BETTIS

SERVICE INSTRUCTIONS

DISASSEMBLY & REASSEMBLY

FOR MODELS

H251.5-S AND H352.1-S

DOUBLE ACTING SERIES

HIGH CYCLE

HYDRAULIC ACTUATORS

PART NUMBER: 116259

REVISION: "A"

RELEASE DATE: November, 1994

1.0 INTRODUCTION

1.1 This service procedure is offered as a guide to enable general maintenance to be performed on Bettis H251.5-S and H352.1-S high cycle "Scotch-Yoke" type hydraulic actuators.

1.2 **SAFETY STATEMENT:** Products supplied by Bettis, in its "as shipped" condition, are intrinsically safe if the instructions contained within this Service Instruction are strictly adhered to and executed by a well trained, equipped, prepared and competent technician.

WARNING: For the protection of personnel working on Bettis actuators, this procedure should be reviewed and implemented for safe disassembly and reassembly. Close attention should be noted to the WARNINGS, CAUTIONS and NOTES contained in this procedure.

1.3 **DEFINITIONS:**

WARNING: If not observed, user incurs a high risk of severe damage to actuator and/or fatal injury to personnel.

CAUTION: If not observed, user may incur damage to actuator and/or injury to personnel.

NOTE: Advisory and information comments provided to assist maintenance personnel to carry out maintenance procedures.

1.4 **BASIC SERVICE INFORMATION: Complete actuator refurbishment requires the actuator be dismounted from the valve or device it is operating.**

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

1.6 This procedure is applicable with the understanding that all electrical power and hydraulic pressure has been removed from the actuator. Also, it is understood that the actuator has been removed from the valve as well as all piping and accessories that are mounted on the actuator have been removed.

2.0 SUPPORT ITEMS AND TOOLS

2.1 SUPPORT ITEMS - Service/Seal Kit, commercial leak testing solution, and non-hardening thread sealant.

2.2 TOOLS - All tools are American Standard inch. Two each medium standard screwdriver, small standard screwdriver with corners rounded, Allen wrench set, and 1/2" drive socket set.

3.0 BETTIS REFERENCE MATERIALS

3.1 Assembly Drawing part number 115887.

4.0 GENERAL

4.1 This procedure should only be implemented by a technically competent technician who should take care to observe good workmanship practices.

4.2 Numbers in parentheses, ( ) indicate the bubble number (reference number) used on the Bettis Assembly Drawing, Exploded Detail Drawing, and actuator Part List.

4.3 This procedure is written using the stop screw side of the housing (1-10) as a reference and this side will be considered the front side of the actuator. The housing cover (1-20) will be the top of the actuator.

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

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

CAUTION: Apply the thread sealant per the manufacture's instructions.

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

4.7 LUBRICATION REQUIREMENTS: For use in housing (1-10) area of the actuator. Lubricants, other than those listed in steps 4.7.1 and 4.7.2, should not be used without prior written approval of Bettis Product Engineering.

4.7.1 Standard and high temperature service (-20°F to +350°F) use Bettis ESL-5 (Kronaplate 100). ESL-5 is contained in the Bettis Service/Seal Kit.

4.7.2 Low temperature service (-50°F to +150°F) use Kronaplate 50. Kronaplate 50 is not contained in the Low Temperature Service/Seal Kit.

4.8 FLUID REQUIREMENTS: For use in ram covers (3-10). The following listed fluids are recommended fluids only and does not limit the use of other hydraulic fluids compatible with supplied seals and coatings.

4.8.1 Standard and high temperature service (-20°F to +350°F) use Dexron II Automatic Transmission Fluid.

4.8.2 Low temperature service (-50°F to +150°F) use Exxon Univis J13 Hydraulic Fluid.

5.0 GENERAL DISASSEMBLY

5.1 If not already removed, remove all operating pressure from actuator rod covers (3-10).

5.2 Mark stop screws (1-60) left and right. Measure and record the exposed length of the right and left stop screws (1-60). The stop screws will be removed later in this procedure.

5.3 Removed the socket cap screws (1-120) from position indicator (1-110) yoke weather cover (6-110).

5.4 Remove the position indicator (1-110) and the yoke weather cover (4-90).

5.6 Remove snubber (1-130) from the housing (1-10).

5.7 On rod covers (3-10) open bleed valves (2-60).

CAUTION: Bleed valves (2-60) are 1/8 npt and may be manufactured out of brass. Use only the correct size wrench (13/32" inch open or box end wrench). Do not use pliers or other style adjustable wrench for bleed valve removal or adjustment.

5.8 Drain the hydraulic fluid from rod covers (3-10).

6.0 ROD COVER DISASSEMBLY

6.1 Unscrew and remove the rod cover socket head cap screws (2-30) on each rod cover (3-10).

6.2 Remove both of the rod covers (3-10), taking care not to disengage the rod bushings (2-20).

7.0 HOUSING GROUP DISASSEMBLY

7.1 Remove hex cap screws (1-30) with seal gaskets (4-20) from cover (1-20).

7.2 Remove housing cover (1-20).

7.3 Move the yoke arms to the center position in housing (1-10).

7.4 Remove upper yoke roller (1-50).

7.5 Life out and remove yoke pin (1-40).

7.6 Holding rod bushings (2-20) in place, remove ram rod (2-10), by pulling ram rod out through rod bushings (2-20).

7.7 Remove both rod bushings (2-20) from housing (1-10).

7.8 Lift yoke (1-140) from housing (1-10).

7.9 Remove lower yoke roller (1-50).

7.10 Remove stop screws (1-60) with jam nuts (1-70) and gasket seals (4-40). NOTE: Be sure to identify stop screws as left and right.

7.11 It is not necessary to remove housing pipe plug (1-100), bleed valves (2-60), drive studs (1-170) or yoke pin bearing (1-160). It is not necessary to remove bearings (1-150) from housing cover (1-20) and housing (1-10) unless yoke (1-140) is being replaced with a new yoke.

8.0 GENERAL RE-ASSEMBLY

CAUTION: Only new seals, that are still within the seals expectant shelf life, should be install back into actuator being refurbished.

8.1 Remove and discard all seals and gaskets.

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 for excessive wear, stress cracking, galling and pitting. Attention should be directed to threads, sealing surfaces and areas that will be subjected to sliding or rotating motion. Sealing surfaces of the ram rod must be free of deep scratches, pitting, corrosion and blistering or flaking coating.

CAUTION: Actuator parts that reflect any of the above listed characteristics must be replaced with new parts.

8.4 Before installation coat all moving parts with a complete film of lubricant. Coat all seals with a complete film of lubricant, before installing into seal grooves.

NOTE: The parts and seals used in the actuator housing assembly will be assembled using lubricant as identified in step 4.7. The parts and seals used in the cylinder assembly (2-10) will be assembled using the hydraulic fluid identified in step 4.8.

9.0 CENTER HOUSING GROUP RE-ASSEMBLY

9.1 If removed, install a pipe plug (1-100) into the drain port of the housing (1-10).

9.2 Apply lubricant to the yoke bore in the housing and arrange housing with yoke bore nearest worker.

9.3 Coat o-ring seals (4-60) with lubricant and install into housing (1-10).

9.4 Apply a generous amount of lubricant to the slots in the upper and lower yoke arms of yoke (1-140).

9.5 Coat the bearing surfaces of yoke (1-140) with lubricant and install into the housing. NOTE: The wide yoke arm should be installed toward the top of housing (1-10).

9.6 Install rod seals (4-50) into the seal groove on the inner diameter of rod bushings (2-20).

CAUTION: The rod seal is to be installed with the energizer ring facing the short side of rod bushing.

9.7 Install o-ring seals (4-70) and backup rings (4-80) into the groove on the outer diameter of rod bushings (2-20).

9.8 Coat ram rod bushings (2-20) with lubricant and install into both sides of the housing (1-10).

9.9 Coat one of the yoke rollers (1-50) with lubricant and place into the lower yoke arm slot.

9.10 Apply a light coat of lubricant to the ram rod (2-10) and install through the rod bushings, in the housing.

9.11 Coat yoke pin (1-40) with lubricant. Install yoke pin through ram rod (2-10) and into lower yoke roller (1-50).

9.12 Coat remaining yoke roller (1-50) with lubricant and install over the yoke pin and into the slot in the upper yoke arm.

9.13 Install gasket seals (4-40) and hex jam nuts (1-70) onto stop screws (1-60).

9.14 Install stop screws (1-60) with gasket seals (4-40) and hex jam nuts (1-70) into housing (1-10) in the position as recorded in step 5.2.

9.15 Coat the yoke bore in cover (1-20) with lubricant.

9.16 Install remaining o-ring seal (4-60) into housing cover (1-20).

9.17 Place cover gasket (4-10) onto housing (1-10).

9.18 Install four gasket seals (4-20) onto four screws (1-30).

9.19 Install housing cover (1-20) onto housing (1-10).

9.20 Install and tighten hex cap screws (1-30) with gasket seals (4-20) into housing cover (1-20).

10.0 RAM ROD COVER RE-ASSEMBLY

10.1 Install one gasket (4-30) on the right side of the housing (1-10) and the remaining gasket (4-30) on the left side of the housing.

10.2 Rotate the actuator to the full clockwise position.

10.3 Install one rod cover (3-10) over the exposed ram rod end (2-10) on the right side of the housing (1-10) and the other rod cover (3-10) on the left side of the housing (1-10).

10.4 Install and tighten four socket cap screws (2-30) into each rod cover (3-10).

10.5 If removed, install bleed valves (2-60) into each rod cover (3-10).

10.6 Position Indicator Installation:

10.6.1 Rotate the yoke to the full clockwise (CW) position.

10.6.2 Position yoke weather cover (4-90) and position indicator (1-110) onto yoke (1-140) with the pointer facing ram rod (2-10).

10.6.3 Install and tighten socket cap screws (1-120).

NOTE: Screws (1-120) will require rechecking for tightness after the actuator has been cycled and tested.

11.0 ACTUATOR TESTING

11.1 All sources of leakage to atmosphere and across the piston are to be checked using hydraulic pressure.

11.2 Cycle the actuator five (5) times at 10% of the operating pressure. This allows the seals to seek their proper working attitude.

11.3 Apply 100% operating pressure to one rod cover and allow the unit to stabilize.

11.4 If there is any notable leakage to atmosphere, the unit must be disassembled and the cause of leakage must be determined and correct.

11.5 Repeat the above procedure for the other rod cover.

12.0 RETURN TO SERVICE

12.1 Replace software components of snubber (1-130).

12.2 Install snubber (1-130) into housing (1-10).

12.3 Adjust both stop screws (1-60) back to settings recorded in step 5.2 under General Disassembly.

12.4 Tighten both jam nuts (1-70) securely, while holding stop screws (1-60).

12.5 After the actuator is remounted on the device it is operating all accessories should be hooked up and tested for proper operation and replaced, if found defective.

ECN	DATE	REV		BY *	DATE
Released	November, 1994	A	COMPILED	Bill Cornelius	8 November 1994
			CHECKED	Bill Cornelius	8 November 1994
			APPROVED	Robert McEver	8 November 1994

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