

4-15 DISASSEMBLY OF VARIABLE SPEED CONTROL VALVE (Seal Replacement with Control Valve in the Bobcat)

1. Remove seat and seat plate (Fig. 4-14).
2. Remove variable speed control lever linkage rod.
3. Remove temperature release valve bracket (Fig. 4-15, Item 1).
4. Remove push rod guide and push rod (Fig. 4-15, Item 2).
5. Use magnet to remove ball and spring (Fig. 4-15, Item 3).

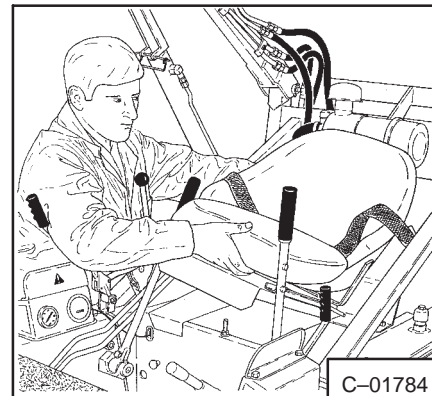


Fig. 4-16 Remove Seat and Plate

6. Remove end cap and spring (Fig. 4-15, Item 4).
7. Install seal on dust cap end of spool (Fig. 4-15, Item 5).
8. Move spool back to install new back seal (Fig. 4-18).
9. Move spool forward to install new seal on clevis end of spool (Fig. 4-17).

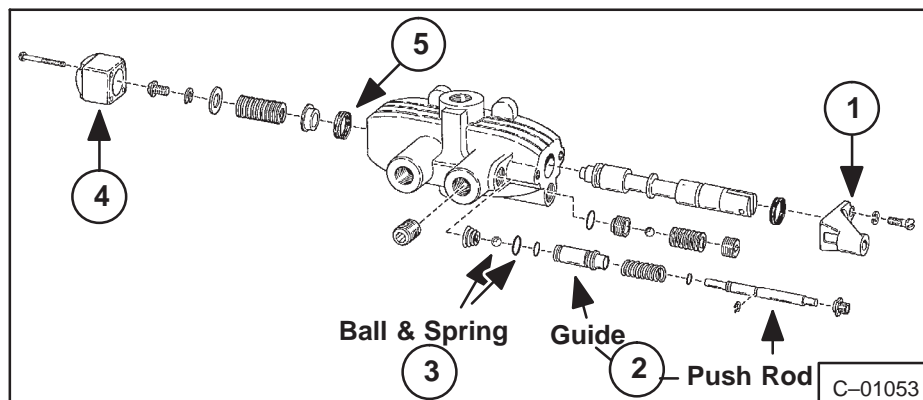


Fig. 4-15 Variable Speed Valve Parts

NOTE: Do not push spool beyond its limits as this can cause seal to go into groove of valve and result in damage to seal.

10. Move spool back into normal position.

4-16 ASSEMBLY OF VARIABLE SPEED CONTROL VALVE, SEAL REPLACEMENT WITH CONTROL VALVE IN THE BOBCAT (With Holding Release Valve) (Fig. 4-15)

1. Install spring assembly and end cap (Item 4)
2. Install new seals on push rod and push rod guide (Item 2)
3. Place ball on small round end of spring (Item 3). (Use grease to hold spring and ball to end of rod guide.)
4. Install push rod and rod guide (Item 2).
5. Install push rod bracket (Item 1).
6. Connect variable speed control linkage.
7. Make pressure adjustments. (See Paragraph 4-13 and 4-14).

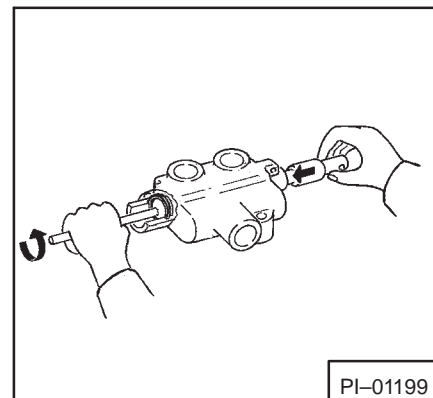


Fig. 4-16 Install Back Seal

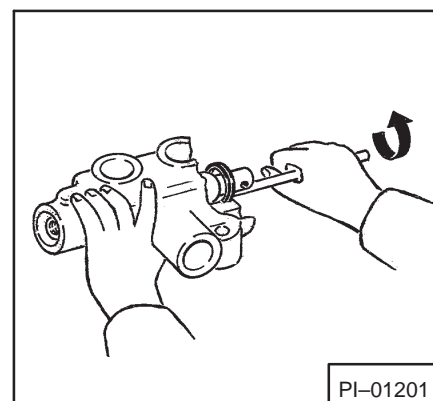


Fig. 4-17 Install Front Seal

4-17 CONTROL VALVE SEAL INSTALLATION (Fig. 4-18, 4-19) (For Tilt, Lift Valve and Auxiliary Cylinder Control Valve)

1. Remove rubber cap from back of valve (Item 1).
2. Remove large snap ring and stop disc (Item 2 & 3).
3. Remove spring assembly bolt. Centering spring lock washer, stop collar, spring and stop washer (Item 4)

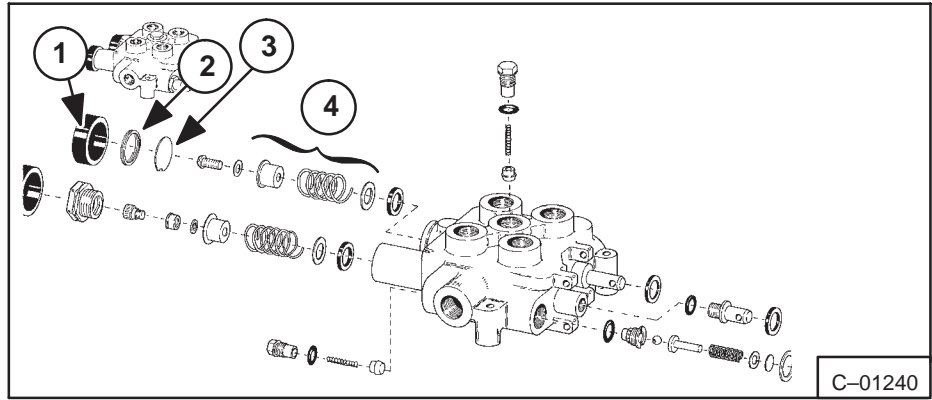


Fig. 4-18 Lift and Auxiliary Valve Parts

4. Push spool into housing from front of valve until front seal is out, then remove front seal (Fig. 4-20).
5. Pull spool out of housing from front of valve and remove back seal (Fig. 4-21).
6. Clean both seal grooves.
7. Install spool, through front of housing with spring fastening end of spool first (Fig. 4-19, Item 5).
8. Push spool into valve until end of spool is at back seal groove.

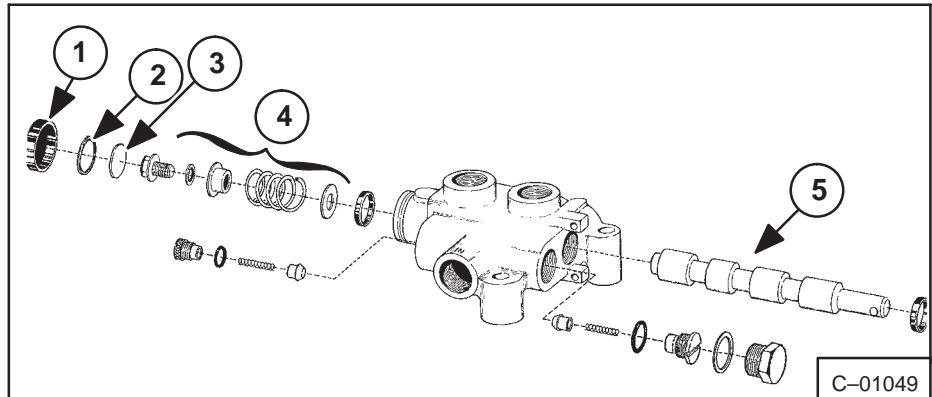


Fig. 4-19 Tilt Valve Parts

9. Install a new seal in back groove. Place U cup of seal toward valve body (Fig. 4-22).
10. Inspect seal for smooth fit.
11. Push spool into housing from front until front groove can be seen.

NOTE: Do not push spool back more than necessary or back seal will be damaged.

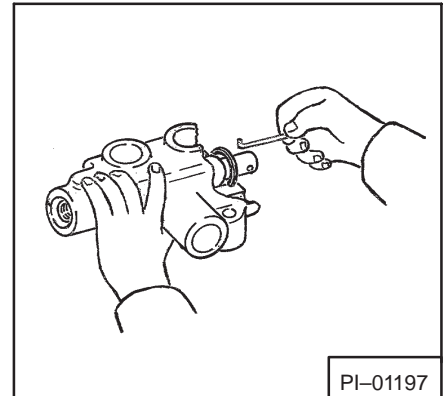


Fig. 4-20 Removing Front Seal

12. Install a new front seal, keep the U cup side of the seal toward valve body (Fig. 4-23).
13. Inspect seal for smooth fit.
14. Push spool through the housing until 1/4 inch of spool surface is shown at front of valve.

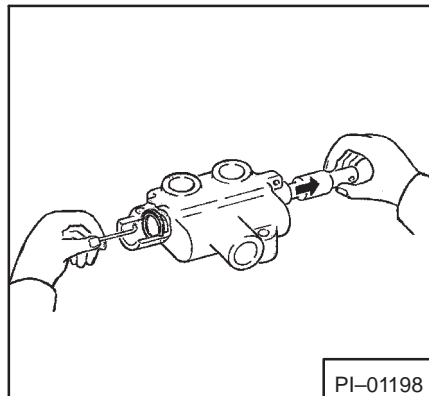


Fig. 4-21 Removing Spool

15. Install spring assembly bolt, spring, lock washer, stop collar, spring and lock washer (Fig. 4-18, 4-19).
16. Tighten assembly bolt.
17. Install stop disc and snap ring (Fig. 4-18, 4-19, Item 2 & 3).
18. Install rubber cap (Fig. 4-18, 4-19, Item 1).

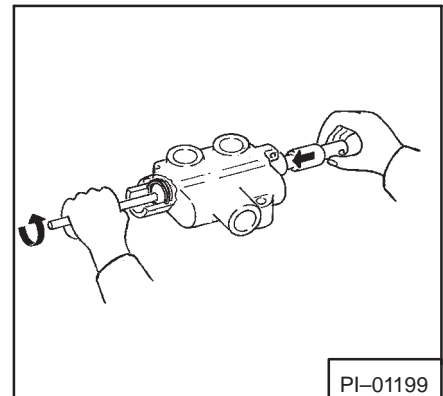


Fig. 4-17 Install Back Seal

4-18 INSTALLING VALVE SPOOL SEALS IN THE VARIABLE SPEED CONTROL VALVE

1. Remove four bolts from valve spring cap (Fig. 4-23, Item 1).
2. Remove screw, lock washer, flat washer, spring and stop collar from end of spool (Fig. 4-23, Items 2, 3, 4, 5 & 6).

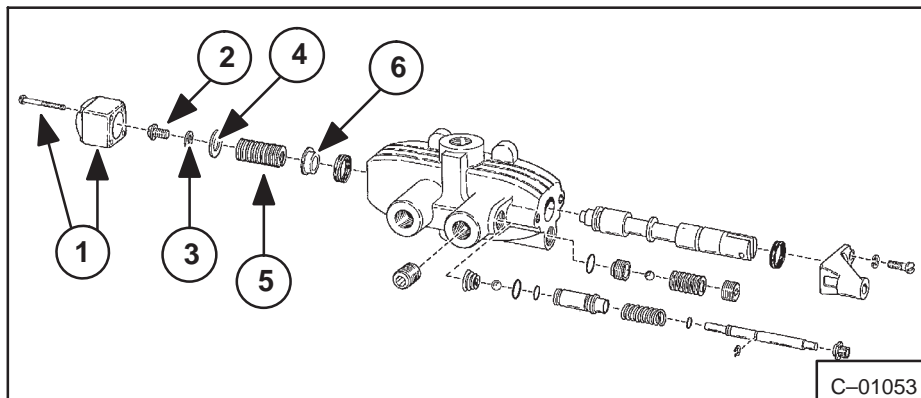


Fig. 4-23 Variable Speed Valve Parts

3. Pull valve spool out of housing (Fig. 4-24).
4. Check position of U cup of seals for correct installation of new seals.
5. Remove worn seal (Fig. 4-24).
6. Install spool in housing with no seals. Push spool into housing until seal groove can be seen at cap end of valve.

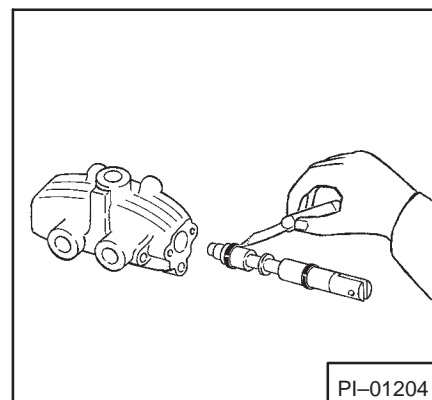


Fig. 4-24 Remove Valve Spool

7. Install a new seal into back groove (Fig. 4-25).
8. Push seal into housing and pull spool into valve housing (Fig. 4-25).
9. Pull valve spool toward control end of valve until front seal groove is visual.

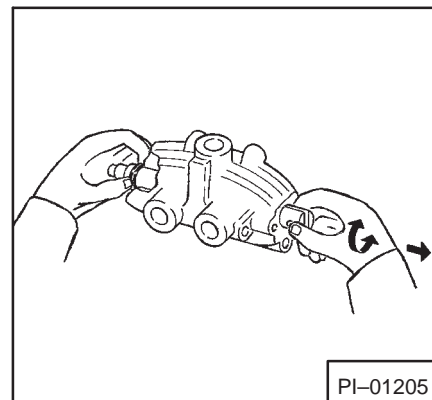


Fig. 4-25 Install Seal On Valve Spool

10. Install a new front seal (Fig. 4-26).
11. Push seal into housing and spool into place (Fig 4-26).
12. Install collar, spring, washers and screw. Tighten screw (Fig. 4-23, Items 2, 3, 4, 5 & 6).
13. Check that washer moves free on spool.

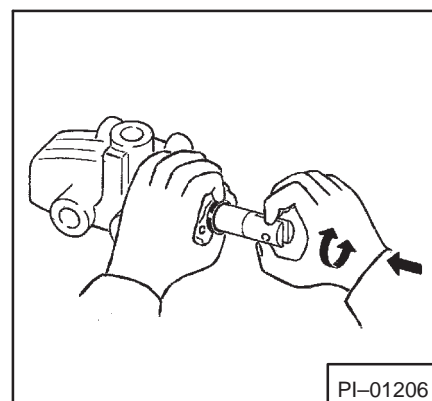


Fig. 4-26 Install Front Seal

14. Install cap and four bolts (Fig. 4-23, Item 1).
15. Check cap for proper alignment. It must be correctly centered over end of spool.

4-19 HYDRAULIC PUMP SERVICE (Webster Pump)

For seal replacement in hydraulic pump, follow the below procedure (Fig. 4-27).

4-20 DISASSEMBLY

1. Clean outside of pump.
2. Make mark on edges of cover so it can be installed again in same position.
3. Remove the pilot plate and seal (Fig. 4-28).
4. Pull the pump drive shaft out of pump (Fig. 4-29). The ball bearing will come with it.
5. Remove all bolts from pump body (Fig. 4-30).
6. Install two bolts into shaft side and turn them in several turns by hand. Hit sharply on heads of two screws, first one, then the other, then first one again (Fig. 4-31). When the dowels are loose, remove the screws and separate the plates.
7. Inspect the gears, shafts and bearings.
8. When needle bearings are bad remove and install new needle bearings (Fig. 4-32).
9. When cover and body plates are worn, grind them smooth.
10. Install new gears after grinding cover and body.

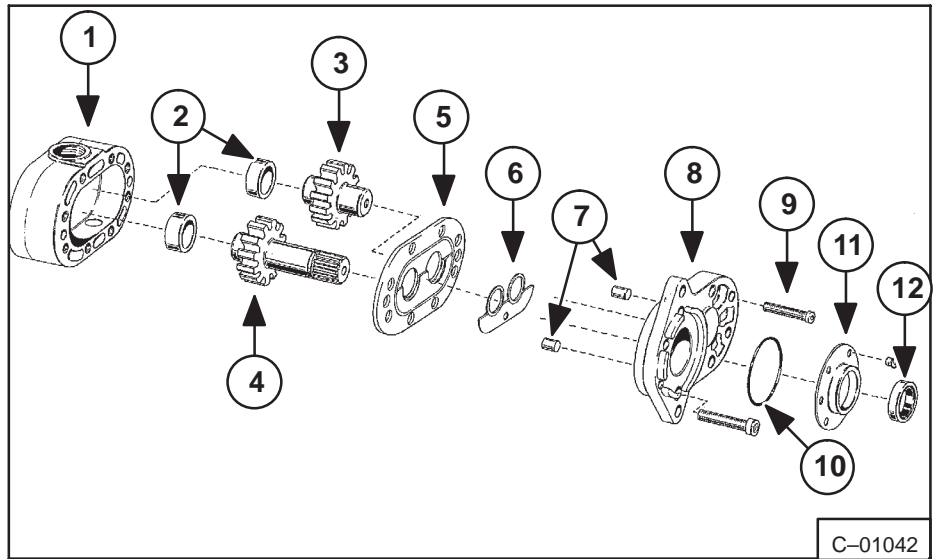


Fig. 4-27 Hydraulic Pump Breakdown (Webster)

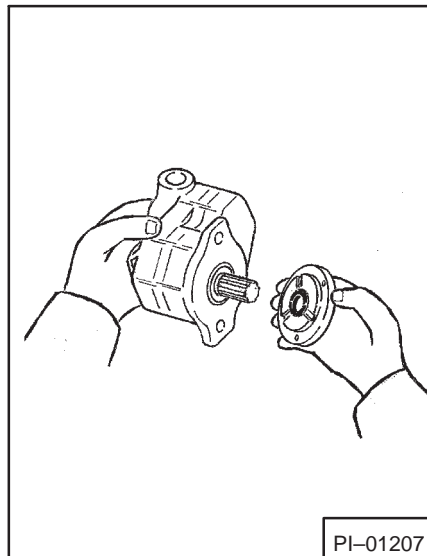


Fig. 4-28 Remove Pilot Plate and Seal

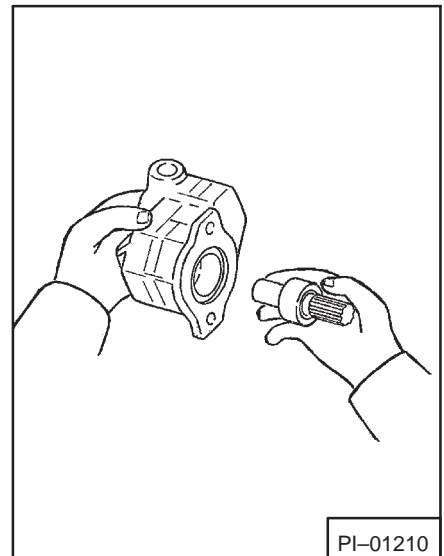


Fig. 4-29 Remove Drive Shaft

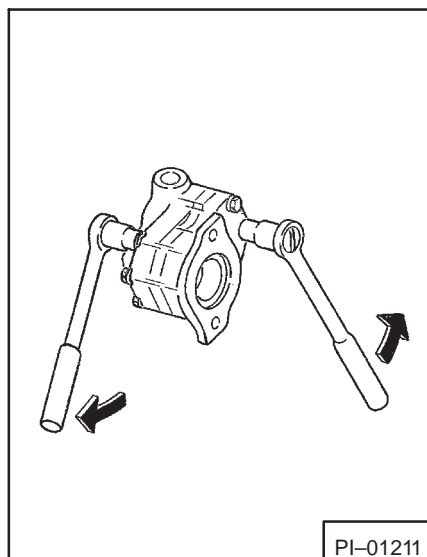


Fig. 4-30 Remove Body Bolts

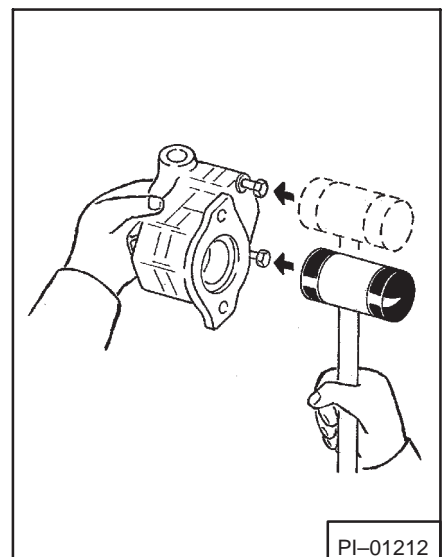


Fig. 4-31 Separating Pump Plates

4-21 ASSEMBLY OF HYDRAULIC PUMP (Webster Pump)

1. Wash off pump parts and dry with air.
2. Install ball bearings to pump drive shaft.
3. Install drive shaft into the body (Fig. 4-29).
4. Make seal replacement in pilot plate (Fig. 4-33).
5. Set pump body with machined face up (Fig. 4-34).
6. Install key in drive shaft and lower drive gear over it (Fig. 4-34).
7. Install idler gear and shaft assembly (Fig. 4-35).
8. Install gear plate over gears and put scratch marks in a line.
9. Install dowel pins through large holes in gear plate (Fig. 4-36).
10. Install cover plate over shaft. Install and tighten the cover bolts, then turn pump over and install and tighten body bolts (Fig. 4-37).
11. Install pilot plate and fasten with machine screws.

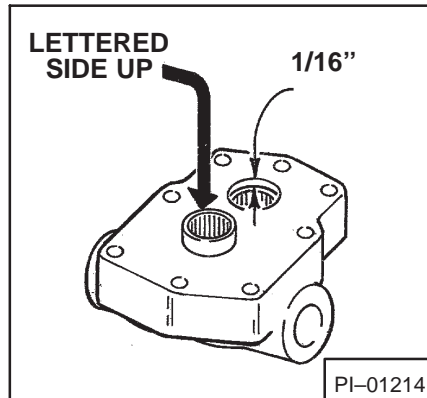


Fig. 4-32 Install New Bearings

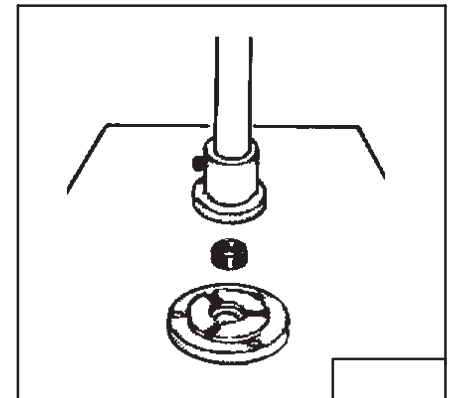


Fig. 4-33 Replace Seal In Pilot Plate

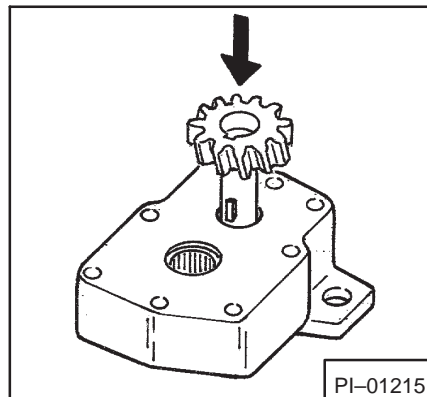


Fig. 4-34 Machined Faced Of Pump

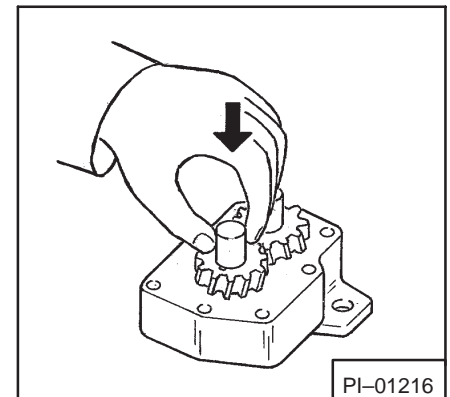


Fig. 4-35 Install Idler Gears

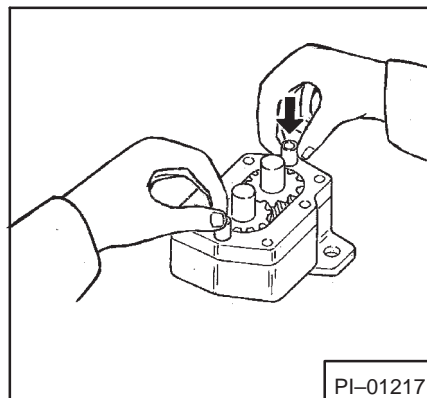


Fig. 4-36 Install Dowel Pins

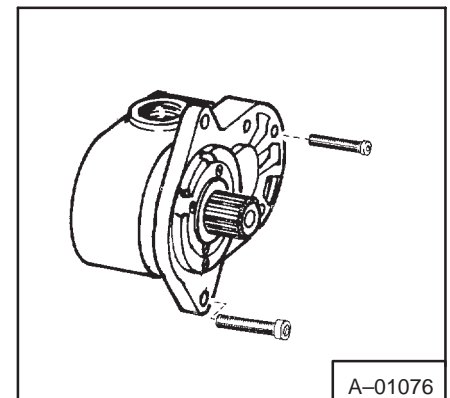


Fig. 4-37 Install Body Bolts

4-22 HYDRAULIC PUMP DISASSEMBLY (Cessna Pump)

1. Remove key from pump drive shaft (Fig. 4-38).
2. Clean outside of pump. Put marks in a line across edges of cover, gear plate and body (Fig. 4-39).
3. Hold pump in a vise shaft down. Remove bolt which holds the pump plates together (Fig. 4-41).
4. Remove pump from vise. Separate pump plates by hitting shaft onto a wooden block (Fig. 4-40).

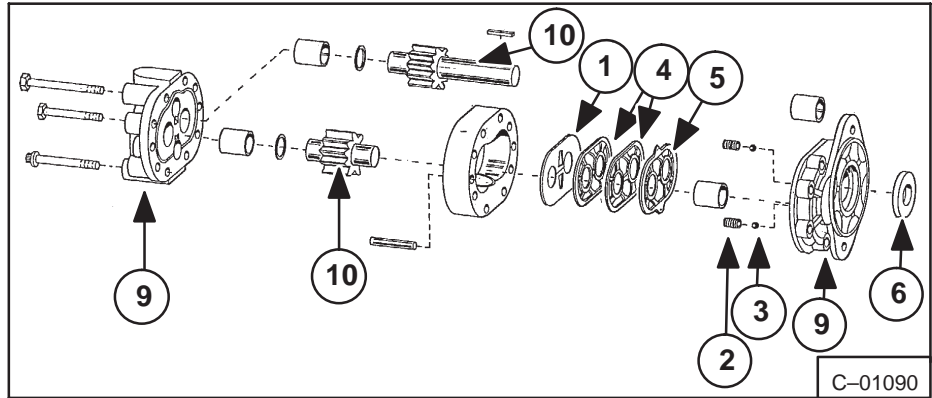


Fig. 4-38 Hydraulic Pump Breakdown (Cessna)

5. Remove these items (Fig. 4-38) from front plate of pump.
 - a. Diaphragm (Item 1)
 - b. Springs (2)* Steel Balls (2) (Item 2 & 3)
 - c. Gaskets (2) (Item 4)
 - d. Molded V Seal (Item 5)
 - e. Shaft Seal (Item 6)
6. Clean and dry all pump parts.
7. Inspect pump drive shaft for a broken key way. Inspect pump drive shaft and idler gear shaft at bearing points and seal areas. When shaft diameter measures less than .6850 inch (17,5 mm) is in the bearing area, make replacement.
8. Inspect the gear faces for wear. Check with following chart: If gear width is below these figures, replace the gears.
 - a. Pump Model B24387-OBAA .636 inch (16,3 mm)
 - b. Pump Model 15509-OEBA .636 inch (16,3 mm)
 - c. Pump Model 15510-OEBA .767 inch (19,6 mm)
9. Inspect the back plate for wear. When worn more than .0015 inch (.038 mm) install new plate.
10. Check inside diameter of bearings in place. When inside diameter is worn more than .691 inch (17,5 mm) install new plates.
11. Inspect chambers in gear plates for wear. When chamber is worn, more than 1.719 inches (43,6 mm) install new gear plate.

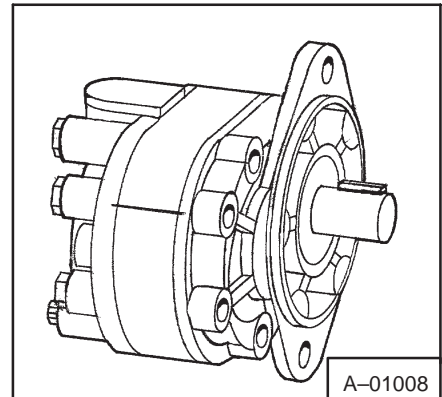


Fig. 4-39 Marking Pump Sections

4-23 HYDRAULIC PUMP ASSEMBLY (Cessna Pump)

1. When assembling install new parts as follows: (Fig. 3-28).
 - a. Diaphragm (Item 1)
 - b. Gaskets (2) (Item 4)
 - c. V Seat (Item 5)
 - d. Shaft Seal (Item 6)
2. Install V seal into groove in front plate. Install seal with open part of V toward plate (Item 5).
3. Put gasket into V seal (Item 4).
4. Drop steel balls into seat and place springs over balls (Item 2 & 3).
5. Place diaphragm over gasket, bronze face up (Item 1).
6. Make sure diaphragm fits inside raised edge of V seal.
7. Put oil on gears and slide them into front plate bearings.
8. Put grease on both faces of gear plates and install plates over gears (Item 9 & 10).

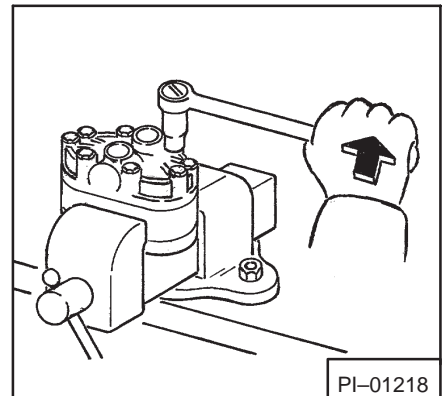


Fig. 4-40 Holding Pump In Vise

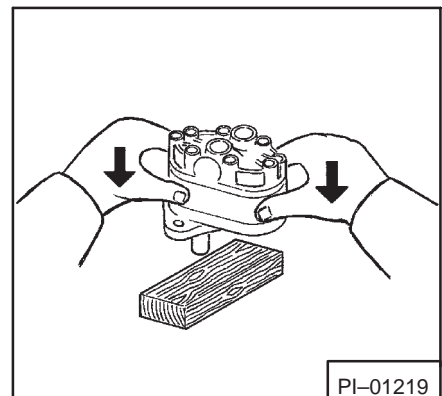


Fig. 4-41 Separating Pump Parts

9. Check marks on side of plates when installing, to be sure they are in alignment (Fig. 4-39).
10. Slide backplate over gear shaft until dowel pins are engaged.
11. Install bolts and tighten them evenly to 25 ft.-lbs. (34 Nm) (Fig. 4-40).
12. Install pump drive shaft seal over shaft being careful not to cut rubber sealing edge.
13. Seat seal with a plastic hammer.

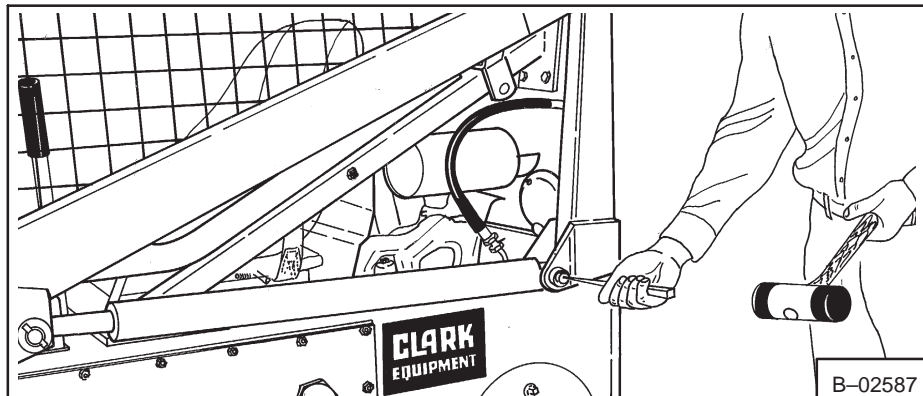


Fig. 4-42 Remove Lift Cylinder

4-24 HYDRAULIC LIFT OR TILT CYLINDER DISASSEMBLY

1. Remove hydraulic cylinder from loader (Fig. 4-42).
2. With spanner wrench, remove head from cylinder (Fig. 4-43).
3. Pull shaft and piston assembly from cylinder housing (Fig. 4-44).

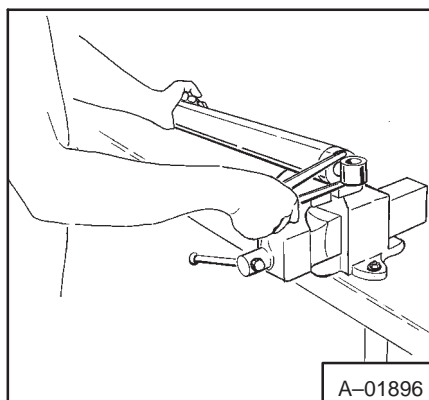


Fig. 4-43 Remove Cylinder Head

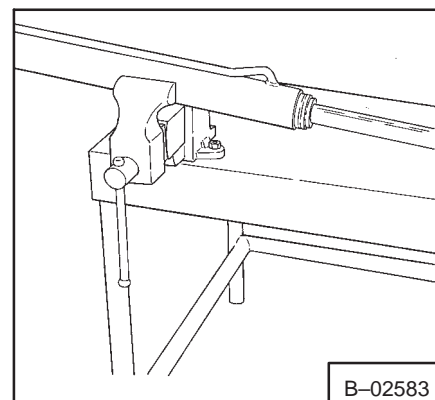


Fig. 4-44 Remove Cylinder Shaft W/Piston

4-25 INSTALLATION OF CYLINDER SEALS

1. File and grind a bevel on shoulder at piston end of cylinder shaft (Fig. 4-45).
2. Remove all rough areas off shaft (Fig. 4-46).
3. Put teflon piston seals in warm oil or water for several minutes before installing.

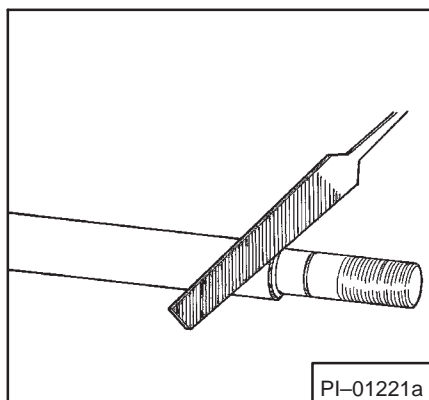


Fig. 4-45 Filing Bevel On Shaft

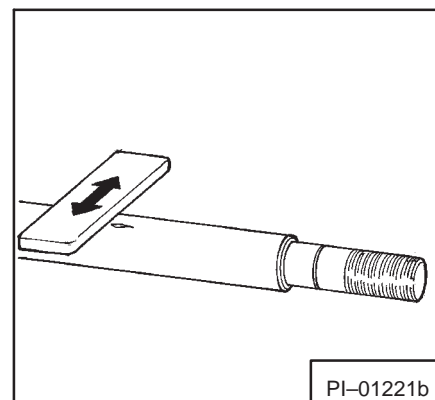


Fig. 4-46 Remove Marks on Shaft

4-26 HYDRAULIC CYLINDER ASSEMBLY (Fig. 4-47)

1. Install cylinder head seals and place cylinder head carefully onto cylinder shaft (Item 1 thru 6).
2. Install bushing onto shaft (lift cylinder only) (Item 7).
3. Install piston seals and place piston onto end of cylinder shaft (Items 8, 9 & 10).
4. Install piston locking nut and tighten it (Item 11).
5. Install piston and shaft into cylinder.
6. Install cylinder head into cylinder case. Be careful not to damage seals.
7. Tighten cylinder head with spanner wrench (Fig. 4-43).

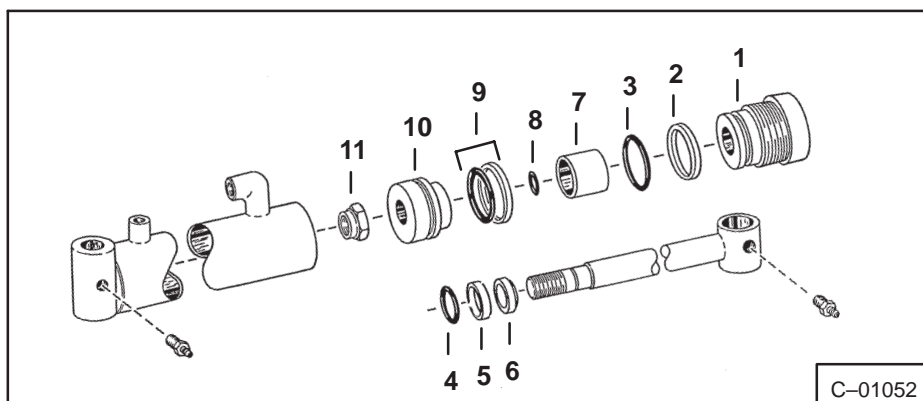


Fig. 4-47 Hydraulic Cylinder Assembly

4-27 HYDRAULIC PUMP ALIGNMENT (500 ELECTRIC)

1. Remove hydraulic pump and pump holding plate from motor housing (Fig. 4-48).
2. Remove two pump holding bolts.
3. Install bolt with lock washers and put nuts on pump side. Tighten nuts and spot weld them to plate (Fig. 4-49).
4. Remove pump from holding plate.
5. With center punch mark 8 drill holes. They should be positioned 2 per every 90° around the bell housing so set screws will seat against four machined bosses on motor housing (Fig. 4-50).
6. Remove bell housing from motor (Fig. 4-50).

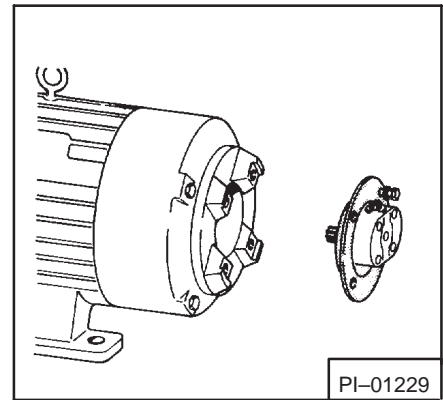


Fig. 4-48 Removing Pump and Plate

7. Drill 8 holes and turn a 1/4 inch (6,4 mm) by 20 tap through them (Fig. 4-50).
8. Start 1/4 inch (6,4 mm) set screws in holes.
9. Remove worn pump drive adapter from motor shaft (Fig. 4-51).
10. Attach bell housing to motor and tighten holding bolts evenly (Fig. 4-52).

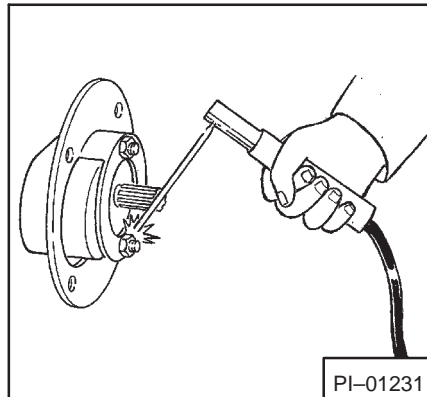


Fig. 4-49 Spot Weld Nuts

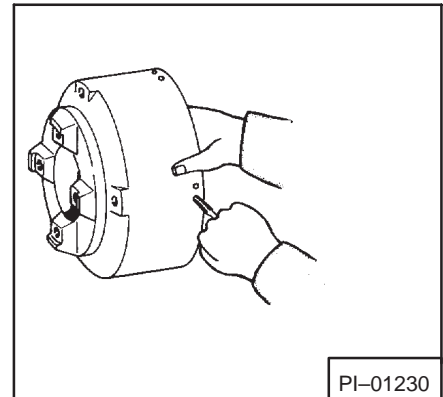


Fig. 4-50 Drilling & Tapping Housing

11. Install pump holding plate to housing (Fig. 4-53).
12. Install a new pump drive adapter into end of motor shaft. Hit bolt lightly with hammer and tighten.
13. Fasten a dial indicator to shaft so that indicator arm slides on inner circumference of holding plate for pump (Fig. 4-54).
14. Using a long bar, force variable speed drive belt into driven sheave. This will loosen belt in drive sheave so motor shaft may be turned by hand.

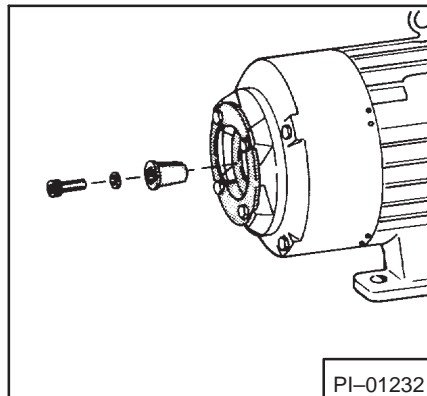


Fig. 4-51 Remove Old Adaptor

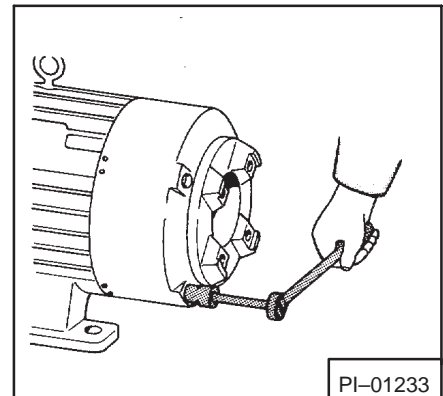


Fig. 4-52 Install Bell Housing

15. Turn motor shaft by hand noting dial indicator reading. Make adjustment of 8 set screws to move bell housing until a maximum total indicator reading of .004 inch (.102 mm) is made.
16. Tighten housing holding bolts (Fig. 4-53).
17. Remove dial indicator.
18. Install hydraulic pump on holding plate (Fig. 4-48).

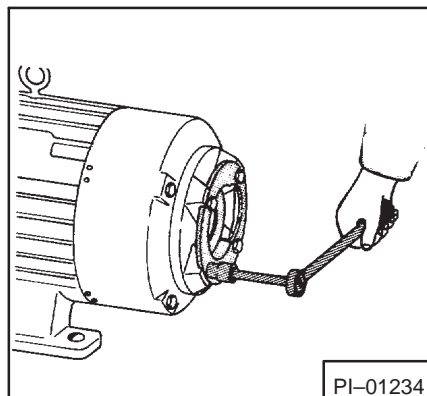


Fig. 4-53 Install Holding Plate

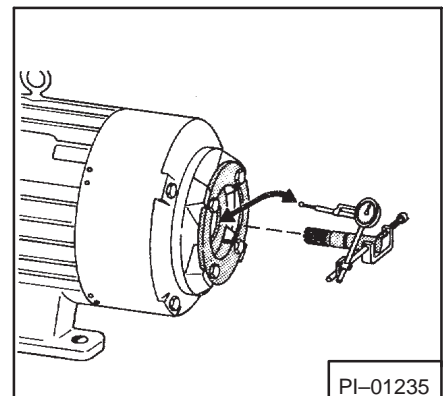


Fig. 4-54 Using Dial Indicator

4-28 HYDRAULIC PUMP ALIGNMENT (600 Wisconsin)

NOTE: Use pump alignment tool. (See parts book for correct tool).

1. Remove pump and drive coupling from engine (Fig. 4-60).
2. Slip tool over pump shaft to bottom position (Fig. 4-55).
3. Place pump into holding bracket and hold it in position (Fig. 4-56).
4. Slide tool over accessory drive shaft (Fig. 4-56).

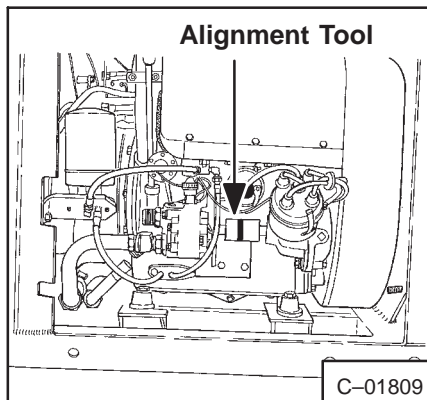


Fig. 4-55 Install Alignment Tool

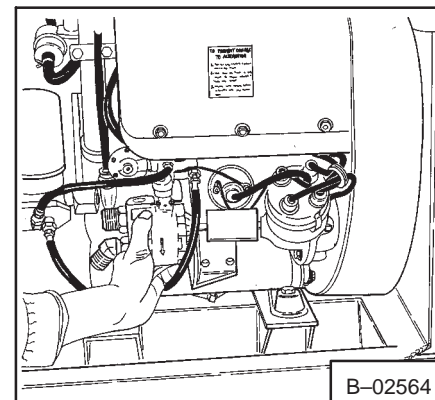


Fig. 4-56 Install Pump and Tool

5. To make correct alignment do the following:
 - a. Loosen holding bolts for pump bracket and move bracket up or down or rotate on accessories shaft.
 - b. With bracket installed loosely shim between bracket and engine block, or grind off block to make alignment. Tighten bolts (Fig. 4-57).

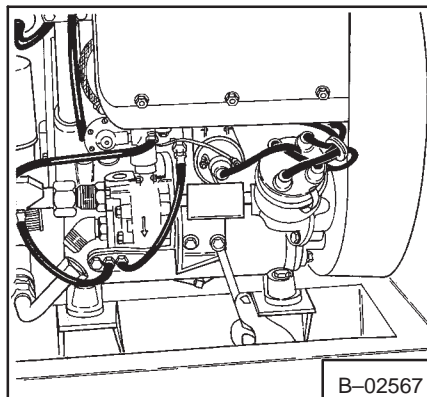


Fig. 4-57 Shimming Holding Bracket

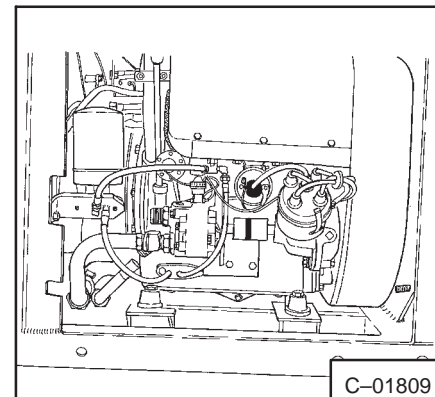


Fig. 4-58 Check Shaft Alignment

6. With brackets fastened and pump fastened in place, check alignment between pump and drive shaft from distributor (Fig. 4-58). Add or remove shims or grind away block on engine with alignment is correct.
7. Remove pump tool and install drive coupling half loosely to accessory drive shaft.
8. Install other half coupling loose on pump (do not install rubber), and push pump into bracket. Install and tighten pump fastening bolts.
9. Pull each coupling half together on drive and pump shaft. Check for .025 inch (.63 mm) clearance between each half of coupling. Use feelers gauge and check all the way around coupling while not turning shaft (Fig. 4-59).

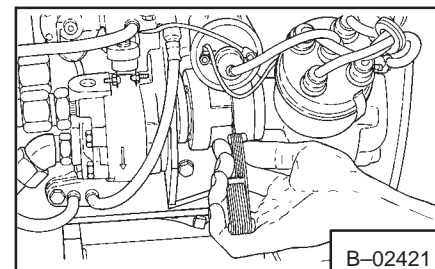


Fig. 4-59 Using Feeler Gauge

10. When alignment is correct, remove pump and tighten set screws in drive hub evenly to 9 ft.-lbs. (14 Nm) (Fig. 4-60).
11. Install pump into bracket and hold with fasteners and bolts (Fig. 4-60).
12. Check again for .025 inch (.63 mm) clearance between each coupling half (Fig. 4-59).

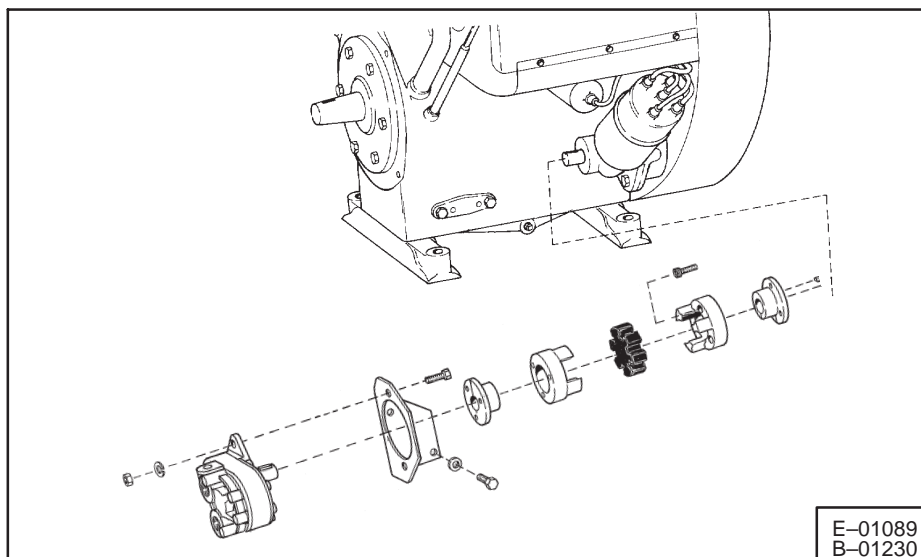


Fig. 4-60 Pump Installation

4-29 37° Flare Connections

Use the following procedure to tighten flare fittings:

- (1) Tighten the nut until it makes contact with the seat.
- (2) Make a line across the *flats* of both the male and female parts of the connection (Fig. 4-61).
- (3) Use chart below to find correct tightness needed.

Fitting Thread Size	Rotate No. Of Hex Flats
9/16-18	2
3/4-16	2
7/8-14	1-1/2-2
1-1/16-12	1
1-5/16-12	3/4-1

4-30 Tubelines and Hoses

Make replacement of tubelines that have damage. A bent tubeline will cause oil to flow at a slow rate and will cause an increase in heat and a decrease in hydraulic action. Make replacement of hoses when wear or damage is present. Use correct clamps to hold tubelines and hoses in position.

4-31 Installing O-Rings

When installing this fitting, lubricate the O-ring with oil. Loosen the jam nut, screw the fitting into place and connect the tubeline first, before tightening the jam nut.

Tighten the jam nut until it and the washer are tight against the face of the opening (Fig. 4-62). The O-ring must be pushed into the space shown.

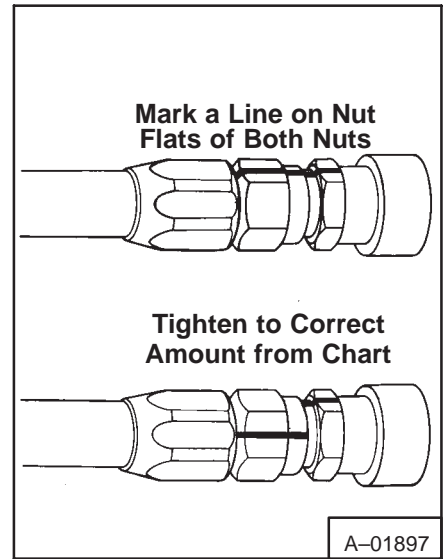


Fig. 4-61 Tightening Flared Fittings

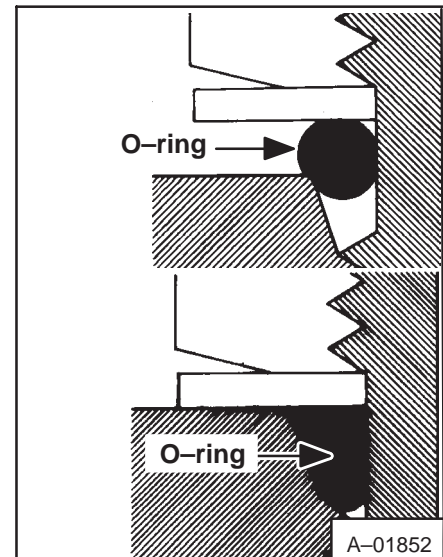


Fig. 4-62 Straight Thread Seal