GH BETTIS

SERVICE INSTRUCTIONS

DISASSEMBLY & REASSEMBLY

FOR MODEL

F10207

DOUBLE ACTING

HYDRAULIC ACTUATOR

PART NUMBER: 074960

REVISION: "A"

RELEASE DATE: NOVEMBER, 1991

1.0 INTRODUCTION

1.1 This operating and maintenance procedure is offered as a guide to enable general maintenance to be performed on GH Bettis F10207 double acting hydraulic actuators. When the model number has a "-S" as a suffix then the actuator is special and may have some differences that are not included in this procedure.

1.2 The maximum recommended service interval for this actuator series is five years for normal service. Storage time is counted as part of the service interval.

1.3 This procedure is written with the understanding that the actuator has been removed from the valve.

COMPLETE ACTUATOR REFURBISHMENT REQUIRES THAT THE ACTUATOR BE DISMOUNTED FROM THE VALVE

2.0 SUPPORT ITEMS AND TOOLS

2.1 **Support Items** - Seal/Service Kit, commercial leak testing solution, non-hardening thread sealant, anti-seize, thread sealant Loctite-56747, Loctite 242, and Master Gasket.

2.2 **General Tools**: All tools are American Standard inch. Extra Large (24 inch) adjustable wrench, two large standard slot screwdrivers, l/2" drive socket set, 3/4" drive socket set, torque wrench (up to 1000 foot pounds), 24 oz. ball peen hammer, pry bar, putty knife, and rubber or leather mallet.

3.0 GH BETTIS REFERENCE MATERIALS

3.1 Assembly Drawing Part Number 107542.

4.0 GENERAL

4.1 Numbers in parentheses, ( ) indicate the bubble number (reference number) used on the GH Bettis Assembly Drawing and actuator parts list.

4.2 Most components of this actuator are very heavy and will require a means of assistance.

4.3 Disassembly and assembly will require a minimum of three technicians.

4.4 When removing seals from seal grooves, use a small screwdriver with the sharp edges rounded off or use a commercial seal removing tool.

4.5 Use a non-hardening thread sealant on all pipe threads.

4.6 Disassembly of actuator should be done in a clean area.

4.7 LUBRICATION REQUIREMENTS: Standard and high temperature service (-20°F to 350°F) use Kronaplate 100 lubricant. This lubricant (ESL-5) is furnished in the GH Bettis Service/Seal Kit.

4.8 FLUID REQUIREMENTS: Standard service use Dexron II Automatic Transmission Fluid.

5.0 GENERAL DISASSEMBLY

5.l Make sure that actuator is in either the open or closed position.

5.2 Remove all operating pressure from both actuator power cylinders (2-10).

5.3 Drain hydraulic fluid from power cylinders by removing drain pipe plugs (2-140). This step may be done any time prior to pressure cylinder disassembly.

6.0 PRESSURE CYLINDERS DISASSEMBLY

6.1 Following steps will be performed on either power cylinder and then repeated on the other cylinder. However, steps 6.2 thru 6.12 may be performed simultaneously on both cylinders.

6.2 Remove the stop screw nut (2-110) and the o-ring seal (5-70).

6.3 Mark the stop screws (2-100). The setting should be checked and recorded before the stop screw is loosened or removed.

6.4 Stop screw (2-100) may remain in the outer end cap (2-30).

6.5 Remove the tie bar hex nuts (2-120).

6.6 Remove the outer end cap (2-30) from the cylinder (2-10). The fit between the cylinder and the outer end cap is very tight. Break the end cap free by tapping with a breaker bar on lip provided on the end cap.

6.8 Unscrew and remove the tie bars (2-40). Flats on outboard end are provided for wrench placement.

6.9 Remove the cylinder (2-10) from actuator. When sliding the cylinder off, tilt the cylinder 15 to 30 degrees with respect to cylinder centerline.

6.10 Remove retaining ring (2-90) and split ring set (2-70) from the piston rod (2-50).

6.11 Slide the piston (2-60) off of the piston rod. Note: The split rings under the piston are not held together with a retainer ring, and they will fall off when the piston is removed. Remove the second split ring set from the piston rod.

6.12 Remove the o-ring seal (5-20) from the piston rod (2-50).

7.0 HOUSING GROUP DISASSEMBLY

7.1 Loosen the socket set screw (1-380) to remove the position indicator (1-350) from the position indicator drive (1-300).

7.2 Unscrew and remove the hex cap screws (1-330) from the position indicator cover (1-320). Remove position indicator cover (1-320).

7.3 Unscrew and remove the hex cap screws (1-310), then remove the position indicator drive (1-300).

7.4 Unscrew and remove the hex cap screws (1-40) from the housing cover (1-20). Note: Do not remove the raised hex cap screws (1-250). (See Next Step)

7.5 Unscrew and remove the raised hex cap screws (1-250). Remove the hex nuts (1-260) from the hex cap screws. Thread the hex cap screws, less the hex nuts, back into the housing cover (1-20). When the hex cap screw comes into contact with the housing (1-10) then alternately turn each screw one full turn each until the housing cover is lifted off of the housing and the dowel pins (1-30) are clear of the housing cover. Now remove the housing cover (1-20) from the housing.

7.6 Unscrew and remove socket cap screws (1-140) with lock washers (1-145) from the sliding block (1-120).

7.7 Remove yoke pin retainer (1-130) and the yoke pin (1-110).

7.8 Pushing on the yoke arms (1-90), move the guide block (1-50) to a position on the guide bar (1-60) that will allow access to the hole in the top of the guide block.

7.9 Using a punch or round tool that will fit through the hole in guide block (1-50) and into the hole in the rod extension (1-210), unscrew the piston rod (2-50) from the rod extension. Flats on the inboard end of the piston rod are provided for wrench placement.

7.10 Remove the piston rod (2-50) by pulling it out through the housing (1-10) and inner end cap (2-20).

7.11 Unscrew and remove the hex cap screws (1-290) from inside the housing (1-10), now remove the inner end cap (2-20).

7.12 Remove the retaining ring (2-150) from the inner end cap (2-20).

7.13 Remove the rod bushing (2-80) from the inner end cap (2-20).

7.14 Unscrew the four hex cap screws (1-80) and remove the guide bar cover (1-70).

7.15 Holding on to the guide block (1-50), remove the guide bar (1-60) by pulling it out through the cylinder side of the housing. Remove the guide block (1-50).

7.16 Unscrew and remove the socket cap screws (1-230) from the rod extension flange (1-220). Remove the rod extension flange from the guide block (1-50). Remove the rod extension (1-210) and spherical washer (1-240). Inspect for excessive wear or damage.

7.17 Remove the sliding blocks (1-120).

7.18 Remove the yoke (1-90) by lifting out of the housing (1-10).

7.19 The snubber (1-180), the bleed valves (1-230) and the cover pins (1-30) do not need removing.

8.0 **GENERAL REASSEMBLY**

8.1 Remove and discard all old seals and gaskets, taking care not to scratch or damage seal grooves.

8.2 All parts should be cleaned to remove all dirt and other foreign material prior to inspection.

8.3 All parts should be thoroughly inspected. Particular attention should be directed to threads, sealing surfaces and areas that will be subjected to sliding motion. Sealing surfaces must be free of deep scratches, pitting, corrosion and blistering or flaking coating.

8.4 Coat all moving parts with lubricant. Coat all seals with lubricant, before installing into grooves. Use Kronaplate 100 lubricant in the housing and customer specified hydraulic fluid in the cylinder.

8.5 Apply stainless steel pipe sealant, Loctite 567-7, to threads as marked on the assembly drawing as note 4.

8.6 Apply sealant, Loctite-242, to external threads as marked on the assembly drawing as note 5.

8.7 Apply Master Gasket to seal all external joints as marked on the assembly drawing as note 6.

8.8 Apply anti-seize to all stainless threads.

9.0 HOUSING REASSEMBLY

9.1 Apply lubricant to o-ring seals (4-10) and install onto the outside, and o-ring seals (4-20) to the inside of the yoke bushings (1-100). Install the yoke bushings into the housing (1-10) and the cover (1-20). Retain the yoke bushing with the yoke bushing retainer rings (1-150), hex cap screws (1-160) and lockwashers (1-170).

9.2 Lubricate the yoke (1-90) and then install into the housing (1-10). **Note:** The top is easily determined by the indicator mounting holes.

9.3 Install one of the sliding blocks (1-120) into the bottom yoke arm and one in the top yoke arm. Install the guide block (1-50) in between the yoke arms. Install the yoke pin (1-110) into and through the sliding blocks and the guide block. Retain the yoke pin with the yoke pin retainer (1-130), the lockwasher (1-145) and socket cap screw (1-140).

9.4 Install the guide bar (1-60) into the side of the housing (1-10) through the guide block (1-50) and into the other side of the housing.

9.5 Install the o-ring seals (4-80) into both of the guide bar covers (1-70). Install both guide bar covers (1-70), retain with the hex cap screws (1-80) and the gasket seals (4-60).

9.6 Install the o-ring seals (5-30) into the inner end caps (2-20). Install the rod seals (5-60) into the rod bushing (2-80). Install the rod bushings into the inner end caps and retain with the retainer ring (2-150).

9.7 Install end cap o-ring seals (5-100). Install the inner end caps (2-20), retain with hex cap screws (1-290), and flat washers (1-370).

9.8 Install the spherical washers (1-240) and the rod extension (1-210) into the guide block (1-50). Install the rod extension flange (1-220) and retain with the socket cap screws (1-230). Torque the socket cap screws to 200 foot pounds.

9.9 Install both piston rods (2-50) through the inner end caps (2-20) and thread into the rod extension (1-210).

9.10 Remove the ten hex cap screws (1-250) from the cover (1-20). Install the hex nuts (1-260) onto the hex cap screws and install the hex cap screws with the hex nuts back into the cover. The ten hex cap screws should not be threaded into the cover far enough to contact the housing (1-10), but should be flush with the bottom of the cover.

9.11 Apply a 1/8" inch bead of master gasket to the housing (1-10) around the cover gasket surface, circling the bolt holes. Install the cover gasket (4-140), apply master gasket the same as above. Install the cover (1-20) onto the housing. Align the cover dowel pins (1-30) with the dowel pins holes in the housing. Using a leather or rubber mallet tap the cover down onto the housing.

9.12 Install the hex cap screws (1-40) with the gasket seals (4-30) thru the cover (1-20) and into the housing (1-10).

9.13 Install the position indicator drive (1-300), retain with the hex cap screws (1-310) and lockwashers (1-315).

9.14 Install the wear ring (4-100), the o-ring seal (4-90), and the rod wiper (4-150) into the position indicator cover (1-320). Install the outer o-ring seal (4-130) into the position indicator cover, apply master gasket per assembly drawing. Install the position indicator cover (1-320), retain with the hex cap screws (1-330), and the gasket seals (4-30).

10.0 POWER CYLINDER REASSEMBLY

10.1 Following steps will be performed on either power cylinder and then repeated on the other cylinder. However, steps 10.2 thru 10.13 may be performed simultaneously on both cylinders.

10.2 Install the o-ring seal (5-40) onto the inner end cap (2-20).

10.3 Install the o-ring seal (5-20) onto the piston rod (2-50).

10.4 Install the two halves of the split rings (2-70) into the inner most groove in the piston rod (2-50).

10.5 Install the piston (2-60) onto the piston rod (2-50) and over the split rings (2-70). Install the second set of split rings and retain with retaining ring (2-90).

10.6 Install the piston seals (5-50), along with the back up rings (5-90) on the back or flat side of the piston seal, and the piston wear rings (5-80) onto the piston (2-60).

10.7 Making sure that the bleed plugs (2-130) are facing up, slide the cylinder (2-10) over piston (2-60) and onto the inner end cap (2-20). Tilt the cylinder approximately 15° to 30° across piston to help with installation. Make certain the piston wear rings (5-80) do not come out of the grooves during installation.

10.8 Install the tie bars (2-40) into the inner end cap (2-20).

10.9 Install the o-ring seal (5-40) onto the outer end cap (2-30).

10.10 Install the outer end cap (2-30) over the tie bars (2-40) and onto the cylinder (2-10). Install the hex nuts (2-120) and torque to 1000 foot pounds. After tightening all four hex nuts, replace all four socket cap screws (2-180).

10.11 Install the o-ring seals (5-70) into the stop screw nuts (2-110). Install the stop screw nuts (2-110) over the stop screws (2-100).

10.12 Install the drain pipe plugs (2-140) into the bottom or lowest point of the cylinder (2-10).

10.13 If removed, install the bleed valves (2-130). For correct cylinder bleeding, the bleed valve must be located at the highest vertical point of the cylinder (2-10).

11.0 ACTUATOR TESTING

11.l **Leakage Test:** All areas, where leakage to atmosphere may occur, are to be checked using hydraulic pressure.

11.2 Cycle the actuator five (5) times at 100% of the normal operating pressure (NOP), as per actuator name tag. This will allow the seals to seek a service ready condition.

11.3 Apply 100% of the maximum operating pressure (MOP), as marked on actuator name tag, and allow unit to stabilize.

11.4 If there is any notable leakage, the actuator must be disassembled and the cause of leakage must be determined and corrected.

11.5 If an actuator was disassembled and repaired, the above leakage test must be performed again.

11.6 **Optional Shell Test:** This test should be performed if any one of the following items are replaced: tie bar, piston, piston rod, end cap or cylinder.

11.6.1 All air should be bled from the cylinder before shell testing.

11.6.2 Shell test the actuator by applying 1.5 times the maximum test pressure, as marked on actuator name tag, to both sides of the piston simultaneously for a period of two (2) minutes.

11.6.3 If any leakage occurs, the unit must be disassembled and the cause of leakage must be determined and corrected.

11.7 **Operational (Functional Test):** This test is used to verify proper function of the actuator and is to be done off of the valve.

11.8 Cycle the actuator at 10% of the maximum operating pressure (MOP) per actuator name tag. Any jumpy or jerky operation. not attributed to seal drag or limited flow capacity, must be corrected.

11.9 All accessories, including solenoid valves, positioners, pressure switches, etc., must be hooked up and tested for proper operations and replaced found defective.

12.0 RETURN TO SERVICE

12.1 If supplied in the service kit, replace the software components of the snubbers (1-180) and then, if removed, install the snubbers back in their original actuator locations.

12.2 Install the position indicator (1-350) and retain with the socket set screw (1-380). With the actuator rotated clockwise the position indicator will be pointing to the full clockwise position.

12.3 The actuator should now be ready to return to service.

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