

# Bushing Series Service Manual

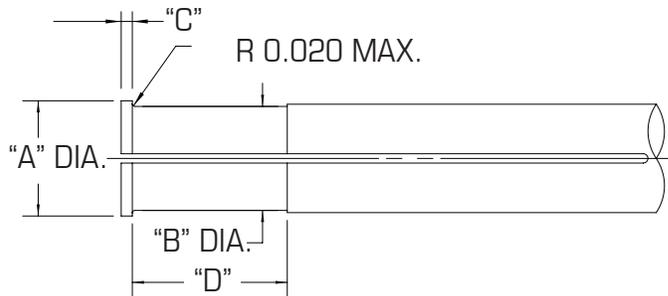


**PERMCO**

## Tool List

1. Arbor Press
2. Bearing Puller
3. Bushing Removal Kit
4. Collets
5. Bushing Installation Kit
6. Soft Face Hammer
7. Medium Grit Stone
8. Oil and Grease
9. Torque Wrench
10. Bench Vise
11. Crayon or Marker
12. Permatex Aviation Form-A-Gasket #3
13. Snap Ring Pliers
14. Lip Seal Install Plug
15. Motor Seal Expansion Sleeve

## Bushing Removal



Series	A Dia.	B Dia.	C	D	Collet	OTC #
<b>124</b>	0.920/0.940	0.830/0.850	0.085/0.095	1.22/1.28	T-1195	33863
<b>197</b>	Stock	Stock	0.085/0.095	Stock	T-1170	33863
<b>257</b>	1.260/1.280	1.140/1.160	0.060/0.070	As Shown	T-1174	33865
<b>360</b>	1.372/1.382	1.250/1.260	0.100/0.120	As Shown	T-1202	33865

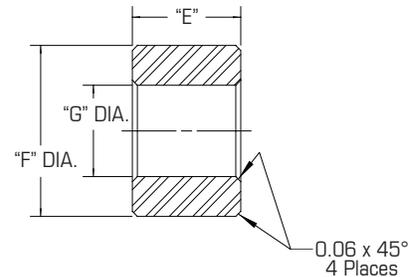
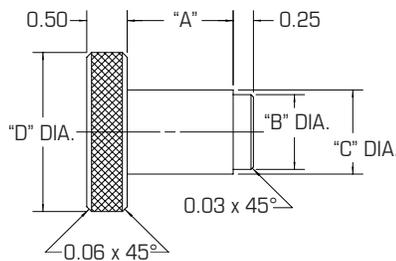
Need 1 kit (T-1243) plus the collet for each series or the OTC collet modified per sketch shown above.

## Bushing Insertion

### Bushing Insertion Kits

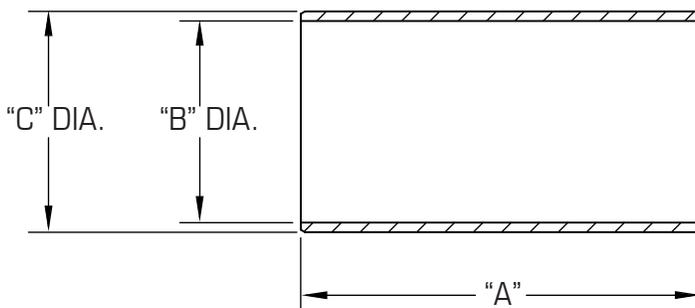
- 124 Series - T-1194
- 197 Series - T-1188
- 257 Series - T-1175
- 360 Series - T-1199

Kits includes insertion tool and guide or see sketches to right.



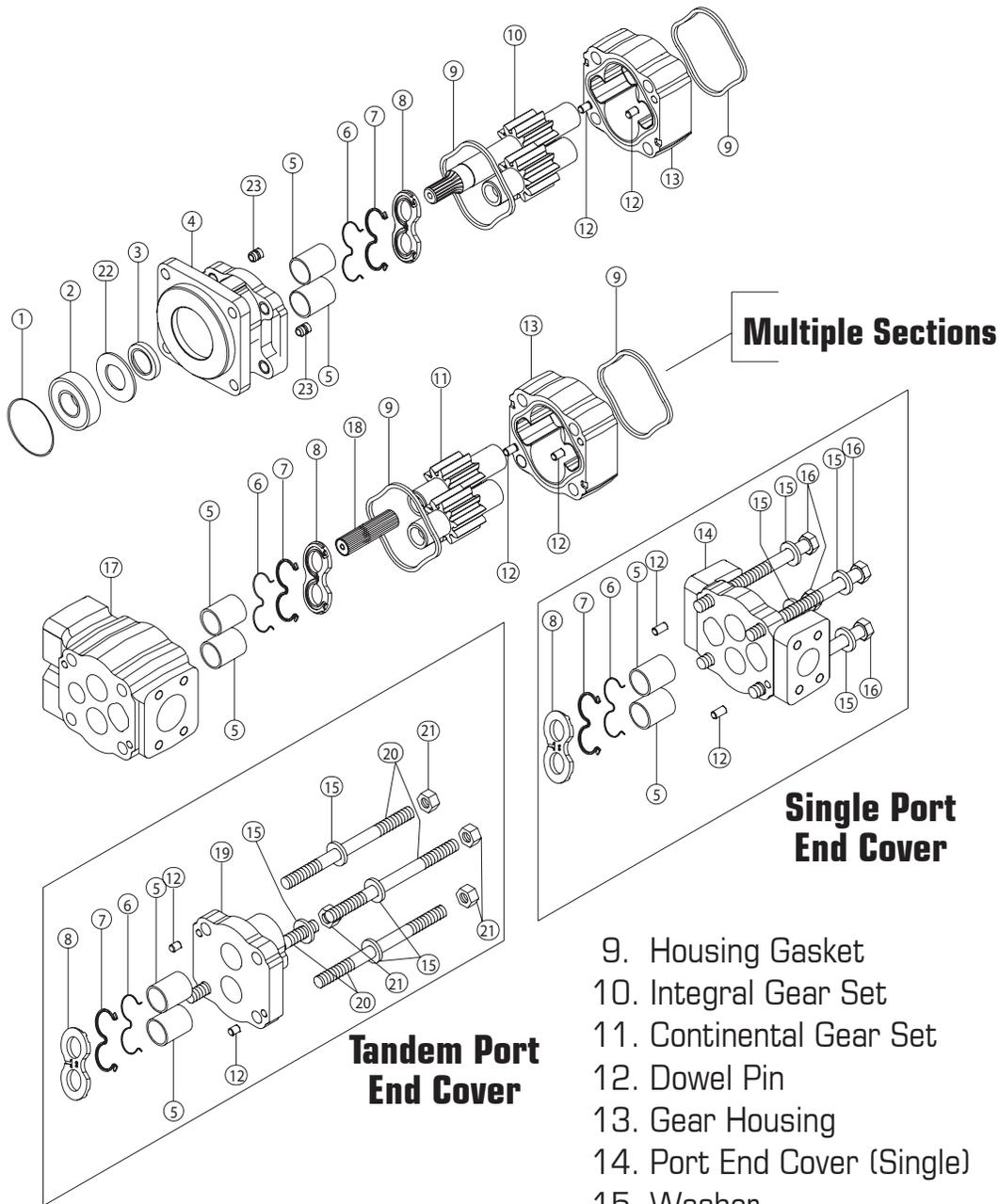
Series	A	B Dia.	C Dia.	D Dia.	E	F Dia.	G Dia.
<b>124</b>	1.307/1.312	0.939/0.941	1.057/1.059	2.00	1.298/1.302	2.000	1.067/1.069
<b>197</b>	1.410/1.415	1.119/1.121	1.275/1.277	2.00	1.395/1.400	2.375	1.285/1.287
<b>257</b>	1.811/1.815	1.286/1.288	1.443/1.445	1.94	1.800/1.804	1.940	1.453/1.457
<b>360</b>	2.002/2.004	1.496/1.498	1.655/1.657	2.50	1.999/2.001	2.500	1.665/1.667

## Motor Seal Expansion Sleeve



Series	Tool Part #	A	B Dia.	C Dia.
<b>124</b>	Q-1956-5	2.500	0.885/0.889	0.940/0.944
<b>257</b>	Q-1956-3	2.500	1.250/1.254	1.286/1.290
<b>360</b>	Q-1956-2	2.500	1.259/1.263	1.379/1.383

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1. Retaining Ring
2. Outboard Bearing (Optional)
3. Shaft Seal
4. Shaft End Cover
5. Journal Bushing
6. Back up Ring
7. Seal Ring
8. Thrust Plate

9. Housing Gasket
10. Integral Gear Set
11. Continental Gear Set
12. Dowel Pin
13. Gear Housing
14. Port End Cover (Single)
15. Washer
16. Hex Head Bolt
17. Bearing Carrier
18. Connecting Shaft
19. Port End Cover (Tandem)
20. Tie Bolt
21. Hex Nut
22. Spacer (Motor only)
23. Check Valves for Motors, Plugs according to BOM

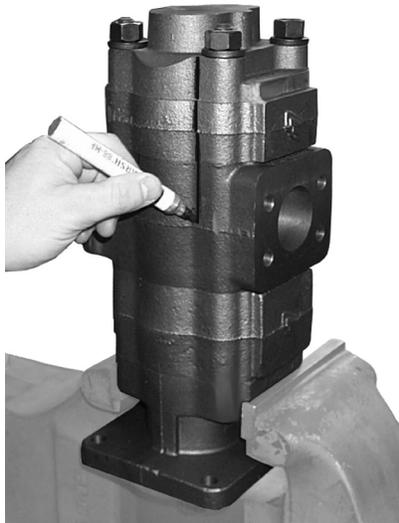
## General Notes

1. Read all instructions prior to disassembly and assembly to familiarize yourself with all steps required.
2. All areas and tools should be clean in the work area, and all parts clean and wiped with a lintless cloth before assembly.
3. Make sure all components are prepared and marked (if needed) for the correct rotation.
4. Use only Geniune Permco parts, as other manufacturers' parts may not fit in all Permco assemblies.
5. Refer to bushing diagrams included for each series on page 9-10.
6. Tear down and assembly shown is a P257 2 section pump.

## 1.

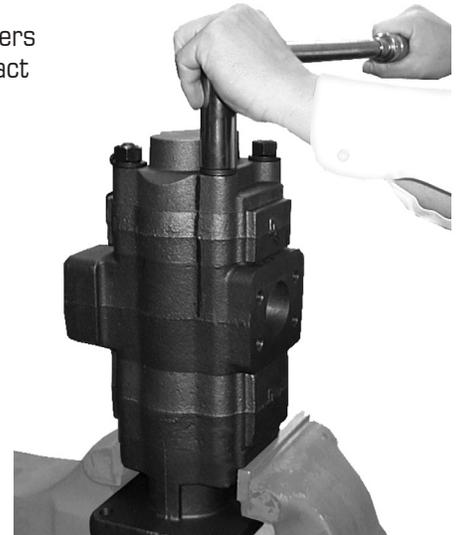
Place pump in vise as shown and scribe a line down the pump from port end cover to shaft end cover. This line will be used for reassembling.

**DO NOT GRIP ON OR NEAR ANY MACHINED SURFACES DURING ASSEMBLY OR DISASSEMBLY**



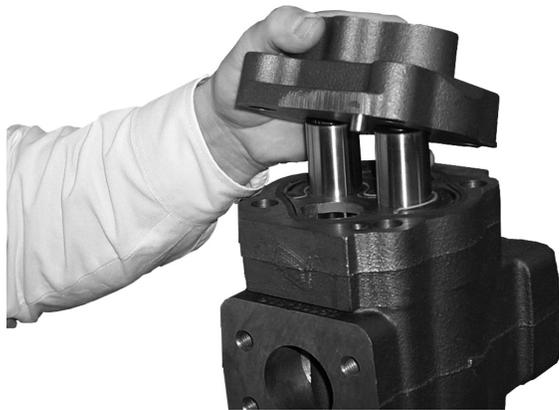
## 2.

Remove the 4 fasteners with a socket or impact wrench.



## 3.

Remove port end cover by inserting screwdrivers into pry-pockets on the side of the gear housing. Be careful not to damage machined surfaces.



## 4.

Remove the thrust plate and inspect. (See Page 8)



## 5.

**Multiple Units Only** Remove gear set keeping gears together. Remove thrust plate from bearing carrier. Examine gear set and thrust plate for replacement. (See Page 8)



## 6.

**Multiple Units Only** Remove gear housing from bearing carrier by using screwdrivers inserted into the pry-pockets. Examine for replacement. (See page 8)



# Bushing Series Service Manual

**7.**

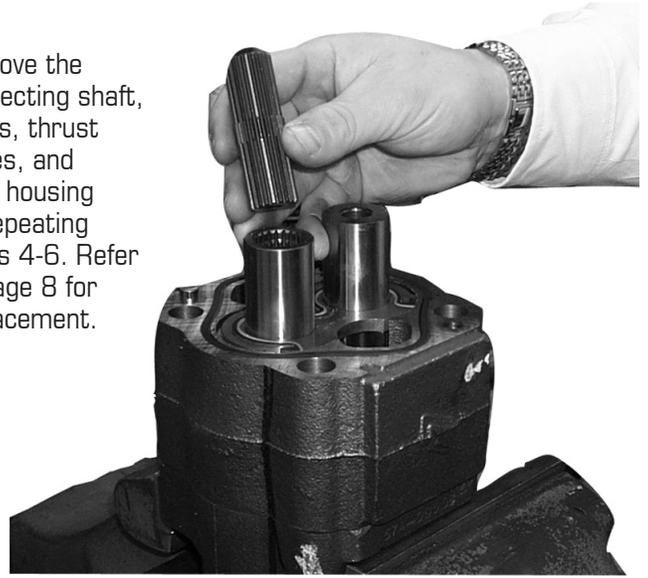
**Multiple Units Only**

Lift bearing carrier from gear housing.



**8.**

Remove the connecting shaft, gears, thrust plates, and gear housing by repeating steps 4-6. Refer to page 8 for replacement.



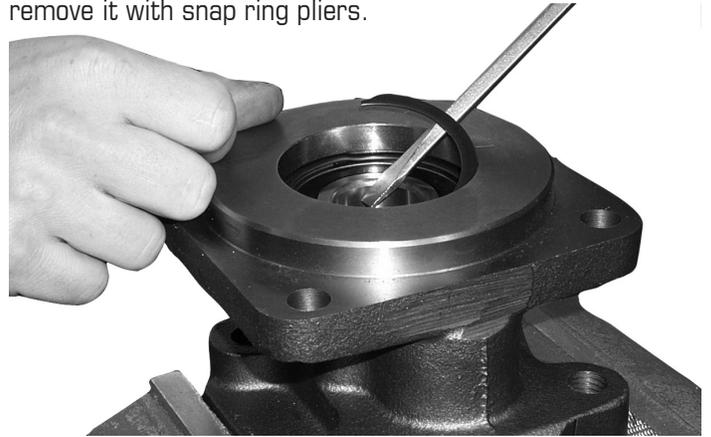
**9.**

Inspect all bushings and refer to page 8 for replacement.



**10.**

If the unit is equipped with an outboard bearing, first remove the retaining ring as shown. If unit has snap ring, remove it with snap ring pliers.



**11.**

Use a bearing puller to remove outboard bearing, if needed.



**12.**

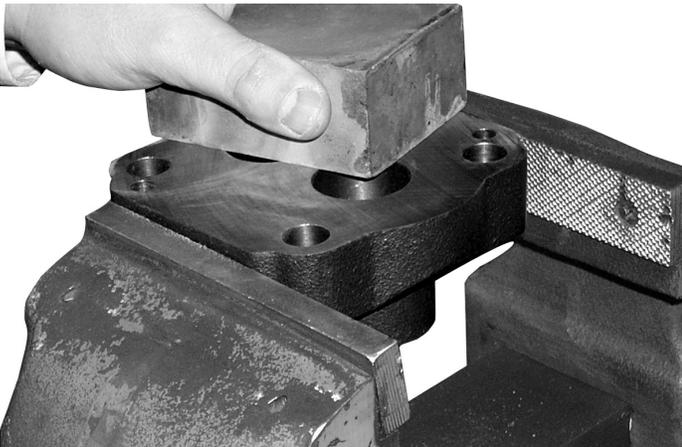
Remove the shaft seal by placing a screwdriver against the back of seal and tapping as shown.



- 1. Shaft End Cover, Gear Housing, Bearing Carrier, and Port End Cover:** Stone or file mating surfaces to remove any raised metal generated in shipping or handling.
- 2. Gear Shafts, Gears:** Stone faces of gears to remove any raised metal generated in shipping and handling.
- 3. Bearing Carrier and Port End Cover:** Probe all bushing drain passages to insure that none are blocked.
- 4. Gear Housing:** Use a deburring knife to break the edge on the gear bores and dowel pin holes to ease assembly. Clean foreign material from dowel pin holes and gasket grooves.
- 5. Shaft End Cover, Bearing Carrier, and Port End Cover:** Use a deburring knife to break the edge of bushing and dowel pin holes to ease assembly. Clean foreign material from dowel pin holes. Use a flapper wheel or emery cloth on edge of the bushing bores to create a small radius.
- 6. Shaft End Cover, Bearing Carrier, and Port End Cover:** Mark the faces to indicate low and high pressures. This will ensure proper bushing orientation.

**1.**

Stone all faces with a medium grit stone.



**2.**

Deburr all bushing bores with emery cloth to assure bushings do not become galled during installation.



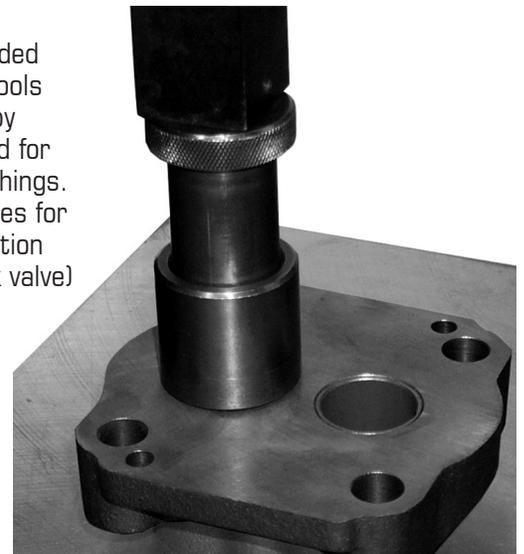
**3.**

Apply a thin film of Permatex Aviation Form-A-Gasket #3 around the O.D. of the lip seal. With the metal side up, press the seal into bore until it is flush with the recessed face.



**4.**

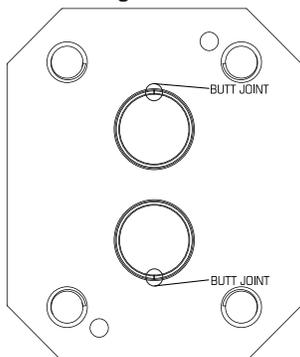
It is recommended that insertion tools manufactured by Permco be used for pressing in bushings. Refer to sketches for bushing orientation and plug (check valve) location.



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**5.**

Install bushings with the lube grooves and butt joints as shown on Page 9-10.



**124 Series shown in this example**

**6.**

If unit has an outboard bearing install as shown. For motors install spacer (22) first.



**7.**

Install spirolox retaining ring as shown.



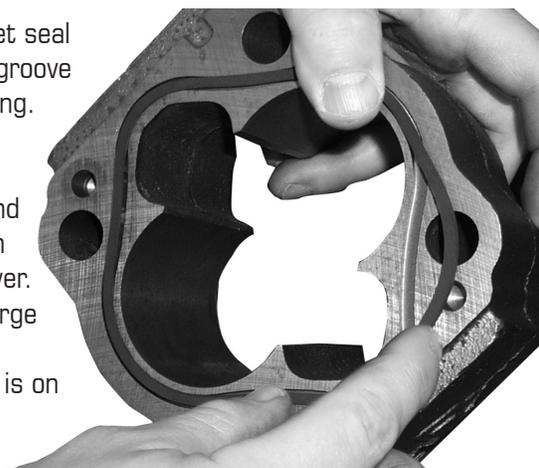
**8.**

Start pin in hole straight, and tap lightly with a soft hammer.



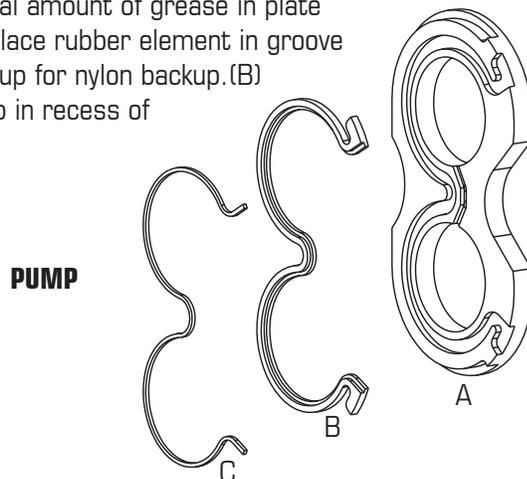
**9.**

Grease gasket seal and place in groove of gear housing. Place gear housing on dowel pins and tap flush with shaft end cover. Make sure large core of 124, 197, or 360 is on inlet side.



**10.**

Place a liberal amount of grease in plate groove(A). Place rubber element in groove with recess up for nylon backup.(B) Place backup in recess of seal ring.(C)



## 11.

Slip the thrust plate into the gear housing with the "T" or "U" shaped trapping pocket up and on the outlet side.



## 12.

Squirt oil into bushings and on thrust plates and slide gears into gear housing. For motors protect the seal by placing a seal insertion sleeve onto gear.



## 13.

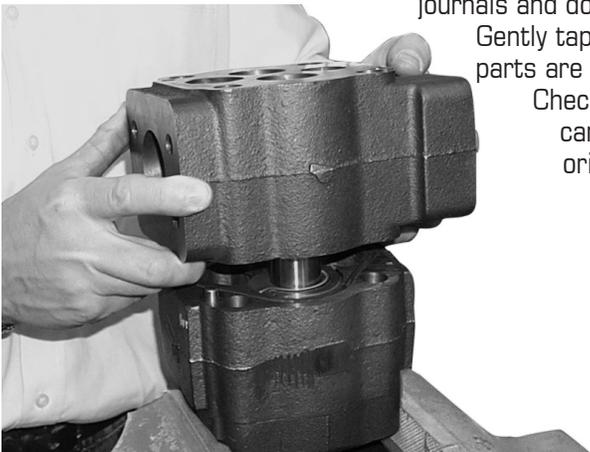
Slide thrust plate over gears with seals facing up and trapping pocket on pressure side. Tap dowel pins into gear housing.



## 14.

### Multiple Units Only

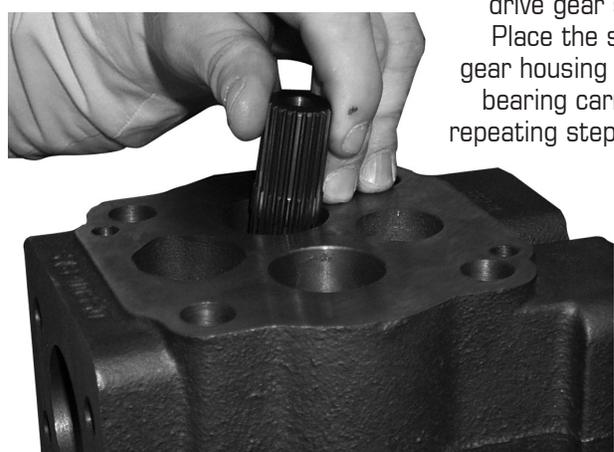
Position bearing carrier over gear journals and dowel pins. Gently tap until the parts are together. Check bearing carrier port orientation.



## 15.

### Multiple Units Only

Insert connecting shaft into the drive gear spline. Place the second gear housing on the bearing carrier by repeating steps 8-9.



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**16.**

**Multiple Units Only**

Repeat steps 10 - 13 using continental gears in step 12.



**17.**

Position port end cover over gear journals and dowel pins. Gently tap until the parts are together.



**18.**

Place 4 washers on the port end cover. Thread 4 clean and dry fasteners into the shaft end cover, and tighten alternately in a diagonal pattern. Rotate the drive shaft with vise grips and torque to specification shown in table below.



	Pump	Motor
<b>124 Series</b>	120 ft. lbs	120 ft. lbs
<b>197 Series</b>	200 ft. lbs	200 ft. lbs
<b>257 Series</b>	200 ft. lbs	200 ft. lbs
<b>360 Series</b>	250 ft. lbs	450 ft. lbs

## Guide for Replacing Parts

### Thrust Plates

Replace plates if scored, eroded, pitted, or discolored from heat.

### Gears

Replace if any scoring on journals is found. Also fretting, nicking, scoring, or grooving of teeth surfaces.

### Gear Shafts

Same as gears, but also replace if any wear is found in seal area. Also replace if any wear on splines or keyway is found.

### Gear Housing

Replace if wear exceeds 0.005" below bore.

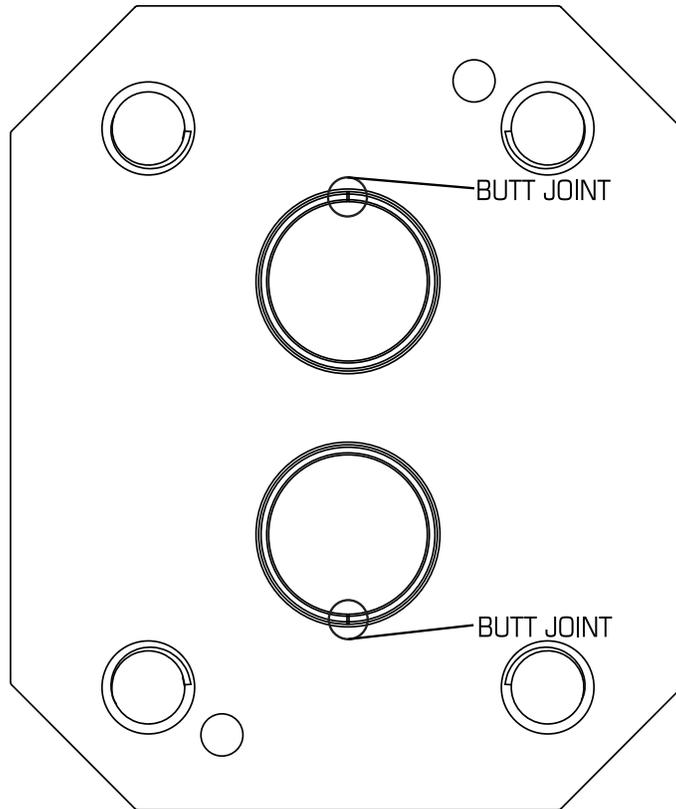
### Dowel Pins

If the dowel pin is loose in the casting, either the dowel pin or casting must be replaced

### Bushings

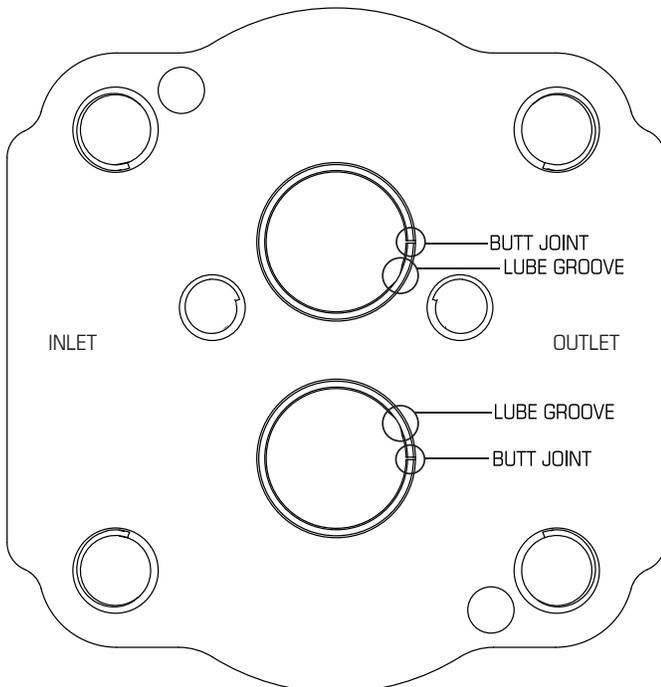
Replace if scoring, discoloration, or signs of copper showing through. If gear set is replaced, the bushings should also be replaced.

## P124/M124

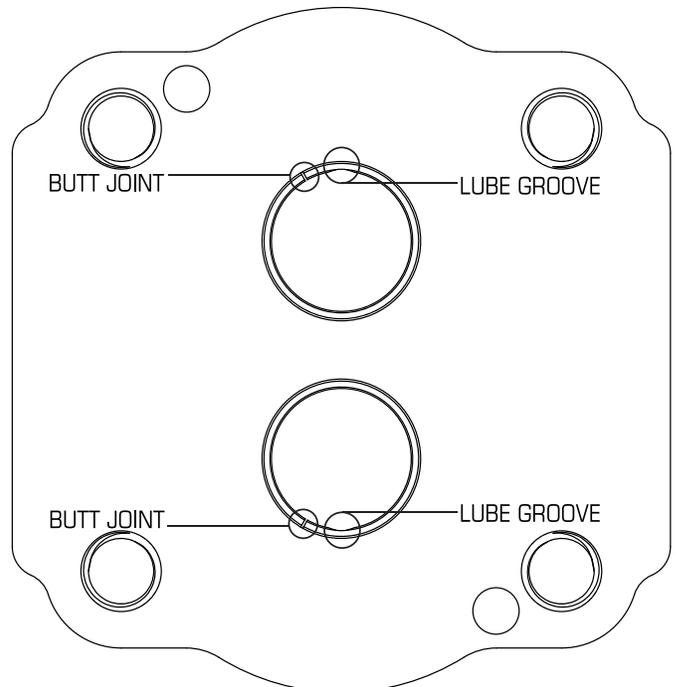


Install bushings as shown with butt joints located at 12:00 and 6:00 o'clock. Bushings must be flush to slightly below surface.

## P197



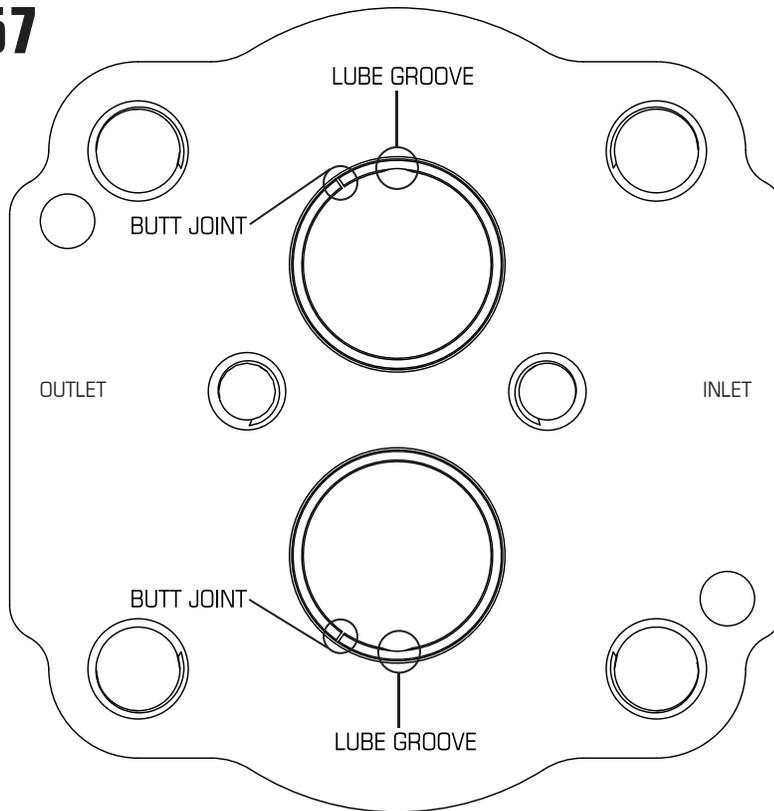
## M197



Install P197 series bushings with lube grooves and butt joints as shown for optimum performance. However, bushings may alternately be installed per M197 diagram and must be flush to slightly below the surface.

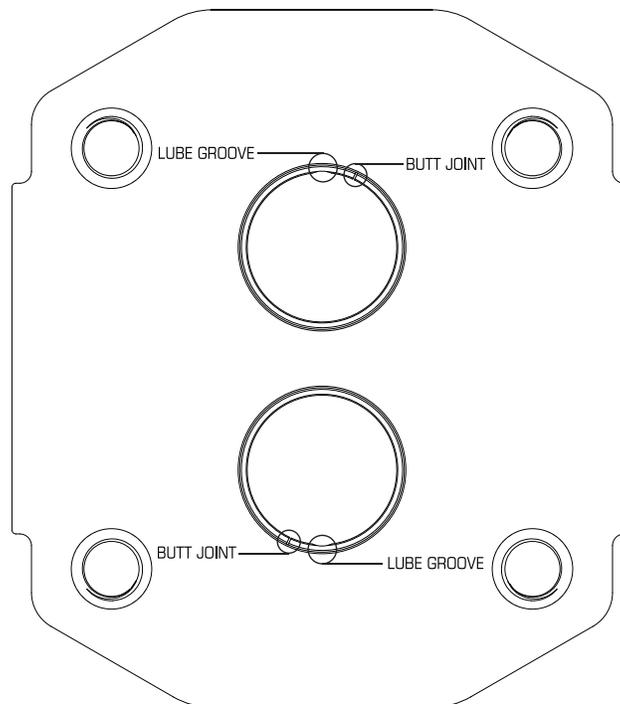
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## P257/M257



Install bushings with lube grooves and butt joints as shown. Bushings must be flush to slightly below the surface.

## P360/M360



Install bushings as shown with lube grooves at 12:00 and 6:00 o'clock. Bushing OD chamfer/ lead-in is down and square corner must be flush to slightly below surface.

## Startup and Break-in Procedure

1. Before you begin testing, unscrew the main relief valve on the circuit.
2. Run the pump for two minutes under no load conditions, low pressure, and low rpm (600 rpm minimum). If everything seems to function properly and no unusual sounds are heard, you may commence testing per the procedure below.

The testing for the Bushing Series units should be followed closely to assure optimum performance.

When testing a multiple unit, test one section at a time. Be sure the other sections are being supplied with adequate oil during the test procedure.

The testing procedure involves loading and unloading the unit to prevent contamination of the bushings and bushing journals. In doing so, particles of contaminate generated during the load cycle will be flushed through the system during the no load cycle.

## Testing Procedure

**Do not test the unit above the working pressure of the destined application. This will minimize unnecessary housing wipe and assure optimum volumetric output.**

0-15 seconds @ 0 psi	136-150 seconds @ 2500 psi
16-30 seconds @ 500 psi	151-165 seconds @ 0 psi
31-45 seconds @ 0 psi	166-180 seconds @ 3000 psi
46-60 seconds @ 1000 psi	181-195 seconds @ 0 psi
61-75 seconds @ 0 psi	196-210 seconds @ 3500 psi
76-90 seconds @ 1500 psi	211-225 seconds @ 0 psi
91-105 seconds @ 0 psi	226-240 seconds @ 4000 psi
106-120 seconds @ 2000 psi	241-255 seconds @ 0 psi
121-135 seconds @ 0 psi	256-270 seconds @ 4500 psi

## Fluid Type and Temperature Conditions

1. The Bushing Series pumps and motors are compatible with mineral base, water glycol, and invert emulsion fluids. Fluids such as phosphate ester may be used in some applications. Please consult the factory prior to using this type of fluid.  
  
It is recommended that a premium quality hydraulic fluid with a viscosity range of 150-300 SUS (32-65 cSt.) at 100°F (38°C) be used to assure optimum performance. The normal operating viscosity range is between 55-1000 SUS (9-220 cSt.) with a start up viscosity not to exceed 2000 SUS (440 cSt.).
2. Under normal operating conditions, fluid temperatures should not exceed 180°F (82°C) for mineral base fluids and 135°F (57°C) for water glycol and invert emulsions. If temperatures greater than these values are required for a particular application, please consult your Permco representative or call the factory.
3. To assure maximum performance and life, a 10 micron return line filter with a Beta 10 rating of 2.2 is required for the system. Testing and operating a new or serviced unit without proper filtration will lead to premature failure of the shaft journals and journal bushings.

# Bushing Series Service Manual

Permco is a leading manufacturer of high-pressure hydraulic gear/vane pumps and motors, flow dividers, intensifiers, and accessories. Available in a wide variety of sizes and configurations to suit your application needs.

# PERMCO

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