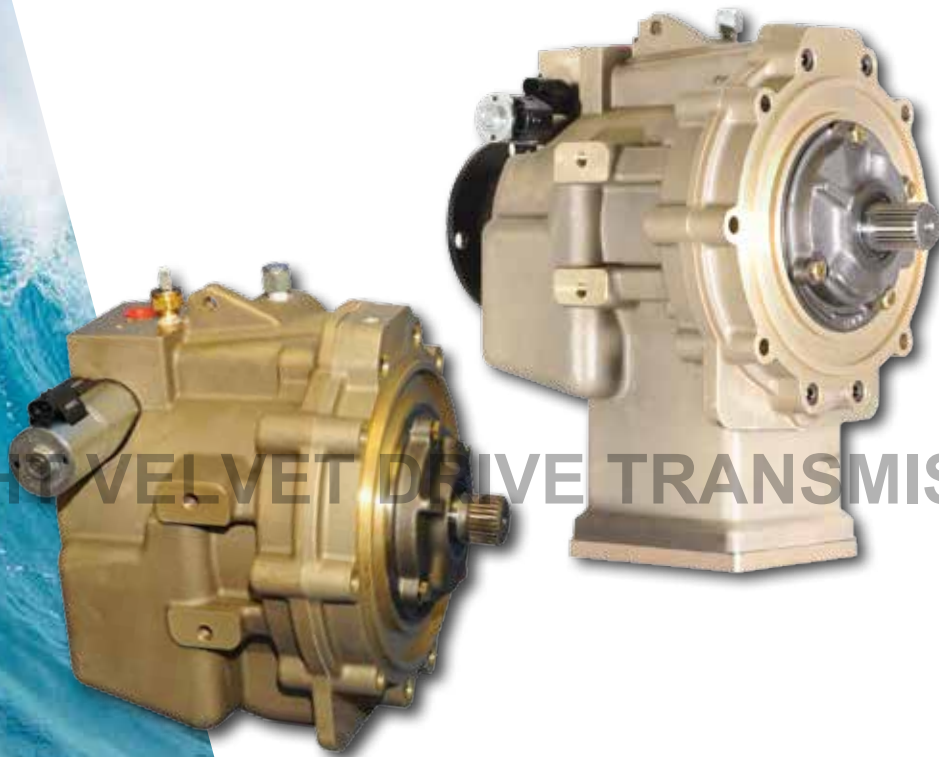




Marine Transmission
Service Manual
71L & 72L Series



A Regal Brand

REGAL

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Models Covered In This Manual

| Transmission Assembly Number | Family Group | Transmission Ratios | | Comments |
|------------------------------|--------------|---------------------|---------|--------------------------------------|
| | | Forward | Reverse | |
| 3007000M01 | 72L | 1:1 | 1.10:1 | MANUAL SHIFT |
| 3007000E01 | 72L | 1:1 | 1.10:1 | ELECTRIC SHIFT |
| 3008000M01 | 72LV | 1.50:1 | 1.65:1 | MANUAL SHIFT V-DRIVE (FRONT MOUNT) |
| 3008000M02 | 72LV | 1.25:1 | 1.37:1 | MANUAL SHIFT V-DRIVE (FRONT MOUNT) |
| 3008000M03 | 72LV | 2.00:1 | 2.20:1 | MANUAL SHIFT V-DRIVE (FRONT MOUNT) |
| 3008000MT1 | 72LVTS | 1.50:1 | 1.65:1 | MANUAL SHIFT V-DRIVE (THRU SHAFT) |
| 3008000MT2 | 72LVTS | 1.25:1 | 1.37:1 | MANUAL SHIFT V-DRIVE (THRU SHAFT) |
| 3008000MT3 | 72LVTS | 2.00:1 | 2.20:1 | MANUAL SHIFT V-DRIVE (THRU SHAFT) |
| 3008000E01 | 72LV | 1.50:1 | 1.65:1 | ELECTRIC SHIFT V-DRIVE (FRONT MOUNT) |
| 3008000E02 | 72LV | 1.25:1 | 1.37:1 | ELECTRIC SHIFT V-DRIVE (FRONT MOUNT) |
| 3008000E03 | 72LV | 2.00:1 | 2.20:1 | ELECTRIC SHIFT V-DRIVE (FRONT MOUNT) |
| 3008000ET1 | 72LVTS | 1.50:1 | 1.65:1 | ELECTRIC SHIFT V-DRIVE (THRU SHAFT) |
| 3008000ET2 | 72LVTS | 1.25:1 | 1.37:1 | ELECTRIC SHIFT V-DRIVE (THRU SHAFT) |
| 3008000ET3 | 72LVTS | 2.00:1 | 2.20:1 | ELECTRIC SHIFT V-DRIVE (THRU SHAFT) |
| 3009000M01 | 72LHP | 1:1 | 1.10:1 | MANUAL SHIFT |
| 3009000M06 | 72LHP | 1:1 | 1.10:1 | MANUAL SHIFT MERC 6 CLOSE COUPLE |
| 3009000E01 | 72LHP | 1:1 | 1.10:1 | ELECTRIC SHIFT |
| 3009000E06 | 72LHP | 1:1 | 1.10:1 | ELECTRIC SHIFT MERC 6 CLOSE COUPLE |
| 3010000M01 | 72LH | 1:1 | 1.10:1 | MANUAL SHIFT |
| 3010000M06 | 72LH | 1:1 | 1.10:1 | MANUAL SHIFT MERC 6 CLOSE COUPLE |
| 3010000E01 | 72LH | 1:1 | 1.10:1 | ELECTRIC SHIFT |
| 3010000E06 | 72LH | 1:1 | 1.10:1 | ELECTRIC SHIFT MERC 6 CLOSE COUPLE |
| 3011000M01 | 72LX | 1:1 | 1.10:1 | MANUAL SHIFT |
| 3011000M06 | 72LX | 1:1 | 1.10:1 | MANUAL SHIFT MERC 6 CLOSE COUPLE |
| 3011000E01 | 72LX | 1:1 | 1.10:1 | ELECTRIC SHIFT |
| 3011000E06 | 72LX | 1:1 | 1.10:1 | ELECTRIC SHIFT MERC 6 CLOSE COUPLE |
| 3018000M01 | 71LV | 1.5 | 1.5 | MANUAL SHIFT V-DRIVE (FRONT MOUNT) |
| 3018000M02 | 71LV | 1.25 | 1.25 | MANUAL SHIFT V-DRIVE (FRONT MOUNT) |
| 3018000MT1 | 71LVTS | 1.5 | 1.5 | MANUAL SHIFT V-DRIVE (THRU SHAFT) |
| 3018000MT2 | 71LVTS | 1.25 | 1.25 | MANUAL SHIFT V-DRIVE (THRU SHAFT) |
| 3018000E01 | 71LV | 1.5 | 1.5 | ELECTRIC SHIFT V-DRIVE (FRONT MOUNT) |
| 3018000E02 | 71LV | 1.25 | 1.25 | ELECTRIC SHIFT V-DRIVE (FRONT MOUNT) |
| 3018000ET1 | 71LVTS | 1.5 | 1.5 | ELECTRIC SHIFT V-DRIVE (THRU SHAFT) |
| 3018000ET2 | 71LVTS | 1.25 | 1.25 | ELECTRIC SHIFT V-DRIVE (THRU SHAFT) |
| 3019000M01 | 71LV | 1:1 | 1:1 | MANUAL SHIFT |
| 3019000E01 | 71LV | 1:1 | 1:1 | ELECTRIC SHIFT |

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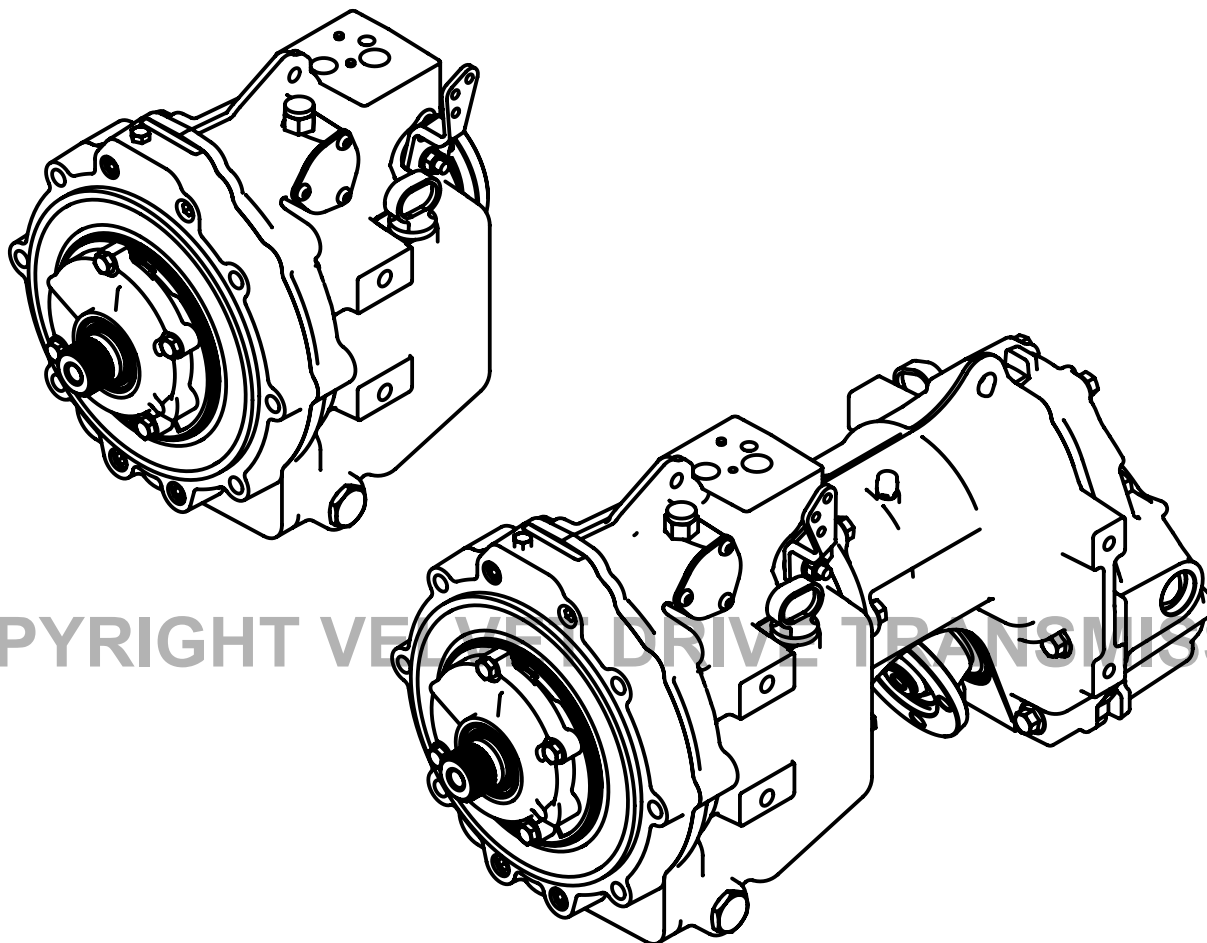
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SEGMENT A

71L & 72L / 71LV & 72LV



The following international symbols are used in this service manual.

⚠ WARNING This symbol warns of possible personal injury

⚠ CAUTION This symbol warns of possible damage to transmissions.

OEM Original Equipment Manufacturer (Boat/Engine Manufacturer)

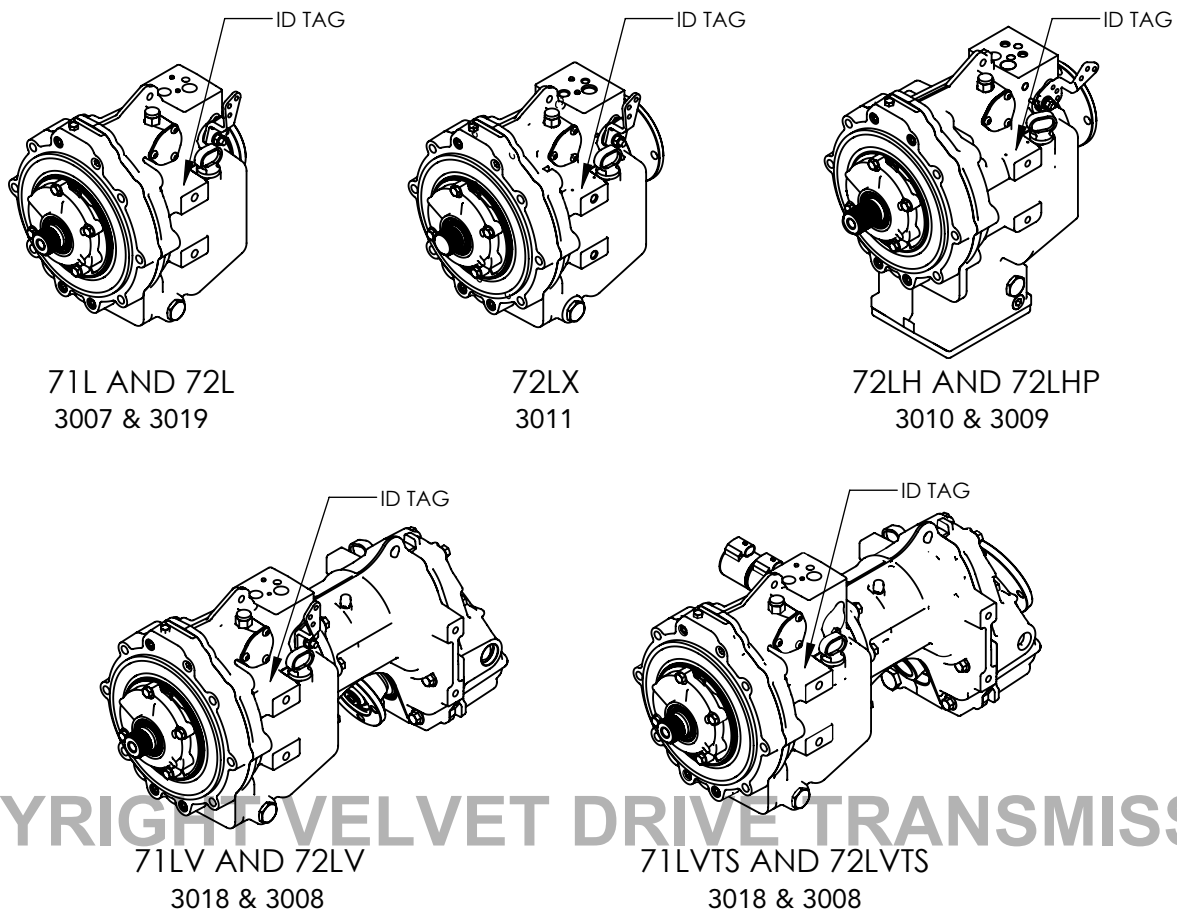


Figure 1. 71L & 72L Transmission Assembly

INTRODUCTION (see figure 1)

The 71L and 72L transmissions consist of a planetary gear set and multiple disc clutches. The input and output shafts are in line.

Hydraulic pressure is provided by a crescent type pump. The pump is driven at engine speed by the input shaft. Oil from the pump is sent to the control valve. The positions on the control valve are forward-neutral-

reverse. An internal regulator valve controls system pressure. Oil discharged by the regulator valve is sent to the oil cooler.

THEORY OF OPERATION

General: Forward is direct drive. A planetary gear set (1.1 to 1.0 ratio for 72L and 1.0 to 1.0 ratio for 71L) is used to obtain reverse.

Table 1. Technical Specifications

| Description | Model 71L | Model 72L | Model 71LV & 71LVTS | Model 72L & 72LVTS | Model 72LX | Model 72LH | Model 72LHP |
|-------------|---------------|---------------|---------------------|--------------------|---------------|---------------|---------------|
| Speeds | Fwd. and Rev. | Fwd. and Rev. | Fwd. and Rev. | Fwd. and Rev. | Fwd. and Rev. | Fwd. and Rev. | Fwd. and Rev. |
| Approx. Wt. | 67 | 71 | 113 | 117 | 71 | 85 | 87 |

The transmission oil pump is driven by the input shaft. It supplies oil pressure to operate the clutch packs, lubricate parts, and provide cooling.

A damper plate is bolted to the engine flywheel. The damper plate is splined to connect to the input shaft. The damper plate reduces torsional vibrations to the transmission from the engine (see figure 2).

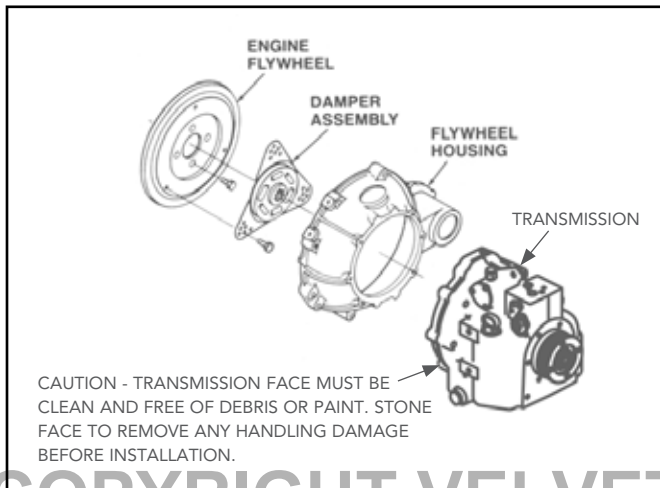


Figure 2. Typical Assembly

Forward: The forward clutch is applied hydraulically when the shift lever is placed in the forward position. This connects the input shaft to the output shaft. The unit then transmits power at a 1 to 1 speed ratio in the same direction of rotation as the engine (see figure 3).

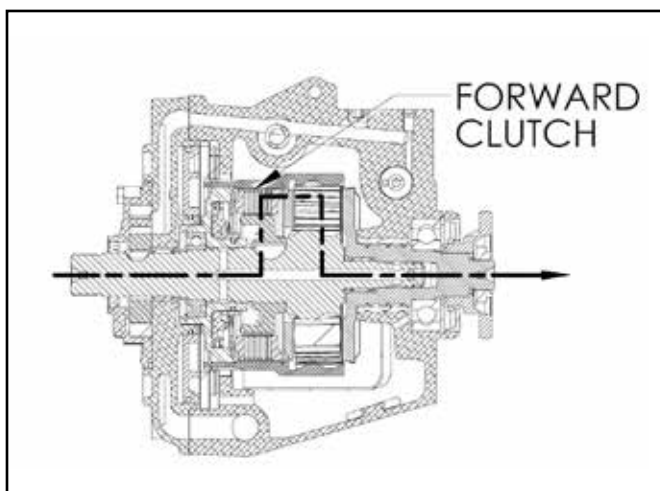


Figure 3. Forward Power Flow

Reverse: The reverse clutch is applied hydraulically when the shift level is placed in the reverse position (see figure 4). The applied clutch holds the ring gear. The input shaft and sun gear, driven by the engine, drive pinions, which drive the carrier output shaft. The output shaft turns opposite to engine rotation at a 1.1 to 1 speed reduction ratio for model 72L and 1 to 1 speed ratio for model 71L.

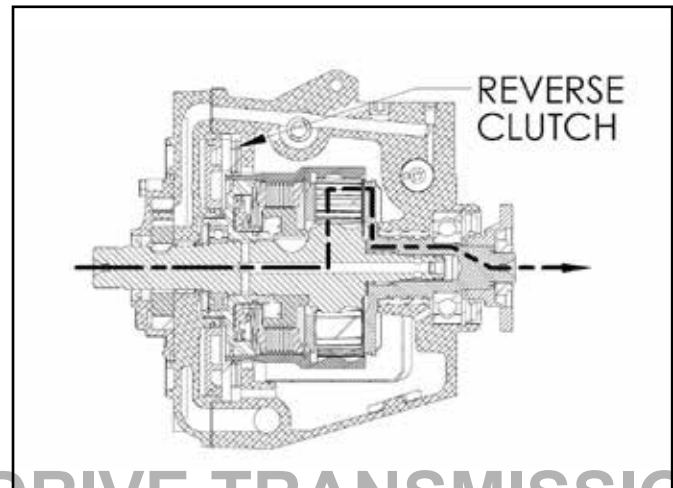


Figure 4. Reverse Power Flow

Hydraulic Circuit: Oil from the sump enters the pump suction passage and is directed to the pump (see figure 5). The pump supplies oil under pressure through passages to the control and regulator valves.

Oil pressure on the end of the regulator valve moves the valve, compressing the spring. This movement allows oil to flow to the cooler.

Selector Valve: The selector valve shifts the transmission from neutral to forward or reverse. When selector valve is placed in the forward position, oil is directed to the forward clutch. When the selector valve is placed in reverse position, oil is fed to the reverse clutch. When one clutch is engaged the other is exhausted by a slot in the selector valve. Electric shift versions forward and reverse are controlled by an electric solenoid.

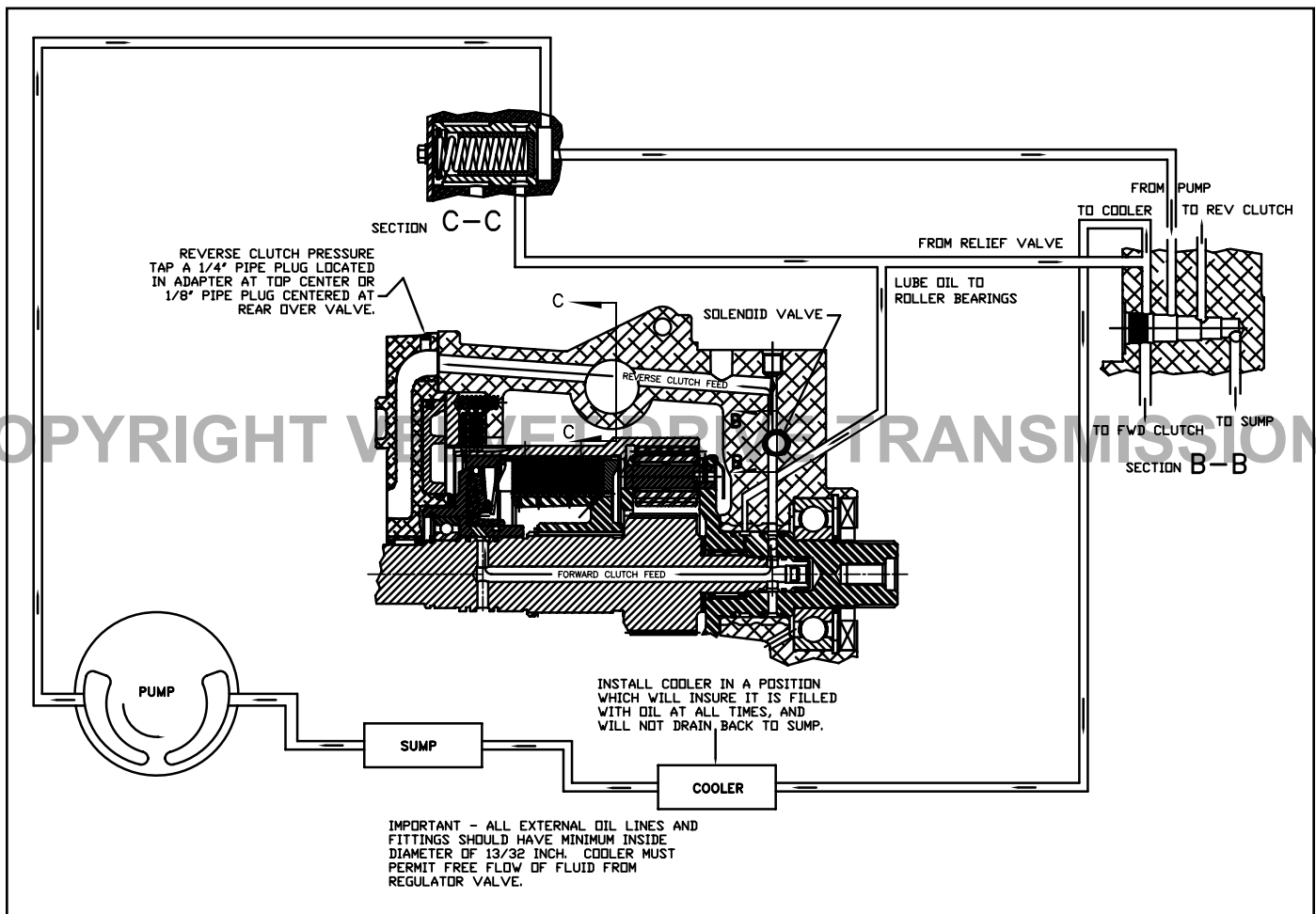


Figure 5. Hydraulic Circuit Schematic
Model 71L & 72L (Electric Shift Shown)





GENERAL

The transmission, cooler, cooler lines, and control linkage should be inspected at regular intervals. Regular inspections will ensure proper operation and help detect minor problems that can be corrected before they cause a transmission failure.

SCHEDULED INSPECTIONS (see table 2)

The following recommended inspection intervals are based on normal operating conditions. Intervals should be adjusted for extremes of temperature or other adverse operating conditions.

Table 2. Scheduled Inspections

| Inspection Task | Inspection Interval | | |
|--|---------------------|--|--|
| | Weekly | Periodic (1 month or 100 hours, whichever comes first) | Safety (annual or 1000 hours, whichever comes first) |
| GENERAL  WARNING: Failure to perform these inspections at required intervals can result in injury to personnel. Inspect control linkage and shift lever for operation. There should be no sticking, binding, or looseness. | | X | X |
| OIL COOLER AND LINKS  CAUTION: Failure to perform these inspections at required intervals can result in transmission failure. Inspect cooler for signs of leakage, damage, or loose mounting bolts. Inspect all connection points for signs of leakage. | | X X | X X |
| TRANSMISSION Inspect for damage or signs of leakage around housing and/or bolts.  CAUTION: If oil is discolored or has been overheated (above 190°F) it must be replaced. Remove dipstick. Check oil for signs of water or other contaminants. Check (smell) oil for signs of burnt oil (overheating). If found, replace fluid. See Maintenance.  CAUTION: Check mounting bolts for tightness. If loose, tighten to torque specified in OEM manual. | X | X | X |

GENERAL

Maintenance to the transmission will normally consist of the following items.

- Checking oil level or changing oil. Regular scheduled oil changes are an important part of the transmission.



WARNING: Manual Shift Only. Shift linkage must be adjusted for proper operation of transmission.

When properly adjusted detent ball must be seated into shift handle holes.

- Checking pressure in each circuit (if a problem is detected).



CAUTION: Transmission mounting bolts should be checked and tightened to torque specified in OEM manual. Do not overtighten! Damage to the transmission can result.

LUBRICATION

Due to the various installation angles and oil cooler set-ups, it may be necessary to adjust your oil level.



WARNING: Do not remove dipstick with engine running. Hot oil can cause burns.



CAUTION: Clean around the area of the dipstick before removing. Small particles of dirt can cause damage to internal components and cause valves to stick.

Check Oil Level

The transmission should be at operating temperature (180° max.) to get an accurate oil level reading. Oil will expand when it is heated. Oil will drain back from the cooler. Expansion and drainback can significantly affect oil level.

Warm Oil Level Check

When the transmission is at operating temperature, place selector lever in neutral. Shut off engine. Carefully remove transmission dipstick. Immediately insert clean dipstick (Do not screw into housing to check level) and read oil level.

NOTE: Oil level must be checked immediately after engine shut-down to prevent an incorrect reading. Oil drains back into transmission from the cooler and cooler lines.

Add or remove oil if necessary. Repeat the above checking procedure as required until oil is at the dipstick mark.

Cold Oil Level Check

For ease of checking the oil prior to engine start-up, a cold oil level mark can be made. To find the cold oil level mark, the oil level must first be set according to the warm oil level checking procedure. Then, let the boat sit overnight. Insert clean dipstick and read oil level.

Put a mark on the dipstick at the cold oil level reading.

You can use the new mark to check the oil level when cold. If oil level adjustment is needed, add oil to the new mark.

Approved Transmission Fluid

General Motors Dexron III fluids are recommended, but any of the following automatic transmission fluids are suitable for use in the 71L-72L transmissions. Approved Specifications are:

1. General Motors Dexron III or Dexron VI
2. Ford Mercon

Do not mix different brands or types of transmission fluid.



CAUTION: If the transmission oil temperature has exceeded 190° F or the alarm sounds, the oil must be changed in the transmission and cooler system.

Changing Oil

Oil in transmission, cooler, and cooler lines should be changed every 500 hours of operation or annually.



CAUTION: Severe service conditions or high operating temperatures may require more frequent changes.

- Place selector lever in neutral. Run engine for five minutes at 1500 RPM. Shut down engine.



CAUTION: Clean around the area of drain plug before removing. Small particles of dirt can cause damage to internal components and cause valves to stick.

- Drain oil from transmission, cooler and cooler lines into suitable container.

- Check oil for signs of metal or rubber particles



CAUTION: A few small metal particles are normal. However, if large metal chips or a large number of particles are found, this could be an early sign of transmission failure. The transmission should be disassembled and inspected for internal damage.

NOTE: Particles of rubber can indicate cooler line wear. Each line should be inspected for cracks or fraying and should be replaced if damaged.

- Fill transmission with new oil.

NOTE: The amount of oil required will vary based on length of cooler lines. Use an amount equal to about three-fourths of the quantity removed.

- Screw in and tighten dipstick. Run engine for two minutes to fill cooler and cooler lines with oil. Set oil level according to procedure at start of section 3, Page 9, Lubrication.

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GENERAL

Before troubleshooting the transmission, do the following.

- Check oil level and condition of oil. See maintenance section for details.
- Check transmission, oil cooler and oil cooler lines for physical damage or leakage. Correct any problem.
- Check that engine, damper plate, or drive train alignment are not causing the problem.

Refer to shaft alignment section on Page 78 of this manual.

Perform all pressure checks at normal operating temperature. Refer to specification section for details. Pressure gauges used should have a range of 0-300 psi. They must be accurate.

GUIDELINES

When troubleshooting, shift into each selector position to determine when noise or problem occurs. Determine which parts are moving. This will help pinpoint the cause. Use the following information as a guide to common problems.

Damper Plate. Some transmission problems are damper plate related. Check and/or replace damper plate when the following problem occurs.

- Transmission “knocks” at idle or low RPM, then stops at 1,000 RPM or higher.

If the damper plate springs are too soft, the sides of the windows will wear. If the springs are too hard, the splines will wear. Consult engine OEM for correct damper plate recommended.

Clutches. Check and/or replace clutches if the following problem occurs.

- Excessive engine RPM (over the rated RPM). This can indicate a slipping clutch. The slipping clutch will usually squeal.



WARNING: Do not operate transmission if the following condition is suspected. Failure to comply can result in personal injury because transmission cannot be disengaged.

The slipping clutch will normally overheat. This can result in warped plates. In severe overheating, plates can weld together. This will cause a tie up condition in transmission when the other clutch is applied.

| Problem | Cause | Correction |
|--|--|--|
| LEAKS | | |
| 1. At pump or output shaft seal | Faulty seal | Replace |
| | Misalignment | Correct |
| | Rough shaft | Replace |
| 2. Between seal and bore | Rough housing bore | Replace seal |
| 3. At gasket(s) | Loose bolts | Torque bolts properly |
| | Defective gaskets | Replace gaskets |
| | Face(s) not flat | Replace defective parts |
| 4. Loss of oil with no trace of missing oil | Oil leaking from cooler or cooler lines | Replace cooler, or cooler lines that are defective |
| 5. Oil out of breather | Oil has been overheated (lost anti-foam additive) | Replace oil |
| | High or low oil level | Correct oil level |
| | Water in oil | Change oil |
| MALFUNCTION IN BOTH FORWARD AND REVERSE | | |
| 1. At pump or output shaft seal | Regulator valve jammed | Clean and polish |
| | Internal leakage | Replace defective sealing rings |
| | Low oil level Pump defective | Add oil Replace pump |
| 2. No oil pressure | Regulator valve jammed | Clean and polish |
| | Internal leakage | Replace defective parts |
| | Pump defective | Replace pump |
| | No oil | Add oil |
| | Pump incorrectly indexed | Rotate pump to correct position |
| 3. High oil temperature | Regulator valve jammed | Clean and polish |
| | Cooler line defective | Replace cooler line |
| | Oil cooler too small | Install larger cooler |
| | Restrictions in cooler lines or cooler | Back flush to remove restrictions |
| | Defective cooler | Replace cooler |
| | Defective temperature sensor | Replace sensor |
| 4. No power, noise | Broken gear teeth – gears not meshed | Replace defective parts |
| 5. No line pressure | Heavy weight oil (90 weight) | Remove and use proper weight oil |
| | Pump incorrectly indexed | Rotate pump to correct position |
| | Oil inlet shield or screen blocked | Inspect and clean |
| 6. Noisy in forward and reverse | Misalignment of damper plate with engine, or misalignment of output shaft components | Align drive train components |
| | Damaged gears | Replace damaged gears |

| Problem | Cause | Correction |
|--|--|---|
| MALFUNCTION IN FORWARD OR REVERSE | | |
| 1. Clutch drags or does not release | Warped clutch plate | Replace defective parts |
| | Mechanical failure | Replace defective parts |
| | Tight pack clearance | Increase clearance to specification |
| 2. Clutch does not apply | Low pressure | See low oil pressure |
| | Defective parts | Replace defective parts |
| 3. Harsh engagement | High pressure - valve sticking | Clean and polish regulator valve |
| | Engine idle too fast | Adjust engine idle |
| | Linkage binding or misadjusted | Repair as required and adjust to OEM spec. |
| 4. Soft engagement | Low pressure | See low oil pressure |
| 5. Won't move or sluggish | Forward clutch seized | Replace defective parts |
| | Worn or broken sealing rings | Replace defective parts |
| MISCELLANEOUS PROBLEMS | | |
| 1. Hydraulic noise or buzz | Low oil level or air in hydraulic circuit | Check oil level and fill if low. Operate engine in neutral at 1200 RPM to remove air. |
| | Regulator valve sticking | Clean and polish |
| 2. Gear noise in forward | Broken, pitted or cracked gear teeth | Replace defective parts |
| 3. Gear noise in reverse | Broken, pitted or cracked gear teeth | Replace defective parts |
| MALFUNCTION IN NEUTRAL | | |
| 1. Drives in forward direction | Broken sealing rings or bushings | Replace defective parts |
| | Warped forward clutch plates or mechanical failure of clutch | Replace defective parts |
| | Exhaust blocked in control valve | Clean control valve |
| 2. Drives in reverse direction | Warped reverse clutch plates or mechanical failure of clutch | Replace defective parts |
| | Exhaust blocked in control valve | Clean control valve |
| 3. Noisy in neutral only | Low oil pressure. Pump gears worn | Replace pump assembly |
| | Oil level low | Add oil |
| 4. Transmission overheating | Oil level low. Cooler too small or restricted lines | Add oil. All external oil lines should have minimum inside dia. of 13/32". Cooler must permit free flow of oil. |
| | Pump pressure low – worn or damaged pump | Check pressures. If low, inspect pump. If worn or damaged, replace. |
| | Clutches slipping | Check sealing rings. Replace if damaged. |
| | Internal leakage bypassing cooler | Locate and fix leak |
| | Temperature sensor defective | Replace sensor |
| | Incorrect type of oil | Drain, flush and replace with correct type of oil |
| | Regulator valve sticking | Clean and polish |

GENERAL

Before removal and disassembly, review the following procedures. Use the proper hand tools, slings, or hoists for the job.

⚠ WARNING **WARNING:** Keep work area, tools, and transmission clean. Wipe up any spilled transmission fluid to prevent accidents. As required, wear safety glasses, safety shoes and a hard hat to prevent personal injury.

DISASSEMBLY

NOTE: Read OEM vehicle manual for specific removal instructions.

Before starting disassembly, review the exploded view shown in Figure 8. The transmission can be disassembled following the index numbers shown in Figure 8.

Seals. Remove O-rings, sealing rings and oil seals carefully to prevent damage if they must be reused. It is best to replace these items.

Bearings. Do not remove bearings unless replacement is required, or cleaning can not be done properly.

- Keep matched parts or sets together. Do not reverse or mix them.

CLEANING

⚠ WARNING **WARNING:** Cleaning solvents can be toxic, flammable, an irritant to the skin, or give off harmful fumes. Avoid prolonged contact, inhalation of vapors, or smoking. Failure to comply can result in injury or death to persons.

- Rinse all metal parts in solvent to remove dirt, grease and transmission fluid.
- Take special care to remove solvent from all parts.
- Air dry clutch plates.
- If O-rings are to be reused, air dry them.

INSPECTION

Case. Inspect for cracks. Check sealing surfaces for nicks, scratches, or burrs that can cause leaks. Inspect output shaft bore for signs of wear on one side. This can indicate misalignment of prop shaft.

Gears. Inspect for unusual wear patterns, chipped, cracked, or broken teeth.

Bearings. Inspect for chips, cracks, galling, or missing bearings. Check for signs of overheating.

Threaded Parts. Inspect for stripped, damaged threads, or burrs.

Springs. Inspect for distortion, cracks or other damage. Check springs against dimensions in specification section.

REPAIR

- Remove scratches, burrs or minor surface defects with very fine emery cloth.
- Threaded holes can be retapped using the same size tap. Do not make the hole oversize.
- Repair or replace all damaged parts.

Assembly

⚠ CAUTION **CAUTION:** Threaded plugs, screws, bolts and coupling nuts must be tightened to the torques shown in Table 4 to prevent premature failure of transmission.

- A new coupling nut must be used as assembly
- Prior to assembly, dip or coat internal parts with transmission fluid. Let excess fluid drain off.
- Use a light coat of vasoline to position or hold a gasket, O-ring or small part for assembly. Apply to sealing rings before assembly.

- Inspect assemblies pressed together for proper fit and position.
- Check that each snap ring is fully engaged in groove.
- Threaded plugs, screws and bolts should be tightened to the torques shown in Table 4.

NOTE: The following procedures are correct for most transmissions. Minor differences may be found on some models.

- Assemble the transmission using the following procedures. If a reduction unit is mounted to the transmission, refer to the correct section at the back of this manual for assembly procedures.

STEP 1. If removed, install the following parts in case. Tighten threaded parts to torque shown in Table 4.

Press bearing into back of case.

Apply loctite #565, or equivalent, to threads of pipe plugs and thread into side of case.

STEP 2. Install screen in case with slot facing bottom of case.

Thread bushing into side of case and tighten to torque shown in Table 4.

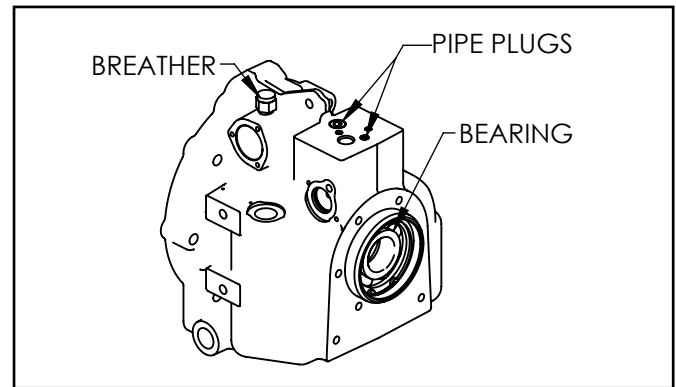
STEP 3. Install baffle in case. Place thrustwasher if used on face of housing bore. Notch in thrustwasher must align with notch in case.



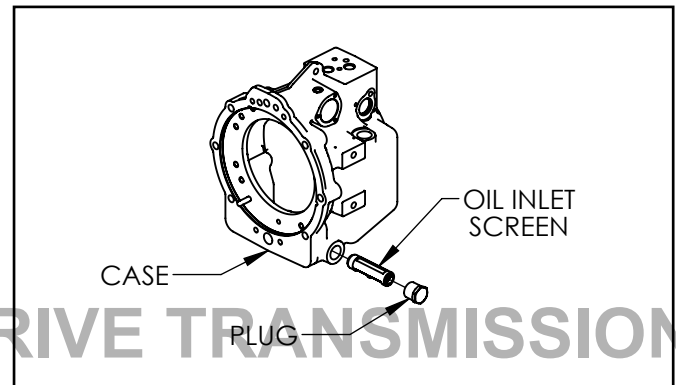
CAUTION: Thrustwasher is used on some models. Close couple options only. (See Model Chart 71L and 72L Transmissions.)

STEP 4. Lubricate all sealing rings with vasoline.

If removed, press bearings into pinion carrier. Contact Velvet Drive for proper depth of bearings.



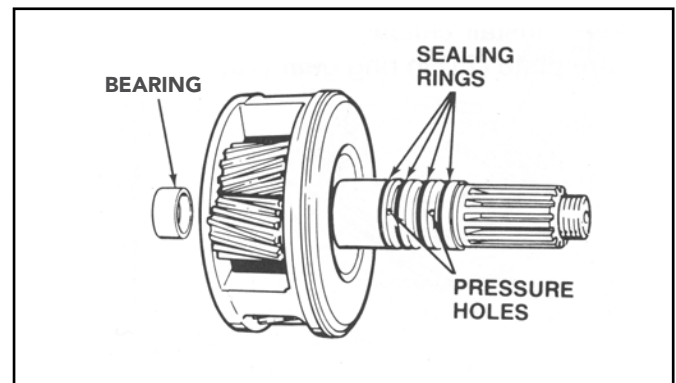
Case Assembly 1



Case Assembly 2

Install sealing rings in grooves of pinion carrier. Compress each sealing ring until it locks in place.

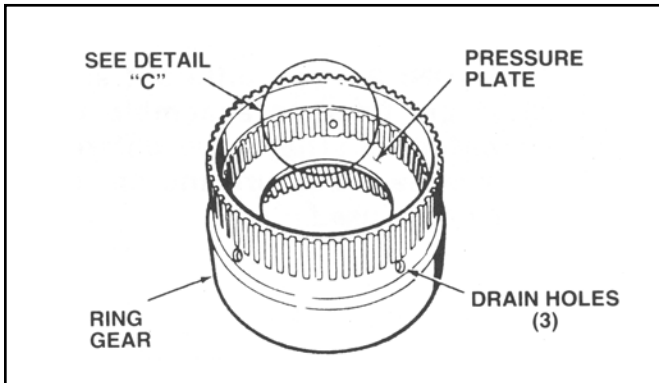
Install pinion carrier in case.



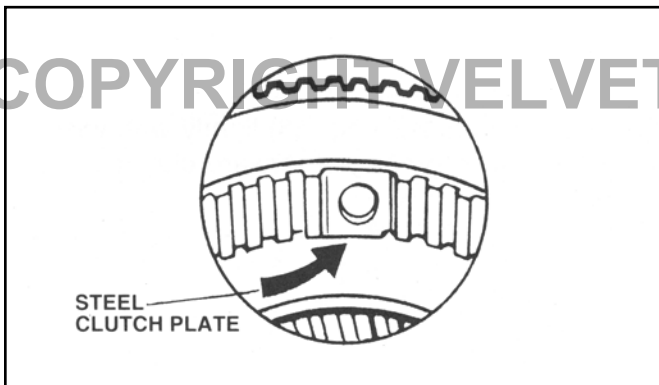
Pinion Carrier Assembly

STEP 5. Starting with a friction clutch plate, alternately stack friction clutch plates and steel clutch plates.

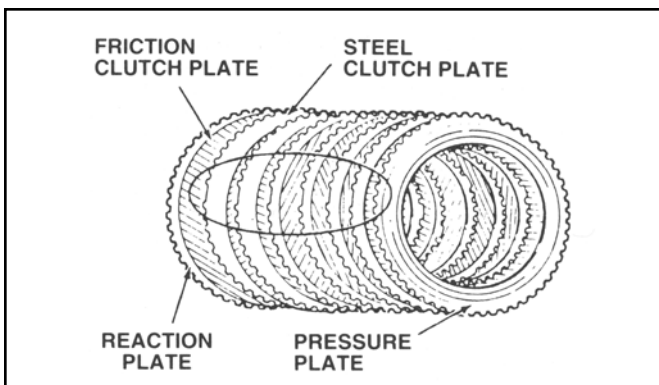
Friction clutch plates are designed with 3 missing teeth 120° apart. When installed in a ring gear, they should be installed with the missing teeth aligned with the 3 large drain holes as shown in detail "C".



Forward Clutch Pack Arrangement: Figure A

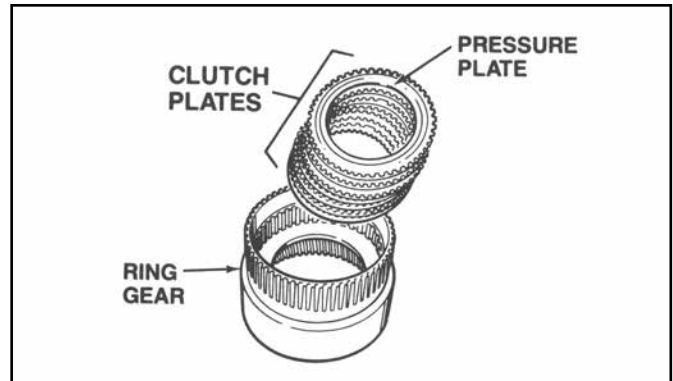


Detail C



Forward Clutch Pack Arrangement: Figure B

STEP 6. Install clutch plates and pressure plate in ring gear.

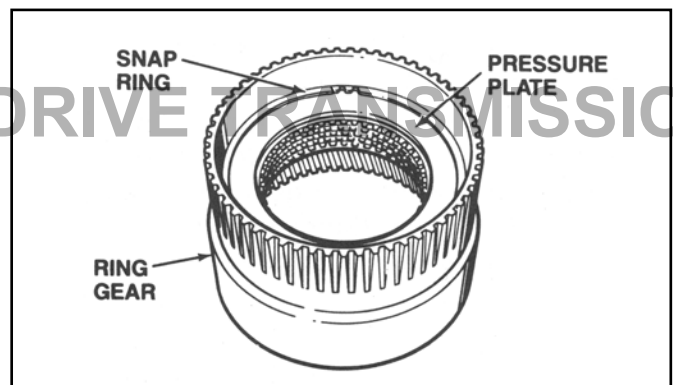


Forward Clutch Pack Assembly

STEP 7. Install spacer ring 4755 in ring gear.

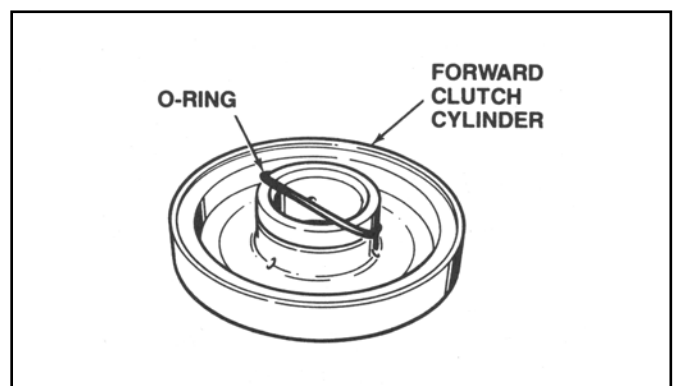


CAUTION: Several different snap rings are used to assemble the clutch group. They have different thickness. Be sure the correct snap ring is used.



Snap Ring Installation

STEP 8. Lubricate O-ring lightly with vasoline and install in groove of forward clutch cylinder.



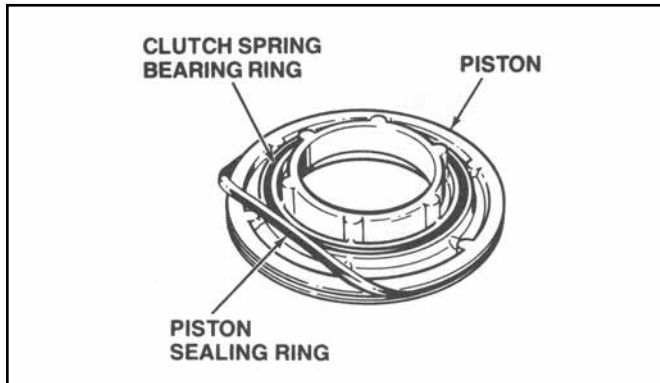
O-Ring Installation

STEP 9. Lubricate clutch spring bearing ring and piston sealing ring with vasoline.

Install clutch spring bearing ring in groove of piston.

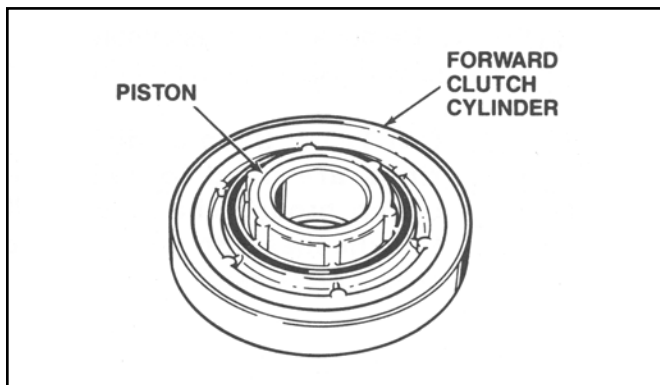
Install piston sealing ring in outer groove of piston.

NOTE: Check that piston sealing ring is not twisted, cut or deformed. Replace if damaged.



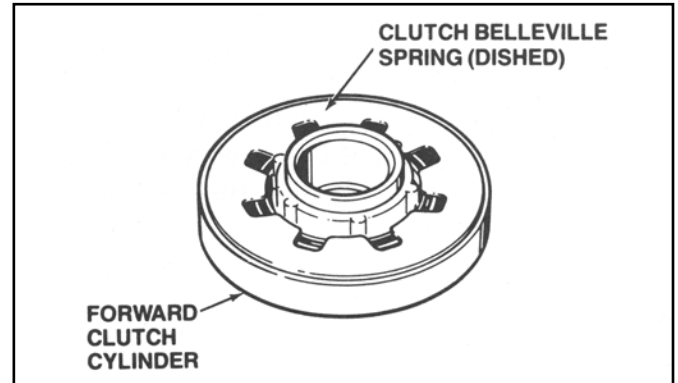
Clutch Ring Installation

STEP 10. Install piston in forward clutch cylinder. Be careful not to damage sealing ring during assembly.



Piston Installation

STEP 11. Place clutch Belleville (dish) spring inside rim of forward clutch cylinder. Spring is dished. The inside of the spring should be lower than the outside.

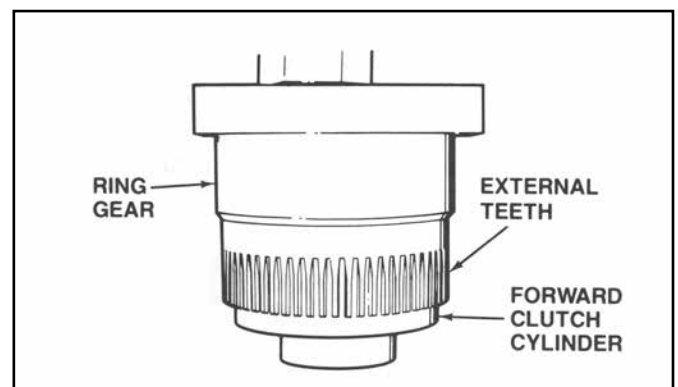


Clutch Spring Assembly

STEP 12. Install ring gear over forward clutch cylinder, with piston and spring facing up. Press ring gear down over forward clutch cylinder.



CAUTION: Check to see that clutch spring bearing ring is still seated in the groove of clutch piston.

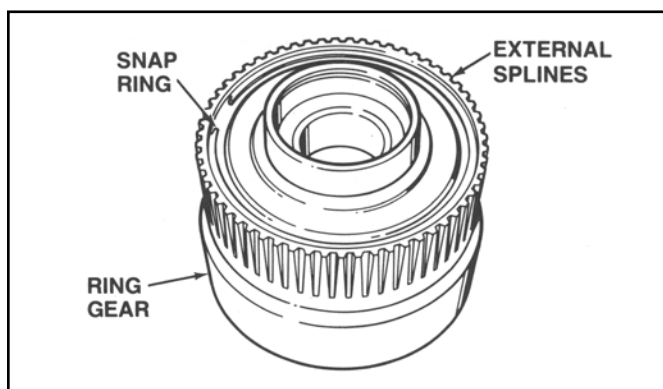


Forward Clutch Cylinder Installation

STEP 13. Remove clutch assembly from press. Install snap ring in groove of ring gear. (Snap ring 4822)

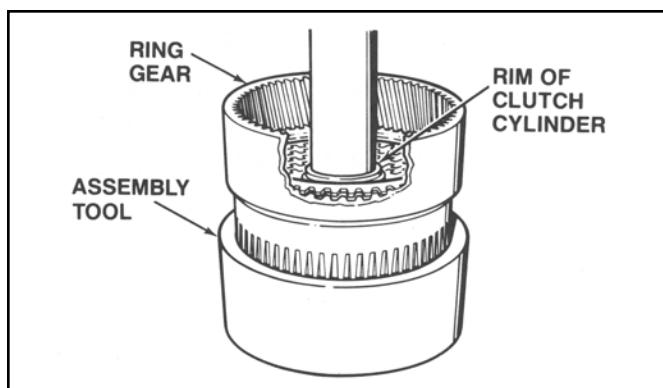


CAUTION: Several different snap rings are used to assemble the clutch group. They have different thickness. Be sure the correct snap ring is used.



Snap Ring Installation

STEP 14. Place ring gear in press with external splines facing down. Assembly tool should support the ring gear only. The forward clutch cylinder should not be touching the assembly tool. Press forward clutch cylinder against snap ring. Remove clutch assembly from press.



Compressing Clutch Pack

STEP 15. The following instructions are for the 71L and 72L models.

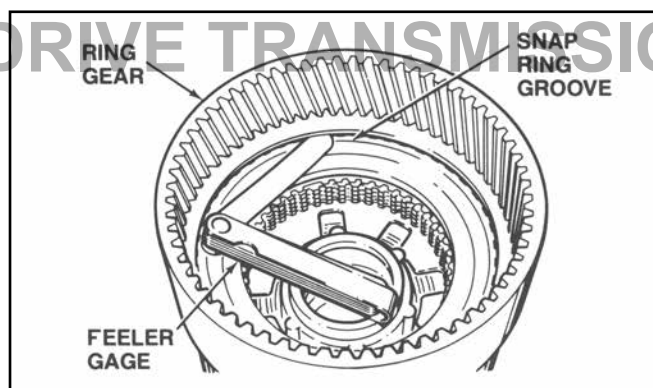
Push down, by hand, on clutch plates. Measure snap ring gap. Select proper thickness snap ring or combination of snap rings to set clutch pack clearance. Refer

to clutch end play chart. More than one snap ring may be required.

Clutch End Play Chart

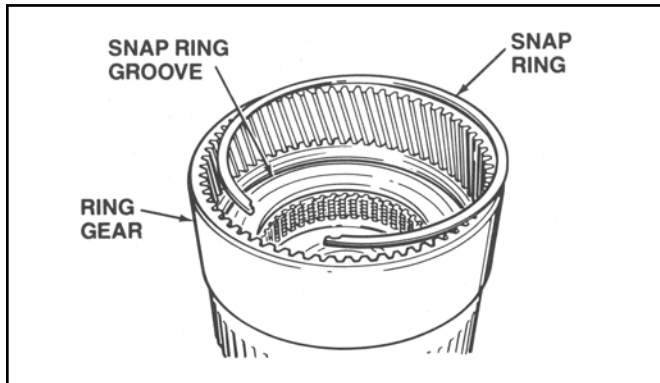
| Model | Assembly Number | Clutch End Play |
|-----------------|-----------------|-----------------|
| 71L (all) | 3018 and 3019 | .018/.053 |
| 72L, 72LV (all) | 3007 and 3008 | .035/.055 |
| 72LX | 3011 | .035/.050 |

| Part Number | Snap Ring Thickness | |
|---------------|---------------------|-------------|
| | in. | mm |
| 10-00-139-048 | .033 - .037 | .84 - .094 |
| 10-00-139-049 | .050 - .054 | 1.27 - 1.37 |
| 4768 | .050 - .054 | 1.3 - 1.4 |
| 10-00-139-018 | .062 - .066 | 1.6 - 1.7 |
| 4768A | .074 - .078 | 1.9 - 2.0 |
| 4768B | .096 - .100 | 2.4 - 2.5 |



Snap Ring Selection

STEP 16. Install selected snap ring(s) in groove of ring gear. If selected snap ring does not result in proper end play, repeat this step. See Chart on Page 18.

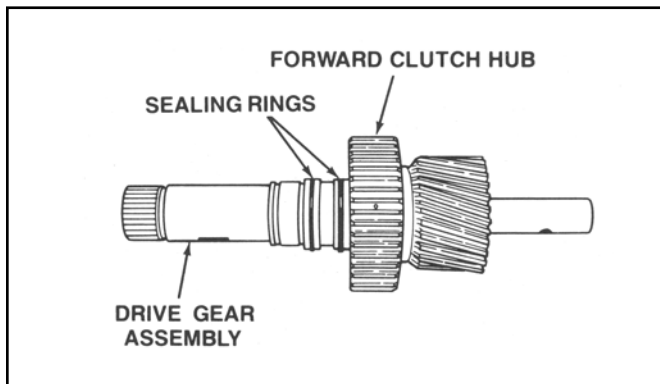


Snap Ring Assembly

STEP 17. If removed, install woodruff key in drive gear assembly. Slide forward clutch hub on drive gear assembly and align with woodruff key. Press forward clutch hub on drive gear assembly and against shoulder. NOTE: 3009, 3010 and 3011 models have a splined hub.

Install snap ring in groove of drive gear assembly.

Lubricate sealing rings with vasoline and install in grooves of drive gear assembly.

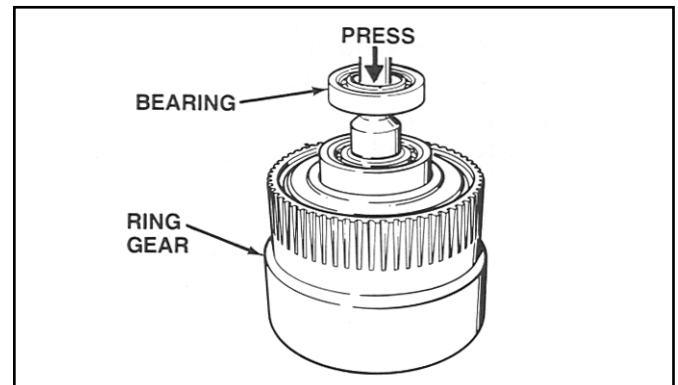


Sealing Ring Installation

Compress each sealing ring until it locks in place.

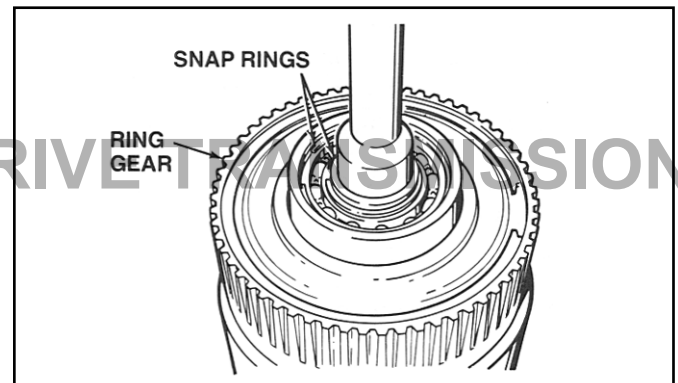
STEP 18. Install drive gear assembly in clutch assembly. Slide bearing down drive gear assembly.

Place complete assembly in press. Press bearing into drive gear assembly until seated against shoulder.



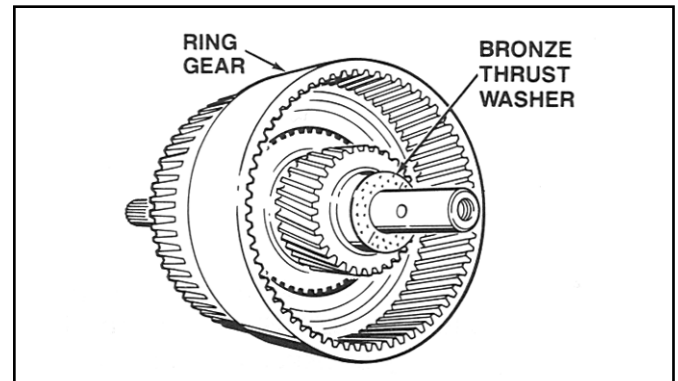
Bearing Installation

STEP 19. Install snap rings in grooves of drive gear assembly and forward clutch cylinder.



Snap Ring Installation

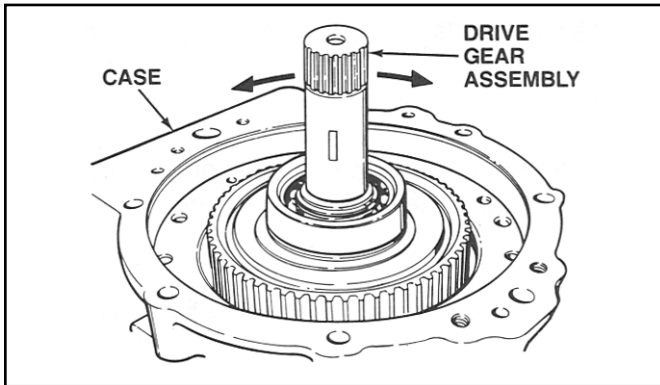
STEP 20. Apply vasoline to bronze thrustwasher. Install over end of shaft and against face of gear.



Thrustwasher Assembly

STEP 21. Install clutch and drive gear assembly in case.

Rotate clutch and drive gear assembly back and forth to engage ring gear teeth with pinion gear teeth.



Clutch and Drive Gear Installation

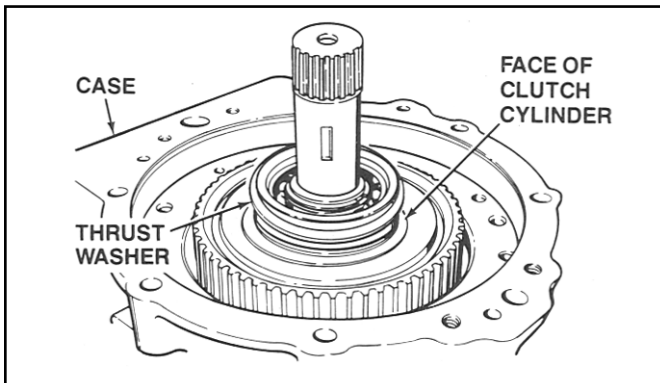
STEP 22. If original case and clutch cylinder are used, install thrustwasher on face of clutch cylinder.

On all model transmissions select new thrustwasher as follows:

Position case vertically as shown. Measure from face of case, without gasket, to face of clutch cylinder.

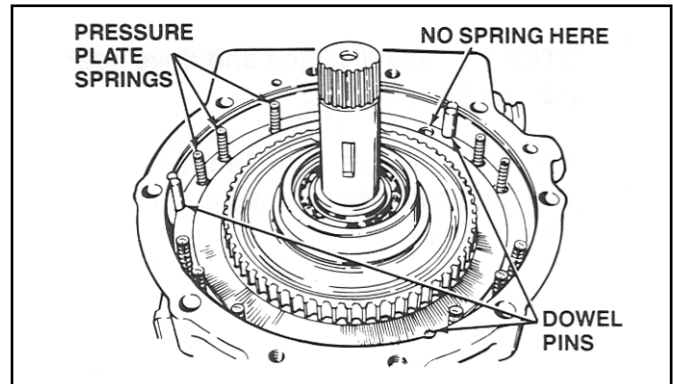
When dimension is 0.424 inch (10.77mm) or less, use 71-15B thrustwasher.

When dimension is greater than 0.424 inch (10.77mm), use 1016-193-001 thrustwasher.



Thrustwasher Installation

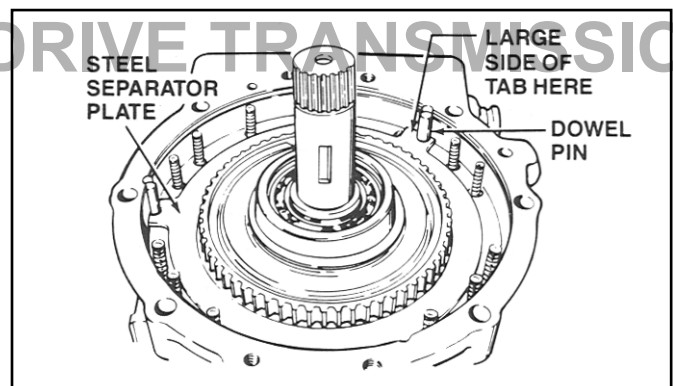
STEP 23. Install three dowel pins and eleven pressure plate springs in case.



Spring and Dowel Pin Installation

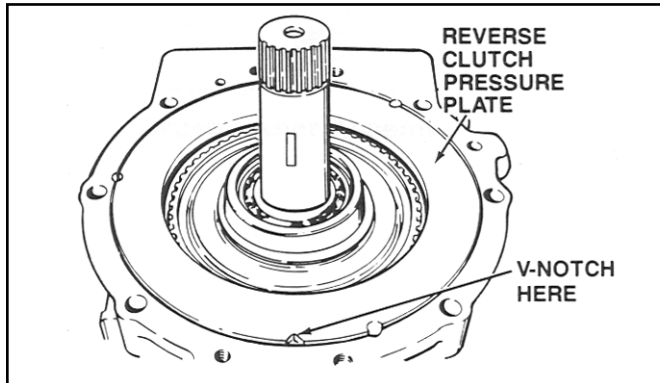
STEP 24. Install one steel separator plate in case with large part of tab to left of dowel pin.

Alternately stack remaining reverse clutch friction plates and steel separator plates in case (see page 34).



Reverse Clutch Pack Installation

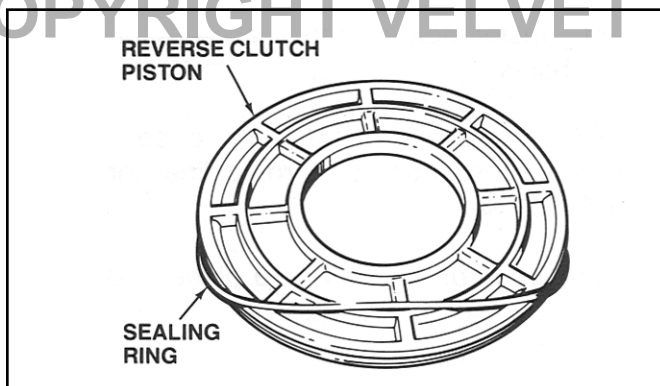
STEP 25. Install reverse clutch pressure plate in case with three half moons aligned with dowel pins. Be sure all springs are seated in their holes.



Pressure Plate Installation

STEP 26. Lubricate sealing ring with vasoline and install in groove of reverse clutch piston.

NOTE: be sure sealing ring is not twisted, cut or distorted. Replace if damaged.



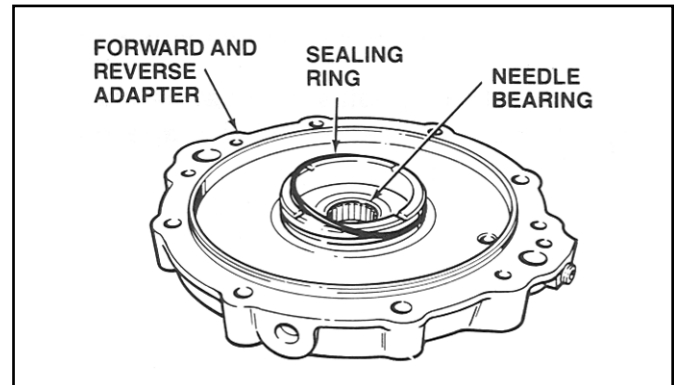
Sealing Ring Assembly

STEP 27. If removed, press needle bearing into adapter. Needle bearing must be installed against bore shoulder.

Lubricate O-ring with vasoline and install in groove of adapter.

NOTE: Be sure O-ring is not twisted, cut or distorted. Replace if damaged.

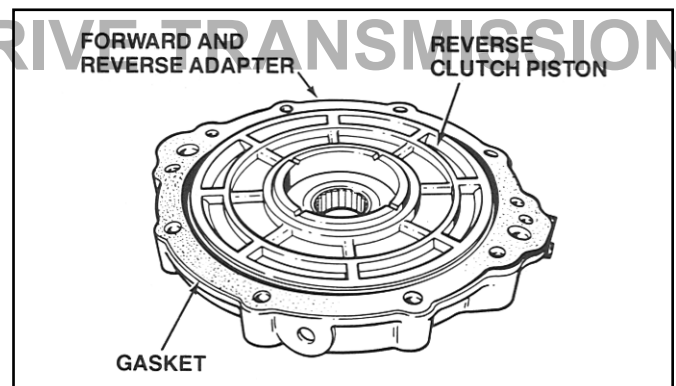
If removed, install dryseal plug in adapter.



Sealing Ring Installation

STEP 28. Install reverse clutch piston in adapter.

Lightly coat gasket with vasoline and place on adapter.



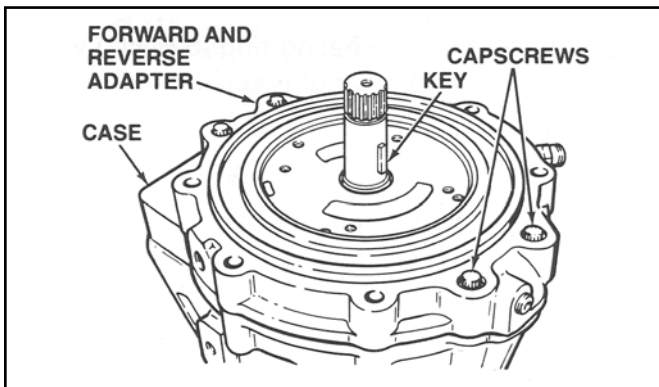
Reverse Clutch Piston Assembly

STEP 29. Install adapter on case and align bolt holes.

Thread four capscrews into case. Tighten in a criss-cross pattern to final torque specified in Table 4.

Lightly tap woodruff key into place in drive gear with a soft-faced mallet.

NOTE: Model 3009 uses a round dowel pin in place of a key.

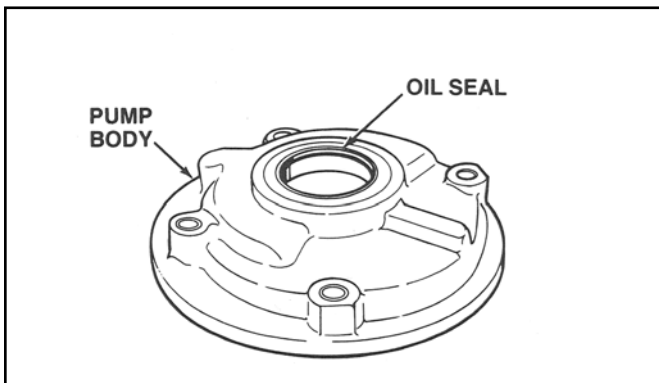


Adapter Installation

STEP 30. Press oil seal into pump body against bore shoulder.



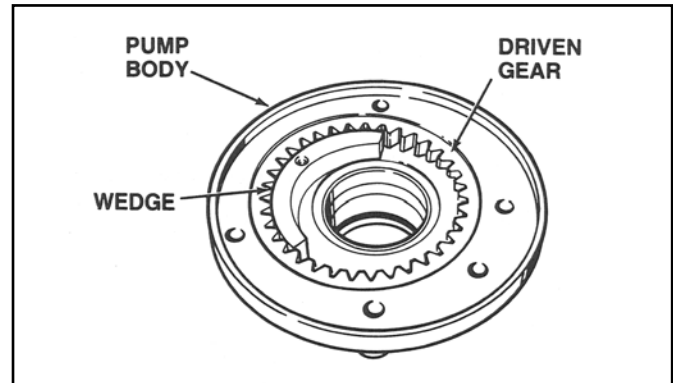
CAUTION: Oil Seal must be installed dry. Lubricants can damage rubber coating.



Oil Seal Installation

STEP 31. Install driven gear in pump body.

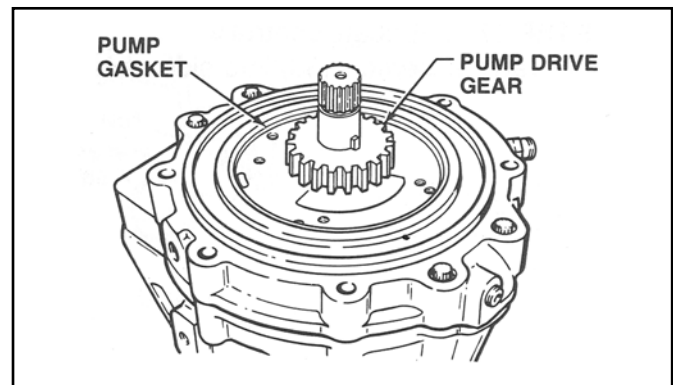
NOTE: Pump gear should be installed the same side down as removed.



Pump Driven Gear Assembly

STEP 32. Lubricate pump gasket with vasoline and install in groove of adapter.

Install pump drive gear onto input shaft. Check that pump drive gear locates freely on woodruff key and shaft.

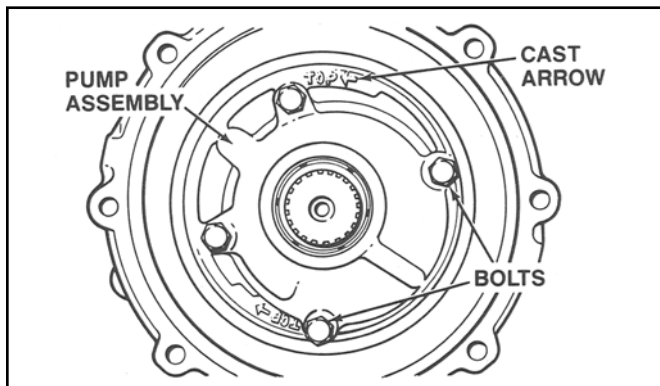


Pump Gasket Installation

STEP 33. Install pump assembly on top of adapter and align bolt holes. Apply thread locker to bolts - apply Loctite 242 or equivalent.

CAUTION **CAUTION:** Position pump housing with cast arrow at top pointing in the same direction as engine rotation.

Thread four bolts into adapter. Tighten in a criss-cross pattern to final torque specified in Table 4.

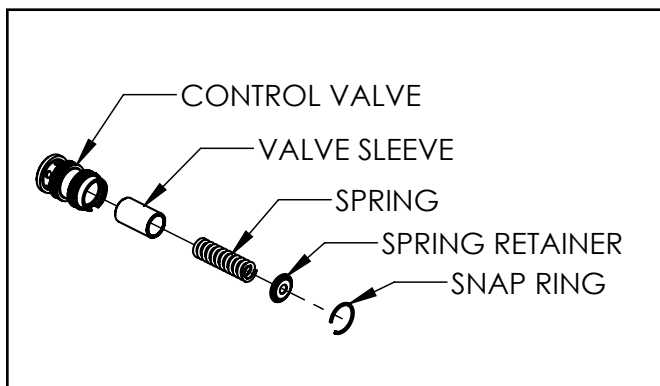


Pump Assembly Installation

STEP 34. Assemble pressure relief valve assembly. Refer to figure below.

Lubricate O-rings with vasoline and install on end of valve assembly.

NOTE: Gap in snap ring must be aligned with notch in control valve.



PRV Valve Assembly

STEP 35. Slide valve assembly into side of case.

STEP 36. Install valve cover as follows:

Position gasket on case. Place valve cover over gasket and align bolt holes.

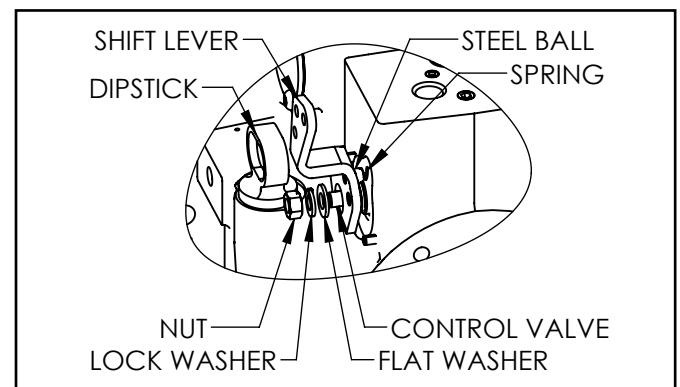
Thread three bolts into case. Tighten bolts in a criss-cross pattern to final torque specified in Table 4. Apply thread sealant to bolts. (Loctite 242 or equivalent)

STEP 37. Install shift lever as follows (manual shift only): Insert shift spool into housing. Lubricate o-ring before installation. Insert snap ring into housing to retain spool.

Lubricate poppet spring and hole in case with grease. Place poppet spring and steel ball in case.

Slide shift lever over end of control valve assembly and against steel ball. Rotate shift lever to engage steel ball in hole of shift lever.

Hold shift lever against steel ball. Install washers and thread nut on shifter spool assembly. Tighten nut to torque specified in Table 4.



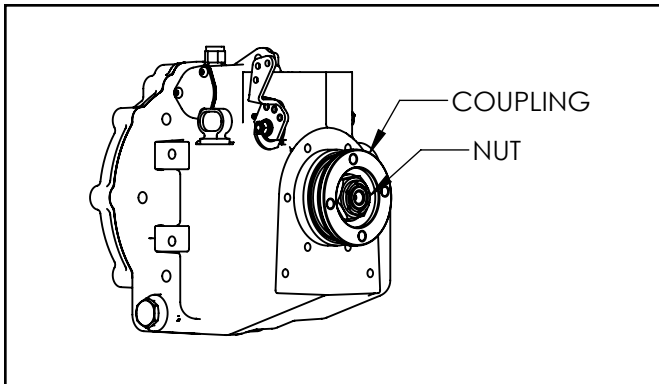
Shift Lever Assembly

STEP 37A. Electric Shift

Be sure cartridge screen is clean. Insert cartridge into port and torque to spec in Table 4.

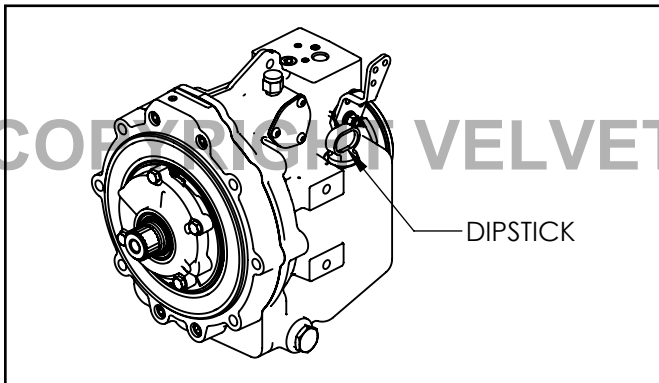
Slide coils over cartridge stem. Be sure you have the spacer washer between the 2 coils. Position coils as needed and tighten nut to spec in Table 4.

STEP 38. Slide coupling on output shaft. Thread nut on output shaft. Tighten nut to torque shown in Table 4.



Coupling Installation

STEP 39. Install dipstick in side of case. Turn handle until snug. Do not over tighten.



Dipstick Installation

CAUTION CAUTION: After a transmission failure, the cooler should be replaced and all lines flushed.

Align input shaft spline with damper plate.

Assemble transmission to engine and then install bolts. Do not use bolts to draw transmission against engine.

WARNING WARNING: Check the shift lever at the helm to see that forward position is also forward position at the transmission shift lever. (Transmission should not be running in reverse when boat is going forward.)

Adjust the shift cable so the holes in the shift lever are centered over the detent ball at each selector location. See figure 7A.

CAUTION CAUTION: If adjustment is not correct this could cause transmission failure.

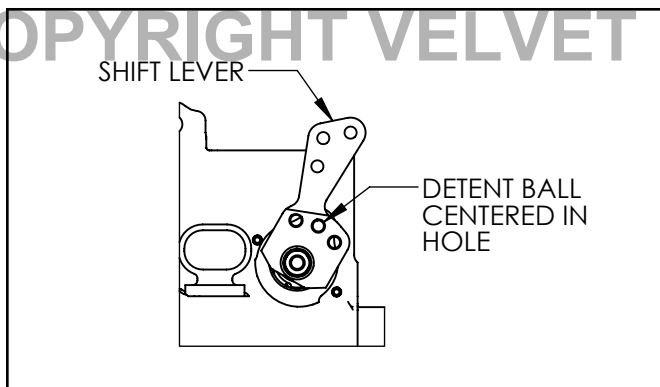


Figure 7A. Shift Cable Adjustment

Read OEM manual for complete installation instructions.

Connect oil line to oil to the cooler outlet. See Figure 7B.

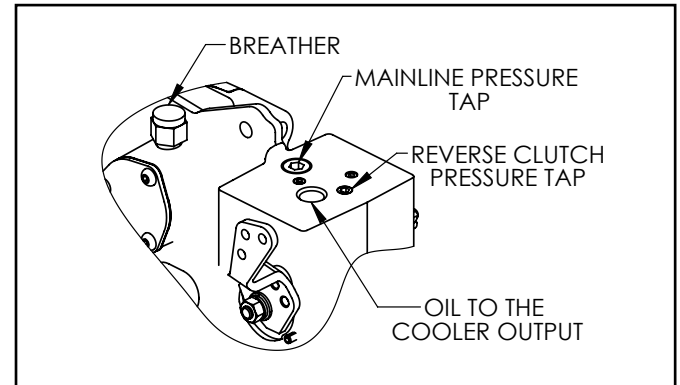


Figure 7B. Oil to Cooler Outlet

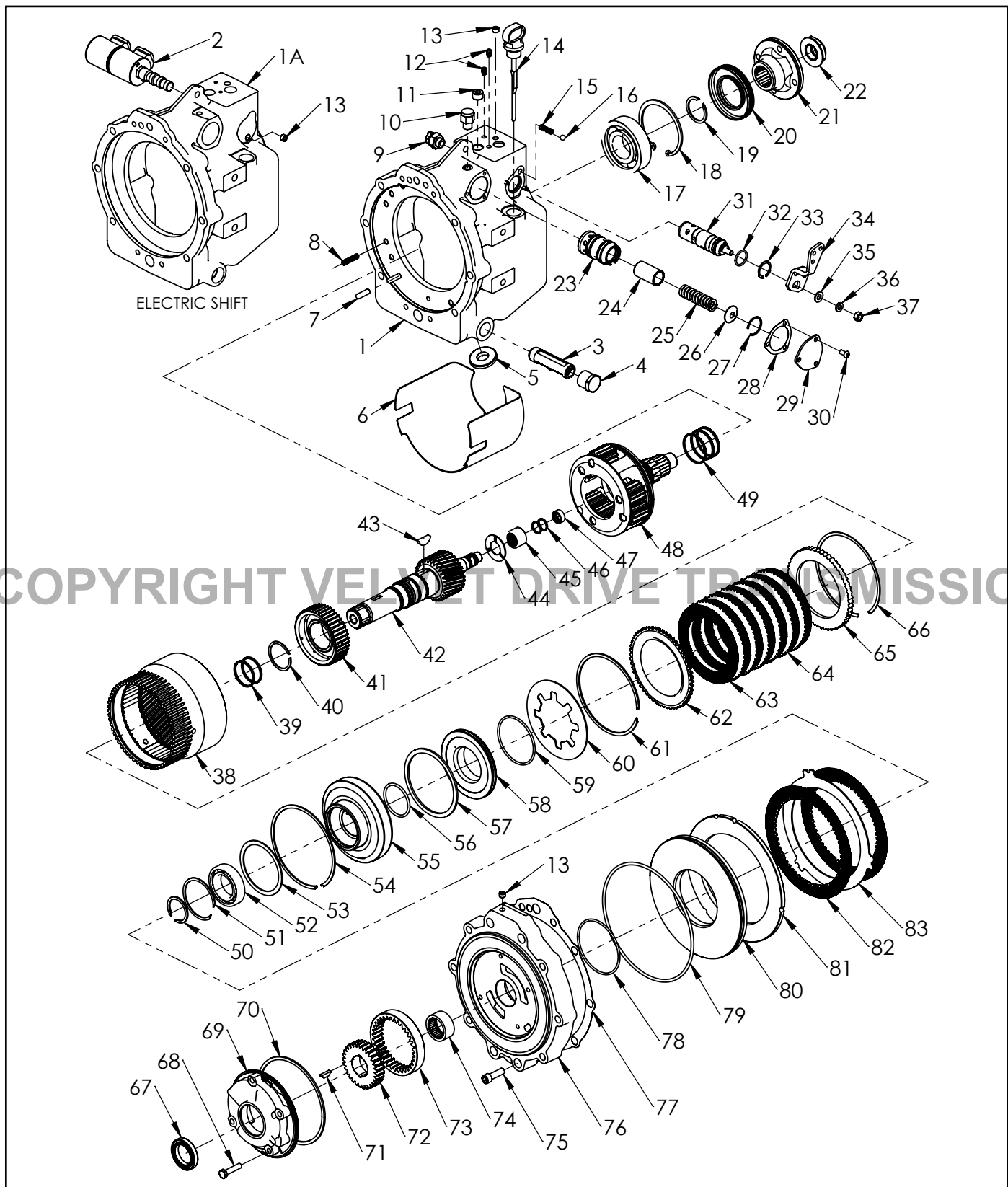


Figure 8. 71L and 72L Transmission Assembly

| Item No. | Part Number | Description | Qty. |
|----------|----------------|---|------|
| 1 | 30-07-065-M01 | MAIN CASE MANUAL SHIFT | 1 |
| 1A | 30-07-065-E01* | MAIN CASE ELECTRIC SHIFT | 1 |
| 2 | 30-00-140-001* | SOLENOID | 1 |
| 3 | 10-00-238-002 | SCREEN | 1 |
| 4 | 3000188001 | THREAD REDUCER (SAE J1926-8 FITTING) 3/4-16 THD | 1 |
| 4A | 4885B | THREAD REDUCER (3/8-18 DRYSEAL THD) | 1 |
| 5 | 4915 | MAGNET | 1 |
| 6 | 30-07-036-001 | OIL BAFFLE | 1 |
| 7 | 10-00-043-031 | DOWEL PIN | 3 |
| 8 | 71-97 | PRESSURE PLATE SPRING | 11 |
| 9 | 3000640001 | NEUTRAL SWITCH - WIRE LEADS | 1 |
| 9A | 10-00-140-007 | NEUTRAL SWITCH WITH SCREW LEADS | 1 |
| 10 | 3000072001 | BREATHER | 1 |
| 11 | 444866 | 3/8 NPT PIPE PLUG | 1 |
| 12 | 10-16-113-001 | PLUG | 2 |
| 13 | 444688 | 1/8 NPT PIPE PLUG | 2 |
| 14 | 3007559001 | DIPSTICK (3007, 3011, AND 3019 MODELS) | 1 |
| 14A | 3007559002 | DIPSTICK (3008 AND 3018 MODELS) | 1 |
| 15 | 71-42 | SPRING - POPPET | 1 |
| 16 | 453632 | STEEL BALL (5/16) | 1 |
| 17 | 20-00-130-001 | BEARING - ANNULAR | 1 |
| 18 | 30-06-139-002 | RING - RETAINING | 1 |
| 19 | 3008139001 | SNAP RING (3008 AND 3018 MODELS ONLY) | 1 |
| 20 | 30-07-044-001 | OIL SEAL (3007, 3011, AND 3019 MODELS) | 1 |
| 20A | 30-08-044-001 | OIL SEAL (3008 MODEL ONLY) | 1 |
| 21 | 30-07-031-001 | COUPLING - OUTPUT (3007 MODEL ONLY) | 1 |
| 21A | 3010031001 | COUPLING - 5" (3011 MODEL OPTION ONLY) | 1 |
| 21B | 3010031002 | COUPLING - 1350 FLANGE (3011 MODEL OPTION ONLY) | 1 |
| 21C | 3010031003 | COUPLING - 1480 FLANGE (3011 MODEL OPTION ONLY) | 1 |
| 21D | 3019031001 | COUPLING 4" (MODEL 3019 ONLY) | 1 |
| 22 | 10-00-149-034 | 1-20 SPIRALOCK HEX NUT (3011 MODEL ONLY) | 1 |
| 22A | 4775L | 1-20 LOCK HEX NUT (3007 AND 3019 MODELS ONLY) | 1 |
| 23 | 3007239002 | VALVE - SLEEVE | 1 |
| 23A | 3007739002 | PRV VALVE ASSEMBLY | 1 |
| 24 | 71-243 | VALVE - PRESSURE REGULATOR | 1 |
| 25 | 71-242 | VALVE - SPRING | 1 |
| 26 | 71-246 | SPRING RETAINER | 1 |
| 27 | 4821 | SNAP RING | 1 |
| 28 | 71-14 | VALVE COVER GASKET | 1 |
| 29 | 3006039001 | VALVE COVER | 1 |
| 30 | 433648 | SCREW | 3 |
| 31 | 3006239005 | CONTROL VALVE | 1 |
| 32 | 3006141001 | O-RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |
| 34 | 71-79B | SHIFT LEVER | 1 |

* Optional electric shift components

| Item No. | Part Number | Description | Qty. |
|----------|---------------|--|------|
| 35 | 103340 | FLAT WASHER (5/16) | 1 |
| 36 | 108579 | LOCK WASHER (5/16) | 1 |
| 37 | 9418892 | HEX NUT (5/16-24) | 1 |
| 38 | 10-16-162-001 | RING GEAR | 1 |
| 38A | 71-6 | RING GEAR (3018 AND 3019 MODELS ONLY) | 1 |
| 39 | 4806J | SEALING RING | 2 |
| 40 | 4495 | SNAP RING | 1 |
| 41 | 10-16-179-001 | CLUTCH HUB (3007 AND 3008 MODELS ONLY) | 1 |
| 41A | 3011090001 | CLUTCH HUB 3011 MODEL ONLY | 1 |
| 41B | 71-40 | CLUTCH HUB (MODELS 3018 AND 3019 ONLY) | 1 |
| 42 | 30-06-085-001 | DRIVE GEAR (3007 AND 3008 MODELS) | 1 |
| 42A | 3011085001 | DRIVE GEAR (3011 MODEL) | 1 |
| 42B | 3019085001 | DRIVE GEAR (3018 AND 3019 MODELS ONLY) | 1 |
| 43 | 124553 | WOODRUFF KEY (3007 AND 3008 MODELS ONLY) | 1 |
| 43A | 218211 | WOODRUFF KEY (3018 AND 3019 MODELS ONLY) | 1 |
| 44 | 71-17 | WASHER - THRUST | 1 |
| 45 | 20-00-132-001 | BEARING - 7/8 ID | 1 |
| | | (2) REQ'D FOR 3018 AND 3019 MODELS ONLY | 2 |
| 46 | 4806S | RING - OIL SEALING | 2 |
| 47 | 20-00-132-200 | BEARING - 5/8 ID | 1 |
| 48 | 30-07-659-002 | CARRIER ASSEMBLY (3007 MODEL ONLY) | 1 |
| 48A | 3008659002 | CARRIER ASSEMBLY (3008 MODEL ONLY) | 1 |
| 48B | 3010659002 | CARRIER ASSEMBLY (3011 MODEL ONLY) | 1 |
| 48C | 3018659002 | CARRIER ASSEMBLY (3018 MODEL ONLY) | 1 |
| 48D | 3019659002 | CARRIER ASSEMBLY (3019 MODEL ONLY) | 1 |
| 49 | 20-00-016-050 | SEALING RING | 3 |
| 50 | 4559A | SNAP RING | 1 |
| 50A | 4734 | SNAP RING (3018 AND 3019 MODELS ONLY) | 1 |
| 51 | 4766B | SNAP RING | 1 |
| 51A | R6A-7 1/2 | SNAP RING (MODELS 3018 AND 3019 ONLY) | 1 |
| 52 | 10-00-130-016 | BEARING - ANNULAR | 1 |
| 53 | 71-15B | WASHER - THRUST | 1 |
| | 1016193001 | WASHER - THRUST (OPTIONAL) | |
| 54 | 4822 | SNAP RING - RING GEAR | 1 |
| 55 | 72-70 | CLUTCH PISTON HOUSING (3007 AND 3008 MODELS) | 1 |
| 55A | 3011014001 | CLUTCH PISTON HOUSING (3011 MODEL) | 1 |
| 55B | 71-70 | CLUTCH PISTON HOUSING (3018 AND 3019 MODELS ONLY) | 1 |
| 56 | 5M-122 | O-RING | 1 |
| 57 | 5L-36 | PISTON SEALING RING (3007, 3008, 3018, AND 3019 MODELS ONLY) | 1 |
| 57A | 3009044001 | PISTON SEALING RING (3011 MODEL) | 1 |
| 58 | 10-16-124-001 | PISTON - FORWARD CLUTCH (3007, 3008, 3018, & 3019 MODELS ONLY) | 1 |
| 58A | 3011124001 | PISTON - FORWARD CLUTCH (3011 MODEL) | 1 |
| 59 | 5C-33 | CLUTCH PISTON WEAR RING | 1 |
| 60 | 3-37 | CLUTCH BELLEVILLE SPRING | 1 |
| 61 | 4755 | SNAP RING | 1 |

* Optional electric shift components

| Item No. | Part Number | Description | Qty. |
|----------|---------------|--|------|
| 62 | 3000166001 | CLUTCH PRESSURE PLATE | 1 |
| 63 | 3000166001 | ASSY - INNER CLUTCH PLATE (MODEL 3007 AND 3008) | 7 |
| | 3000166001 | ASSY - INNER CLUTCH PLATE (MODEL 3018 AND 3019 ONLY) | 5 |
| 63A | 3009166001 | PAPER CLUTCH PLATE MODEL 3011 ONLY | 7 |
| 64 | 10-16-166-001 | PLATE - OUTER CLUTCH | 6 |
| 65 | 5L-67 | REAR CLUTCH PRESSURE PLATE | 1 |
| 66 | 4768 | RING - SHIM (SELECTIVE FIT) | 1 |
| 66A | 4768A | RING - SHIM (SELECTIVE FIT) | |
| 66B | 4768B | RING - SHIM (SELECTIVE FIT) | |
| 66C | 1000139018 | RING - SHIM (SELECTIVE FIT) | |
| 66D | 1000139019 | RING - SHIM (SELECTIVE FIT) | |
| 66E | 1000139048 | RING - SHIM (SELECTIVE FIT) | |
| 67 | 10-00-044-014 | OIL SEAL | 1 |
| 68 | 10-00-183-021 | BOLT, HEX - 5/16-18 X 1 3/8 | 3 |
| 69 | 71C-60 | FRONT PUMP HOUSING | 1 |
| 70 | 3-61 | PUMP GASKET | 1 |
| 71 | 4873 | #9 KEY | 1 |
| 72 | 71-64 | FRONT PUMP DRIVE GEAR | 1 |
| 73 | 3-63A | FRONT PUMP DRIVEN GEAR | 1 |
| 74 | 4840D | NEEDLE BEARING | 1 |
| 75 | 2000183017 | SHCS 3/8-16X1.25 | 4 |
| 76 | 3006172001 | ADAPTER - MACHINED | 1 |
| 77 | 30-06-045-003 | GASKET - CASE & ADAPTER | 1 |
| 78 | 4804G | ADAPTOR O-RING | 1 |
| 79 | 4805A | REV. PISTON SEALING RING | 1 |
| 80 | 71-35 | REVERSE CLUTCH PISTON | 1 |
| 81 | 71-71 | REVERSE CLUTCH PRESSURE PLATE | 1 |
| 82 | 72-A66B | BRONZE REVERSE CLUTCH PLATE (STD) | 2 |
| 82A | 3000166002 | BRONZE HEAVY DUTY REVERSE CLUTCH PLATE HARDEN (3011 MODEL) | 2 |
| 82B | 3009166002 | PAPER HIGH PERFORMANCE REVERSE CLUTCH PLATE (OPTIONAL) | 2 |
| 83 | 72-176 | OUTER STEEL CLUTCH PLATE | 1 |

* Optional electric shift components

NOTE: The following kits are available for Model 71L and 72L transmissions. Index numbers shown match the index numbers on the exploded view, Figure 8.

Forward Clutch Kit (Models 3007 & 3008 Only)

| Index No. | Part Number | Description | Qty. |
|-----------|----------------|--------------------------------|------|
| | A4867AB | FORWARD CLUTCH PACK KIT | |
| 62 | 5C-175A | CLUTCH PRESSURE PLATE | 1 |
| 64 | 10-16-166-001 | STEEL CLUTCH PLATE | 6 |
| 63 | 3000166001 | FRICTION CLUTCH PLATE (BRONZE) | 7 |
| 65 | 5L-67 | CLUTCH PRESSURE PLATE | 1 |

Forward Clutch Kit (Models 3018 & 3019 Only)

| Index No. | Part Number | Description | Qty. |
|-----------|----------------|--------------------------------|------|
| | A4867AE | FORWARD CLUTCH PACK KIT | |
| 62 | 5C-175A | CLUTCH PRESSURE PLATE | 1 |
| 64 | 10-16-166-001 | STEEL CLUTCH PLATE | 4 |
| 63 | 3000166001 | FRICTION CLUTCH PLATE (BRONZE) | 5 |
| 65 | 5L-67 | CLUTCH PRESSURE PLATE | 1 |

Forward Clutch Kit (Model 3011 Only)

| Index No. | Part Number | Description | Qty. |
|-----------|-------------------|--------------------------------|------|
| | 3011410002 | FORWARD CLUTCH PACK KIT | |
| 62 | 3009062001 | CLUTCH PRESSURE PLATE | 1 |
| 64 | 10-16-166-001 | STEEL CLUTCH PLATE | 6 |
| 63 | 3009166001 | FRICTION CLUTCH PLATE (PAPER) | 7 |
| 65 | 5L-67 | CLUTCH PRESSURE PLATE | 1 |

Gasket, Sealing Rings, O-Ring and Oil Seal Kit (Model 3011 Only)

| Index No. | Part Number | Description | Qty. |
|-----------|-------------------|--|------|
| | 3011410001 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| 77 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 28 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 67 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 20 | 3007044001 | OUTPUT SHAFT SEAL | 1 |
| 79 | 4805A | SEALING RING | 1 |
| 78 | 4804G | SEALING RING | 1 |
| 70 | 3-61 | PUMP GASKET SEAL | 1 |
| 56 | 5M-122 | SEALING RING | 1 |
| 57A | 3009044001 | PISTON SEALING RING | 1 |
| | 3007141001 | PRV VALVE O-RING | 2 |
| 46 | 4806S | SEALING RING | 2 |
| 39 | 4806J | SEALING RING | 2 |
| 49 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 50 | 4559A | SNAP RING | 1 |
| 51 | 4766B | SNAP RING | 1 |
| 54 | 4822 | SNAP RING | 1 |
| 40 | 3009139001 | SNAP RING | 1 |
| 18 | 3006139002 | SNAP RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |

Gasket, Sealing Rings, O-Ring and Oil Seal Kit (Model 3008 Only)

| Index No. | Part Number | Description | Qty. |
|-----------|-------------------|--|------|
| | 3008420002 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| 77 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 28 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 67 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 20 | 3008044001 | OUTPUT SHAFT SEAL | 1 |
| 79 | 4805A | SEALING RING | 1 |
| 78 | 4804G | SEALING RING | 1 |
| 70 | 3-61 | PUMP GASKET SEAL | 1 |
| 56 | 5M-122 | SEALING RING | 1 |
| 57 | 5L-36 | PISTON SEALING RING | 1 |
| | 3007141001 | PRV VALVE O-RING | 2 |
| 46 | 4806S | SEALING RING | 2 |
| 39 | 4806J | SEALING RING | 2 |
| 49 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 50 | 4559A | SNAP RING | 1 |
| 51 | 4766B | SNAP RING | 1 |
| 54 | 4822 | SNAP RING | 1 |
| 40 | 4495 | SNAP RING | 1 |
| 18 | 3006139002 | SNAP RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |
| 19 | 3008139001 | SNAP RING | 1 |

Gasket, Sealing Rings, O-Ring and Oil Seal Kit (Model 3007 Only)

| Index No. | Part Number | Description | Qty. |
|-----------|-------------------|--|------|
| | 3007420001 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| 77 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 28 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 67 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 20 | 3007044001 | OUTPUT SHAFT SEAL | 1 |
| 79 | 4805A | SEALING RING | 1 |
| 78 | 4804G | SEALING RING | 1 |
| 70 | 3-61 | PUMP GASKET SEAL | 1 |
| 56 | 5M-122 | SEALING RING | 1 |
| 57 | 5L-36 | PISTON SEALING RING | 1 |
| | 3007141001 | PRV VALVE O-RING | 2 |
| 46 | 4806S | SEALING RING | 2 |
| 39 | 4806J | SEALING RING | 2 |
| 49 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 50 | 4559A | SNAP RING | 1 |
| 51 | 4766B | SNAP RING | 1 |
| 54 | 4822 | SNAP RING | 1 |
| 40 | 4495 | SNAP RING | 1 |
| 18 | 3006139002 | SNAP RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |

Gasket, Sealing Rings, O-Ring and Oil Seal Kit (Model 3018 Only)

| Index No. | Part Number | Description | Qty. |
|-----------|-------------------|--|------|
| | 3018420001 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| 77 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 28 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 67 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 20 | 3007044001 | OUTPUT SHAFT SEAL | 1 |
| 79 | 4805A | SEALING RING | 1 |
| 78 | 4804G | SEALING RING | 1 |
| 70 | 3-61 | PUMP GASKET SEAL | 1 |
| 56 | 5M-122 | SEALING RING | 1 |
| 57 | 5L-36 | PISTON SEALING RING | 1 |
| | 3007141001 | PRV VALVE O-RING | 2 |
| 46 | 4806S | SEALING RING | 2 |
| 39 | 4806J | SEALING RING | 2 |
| 49 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 50A | 4734 | SNAP RING | 1 |
| 51A | R6A-7 1/2 | SNAP RING | 1 |
| 54 | 4822 | SNAP RING | 1 |
| 40 | 4495 | SNAP RING | 1 |
| 18 | 30081390012 | SNAP RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |

Gasket, Sealing Rings, O-Ring and Oil Seal Kit (Model 3019 Only)

| Index No. | Part Number | Description | Qty. |
|-----------|-------------------|--|------|
| | 3019420001 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| 77 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 28 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 67 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 20 | 3007044001 | OUTPUT SHAFT SEAL | 1 |
| 79 | 4805A | SEALING RING | 1 |
| 78 | 4804G | SEALING RING | 1 |
| 70 | 3-61 | PUMP GASKET SEAL | 1 |
| 56 | 5M-122 | SEALING RING | 1 |
| 57 | 5L-36 | PISTON SEALING RING | 1 |
| | 3007141001 | PRV VALVE O-RING | 2 |
| 46 | 4806S | SEALING RING | 2 |
| 39 | 4806J | SEALING RING | 2 |
| 49 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 50A | 4734 | SNAP RING | 1 |
| 51A | R6A-7 1/2 | SNAP RING | 1 |
| 54 | 4822 | SNAP RING | 1 |
| 40 | 4495 | SNAP RING | 1 |
| 18 | 3006139002 | SNAP RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |

Reverse Plates Used in Each Model

| Model Number | Steel Plates | Friction Plates |
|-------------------------------|--------------|-----------------|
| 3007, 3008, 3011, 3018 & 3019 | 2 | 2 |
| 3009 & 3010 | 3 | 3 |

CAUTION CAUTION: Threaded plugs, screws, bolts and coupling nuts must be tightened to torque shown in this table to prevent premature failure of transmission or reduction unit. Recommend using Thread Locker Loctite 242 or equivalent to all fasteners.

Table 4. Bolt and Fastener Torque Specs. (Non-Lubricated)

| Part Number | Description | FT-LB | Nm |
|------------------------------|----------------------------|---------|---------|
| MAIN HOUSING | | | |
| 9418892 | 5/16-24 Shift Lever Nut | 8-11 | 11-15 |
| 4775L | Coupling Nut | 160-260 | 217-353 |
| 10-00-149-034 | Coupling Nut | 160-260 | 217-353 |
| 10-00-183-021 | 5/16-18 x 1" Hex Head Bolt | 15-16 | 20-21 |
| 20-00-183-017 | 3/8-16 x 1-1/4 Capscrew | 32-36 | 43-48 |
| 4885B | 3/4-14 Dryseal Bushing | 20-30 | 27-40 |
| 444688 | 1/8-27 Pipe Plug | 7-12 | 9-16 |
| 10-00-640-004 | Neutral Switch | 20-22 | 27-29 |
| 30-00-064-001 | Neutral Switch | 20-22 | 27-29 |
| 433648 | 1/4-20 x Button Head Bolt | 6-8 | 8-10 |
| 30-00-072-001 | 1/4-18 NPSF Breather | 14-24 | 19-32 |
| ELECTRIC SHIFT OPTION | | | |
| 30-00-140-001 | 3/4-16 Solenoid Stem | 25 | 34 |
| | Coil Nut | 5 | 7 |
| V-DRIVE HOUSING | | | |
| 30-08-183-001 | 3/8-16 Hex Head Bolt | 32-36 | 43-48 |
| 30-08-183-002 | 3/8-16 Hex Head Bolt | 32-36 | 43-48 |
| 30-08-183-003 | 3/8-16 Hex Head Bolt | 32-36 | 43-48 |
| 30-08-052-001 | 3/4-14 NPT | 20-30 | 27-40 |
| 10-00-052-021 | 1/2-14 NPSF | 17-27 | 23-36 |

| PIPE PLUGS | | |
|---------------------|--------------|-------|
| Thread Size | Torque FT-LB | Nm |
| 1/8-27 DRYSEAL NPSF | 7-12 | 9-16 |
| 1/4-18 DRYSEAL NPSF | 14-24 | 19-33 |
| 3/8-18 DRYSEAL NPSF | 17-27 | 23-36 |
| 3/4-18 DRYSEAL NPSF | 25-35 | 34-48 |

CAUTION CAUTION: When changing a factory installed fastener, it is the responsibility of the person making the change to properly account for fastener grade, thread engagement, load, tightening torque and the means of torque retention.

Table 5. Spring Dimensions

| Part Number | Where Used | Approx. Free Length | | Approx. OD | | Diameter of Wire | | No. of Active Coils |
|-------------|----------------|---------------------|------|------------|------|------------------|-----|---------------------|
| | | in. | mm | in. | mm | in. | mm | |
| 71-242 | Control Valve | 2.66 | 67.6 | 0.78 | 19.8 | 0.14 | 3.6 | 12 |
| 71.42 | Poppet | 1.00 | 25.4 | 0.29 | 7.4 | 0.04 | 1.0 | 6 |
| 71.97 | Pressure Plate | 1.25 | 31.8 | 0.31 | 7.9 | 0.05 | 1.3 | 11 |

Table 7. Test Pressures: 71L, 72L, 72LX (Models 3007, 3008, 3011, 3018 & 3019)

| Pressure Tap | Engine RPM | Typical Range | | Typical Range | |
|---------------------|------------|---------------|----------|---------------|----------|
| | | PSI | PSI | kPA | kPA |
| Neutral Line | 600 | 130 | 185 | 896 | 1275 |
| | 2000 | NOT USED | NOT USED | NOT USED | NOT USED |
| | 3500 | NOT USED | NOT USED | NOT USED | NOT USED |
| Reverse Clutch | 600 | 130 | 185 | 836 | 1275 |
| | 2000 | 150 | 195 | 1034 | 1344 |
| | 3500 | NOT USED | NOT USED | NOT USED | NOT USED |
| Reverse Main Line | 600 | 130 | 185 | 896 | 1275 |
| | 2000 | 150 | 195 | 1034 | 1344 |
| | 3500 | NOT USED | NOT USED | NOT USED | NOT USED |
| Forward Main Line | 600 | 130 | 185 | 896 | 1275 |
| | 2000 | 150 | 195 | 1034 | 1344 |
| | 3500 | 150 | 215 | 1034 | 1482 |
| | | GPM | GPM | LPM | LPM |
| Reverse Cooler Flow | 600 | 0 | 2.6 | 0 | 9.8 |
| | 2000 | 3.5 | 9.0 | 13.25 | 30.3 |
| | 3500 | NOT USED | NOT USED | NOT USED | NOT USED |
| Forward Cooler Flow | 600 | 0 | 2.6 | 0 | 9.8 |
| | 2000 | 3.5 | 9.0 | 13.25 | 30.3 |
| | 3500 | 6.0 | 12.5 | 22.7 | 47.3 |

NOTE: Pressures shown are typical at an oil temperature of 120 degrees F. Variations can occur due to plumbing, fittings and cooler differences.

NOTE: Forward clutch feed does not have an external tap for checking pressure. When selector is in "F" position, line pressure indicates clutch pressure. Pressure drop from "N" to "F" indicates leakage in forward clutch circuit.

PROPELLER SHAFT ALIGNMENT

The term "Propeller Shaft Alignment" is really a misnomer because we are really not aligning the prop shaft. We are aligning the engine and transmission as an assembly. We can reposition the prop shaft axially, but we cannot move it laterally. We must instead move the engine and transmission assembly to align with the prop shaft. The prop shaft is the boss.

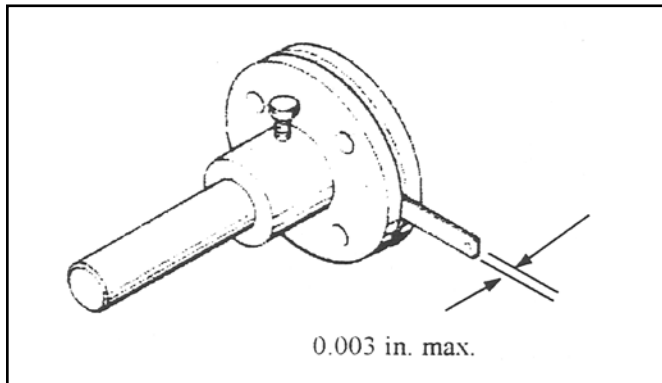


Figure 1. Flange and Coupler

The following are the three basic conditions that are at the root of all prop shaft alignment problems.

1. The face of the prop shaft coupler and/or transmission flange may not be perpendicular to the center line of its respective shaft (figure 2).

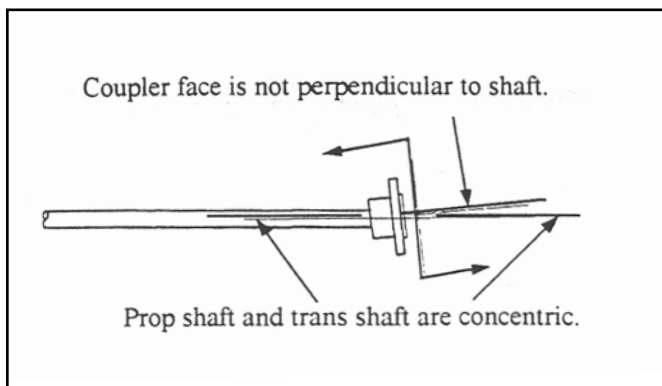


Figure 2. Coupler Perpendicularity

2. The shaft may be bent (figure 3). Place indicator in position "2" to determine coupler position relative to shaft.

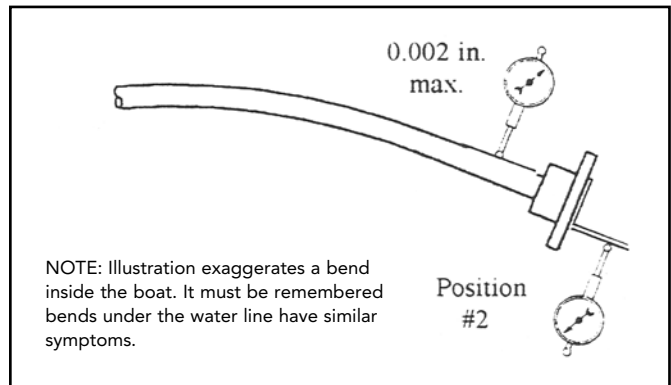


Figure 3. Bent Shaft (Exaggerated)

3. The center lines of the transmission output and propeller shafts are not concentric. Their center lines may be parallel or crossing (figure 4).

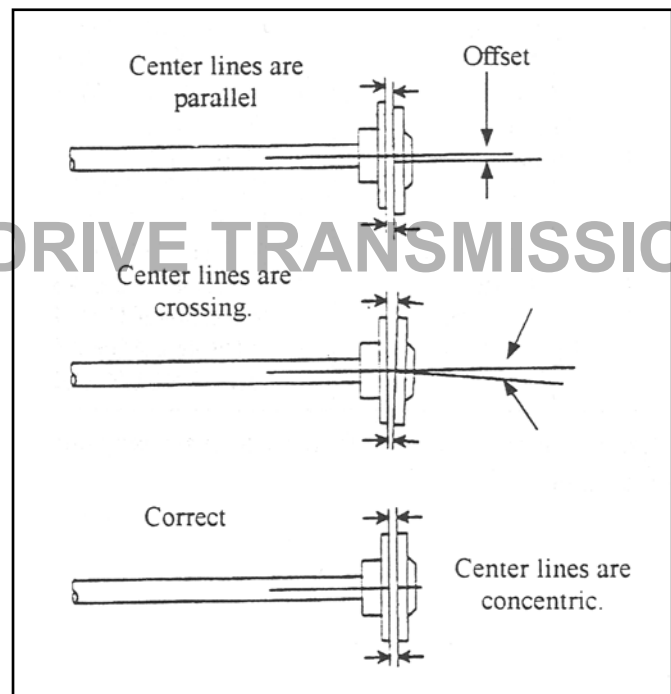


Figure 4. Shaft Concentricity

SHAFT ALIGNMENT PROCEDURE

Propeller shafts with a third or more of their total length protruding inside the boat should be supported in their best neutral position when disconnected from the transmission. If there is any doubt, support.

NOTE: It is most important the following steps be taken in order.

THE COUPLER AND/OR FLANGE FACES ARE NOT PERPENDICULAR TO THE SHAFT

Symptoms may include: Knocking noise, leaking stuffing box, leaking transmission rear seal, loose transmission output shaft nut, broken transmission shaft at output nut.

TRANSMISSION FLANGE FACE IS NOT PERPENDICULAR

The face and pilot bore are best checked with a dial indicator. Both readings should be within 0.002 inch (figure 5).

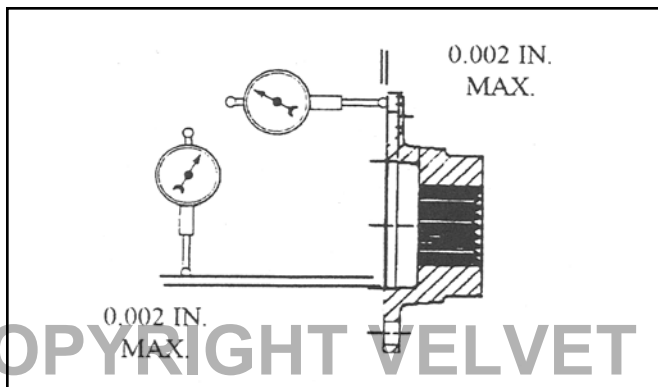


Figure 5. Determining Transmission Flange Runout

PROPELLER SHAFT COUPLER NOT PERPENDICULAR

The face of the coupler is best checked by taking four (4) feeler gauge readings at one location against the transmission flange and move the coupler in 90° increments for each reading (figure 6). Readings must be within 0.002 inch.

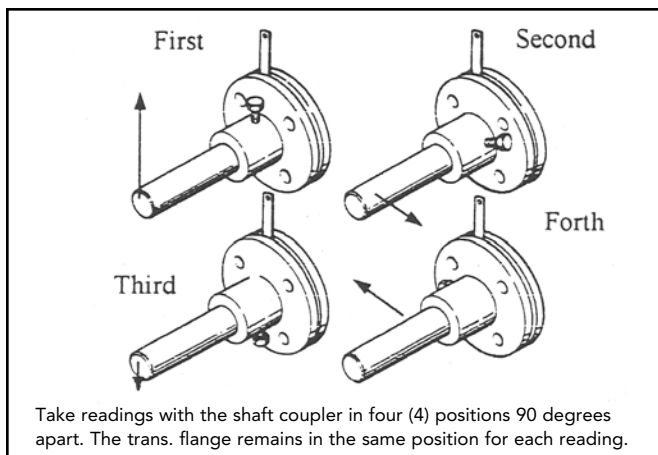


Figure 6. Determining Coupling Perpendicularity

BENT SHAFT

Symptoms may include: Knocking noise, leaking stuffing box, leaking transmission rear seal, loose transmission output shaft nut, broken transmission shaft at output nut.

Rotate shaft with a dial indicator held against its side (figure 3). Place indicator in position "2" to determine coupler position relative to shaft.

Reading must be within 0.002 inch. Replacement is the only cure for a bent shaft.

NOTE: It is imperative the transmission flange and propeller shaft coupler faces be perpendicular to their shaft center lines and the propeller shaft be free of bends below the water line as well as inside the boat, before continuing with this next step.

THE SHAFTS ARE NOT CONCENTRIC

Symptoms may include: knocking noise, squeal or moaning noise, leaking transmission rear seal.

This condition is corrected by moving the engine and transmission as an assembly until the male pilot on the shaft coupler enters the female pilot bore in the transmission flange without force and the flange faces meet with no more than a 0.003 inch space at any point around the circumference (figure 1).

FIVE INCH FLANGE

Velvet Drive five (5) inch flanges conform to the requirements of SAE 510 specifications. There are two features that make this flange unique to the industry. The female pilot bore is in the transmission flange and the bolt circle is a 4 ¼ inch diameter. No other SAE flange meets this criterion. See figure 7.

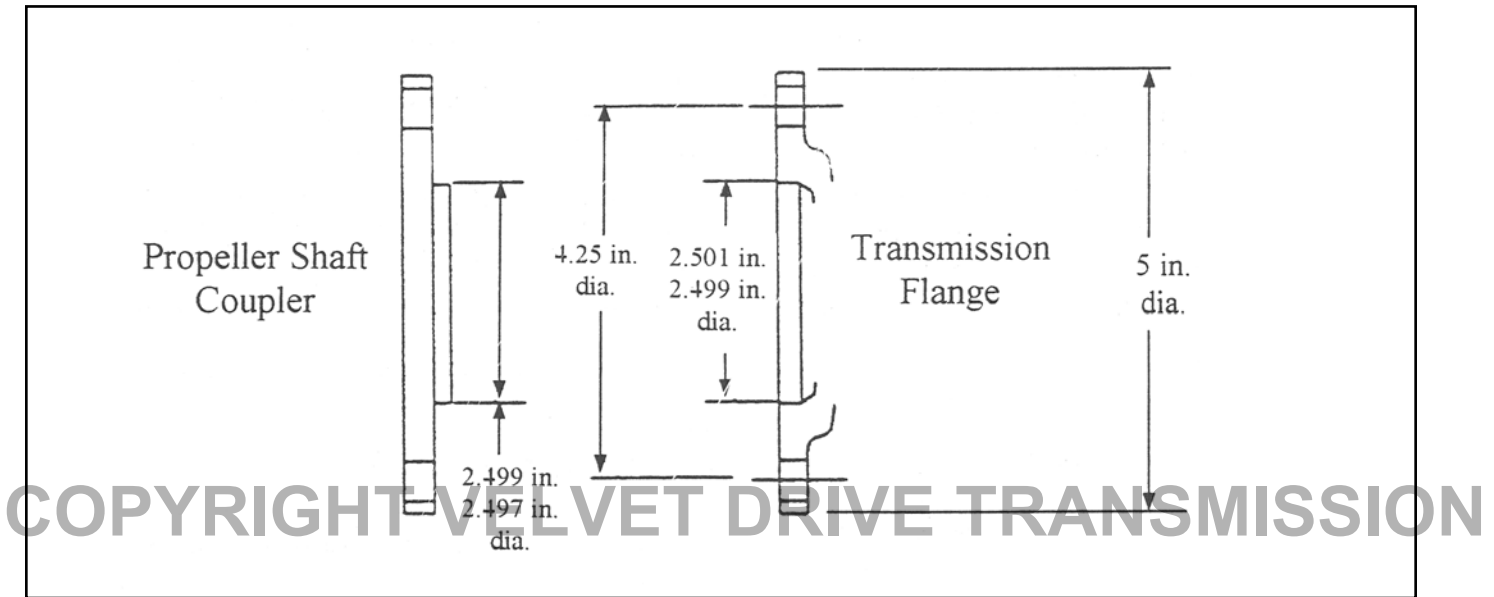
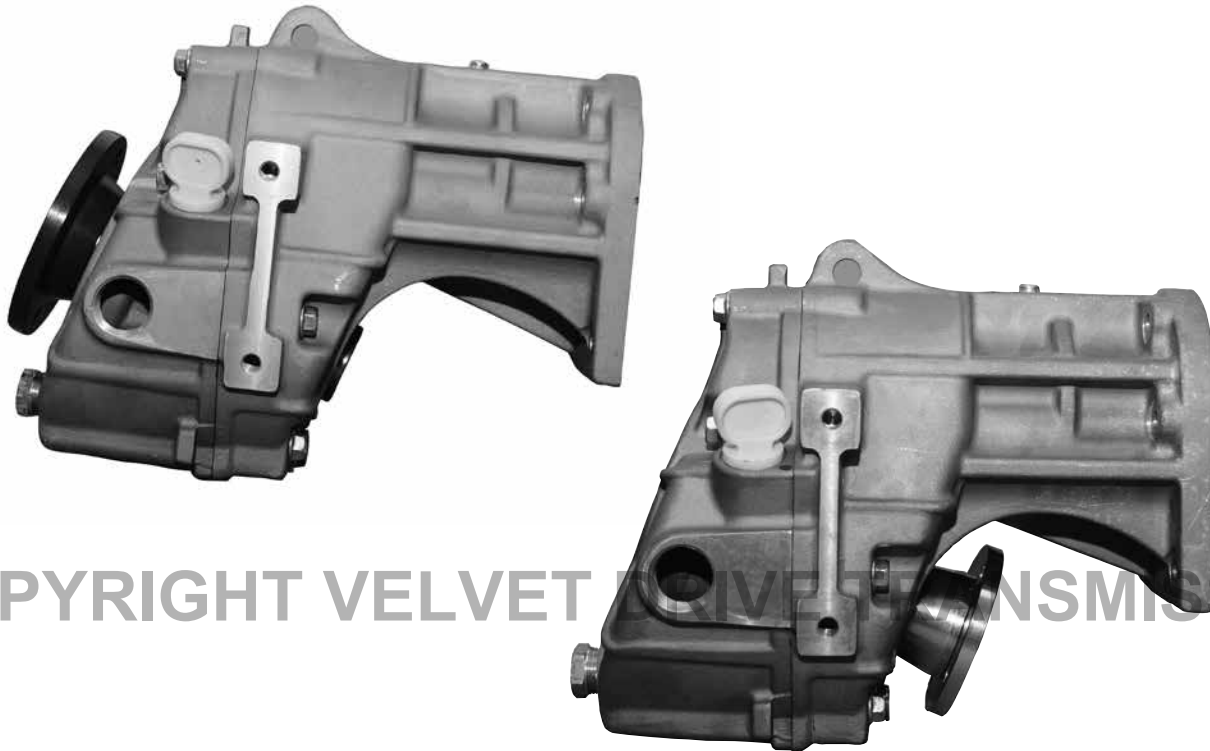


Figure 7. Five Inch Flange SAE 510

SEGMENT B

V-DRIVES



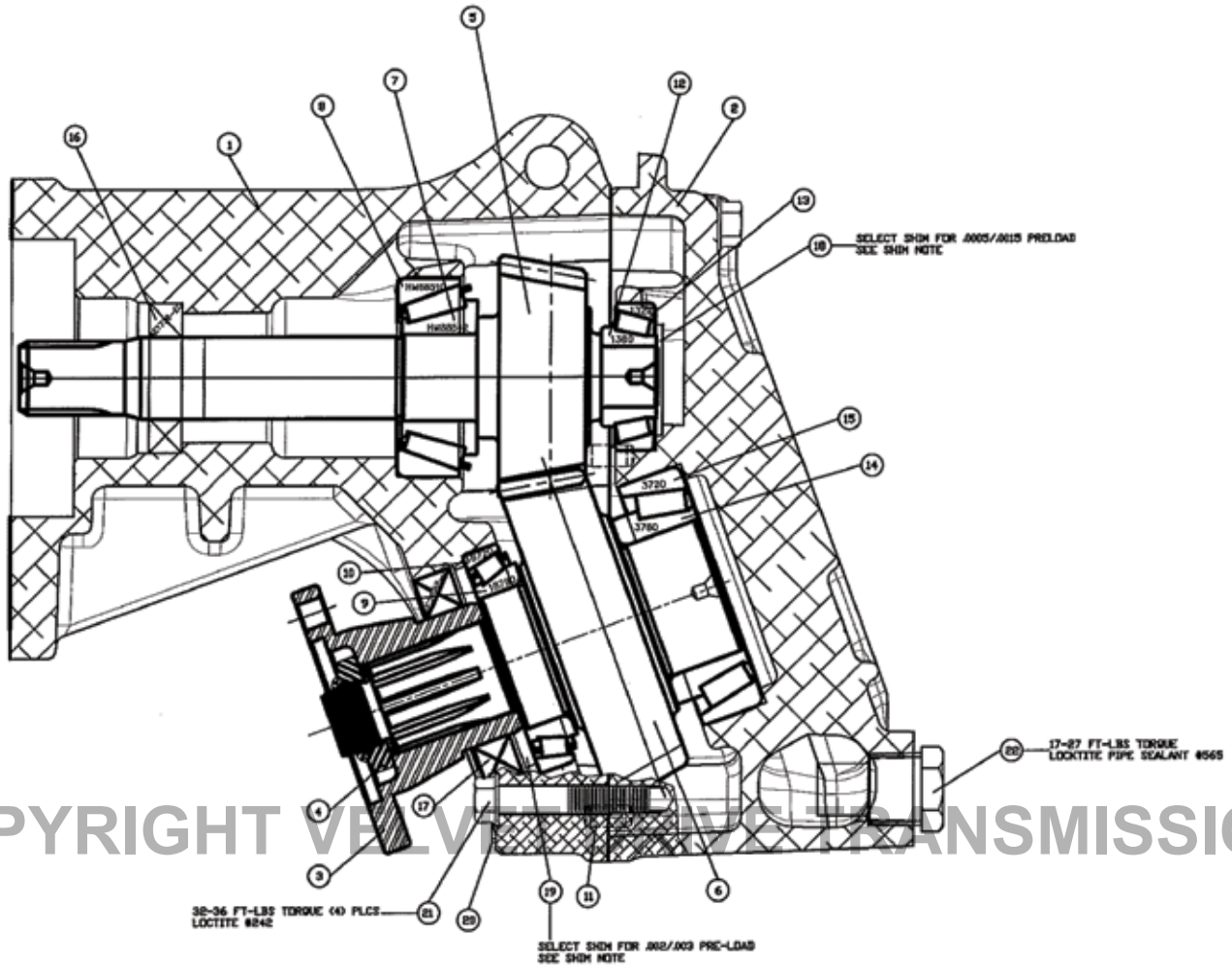
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The following international symbols are used in this service manual.

⚠ WARNING This symbol warns of possible personal injury

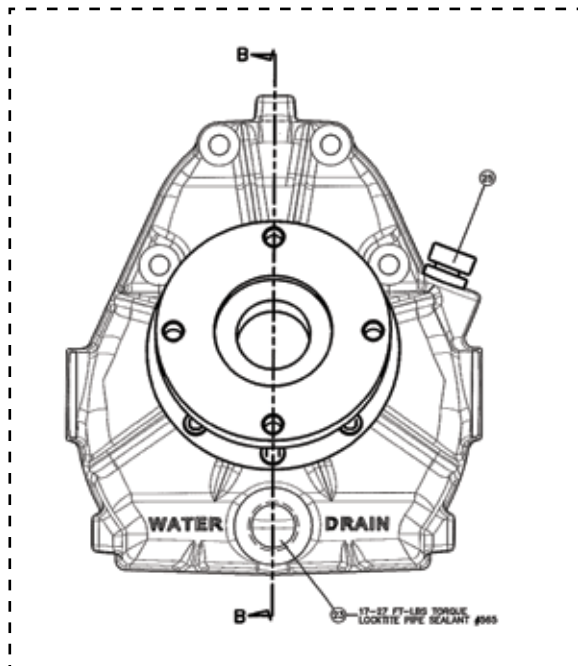
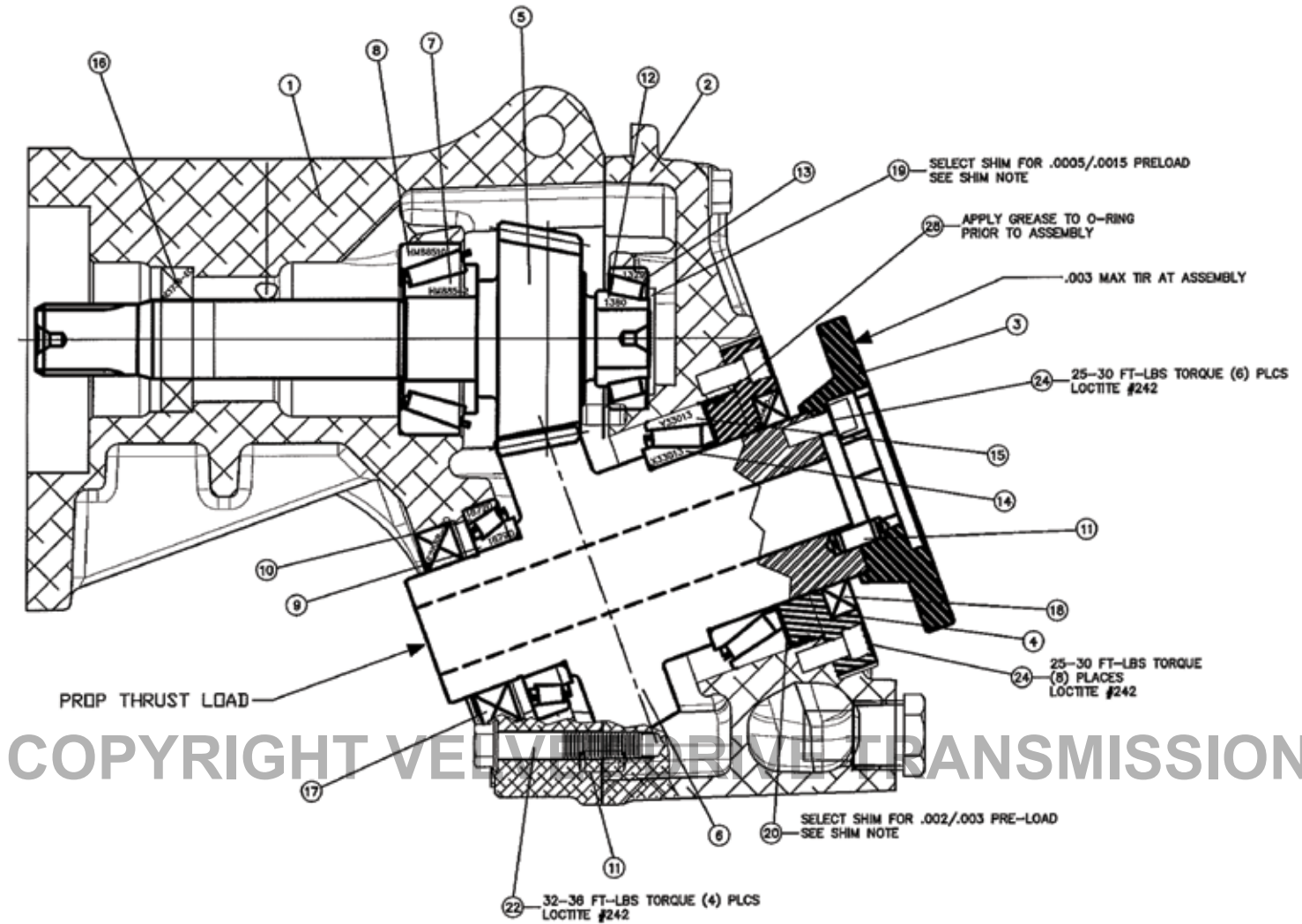
⚠ CAUTION This symbol warns of possible damage to transmissions.

OEM Original Equipment Manufacturer (Boat/Engine Manufacturer)



| VIEW # | QTY | PART NUMBER | DESCRIPTION |
|--------|-----|-------------|--------------------------|
| 1 | 1 | 30080650C1 | CASE- FRONT HALF |
| 2 | 1 | 30080650C2 | CASE - BACK HALF |
| 3 | 1 | 3008031001 | OUTPUT FLANGE |
| 4 | 1 | 4775L | LOCK NUT |
| 5 | 1 | 3008085001 | INPUT GEAR 1.5 RATIO |
| | | 3008085002 | INPUT GEAR 1.25 RATIO |
| | | 3008085003 | INPUT GEAR 2.0 RATIO |
| 6 | 1 | 3008070001 | OUTPUT GEAR 1.5 RATIO |
| | | 3008070002 | OUTPUT GEAR 1.25 RATIO |
| | | 3008070003 | OUTPUT GEAR 2.0 RATIO |
| 7 | 1 | 2000133075 | FRONT INPUT BEARING |
| 8 | 1 | 2000133074 | FRONT INPUT BEARING CUP |
| 9 | 1 | 3000133003 | FRONT OUTPUT BEARING |
| 10 | 1 | 3000133005 | FRONT OUTPUT BEARING CUP |
| 11 | 2 | 2002043001 | DOWEL PIN |

| VIEW # | QTY | PART NUMBER | DESCRIPTION |
|--------|-----|-------------|------------------------------|
| 12 | 1 | 3000133001 | REAR INPUT GEAR BEARING |
| 13 | 1 | 3000133002 | REAR INPUT GEAR BEARING CUP |
| 14 | 1 | 3000133007 | REAR OUTPUT GEAR BEARING |
| 15 | 1 | 3000133006 | REAR OUTPUT GEAR BEARING CUP |
| 16 | 1 | 3005044001 | INPUT GEAR SEAL |
| 17 | 1 | 3005044002 | OUTPUT GEAR SEAL |
| 18 | 1 | 3005037006 | INPUT GEAR BEARING SHIM KIT |
| 19 | 1 | 3008037006 | OUTPUT GEAR BEARING SHIM KIT |
| 20 | 1 | 3008052002 | PIPE PLUG (MAGNETIC) |
| 21 | 8 | 3008183001 | CASE BOLTS 3/8-16 X 2.25 LG. |
| 22 | 1 | 3008052001 | PIPE PLUG (ZINC ANODE) |
| 23 | 1 | 3008559001 | OIL DIP STICK |
| 24 | 1 | A4740G | BREATHER |
| 25 | 1 | 3008045001 | CASE GASKET |



SHIM NOTE
NOTE: MIN. THICKNESS SHIM ADJACENT TO BEARING CUP.
MAX. THICKNESS SHIM ADJACENT TO COVER.

FINISHED ROLLING TORQUE - NO SEALS
15 - 30 IN.LBS. CHECKED THRU INPUT

72LVTS V-DRIVE

| VIEW # | QTY | PART NUMBER | DESCRIPTION |
|--------|-----|-------------|--------------------------|
| 1 | 1 | 30080650C1 | CASE- FRONT HALF |
| 2 | 1 | 3008065TC3 | CASE - BACK HALF |
| 3 | 1 | 3008031T01 | OUTPUT FLANGE |
| 4 | 1 | 3008039T01 | OUTPUT SEAL PLATE |
| 5 | 1 | 3008085001 | INPUT GEAR 1.5 RATIO |
| | | 3008085002 | INPUT GEAR 1.25 RATIO |
| | | 3008085003 | INPUT GEAR 2.0 RATIO |
| | | 3008085004 | INPUT GEAR 1.76 RATIO |
| 6 | 1 | 3008070T01 | OUTPUT GEAR 1.5 RATIO |
| | | 3008070T02 | OUTPUT GEAR 1.25 RATIO |
| | | 3008070T03 | OUTPUT GEAR 2.0 RATIO |
| | | 3008070T04 | OUTPUT GEAR 1.76 RATIO |
| 7 | 1 | 2000133075 | FRONT INPUT BEARING |
| 8 | 1 | 2000133074 | FRONT INPUT BEARING CUP |
| 9 | 1 | 3000133003 | FRONT OUTPUT BEARING |
| 10 | 1 | 3000133005 | FRONT OUTPUT BEARING CUP |
| 11 | 2 | 2002043001 | DOWEL PIN |
| 12 | 1 | 3000133001 | REAR INPUT GEAR BEARING |

| VIEW # | QTY | PART NUMBER | DESCRIPTION |
|--------|-----|-------------|------------------------------|
| 13 | 1 | 3000133002 | REAR INPUT GEAR BEARING CUP |
| 14 | 1 | 2000133073 | REAR OUTPUT GEAR BEARING |
| 15 | 1 | 2000133072 | REAR OUTPUT GEAR BEARING CUP |
| 16 | 1 | 3005044001 | INPUT GEAR SEAL |
| 17 | 1 | 3005044002 | FRONT OUTPUT GEAR SEAL |
| 18 | 1 | 2000044003 | REAR OUTPUT GEAR SEAL |
| 19 | 1 | 3005037006 | INPUT GEAR BEARING SHIM KIT |
| 20 | 1 | 3005037007 | OUTPUT GEAR BEARING SHIM KIT |
| 21 | 1 | 3008052002 | PIPE PLUG (MAGNETIC) |
| 22 | 8 | 3008183001 | CASE BOLTS 3/8-16 X 2.25 LG. |
| 23 | 1 | 3008052001 | PIPE PLUG (ZINC ANODE) |
| 24 | 12 | 3006183005 | SEAL PLATE AND FLANGE BOLTS |
| | | | 5/16-18 X .75 LONG |
| 25 | 1 | 3008559001 | OIL DIP STICK |
| 26 | 1 | A4740G | BREATHER |
| 27 | 1 | 3008045001 | CASE GASKET |
| 28 | 1 | 2000141500 | O-RING |

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71LVTS V-DRIVE

| VIEW # | QTY | PART NUMBER | DESCRIPTION |
|--------|-----|-------------|-----------------------------|
| 1 | 1 | 30080650C1 | CASE- FRONT HALF |
| 2 | 1 | 3008065TC3 | CASE - BACK HALF |
| 3 | 1 | 3008031T01 | OUTPUT FLANGE |
| 4 | 1 | 3008039T01 | OUTPUT SEAL PLATE |
| 5 | 1 | 3018085001 | INPUT GEAR 1.50 RATIO |
| | | 3018085002 | INPUT GEAR 1.25 RATIO |
| 6 | 1 | 3018070T01 | OUTPUT GEAR 1.50 RATIO |
| | | 3018070T02 | OUTPUT GEAR 1.25 RATIO |
| 7 | 1 | 2000133075 | FRONT INPUT BEARING |
| 8 | 1 | 2000133074 | FRONT INPUT BEARING CUP |
| 9 | 1 | 3000133003 | FRONT OUTPUT BEARING |
| 10 | 1 | 3000133005 | FRONT OUTPUT BEARING CUP |
| 11 | 2 | 2002043001 | DOWEL PIN |
| 12 | 1 | 3000133001 | REAR INPUT GEAR BEARING |
| 13 | 1 | 3000133002 | REAR INPUT GEAR BEARING CUP |
| 14 | 1 | 2000133073 | REAR OUTPUT GEAR BEARING |

| VIEW # | QTY | PART NUMBER | DESCRIPTION |
|--------|-----|-------------|------------------------------|
| 13 | 1 | 3000133002 | REAR INPUT GEAR BEARING CUP |
| 14 | 1 | 2000133073 | REAR OUTPUT GEAR BEARING |
| 15 | 1 | 2000133072 | REAR OUTPUT GEAR BEARING CUP |
| 16 | 1 | 3005044001 | INPUT GEAR SEAL |
| 17 | 1 | 3005044002 | FRONT OUTPUT GEAR SEAL |
| 18 | 1 | 2000044003 | REAR OUTPUT GEAR SEAL |
| 19 | 1 | 3005037006 | INPUT GEAR BEARING SHIM KIT |
| 20 | 1 | 3005037007 | OUTPUT GEAR BEARING SHIM KIT |
| 21 | 1 | 3008052002 | PIPE PLUG (MAGNETIC) |
| 22 | 8 | 3008183001 | CASE BOLTS 3/8-16 X 2.25 LG. |
| 23 | 1 | 3008052001 | PIPE PLUG (ZINC ANODE) |
| 24 | 12 | 3006183005 | SEAL PLATE AND FLANGE BOLTS |
| | | | 5/16-18 X .75 LONG |
| 25 | 1 | 3008559001 | OIL DIP STICK |
| 26 | 1 | A4740G | BREATHER |
| 27 | 1 | 3008045001 | CASE GASKET |
| 28 | 1 | 2000141500 | O-RING |

V-Drive Gasket and Seal Kit (Front Mount Coupling Only)

| Index No. | Part Number | Description | Qty. |
|-----------|-------------|---------------------------------|------|
| | 3008420003 | V-DRIVE GASKET AND SEAL KIT | |
| | | MODEL 3008 AND 3019 MODELS ONLY | |
| | 3008045001 | GASKET | 1 |
| | 3005044002 | OUTPUT SEAL | 1 |
| | 3005044001 | INPUT SHAFT SEAL | 1 |

V-Drive Gasket and Seal Kit (Thru Shaft Coupling Only)

| Index No. | Part Number | Description | Qty. |
|-----------|-------------|---------------------------------|------|
| | 3008420003 | V-DRIVE GASKET AND SEAL KIT | |
| | | MODEL 3008 AND 3019 MODELS ONLY | |
| | 3008045001 | GASKET | 1 |
| | 3005044002 | FRONT OUTPUT SEAL | 1 |
| | 2000144003 | REAR OUTPUT SEAL | 1 |
| | 3005044001 | INPUT SHAFT SEAL | 1 |

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SEGMENT C

72LH & 72LHP



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The following international symbols are used in this service manual.

⚠ WARNING This symbol warns of possible personal injury

⚠ CAUTION This symbol warns of possible damage to transmissions.

OEM Original Equipment Manufacturer (Boat/Engine Manufacturer)

STEP 1. If removed, install the following parts in case. Install orfis in back of housing under rear bearing. Press bearing into case and retain with retainer ring. Install all plugs and fittings into top of housing. See chart for torque specs.

NOTE: Apply Loctite 565 thread sealant to all plugs.

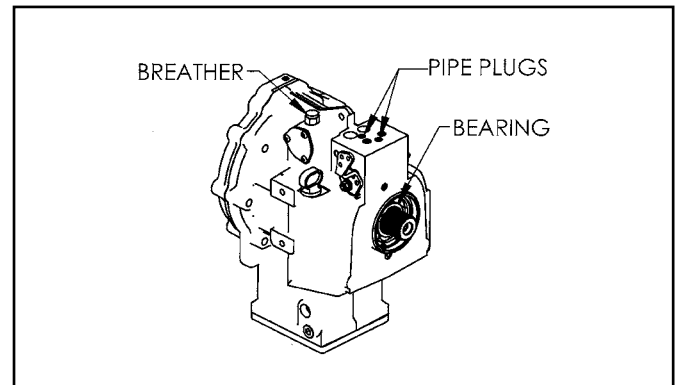
STEP 2. Install soil pick up scree. Use vasaline on o-ring prior to install insert oil pick up screen. Install cover gasket and install bottom plate.

Use loctite 242 on bolt thread and torque (8) bolts to spec. See chart for torque specs.

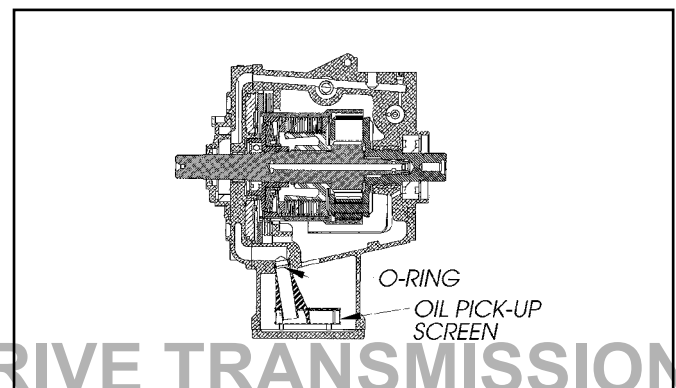
STEP 3. Install oil baffle in housing and retain with 2 screws.

STEP 4. Install pinion carrier assembly into housing. Lubricate sealing rings prior to assembly. Be sure sealing rings are locked into position. Oil sealing rings must spin freely in grooves. Once pinion carrier is pressed against bearing shoulder install retainer ring onto shaft. (72LHP Only)

NOTE: 72LH models Do not use a retainer ring on the output shaft. The carrier is retained by the output shaft coupling and nut.



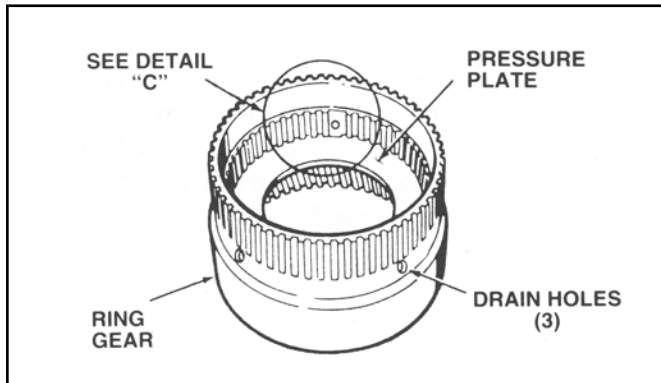
72LHP Case Assembly



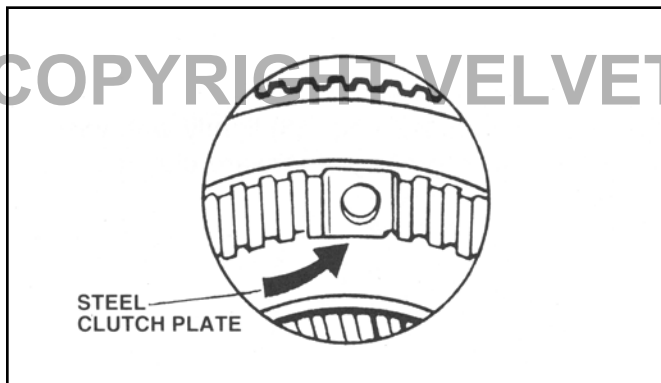
Oil Screen Assembly

STEP 5. Starting with a friction clutch plate , alternately stack friction clutch plates and steel clutch plates .

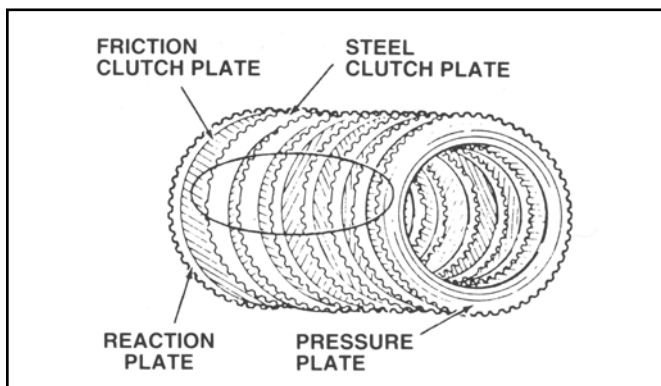
Steel clutch plates are designed with 3 missing teeth 120° apart. When installed in a ring gear, they should be installed with the missing teeth aligned with the 3 large drain holes as shown in detail "C".



Forward Clutch Pack Arrangement: Figure A

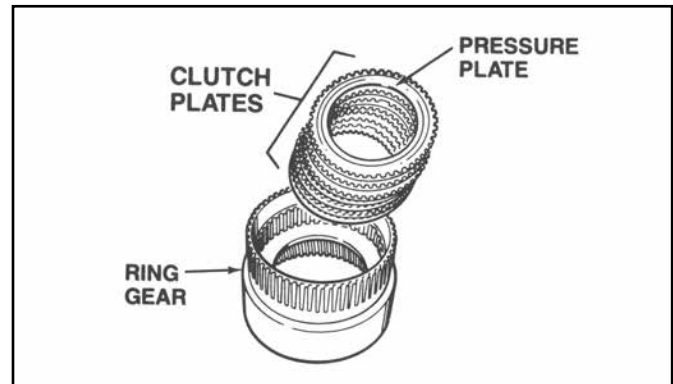


Detail C



Forward Clutch Pack Arrangement: Figure B

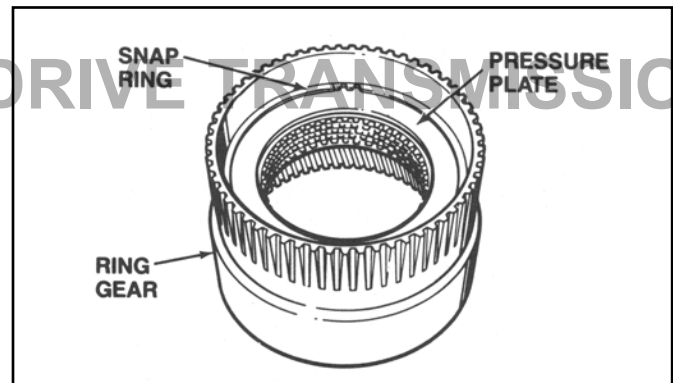
STEP 6. Install Clutch plates and pressure plate in ring gear.



Forward Clutch Pack Assembly

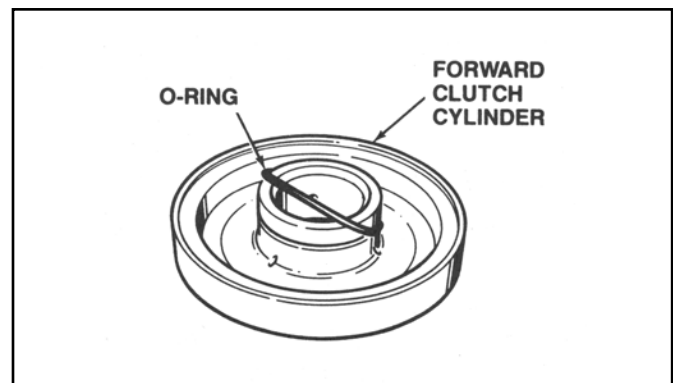
STEP 7. Install spacer ring 4755 in ring gear.

CAUTION CAUTION: Several different snap rings are used to assemble the clutch group. They have different thickness. Be sure the correct snap ring is used.



Snap Ring Installation

STEP 8. Lubricate O-ring lightly with vasoline and install in groove of forward clutch cylinder.



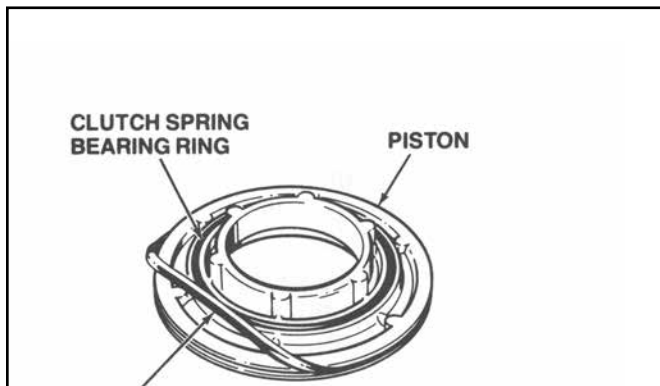
O-Ring Installation

STEP 9. Lubricate clutch spring bearing ring and piston sealing ring with vasoline.

Install clutch spring bearing ring in groove on piston face.

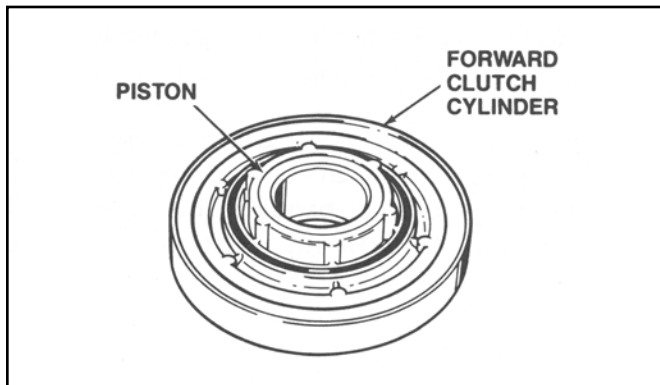
Install piston sealing ring in outer groove of piston.

NOTE: Check that piston sealing ring is not twisted, cut or deformed. Replace if damaged.



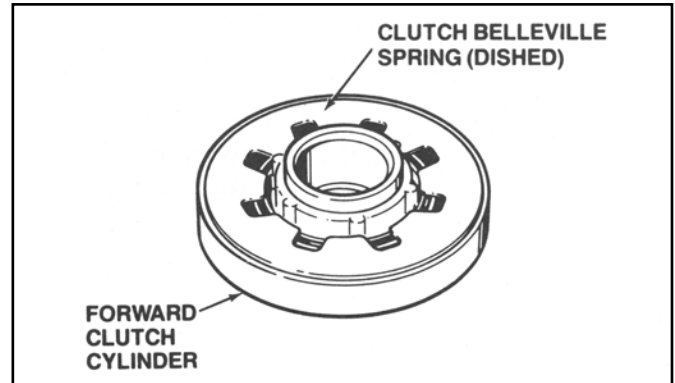
Clutch Ring Installation

STEP 10. Install piston in forward clutch cylinder.



Piston Installation

STEP 11. Place clutch Belleville (dish) spring inside rim of forward clutch cylinder. Spring is dished. The inside of the spring should be lower than the outside.

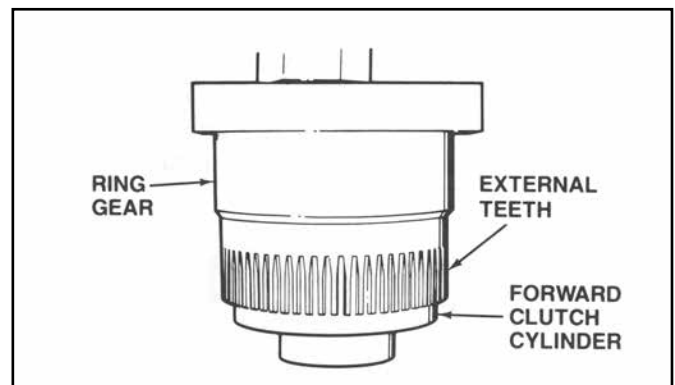


Clutch Spring Assembly

STEP 12. Install ring gear over forward clutch cylinder, with piston and spring facing up. Press ring gear down over forward clutch cylinder.



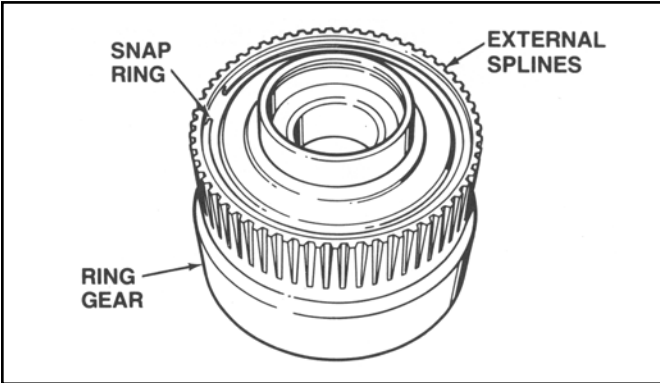
CAUTION: Check to see that clutch spring bearing ring is still seated in the groove of clutch piston.



Forward Clutch Cylinder Installation

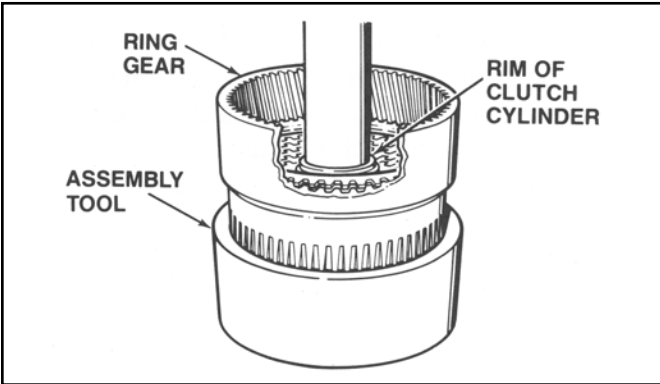
STEP 13. Remove clutch assembly from press. Install snap ring in groove of ring gear. (Snap ring 4822)

CAUTION: Several different snap rings are used to assemble the clutch group. They have different thicknesses. Be sure the correct snap ring is used.



Snap Ring Installation

STEP 14. Place ring gear in press with external splines facing down. Assembly tool should support the ring gear only. The forward clutch cylinder should not be touching the assembly tool. Press forward clutch cylinder against snap ring. Remove clutch assembly from press.



Compressing Clutch Pack

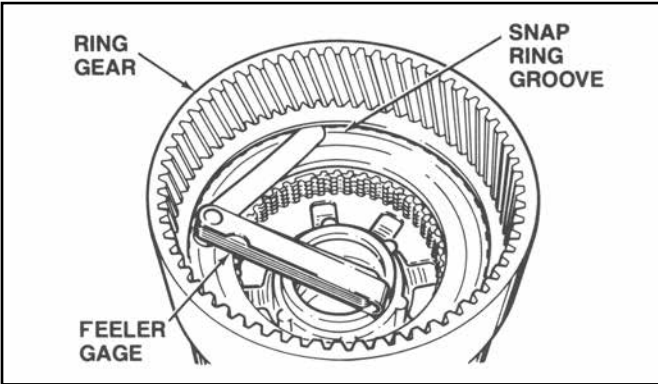
STEP 15. The following instructions are for the 72C models. Clutch pack clearance is not adjustable on 71C models. The clearances shown for 71C models are for reference only.

Push down, by hand, on clutch plates. Measure snap ring gap. Select proper thickness snap ring or combination of snap rings to set clutch pack clearance. Refer to chart below. More than one snap ring may be required.

Clutch End Play Chart

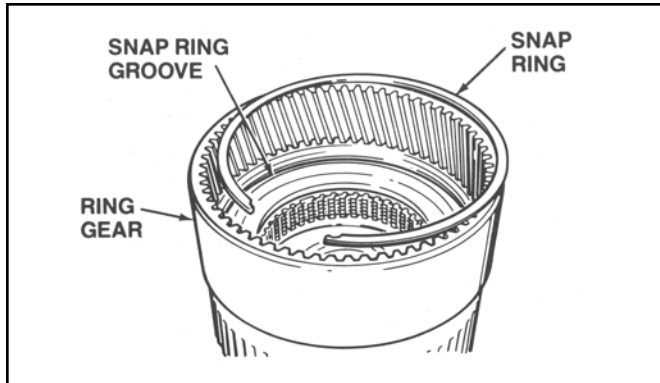
| Model | Assembly Number | Clutch End Play |
|-------|-----------------|-----------------|
| 72LH | 3010 | .040/.055 |
| 72LHP | 3009 | .050/.060 |

| Part Number | Snap Ring Thickness | |
|---------------|---------------------|-------------|
| | in. | mm |
| 10-00-139-048 | .033 - .037 | .84 - .094 |
| 10-00-139-049 | .050 - .054 | 1.27 - 1.37 |
| 4768 | .050 - .054 | 1.3 - 1.4 |
| 10-00-139-018 | .062 - .066 | 1.6 - 1.7 |
| 4768A | .074 - .078 | 1.9 - 2.0 |
| 4768B | .096 - .100 | 2.4 - 2.5 |



Snap Ring Selection

STEP 16. Install selected snap ring(s) in groove of ring gear. Repeat step till proper clutch end play is achieved.



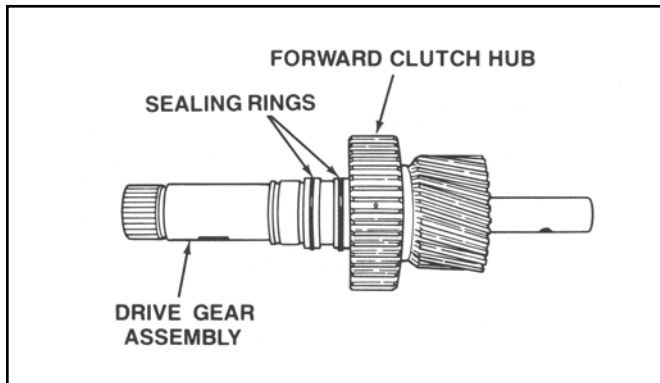
Snap Ring Assembly

STEP 17. If removed, press forward clutch hub on drive gear assembly and against shoulder.

Install snap ring in groove of drive gear assembly.

Lubricate sealing rings with vasoline and install in grooves of drive gear assembly.

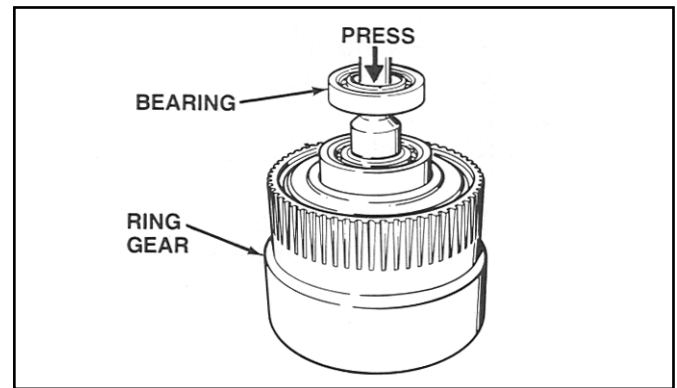
Compress each sealing ring until it locks in place.



Sealing Ring Installation

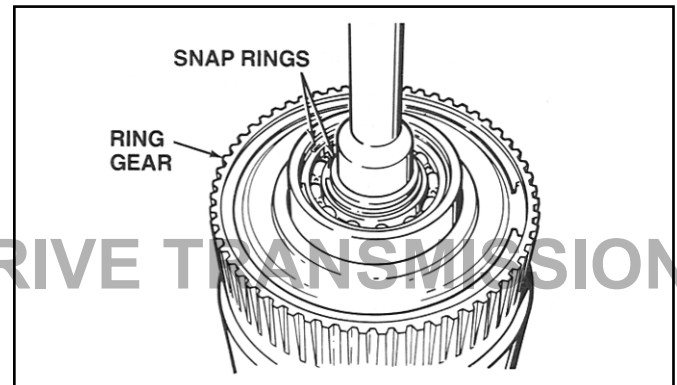
STEP 18. Install drive gear assembly in clutch assembly. Slide bearing down drive gear assembly.

Place complete assembly in press. Press bearing into drive gear assembly until seated against shoulder.



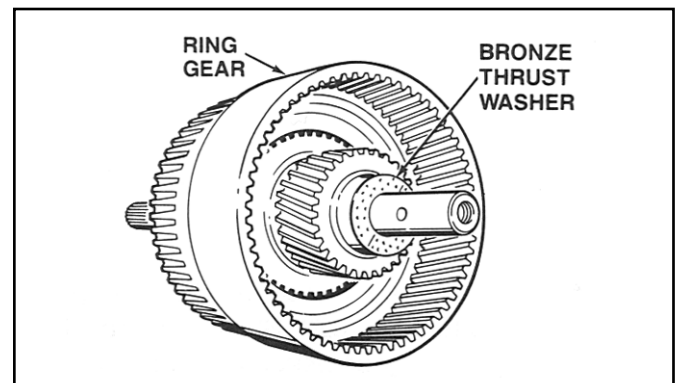
Bearing Installation

STEP 19. Install snap rings in grooves of drive gear assembly and forward clutch cylinder.



Snap Ring Installation

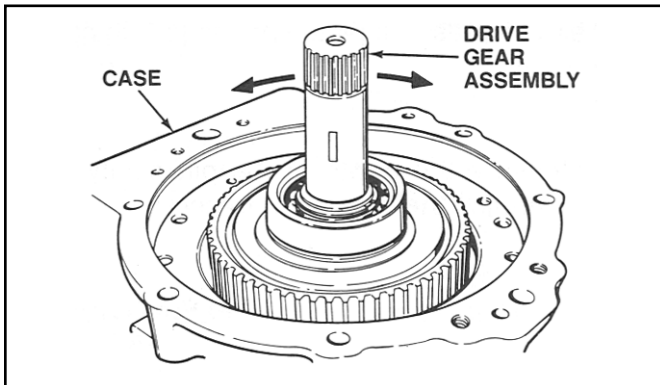
STEP 20. Apply vasoline to bronze thrustwasher. Install over end of shaft and against face of gear.



Thrustwasher Assembly

STEP 21. Install clutch and drive gear assembly in case.

Rotate clutch and drive gear assembly back and forth to engage ring gear teeth with pinion gear teeth.



Clutch and Drive Gear Installation

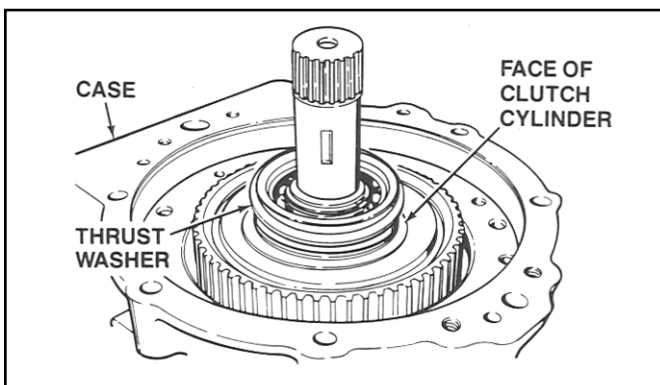
STEP 22. If original case and clutch cylinder are used, install thrustwasher on face of clutch cylinder.

If new components are used, measure to select proper thrustwasher.

Position case vertically as shown. Measure from face of case, without gasket, to face of clutch cylinder.

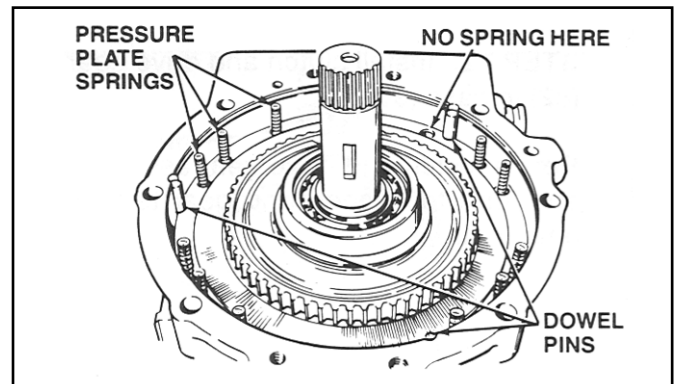
When dimension is 0.424 inch (10.77mm) or less, use 71-15B thrustwasher.

When dimension is greater than 0.424 inch (10.77mm), use 1016-193-001 thrustwasher.



Thrustwasher Installation

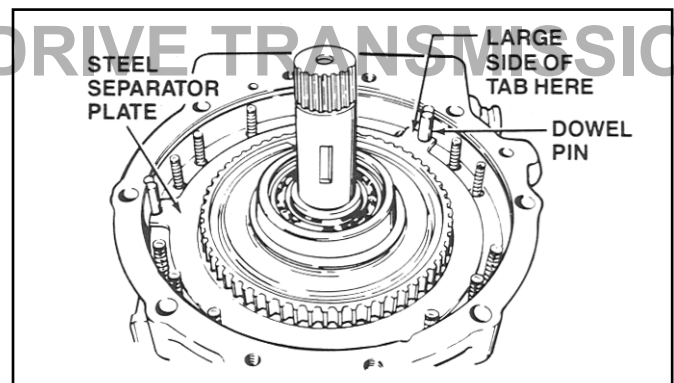
STEP 23. Install three dowel pins and eleven pressure plate springs in case.



Spring and Dowel Pin Installation

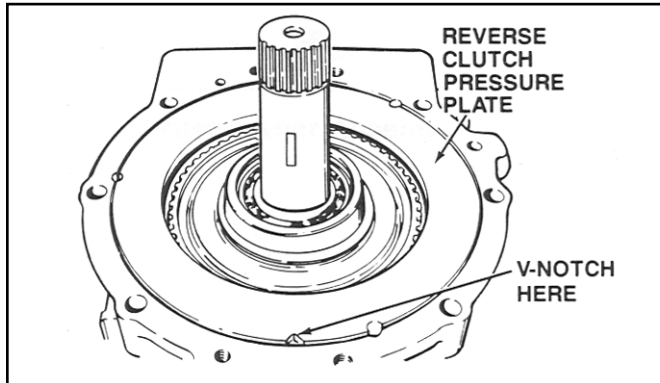
STEP 24. Install one steel separator plate in case with large part of tab to left of dowel pin.

Alternately stack remaining reverse clutch friction plates and steel separator plates in case (see page 34).



Reverse Clutch Pack Installation

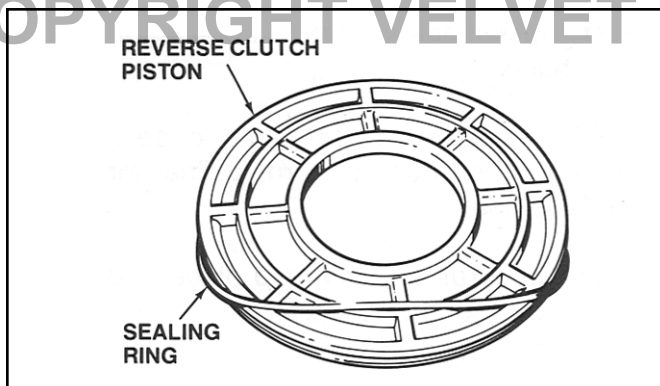
STEP 25. Install reverse clutch pressure plate in case with three half moons aligned with dowel pins. Be sure all springs are seated in their holes.



Pressure Plate Installation

STEP 26. Lubricate sealing ring with vasoline and install in groove of reverse clutch piston.

NOTE: be sure sealing ring is not twisted, cut or distorted. Replace if damaged.



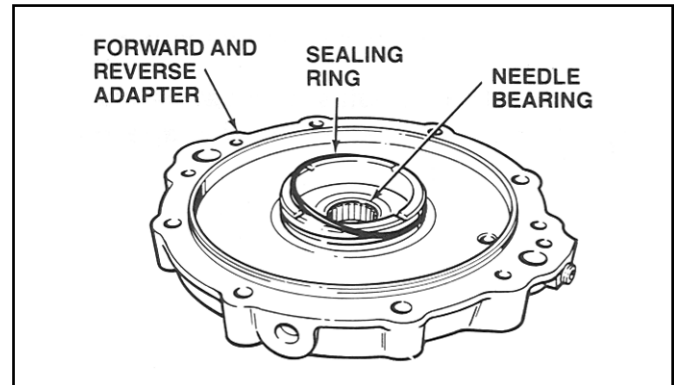
Sealing Ring Assembly

STEP 27. If removed, press needle bearing into adapter. Needle bearing must be installed flush against bore shoulder of adapter.

Lubricate O-ring with vasoline and install in groove of adapter.

NOTE: Be sure O-ring is not twisted, cut or distorted. Replace if damaged.

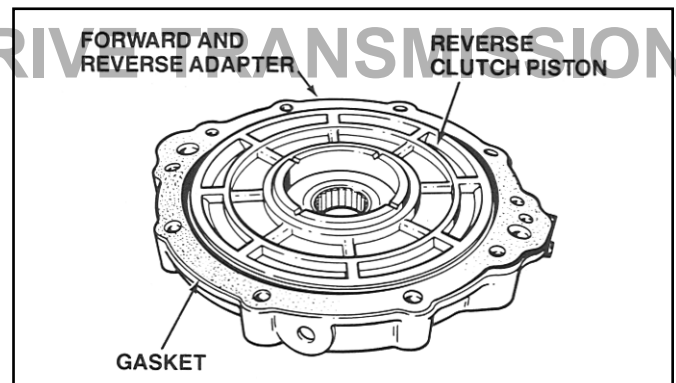
If removed, install dryseal plug in adapter.



Sealing Ring Installation

STEP 28. Install reverse clutch piston in adapter.

Lightly coat gasket with vasoline and place on adapter.

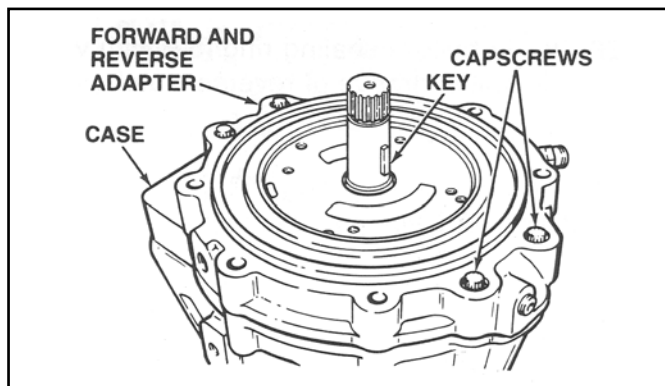


Reverse Clutch Piston Assembly

STEP 29. Install adapter on case and align bolt holes.

Thread four capscrews into case. Tighten in a criss-cross pattern to final torque specified in Table 4.

Lightly tap dowel key into place in drive gear with a soft-faced mallet.

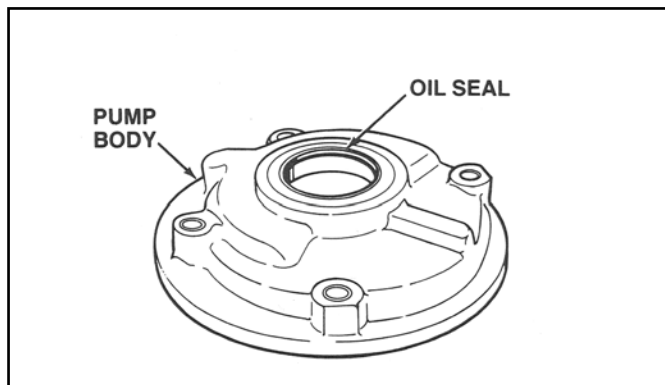


Adapter Installation

STEP 30. Press oil seal into pump body. Due to seal retainer lip, seal must be pressed from back side.



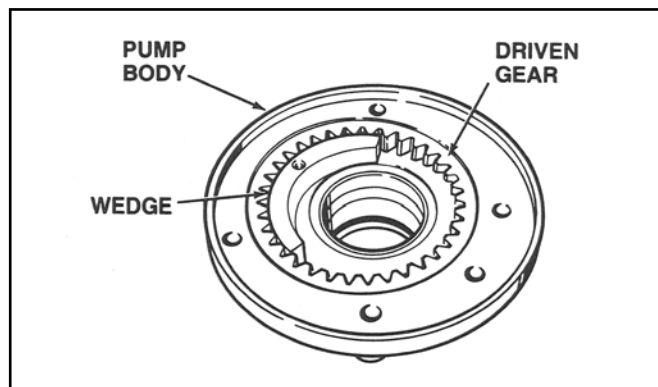
CAUTION: Oil Seal must be installed dry. Lubricants can damage rubber coating.



Oil Seal Installation

STEP 31. Install driven gear in pump body.

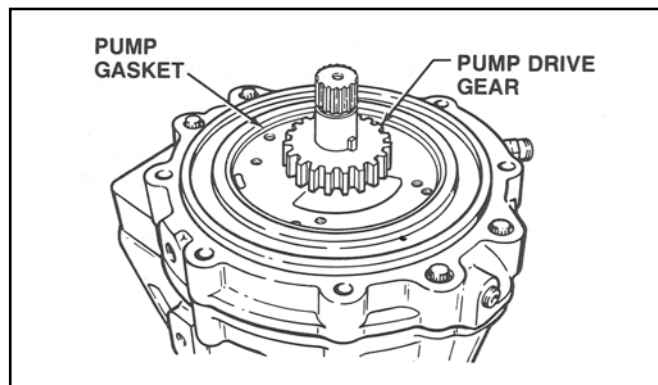
NOTE: Pump gear should be installed the same side down as removed. Fill cavity with ATF to lubricate gears.



Pump Driven Gear Assembly

STEP 32. Lubricate pump gasket with vasoline and install in groove of adapter.

Install pump drive gear onto input shaft. Check that pump drive gear locates freely on dowel key and shaft.

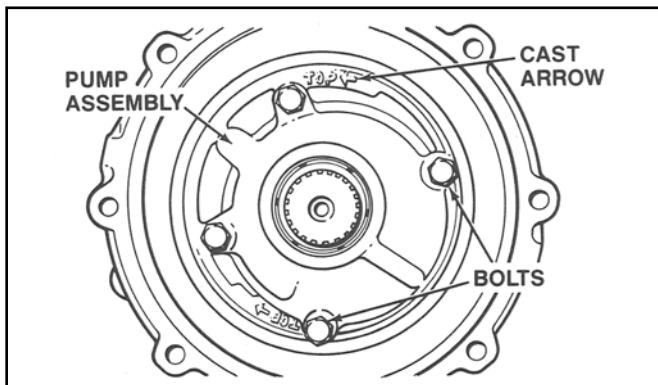


Pump Gasket Installation

STEP 33. Install pump assembly on top of adapter and align bolt holes.

CAUTION: Position pump housing with cast arrow at top pointing in the same direction as engine rotation.

Thread four bolts into adapter. Tighten in a criss-cross pattern to final torque specified in Table 4.

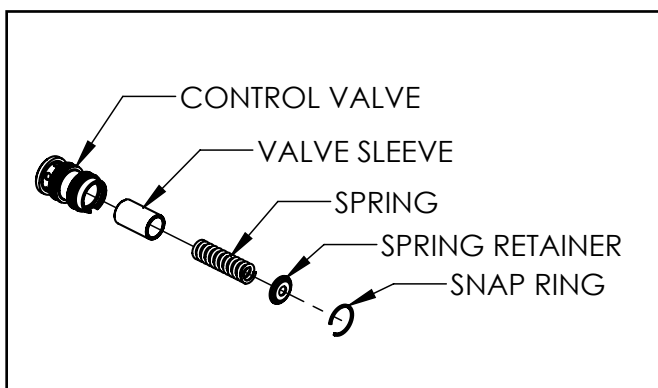


Pump Assembly Installation

STEP 34. Assemble pressure relief valve assembly. Refer to figure below.

Lubricate O-rings with vasoline and install on end of valve assembly.

NOTE: Gap in snap ring must be aligned with notch in control valve.



PRV Valve Assembly

STEP 35. Lubricate control valve O.D. Slide valve assembly into side of case.

STEP 36. Install valve cover as follows:

Position gasket on case. Place valve cover over gasket and align bolt holes.

Thread three bolts into case. Tighten bolts in a criss-cross pattern to final torque specified in Table 4.

If removed, lubricate O-ring with vasoline and install in groove of neutral switch. Thread neutral switch assembly into valve cover and tighten to torque specified in Table 4.

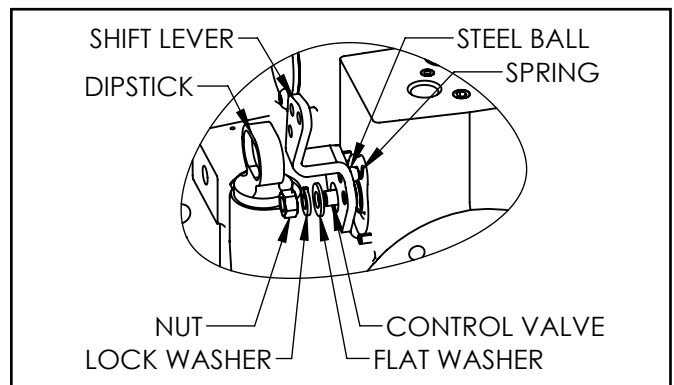
STEP 37. Manual Shift:

Install shift spool in housing. Lubricate O-ring before installing with spool in position insert retainer ring into groove in housing.

Lubricate poppet spring and hole in case with grease. Place poppet spring and steel ball in case.

Slide shift lever over end of control valve assembly and against steel ball. Rotate shift lever to engage steel ball in hole of shift lever.

Hold shift lever against steel ball. Install washers and thread nut on valve assembly. Tighten nut to torque specified in Table 4.



Shift Lever Assembly

STEP 37A. Electric Shift:

Be sure cartridge screen is clean. Insert cartridge into port and torque to spec in Table 4.

Slide coils over cartridge stem. Be sure you have the spacer washer between the 2 coils. Position coils as needed and tighten nut to spec in Table 4.

STEP 38. For 72LH Only. Slide coupling on output shaft. Thread nut on output shaft. Tighten nut to torque shown in Table 4.

For 72LHP. Slide coupling onto shaft. Insert alignment washer and bolt. See torque spec shown in Table 4.

STEP 39. Install dipstick in side of case. Turn handle until snug. Do not over tighten.

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CAUTION **CAUTION:** After a transmission failure, the cooler should be replaced and all lines flushed.

Align input shaft spline with damper plate.

Assemble transmission to engine and then install bolts.
Do not use bolts to draw transmission against engine.

WARNING **WARNING:** Check the shift lever at the helm to see that forward position is also forward position at the transmission shift lever. (Transmission should not be running in reverse when boat is going forward.)

Adjust the shift cable so the holes in the shift lever are centered over the detent ball at each selector location. See figure 7A.

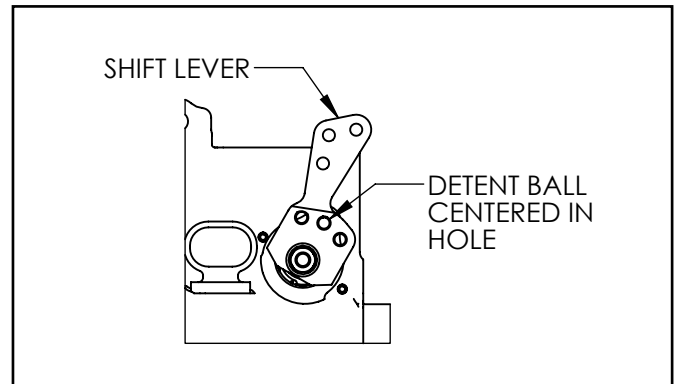


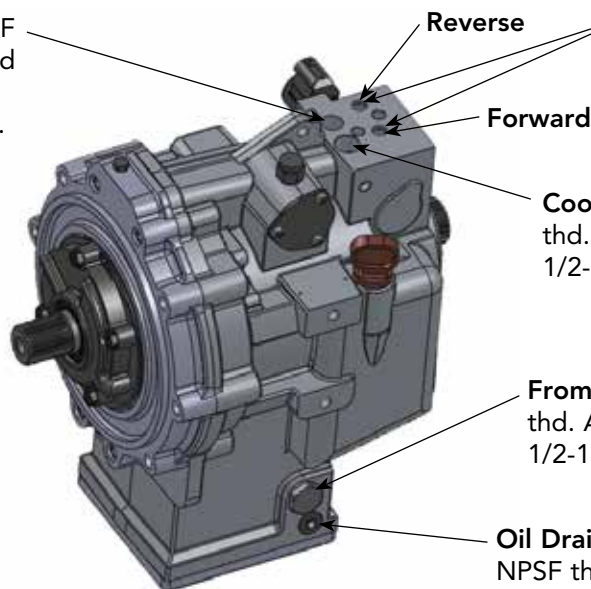
Figure 7A. Shift Cable Adjustment

Read OEM manual for complete installation instructions.

Connect oil line to oil to the cooler outlet. See Figure 7B.

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Temp Sensor Port: 3/8-18 NPSF thread. Accommodates standard 3/8 NPT thread sensor. Can be used for mainline pressure port.



Pressure Sensor Ports:
Plug if not using sensors.
(SAE J1926-4 7/16-20 thd.)

Cooler Out Port: 1/2-14 NPSF thd. Accommodates standard 1/2-14 NPT fitting.

From Cooler Port: 1/2-14 NPT thd. Accommodates standard 1/2-14 NPT fitting.

Oil Drain Hole: 1/2-14 NPSF thd.

72LHP and 72LH (Models 3009 and 3010)

Pressure Readings

Pressures should read as follows with transmission temperature of 120° – 130°F.

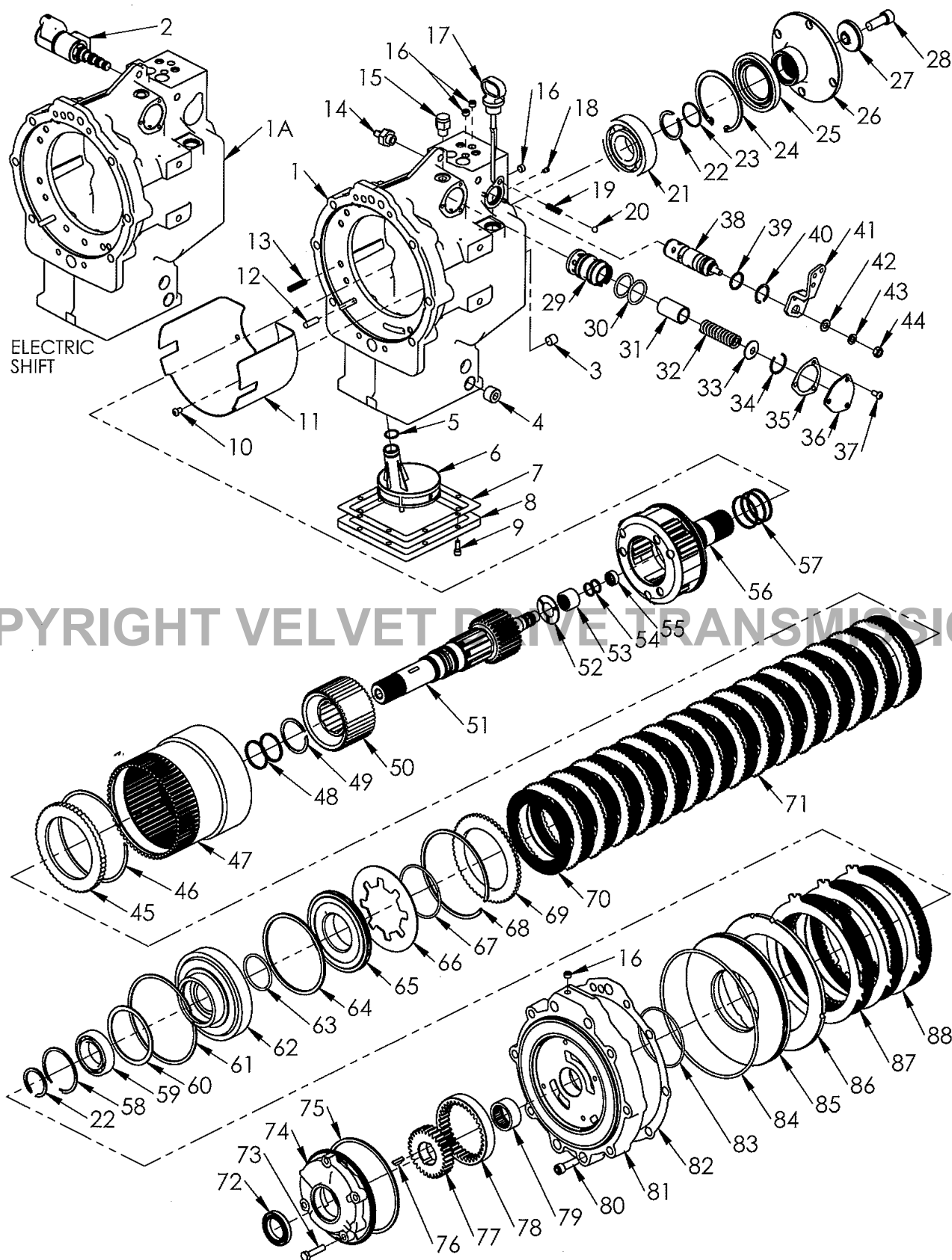
| Engine RPM | Neutral Line | | Reverse Clutch | | Mainline Reverse Pressure | | Mainline Forward Pressure | | GPM Cooler Flow Reverse | | GPM Cooler Flow Forward | |
|------------|--------------|------|----------------|------|---------------------------|------|---------------------------|------|-------------------------|------|-------------------------|------|
| | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. |
| 700 | 160 | 215 | 140 | 225 | 140 | 205 | 145 | 210 | .25 | 2.0 | .25 | 2.0 |
| 2000 | -- | -- | 175 | 235 | 175 | 235 | 175 | 225 | 4.0 | 10.0 | 4.0 | 10.0 |
| 3500 | -- | -- | -- | -- | -- | -- | 190 | 245 | -- | -- | 8.0 | 13.5 |

TABLE 4. Bolt and Fastener Torque Specs. (Non Lubricated)

72LH and 72LHP (Models 3009 and 3010)

| Part Number | Description | FT-LB | Nm |
|------------------------------|-----------------------------------|---------|---------|
| Main Housing | | | |
| 9418892 | 5/16-24 Shift Lever Nut | 8-11 | 11-15 |
| 3009183021 | 1/2-20 X 1.25 LG SOC HD CAP SCREW | 120-130 | 162-176 |
| 10-00-149-034 | Coupling Nut (3010 model only) | 160-260 | 217-353 |
| 10-00-183-021 | 5/16-18 X 1" Hex Head Bolt | 15-16 | 20-21 |
| 20-00-183-017 | 3/8-16 X 1-1/4 Capscrew | 32-36 | 43-48 |
| 4885B | 3/4-14 Dryseal Bushing | 20-30 | 27-40 |
| 444688 | 1/8-27 Pipe Plug | 7-12 | 9-16 |
| 10-00-640-004 | Neutral Switch | 20-22 | 27-29 |
| 30-00-064-001 | Neutral Switch | 20-22 | 27-29 |
| 433648 | 1/4-20 X Button Head Bolt | 6-8 | 8-10 |
| 30-09-183-001 | 1/4-20 X .62 Socket HD Cap Screw | 6-8 | 8-10 |
| 30-00-072-001 | 1/4-18 NPSF Breather | 14-24 | 19-32 |
| Electric Shift Option | | | |
| 30-09-140-001 | 3/4-16 Solenoid Stem | 20 | 27 |
| | Coil Nut | 5 | 7 |

| Pipe Plugs | | |
|---------------------|--------------|-------|
| Thread Size | Torque FT-LB | Nm |
| 1/8-27 Dryseal NPSF | 7-12 | 9-16 |
| 1/4-18 Dryseal NPSF | 14-24 | 19-33 |
| 3/8-18 Dryseal NPSF | 17-27 | 23-36 |
| 3/4-18 Dryseal NPSF | 25-35 | 34-48 |



| Item No. | Part Number | Description | Qty. |
|----------|----------------|---|------|
| 1 | 3009065MC1 | MAIN CASE MANUAL SHIFT | 1 |
| 1A | 3009065ECI* | MAIN CASE ELECTRIC SHIFT | 1 |
| 1B | 3009065MC6 | MAIN CASE MANUAL SHIFT MERC 6 BC | 1 |
| 1C | 3009065EC6 | MAIN CASE ELECTRIC SHIFT MERC 6 BC | 1 |
| 2 | 3009140001* | SOLENOID | 1 |
| 3 | 413281 | 1/4-18 NPTF PIPE PLUG | 1 |
| 4 | 3008052002 | PIPE PLUG | 1 |
| 5 | 4804M | O-RING | 1 |
| 6 | 10-16-238-001 | SUPM SCREEN | 1 |
| 7 | 3009045001 | GASKET - OIL PAN BOX COVER | 1 |
| 8 | 30090130C1 | OIL PAN COVER | 1 |
| 9 | 3009183001 | BOLT | 8 |
| 10 | 433638 | BOLT, HEX SOCKET 1/4-20 X 3/8 | 2 |
| 11 | 3009036001 | OIL BAFFLE | 1 |
| 12 | 10-00-043-031 | DOWEL PIN | 3 |
| 13 | 71-97 | PRESSURE PLATE SPRING | 11 |
| 14 | 3000640001 | NEUTRAL SWITCH - WIRE LEADS | 1 |
| 14A | 10--00-140-007 | NEUTRAL SWITCH WITH SCREW LEADS | 1 |
| 15 | 3000072001 | BREATHER | 1 |
| 16 | 444688 | 1/8 NPT PIPE PLUG | 4 |
| 17 | 3009559001 | DIPSTICK | 1 |
| 18 | 3009183004 | ORIFICE | 1 |
| 19 | 71-42 | SPRING - POPPET | 1 |
| 20 | 453632 | STEEL BALL (5/16) | 1 |
| 21 | 20-00-130-001 | BEARING - ANNULAR | 1 |
| 22 | 4559A | SNAP RING MODEL 3009 ONLY | 2 |
| 23 | 3009141001 | O-RING MODEL 3009 ONLY | 1 |
| 24 | 30-06-139-002 | RING - RETAINING | 1 |
| 25 | 3009044002 | OIL SEAL | 1 |
| 26 | 3009031001 | COUPLING - OUTPUT 3009 MODEL ONLY - 1480 FLANGE | 1 |
| 26A | 3009031002 | COUPLING - OUTPUT 3009 MODEL ONLY - 1350 FLANGE | 1 |
| 26B | 3010031001 | 5" PROP SHAFT COUPLING MODEL 3010 ONLY | 1 |
| 26C | 3010031002 | COUPLING - OUTPUT 3010 MODEL ONLY - 1350 FLANGE | |
| 26D | 3010031003 | COUPLING - OUTPUT 3010 MODEL ONLY - 1480 FLANGE | |
| 26E | 1000149034 | COUPLING NUT FOR MODEL 3010 ONLY | |
| 27 | 3009047001 | SPACER | 1 |
| 28 | 3009183021 | BOLT, 1/2-20 X 1.25 | 1 |
| 29 | 3009239002 | VALVE - SLEEVE | 1 |
| 29A | 3009739002 | VALVE ASSEMBLY | |
| 30 | 3007141001 | O-RING | 2 |
| 31 | 71-243 | VALVE - PRESSURE REGULATOR | 1 |
| 32 | 71-242 | VALVE - SPRING | 1 |
| 33 | 71-246 | SPRING RETAINER | 1 |
| 34 | 4821 | SNAP RING | 1 |
| 35 | 71-14 | VALVE COVER GASKET | 1 |

| Item No. | Part Number | Description | Qty. |
|----------|---------------|-------------------------------------|------|
| 36 | 3006039001 | VALVE COVER | 1 |
| 37 | 433648 | SCREW | 3 |
| 38 | 3006239005 | CONTROL VALVE | 1 |
| 39 | 3006141001 | O-RING | 1 |
| 40 | 3006139001 | SNAP RING | 1 |
| 41 | 71-79B | SHIFT LEVER | 1 |
| 42 | 103340 | FLAT WASHER (5/16) | 1 |
| 43 | 108579 | LOCK WASHER (5/16) | 1 |
| 44 | 9418892 | HEX NUT (5/16-24) | 1 |
| 45 | 5L-67 | REAR CLUTCH PRESSURE PLATE | 1 |
| 46 | 4768 | RING - SHIM (SELECTIVE FIT) | 1 |
| 46A | 4768A | RING - SHIM (SELECTIVE FIT) | |
| 46B | 4768B | RING - SHIM (SELECTIVE FIT) | |
| 46C | 1000139018 | RING - SHIM (SELECTIVE FIT) | |
| 46D | 1000139019 | RING - SHIM (SELECTIVE FIT) | |
| 46E | 1000139048 | RING - SHIM (SELECTIVE FIT) | |
| 47 | 3009162001 | RING GEAR MODEL 3009 ONLY | 1 |
| 47A | 3010162001 | RING GEAR MODEL 3010 ONLY | 1 |
| 48 | 4806J | SEALING RING | 2 |
| 49 | 3009139001 | SNAP RING | 1 |
| 50 | 3009090001 | CLUTCH HUB MODEL 3009 ONLY | 1 |
| 50A | 3010090001 | CLUTCH HUB MODEL 3010 ONLY | 1 |
| 51 | 3009085001 | DRIVE GEAR MODEL 3009 ONLY | 1 |
| 51A | 3010085001 | DRIVE GEAR MODEL 3010 ONLY | 1 |
| 52 | 71-17 | WASHER - THRUST | 1 |
| 53 | 20-00-132-001 | BEARING - 7/8 ID | 1 |
| 54 | 4806S | RING - OIL SEALING | 2 |
| 55 | 20-00-132-200 | BEARING - 5/8 ID | 1 |
| 56 | 3009659002 | CARRIER ASSEMBLY MODEL 3009 ONLY | 1 |
| 57 | 20-00-016-050 | SEALING RING | 3 |
| 58 | 4766B | SNAP RING | 1 |
| 59 | 10-00-130-016 | BEARING - ANNULAR | 1 |
| 60 | 71-15B | WASHER - THRUST | 1 |
| | 1016193001 | WASHER - THRUST (OPTIONAL) | |
| 61 | 4822 | SNAP RING - RING GEAR | 1 |
| 62 | 3009014001 | CLUTCH PISTON HOUSING | 1 |
| 63 | 5M-122 | O-RING | 1 |
| 64 | 3009044001 | PISTON SEALING RING | 1 |
| 65 | 3009124001 | PISTON - FORWARD CLUTCH | 1 |
| 66 | 3-37 | CLUTCH BELLEVILLE SPRING | 1 |
| 67 | 5C-33 | CLUTCH PISTON WEAR RING | 1 |
| 68 | 4755 | SNAP RING | 1 |
| 69 | 3009062001 | CLUTCH PRESSURE PLATE | 1 |
| 70 | 3009166001 | CLUTCH DISC (PAPER) MODEL 3009 ONLY | 16 |
| 70A | 3009166001 | CLUTCH DISC (PAPER) MODEL 3010 ONLY | 12 |
| 70B | 3000166001 | CLUTCH DISC (BRONZE) OPTIONAL | |

| Item No. | Part Number | Description | Qty. |
|----------|---------------|---|------|
| 71 | 10-16-166-001 | PLATE - OUTER CLUTCH (MODEL 3009 ONLY) | 15 |
| 71A | 10-16-166-001 | PLATE - OUTER CLUTCH (MODEL 3010 ONLY) | 11 |
| 72 | 10-00-044-014 | OIL SEAL | 1 |
| 73 | 20-00-183-005 | BOLT, HEX - 5/16-18 X 1 3/8 | 4 |
| 74 | 71C-60 | FRONT PUMP HOUSING | 1 |
| 75 | 3-61 | PUMP GASKET | 1 |
| 76 | 3009043001 | DOWEL MODEL 3009 ONLY | 1 |
| 76A | 4873 | KEY MODEL 3010 ONLY | 1 |
| 77 | 71-64-1 | FRONT PUMP DRIVE GEAR MODEL 3009 ONLY | 1 |
| 77A | 71-64 | FRONT PUMP DRIVE GEAR MODEL 3010 ONLY | 1 |
| 78 | 3-63A | FRONT PUMP DRIVEN GEAR | 1 |
| 79 | 4840D | NEEDLE BEARING | 1 |
| 80 | 2000183017 | SHCS 3/8-16 X 1.25 | 4 |
| 81 | 3006172001 | ADAPTER - MACHINED | 1 |
| 82 | 30-06-045-003 | GASKET - CASE & ADAPTER | 1 |
| 83 | 4804G | ADAPTOR O-RING | 1 |
| 84 | 4805A | REV. PISTON SEALING RING | 1 |
| 85 | 71-35 | REVERSE CLUTCH PISTON | 1 |
| 86 | 71-71 | REVERSE CLUTCH PRESSURE PLATE | 1 |
| 87 | 3000166002 | BRONZE HEAVY DUTY REVERSE CLUTCH PLATE (OPTIONAL) | 3 |
| 87A | 3009166002 | PAPER HIGH PERFORMANCE REVERSE CLUTCH PLATE | 3 |
| 88 | 72-176 | OUTER CLUTCH PLATE | 3 |

*OPTIONAL ELECTRIC SHIFT COMPONENTS

FORWARD CLUTCH KITS

FORWARD CLUTCH PACK KIT (3009 MODEL ONLY)

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--|------|
| | 3009410002 | PAPER FWD CLUTCH PACK KIT (3009 MODEL ONLY) | |
| 69 | 3009062001 | CLUTCH PRESSURE PLATE | 1 |
| 71 | 10-16-166-001 | STEEL CLUTCH PLATE | 15 |
| 70 | 3009166001 | FRICTION CLUTCH PLATE (PAPER) | 16 |
| 45 | 5L-67 | REAR CLUTCH PRESSURE PLATE | 1 |

FORWARD PAPER CLUTCH PACK KIT (3010 MODEL ONLY)

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--|------|
| | 3010410002 | PAPER FWD CLUTCH PACK KIT (3010 MODEL ONLY) | |
| 69 | 3009062001 | CLUTCH PRESSURE PLATE | 1 |
| 71 | 10-16-166-001 | STEEL CLUTCH PLATE | 11 |
| 70 | 3009166001 | FRICTION CLUTCH PLATE (PAPER) | 12 |
| 45 | 5L-67 | REAR CLUTCH PRESSURE PLATE | 1 |

FORWARD BRONZE CLUTCH PACK KIT (3010 MODEL ONLY)

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|---|------|
| | 3010410B02 | BRONZE FWD CLUTCH PACK KIT (3010 MODEL ONLY) | |
| 69 | 3009062001 | CLUTCH PRESSURE PLATE | 1 |
| 71 | 10-16-166-001 | STEEL CLUTCH PLATE | 11 |
| 70 | 3000166001 | FRICTION CLUTCH PLATE (BRONZE) | 12 |
| 45 | 5L-67 | REAR CLUTCH PRESSURE PLATE | 1 |

REVERSE CLUTCH KITS

HIGH PERFORMANCE REVERSE CLUTCH

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--|------|
| | 3009410003 | PAPER REVERSE CLUTCH KIT (3009 & 3010 MODELS) | |
| 87 | 3009166002 | PAPER REVERSE CLUTCH | 3 |
| 88 | 72-176 | STEEL PLATES | 3 |

HEAVY DUTY REVERSE CLUTCH

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|---|------|
| | 3000410008 | HEAT TREATD BRONZE REVERSE CLUTCH KIT (3009 & 3010 MODELS) | |
| 87 | 3000166002 | HT BRONZE REVERSE CLUTCH | 3 |
| 88 | 72-176 | STEEL PLATES | 3 |

COPYRIGHT VELVET DRIVE TRANSMISSION

GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT MODEL 3009 AND 3010 ONLY

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--|------|
| | 3009420005 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| | | MODEL 3009 AND 3010 ONLY | |
| 82 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 35 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 7 | 3009045001 | OIL PAN GASKET | 1 |
| 72 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 25 | 3009044002 | OUTPUT SHAFT SEAL | 1 |
| 84 | 4805A | SEALING RING | 1 |
| 83 | 4804G | SEALING RING | 1 |
| 75 | 3-61 | PUMP GASKET SEAL | 1 |
| 63 | 5M-122 | SEALING RING | 1 |
| 64 | 3009044001 | PISTON SEALING RING | 1 |
| 30 | 3007141001 | PRV VALVE O-RING | 2 |
| 54 | 4806S | SEALING RING | 2 |
| 48 | 4806J | SEALING RING | 2 |
| 57 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 5 | 4804M | O-RING | 1 |
| 22 | 4559A | SNAP RING (3009 ONLY) | 2 |
| 58 | 4766B | SNAP RING | 1 |
| 61 | 4822 | SNAP RING | 1 |
| 49 | 3009139001 | SNAP RING | 1 |
| 24 | 3006139002 | SNAP RING | 1 |
| 40 | 3006139001 | SNAP RING | 1 |

GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT MODEL 3008 ONLY

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--|------|
| | 3008420002 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| | | MODEL 3011 ONLY | |
| 77 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 28 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 67 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 20 | 3008044001 | OUTPUT SHAFT SEAL | 1 |
| 79 | 4805A | SEALING RING | 1 |
| 78 | 4804G | SEALING RING | 1 |
| 70 | 3-61 | PUMP GASKET SEAL | 1 |
| 56 | 5M-122 | SEALING RING | 1 |
| 57 | 5L-36 | PISTON SEALING RING | 1 |
| | 3007141001 | PRV VALVE O-RING | 2 |
| 46 | 4806S | SEALING RING | 2 |
| 39 | 4806J | SEALING RING | 2 |
| 49 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 50 | 4559A | SNAP RING | 1 |
| 51 | 4766B | SNAP RING | 1 |
| 54 | 4822 | SNAP RING | 1 |
| 40 | 4495 | SNAP RING | 1 |
| 18 | 3006139002 | SNAP RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |
| 19 | 3008139001 | SNAP RING | 1 |

GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT MODEL 3007 ONLY

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--|------|
| | 3007420001 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| | | MODEL 3011 ONLY | |
| 77 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 28 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 67 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 20 | 3007044001 | OUTPUT SHAFT SEAL | 1 |
| 79 | 4805A | SEALING RING | 1 |
| 78 | 4804G | SEALING RING | 1 |
| 70 | 3-61 | PUMP GASKET SEAL | 1 |
| 56 | 5M-122 | SEALING RING | 1 |
| 57 | 5L-36 | PISTON SEALING RING | 1 |
| | 3007141001 | PRV VALVE O-RING | 2 |
| 46 | 4806S | SEALING RING | 2 |
| 39 | 4806J | SEALING RING | 2 |
| 49 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 50 | 4559A | SNAP RING | 1 |
| 51 | 4766B | SNAP RING | 1 |
| 54 | 4822 | SNAP RING | 1 |
| 40 | 4495 | SNAP RING | 1 |
| 18 | 3006139002 | SNAP RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |

GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT MODEL 3018 ONLY

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--|------|
| | 3018420001 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| | | MODEL 3011 ONLY | |
| 77 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 28 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 67 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 20 | 3007044001 | OUTPUT SHAFT SEAL | 1 |
| 79 | 4805A | SEALING RING | 1 |
| 78 | 4804G | SEALING RING | 1 |
| 70 | 3-61 | PUMP GASKET SEAL | 1 |
| 56 | 5M-122 | SEALING RING | 1 |
| 57 | 5L-36 | PISTON SEALING RING | 1 |
| | 3007141001 | PRV VALVE O-RING | 2 |
| 46 | 4806S | SEALING RING | 2 |
| 39 | 4806J | SEALING RING | 2 |
| 49 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 50A | 4734 | SNAP RING | 1 |
| 51A | R6A-7 1/2 | SNAP RING | 1 |
| 54 | 4822 | SNAP RING | 1 |
| 40 | 4495 | SNAP RING | 1 |
| 18 | 30081390012 | SNAP RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |

GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT MODEL 3019 ONLY

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--|------|
| | 3019420001 | GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT | |
| | | MODEL 3011 ONLY | |
| 77 | 3006045003 | GASKET, CASE/ADAPTOR | 1 |
| 28 | 71-14 | PRV VALVE COVER GASKET | 1 |
| 67 | 1000044014 | INPUT SHAFT PUMP SEAL | 1 |
| 20 | 3007044001 | OUTPUT SHAFT SEAL | 1 |
| 79 | 4805A | SEALING RING | 1 |
| 78 | 4804G | SEALING RING | 1 |
| 70 | 3-61 | PUMP GASKET SEAL | 1 |
| 56 | 5M-122 | SEALING RING | 1 |
| 57 | 5L-36 | PISTON SEALING RING | 1 |
| | 3007141001 | PRV VALVE O-RING | 2 |
| 46 | 4806S | SEALING RING | 2 |
| 39 | 4806J | SEALING RING | 2 |
| 49 | 2000016050 | SEALING RING | 3 |
| 32 | 3006141001 | O-RING | 1 |
| 50A | 4734 | SNAP RING | 1 |
| 51A | R6A-7 1/2 | SNAP RING | 1 |
| 54 | 4822 | SNAP RING | 1 |
| 40 | 4495 | SNAP RING | 1 |
| 18 | 3006139002 | SNAP RING | 1 |
| 33 | 3006139001 | SNAP RING | 1 |

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GASKET, SEALING RINGS,O-RING AND OIL SEAL KIT MODEL 3019 ONLY

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|------------------------------|------|
| | 3009420001 | DANA 1480 COUPLER KIT | |
| 26 | 3009031001 | COUPLING | 1 |
| 27 | 3009047001 | PILOT SPACER | 1 |
| 28 | 3009183021 | BOLT 1/2-20 X 1.25 LG | 1 |

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|------------------------------|------|
| | 3009420003 | DANA 1350 COUPLER KIT | |
| 26 | 3009031002 | COUPLING | 1 |
| 27 | 3009047001 | PILOT SPACER | 1 |
| 28 | 3009183021 | BOLT 1/2-20 X 1.25 LG | 1 |

72LH AND 72LX COUPLING KIT ONLY (MODEL 3010 AND 3011)

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|-----------------------------------|------|
| | 3010042004 | 5" PROP SHAFT COUPLING KIT | |
| 26 | 3010031001 | COUPLING | 1 |
| 27 | 1000149031 | COUPLING NUT | 1 |

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|------------------------------|------|
| | 3009420005 | DANA 1350 COUPLER KIT | |
| 26 | 3009031001 | COUPLING | 1 |
| 27 | 1000149031 | COUPLING NUT | 1 |

SOLENOID SERVICE KITS MODELS 3009 AND 3010 ONLY

COIL KITS (COILS ONLY)

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|---------------|------|
| | 3009140101 | 10 VOLT COILS | 2 |
| | 3009140241 | 24 VOLT COILS | 2 |

SOLENOID O-RING AND SEAL KIT MODELS 3009 AND 3010 ONLY

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--------------------|------|
| | 3009420006 | FOR #8 SERIES ONLY | |

SOLENOID COIL PLUG CONNECTORS ALL MODELS

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|---|------|
| | 3000140003 | METRI-PAK MALE CONNECTOR WITH 12" LEADS | 1 |

OPTIONAL NEUTRAL SWITCH CONNECTORS ALL MODELS

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|---|------|
| | 3000140004 | METRI-PAK FEMALE CONNECTOR WITH 12" LEADS | 1 |

MERC 6 ADAPTOR KIT FOR MODEL 3009 ONLY

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--------------------------------------|------|
| | 3009420002 | MERC 6 ADAPTOR KIT CONSIST OF | |
| | | | |
| | 3009045002 | GASKET | 1 |
| | 3009172001 | MERC 6 ADAPTOR | 1 |
| | 3009183003 | BOLT 3/8-16 X 7/8 LG | 3 |
| | 3009146001 | STUD 7/16-14 X 4-1/8 LG | 6 |
| | 179858 | BOLT 7/16-14 X 1" LG | 2 |
| | 3009149001 | LOCK NUT 7/16-14 NYLON LOCK NUT | 6 |
| | 03-0022-1 | 7/16 FLAT WASHER | 6 |
| | 3009141002 | O-RING | 1 |
| | 3009141003 | O-RING | 1 |
| | 3009141004 | O-RING | 1 |

MERC 6 ADAPTOR KIT FOR MODEL 3010 AND 3011 ONLY

| Item No. | Part Number | Description | Qty. |
|----------|-------------------|--------------------------------------|------|
| | 3010420002 | MERC 6 ADAPTOR KIT CONSIST OF | |
| | | | |
| | 3009045002 | GASKET | 1 |
| | 3010172001 | MERC 6 ADAPTOR | 1 |
| | 3009183003 | BOLT 3/8-16 X 7/8 LG | 3 |
| | 3010146001 | STUD 7/16-14 X 3-3/8 | 6 |
| | 179858 | BOLT 7/16-14 X 1" LG | 2 |
| | 3009149001 | LOCK NUT 7/16-14 NYLON LOCK NUT | 6 |
| | 03-0022-1 | 7/16 FLAT WASHER | 6 |
| | 3009141002 | O-RING | 1 |
| | 3009141003 | O-RING | 1 |
| | 3009141004 | O-RING | 1 |

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| Series | Model | Description | Ratios Available |
|---------------|-------|------------------------------|------------------------------------|
| 71C | 1017 | In-Line | 1.00 |
| 71C | 1017W | In-Line Wakeboard | 1.00 |
| 72C | 1018 | High Capacity | 1.00, 1.52, 1.88, 2.10, 2.57, 2.91 |
| 72V | 1005 | 15 Degree V-Drive Cast Iron | 1.21, 1.51, 1.99, 2.50 |
| 72L | 3007 | In Line/Wakeboard | 1:1 |
| 72L-V | 3008 | V-Drive/Wakeboard | 1.5:1, 1.25:1 |
| 72L-X | 3011 | High Capacity In-Line | 1:1 |
| 72L-H | 3010 | High Performance | 1:1 |
| 72L-HP | 3009 | High Performance | 1:1 |
| Liberty A | 3001 | 8 Degree Down Angle Aluminum | 1.00, 1.25, 1.50, 2.00, 2.50, 2.80 |
| Liberty 6000A | 3021 | 8 Degree Down Angle Aluminum | 1.00, 1.25, 1.50, 2.00, 2.50, 2.80 |
| Liberty V | 2002 | 12 Degree V-Drive Aluminum | 1.25, 1.51, 2.00, 2.50 |



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