BETTIS

SERVICE INSTRUCTIONS

DISASSEMBLY AND REASSEMBLY

FOR MODELS

HD25X.X-SR-M11 AND HD35X.X-SR-M11

SPRING RETURN SERIES HYDRAULIC

ACTUATORS WITH MANUAL HYDRAULIC

OVERRIDE PACKAGE

PART NUMBER: 135185

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CONTENTS

1.0 INTRODUCTION

1.1 This service procedure is offered as a guide to enable general maintenance to be performed on Bettis H25X.X-SR-M11 and H35X.X-SR-M11 Spring Return Series Hydraulic Actuators with M11 Manual Hydraulic Override Package. When the model number has "-S" as a suffix then the actuator is special and may have some differences that are not included in this procedure.

1.2 **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.

1.3 **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.

WARNING: This procedure should not supersede or replace any customer's plant safety or work procedures. If a conflict arises between this procedure and the customer's procedures the differences should be resolved in writing between an authorized customers representative and an authorized Bettis representative.

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

1.5 Normal recommended service interval for this actuator series is five years to maximum total life cycle.

NOTE: Storage time is counted as part of the service.

1.6 This procedure does not include M11 Disassembly and Reassembly Instructions. Bettis does not recommend periodic maintenance for the M11 itself. The Manual Hydraulic Override needs only to be serviced when it malfunctions.

1.7 This procedure is applicable with the understanding that all electrical power and hydraulic pressure has been removed from the actuator, allowing the spring to stroke and rotate the actuator to its fail position. 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 Kit, commercial leak testing solution, and non-hardening thread sealant.

2.2 Tools - All tools are Imperial. Two each medium standard screwdrivers, small standard screwdriver with corners rounded, putty knife, rubber or leather mallet and a torque wrench (up to 2,000 inch pounds). Refer to the following table for recommended tool style and size.

H25X.X/H35X.X-SR-M11 & TOOL STYLE AND WRENCH SIZES

ITEM NO.	ITEM QTY.	H25X.X WRENCH SIZE	H35X.X WRENCH SIZE	DESCRIPTION OR LOCATION	RECOMMENDED WRENCH STYLE
1-30	4	9/16"	3/4"	Cover Screws	Socket
1-60	2	3/8"	1/2"	Stop Screws	Open End or Adjustable
1-70	2	15/16"	1-5/16"	Hex Jam Nut	Open End or Adjustable
1-120	4	3/16"	3/16"	Socket Cap Screws	Allen **(1)**
1-130	1	7/8"	7/8"	Snubber Assy	Deep Socket
2-30	4	7/16"	1/2"	Socket Cap Screws	Allen **(1)**
2-60	2	9/32"Sq.	9/32"Sq.	Pipe Plug	Open End
2-100	1	1-1/4"	1-5/8"	Standard Hex Nut	Socket
2-110	4	7/16"	1/2"	Ferry Cap Screws	12 Point Socket **(1)**
2-120	1	7/16"Sq.	7/16"Sq.	Pipe Plug	Open End
4-10	1	**(2)**	**(2)**	SR Cylinder Assembly	Chain Wrench **(1)**

(1) No alternate style tool recommended.
(2) Bettis recommends a short handled Chain Wrench with a 40" inch chain.

3.0 BETTIS REFERENCE MATERIALS

3.1 Assembly drawing part number 134860 for H25X.X-SR-M11 and H35X.X-SR-M11 actuators.

NOTE: Assembly drawing is included in the Bettis Service Kit.

4.0 GENERAL DETAILS

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 (item reference number) used on the Bettis assembly drawing and actuator parts lists.

4.3 This procedure is written using the following Actuator references:

4.3.1 Stop screw side of housing (1-10) will be considered the front of the actuator.

4.3.2 Housing cover (1-20) will be the top of the actuator.

4.4 Mating parts should be marked for ease of reassembly, i.e. with spring cartridge on same end of housing as was, cylinder to cylinder adapter, cylinder adapter to housing, and right and left stop adjustment screws, ect.

4.5 When removing seals from seal grooves, use a commercial seal removing tool or a small standard screwdriver with sharp corners rounded off.

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

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

4.7 Disassembly of actuator should be done in a clean area on a work bench when possible.

4.8 Some H25X.X-SR-M11 AND H35X.X-SR-M11 series actuator models are heavy and will require a means of assistance.

5.0 LUBRICATION REQUIREMENTS

5.1 The actuator should be re-lubricated at the beginning of each service interval using the following recommended lubricant.

NOTE: Lubricants other than those listed in step 5.2 should not be used without prior written approval of Bettis Product Engineering.

5.2 LUBRICANT REQUIREMENTS: All temperature service (-50°F to +200°F) use Bettis ESL-4,5 & 10 lubricant contained in the Bettis Standard Service Kit.

NOTE: Fluids other than those listed in step 5.3 should not be used without prior written approval of Bettis Product Engineering.

5.3 FLUID REQUIREMENTS: For use in the M11 assembly and the hydraulic ram cylinder (3) use Dexron Automatic Transmission Fluid.

6.0 GENERAL DISASSEMBLY

6.1 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.

6.2 Record the locations of the pressure ports in the cylinder adapter (2-80).

6.3 Drain the hydraulic fluid from the hydraulic ram cover (3) using the pipe plug (2-60).

NOTE: Record location of the port that pipe plug (2-120) is installed in.

6.4 Drain the hydraulic fluid from the inboard side of piston (2-70) using the pipe plug (2-120).

6.5 Remove all piping (plumbing) from the actuator and the M11 Hydraulic Control Package.

6.6 If the M11 package is remote mounted then disregard the rest of this step. If the M11 is mounted on the actuator then remove the M11 control package from the actuator.

7.0 SR CYLINDER ASSEMBLY REMOVAL

7.1 If not already removed disconnect all operating pressure from actuator hydraulic ram cover (3), allowing the spring to stroke. The spring will rotate the yoke to the actuators fail position.

WARNING: When SR cylinder assembly (4-10) is installed on the actuator, spring cartridge (5) is under compression. Do not remove SR cylinder assembly (4-10) until actuator has the "pre-load" removed.

7.2 Remove stop screw "pre-load" as follows:

NOTE: Perform step 6.1 in Section 6 before proceeding to step 7.2.1.

7.2.1 On the front side of housing (1-10) loosen two hex jam nuts (1-70).

7.2.2 On the front side of housing (1-10) unscrew and remove two stop screws (1-60).

7.3 Remove breather (4-20) from end of SR cylinder assembly (4-10).

CAUTION: Due to the weight and nature of a spring cartridge pre-loaded assembly, caution should be exercised when handling spring cartridge (5). The spring cartridge (5) is unattached and is only contained by SR cylinder assembly (4-10).

7.4 Secure the chain wrench around the SR cylinder assembly (4-10) as close to the welded end cap as possible. Using a mallet, break the cylinder loose sufficiently so it can be removed.

7.5 Remove SR cylinder assembly (4-10) from cylinder adapter (2-80) by rotating in a counter clockwise direction.

NOTE: When removing and setting cylinder assembly (4-10) aside, care should be taken to protect the chamfered edge and cylinder threads.

7.6 Carefully remove spring cartridge (5) from SR cylinder assembly (4-10) by slightly tilting open end of cylinder down.

WARNING: Spring cartridge (5) is not field repairable. Under no circumstances should spring cartridge (5) be disassembled, as the spring assembly is pre-loaded.

7.7 Unscrew and remove light hex Lok nut (2-100) from piston rod (2-10).

7.8 Remove piston (2-70) from piston rod (2-10).

NOTE: Record cylinder adapter (2-80) inlet port locations.

7.9 Unscrew and remove the four ferry screws (2-110) with gasket seals (6-20) from the cylinder adapter (2-80).

7.10 Remove the cylinder adapter (2-80), taking care not to scratch the piston rod (2-10) or disengage the rod bushing (2-90).

8.0 HYDRAULIC RAM COVER DISASSEMBLY

8.1 If not already removed disconnect all operating pressure from actuator hydraulic ram cover (3), allowing the spring to stroke. The spring will rotate the yoke to the fail position.

8.2 Remove pipe plug (2-60) from ram cover (3) and drain the hydraulic fluid.

8.3 Unscrew four rod cover socket head cap screws (2-30) on rod cover (3) and remove with gasket seals (6-20).

8.4 Remove the rod cover (3), taking care not to disengage the rod bushing (2-20).

9.0 HOUSING DISASSEMBLY

9.1 Remove socket cap screws (1-120) from position indicator (1-110), yoke weather cover (6-110) and remove position indicator/yoke weather cover.

9.2 Remove snubber (1-130) from housing (1-10).

9.3 Remove the cover screws (1-30) and seal gaskets.

9.4 Remove the housing cover (1-20).

NOTE: The housing cover has a tight fit and will require the use of two pry bars or screw drivers to assist in removal.

9.5 Rotate the arms of yoke (1-140) to the center position of housing (1-10).

9.6 Remove upper yoke roller (1-50) from yoke pin (1-40).

9.7 Remove yoke pin (1-40) from yoke arms of yoke (1-140).

9.8 Holding rod bushing (2-90) and (2-20) in place, pull the piston rod (2-10) out through the rod bushing (2-20).

9.9 Remove both rod bushings (2-90) and (2-20) from housing (1-10).

9.10 Remove yoke (1-140) from housing (1-10).

CAUTION: The yoke/housing bearing area must be lubricated and inspected to extend service life and prevent degradation of torque output. This can only be accomplished by removing the yoke from the housing which requires removing the actuator from the device it is mounted on.

9.11 Remove lower yoke roller (1-50).

10.0 GENERAL REASSEMBLY

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

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

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

10.3 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 cylinder, and piston 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.

10.4 Before installing coat all surfaces of actuators moving parts with lubricant. Coat all seals with lubricant, before installing into grooves.

NOTE: Parts and seals used in the actuator housing assembly and the outboard side of piston (2-70) including spring cartridge (5) will be assembled using lubricant as identified in Section 5 step 5.2. Parts and seals used in the hydraulic ram cover (3) and the inboard side of piston (2-70) will be assembled using the hydraulic fluid as identified in Section 5 step 5.3.

10.5 The torque requirements for critical fasteners are specified at the appropriate step of the assembly procedure.

11.0 HOUSING REASSEMBLY

CAUTION: Use the lubricants as referenced in Section 5 step 5.2 on all moving parts and seals in the housing assembly.

11.1 Apply lubricant to the yoke bore and the raised ribs in the bottom of housing (1-10). Arrange the housing so that the yoke bore is nearest to you.

11.2 Install one of the yoke o-ring seals (6-60) into the o-ring groove located in the lower area of housing (1-10).

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

11.4 Install the yoke (1-140) into the housing (1-10). NOTE: The wide yoke arm should be installed toward the top of the housing.

11.5 Coat rod bushing (2-20) with lubricant.

11.6 Coat o-ring (6-70) with lubricant and install into the groove on the outer diameter of rod bushing (2-20).

11.7 Install backup rings (6-80) into the groove on the outer diameter of rod bushing (2-20). NOTE: One backup ring on each side of the o-ring (6-80) with the concave side of backup ring facing the o-ring.

11.8 Coat seal (6-50) with lubricant and install into the groove on the inner diameter of rod bushing (2-20). NOTE: The seal is to be installed with the energizer ring (open side of seal) facing the hydraulic ram cover (3).

11.9 Install rod bushing (2-20) into the right side of housing (1-10) for fail clockwise (CW) actuators and on the left side for fail counter-clockwise (CCW) actuators.

11.10 Coat piston rod bushing (2-90) with lubricant and install into left side of housing (1-10) for fail clockwise actuators and on the right side for fail counter-clockwise actuators.

11.11 Coat one of the yoke rollers (1-50) with lubricant and place into the slot in the lower arm of yoke (1-140).

11.12 Apply a light coat of lubricant to the piston rod (2-10) and install through the bushing (2-20), through housing (1-10) and out through rod bushing (2-90).

11.13 Coat yoke pin (1-40) with lubricant and install through the piston rod (2-10) into the lower yoke roller (1-50).

CAUTION: Verify that the yoke pin (1-40) is install through the lower yoke roller (1-50).

11.14 Coat the remaining yoke roller (1-50) with lubricant and install over the yoke pin and into the slot in the upper arm of yoke (1-140).

11.15 Install the remaining o-ring seal (6-60) into seal groove located in the housing cover (1-20).

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

11.17 Install the cover gasket (6-10) onto the top of housing (1-10).

11.18 Install housing cover (1-20) over cover gasket (6-10) and onto the top area of housing (1-10).

11.19 Install four gasket seals onto four hex cap screws (1-30) as follows:

11.19.1 H25 install gasket seals (6-90) on to hex cap screws (1-30).

11.19.2 H35 install gasket seals (6-20) on to hex cap screws (1-30).

11.20 Install four hex cap screws (1-30) with gasket seals through housing cover (1-20) and into housing (1-10).

11.21 Torque tighten the four hex cap screws (1-30) as follows:

11.21.1 H25X.X torque tighten hex cap screw (1-30) to 20 foot pounds / 27.1 N-m (±5 %).

11.21.2 H35X.X torque tighten the hex cap screw (1-30) to 45 foot pounds / 61 N-m (±5 %).

11.22 If supplied in the service kit, replace the software components of the snubber (1-130) and then install the snubber into the housing.

12.0 SR CYLINDER ASSEMBLY REASSEMBLY

CAUTION: Use hydraulic fluid as referenced in Section 5 step 5.3, on all moving parts and seals that are indicated as "coat with fluid" in the SR cylinder assembly.

12.1 Install one cylinder adapter gasket (6-30) onto the left side of the housing for clockwise (CW) actuators and on the right for counter clockwise (CCW) actuators.

NOTE: H-SR actuators use a Polypak rod seal to seal the SR cylinder from the center housing (1-10). The dimensional stack of the rod seal and the rod bushing is less than the rod seal cavity. This dimensional difference does not affect the ability of the Polypak seal to provide sealing in this application.

12.2 Coat rod seal (6-55) with fluid and install; lip first, into the cylinder adapter (2-80).

CAUTION: Energizer ring (o-ring) of rod seal (6-55) must face into cylinder adapter (2-80) or when SR cylinder assembly is installed on the actuator the rod seal o-ring will be facing towards piston (2-70).

12.3 Install the cylinder adapter (2-80) over the piston rod and arrange the cylinder adapter so that it is in the same position as recorded in step 6.3. Care should be taken at this point not to scratch the piston rod when installing the cylinder adapter.

12.4 Install gasket seals (6-20) onto four ferry cap screws (2-110).

12.5 Install four ferry cap screws (2-110) with gasket seals through cylinder adapter (2-80) and into housing (1-10).

12.6 Apply pipe dope onto the threads of pipe plug (2-120) and install into the cylinder adapter (2-80) pressure port (port location as recorded in Section 6 step 6.4).

12.7 Coat o-ring seal (6-120) with fluid and install into the cylinder adapter seal groove located at the inner end of the threads.

12.8 Coat o-ring seal (6-100) with fluid and install over the threads and up against the shoulder of piston rod (2-10).

12.9 Install piston (2-70) onto piston rod (2-10). NOTE: One side of piston (2-70) has a raised boss in the center that is counter bored to accept the o-ring seal (6-100) installed in step 12.8.

CAUTION: When installing hex lock nut (2-100) the flat side of the nut should rest up against piston (2-20).

12.10 Install hex lock nut (2-100) onto piston rod (2-10).

12.11 Torque tighten hex nut (2-100) to approximately 146 foot pounds / 197.8 N-m lubricated.

12.12 PISTON SEAL INSTALLATION:

12.12.1 Standard and High Temp Actuators: Coat U-cup seal (6-130) with fluid and install into the innermost piston seal groove. NOTE: The lip of the U-cup seal should point outward toward the side of the piston.

12.12.2 Low Temp Actuators: Coat T-seal (6-130) with fluid and install as follows:

12.12.2.1 Coat piston seal groove with lubricant.

NOTE: T-Seal is composed of one rubber seal and two skive-cut back-up rings.

12.12.2.2 Install T-seal (6-130) into piston inboard seal groove.

12.12.2.3 Install a back-up ring on each side of the T-seal. NOTE: When installing the back-up rings, do not align the skive-cuts.

NOTE: If the back-up rings are too long and the rings overlap beyond the skive-cuts, then the rings must be trimmed with a razor sharp instrument.

12.13 Push the piston in towards the housing as far as it will go.

12.14 Coat the cylinder threads and the entire bore of cylinder (4-10) with fluid.

12.15 Coat the outside of the spring with lubricant and insert the spring cartridge assembly (5) into the spring cylinder (4-10). One end of the spring cartridge assembly has a flat face with a deep hole in it, this end should be inserted into the cylinder first.

12.16 Install the spring cylinder (4-10), containing the spring cartridge, over the piston and screw into the cylinder adapter (2-80). Tighten with a chain wrench.

NOTE: While the chain wrench is still positioned on the cylinder and after the cylinder is tight, take a mallet and rap (hit) the chain wrench handle a couple of times. This will seat the cylinder assembly into the o-ring seal located in the cylinder adapter. Repeat this step if during testing the area between the cylinder assembly and the cylinder adapter is leaking pressure at an unacceptable rate.

12.17 Install jam nuts (1-70) onto stop screws (1-60).

12.18 Install gasket seals (6-40) onto stop screws (1-60) and up against back side of hex jam nuts (1-70).

12.19 Install stop screws (1-60) with gasket seals (6-40) and hex jam nuts (1-70) into the front housing (1-10).

12.20 Adjust both stop screws (1-60) back to the settings recorded in section 6.

12.21 Tighten both stop screw hex jam nuts (1-70) securely, while holding stop screws (1-60) in place.

12.22 POSITION INDICATOR INSTALLATION

12.22.1 For spring to close actuators (clockwise) rotate the yoke to the full clockwise (CW) position. Position the yoke weather cover (6-110) and position indicator (1-110) on the yoke (1-140) with the pointer pointing to the piston rod and perpendicular to the SR cylinder assembly.

12.22.2 For spring to open actuators (counterclockwise) rotate the yoke to full counter-clockwise (CCW) position. Position the yoke weather cover (6-110) and position indicator (1-110) on the yoke with the pointer to the hydraulic ram cover (3) and parallel to the piston rod (2-10).

12.22.3 Install and tighten four socket cap screws (1-120) through position indicator (1-110), weather cover (6-110) and into top of yoke (1-140).

NOTE: The four socket cap screws (1-120) will need to be rechecked for tightness after the actuator has been cycled and tested.

12.23 Apply pipe dope onto the threads of pipe plug (2-60) and install into the vacant pipe plug port located in the actuator's cylinder adapter (2-80).

12.24 Install breather (4-20) in the end of the spring cylinder (4-10).

13.0 HYDRAULIC RAM COVER REASSEMBLY

13.1 Install the remaining end cap gasket (6-30) onto the right side of housing (1-10) for clockwise actuators, or the left end of the housing for counterclockwise actuators.

13.2 Install the hydraulic ram cover (3) over the exposed piston rod end (2-10).

13.3 Install gasket seals (6-20) onto four socket cap screws (2-30).

13.4 Install and tighten four socket cap screws (2-30) with gasket seals through the flange of hydraulic ram cover (3) and into housing (1-10).

13.5 Install pipe plug (2-60) into the hydraulic ram cover.

14.0 ACTUATOR TESTING

14.1 Leakage Test – Hydraulic Ram General

14.1.1 All areas, where leakage to atmosphere may occur, are to be checked using hydraulic pressure.

14.1.2 All hydraulic leak testing will use 100% percent of the nominal operating pressure (NOP) as listed on the actuator name tag or the pressure used by the customer to operate the actuator during normal operation.

14.2 Before testing for leaks, alternately apply and release operating pressure, as described in step 14.1.2, to the pressure end of hydraulic ram cover (3) to stroke the actuator fully. Repeat this cycle approximately five times. This will allow the new seals to seek their proper working attitude.

14.3 Hydraulic Ram Leakage Test -Procedure

CAUTION: Pressure applied to the actuator is not to exceed the maximum operating pressure rating listed on the actuator name tag. Test the actuator using a properly adjusted self relieving regulator, with gauge.

14.3.1 Apply pressure as listed in step 14.1.2 to the pressure port in the end of the ram cover (3) and check for leaks.

14.3.2 Remove pressure from pressure inlet port in the end of the ram cover (3).

14.3.3 If excessive leakage is noted, the actuator must be disassembled and the cause of leakage must be determined and corrected.

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

15.0 M11 HYDRAULIC CONTROL PACKAGE INSTALLATION

NOTES:
1. The M11 unit must be mounted with reservoir upright.
2. Recommend that a non-hardening thread sealant, compatible with the hydraulic fluid be used in this system.

CAUTION: Do not use Teflon tape to seal hydraulic system threads.

15.1 If the M11 was mounted on the actuator then reinstall it on the actuator.

15.2 Hook up piping from the M11 hydraulic control block to cylinder port.

15.3 Use either Refilling Method Number 1 (steps 15.4) or Refilling Method Number 2 (steps 15.5). NOTE: Method Number 1 is the best, most efficient and the recommended method.

15.4 **REFILLING METHOD NUMBER 1.** - Refilling of the M11 Manual Hydraulic Override System is best accomplished using a pump motor.

NOTE: If a pump motor is not available go to step 15.5 (Method number 2) for the manual field service refilling procedure.

15.4.1 Remove the pipe plug from the actuator cylinder adapter (2-80).

15.4.2 Disconnect the pump hose from the reservoir fitting, located close to the reservoir inner end cap, and connect the pump motor to the pump hose.

15.4.3 Place the M11 pump selector knob in the “Auto” position.

NOTE: The pressure pump should not exceed 10 to 20 psi when force filling the M11 hydraulic system.

15.4.4 Start pumping the hydraulic fluid into the system with the pump motor.

15.4.5 Stop the pump motor when hydraulic fluid appears at vacant pipe plug port located in the actuator’s cylinder adapter (2-80).

15.4.6 Apply pipe dope onto pipe plug thread and install into the vacant pipe plug port located in the actuator’s cylinder adapter (2-80).

15.4.7 Disconnect the pump motor from the M11 pump hose.

15.4.8 Connect the M11 pump hose to the fitting on the M11 reservoir outer end cap.

15.4.9 Remove the breather from the top of the reservoir inner end cap.

15.4.10 Fill reservoir to 1-1/2 inches (40 mm) from top of reservoir end cap. Note: Add fluid to the reservoir through the open port left vacant in step 15.4.9.

15.4.11 Apply pipe dope to breather threads and install breather into port vacated in step 15.4.9.

15.5 **REFILLING METHOD NUMBER 2.** - Refilling the M11 Manual Hydraulic Override System without using a pump motor.

15.5.1 Remove the breather from the top of the M11 reservoir end cap.

15.5.2 Remove the pipe plug from the actuator cylinder adapter (2-80).

15.5.3 Place the M11 pump selector knob in the “Manual” position.

CAUTION: Never allow the M11 reservoir to be pumped dry of hydraulic fluid.

15.5.4 Fill reservoir to 1-1/2 inches (40 mm) from top of reservoir end cap (10-10). Note: Add fluid to the reservoir through the open port left vacant in step 15.5.1.

15.5.5 Start pumping the hydraulic fluid into the system with the M11 pump handle.

15.5.6 Stop pumping the M11 pump handle when hydraulic fluid appears at the vacant pipe plug port located in the actuator's cylinder adapter (2-80).

15.5.7 Apply pipe dope onto the pipe plug threads and install into vacant pipe plug port located in the actuator's cylinder adapter (2-80).

15.5.8 Fill the M11 reservoir 1-1/2 inches (40 mm) from the top of the reservoir.

15.5.9 Apply pipe dope to the breather threads and install into the port on top of the reservoir upper end cap.

16.0 RETURN TO SERVICE

16.1 After actuator is reinstalled on the device it is to operate all accessories should be hooked up, leak tested, and then tested for proper operation and replaced if found defective.

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

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*** Signatures on file Bettis Actuator & Controls, Waller, Texas**