

**BETTIS ACTUATOR & CONTROLS**

**SERVICE INSTRUCTIONS**

**FIELD CONVERSION FROM**

**GXXXX DOUBLE ACTING SERIES**

**PNEUMATIC OR HYDRAULIC ACTUATOR**

**TO GXXXX-M11-S**

**DOUBLE ACTING SERIES**

**PNEUMATIC OR HYDRAULIC ACTUATOR**

**WITH AUXILIARY HYDRAULIC CYLINDER**

PART NUMBER: 122931

REVISION: "A"

RELEASE DATE: March 21, 1997

## 1.1 INTRODUCTION

1.1.1 This conversion procedure is offered as a guide to field convert G series pneumatic or hydraulic double acting series actuators to a double acting actuator with a auxiliary GX-M11-S-XX Module on the opposite side of the Actuator Drive Module from the Power Module.

### 1.1.2 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.

1.1.3 **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 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.

## 2.1 SERVICE SUPPORT ITEMS

2.1.1 Bettis GX-M11-S-XX Module.

2.1.2 For rod extension retainer nut tool, refer to the following table.

ACTUATOR MODEL	BETTIS PART NUMBER
G3/G4	117370
G5/G7	117369
G8/G10	117368

### **3.1 BETTIS REFERENCE MATERIALS**

- 3.1.1 Assembly Drawing part number 116422 for GXXXX Double Acting Pneumatic Series Actuators.
- 3.1.2 Assembly Drawing part number 115680 for GXXXX-H Double Acting Pneumatic Series Actuators.
- 3.1.3 Assembly Drawing part number 116423 for GXXXX Double Acting Hydraulic Series Actuators.
- 3.1.4 Assembly Drawing part number 115680 for GXXXX-H Double Acting Hydraulic Series Actuators.

### **4.1 GENERAL DETAILS**

- 4.1.1 This procedure should only be implemented by a technically competent technician who should take care to observe good workmanship practices.
- 4.1.2 Numbers in parentheses, ( ) indicate the bubble number (item reference number) used on Bettis Assembly Drawing, Exploded Detail Drawings, and actuator parts lists.
- 4.1.3 This procedure is written using the stop screw side of housing (1-10) as a reference and this side will be considered the front of the actuator. Housing cover (1-20) will be considered as the top of the actuator.
- 4.1.4 Use a non-hardening thread sealant on all pipe threads.

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

- 4.1.5 LUBRICATION REQUIREMENTS: For use in all areas of the actuator. Lubricants, other than those listed in steps 4.1.5.1, 4.1.5.2, and 4.1.5.3, should not be used without prior written approval of Bettis Product Engineering.
  - 4.1.5.1 Standard Temperature Service (-20°F to +200°F) use Bettis ESL-5 lubricant contained in the Bettis Standard Temperature Service Kit.
  - 4.1.5.2 High Temperature Service (0°F to +350°F) use Bettis ESL-5 lubricant contained in the Bettis High Temperature Service Kit.
  - 4.1.5.3 Low temperature service (-40°F to +150°F) use ESL-4 lubricant contained in the Bettis Low Temperature Service Kit.

### **5.1 ACTUATOR CONVERSION**

- 5.1.1 Remove hex cap screws (5-20), with spring lockwashers (5-30), from blind end cap (5-10).
- 5.1.2 Remove blind end cap (5-10) from end of housing (1-10).
- 5.1.3 Loosen right side stop screw nut (1-190) located on right side of housing (1-10).

- 5.1.4 Unscrew right side stop screw (1-180) until it will allow the yoke maximum travel.
  - 5.1.5 Apply 5 psig pressure to pneumatic cylinder port "B", port is located in outer end cap (3-80). Allow the actuator to move guide block (1-30) up against the hole left where the blind end cap was previously located.
- NOTE: Maintain the 5 psig pressure on the pneumatic cylinder until told to remove the pressure.
- 5.1.6 Lubricate guide block (1-30), two spherical washers (1-40), and one extension rod assembly (1-50).
  - 5.1.7 Install one spherical washer (1-40) into the side of guide block (1-30). NOTE: The spherical side of washer (1-40) will be facing to the outside of guide block (1-30).
  - 5.1.8 Install second spherical washer (1-40) over threaded end of extension rod assembly (1-50). NOTE: The spherical side of the washer will go on the extension rod assembly facing the head of the extension rod assembly.
  - 5.1.9 Install extension rod assembly (1-50) into guide block (1-30) and up against the first spherical washer (1-40).
  - 5.1.10 Install extension retainer nut (1-60) over extension rod assembly (1-50) and screw into guide block (1-30).
  - 5.1.11 Tighten extension retainer nut assembly (1-60) until extension rod assembly (1-50) can not move. Back off the extension retainer nut assembly (1-60) just enough to allow for extension rod assembly (1-50) to move freely.
  - 5.1.12 Remove pressure from outer end cap pressure port "B".

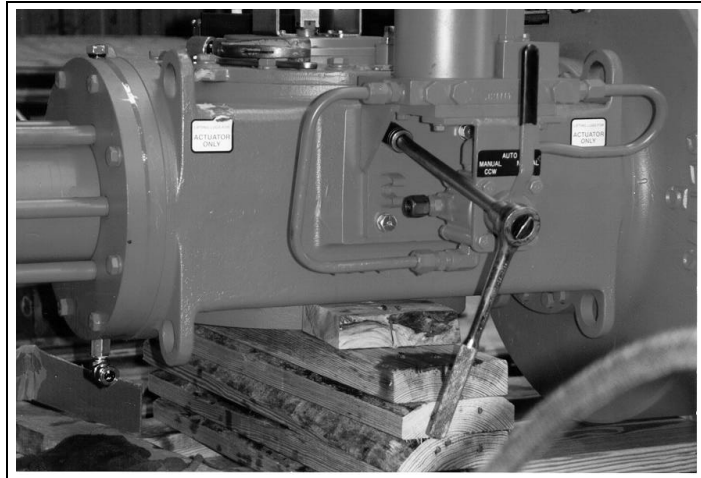
## **6.1 HYDRAULIC CYLINDER MODULE INSTALLATION**

- 6.1.1 Install one o-ring seal (8-90) onto the outer diameter seal groove of inner end cap (7-10).
  - 6.1.2 Using lifting equipment move one hydraulic cylinder module up to right side of housing (1-10) and align piston rod (7-40) with extension rod assembly.
- NOTE: The pressure inlet ports should be installed in the position that will allow the ports to be in the versatile position when the actuator is installed on the device it is to operate.
- 6.1.3 Using a 3/4 inch male square drive extension, go through outer end cap (7-80), screw piston rod (7-40) into extension rod assembly.
  - 6.1.4 Install lock washers (7-110) onto hex cap screws (7-115).
  - 6.1.5 Install hex cap screws (7-115) through inner end cap (7-10) and screw into housing (1-10).
  - 6.1.6 Install lock washers (7-110) onto hex cap screws (7-100).
  - 6.1.7 Install hex cap screws (7-100) through housing (1-10) and through inner end cap (7-10).

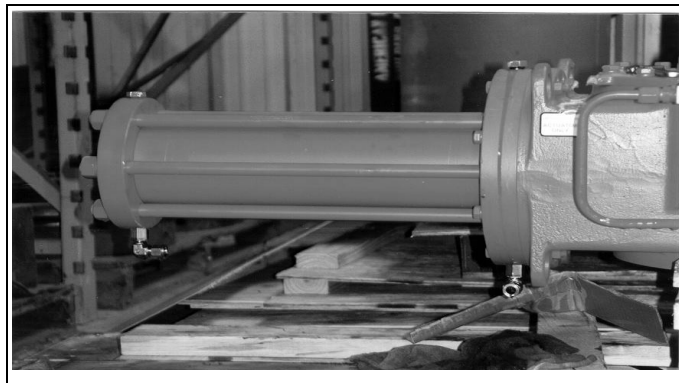
- 6.1.8 Install hex nuts (7-105) onto hex cap screws (7-110).
- 6.1.9 Torque tighten hex cap screws (7-100) to 240 foot pounds lubricated  $\pm 5\%$ ..
- 6.1.10 Torque tighten hex cap screws (7-115) to 240 foot pounds lubricated  $\pm 5\%$ ..
- 6.1.11 Using a 3/4 inch male square drive extension, go through outer end cap (7-80), torque tighten piston rod (7-40) to 240 foot pounds lubricated.
- 6.1.12 Install and tighten SAE hex plug (7-120), with o-ring seal, into outer end cap (7-80).

## 7.1 HYDRAULIC CONTROL PACKAGE INSTALLATION

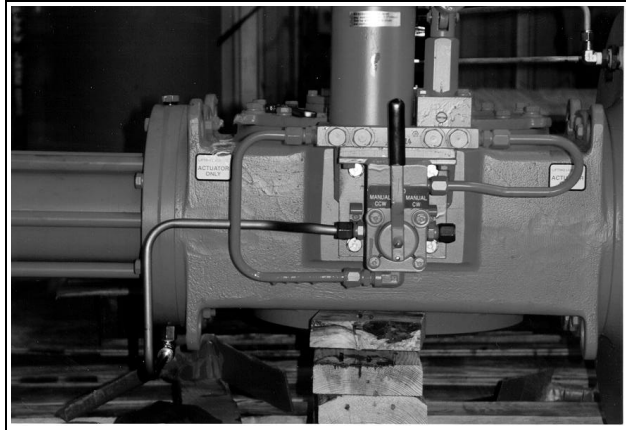
- 7.1.1 Install M11D-S hydraulic control package onto accessory pad number 1. Refer to following picture



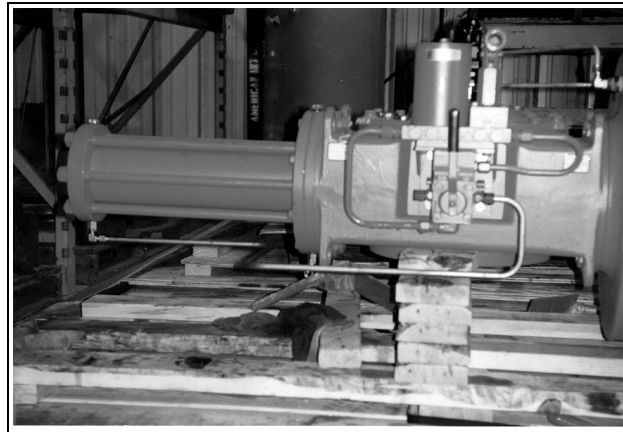
- 7.1.2 Install fittings into outer end cap (7-10) and inner end cap (7-80) as shown in following picture.



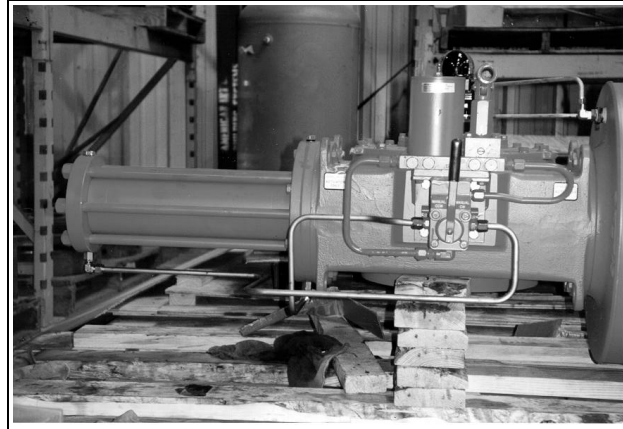
- 7.1.3 Install piping from M11D-S hydraulic control package to fittings installed into inner end cap (7-10). Refer to following picture.



- 7.1.4 .Install piping from M11D-S hydraulic control package to fittings installed into outer end cap (7-80). Refer to following picture.



NOTE: Refer to following picture for completed installation.



#### 8.1 **M11-S HYDRAULIC CONTROL PACKAGE FILLING INSTRUCTIONS**

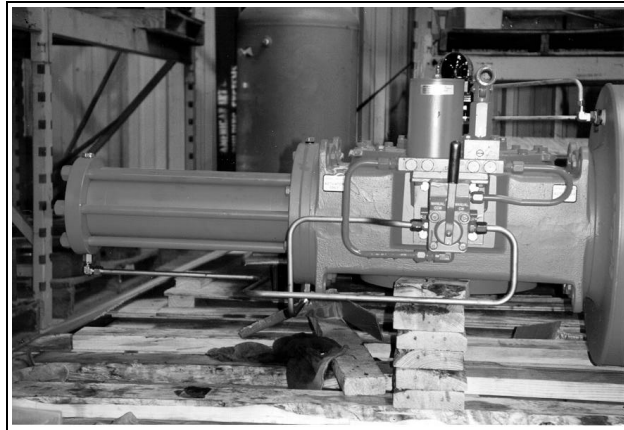
- NOTES:
1. The M11-S must be mounted with reservoir upright.
  2. Recommend that a non hardening thread sealant, compatible with petroleum base hydraulic fluid be used in this system.

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

- 8.1.1 Filling of the M11-S Hydraulic Control System and actuator cylinder is best accomplished using a pressure pump. Approximately 3 to 5 psi will be required. Refer to picture number 6.
- 8.1.2 Apply 5 psig pressure to outer end cap (3-80) pressure port "B".
- 8.1.3 Remove pressure from outer end cap (3-80) pressure port "B".
- 8.1.4 Attach the pump discharge line to reservoir breather port. Refer to following picture.



- 8.1.5 Loosen the two o-ring plugs located at each end of the hydraulic cylinder.
- 8.1.6 Position the selector valve in the middle (auto) position. Refer to following picture.



- 8.1.7 Slowly pump hydraulic fluid into the reservoir. As the fluid passes through the M11-S control module into the cylinder module, air will be displaced and fluid will appear at port "A" in inner end cap (7-10).
- 8.1.8 Close each o-ring plug when the air has been displaced and hydraulic fluid appears. Refer to following picture.



- 8.1.9 Remove the pressure pump.



- 8.1.10 Position the actuator in its full clockwise position; add fluid to the reservoir so that its level is within approximately 1-½ inches of full. Refer to following picture.



- 8.1.11 Install the breather.
- 8.1.12 Place the selector valve handle in the CCW position and operate the M11-S hand pump to stroke the actuator counter-clockwise. Refill reservoir as required.
- 8.1.13 Place the selector valve in the CW position and operate the M11-S hand pump to stroke the actuator clockwise. Refill reservoir so that its level is within approximately 1-½ inches of full.
- 8.1.14 The actuator is ready for service.

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<u>ECN</u>	<u>DATE</u>	<u>REV</u>	<u>BY *</u>	<u>DATE</u>	
Released March, 1997		A	COMPILED	Bill Cornelius	21 March, 1997

CHECKED	<u>Bill Cornelius</u>	<u>21 March, 1997</u>
APPROVED	<u>R.M. McEver</u>	<u>21 March, 1997</u>

\* Signatures on file Waller, Texas