

BETTIS ACTUATORS & CONTROLS

OPERATING INSTRUCTIONS

M11S-S

HYDRAULIC CONTROL SYSTEM

FOR "G" SERIES

SPRING RETURN ACTUATORS

PART NUMBER: 121960

REVISION: "B"

RELEASE DATE: July, 2006

1.0 INTRODUCTION

1.1 **SYSTEM DESCRIPTION:** M11S-S Hydraulic Control System is a compact, modular system designed for use with Bettis spring return actuators. The system incorporates a piston type hand pump and a make-up oil reservoir necessitated by the differential volume of the hydraulic cylinder (the differential volume is due to the inboard piston rod displacement).

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 operation. Close attention should be noted to the **WARNINGS, CAUTIONS and NOTES** contained in this procedure.

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

2.0 GENERAL INFORMATION

CAUTION: The M11S-S package must be mounted with the pump and reservoir upright and vertical. The reservoir fill plug must be removed and replaced, with the breather supplied, before operation.

2.1 Numbers in parentheses (), indicate the bubble number (reference number) used on the Bettis Assembly Drawing.

2.2 Bettis M11S-S System Assembly Drawing part number 121107.

2.3 M11S-S Hydraulic Control System Fluid Requirements: Hydraulic fluids, other than those listed in steps 2.3.1 and 2.3.2, should not be used without prior written approval of Bettis Product Engineering.

2.3.1 Standard and high temperature service (-20°F to +350°F) use Dexron II or Shell Tellus T-32 Automatic Transmission Fluid.

- 2.3.2 Low temperature service (-50°F to +150°F) Use Exxon Unavis J13 or HVI 13 Hydraulic Fluid.

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

- 2.4 Do not use Teflon tape on threads, use a non-hardening thread sealant on all pipe threads.

3.0 ACTUATOR POWER OPERATION

- 3.1 Fully open the M11S-S by-pass control valve (30). NOTE: The valve is located on the right hand side of the M11S-S control module.

CAUTION: Do not exceed the maximum operating pressure rating of the actuator.

- 3.2 Apply a operating media, of the correct pressure, through a control valve to the actuator's power cylinder.

4.0 ACTUATOR M11S-S MANUAL OPERATION

- 4.1 Shut off and exhaust the operating media from the actuators power cylinder.
- 4.2 Fully close the M11S-S by-pass control valve (30).
- 4.3 Operate the M11S-S hand pump (280) until the actuator strokes to the desired degree.

NOTE: When the actuator is fully stroked against the travel stops, an increased resistance in pumping effort will be noted. Continued operation of the pump simply circulates fluid through a high pressure relief.

- 4.4 Fully open the M11S-S by-pass control valve (30) to reverse the actuator rotation or to return to normal power operation.

5.0 SYSTEM REFILLING

- 5.1 Use either Refilling Method Number 1 (steps 5.2) or Refilling Method Number 2 (steps 5.3). Method number 1 is the best, most efficient and the recommended method.
- 5.2 REFILLING METHOD NUMBER 1. - Refilling of the M11S-S module and actuator hydraulic cylinder is best accomplished using a pressure pump.
- 5.2.1 Shut off and exhaust the operating media from the actuators power cylinder.
- 5.2.2 Allow the actuator to fully stroke to its fail position by opening the M11S-S by-pass control (30) valve.
- 5.2.3 Remove the breather (150) from the reservoir end cap (25).
- 5.2.4 Attach the pump discharge line to the reservoir end cap (25) breather port.
- 5.2.5 Remove the two top o-ring plugs located in the top of the hydraulic cylinder(s) inner and outer end caps..
- 5.2.6 Slowly pump hydraulic fluid into the reservoir. Approximately 3 to 5 psi will be required. As the fluid passes through the M11S-S module and into the hydraulic

cylinder, air will be displaced. Install each top o-ring plug when the air has been displaced and hydraulic fluid appears.

5.3 REFILLING METHOD NUMBER 2. - Refilling the M11S-S control system during field service often must be done without the use of a pressure pump. Proceed as follows:

5.3.1 Shut off and exhaust the operating media from the actuator's power cylinder.

5.3.2 On the M11S-S block (10) fully close the by-pass control valve (30).

5.3.3 Fill hydraulic cylinder(s) with fluid by removing the top o-ring plugs located in the top of the hydraulic cylinder(s) inner and outer end caps.

5.3.4 Fill the M11S-S reservoir. Maintain at least 1 through 1-1/2 inches of fluid from the top of the reservoir at all times.

5.3.5 On the M11S-S block (10), close by-pass control valve (30).

5.3.6 Operate M11S-S hand pump (280) slowly. Keep handle up for about 4 to 5 seconds before each pressure stroke. This allows time for the pump cylinder to fill in order that full displacement of the pump is utilized.

NOTE: If the pump fails to deliver fluid, open the by-pass valve, rapidly operate the pump 15 to 20 times, close the by-pass valve and continue filling sequence.

5.3.7 Replace the hydraulic cylinder outboard top o-ring plugs valve when fluid appears.

5.3.8 Operate the M11S-S hand pump (280) to fully stroke the actuator. Refill the M11S-S reservoir as required.

5.3.9 Open the M11S-S block (10) by-pass control valve (30).

5.3.10 As the actuator strokes, fluid will be displaced from the greater volume of the outboard cylinder into the lesser volume of the inboard cylinder. Fluid will begin flowing from the hydraulic cylinder inboard top o-ring plug port hole.

5.3.11 Replace the hydraulic cylinder inboard top o-ring plug when fluid appears and proceed to step 5.3.16.

NOTE: If the actuator completes its stroke and fluid does not appear at the hydraulic cylinder inboard top o-ring plug port hole, omit step 5.3.10 and proceed as follows:

5.3.12 Close the M11S-S block (10) by-pass control valve (30).

5.3.13 Operate the M11S-S hand pump as described in section 4.0 to cycle actuator.

5.3.14 Replace the hydraulic cylinder inboard top o-ring plug when fluid appears. Stop operation of pump.

NOTE: If fluid does not appear, repeat steps 5.3.8 through 5.3.11.

5.3.15 Open the M11S-S by-pass control valve (30).

- 5.3.16 Add fluid to reservoir so that level is within approximately 1 inch through 1-1/2 inches of fluid from the top of the reservoir.
- 5.3.17 Install breather (150) back into reservoir end cap (25) port.
- 5.3.18 Connect power supply lines back to the actuator control system or power cylinder and cycle the actuator using available power media.

6.0 MAINTENANCE

Bettis does not recommend periodic field maintenance for the M11S-S module and pump. The only time the M11S-S module or pump should be disassembled is when either the pump or the M11S-S module fails to perform its override function. If maintenance is required and when possible the M11S-S package should be returned to the factory for maintenance.

ECN	DATE	REV		BY *	DATE
Released	September, 1997	A	COMPILED	COLBY	22 JUNE 06
19110	July, 2006	B	CHECKED	JOHN R	6/22/06
			APPROVED	DAVID MCGEE	7/18/06

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