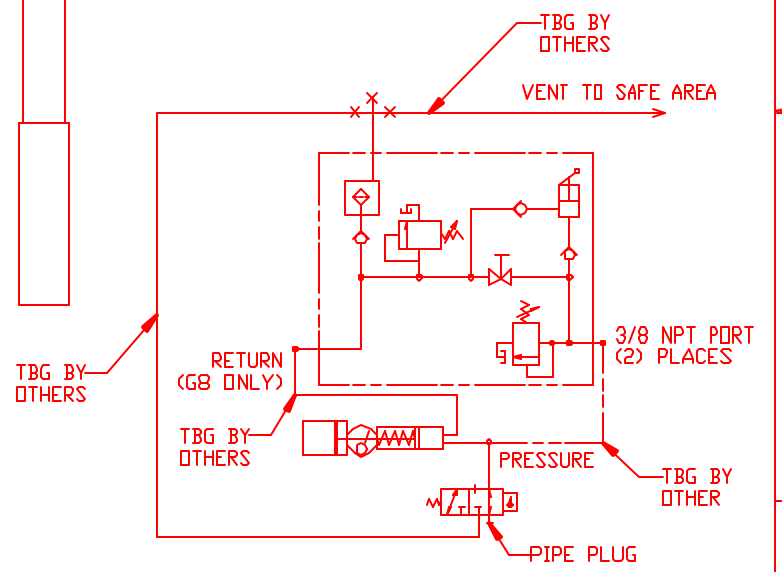
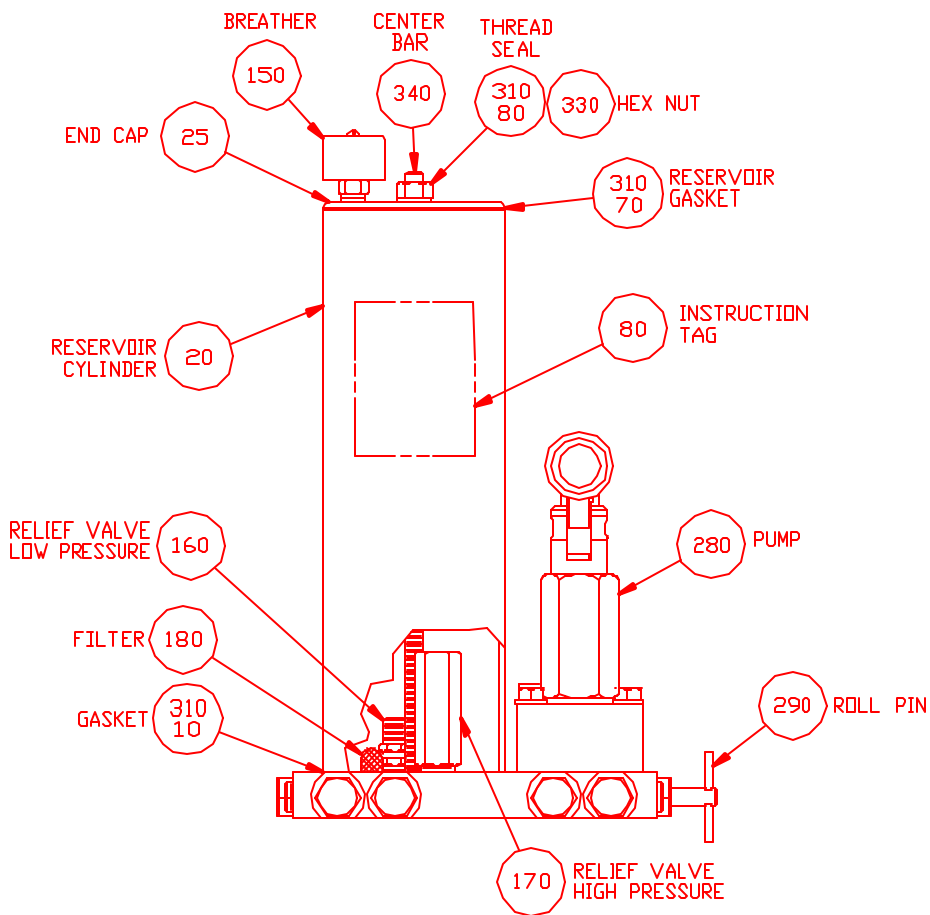
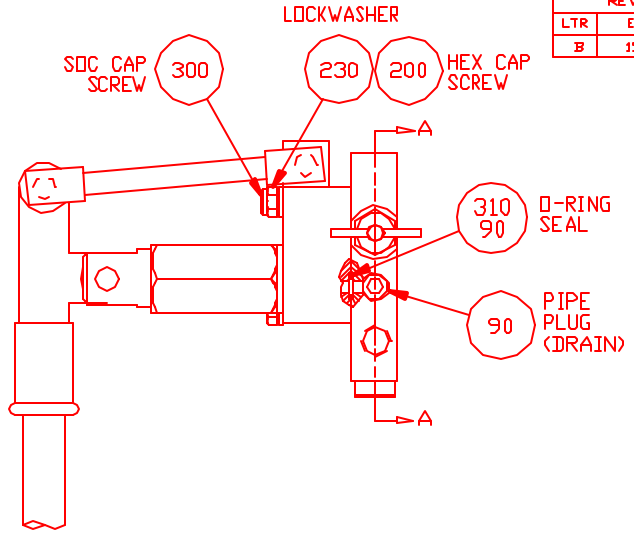
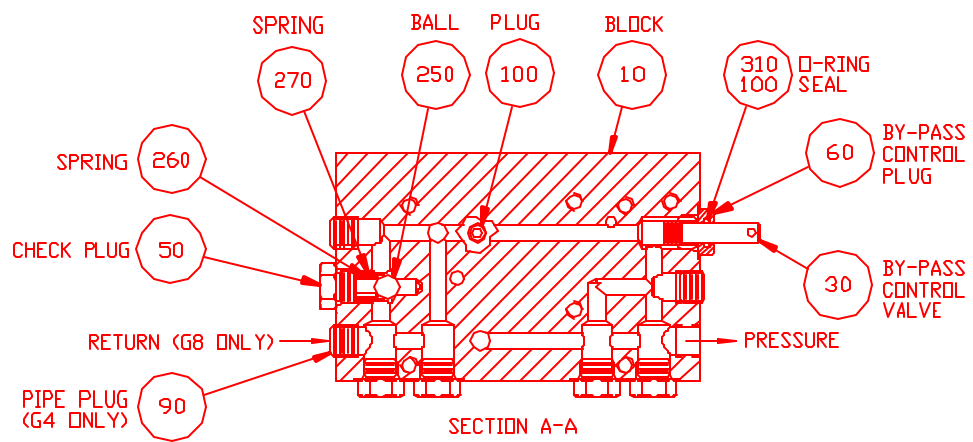
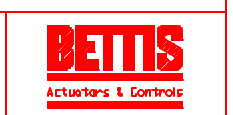


REVISIONS		
LTR	EEN	DATE
B	13863	05/20/97



DRAWN BY: EDINSON	DATE 07/11/96
CHECKED BY: ROONEY	DATE 07/19/96
APPROVED BY: MAN	DATE 07/19/96

TITLE:  
REMOTE MOUNT  
ASSEMBLY DWG  
M1S - S  
G4/G8  
FOR FIRE SAFE



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SALES ORDER:

THIRD ANGLE PROJECTION  
CAD GENERATED DRAWING

PART No. 121107	
SCALE NTS	DWG. SIZE C
SHEET 1 OF 2	
REV.	

4

3

2

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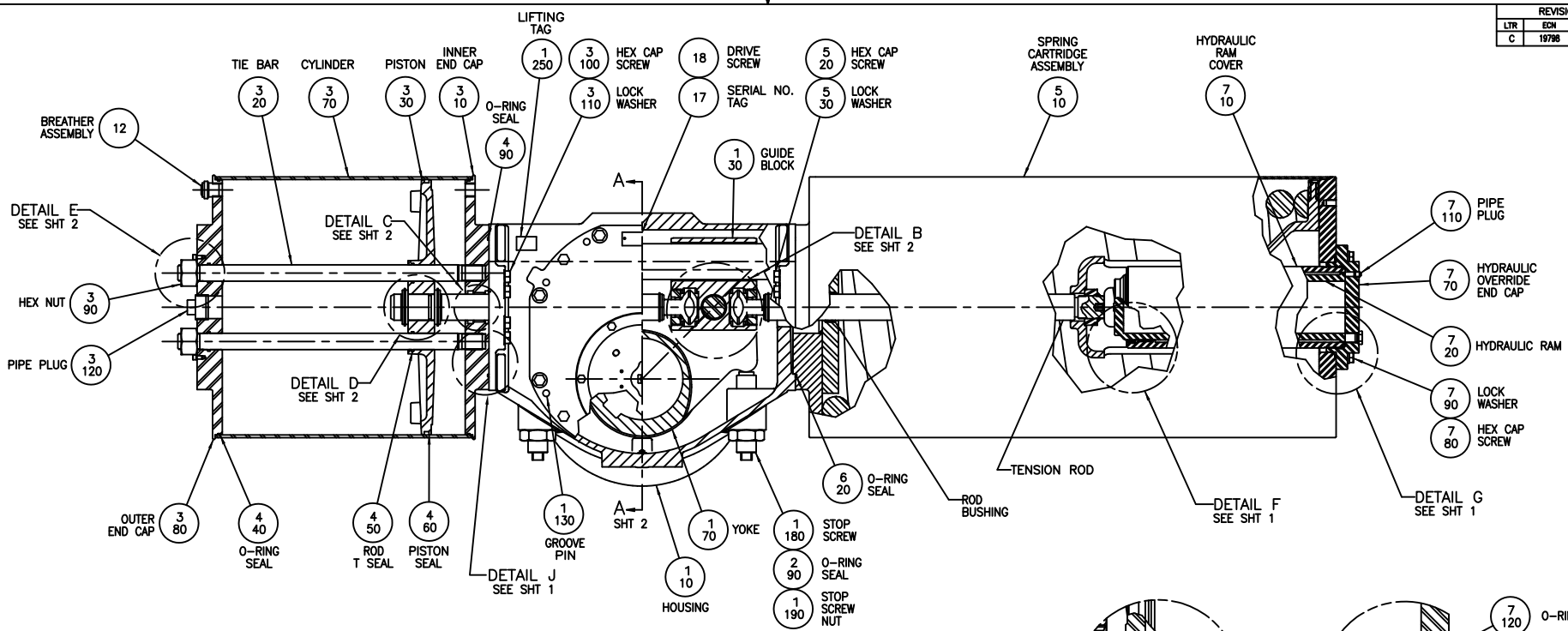
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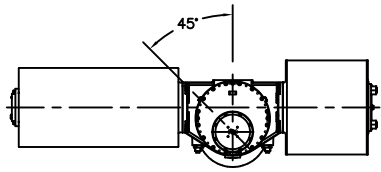
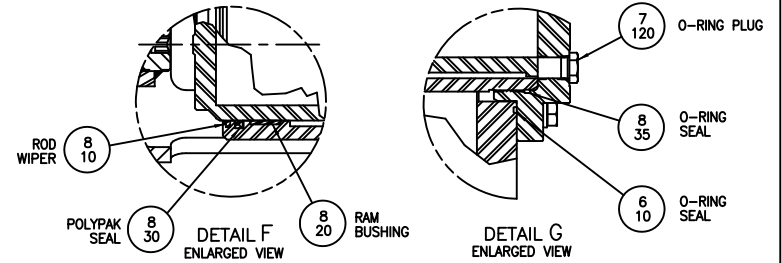
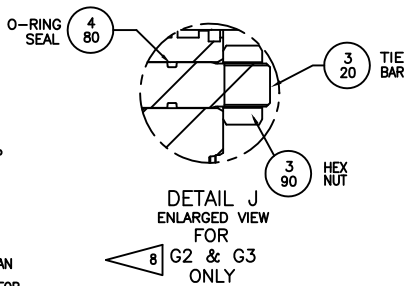
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REVISIONS		
LTR	ECN	DATE
C		1978 09/14/07



9. FOR ACTUATORS THAT REQUIRE JAPANESE MINISTRY OF HEALTH, LABOR, AND WELFARE APPROVAL INSPECT PER ES 39.
  - 8 EARLY RELEASE MODELS OF G2 & G3 ACTUATORS USED TIE BARS THAT EXTENDED THRU THE CYLINDER INNER END CAP AND WERE SECURED BY A HEX NUT (ITEM 3-90). SEALS WERE ALSO ON THE TIE BARS.
  7. INSPECT PER ES-6.
  6. TO REMOVE HSG COVER (1-20), REMOVE ALL HEX CAP SCREWS FROM HSG COVER. INSTALL HEX CAP SCREW 1-110 INTO HOLES TAPPED THRU HSG COVER ONLY. TIGHTEN UNTIL HSG COVER IS LOOSE. THIS PROCEDURE DOES NOT APPLY TO G4 ACTUATORS. HEX CAP SCREW 1-120 NOT USED ON G4 ACTUATORS. LOCKWASHER 1-115 NOT USED ON G4 ACTUATORS, USE LOCKWASHER 1-170.
  - 5 TIGHTEN THE EXTENSION RETAINER NUT ASSY (1-60) UNTIL THE EXTENSION ROD ASSY (1-50) CAN NOT MOVE, THEN BACK OFF THE EXTENSION RETAINER NUT ASSY (1-60) JUST ENOUGH TO ALLOW FOR THE EXTENSION ROD ASSY (1-50) TO MOVE FREELY.
  - 4 YOKE BEARING (2-40) MUST BE PRESS FIT INTO THE HSG (1-10) AND HSG COVER (1-20) WITH THE SEAM LOCATED 45°±5° CCW FROM THE YOKE (1-70) SLOT WHEN AT FULL CLOCKWISE ROTATION. NOTE: SOME HAND FITTING MAY BE REQUIRED AT THE SEAM FOR ASSEMBLY.
  - 3 GUIDE BAR BEARINGS (2-20) MUST BE PRESS FIT INTO THE GUIDE BLOCK (1-30) GUIDE BAR BORE WITH THE SEAM LOCATED WITHIN ±5° AS SHOWN IN SECTION A-A.
2. APPLY LUBRICANT (500) TO ALL MOVING PARTS AND FASTENERS.
  1. ALL PARTS TO BE CLEANED TO REMOVE ALL DIRT AND FOREIGN MATTER PRIOR TO ASSEMBLY.
- NOTES:



OPTIONAL ASSEMBLY  
TOP VIEW  
COUNTERCLOCKWISE POSITION

DRAWN BY: EDMONSTON	DATE: 09/09/98
CHECKED BY: LFG	09/12/98
APPROVED BY: RMI	09/12/98
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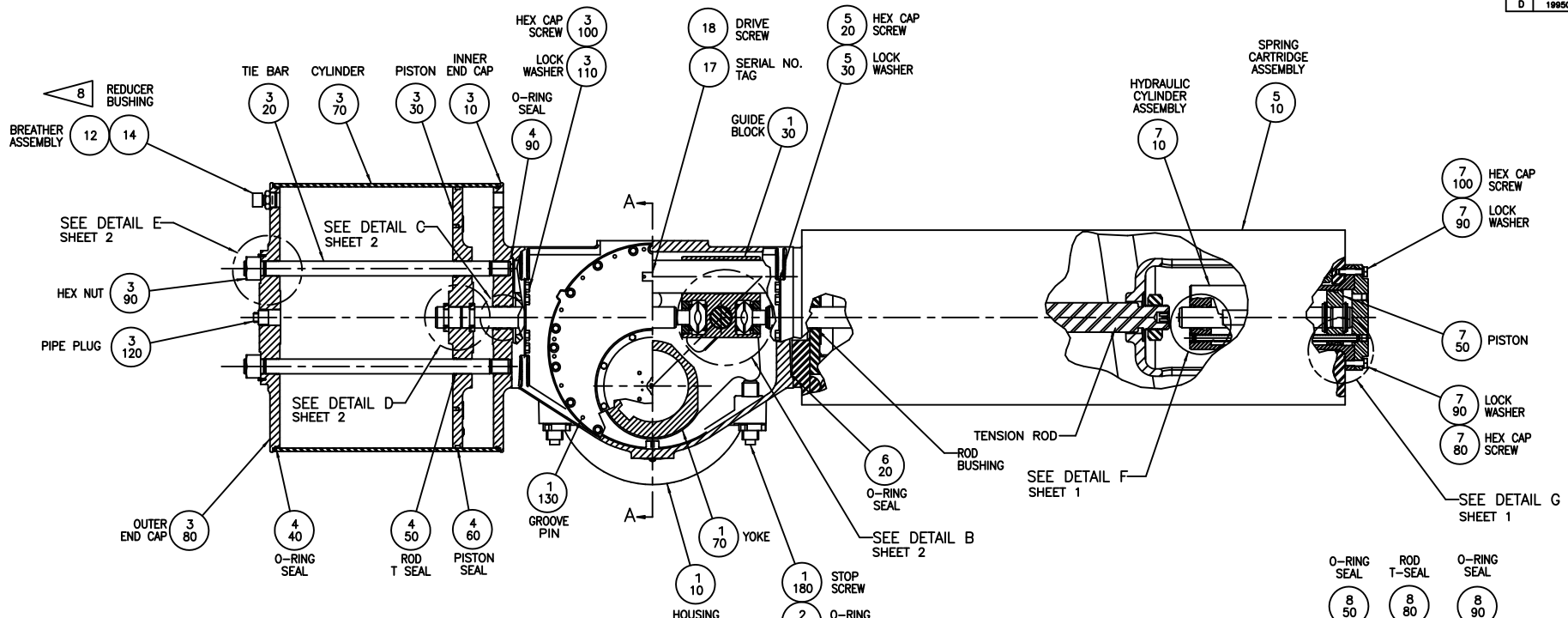
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G01/2/3/4/5-SRX-H  
PNEUMATIC  
ASSEMBLY DWG



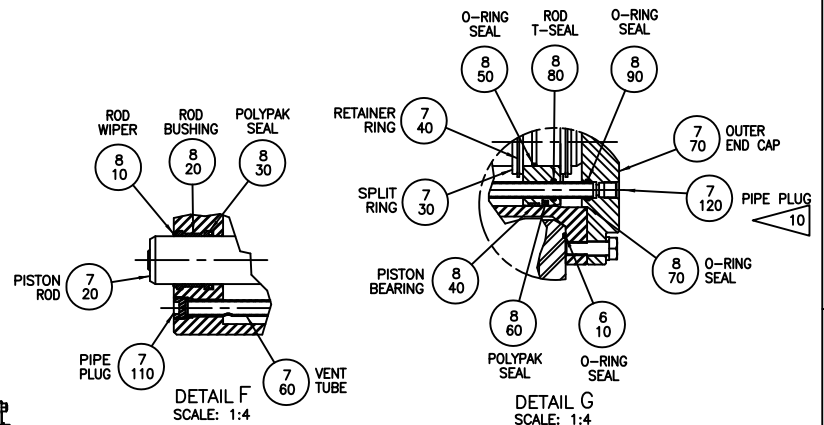
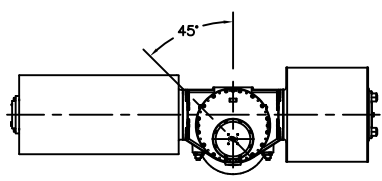
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SHEET 1 OF 2		REV.	



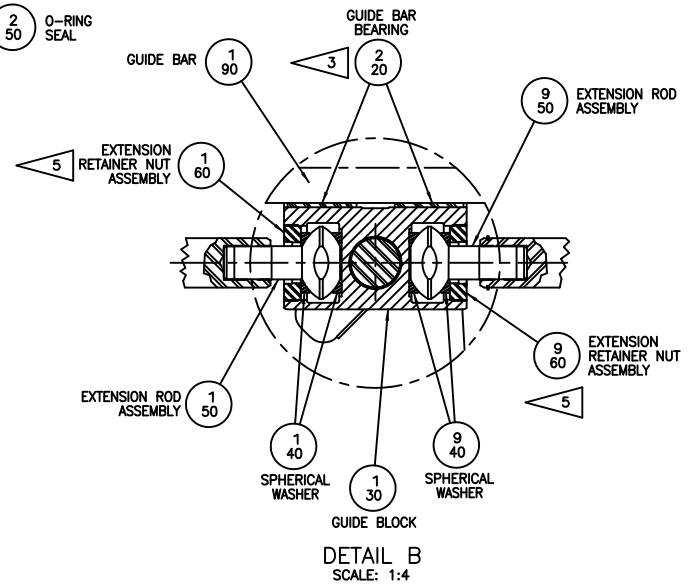
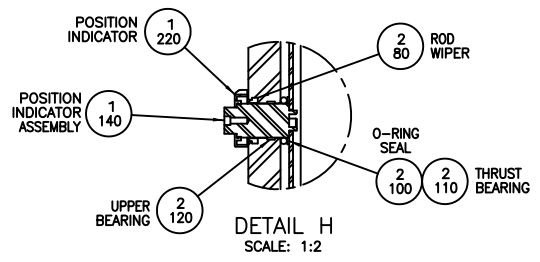
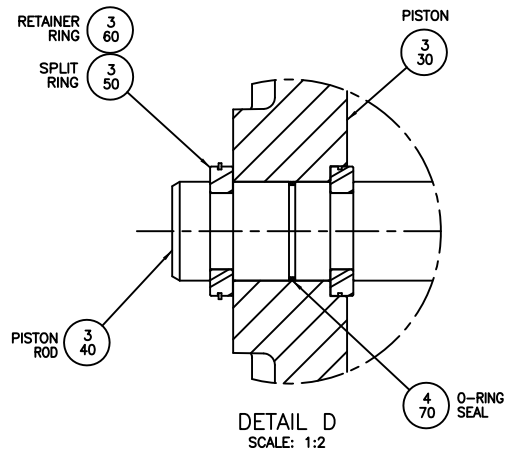
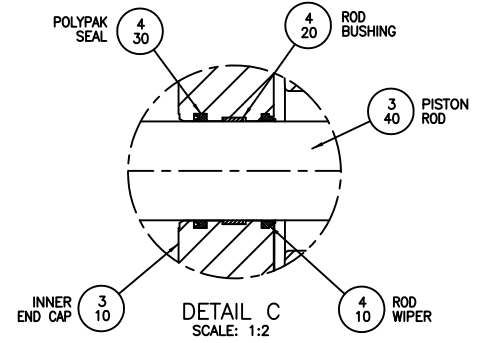
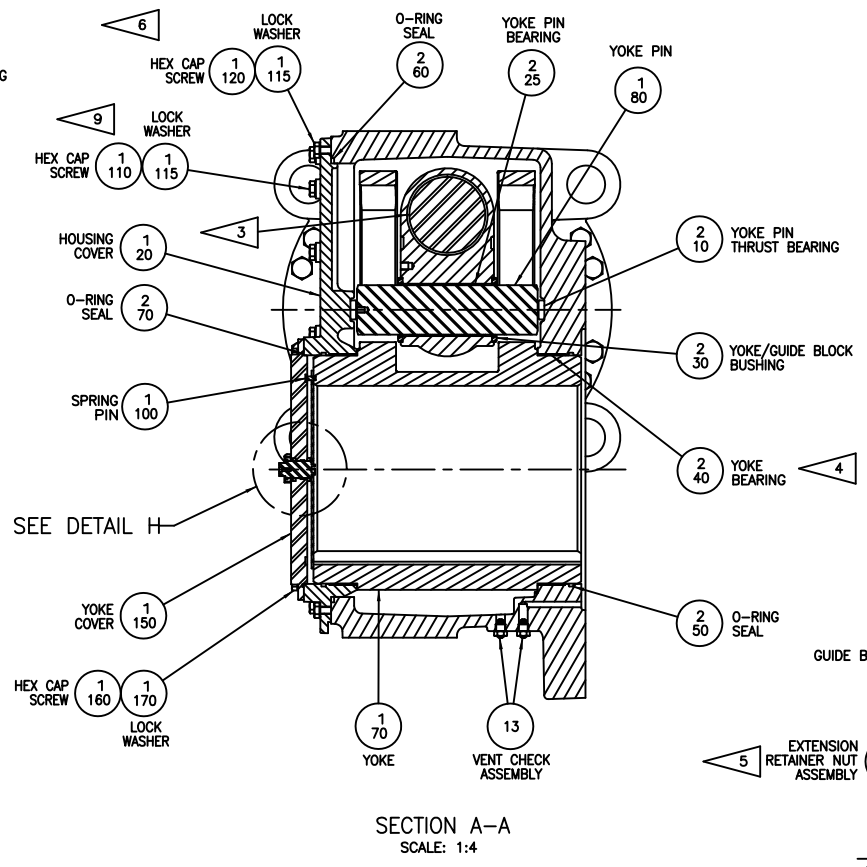
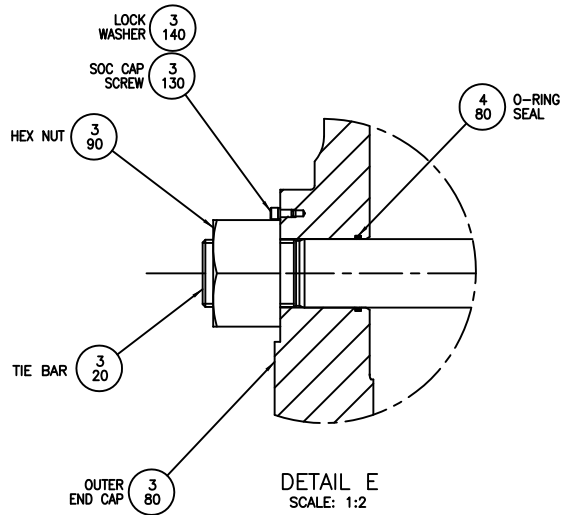
REVISIONS		
LTR	ECN	DATE
D	19950	01-17-08



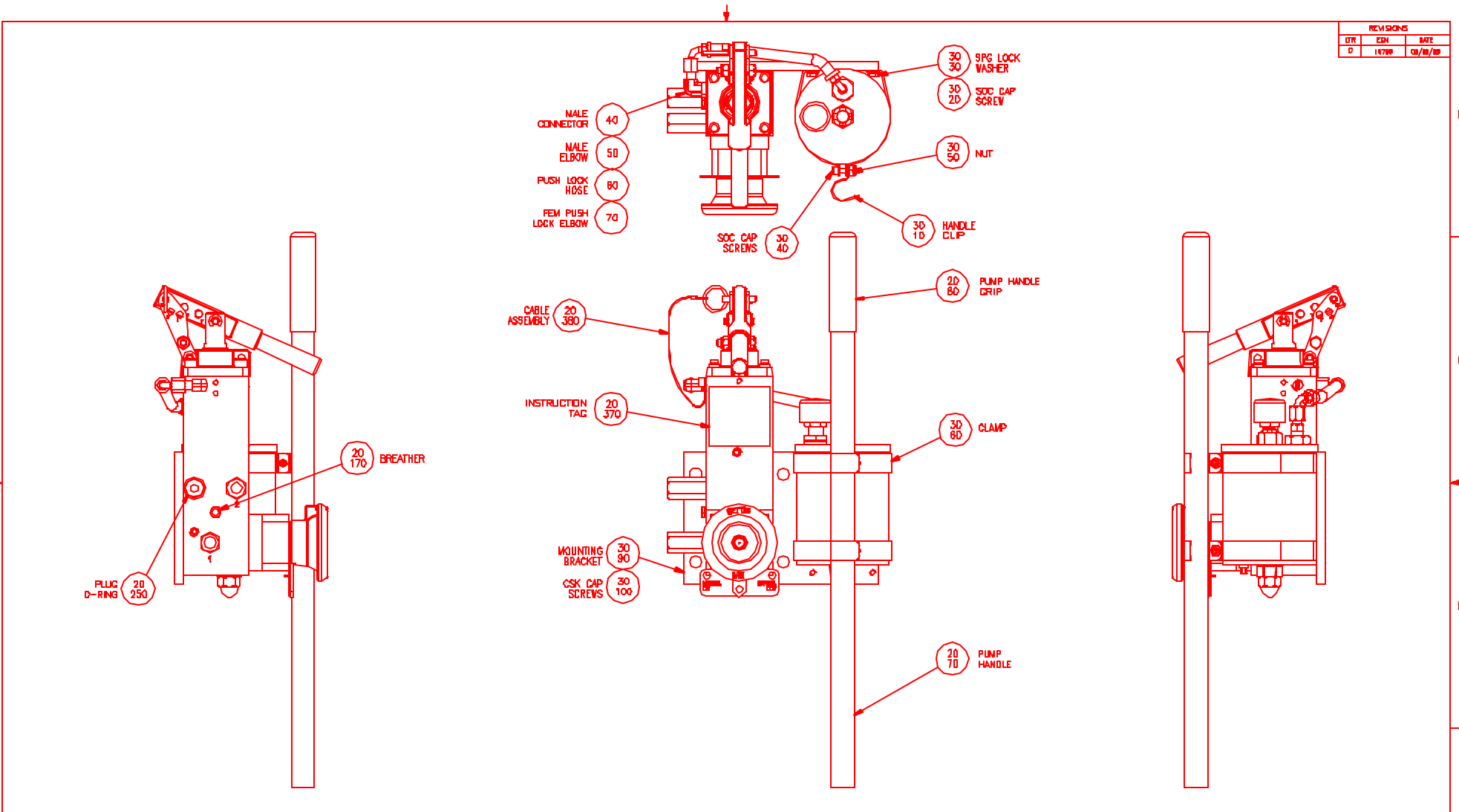
11. FOR ACTUATORS THAT REQUIRE JAPANESE MINISTRY OF HEALTH, LABOR, AND WELFARE APPROVAL INSPECT PER ES 39.
  10. PIPE PLUG (7-120) FOR SHIPPING ONLY.
  9. APPLY THREAD ADHESIVE (2-130) TO HSG COVER SCREWS ON G7, G8, G10 AND G13 ACTUATORS.
  8. REDUCER BUSHING NOT REQUIRED ON ALL MODELS.
  7. INSPECT PER ES-6.
  6. TO REMOVE HSG COVER (1-20), REMOVE ALL HEX CAP SCREWS FROM HSG COVER. INSTALL HEX CAP SCREW 1-110 (IN THE PLACE OF HEX CAP SCREW 1-120) INTO HOLES TAPPED THRU HSG COVER ONLY. TIGHTEN UNTIL HSG COVER IS LOOSE.
  5. TIGHTEN THE EXTENSION RETAINER NUT ASSY (1-60) UNTIL THE EXTENSION ROD ASSY (1-50) CAN NOT MOVE, THEN BACK OFF THE EXTENSION RETAINER NUT ASSY (1-60) JUST ENOUGH TO ALLOW FOR THE EXTENSION ROD ASSY (1-50) TO MOVE FREELY.
  4. YOKE BEARING (2-40) MUST BE PRESS FIT INTO THE HSG (1-10) AND HSG COVER (1-20) WITH THE SEAM LOCATED 45°±5° CCW FROM THE YOKE (1-70) SLOT WHEN AT FULL CLOCKWISE ROTATION. NOTE: SOME HAND FITTING MAY BE REQUIRED AT THE SEAM FOR ASSEMBLY.
  3. GUIDE BAR BEARINGS (2-20) MUST BE PRESS FIT INTO THE GUIDE BLOCK (1-30) GUIDE BAR BORE WITH THE SEAM LOCATED WITHIN ±5° AS SHOWN IN SECTION A-A.
2. APPLY LUBRICANT (500) TO ALL MOVING PARTS AND FASTENERS.
1. ALL PARTS TO BE CLEANED TO REMOVE ALL DIRT AND FOREIGN MATTER PRIOR TO ASSEMBLY.
- NOTES:



DRAWN BY: EDMONSTON CHECKED BY: GROWMAN APPROVED BY: MILNER	DATE: 08/14/98 08/18/98 08/18/98	TITLE: <b>G7/8/10/13-SRX-H          PNEUMATIC          ASSEMBLY DWG</b>	<b>BETTS</b> ACTUATORS & CONTROLS
PART NO. <b>121411</b>			SCALE HTS D D
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SALES ORDER:			SHEET 1 OF 2 REV.



REV'SIONS		
QTR	EGN	DATE
D	14788	02/06/08



- MALE CONNECTOR 40
- MALE ELBOW 50
- PUSH LOCK HOSE 80
- REM PUSH LOCK ELBOW 70

- 30 30 SPS LOCK WASHER
- 30 2D SOC CAP SCREW
- 30 50 NUT

- SOC CAP SCREWS 30 40
- 30 1D HANDLE CLIP

- CABLE ASSEMBLY 20 380

- 20 60 PUMP HANDLE DRIP

- INSTRUCTION TAG 20 370

- 30 60 CLAMP

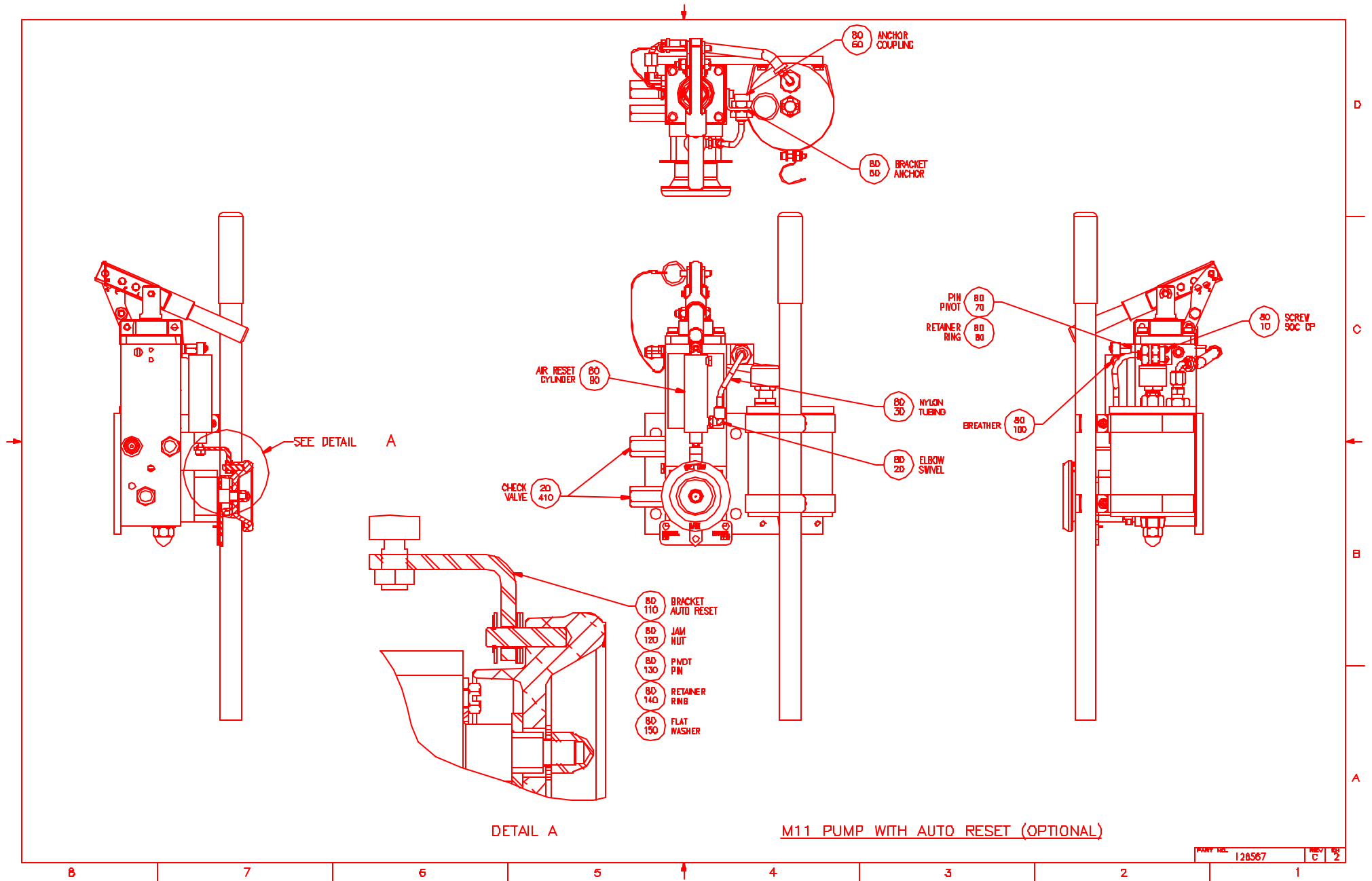
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- CSK CAP SCREWS 30 100

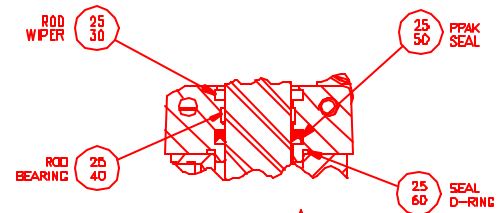
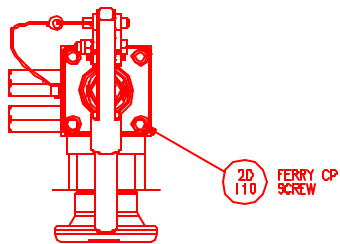
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- PLUG O-RING 20 250

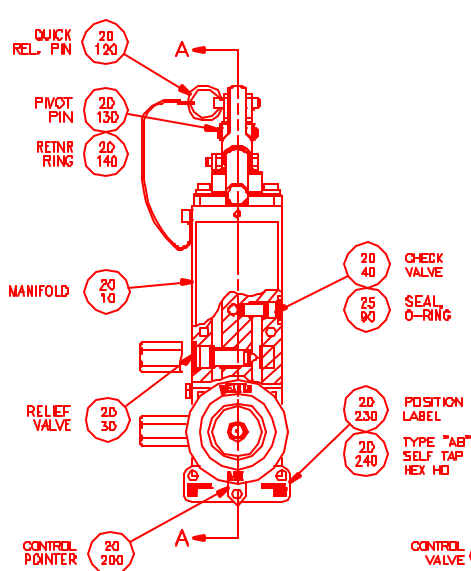
- 20 170 BREATHER

UNLESS OTHERWISE SPECIFIED				ISSN BY	R. DAVOOD	DATE	TITLE		
<b>GENERAL NOTES</b> 1 DIMENSIONS ARE IN INCHES 2 HONEY BEEBEE ARE DRAWN TO SIZE 3 CHAMFER ANGLES 45° 4 SURFACE FINISH 125 RMS 5 FILLETS .0314 IN. R16 6. NO KEY SEALS BEARING 7 DIMENSIONS IN PARENTHESIS ARE FOR (S-7)				DECIMALS IN MM .005 0.015 0.030 .010 0.020 0.040 .015 0.030 0.060 .020 0.040 0.080 .030 0.060 0.120 .040 0.080 0.160 .050 0.100 0.200 .060 0.120 0.240 .080 0.160 0.320 .100 0.200 0.400 .120 0.240 0.480 .150 0.300 0.600 .200 0.400 0.800 .250 0.500 1.000 .300 0.600 1.200 .400 0.800 1.600 .500 1.000 2.000 .600 1.200 2.400 .800 1.600 3.200 1.000 2.000 4.000		APPROVED BY M. P. S. 12/08		M11 ASSEMBLY	
				FINISH PER ISO UNLESS OTHERWISE SPECIFIED		THIS DOCUMENT AND THE DATA IT CONTAINS ARE THE PROPERTY OF HONEYWELL INTERNATIONAL INC. AND ARE NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE WRITTEN PERMISSION OF HONEYWELL INTERNATIONAL INC.		PART NO. 126567	
INCREASING INCHES APPROX. HEIGHT DIMEN. IN INCHES DIMEN. IN MILLIMETERS				DIMENSIONS ARE IN INCHES APPROX. HEIGHT DIMEN. IN INCHES DIMEN. IN MILLIMETERS		SCALE 1:2 DWG. SIZE D SHEET 1 OF 1 REV.			

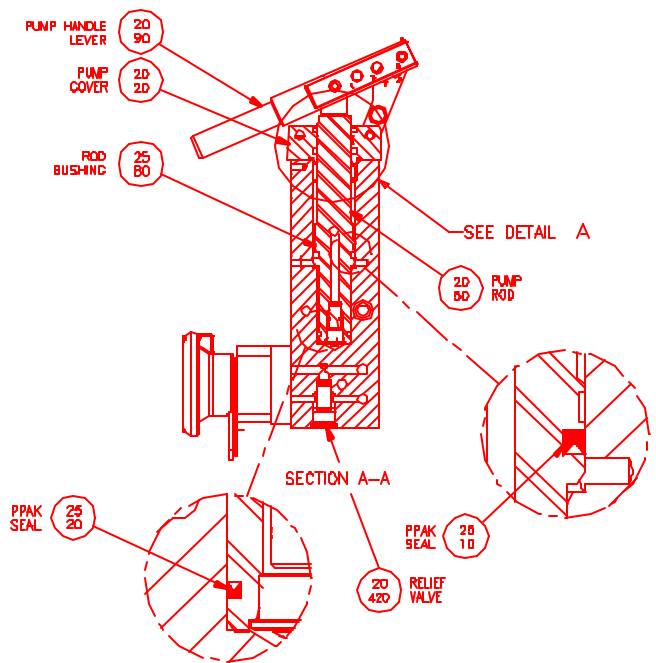
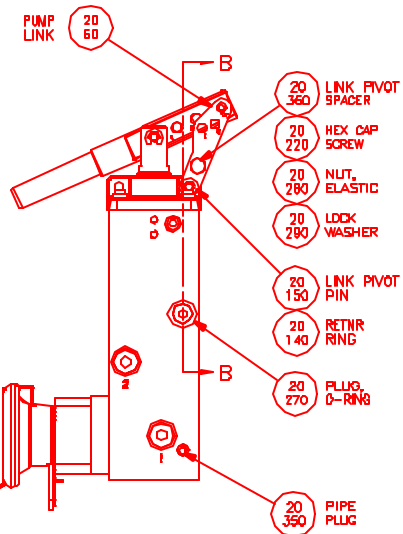
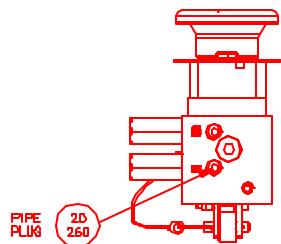




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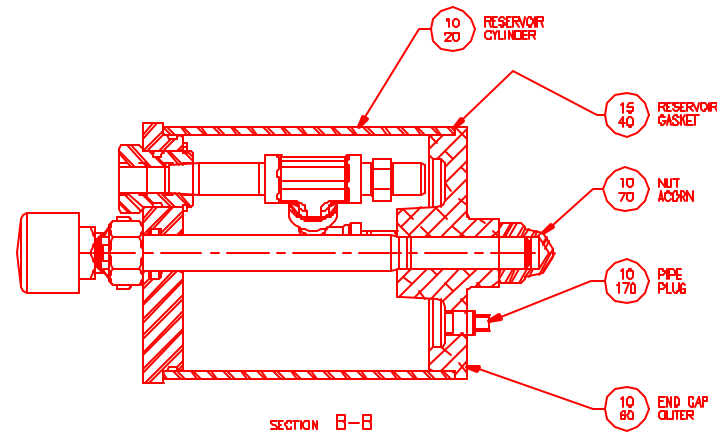
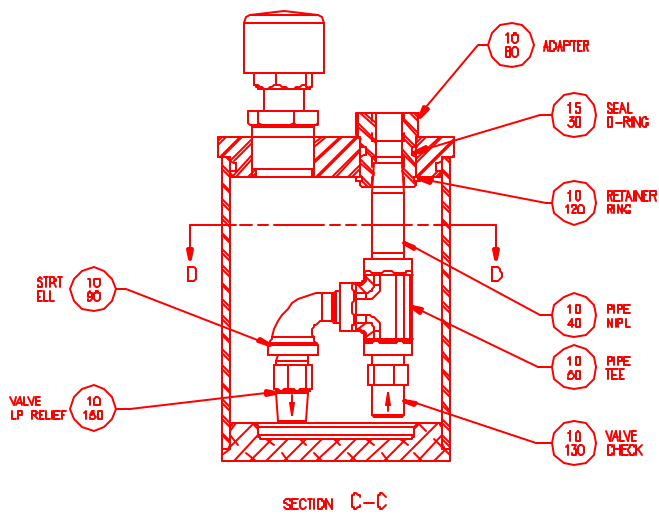
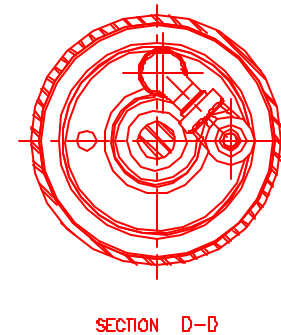
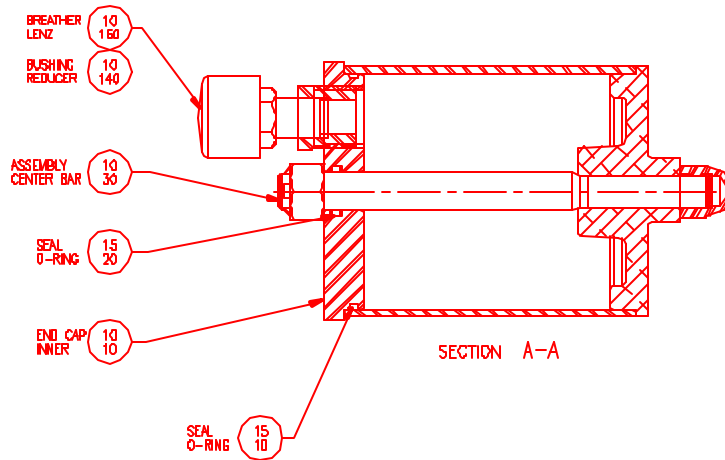
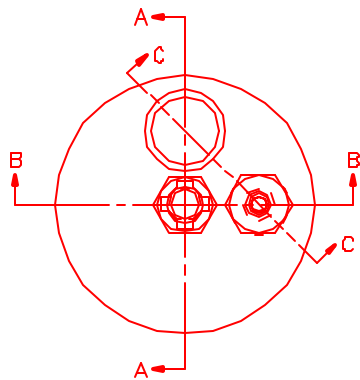


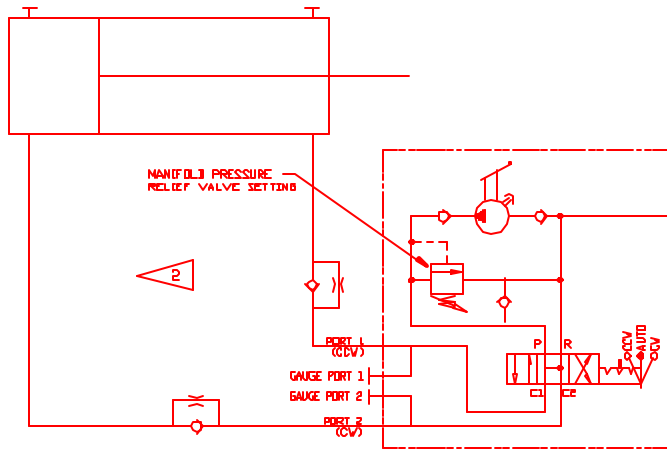
SECTION B-B



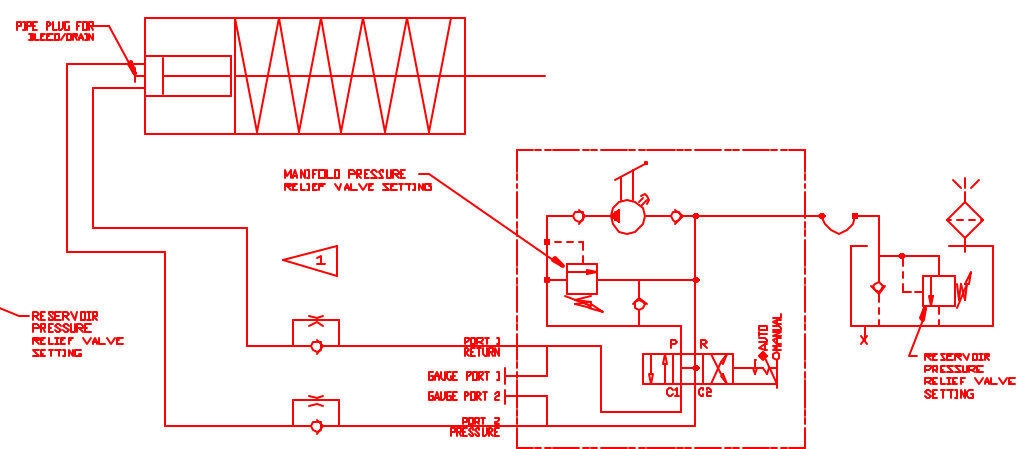
SECTION A-A

- 2D 190 CONTROL VALVE
- 2D 320 CONTROL KNDS
- 2D 180 SOC CAP SCREW

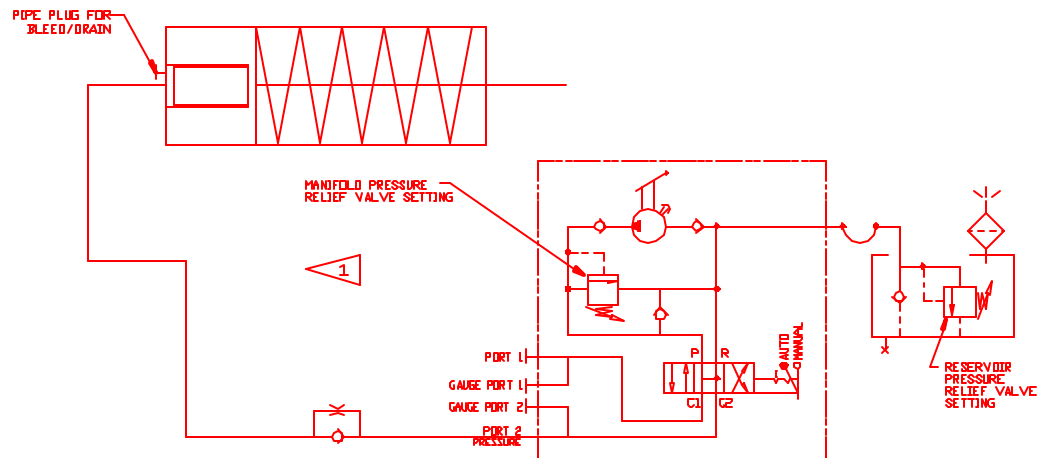




**M11 - DA**  
(ALL DOUBLE ACTING G, T'S, HD'S)



**M11 - SR-PSTN**  
(HD, T'S AND G7-G10)



**M11 - SR RAM**  
(ONLY G2-G5)

ACTUATOR	PRESSURE RELIEF VALVE SETTINGS	
	MANIFOLD	RESERVOIR
HD SR	250 PSI	33
HD DA	350 PSI	33
T DA / TR DA / TRQ DA	1000 PSI	200
T3SR/ T4SR/ T5SR2,3,4&5 T8SR3,4&5/ TRSR/ TRQSR	1500 PSI	200
T5SR1 / TBSR1&2	2000 PSI	200
G SERIES	3000 PSI	200

**NOTES:**

- 1 OPTIONS:
  - > ONE FLOW CONTROL
  - > AUTO RESET
  - > SUBMERGED TRIM
- 2 OPTIONS:
  - > 2 FLOW CONTROL
  - > AUTO RESET
  - > BYPASS, INCLUDING 2 FLOW CONTROL
  - > SUBMERGED TRIM

**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.

<b>ECN</b>	<b>DATE</b>	<b>REV</b>		<b>BY *</b>	<b>DATE</b>
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