

BETTIS

SERVICE INSTRUCTIONS

FIELD CONVERSION FROM

T3/ST3/T4/ST4XX-SR-M7

PNEUMATIC ACTUATORS

TO

T3/ST3/T4/ST4XX-SR-M11

PNEUMATIC ACTUATORS

PART NUMBER: 135647

REVISION: "A"

RELEASE DATE: June 2001

1.1 **INTRODUCTION**

1.1.1 This conversion procedure is offered as a guide to field convert T3XX-SR-M7, ST3XX-SR-M7, T4XX-SR-M7 or ST4XX-SR-M7 series pneumatic spring return series actuators to a T3XX-SR-M11, ST3XX-SR-M11, T4XX-SR-M11 or ST4XX-SR-M11 series pneumatic spring return actuators.

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 **GENERAL DETAILS**

2.1.1 This procedure should only be implemented by a technically competent technician who should take care to observe good workmanship practices.

3.1 **FLUID REQUIREMENTS**

NOTE: Fluids, other than listed in step 3.1.1 and 3.1.2 should not be used without prior written approval of Bettis Product Engineering.

3.1.1 M11 Manual Hydraulic Override System Fluid Requirements: Hydraulic fluids, other than those listed in steps 3.1.1.1, 3.1.1.2 and 3.1.1.3, should not be used without prior written approval of Bettis Product Engineering.

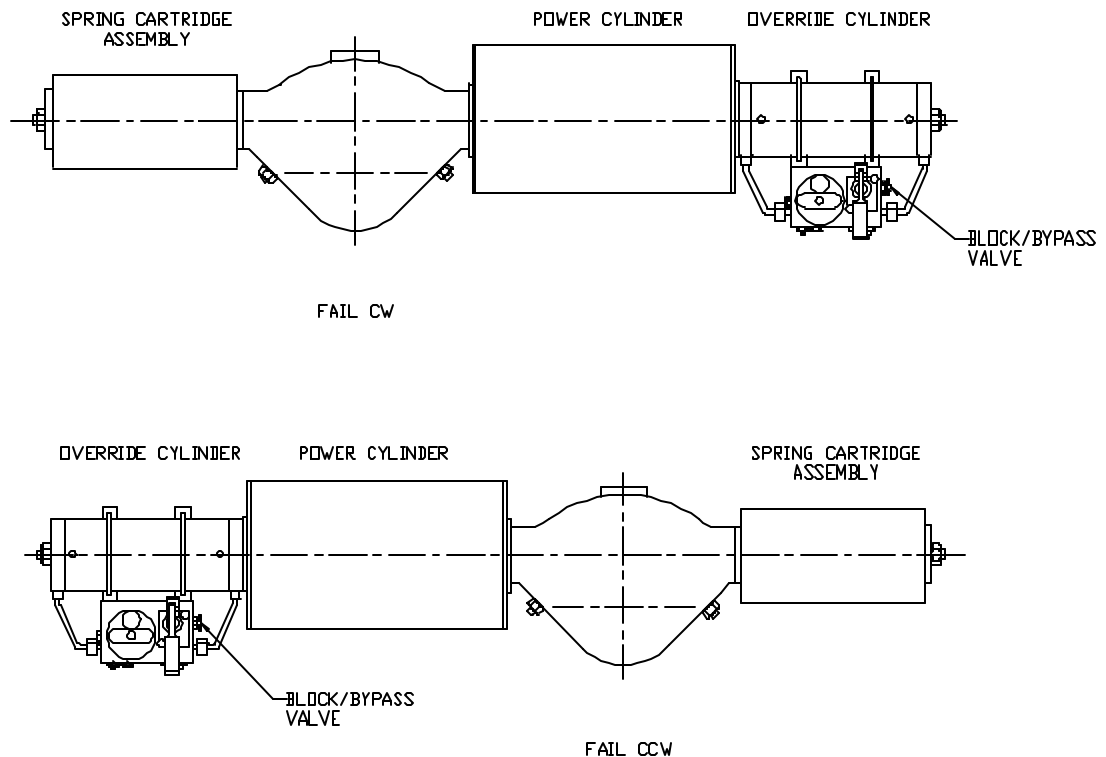
3.1.2.1 Standard temperature service (-35°F to +350°F) use Dexron Automatic Transmission Fluid.

3.1.2.2 High temperature service (0°F to +350°F)/(-17°C to +176.6°C) use Dexron Automatic Transmission Fluid.

3.1.2.3 Low temperature service (-40°F to +150°F)/(-40°C to 65.6°C) use Exxon Univis J13 Hydraulic Fluid.

4.1 **M7 OVERRIDE REMOVAL**

NOTE: Using a means of capturing the hydraulic fluid that will be lost during the following steps. Use a bucket, tub, or large container, ECT.



4.1.1 Make sure that the M7 block/bypass valve, located on the right hand side of the control module, is fully open. Remove all operating pressure from

actuator power cylinder allowing the spring to stroke. The spring will rotate the yoke to the fail position.

4.1.2 Remove all the piping from the M7 override.

NOTE: If the M7 override is remote mounted then skip the following procedure step.

4.1.3 Remove M7 hydraulic control package and related mounting bracket from actuator override cylinder.

5.1 M11 OVERRIDE INSTALLATION

NOTE: If the M7 override is remote mounted then skip step 5.1.1.

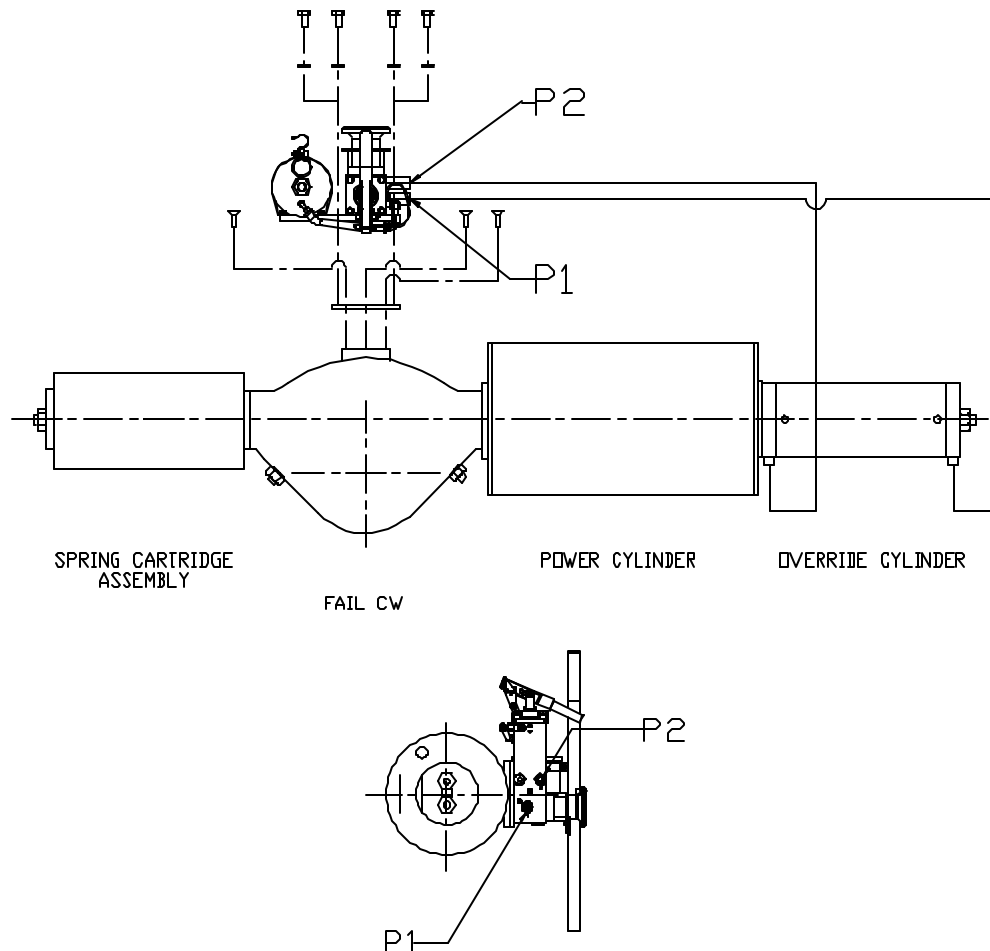
5.1.1 Install M11 override onto accessory pad as shown in the following illustration.

WARNING: Do not use Teflon tape on M11 system threads.

5.1.2 Use a non-hardening thread sealant on all system threads.

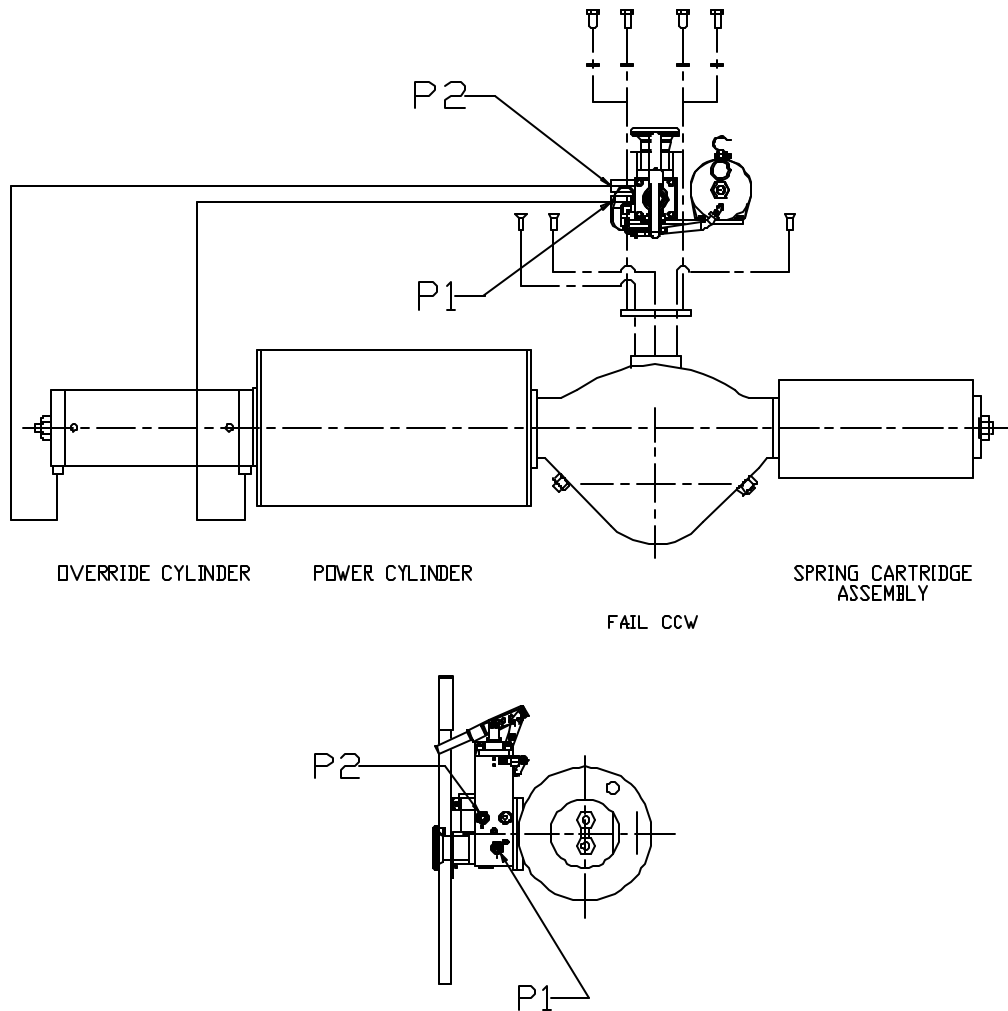
CAUTION: Apply thread sealant per the manufacture's instructions.

5.1.3 PIPE M11 OVERRIDE TO ACTUATOR OVERRIDE CYLINDER FOR FAIL CLOCKWISE ACTUATORS PER THE FOLLOWING DRAWINGS.



END VIEW FROM POWER /OVERRIDE CYLINDER END

- 5.1.3.1 Using thread sealant on all threads install tubing from M11 port marked P1 to the outboard override cylinder end cap inlet port.
- 5.1.3.2 Using thread sealant on all threads install tubing from M11 port marked P2 to the inboard override cylinder end cap inlet port.
- 5.1.4 PIPE M11 OVERRIDE TO OVERRIDE CYLINDER FOR FAIL COUNTER CLOCKWISE (CCW) ACTUATORS PER THE FOLLOWING DRAWINGS.



END VIEW FROM POWER /OVERRIDE CYLINDER END

- 5.1.4.1 Using thread sealant on all threads install tubing from M11 port marked P1 to the inboard override cylinder end cap inlet port.
- 5.1.4.2 Using thread sealant on all threads install tubing from M11 port marked P2 to the outboard override cylinder end cap inlet port.

6.1 **M11 SYSTEM FLUID FILLING** - Use either Refilling Method Number 1 (steps 6.2.1) or Refilling Method Number 2 (steps 6.2.2). NOTE: Method Number 1 is the best, most efficient and the recommended method.

6.2.1 **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 6.2.2 (Method number 2) for the manual field service refilling procedure.

6.2.1.1 Remove the pipe plugs from the actuator hydraulic override cylinder outer and inner end. NOTE: Only remove the pipe plugs located at the highest points, in the vertical plane, of the hydraulic override cylinder.

6.2.1.2 Disconnect the pump hose from the reservoir fitting, located close to the reservoir inner end cap (10-10), and connect the pump motor to the pump hose.

6.2.1.3 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.

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

6.2.1.5 Stop the pump motor when hydraulic fluid appears at both vacant pipe plug ports located in the actuator's hydraulic override cylinder.

6.2.1.6 Apply pipe dope onto pipe plug threads and install into the vacant pipe plug port at both vacant pipe plug ports located in the actuator's hydraulic override cylinder.

6.2.1.7 Disconnect the pump motor from the M11 pump hose.

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

6.2.1.9 Remove the breather (10-160) from the top of the reservoir inner end cap.

6.2.1.10 Fill reservoir to 1-1/2 inches from top of reservoir end cap (10-10). Note: Add fluid to the reservoir through the open port left vacant in step 6.2.1.9.

6.2.1.11 Apply pipe dope to breather threads and install breather (10-160) into port vacated in step 6.2.1.9.

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

6.2.2.1 Remove breather (10-160) from the top of the reservoir end cap (10-10).

6.2.2.2 Remove the pipe plugs from the actuator hydraulic override cylinder outer and inner end. NOTE: Only remove the pipe plugs located at the highest points, in the vertical plane, of the hydraulic override cylinder.

6.2.2.3 Place the M11 pump selector knob in the "Manual" position.

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

6.2.2.4 Fill reservoir to 1-1/2 inches from top of reservoir end cap (10-10). Note: Add fluid to the reservoir through the open port left vacant in step 6.1.15.

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

6.2.2.6 Stop pumping the M11 pump handle when hydraulic fluid appears at both vacant pipe plug ports located in the actuator's hydraulic override cylinder.

6.2.2.7 Apply pipe dope onto pipe plug threads and install into the vacant pipe plug port at both vacant pipe plug ports located in the actuator's hydraulic override cylinder.

6.2.2.8 Fill the M11 reservoir 1-1/2 inches from the top of the reservoir.

6.2.2.9 Apply pipe dope to the breather (10-160) threads and install into the port on top of the reservoir upper end cap (10-10).

7.1 ACTUATOR POWER OPERATION

CAUTION: Power operation of the actuator with the M11 control knob in any other position than "AUTO" will cause fluid to overflow at the low pressure relief valve located in the reservoir outer end cap.

7.1.1 Place the M11 control knob (20-320) in the Auto position (middle position).
NOTE: The control knob (20-320) is located in front and at the bottom of the M11 pump.

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

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

7.2 ACTUATOR M11 MANUAL HYDRAULIC OPERATION

7.2.1 Shut off and exhaust the operating media from both sides of the actuator's power cylinder.

7.2.2 M11 Manual Hydraulic Operation as follows: Place the control knob in the Manual position.

7.2.3 Operate the M11 pump handle until required valve position is reached.

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 relief valve.

ECN	RELEASE DATE	REV		BY *	DATE
Released	June 2001	A	COMPILED	BC	25 June 2001
			CHECKED	GB	25 June 2001
			APPROVED	TJ	25 June 2001

* Signatures on file Bettis, Waller, Texas