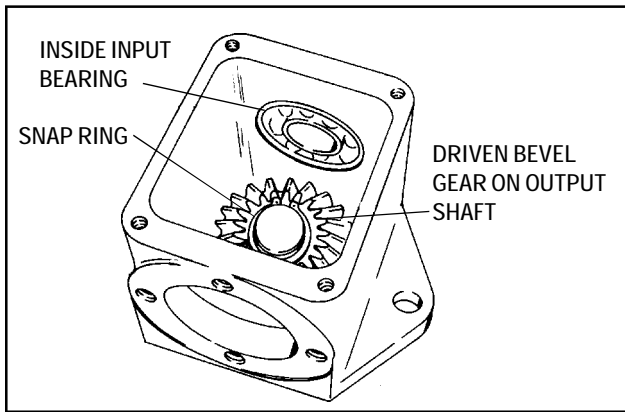
3. Remove four screws and the cover and seal assembly.



4. Remove the seal at the output shaft.
5. Remove the snap ring on the output shaft and tap it with a mallet on the outside end to drive it and the inner ball bearing, out of the housing. Remove the out put end ball bearing by driving it out from the inside.



6. Remove the input shaft from the ball bearing, with an arbor press. Always support the inner race when removing and replacing the input shaft into the ball bearing. Use tool 670293 to support the inner ball bearing race.



7. The ball bearing that supports the inner end of the input shaft is removed by holding the housing in the hand and tapping the housing sharply on the outside with a soft mallet behind the bearing. It may at times be necessary to heat the housing to remove this bearing.

**INSPECTION**

Clean all parts in cleaning solvent. Examine for wear or damage and replace as needed. Use care when handling ball bearings. See the Chapter on Bushing and Bearing Service.

**REASSEMBLY**

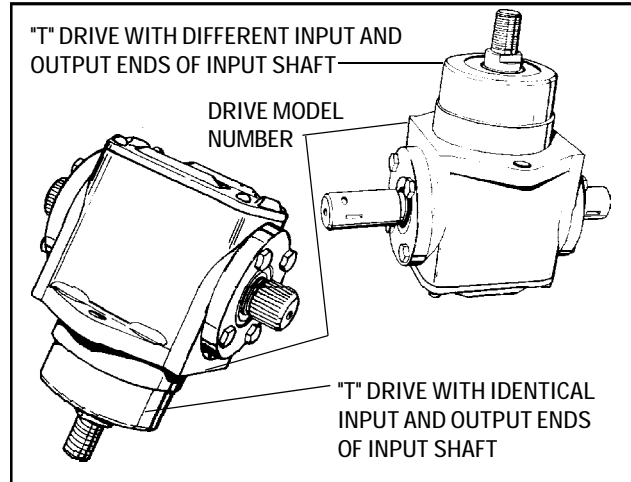
Assemble the unit in reverse of the disassembly. When building up the units it is important to install the correct input shaft, and identify it with the correct cover, if there is any identification on the cover, either R.H. or L.H.

**LUBRICATION**

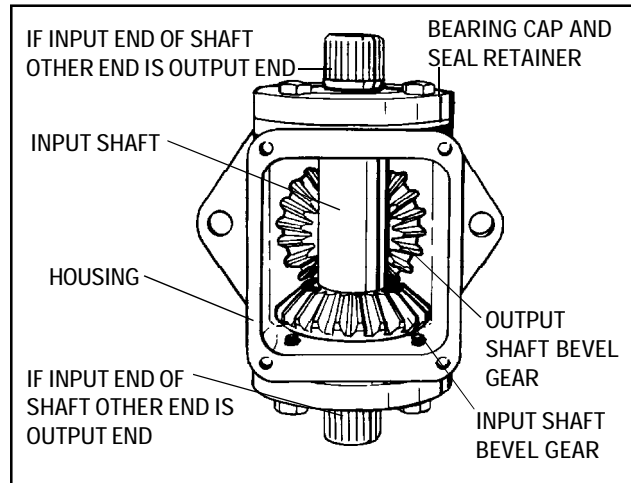
See Section 2. Lubrication Chart.

**D. "T" DRIVE SERVICE**

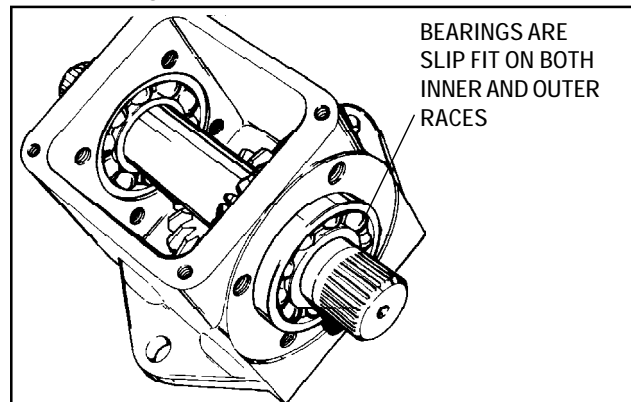
1. Before removing "T" Drive from equipment, be sure to scribe marks at one mounting hole to insure correct reassembly.



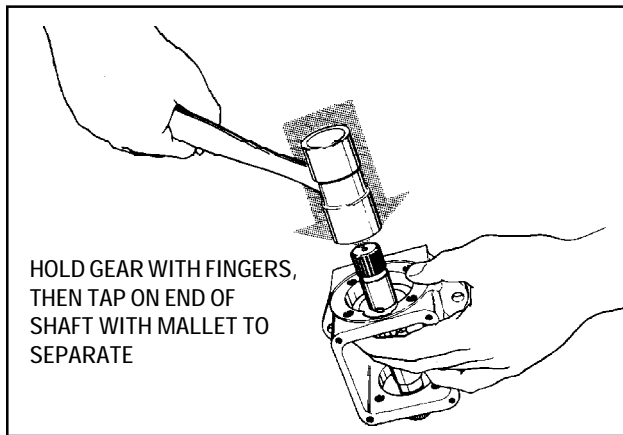
2. To disassemble "T" Drive, remove self-tapping screws and housing cover and clean grease from internal area. Note and mark near the casting gasket surface on the side where the beveled input gear is located. To switch the "T" 180° will result in output shaft opposite rotation.



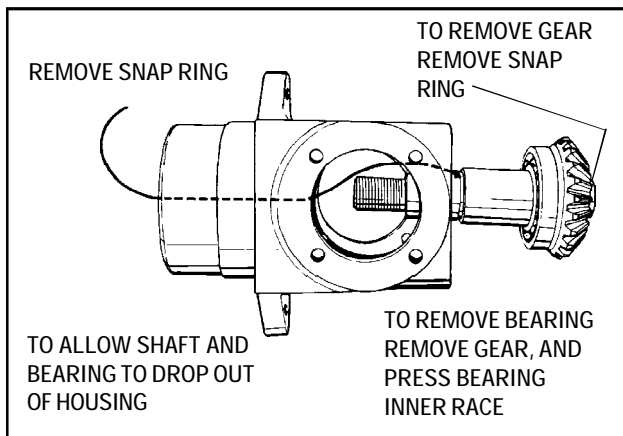
3. Remove capscrews and both retainer cap and seal assemblies. Separate and discard oil seals and gaskets.



4. Press input shaft ball bearings out of the housing with fingers. If they stick, tap lightly using a drift punch around the outer race.



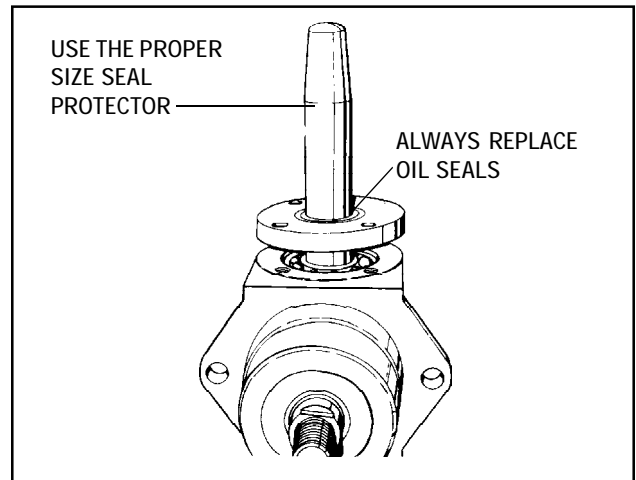
5. Using a soft mallet, separate the input shaft and gear. A slight press fit holds a spline surface on the shaft in a spline of the gear.
6. Remove and discard the output shaft oil seal. Do not scratch shaft. Remove and discard snap ring. Tap the shaft into the housing, using a soft mallet.



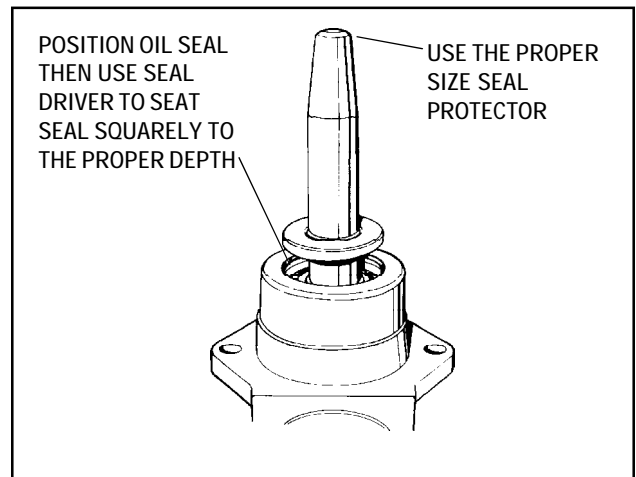
7. If necessary, remove the snap ring to separate the gear and bearing from the shaft. Hold the gear and bearing in one hand and tap the end of the shaft vigorously with a soft mallet.
8. Cleaning, Inspection and Repair
  - a. Clean all parts of grease, rust, or foreign matters.
  - b. Dry all parts. Compressed air may be used on all parts EXCEPT BEARINGS.
  - c. Check bearings for smooth rotation. Lubricate.
  - d. Remove all burrs and scratches from shafts.
  - e. Check housing for cracks or pulled metal.
  - f. Replace all snap rings removed.
  - g. Replace all oil seals.
9. If separated, install inner ball bearing and bevel gear on output shaft. Be careful of alignment. Use of a press is preferable to tapping parts together with a mallet.

10. Press shaft, bearing and gear assembly into housing until outer bearing race bottoms in retaining cavity.

11. Install outer bearing and new snap ring.



12. Install new oil seal, using seal sleeve No. 670293 and driver until seal is flush with housing.



13. Position input bevel gear in mesh with output shaft bevel gear. Tap the input shaft into place with a soft hammer. Use one hand to hold the gear and shaft to dampen tapping blows. Be sure gear is on the marked side of the housing.

14. Align shaft and insert ball bearing on each bearing surface by hand.

15. Install new seals in retainer caps, using driver.

16. Using seal sleeve 670293 over the shaft serrated ends, install new gaskets and bearing cap. Tighten retaining capscrews to 8-11 ft. lbs.

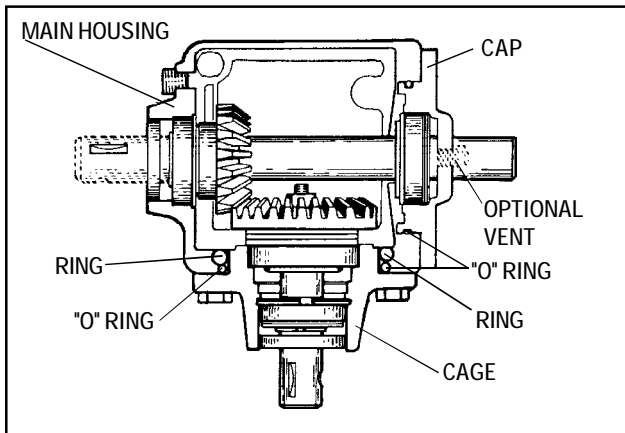
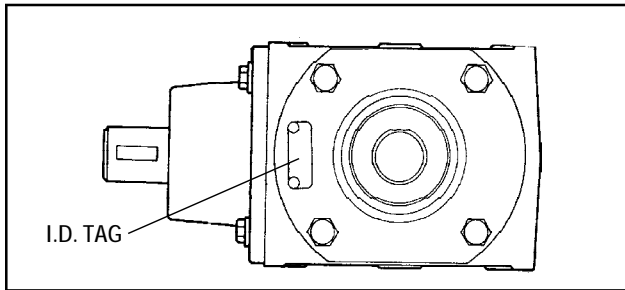
17. Lubrication: See Section 2. Lubrication Chart.

18. Install gasket and cover and secure with self tapping screws. Torque to 20-24 in. lbs.

19. Align scribe marks and install "T" Drive on equipment.

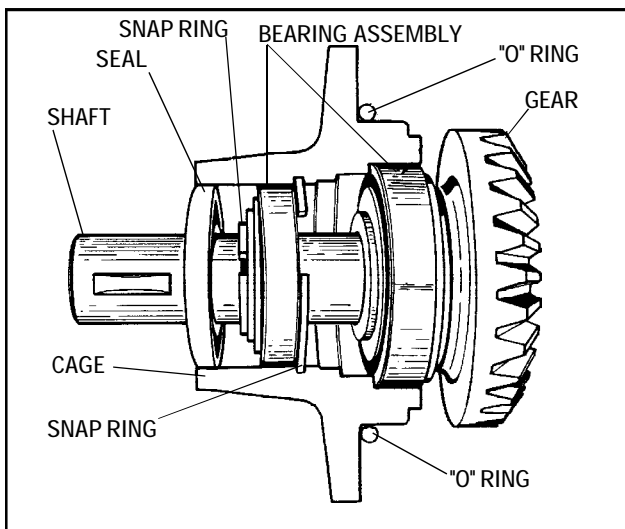
# 1100 SERIES

## A. GENERAL

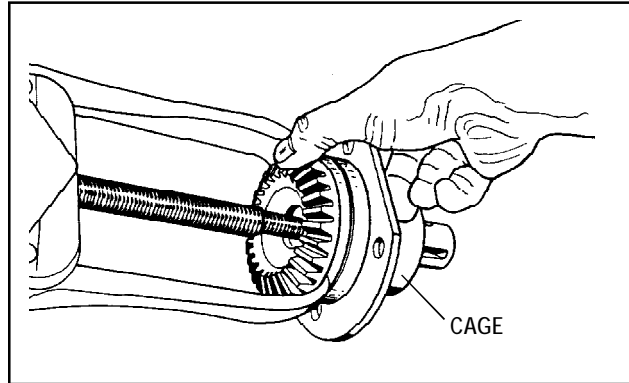


The 1100 series angle drive is a heavy duty gear box used with larger equipment with a larger H.P. rating up to 20 H.P. This unit is of cast iron construction for strength and taper roller bearing for longer life. This unit can be either right angle drive with right or left handed rotation, or a "T" drive. Disassembly and reassembly are the same.

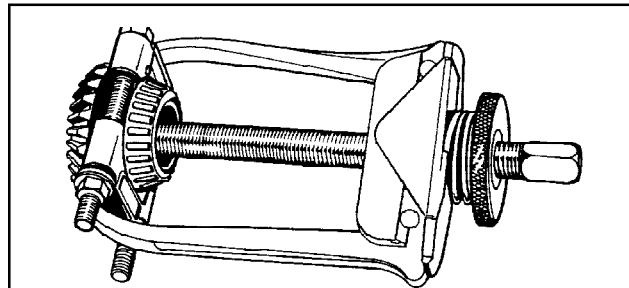
## B. DISASSEMBLY



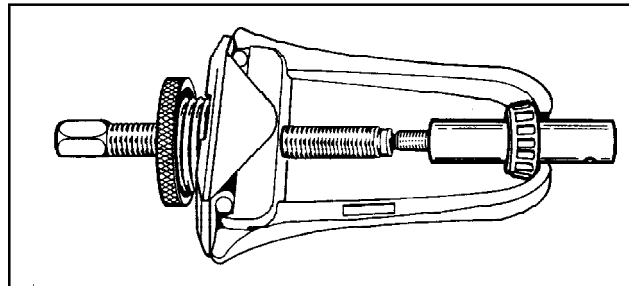
1. Clean and check all shaft ends before removing cap and cage assembly.
2. Remove the 4 input cage bolts and remove input cage, assembly will follow.



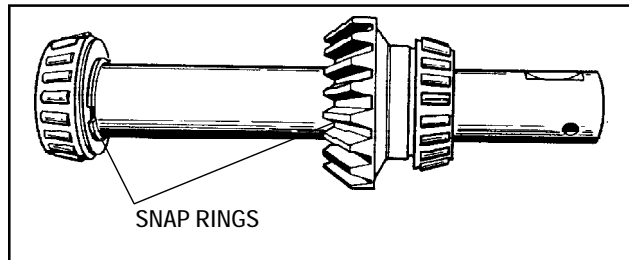
3. To disassemble the input cage assembly, first remove the nut and washer that holds the large keyed gear onto the shaft. With an outside puller, if necessary, remove gear. Roller bearings will be attached.



- \*4. Remove bearing from gear by using a bearing splitter and puller.

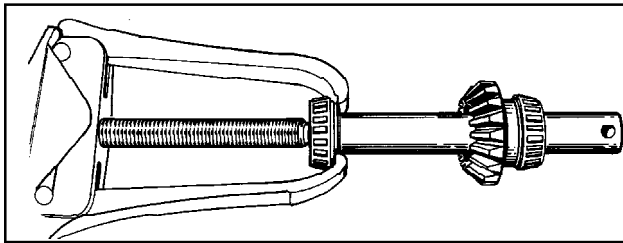


5. Remove shaft out of cage.\* Remove roller bearing with outside puller toward threaded side. Remove snap ring.
6. To remove races, simply tap out with punch and hammer. The large snap ring will be left in cage when all parts are removed.



7. Remove the output cap and assembly will follow.

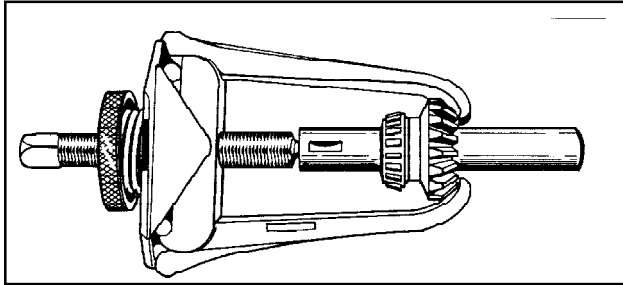
\*When roller bearings are removed with puller, discard, do not reuse. Also discard races.



- To disassemble the output shaft assembly\*, first remove the bearing that is located under cap on shaft, by using an outside puller.

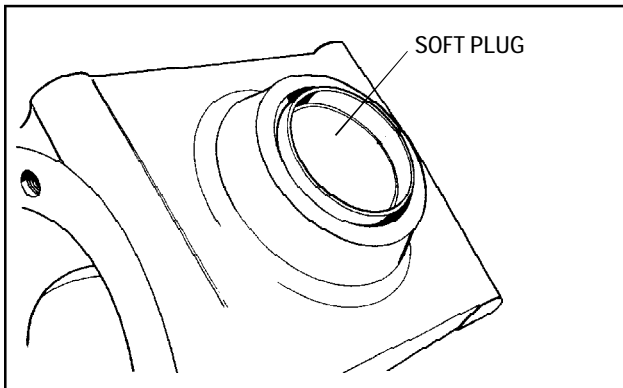
**CAUTION:** Do not hook puller on snap ring.

- Remove snap ring.



- On other end, use the same puller and remove both the keyed gear and bearing at the same time.

- Remove snap ring.



- To remove 1-3/4" soft plug, simply tap out of case. Discard old plug.

- To remove races, simply tap the race out of the cap and pry crush ring out. The other race can be tapped out with punch and hammer. If unit is not equipped with plug, very carefully pry race and crush ring out of cap and discard.

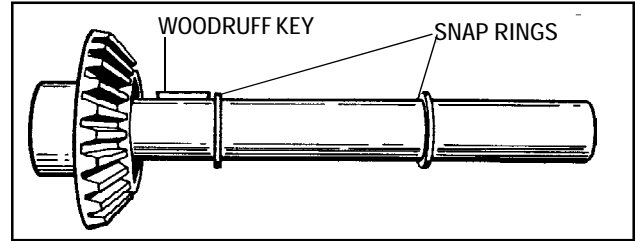
### C. INSPECTION

Clean all parts in cleaning solvent. Examine for wear or damage and replace as needed.

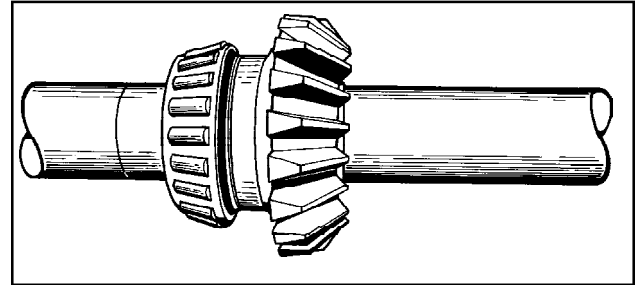
\*When roller bearings are removed with puller. Discard, do not reuse. Also discard races.

### D. REASSEMBLY

It's very important when assembling this unit that all new seals and "O" rings be used.

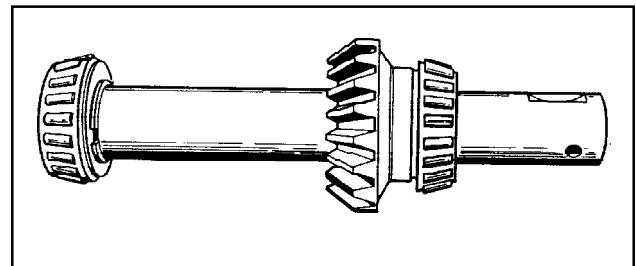


- Replace snap rings on the output shaft. Press keyed gear on, if necessary.



- When pressing roller bearings into place with press, make sure inner bearing race is used.

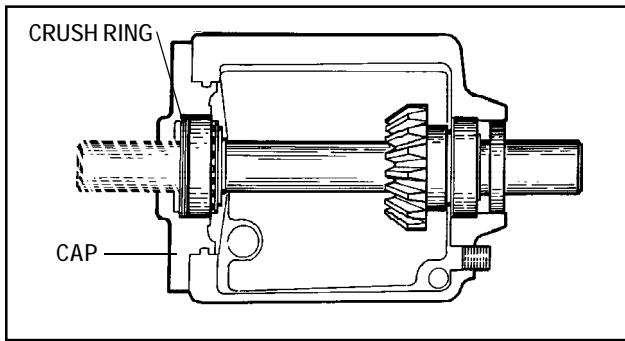
**NOTE:** Service bearings in this unit may have a shim in the box along with a new outer race. When pressing the bearing next to the gear, place shim if present, for that bearing and race next to the gear first, then the bearing.



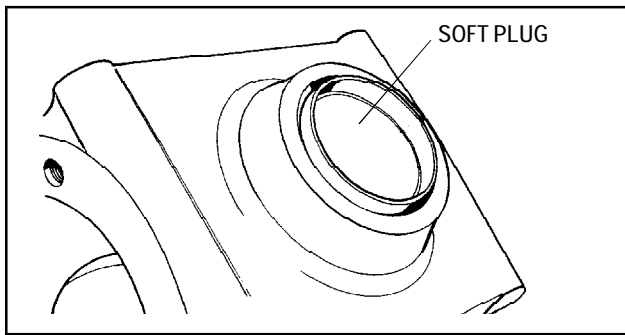
- Install the other bearing that fits into the cap without shim. Discard the shim. **NOTE:** There may be shims in the service bearing kit. Only the bearings next to the gears may need a shim only if the shim is in the kit.

- The race that is used with roller bearing on the gear side, mounts into the case. Press carefully until seated.

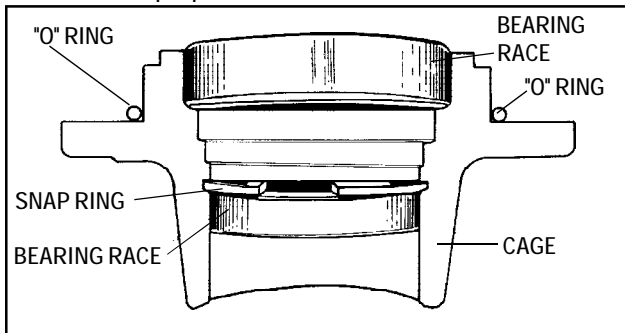
**NOTE:** Make sure that all races and roller bearings are kept together as provided in the kit.



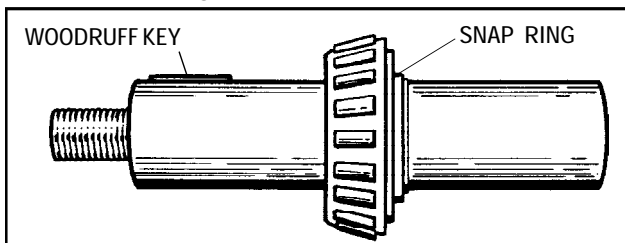
5. Before installing the cover, install new crush ring into cover first. Place new race up to ring. To properly set up the output shaft preload, place shaft into box, place cover over shaft without case/cover shim and "O" ring. Tighten and torque the 4 bolts to 200 in. lbs. at 50 inch pound increments.
6. Remove cover and place new case/cover shim in place with new "O" ring and torque to 200 in lbs. at 50 inch pound increments.



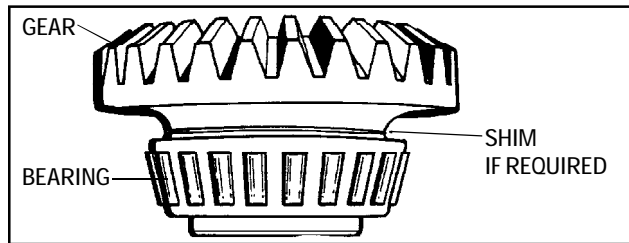
7. To reinstall 1-3/4" soft plug, tap in carefully with lip up, until 1/16" below flush is achieved.



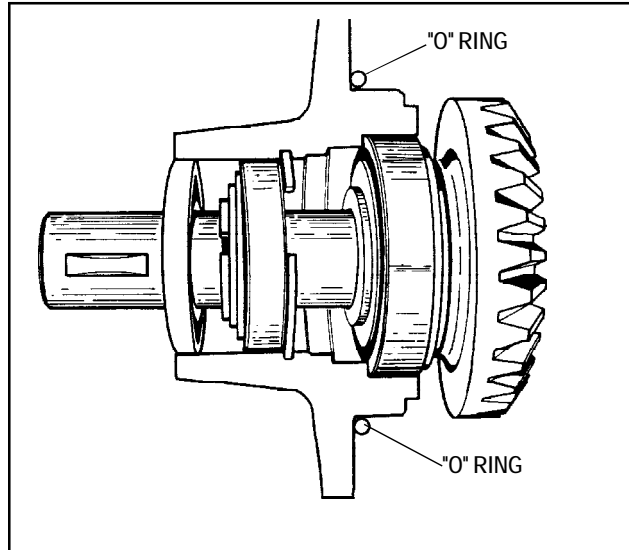
8. To assemble the cage assembly, place the large snap ring in its mounting area in cage. Press small race to snap ring from the outside.
9. Press large race into cap from back side.



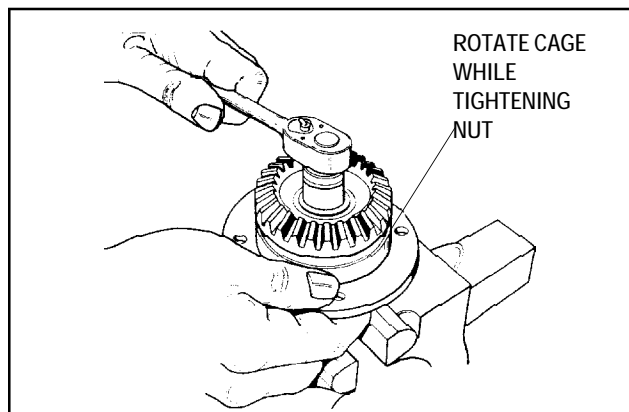
10. Place small snap ring on shaft.
11. Press roller bearing on shaft to back side of snap ring. Do not use shim. Install woodruff key.



12. Press large shim and new large roller bearing on to gear using inner bearing race.



13. Place shaft into proper position in cage, push gear with bearing onto shaft.



14. To achieve proper pre-load on bearings, place the outboard side of shaft in protected vice. Begin to tighten nut on gear side, while turning cage until a very slight drag is achieved on the cage housing with no end play. Parts must spin freely.

15. After loading to the bearing is done, place new "O" ring around the outer diameter of cage and position in case. Reinstall bolts, tighten and torque to 200 in. lbs.

16. To install seals, use a 1" seal protector. Position seals so that it is .100 below flush.

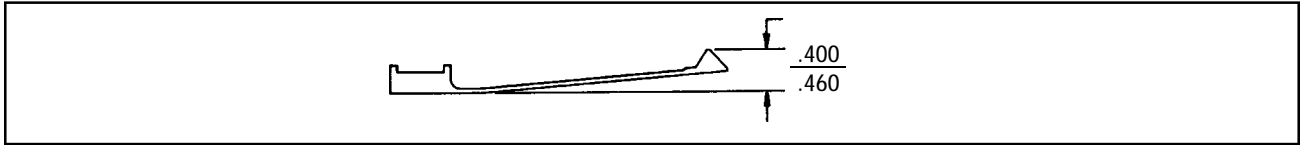
## F. LUBRICATION

After assembly, fill with 1 pt. E.P. 90 gear oil.

# CHAPTER 10. SHIFTING ASSEMBLY

## KEY SPRING HEIGHT

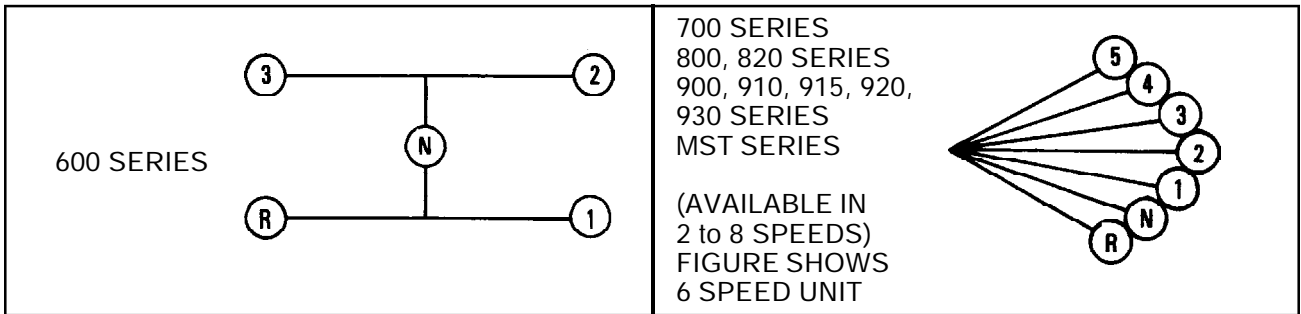
To check shifting keys for loss of spring height, place the short flat portion of key on flat surface as shown, measure the distance from surface to key tip. The measurement should be from .400 to .460, if measurement is below .400 key should be replaced.



## A. SHIFT PATTERNS

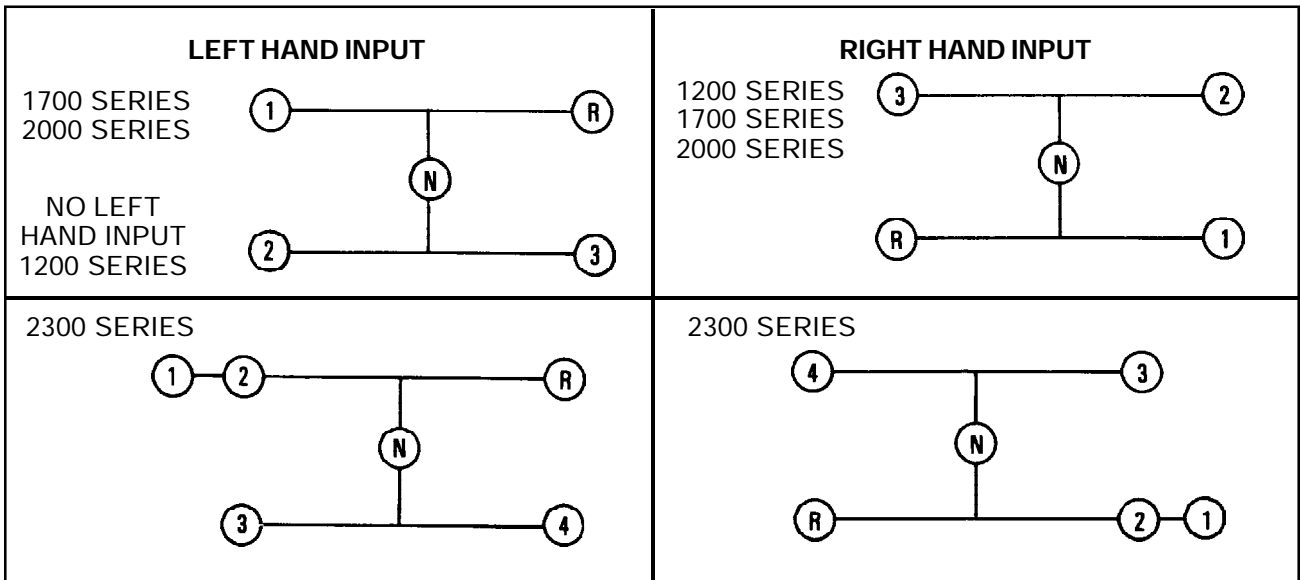
### VERTICAL INPUT

#### FRONT OF EQUIPMENT



### HORIZONTAL INPUT

#### FRONT OF EQUIPMENT



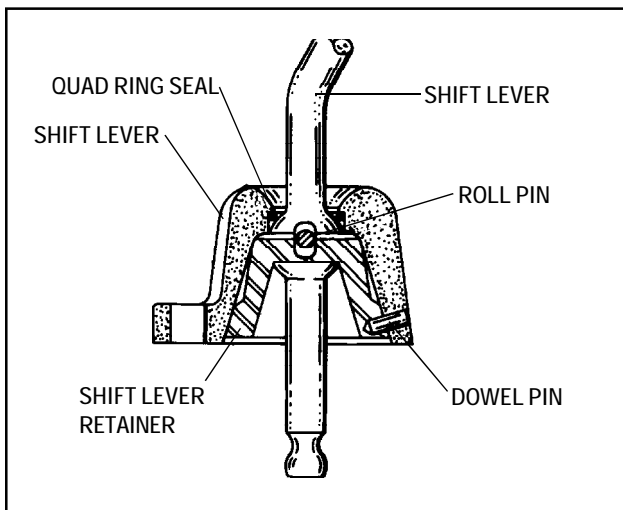
## B. SHIFT LEVER ASSEMBLY

### 1. GENERAL

- a. Prior to removing a shift lever assembly from a transaxle, make note of the position of the shift lever so that it may be assembled correctly to the shift lever housing.
- b. Move the shift lever to Neutral, if possible, before removing it from the transaxle. Clean around the lever housing to prevent dirt from falling into the transaxle. Cover this opening if possible.

### 2. DISASSEMBLY

- a. Place the shift lever in a vise so that the shift lever housing is at least one inch from the top of the vise jaws.

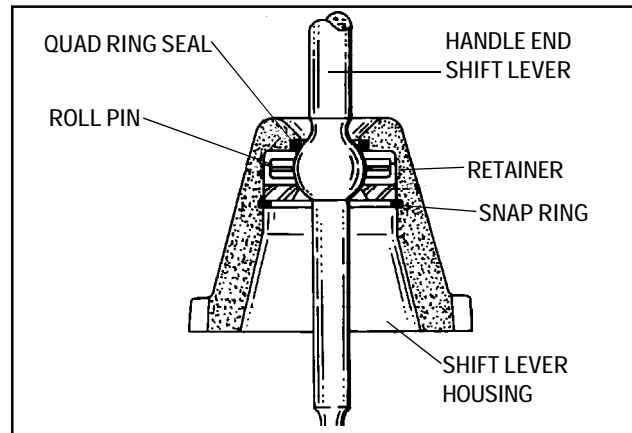


- b. **DOWEL PIN TYPE.** Locate the dowel pin holding the retainer in the housing from the outside. Place a 1/4" flat face punch on the gasket surface directly over the dowel pin. Strike the punch sharply but lightly with a hammer to dislodge the retainer from the shift lever housing. Always use a new dowel pin for reassembly. **SNAP RING TYPE.** Use the proper compressing type tool for removing the snap ring. Loosen the vise and disassemble the pieces.
- c. Remove the shift lever from the shift lever housing. Examine the roll pin in the ball of the shift lever. If bent or worn, replace. When inserting a new roll pin in the ball, position so that equal lengths protrude from both sides of the ball.
- d. Oil leakage past the point where the shift lever enters the shift lever housing will require replacement of the quad ring seal in the shift lever housing.

Prior to reassembly, be sure that bends in the shift lever correspond to the mounting on the vehicle.

## 3. REASSEMBLY

- a. **DOWEL PIN TYPE.** Secure with a new dowel pin. A second dowel pin is used in some assemblies for alignment. This dowel pin is located in the gasket surface of the shift lever housing and fits into a mating hole in the transaxle.

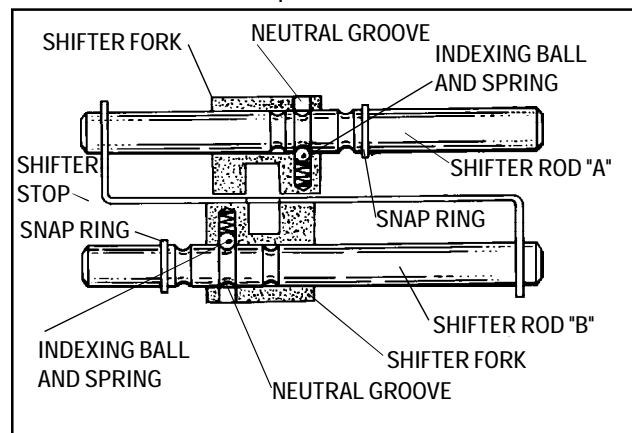


- b. **SNAP RING TYPE.** Secure parts with the snap ring. Before installing the shift lever and housing to the transaxle housing, check the shifting forks for neutral position.
- c. Always use new gaskets between the shift lever housing and the transaxle.

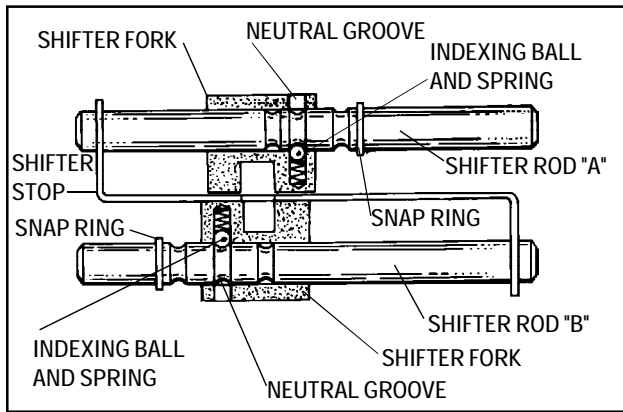
## C. SHIFTING ASSEMBLY

### 1. GENERAL

- a. Differences in assemblies will be noted in the following servicing procedure. Always use the parts list for each model to obtain the correct parts.



3 Stop, 3-Speed Transaxle Shifter Rod & Fork Assy.



4 Stop, 4-Speed Transaxle Shifter Rod & Fork Assy.

- b. Shifting assemblies are removed from and installed into transaxles by squeezing the top end of the shifter rods. This causes a binding that retains all parts during removal or installation.

## 2. INSPECTION

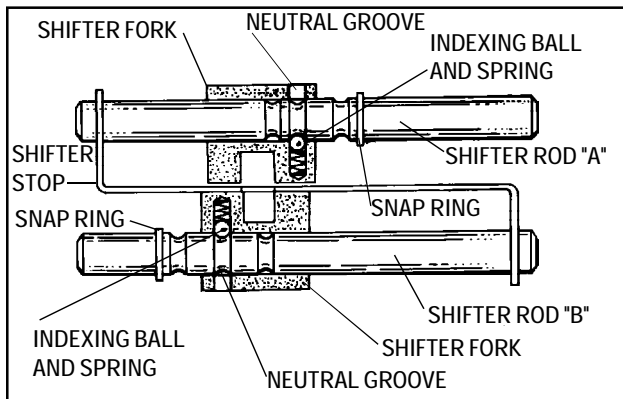
- a. Replace the shifter stop if worn or damaged.
- b. Examine the teeth and internal splines of the two shifter gears. Replace damaged gears. The gears must slide freely on the shifter shaft. Excessive wear of the internal spline in the gears will create cocking and difficult shifting. Replace the gear if this condition is present.
- c. Replace the shifter shaft needle bearing if wear is evident. See the Chapter on bearings for removal. Replace if the bearing surface of this shaft should be scuffed, pitted or worn to a diameter less than .750".
- d. Replace other parts showing wear, looseness, cracks, etc...

## 3. DISASSEMBLY

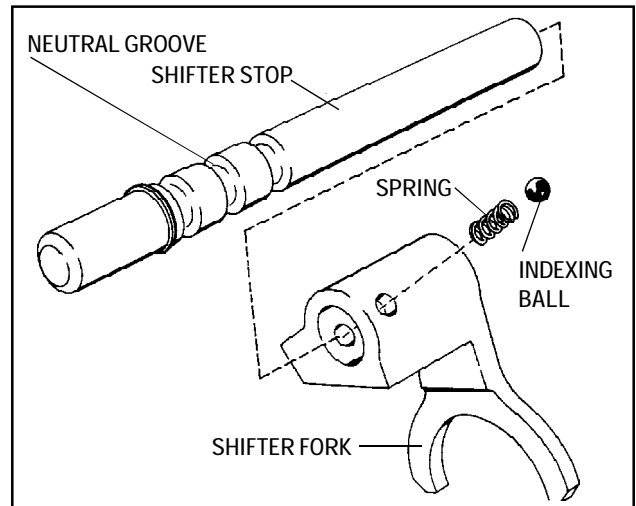
To disassemble the shifter and fork assembly would be the same procedure as assembly except in reverse.

## 4. ASSEMBLY

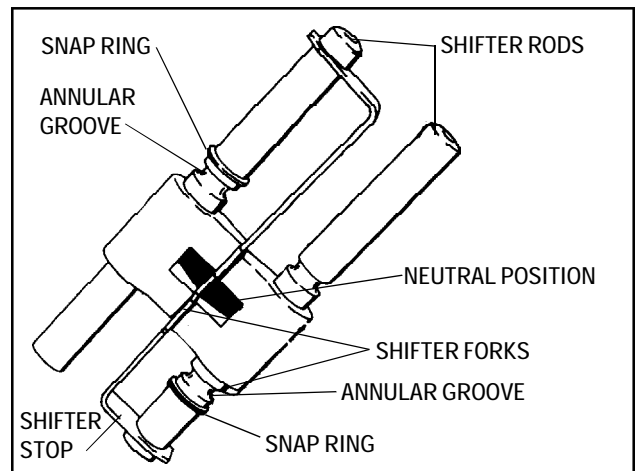
- a. Reassemble the shifting assembly by following the illustrations. Lay the parts on the bench. On a clean paper or shop cloth. Pay particular attention to the annular grooves in the shifter rods and the snap ring.



1. Assemble the shifter forks to the shifter rods. The shifter forks are interchangeable.



2. Slide the shifter fork into the shifter rod until it comes to the hole with the indexing ball and spring. With a flat blade screw driver, press the indexing ball into the hole and move the shifting fork completely onto the shifter rod.
3. Move the shifting fork to the neutral position. The neutral groove is the center groove. If the shifter rod has four grooves, the neutral groove is the second groove from the shortest end. This neutral groove can be seen through the hole in the shifter fork. The arrow from the words "NEUTRAL GROOVE" is passing through the hole for viewing.



4. When the shifter forks are properly assembled to the shifter rods and positioned in neutral, the ends of the notches in the shifter forks are in alignment.

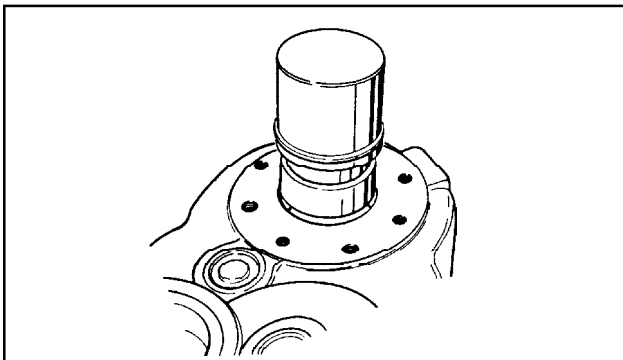
# CHAPTER 11. BEARING AND BUSHING SERVICE

## A. GENERAL BEARING AND BUSHING CARE

1. Bearings, bushings and bearing surfaces should be thoroughly cleaned prior to examination. Examine closely for scuffing, wear, pitting, and abnormal conditions. Replace if any conditions mentioned appear.
2. Use a good grade of clean solvent to clean bearings. After cleaning, always use clean, lintfree cloth to dry and wipe bearings. Immediately coat cleaned bearing with lubricant to prevent rusting or corrosion. If the bearing is to be stored, wrap in oil proof paper until needed. Ball bearings will be damaged if spun with compressed air. Moisture from compressed air will cause rust.
3. Take care of bearings in the case and cover. Cover them to keep out any foreign matter. Place gasket surface down on clean paper and cover with clean cloth. Never clean the lubricant from new bearings. This lubricant prevents damage before the transaxle lubricant enters the bearing.

## B. BALL BEARING SERVICE

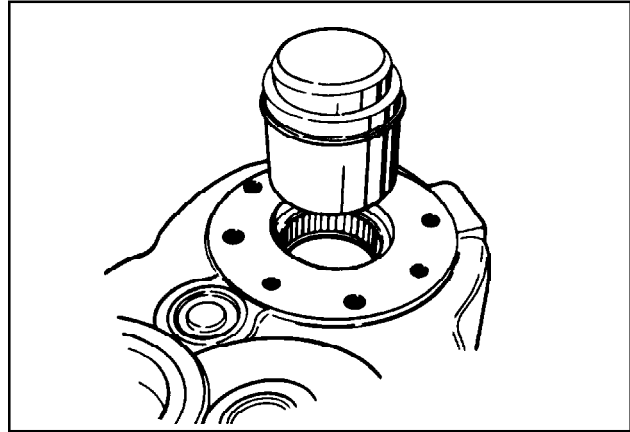
The ball bearings used in the outer ends of the axle supports are sealed. Without removing, but with the axle out, rotate the inner race with the fingers. If any roughness is noted, replace the ball bearing assembly. These ball bearings are factory lubricated and additional lubrication cannot be added. When driving in these ball bearings, use the proper tool that drives on the outer race.



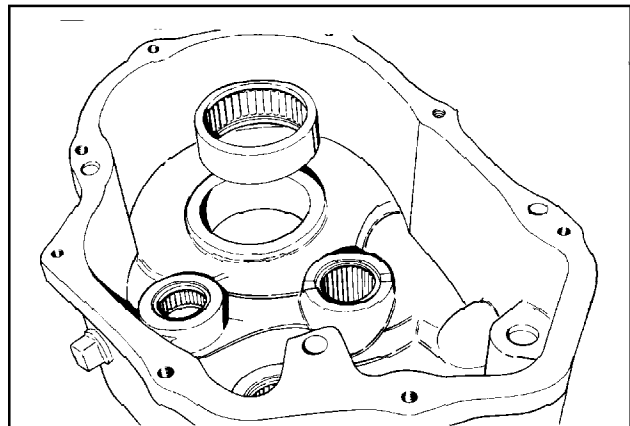
1. Install the needle and ball bearing combination for the input shaft into the cover prior to the installation of the input shaft.
2. When installing ball bearings, use a tool to drive on the race which is encountering the restricted fit. For example, install the input shaft ball bearing into the case by driving on the outer race. After the input shaft bearings are installed, assemble the input shaft. Press the input shaft into the bearing combination while supporting the inner race of the ball bearing on a hollow tube.

## C. NEEDLE BEARING SERVICE

It is advisable to use an arbor press to remove and install needle bearings.

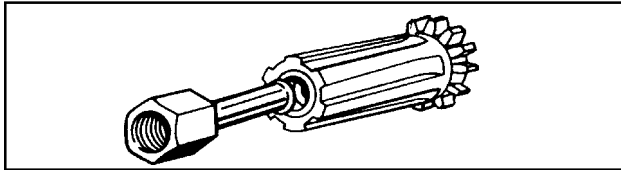


1. Use a bearing tool to press out the bearing. Insert the proper tool in the bearing, and with an arbor press, press out the bearing from the inside.
2. When installing open end needle bearings, always apply pressure to the stamped side.
3. Use only recommended tools to insert bearings. The opposite end of the same tool used for removal, is used for replacement.

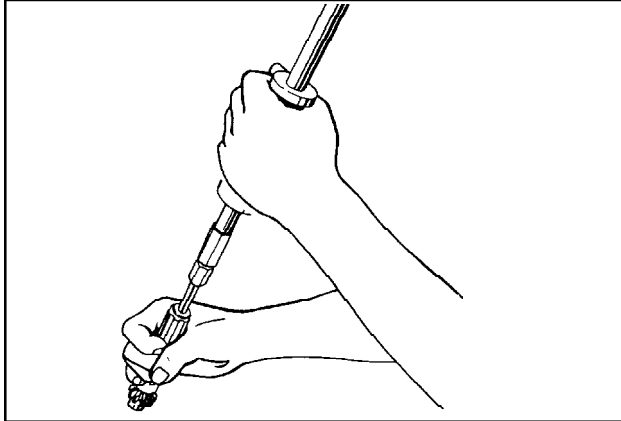


4. The inside face of the bearing housing should be below the thrust face on the case or cover. This distance is controlled by the design of the inserting tool. By using the proper tool, bearing life will be extended. Bearings should be pressed into the cover .015" to .020" below the thrust surface. The open end bearing in the low speed shaft of four speed transaxles, is to be .010" below the thrust surface. The open end bearing in the shifter shaft should be .010" below the end.
5. To remove the needle bearing in the splined shifter shaft, proceed as follows:

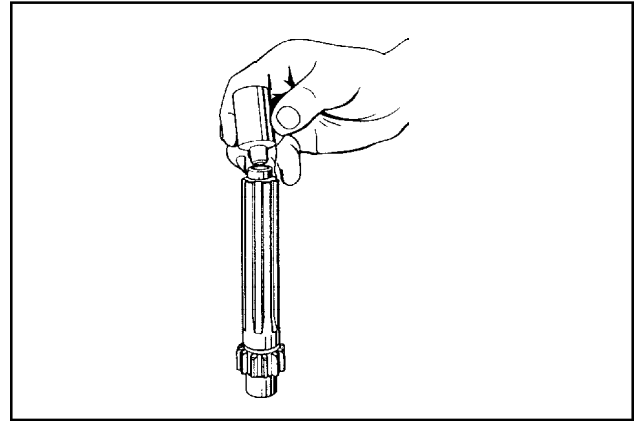
**NOTE:** Blind bearing pullers are available to remove this bearing. There is a space between the bottom of the drilled hole and the inside end of the bearing to accommodate the ridges of the bearing puller.



- a. With the needle bearing up, clamp the splined shifter shaft vertically in a soft jaw vise so that the lower end of the shaft rests on a block of wood.
- b. Prepare some pieces of paper toweling, newspaper, etc. by soaking in water.



- c. Tear paper into pieces, approximately one to two inches square. Stuff these wet pieces of paper into the needle bearings until full.
- d. Insert a 7/16" metal rod into this bearing. With a mallet strike the rod sharply, this will compress the wet paper. Continue to add more wet paper, this will hydraulically lift the bearing out of the shaft.



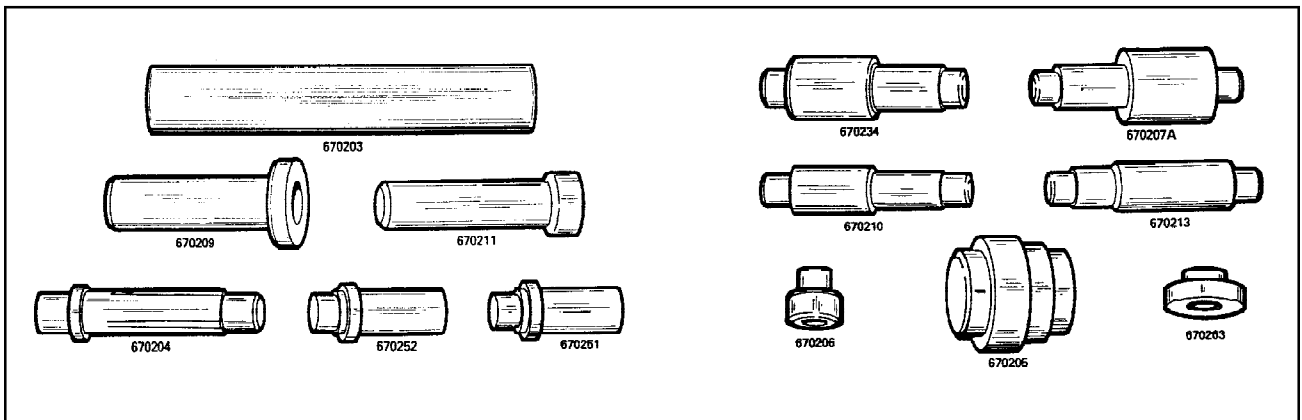
- e. Use the authorized tool to install the new bearing. Needle bearings in shifter shafts should be installed .010" below flush.

#### D. BUSHING SERVICE

When removing bushings, use the combined bushing remover and installation tool. Position the piece to be serviced on the table of an arbor press with an opening to allow the bushing to pass through.

1. Use the proper tool as illustrated.
2. The bushings in the three gear cluster, four speed transaxle, are both removed at the same time. The bushing from one end will contact the bushing in the opposite end and both may be pushed out.
3. Use an arbor press and push the steel ball through the new bushing to expand it to the required size.

### PEERLESS TOOL KIT 670254A



#### Tool No.

670203  
670204  
670205  
670206  
670207A  
670209  
670210  
670211  
670213  
670234  
670251  
670252

#### Description

Oil Seal Installer  
Bushing Driver and Installer  
Bushing Driver and Installer  
Oil Seal Protector  
Bearing Driver and Installer  
Oil Seal Installer  
Bearing Driver and Installer  
Oil Seal Installer  
Bearing Driver and Installer  
Bearing Driver and Installer  
Bearing Installer  
Bearing Driver

#### Use with:

Seal with 13/16" I.D.  
Bushing with 3/4" I.D.  
Busing with 1-1/2" I.D.  
Seal with 1/2" I.D.  
Bearing with 5/8" I.D.  
Seal with 21/32" I.D.  
Bearing with 1/2" I.D.  
Seal with 1/2" I.D.  
Bearing with 9/16" I.D.  
Bearing with 5/8" I.D.  
Input Bearing on 800 Series  
Bearing with 11/16" I.D. - 800 Series