

TECUMSEH

TECHNICIAN'S HANDBOOK

This manual covers all Tecumseh Peerless® gear products as follows:

100 Series Differentials	915/940 Series Transaxles
MST200 Series Transaxles	920 Series Transaxles
300 Series Transaxles	930 Series Transaxles
600 Series Transaxles	1000/1100 Series Right Angle/T-Drives
601 Slow Speed Transaxle	1200 Series Transaxles
700 Series Transmissions	1300 Series Transaxles
700H Series Transmissions	2300 Series Transaxles
800/801 Series Transaxles	2400 Series Transaxles
820 Series Transmissions	2500 Series Transaxles
900 Series Transaxles	2600 Series Transaxles
910 Series Transaxles	VST Transaxles

Other illustrated Tecumseh 2-Cycle Engine, 4-Cycle Engine and Transmission manuals; booklets; and wall charts are available through Tecumseh.

For complete listing write or call

TECUMSEH & PEERLESS TRANSMISSION and DRIVE PRODUCTS



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ENGINES & TRANSMISSIONS

IMPORTANT NOTICE!

SAFETY DEFINITIONS

Statements in this manual preceded by the following words are of special significance:



or



WARNING indicates a potentially hazardous situation which if not avoided, could result in death or serious injury.

NOTE

Refers to important information and is placed in italic type.

It is recommended that you take special notice of all items discussed on each page and wear the appropriate safety equipment.

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CHAPTER 1. MODEL OVERVIEW AND TERMS USED

TECUMSEH/TRANSMISSIONS UNITS

GENERAL

Manufactured since 1945, Tecumseh/Peerless gear products are found in many products worldwide. Applications vary from industrial products to residential and commercial lawn and garden equipment.

This book is intended for use by properly trained technicians that have appropriate facilities and the proper tools. If you are not a Tecumseh trained technician, DO NOT attempt a repair. Consult an Authorized Tecumseh Servicing Dealer.

IDENTIFICATION OF MODELS

All units manufactured since 1964 have identification numbers located on an attached tag or are stamped into the case. This information is required to obtain parts or replacement units. We have included illustrations on page 9 of this book to assist you in locating them.

TRANSAXLES

The term transaxle is a combination transmission and differential in one case. Tecumseh transmissions and transaxles are manufactured in many different gear ratio combinations from one to seven forward speeds with one reverse.

600 Series The 600 series is a lightweight transaxle used in riding mowers or similar applications. The 600 series has a vertical input shaft at the top of the aluminum case. Variations in the series (which determine the specific model number such as 603, 603A, 609 etc.) include:

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).

800 Series This unit has 3 to 6 speeds forward and 1 reverse. This transaxle features bronze oil impregnated bushings with needle bearings or ball bearings on the axles, input and output shafts.

820 Series With 2 to 6 speeds forward and 1 reverse, this transaxle is built for heavy duty applications including use with ground engaging attachments. Sleeved needle bearings are used in place of oil impregnated bushings on all shaft ends and ball bearings are standard on the axles. The 820 also features steel cut gears for maximum durability.

900 Series This unit is similar to the 800 series transaxle with the added feature of 2, 3, or 4 speeds forward and 1 reverse.

910 Series The 910 series transaxle offers a forward and reverse unit. The speed changes with the use of a variable-drive pulley arrangement.

915/940 Series This unit has 3 to 5 speeds forward and 1 reverse. Reverse is gear driven instead of chain driven and the case is contoured around the gears.

920 Series The 920 series offers 3 to 7 speeds forward and 1 reverse. The shifter/brake shaft is similar to the 800 series shifter/brake shaft.

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

The MST Series The MST (Manual Shift Transaxle) is a sealed unit which uses 16 oz. (473 ml) of 80W90 gear lube (part #730229B). The MST series is available with up to 6 speeds forward and one reverse and has a contoured case and cover.

1200 Series The distinguishing feature of the 1200 series transaxle is that the axle support housings are pressed in from the inside of the case and cover. Therefore they are not readily removable until the unit is completely disassembled. The case is cast iron for rugged, longtime use.

2300 Series Generally similar to the 1200 series transaxle. The distinguishing features are a more massive case 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 1200 and 2300 series transaxles are fairly similar in appearance, but do have recognizable characteristics. Both of these units have cast iron cases for rugged applications, although the 2300 series is the only unit that can be used with ground engaging applications.

HYDROSTATIC GEAR REDUCTION AND DIFFERENTIAL UNITS

GENERAL

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

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, which is characteristic of the 1200 series. The hydrostatic pump is made by Eaton® Manufacturing and is not serviced by Tecumseh Service Dealers.

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 pump is manufactured by Sundstrand® Corp.

TRANSMISSIONS

Transmissions manufactured by Tecumseh consist of a shifting mechanism to take a constant input shaft speed and reduce it to the desired output speed. Transmissions need a belt drive or chain drive/differential assembly to deliver power to the wheels.

700 Series This unit can be 2, 3, 4, 5 & 6 speeds forward and 1 reverse. The brake system can be mounted on either side of the unit.

700 "H" Series This unit is built with almost all interchangeable parts within its two cases except with an "H" shift pattern. This unit has 3 or 4 speeds forward and 1 reverse.

DIFFERENTIALS

The 100 series is a self-contained differential/axle unit. It features hardened or non-hardened axle shafts of various lengths and is machined with many variations for hub attachment. The case is cast aluminum and the differential gears are sintered metal (powdered metal) or cut steel. The differential pin is held in place by the four retaining cap screws. Oil Lite bushings reduce friction during differential operation. The drive sprocket is part of the unit which, depending upon the application, can be of several diameters in size thus having a different number of gear teeth. This sprocket is often supplied by the O.E.M.

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.

Right Angle Drives These units consist of input shafts, output shafts, and the beveled gearing necessary to change the direction of power at right angles. If the bevel gear (drive gear) on the input shaft is turned around and moved to the other side of the case (opposite end of the shaft), the output shaft will rotate in the opposite direction.

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

"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.

Shafts, Couplings, Pulleys, etc. These items are part of complete units and are used to connect angle drives, and other attachments. The serrated couplings match the serrations on the shafts of the angle drives and connecting shafts.

TERMS USED

AXLE - The shaft which connects the wheel or hub to the differential unit and transmits force back to the wheels.

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) This is a chamfer or roundness of the meshing side of the gear teeth to permit easy shifting. For instance, with "H" shift pattern transaxles, this is about the only allowance that can be made to make shifting easier. Input power should be stopped before shifting to keep these spur gears from developing wear.

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.

BRAKESHAFT/SHIFTER BRAKESHAFT) - The shaft on a unit (Transaxles or Transmission) to which a braking system may be attached. It is usually larger in diameter than the input shaft due to its function of taking shock loads experienced in braking.

CASE - That bottom half of the gear box which contains the shift lever , axle and brake shaft openings. The other half is the COVER. Unit reassembly is normally done into the case with variations listed by individual model.

CHAMFER - In gear products, chamfers provide two main functions. The first is to reduce gear wear at the leading contact point as two gears mate. The second purpose is to act as a ramp for shifter key compression through the shift washer prior to gear engagement. The chamfer in the washer is either stamped or machined in.

COUNTERSHAFT - A splined shaft which hold spur gears that are in constant mesh with shift gears and transfer input power to the shift gears.

COUPLING - A sleeve to connect two serrated or splined shafts in the same axial plane. Used in right angle drive systems, 700 series, output shafts or in a hydrostatic drive connecting the pump and motor to the gear drive of a transaxle.

COVER - The top half of a horizontally parting gear box such as 700,800,900 and MST models. The cover normally contains the input shaft, bearing(s) and the input bevel gear. The shaft may change location in the cover based on the OEMs mounting position.

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 - An alignment pin used to align the case and cover and other parts in a transmission or transaxle. The dowel pins should be installed 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 assembled product (riding mower, tractor etc.) which uses of the drives listed in this manual.

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 unit which is always connected to the drive. Its rotational speed is dependent on the driving mechanism. The input shaft brings power to the unit.

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, the terms can be the same.

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

NEUTRAL SPACER - A single or split collar between forward and reverse gears that the shift keys engage into when the unit is in neutral.

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

OIL SEAL, (SQUARE CUT O-RING)- A seal with two external and two internal sealing surfaces. Used in the shifter housing.

OUTPUT, OR OUTPUT SHAFT - On a transaxle, the shaft that contains the output pinion which is in direct mesh with and drives the differential. The output shaft on a transmission 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 bull gear (except the 2400 series).

GEAR REDUCTION AND DIFFERENTIAL UNIT - A unit that reduces a high R.P.M. 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) - The gear located between the reverse gear of the countershaft and the reverse gear of the shifter/brake shaft that allows the drive to operate in the opposite direction.

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

RIGHT ANGLE DRIVE / HEAD ASSEMBLY. The major operating parts are a pair of miter gears. The assembly consists of other right angle or "T" drive head assemblies and connecting hardware.

SEAL - A material which prevents lubricant from leaking past a rotating shaft. It can be a rubber or square cut "O"-ring, a sealing-type ball bearing, or most commonly, a rubber sealing surface encased in a metal form.

SEAL RETAINER - Found on some models of transaxles and on right angle drives.

SHIFT COLLAR - A 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 move the shift keys.

SHIFT GEARS - The gears on the shifter/brake shaft that are in constant mesh with the spur gears of the counter shaft. The shift gear is engaged by the shift keys and it's size determines the speed of output by the axles.

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 - The shift washer provides a ramp to gradually compress the shift key prior to engagement with the gear. We have used two types in production; the newer style has the chamfer stamped into the washer. Earlier production washer's had the chamfer machined in.

SHIFTER ASSEMBLY - Consists of a 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 is connected to the shifter rod to position the shifter gear at an exact spot axially along the shifter shaft.

SHIFTER GEAR, LARGE (600/2300) - This gear transmits 1st gear, reverse gear (and 2nd gear in 4-speed units) ratio force to the output shaft. It is beveled on both sides.

SHIFTER GEAR, SMALL (600/2300) - 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 beveled tooth diameters or it can have a beveled spline to engage 3rd (or 4th) gear through an additional splined shaft.

SHIFTER HOUSING (600/2300's) - This housing contains the shift lever and must be re-installed in the proper position to function correctly. If the 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 positioning with meshed positions of the shifter gears and those 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. On in-line transmissions and transaxles the shaft has machined channels to accommodate the shift keys.

SHIFTER STOP (600/2300's) - 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 actuate the other fork.

SPROCKET - A geared wheel designed to turn a chain drive. Sprocket diameters vary and are available in different sizes for changing 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" drives with dissimilar input and output ends, care must be taken to insure that the parts do not run in reverse when reassembled.

THREE GEAR CLUSTER (2300) - A three 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 moved along a shaft to vary the gear ratio in a unit. The net effect is to change speeds to the rear wheel according to the type of work being done.

UNIT - A general term for Tecumseh/Peerless Transmission products.

GENERAL SERVICING PROCEDURES

The following service procedures should be understood and practiced whenever service is needed on a Tecumseh transmission or drive product.

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

Before removing a unit (Transmission product) from any equipment, look for and ask the customer about:

1. Loose, worn or glazed drive belts.
2. A misadjusted or badly worn clutch or belt tension.
3. Loose/lost set screws and or sheared keys in drive, driven pulleys or axle.
4. Oil saturated drive belts or clutches.
5. Bad operating habits, such as clutch riding or not clutching when shifting.
6. Oil leaks.
7. If possible operate the equipment to help isolate the problem.
8. Review Service Bulletin 304.

Removal of the unit from the equipment:

1. Raise the equipment so the transmission or transaxle is accessible. Use wood blocks to prevent equipment from shifting. Do not use bricks, cement or cinder blocks.
2. Visually inspect the Tecumseh unit for oil leaks, a cracked housing, binding or rubbing of parts, or other symptoms of malfunction.
3. Use a jack under the unit to support it's weight when attachments are removed.
4. Remove wheels, drive belts, pulleys, chains and other associated equipment from the unit. Be aware of positioning of parts. Use a scribe mark, if in doubt, to reassemble parts quickly and accurately.
5. If the shifter lever will interfere with removal of the unit in anyway, remove it before unit removal. These can easily be bend out of shape.
6. Remove all attached hardware holding the Tecumseh/Transmission unit to the equipment on the case, cover, axle supports, brake and shifter.
7. Remove the unit from the equipment.

Preparing for disassembly of a unit:

1. Visually inspect for evidence of oil seepage, tampering, misalignment, freedom of rotating shafts, etc.
2. Clean the unit thoroughly of any dirt, oil and debris.

3. Remove the shift housing and drain the lubricant from unit. Observe the old lubricant to see if metal particles are present.
4. Check axle shafts carefully for smoothness. Use crocus cloth or a Scotch-Bright™ pad to rub down high spots and eliminate rust or paint from the shafts.
5. Check the model and specification number and remember to have the exploded parts diagram accessible during disassembly.
6. Have on hand seal protectors, drivers, shop cloths, appropriate tools and this technicians handbook while servicing a unit.

OIL LEAKS, SEAL AND GASKET SERVICE

Tecumseh units contain various styles and sizes of oil seals. The function of any oil seal is to seal inward to prevent lubricant leaks and prevent outside debris from entering the unit. Seals can be **single lipped** with the sealing edge facing inward or **double lipped** sealing inside and out.

GUIDELINES TO REMEMBER

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. Replace ALL seals/gaskets if disturbed. The small cost of installing new seals is small in comparison to a dissatisfied customer and the cost of rework.
3. Some seals have a "Redicoat" sealant applied, while others may need a thin coat of RTV silicone to the outer shell upon installation.
4. The surface over which the seal makes contact must be free of all cuts, scratches, high spots and rust. The shafts should be smooth, shiny and a thin film of light oil applied. Seal protectors must be used to clear keyways, splines, or other machined sharp edges on the shafts.

TORQUE VALUE TROUBLESHOOTING GUIDELINES

ALWAYS torque all fasteners to the appropriate value as listed in Chapter 1 page 9.

Over-tightening can strip the threads in the cases or on a fastener. It also can over-compress gaskets, and possibly cause binding in the unit.

A cross-tightening sequence to half the torque then finally to full torque value is a recommended procedure to prevent comebacks (repair returns).

Under-tightening fasteners can cause oil leakage, loosening of attaching parts, and possible shifting of the internal parts which may bring about a complete failure.

BASIC 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, the following procedures are accurate and the preferred method for a quick check of the unit.

On an "H" shift pattern drive 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 brakeshaft should turn. For ease in turning the various shafts, insert a tool (such as a punch or a socket head screw key) into the keyway, however, do not force if the shaft is binding.

Potential reasons for binding in the unit could be:

1. Gaskets were left out on reassembly or installed incorrectly.
2. Oil seal retainers, differential, thrust washers, shifter stop or oil seal retainers were installed improperly.
3. The shifter assembly or spacers were installed incorrectly.
4. Foreign matter could be blocking the gear teeth that are in mesh.
5. The input shaft was not properly seated in the case.
6. The case and cover could be mis-aligned (dowel pins were missing).
7. The bearing(s) do not have the lock tabs or notches in the correct position.

For more information, consult the troubleshooting section.

LUBRICATION CHART

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

Model No.	Quantity	Model No.	Quantity	Model No.	Quantity						
300	Sealed	700	12 oz./355 ml Grease	All Models	4 oz./118 ml Grease						
600	24 oz./710 ml Oil	700H	12 oz./355 ml Grease	Except *							
800	30 oz./887 ml Grease	2800	†	*1408-P91	3 oz./89 ml Grease						
801	36 oz./1065 ml Grease										
820	36 oz./1065 ml Grease										
900	26 oz./769 ml Grease										
910	18 oz./532 ml Grease										
915/940	10 oz./296 ml Grease										
920	30 oz./887 ml Grease										
930	30 oz./887 ml Grease			*3002							
1200	48 oz./1420 ml Oil ††			*3003							
1305	32 oz./946 ml Oil			*3028							
1309				*3029							
1313				*3035							
1301				44 oz./1301 ml Oil	1000 Series	6 oz. / 180 ml SAE E.P. 80W90 Oil					
1302	44 oz./1301 ml Oil				1100	16 oz./473 ml Oil					
1303					44 oz./1301 ml Oil	DIFFERENTIALS					
1304		44 oz./1301 ml Oil	All Models			3 oz./89 ml Grease					
1306			44 oz./1301 ml Oil			TWO SPEED AXLE					
1307						44 oz./1301 ml Oil	All Models	2 oz./59 ml Grease			
1308							44 oz./1301 ml Oil	THREE SPEED AXLE			
1310								44 oz./1301 ml Oil	All Models	2 oz./59 ml Grease	
1311									44 oz./1301 ml Oil		
1312											
1314											
1315											
1316											
1317											
1318											
1320											
1321											
1322											
1325											
1328											
1329	24 oz./710 ml Oil										
1319											
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 788067C

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

† Refer to O.E.M. Technician's Manual for type of lubricant and capacity system

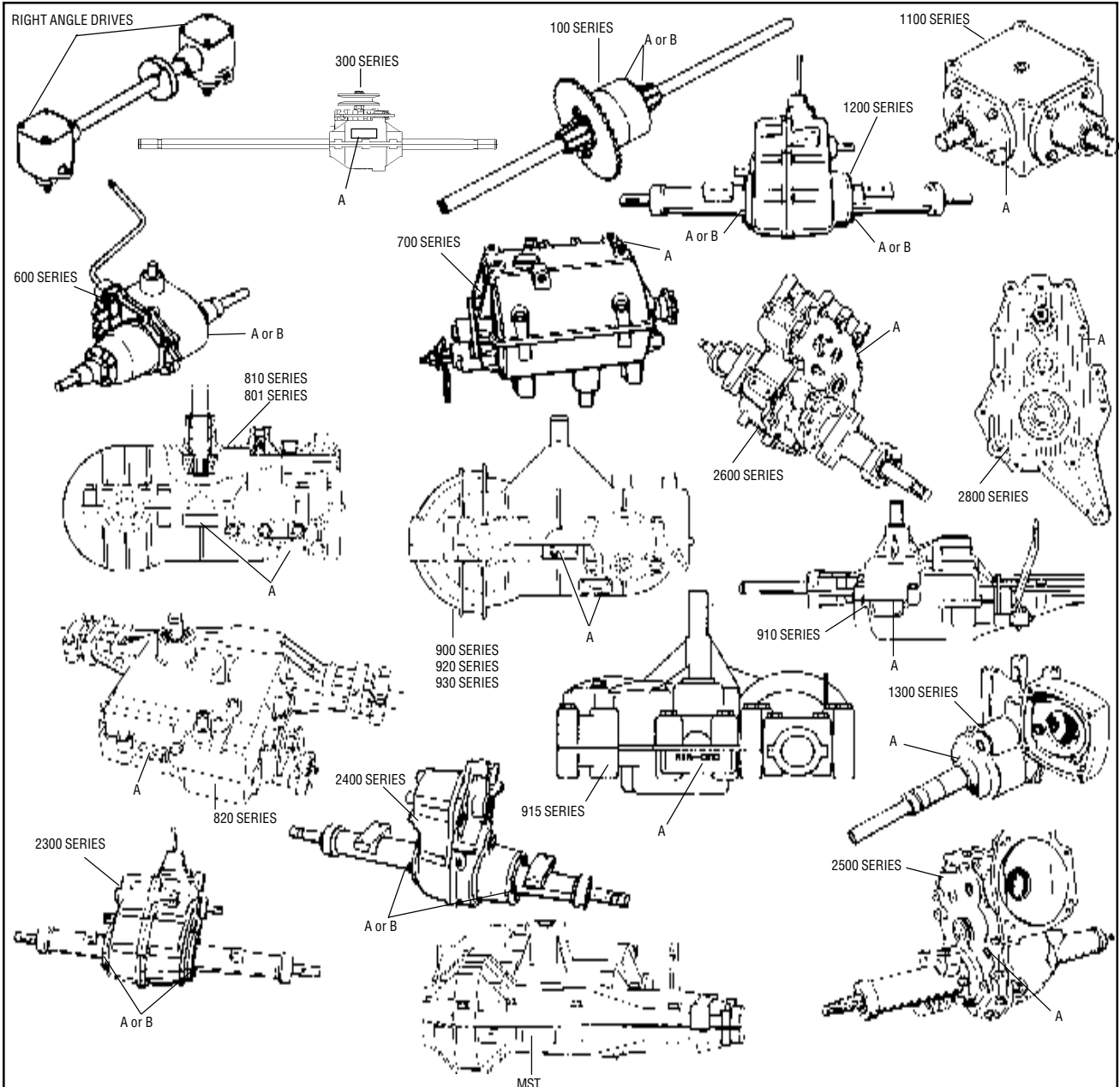
†† To be filled through shift lever opening

TORQUE VALUES CHART

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

NOTE: On all units containing two jam nuts, secure brake lever, hold the bottom nut and torque the top nut to 100 in. - lbs. (11.3 Nm).

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)



MOD 506
PEERLESS
1 275 1374

Individual Serial Number
 Manufactured on the 275th Day
 Manufactured in 1991

VARIOUS STYLES OF IDENTIFICATION USED

MODEL NUMBER REQUIRED FOR WARRANTY
 SPECIFICATION NUMBER REQUIRED FOR WARRANTY

PEERLESS **205 - 027C** TECUMSEH
 MODEL DATE SERIAL

205 - 027C8194A0048

D.O.M. (DATE OF MANUFACTURE)
 ORIGINAL SERIAL NUMBER

MODEL NUMBER REQUIRED FOR WARRANTY

SPECIFICATION NUMBER REQUIRED FOR WARRANTY

MODEL NUMBER REQUIRED FOR WARRANTY

SPECIFICATION NUMBER REQUIRED FOR WARRANTY

PEERLESS **MST - 206 - 502A** TECUMSEH
 DATE MFG. SERIAL NO.

6304A00013

D.O.M. (DATE OF MANUFACTURE)
 ORIGINAL SERIAL NUMBER

PEERLESS **VST - 205 - 020C** TECUMSEH
 MODEL SPEC

7070A - 0005

D.O.M. (DATE OF MANUFACTURE)
 ORIGINAL SERIAL NUMBER

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

TROUBLE SHOOTING TABLE

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

With the engine off, shift through the gear sequence. Only light resistance should be felt. If the unit shifts hard the problem is in the transaxle. Otherwise, check the following areas: the clutch adjustment, brake adjustment, belt release and the belt guide positioning.

All current gear drive units are in-line shift and use shift keys to engage the desired gear to lock and then rotate with the shaft. This type of unit requires the transaxle or transmission to be in a no load condition (the clutch engaged) when gear selection occurs. Depressing the clutch pedal and therefore engaging the clutch, allows the unit to have the input and brake forces removed from the gears and shift keys, which allows the unit to shift freely and easily. Improper shifting (shifting while on an incline, shifting while towing any type of load, or shifting without clutch engagement) forces the shift keys to engage into a gear that is in a loaded condition. Improper shifting leads to premature wear and failure of the shift keys and drive gears and is considered abuse. 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 normal wear or abuse by the operator.

Some Original Equipment Manufacturers (OEM)'s use Tecumseh 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 tension released (clutch engaged), the transaxle is able to shift while on an incline or while towing any type of load. Remember, the Tecumseh Peerless limited warranty covers defects in the material or workmanship. It does not cover worn shift keys or gears caused by clutch/belt linkages not adjusted correctly.

Isolate Unit from Transaxle

Use the following procedure to determine if a hard shifting condition is caused by the shifter/clutch linkage or an internal problem in the unit.

1. On level ground, start the engine and with engine running proceed to shift through the gears with the clutch pedal depressed (engaged).
2. If shifting is difficult, try shifting the transaxle with the engine shut off.
3. If the transaxle 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.**
4. If shifting the unit with the engine shut off is difficult then disconnect the linkage from the shifter rod and shift through the gears with an open end wrench and compare the shift effort.
5. Check the clutch, shifter, and brake linkage for the proper adjustment by using the guidelines provided by the owner's manual or the Technician's Handbook for that specific equipment.
6. Hard shifting with the engine shut off can be caused by:
 - a. bent or binding shift lever or linkage.
 - b. shift linkage out of adjustment.
 - c. corrosion in the transaxle or transmission.
 - d. damaged shift keys, gears or shifter brake shaft.
 - e. missing or misadjusted belt guides (see the (OEM's specs).

NOTE

DO NOT REMOVE TRANSAXLE UNTIL YOU HAVE CHECKED ITEMS 6A AND 6B.

If the problem is internal, remove the transaxle from the equipment, disassemble and determine the cause.

TROUBLESHOOTING TABLE

PROBLEM	REMEDY
UNIT CANNOT BE SHIFTED (OR DIFFICULT TO SHIFT)	
Gears installed incorrectly	Review positioning of gearing.
Forks and Rod assembly installed incorrectly	Remove assembly, recheck and correctly position parts.
Axle Housing installed incorrectly or not tightened correctly/ Axles cannot be turned (in the same direction) while unit is in Neutral	Seal retainers are not properly sealed. Tighten axle housing bolts.
Shifting lever improperly positioned	Determine if finger of shifting lever is correct for the unit and is correctly installed. Make sure shift lever housing has the required gasket.
Shifting keys broken or damaged	Replace keys and check unit for additional damage.
Shifting washers in backwards	Chamfered side on the inside diameter of the washer must face the tips of the keys.
Shifter/Brake shaft keyways damaged	Remove nicks and burrs from keyway.
Shift lever housing misaligned to case	Check if alignment marks on unit are correctly positioned. Also, determine if bend on shaft is in correct position.
Equipment clutch not engaging	Adjust clutch according to the operator manual of the equipment.
Shifter stop assembled backwards	Determine that the notch in the shifter STOP aligns with shifter forks in the NEUTRAL position.
Shift gear chamfer is positioned on the wrong side	Check that bevels on shifter gears are correct (fork flanges should be toward each other). On three-gear cluster models, the small gear and medium gear chamfers go down toward the larger gear. In-line models have the chamfer side of the gear facing toward the brake disc.
Improper fit of case to cover	Recheck positioning of thrust washers. A misplacement or omission of a washer can cause binding. Be sure that all tabs are down in the corresponding notches located in the case.
Dowel pins not installed	Check the exploded view for a correct assembly of parts.
Gears improperly installed	Check the exploded view for a correct assembly of parts.
Input shaft not properly installed	Input shaft spline must fit into the gear squarely and be tapped completely into the case.
Differential installed improperly	Re-check the positioning of the bolts in the differential. It must be opposite the output shaft gear (except 2400). In-line shift models need to have the differential gears centered so they will spin freely in the case with the cover removed.
Seal retainers improperly positioned	Check that seals are correctly installed.

TROUBLESHOOTING TABLE (Continued)

PROBLEM	REMEDY
UNIT JUMPS OUT OF GEAR	
Gear teeth are worn beyond tolerances	Replace worn gears.
Spring in shifter fork weak or broken	Replace spring.
Attaching screws for shift lever and housing assembly not properly torqued	Torque screws to 10 ft. lbs. (13.6 Nm).
Shifter/Brake shaft improperly assembled	Reassemble properly per exploded view
Keys weak or worn, shift gears damaged	Replace keys/Shift gears.
Shift lever bent and hitting unit frame	Replace shift lever.
Shift rod grooves worn	Replace shift rods.
Shift rod of improper length or grooving installed	Check rod length. Replace with correct part.
Constant mesh gears improperly installed on counter shaft	Reposition gears.
AXLES CANNOT BE TURNED (IN THE SAME DIRECTION) WITH UNIT IN NEUTRAL	
Axle housing not installed (or not tightened)	Seal retainers are not properly seated. Tighten axle housing bolts.
Burrs on gearing	Remove gear and debur with a sharpening stone.
Broken shifter stop allowing unit to be shifted into two speeds at the same time	Replace snap rings on shift rod out of groove.
Thrust washers in wrong position	Recheck thrust washer and if wrong, reposition.
Bearings not pressed in deep enough	Use the proper bearing tool to seat the bearing.
UNIT DOES NOT DRIVE	
Differential bevel gears broken	Replace.
Three gear cluster countershaft key sheared in Model 600	Replace.
Stripped teeth on gears	Replace.
Keys sheared in drive pulleys	Replace.
Broken input gear	Replace.
Shift keys broken	Replace keys/check keyways and shift gears.
Reverse chain broken (reverse only unless chain becomes wedged)	Replace chain.
UNIT IS NOISY	
Gearing is overly noisy chatter, etc.	Check oil/grease level.
Metallic pieces or other foreign objects in unit	Remove bits of broken metal, loose washers, etc.
Worn gears	Remove and replace with new gears.
Worn bearings, mainly input shaft ball bearing	Replace the bearing in question/check the belt tension.

CHAPTER 2. 300 SERIES

GENERAL INFORMATION

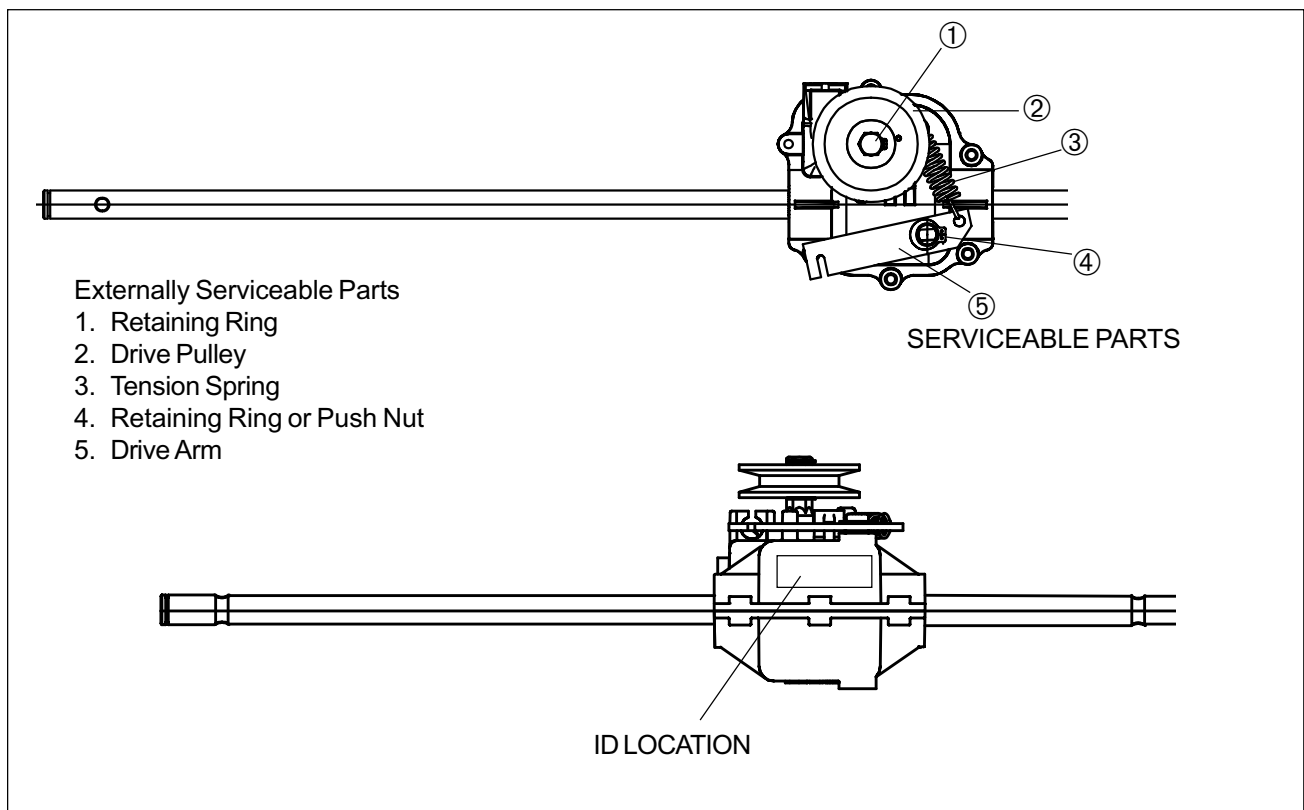
The 301 series is a single speed transmission manufactured in various styles to meet customer application needs. The unit uses synthetic lubrication and is completely sealed for life and therefore not internally serviceable.

Only the external parts listed below in the illustration are available from your normal source of supply.

Basic Troubleshooting

Should a drive problem exist, check the following:

1. Cable adjustment
2. Belt tension and mechanism
3. Drive lever operation
4. Check for worn or glazed belt or damaged pulley
5. Should the unit still not operate correctly replacement will be required.



CHAPTER 3. 600 SERIES TRANSAXLES

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

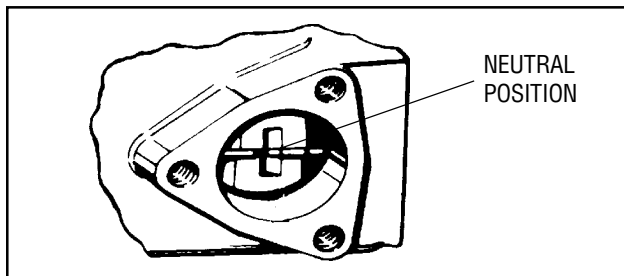
WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL INFORMATION

There are two types of 600 Series transaxles. One is the 600 standard series and 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 for information on 601 slow speed transaxle.

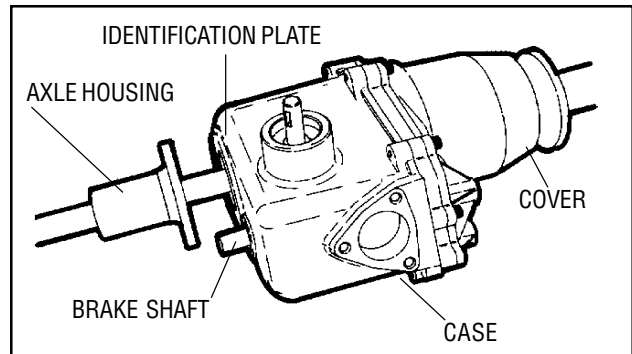
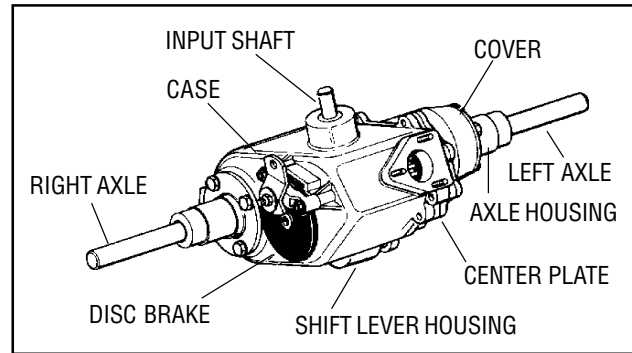
The 600 Series transaxle has an aluminum case and cover. The input shaft is on the top of the case to receive vertical shaft power from the engine. Some 600 series transaxles are equipped with an optional disc brake. Due to the many variations of equipment braking systems, adjustments and repair to these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

TRANSAXLE DISASSEMBLY

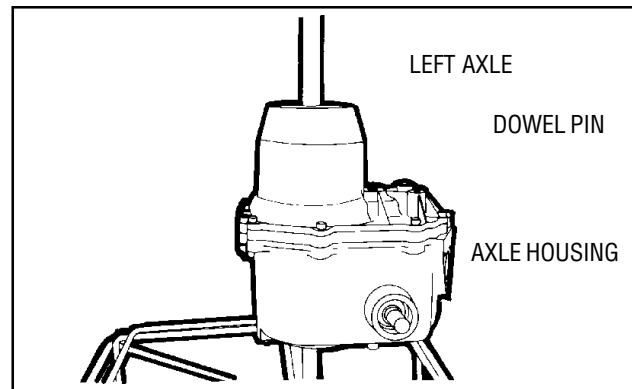


1. Clean the outside surface of the transaxle in an area away from where service will take place. Position the shift lever in the neutral position to ease disassembly of the transaxle. Remove the three screws holding the shift lever. Remove all keys from key ways, and remove all burrs and dirt from the shafts.

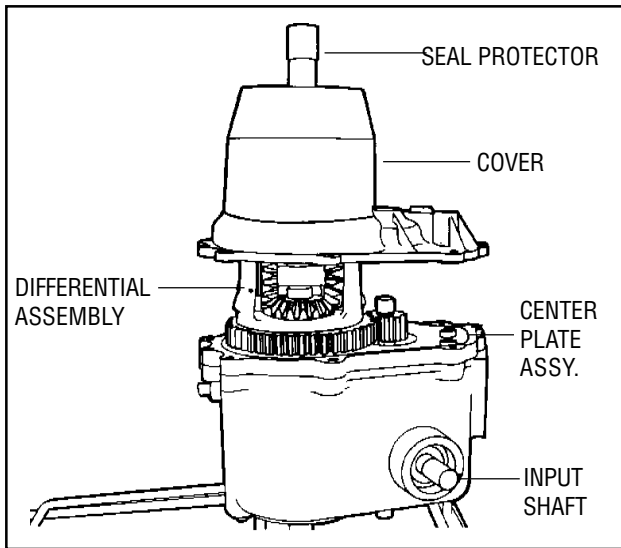
On hardened shafts, use a stone or crocus cloth to remove any burrs and oxidation. All seals should be replaced whenever a shaft is pulled through a seal. Always use a new gasket whenever the gasket surfaces have been separated.



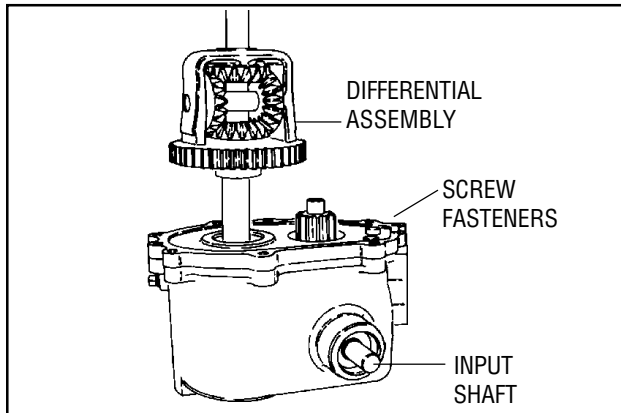
2. After removing axle housings bench or clamp the transaxle in a soft jaw vise. Position the transaxle so that the socket head cap screws are facing up.



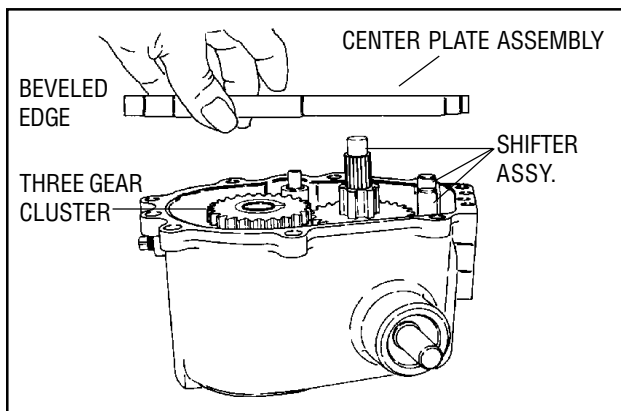
3. Remove the socket head cap screws holding the case and cover together. Drive out the dowel pins used for aligning the case and cover.



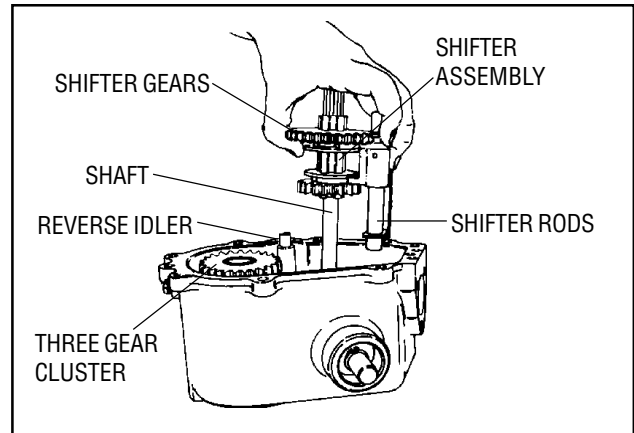
4. Use a seal protector on the axle shaft and lift off the transaxle cover assembly. Because this seal is the single lip style, it may be reused if care is taken to see that it isn't cut or scratched.



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



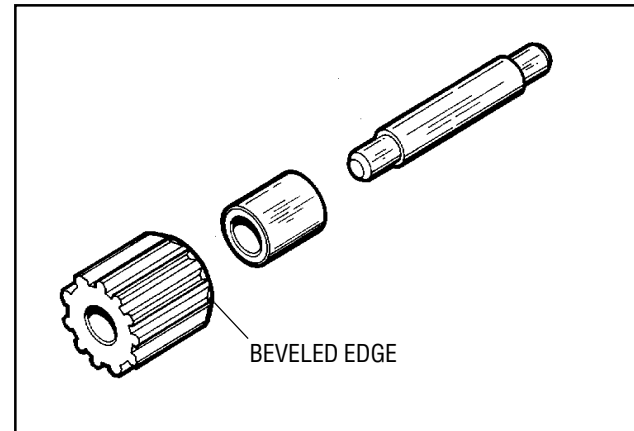
6. After removing the center plate assembly screws, remove center plate and discard the gasket.



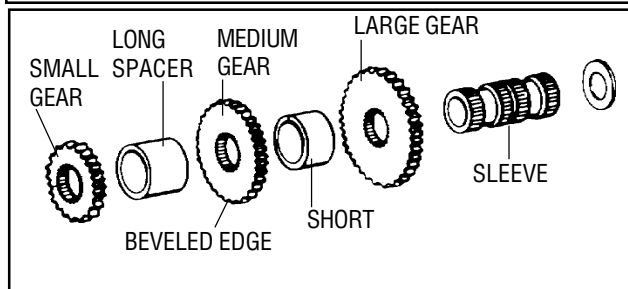
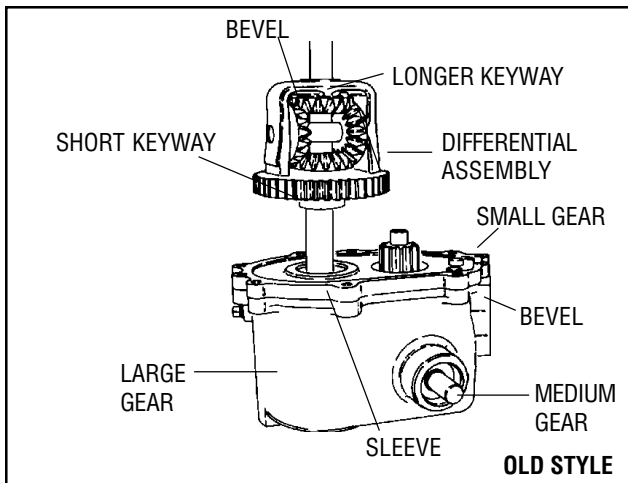
7. Remove the complete shifter assembly by grasping the shifting gears, shaft and both shifter rods as a complete unit.

NOTE

Examine the assembly carefully; if no service is required, keep the assembly together as a unit. If service is necessary refer to Chapter 21 on shifting assemblies.

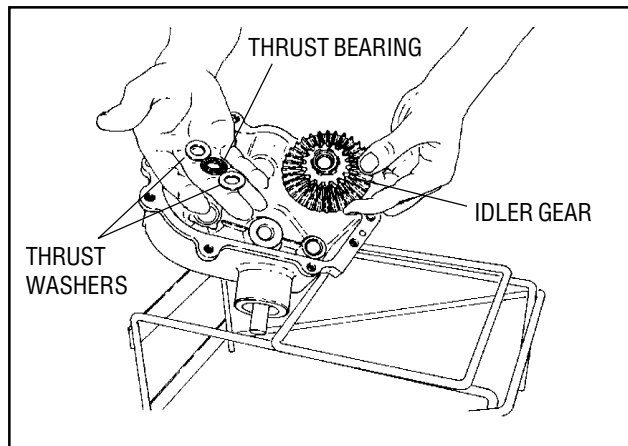


8. Remove the reverse idler shaft, spacer and gear.
9. Remove the cluster gear sub assembly and thrust washer.

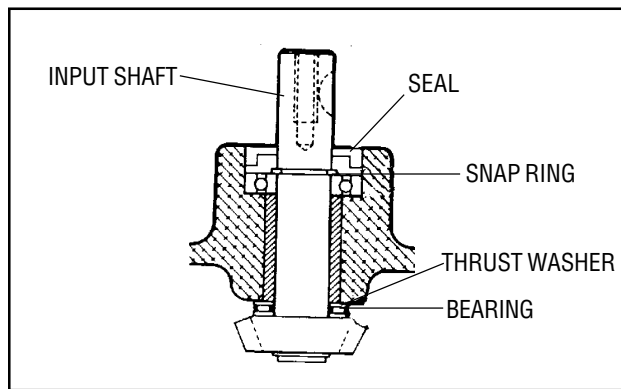


10. Cluster Gear Sub-Assembly

- a. The cluster gear can be disassembled. All worn gears are replaceable if damaged or worn. It's preferred to use a press to drive the shaft out squarely.
- b. The small and medium gears' bevel faces down. There is no beveled edge on the large gear. The shorter spacer fits between the medium and the large gear.
- c. Key edge ends must align with shaft ends.



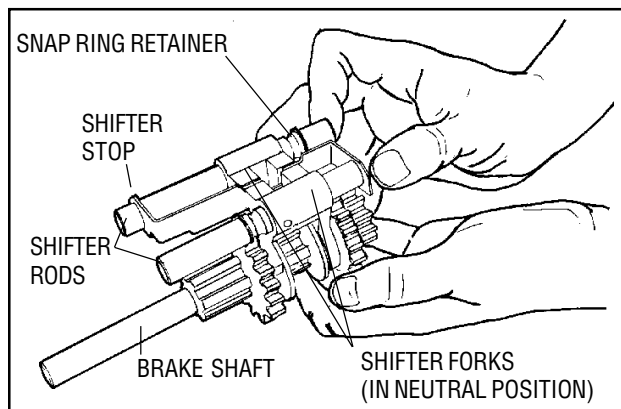
11. Remove the idler gear, thrust washers and thrust bearing.



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

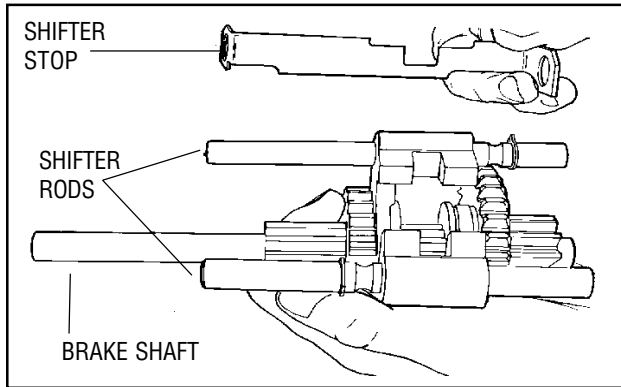
NOTE

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

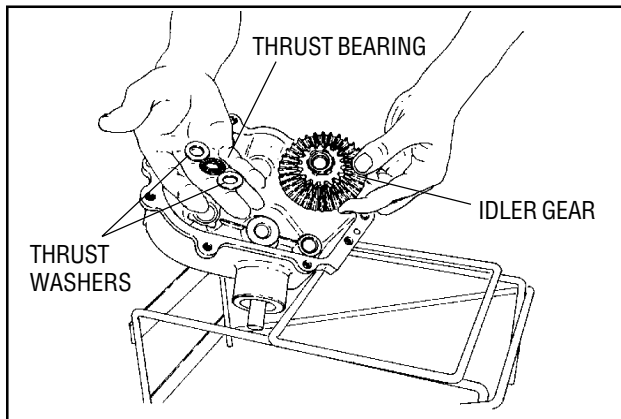
The shifting assembly is usually removed from and installed into the transaxle as a unit. The assembly is removed and replaced by grasping the shifting rods firmly. This will cause the binding necessary to hold the assembly together. Before removal or installation of the shifting assembly, the notches in the shifter forks should be aligned with those on the shifter stop.



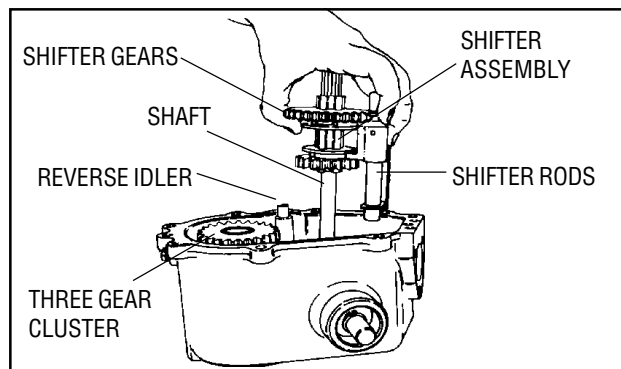
This alignment indicates the shifting assembly is in a neutral position. The shifter stop must be positioned so the notch aligns with the notches in the shifter forks. For service of the shifting assembly, refer to Chapter 9.

Transaxle Assembly

1. Install new seal, thrust washers, and bearing on input shaft. Note sequence, and install into case, using a seal protector.
2. 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.

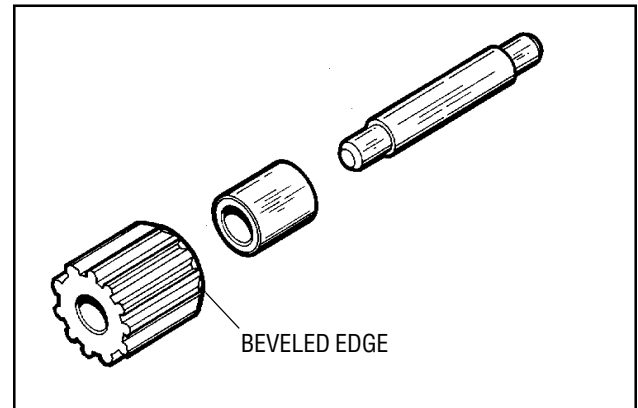


CAUTION Make sure the bearing and thrust washers remain in place while assembling the idler gear, shifter and brake shaft.

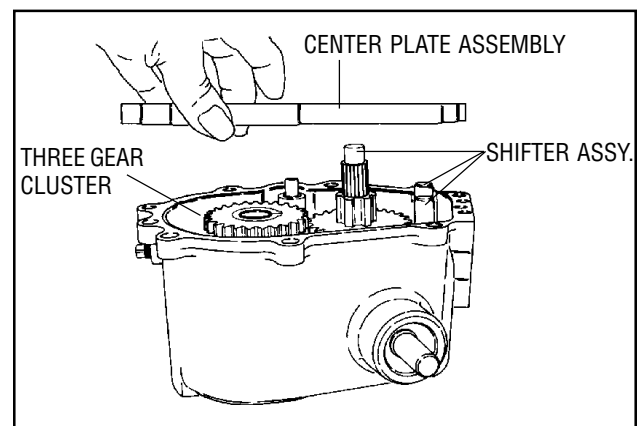


3. Insert the washer and then the three gear cluster assembly. Make sure the bevels on the two shifting gears are facing down.

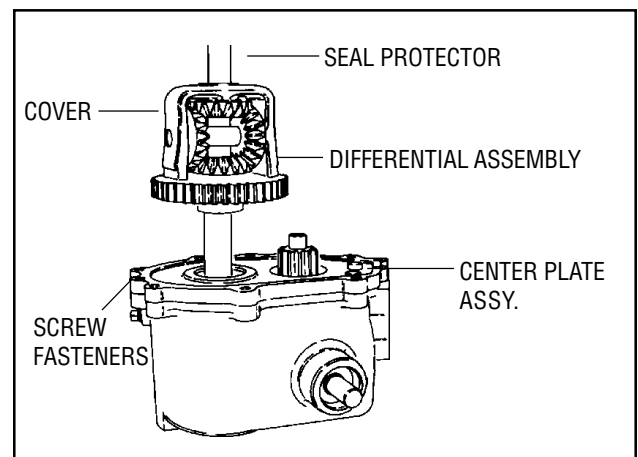
4. Insert the shifter assembly. Check that the shifter rods are seated properly.



5. Install the reverse idler. Make sure the beveled edge is up. Place the spacer on top of the gear.

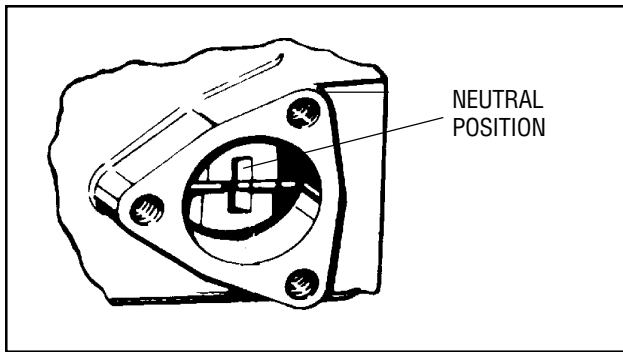


6. Install the dowel pins to ease the cover installation. Then place a new gasket on the case and install the center plate. Position the differential assembly with the longer axle in the down position and be sure the gear on the shifter shaft is installed.

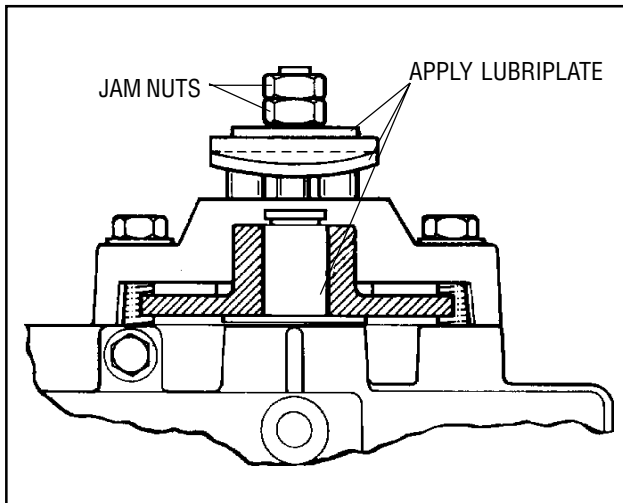


7. Install the cover assembly and torque the cap screws to 7-9 ft. lbs. / 84-108 in. lbs. (9.5-12.2 Nm).
8. If the unit needs bearings or bushings installed, consult Chapter 22 for proper procedures.

9. Install the axle supports and fill with 24 oz. (710 ml) of S.A.E. 80W90 part number 730229B gear lube. Fill through the shifter housing.



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



11. The brake lever type is determined by the original equipment manufacturer's selection of this option. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flat washer, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. To secure the brake lever, hold the bottom nut and torque top nut to 100 in. lbs. (10.2-11.3 Nm).

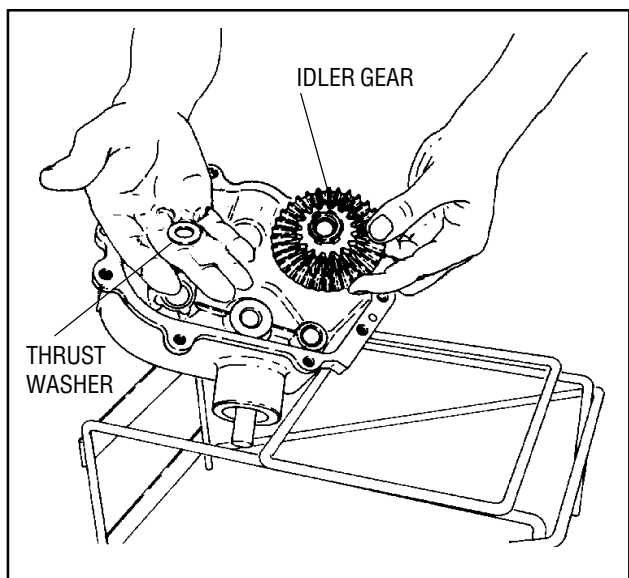
The brake and linkages may vary.

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

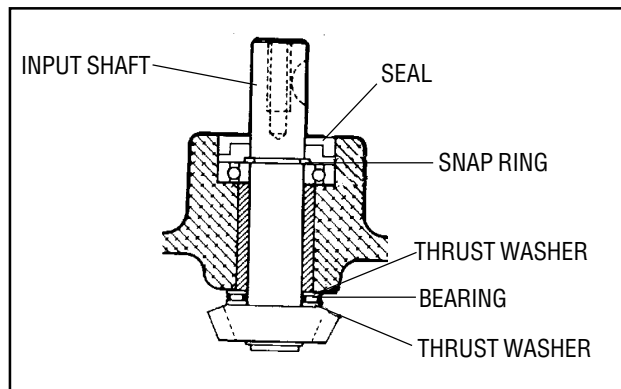
601 SLOW SPEED TRANSAXLE

GENERAL INFORMATION

The 601 slow speed series uses the same case and cover as the 600 series so the appearance is the same. The following differences are as listed in three steps.



1. Under the idler gear is one washer instead of a thrust bearing and two thrust washers. The 601 idler gear is different than the standard 600 Series.



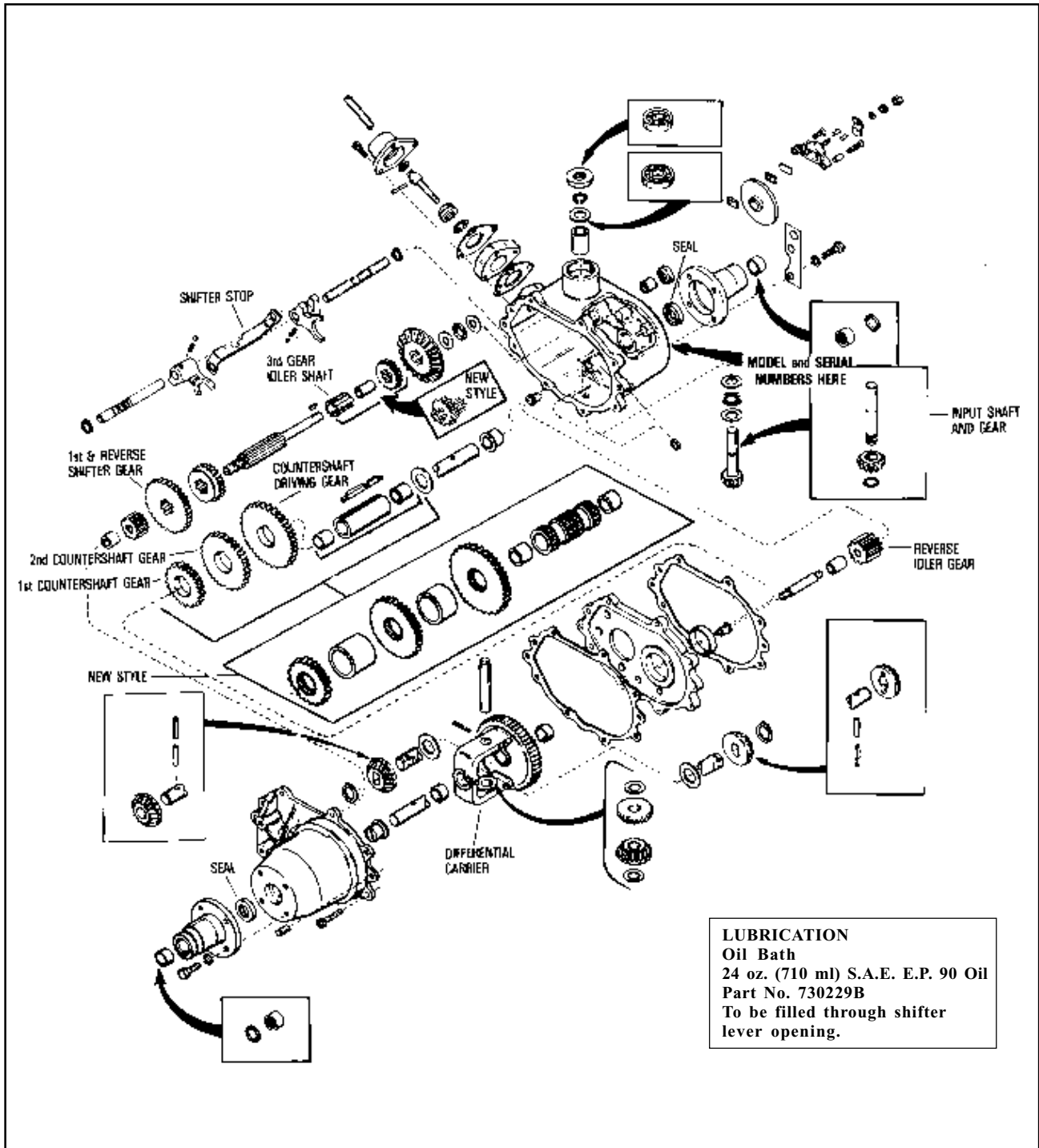
2. The input shaft only has one thrust washer instead of a thrust bearing and two thrust washers.
3. The 601 also has a different input shaft and bevel gear than the 600 transaxle.

600 SERIES BEARING TOOLS

PART LOCATION	TOOL REMOVE & REPLACE	BEARING SIZER
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.

600 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 4. 700 SERIES TRANSMISSION

IN-LINE SHIFT

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

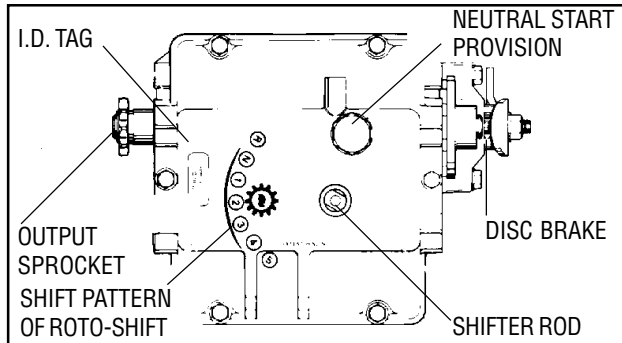
⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL INFORMATION

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

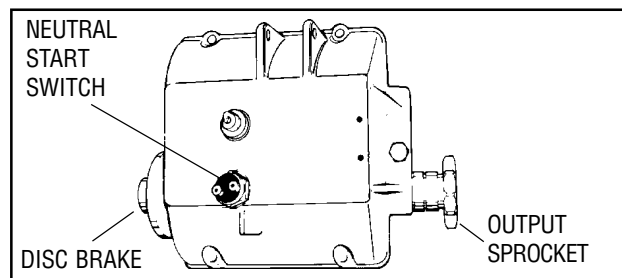
The two speed version is not covered here but can be disassembled and reassembled using the same information for the 700 described in this section.



Optional features include right or left hand output and a disk brake, for either in-line or "H" pattern unit.

NOTE

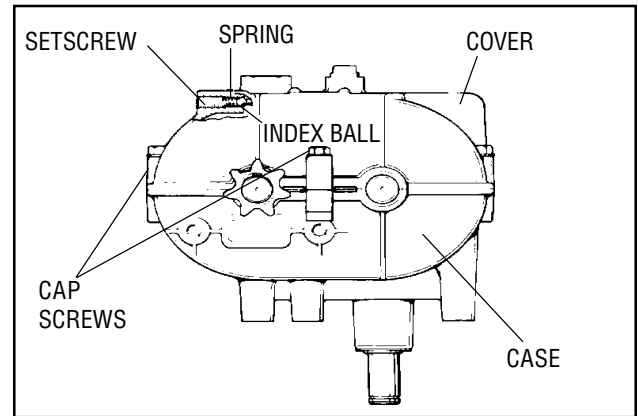
Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.



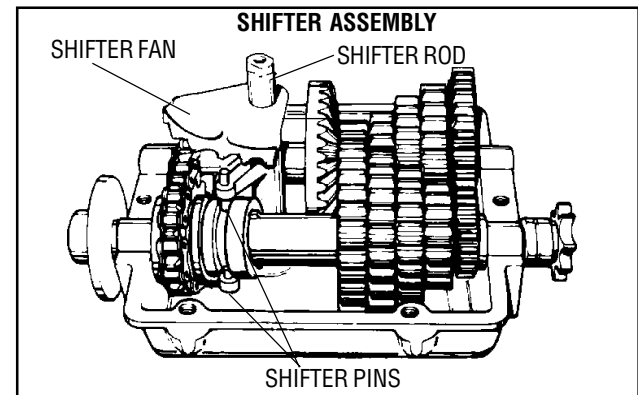
DISASSEMBLY OF TRANSMISSION

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

1. If the unit has the OEM option of a neutral start switch, remove the switch.
2. Remove setscrew, spring and index ball from the transmission cover and six cap screws that fasten the cover to the case.
3. Remove cover. Remove shifter assembly (includes shafts, pins and fan from transmission by lifting shaft out of case.

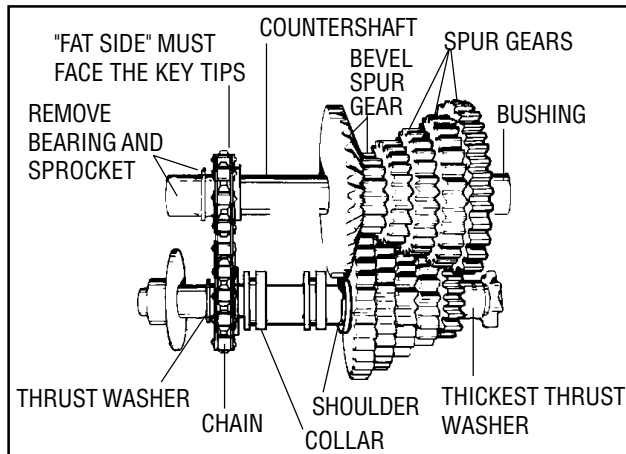


4. Remove gear and shaft assemblies from the case lifting the two shaft assemblies together taking care not to separate the drive chain and sprocket relationship. Take note that the "fat" side of the sprockets must face the tips of the keys.

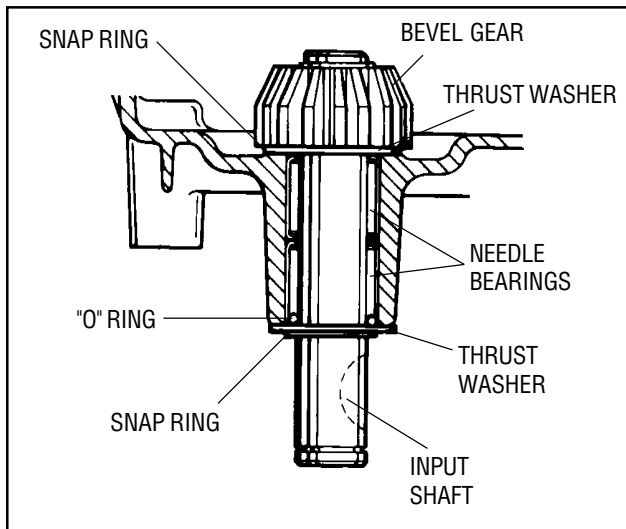


- Remove the one-piece bevel spur combination gear and the remaining splined spur gears from the countershaft.
- Remove from the shifter/brakeshaft the output sprocket, brake disc, all bushings, shifter spur gears, sprocket, collar, keys and chamfered washers. Note the inside chamfer on the shift washers face the tips of the keys to compress them and provide ease in shifting.

CAUTION Use approved safety procedures with equipment when handling shifter/brakeshaft parts. These parts have extremely sharp edges. Inadequate safety precautions could result in equipment damage and serious injury.



- Remove the snap ring from the input shaft; remove bevel gear and pull shaft through case.
- Input shaft needle bearings should be installed flush to .005" (.127 mm) below bearing bore surfaces from inside and outside the case.



INSPECTION AND REPAIR

Remove grease with rags and cleaning solvent and replace worn or damaged parts.

ASSEMBLY OF THE 700 SERIES IN-LINE TRANSMISSION

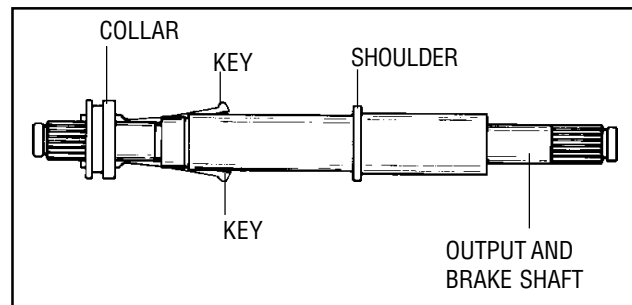
- Install and secure the input shaft and bevel gear in the case. Review paragraphs 7 & 8 and reverse the order.

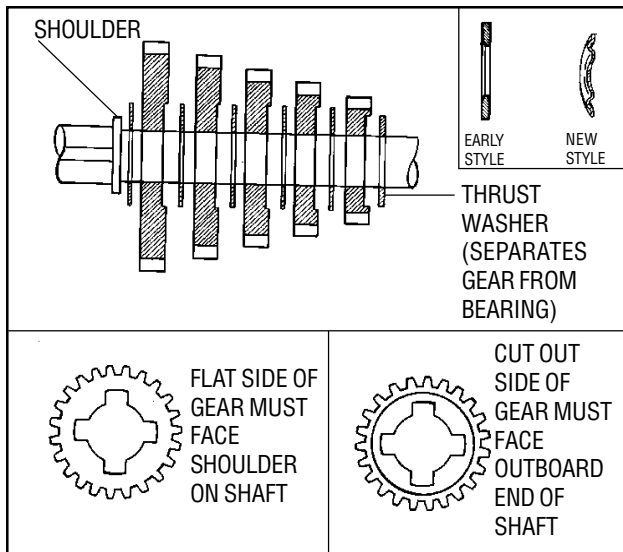
NOTE

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

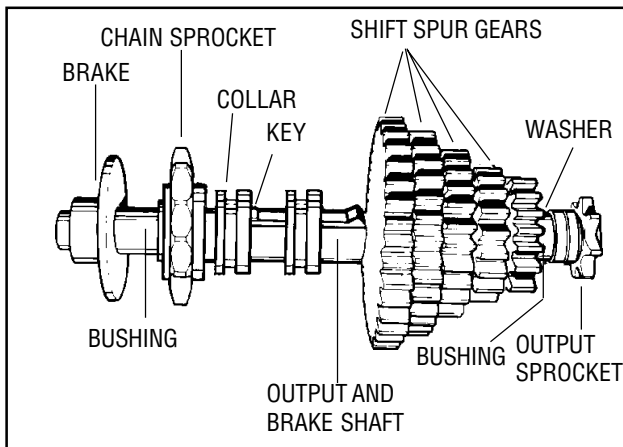
CHAMFERED SHIFT WASHERS. Many older models have a thrust washer with a 45° chamfer on the inside diameter. The latest style washer has a curved or rounded side. The purpose of the washers is to compress the shift keys as they slide into a gear. Therefore, the chamfered or rounded side of these washers must face the shoulder of the shaft or towards the tips of the shift keys. The washers are interchangeable.

SHIFT GEARS. One side of the gear is flat and the other side is chamfered or recessed. The flat side of the gear is placed onto the shaft towards the shoulder of the shaft or towards the shift keys.

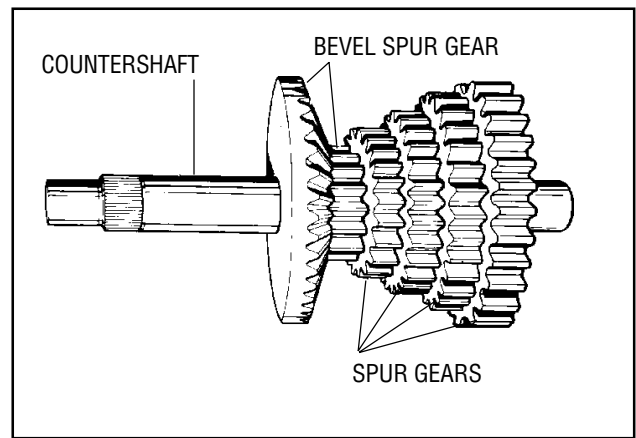




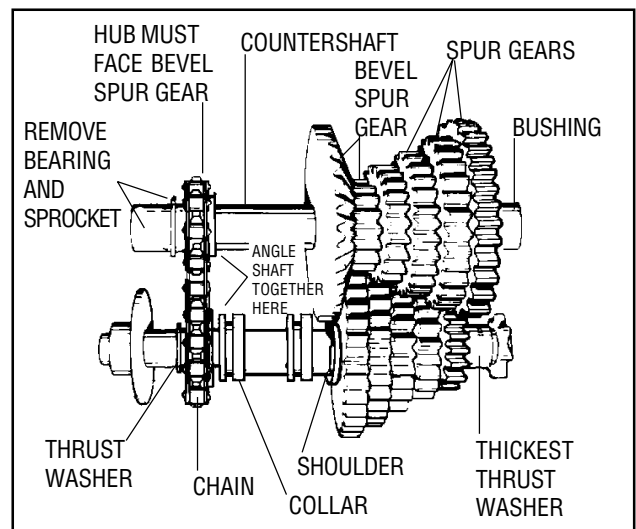
- Starting from the output sprocket end on the shifter/brake shaft, install a chamfered washer with the chamfer facing the shoulder on the shaft. With the output sprocket end down, place the shaft vertically in a vice with protective jaws and slide the collar and keys downward toward the shoulder and through the chamfered washer. Remember the "fat" side of the shift collar **MUST** face the key tips. **Use work gloves as the keyways on the shifter/brake shaft are extremely sharp.**



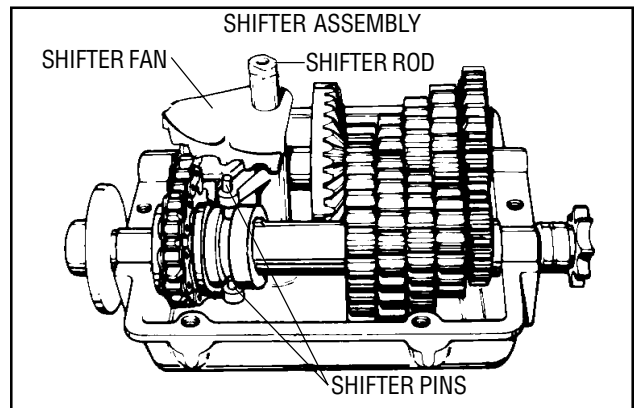
- Install the largest gear (first gear) with the chamfered end facing away from the key tips so that the flat side of the gear contacts the flat side of the chamfered washer. Remember the order as chamfer to chamfer and flat to flat when assembling the gears on the shifter brake/shaft. Install another chamfered washer noting that the chamfered side makes contact with the chamfered side of first gear. Install second gear and all remaining gears and washers the same way. The number of gears and/or spacers will be determined by the number of speeds requested by the OEM.
- Install the splined bevel spur gear first (with the bevel facing away from the shifter rod) and remaining splined spur gears starting with the smallest to the largest on the counter shaft as shown.



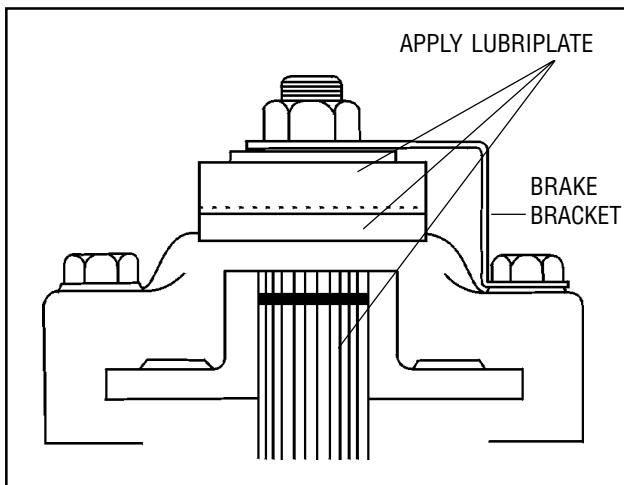
- Install the chain over the two shafts making sure that the collars of both sprockets face inward toward the tips of the keys.
- Install the appropriate protection washers on sprocket ends and bronze oil light bushings



- Install shifter assembly (shaft, pins and fan) 12 oz. (355 ml) of Bentonite grease around the gearing, and reinstall the cover to the case. Torque cap screws 90-110 in. lbs. (10.2 - 12.5 Nm).



8. For in-line transmissions, install the detent ball, spring and setscrew, in that order, into the cover. Slowly tighten the screw to flush, then one full turn below flush. The deeper you turn in the set screw the more tension will be on the shifter fan which will make the gear positions feel more deliberate to the operator.

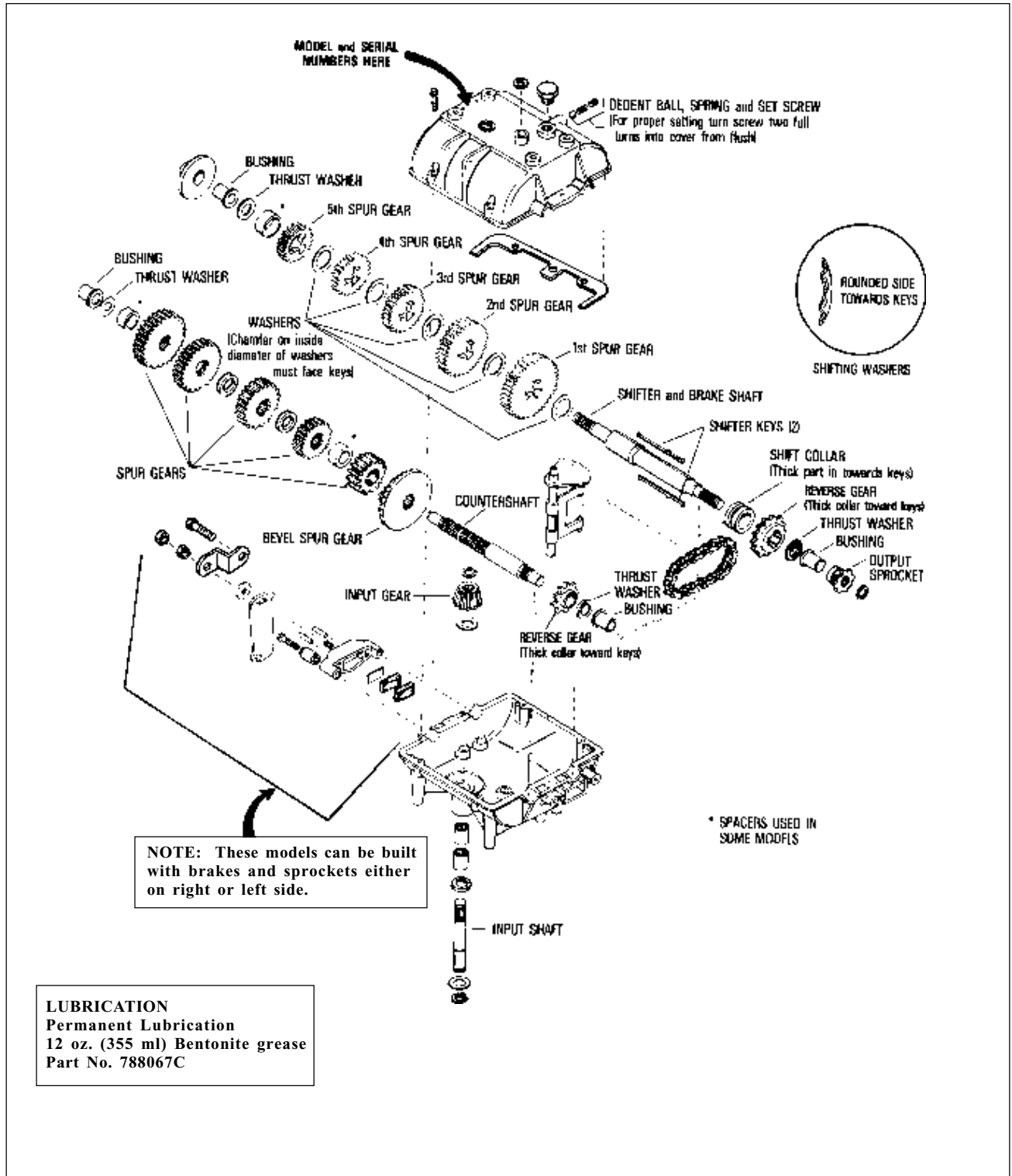


9. Check for binding by turning the input shaft. Install transmission on equipment. Install brake and linkage, and adjust to disengage when clutch is engaged. Consult equipment Owner's Manual.
10. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install the brake assembly.

The brake and linkages may vary.

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

700 SERIES TRANSMISSION



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

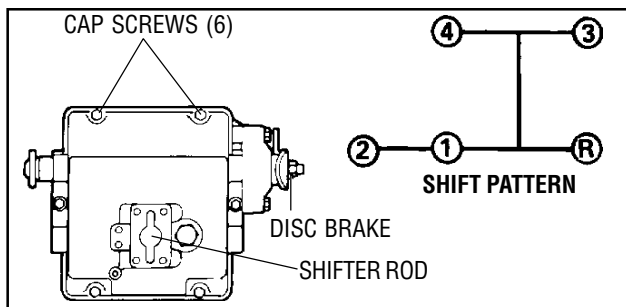
700H SERIES TRANSMISSIONS

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

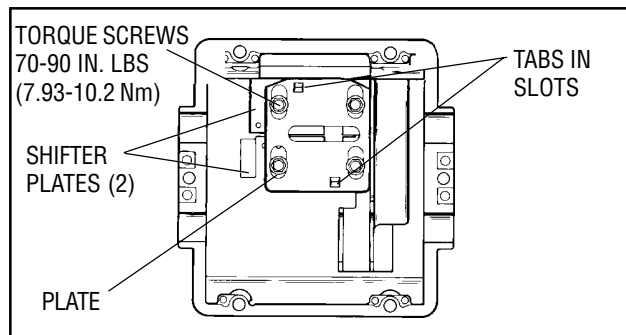
WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

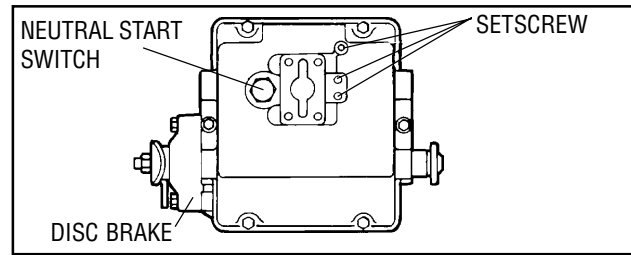
WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.



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



The 700 "H" pattern transmission gear arrangement is similar to the in-line transmission except for the shift gate and an additional collar and spacer on the shifter/brake shaft. The countershaft also has an additional spacer.



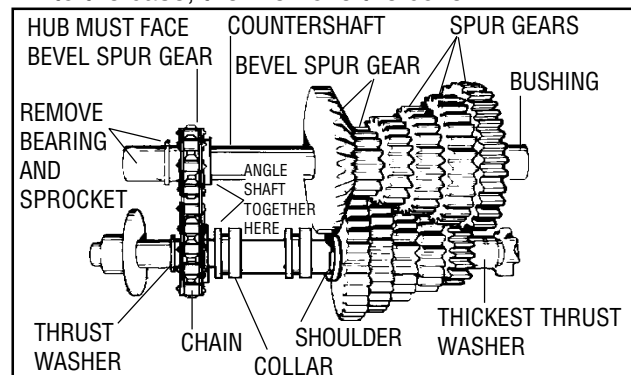
If installed, remove the neutral start switch. This can be an option to the OEM.

NOTE

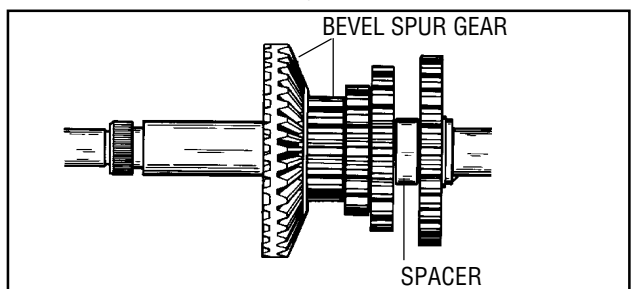
Due to the many variations of equipment braking systems, adjustments and repair to these components and linkages are not considered warranty.

DISASSEMBLY OF THE TRANSMISSION

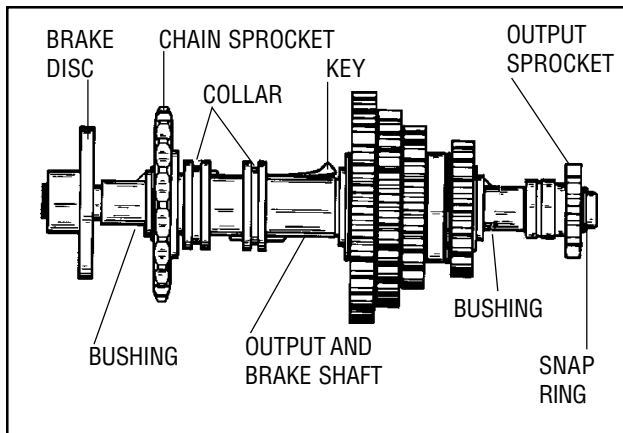
1. Clean the outside of the transmission and position the shift lever in the neutral position as indicated by the shift pattern.
2. Remove the shift lever by removing the four hex screws on the shift lever cover.
3. With a 3/32 inch Allen wrench, remove the set screw, spring and detent ball.
4. Remove the six cap screws that fasten the cover to the case; then remove the cover.



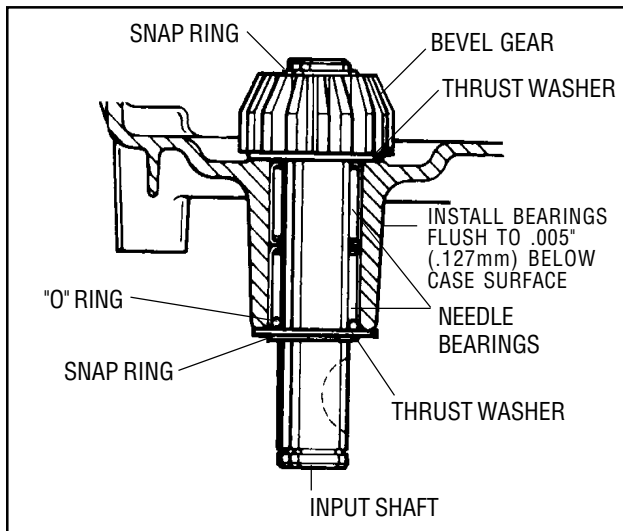
5. Remove the gear shaft assemblies from the case half of the transmission by lifting the two shafts out of the bearing supports taking care not to disturb the drive chain relationship of the sprockets.
6. Angle the chain and sprocket ends of shaft toward each other, removing the bearing and sprocket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



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



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



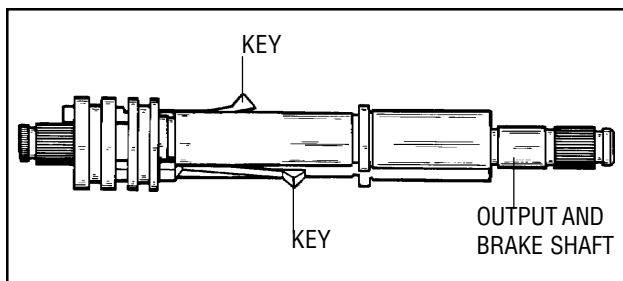
Input shaft removal is the same for both the 700 series in-line and "H" shift pattern transmissions.

7. Remove the snap ring and bevel gear from the input shaft and pull the shaft through the case.
8. The input shaft needle bearings should be installed flush or no more than .005" (.127 mm) below the bearing bore surface from inside and outside the case.

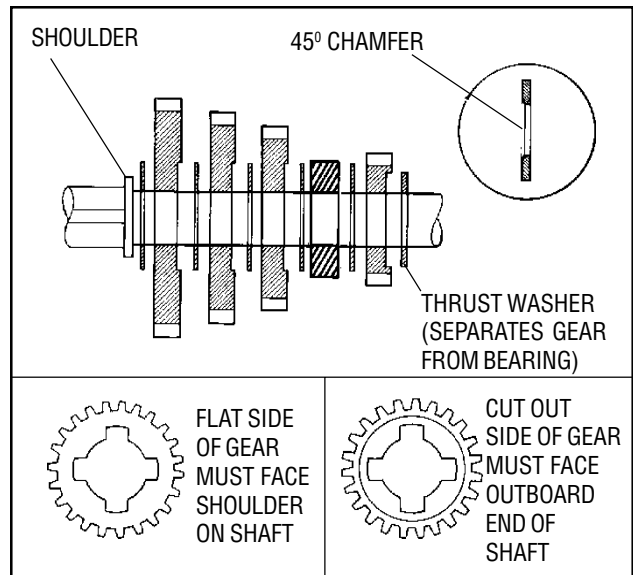
INSPECTION AND REPAIR

Examine all parts after removing grease with rags and cleaning solvent to determine which parts need replacement.

ASSEMBLY OF 700H SERIES TRANSMISSION

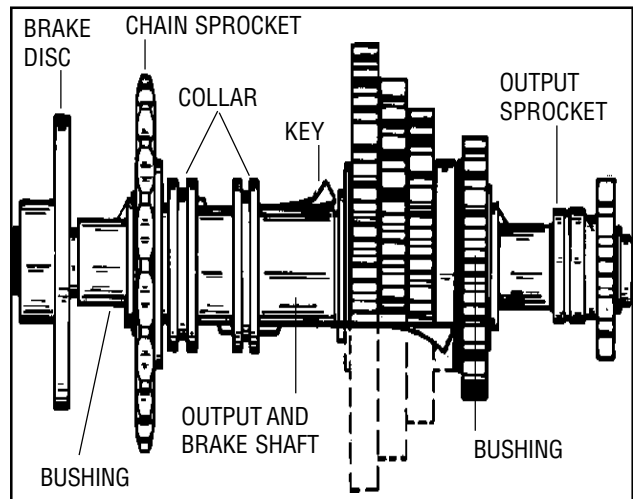


Assembly is the same as the 700 series in-line transmission except for an additional collar and spacer.

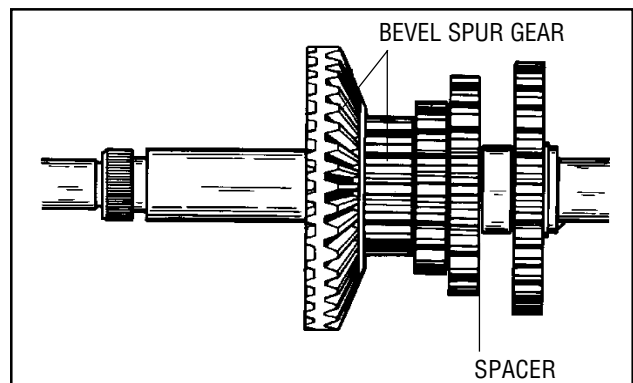


NOTE

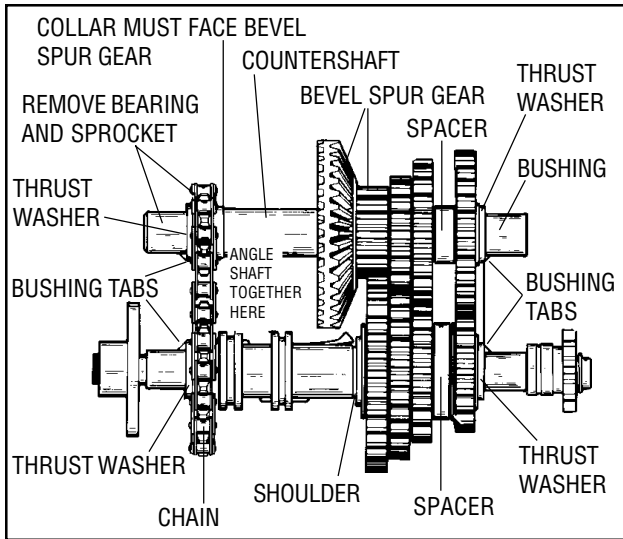
The thrust washer on the brake disc end of the shifter/brake shaft does not have a chamfer on the inside diameter and must be positioned as shown above. It is thicker than the other thrust washers separating the gear works from the bearings.



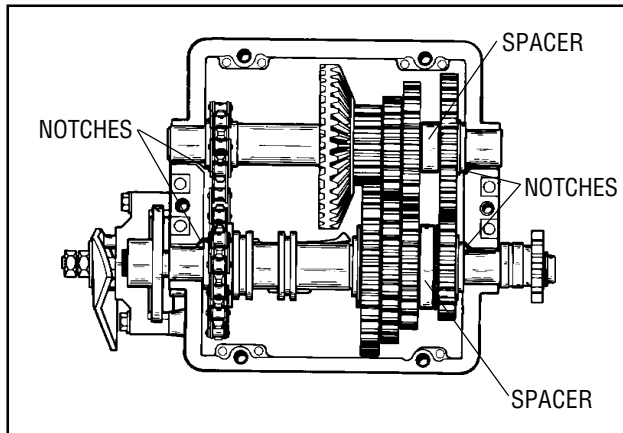
1. The first, second and third gears have to be forced over the keys when assembling. Remember to place the spacer in the 4th gear position.



2. Assemble the countershaft and gears as shown above remembering the spacer is in the 4th gear position.

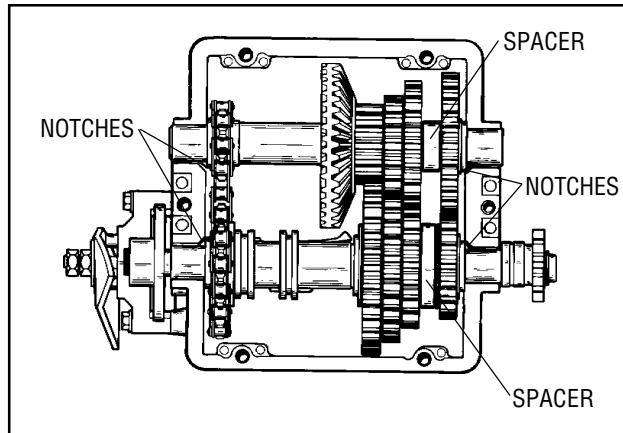


3. With the collar on the countershaft sprocket facing the bevel spur gear, install sprocket onto the serration and install chain. Install all four (4) thrust washers.

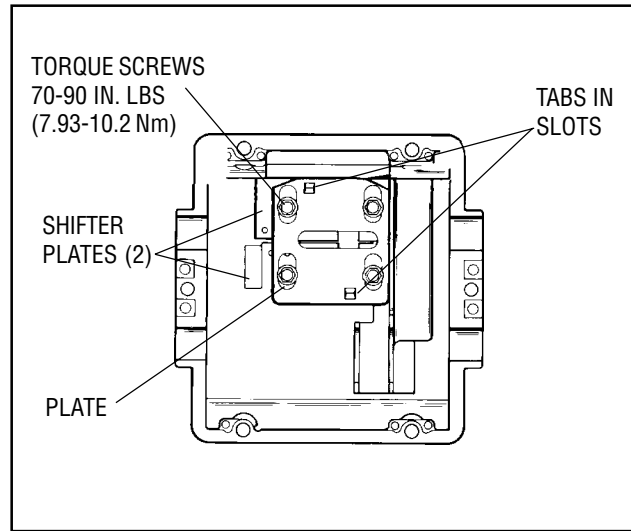


4. Install the bronze bushings, disc and sprocket. Install the shaft assemblies into the case pressing the bushing tabs into the notches in the case.

CAUTION Be sure bushings tabs are seated in transmission case, or the cover won't sit squarely on the case.

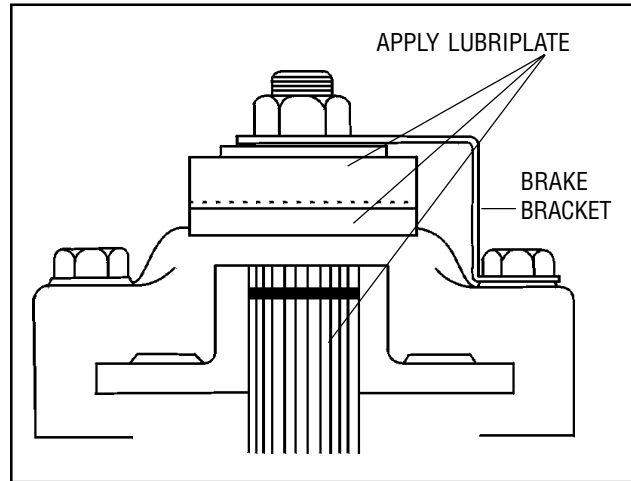


5. Install the shifter assembly, 12 oz. (355 ml) of Bentonite grease around the gearing, installing the cover on the case. Torque the cover fasteners 90-110 in. lbs. (10.2-12.5 Nm).



6. For in-line transmissions, install the detent ball, spring, and setscrew, in that order, into the cover and slowly tighten the screw up to two turns below flush. Depending on personal preference. The deeper you turn in the set screw the more tension will be on the shifter fan which will make the gear positions feel more deliberate to the operator.

7. Check for binding by turning the input shaft. Install the transmission on the equipment. Install the brake and linkage and adjust the clutch according to the equipment Owner's Manual.

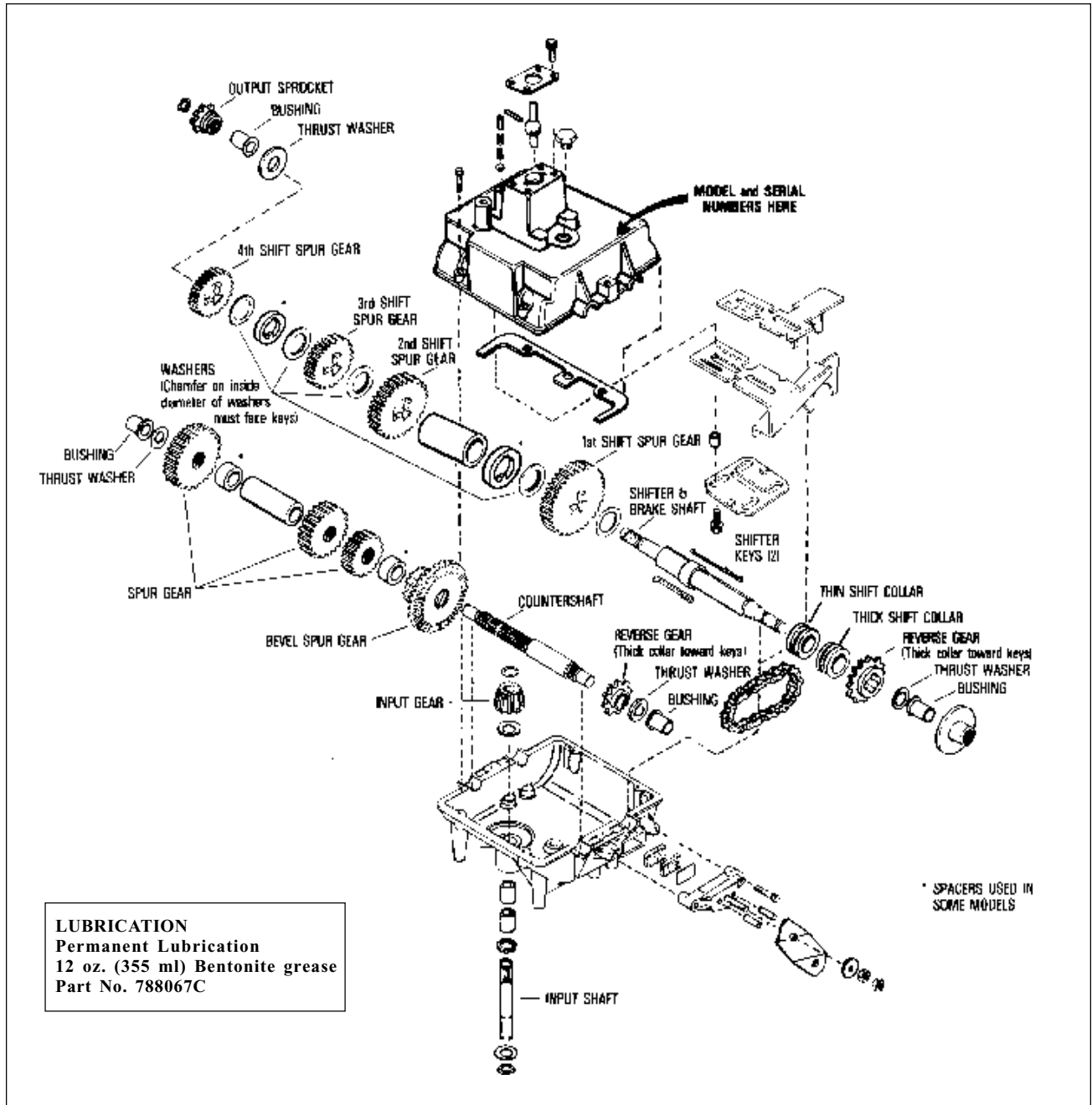


8. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil.

The brake and linkages may vary.

WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

700H SERIES TRANSMISSION



LUBRICATION
 Permanent Lubrication
 12 oz. (355 ml) Bentonite grease
 Part No. 788067C

The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 5. 800/801 SERIES TRANSAXLES

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

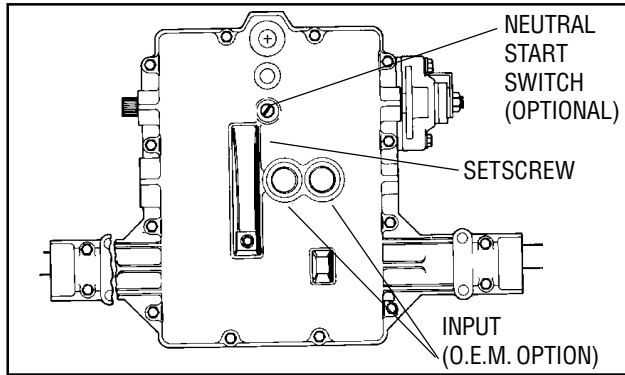
WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

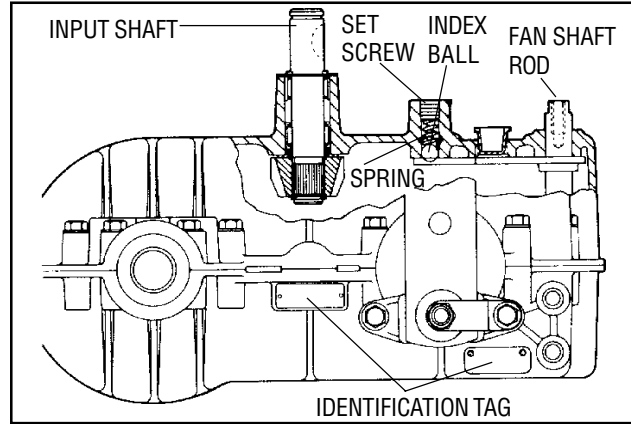
GENERAL INFORMATION

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.



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 the input shaft and gear positioning on either side of the bevel gear, the axle output will vary, which allows the O.E.M. the ability to rotate and reverse mount the transaxle. The model described in this section is a five speed forward, single reverse. The input shaft for this model is located to the left of the bevel gear.

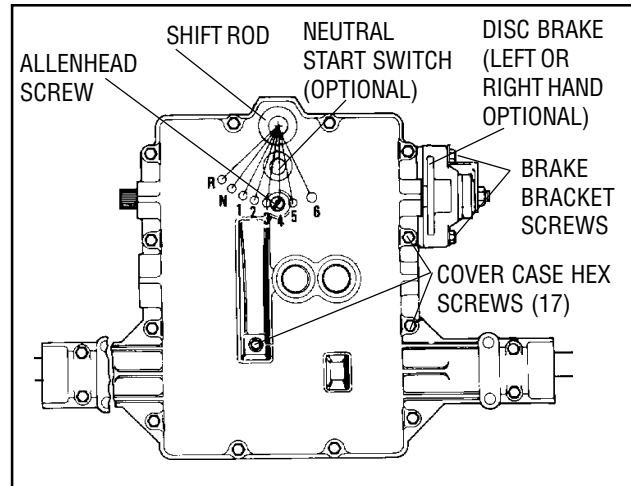


IDENTIFICATION

The unit model number will be found on a metal tag at either of the two locations.

DISASSEMBLY

1. Clean outside surface of the transaxle.
2. Position shift lever in the neutral position as indicated by the shift pattern.
3. If installed, (O.E.M. option) remove neutral start switch.
4. Remove the allenhead setscrew, the detent ball and spring .



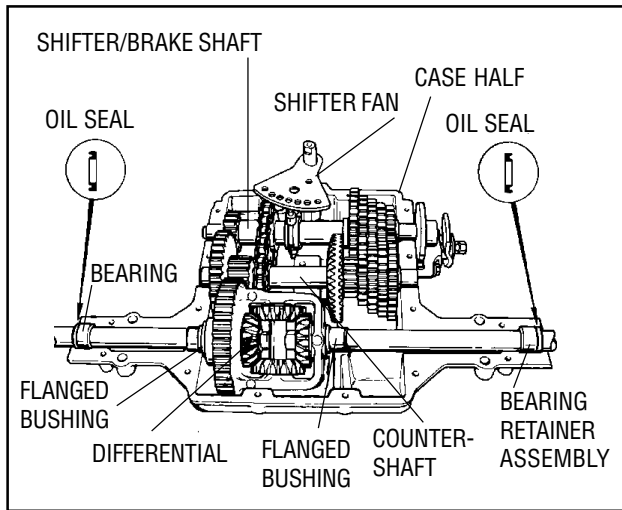
NOTE

Prior to removing the cover and the two gear shaft assemblies from the case, remove the square cut "O" ring from the top of the shifter rod.

5. Remove the case fasteners and push the shift rod through the cover. The shifting assembly may temporarily remain in the case.
6. Remove the two brake bracket screws, and remove the brake assembly.

NOTE

Before disassembly, observe how the "V" notches on the flanged bushings fit into the corresponding recess in the case.



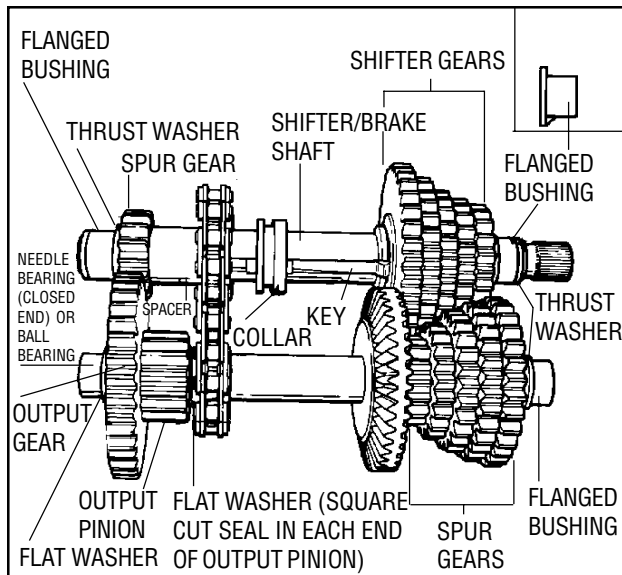
NOTE

The square cut black rubber "O" rings on the shifter brake shaft which retain the Bentonite grease in the case.

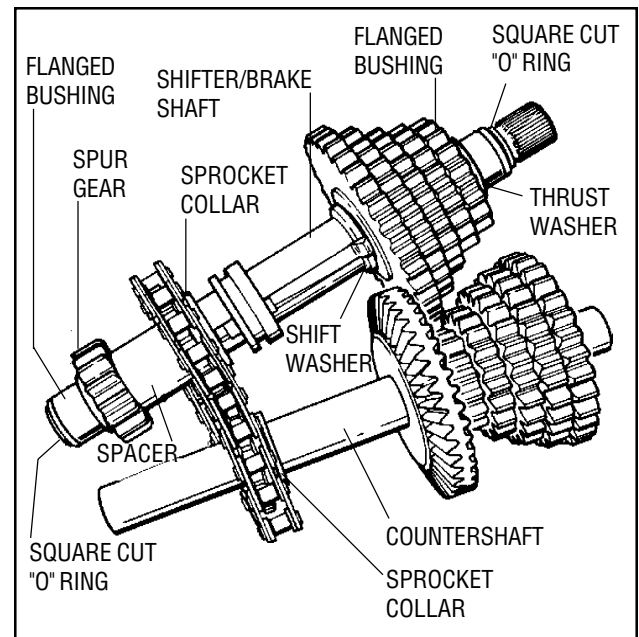
7. Remove gear and shaft assemblies from case half by lifting the two shafts out of the bearing supports taking care not to disturb drive chain relationship with the hubs on the sprockets.

NOTE

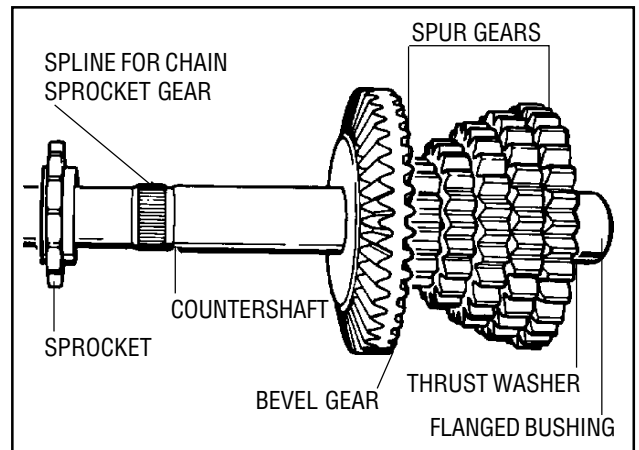
Remove the Bentonite grease from all parts and case halves as they are removed.



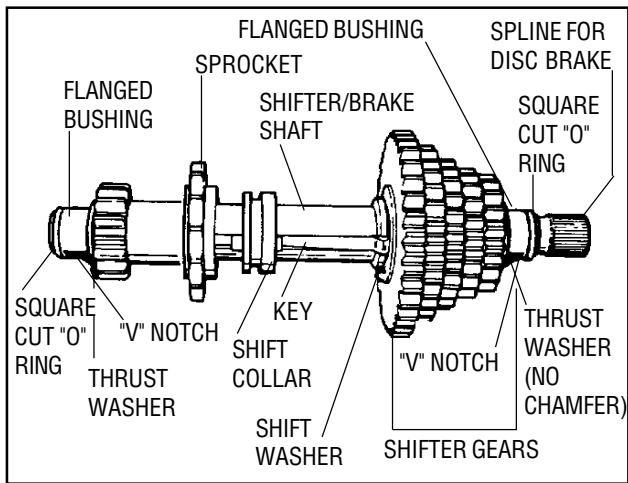
8. Remove the needle bearing (closed end) flat washers (2), output gear and output pinion, and 3 square cut seals from the countershaft. (2 seals in the output pinion 1 in the needle bearing cap). The "O" rings on the countershaft are larger than those on brake the shaft ends. Always replace with new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



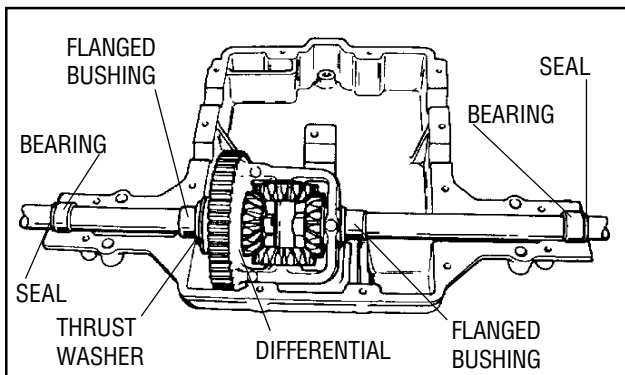
9. Angle the shifter/brake shaft and countershaft chain sprocket ends toward each other. Note the collar on the sprockets face the bevel gear. Next remove the chain.



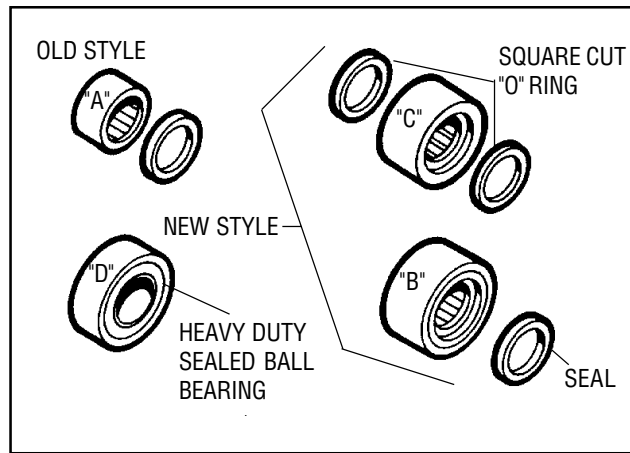
10. Remove the sprocket, bevel gear, spur gears, thrust washer, and flanged bushing. The spur gears are splined to the countershaft.



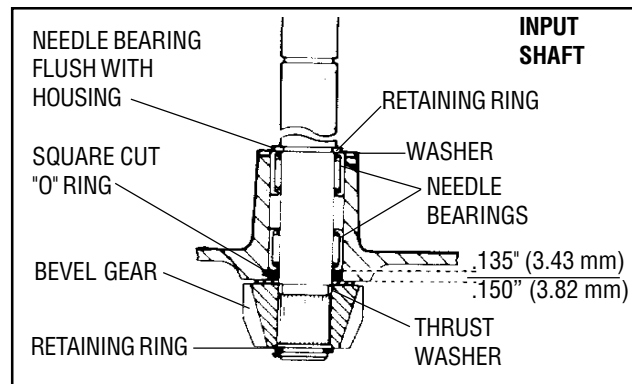
11. From the shifter/brake shaft remove the square cut seals (2), flanged bushings (2), thrust washers (2) on the shaft ends, spur gear, spacer, sprocket, shift collar with keys, thrust washers and the shifter gears.



12. Remove the differential from the case. Remove the (2) seals, needle bearings or ball bearings (2).



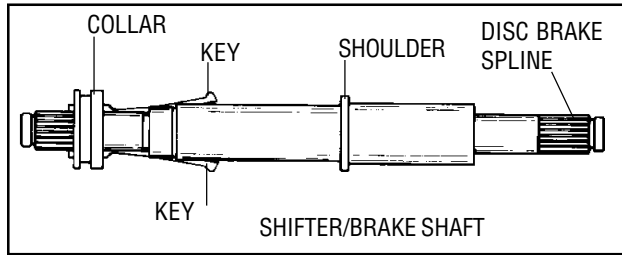
The 800 Series has used four styles of bearings on the axles. The earliest style "A" was a smaller caged needle bearing. Style "B" must have the seal to the outside of the bearing. When bearing style "C" is used, a square cut "O" ring must be used on each side of the bearing. Bearing style "D" is a sealed ball bearing used in heavy duty applications. Styles "B", "C" and "D" are interchangeable. All needle bearings must be repacked with grease. Never use Bentonite grease in ball or needle bearings; use wheel bearing grease.



13. To disassemble the input shaft remove the retaining ring on the bevel gear side from the input shaft; then remove the bevel gear and pull the shaft through the 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 the inboard side is installed .135" - .150" (3.43 - 3.82 mm) below flush.

ASSEMBLY

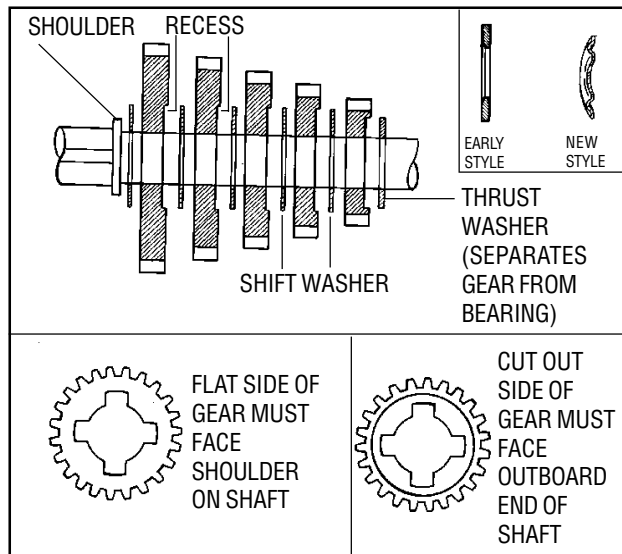
1. Apply E. P. grease between bearings and install and secure the input shaft and bevel gear in the cover. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.



2. Grease the keyways and slide the shift keys and collar onto the shifter/brakeshaft. The thick side of the shift collar **MUST** face the shoulder (brake end) on the shaft. Service replacement shifter/brake shafts will come with four keyways on the shaft instead of two.

NOTE

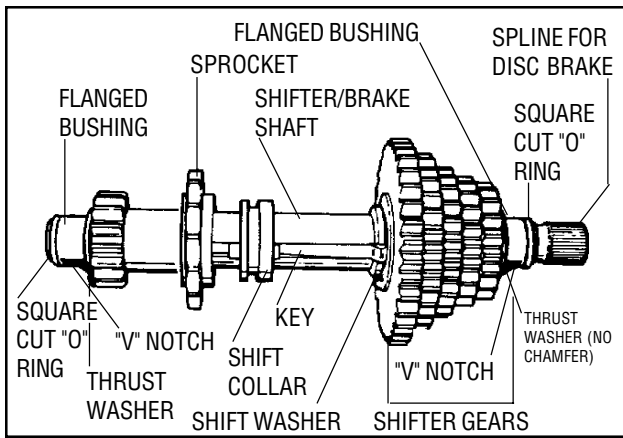
When repairing the unit use, the same number of keys that were used originally.



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 ordered by the O.E.M.

THRUST WASHERS. A running change has been made to the shift 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 shift 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 shift keys. The washers are interchangeable.

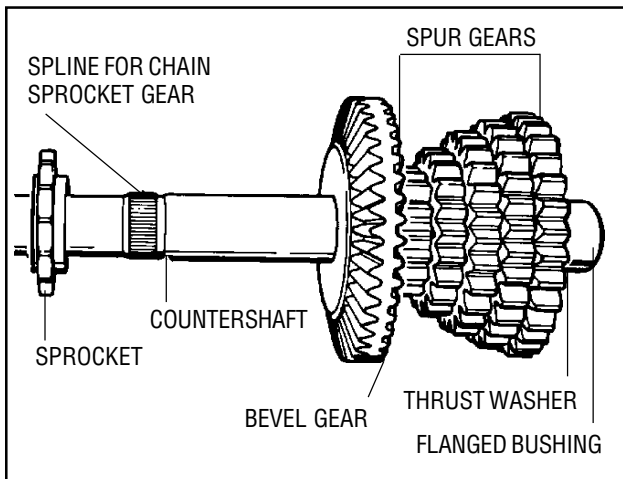
SHIFTING GEARS. The two sides of the shift gears are different. One side is flat and the other side is recessed to accept shift washers. The flat side of the gear is placed onto the shaft towards the shoulder of the shaft or towards the shift keys.



NOTE

The large thrust washer on the shift gear end of the shifter/brake shaft does not have a chamfer on the inside diameter.

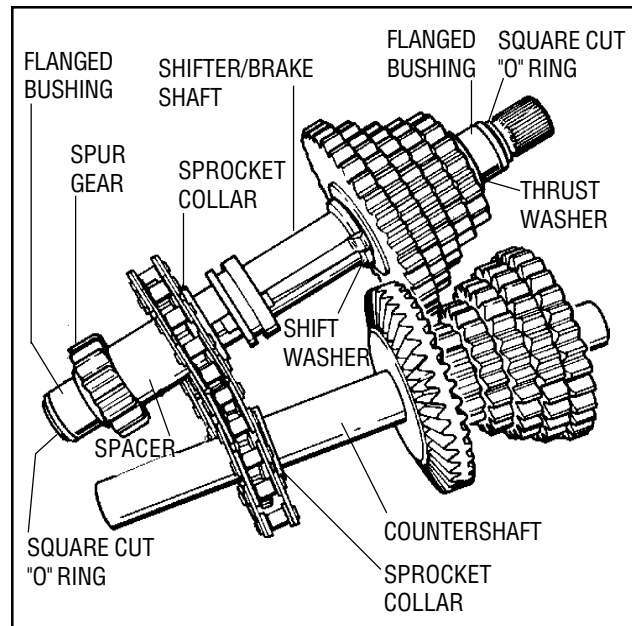
- Reassemble the shifter/brake shaft by installing the sprocket and chain, spacer, spur gears, and thrust washers. Be sure the collar on the sprocket faces inward toward the shift collar or toward the brake end of the shaft. Install the appropriate thrust washers and the bronze oil light bushings on both ends of the shifter/brake shaft; then install the square cut "O" ring on the brake end of the shaft. Opposite the brake end, there is a steel spacer disk; there is not an "O" ring on that end.



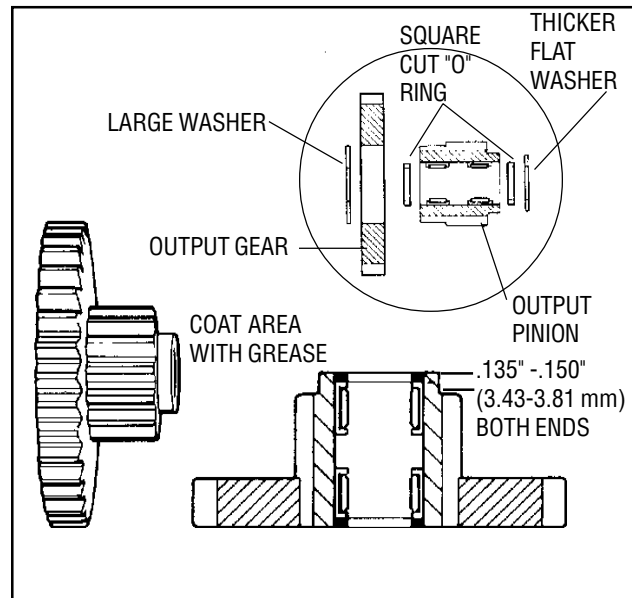
NOTE

Depending on the model specification, the bevel gear may be installed one of two ways. For description purposes, in this section, the model used has the bevel on the gear facing inward.

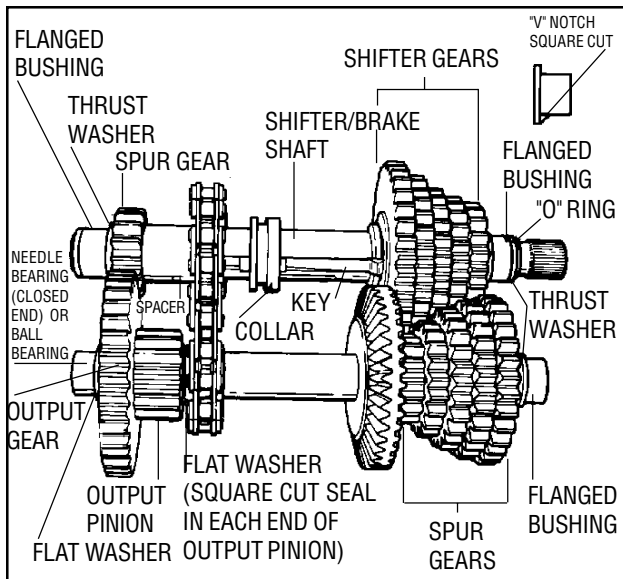
- On the countershaft, install the bevel gear and the spur gears starting with the smallest to largest, (opposite the shifter/brake shaft spur gear arrangement). Place a thrust washer and bronze oil light bushing on the spur gear end of the countershaft. Note that the "V" notch on the bushing fits into the recess "V" in the case.



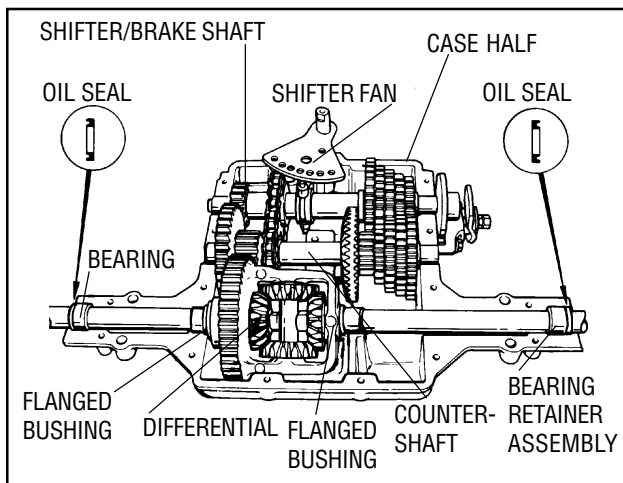
- With the ends of the countershaft and shifter/brake shaft angled together, install the countershaft sprocket and chain on the countershaft.



- For correct positioning of the needle bearings use the removal/installation tool, Tecumseh part # 670252. Fill the area between the needle bearings with axle grease before installing on the countershaft.



8. Install the flat washer to protect the turning sprocket from the square cut seal which fits into the recessed end of the output pinion gear. Install a square cut seal on the other end of the output pinion and the output gear. The large protective thrust washer keeps these in position. There is another square cut rubber seal that fits into the recessed end of the needle bearing sleeve assembly (closed end). Place it on the end of the countershaft and the two shafts are complete and ready to install into the case.



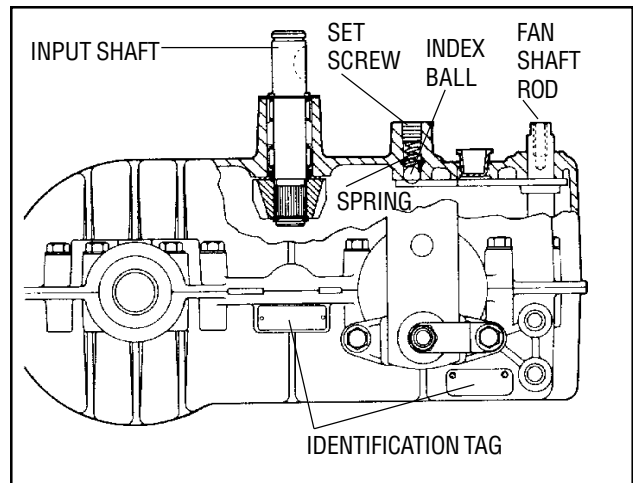
9. DIFFERENTIAL ASSEMBLY

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

For teardown and reassembly of the differential, see Chapter 18 on differentials.

Install the differential in the case.

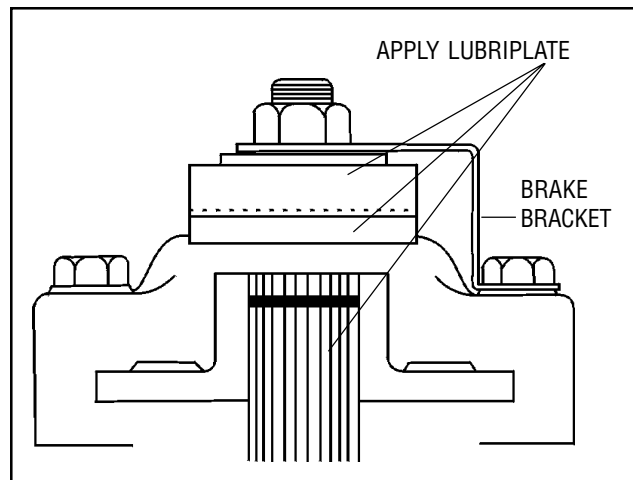
10. Install the shifter assembly, and pack 30 oz. (887ml) (36 oz. [1065 ml] 801 Series) of Bentonite grease around the bearings and gearing, then reinstall cover on the case. Torque cap screws 90-100 inch pounds (10.2-11.3 Nm).



NOTE

On reassembly, use either gasket eliminator Loctite 515 (part number 510334) or silicone RTV Loctite 598 (part number 788093).

11. Install the shifter fan detent ball, spring and setscrew in that order, into the cover, and slowly tighten the screw one turn below flush. If unit contained a neutral start switch, reinstall it. Check for binding by turning the input shaft.

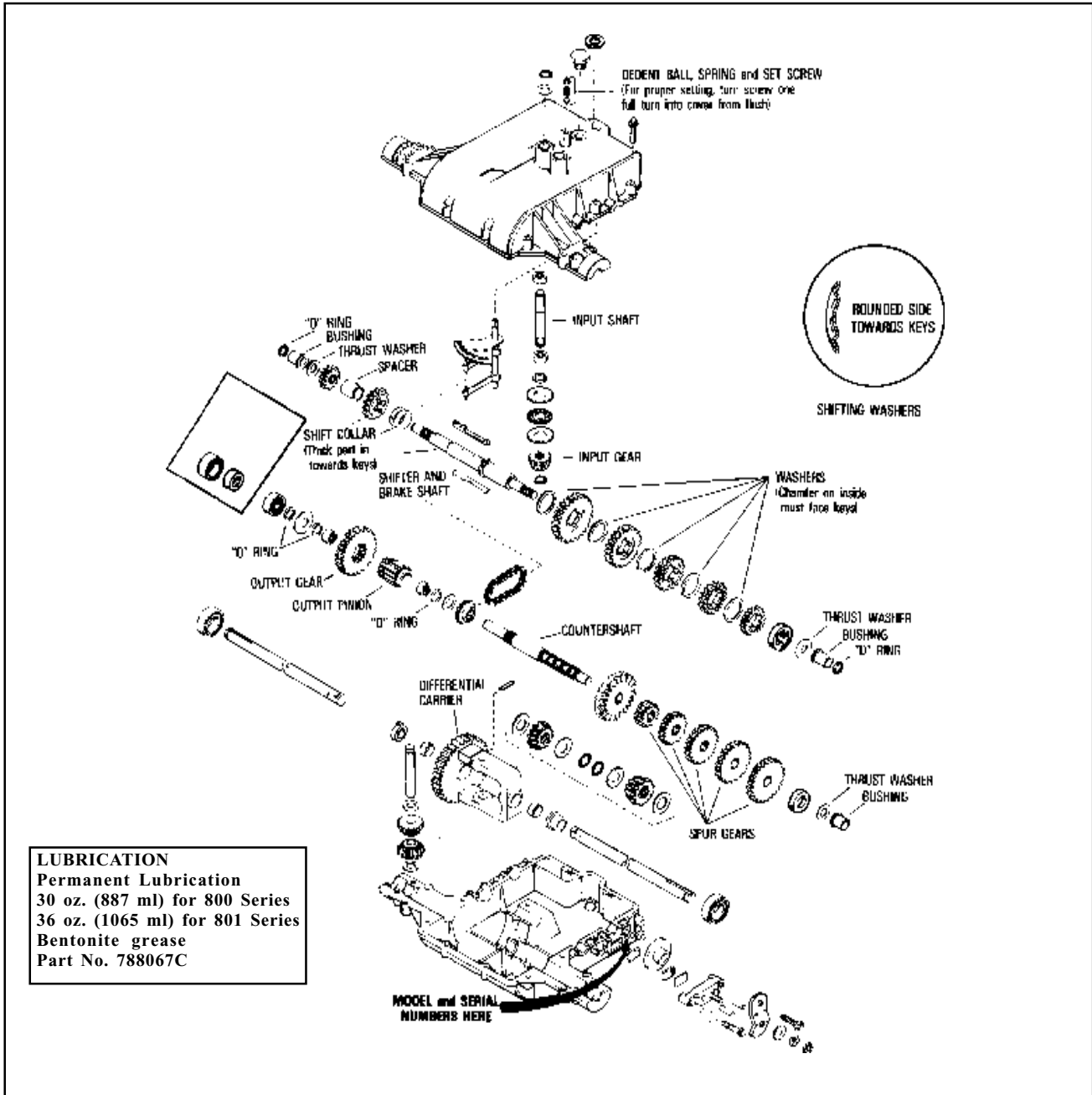


12. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flat washer, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

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

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

800/801 SERIES TRANSAXLES



LUBRICATION
 Permanent Lubrication
 30 oz. (887 ml) for 800 Series
 36 oz. (1065 ml) for 801 Series
 Bentonite grease
 Part No. 788067C

The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

820 SERIES TRANSMISSIONS

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

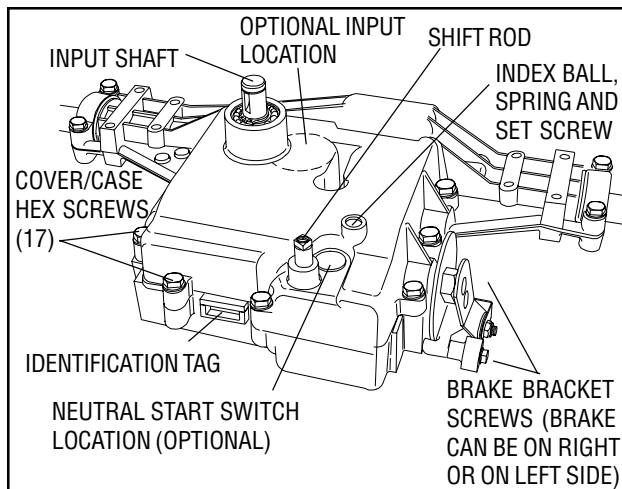
⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

The 820 series is similar to the 920 series transaxle in basic operation. It has up to 6 speeds forward and one reverse. The 820 series is a heavy duty unit which is suited for ground engaging attachments. The 820 features ball bearings, needle bearings and steel cut gears throughout.

NOTE

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



DISASSEMBLY OF TRANSMISSION

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

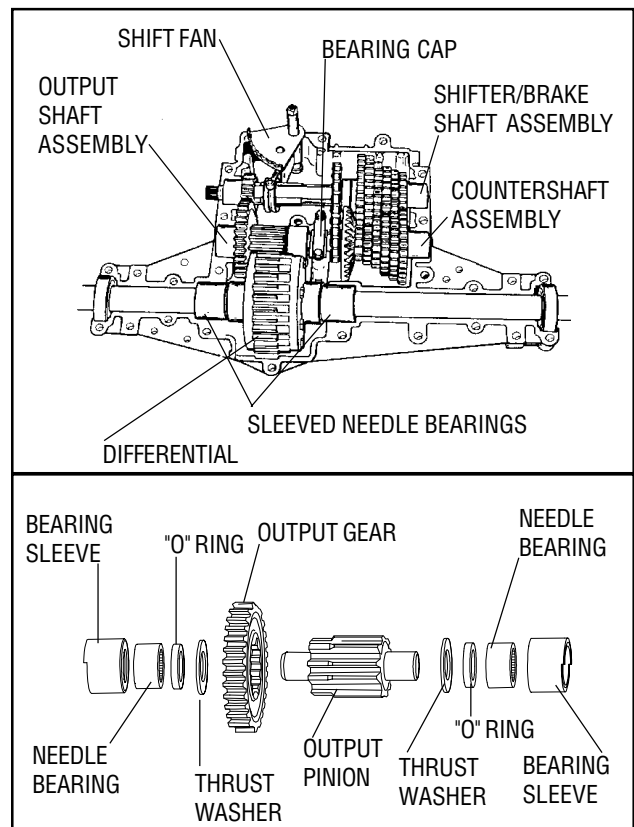
1. The unit may have the OEM option of a neutral start switch, remove the switch.
2. Remove setscrew, spring and index ball from the transmission cover and six cap screws that fasten the cover to the case.

3. Remove cover. Remove shifter assembly (includes shift rod and shifter fan) from transmission by lifting shaft out of case.

4. Remove bearing cap, differential, shift fan, output shaft assembly and then both the shifter/brake shaft and countershaft simultaneously. Take note that the "fat" side of the sprockets must face the tips of the keys or the brake side.

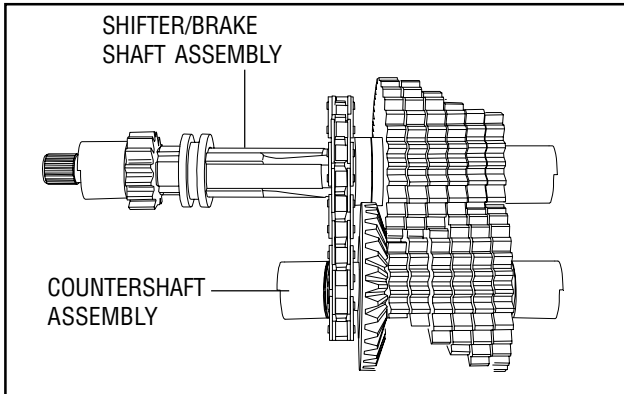
5. OUTPUT PINION AND SHAFT.

Remove sleeved needle bearings. Remove the large thrust washers and large output gear. The output pinion gear is machined directly onto the output shaft in most models. There are models in which the output shaft is splined to accept a splined output pinion gear and a splined output gear.



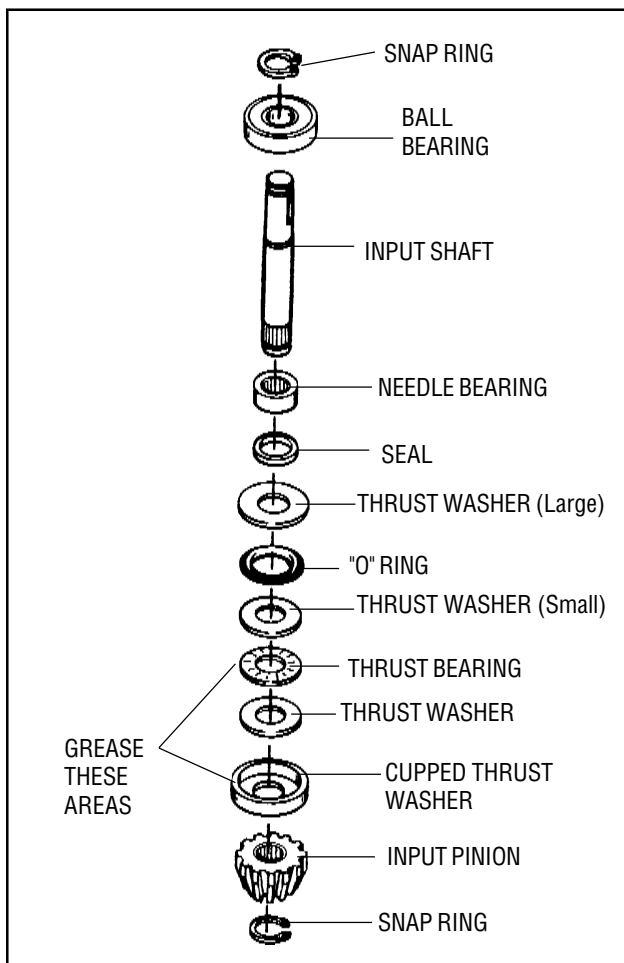
6. COUNTERSHAFT AND SHIFTER/BRAKE SHAFT

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

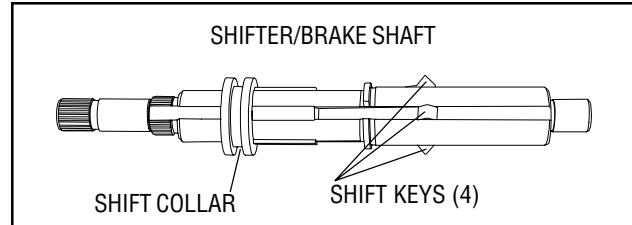
Refer to Chapter 18 on differentials for service. Should disassembly of the differential be necessary, 2 oz. (.59 ml) of bentonite grease should be placed around the gears on reassembly.

REASSEMBLY

NOTE

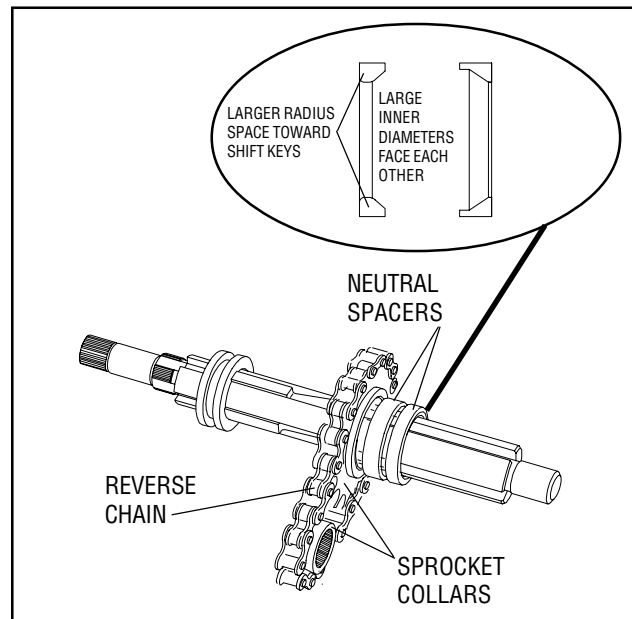
Do not apply bentonite grease to needle bearings; use only EP grease. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.

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.

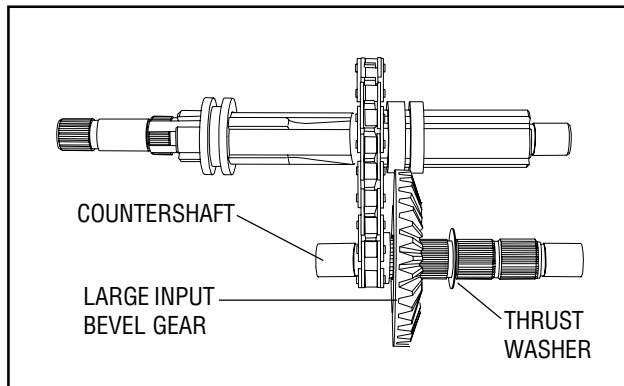


3. It is easier to assemble this transaxle if the countershaft and the shifter/brake shaft are assembled at the same time. Start by placing the reverse chain over the reverse sprockets. Make sure the collars on the sprockets are on the same side of the chain, facing the brake side and toward the tips of the keys.

Place the neutral spacers onto the shifter/brake shaft with the larger inner diameter sides facing together. Position the spacer with the largest inner diameter radius toward the shift keys and brake end of the shifter/brake shaft. 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.

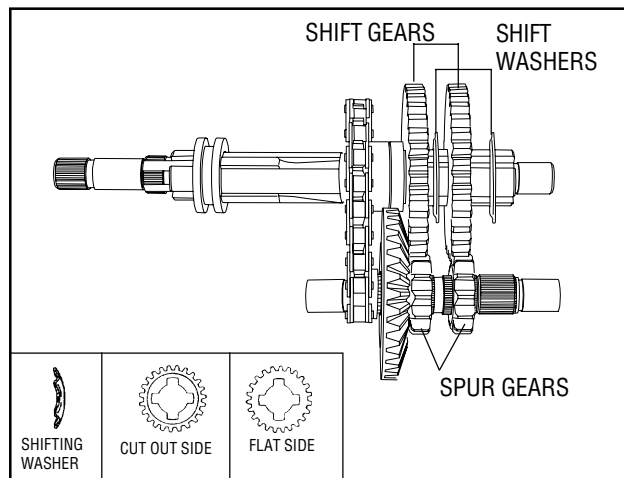


4. Insert the countershaft into the smaller reverse sprocket. Then install the large bevel gear, with the bevel facing away from the reverse sprocket. Place thin thrust washer on the countershaft next to the bevel gear.



NOTE

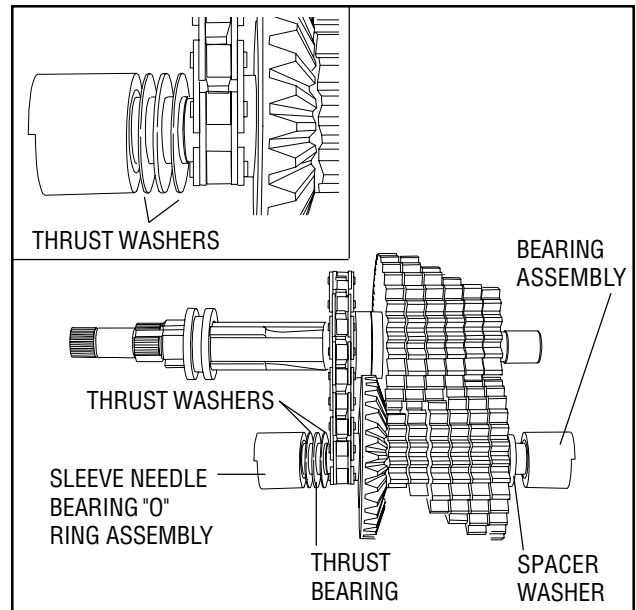
Depending on model, the bevel may be installed one of two ways. For description purposes in this section, the model used has the bevel side of the large bevel gear facing away from the reverse sprocket; in other models the bevel may face toward the reverse sprocket. In either case there is a thrust washer 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 is the largest of the shift gears. Place this gear next to the neutral spacer with the flat side of the gear next to the spacer. Place a shift washer onto the shifter/brake shaft with the rounded edge towards the shift keys. Continue this procedure until all the gears on both shafts have been added.

NOTE

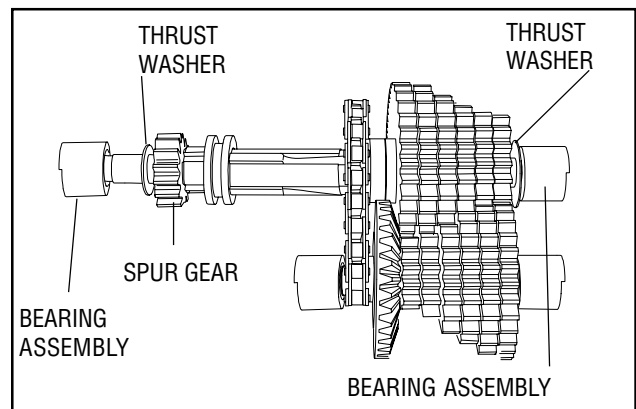
It is not only important that gears match up diameter-wise, but must match up according to thickness. As all the gears are placed back into the assembly, pack each with bentonite grease.



6. In the model pictured above, a thrust washer, thrust bearing, thrust washer and sleeved needle bearing with an "O" ring are placed on the countershaft next to the reverse sprocket. Place a spacer washer and sleeved needle bearing with an "O" ring next to largest spur gear. Install the sleeved needle bearing with 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 two thrust washers and the thrust bearing will be placed next to the largest spur gear, and the spacer washer will be placed next to the reverse sprocket. See the diagram at the top of the next page.

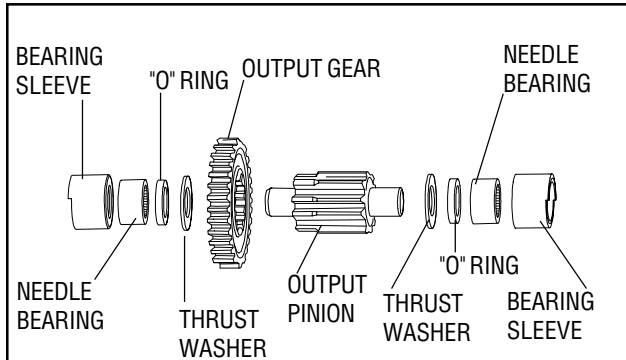


7. Place a large thrust washer next to the last shifting gear (this may be a step washer on some models) then a sleeved needle bearing with an "O" ring. Place the spur gear, small thrust washer and sleeved needle bearing with "O" rings on the opposite end of the shifter/brake shaft.

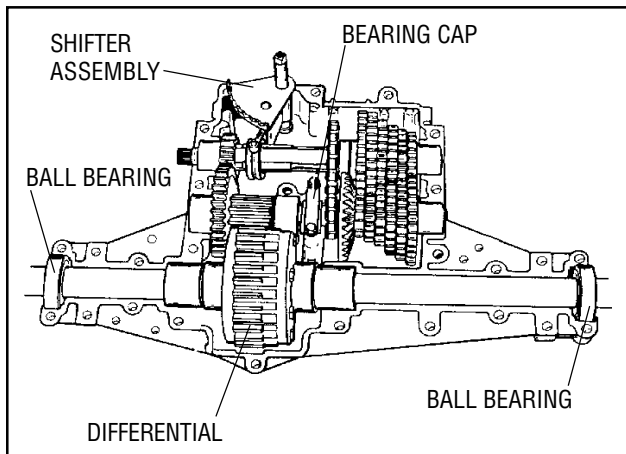
NOTE

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

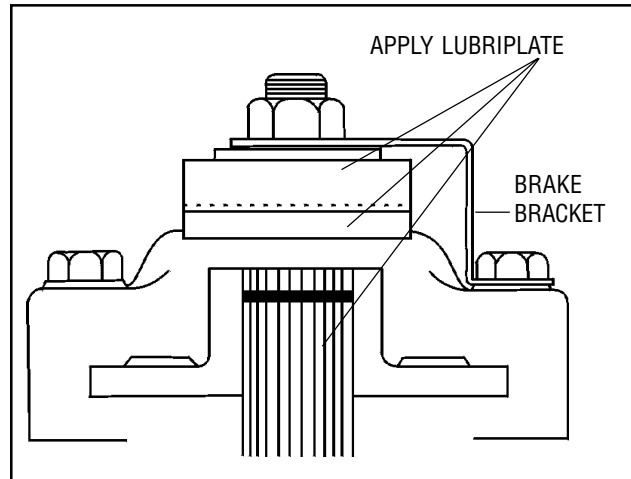
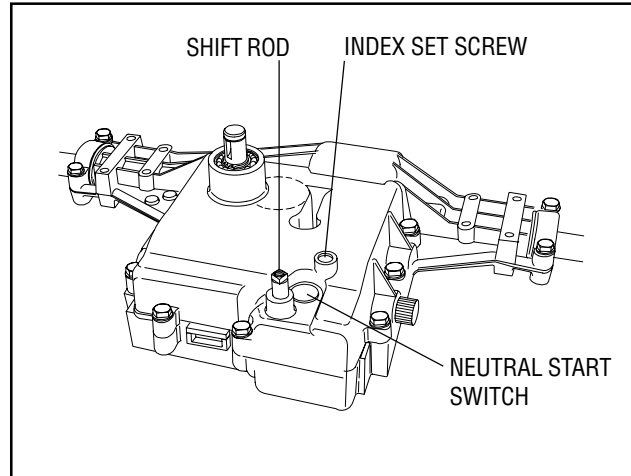
- Place the output gear on the stepped end of the output pinion. Place thrust washers on each end and then the large sleeved needle bearings with "O" rings. The "O" rings protect the axle/wheel bearing grease in the sleeved needle bearing from the Bentonite grease which lubricates the spur gears. Install the three shaft assemblies into the case.



- Insert differential into the 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 the bolts 90-100 inch pounds (10.2-11.3 Nm). Install shifter fan and pack the transaxle with remaining bentonite grease. (36 oz. / 1065 ml total)
- Clean mating surfaces of the 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.



- Guide cover over shift rod and position onto case. Torque cover screws 180-216 inch pounds (20.4-24.5 Nm). Replace the detent ball, spring, and set screw. Turn set screw one (1) turn below flush. Install the neutral start switch if applicable. Check for binding by turning the input shaft.

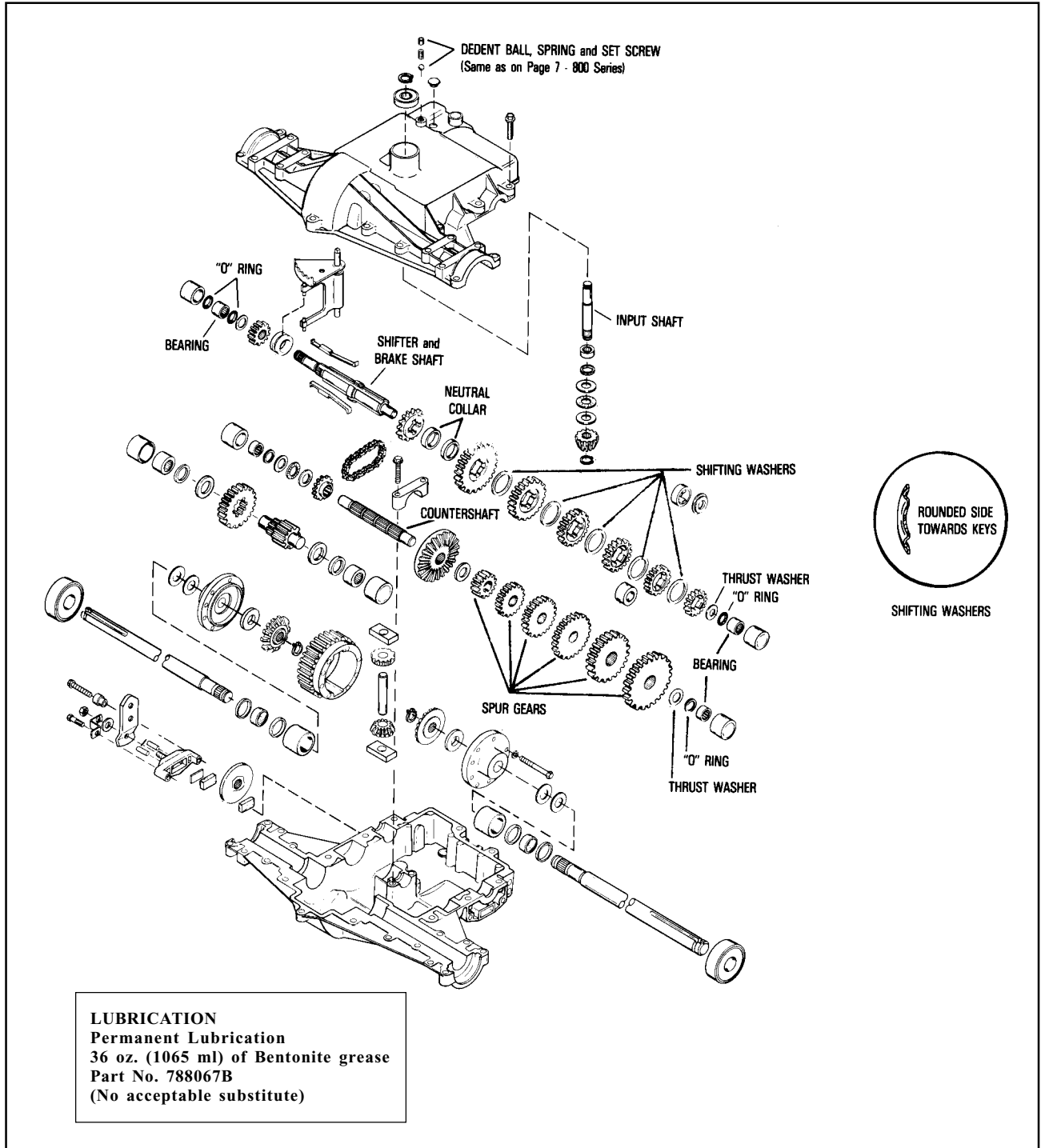


- Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

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

WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

820 SERIES TRANSMISSION



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 6. 900 SERIES TRANSAXLES

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

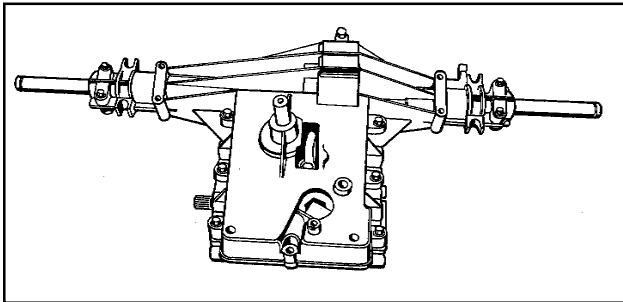
WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

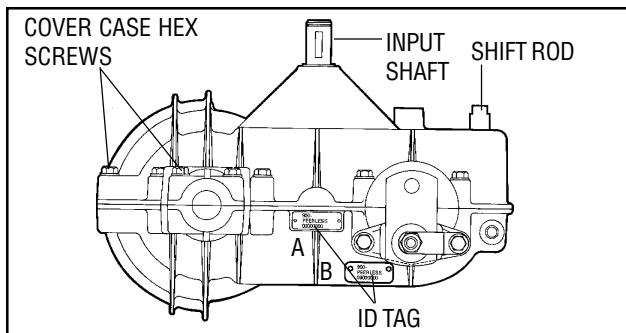
NOTE

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



GENERAL

The 900 series is similar to the 800 series transaxle but has only up to 4 speed offerings forward and 1 reverse. The differential utilizes bearing blocks and is retained by the case and cover. This unit contains an aluminum tag at location A or B, showing the model number.



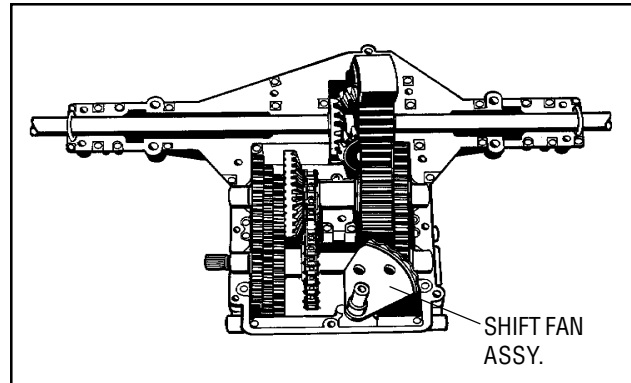
DISASSEMBLY OF TRANSAXLE

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

1. The unit may have the OEM option of a neutral start switch, remove the switch.
2. Remove Allen head setscrew, spring and detent ball from the transmission cover and six cap screws that fasten the cover to the case.
3. Remove cover. Remove shifter assembly (includes shift rod, and shifter fan from transaxle by lifting shaft out of case.
4. Remove two brake bracket screws and remove brake assembly.

NOTE

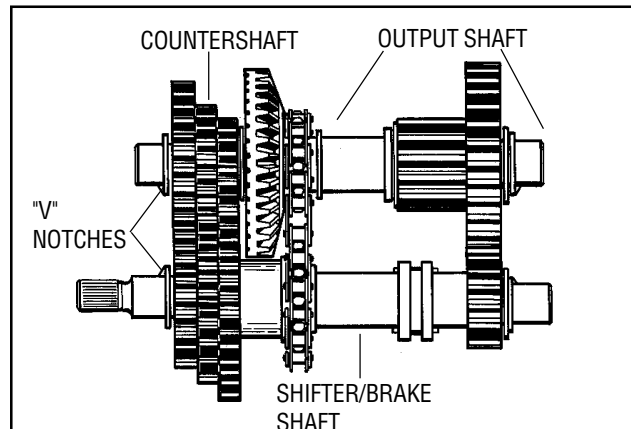
Remove grease from the unit as parts are removed. It will be difficult to keep parts from falling off the assemblies. Note position of parts before removal.



5. Remove the gear and shaft assemblies from the case half.

NOTE

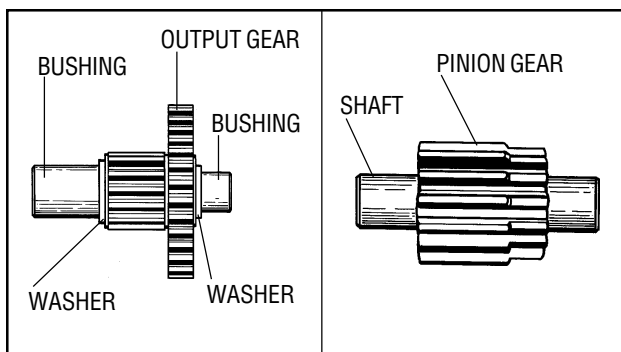
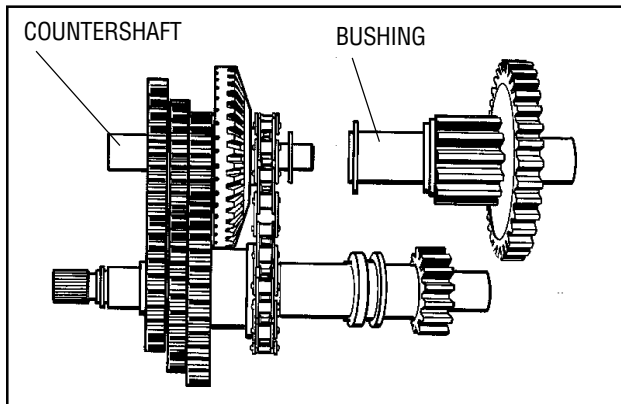
Before disassembly, observe how the bushing tabs on the flange bushings fit into recess "V" notches of the case. The cover will rock back and forth and not rest tightly on the case if these bushing tabs are not pressed down in the "V" notches.



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

COUNTERSHAFT

7. 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.

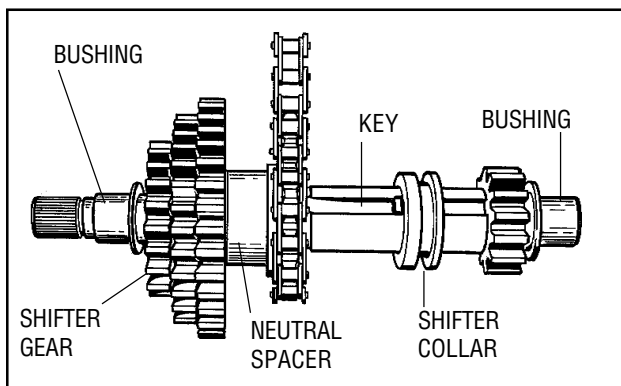


8. OUTPUT PINION AND SHAFT

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

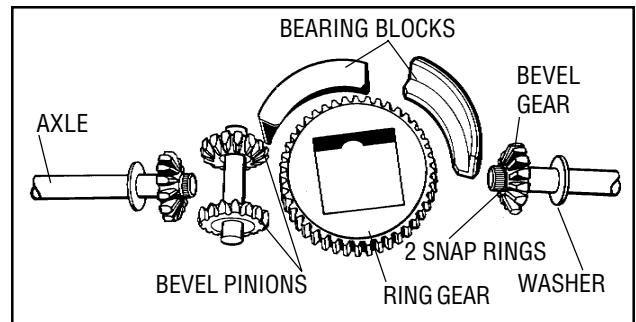
9. SHIFTER SHAFT

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.



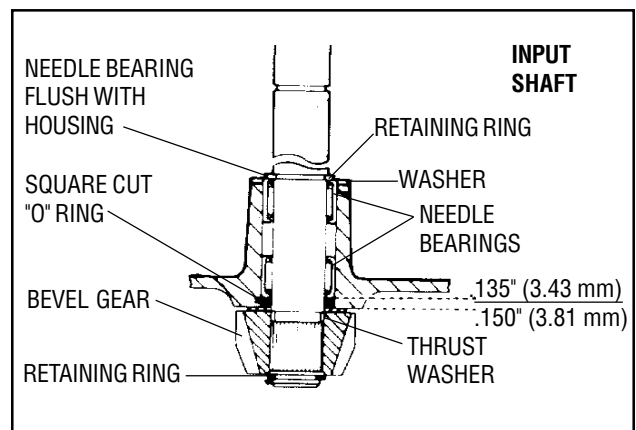
10. DIFFERENTIAL

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.



11. 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.



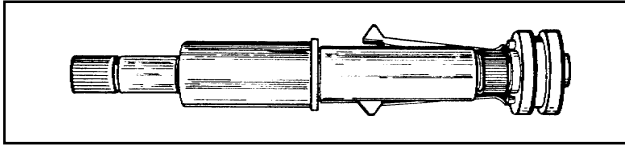
Tool part no. 670251 is used for removal and installation of needle bearings for the input shaft. The needle bearing on inboard side is installed $.135"-.150" (3.43-3.81 \text{ mm})$ below flush.

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

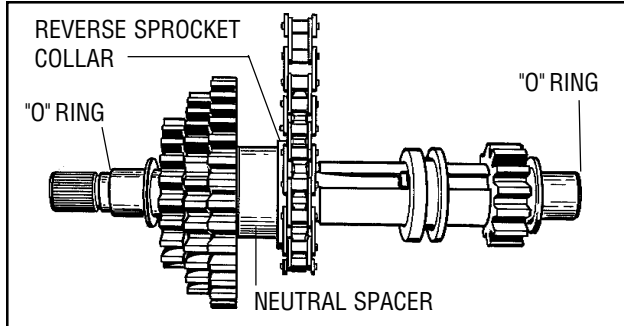
Needle bearings are lubricated with E.P. grease. Do not use bentonite on any needle bearing. For maximum gear train life use bentonite grease on shifter/brake shaft.



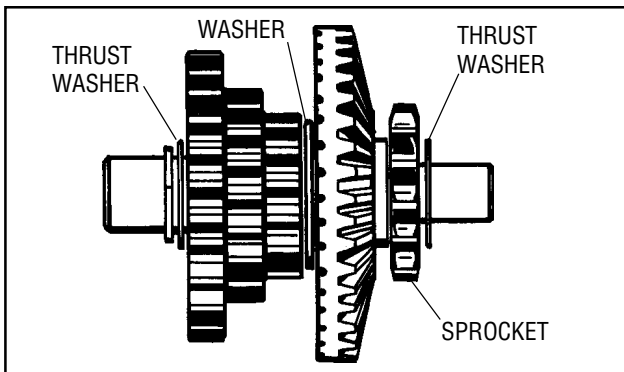
2. Grease both keyways and slide keys and collar on the shifter/brake shaft.

NOTE

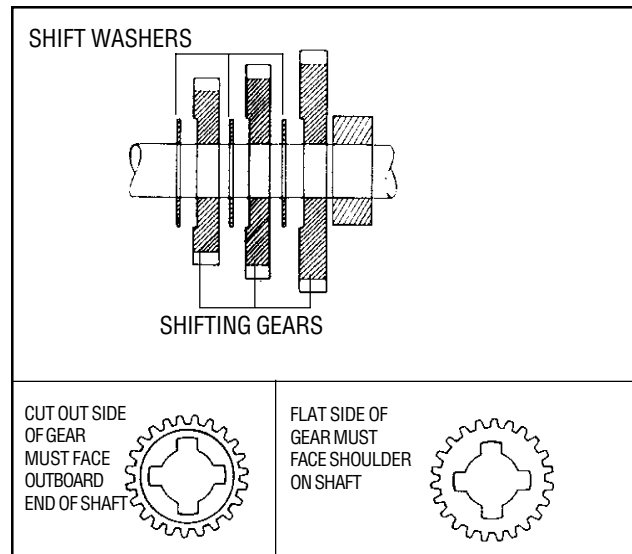
When reassembling the 900 series it is easier to assemble the shifter/brake shaft and the countershaft at the same time.



3. Place the reverse chain on the reverse sprockets. Make sure the collars on the sprockets are on the same side of the chain, facing the brake side, and toward the tips of the keys. 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.



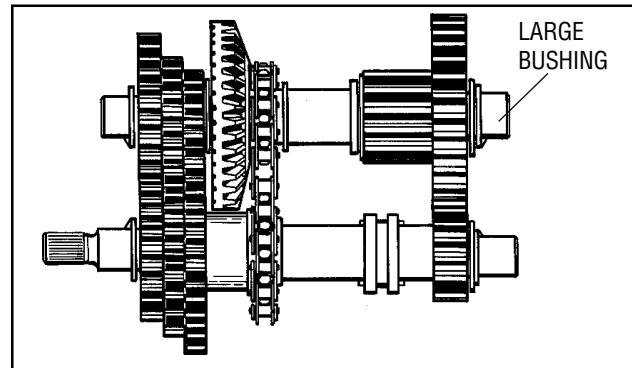
4. Insert the splined countershaft into the smaller reverse sprocket. Then place the large beveled gear on the countershaft with the beveled side of the gear towards the reverse sprocket. If the 900 series is a 1, 2, or 3 speed forward unit, place a washer over the shaft and next to the backside of the large bevel gear. If the unit is a speed forward there will not be a washer on the inside diameter of the washer next to the gear. The chamfer or rounded side must face towards the shifting keys.



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.

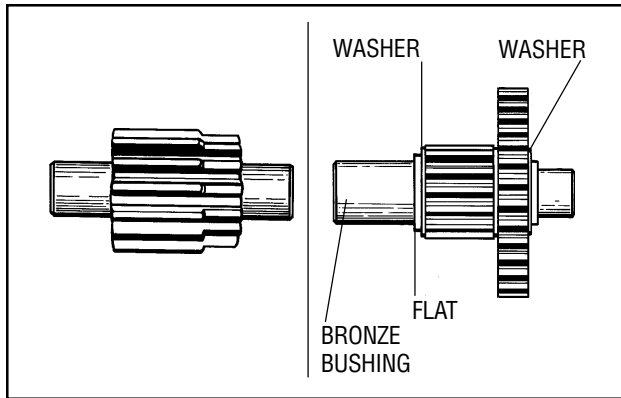


6. Next place a thrust washer on each end of the countershaft and a bushing on the end of the shaft with the largest spur gear.
7. On the shifter/brake shaft place a large thrust washer next to the smallest shifting gear, next the bronze bushing and then an "O" ring.

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 (opposite the shifting gears) has a spline. Install the spur gear on the spline that drives the output gear. Next install the thrust washer, bushing and "O" ring.



9. To assemble the output shaft assembly, place a washer and then the bronze bushing with the collar (flat down) next to the pinion. Place the output gear over the pinion as in the diagram above. There is a washer on the outside of the gear.

10. After both shafts are completed, place the flanged bushings on each end. Notice that one is larger than the other.

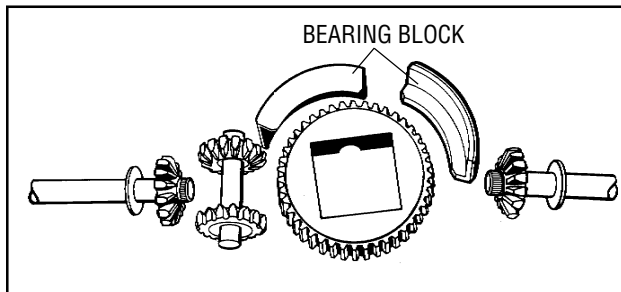
NOTE

The "V" notch on the bushing fits into the recess "V" in case.

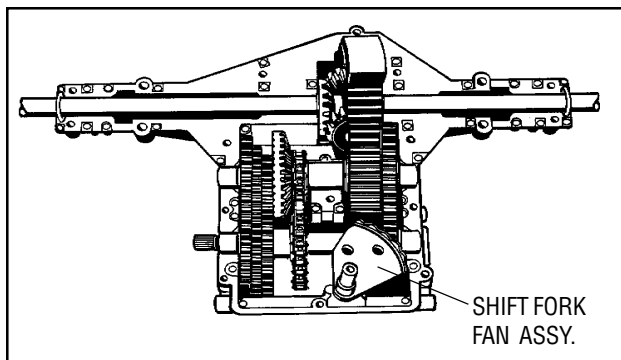
11. DIFFERENTIAL ASSEMBLY

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

When installed in the case the bearing block must have the flange to the left hand side. The bearing block in the cover must have the flange to the right hand side.



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

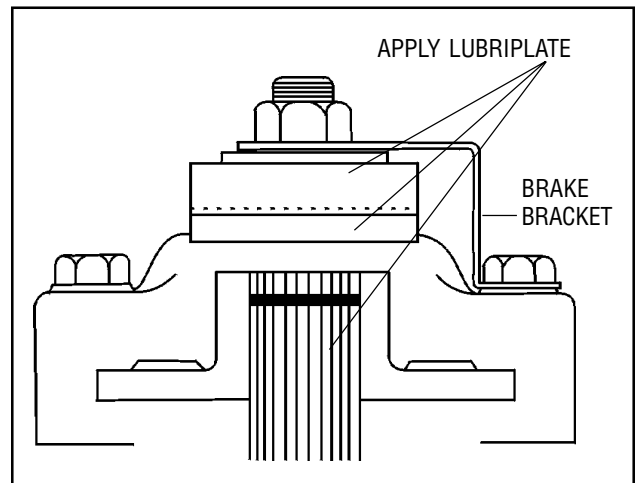


13. Install shifter assembly and pack 26 oz. (769 ml) Bentonite grease around bearings, gearing, and top of shift fan. Then reinstall the cover on the case. Torque cap screws 90-100 inch pounds (10.2-11.3 Nm).

14. Clean the mating surfaces of the 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, reinstall it now.

Check for binding by turning the input shaft.

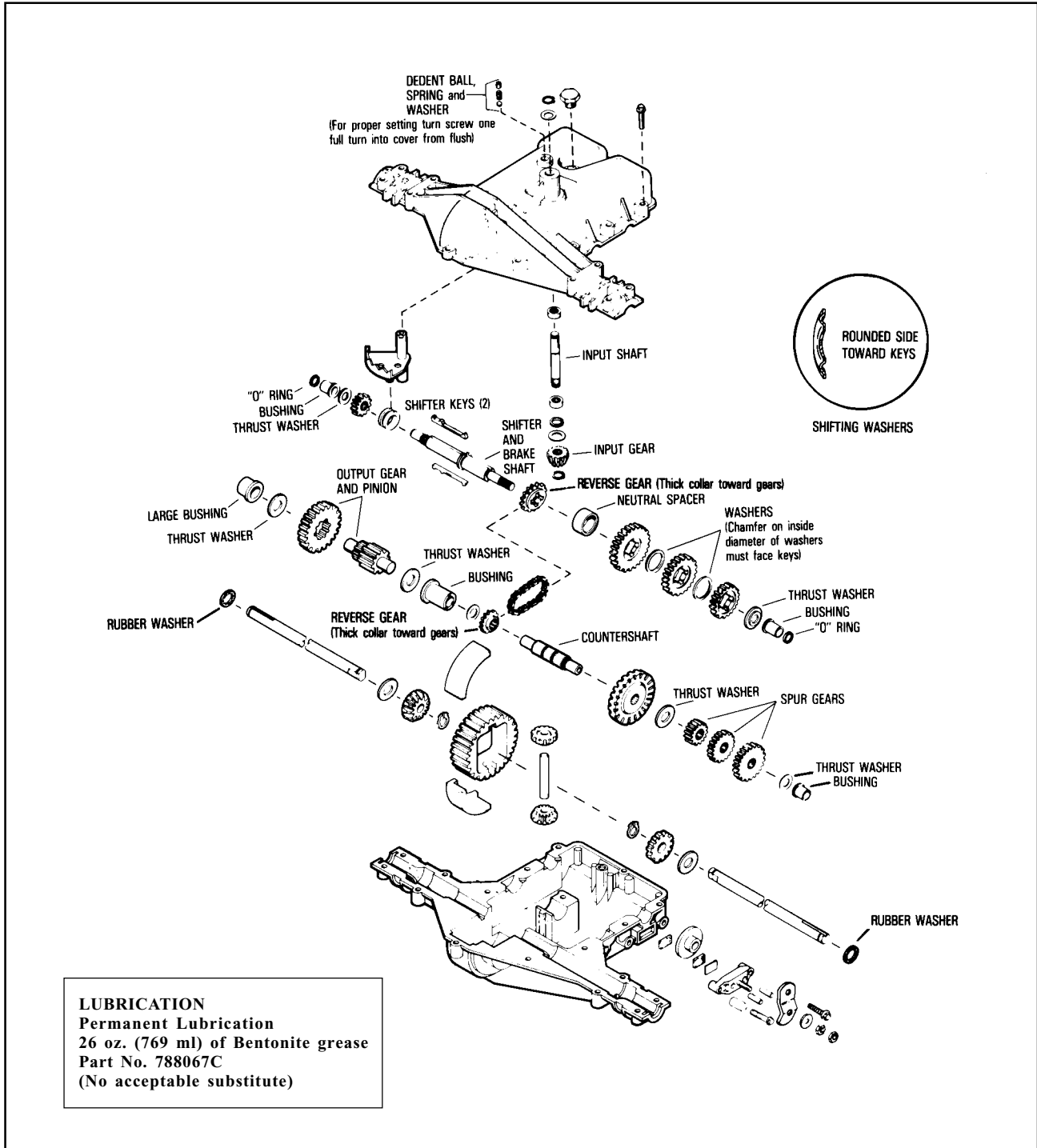


16. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install the brake assembly.

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

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

900 SERIES TRANSAXLE



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 7. 910 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

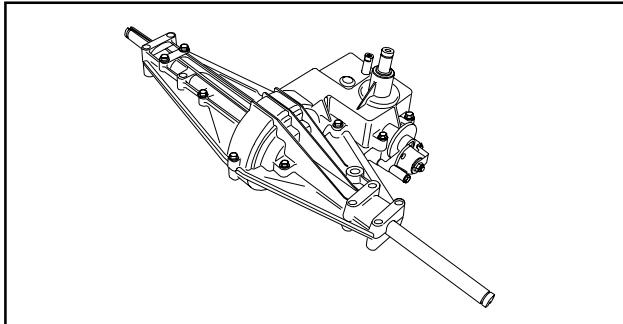
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

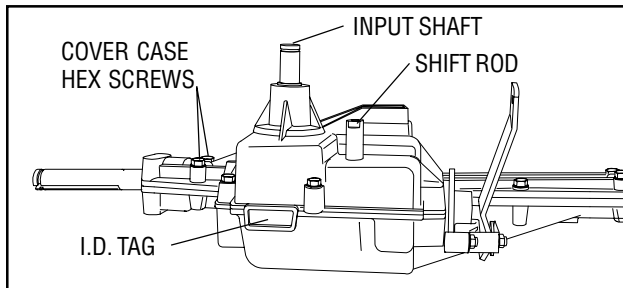
⚠ WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts may affect performance and could result in death or serious injury.

- Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.



GENERAL

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



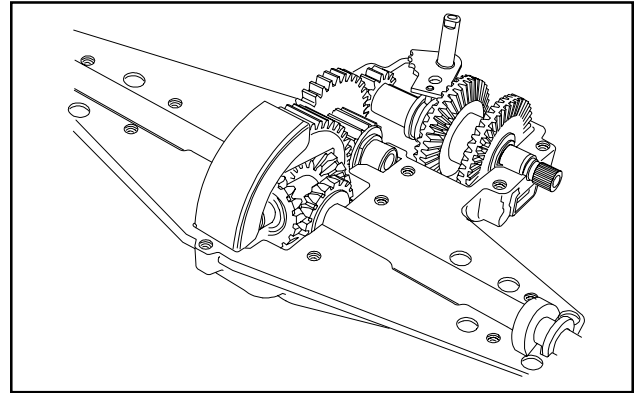
IDENTIFICATION

This unit contains an aluminum tag showing the model number.

DISASSEMBLY OF TRANSAXLE

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

1. The unit may have the OEM option of a neutral start switch; remove the switch.
2. Some 910 Series transaxles will have a Allen head setscrew, spring and detent ball. Remove these and the cap screws that fasten the cover to the case.
3. Push the shift rod through the cover and lift off. Then remove the shifter assembly (which includes the shift rod, and shifter fan and lift out of case.

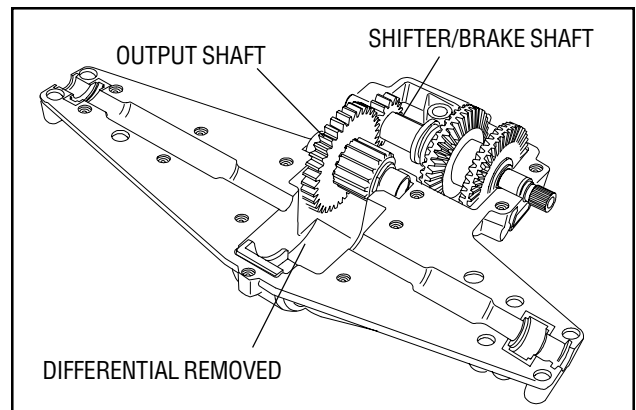


4. Remove the two brake bracket screws and remove brake assembly.
5. Remove the grease from the unit as the parts are removed. Prior to removal of gear shaft assemblies from the case, the shifter fan may be removed. Note the position of the parts before removal. Some parts may come off the shafts upon removal.

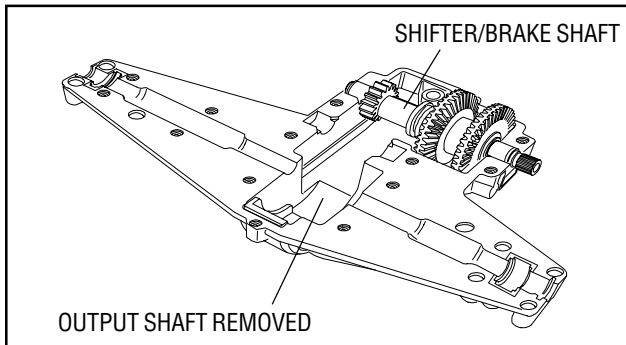
NOTE

Bentonite grease may stain clothing. Care should be used when handling.

6. 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.



- Remove the output shaft assembly and the shifter/brake shaft assembly.

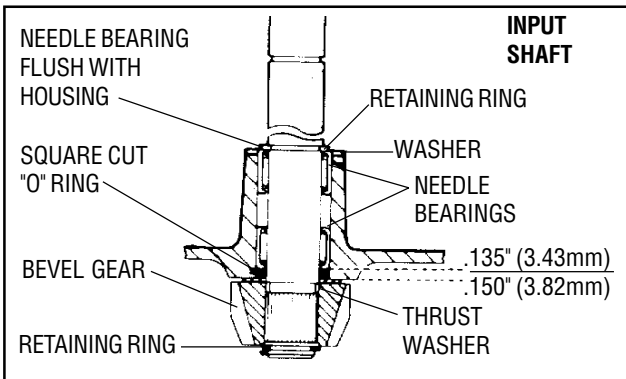


- The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut "O" ring must be replaced if the shaft is removed.

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" (3.43-3.81 mm) below flush.

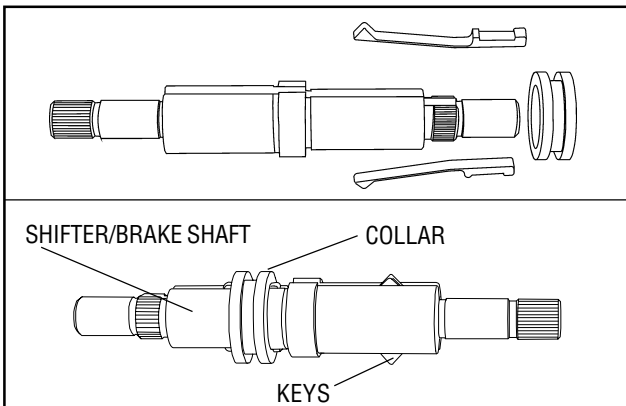
NOTE

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 788067C.



REASSEMBLY

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

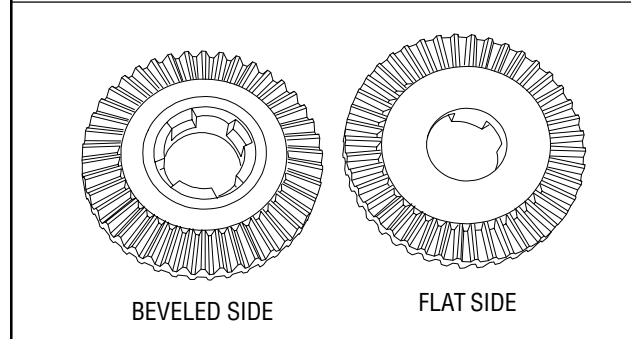
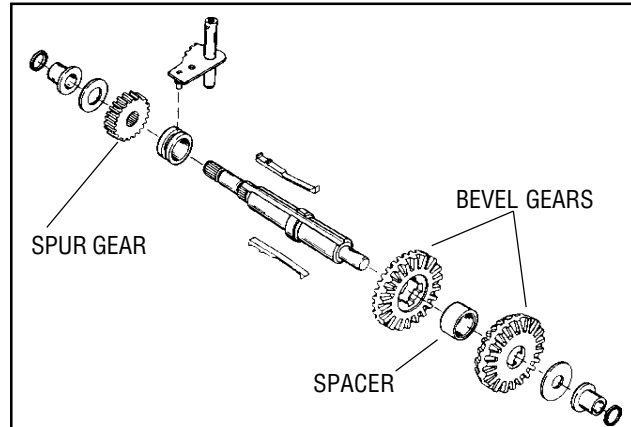


- Grease both keyways and slide keys and collar on shifter/brake shaft.

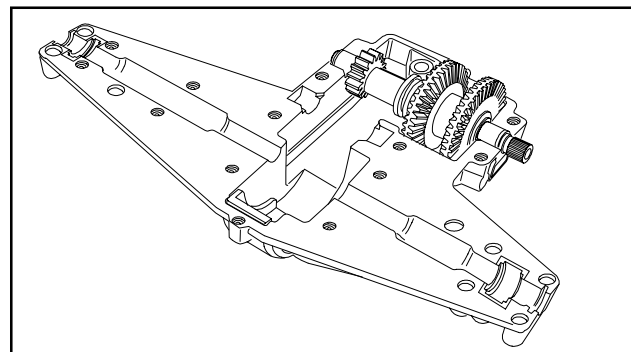
- The large beveled shifting gears can be placed onto the shifter/brake shaft. The bevels on the gears face each other and are separated with a neutral spacer. Push shifting keys into the neutral spacer.

Then place a thrust washer, bronze bushing, and an "O" ring on the shaft.

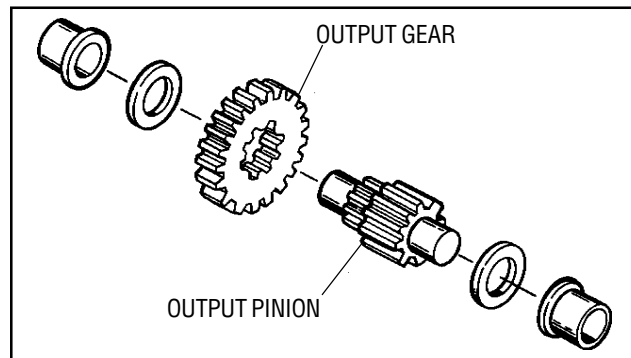
The spur gear, washer, bushing and "O" ring are assembled to the other end of the shaft.

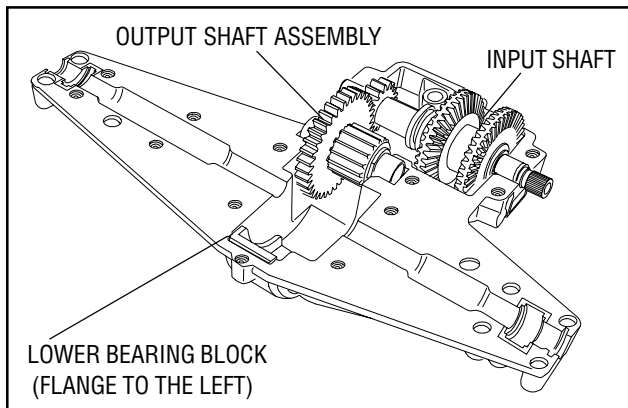


- Place the shifter/brake shaft assembly in the case.

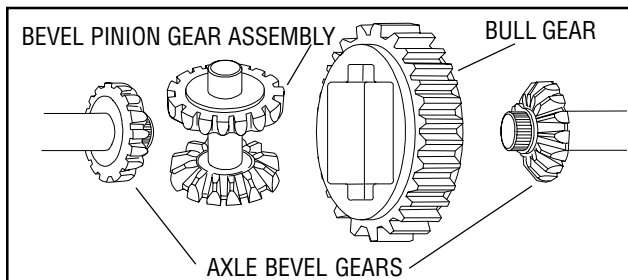


- Place the output gear onto the output pinion. Install the thrust washers and bushings.





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



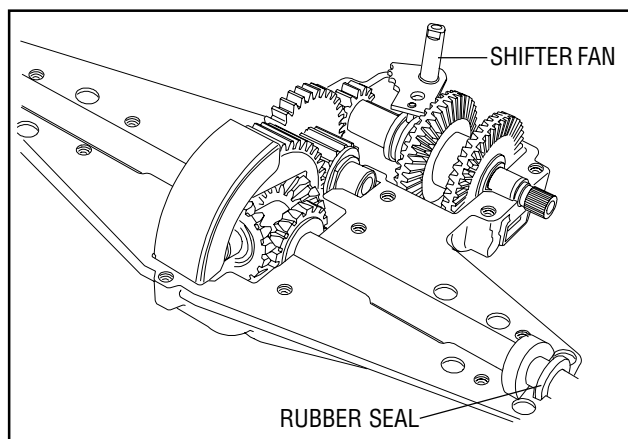
NOTE

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

8. Insert the lower bearing block into the case with the flange to the left. (See diagram on the top of this page.) 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 is located. On the opposite side of the bull gear, center the bevel gear with the other axle. 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

With models that have an offset input, the differential assembly begins with the shortest axle.



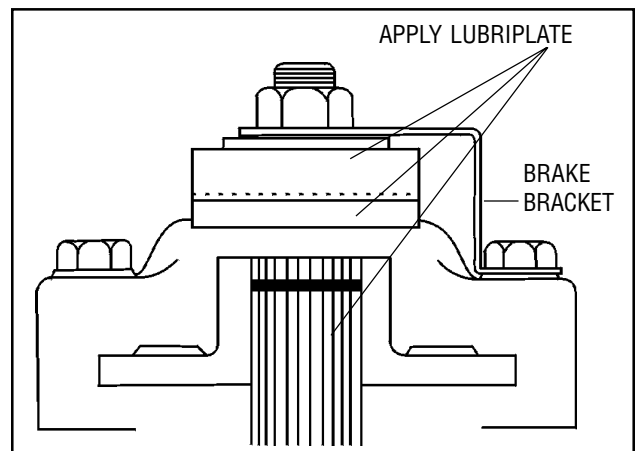
9. Install the shifting fan with the pin in the groove of the shifting collar. Grease the top of the shift fan. Fill the unit with 18 oz. (532 ml) of Bentonite grease. Install the top bearing block with the flange to the right.

10. Clean the mating surfaces of the 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.

11. 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 (10.2-11.3 Nm).

12. 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 the input shaft.

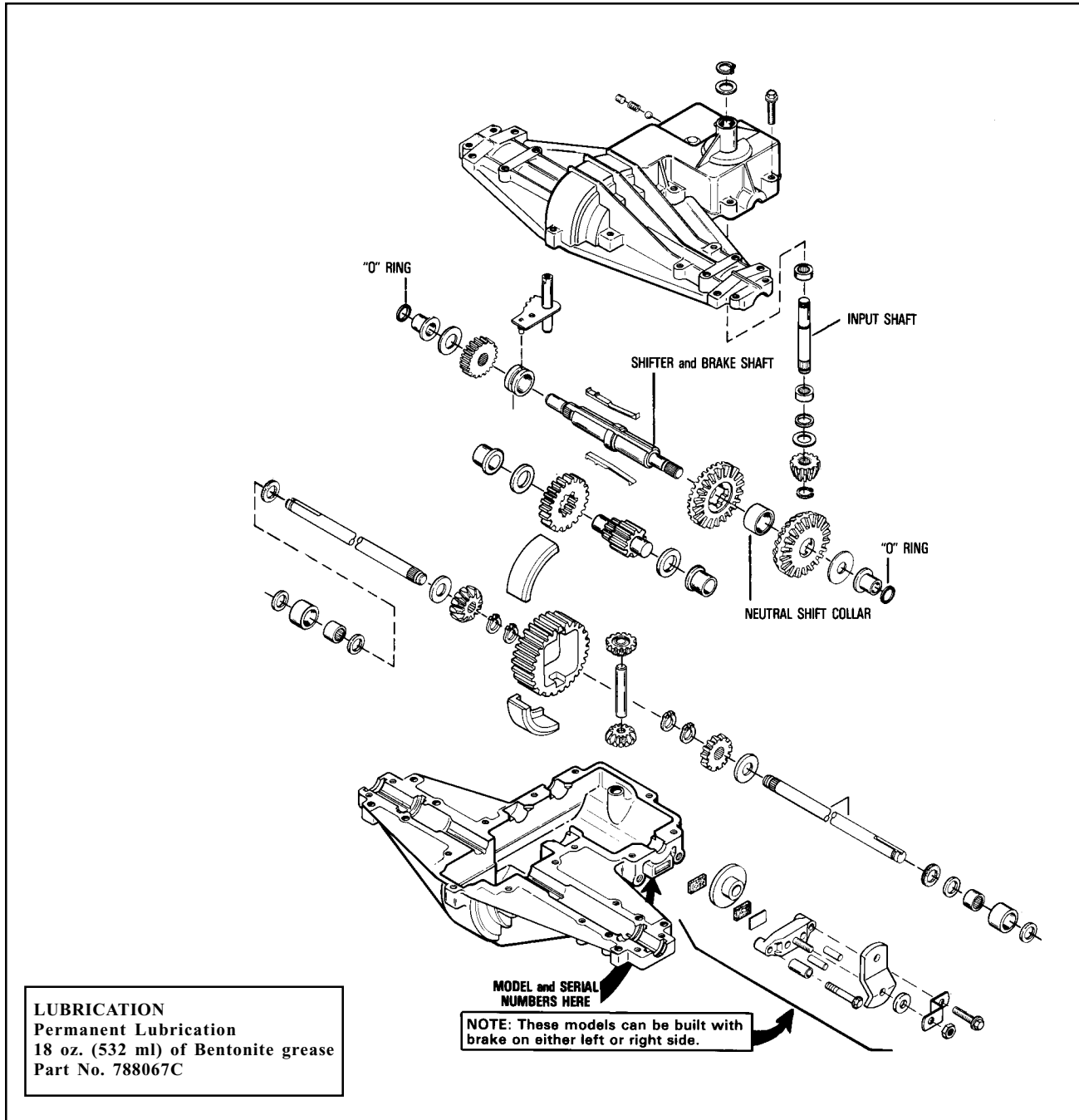


13. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install the brake assembly.

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

WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

910 SERIES TRANSAXLE



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 8. 915 SERIES / 940 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

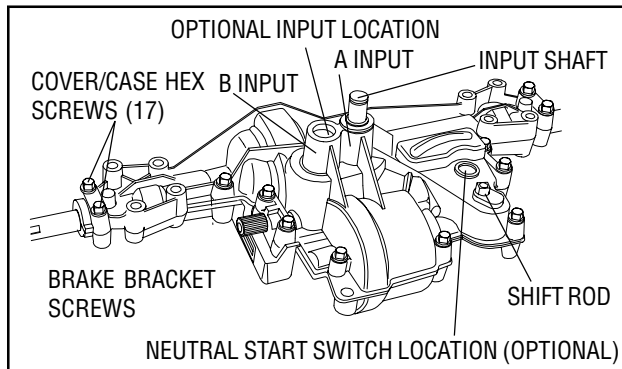
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

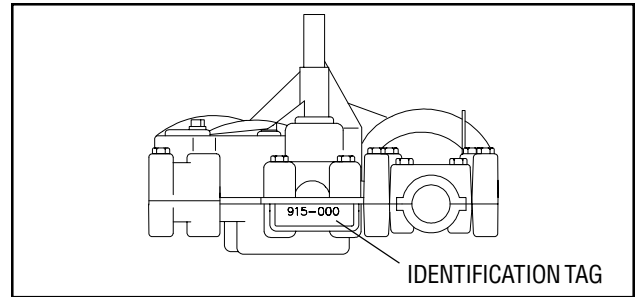
⚠ WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts may affect performance and could result in death or serious injury.

- Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.



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.



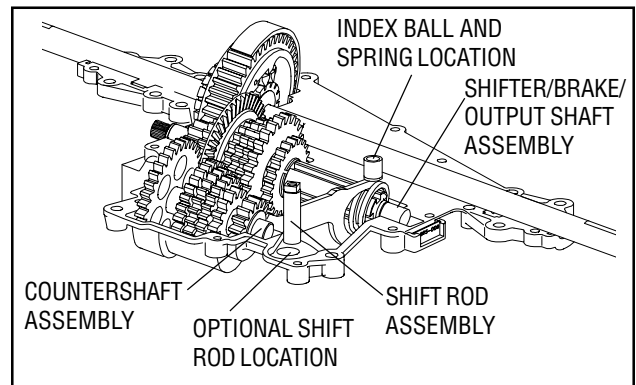
IDENTIFICATION

This unit contains an aluminum tag showing the model number.

DISASSEMBLY OF TRANSAXLES

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

1. The unit may have the OEM option of a neutral start switch, remove the switch.
2. 915/940 Series transaxles will have a Allen head setscrew, spring and detent ball. Remove these and the cap screws that fasten the cover to the case.
3. Push the shift rod through the cover and lift off. Then remove the shifter assembly (which includes the shift rod, and shifter fan) and lift out of case.
4. Remove the "O" ring from the top of the shifter rod.



5. Remove the two brake bracket screws and remove brake assembly.
6. Remove the grease from the unit as the parts are removed.

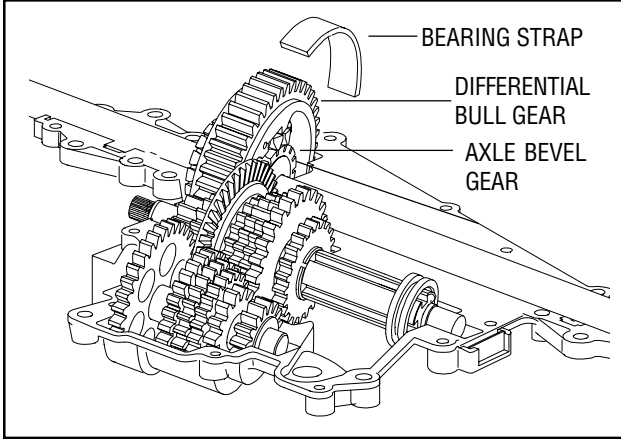
NOTE

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 is located on the shifter brake shaft one opposite the brake rotor end. The other two are located on the spur gear shaft, one on each end.

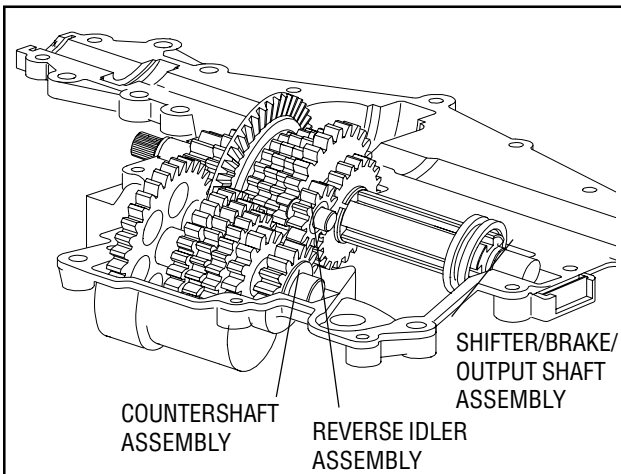
- Remove the bearing strap on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft, and the axles. Grasp the axle bevel gears between your thumb and fingers, hold together while lifting differential from the case.



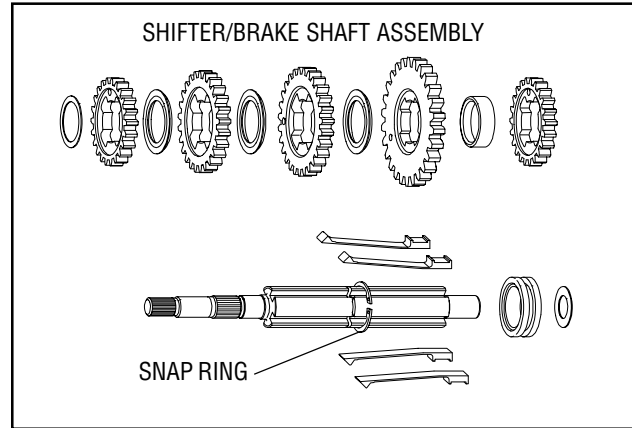
- There are two (2) shaft assemblies in this transaxle; the countershaft and the shifter/brake/output shaft assembly. Remove these two shafts as complete assemblies from the case.

NOTE

Depending 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.



- As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly and inspection of parts easier. 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 the snap ring; it is not necessary to remove the snap ring from shaft.

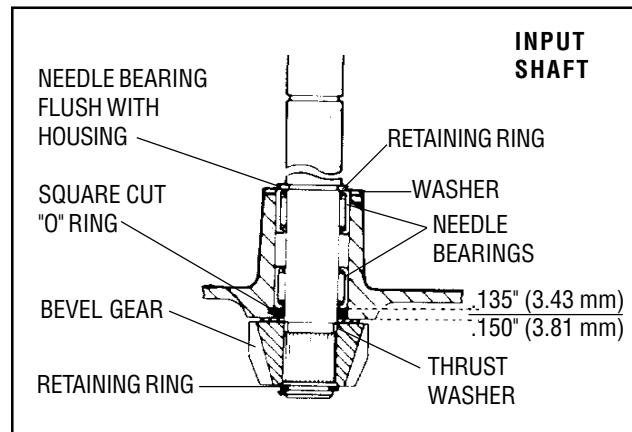


- The input shaft can also be removed and inspected or serviced. Remove the snap ring on the bevel gear and pull the shaft through the case. The square cut "O" ring must be replaced if the shaft is removed.

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" (3.43-3.81 mm) below flush.

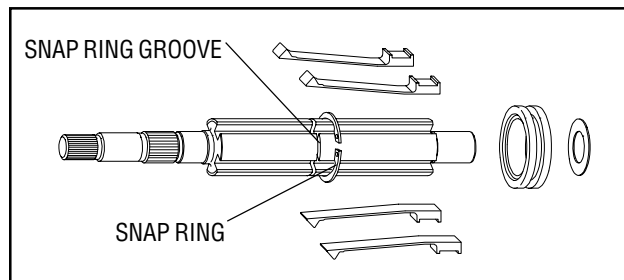
NOTE

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 788067C.

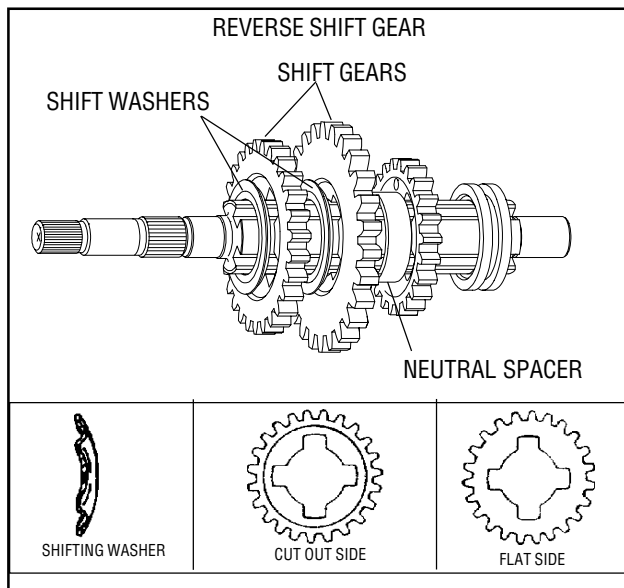


REASSEMBLY

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 toward the gears and snap ring for proper gear selection. Place the 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.

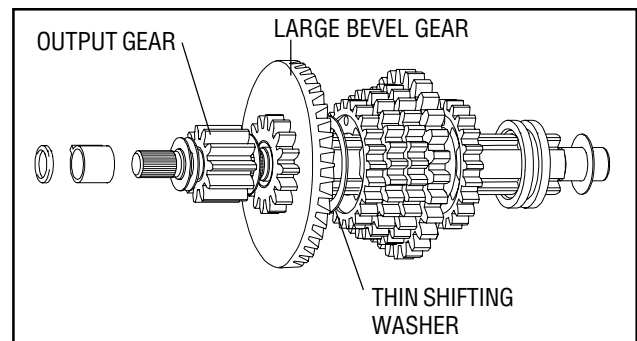


NOTE

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

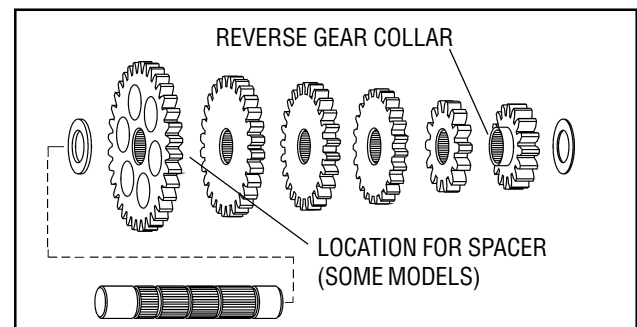
3. The shafts in this transaxle can be assembled separately. After replacing the snap ring into its' groove, place the reverse shifter gear onto the shaft with the flat side next to the snap ring. Push the shifting keys through the reverse gear and push the neutral spacer over the end of the keys and pull the neutral spacer and reverse gear up against the snap ring. Next place the shifting gear onto the shaft 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. On the Shifter/brake shaft 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 output gear followed by a bronze bushing and rubber "O" ring. Then place a washer on the opposite end of the shaft to complete the assembly of the shifter/brake shaft.



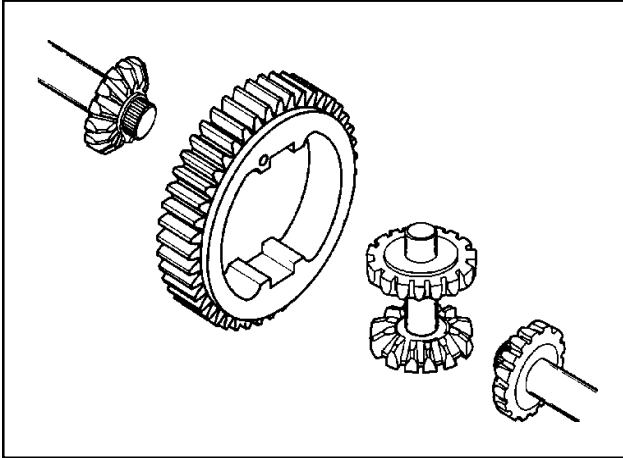
5. The countershaft must have the longer unsplined end toward the outside or brake side of the case and the shorter unsplined end toward the shifter assembly. The wide washer or spacer is placed on the longer unsplined end followed by the largest spur gear.

If assembling a six speed or on some five speed models, 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 the model has the reverse idler held in place by the case, insert the reverse idler into the case prior to the shafts.

NOTE

Depending on the rotation of the countershaft gears, the reverse idler assembly will be located either above the reverse gears and held in place by the bosses in the cover, or below the reverse gears and held in place by the 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.

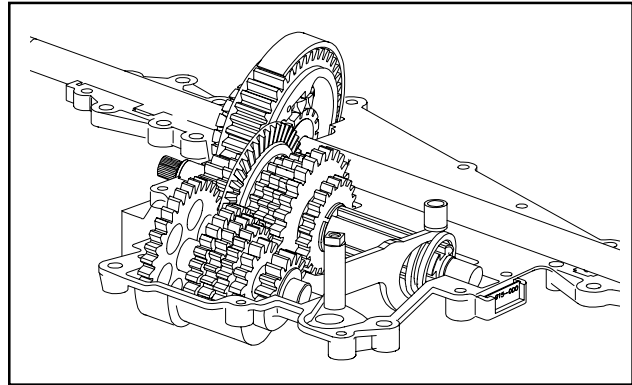


NOTE

The differential must be assembled out of the case and then placed in the case. Apply Bentonite grease anywhere the axle contacts the case.

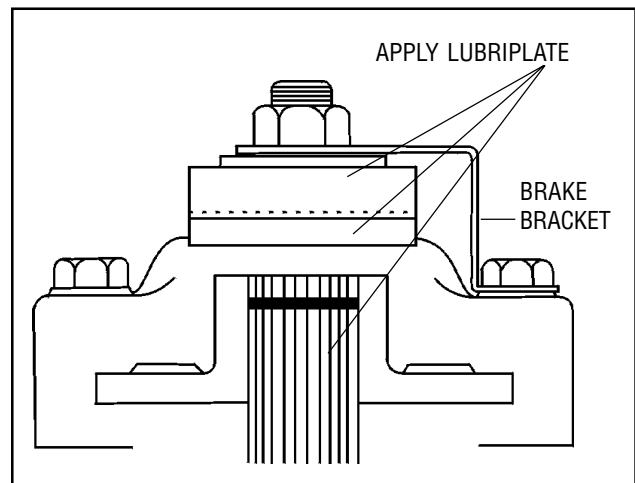
6. Place the center shaft with the bevel pinion gears into the bull gear of the differential. Center the bevel gear of one axle with the pinion gears of the differential. Center the bevel gear of the other axle to the pinion gears of the differential. Pick up the entire unit and place it in the case as an assembly. Reposition the rubber seals on the ends of the axles in their bosses. (If damaged or old replace them).
7. Install the shifter assembly, bearing strap and reverse idler assembly (if applicable). Pack the transaxle with the remaining Bentonite grease (10 ounces [296 ml] total). Replace the spring, set screw and the detent 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 788093A.



8. Guide the cover over the shift rod and position onto the case. Install the cover cap screws and torque 90-100 inch pounds (10.2-11.3 Nm). Install the neutral start sensing switch if applicable. Replace the square cut "O" ring on the exposed shift rod.

Check for binding by turning input shaft.

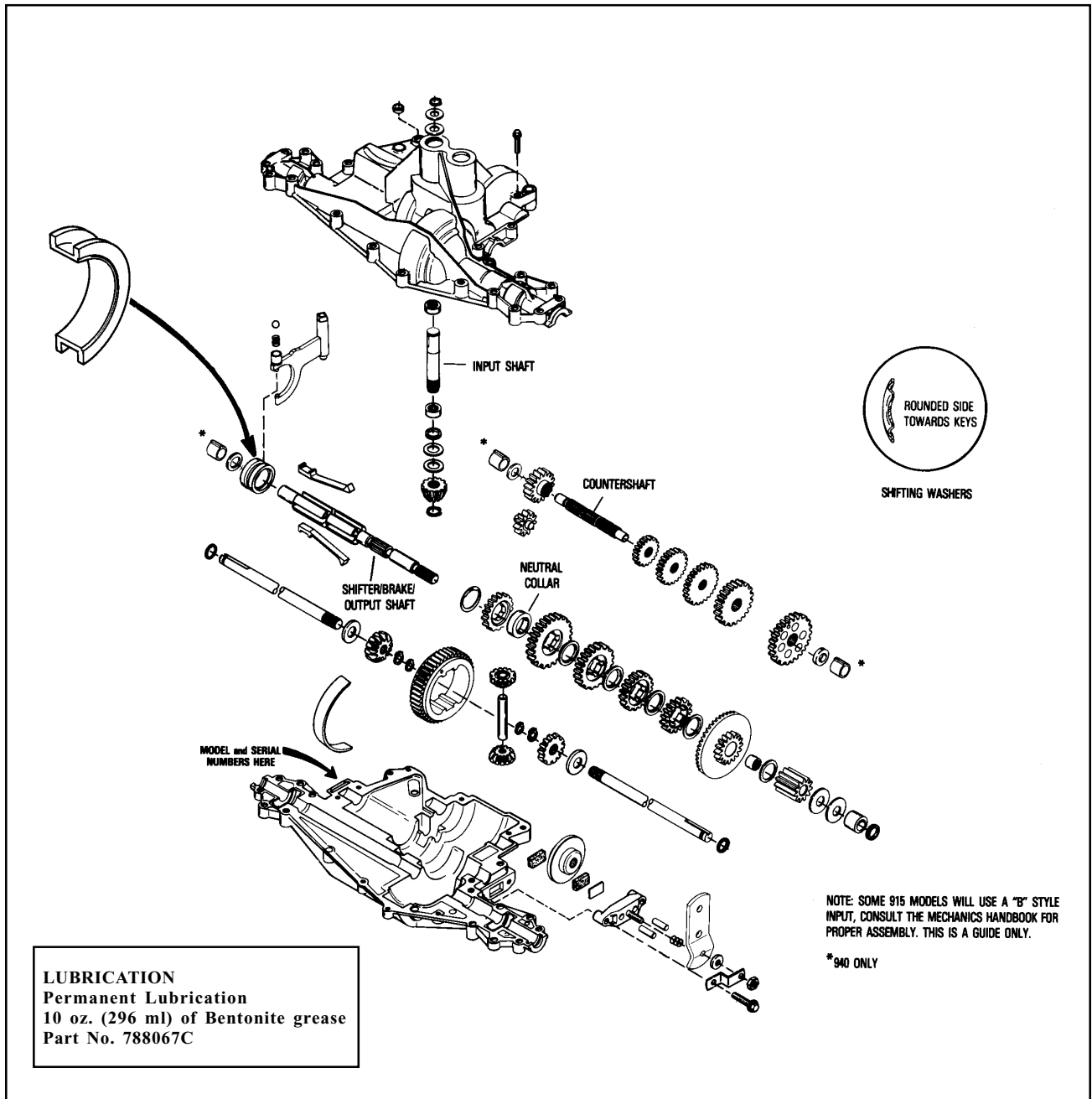


9. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flatwasher, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

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

WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

915 SERIES / 940 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 9. 920 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

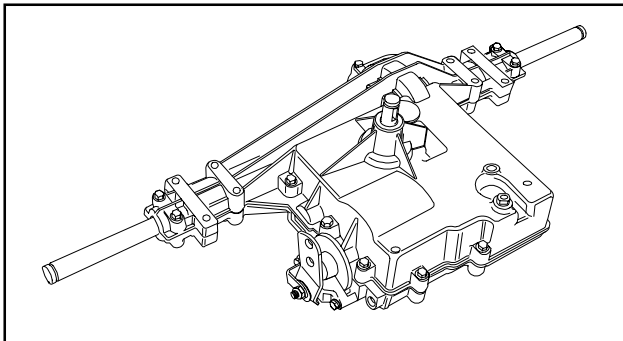
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

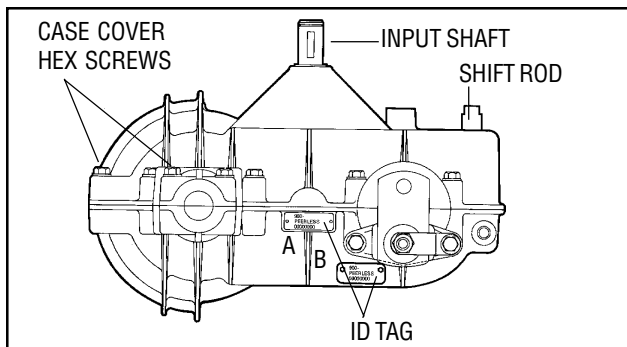
NOTE

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



GENERAL

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



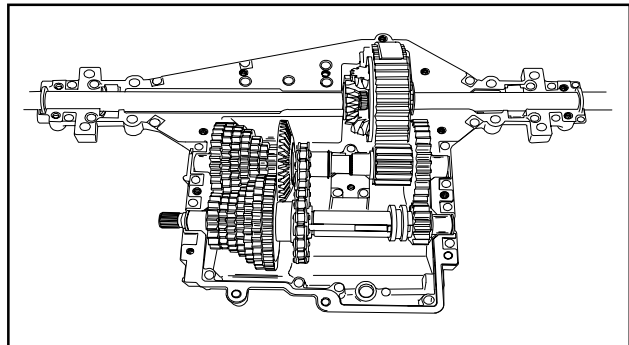
IDENTIFICATION

This unit contains an aluminum tag showing the model number.

DISASSEMBLY OF TRANSAXLE

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

1. The unit may have the OEM option of a neutral start switch; remove the switch.
2. Remove the Allen head setscrew, spring and detent ball. Remove the cap screws that fasten the cover to the case.
3. Push the shift rod through the cover and lift off. Then remove the shifter assembly (which includes the shift rod and shifter fan) and lift out of case.



NOTE

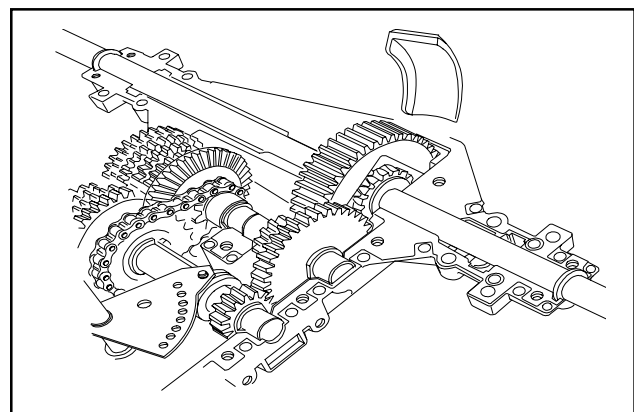
Some models will have the index ball and spring on the case end of the shift rod. Be careful not to lose parts when removing shift rod assembly.

4. Remove the two brake bracket screws and remove the brake assembly.
5. Remove the grease from the unit as the parts are removed.

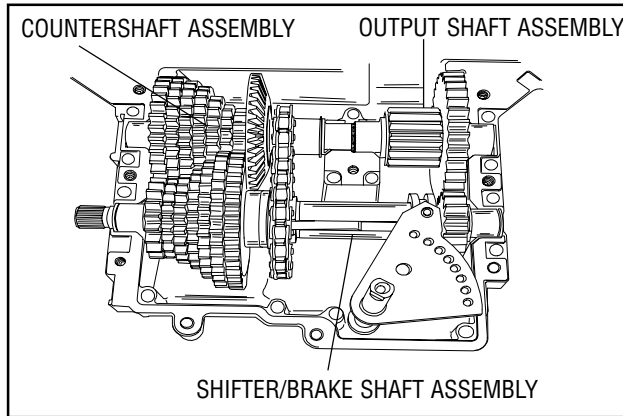
NOTE

Bentonite grease may stain clothes. Care should be used when handling.

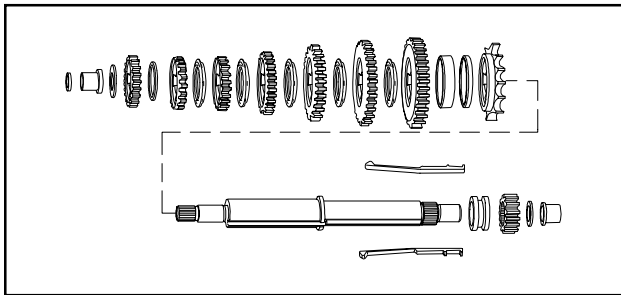
6. Remove the top bearing block on the bull gear of the differential. Remove the bull gear, bevel pinion gears with center shaft and the axles. Grasp the axle bevel gears between your thumb and fingers, holding together while lifting differential from case.



- There are three (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.

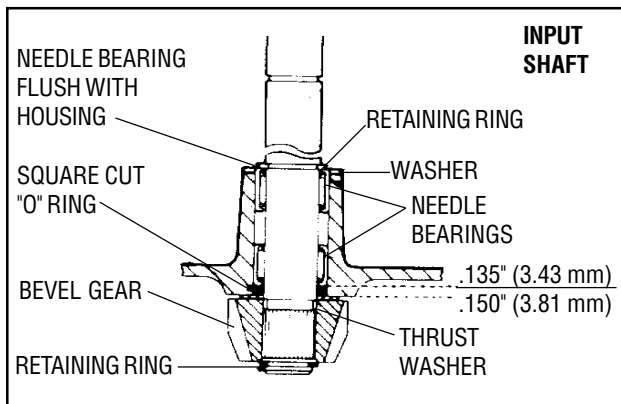


- As these assemblies are taken apart, lay the parts out in a systematic order. This will help to make reassembly easier and inspection of all parts possible. Clean each part of grease as the parts are laid out.



- 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" (3.43-3.81 mm) below flush.

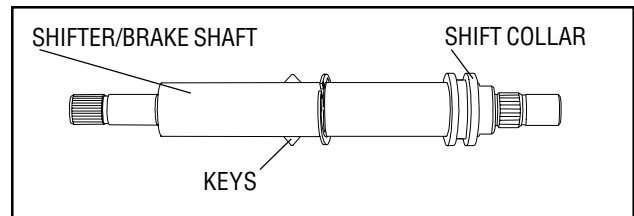


NOTE

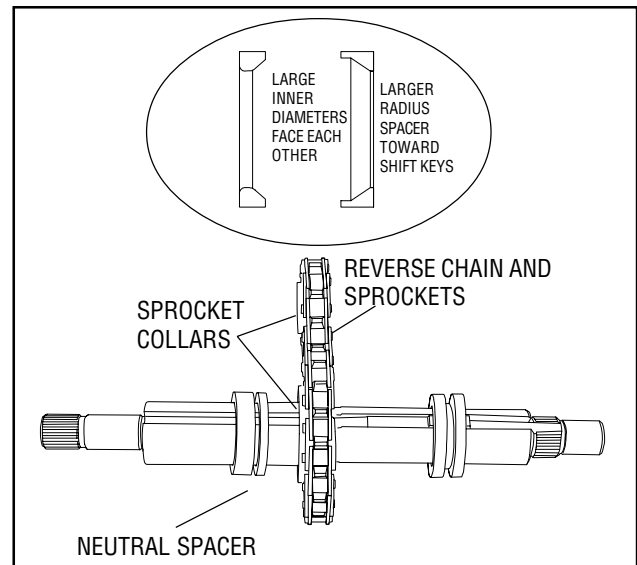
Needle bearings are lubricated with E.P. grease. **DO NOT USE BENTONITE** on needle bearings. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.

REASSEMBLY

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



- Grease both keyways and slide the shift keys and collar onto the shifter/brake shaft.
- 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 the collars on the sprockets are on the same side of the chain and install the sprocket onto the shifter/brake shaft with the collar away from the shift 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.

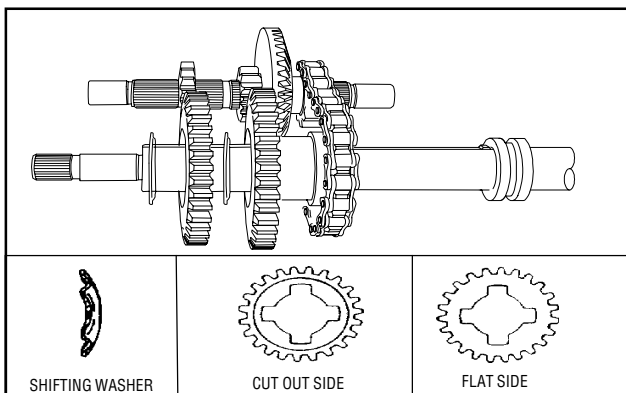
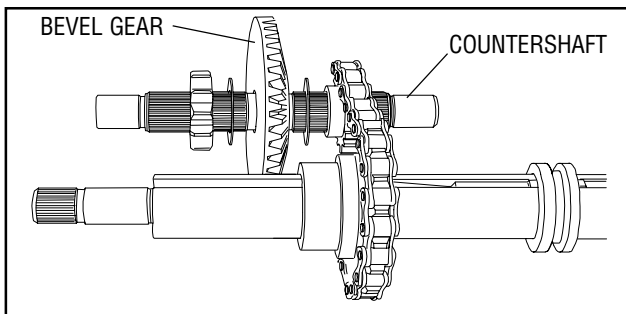
NOTE

There have been a few 900 models built with identical neutral collar halves. These can be installed in 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 onto the assembly, each should be packed with bentonite grease.

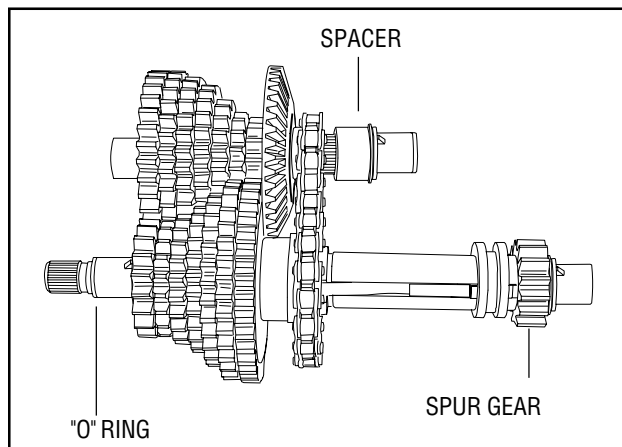


5. Build the gears on the countershaft and shifter/brake shaft alternately, meshing each gear with its mating gear on the opposite shaft. The first gear on the shifter/brake shaft would be the largest of the shift gears. Place this gear next to the neutral collar with the flat side of the gear next to the collar. (See the drawing on the prior page).

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

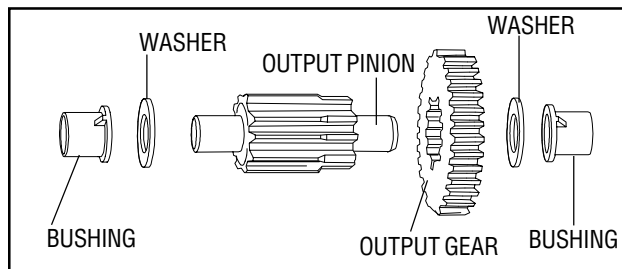
It is not only important that gears match up according to diameter, but also to thickness.



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, followed by 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 two shafts.



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

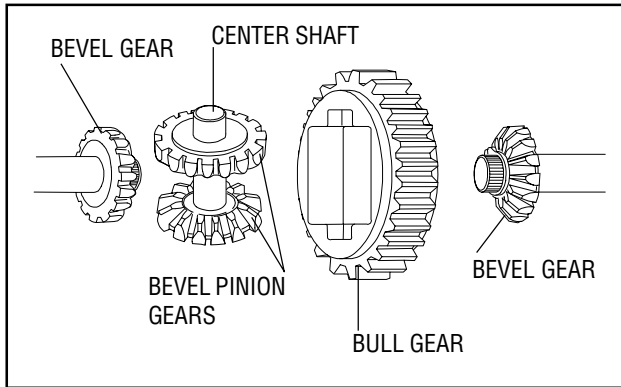
NOTE

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

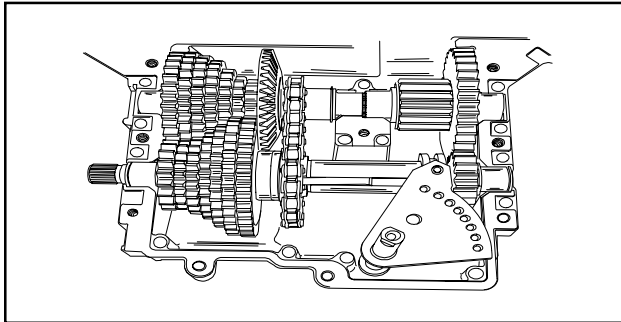
***ASSEMBLY VARIATIONS**

On models which are driven from the opposite side of the input bevel gear, the following changes take place.

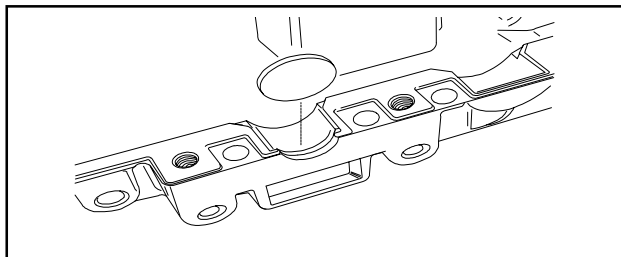
A slightly thicker large bevel gear is placed on the countershaft with the bevel facing the spur gears and in the previous location of the spacer. The thickness of the gear eliminates the need for the washers on each side of the large bevel gear. The reverse chain and sprocket are also turned 180°, which places the 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.



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 of the other axle on 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 [887 ml] total). Apply grease to the top of the shifter fan.

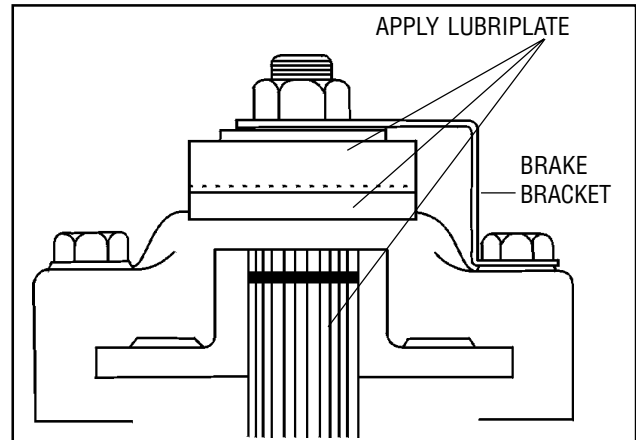


11. To seal the case and cover at the end of the shifter/brake shaft, a flat plug is placed on the opposite end of the brake assembly. Clean the mating surfaces of case and cover; place a continuous thin bead of sealant all around the seam. Use Loctite Gasket Eliminator # 515, Tecumseh part number 510334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

12. Guide the cover over the shift rod and position onto the case. Install the cover cap screws and torque 90-100 inch pounds (10.2-11.3 Nm). Install the neutral start sensing switch if applicable. Replace the square cut "O" ring on the exposed shift rod.

Replace the detent 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 the input shaft.

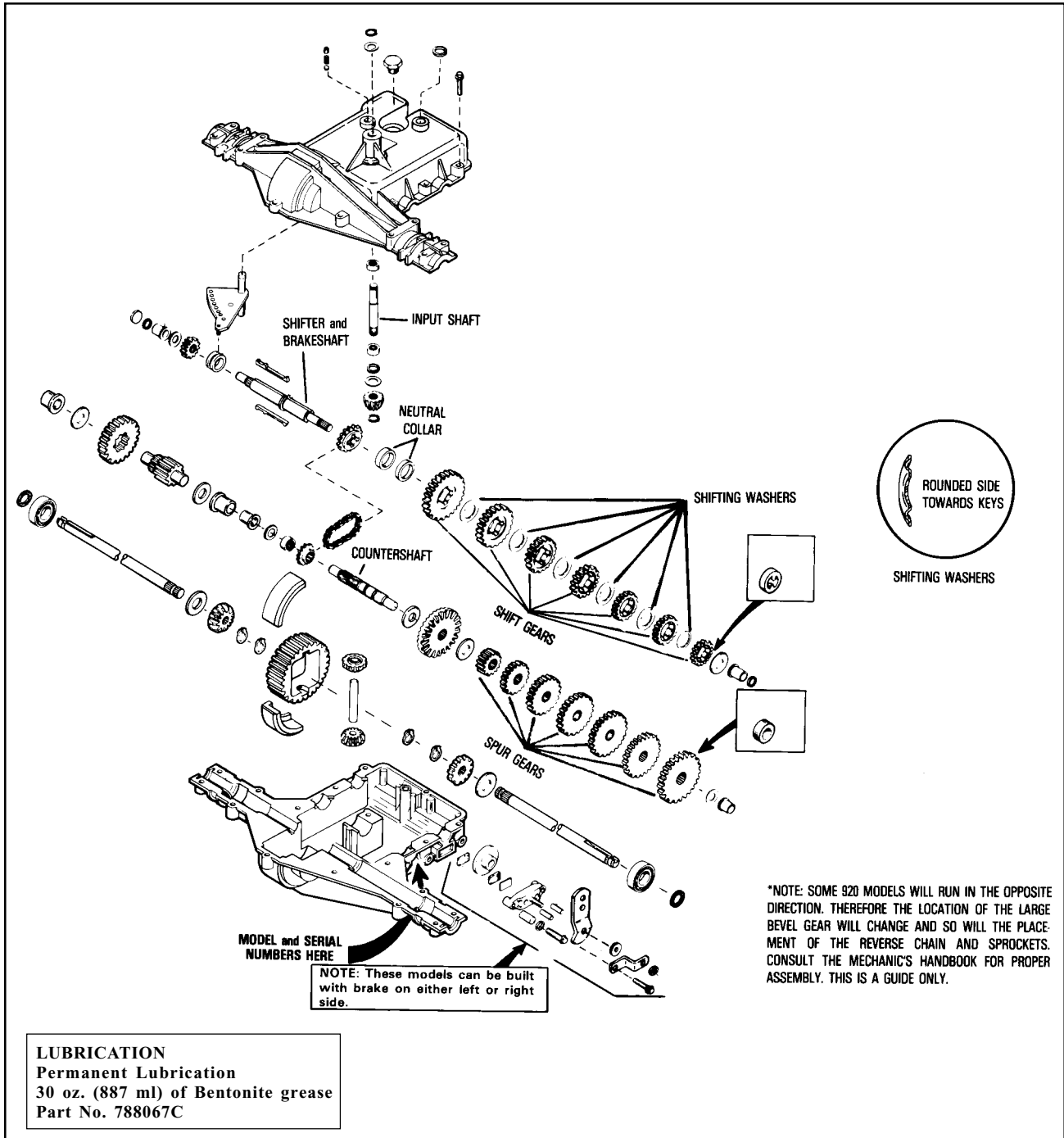


13. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flat washer, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

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

⚠ WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

920 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 10. 930 SERIES TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

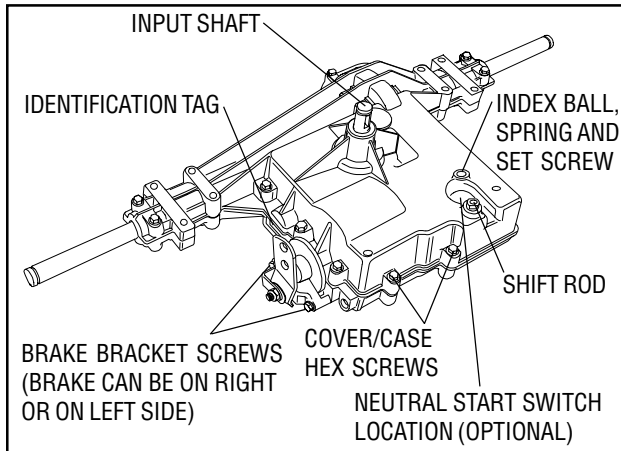
⚠ WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

NOTE

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

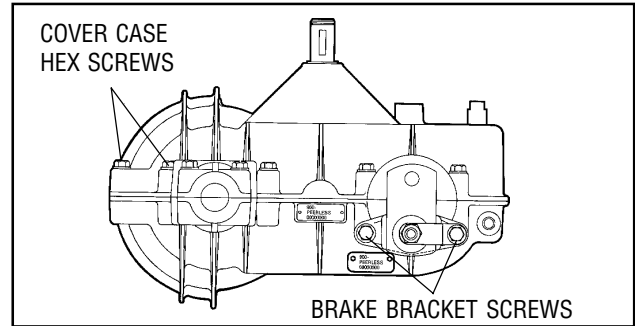


GENERAL

The 930 series transaxle is very similar to the 920 series. The 930 series is 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 are explained.

IDENTIFICATION

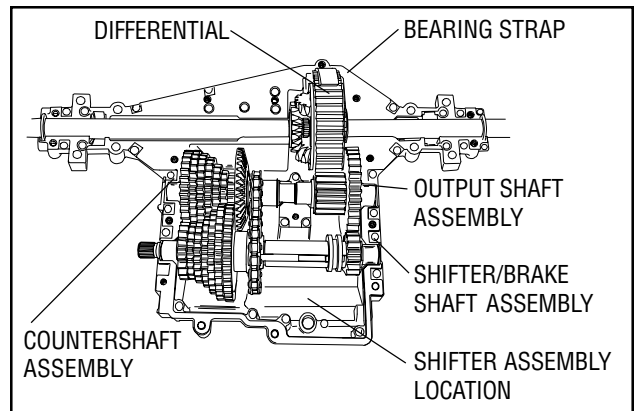
This unit contains an aluminum tag showing the model number.



DISASSEMBLY OF TRANSAXLE

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

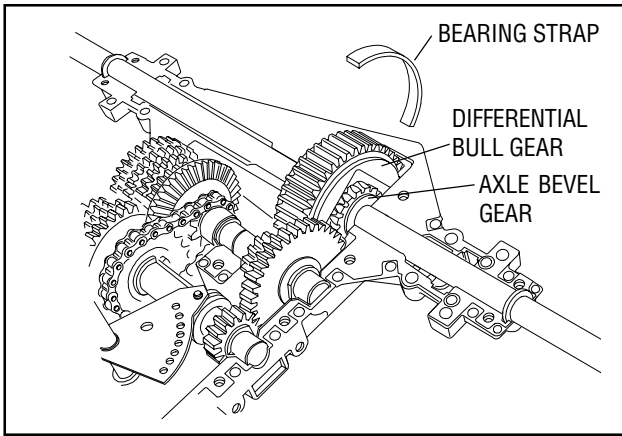
1. The unit may have the OEM option of a neutral switch; remove the switch.
2. Remove the Allen head setscrew, spring and detent ball. Remove the cap screws that fasten the cover to the case.
3. Push the shift rod through the cover and lift off. Then remove the shifter assembly (which includes the shift rod, and shifter fan) and lift out of case.



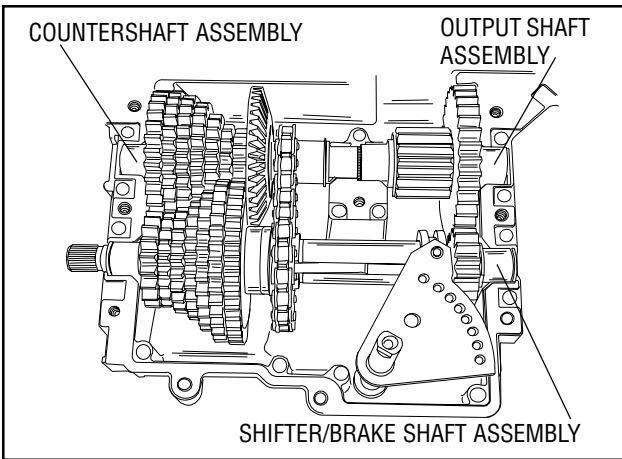
4. Remove the "O" ring from the top of the shifter rod.
5. Remove the two brake bracket screws and remove brake assembly.
6. Remove the grease from the unit as the parts are removed.

NOTE

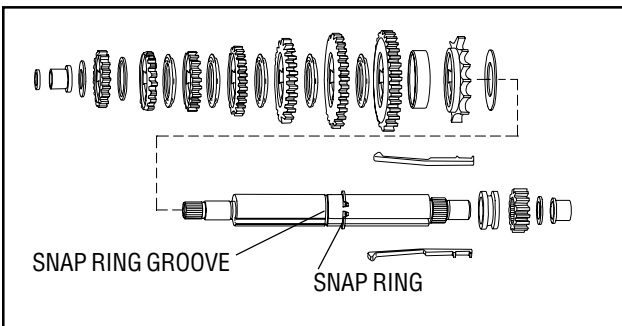
Bentonite grease may stain clothes. Care should be used when handling.



- 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 and hold together while lifting differential from case.

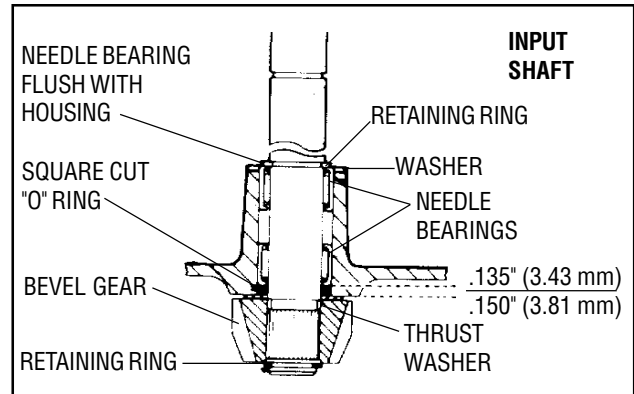


- There are three (3) shaft assemblies in this transaxle; the output shaft, the countershaft, and the shifter/brake shaft assembly. Remove these assemblies as complete as possible from the case.



- 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 the snap ring; it is not necessary to remove the snap ring from the 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 case. The square cut "O" ring must be replaced if the shaft is removed.

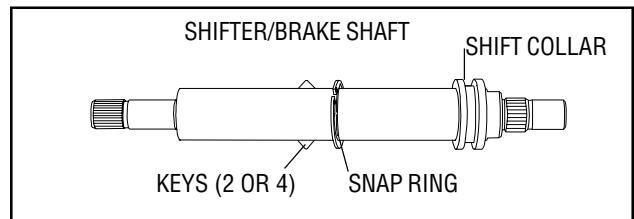
Tool part No. 670251, is used for removal and installation of needle bearings for the input shaft. The needle bearing on the inboard side is installed .135 - .150" (3.43-3.81 mm) below flush.

NOTE

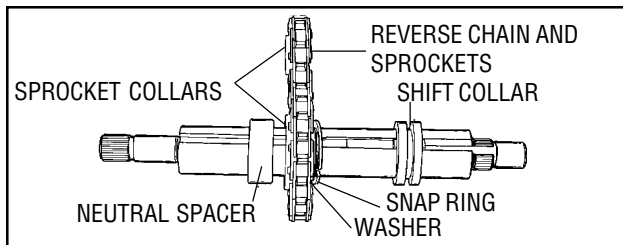
Needle bearings are lubricated with E.P. grease. DO NOT USE BENTONITE on needle bearings. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.

REASSEMBLY

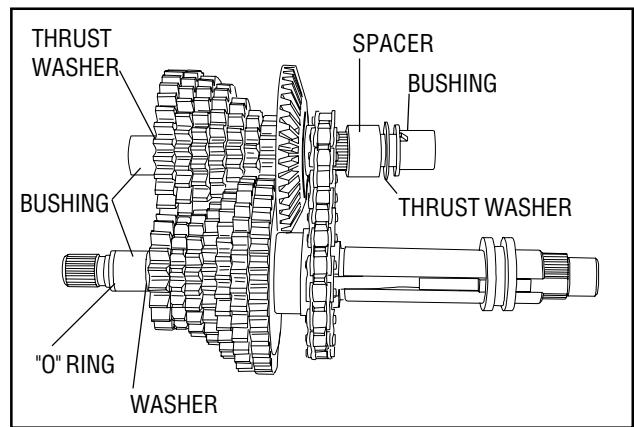
- Apply grease between the bearings in the cover and install the input shaft, square cut seal, thrust washers, bevel gear and snap ring.



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

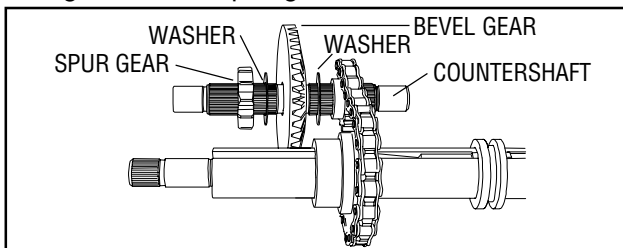


*3. To assemble this transaxle the countershaft and the shifter/brake shaft should be assembled at the same time. Start by placing the reverse chain over the reverse sprockets. Make sure that the collars on the sprockets are on the same side of the chain. Install a large washer onto the shifter/brake 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. Pull the neutral spacer and reverse sprocket up against the snap ring on the shifter/brake shaft.

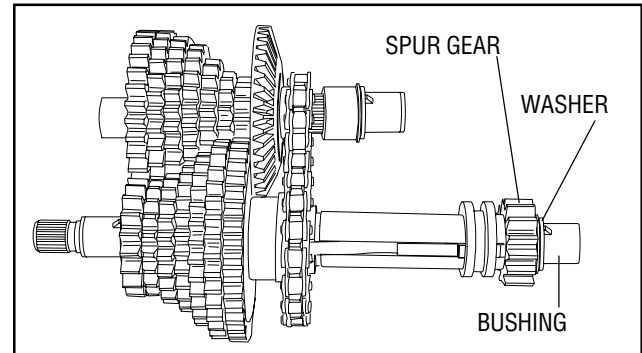


*6. Place the spacer on the countershaft next to the reverse sprocket. Then place a thrust washer on each end of the countershaft and insert the bronze bushings.

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



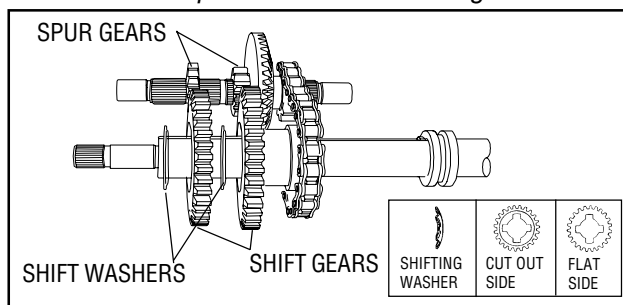
*4. Insert the countershaft into the smaller reverse sprocket. Insert a thin thrust washer next to the sprocket (collar side) and then install the large bevel gear with the bevel towards the reverse sprocket. Place another thin thrust washer on the back side of the bevel gear.



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 two shafts.

NOTE

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

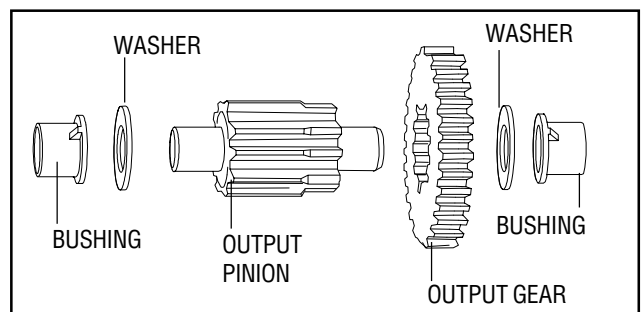


5. Build the gears on the countershaft and shifter/brake shaft alternately, meshing each gear with its mating gear on the other shaft. The first gear on the shifter/brake shaft would be the largest of the shifting gears. Place this gear next to the neutral spacer with the flat side of the gear next to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

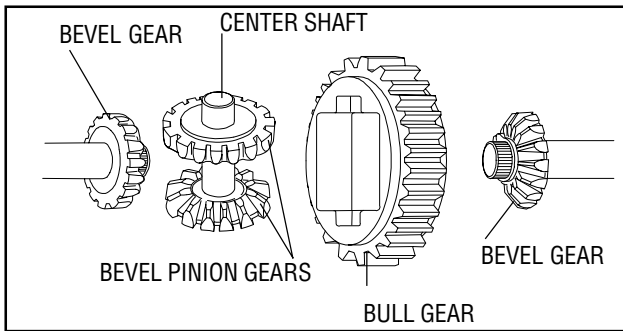
NOTE

It is not only important that gears match up according to diameter, but also to thickness.



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 three shaft assemblies back into the case. Make sure that the tabs of all the bushings are in their "V" notches in the case.

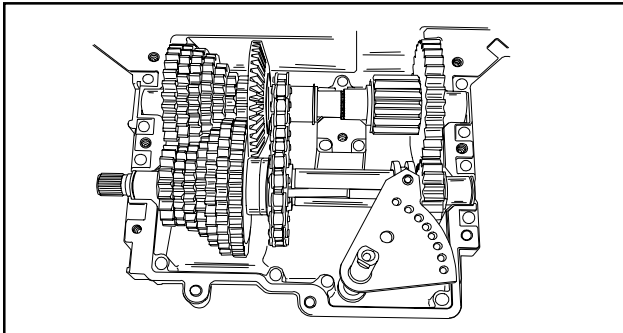
* See Assembly Variations on page 64



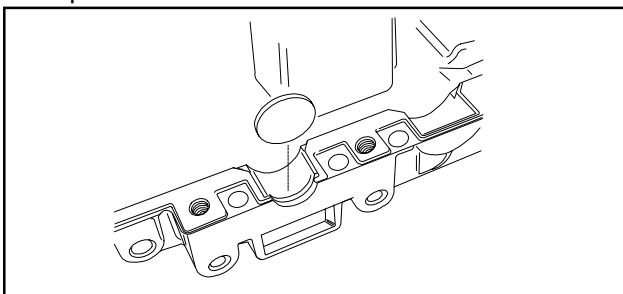
NOTE

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 with 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).



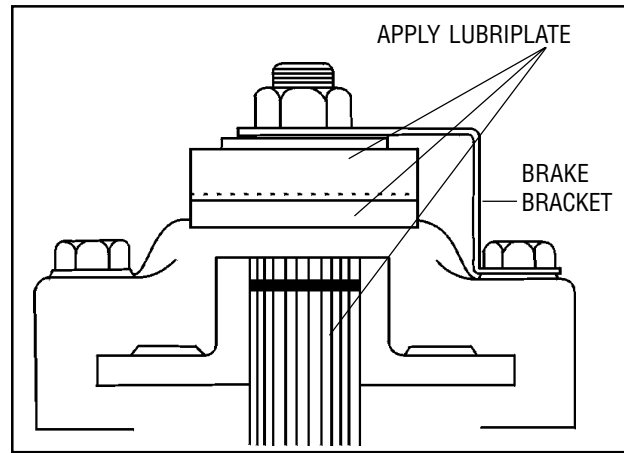
10. Install the shifter assembly and bearing strap, pack the transaxle with the remaining Bentonite grease (30 ounces total) (887 ml). Apply grease to the top of the shifter fan.



11. To seal the case and cover at the end of the shifter/brake shaft, a flat plug is placed on the opposite end of 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 788093A. Install cover screws and torque to 90-100 inch pounds (10.2-11.3 Nm).

Replace the detent 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. Apply a light film of lubriplate to the inside lever which contacts the brake pins, the outside of the lever which contacts the flat washer, and between the shaft O.D. and the I.D. of the splined brake disc. The brake pads and brake disc must be free of grease and oil. Install brake assembly.

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

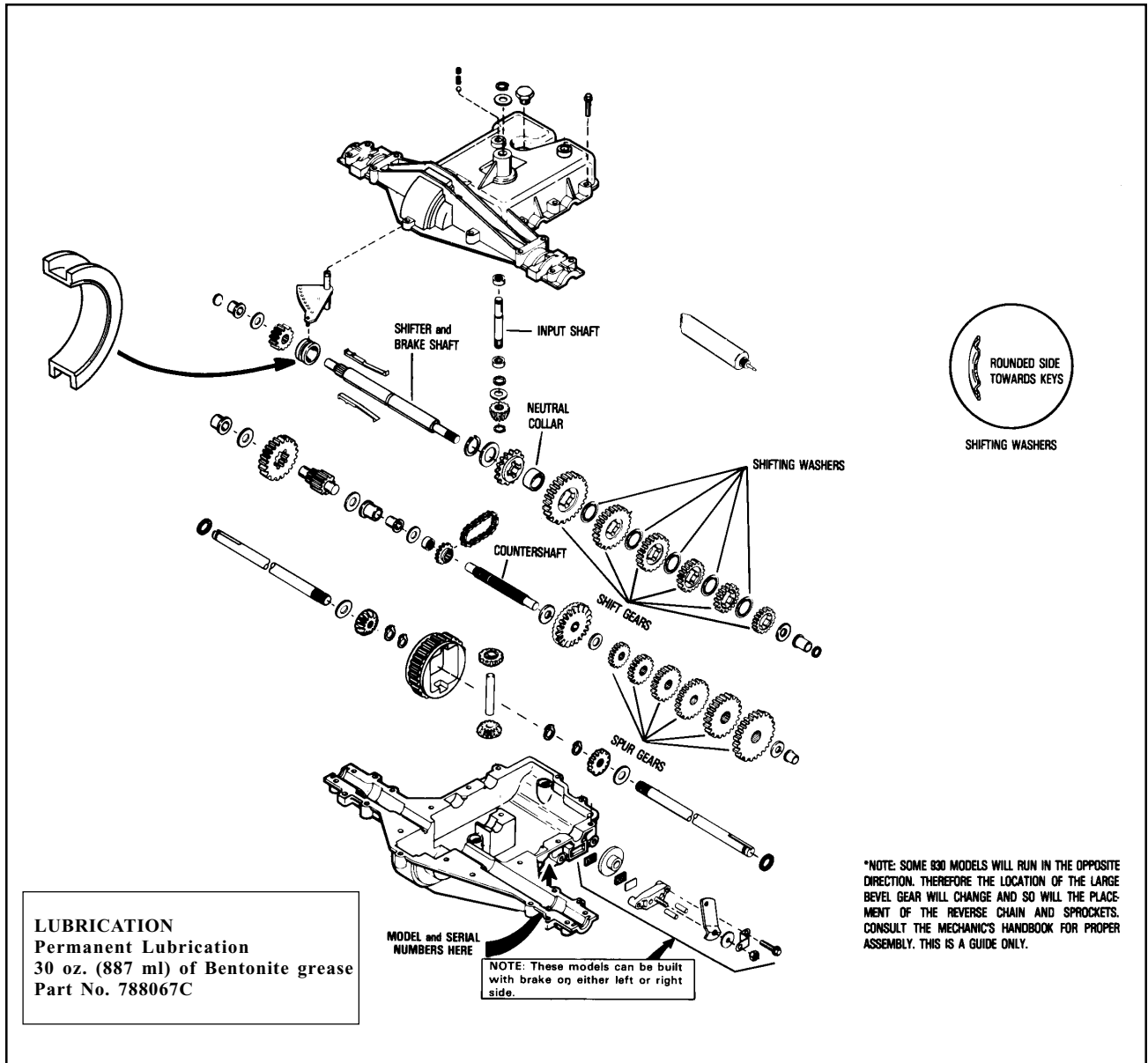
WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

*** 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.

930 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 11. MST200 SERIES TRANSAXLES

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

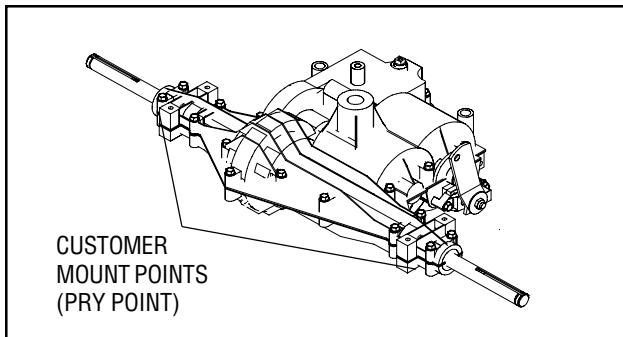
WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts may affect performance and could result in death or serious injury.

- Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.



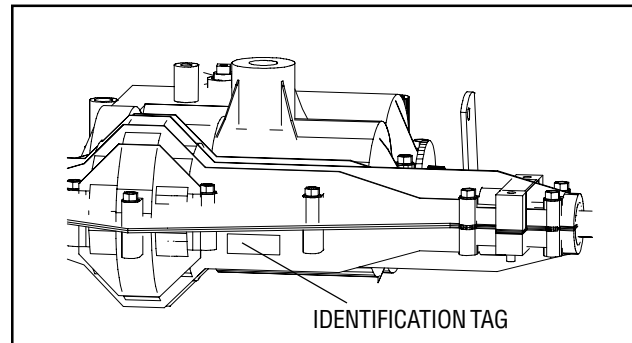
GENERAL

The MST (Manual Shift Transaxle) 200 is a sealed unit which uses 16 oz. (473 ml) of 80W90 gear lube (part #730229B). The MST series is available with up to 6 speeds forward and one reverse. It has a contoured 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.

Thrust washers are used on all transaxles 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.

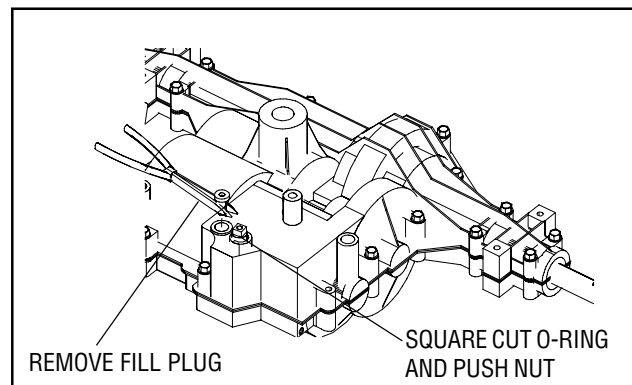
IDENTIFICATION

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.

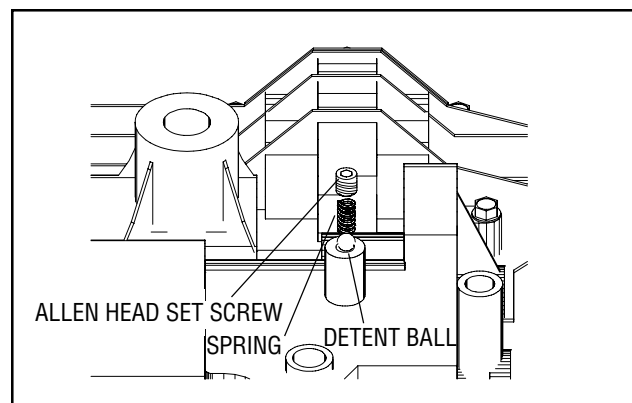


STEPS TO TAKE BEFORE DISASSEMBLY.

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.
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.



6. Remove the set screw, spring and detent ball.

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 When prying the crankcase from the crankcase cover use specified mount points. Failure to do so may result in equipment damage.

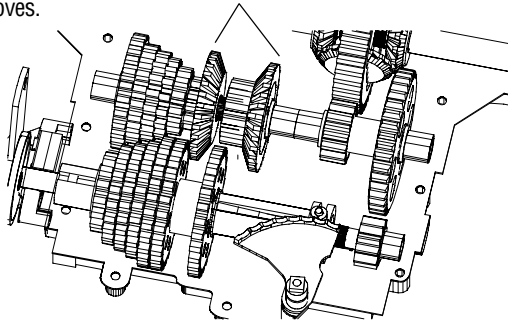
2. With a rubber or leather mallet tap down on the shift lever rod while removing the cover from the case.

NOTE

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.

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



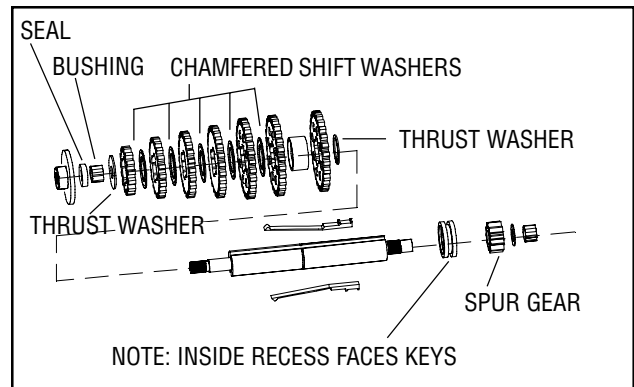
5. There are three shaft assemblies in this transaxle. The countershaft, shifter/brake shaft and output shaft. Remove the shifter fork assembly and then remove the shaft assemblies from the case.

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.

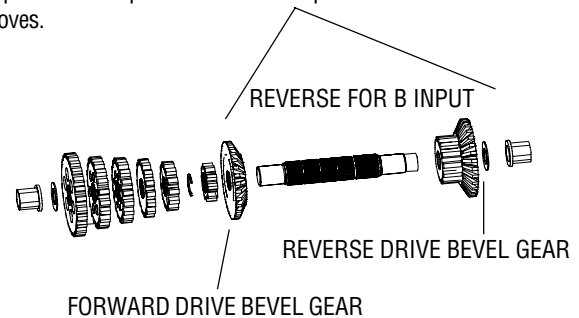
WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.



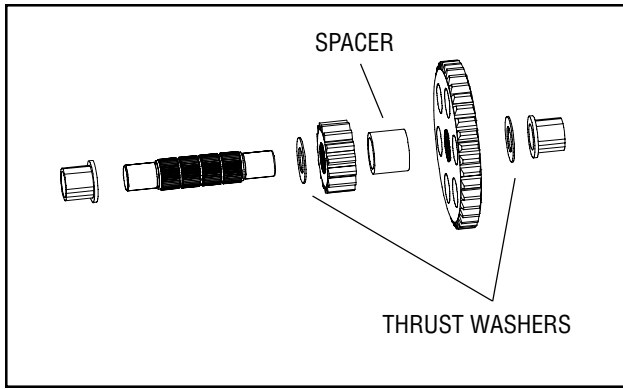
7. To disassemble the shifter/brake shaft, start on the spur gear side. Remove the oil seal, the bronze bushing and thrust washer. Remove all of the shifter spur gears (and spacers if used) and shift washers. Remove the neutral collar, reverse gear and thrust washer. On the output side of the shifter/brake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

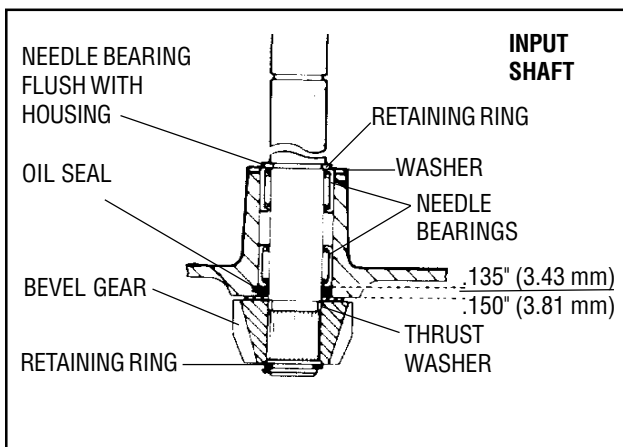
NOTE: When a "B" input is used the input bevel gears will be opposite of this picture. The drive spline on this shaft also moves.



8. To disassemble the counter spur gear shaft, remove the bushing, thrust washer and spur gears (and 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.



9. To disassemble the output shaft, remove the bushing, thrust washer, large output spur gear, spacer, small output spur gear, thrust washer, and bushing.

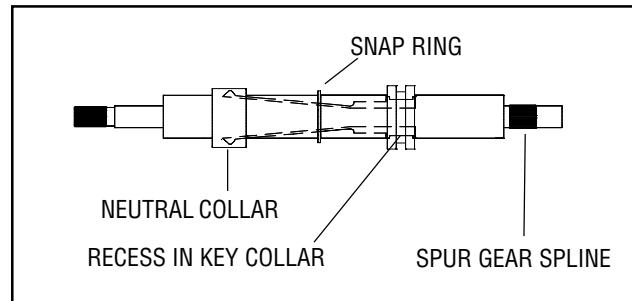


10. The input shaft can also be removed and inspected or serviced. Remove the snap ring and thrust washer on the input shaft, pull the shaft through the cover. The oil seal located on the inboard side of the cover should be replaced when reassembled. Be sure to reinstall the upper and lower thrust washers.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

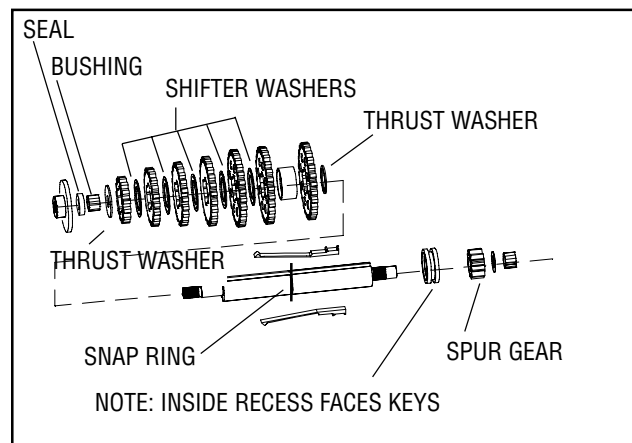
REASSEMBLY

The tool, part number 670251 can also be used for installation of the needle bearings for the input shaft. The inside needle bearings are installed .135"-.150" (3.43-3.81 mm) below flush. The top bearing is installed flush to the casting.

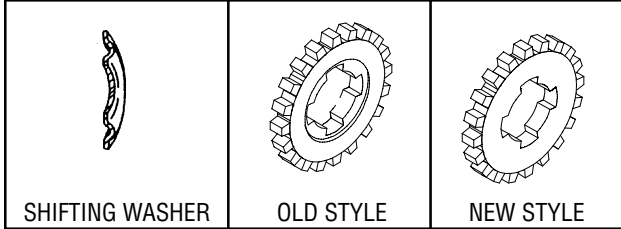
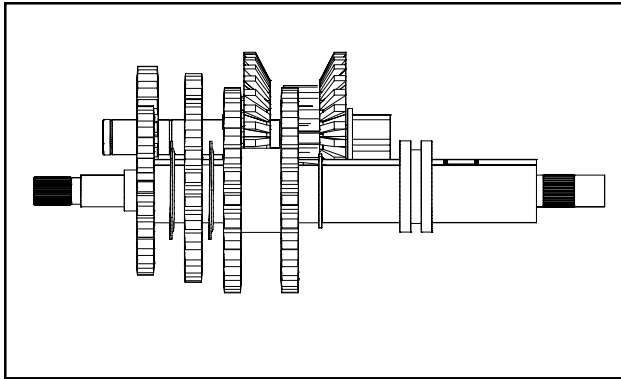
1. Use an EP bearing grease and apply it to the bearings in the cover. Place the seal into the cover with the grooved side of the seal visible and facing the installer. Place the snap ring and thrust washer on the input shaft and slide the shaft through the cover and seal. Place the square cut o-ring,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



2. 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 the 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 keys. Place the notch from the second key on the inside diameter of the shift 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.



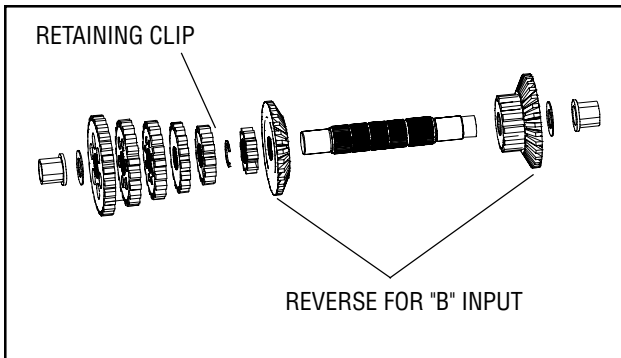
3. Place the plain large thrust washer over the key tips on the spur gear side of the shaft next to the snap ring. The sequence that follows is reverse gear, the neutral collar, then 1st thru the number of gears the unit contains (largest to smallest). Between each gear place a shift washer with the chamfered I.D. facing the shift key (opposite the brakeshaft).



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 and do not require that they 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.

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.



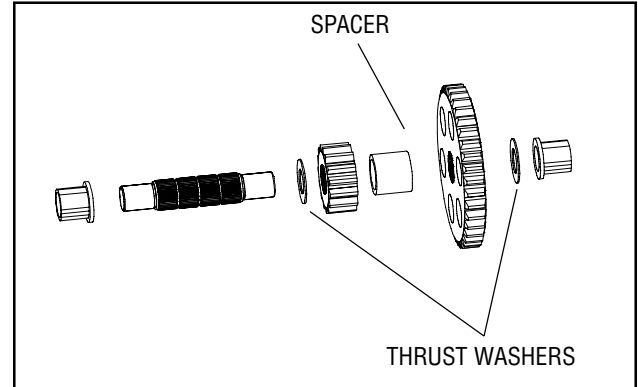
4. To assemble the countershaft, place the reverse input bevel gear on the unsplined end of the shaft. Follow with a washer and a bronze bushing to complete the reverse drive side of the countershaft. The forward drive side requires the forward input bevel gear and the smallest spur gear to be placed

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 sections to prevent the bevel gears from spreading.

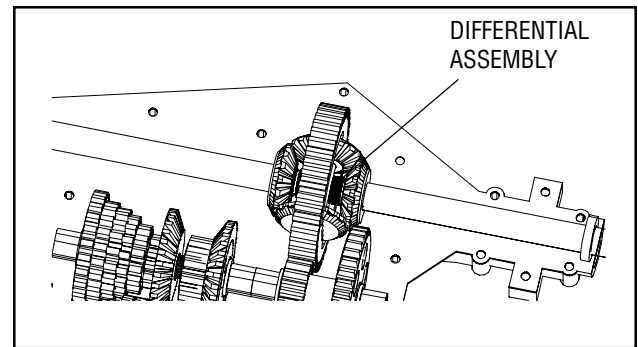
The countershaft is then completed by placing the remaining spur gears on the shaft (smallest to largest). If the spacers are used they will be placed between the final spur gear and the thrust washer with the bushing to follow.

NOTE

The spur gears on the countershaft can be installed in either direction.

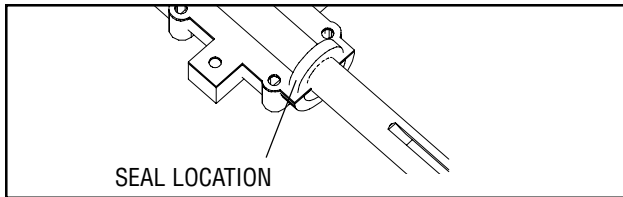


5. The output shaft is completely splined and consists of a bronze bushing, thrust washer, a large output gear, spacer, small output gear, thrust washer and bronze bushing.



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.

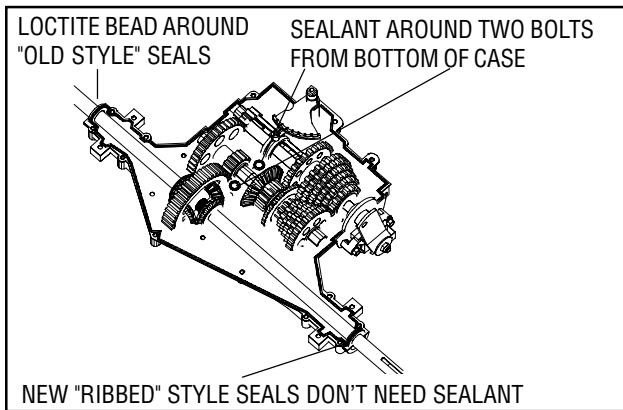
The differential must be assembled outside of the case and placed into the case as an assembly. Using seal protector (part # 670262) place a new seal on each shaft with the open side facing inward. Hold the longest shaft with the bevel gear and washer in your hand between the ring and middle finger. 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 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 pockets. When properly installed, the axle shaft should turn freely without any binding.

NOTE

Before closing the case make sure the case and cover fit together evenly. Insure the bushings are properly positioned with the flat sides of the bushings matching the pockets of the case and cover.

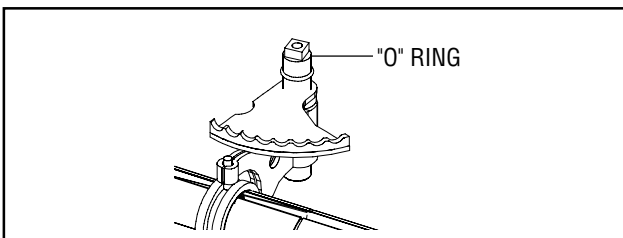


WARNING Avoid blocking oil passages leading to axle shafts when applying a silicone bead to case as shown. Failure to do so may result in oil leaks and could result in death or serious injury.

- To seal the case and cover, clean the mating surfaces and place a continuous thin bead (1/16" / 1.5 mm) of Loctite 598 Silicone RTV (part # 788093A) around the entire perimeter of the cover to prevent an oil leak. Don't forget the two bottom bolts.

NOTE

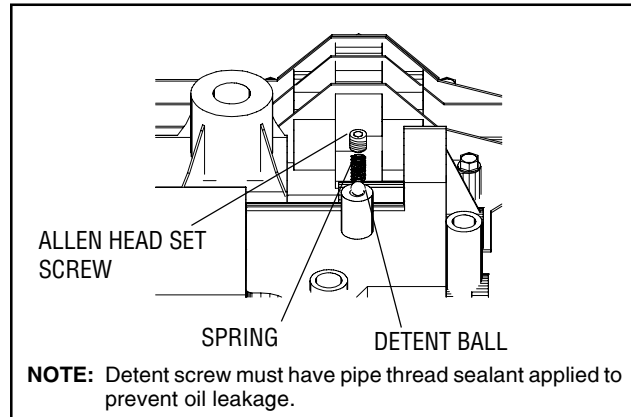
The axle and brake shaft seals on later production MST's have been redesigned to eliminate the need for sealant in the seal/bearing pocket area. These new seals are identified by external ribs that hold the seal in place and prevent leakage. **DO NOT** put sealant in the seal/bearing pockets with this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



- Before placing the cover on the case, place the shift rod and fork pins into the shift collar and the shaft into its' boss in the case. Inspect the shaft on the rod and fork for rust and burrs.

- 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.

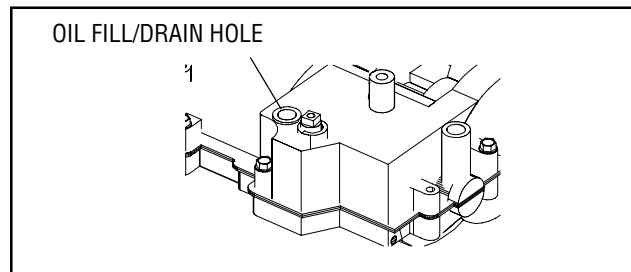
- Install the cover screws and torque them to 90-100 inch pounds (10-11.3 Nm). Replace the detent ball, spring and set screw. Turn the set screw down to the flush position. Install the neutral start sensing switch if applicable.



NOTE

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

- 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. (473 ml) of 80W90 gear lube (part #730229B). When completed, lubricate the plug lightly on the outside with oil. Use a 3/16" (4.7 mm) wood dowel placed in the plug recess to push it into the plug hole.

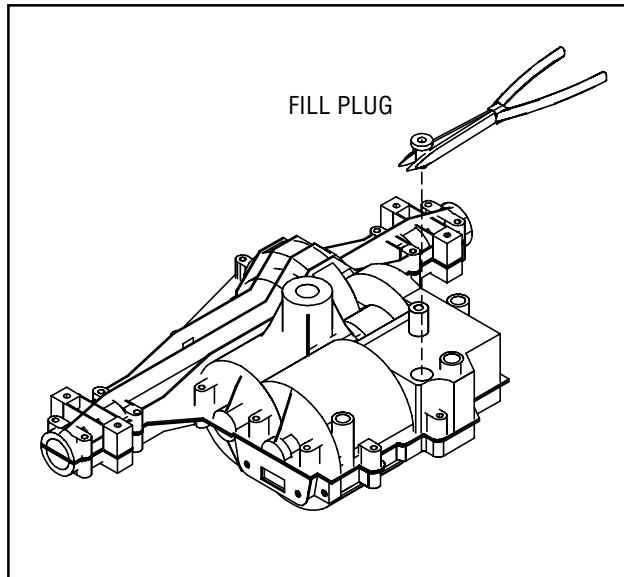
- Install the transaxle on the equipment. Make any clutch and brake adjustments in accordance with the equipment manufacturers owners manual.

WARNING Follow recommended guidelines in equipment manufacturer's manual for correct brake adjustment. Failure to do so could result in excessive brake pad wear and brake failure which could result in equipment damage, death or serious injury.

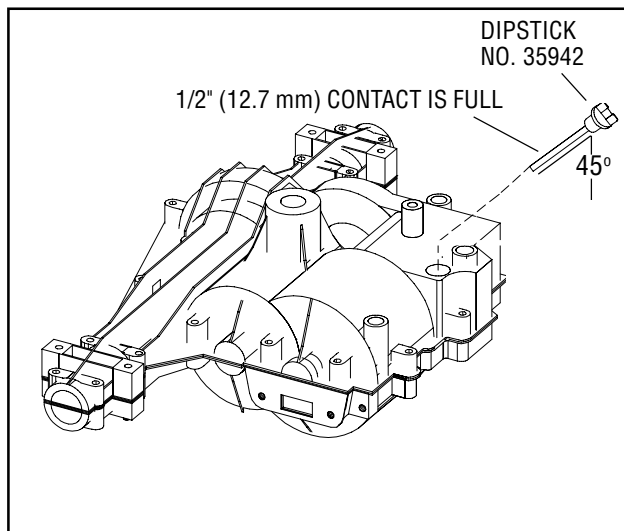
CHECKING OIL LEVEL

PROCEDURE:

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

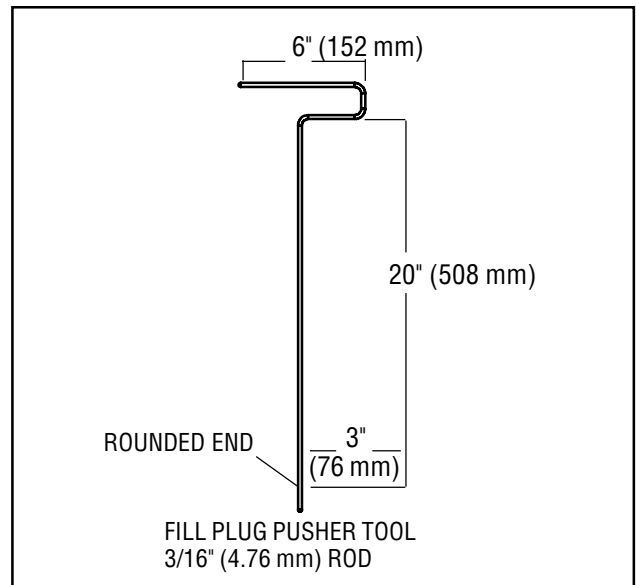


4. Work a needle nose pliers under the lip of the plug, rocking from side to side until plug is removed. Use care to not damage the rubber plug.

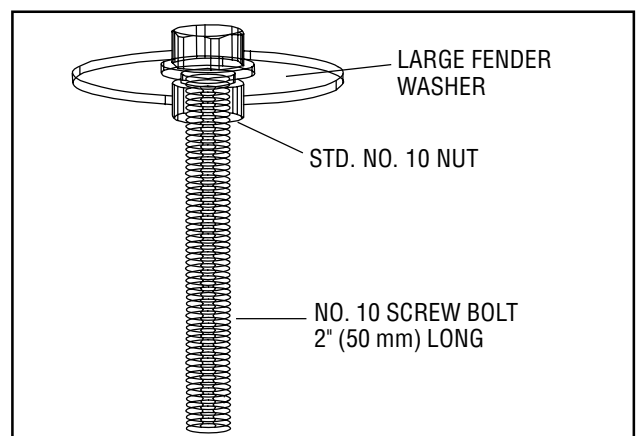


5. Insert the dipstick gauge at a 45° angle (Part Number 35942). Check for approximately 1/2 inch (12.7 mm) of oil when fully inserted. This is 16 ounces (473 ml) of EP90 gear oil.

6. If oil is needed, we recommend using a **16 ounce (473 ml)** goose neck mechanics oil can. (These are readily available at any hardware store.) Fill the unit with all **16 ounces (473 ml)** of 90 wt. gear oil to the level indicated.
7. Reinstall the plug by lubricating it with a silicon spray lubricant. An installation tool can be made by using one of the following procedures.



8. When the plug is accessible from the battery box area, make an installation tool from 3/16" (4.76 mm) cold rolled steel rod as shown.



9. If working from the bottom or side, use a No. 10 bolt screw approximately 2 inches (50 mm) 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 reinstallation of the plug. The blunt end of a TORX 30 bit works well also.

CHAPTER 12. 1200 SERIES THREE-SPEED TRANSAXLES

H-SHIFT PATTERN

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

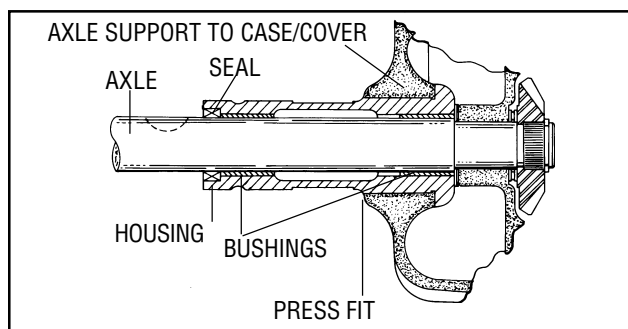
WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts may affect performance and could result in death or serious injury.

- Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.

GENERAL

1. The 1200 series transaxle 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, tillers or similar equipment. Care is to be used and common sense is expected in any situation where a severe strain will be placed on the axles.

1200 Housing, Bushing and Seal Assy.

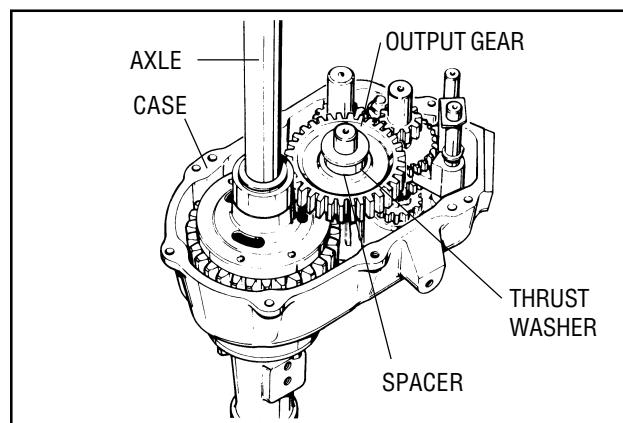
On the 1200 series, replace the seals after complete reassembly.

DISASSEMBLY

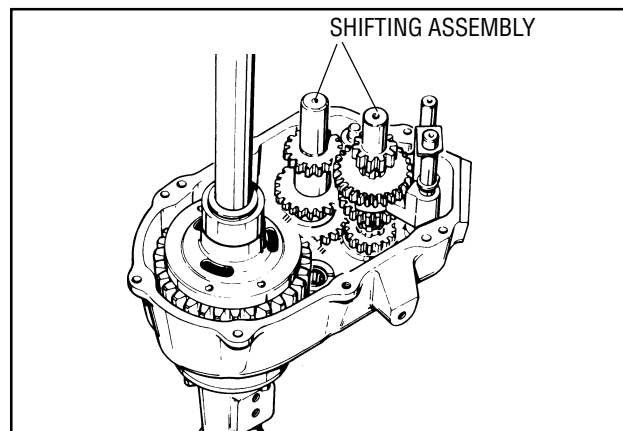
1. Position the shifter forks in neutral.
2. When disassembling the unit, it should be held so it lies on the case, and properly blocked so no weight rests on the input shaft or differential, but keeping the case rigid.

The unit also needs to be held in a vice in such a way that it can be worked on without the chance of falling, or causing injury.

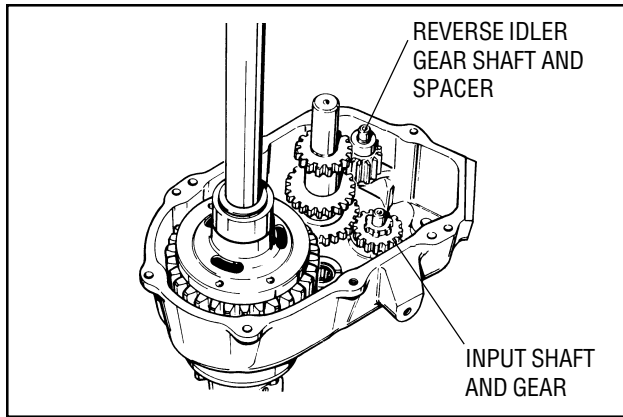
3. Oil seals have a double lip so seal sleeves do not offer much protection during removal. Upon reassembly new seals should be used.
4. Tap dowel pins into the case and remove socket head cap screws.



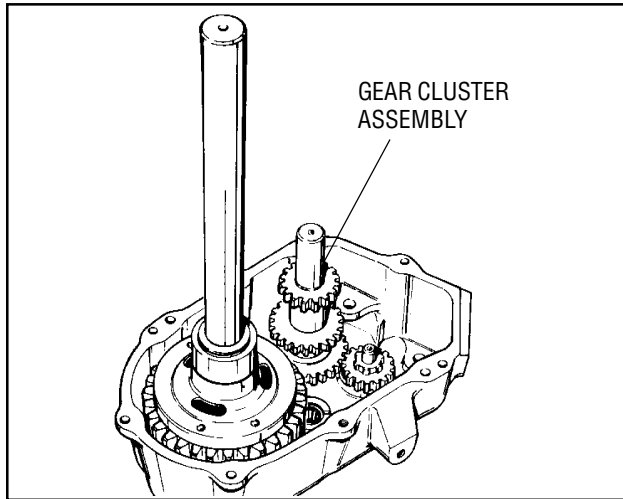
5. Lift the cover off of the case. Discard the gasket. Remove output gear and shaft.



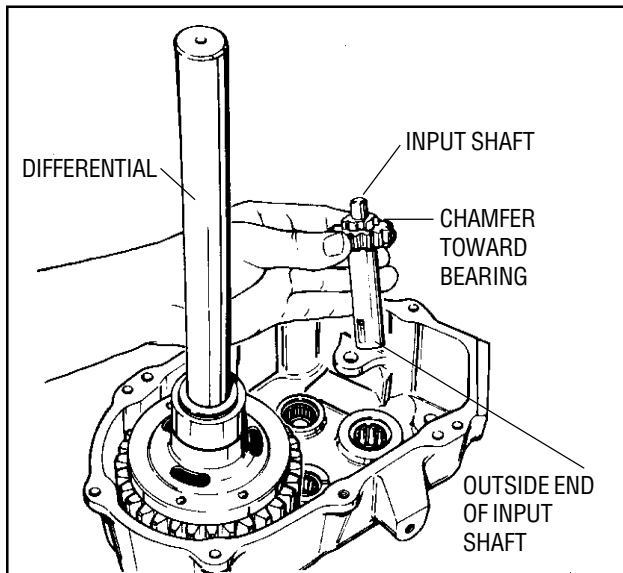
6. Remove the shifting assembly as one unit.



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



8. Lift out the three gear cluster.



9. Remove the input shaft, then the differential.

NOTE

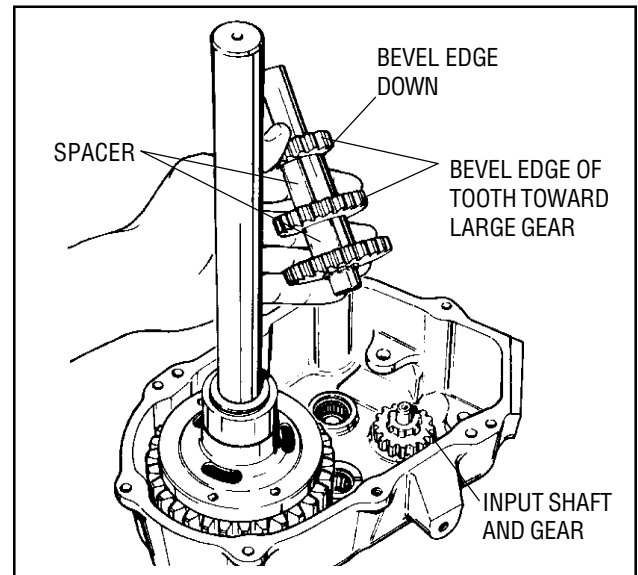
Note what the relationship of the bolt heads are prior to removal of the assembly.

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.

ASSEMBLY

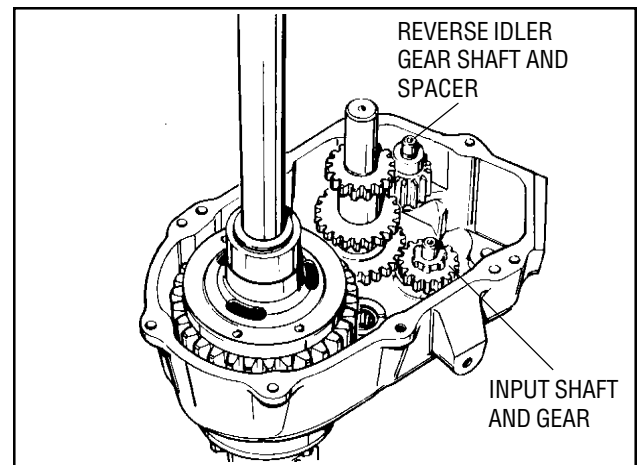
1. Install the input shaft in the case. Use a soft mallet to seat the shaft and gear completely. Binding can occur if the shaft is driven in only part way.
2. Install the differential assembly. The four cap screw heads should face away from the output gear or downward.



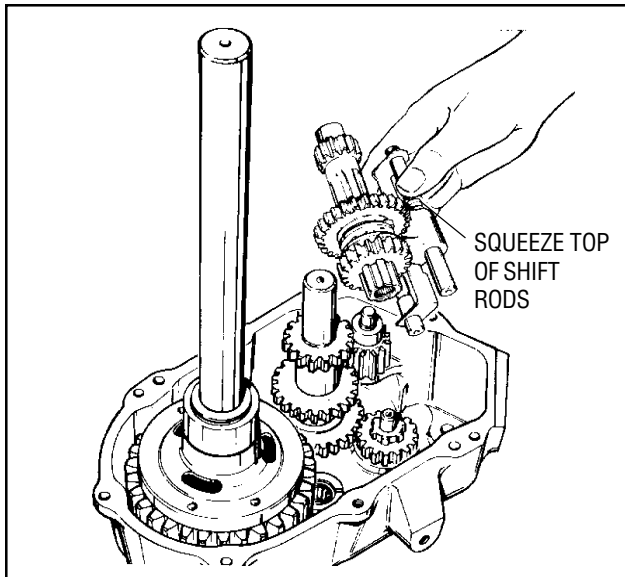
3. Install the three gear cluster, with the smallest gear facing up.

NOTE

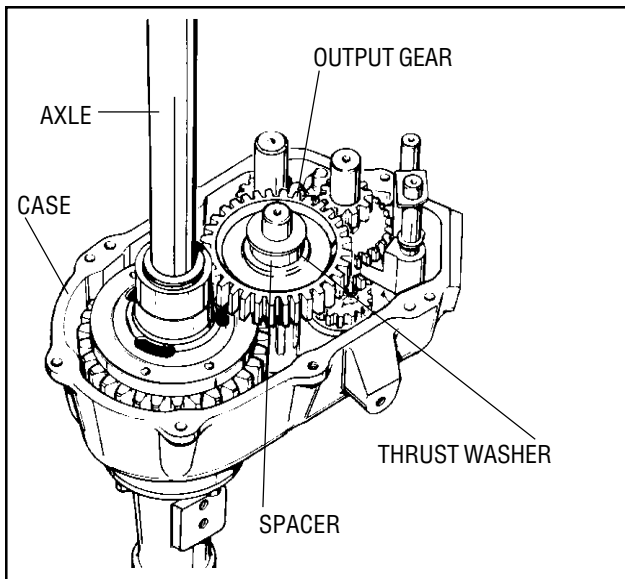
Bevels of the small and middle gears go down toward the large gear with the large gear bevel facing up. The short spacer goes between the large and middle gears.



4. Position the reverse idler shaft in the unit; then install the 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 the cover.
8. Align the cover with the dowel pin and secure with the socket head cap screw. Torque to 10 ft. lbs. (13.6 Nm).
9. Install the axle seals using a sleeve and driver.
10. Install the axle supports. Be sure the mounting pad position is correct before tightening down the cap screws to 13 ft. lbs. (17.7 Nm).
11. Install a new gasket and shift lever housing. Torque screws to 10 ft. lbs. (13.5 Nm). Be sure the shift lever is in the proper position to allow shifting.

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 (1420 ml) of oil. All other units, fill with 2 pints (946 ml) of oil.

CHAPTER 13. HYDROSTATIC GEAR REDUCTION DIFFERENTIALS

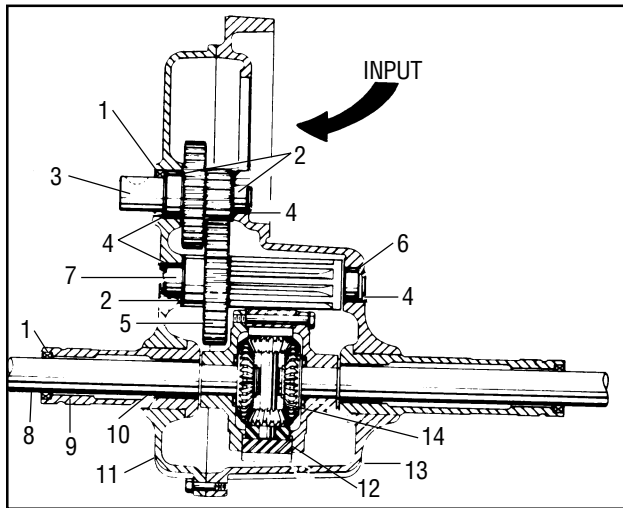
1300 SERIES

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

The 1300 series unit, is driven by a hydrostatic pump connected to the units case. The transmission function is accomplished by the hydrostatic controls. The Tecumseh/Peerless unit, therefore, only reduces input shaft speed to the differential and axle assembly.

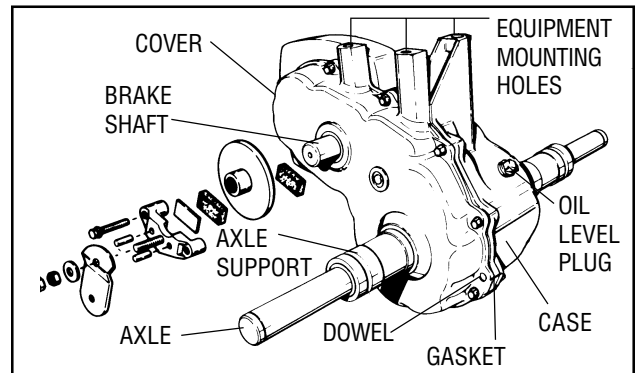


Legend for the 1300

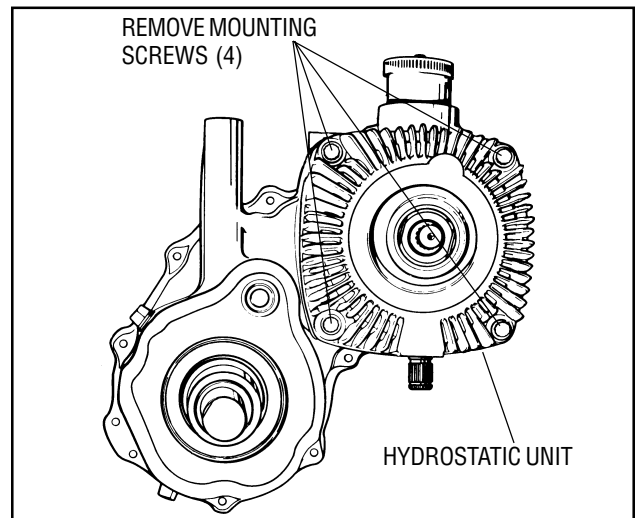
- | | |
|--------------------|------------------------|
| 1 - Oil Seal | 8 - Axle |
| 2 - Thrust Washer | 9 - Axle Support |
| 3 - Brakeshaft | 10 - Bushing |
| 4 - Needle Bearing | 11 - Cover |
| 5 - Output Gear | 12 - Differential Gear |
| 6 - Output Shaft | 13 - Case |
| 7 - Spacer | 14 - Thrust Washer |

DISASSEMBLY

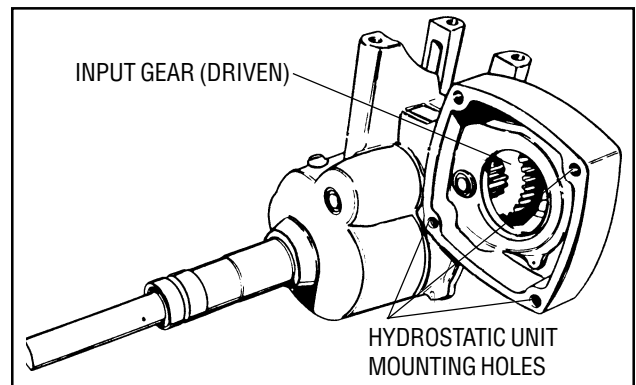
1. Clean the exterior surfaces. Drain lubricant; then separate the gear reduction from the hydrostatic unit. Check axle shafts for rough edges and high spots. Due to the hardness of the shafts, a stone may be necessary to remove metal burrs. Check for any evidence of oil leakage at the gasket or bearing surfaces.



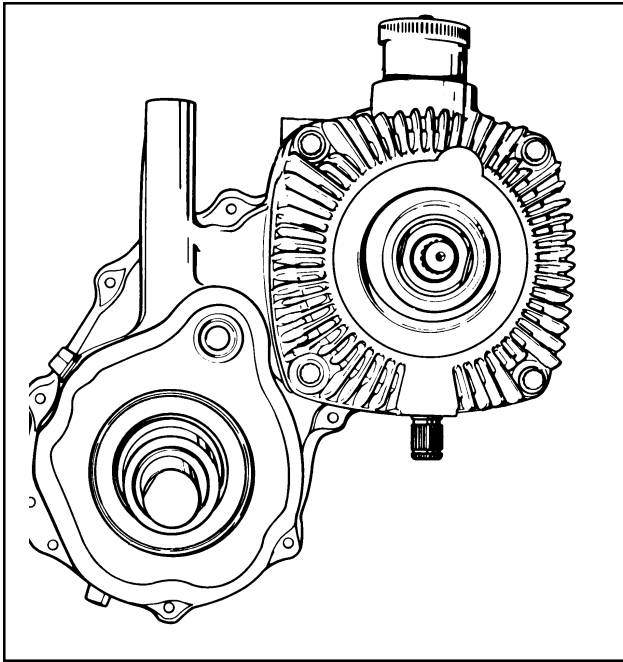
2. Axle supports, pressed from the inside out, must be removed from the case and cover, similar to the method used in the 1200 series transaxle.



3. To separate the hydrostatic unit from the 1300, support both parts, then remove the four mounting screws, and separate the parts. Drain the oil from the 1300 unit. Any hydrostatic repair must be done through the equipment brand dealer.



4. After removing the hydrostatic unit, inspect the surfaces and the gears from outside the unit.



5. Remove the lockscrews and tap the dowel pins out of the cover. Lift off the cover and discard the gasket.
6. Lift out the brake shaft, gear, and thrust washers on each side of the gears.
7. Lift the output shaft, gear, spacer, and thrust washer from the case. At the same time, lift out the differential assembly.

NOTE

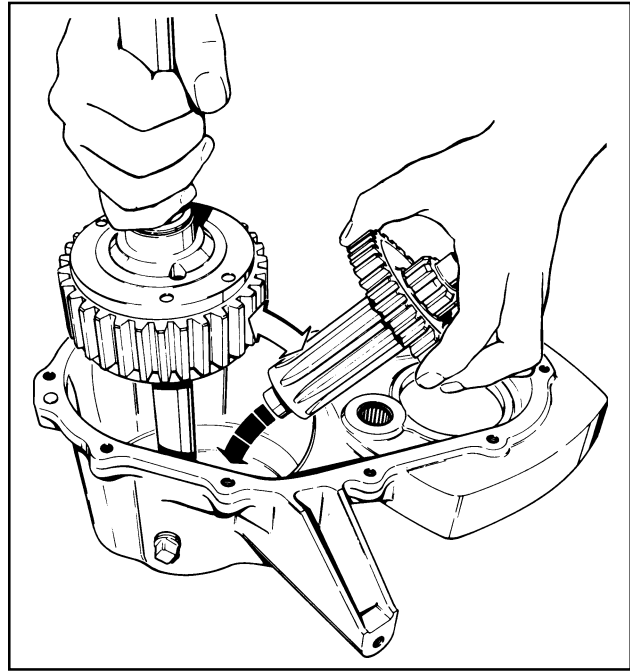
No thrust washer is located between the output shaft and the case.

8. To service the differential, refer to Chapter 18 on differentials.
9. To service bearings, refer to Chapter 22 on bearing service.
10. 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 ram of the press that you are using.

INSPECTION AND REPAIR

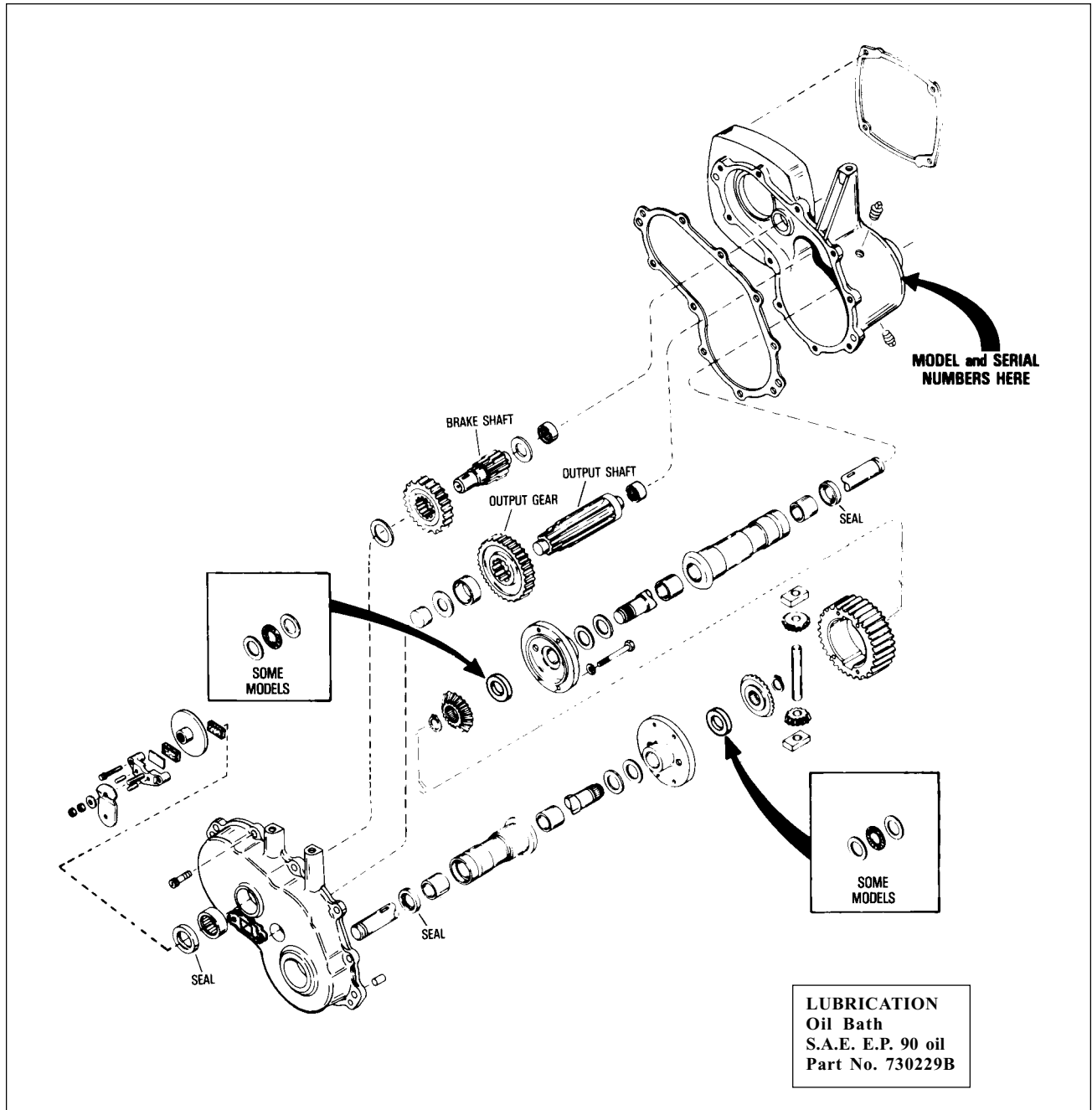
1. Inspect the case and cover for cracks, stripped threads, marred sealing surfaces, and bearing condition. The cause of any oil leakage should be corrected and if parts cannot be repaired, replace them.
2. Check shafts and gears for worn or chipped teeth. Check bearing surfaces for scratches which might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

REASSEMBLY



1. When installing axle supports, be sure the case and cover alignment is true with the press. Press supports in until the flanged surfaces contact the case and cover.
2. Install the differential and output shaft simultaneously. Position the 3/4" (19.1 mm) I.D. gear spacer and thrust washer on the shaft.
3. Center one 3/4" (19.1 mm) I.D. thrust washer over the case needle bearings then install the brakeshaft gear, and another 1-1/8" (28.6 mm) I.D. thrust washer.
4. Position a new gasket on the mounting surface of the case, then install the cover. Align the cover and case by tapping dowel pins into the cover and secure with lockscrews torqued to 10 ft. lbs. (13.6 mm).
5. Install a new brakeshaft oil seal and axle using seal protector.
6. Install new axle support oil seals using a seal protector.
7. Add 2-3/4 pints (44 oz.) (1301 ml) Oil (S.A.E. EP 90) before securing the hydrostatic drive to the 1300 series unit. Clean the mounting surfaces and use a new gasket between the units. Torque the four mounting bolts to 90-100 inch pounds (10.2-11.3 Nm).

1300 SERIES HYDROSTATIC GEAR REDUCTION DIFFERENTIAL



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 14. 2300 SERIES FOUR-SPEED TRANSAXLES

H-SHIFT PATTERN

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

WARNING When shifting gears verify the clutch is operated. Failure to do so may cause premature transmission failure which could result in death or serious injury.

WARNING DO NOT shift on a hill or when carrying a heavy load. Shifting on a hill may cause premature transmission failure which could result in death or serious injury.

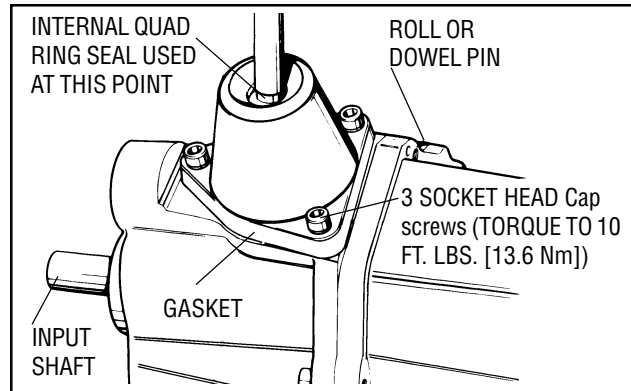
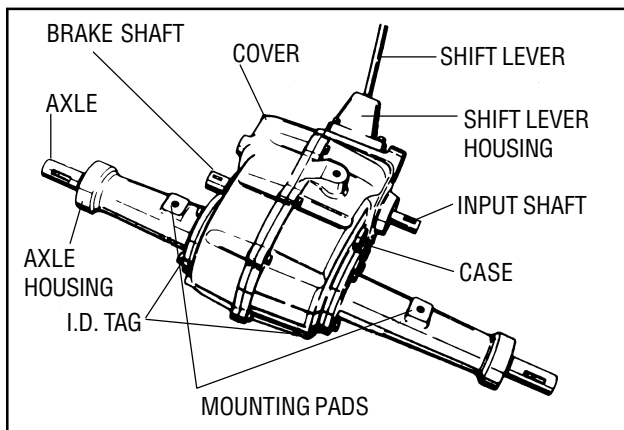
WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

WARNING We caution you against the use of aftermarket variations of braking systems, adjustments and service of these components. Removing or altering factory installed parts may affect performance and could result in death or serious injury.

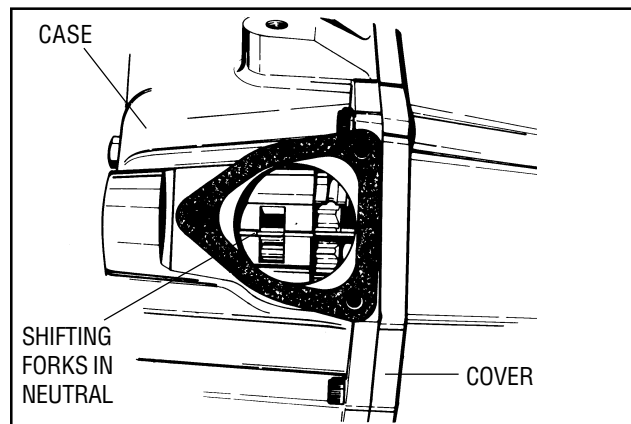
- Servicing the braking system will void your warranty. See your Authorized Tecumseh Servicing Dealer.

GENERAL

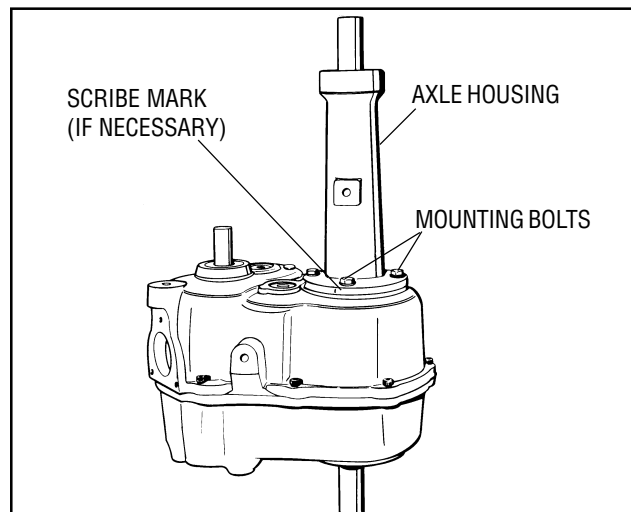
The 2300 series transaxle is a four speed forward with one speed reverse transaxle.



DISASSEMBLY

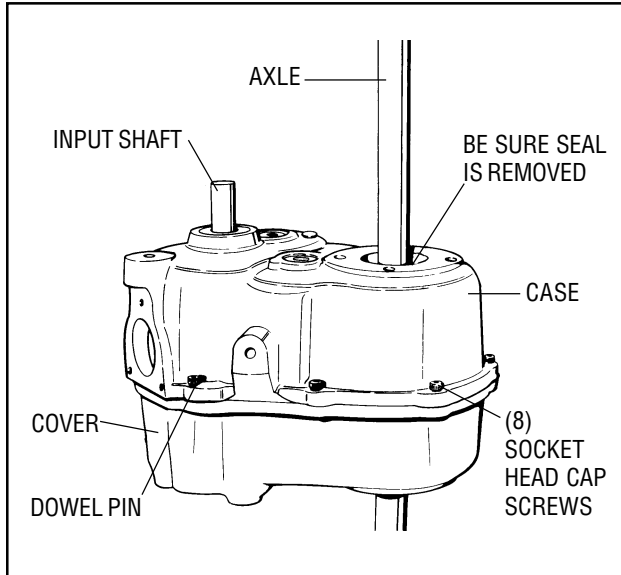


1. Position the shifter forks in neutral before disassembly.

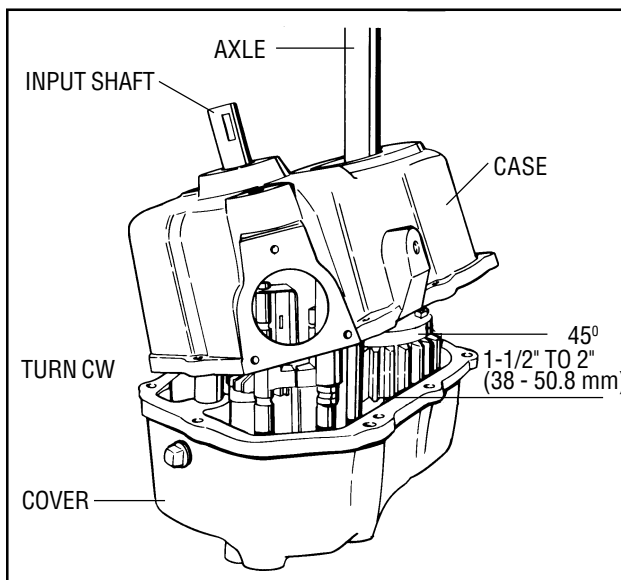


2. Remove both axle housings, and use the exposed axle as a ram to separate the seal retainers from the case and cover.
3. When disassembling the rest of the unit, it should be held so that it lies on the cover, properly blocked up, so that no weight rests on the brake shaft. The cover should sit rigidly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

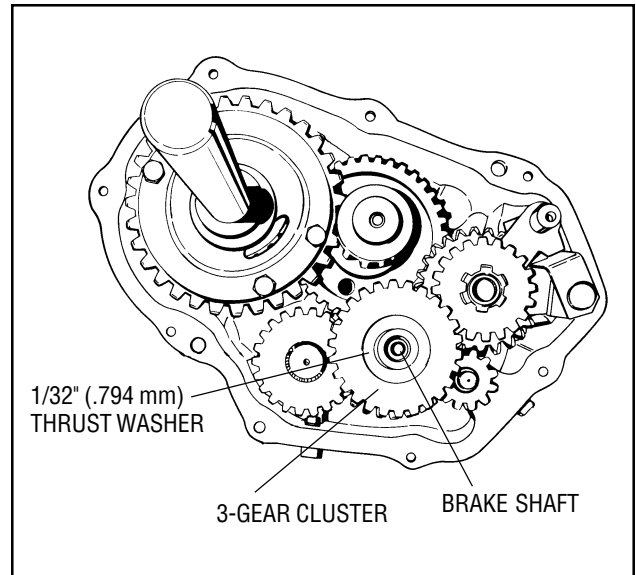
- Oil seals are of the double lip type so sleeve protectors do not offer much protection when removing them. Upon replacement, new seals should be used.



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



- To separate the case from the cover. Lift the case 1-1/2 to 2" (38-50.8 mm) above the cover. Tilt the case so that the shift rods will clear the edge. Rotate the case so the boss hidden inside will clear the gears, then lift it free of the differential.

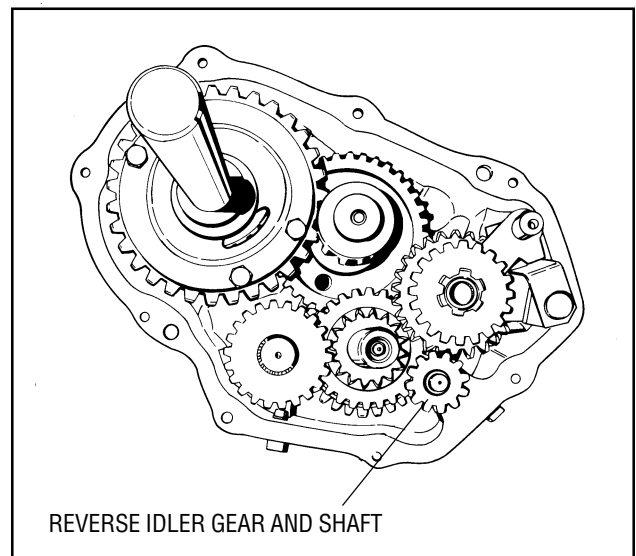


- Remove thrust washer and three gear cluster from the brake shaft, noting whether the cluster has a sloppy fit.

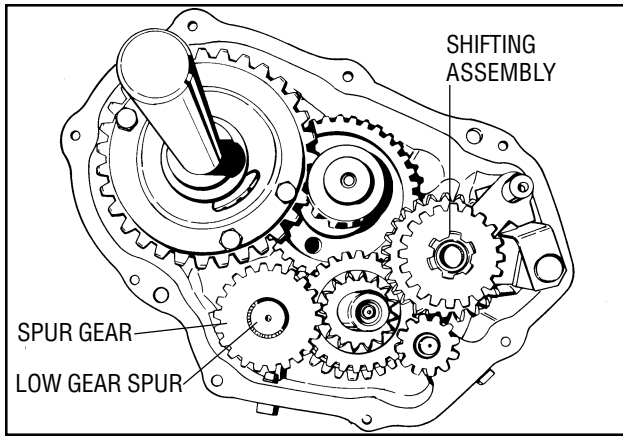
NOTE

To service the cluster bushings, refer to Chapter 22 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.

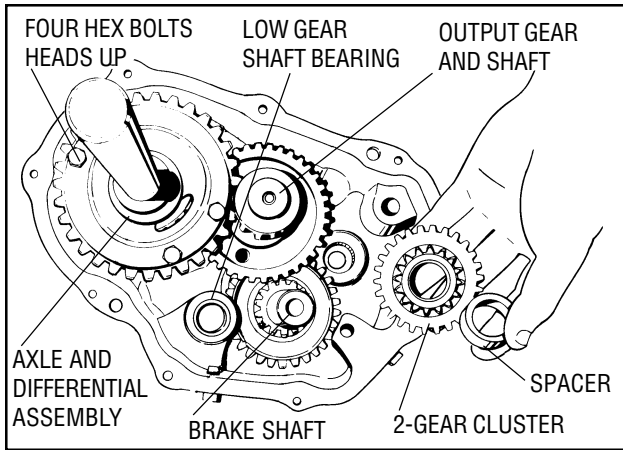


- Remove the reverse idler gear, spacer and shaft from the boss in the cover. Note that the spacer goes between the gear and the cover, and the gear bevels go down. Excessive wear on teeth bevels indicates improper shifting technique.



10. Lift out the shifter assembly. Service of this unit is described in Chapter 21 on shifting assemblies. If it is evident that the shifter assembly needs no further teardown, place it aside intact in a clean place for servicing at a later time.

11. Remove the low gear and shaft, and splined spur gear. Separate the gear and shaft. Note there is no thrust washer between the gear and case.

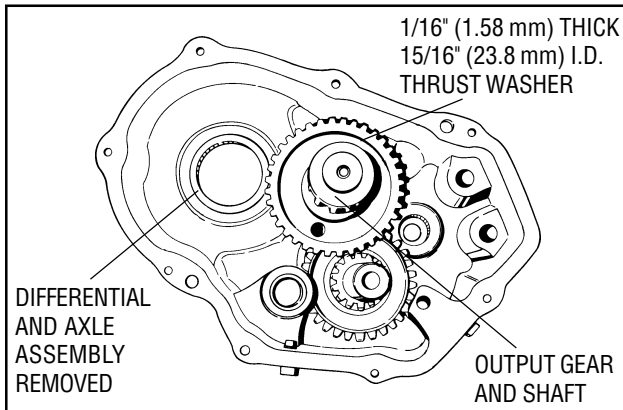


12. Remove the two gear cluster and spacer from the brake shaft.

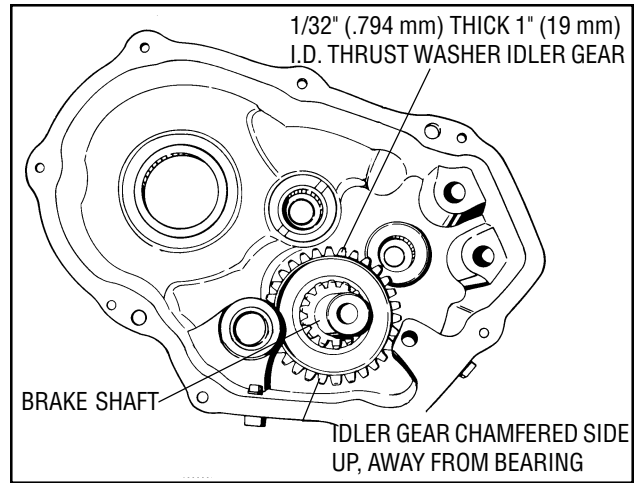
13. Lift the differential unit out of the cover.

NOTE

Service information appears in Chapter 18 on differentials.



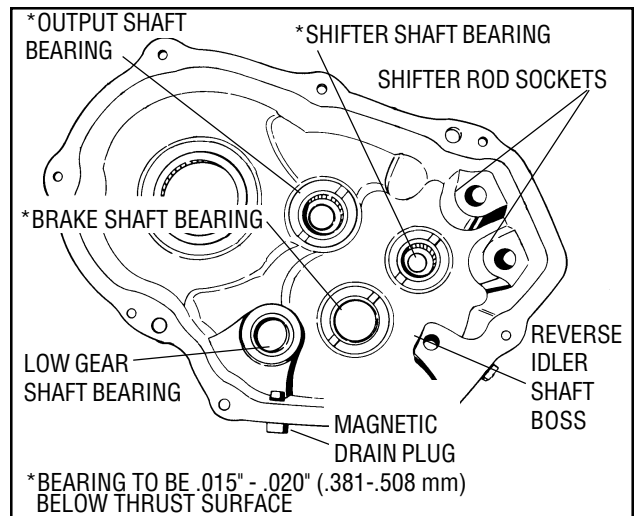
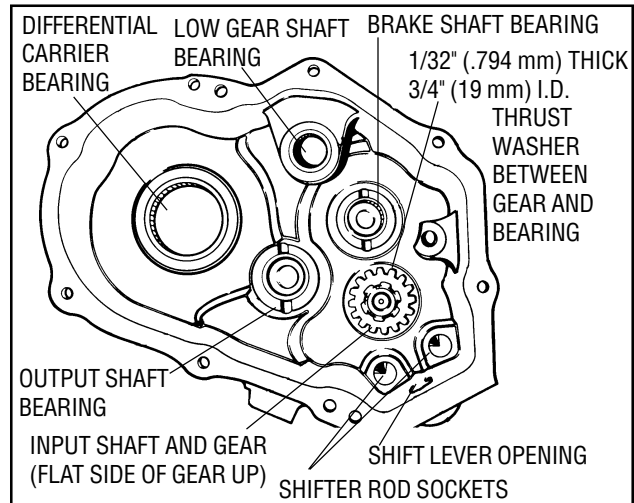
14. Remove the output shaft and gear and thrust washer from each end of the shaft.



15. Remove the brake shaft.

NOTE

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



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

INSPECTION AND REPAIR

1. Gears.

- Check bevels for evidence of damage due to improper shifting.

NOTE

Input power to Tecumseh/Peerless Transaxles must be stopped before shifting.

- Check face of teeth for wear. Large shiny areas indicate too much tooth contact and possible excessive wear. Replace gears that are damaged or show excessive wear.

2. Shafts and Axles.

- Check surfaces for rust, pitting, scratches or wear.
- Check keyways, splines, threads, and grooves for wear. Replace parts if worn or damaged beyond a refinished 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 shiny surfaces which indicate wear and replace if evident. Try to determine the cause of thrust washer wear such as lack of end play due to the reuse of an old gasket, or use of the wrong thrust washer.

5. Shifting Assembly.

Refer to Chapter 21 on shifting assemblies.

6. Gaskets.

Replace all gaskets.

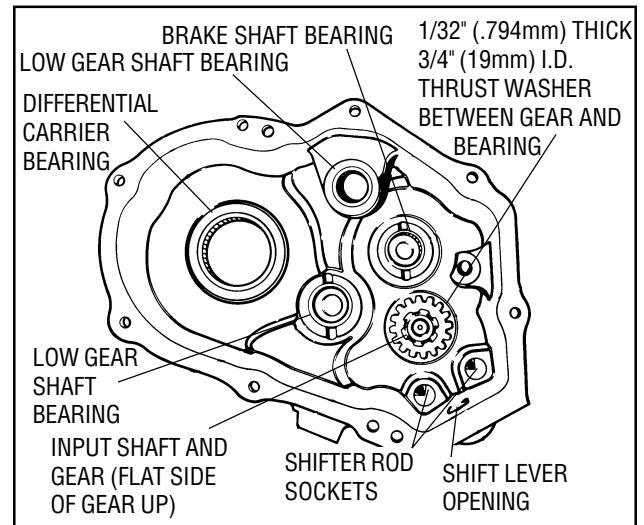
7. Oil Seals.

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

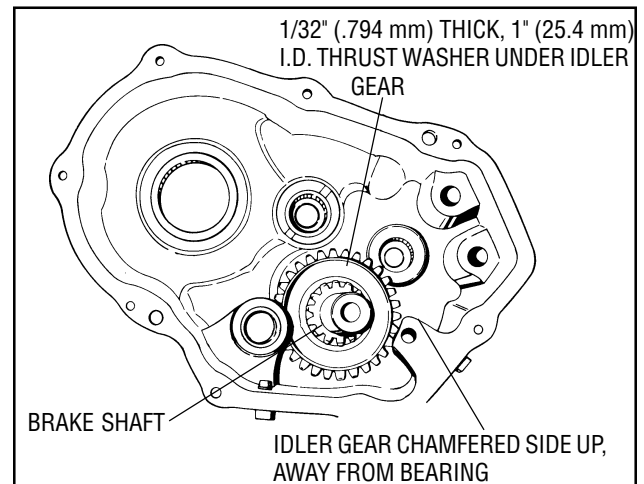
8. Bearings and Bushings.

Refer to Chapter 22 on bearings and bushings.

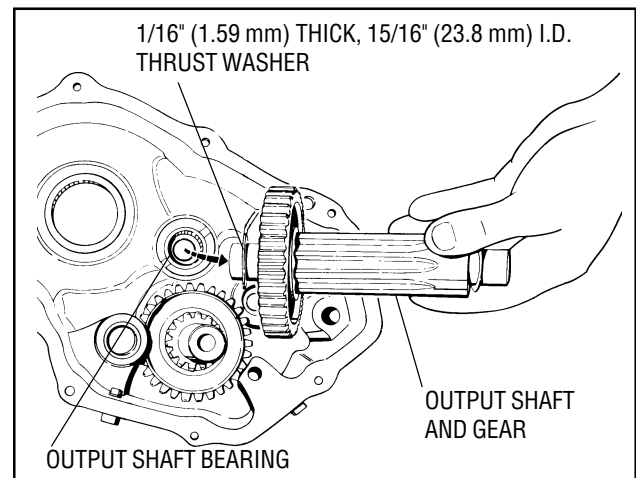
ASSEMBLY



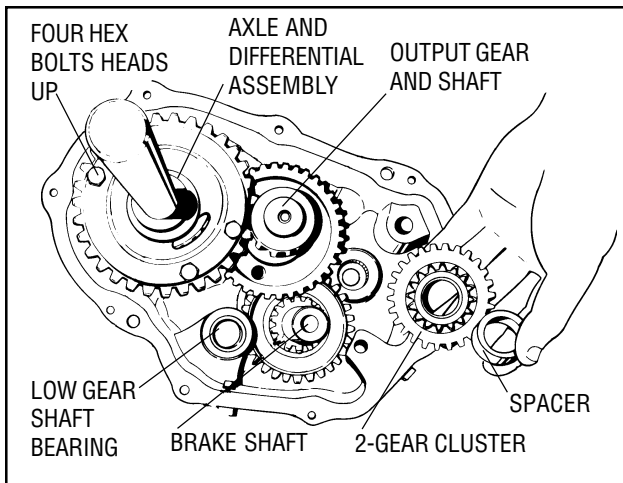
- Install the input shaft in the case. Use a soft mallet to seat the shaft and gear completely. Often, binding in the assembled unit can be traced to a partially installed input shaft.



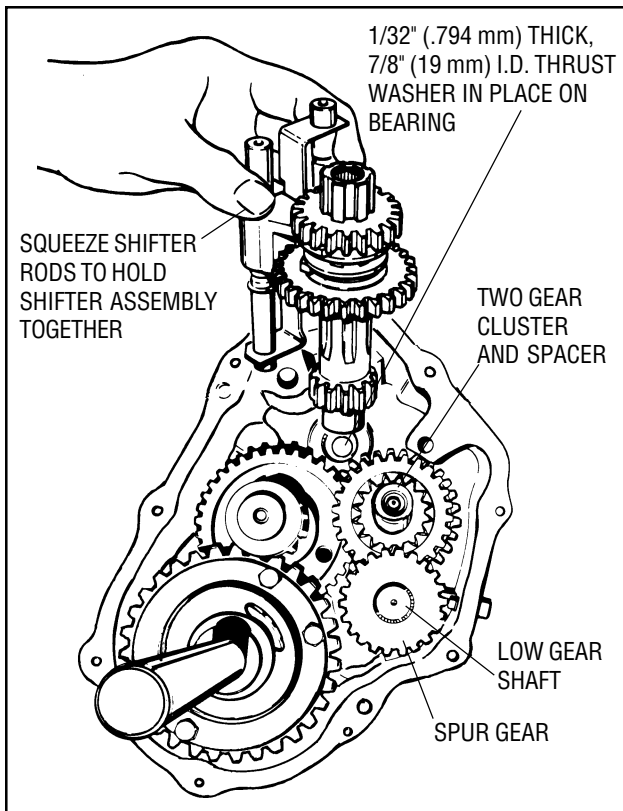
- Center one 1/32" (.794 mm) thick by 1" (25.4 mm) I.D. thrust washer on the cover brake shaft needle bearing, then install the brake shaft and gear, (with the chamfer side away from the cover).



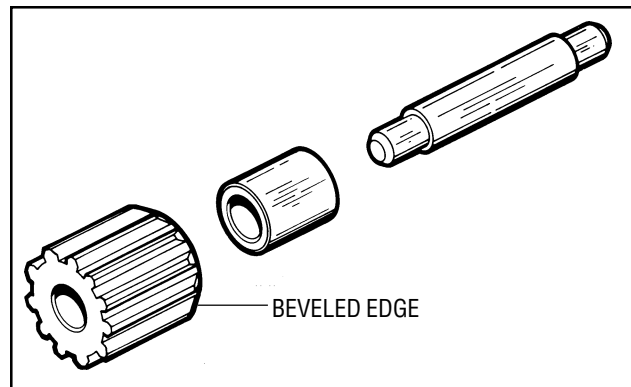
- Install the output shaft and gear after centering a 1/16" (1.59) thick by 15/16" (23.8 mm) I.D. thrust washer on each end of the shaft.



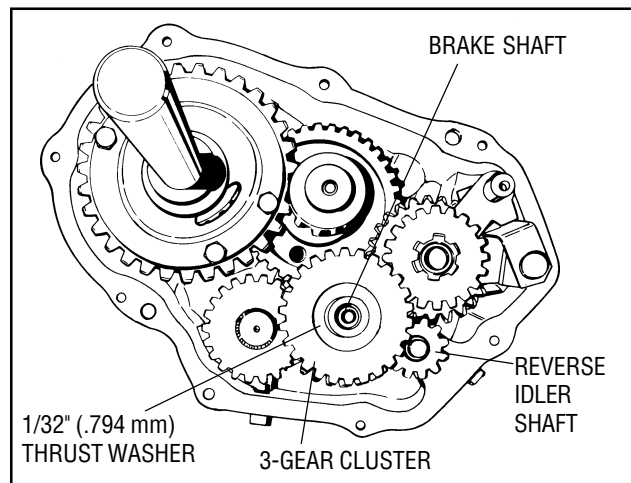
4. Insert the differential assembly into the cover. Note that the four bolt heads should be facing away from the output gear.
5. Install the two gear cluster and spacer on the brake shaft.



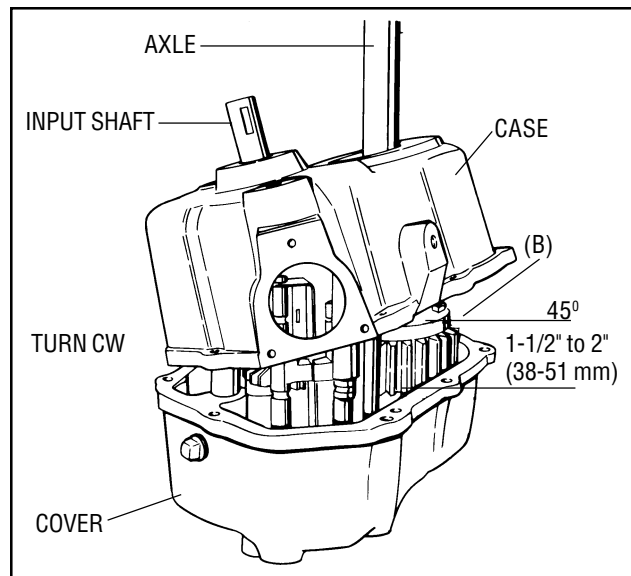
6. Install a 1/16" (1.59 mm) thick by 3/4" (19 mm) I.D. thrust washer, gear and low gear idler shaft in the cover. Do not put a thrust washer on the exposed end of this shaft. Be sure the small gear meshes with the larger gear of the two gear cluster.
7. Center one 1/32" (.794 mm) thick by 7/8" (19 mm) I.D. thrust washer on cover shifter shaft bearing.
8. Install the shifter assembly (as a unit) into the cover.



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

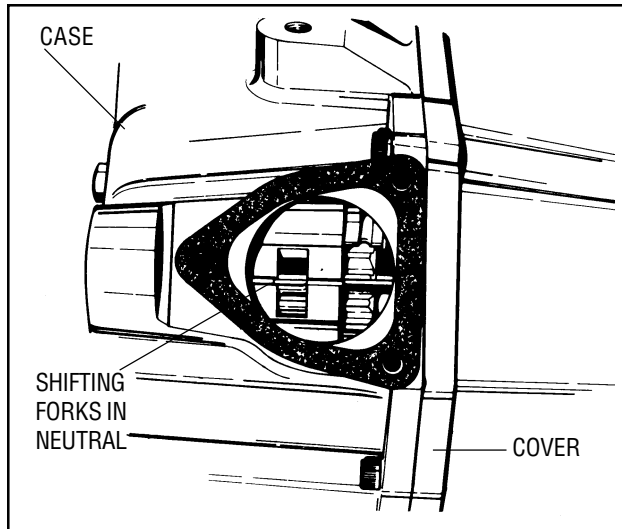


10. With the small gear of the three gear cluster toward the spacer, install the three gear cluster and another 1/32" (.794 mm) thick by 7/8" (19 mm) I.D. thrust washer on the brake shaft.



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

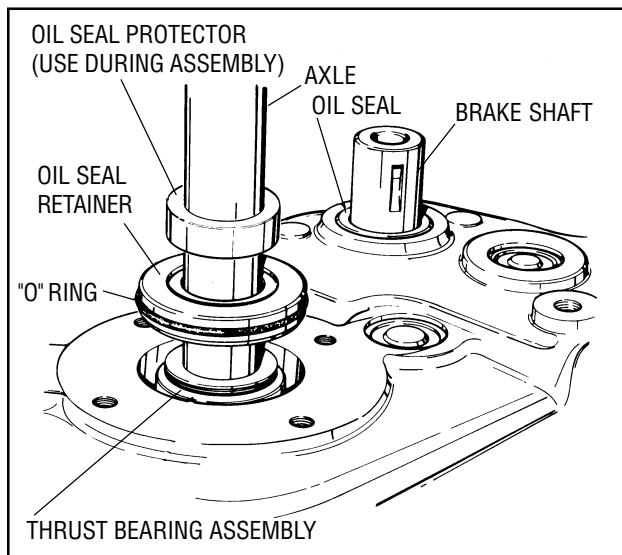
- Once in position, if the case hangs up 1/2" to 1" (12.7 - 25.4 mm) above the cover, turn the input shaft to get the gears to mesh. The case should drop to about 1/4" (6.3 mm) from closing.



- 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.
- Align the case and cover with the two dowel pins, 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.

NOTE

Seal protectors must be used, when installing a seal over the axle ends or any shaft with a machined keyway.



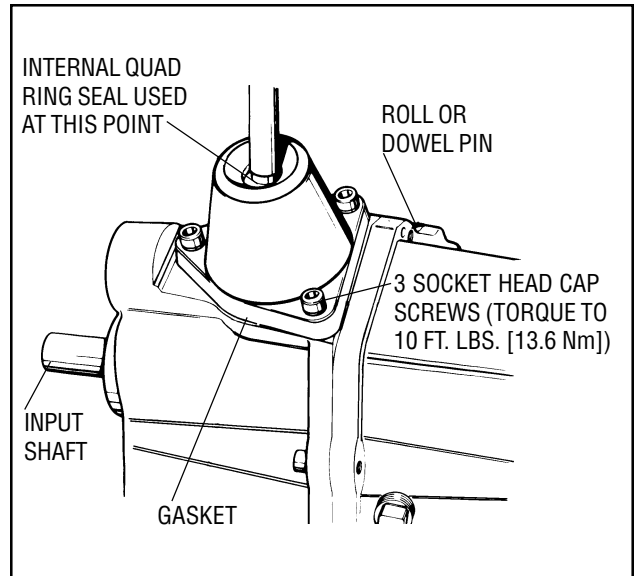
- Install new "O" rings and oil seals using the seal protector as shown.

NOTE

Coating both the "O" ring and seal with lubricant will help ease assembly.

- Upon installation of the axle housing, be sure mounting pads face in the same direction as when removed. Install cap screws and torque to 13 ft. lbs. (17.6 Nm).

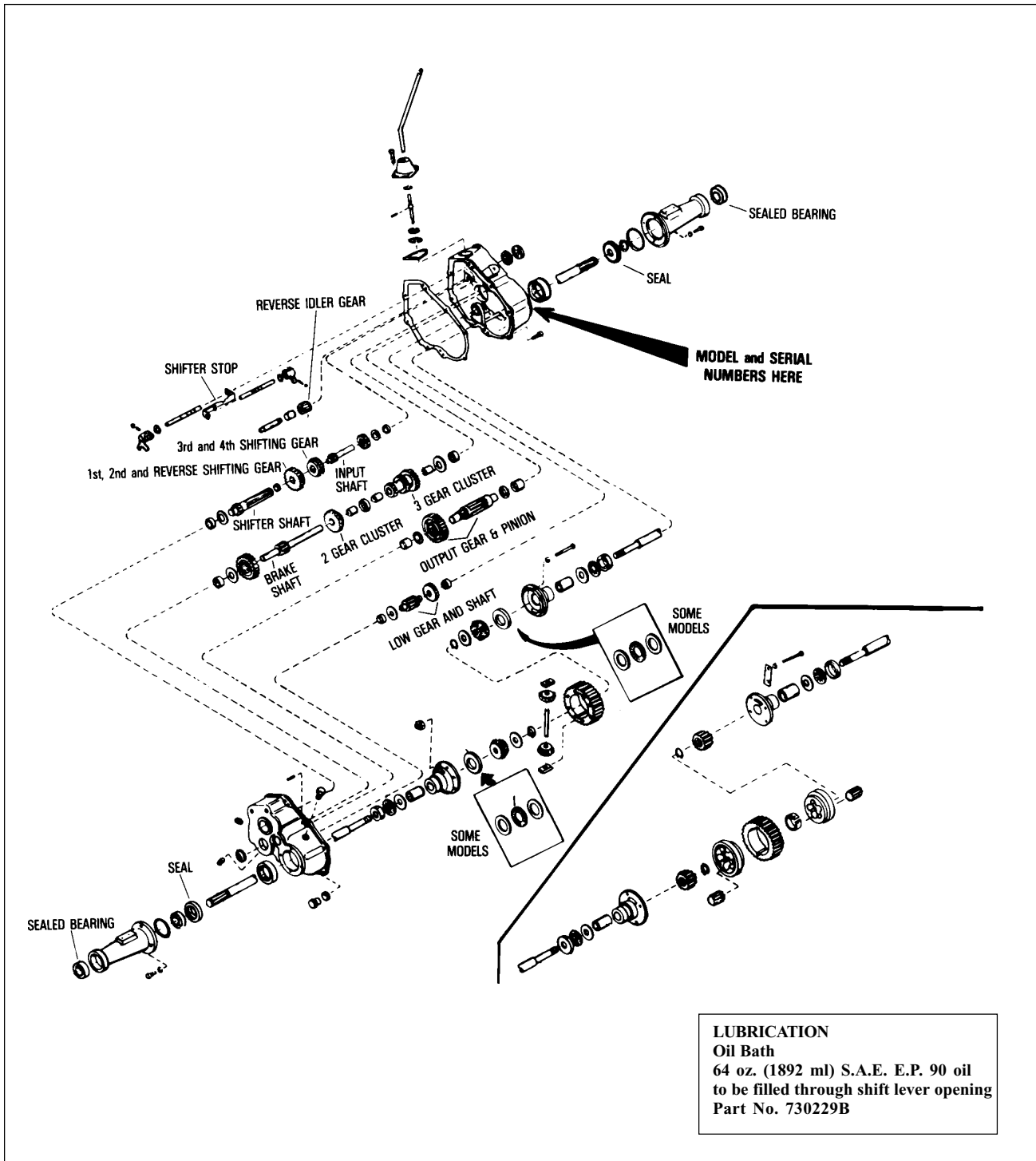
- Install the shift lever housing and new gasket.



TESTING AND LUBRICATION

- For testing, refer to Chapter 1, page 6.
- For proper lubrication type and amount, refer to Chapter 1.

2300 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 15. 2400 SERIES HYDRO POWERED TRANSAXLES

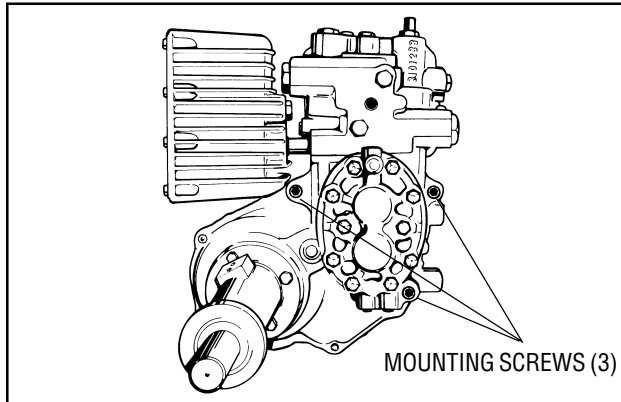
⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

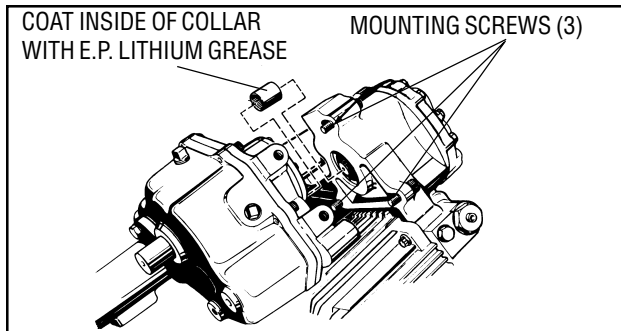
The 2400 Series transaxle is a gear reduction unit which is powered by a hydrostatic pump.

SEPARATING AND COMBINING THE HYDROSTATIC PUMP AND THE 2400 SERIES TRANSAXLE.

The two parts, gear reduction unit and pump, should be removed from the vehicle together.



1. To separate the units, block the assembly in a protective vise, then remove the three hydrostatic mounting screws. Separate one unit from the other. If any binding occurs, remember that the drive shafts are held in common rotation by a splined coupling which will bind if the relationship between the input shaft and the pump is not straight.

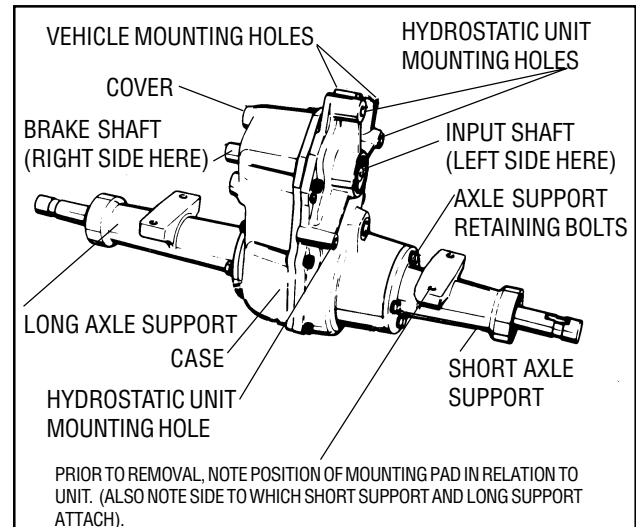


NOTE

For service to the hydrostatic pump, it must be returned to the dealer who sold the vehicle for his service arrangement.

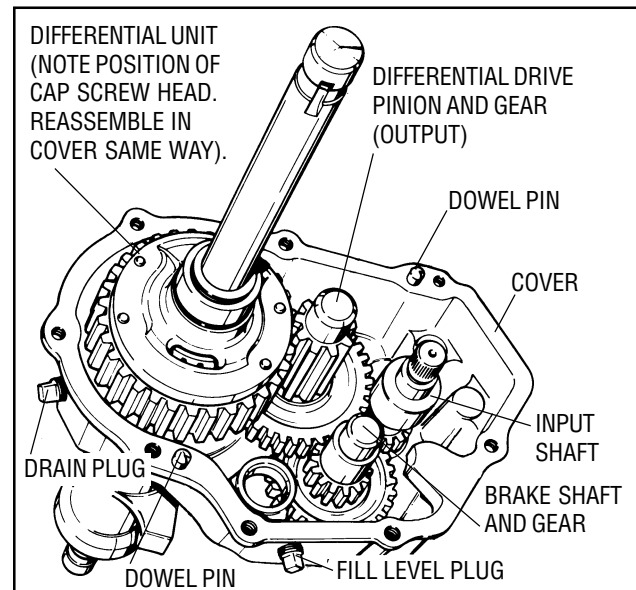
2. To combine the hydrostatic pump and the 2400 transaxle, coat the splined coupling with E.P. Lithium grease, and install it on the 2400 input driveshaft.

3. After the coupling is installed over the driveshaft of the hydrostatic pump press the parts together. Secure the assembly with three socket head cap screws, torqued to the standard for the bolt being used.

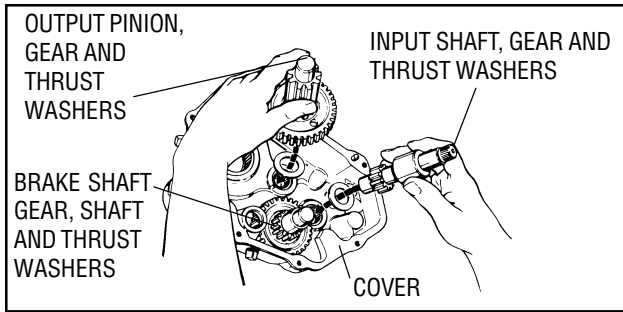


DISASSEMBLY

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



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



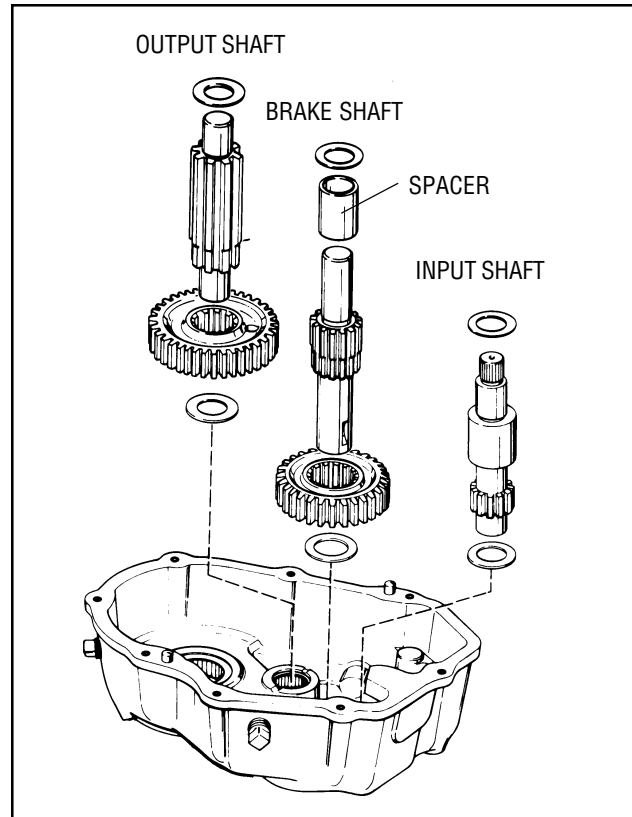
9. Remove the input shaft and gear assembly. Note that thrust washers are on both ends of the shaft.
10. Remove the output pinion and the gear splined to it. Note the position of thrust washers on each end of the pinion.
11. To remove the brake shaft, the shaft must be tapped from the gear splined to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

INSPECTION AND REPAIR

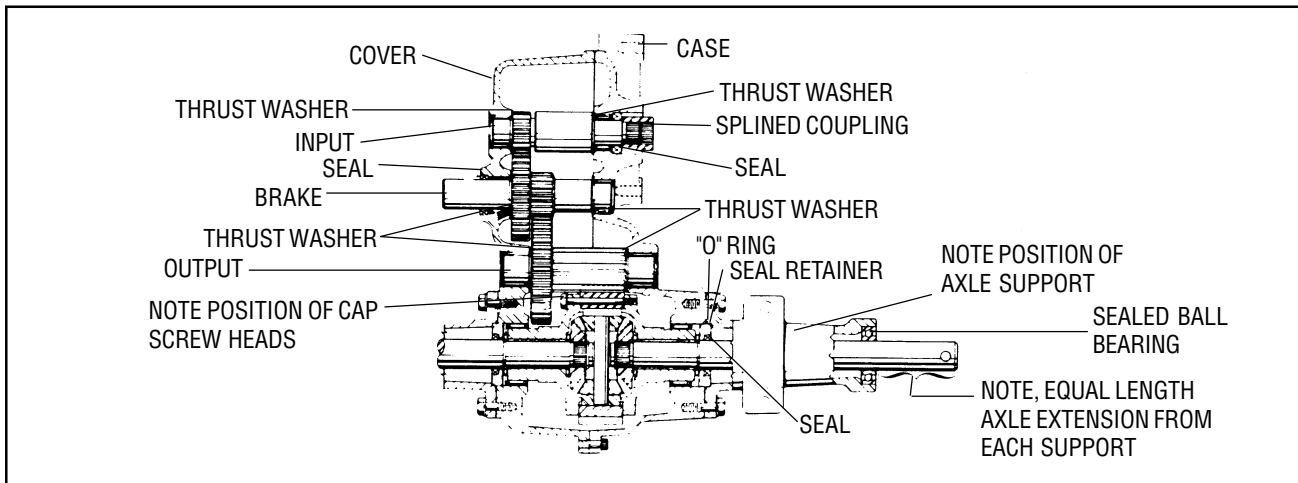
1. Clean all parts and examine for wear or damage.
2. Refer to Chapter 18 on differentials for service when working on differentials. Refer to Chapter 22 on bearing and bushing service to replace any loose or worn bearings.
3. Remove and discard oil seals from the input and brake shafts. Check axle seals and replace if any evidence of leaking exists. If protective seal sleeves were not used when removing seals and retainer assemblies, replace seals after assembly. Use seal protectors and correct drivers. See the paragraph in Chapter 1 "OIL LEAKS, SEAL AND GASKET SERVICE" for service.
4. Clean the case and cover. Protect the bearings from dirt. Lubricate the bearings to prevent rusting.

ASSEMBLY

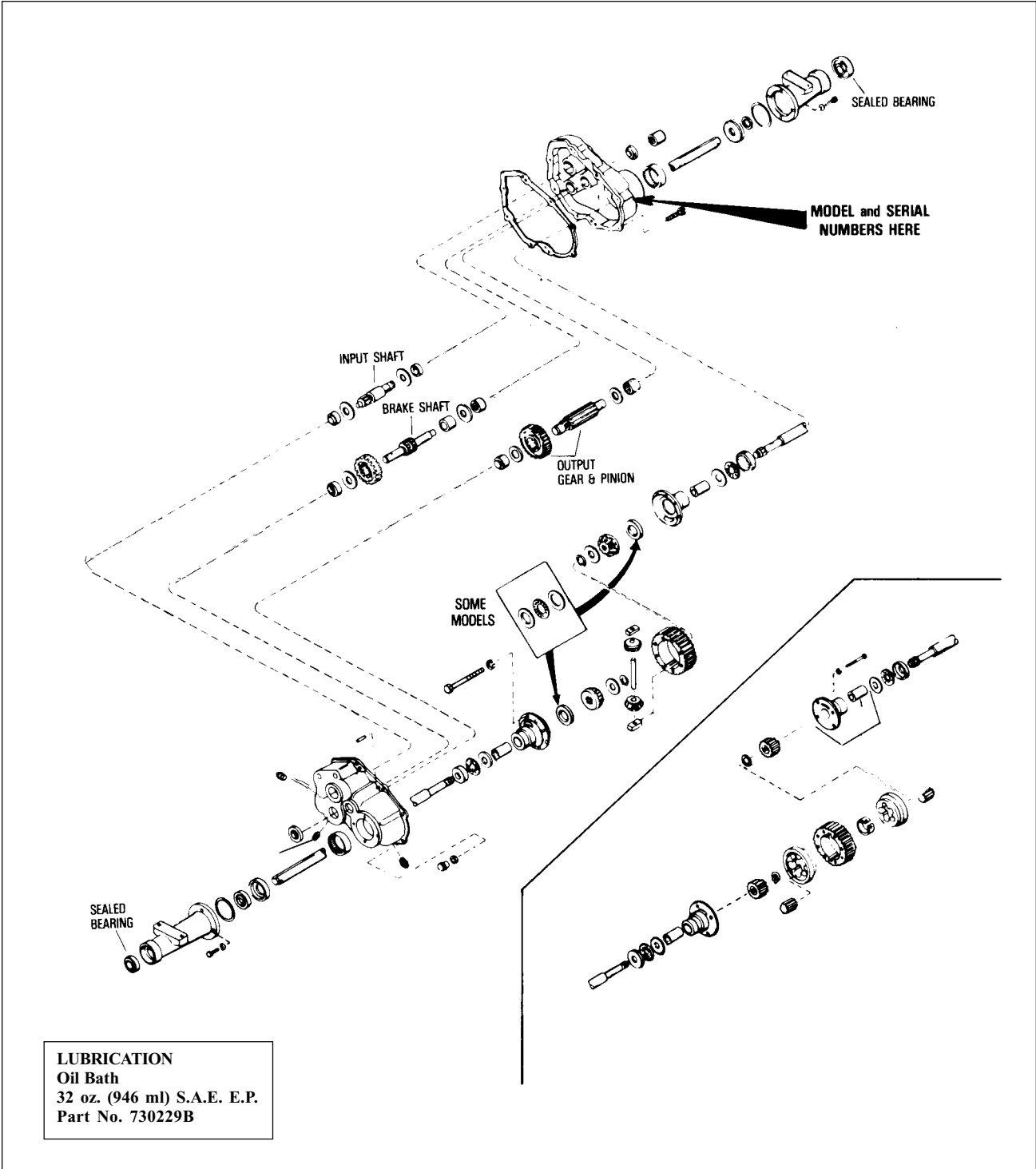
1. Install thrust washer in the cover for input, output and brake shafts.
2. Install the brake shaft into the gear in the cover.
3. Install the input and output shafts (with gear) and position spacers on the brake shaft. Install thrust washers on all shafts.



4. Install the differential unit with cap screw facing down.
5. Position a new gasket on slightly raised dowels and install the case. Turn down eight (8) socket head cap screws lightly. Tap dowel pins in and tighten the cap screws to 10 ft. lbs. (13.6 Nm).
6. Use a seal protector and install the seal and retainer assemblies. Position a new "O" ring on the seal retainer. Be sure the mounting pad is in the correct position. Install each axle support and bolt down. Torque the cap screws to 13 ft. lbs. (13.7 Nm).
7. Using the proper seal protector and driver, replace the input and brake shaft seals.
8. Rotate shafts to check for binding or noise.
9. Add lubricant (2 pints [946 ml] S.A.E. EP90 oil) to level of the fill plug with the unit in normal mounted position.



2400 SERIES HYDRO POWERED TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 16. 2500 SERIES HYDRO POWERED TRANSAXLES

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GEAR REDUCTION AND DIFFERENTIAL UNIT

GENERAL

Most 2500 Series two speed gear boxes are run by an Eaton® Model 10 hydrostatic unit. Power for the hydrostat is supplied by an engine with 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. 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. (3.3 - 3.8 Lt) of SAE Type A automatic transmission fluid.

DISASSEMBLY

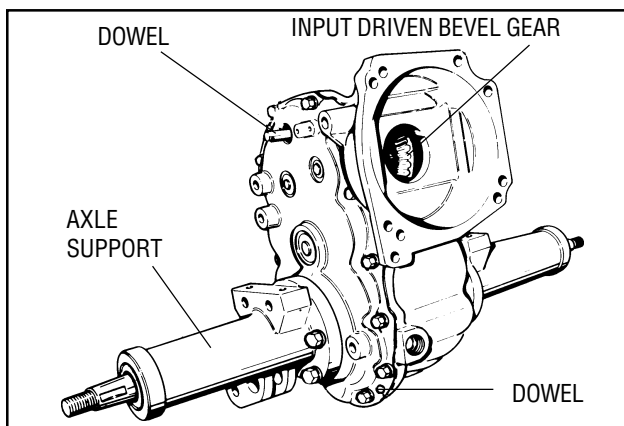
1. Remove piping and hydrostatic unit as necessary to allow repair.
2. Although the unit should have been drained of lubrication, be aware that removal of the axle support will allow trapped oil to spill.

NOTE

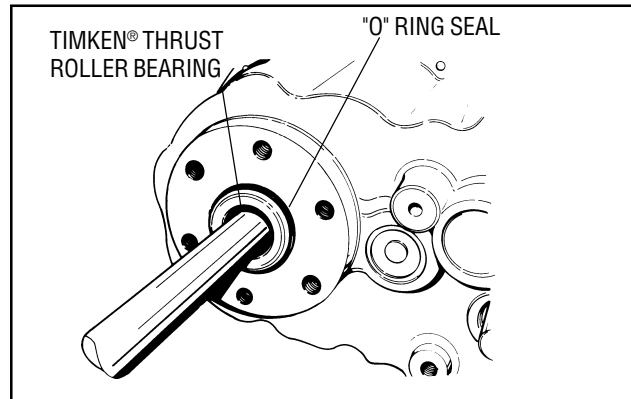
An oil supply is blocked in the hydrostatic pump when not running, so upon reassembly hydrostatic charging is not necessary.

NOTE

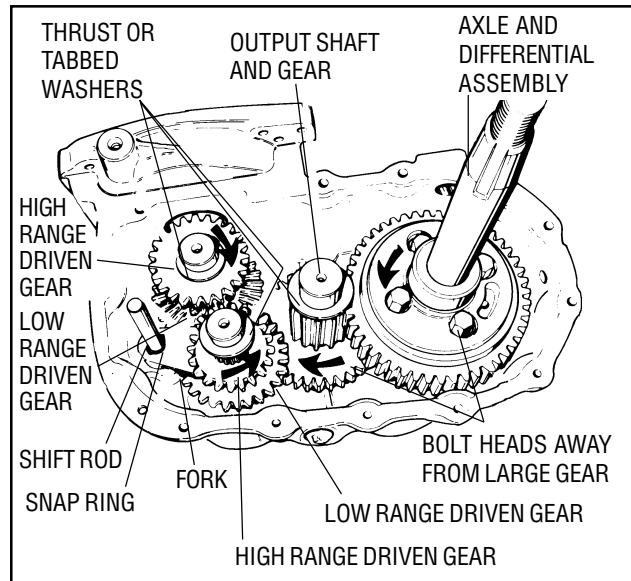
Any attempt to service the hydrostatic pump should be done only upon authorization of Eaton or the equipment manufacturer. Tecumseh does not authorize repair or adjustment of the unit.



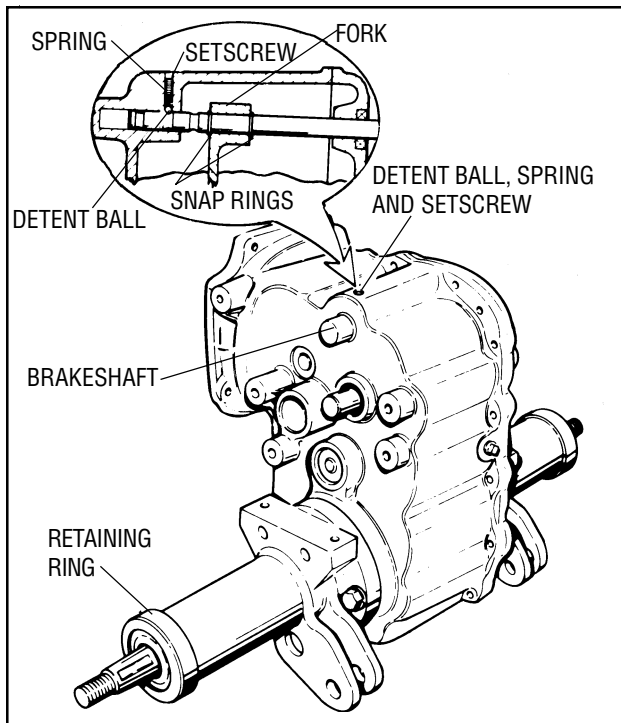
3. Clean all exterior surfaces of the transaxle.
4. Remove the axle supports. If supports are different or if there is a chance for confused reassembly, scribe alignment marks.



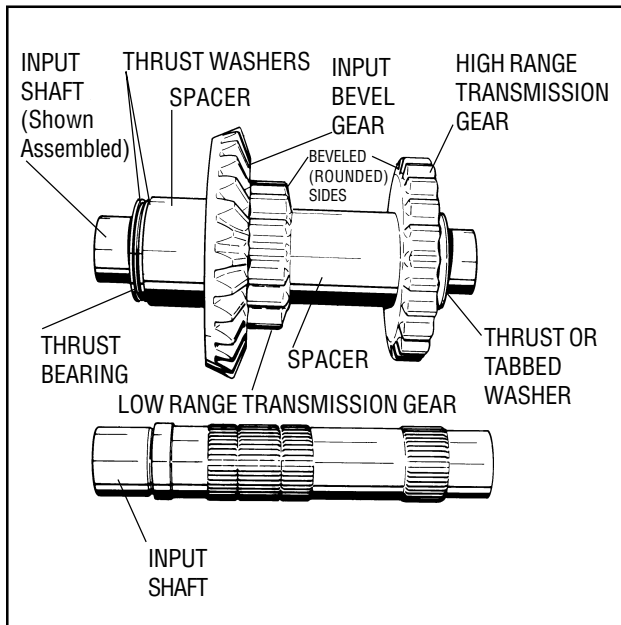
5. Remove and discard square "O" ring seal.
6. If the tapered roller bearings are loose, remove them.
7. Position the unit with the cover up side; then remove the dowels and screws. Lift off the cover and discard the gasket.



8. To remove the inside components, first remove the differential and then thrust washers.



9. To remove the shifter rod and fork, the set screw, spring and detent ball should be removed from the outside of the case.



10. Remove both the input and shifter gear and shaft assemblies, along with the shifter rod and fork.

11. Remove the input shaft and gear assembly.

12. Remove the output shaft and gear.

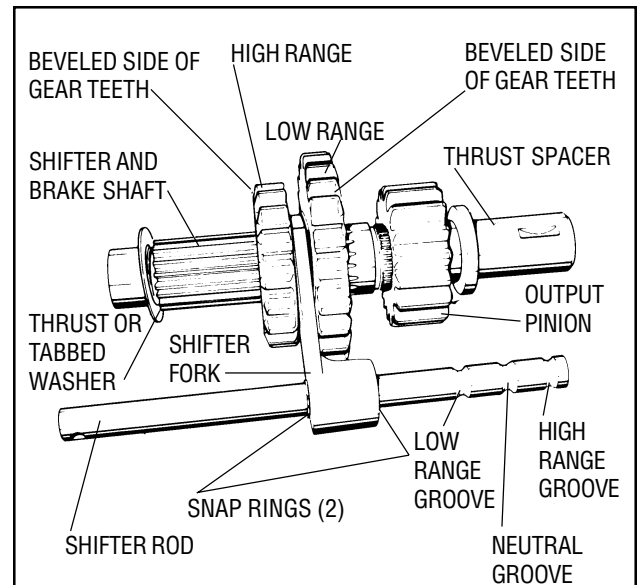
INSPECTION AND REPAIR

Axle Supports

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

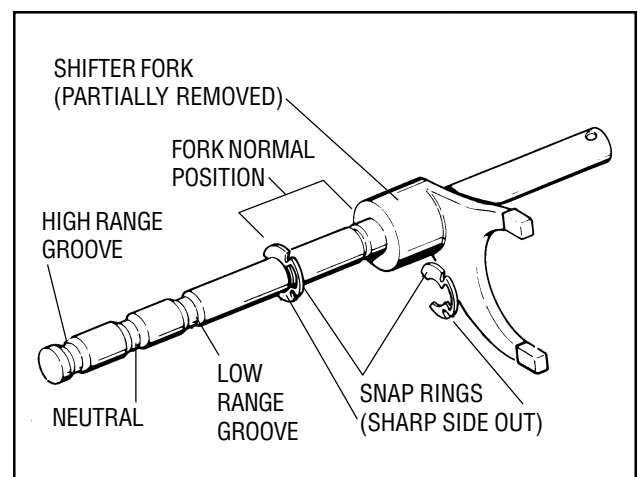
Case and Cover

1. Check for leaks or cracks.
2. As necessary, replace needle bearings as described in Chapter 10.
3. Do not replace brake shaft and shifter rod seals until the unit is reassembled.



Shafts and Gears

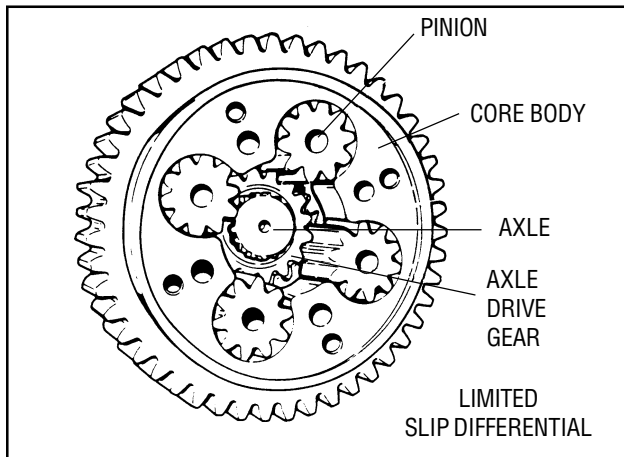
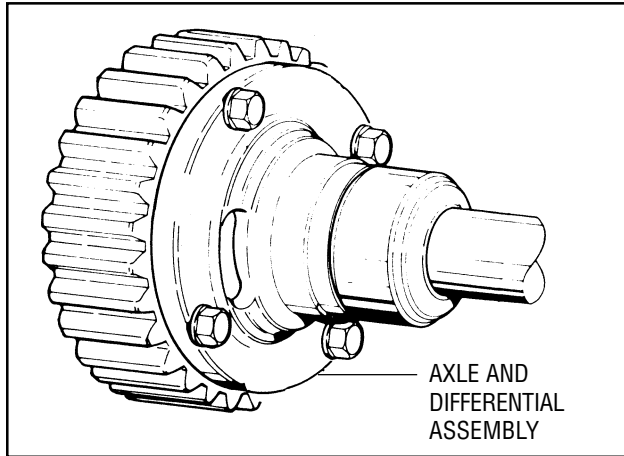
1. Check teeth for wear, pitting or breakage.
2. Inspect bearing surfaces for smoothness.
3. Inspect gears and shafts for out-of-round.
4. Splines should allow a smooth fit. Rotate meshing parts for a better fit if binding seems excessive.



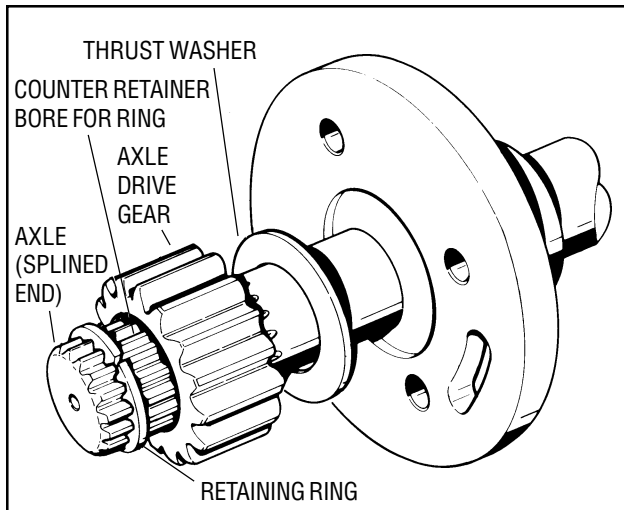
Shifter Mechanism

1. Check spring for tension and ball for wear.
2. Check shifter rod grooves for wear. Be sure the sharp edge of the snap ring goes away from shifter fork.
3. Inspect the shifter fork for straightness and wear.

Differential



1. Make sure you have all parts are present.
2. Check the snap rings for their condition.

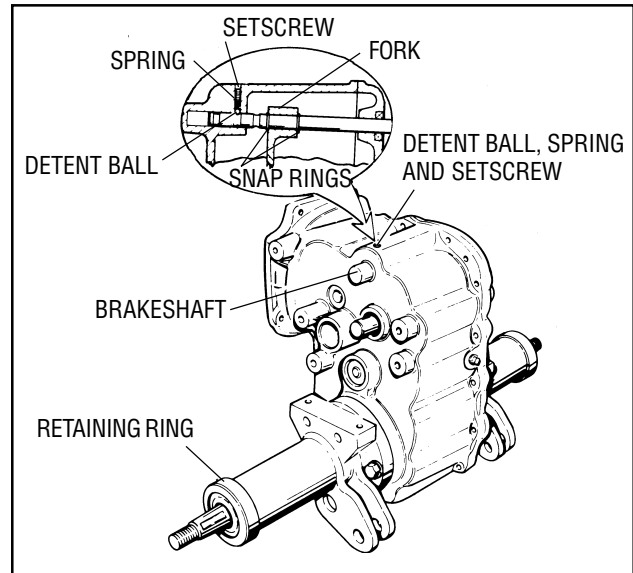


Other

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

ASSEMBLY

Install parts reversing the disassembly procedure. Be careful of the following:



1. After the shifter rod is positioned, install the detent ball, spring and setscrew. Slowly turn the setscrew inward while raising and lowering the rod until the detent ball stops the rod movement.
2. Be sure that thrust washers and spacers are between every shaft and the case and cover.
3. Threads of the differential bolts must be coated with standard stud Loctite. The bolt heads on the differential are up when installed.
4. Install a new gasket. It may be helpful to dampen the gasket with oil to get it to lie flat.
5. Use a seal protector to protect the axle support oil seals during installation.
6. 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.

AFTER ASSEMBLY

1. To install the brake shaft oil seal using a seal protector.
2. To install the shifter rod oil seal, use seal sleeve 670206 and driver 670211.
3. Lubrication for all models is 7 to 8 pints (3.3 - 3.8 Lt) of S.A.E. Type A automatic transmission fluid. When filling, allow the fluid to settle behind the tapered bearings into the axle supports. This may necessitate filling, checking and adding. The oil fill hole is located in the case. If the shrouding on the equipment does not allow access to the oil fill hole when the 2500 is installed in the chassis, lubrication should be filled prior to installation in the equipment. If filling takes place before installing the 2500, orient the unit to a 90° angle to the axles. There should be no fluid leak.
4. Install the drive assembly according to the manufacturer's instructions.

LOW RANGE TRANSMISSION
DRIVE GEAR

HYDROSTATIC DRIVE
MOUNTING SURFACE

DRIVEN
INPUT
GEAR

HIGH RANGE TRANSMISSION
DRIVE GEAR

SPACER

THRUST BEARING

SPACER OR SHOULDER

INPUT SHAFT

THRUST WASHER

TABBED THRUST WASHER

SHIFTER AND BRAKE SHAFT

OIL SEAL

BEVELED SIDES OF GEARS

OUTPUT SHAFT

TABBED THRUST
WASHER

TABBED THRUST
WASHER

THRUST
WASHER

THRUST
WASHER

SEAL

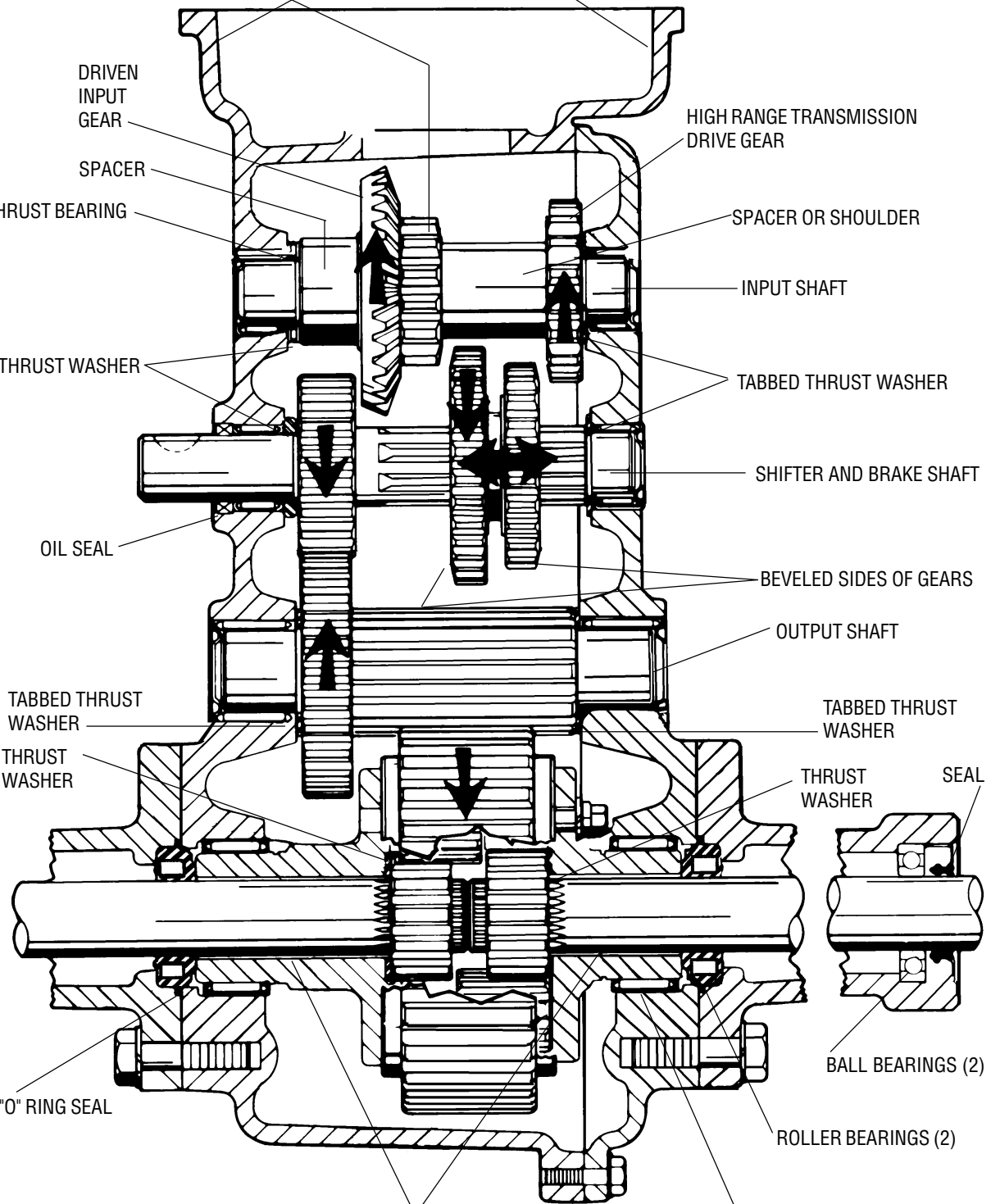
"O" RING SEAL

BALL BEARINGS (2)

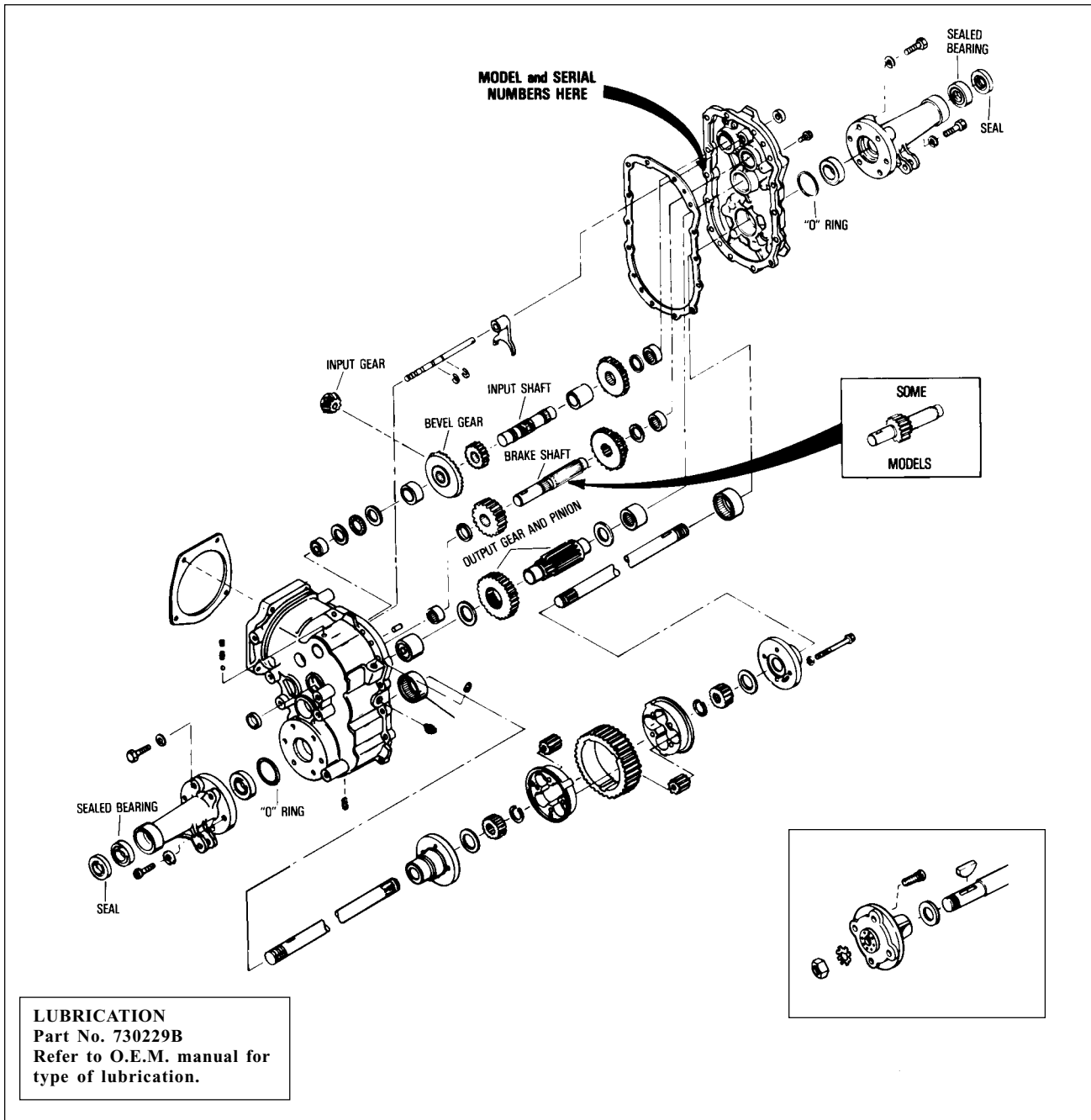
NOTE: NO BEARING AT THESE POINTS

ROLLER BEARINGS (2)

NEEDLE BEARINGS (2)



2500 SERIES TRANSAXLES



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 17. 2600 SERIES HYDRO POWERED TRANSAXLES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

The 2600 series transaxle has infinite forward and reverse speeds. It is powered by a Sundstrand® hydrostatic drive connected to an engine with up to a 20 Horsepower rating. The 2600 series are shipped without lubrication from Tecumseh/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. (3.3 - 3.8 Lt) SAE Type A automatic transmission fluid.

DISASSEMBLY

1. Remove the hydrostatic pump as necessary to allow repair.

NOTE

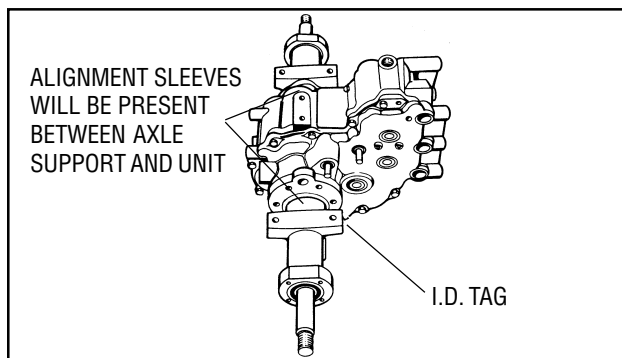
An oil supply is blocked in the hydrostatic pump when not running so upon reassembly, hydrostatic charging is not necessary.

2. Although the unit should have been drained of lubrication, be aware that upon removal of the axle support, the axle will be removed as well. This will allow trapped oil to spill.

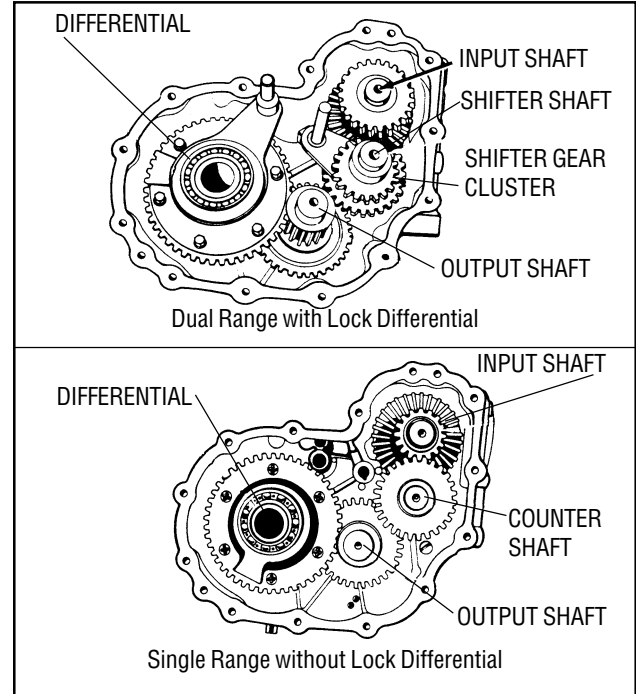
NOTE

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.

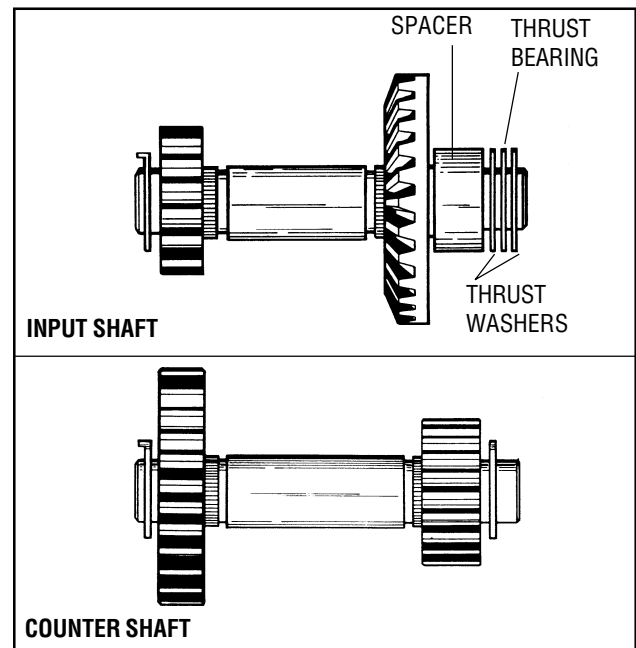
3. Clean all exterior surfaces before disassembly.
4. Scribe alignment marks on the unit before removal to assist in reassembly. Remove the axle supports.



5. To remove axle out of its support, tap lightly with a mallet from the inside out. A pressed-on sealed bearing will be on the end of axle.
6. Position the unit with the cover side up. Then remove the dowels and screws. Lift the cover off, and discard the gasket.

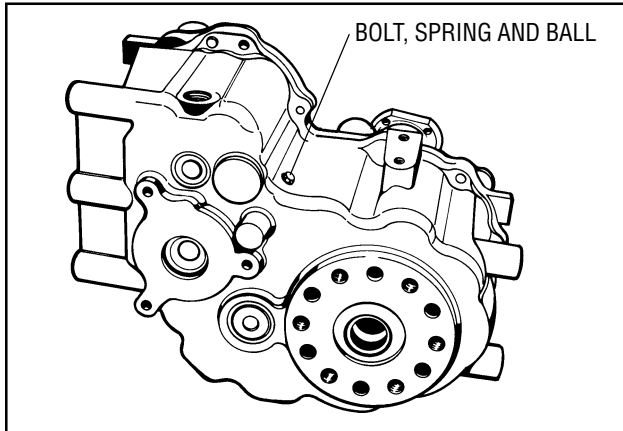


There are two different 2600 models as shown above.

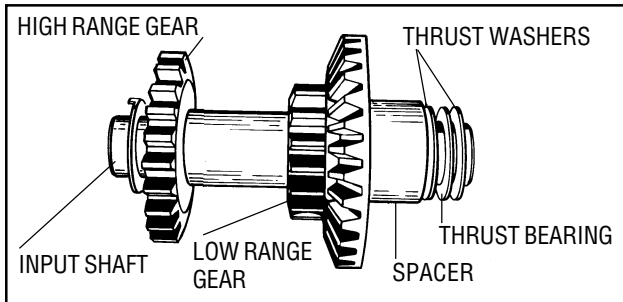


7. To remove components from the single speed version, first remove the differential, thrust washers, drive gear, input shaft, countershaft, output gear and shaft.

- To remove components from the 2 speed with locking differential version, remove the shifter rod and fork, the outside bolt, spring and detent ball. Next remove the high range gear; then the shifter gear cluster and fork assembly together.



- Remove the input shaft assembly.



- Remove shifter shaft, output shaft and the output gear in this order.
- Remove differential and lock fork assembly together.

INSPECTION AND REPAIR

Axle Supports.

- Check the roller bearings on the axles. Clean and remove any rust.
- Clean the axle supports and inspect.

Case and Cover.

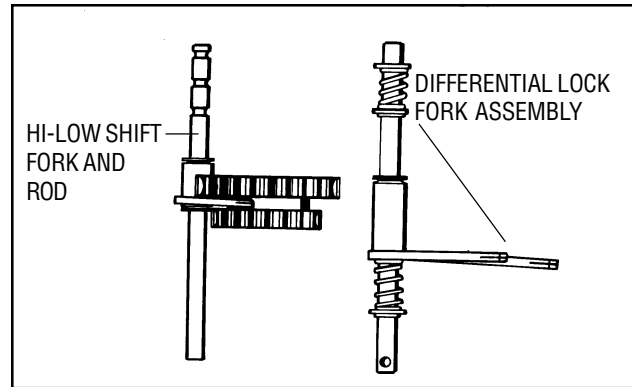
- Check for leaks or cracks.
- Replace all oil seals. As necessary, replace needle bearings as described in Chapter 22 on bearing service.
- Do not replace brake shaft seal, brake shaft, shifter rod and shifter differential lock seals until the unit is reassembled.

Shafts and Gears.

- Check teeth for wear, pitting or breakage.
- Inspect bearing surfaces for smoothness.
- Inspect gears and shafts for an out-of-round condition.

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

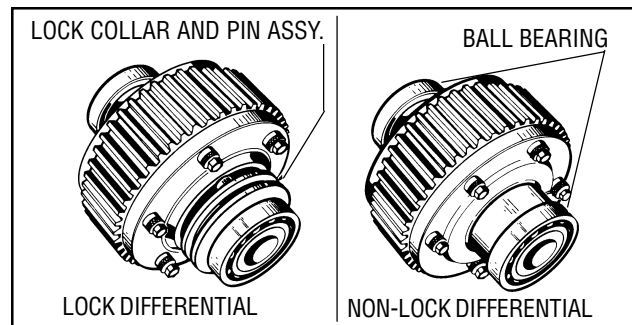
Shifter Mechanism (Dual Range).



- Check spring for tension and ball for wear.
- Check shifter rod grooves for wear. Be sure snapping sharp edges goes away from shifter fork on both shifter shafts.
- Inspect shifter fork for straightness and wear.

Differential

- Make sure you have all parts.
- Check thrust washers for wear.



- Check differential lock collar for fork or pin wear.
- Check ball bearings for ease of rotation. Replace any parts if necessary.

ASSEMBLY

Install parts reversing the disassembly procedure. Be careful of the following:

- After the shifter rod is positioned, install the detent ball, spring and bolt. Turn the set bolt inward (dual speed) until it contacts the case.
- Be sure that thrust washers and spacers are between every shaft and case and cover.
- Threads of the differential bolts must be coated with standard stud Loctite. The bolt heads are up when installed. Refer to Chapter 18 on differentials.
- Install a new gasket. It may be helpful to dampen the gasket with oil for easier installation.

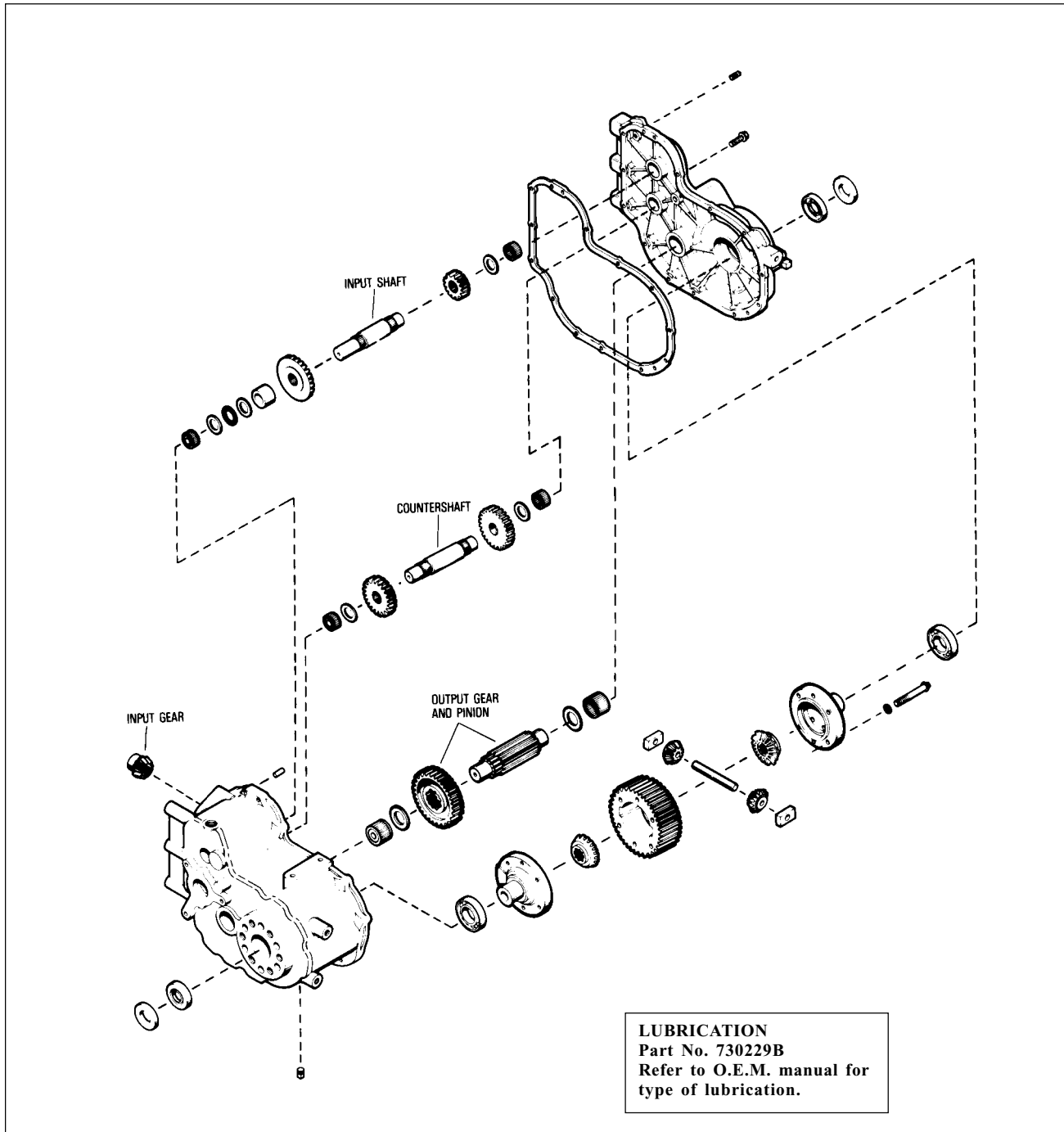
5. To place axle assemblies into case and/or cover, grease axle spline ends heavily. Push the axle through the seal, using extreme caution when axle splines are going through the seal.

NOTE

If you do not have the proper seal protector spray axle with brake cleaner and when dry, place one layer of thin, clear packing tape around splines and keyways. Lubricate the exposed tape, and the seals will be protected when pushing the axles through.

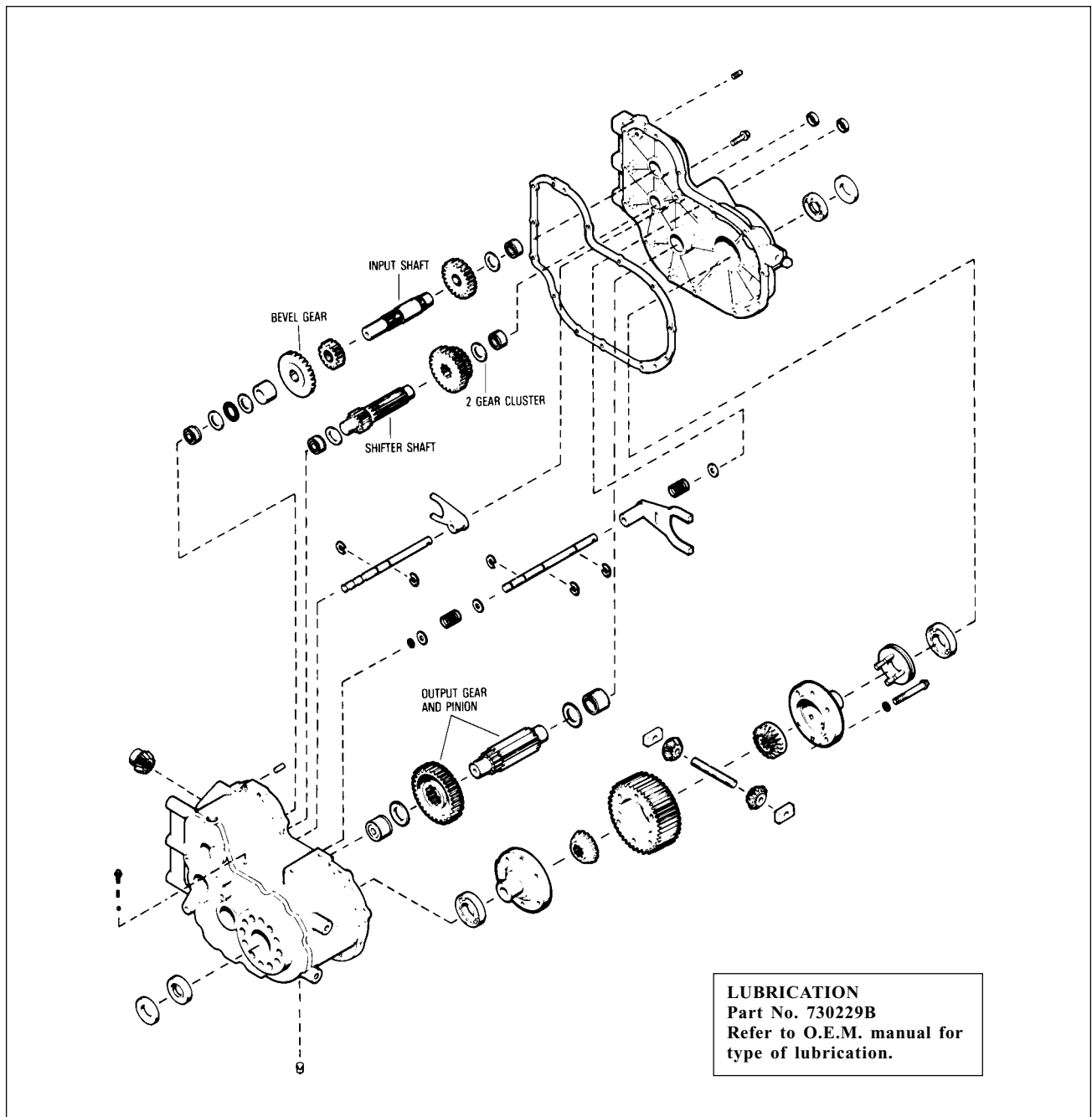
6. After the unit is assembled install the brake shaft oil seal, using a seal protector/installer.
7. Install the shifter rod oil seal, using the seal protector 670206 and driver 670211.
8. Install the locking differential shifter rod oil seal, using the seal protector 670206 and installer 670211.
9. Lubrication for all models is 7 to 8 pints (3.3 - 3.8 Lt) of SAE Type A automatic transmission fluid.

2600 SERIES HYDRO POWERED TRANSAXLE SINGLE SPEED



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

2600 SERIES HYDRO POWERED TRANSAXLE TWO SPEED



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 18. DIFFERENTIALS

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

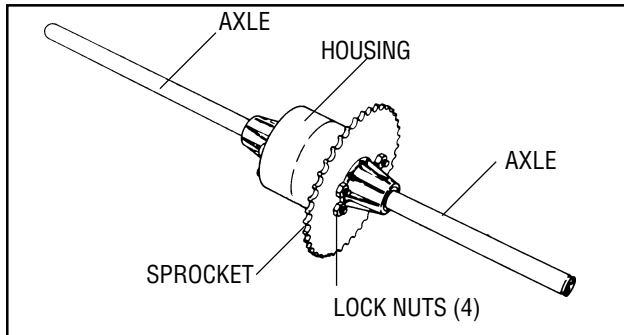
The differential assemblies of Tecumseh/Peerless units are grouped together in this section. Though there is little similarity between the 100, 600, 800 and remaining series units, they are grouped here because their function is the same.

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.

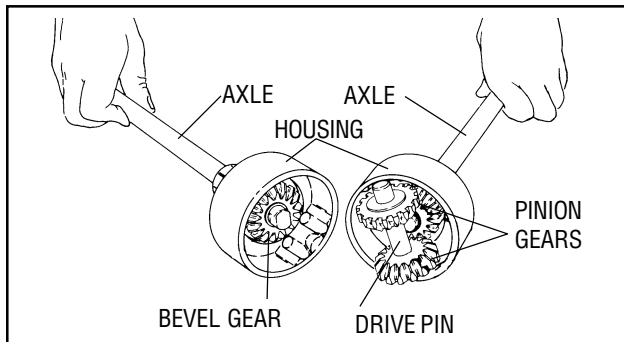
MODEL 100 DIFFERENTIAL

DISASSEMBLY

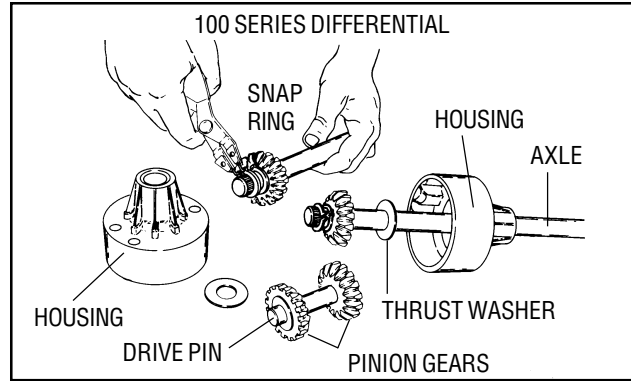
1. Clean the outside of the differential. Remove all keys, pins, etc. Remove all burrs from keyways and holes. Use a stone on hardened shafts.



2. Remove four (4) locknuts, bolts and the sprocket. Separate the differential carrier housings.



3. Remove the drive pin, pinion gears and thrust washers as a unit.



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

NOTE

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

ASSEMBLY

1. Slip the axle into the differential housing carrier. Place the thrust washer and bevel gear on the axle and secure with a snap ring. Make sure the flat side of the snap ring is away from the gear.
2. Place pinion gears and thrust washers on the drive pin and insert the assembly into either differential housing carrier.
3. Use 3 oz. (89 ml) of bentonite grease as a lubricant.
4. Assemble the 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 and seals around the axles.

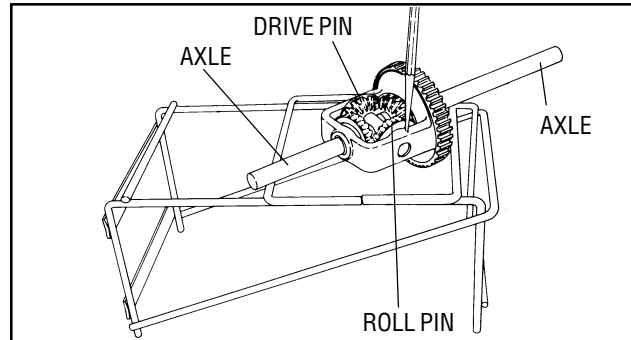
If no gasket is present, seal the housing with Loctite 598 part number 788093 using a 1/8" (3.18 mm) bead.

MODEL 600

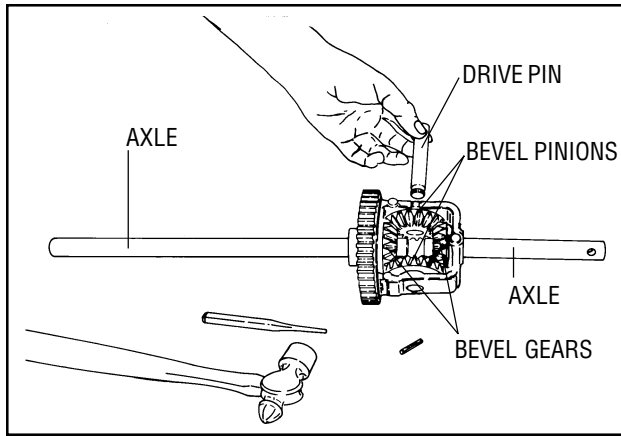
DISASSEMBLY

NOTE

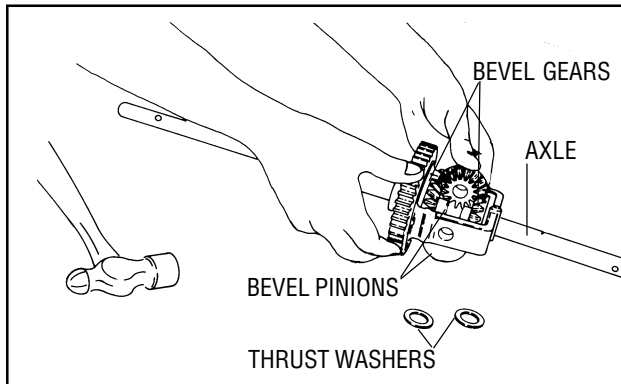
Axles vary in length so make a sketch of which axle goes where.



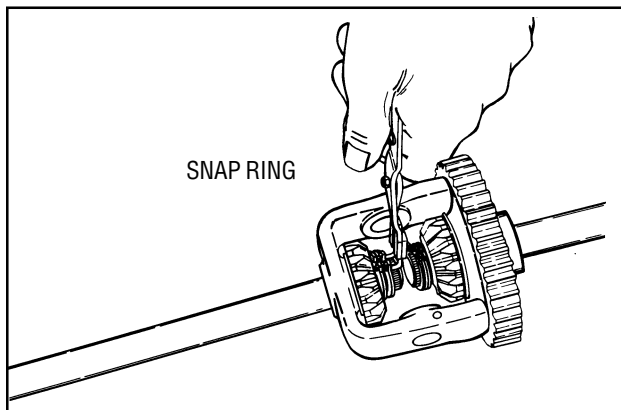
1. Drive out the roll pin that secures the drive pin with a suitable punch.



2. Remove the drive pin.



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

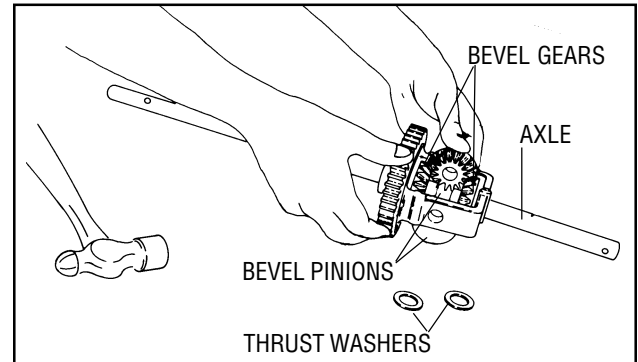


4. Remove snap ring, bevel gear and thrust washer. Slide the axle out.
5. Inspect the bushings and gears for wear and replace when necessary.

REASSEMBLY OF DIFFERENTIAL ASSEMBLY

1. Place axles (left and right) into differential gear assembly. Install thrust washers.
2. Place the bevel gears on the shaft and install the snap ring in the groove on the shaft.

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



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

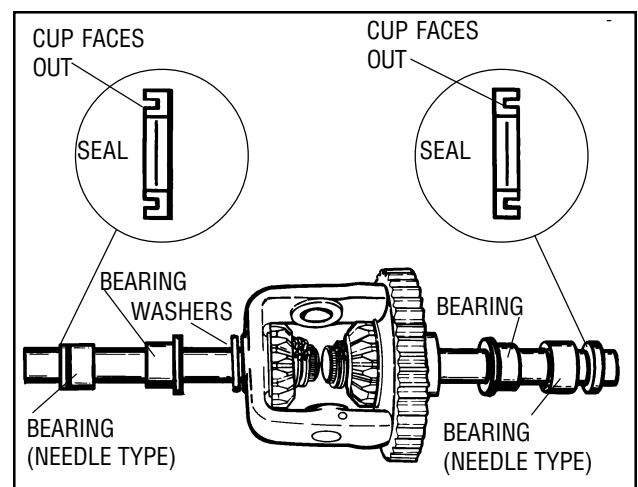
MODEL 800

DISASSEMBLY

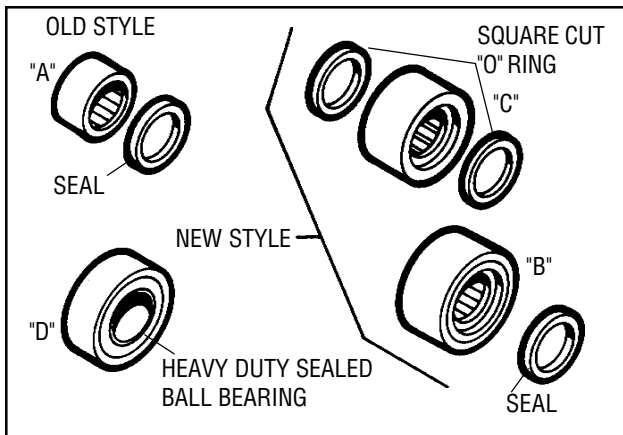
1. Same as disassembly for model 600, except for additional parts on the axle.
2. Remove and inspect seals, bearings and washers for wear; replace if necessary.
3. If differential was disassembled note positioning of differing length axles so correct reassembly may be performed.

REASSEMBLY

1. Reassemble in reverse order of disassembly.



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



The 800 Series has used four styles of axle bearings. 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 Heavy Duty applications. Styles "B", "C" and "D" are interchangeable. Needle bearings A, B, and C must be repacked with E.P. Lithium grease.

NOTE

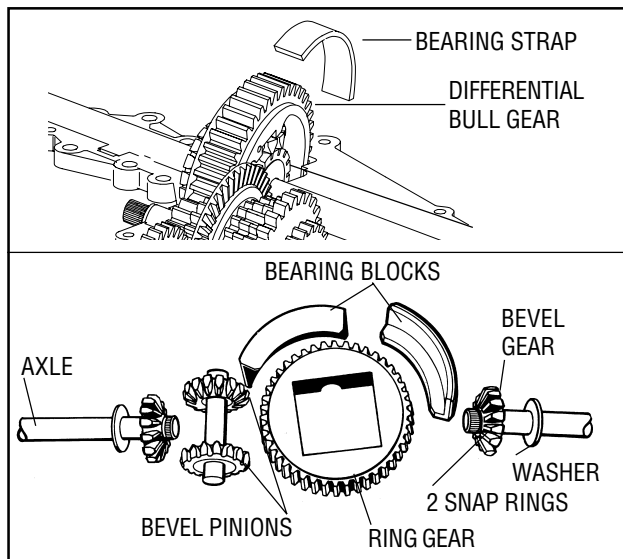
Needle bearings are lubricated with E.P. grease. DO NOT USE BENTONITE on needle bearings. For maximum gear train life use only Bentonite grease on all shafts and gears, Tecumseh part number 788067C.

MODELS 900, 910, 915, 920 and 930

DIFFERENTIAL

This style differential is supported by the case and cover with thrust load being absorbed by either bearing blocks or a bearing strap as shown. Both types use thrust washers on the axle bevel gears.

DIFFERENTIAL ASSEMBLY

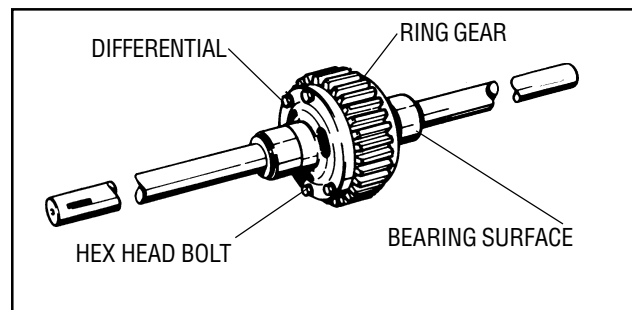


Ensure you have all of the parts as the unit is assembled in your hands and placed directly into the case.

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.

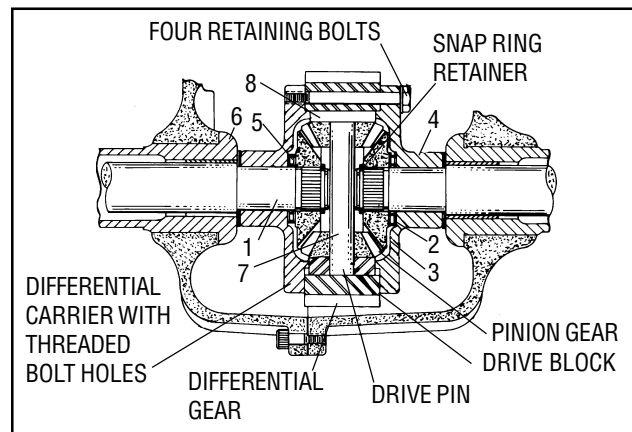
CAST IRON DIFFERENTIALS USED IN TECUMSEH/ PEERLESS TRANSAXLES



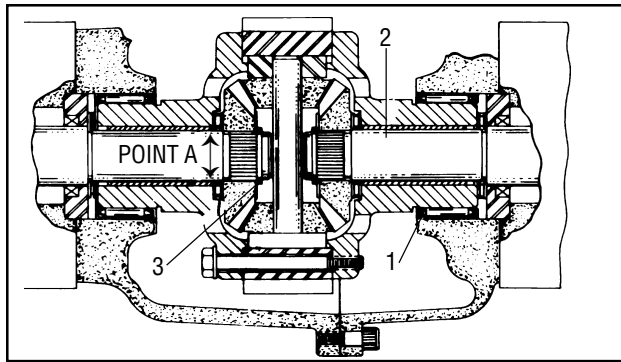
NOTE

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

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



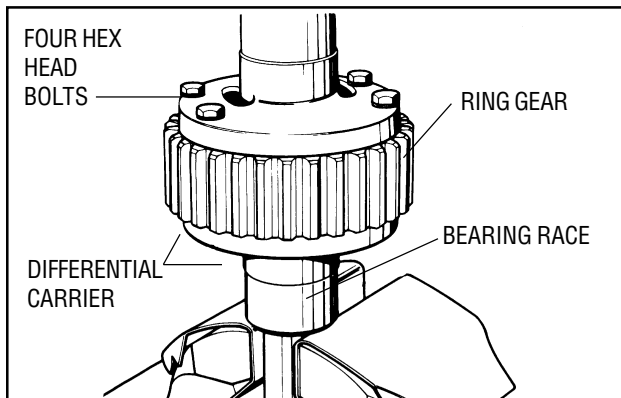
The 1200 series differential carrier is supported directly on the axle (1). Roller thrust bearings (2) are used between the bevel gear (3) and the differential carrier (4). This illustration shows axles with snap ring (5) retainers; some earlier production had rolled over axle ends to secure the assembly. Thrust washers (6) are used at the ends of the differential carriers and the 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 .878 (22.3 mm) at point A.



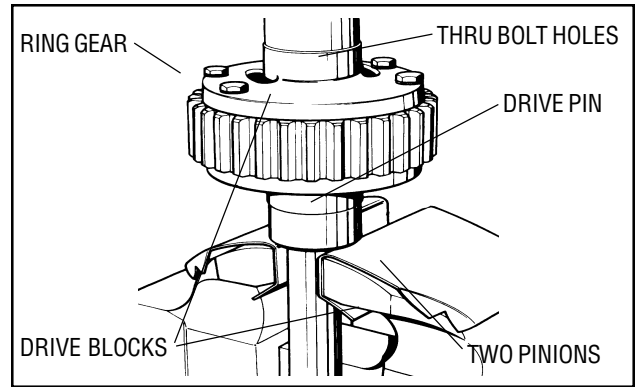
The 2000 series, three speed and the 2300 series, four speed differential will be discussed in this section. Examine the external bearing race on the differential carriers (1) for wear or pitting. Replace if necessary. The differential carriers in this assembly have replaceable bushings (2). Replace if worn in excess of .878" (22.3 mm) at point A. See Chapter 22 on Bearing and Bushing Service. These differentials have been built with rolled axle ends and also snap rings (3), as illustrated.

DISASSEMBLY

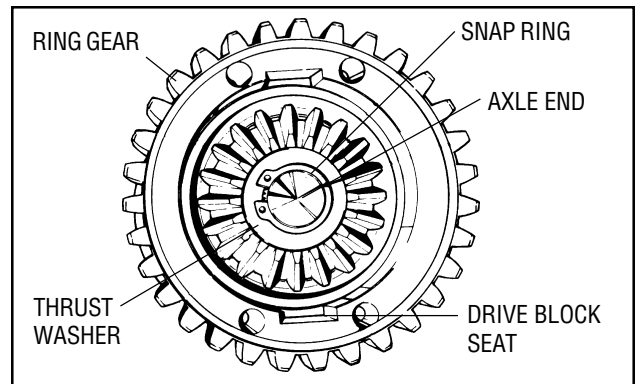
1. Clean the differential assembly, then check and note the axle lengths and their relation to the heads of the four hex screw bolts.
2. If the unit will not turn freely, note where the unit binds. Check and replace those parts.



3. 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.
4. Remove the four hex head bolts, the upper axle and differential carrier. Remove the drive blocks, pinions, drive pin and thrust spacer if used, by lifting them out of the ring gear. Tap the ring gear lightly with a mallet to loosen them from the differential carrier.



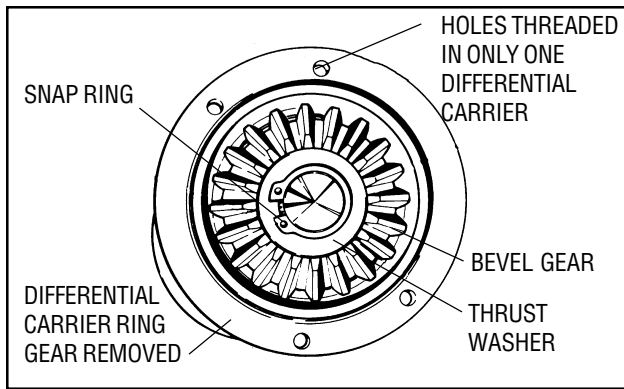
5. If a snap ring is used, the axle assembly may be disassembled. If the axle end has been rolled, do not attempt to break the rolled retaining edge. The parts are to be replaced as an assembly.



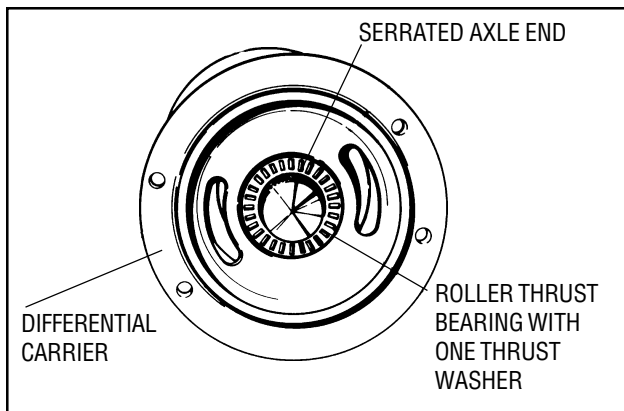
6. Remove the snap ring and the thrust washer. Separate the bevel gear and the differential carrier from the axle.

INSPECTION

1. See Chapter 22 on Bearing and Bushing Service.
2. Examine the 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.
3. Examine the drive pinions, drive pins and drive blocks for wear and damage. Replace the pinion or the drive pin if excessively worn.



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



- 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.

REASSEMBLY

- Oil all parts during reassembly. 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.
- Clamp the axle, in a soft jaw vise (not the bearing or oil seal surfaces). The differential carrier with threaded holes is assembled to this axle.
- Torque the four hex head bolts to 7 ft. lbs. (5.2 Nm).

TESTING

- Test the 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.

DUO-TRAK (Illinois tool works)* DIFFERENTIAL

OPERATION

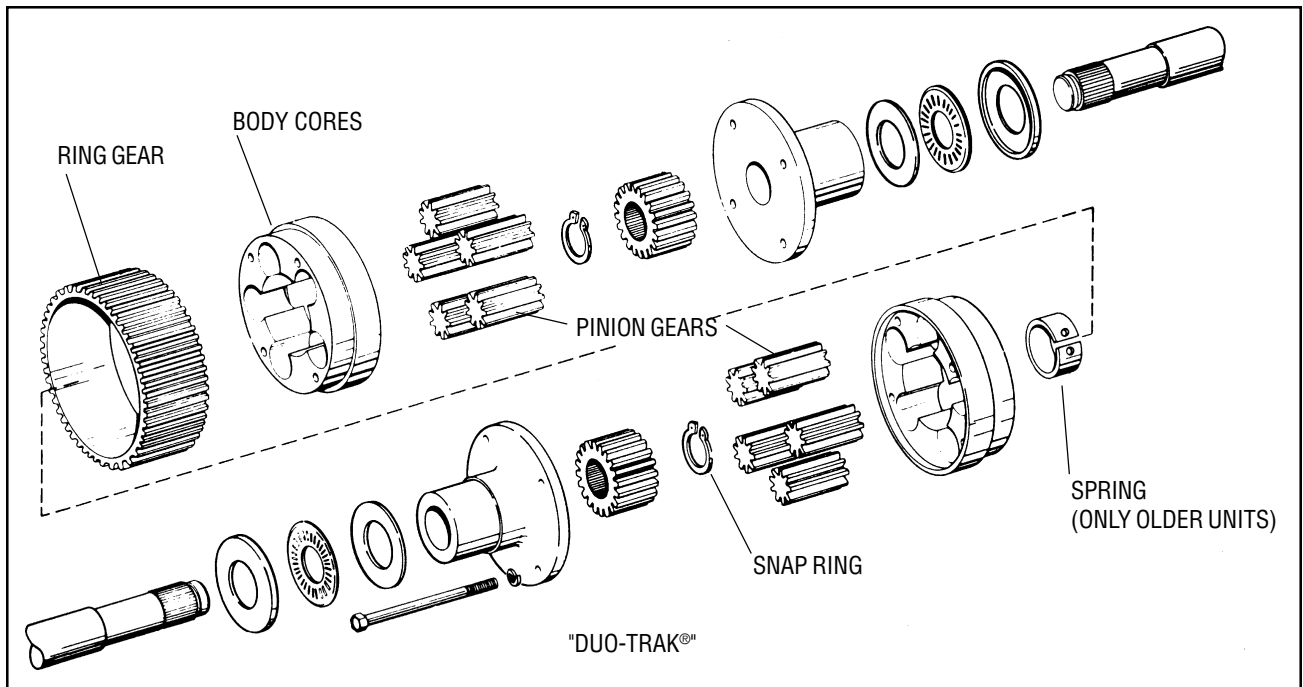
A cylindrical spring in the center of the unit presses the ten pinion gears against their pockets setting up a resistance to rotation. This resistance serves to lock up the gears in the differential until a moderate tractive difference in the wheels causes the resistance to be overcome. At this time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

DISASSEMBLY, INSPECTION AND REPAIR

Parts breakdown will be found on the next page. Remove the four through-bolts. Separate axle assemblies from the body cores. To disassemble the axles, remove the snap ring and retained parts. Be sure the flanged thrust washer goes toward hub end of the 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.

ASSEMBLY

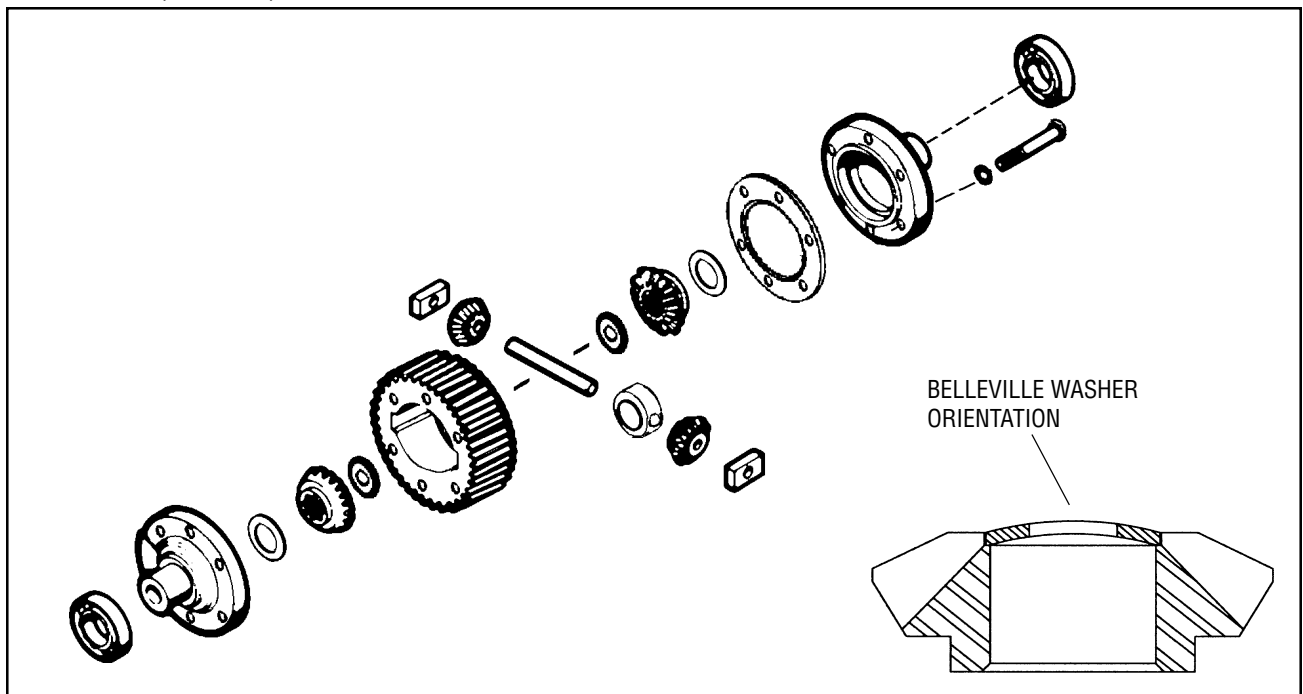
Install the body cores to the ring gear so that the pockets in one core are out of alignment with pockets in other core. Reassemble the thrust washers, bearing, carrier and side gear to the axle and secure with the snap ring. Install the pinion gears on one side, then use the differential carrier and 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 the other side to mesh with the 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 the other axle and secure the assembly with four through bolts and torque to 7-10 ft. lbs. (5.2 - 13.6 Nm).



*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. (68 - 95.2 Nm). 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, but not on 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 in 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 19. DRIVES

This chapter relates to service of all Right Angle and T-drives.

WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

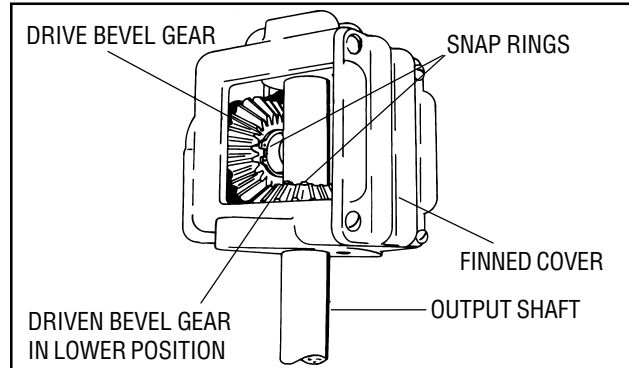
1. Prior to removing the assemblies, examine the following items that may have failed causing the right angle drives to appear inoperative.
2. Drive belts: Inspect for breaks, tension, oil or grease saturation and inoperative tightening devices.
3. Pulleys: Tighten retaining screws. Examine for sheared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

FINNED COVER RIGHT ANGLE DRIVE

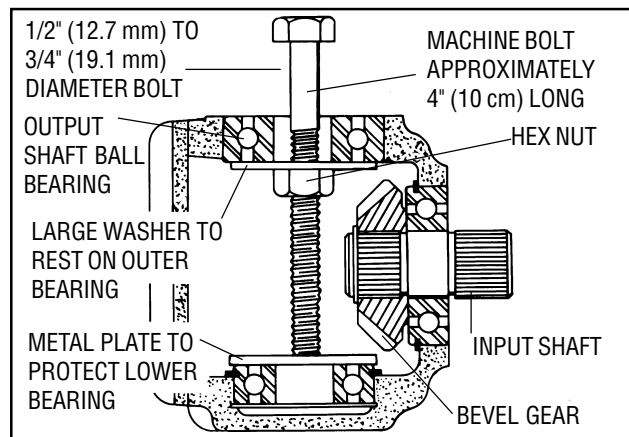
When finned cover right angle drives are to be serviced because of lubricant leakage, it will be necessary to replace the ball bearings.

DISASSEMBLY

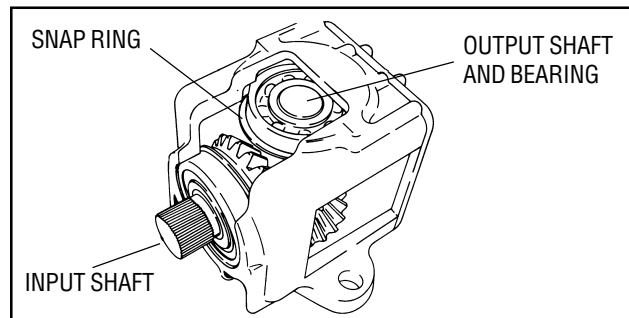
1. Scribe marks on the covers and shafts to ease in reassembly.
2. Remove the cover, gasket and the lubricant from the drive.



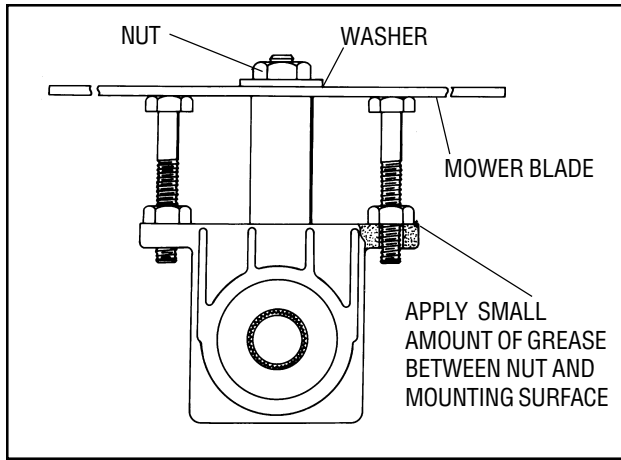
3. Output shafts achieve a different rotation by mounting a gear at the top or bottom of the shaft.



4. If the driven bevel gear is on the bottom, remove the snap ring on the output shaft and pull out the output shaft.
5. Remove the output shaft bearing by using a large machine bolt, washer and nut.



6. The input shaft bearing, input shaft and bevel gear may now be driven out of the housing. Press the bearing into housing to remove.
7. The top ball bearing in the blind end of the housing is removed by heating the housing on a hot plate and tapping the outside of the housing with a nonmetallic mallet. Another option is to simply load the bearing area with grease and tap the output shaft in the center of the bearing quickly with a hammer. It will pop the bearing out of its position.



8. Right angle drives 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

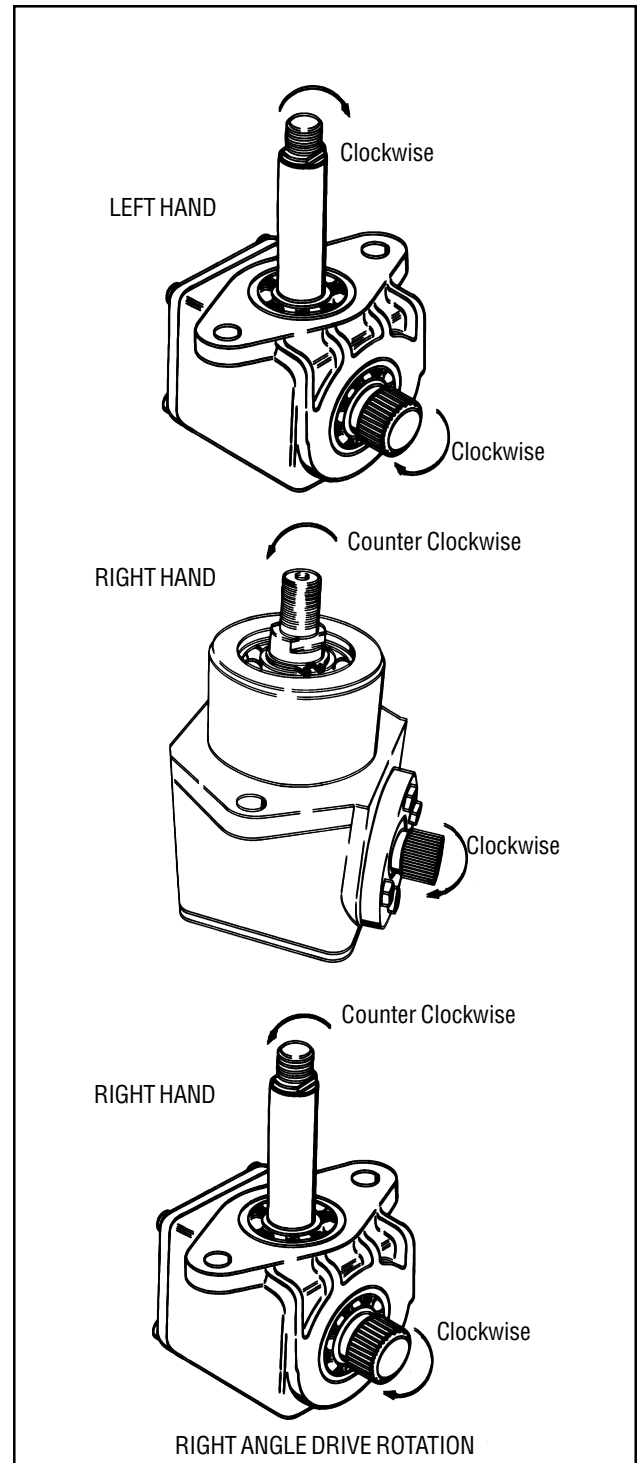
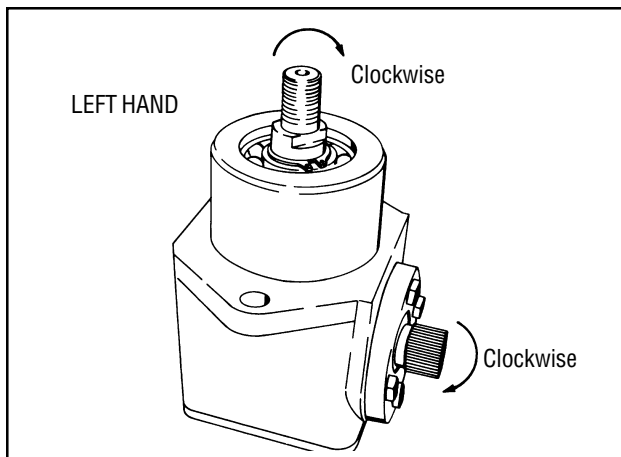
Clean all parts in a cleaning solvent. Examine for wear or damage and replace as needed. Use care when handling ball bearings. See Chapter 22, Bearing and Bushing Service.

REASSEMBLY

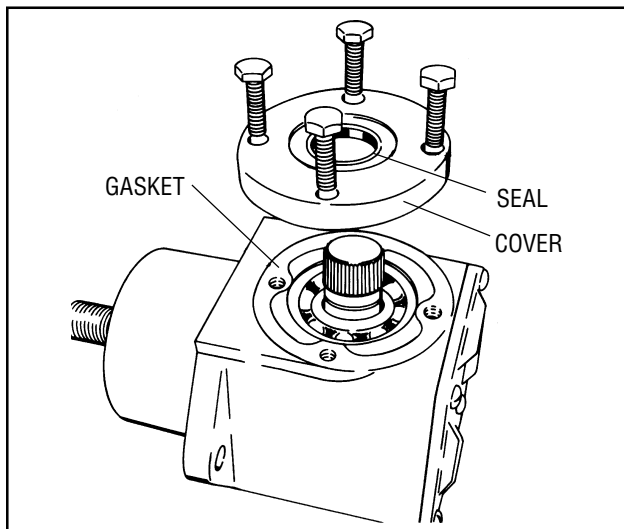
Assemble in reverse of the disassembly instructions. It is important that only ball bearings with snap rings be used for the input shaft and top output shaft bearing. Use a tool for driving in bearings. In the event bearing bore is tight in the housing, heat the housing on a hot plate. Place a steel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

LUBRICATION

See Lubrication Chart in Chapter 1.



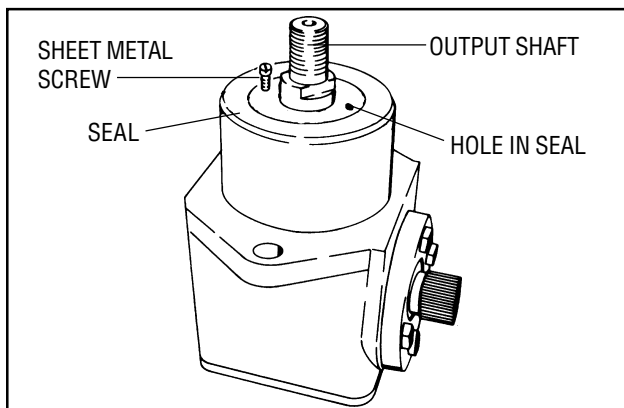
SMOOTH COVER RIGHT ANGLE DRIVE



SERVICE

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

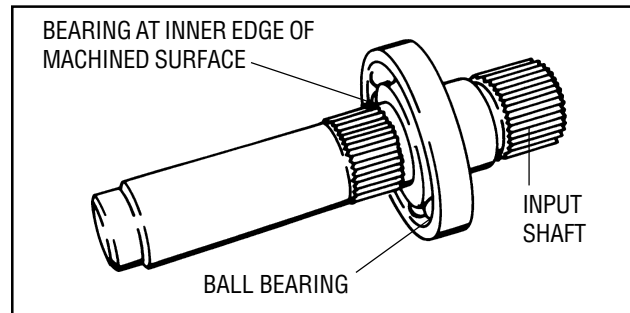
1. **Input shaft seal replacement:** Remove four screws and the cover. Replace the seal by driving in squarely so that it is .040" to .050" (1.02 - 1.27 mm) below flush. Use tool 670293 to protect the seal when replacing the cover and seal assembly over the input shaft. Place the seal protector on the shaft and coat with oil. Slide the seal and cover over the sleeve. Tighten the seal retainer screws and remove the sleeve.



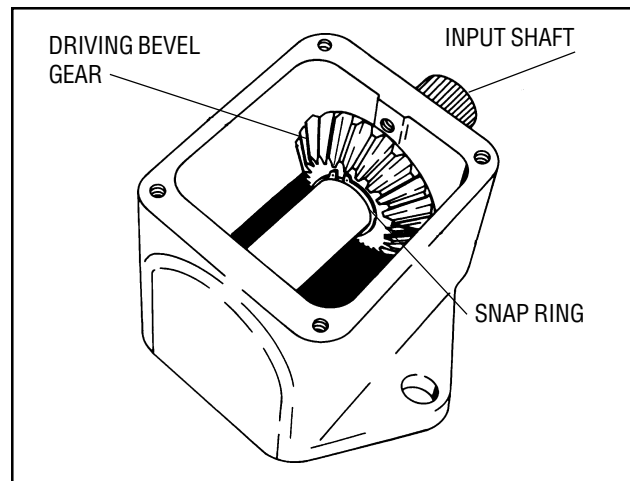
2. **Output shaft seal replacement.** Remove the seal by punching two small holes in the seal with an awl as close to the outer edge of the seal as possible and opposite each other. Use care when making holes in the seal so ball bearing underneath is not damaged. Do not use a drill. Insert sheet metal 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 protector 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.

DISASSEMBLY

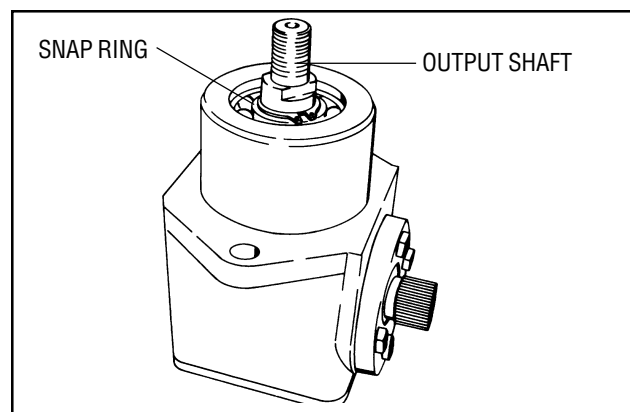
1. Scribe marks on the covers and shafts to aid in reassembly.



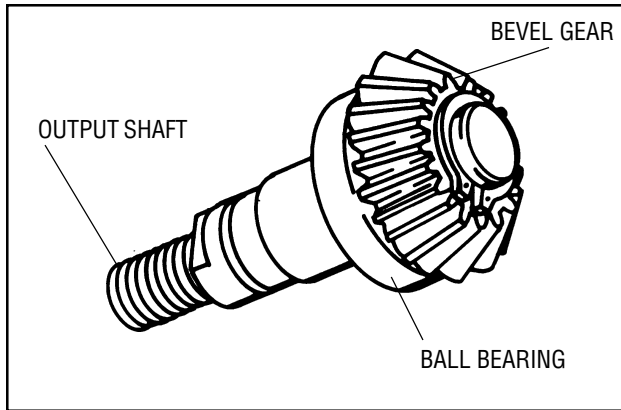
2. Remove the cover, gasket and lubricant.



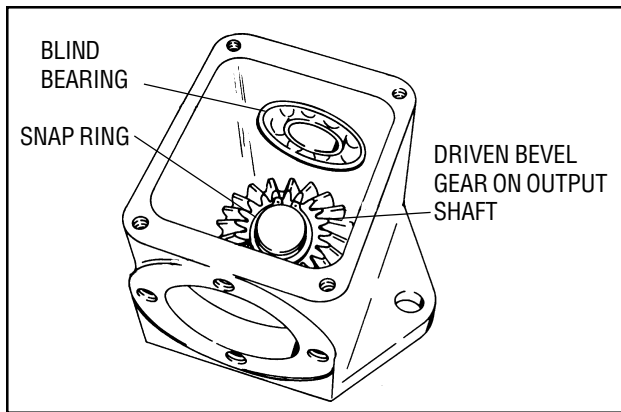
3. If the unit is built with the bevel gear on the input shaft toward the cover, remove the snap ring from the groove of the input shaft.



4. Remove four screws and the cover/seal assembly.
5. Remove the seal at the output shaft.
6. 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 output end ball bearing by driving it out from the inside.



- 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 inside ball bearing race.



- The ball bearing that supports the inside end of the input shaft is removed by holding the housing in hand while tapping the housing sharply on the outside with a nonmetallic soft mallet behind the bearing. It may be necessary to heat the housing to remove this bearing. Be careful not to distort the case by overheating.

INSPECTION

Clean all parts in a cleaning solvent. Examine for wear or damage and replace parts as needed. Use care when handling ball bearings. See Chapter 22 on Bearing and Bushing Service.

REASSEMBLY

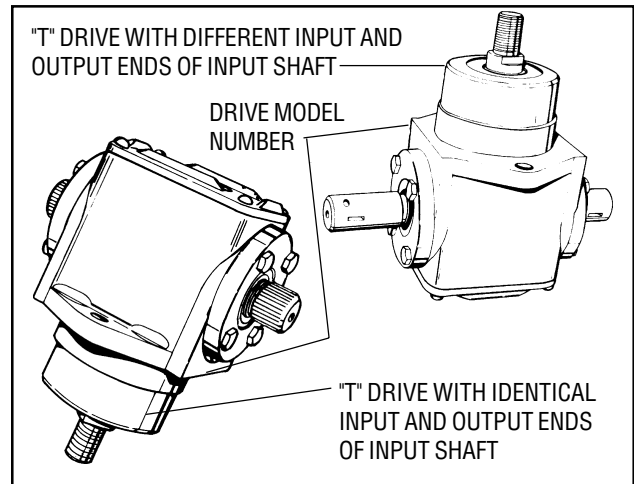
Assemble the unit in reverse of the disassembly. When building up the unit, it is important to install the correct input shaft and identify it with the correct cover. Use the identifying scribe marks to assemble parts correctly.

LUBRICATION

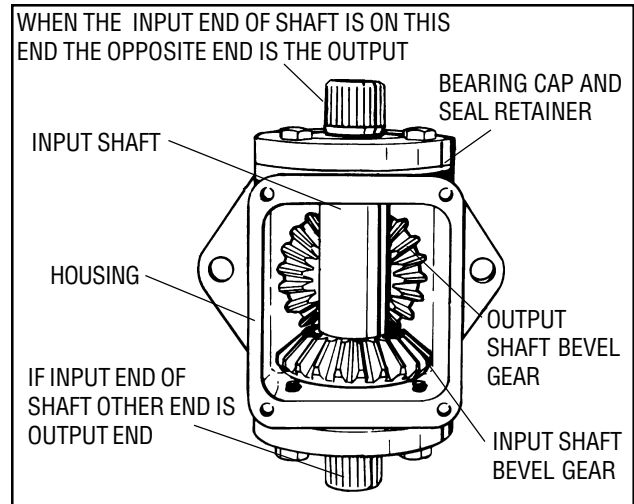
See the Lubrication Chart in Chapter 1.

"T" DRIVE SERVICE

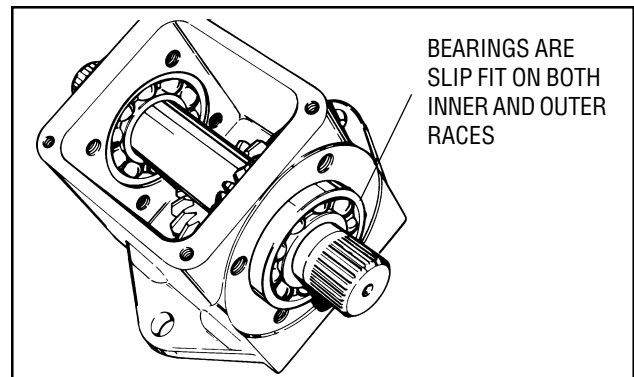
- Before removing a "T" Drive from equipment, be sure to scribe marks at one mounting hole to ensure correct reassembly.



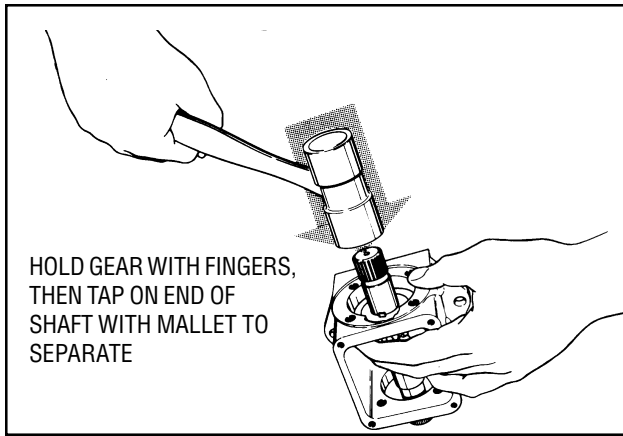
- To disassemble "T" Drive, remove self-tapping screws and housing cover and clean grease from internal area. Note and mark near the gasket surface on the side where the beveled input gear is located. Switching the "T" 180° will result in the output shaft having the opposite rotation.



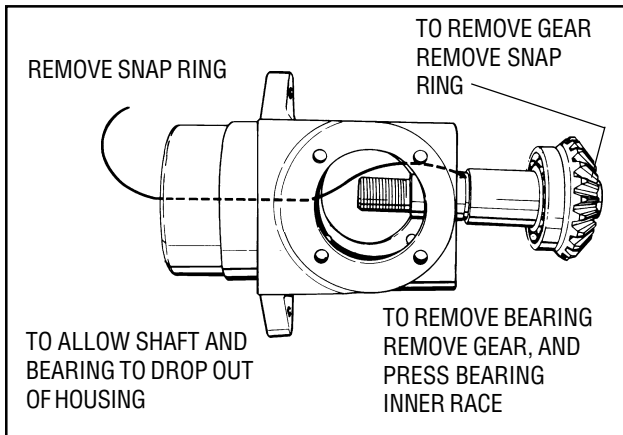
- Remove cap screws and both retainer cap and seal assemblies. Separate and discard oil seals and gaskets.



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



- 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.
- Remove and discard the output shaft oil seal. **TAKE CARE NOT TO SCRATCH THE SHAFT.** Remove and discard the snap ring and tap the shaft into the housing using a nonmetallic mallet.

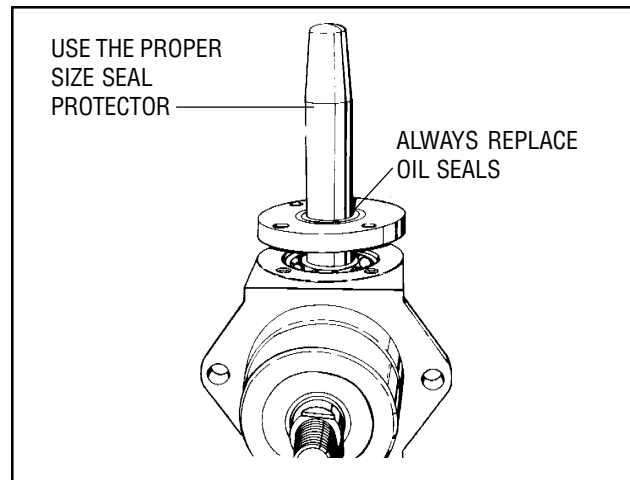


- If necessary, remove the snap ring to separate the gear and bearing from the shaft. Hold the gear and bearing in one hand and tap the end of the shaft vigorously with a soft mallet.

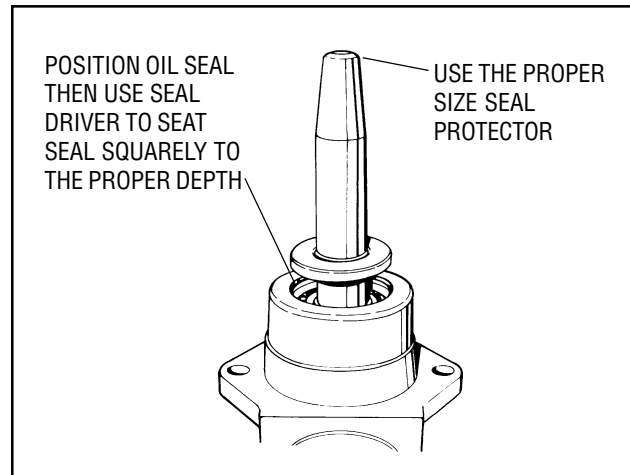
Cleaning, Inspection and Repair

- Clean all parts of grease, rust, or foreign material.
- Dry all parts. Compressed air may be used on all parts EXCEPT BEARINGS.
- Check bearings for smooth rotation, then lubricate.
- Remove all burrs and scratches from shafts with a fine file or stone.
- Check housing for cracks or pulled metal.
- Replace all snap rings.
- Replace all oil seals.
- If separated, install the inside ball bearing and bevel gear on the output shaft. Be careful of alignment. The use of a press is preferable to installing bearings and seals with a mallet.

- Press shaft, bearing and gear assembly into the housing until outer bearing race bottoms in its retaining cavity.
- Install the outer bearing and a new snap ring.



- Install a new oil seal, using a seal protector sleeve part # 670293 and driver until the seal is flush with the housing.



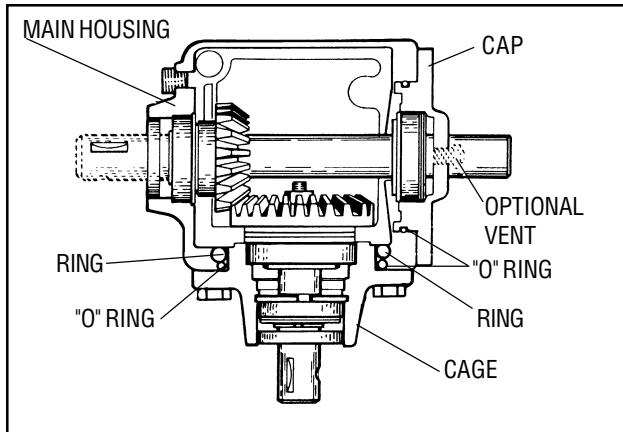
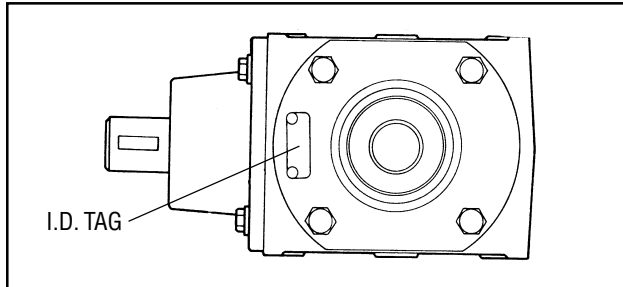
- Position the input bevel gear in mesh with the output shaft bevel gear. Tap the input shaft into place with a nonmetallic mallet. Use one hand to hold the gear and shaft to dampen the blows from the mallet. Be sure gear is on the marked side of the housing.
- Align the shaft and insert a ball bearing on each bearing surface by hand.
- Install new seals in the retainer caps using a driver.
- Using seal protector # 670293 over the shaft serrated ends; install new gaskets and the bearing cap. Tighten retaining cap screws to 8-11 ft. lbs. (27.3 - 14.7 Nm).
- Lubrication: See the Lubrication Chart in Chapter 1.
- Install the gasket and cover and secure with self tapping screws. Torque to 20-24 in. lbs. (2.3 - 2.7 Nm).
- Align scribe marks and install "T" Drive on the equipment.

CHAPTER 20. 1100 SERIES DRIVES

⚠ WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

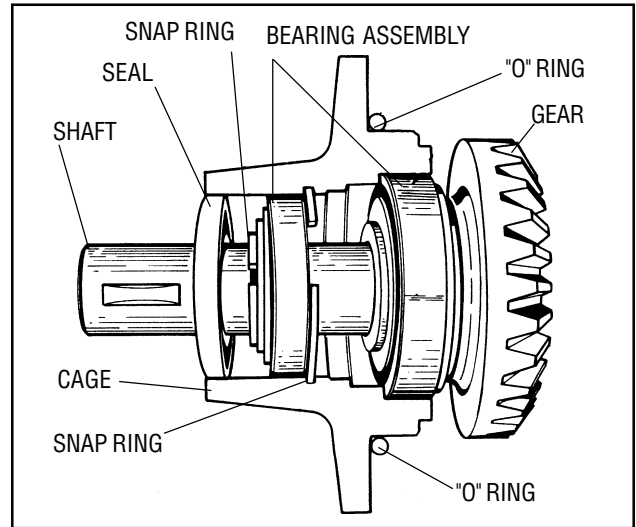
⚠ WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

GENERAL

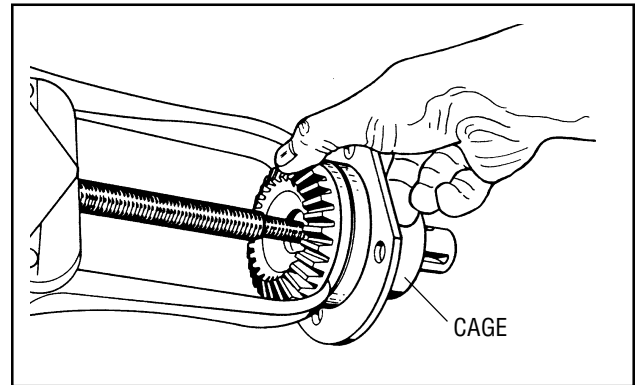


The 1100 series angle drive is a heavy duty gear box used with larger equipment with horse power ratings up to 20 H.P. This unit is of cast iron construction for strength featuring tapered roller bearings for longer life. It can be configured wither as a right angle drive with right or left handed rotation, or a "T" drive. Reassembly is the reverse of the disassembly procedure.

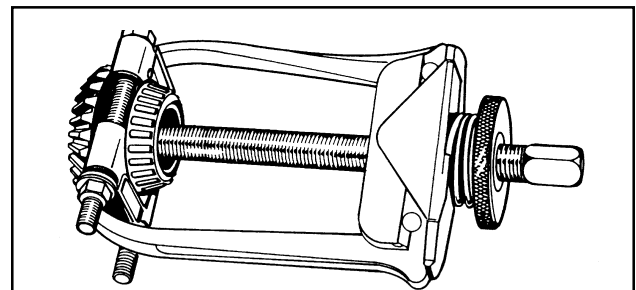
DISASSEMBLY



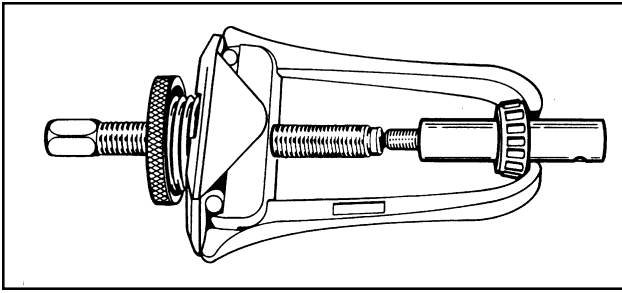
1. Scribe marks on the covers and shafts to aid in reassembly.
2. Clean and check all shaft ends before removing the cap and cage assembly.



3. Remove the four input cage bolts and remove the input cage; the assembly will follow.

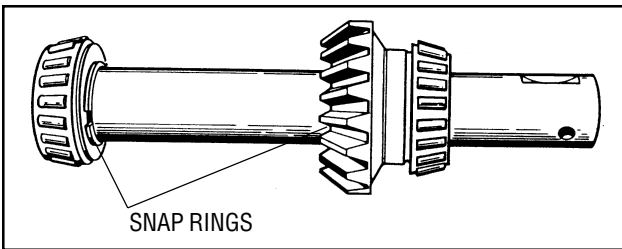


4. To disassemble the input cage assembly, first remove the nut and washer that holds the large keyed gear onto the shaft. With an outside puller, if necessary, remove the gear. The roller bearings will be attached.

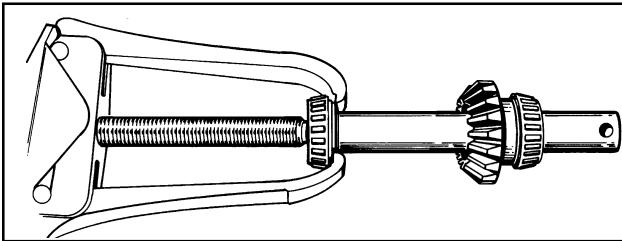


5. Remove bearing from gear by using a bearing splitter and puller.*
6. Remove the shaft out of the cage. Remove roller bearing with outside puller toward threaded side. * Then remove the snap ring.

*When roller bearings and races are removed with a bearing puller, discard and do not reuse.



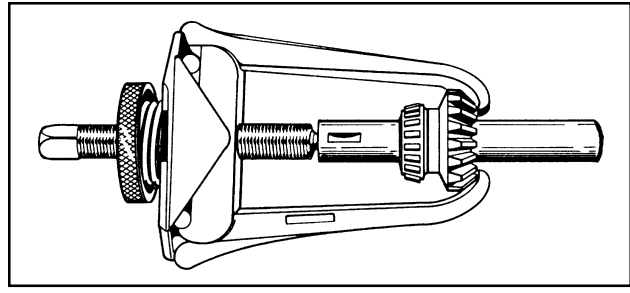
7. To remove the races, simply tap out with a punch and hammer. The large snap ring will be left in the cage when all parts are removed.



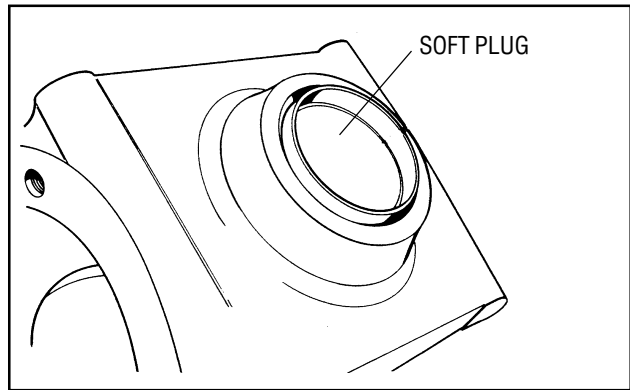
8. Remove the output cap and the assembly will follow.
9. To disassemble the output shaft assembly, first remove the bearing that is located under the cap on the shaft, by using an outside puller.*

NOTE

Do not hook a puller on the snap ring.



10. Remove the snap ring.
11. On the other end, use the same puller and remove both the keyed gear and bearing at the same time.
12. Remove the snap ring.



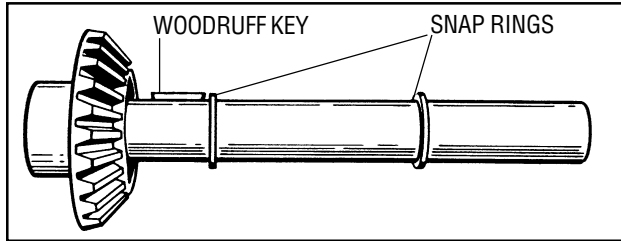
13. To remove the 1-3/4" (44.5 mm) soft plug, simply tap it out of the case. Discard the old plug.
14. To remove races, simply tap the race out of the cap and pry the crush ring out. The other race can be tapped out with a punch and hammer. If the unit is not equipped with a plug, very carefully pry the race and crush ring out of cap and discard.

INSPECTION

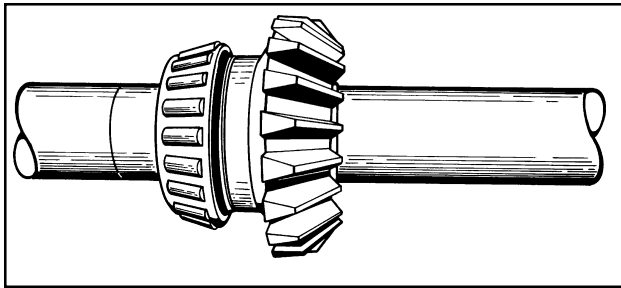
Clean all parts in cleaning solvent. Examine for wear or damage and replace as needed.

REASSEMBLY

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



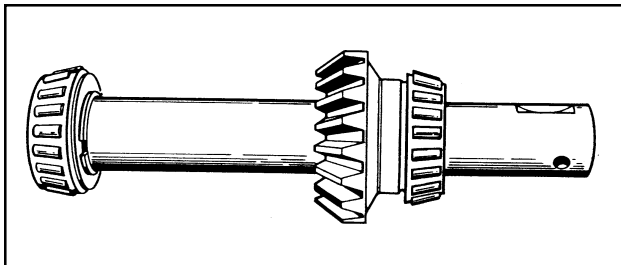
1. Following the scribe marks, press the keyed gear on if necessary, and replace the snap rings on the output shaft.



2. Make sure the inner bearing race is used when pressing roller bearings into place.

NOTE

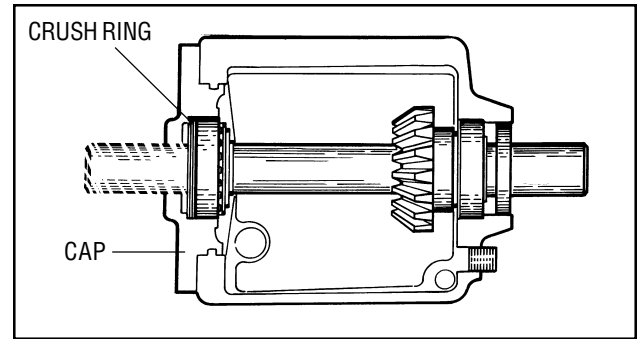
Service bearings for this unit may have a shim in the box along with a new outer race. When pressing the bearing next to the gear, place the shim for that bearing and race (if present) next to the gear first, then press in the race and bearing.



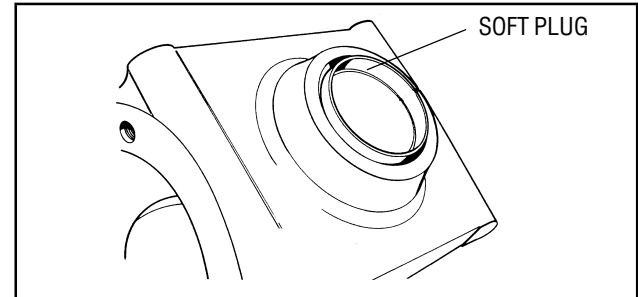
3. Install the other bearing that fits into the cap without the shim.
4. The race that is used with a roller bearing on the gear side mounts into the case. Press the race in carefully until seated.

NOTE

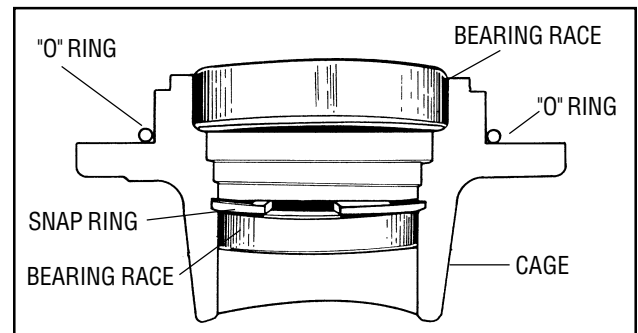
Make sure that all races and roller bearings are kept together as provided.



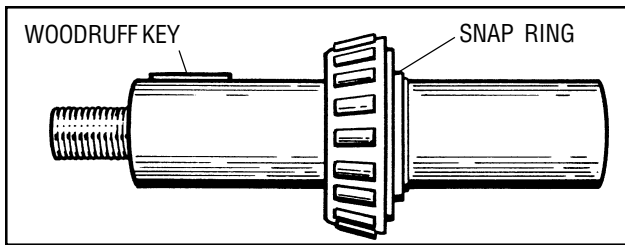
5. Before installing the cover, first install a new crush ring into the cover. Press a new race up to the crush ring. To properly set up the output shaft preload, place the shaft into the case, and place the cover over the shaft without the case/cover shim and "O" ring. Tighten the four bolts to a torque of 200 in. lbs. (22.6 Nm) at 50 inch pound (5.65 Nm) increments.
6. Now remove the cover and place a new case/cover shim with a new "O" ring and torque to 200 in. lbs. (22.6 Nm) at 50 inch pound (5.65 Nm) increments.



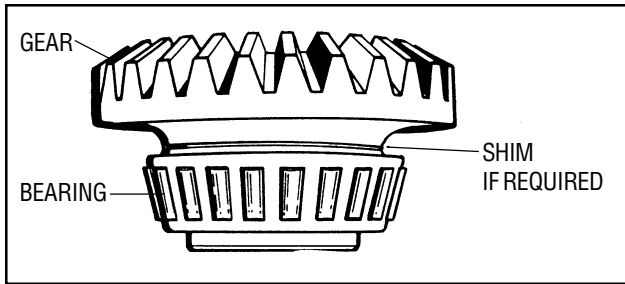
7. To install a 1-3/4" (44.5 mm) soft plug, tap in carefully with the lip up until 1/16" (.34 mm) below flush is achieved.



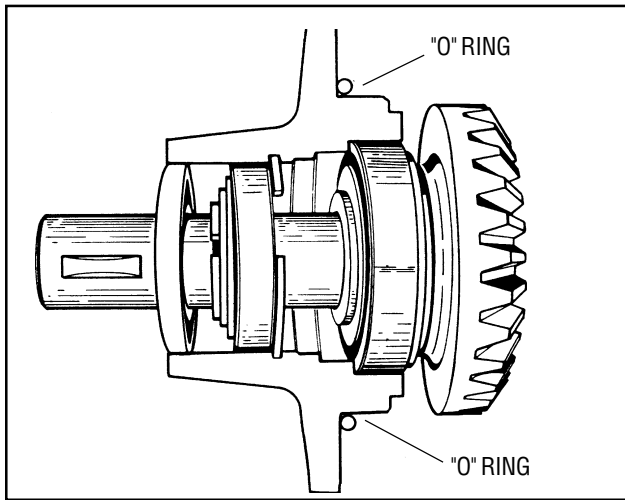
8. To assemble the cage assembly, place the large snap ring in its mounting area in the cage. Press the small race to the snap ring from the outside.
9. Press the large race into the cap.



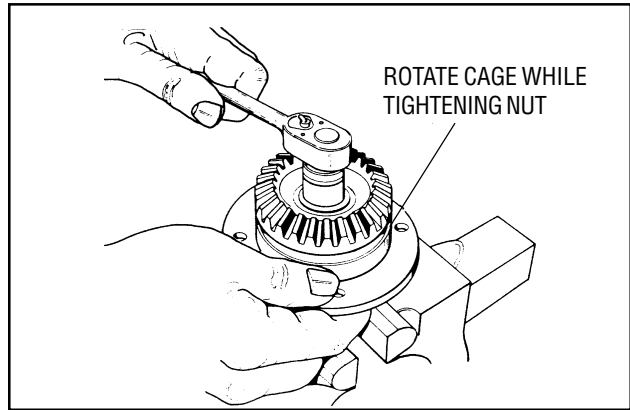
10. Place a small snap ring on the shaft.
11. Press a roller bearing on the shaft to the back side of the snap ring and do not use a shim. Install the woodruff key.



12. Press a large shim and a new large roller bearing onto the gear pressing on the inside bearing race.



13. Place the shaft into the proper position in the cage, and place the gear with the bearing onto the shaft.

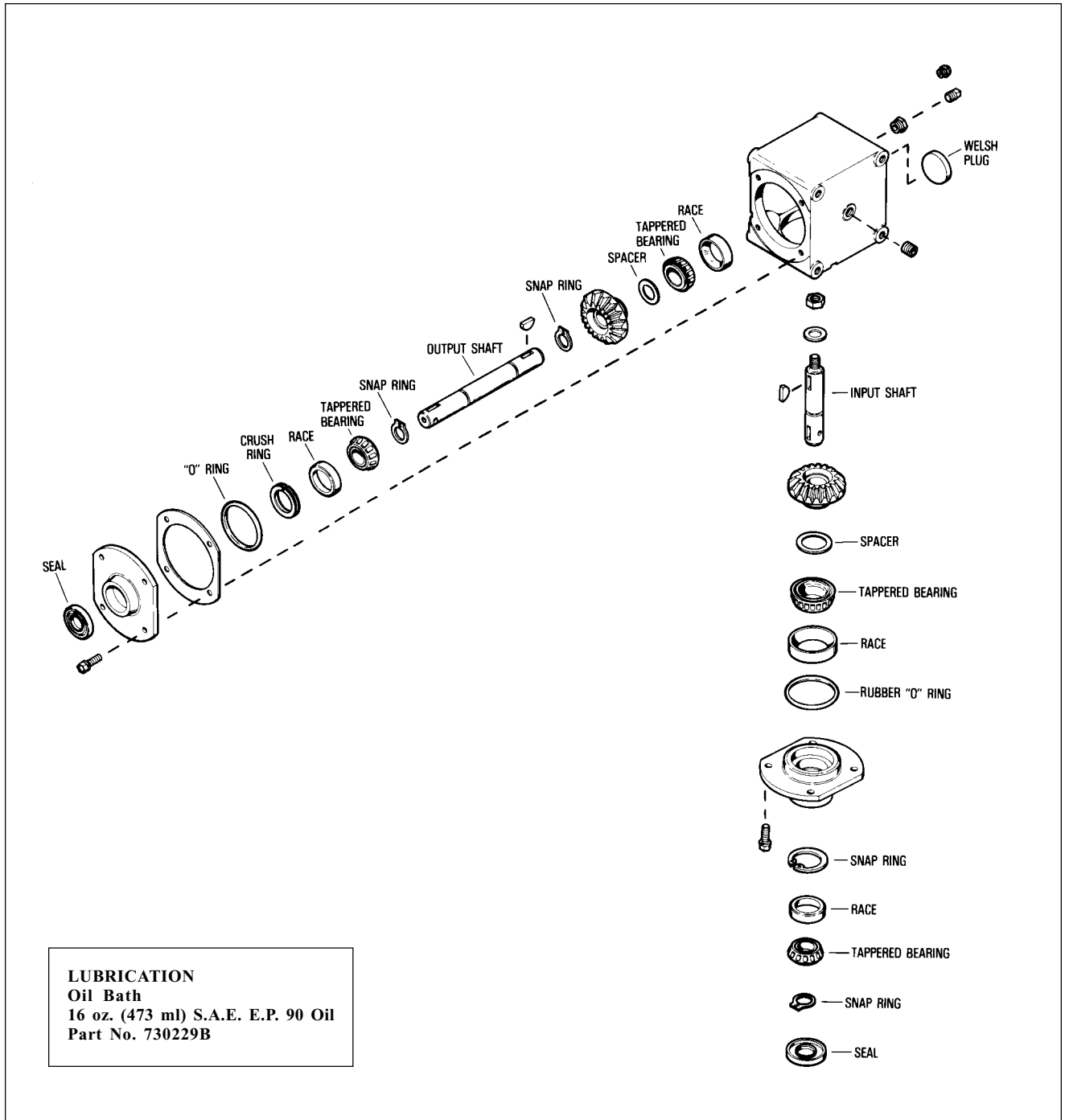


14. To achieve a proper pre-load on the bearings, place the outboard side of shaft in a protected jawed vice. Begin to tighten the nut on the gear side, while turning the cage until a very slight drag is achieved. Tighten so the bearing in the cage housing does not have end play and the parts should spin freely.
15. After loading to the bearing is done, place a new "O" ring around the outer diameter of the cage and position it in the case. Reinstall bolts and tighten to a torque of 200 in. lbs. (22.6 Nm).
16. To install seals, use a 1" seal protector. Position seals so that they are installed .100" (2.5 mm) below flush.

LUBRICATION

After assembly, fill with 1 pt. (473 ml) E.P. 90 gear oil.

1100 SERIES DRIVE



The above illustration is supplied as a general assembly guide, your model may be different based on manufacturers requirements.

CHAPTER 21. SHIFTING ASSEMBLY

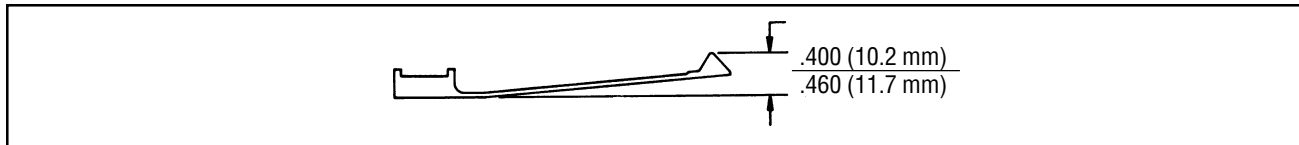
WARNING It is recommended that you take special notice of all items discussed in this manual and wear the appropriate safety equipment. Failure to do so may result in death or serious injury.

WARNING Use approved safety procedures with equipment for removal/installation of axles, keyways and hardened shafts. Remove all burrs and sharp edges with a honing stone or crocus cloth before installation. Failure to do so could result in equipment damage, death or serious injury.

KEY SPRING HEIGHT

To check shifting keys for loss of spring height, place the short flat portion of a key on a flat surface as shown, measure the distance from the surface to the key tip. The measurement should be from .400" to .460" (10.2-11.7 mm); if the measurement is below .400" (10.2 mm) the key should be replaced.

VERTICAL INPUT



H-SHIFT PATTERNS

IN-LINE SHIFT PATTERN

HORIZONTAL INPUT H-SHIFT PATTERNS

<p>600 SERIES</p>	<p>700 SERIES 800, 820 SERIES 900, 910, 915, 920, 930 SERIES MST SERIES</p> <p>(AVAILABLE IN 2 to 8 SPEEDS) FIGURE SHOWS 5 SPEED UNIT</p>	
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LEFT HAND INPUT

RIGHT HAND INPUT

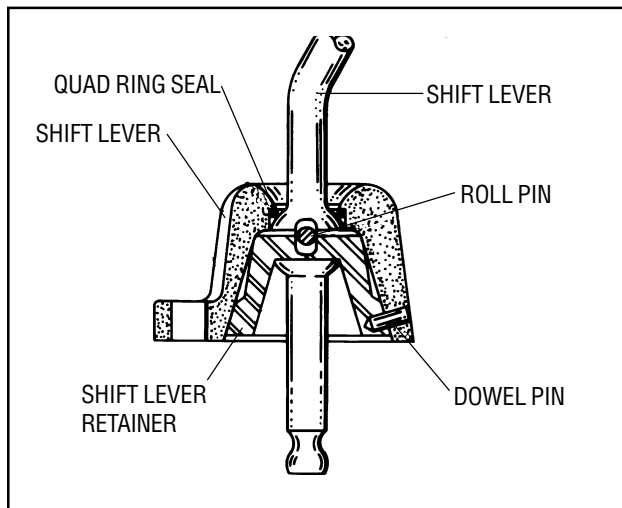
<p>SHIFT LEVER ASSEMBLY</p> <p>1700 SERIES 2000 SERIES</p> <p>NO LEFT HAND INPUT 1200 SERIES</p>	<p>1200 SERIES 1700 SERIES 2000 SERIES</p>
<p>2300 SERIES</p>	<p>2300 SERIES</p>

GENERAL

1. 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.
2. 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 by inserting a clean rag with a screwdriver.

DISASSEMBLY

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

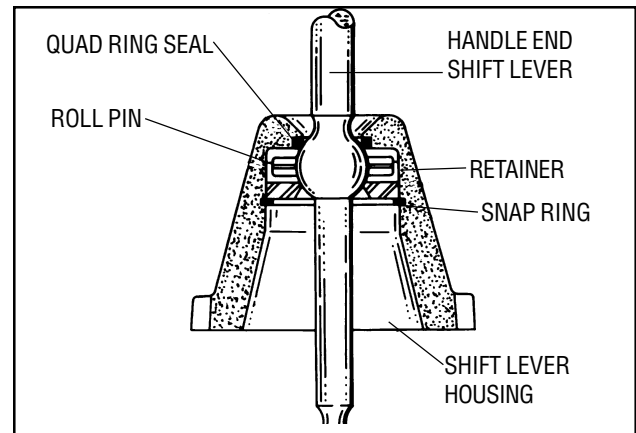


2. **DOWEL PIN STYLE.** Locate the dowel pin holding the retainer in the housing from the outside. Place a 1/4" (6.3 mm) flat face punch on the gasket surface directly over the dowel pin. Strike the punch firmly with a hammer to dislodge the retainer from the shift lever housing. Always use a new dowel pin for reassembly.
3. **SNAP RING STYLE.** Use a snap ring pliers for removing the snap ring; loosen the vise and disassemble the pieces.
4. 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 equal lengths protrude from both sides of the ball.
5. 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 the bends in the shift lever correspond to the mounting on the vehicle.

REASSEMBLY

1. **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 on the gasket surface of the shift lever housing and fits into a mating hole in the transaxle.

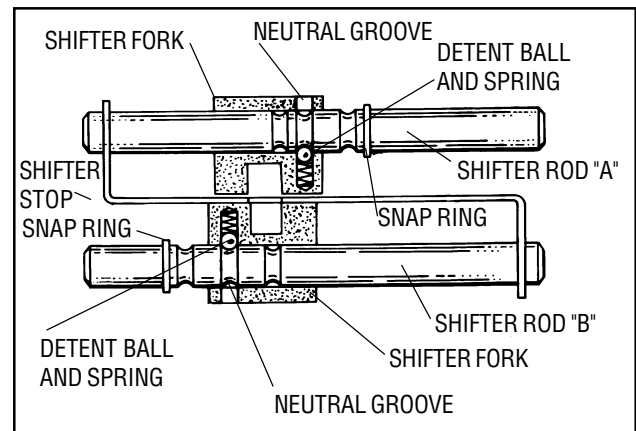


2. **SNAP RING TYPE.** Secure parts with the snap ring. Before installing the shift lever and housing into the transaxle housing, ensure the shifting forks are in the neutral position.
3. Always use new gaskets between the shift lever housing and the transaxle.

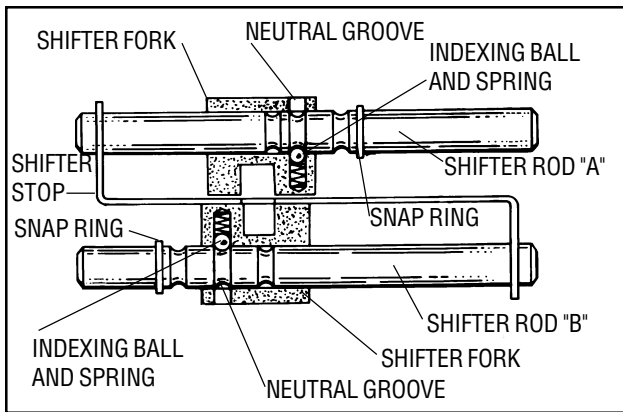
SHIFTING ASSEMBLY

GENERAL

1. 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.

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

INSPECTION

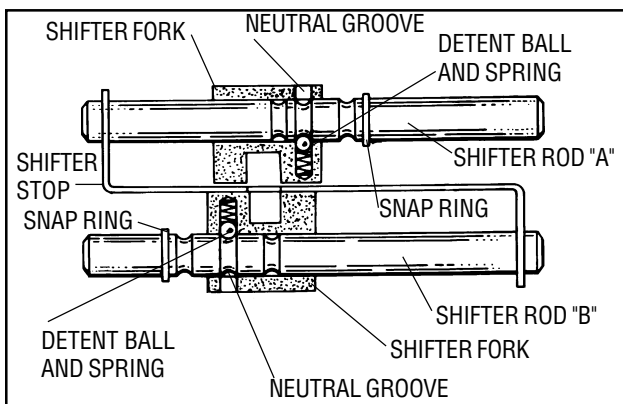
- Replace the shifter stop if worn or damaged.
- Examine the teeth and the internal splines of the two shifter gears. Replace damaged gears. The gears must slide freely on the shifter shaft. Excessive wear of the internal spline of the gears will create cocking and difficult shifting. Replace the gear if this condition is present.
- Replace the shifter shaft needle bearings if wear is evident. See Chapter 22 on bearings for removal. Replace if the bearing surface of this shaft should be scuffed, pitted or worn to a diameter less than .750" (19.1 mm).
- Replace other parts showing wear, looseness, cracks, etc...

DISASSEMBLY

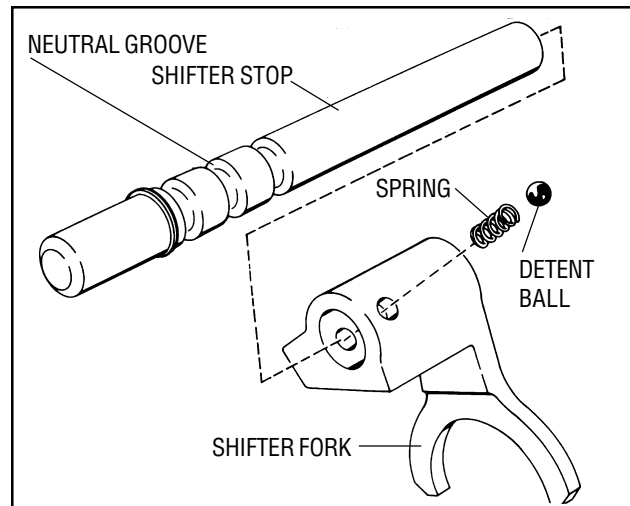
To disassemble the shifter and fork assembly, use the assembly procedure in reverse.

ASSEMBLY

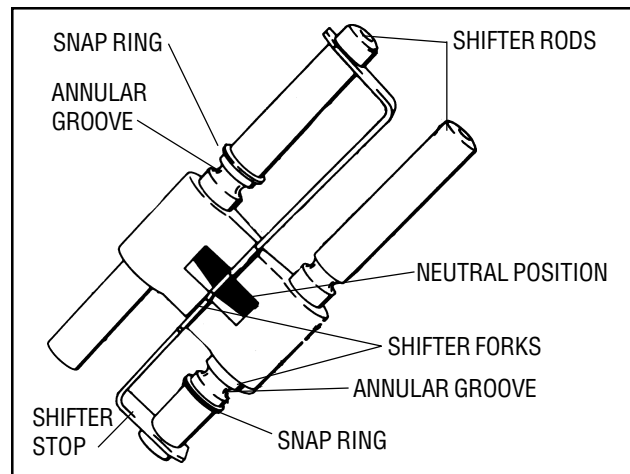
- Reassemble the shifting assembly by following the illustrations. Lay the parts on the bench on a clean paper or shop cloth. Pay particular attention to the annular grooves in the shifter rods and snap rings.



- Assemble the shifter forks onto the shifter rods. The shifter forks are interchangeable.



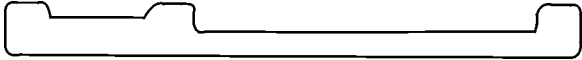


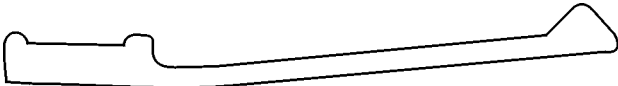
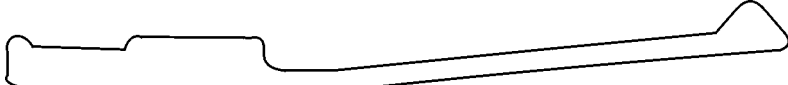

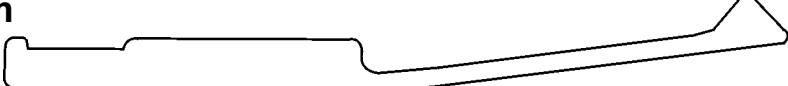
- Slide the shifter fork into the shifter rod until it lines up with the hole with the detent ball and spring. With a flat blade screw driver, press the detent ball into the hole and move the shifting fork completely onto the shifter rod.
- Move the shifting fork to the neutral position. The neutral 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.



- 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.

Tecumseh Transmissions

Shift Key Quick Reference Guide

Service No.	Length	Where Used	Shape and Size (shown actual size)
792071	2.950" 7.493 cm	500s	
792089A	2.625" 6.668 cm	700/800/801/910	
792094	2.812" 7.142 cm	728/A/729/A/757/A/759/780/792	
792018	3.165" 8.039 cm	900s	
792123A	3.980" 10.109 cm	820/920/930	
792136A	3.980" 10.109 cm	820/930/MST	
792131	4.040" 10.262 cm	820-014/A	

CHAPTER 22. BEARING AND BUSHING SERVICE

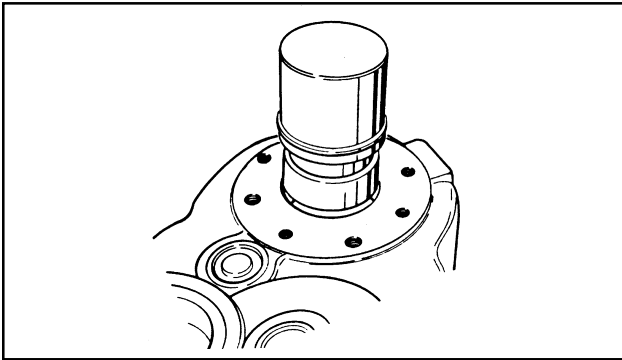
GENERAL BEARING AND BUSHING CARE

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 of these conditions appear.
2. Use clean, filtered solvent to clean bearings. Then use a clean, lint free cloth to dry the bearings. Immediately coat the cleaned bearings with lubricant to prevent oxidation and corrosion. If the bearing is to be stored, wrap in oil proof paper until needed.
3. Take care of bearings in the case and cover. Cover them to keep out any foreign material. Place the gasket surface down on clean paper and cover with a clean cloth. Never clean the lubricant from new bearings. This lubricant prevents damage before the transaxle lubricant enters the bearing.

BALL BEARING SERVICE

The ball bearings used in the outer ends of the axle supports are sealed. Without removing the bearings, but with the axle removed, rotate the inner race with your 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 as shown on the next page.

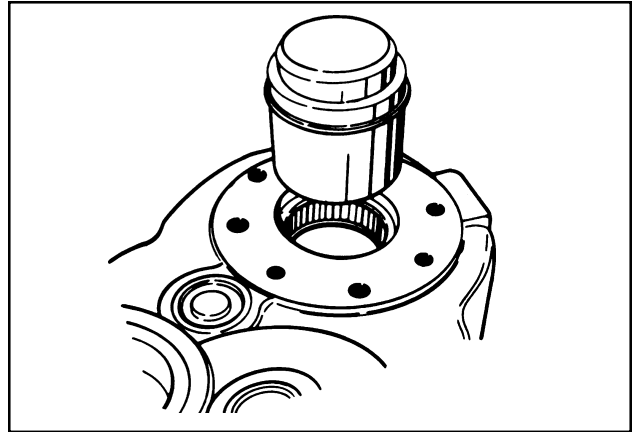
1. Install the needle and ball bearing combination for the input shaft into the cover prior to the installation of the input shaft.



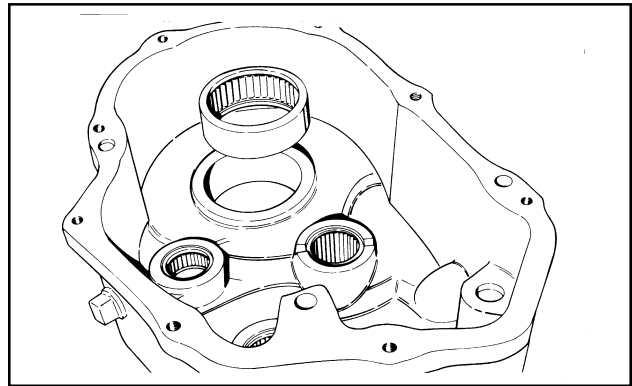
2. Using a socket or bearing installer, install the input shaft ball bearing into the case by driving on the outer race. After the input shaft bearings are installed, assemble the input shaft. Press the input shaft into the bearing combination while supporting the inner race of the ball bearing on a hollow tube.

NEEDLE BEARING SERVICE

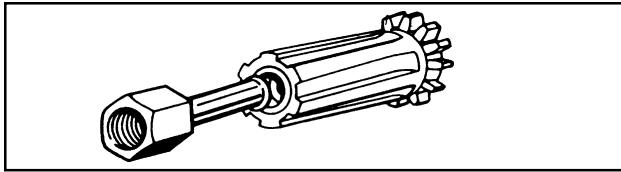
It is advisable to use an arbor press to remove and install needle bearings.



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, the bearing will be protected upon installation. Bearings should be pressed into the cover .015" to .020" (.381-.508 mm) below the thrust surface. The open end bearing in the low speed shaft of four speed transaxles is to be .010" (.254 mm) below the thrust surface. The open end bearing in the shifter shaft should be .010" (.254 mm) below the end as well.

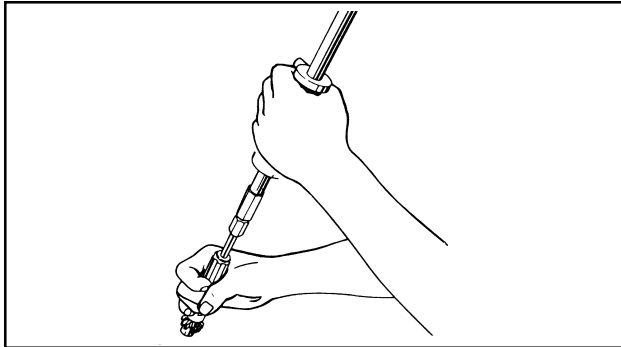


- To remove the needle bearing in the splined shifter shaft, proceed as follows:

NOTE

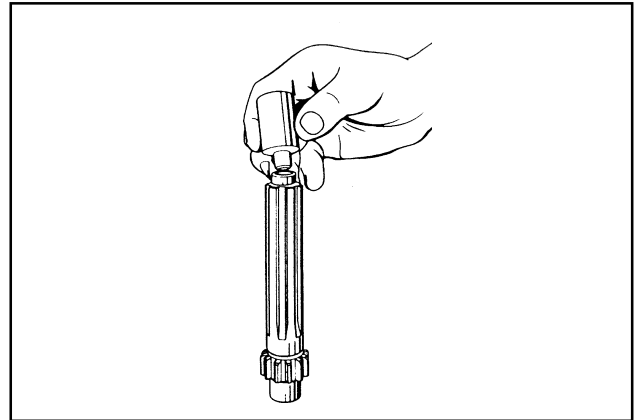
Blind bearing pullers are available to remove this bearing. There is a space between the bottom of the drilled hole and the inside end of the bearing to accommodate the ridges of the bearing puller.

- With the needle bearing up, clamp the splined shifter shaft vertically in a soft jaw vise so the lower end of the shaft rests on a block of wood.
- Prepare some pieces of paper toweling, newspaper, etc. by soaking in water.
- Tear paper into pieces, approximately one to two inches square. Stuff these wet pieces of paper into the needle bearings until full.



- Insert a 7/16" (.438 mm) metal rod into this bearing. With a mallet strike the rod sharply to compress the wet paper. Continue to add more wet paper, this will hydraulically lift the bearing out of the shaft.

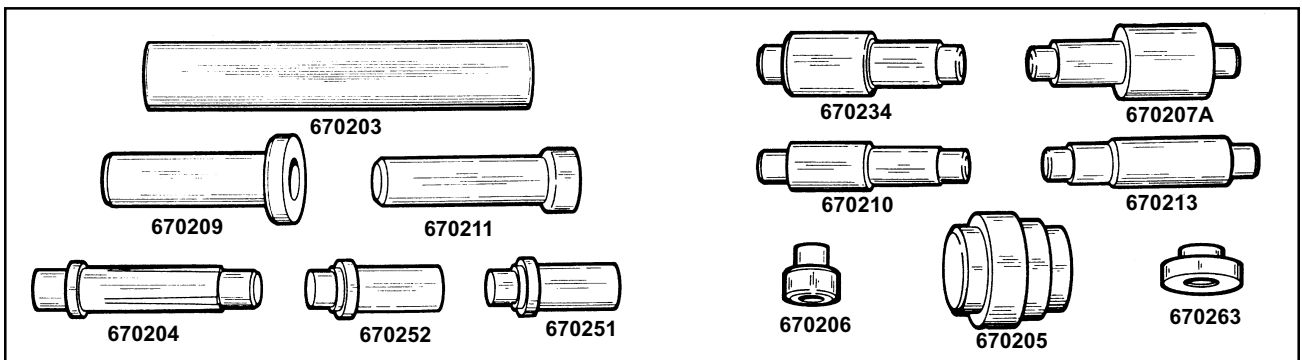
- Use the authorized tool listed below to install the new bearing. Needle bearings in shifter shafts should be installed .010" (.254 mm) below flush.



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.

- Use the proper tool as illustrated.
- 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.
- 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.	Description	Use with:
670203	Oil Seal Installer	Seal with 13/16" (20.64 mm) I.D.
670204	Bushing Driver and Installer	Bushing with 3/4" (19.05 mm) I.D.
670205	Bushing Driver and Installer	Busing with 1-1/2" (38.1 mm) I.D.
670206	Oil Seal Protector	Seal with 1/2" (12.7 mm) I.D.
670207A	Bearing Driver and Installer	Bearing with 5/8" (15.87 mm) I.D.
670209	Oil Seal Installer	Seal with 21/32" (16.7 mm) I.D.
670210	Bearing Driver and Installer	Bearing with 1/2" (12.7mm) I.D.
670211	Oil Seal Installer	Seal with 1/2" (12.7 mm) I.D.
670213	Bearing Driver and Installer	Bearing with 9/16" (14.29 mm) I.D.
670234	Bearing Driver and Installer	Bearing with 5/8" (15.87 mm) I.D.
670251	Bearing Installer	Input Bearing on 800 Series
670252	Bearing Driver	Bearing with 11/16" (17.46 mm) I.D. - 800 Series
670262A	Oil Seal Protector	All 3/4" (1.8 mm) Axle Shaft Seals
670263	Oil Seal Protector	Seal with 5/8" (15.87 mm) I.D.

CHAPTER 23. 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, we 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 (12.7 mm) 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 show 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.
3. **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. Insert a small pocket rule until you touch the bottom of the case. Remove it and check for 1/4 - 3/8 inches (6.5 - 9.5 mm) contact; this is full at its 8 oz. (236 ml) capacity.

4. **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) 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" (7.94 mm) 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.

5. **Hard to shift:** Typically, hard to shift symptoms are not caused by the hydrostatic unit. The shift arm should move with relative ease. Check the ease of movement of the shift arm with a torque wrench. For the following spec numbers, the reading should be 40-65 inch lbs (4.5-7.34 mm). measured at the end of the shaft (205-006, 016, 021, 022, 030, 033, 036, 040, 046). If the model has a neutral spring, the torque reading should be 70-150 inch lbs. (7.9-16.9 mm). All other models (without neutral return spring) should read 150 - 120 inch lbs. (13.5-16.9 mm) measured at the end of the shaft. 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.

