

GH BETTIS
OPERATING & MAINTENANCE INSTRUCTIONS
DISASSEMBLY & ASSEMBLY
T20X.X SERIES DOUBLE ACTING
HYDRAULIC ACTUATORS

PART NUMBER: 74642

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1.0 **INTRODUCTION**

- 1.1 This service procedure is offered as a guide to enable general maintenance to be performed on GH Bettis T20X.X "Scotch-Yoke" type hydraulic actuators.
- 1.2 The maximum recommended service interval for this actuator series is five years. Storage time is counted as part of the service interval.

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

2.0 **BASIC TOOLS**

All tools are American Standard inch. Large adjustable Wrench, Screwdriver, 1/2" Drive Socket Set, Torque Wrench (0-2,000 in.lbs.), Pipe Wrench, (1/2") Drift Punch, 24 oz. Ball Peen Hammer, Allen Wrench Set and Pry Bar.

3.0 **REFERENCE GH BETTIS MATERIALS**

- 3.1 Assembly Drawing Part Number 39100 for T20X.X.
- 3.2 Exploded Detail Drawing Part Number 68259 for T201.5.
- 3.3 Exploded Detail Drawing Part Number 68260 for T202.0.

4.0 **GENERAL**

- 4.1 Numbers in parentheses, () indicate the bubble number (reference number) used on the GH Bettis Assembly Drawing, Exploded Detail Drawing, and actuator Parts Lists.
- 4.2 This procedure is written using the stop screw side of the housing (1-10) as the front side of the actuator and the housing cover (1-20) as the top of the actuator.
- 4.3 Mating parts should be marked for ease of reassembly, i.e. housing to cylinder adapter.
- 4.4 When removing seals from seal grooves, use a small standard screwdriver with the sharp edges rounded off or use a commercial seal removing tool.
- 4.5 Disassembly should be done in a clean area on a work bench.
- 4.6 Lubrication Requirements:
 - 4.6.1 Standard and high temperature service (-20°F to 300°F) use Kronaplate 100 lubricant. This lubricant is furnished in the GH Bettis Service/Seal Kit.
 - 4.6.2 Low temperature service (-50°F to +150°F) use Kronaplate 50. This lubricant is not furnished in the Service/Seal Kit.
- 4.7 Fluid Requirements:
 - 4.7.1 Standard and high temperature service -20°F to +350°F) use Dexron II Automatic Transmission Fluid.
 - 4.7.2 Low temperature service (-50°F to +150°F) use Exxon Univis J13 Hydraulic Fluid.

5.0 GENERAL DISASSEMBLY

- 5.1 Remove all operating pressure from actuator power cylinder (2-10).
- 5.2 Remove all plumbing and accessories mounted on actuators.
- 5.3 Mark the stop screws (1-60) left and right. The setting of the stop screws (1-60) should be checked and setting recorded before stop screws are loosened or removed.
- 5.4 Remove four round head cap screws (1-180) from position indicator (1-170)/yoke weather cover (3-130) and remove position indicator/ yoke weather cover.
- 5.5 Drain the hydraulic fluid from hydraulic cylinder by removing bleed plugs (2-80) - located on the bottom side at inboard and outboard ends of the cylinder assembly (2-10).

6.0 DISASSEMBLY - HYDRAULIC CYLINDER

- 6.1 Remove socket cap screws (2-120) and lockwashers (2-130) from cylinder assembly (2-10).
- 6.2 Apply downward pressure on end of cylinder assembly (2-10). By slightly canting cylinder up or down, assembly should break free from adapter (2-40). Remove the cylinder.
- 6.3 Remove hex nut (2-100) from piston rod (2-170).
- 6.4 Slide piston (2-20) off the piston rod (2-170). On T201.5 units, piston split ring (2-60) will be removed at this step as well.

7.0 HOUSING GROUP DISASSEMBLY

- 7.1 Remove the snubber (1-190) from the housing cover (1-20).
- 7.2 Remove hex cap screws (1-90) and gasket seals (3-100) from housing cover (1-20).
- 7.3 Remove housing cover (1-20). The cover will have a very tight fit. It is not necessary to remove the cover pins (1-130).
- 7.4 Remove the top two rollers (1-50).
- 7.5 Remove the yoke pin (1-40) from the yoke pin nut (4).
- 7.6 Slide the piston rod (2-170) and yoke pin nut (4) out of the way and remove bottom yoke rollers (1-50). You may need to move the yoke arms to one side in order to remove the bottom rollers.
- 7.7 Remove hex cap screw (6-20) and gasket seal (6-30) on blind end cap side.
- 7.8 Remove blind end cap (6-10).
- 7.9 Remove yoke pin nut (4), nut pin (2-180) and piston rod assembly (2-170) from housing by sliding it out of the housing - blind end cap side.
- 7.10 The yoke (1-160) can now be removed by lifting it from the housing.
- 7.11 Remove socket head cap screws (2-140) and lockwashers (2-130) from inside housing (1-10).
- 7.12 Remove cylinder adapter (2-40) from housing.
- 7.13 Remove rod bushing (2-50) from cylinder adapter.

7.14 It is not necessary to remove the stop screws or drain plug to service the actuator.

8.0 GENERAL RE-ASSEMBLY

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

8.2 Before starting the assembly of an actuator, all parts should be thoroughly cleaned, inspected and de-burred. Particular attention should be directed to threads, sealing surfaces and areas that will be subjected to sliding motion.

8.3 After inspection, the parts should be carefully cleaned to remove all dirt, gaskets and other foreign material.

8.4 Coat all seals with lubricant before installing into seal grooves.

9.0 RE-ASSEMBLY - HOUSING GROUP

9.1 Apply fluid to rod seal (3-70) and install inside cylinder adapter (2-40). Lips or energizer ring of rod seal must face away from housing.

9.2 Apply fluid to rod bushing (2-50) and install into cylinder adapter (2-40).

9.3 Bolt cylinder adapter (2-40) to housing from inside, using socket head screws (2-140) and lockwashers (2-130). Insert end cap gasket (3-140) between housing and cylinder adapter.

9.4 If removed, install drain plug (1-80) in actuator housing (1-10).

9.5 Take all the yoke rollers (1-50) and check to see if they will run (move) freely thru the tracks in the bottom of the housing and the housing cover.

9.6 Coat the yoke o-ring seal (3-50) with lubricant and install into the housing (1-10).

9.7 Inside the housing (1-10) apply lubricant to the tracks and yoke bore and arrange the housing with the yoke bore nearest you.

9.8 Apply lubricant to the slots in the upper and lower yoke arm.

9.9 Apply lubricant to the yokes lower bearing surface and install into the housing (1-10) as follows: rotate the yoke arm to approximately a 45° position in either direction and lower into the housing. The hub with tapped holes must face up. Rotate the yoke back to approximately the mid-stroke (center) position.

9.10 Apply lubricant to all surfaces of all four yoke rollers (1-50). Place one yoke roller (1-50) in the track in the bottom of the housing and position it under the slot in the yoke arms. Place a second yoke roller on top of the first yoke roller in the slot in the lower yoke arm and align the holes in the yoke rollers.

9.11 Piston rod (2-170) installation. Do steps 9.11.1 or 9.11.2 if the yoke pin nut was removed from the piston rod.

9.11.1 For T202.0 Actuators - Slide piston rod (2-170), into yoke pin nut (4) and line up the two thru holes. Drive nut pin (2-180) into small thru hole until end is flush with top of split nut retainer.

9.11.2 For T201.5 Actuators - Screw piston rod (2-170) into threaded hole in split nut retainer (4) until hand tight.

9.12 Slide the piston rod/yoke pin nut assembly through the left side of the housing (1-10) and align the yoke pin hole with the hole in the lower rollers (1-50).

9.13 Lubricate the yoke pin (1-40) and insert through the split nut retainer (4) and the two bottom yoke rollers (1-50).

- 9.14 Apply lubricant to all the surfaces of the two remaining yoke rollers (1-50) and install on yoke pin (1-40).
- 9.15 Do this step only if you have removed the housing stop screws (1-60). Place gasket (3-110) and jam nut (1-120) on the stop screw (1-60). Install stop screws in the housing.
- 9.16 Install gasket (3-120) and the blind end cap (6-10) using hex cap screws (6-20) and gaskets (6-30).
- 9.17 Place the housing cover gasket (3-10) on the housing (1-10).
- 9.18 Coat the yoke o-ring seal (3-50) with lubricant and install in cover (1-20).
- 9.19 Apply lubricant to the yoke bore and track in the housing cover.
- 9.20 Apply lubricant to the yoke upper bearing surface and install the housing cover (1-20), being careful not to damage the gasket (3-10) or yoke o-ring seal (3-50).
- 9.21 Install the cover screws (1-90) and seal gaskets (3-100). LEAVE FINGER TIGHT - DO NO TIGHTEN.
- 9.22 Do this step only if you have pulled the cover pins (1-130) or if you are replacing the cover pins. Drive the four pins (1-130) thru the cover (1-20) and into the housing (1-10) until the pin is flush with the cover. The pins are deeply grooved at one end, tapering to a smooth diameter at the other end. The pin should be installed smooth end first.
- 9.23 Tighten the cover screws (1-90) to a torque of approximately 100 in.lbs. or 8.3 ft.lbs.
- 9.24 With yoke to the full clockwise (cw) position (as shown on the assembly drawings), position the yoke weather cover (3-130)/position indicator (1-170) on the yoke with the pointer facing toward the front and perpendicular to the piston rod (2-170) - secure with the four round head screws (1-180).

10.0 HYDRAULIC CYLINDER RE-ASSEMBLY

- 10.1 Coat o-ring seal (3-20) and back-up ring (3-30) with hydraulic fluid and install in cylinder adapter (2-40). Back-up ring will be installed in the groove between the o-ring and the 'housing side' of the groove.
- 10.2 Coat o-ring seal (3-40) with hydraulic fluid and install on piston rod (2-170).
- 10.3 Coat piston seals (3-90) with hydraulic fluid and install on piston (2-20). Piston seal will have to be installed over piston. Back-up/wear rings will fold over piston seal.
- 10.4 Coat end of piston rod (2-170) with hydraulic fluid and slide piston (2-20) into place. On model T201.5, install the piston split ring (2-60) on piston rod first, then slide the piston over the split ring onto the piston rod.
- 10.5 Install hex lock nut (2-100) onto piston rod and torque to 1,000 in.lbs. or 83.3 ft. lbs. maximum.
- 10.6 Coat cylinder adapter (2-40) and cylinder assembly cylinder bore (2-10) with hydraulic fluid. Install cylinder assembly over the piston and onto the adapter. Install the cylinder (2-10) so the bleed ports will be facing up when the actuator is mounted on the valve.
- 10.7 Fasten cylinder assembly (2-10) with socket capscrews (2-120) and lockwasher (2-130).
- 10.8 Install plugs (2-80), if removed, in bottom and top of cylinder (2-10).

11.0 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) time at 100% of the normal operating pressure (NOP), as marked on actuator name tag. This allows the seals to seek their proper working attitude.
- 11.3 Apply 100% of the maximum operating pressure (MOP), as marked on actuator name tag, and allow the 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. If no leakage is noted, repeat step 11.3 for the opposite side of the piston.
- 11.5 If an actuator was disassembled and repaired, the above leakage test must be performed again.

PRESSURE REQUIREMENTS & LIMITATIONS
FOR
T20X.X HYD. ACTUATORS

MODEL		NOMINAL OPERATING PRESSURE (NOP)	MAXIMUM OPERATING PRESSURE (MOP)	MAXIMUM ALLOWABLE WORKING PRESSURE (MAWP)
T201.5	(1)	3150	3500	
T202.0	(1)	1550	2000	

(1) Per customer specification or not applicable.

12.0 RETURN TO SERVICE

- 12.1 If removed, re-install any piping and accessories that were removed.
- 12.2 Replace software components of snubber (1-190) and install snubber back into the housing cover.
- 12.3 Adjust both stop screws (1-60) back to settings recorded in step 5.3 under 5.0 General Disassembly. Hold then stop screw and tighten the jam nut (1-120) down against the actuator housing.

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