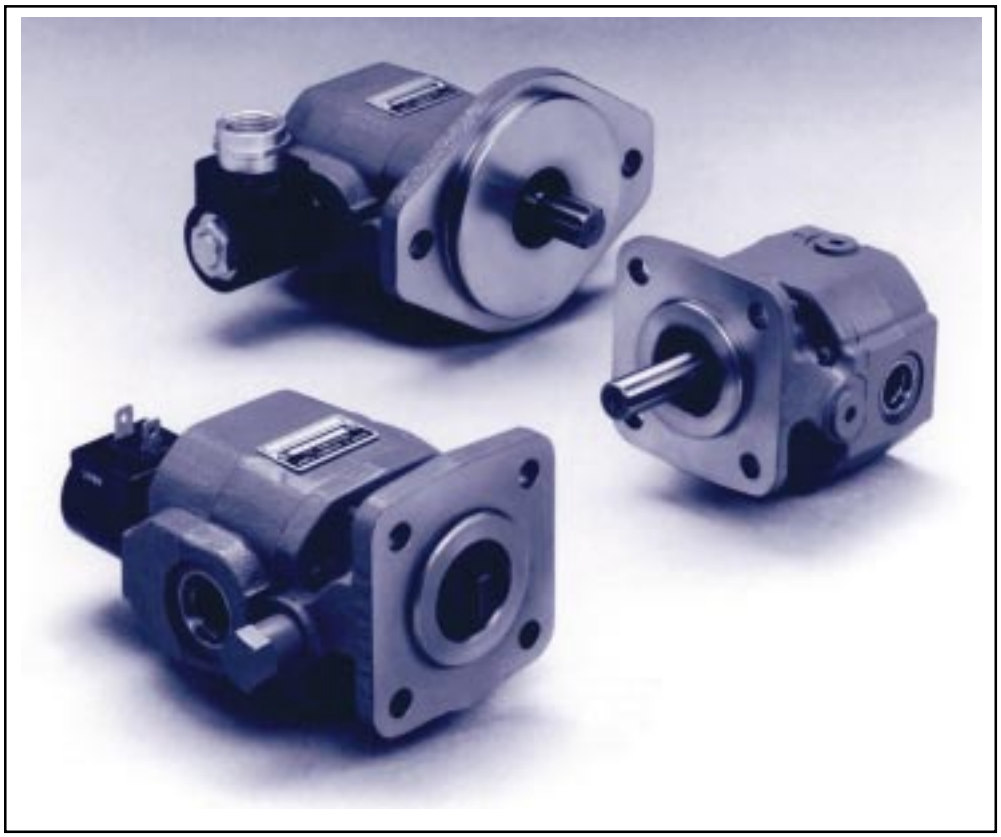
G.C. Series
Hydraulic Gear Pump
& Gear Motor

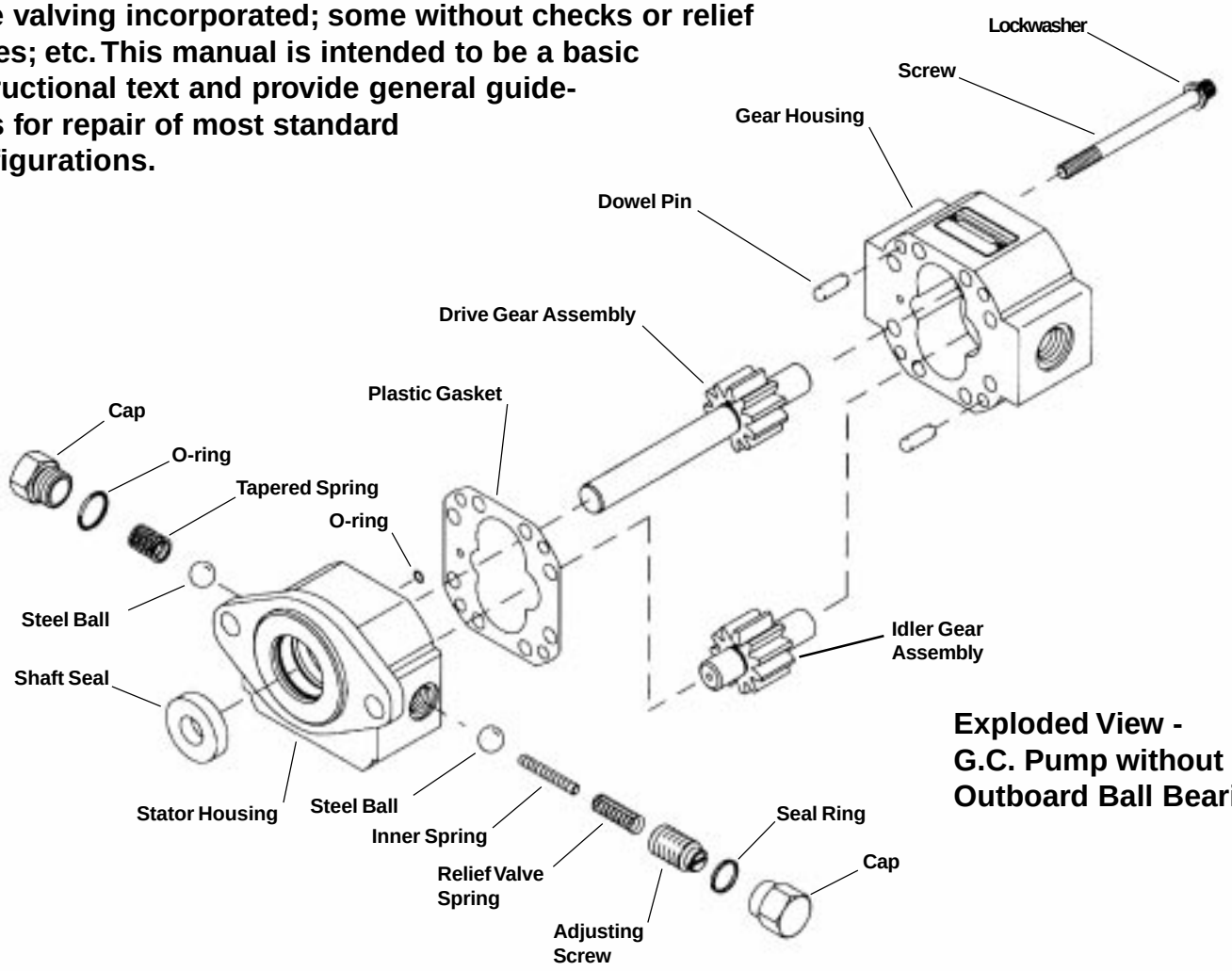
Inspection / Servicing



Service Manual

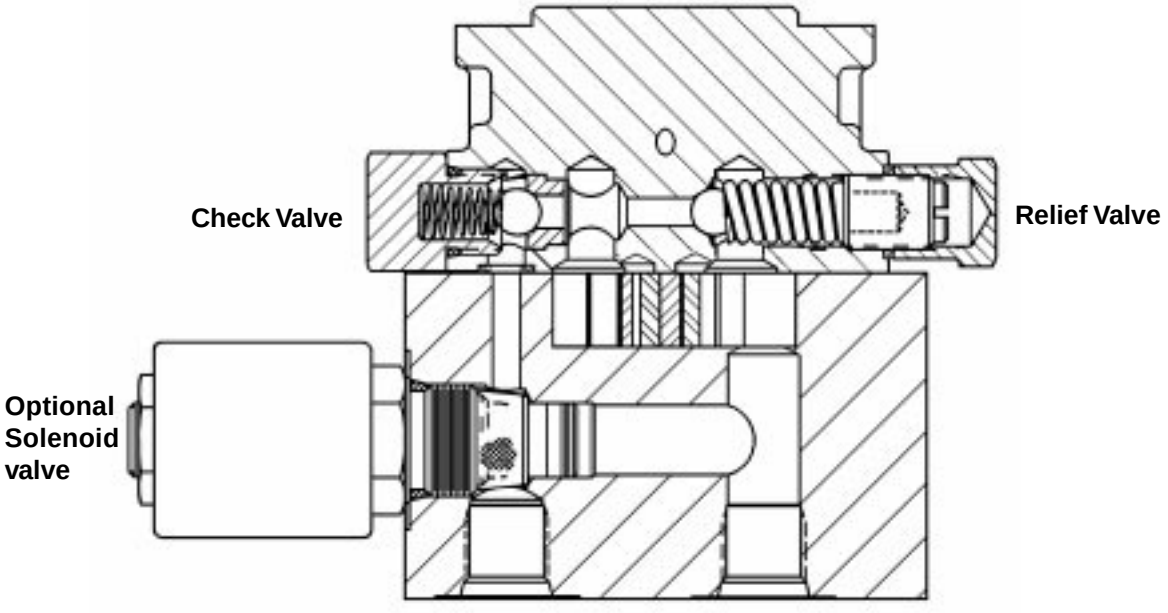
No. SD - 96104
April 1997

Note: There are many design variations of the GC-Series Pumps and Motors. Some may have different bolts than shown; some have valving incorporated; some without checks or relief valves; etc. This manual is intended to be a basic instructional text and provide general guidelines for repair of most standard configurations.



Exploded View - G.C. Pump without Outboard Ball Bearing

Cross Section View



Tools Required

- 5/8” Socket
- 11/16” Socket
- Six Point Apex Socket
- 5/32” Allen Wrench
- Torque Wrench
- Protected Jaw Vise

Disassembly (without outboard ball bearing)

Note: These first instructions apply to pumps without the outboard shaft ball bearing. The following general instructions also apply to multiple section gear pumps.

1. It is very important to work in a clean work area when repairing hydraulic products. Plug ports and wash exterior of pump with a proper cleaning solvent before continuing.

2. Remove port plugs and drain oil from pump.

3. Use a permanent marker pen to mark a line across stator and gear housing. This will assure proper reassembly and rotation of pump.

4. Remove key from drive shaft if applicable.

5. Use 5/8” socket to remove relief valve hex cap.

6. Use 5/32” allen wrench to remove relief valve adjusting screw. *(Count number of turns to remove screw and record for reassembly purposes).*

7. Remove the remaining relief valve parts from the stator, the gasket, one or two spring(s) and steel ball. The relief valve seat is not removable.

8. Use 11/16” socket to remove check valve hex cap.

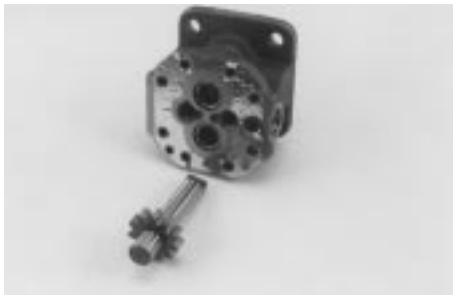
9. Remove tapered spring and steel ball from stator.

10. Place pump in a protected jaw vise and use a 6 point Apex socket to loosen and remove the 8 screws.

11. Remove pump from vise and carefully separate the gear housing from the stator. It may be necessary to lightly tap the parts to separate them.

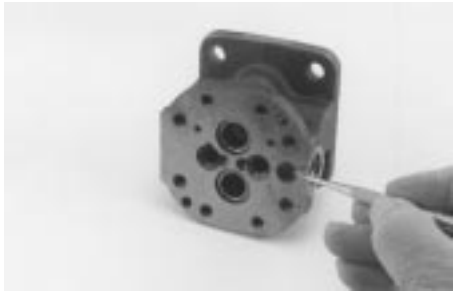
12. Remove the idler gear assembly from the gear housing.

13. Remove the two dowel pins from the gear housing or stator.

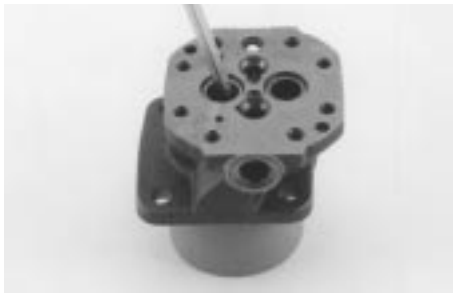


14. Remove the drive gear assembly from the stator.

15. Remove the plastic gasket from the stator, this gasket may also remain on the gear housing. *(Important! Please note the color of the plastic gasket and use a new gasket of the same color when reassembling the pump).*



16. Remove the o-ring from the stator.



17. Remove the oil seal from the stator, be careful not to mar or scratch the seal bore.

Inspect Parts For Wear

1. Clean and dry all parts thoroughly prior to inspection. It is not necessary to inspect the seals or plastic gasket as they will be replaced as new items.

2. Check drive shaft end for excessive wear or damage.

3. Inspect both the drive gear shaft and idler gear shafts at the bearing points and seal area for rough surfaces and excessive wear.

4. Inspect gear face for scoring or excessive wear. If the face edge of gear teeth are sharp, they will mill into the stator face or gear housing face. If wear has occurred, the parts are unusable.

5. Inspect the gear pockets inside the gear housing. It is normal for the surface inside the gear housing to show a clean “wipe” on the inside gear pocket wall on the intake side. There should not be excessive wear or deep scratches and gouges. Inspect needle bearings for loose needles or other signs of wear.

6. Inspect the face of the stator for scoring from the gears. Check the needle bearings for loose needles or other signs of wear.

7. Check seats in stator for damage. The check valve seat is a hardened seat and is not removable. The relief valve seat is machined in the stator casting.

8. Check all springs for excessive weakness or breakage.

General Information

It is important that the relationship of the stator and gear housing is correct. It is also important to use the same thickness plastic gasket upon reassembly as this gasket determines the clearance between the gear face and the surface of the stator and gear housing. Failure to properly assemble this pump will result in low flow at rated pressure. *Note: Upon reassembly of pump, all parts should be lightly oiled with a clean oil or assembly fluid.*

Shaft Rotation of Pump ***(Note: This pump is not bi-rotational and the shaft rotation cannot be reversed).***

Reassembly

(Note: New seals and plastic gasket should be installed upon reassembly of pump).

Seal Kit Part Numbers:

2300695 - Seal Kit, Viton shaft seal, for servicing pumps with relief valve, no check valve, no outboard ball bearing.

2300696 - Seal Kit, Viton shaft seal, for servicing pumps with relief valve and check valve, no outboard ball bearing.

Contents of typical Seal Repair Kit.

1. Install drive gear assembly in stator. Lubricate new shaft seal then carefully install new shaft seal over drive shaft with part number side facing outboard. Press the seal into the seal bore until the seal face is just below the retaining ring groove. Uniform pressure must be used to prevent misalignment or damage to the seal. (Note, if the shaft has shown some wear in the seal area, the new shaft seal may be pressed further down in the bore until it bottoms out in the bore cavity to establish a new shaft wear track area).

2. Turn the stator over and install idler gear assembly.

3. Install new o-ring in groove in stator.

4. Install the two dowel pins in the stator.

5. Select the proper color plastic gasket (use same color as was in pump when disassembled) and carefully smooth the gasket onto the stator surface. *(Caution: Do not use the paper which is used as a separator between the plastic gaskets).*

Note: There are three colored plastic gaskets; Silver = .0005 thick
Gold = .00075 thick
Amber = .001 thick

It is critical to use the proper thickness gasket. A gasket too thin will cause the pump to be tight and bind up causing possible pump damage. A gasket too thick will create too much clearance between gear face and housings, causing loss of pump volumetric efficiency.

6. Line up marker line and place gear housing over gear shaft assemblies.

7. Place pump in protected jaw vise and install the eight screws in the rear of the gear housing. Cris-cross torque all eight screws to 114-150 lb-in / 9.5-12.5 lb-ft or 12.8-16.9 Nm.

8. Install the check valve ball, tapered spring, *(small end of spring must be next to the ball)*. Install new o-ring on hex cap and install cap. Torque hex cap to 144-180 lb-in / 12-15 lb-ft or 16.2-20.2 Nm.

9. Install the relief valve ball, small and large spring and retain with adjusting

screw. Use 5/32" allen wrench on adjusting screw. *(Screw in same number of turns as was counted when removing screw).* Install new gasket around adjusting screw. After the relief valve has been set on final application, the hex cap should be torqued to 144-180 lb-in / 12-15 lb-ft / or 16.2-20.2 Nm.

10. Place a small amount of clean oil in the inlet of the pump and rotate the drive shaft away from the inlet one revolution. If the drive shaft binds, disassemble the pump and check for assembly problems, then reassemble the pump.

11. The name plate located on pump contains the build date code and the model number. Please refer to this information when corresponding with the Haldex Barnes Service Department.

Date Code Identification:

3 4 97

Month **Year**

Week of Month

Placing Pump Back Into Service

1. ***If shop test stand is available,*** the following procedure for testing rebuilt pumps is recommended:

A. Mount pump on test stand making sure that the proper level of clean oil is available in the reservoir. Check suction line for leaks and obstructions.

B. Start pump and run for three minutes at zero pressure.

C. Intermittently load pump at 500 P.S.I. increments for three minutes up to the relief valve setting of the pump. **Caution! Do not run at relief valve setting for more than a few seconds at a time. This creates high internal heat which could damage the pump.**

D. Remove pump from test stand and check for freeness of drive shaft. Check pump for signs of external leakage.

2. ***If shop test stand is not available,*** the following procedure for testing rebuilt pumps is recommended:

A. ***For engine driven pumps,*** mount pump on equipment and run pump at 1/2 engine speed at zero pressure for three minutes.

B. By operating control valve, build pressure intermittently for three minutes.

C. Increase engine speed to full throttle and build pressure intermittently for three minutes.

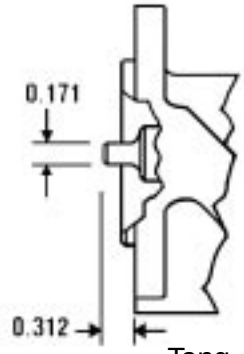
D. Stop engine and check pump for external leaks.

E. ***For electric motor driven pumps,*** run pump at little or no load for three minutes, gradually increase load on pump and cycle each succeeding load for three minutes. Check pump for external leaks after break-in test.

Single or Double Pump Trouble Shooting

PUMP TROUBLE	PROBABLE CAUSE	REMEDY
1. Pump does not develop full pressure.	a. System relief valve set too low or leaking. b. Oil viscosity too low. (oil too thin) c. Pump is worn out.	a. Check system relief valve for proper setting. b. Change to proper viscosity oil. c. Repair or replace pump.
2. Pump will not pump oil.	a. Reservoir low or empty. b. Suction strainer clogged. c. Incorrect shaft rotation.	a. Fill reservoir to proper level. b. Clean suction strainer. c. Check for proper rotation of pump shaft.
3. Noisy pump caused by cavitation.	a. Oil too thick. b. Oil filter plugged. c. Suction line plugged or too small.	a. Change to proper viscosity. b. Clean filters. c. Clean line and check for proper size.
4. Oil heating.	a. Oil supply low. b. Contaminated oil. c. Setting of relief valve too high or too low. d. Oil viscosity too low.	a. Fill reservoir to proper level. b. Drain reservoir and refill with clean oil. c. Set to correct pressure. d. Drain reservoir and fill with proper viscosity.
5. Foaming oil.	a. Low oil level. b. Air leaking into suction line. c. Wrong kind of oil.	a. Fill reservoir to proper level. b. Tighten fittings, check condition of line. c. Drain reservoir, fill with non-foaming oil.
6. Shaft seal leakage.	a. Worn shaft seal or cut seal lip. b. Worn shaft in seal area. c. Wrong pump shaft rotation.	a. Replace shaft seal. b. Replace drive shaft and seal. c. Check for proper rotation of pump shaft.

Optional Pump Shafts



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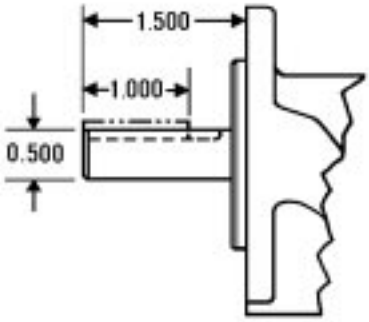
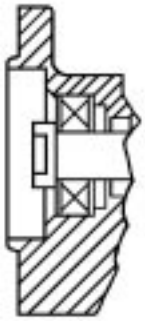
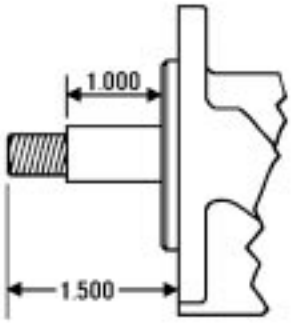


Extended Shaft

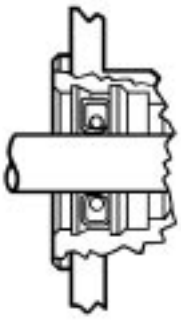

Flexible Coupling



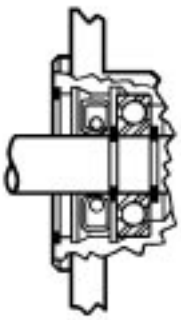
Threaded End

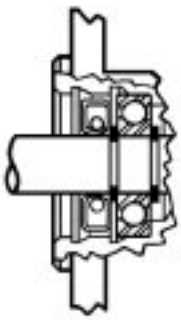

SAE Spline

Optional Seals & Bearings

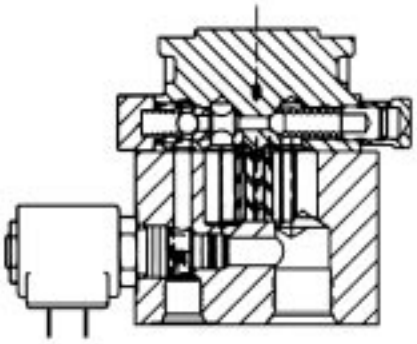

Single Lip
Low Pressure Seal

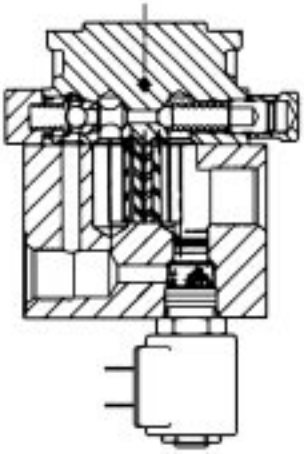

Double Seal with
Overboard Drain


High-pressure Seal
with Outboard Bearing
for Thrust Load

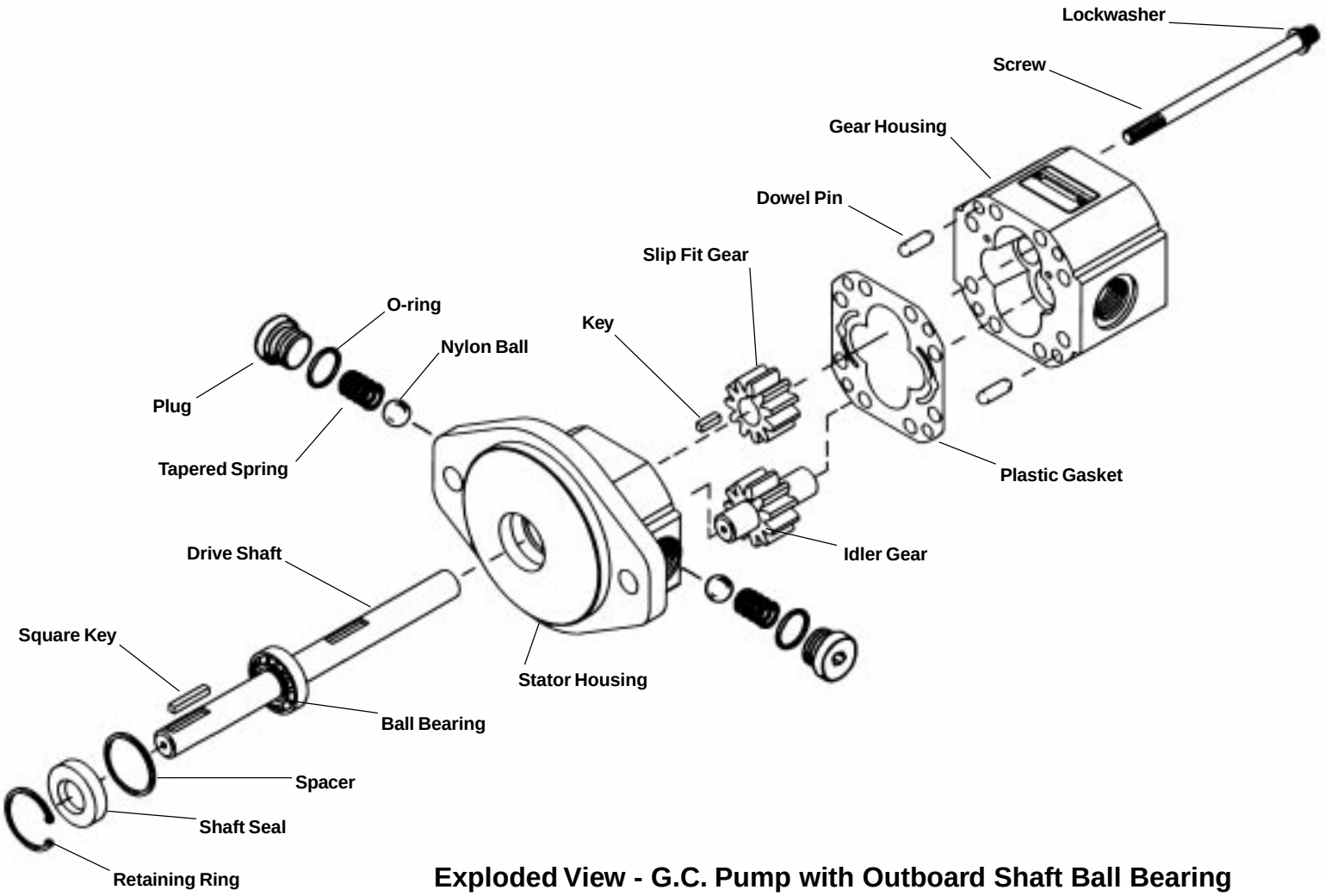

Seal with
Outboard Bearing for
Belt or Gear Drive

Optional Solenoids


Side Mounted Solenoid


Rear Mounted Solenoid

Note: There are many design variations of the GC-Series Pumps and Motors. Some may have different bolts than shown; some have valving incorporated; some without checks or relief valves; etc. This manual is intended to be a basic instructional text and provide general guide-lines for repair of most standard configurations.



Exploded View - G.C. Pump with Outboard Shaft Ball Bearing

Tools Required

- Six Point Apex Socket
- 3/16” Allen Wrench
- Internal Snap ring Pliers
- Clear Tape to protect shaft seal
- Torque Wrench
- Protected Jaw Vise

Disassembly (with outboard ball bearing)

Note: These first instructions apply to pumps with the outboard shaft ball bearing. The following general instructions also apply to multiple section gear pumps.

1. It is very important to work in a clean work area when repairing hydraulic products. Plug ports and wash exterior of pump with a proper cleaning solvent before continuing.

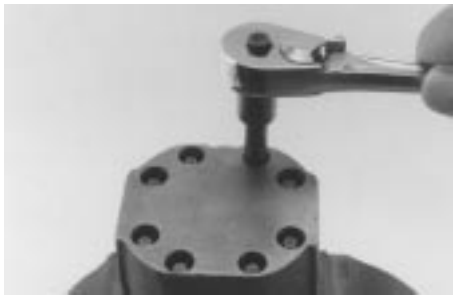
2. Remove port plugs and drain oil from pump.

3. Use a permanent marker pen to mark a line across stator and gear housing. This will assure proper reassembly and rotation of pump.

4. Remove key from drive shaft if applicable.

5. Place pump in a protected jaw vise with shaft up. Use 3/16” allen wrench to remove the check valve plugs from both sides of pump stator.

6. Remove the plugs, tapered springs and nylon balls from both sides of pump.



7. Use a 6 point apex socket to loosen and remove the 8 screws.

8. Remove pump from vise and carefully separate the gear housing from the stator. It may be necessary to lightly tap the parts to separate them.

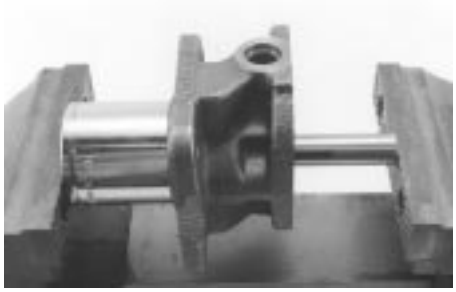
9. Remove the slip fit gear and square key from the drive shaft.

10. Remove the idler gear assembly from the gear housing.

11. Remove the two dowel pins from the gear housing or stator.

12. Remove the plastic gasket from the stator, this gasket may also remain on the gear housing. *(Important! Please note the color of the plastic gasket and use a new gasket of the same color when reassembling the pump).*

13. Turn the stator over with shaft up and use a pair of internal snap ring pliers to remove the retaining ring from the shaft seal cavity.



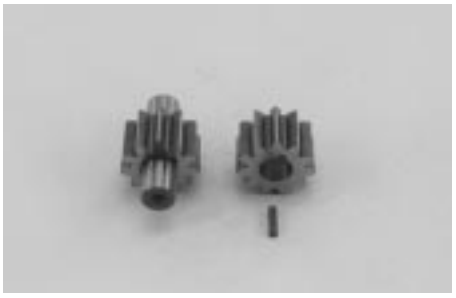
14. To remove the drive shaft, shaft seal and ball bearing from the stator it is suggested that an arbor press be used. If the press is not available, a vise can be used by using a collar of sufficient size to place between the stator and vise on the shaft seal side. The drive shaft may be placed against the vise and the shaft may be carefully pressed out of the front stator. It is only the resistance of the shaft seal that is holding the shaft assembly in place. The ball bearing is not a press fit in seal bore.

15. Remove the drive shaft, bearing, spacer and shaft seal from the stator.

Inspect Parts For Wear

1. Clean and dry all parts thoroughly prior to inspection. It is not necessary to inspect the seals or plastic gasket as they will be replaced as new items.

2. Check the drive shaft keyways for chipping or excessive wear. Inspect the drive shaft at the bearing points and shaft seal area for rough surfaces and excessive wear. A new ball bearing is included in the seal repair kits and should be replaced. Do not slide ball bearing over shaft seal wear area when removing or replacing bearing. Make sure the snap rings are in good condition. Inspect drive shaft key.

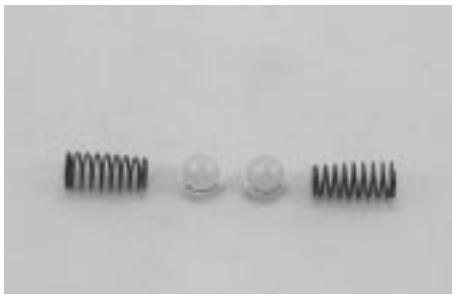


3. Inspect the gear face of both the drive and idler gears for scoring or excessive wear. If the face edge of gear teeth are sharp, they will mill into the stator face or gear housing face. If wear has occurred, the parts are unusable. Inspect key and keyway in slip fit gear.

4. Inspect the gear pockets inside the gear housing. It is normal for the surface inside the gear pocket wall to show a clean "wipe" on the inside surface on the intake side. There should not be excessive wear or deep scratches and gouges. Inspect needle bearings for loose needles or other sign of wear.

5. Inspect the face of the stator for scoring from the gears. Check the needle bearings for loose needles or other signs of wear.

6. Check the machined seats in the stator for damage.



7. Check the nylon balls for damage and the springs for damage.

General Information

It is important that the relationship of the stator and gear housing is correct. It is also important to use the same thickness plastic gasket upon reassembly as this gasket determines the clearance between the gear face and the surface of the stator and gear housing. Failure to properly assemble this will result in low flow at rated pressure. *Note: Upon reassembly of pump, all parts should be lightly oiled with a clean oil or assembly fluid.*

Shaft Rotation of Pump (Note: This pump is bi-rotational and the shaft rotation can be reversed)

Reassembly

(Note: New seals and plastic gasket should be installed upon reassembly of pump).

Seal Kit Part Numbers:
2300697 - Seal Kit, Viton shaft seal, for servicing pumps with relief valve and includes new ball bearing.

2300698 - Seal Kit, Viton shaft seal, for servicing pumps with (2) bi-rotational check valves, includes new ball bearing.

Contents of typical Seal Repair Kit.

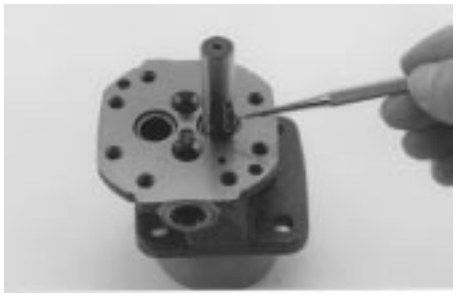
1. Install new ball bearing on drive shaft. Insert drive shaft and ball bearing into stator.

2. Place spacer over ball bearing.

3. Use a seal sleeve or clear tape over drive shaft and slide new shaft seal over drive shaft with part number side facing outboard.

4. Place a collar or deep socket over the shaft and shaft seal and press in until the seal is just below the snap ring groove. Uniform pressure must be used to prevent misalignment or damage to rim of seal.

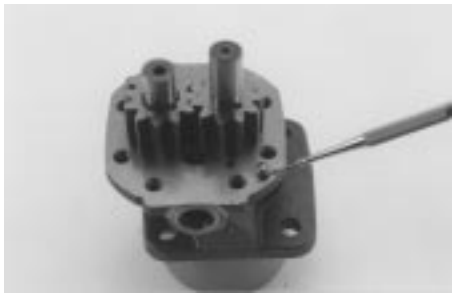
5. Install retaining ring in groove.



6. Turn stator over and install drive key in keyway. *(Several types of keys have been used in this application)*.

7. Slide slip fit gear over shaft and key.

8. Install idler gear assembly in stator.



9. Install two dowel pins in stator.

10. Select the proper color plastic gasket *(use same color as was in pump when disassembled)* and carefully smooth the gasket onto the stator surface. *(Caution: Do not use the paper which is used as a separator between the plastic gaskets)*.

Note: There are three colored plastic gaskets;
Silver = .0005 thick
Gold = .00075 thick
Amber = .001 thick

It is critical to use the proper thickness gasket. A gasket too thin will cause the pump to be tight and bind up causing possible pump damage. A gasket too thick will create too much clearance between gear face and housings, causing loss of pump volumetric efficiency.

11. Line up marker line and place gear housing over gear shaft assemblies.

12. Place pump in protected jaw vise and install the eight screws in the rear of the gear housing. Cris-cross torque all eight screws to 114-150 lb-in / 9.5-12.5 lb-ft or 12.8-16.9 Nm.

13. Install check valve nylon balls and tapered springs in both sides stator bores and retain with plugs. Be sure small end of spring is next to nylon ball. Use a 3/16" allen wrench and torque plug to 144-180 lb-in / 12-15 lb-ft or 16.2-20.2 Nm.

14. Place a small amount of clean oil in the inlet of the pump and rotate the drive shaft one revolution. If the drive shaft binds, disassemble the pump and check for assembly problems, then re-assemble the pump.

15. The name plate located on the pump contains the build date code and the model number. Please refer to this information when corresponding with the Haldex Barnes Service Department. (Refer to page 6).

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