

SERVICE INSTRUCTIONS
ASSEMBLY & DISASSEMBLY
T30X.X H.P. & T40X.X H.P.
5000 PSI HYDRAULIC ACTUATORS

INTRODUCTION

This service procedure is offered as a guide to enable general maintenance to be performed on GH-Bettis T30X.XH.P./T40X.XH.P. & 5000 PSI "Scotch-Yoke" hydraulic type actuators.

BASIC TOOLS

Large adjustable wrench, screwdriver, pipe wrench, (1/4") drift punch, 1/2" drive socket set, torque wrench (up to 2000 in. lbs.), 24 oz. ball peen hammer, Allen wrench set and pry bar.

REFERENCE GH-BETTIS MATERIALS

T30X.X Assembly Drawing 041780
T30X.X-H.P. Base I Dimensional Drawing 042344
T40X.X Assembly Drawing 041785
T40X.X-H.P. Base I Dimensional Drawing 042346
Operating, Storage and Maintenance Instructions for GH-Bettis Hydraulic Rotary Valve Actuators (O/P Maint-002)

GENERAL DISASSEMBLY

NOTE: Numbers in parenthesis indicate the bubble number (reference number) used on GH-Bettis Assembly Drawing and Actuator Bill of Material.

1. Rotate actuator to mid-stroke position.
2. Remove all operating pressure from actuator power cylinder (2-310).
3. Remove all piping and accessories mounted on actuator.
4. Drain the hydraulic fluid from hydraulic cylinder (2-310) by removing the cylinder drain plugs located on outboard end and inboard end of cylinder - bottom side. Open bleed valves to facilitate fluid drain.

ACTUATOR DISASSEMBLY

1. Remove four socket cap screws (1-180) from position indicator (1-170), yoke weather cover (3-130) and remove position indicator/yoke weather cover.
2. Remove cover screws (1-90) and gasket seals (3-100).

3. Remove housing cover (1-20). NOTE: This piece will have a very tight fit.
4. Loosen jam nut (2-340) and back away from yoke pin nut (1-30).
5. Unscrew piston rod from yoke pin nut (1-30). Flats are provided on the inboard end of the piston rod for wrench placement. DO NOT use a pipe wrench on the piston rod, as it will mark the rod and cause seal leakage.
6. Remove hex jam nut (2-340) from piston rod.
7. Dis-assemble hydraulic cylinder from adapter by removing hex cap screws (2-360) and lockwashers (2-370). Remove adapter gasket (2-330) as well.

NOTE: Support cylinder during this step and carefully pull away from housing to prevent piston rod from scratching rod bushing and piston rod surfaces.
8. Remove cylinder adapter (2-320) away from housing by unscrewing socket cap screws (2-350).
9. Remove rod bushing (2-50) from housing. Remove end cap gasket (3-10).
10. Remove the top two yoke rollers (1-50) from the top of the yoke pin (1-40). Remove yoke pin (1-40).
11. Remove yoke pin nut (1-30).
12. Remove bottom two yoke rollers (1-50) from the housing. You may have to swing yoke (1-160) to one side in order to remove rollers.
13. The yoke (1-160) can now be removed by lifting it from the housing.
14. Remove socket cap screws (2-350) from inside cylinder adapter (2-320).
15. It is not necessary to remove the stop screws, drain plug, grease fittings or blind end cap assembly to service the actuator.

GENERAL RE-ASSEMBLY

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

Before starting the assembly of an actuator, all parts should be thoroughly inspected, cleaned and de-burred. Particular attention should be directed to threads, sealing surfaces and areas that will be subjected to sliding motion. After inspection, the parts should be carefully cleaned to remove all dirt, gaskets and other foreign material.

LUBRICATION REQUIREMENTS

1. Standard and high temperature service (-20°F to 350°F) use Kronaplate 100. Reference GH-Bettis Engineering Standard ESL-5.
2. Low temperature service (-10°F to 300°F) use Aeroshell 17. Reference GH-Bettis Engineering Standard ESL-4.

FLUID REQUIREMENTS

1. Standard and high temperature service (-35°F to 350°F) use Exxon Dexron II Automatic Transmission Fluid. Identification #D-20106. Reference GH-Bettis Engineering Standard ESF-1.
2. Low temperature service (-65°F to 180°F) use Exxon Univis J13 Hydraulic Fluid. Reference GH-Bettis Engineering Standard ESF-2.

ACTUATOR RE-ASSEMBLY

1. If removed install drain plug (1-80) in actuator housing (1-10).
2. If removed, install grease fitting (1-70) in the actuator housing (not shown on assembly drawing). This fitting is located on the bottom of the housing next to the lower yoke bearing area. NOTE: Grease fittings optional as of 3/1/83.
3. 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.
4. Coat the yoke o-ring seal (3-50) with grease and install into the housing (1-10).
5. Inside the housing (1-10) apply grease to the tracks and yoke bore and orient the housing with the yoke bore nearest you and top of housing (gasket surface) facing up.
6. Apply grease to the yoke (1-160) lower bearing surface and install into the housing (1-10) as follows: Orient the yoke arm to approximately a 45° position in either direction and lower into the housing. The hub with tapped holes faces up. Rotate the yoke back to approximately the mid-stroke (center) position.
7. Apply grease to the slots in the upper and lower yoke arm.
8. Apply grease to all surfaces of all four yoke rollers (1-50). Place one yoke roller (1-50) in the bottom track 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. Coat the upper and lower surfaces of the yoke pin nut (1-30) with grease and insert into position between the yoke arm, parallel to the track in the housing. Align the yoke pin hole with the yoke rollers.
10. Grease the yoke pin (1-40) and insert through the yoke pin nut (1-30) and the two bottom yoke rollers (1-50).
11. Apply grease to all the surfaces of the two remaining yoke rollers (1-50).

12. Install the third yoke pin roller over the yoke pin in the slot in the upper yoke arm and now install the fourth and last remaining yoke roller on top of the yoke roller you just installed in the upper yoke arm slot.

NOTE: The top roller will remain above the yoke arm and will engage the cover track when cover is installed.
13. Apply grease to the rod bushing (2-50), install it into the housing.
14. Coat end cap gasket (3-10) with grease on both sides and install over the rod bushing.
15. Install cylinder adapter (2-320) over bushing and slide adapter up against housing. As adapter is installed, be sure to align bolt holes in housing.
16. Fasten cylinder adapter (2-320) to housing (1-10) with socket cap screws (2-350).
17. 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. Screw the jam nut down against the actuator housing finger tight.
18. Coat cylinder adapter gasket (2-330) with grease and place against cylinder adapter (2-320). Extend piston rod from hydraulic cylinder and insert through cylinder adapter gasket (2-330), cylinder adapter, rod bushing and into housing. Insert hex head screws (2-360) and lockwashers (2-370) through cylinder assembly and into adapter. **DO NOT TIGHTEN.**
19. Install jam nut (2-340) onto piston rod.
20. Install piston rod into yoke pin nut (1-30). Use wrench flats on inboard end of rod to tighten piston rod.
21. Back hex jam nut (2-340) against yoke pin nut (1-30). Tighten jam nut.
22. Start tightening hex head screws (2-360), one at a time and one across from one another, until all screws are securely tightened.
23. Apply a thin coating of grease to the housing cover gasket (3-20) surface.
24. Place the housing cover gasket (3-20) on the housing (1-10).
25. Coat the yoke o-ring seal (3-50) with grease and install in cover (1-20).
26. Apply grease to the cover yoke bore and the track in the housing cover (1-20). Apply a thin coat of grease to the gasket surface.
27. Apply grease to the yoke upper bearing surface.
28. Install the housing cover (1-20), being careful not to damage the gasket (3-20) or yoke o-ring (3-50).
29. Install the cover screws (1-90) and seal gasket (3-100). **LEAVE FINGER TIGHT - DO NOT TIGHTEN.**

30. Do this step ~~only~~ if you have pulled the cover pins (1-130) or if you are replacing the cover pins. Drive the four (4) pins (1-130) thru the cover (1-20) and into the housing (1-10) until the pin is flush with the cover.

NOTE: 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.
31. Tighten the cover screws (1-90).
32. Stroke actuator to full clockwise position.
33. Install position indicator (1-170) and yoke weather cover (3-130) with four socket cap screws. Pointer of indicator will face front (stop screw side of housing) and perpendicular to piston rod.

TESTING HYDRAULIC ACTUATORS

A. ~~Leakage Test~~

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

Procedure:

1. Cycle the actuator five (5) times at 10% of the nominal operating pressure (NOP), as marked on actuator name tag. This allows the seals to seek their proper working attitude.
2. Apply 100% of the maximum operating pressure (MOP), as marked on actuator name tag, to one side of the piston and allow the unit to stabilize.
3. If there is any notable leakage, the actuator must be disassembled and the cause of leakage must be determined and corrected.
4. Repeat the above procedure for the opposite side of the piston.
5. Shell tests the actuator by applying the maximum test pressure, as marked on actuator name tag, to both sides of the piston simultaneously for a period of two (2) minutes. If any leakage occurs, the unit must be disassembled and the cause of leakage must be determined and corrected.
6. If an actuator was disassembled and repaired, the above leakage test must be performed again.

B. ~~Operational (Functional) Test~~

NOTE: This test is used to verify proper function of the actuator and its' related system (accessories).

Procedure:

1. Cycle the actuator at 10% the maximum operating pressure. Any jumpy or jerky operation, not attributed to seal drag or limited flow capacity, must be corrected.
2. All accessories, including solenoid valves, positioners, pressure switches, etc., must be hooked up and tested for proper operations, and replaced if found defective.

RETURN TO SERVICE

1. Pneumatic rotary valve actuators - Refer to "Operating, Storage & Maintenance Instructions for GH-Bettis Pneumatic Rotary Valve Actuators" (OP/MAINT-001) for actuator start-up procedures.
2. Hydraulic rotary valve actuators - refer to "Operating, Storage and Maintenance Instructions for GH-Bettis Hydraulic Rotary Valve Actuators" (OP/MAINT-002) for actuator start-up procedures.

PRESSURE REQUIREMENTS & LIMITATIONS

FOR

~~T30X.X H.P./T40X.X H.P. 5000 PSI ACTUATORS~~

	NOMINAL OPERATING PRESSURE	MAXIMUM OPERATING PRESSURE	MAXIMUM ALLOWABLE WORKING PRESSURE
MODEL	(NOP)	(MOP)	(MAWP)
T302.0	Customer spec or N.A.	5000	6000
T402.0	"	5000	6000