

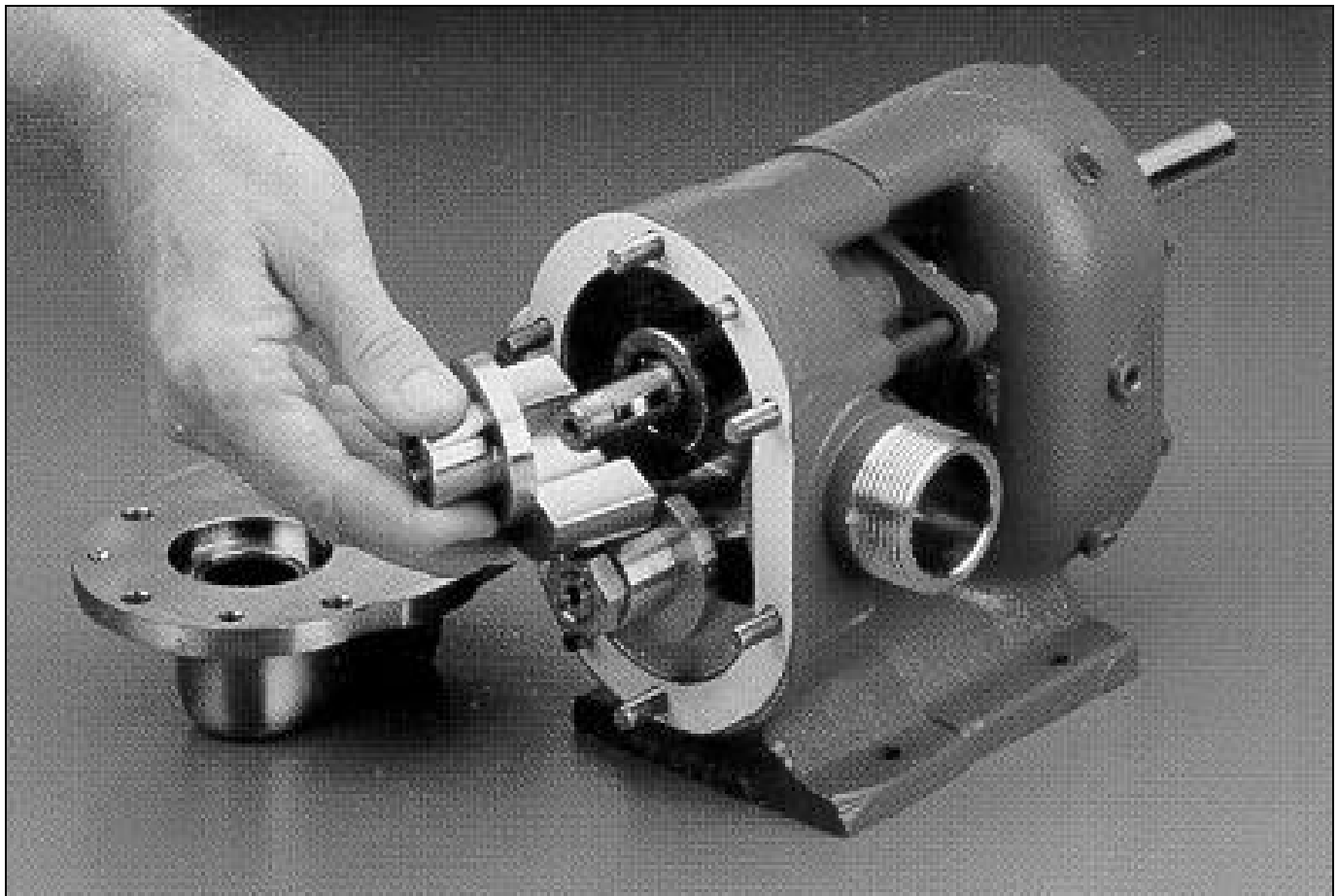


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Installation and Service Instructions

HD Series Pumps Standard Duty Models



Notes:

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**WARNING**

Failure to follow these instructions could result in serious bodily injury or death.

Do not attempt to work on any Tuthill pump installation before completing the following steps:

Disconnect the drive so that it cannot be started while work is being performed.

Review the Material Safety Data Sheet (MSDS) applicable to the fluid being pumped to determine its characteristics and the precautions necessary to ensure safe handling.

Vent all pressure within the pump through the suction or discharge lines.

All Tuthill pumps contain residual hydraulic oil from the factory production test. Determine if this is compatible with the fluid you are pumping. If the fluid is incompatible, consult the factory.

Section 1: Minor Disassembly For Fluid Chamber Inspection

Refer to Figure 1 on Page 4.

1. Remove six faceplate nuts (15).
2. Remove faceplate (13). If faceplate does not pull off readily, it may require a slight tap with a mallet.
3. Remove nuts (19) from ends of shafts. To facilitate this operation, you can wedge a small block of wood or other soft material between the impellers. Loosen both nuts in this manner before removing
4. Slide impellers from shafts. Mark impellers so they can be replaced on the same shaft.
5. The fluid chamber is now ready for inspection.

Section 2: Reassembly after Minor Disassembly

Refer to Figure 1 on Page 4.

1. Replace impeller and impeller keys on appropriate shafts.
2. Install nuts on end of shafts. Use piece of wood or other soft object wedged between the impellers as in Section 1, Step 3. The torque required to lock the shaft nuts is listed in table 1.

Model	Torque (ft-lbs)	Torque (N-m)
5A, 10, 16, 25A	40 - 45	54 - 61
65, 125A	50 - 55	- 75

Table 1 - Impeller Nut Torque Values

3. Check clearances between lobe face and housing bottom face (dimension B on Table 2). If clearances are incorrect, reset clearances according to Section 4 (Models 5A, 10, 16, 25A) or Section 6 (65, 125A, 125H).
4. Rotate drive shaft several revolutions to assure proper timing.
5. Clean housing gasket face of any burrs.
6. Place new gasket (12) on impeller housing. If original gasket is in good condition, it can be reused.
7. Replace faceplate and six faceplate nuts.
8. Rotate assembled pump drive shaft several revolutions to be certain that there is no interference or rubbing. If no interference is apparent, the pump is ready to be put back in service.

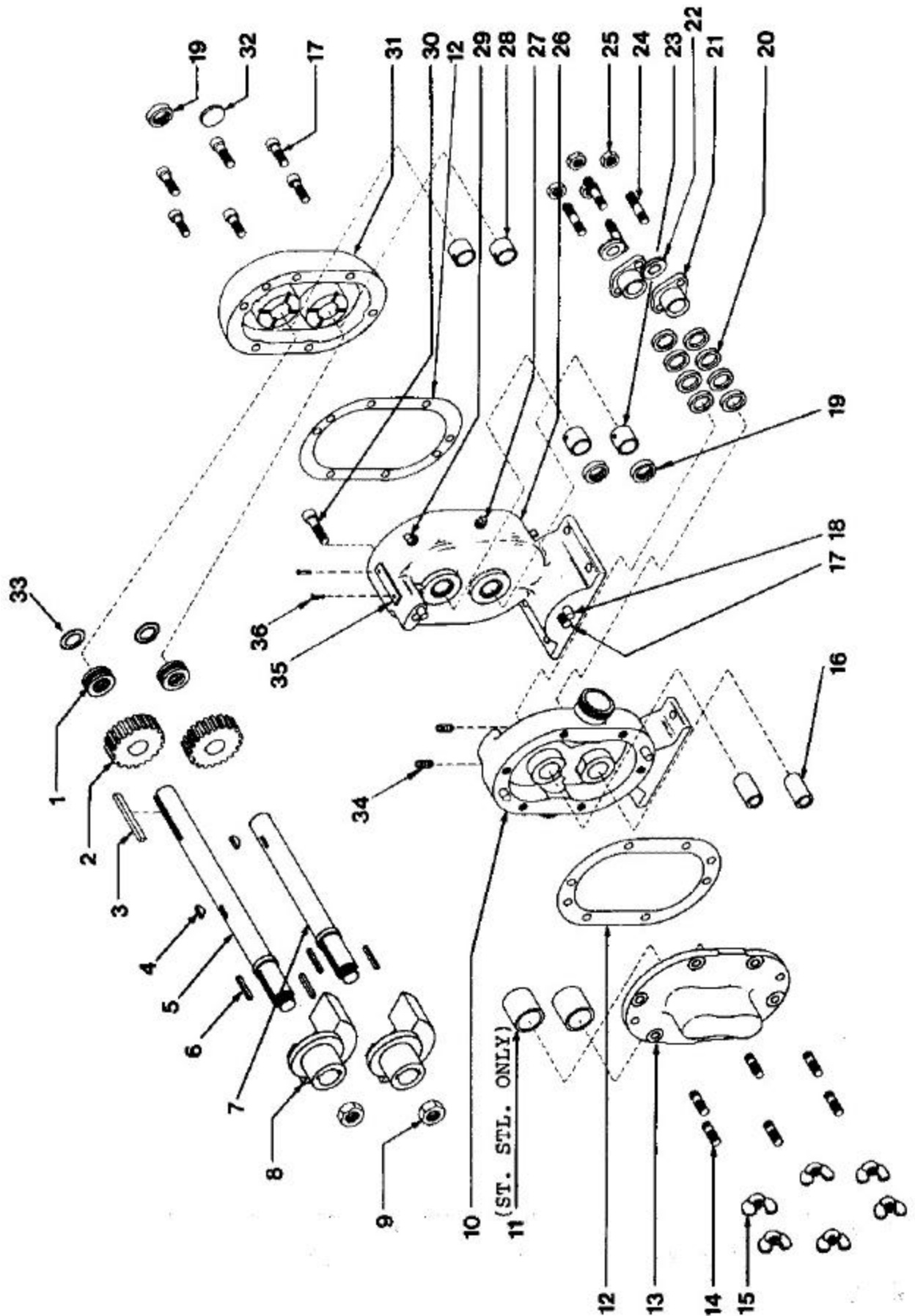
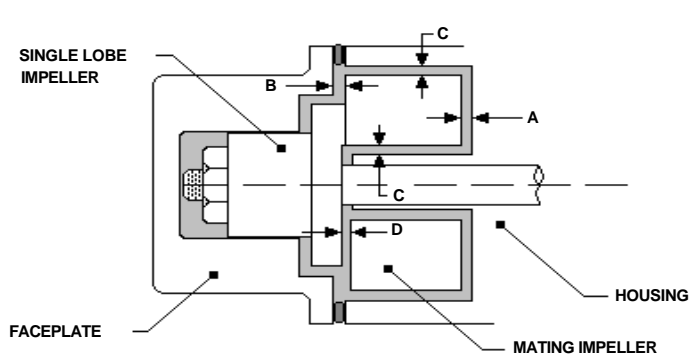


Figure 1 - Exploded View of Pump

Model	Matl	Clearance	Dimension A		Dimension B		Dimension C		Dimension D	
			Impeller Setting Clearance		Resulting Side Clearance		Radial Clearance		Pass Over Clearance	
			inch	mm	inch	mm	inch	mm	inch	mm
Models 5A, 10	ductile iron	std.	0.001	0.03	*	*	0.002	0.05	0.001	0.01
			0.002	0.04	0.004	0.10	0.004	0.09	0.003	0.06
		hot	0.002	0.05	0.003	0.06	0.004	0.10	0.003	0.06
			0.003	0.06	0.007	0.18	0.006	0.14	0.005	0.11
	stainless steel	std.	0.003	0.08	0.005	0.11	0.004	0.10	0.006	0.14
			0.004	0.09	0.009	0.23	0.006	0.14	0.008	0.19
		hot	0.004	0.10	0.005	0.11	0.006	0.15	0.006	0.14
			0.005	0.11	0.009	0.23	0.008	0.19	0.008	0.19
Model 16	ductile iron	std.	0.001	0.03	*	*	0.002	0.05	0.001	0.01
			0.002	0.04	0.004	0.10	0.004	0.09	0.003	0.06
		hot	0.002	0.05	0.003	0.06	0.004	0.10	0.003	0.06
			0.003	0.06	0.007	0.18	0.006	0.14	0.005	0.11
	stainless steel	std.	0.004	0.10	0.005	0.11	0.006	0.15	0.004	0.09
			0.005	0.11	0.009	0.23	0.008	0.19	0.006	0.14
		hot	0.004	0.10	0.005	0.11	0.006	0.15	0.004	0.09
			0.005	0.11	0.009	0.23	0.008	0.19	0.006	0.14
Model 25A	ductile iron	std.	0.001	0.03	*	*	0.002	0.05	0.001	0.01
			0.002	0.04	0.004	0.10	0.004	0.09	0.004	0.09
		hot	0.003	0.08	0.004	0.09	0.005	0.13	0.002	0.04
			0.004	0.09	0.008	0.20	0.007	0.17	0.005	0.11
	stainless steel	std.	0.005	0.13	0.006	0.14	0.005	0.13	0.006	0.14
			0.006	0.14	0.010	0.25	0.007	0.17	0.009	0.22
		hot	0.007	0.17	0.007	0.18	0.008	0.20	0.006	0.14
			0.007	0.18	0.012	0.29	0.010	0.24	0.009	0.22
Models 65, 125A, 125H	ductile iron	std.	0.002	0.05	0.003	0.06	0.004	0.10	0.001	0.01
			0.003	0.06	0.008	0.20	0.006	0.15	0.005	0.11
		hot	0.006	0.15	0.007	0.17	0.008	0.20	0.004	0.09
			0.007	0.17	0.012	0.30	0.010	0.25	0.008	0.19
	stainless steel	std.	0.007	0.17	0.007	0.18	0.008	0.20	0.004	0.09
			0.007	0.18	0.013	0.32	0.010	0.25	0.008	0.19
		hot	0.011	0.27	0.011	0.27	0.012	0.30	0.006	0.15
			0.012	0.29	0.017	0.42	0.014	0.36	0.011	0.28

for faceplate gaskets compressed to 0.003 - 0.004 inch [0.076 - 0.102 mm]



* Check to ensure that pump still rotates freely

Table 2 - Pump Chamber Clearances

Section 3: Major Disassembly - Models 5A, 10, 16 and 25A

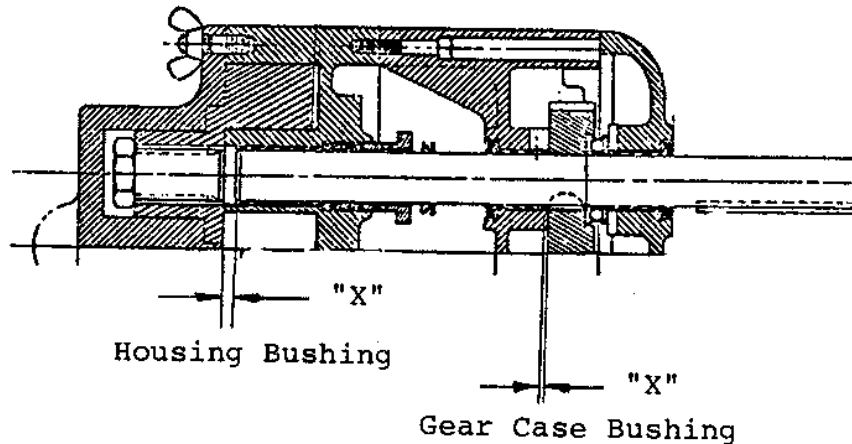
Refer to Figure 1 on Page 4.

1. Remove six faceplate nuts (15).
2. Remove faceplate (13). If faceplate does not pull off readily, it may require a slight tap with a mallet.
3. Remove nuts (19) from ends of shafts. To facilitate this operation, you can wedge a small block of wood or other soft material between the impellers. Loosen both nuts in this manner before removing
4. Slide impellers from shafts. Mark impellers so they can be replaced on the same shaft.
5. Remove all burrs on drive shaft with a mill file or emery paper. Also remove any deposits of paint. Special care should be taken around the keyway and shaft-end. This is where burrs are most likely to be found.
6. Drain the oil from the gear case by removing lower drain pipe plug.
7. Remove six screws (17) from gear case cover. Remove gear case cover by sliding over drive shaft.
8. Loosen packing gland nuts and slide packing glands out of stuffing boxes. NOTE: Pumps with mechanical seals require special handling and these instructions are shipped with the pump.
9. Examine gears for factory timing marks prior to removal. Timing marks should be visible at gear tooth base and consist of two punch marks on the drive shaft gear and one punch mark on the mating tooth cavity on the driven shaft gear. In the event these marks are not provided, gears should be marked at this time.
10. Pull drive and driven shaft/gear assemblies out through the gearcase. Note that timing gear is press-fitted on the shaft, and this feature maintains pump clearance setting.
11. If shaft or gear needs to be replaced, measure the distance from the gear to the end of the shaft. Use a gear puller to remove the gear.
12. All parts should be inspected for wear and damage. Replace worn or damaged parts.
13. Bushings in the housing, gear case and gear case cover are removed by being pressed out.
14. Faceplate bushings, if supplied, are either carbon or glass-filled Teflon. To remove excessively worn Teflon bushings, carefully slit them and remove. To remove excessively worn carbon bushings, carefully break them and remove the pieces.
15. Oil seals (19) in gear case will be pressed out at the same time as the bushings.
16. Oil seal and expansion plug (32) in gear case cover will be pressed out at the same time as the bushings.

Section 4: Major Reassembly - Models 5A, 10, 16 and 25A

Refer to Figure 1 on Page 4.

1. Press new bushings into housing, gear case and gear case cover. Press oil seals into place. Refer to Table 3 for proper installation. When replacing gear case bushings, make sure oil holes line up with cast grooves in the hubs.



pump models	"X" dimension	
	housing	gear case
5A, 10, 16	5/32" [4 mm]	5/32" [4 mm]
25A	5/32" [4 mm]	0
65, 125	3/8" [10 mm]	0

Table 3 - Bushing Installation Dimensions

2. Replace expansion plug.
3. Faceplate bushings, if supplied, are pressed in until bottomed.
4. Replace packing glands and thread packing gland nuts loosely on studs.
5. If any of the shafts or impellers are replaced,
 - a. Install the timing gear key on the shaft.
 - b. Press timing gear on the shaft to the distance measured in Section 3, Step 11.
6. Slide the shaft/gear assemblies through the gearcase, but not yet into the housing.
7. Install the v-rings on the shafts. V-rings should be staggered such that the bottom ring is closer to the gear case. This is easily adjusted after pump is completely assembled by sliding the rings on the shaft.
8. Continue sliding shaft/gear assemblies through the housing until the gear contacts the gearcase.
9. Assemble impeller keys, impellers and shaft nuts on both shafts. Torque impeller nuts per Table 1.
10. Set the timing per Figure 2. Gears that have been in service and marked may be used, as timing will be correct. "X" and "Y" dimensions should be equal when meshing gears to set timing. The normal identification method for timing is two punch marks on the drive shaft gear tooth and one mark on the driven shaft gear mating cavity. Rotate shaft one full revolution to assure correct timing.

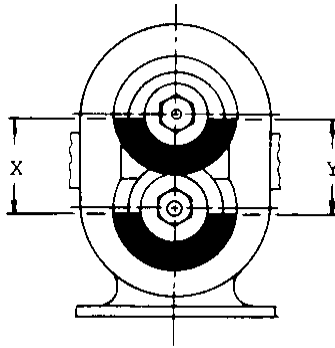


Figure 2 - Impeller Timing

11. Remove shaft nut and impeller from **driven** shaft. See Section 3, Steps 3 and 4 for proper procedure.
12. Press or tap gear case end of **drive** shaft to required setting clearance. Clearance is checked with a feeler gage between impeller lobe face and impeller housing bottom face. This clearance will vary with material of construction and pumping temperature (See Table 2).

Hot clearances are for pumps rated for applications in excess of 150°F (66°C). Hot clearance impellers have an "H" stamped on hub face closest to impeller housing. Standard clearance impellers are not stamped.
13. Replace impeller and nut on **driven** shaft and torque nut as required.
14. Remove shaft nut and impeller from **drive** shaft.
15. Repeat Step 12 for **driven** shaft.
16. Replace impeller and nut on **drive** shaft and torque nut as required.
17. Recheck clearance and timing.
18. Apply grease to gear case face and press gasket in place.
19. Assemble gear case cover and tighten screws. Rotate drive shaft to assure smooth operation.
20. Assemble housing gasket and faceplate and tighten nuts. Rotate drive shaft to assure smooth operation.
21. Install drain pipe plug.
22. Remove oil-level plug and fill plug. Fill with oil to level hole. See Lubrication Schedule on Page ???
23. Install oil-level plug and fill plug. NOTE: Use vented plug (29) for the fill hole.
24. Repack stuffing box. See Section ? for proper installation of packing rings.
25. Snug up packing gland nuts.
26. Pump is now ready for service. Adjust packing leakage gradually for 5 to 10 drops a minute.



CAUTION

Coupling hubs or sheaves must be slip-fit on drive shaft. Shock loads from a hammer or mallet can upset impeller clearances, resulting in immediate pump failure.

Section 5: Major Disassembly - Models 65, 125A and 125H

Refer to Figure 1 on Page 4

1. Remove six faceplate nuts (15).
2. Remove faceplate (13). If faceplate does not pull off readily, it may require a slight tap with a mallet.
3. Remove nuts (19) from ends of shafts. To facilitate this operation, you can wedge a small block of wood or other soft material between the impellers. Loosen both nuts in this manner before removing
4. Slide impellers from shafts. Mark impellers so they can be replaced on the same shaft.
5. Remove all burrs on drive shaft with a mill file or emery paper. Also remove any deposits of paint. Special care should be taken around the keyway and shaft-end. This is where burrs are most likely to be found.
6. Drain the oil from the gear case by removing lower drain pipe plug.
7. Remove six screws (17) from gear case cover. Remove gear case cover by sliding over drive shaft.
8. Remove thrust bearings (1) and shims (33) and identify them so they can be correctly reassembled later.
9. Examine gears for factory timing marks prior to removal. Timing marks should be visible at gear tooth base and consist of two punch marks on the drive shaft gear and one punch mark on the mating tooth cavity on the driven shaft gear. In the event these marks are not provided, gears should be marked at this time.
10. Timing gears are press-fitted on the shafts, and this feature maintains pump clearance setting. Use a gear-puller to remove timing gears.
11. Remove gear keys.
12. Remove any burrs on the shaft that may have occurred during gear removal.
13. Loosen packing gland nuts and slide packing glands out of stuffing boxes. NOTE: Pumps with mechanical seals require special handling and these instructions are shipped with the pump.
14. Pull shafts out of pump from faceplate side. V-rings (22) will also need to be removed from the opposite end of the shafts at this time.
15. All parts should be inspected for wear and damage. Replace worn or damaged parts.
16. Bushings in the housing, gear case and gear case cover are removed by being pressed out.
17. Faceplate bushings, if supplied, are either carbon or glass-filled Teflon. To remove excessively worn Teflon bushings, carefully slit them and remove. To remove excessively worn carbon bushings, carefully break them and remove the pieces.
18. Oil seals (19) in gear case will be pressed out at the same time as the bushings.
19. Oil seal and expansion plug (32) in gear case cover will be pressed out at the same time as the bushings.

Section 6: Major Reassembly - Models 65, 125A and 125H

Refer to Figure 1 on Page 4

1. Press new bushings into housing, gear case and gear case cover. Press oil seals into place. Refer to Table 3 for proper installation. When replacing gear case bushings, make sure oil holes line up with cast grooves in the hubs.
2. Replace expansion plug.
3. Faceplate bushings, if supplied, are pressed in until bottomed.
4. Replace packing glands and thread packing gland nuts loosely on studs.
5. Assemble impeller keys, impellers and shaft nuts on the shafts. Use a soft-faced vise to hold shaft and impeller while torquing the shaft nuts per Table 1.
6. Slide the shaft/gear assemblies through the housing, but not yet into the gearcase.
7. Install the v-rings on the shafts. V-rings should be staggered such that the bottom ring is closer to the gear case. This is easily adjusted after pump is completely assembled by sliding the rings on the shaft.
8. Continue sliding shaft/gear assemblies through the gearcase until the impeller contacts the housing.
9. Assemble timing gear keys.
10. Slide timing gears over shafts until they are partially engaged with the keys.
11. Set the timing per Figure 2. Gears that have been in service and marked may be used, as timing will be correct. "X" and "Y" dimensions should be equal when meshing gears to set timing. The normal identification method for timing is two punch marks on the drive shaft gear tooth and one mark on the driven shaft gear mating cavity. Rotate shaft one full revolution to assure correct timing.
12. Press both timing gears onto shafts.
13. Remove shaft nut and impeller from **driven** shaft. See Section 3, Steps 3 and 4 for proper procedure.
14. Press or tap gear case end of **drive** shaft to required setting clearance. Clearance is checked with a feeler gage between impeller lobe face and impeller housing bottom face. This clearance will vary with material of construction and pumping temperature (See Table 2).
15. Hot clearances are for pumps rated for applications in excess of 150°F (66°C). Hot clearance impellers have an "H" stamped on hub face closest to impeller housing. Standard clearance impellers are not stamped.
16. Replace impeller and nut on **driven** shaft and torque nut as required.
17. Remove shaft nut and impeller from **drive** shaft.
18. Repeat Step 13 for **driven** shaft.
19. Replace impeller and nut on **drive** shaft and torque nut as required.
20. Recheck clearance and timing.
21. Apply grease to gear case face and press gasket in place.

22. Install thrust bearing and shims into timing gear counter-bore.
23. If necessary, add or remove shims to provide 0.0005" - 0.0010" (0.013 - 0.025 mm) axial shaft play.
24. Assemble gear case cover and tighten screws. Rotate drive shaft to assure smooth operation.
25. Assemble housing gasket and faceplate and tighten nuts. Rotate drive shaft to assure smooth operation.
26. Install drain pipe plug.
27. Remove oil-level plug and fill plug. Fill with oil to level hole. See Lubrication Schedule on Page ???
28. Install oil-level plug and fill plug. NOTE: Use vented plug (29) for the fill hole.
29. Repack stuffing box. See Section 11 for proper installation of packing rings.
30. Snug up packing gland nuts.
31. Pump is now ready for service. Adjust packing leakage gradually for 5 to 10 drops a minute.



CAUTION

Coupling hubs or sheaves must be slip-fit on drive shaft. Shock loads from a hammer or mallet can upset impeller clearances, resulting in immediate pump failure.

Section 7: Disassembly of 3:1 Gear Reduction Unit - Models 5A, 10 and 16

The following instructions pertain only to the Models 5A, 10 and 16 pumps with optional 3:1 gear reduction unit. Refer to Figure 3 for parts identification.

1. Drain oil from gear case by removing lower drain plug.
2. Remove six screws (10) on face of gear reduction cover. Remove cover (9) by sliding over shafts.
3. Remove cone bearing (8), long spacer (7), reduction gear (6), short spacer (5) and timing gear from top gear reduction shaft. Also remove cone bearing, spacer and timing gear from lower gear reduction shaft.

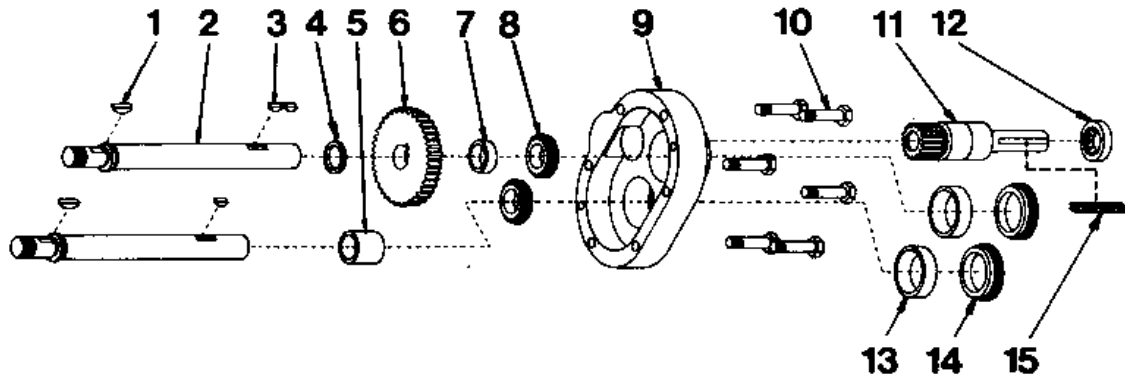
NOTE: Check timing gears for timing marks per Section 5, Step 9. If timing gears are not marked, mark them before removing.

4. To replace pinion shaft assembly (1), press assembly out of hub. Oil seal (12) will remain on shaft. Press new shaft assembly in place. Slip oil seal over shaft and press into oil seal bore.
5. To replace cup bearing, first remove adjusting plug (14) with spanner wrench. Insert new bearing cup and screw adjusting plug partially in. Adjust plugs after reassembly of gear reduction unit. All play should be removed from cone bearing.
6. To disassemble entire pump, see Section 3.

Section 8: Reassembly of 3:1 Gear Reduction Unit - Models 5A, 10 and 16

The following instructions pertain only to the Models 5A, 10 and 16 pumps with optional 3:1 gear reduction unit. Refer to Figure 2 for parts identification.

1. Assemble entire pump, except for the gear reduction unit, per Section 4, Steps 1-17.
2. If timing is correct, place short spacer (4), reduction gear (6), a long spacer (7) and cone bearing (8) on upper gear reduction shaft. Also place spacer (5) and cone bearing (8) on bottom shaft.
3. Apply grease to housing gasket seal surface. Press gasket in place.
4. Slide gear reduction cover over shafts, revolving pinion shaft to mesh with gear reduction gear.
5. Tighten six screws holding cover in place.
6. Remove oil-level plug and fill plug. Fill with oil to level hole. See lubrication recommendations on Page ???



item	part name	no. req'd	part numbers		
			5A	10	16
1	key, impeller	2	P500-19S4	P500-19S4	P500-19S4
2	shaft, gear reduction	2	10619300	10619300	10619400
3	key, gear	3	10511700	10511700	10511700
4	spacer, short, upper	1	10618700	10618700	10618700
5	spacer, lower shaft	1	10618800	10618800	10618800
6	gear, reduction	1	10618600	10618600	10618600
7	spacer, long, upper	1	10636500	10618600	10618600
8	bearing, cone	2	P652-9	P652-9	P652-9
9	cover, gear reduction	1	10618300	10618300	10618300
10	cap screw, hex	6	P101-6H	P101-6H	P101-6H
11	pinion shaft assembly	1	10673700	10673700	10673700
12	oil seal, pinion shaft	1	P941-14	P941-14	P941-14
13	bearing cup	2	P652-10	P652-10	P652-10
14	adjusting plug, gear reduction	2	10606300	10606300	10606300
15	key	1	12313700	12313700	12313700

Figure 2 - 3:1 Gear Reduction Unit

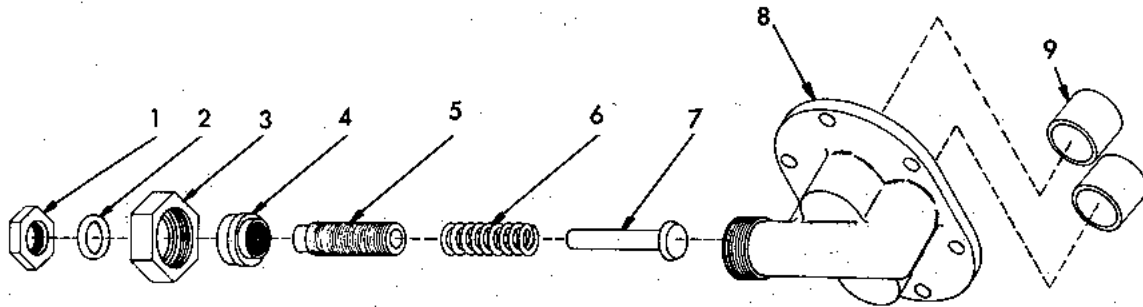
Section 9: Disassembly of Relief Valve

All Standard Duty pumps are available with optional pressure relief valves. The valve, when supplied, is built into the faceplate. Therefore, servicing of the valve is a minor disassembly procedure which can be performed without disturbing pump mounting, piping or installation.

NOTE: The adjustment end of the valve must be on suction side of pump for proper operation.

1. For Models 5A, 10, 16, 25A (See Figure 3):

- a. Remove locknut and o-ring.
- b. Remove sanitary nut.
- c. Plug and valve housing subassembly may then be removed and separated.
- d. Remove spring and valve.



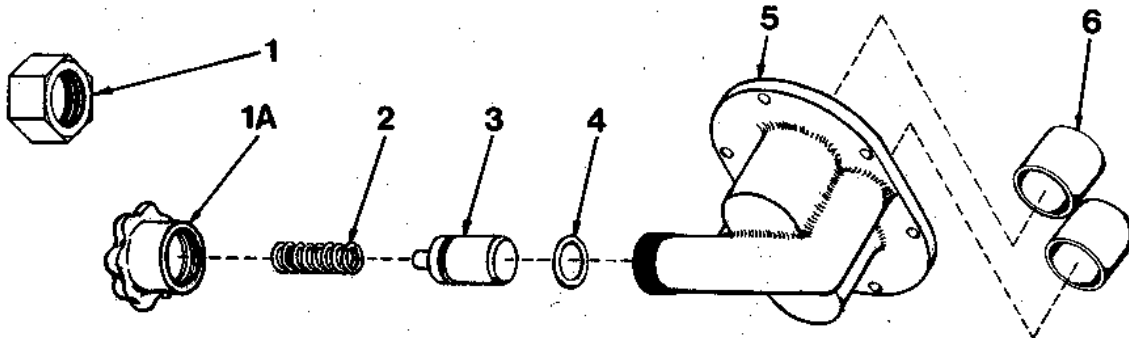
item	part name	material	no. req'd.	part number	
				5A, 10, 16	25A
1	lock nut	stainless steel	1	10596800	10597500
2	"o" ring, locknut	buna-N	1	P701-22-37	P701-26-37
3	sanitary nut	nickel alloy	1	P208-1N	P208-2N
4	plug, threaded	stainless steel	1	10596700	10597400
5	housing, valve	stainless steel	1	10596500	10597200
6	spring	stainless steel	1	10597000	10597700
7	valve	stainless steel	1	10596400	10597100
8	faceplate	cast iron	1	13900901	13903401
		stainless steel	1	42002601*	42004700*
9	bushing, faceplate	filled Teflon	2	10541800	10543300

*Includes Bushings

Figure 3 - Relief Valve for Models 5A, 10, 16 & 25A

2. For Models 65, 125A and 125H (See figure 4):

- a. Remove adjustment nut or hand wheel.
- b. Remove spring, valve and o-ring subassembly.



item	part name	no req'd.	part number	
			cast iron	stainless steel
1	adj. nut	1	50240100	--
1A	handwheel	1	--	10592700
2	spring	1	20386800	20386800
3	valve	1	20339600	20338600
4	o'ring	1	P701-36-37	P701-36-37
5	faceplate	1	13904100	42005301*
6	bushing	2	--	10545100

*Includes Bushings

Figure 4 - Relief Valve for Models 65 & 125A

Section 10: Reassembly of Relief Valve

1. For Models 5A, 10, 16, 25A(See Figure 3):

- a. Check beveled end of valve for burrs or damage. If present, correct before assembly.
- b. Install valve on seat in faceplate.
- c. Place spring on valve stem
- d. Engage threaded plug approximately ¾ of the length of the valve housing. Place plug and valve subassembly over valve stem.
- e. Tighten sanitary nut to capture valve assembly.
- f. Set valve for bypass pressure. To do this, first install a pressure gage in the discharge line. Turn valve housing clockwise until pressure stops increasing. More turns will cause the relief valve to operate at a higher pressure. The valve is now seated and pump is discharging at full capacity.
- g. Install o-ring and locknut.

2. For Models 65, 125A and 125H (See figure 4):
 - a. Check beveled end of valve for burrs or damage. If present, correct before assembly.
 - b. Place o-ring and valve assembly in valve seat.
 - c. Place spring over valve stem.
 - d. Engage adjustment nut or hand wheel 2 full threads.
 - e. Set valve for bypass pressure. To do this, first install a pressure gage in the discharge line. Turn locknut or hand wheel clockwise until pressure stops increasing. More turns will cause the relief valve to operate at a higher pressure. The valve is now seated and pump is discharging at full capacity.

Section 11: How Packings Work

All packings must leak to perform properly. Their purpose is to control leakage – not to prevent it. The slight leakage along the shaft provides proper lubrication and cooling of the packings.

NOTE: All packed pumps are provided with slinger rings as standard equipment.

1. Installing Packings in Pumps:

- a. Remove all old packing. Clean stuffing boxes (areas occupied by packing) and shafts thoroughly and examine shafts for wear or scoring. Check bearings for wear as this can cause an eccentric shaft rotation, resulting in excessive leakage. Packings will not act as a bearing. If shaft surface is worn, replace shaft or have seal mating area resurfaced.
- b. Be certain the proper size packing is used. The following packing sizes are provided:

Pump Model	Packing Size	Shaft Diameter	No. of Rings
5A, 10, 16	1/4" (6.35mm) square	3/4" (19mm)	4
25A	1/4" (6.35mm) square	1" (25.4mm)	4
65, 125H	1/4" (6.35mm) square	1 3/8" (34.9mm)	4
125A	1/4" (6.35mm) square	1 3/8" (34.9mm)	6

Table 4 - Packing Sizes

- c. Always cut packings into separate rings. Never coil around shaft. (Standard factory packings are pre-cut and pre-formed.) If bulk packing is used, cut each ring on a mandrel the same size as the pump shaft. Test rings in stuffing box to be certain that each ring fills the seal chamber and that there is no gap between packing joints.
- d. Install one ring at a time, seating each ring independently. Use clean oil to lubricate shaft and inside of stuffing box. Joints should be staggered and kept at least 90° apart. Each individual ring should be firmly seated with a tamping tool. Never depend entirely on the gland to seat a set of packings, as this practice will jam the last rings installed but lets the front rings loose, resulting in excessive and rapid wear.
- e. After last ring is installed, tighten gland nuts finger tight. Then start pump and take up nuts until leakage is decreased. Stopping leakage at this point will cause packing to burn. If temperature rises in seal area, back off on packing nuts as this indicates excessive gland pressure.
- f. Allow packing to leak freely for at least one hour when starting up a newly packed pump. Take up gland nuts gradually, 1/16 turn every 5-10 minutes, until leakage stabilizes at about 3-5 drops per minute. If temperature in seal area increases, back off and start over.

- g. Replace packing when leakage cannot be controlled by further take up of gland.

Test results indicate that 70% of the wear occurs on the first two rings of packing nearest the gland. Rings next to the gland work the hardest. The rings in the bottom of the stuffing box serve to throttle some fluid pressure. On abrasive service the bottom ring takes most of the beating. Therefore, this ring should be a firm ring.

2. How To Pack For Abrasive Liquids:

As used here, "abrasives" is a broad term intended to cover the problem of packing against slurries, congealing liquids and the like. They cause the greatest damage to equipment and present difficulties for packing. In general, this involves flush, purges and temperature control. Hard facing on the shaft seal surfaces, such as stellite or ceramic, is also recommended.

When pumping slurries and abrasives, an external source of clear or otherwise suitable liquid must be force-fed at a pressure higher than that existing in the stuffing box. This differential pressure is approx. 10 - 25 psi (0.7 - 1.7 bar).

3. How To Pack For Suspended Solids:

Solids which are suspended in liquids and which are an inherent part of their structure would include starch, clay slurry, muddy water and other similar slurries. This is best handled by an external flush of clear liquid through a lantern ring as shown in Figure 5. This arrangement will result in a small amount of product dilution and is controlled by the differential pressure in the seal chamber.

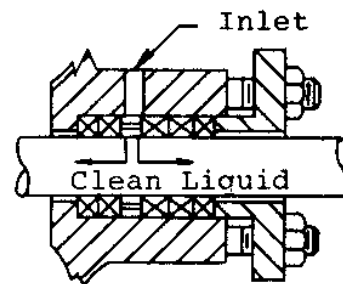


Figure 5
Packing with Internal Flush

4. How To Pack For Congealing Liquids:

These liquids congeal either because of a change in temperature or as a result in drying out after exposure to air. Clay coatings and latex fall into both categories. A good rule is to keep the fluid moving before congealing can take place. Control with cooling or heat and/or by flush or purge.

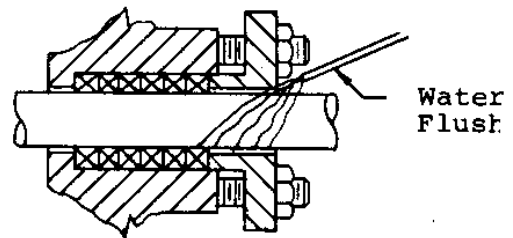


Figure 6
Packing with External Flush

Some products harden to a solid state when exposed to air. Clay coatings, latex and sugars are examples. An effective flush is shown in Figure 6. Note that this type of flush does not enter the product, but only mixes with the product leakage. This arrangement also tends to serve as cooling medium for the seal chamber.

Section 12: Direction of Flow

All Standard Duty pumps are equipped with a vertical shaft arrangement. When facing the gear case-end of the pump equipped with top drive shaft (standard), clockwise drive shaft rotation will provide a left-hand suction port and a right-hand discharge port. The pumps are designed for reversible flow either by changing direction of drive shaft rotation or switching the drive and driven shafts in the pump.

Gear reduction pumps employ an additional gear stage, thus clockwise top drive shaft rotation will provide a right-hand suction and left-hand discharge.

NOTE: Position the faceplate for correct bypass relief valve operation, if pump is so supplied.

Section 13: Serial Number Location

Serial number nameplate is located as shown in Figure 1, item 35. In addition to the nameplate, the serial number is also stamped on top of the impeller housing (10).

This serial number should be furnished to Tuthill whenever service parts are required and when questions regarding pump design or construction arise.

Section 14: Material Returns

If it becomes necessary to return a pump to the factory, a Return Goods Authorization (RGA) must be obtained from either your local Authorized Distributor or our Alsip plant. No RGA can be issued until a completed Material Safety Data Sheet (MSDS) has been forwarded to our Alsip plant and return of the pump approved.

- Tuthill pumps are precision built and must be handled with care.
- Pumps must be drained of all fluid and the ports plugged to prevent foreign material from getting into the pump.
- Pumps must be packaged securely to prevent damage while in transit.

Section 15: Lubrication Schedule

The following tables of lubrication requirements are offered as a guide only. Unusual ambient conditions (dust, temperature, humidity, etc...) can alter the requirements.

Temperature (°F)	Temperature (°C)	Gearcase Oil
-100 to 350	-73 to 177	90 weight gear oil
350 to 525	177 - 274	250 weight gear oil

Table 5 - Gearcase Oil Requirements

Model	Gearcase Capacity	First Oil Change	Subsequent Oil Changes
5A, 10, 16	5 oz [150 ml]	500 hours	every 3000 hours
5A, 10, 16 with 3:1 gear reduction	7 oz [200ml]	500 hours	every 3000 hours
25A	5 oz [150ml]	500 hours	every 3000 hours
65, 125A, 125H	56 oz [1650 ml]	500 hours	every 3000 hours

Table 6 - Gearcase Capacity and Change Schedule

Section 16: Common causes of pump failure

SYMPTOMS								CAUSES	SUGGESTED SOLUTIONS
Excessive gland leakage	Noisy	Excessive Heat	Wear	Starts then loses prime	Fails to discharge	Not up to capacity	Takes too much power		
	X			X		X		Suction lift to high for vapor pressure of liquid	Reduce vacuum requirements
	X		X			X		Liquid too viscous for pump speed	Reduce pump speed
	X			X		X		Air leakage in suction piping	Tighten and seal all joints
				X	X			Suction pipe not immersed in liquid	Lengthen suction pipe or add liquid to supply tank
	X				X			Suction strainer clogged or of insufficient area	Clean strainer or use larger size
X	X	X	X				X	Misalignment between pump and driver	Re-align. Check coupling alignment with dial indicator
	X	X	X				X	Rotating elements binding	Disassemble and inspect
	X	X	X				X	Pipe strain on pump casing	Disassemble pipe and re-align before reassembling
	X					X		Relief valve chattering	Check setting and valve seating
X			X			X	X	Excessive system pressure	Check for obstructions in discharge lines
X		X					X	Stuffing box packed too tightly	Repack and adjust
						X		Pump speed to low	Check pump impeller speed
X						X		Pump parts worn	Have pump reconditioned or replace worn parts
						X	X	Obstruction in discharge line	Check discharge piping and valves for obstruction
					X			Wrong direction of rotation	Reverse motor
	X					X		Suction line sized too small	Increase suction piping size
						X		Torque control coupling not adjusted	Readjust coupling

Notes:



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