PDOC - 096

SAN/0499-82
MDC G9705

STMPO #235
EXTRA Q.A.S.

10 MWe Solar Thermal
Central Receiver Pilot Plant

SOLAR FACILITIES DESIGN INTEGRATION

PLANT MAINTENANCE/TRAINING MANUAL
(RADL ITEM 2-37)
SECTION 4 – VALVES, BOOK 2 OF 3

Revised September 1982
July 1981

WORK PERFORMED UNDER CONTRACT
DE-AC03-79SF10499

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY
5301 BOLSA AVENUE
HUNTINGTION, CA 92647

U.S. Department of Energy

MCDONNELL DOUGLAS CORPORATION | Rockwell International Rocketdyne Division | Stearns-R

PDOC - 101

SAN/0499-82
MDC G9705

10 MWe Solar Thermal
Central Receiver Pilot Plant
Solar Facilities Design Integration

PLANT MAINTENANCE/TRAINING MANUAL (RADL ITEM 2-37) SECTION 4 – VALVES, BOOK 1 OF 3

July 1981
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MCDONNELL DOUGLAS ASTRONAUTICS COMPANY
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HUNTINGTON BEACH, CA 92647

PREPARED FOR THE
U.S. DEPARTMENT OF ENERGY
SOLAR ENERGY
UNDER CONTRACT DE-AC03-79SF10499

INSTRUCTIONS

Update for Plant Maintenance/Training Manual (RADL 2-37).

Section 4 - Valves

The material contained in Books 1 and 2 of the July 1981 version of this Section has been updated to make corrections to existing material and to add new valve information that became available after the July 1981 printing. The additional new material has necessitated printing the September 1982 version of Section 5 in 3 books. These documents, as currently published, totally replace the 2 books printed in July of 1981.

Modifications and additions have been made to the following paragraphs in each book:

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- 4.1.2
- 4.1.4
- 4.1.5
- 4.1.10
- 4.1.11
- 4.1.12
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PREFACE

This document is provided by the McDonnell Douglas Astronautics Company (MDAC) in accordance with Department of Energy Contract Number DE-AC03-79SF10499, Reports and Deliverables List Item 2-37. The material presented here is intended for training and maintenance usage by Southern California Edison Operations Personnel.

Specific notes on the organization and content of the document are as follows:

1. This document is organized in major sections that reflect the top level breakdown of the Master Equipment List as defined in RADL Item 2-19. This is in contrast to the subsystem approach used in designing the plant, however, is consistent with the Southern California Edison operating plant equipment lists.

Section 1	-	Rotating Apparatus
Section 2	-	Stationary Apparatus
Section 3	-	Electrical Apparatus
Section 4	-	Valves
Section 5	-	Instrumentation
Section 6	-	Control and Data Systems
Section 7	-	Collector System
Section 8	-	Special Heliostat Instrumentation and Meteorological Measurements Equipment
Section 9	-	Heating Ventilating and Air Conditioning
Section 10	-	Facilities

2. Assignments to categories are made on the basis of the lowest level tag numbers. For example, maintenance information for the thermal storage extraction pump skid assembly (SA-309) is not listed in the stationary apparatus section, but broken down to the generic categories as defined by the tag number; i.e., pumps (Section 1.2), air operated stop valves (Section 4.2), pressure transmitter (Section 5.2), etc.

3. The Process Instrumentation Section (Section 5.0) is organized on the basis of sensor type as defined by the first letter of the designating tag number. It contains sensor-related information only. Signal conditioning equipment is treated in Section 6.0.

4. The information on the Collector System, which was provided by the Martin Marietta Corp. (MMC) and the major items of the Electrical Power Generation System equipment, provided by Southern California Edison is not provided herein. However, the various sections were structured for their inclusion where applicable.

Technical questions concerning this RADL Item should be directed to Mr. R. G. Riedesel at (714) 896-3357 or Mr. R. J. Perkins at (714) 896-3073.

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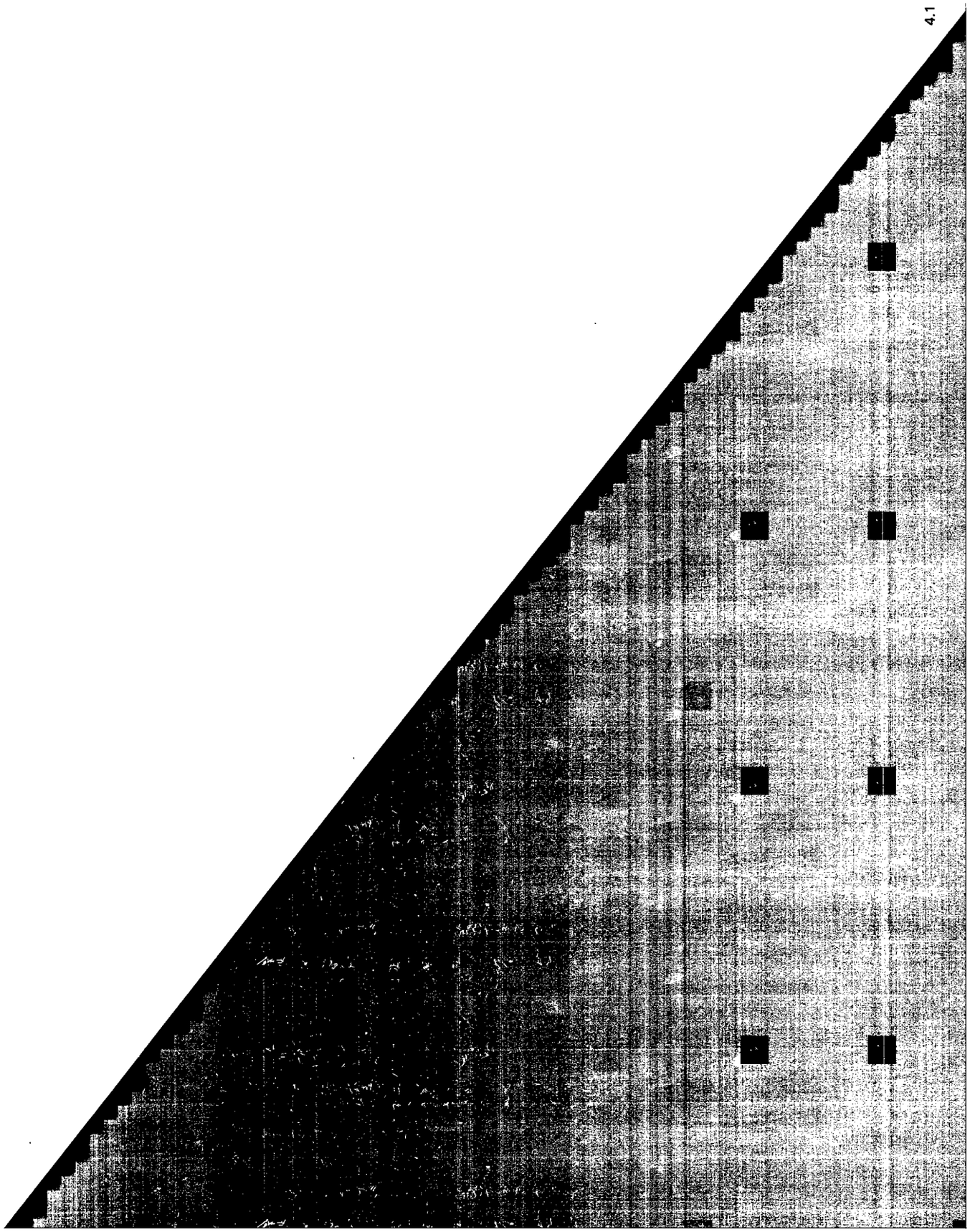

Equipment Number	Description	Maintenance Section	P&ID Dwg. Number
CV-241	Circ. Water Blowdown to Evaporator Pond	4.1.1	5163154
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FV-1007	Steam Dump Atom Steam Control Valve	4.1.4	5163149
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LV-24B	2nd Pt. Heater Drain Flow to Condenser Control	4.1.8	5163151
LV-64	Receiver Pump Drain Trap to Condenser	4.1.9	5163151
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LV-74C	Cond. from Receiver Flash Tank to Condenser	4.1.12	5163151
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LV-74D2	Cond. from TSS Flash Tank to Condenser-Max Flow	4.1.14	5163151
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LV-83B	Deaerator Inlet Level Control Valve	4.1.16	5163151
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LV-162	Condensate Storage Tank Makeup Control	4.1.20	5163151
LV-210	Service Water Makeup to Circ. Water System	4.1.21	5163154

Equipment Number	Description	Maintenance Section	P&ID Dwg. Number
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LV-1011	Steam Dump Drain Pot Control Valve	4.1.24	5163149
LV-1012	Steam Dump Drain Pot Control Valve	4.1.25	5163149
LV-1013	TSS Ms. Drain Pot Control Valve	4.1.26	5163149
LV-1015	Aux. Steam Drain Pot Control Valve	4.1.27	5163149
LV-1016	Main Steam Drain Pot Control Valve	4.1.28	5163149
LV-1203	Demin. Tank Level Control Valve	4.1.29	5163160
LV-1702	Raw Water Tank Level Valve	4.1.30	5163159
LV-3505	Boiler Water Level Control Valve	4.1.31	5163146
LV-3605	Boiler Water Level Control Valve	4.1.31	5163146
PV-605	N_2 Blanketing Supply to Heaters	4.1.32	5163152
PV-640	Thermal Storage Flash Tank to Condenser	4.1.33	5163152
PV-647A	Feedwater Heaters N_2/Aux. Steam Supply	4.1.34	5163152
PV-647B	Steam from Receiver Flash Tank to Deaerator	4.1.35	5163152
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PV-1001	Steam Dump Valve	4.1.39	5163149
PV-1003	Aux. Desuperheater Control Valve	4.1.40	5163149
PV-1005	Aux. Steam Control Valve	4.1.41	5163149
PV-1703	Raw Water Pump Recirc. Control Valve	4.1.42	5163159
PV-2002	Water Bypass Valve	4.1.43	5163140

Equipment Number	Description	Maintenance Section	P&ID Dwg. Number
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PV-3110	Steam Trap Water Press Control Valve	4.1.45	5163144
PV-3111	Steam Trap Water Press Control Valve	4.1.45	5163144
PV-3702	Boiler Oil Control Valve	4.1.46	5163145
PV-3802	Boiler Oil Control Valve	4.1.46	5163145
PV-3910	Aux. Pump Oil Control Valve	4.1.47	5163145
TV-1002	Steam Dump Desuperheater Cond. Control Valve DS-901	4.1.48	5163149
TV-1004	Steam Dump Desuperheater Cond. Control Valve DS-902	4.1.48	5163149
TV-2301 thru TV-2303	Boiler Water Temp. Control Valve	4.1.49	5163134
TV-2401 thru TV-2403	Boiler Water Temp. Control Valve	4.1.49	5163134
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TV-3410	Condenser Oil Temp. Control Valve	4.1.51	5163142

Equipment Number	Description	Maintenance Section	P&ID Dwg. Number
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TV-3710	Superheater Oil Control Valve	4.1.52	5163145
TV-3810	Superheater Oil Control Valve	4.1.52	5163145
UV-2905	Downcomer Manifold Steam Inlet Valve	4.1.53	5163140
UV-3102	Desuperheater Inlet Steam Pressure Control Valve	4.1.54	5163144
None	Copes Vulcan Instruction Manual	4.1.55	None
None	Copes Vulcan Instruction Manual	4.1.56	None
None	Copes Vulcan Instruction Manual	4.1.57	None

4.1.2 FV-37 Modulating Control Valve

4.1.2.1 Description

Receiver Feedwater Min. Recirc to Deaerator

4.1.2.2 Manufacturer: Leslie Co., Parsippany, N.J.

4.1.2.3 Description & Information

(See Section One, paragraph 1.2, Instruction Manual for Receiver Feedwater Pump)

4.1.4 Steam Dump Atomizing Steam Control Valve

4.1.4.1	Identification	Description
	Tag Number	
	FV-1007	Steam Dump Atomizing steam control valve to DS-901
4.1.4.2	Description	
	Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
	Part No.	D-100-40
	Spec No.	DOE Spec 40I700-13S
	Material:	Body: A217 GRWC9
	Weight:	

4.1.4.3 Prescribed Service

Steam

4.1.4.4 Vendor

Copes-Vulcan Inc.

4.1.4.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.4.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.4.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.4.8 Special Tools

None

4.1.4.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.4.10 Acceptance Test

4.1.5 Aux. Boiler/Thermal Storage Pump Discharge to TSS

4.1.5.1 Identification	Description
Tag number	
LV-1	Aux boiler/thermal storage pump discharge to TSS control valve with ASCO type 8302D26 solenoid valve.

4.1.5.1.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn. 16423
Part No.	CV600-4R
Spec No.	Doe spec 40M7006S, CP 9
Material:	Body: ASTM grade WCB
Weight:	

4.1.5.1.3 Prescribed Service

Water, 170 psig, 285"F

41.5.1.4 Vendor

Copes-Vulcan Inc.

4.1.5.1.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.5.1.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.5.1.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.5.1.8 Special Tools

None

4.1.5.1.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.5.1.10 Acceptance Tests

4.1.10 Condensate from Receiver Flash Tank to 2nd Pt. Htr

4.1.10.1 Identification	Description
Tag Number	Receiver Flash Tank
LV-74A	drain to 2nd Pt. Heater

4.1.10.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
Part No.	CV-600-6R
Spec No.	D.O.E. Spec 40I700-13S
Material:	Body A216-GRWCB
Weight:	118 lbs

4.1.10.3 Prescribed Service

Condensate

4.1.10.4 Vendor

Copes-Vulcan Inc.

4.1.10.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.10.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.10.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.10.8 Special Tools

None

4.1.10.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.10.10 Acceptance Test

4.1.11 Condensate from Thermal Storage Flash Tank to 2nd Pt Heater

4.1.11.1 Identification	Description
Tag Number	TSS Flash Tank drain
LV-74B	to 2nd Pt Heater

4.1.11.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
Part No.	CV-600-10R
Spec No.	D.O.E. Spec 40I700-13S
Material:	Body A216 GR WCB
Weight:	290 lbs

4.1.11.3 Prescribed Service

4.1.11.4 Vendor

Copes-Vulcan Inc.

4.1.11.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.11.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.11.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.11.8 Special Tools

None

4.1.11.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.11.10 Acceptance Test

4.1.12 Condensate from Receiver Flash Tank to Condenser

4.1.12.1 Identification	Description
Tag Number	Receiver Flash Tank
LV-74C	drain to condenser

4.1.12.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
Part No.	CV-600-6R
Spec No.	D.O.E. 40I700-13S
Material:	Body A217 GR WC6
Weight:	120 lbs

4.1.12.3 Prescribed Service

Condensate

4.1.12.4 Vendor

Copes-Vulcan Inc.

4.1.12.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.12.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.12.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.12.8 Special Tools

None

4.1.12.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.12.10 Acceptance Test

4.1.13 Condensate from Thermal Storage Flash Tank to Condenser

4.1.13.1 Identification	Description
Tag Number	TSS Flash Tank drain
LV74D-1	to condenser

4.1.13.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
Part No.	CV-600-10R
Spec No.	D.O.E. Spec 40I700-13S
Material:	Body A216 GR WCB
Weight:	290 lbs

4.1.13.3 Prescribed Service

Condensate

4.1.13.4 Vendor

Copes-Vulcan Inc.

4.1.13.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.13.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.13.7 Parts List

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4.1.13.8 Special Tools

None

4.1.13.9 Maintenance Instructions

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4.1.13.10 Acceptance Test

4.1.14 Condensate from TSS Flash Tank to Condenser-Max Flow

4.1.14.1 Identification

Tag Number	Description
LV74D-2	TSS Flash Tank Drain to Condenser

4.1.14.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
Part No.	CV-600-4R
Spec No.	D.O.E. Spec 40I700-13S
Material:	Body A-217 GR WC6
Weight:	132 lbs

4.1.14.3 Prescribed Service

Condensate

4.1.14.4 Vendor

Copes-Vulcan Inc.

4.1.14.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.14.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.14.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.14.8 Special Tools

None

4.1.14.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.14.10 Acceptance Test

4.1.23 Receiver Flash Tank Vent Drain Pot Control Valve

4.1.23.1 Identification

Tag number	Description
LV-1010	Receiver flash tank vent drain pot control valve with micro type ICX43 limit switches and ASCO type 8300D 61 U solenoid valve

4.1.23.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn 16423
Part No.:	Type D100
Spec No.	DOE Spec. 40M7006S, CP 6
Material:	CR-Moly WC 9
Weight:	

4.1.23.3 Prescribed Service

Condensate and steam, 585 psig, 1010°F

4.1.23.4 Vendor

Copes-Vulcan, Inc.

4.1.23.5 Special Cautions

See C.V.I. Instruction manual in maintenance section 4.1.56

4.1.23.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.23.7 Parts List

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4.1.23.8 Special Tools

None

4.1.23.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.23.10 Acceptance Tests

4.1.24 Steam Dump Drain Pot Control Valve

4.1.24.1 Identification

Tag Number	Description
LV-1011	Steam dump drain pot control valve with micro type ICS43 limit switches and ASCO type 8300D61U solenoid valve

4.1.24.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn 16423
Part No.	Type D100
Spec No.	DOE spec No. 40M7006S, CP 9
Material:	CR-Moly WC9
Weight:	

4.1.24.3 Prescribed Service

Condensate and steam, 1775 psig, 1010°F

4.1.24.4 Vendor

Copes-Vulcan, Inc.

4.1.24.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.24.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.24.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.24.8 Special Tools

None

4.1.24.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.24.10 Acceptance Tests

4.1.25 Steam Dump Drain Pot Control Valve

4.1.25.1 Identification

Tag number	Description
LV-1012	Steam dump drain pot control valve with micro type ICS43 limit switches and ASCO type 8300D61U solenoid valve

4.1.25.2 Description

Manufacturer:	Copes-Vulcan, Inc., Lake City, Penn. 16423
Part No.	Type D100
Spec No.	DOE Spec 40M7006S, CP 9
Material:	Body: CR-MOLY WC9
Weight:	

4.1.25.3 Prescribed Service

Condensate and steam, 110 psig, 1010°F

4.1.25.4 Vendor

Copes-Vulcan, Inc.

4.1.25.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.25.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.25.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.25.8 Special Tools

None

4.1.25.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.25.10 Acceptance Tests

4.1.26 TSS Mx. Drain Pot Control Valve

4.1.26.1 Identification

Tag number	Description
LV-1013	TSS ms. drain pot control valve with micro type ICS43 limit switches in ASCO type 8300D61U solenoid valve

4.1.26.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn. 16423
Part No.	Type D100
Spec No.	DOE spec 40M7006S, CP 9
Material:	Body: CR-MOLY WC9
Weight:	

4.1.26.3 Prescribed Service

Condensate & Steam, 1451 psig, 960°

4.1.26.4 Vendor

Copes-Vulcan, Inc.

4.1.26.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.26.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.26.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.26.8 Special Tools

None

4.1.26.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.26.10 Acceptance Tests

4.1.27 Aux. Steam Drain Pot Control Valve

4.1.27.1 Identification

Tag Number	Description
LV-1015	Aux. steam drain pot control valve with micro type ICX43 limit switches and ASCO type 8300D61U solenoid valve

4.1.27.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn. 16423
Part No.	Type D100
Spec No.	DOE spec 40M7006S, CP 9
Material:	Body: CR-MOLY WC9
Weight:	

4.1.27.3 Prescribed Service

Condensate & Steam, 1450 psig, 960°

4.1.27.4 Vendor

Copes-Vulcan, Inc.

4.1.27.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.27.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.27.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.27.8 Special Tools

None

4.1.27.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.27.10 Acceptance Tests

4.1.28 Main Steam Drain Pot Control Valve

4.1.28.1 Identification

Tag number	Description
LV-1016	Main steam drain pot control valve with micro type ICX43 limit switches and ASCO type 8300D61U solenoid valve

4.1.28.2 Description

Manufacturer:	Copes-Vulcan, Inc., Lake City, Penn 16423
Part No.	Type D100
Spec No.	DOE spec 40M7006S, CP 9
Material:	Body: CR-MOLY WC9
Weight:	

4.1.28.3 Prescribed Service

Condensate & steam, 1451 psig, 960°

4.1.28.4 Vendor

Copes-Vulcan, Inc.

4.1.28.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.28.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.28.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.28.8 Special Tools

None

4.1.28.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.28.10 Acceptance Tests

4.1.29 Demin. Tank Level Control Valve

4.1.29.1 Identification

Tag number	Description
LV-1203	Demin. tank level control valve with ASCO type 8302D26 solenoid valve

4.1.29.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn 16423
Part No.	CV600-4D
Spec No.	DOE spec 40M7006S, CP 9
Material:	Body: ASTM Grade WCB
Weight:	

4.1.29.3 Prescribed Service

Water, 60 psig, 100°

4.1.29.4 Vendor

Copes-Vulcan, Inc.

4.1.29.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.29.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.29.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.29.8 Special Tools

None

4.1.29.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.29.10 Acceptance Tests

4.1.30 Raw Water Tank Level Control Valve

4.1.30.1 Identification

Tag number	Description
LV-1702	Raw water tank level control valve with ASCO type 8302D26 solenoid valve

4.1.30.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn. 16423
Part No.	CV600-10D
Spec No.	
Material:	Body: ASTM Grade WCB
Weight:	

4.1.30.3 Prescribed Service

Water, 155 psig, 80°

4.1.30.4 Vendor

Copes-Vulcan, Inc.

4.1.30.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.30.6 Period Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.30.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.30.8 Special Tools

None

4.1.30.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.56

4.1.30.10 Acceptance Tests

4.1 Modulating Control Valves

4.1.31 Boiler Water Level Control Valves

4.1.31.1 Identification Tag Number — Description

LV-3505	Boiler Water Level Control Valve
LV-3605	Boiler Water Level Control Valve

4.1.31.2 Description

Manufacturer : Valtek, Springville, Utah

Part Number : Mark one body, Mark one actuator

Rocketdyne Specification No. : SP42-066 (following)

Material : Body: Carbon Steel

Weight : 65 lb

4.1.31.3 Prescribed Service

Water

4.1.31.4 Vendor

Valtek, Springville, Utah

4.1.31.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.31.6 Periodic Service

none

4.1.31.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.31.8 Special Tools

none

4.1.31.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.31.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19219-001 TAG NO. LV-3505, 3506

1.5" MARK I BODY SUB-ASSEMBLY
300# 2.00" SPUD 0.88" STEM DIA.
STD SEAL, FLOW OVER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 1-1/2", 150/600#.....	1	...018883.001.041		
10	END FLANGE, 2-1/2", 300#.....	2	...029688.018.041		
11	END FLANGE HALF-RING, 3.12 X 2.62, 0.	4	...001046.029.002		
20	SEAT RING, 1-1/2", CV 28.....	1	...001358.150.000	**	88.12
30	SEAT RETAINER, 1-1/2" & 2", 600#.....	1	...001847.150.000		
40	BONNET, 1-1/2" & 2", 2.00" SPUD.....	1	...002127.029.041		
50	PLUG, 1-1/2" & 2", =%.....	1	...002042.150.000	**	152.99
55	SEAT GASKET, SPIRAL, 2.50 X 2.12.....	1	...001027.832.000	**	5.36
58	BONNET GASKET, SPIRAL, 3.25 X 2.88...	1	...001110.832.000	**	5.36
70	BONNET FLANGE, 1-1/2" & 2", 600#.....	1	...001057.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.....	2	...001133.150.000		
80	GLAND FLANGE, 0.88" STEM, 2.00" SPUD.	1	...008531.150.000		
82	GUIDE LINER, 0.88" STEM, GRAFOIL.....	1	...007602.842.000	**	9.79
83	GUIDE RETAINER, 0.88" STEM, GRAFOIL..	1	...007843.150.000		
86	GUIDE LINER, 0.88" STEM, GRAFOIL.....	1	...007602.842.000	**	9.79
87	GUIDE RETAINER, 0.88" STEM, GRAFOIL..	1	...007843.150.000		
88	PACKING SET, STD SQUARE, 0.88" STEM..	1	...024242.932.000	**	4.77
93	PKG SPR, 0.88" STEM, 2.00 L.....	1	...020908.150.000		
94	PKG SPR, 0.88" STEM, 0.25 L.....	1	...009730.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L.....	2	...001116.010.002		
108	BONNET FLANGE BOLT, 3/4"-10, 2.00 L..	4	...001117.015.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
117	PACKING BOX NUT, 3/8"-16.....	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18.....	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19219-001 TAG NO. LV-3505, 3506

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
8" H D SPRING, AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 25 SQ. INCH, 2.00" SPUD.....	1	...017655.300.040		
202	CYLINDER, 25 SQ. INCH, 8/12" H D SPRI	1	...016682.609.008		
210	ADJUSTING SCREW, 8" H D, 25 SQ. INCH.	1	...005306.029.002		
211	ACTUATOR STEM, 25 SQ. INCH, H D.....	1	...003615.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 25 SQ. INCH.....	1	...001004.601.003		
227	SPRING BUTTON, 25 SQ. INCH, H D.....	1	...003924.029.040		
229	SPRING, 25 SQ. INCH, 8" H D.....	1	...003613.006.040		
235	TAKE-OFF ARM, 25 SQ. INCH.....	1	...001214.029.002		
236	SPACER, TAKE-OFF ARM, 25 SQ. INCH....	1	...001215.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 1-1/2" STROKE.	1	...007267.652.000		
240	TAKE-OFF ARM, POTENTIOMETER, 25 SQ. I	1	...030004.029.002		
247	BELLOWS, STEM, 25 SQ. INCH.....	1	...015498.652.000	**	3.93
248	GASKET, ADJUSTING SCREW, 25 SQ. INCH.	1	...001501.655.000	**	.40
249	CLAMP, STEM, BAILEY.....	1	...019979.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017665.431.000		
256	RETAINING RING, 25 SQ. INCH, CYLINDER	1	...016680.029.014		
270	SPRING CAP O-RING.....	1	...005393.650.000	**	1.91
271	PISTON O-RING.....	1	...001114.650.000	**	2.81
272	PISTON STEM O-RING.....	1	...001112.650.000	**	.21
274	YOKE O-RING.....	1	...001114.650.000	**	2.81
275	ACTUATOR STEM O-RING.....	1	...001113.650.000	**	.30
280	POSITIONER, 74SG1.....	1	...018085.999.000		
290	BRACKET, POSITIONER, 25 SQ. INCH.....	1	...001188.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 25 SQ. INCH..	1	...019985.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
303	SOLENOID, HT8320A173, 115 VAC.....	1	...009336.999.000		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
321	GAUGE, 0-30 PSI.....	1	...001294.999.000		
322	L V D T, 500 HR-DC.....	1	...022697.999.000		
325	SPRING CAP, 25 SQ. INCH, 8" H D SPRIN	1	...005288.300.040		
326	GUIDE, SPRING, 25 SQ. INCH.....	1	...003618.029.040		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 5/8"-11.....	1	...001120.013.002		
400	PLATE, VALTEK, 25 SQ. INCH.....	2	...001229.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19219-001 TAG NO. LV-3505, 3506

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
8" H D SPRING, AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002	
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002	
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002	
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE.....	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, 4.00 L.....	1	...030132.029.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER
J. K. CHENG	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	SP42-066
APPROVALS		TYPE EQUIPMENT
		DATE 6-27-80
	SPECIFICATION	SUPERSEDES SPEC. 5-5-80
		REV. LTR. B / PAGE

TITLE

PREHEATER WATER CONTROL VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TPWCV-1 AND -2 (COMPONENTS SHALL BE TAG IDENTIFI
FUNCTION:	MODULATING VALVE
BODY TYPE:	GLOBE, IN-LINE
END CONNECTIONS:	2 1/2 INCH RF FLANGE
BODY MATERIAL:	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
ANSI RATING:	300 LB CLASS
LINE FLUID:	WATER
MAXIMUM INLET PRESSURE PRESSURE @ TEMPERATURE:	580 PSIG @ 540 F
AMBIENT TEMPERATURE:	16° TO 113° F
TRIM FLOW CHARACTERISTIC:	EQUAL PERCENTAGE
Ø FLOW COEFFICIENT:	Cv = 28
INTERNAL LEAKAGE:	MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY
EXTERNAL LEAKAGE:	NONE VISIBLE
ACTUATOR:	PNEUMATIC WITH TRAVEL INDICATOR
FAIL SAFE POSITION:	CLOSED (ELECTRICAL FAILURE) CLOSED (PNEUMATIC FAILURE)
INSTRUMENT AIR SUPPLY:	125 ± 25 PSIG
PACKING & GASKET MATERIAL:	COMPATIBLE WITH LINE FLUID AND TEMPERATURE
ACCESSORIES:	THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED PLUMBED ACCORDING TO FIGURE 1 ON PAGE 5:

ACCESSORIES: (CONT'D)

- ELECTRO-PNEUMATIC TRANSDUCER

  PNEUMATIC INPUT: 20 PSIG ± 2 PSI
  ELECTRICAL INPUT SIGNAL: 4-20 MA DC (CONTROL
  PNEUMATIC OUTPUT SIGNAL: 3-15 PSIG DIRECTLY P
  TIONAL TO INPUT SIGNAL
  CONTROL RANGE.
  ELECTRICAL ENCLOSURE: WEATHERPROOF (NEMA TYPE
  ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/
  THREADED CONDUIT CONN

- LVDT

  TYPE: DC/DC
  VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SI
  LINEARITY TO BE ± 2 PERCENT OR BETTE
  THROUGHOUT VALVE LIFT
  ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/
  THREADED CONDUIT CONN

- POSITIONER

  INSTRUMENT SIGNAL: 3-15 PSIG
  PRESSURE GAUGES (3 REQD): INSTRUMENT SIGNAL,
  LOWER CYLINDER PRE

- REGULATOR

  TYPE: AIRSET WITH OUTLET PRESSURE GAUGE
  INLET PRESSURE: 125 ± 25 PSIG
  OUTLET PRESSURE: 20 PSIG ± 2 PSI

- FILTER

  ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MI
  ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

ACCESSORIES: (CONT'D)

- SOLENOID VALVE

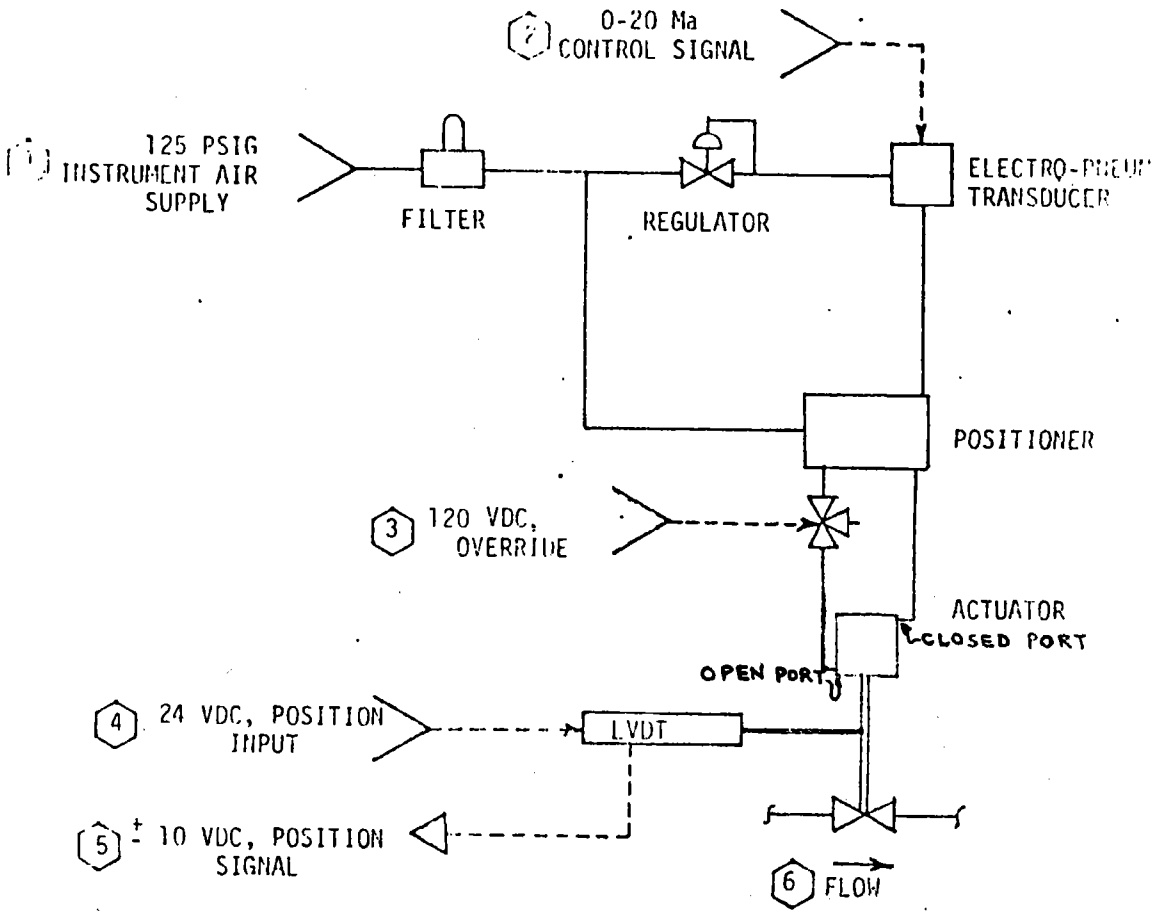
  3-WAY, 120 VAC 60 HZ FOR OVERRIDE OF THE POWER TO CLOSE THE VALVE WHEN THE SOLENOID IS DE-ENE

MAXIMUM ENVELOPE DIMENSIONS: REFER TO FIGURE 2 ON PAGE 6

CLEANING AND PACKAGING: VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING AND MILL SCALE) AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

DESIGN FEATURES:

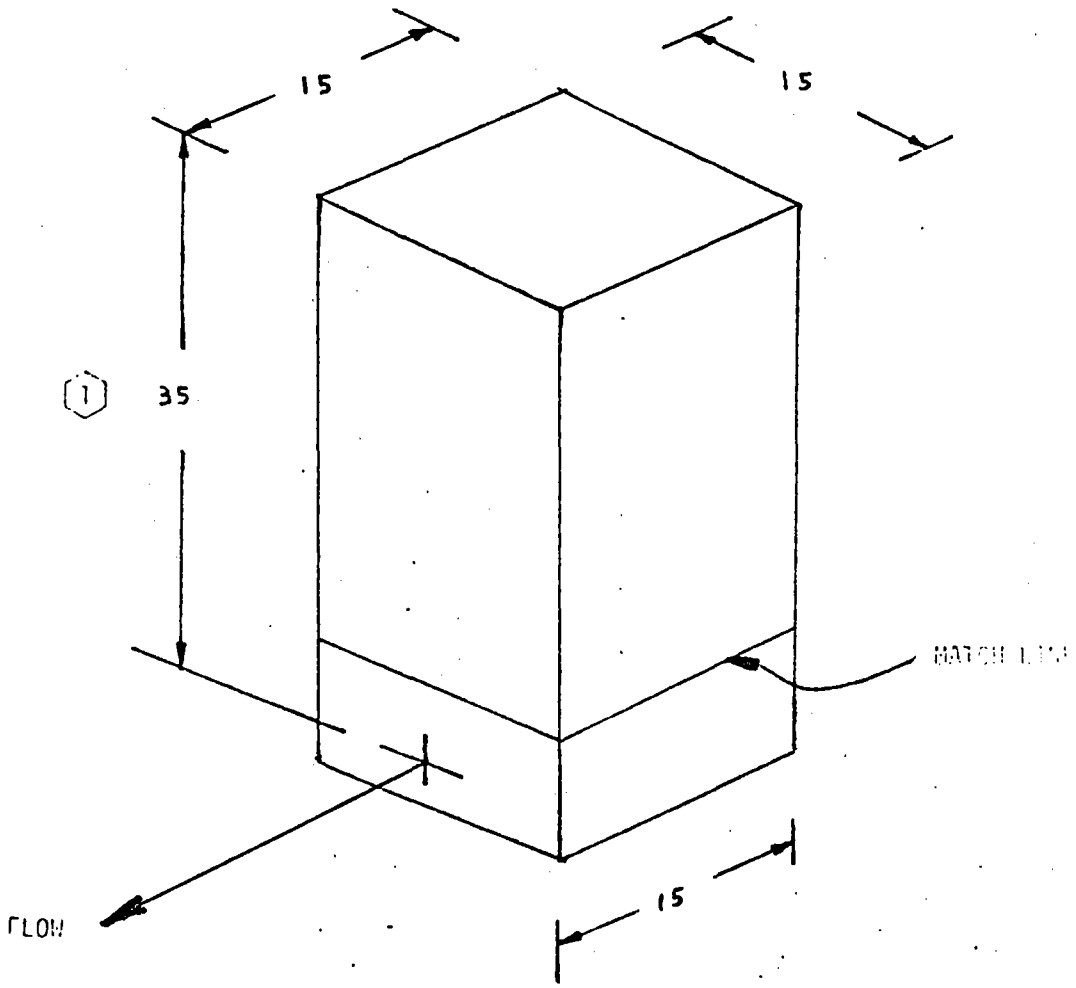
- ELECTRICAL COMPONENTS ARE TO HAVE WEATHERTIGHT E (NEMA TYPE 3). ENCLOSURES SHALL BE EQUIPPED WITH 1/2 INCH THREADED CONDUIT CONNECTION.
- ALL THE ACCESSORY COMPONENTS SHALL BE MOUNTED ON PROPERLY CONNECTED TO THE VALVE AS PER FIGURE 1. SHALL BE READILY REMOVABLE FOR SERVICING.
- THE VALVE SHALL BE DELIVERED FULLY ADJUSTED AND FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY
- VALVE SHALL BE DESIGNED TO PERMIT 2 INCH THICK IN WITH ALL THE ACCESSORIES MOUNTED.
- THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FR THE LINE.
- POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND 0 TO 100 PERCENT OF VALVE OPERATING LIFT RESPECT



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE
4. POSITION
5. SIGNAL
6. FLOW

FIGURE 1



NOTES: 1. ALL DIMENSION ARE IN IN
1 2. MAXIMUM DIMENSION FOR A REMOVAL

FIGURE 2

4.1.31.11 SUPPLEMENTARY SUPPLIER MAINTENANCE INSTRUCTIONS

Procedures and instructions in this paragraph apply also to components in other paragraphs under 4.1.

ASCO Bulletin 8320 Installation and Maintenance Instructions-3-Way Solenoid Valves

ASCO Bulletin 8321 Installation and Maintenance Instructions-3-Way Piston Valve

Bellofram Types 40-50-60-65 Instructions, Pressure Regulators

Micro Switch PK 8800 4 Installation Instructions

Moore DS-305 Auxiliary Instructions Model 74

Moore SD74 Service Instructions Model 74

Robertshaw No. 1406 Instruction Manual

Speedaire Model 2Z435 Installation Instructions and Parts List

Valtek Maintenance Bulletin No. 1 Valtek Mark One and Mark Two Control Valve

Valtek Maintenance Bulletin No. 2 Cylinder Actuator

Valtek Maintenance Bulletin No. 11 Limit Switches

Valtek Maintenance Bulletin NO. 14 Bonnet Extensions

INSTALLATION AND MAINTENANCE INSTRUCTIONS

3–WAY SOLENOID VALVES – NORMALLY OPEN NORMALLY CLOSED AND UNIVERSAL OPERATION 1/4 N.P.T. – BRASS CONSTRUCTION

BULLETIN **8320**

ASCO

Form No. V-5688

DESCRIPTION

Bulletin 8320 is a small 3-way solenoid valve with all three connections located in the body. Valve bodies are of brass construction. Standard valves have a General Purpose, NEMA Type 1 Solenoid Enclosure. Valves may be equipped with a solenoid enclosure which is designed to meet NEMA Type 4 - Watertight, NEMA Type 7 (C or D) Hazardous Locations - Class I, Group C or D and NEMA Type 9 (E, F or G) Hazardous Locations - Class II, Groups E, F or G.

MANUAL OPERATORS (Optional)

Valves with suffix "MO" or "MS" in catalog numbers are provided with a manual operator which allows manual operation when desired or during an interruption of electrical power.

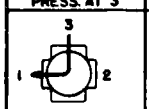
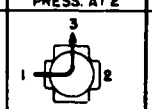
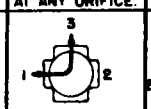
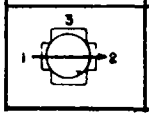
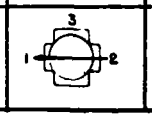
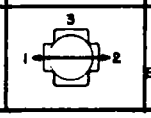
OPERATION

Normally Closed: Applies pressure when solenoid is energized; exhausts pressure when solenoid is de-energized. When solenoid is energized, flow is from two to one. When solenoid is de-energized, flow is from one to three.

Normally Open: Applies pressure when solenoid is de-energized; exhausts pressure when solenoid is energized. When solenoid is energized, flow is from one to two. When solenoid is de-energized, flow is from three to one.

Universal: For normally closed, normally open operation, selection or diversion of pressure can be applied to one, two or three.

FLOW DIAGRAMS

NORMALLY OPEN PRESS. AT 3	NORMALLY CLOSED PRESS. AT 2	UNIVERSAL-PRESS. AT ANY ORIFICE.	FORM
			SOL. DE-ENERGIZED
			SOL. ENERGIZED

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

TEMPERATURE LIMITATIONS

Maximum valve ambient and fluid temperatures for standard valves are listed below. Check catalog number for prefix and wattage to determine ambient and fluid temperature limitations. The temperature limitations are for UL applications. For non UL applications, higher ambient and fluid temperature limitations are available. Consult factory.

WATTAGE	CATALOG NO. PREFIX	COIL CLASS	AMBIENT TEMP. °F.	FLUID TEMP. °F.
10.5	None or DA	A	77	200
10.5	DF or FT	F	122	200
10.5	HT	H	140	200
11.2	None, FT or HT	A, F or H	77	150
16.7*	None or DP	F	77	200

*Catalog Nos. 8320A170, 8320A180 and 8320A190 are limited to 140°F fluid temperature.

POSITIONING

Valve may be mounted in any position.

PIPING

Connect piping to valve according to markings on valve body. Refer to flow diagrams provided. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening pipe, do not use valve as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point.

IMPORTANT: For protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required, depending on the service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

ING WIRING

Wiring must comply with Local and National Electrical Codes. Housings for all solenoids are provided with a 7/8 diameter hole to accommodate 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap. For explosion-proof, watertight construction, loosen cover. Rotate to desired position. Replace retaining cap or tighten cover before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) Solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid including the core assembly.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the bare hand only for an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power supply and line pressure to valve before making repairs. It is not necessary to remove valve from pipe line for repairs.

CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary, depending on the media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive leakage or noise will indicate that cleaning is required.

PREVENTIVE MAINTENANCE

1. Keep medium flowing through valve as free from dirt and foreign material as possible.
2. While in service, operate valve at least once a month to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check electrical system by energizing solenoid. A metallic click signifies that solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open-circuited or grounded coil, broken lead wires or splices.
2. **Burned-Out Coil:** Check for open-circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve and clean all parts. Replace parts that are worn or damaged with a complete Spare Parts Kit for best results.

COIL REPLACEMENT (Refer to Figure 1 or 2)

Turn off electrical power supply and disconnect coil lead wires. Proceed in the following manner:

GENERAL PURPOSE ENCLOSURE (Refer to Figure 1)

1. Remove retaining cap, nameplate and housing. Remove spring washer, insulating washer and coil off solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
2. Reassemble in reverse order of disassembly.

EXPLOSION-PROOF WATERTIGHT (Refer to Figure 2)

1. Unscrew cover with nameplate and retaining ring attached. Two wrenching flats are provided to hold housing securely in place while cover is being removed or replaced.
2. Remove spring, fluxwasher, insulating washer and coil off solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
3. Reassemble in reverse order of disassembly.

CAUTION: Solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit. Place insulating washer at each end of coil if required.

NOTE: Installation and maintenance of explosion-proof equipment requires more than ordinary care to insure safe performance. All finished surfaces of the solenoid are constructed to provide a flameproof seal. Be sure that the surfaces are wiped clean before replacing. If watertight, as well as explosion-proof is a requirement, grease the joints of the explosion-proof, watertight solenoid with Exxon Company, U.S.A. Nebula EP2 grease or equivalent. A high grade silicone grease similar to Dow Corning's Valve Seal may also be used.

VALVE DISASSEMBLY AND REASSEMBLY (Refer to Figure 1)

Depressurize valve and turn off electrical power supply. Proceed in the following manner:

1. Remove retaining cap or clip and slip entire solenoid enclosure off solenoid base sub-assembly. For explosion-proof/watertight construction, disassemble solenoid. See "Coil Replacement".
2. Unscrew solenoid base sub-assembly. For explosion-proof/watertight solenoid enclosure a special wrench (Order No. 168-146) is required to remove solenoid base sub-assembly.

ASCO Valves ASCO

Form No. V-5688 PRINTED IN U.S.A. 1973 Automatic Switch Co. FLORHAM PARK, NEW JERSEY 07932

3. Remove core assembly, core spring and body gasket. Unscrew end cap. Remove body gasket, disc spring and disc/holder sub-assembly.
4. All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare Parts Kit for best results.
5. When reassembling, lubricate body gasket with Dow Corning's Valve Seal or an equivalent silicone grease.
6. Reassemble in reverse order of disassembly, paying careful attention to exploded views provided for identification and placement of parts.

SPARE PARTS KITS

Spare Parts Kits and Coils are available for ASCO valves. Parts marked with an asterisk (*) are supplied in Spare Parts Kits.

ORDERING INFORMATION FOR SPARE PARTS KITS

When Ordering Spare Parts Kits or Coils Specify Valve Catalog Number, Serial Number and Voltage.

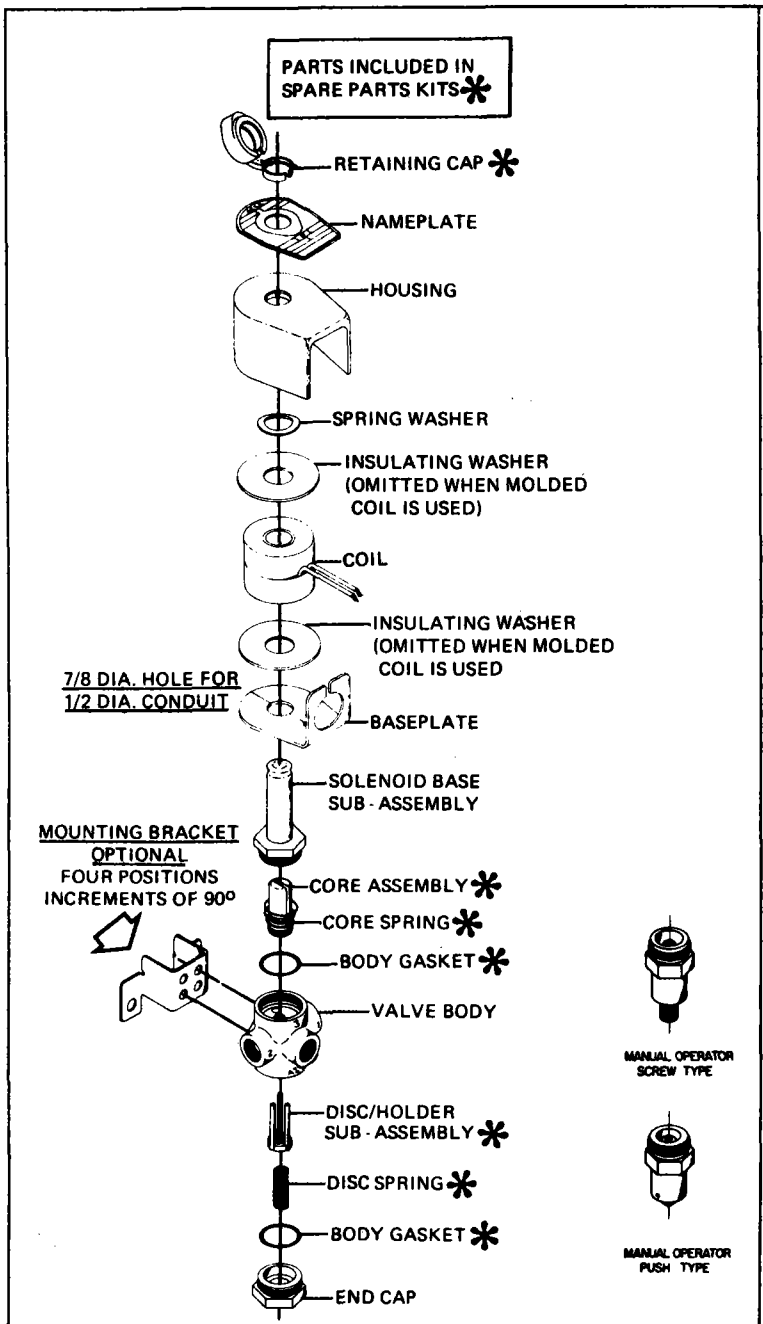


Figure 1. Bulletin 8320 General Purpose Solenoid Enclosure

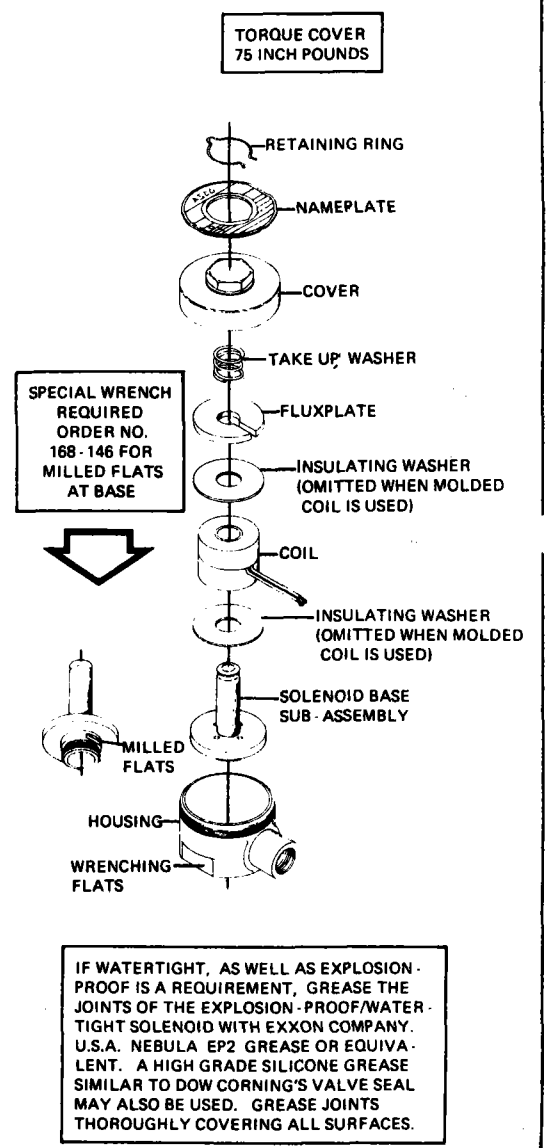


Figure 2. Explosion-Proof/Watertight Solenoid Enclosure

INSTALLATION AND MAINTENANCE INSTRUCTIONS

3-WAY PISTON VALVE

BULLETIN
8321
ASCO
Form No. V-5417 R1

DESCRIPTION

Bulletin 8321 is an internal pilot operated 3-way solenoid valve. Standard valves have a General Purpose Nema Type 1 Solenoid Enclosure. Valves may also be equipped with an enclosure which is designed to meet Nema Type 4-Watertight, Nema Type 7 (C or D) Hazardous Locations – Class 1, Group 'C' or 'D' and Nema Type 9 ('E', 'F' or 'G') Hazardous Location – Class II, Group 'E', 'F' or 'G'.

MANUAL OPERATOR (Optional)

Valves with suffix "MO" or "MS" after catalog number are provided with a manual operator which allows manual operation when desired or during an interruption of electrical power.

OPERATION

NORMALLY CLOSED (Refer to Figure 1)

Solenoid De-energized: Flow is from Cylinder 'A' to Exhaust. Pressure connection is closed.
Solenoid Energized: Flow is from Pressure to Cylinder 'A'. Exhaust connection is closed.

NORMALLY OPEN (Refer to Figure 1)

Solenoid De-energized: Flow is from Pressure to Cylinder 'A'. Exhaust connection is closed.
Solenoid Energized: Flow is from Cylinder 'A' to Exhaust. Pressure connection is closed.

NOTE: To change from normally closed construction to normally open construction, the plastic pilot insert and lower disc spring have to be replaced. (Consult factory).

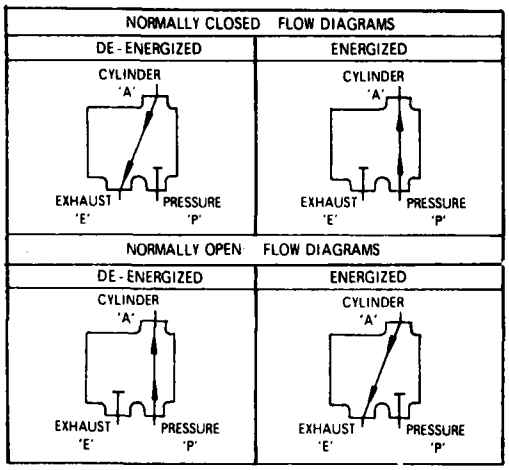


FIGURE 1

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

POSITIONING

valve may be mounted in any position.

PIPING

Connect piping to the Pressure (P), Exhaust (E), and Cylinder (A) Ports according to flow diagram. If a speed/flow control valve is used, it must be located in the piping between the solenoid valve and the cylinder.

For precision control of cylinder positions, there should be no leaks in piping between cylinder and valve. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening pipe, do not use valve as a lever.

CAUTION: To insure operation of the valve, the pressure and exhaust lines must be full area without restriction, and a minimum differential pressure as stamped on the nameplate must be maintained between the pressure and exhaust. Do not install any restrictive devices in either the pressure (inlet) connection or the exhaust (outlet) connection of the valve. Restricting either of these lines may cause valve malfunction. Should metering or restrictive devices be required they must be installed in cylinder connection (between solenoid valve and cylinder).
IMPORTANT: For protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required, depending on the service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with Local and National Electrical Codes. For valves equipped with an explosion-proof, watertight enclosure (Nema 4, 7 & 9), the electrical fittings must be approved for use in the approved hazardous locations. Housings for all solenoids are made with connections for 1/2 inch conduit. The general purpose enclosure may be rotated to facilitate wiring by removing the retaining cap. After rotating to desired position, be certain to replace cap before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) Solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid, not just the coil.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched by hand for only an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power and line pressure to valve before making repairs. It is not necessary to remove valve from pipe line for repairs.

CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary, depending on the media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation or excessive leakage will indicate that cleaning is required.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. Operate the valve periodically to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic click signifies the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open-circuited or grounded coil, broken lead wires or splice connections.

ASCO Valves ASCO

2. **Burned-Out Coil:** Check for open-circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within the range specified on nameplate.
5. **Excessive Leakage (Improper Opening and Closing of Ports):** Disassemble valve (See Valve Disassembly Instructions) and clean all parts and passageways. Replace worn or damaged parts with a complete "Spare Parts Kit" for best results.

COIL REPLACEMENT (Refer to Figure 2)

Turn off electrical power, disconnect coil lead wires.

CAUTION: The solenoid must be fully reassembled as the housing is part of, and completes the magnetic circuit. Be careful to place insulating washers at each end of the coil if required.

1. Remove retaining cap, nameplate and solenoid cover.
2. Slip yoke containing coil, sleeves and insulating washers off the solenoid base sub-assembly. **NOTE:** Insulating washers are omitted when molded coil is used. In some D-C Constructions, a single flux plate over the coil replaces yoke, sleeves and insulating washers.
3. Reassemble in reverse order of disassembly.

VALVE DISASSEMBLY AND REASSEMBLY (Refer to Figure 2)

Depressurize valve and turn off electrical power.

1. Solenoid may be removed intact by loosening and removing solenoid base sub-assembly from body.
2. Remove core spring, core assembly and body gasket respectively.
3. A 4-36 Machine Screw (provided in "Spare Parts Kits") serves as a self-tapping screw to remove insert from body. Thread screw a few turns in thru hole located in the flat surface of insert. **CAUTION:** Do not damage center hole (Pilot Orifice) in raised surface of insert. Remove insert by using a pair of pliers on the head of the screw.
4. Remove three gaskets from insert. Tag each as they are removed so that they can be reassembled in the same locations. **NOTE:** Middle and lower gaskets have the same physical dimensions, however, the lower gasket is made of a softer material.
5. Remove lower disc holder assembly and lower disc spring. This completes pilot disassembly.
6. Remove end cap, end cap gasket and outer piston gasket.
7. Slide out piston assembly and inner piston gasket.
8. All parts and passageways are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete "Spare Parts Kit" for best results.
9. Reassemble valve in reverse order of disassembly. **NOTE:** Lubricate all rubber parts with Dow Corning's Valve Seal or equivalent silicone grease.

MANUAL OPERATOR DISASSEMBLY AND REASSEMBLY

(Refer to Figure 3)

Depressurize valve and turn off electrical power.

1. Remove two retaining screws.
2. Slide out manual operator stem/knob/retainer sub-assembly.
3. Remove stem O-ring.
4. Remove guide and gasket.
5. Manual operator parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete "Spare Parts Kit" for best results.
6. Reassemble manual operator in reverse order of disassembly. **NOTE:** Lubricate all rubber parts with Dow Corning's Valve Seal or equivalent silicone grease.

SPARE PARTS KITS

Spare Parts Kits and Coils are available for ASCO valves.
Parts marked with an asterisk (*) are supplied in Spare Parts Kits.

ORDERING INFORMATION FOR SPARE PARTS KITS

When Ordering Spare Parts Kits or Coils
Specify Valve Catalog Number,
Serial Number and Voltage.

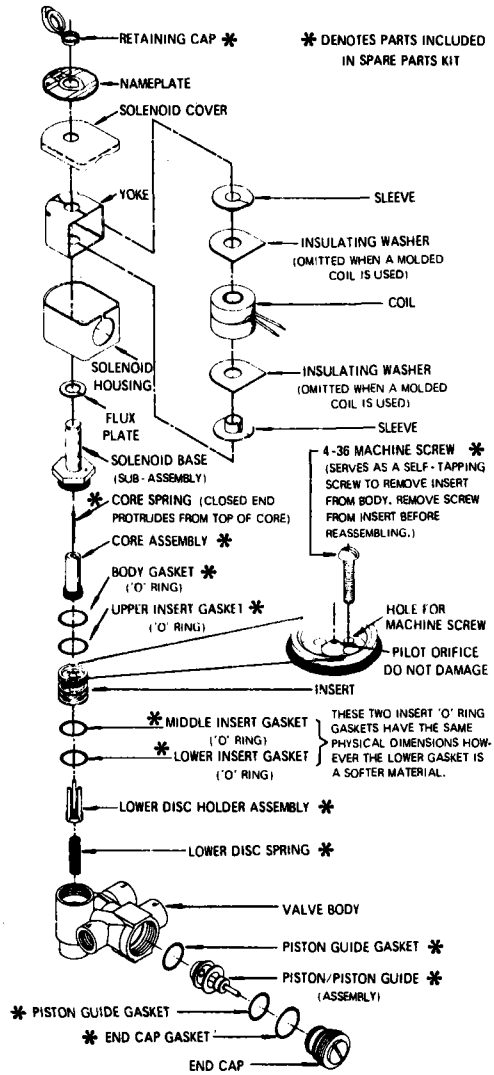


FIGURE 2 BULLETIN 8321

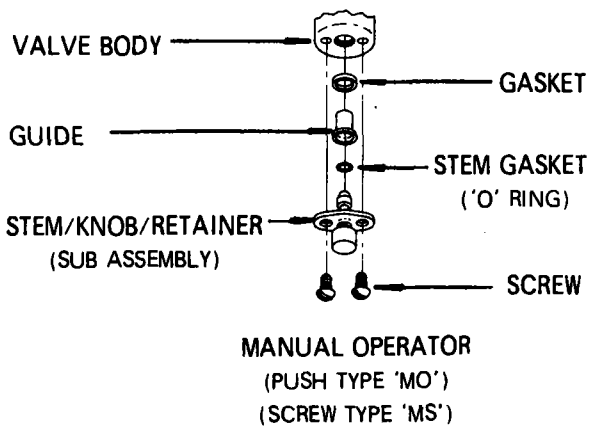


FIGURE 3

T

4-1-31-11

Bellofram
CORPORATION
a Rexnord Company
Blanchard Road, Burlington, Massachusetts U.S.A. 01803

Instructions Pressure Regulators Types 40-50-60-65

These regulators are designed for air service only and maximum pressures are described on the individual labels. Operating temperatures are 0 to 160°F.

INSTALLATION:

Install the regulator as close as possible to the instrument or tool it is to service. The words "IN" and "OUT" are cast into the body to indicate the direction of flow. (NOTE: If a lubricator is to be used in the system, install it downstream of the regulator.)

OPERATION:

Types 40 & 50: Before turning on the supply air, screw out the adjusting screw until there is no compression on the regulating spring. Turn on the air supply and turn the adjusting screw until the desired secondary pressure is reached.

Types 60 & 65: These are preset at the factory and no further adjustment can be made.

MAINTENANCE:

Periodic cleaning of the filter and bowl is recommended on Type 50 and Type 60 regulators.

A. To remove condensate, slowly open drain valve and bleed accumulated liquid.

B. To clean filter element
   1) Shut off air supply
   2) Drain condensate
   3) Remove large bolt from bottom of unit
   4) Remove bowl, filter and gasket
   5) Clean all parts thoroughly and reassemble in reverse order.

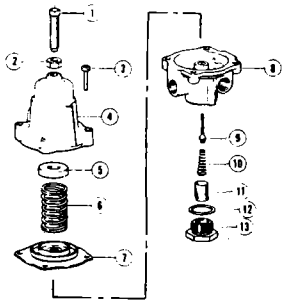
C. To install replacement parts
   1) Order repair kit for Type 40, 50, 60 or 65 regulator. See exploded views on back of this sheet.
   2) Shut off air supply. On Types 40 & 50, screw out adjusting screw.
   3) Remove 4 screws and bottom plug and remove all parts
   4) Replace parts that show excessive wear with items in kit
   5) Clean all parts and replace in reverse order

   Direct any specific questions to nearest Bellofram Sales Engineer or to the factory.

NOTE: On Type 50 and Type 60 the Pintle Spring Screw Item No. 13 should be installed finger tight with a screw driver. Item No. 16 Hex Head Screw should be torqued to 22-25 ft. lbs.

FORM R-215-1 7/80

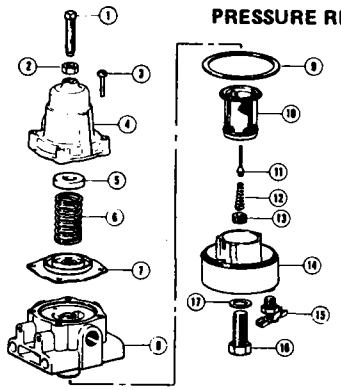
PRESSURE REGULATORS



Adjustable – without Dripwell
TYPE 40

1 Sq. Hd. Adjusting Screw
2 Nut, Lock
3 Build Screw
4 Bonnet
5 Guide, Spring
6 Spring, Range
7 *Diaphragm Assembly
8 Body
9 *Pintle, Valve
10 *Spring, Pintle
11 *Screen
12 *Gasket, Plug
13 Plug, Bottom

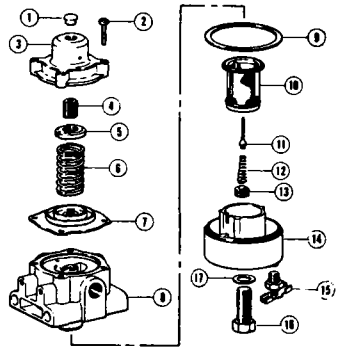
Repair Kit: Part No. 211-971-019



Adjustable – with Dripwell
TYPE 50

1 Sq. Hd. Adjusting Screw
2 Nut, Lock
3 Build Screw
4 Bonnet
5 Guide, Spring
6 Spring, Range
7 *Diaphragm Assembly
8 Body
9 *Gasket, Dripwell
10 *Filter
11 *Pintle, Valve
12 *Spring, Pintle
13 Screw, Pintle Spring
14 Housing, dripwell
15 Petcock
16 Screw, Hex. Head
17 *Washer

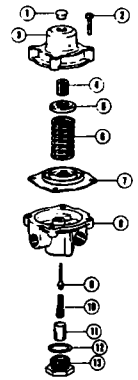
Repair Kit: Part No. 211-971-018



Preset – with Dripwell
TYPE 60

1 Plug, Cover
2 Build Screw
3 Bonnet
4 Screw, Adjusting
5 Guide, Spring
6 Spring, Range
7 *Diaphragm Assembly
8 Body
9 *Gasket, Dripwell
10 *Filter
11 *Pintle, Valve
12 *Spring, Pintle
13 Screw, Pintle Spring
14 Housing, Dripwell
15 Petcock
16 Screw, Hex. Head
17 *Washer

Repair Kit: Part No. 211-971-018



Preset – without Dripwell
TYPE 65

1 Plug, Cover
2 Build Screw
3 Bonnet
4 Screw, Adjusting
5 Guide, Spring
6 Spring, Range
7 *Diaphragm Assembly
8 Body
9 *Pintle, Valve
10 *Spring, Pintle
11 *Screen
12 *Gasket, Plug
13 Plug, Bottom

Repair Kit: Part No. 211-971-019

All items marked with an asterisk (*) will be included in the repair kit.

Other parts may be ordered separately by specifying the item number, part name, and the part number of the regulator for which the parts are intended.

IMPORTANT: Orders for these parts cannot be properly filled unless you specify the regulator part number and pressure range

4.1.31-18

Installation Instructions

EXPLOSION-PROOF and SPLASH-PROOF SWITCHES

"EX" EXPLOSION–PROOF

Flame paths within the housings of these switches cool exploding gases below the kindling temperature before they reach explosive gases surrounding the housing.

The enclosed replaceable basic switch is accessible when the cover plate is removed. Explosion-proof switches are not sealed and therefore are not recommended for use in areas where they will be subjected to liquid splash.

MICRO SWITCH "EX" switches are listed by Underwriters' Laboratories and CSA for use in hazardous locations Class I, Groups C & D, and Class II, Groups E, F and G. This includes vapors of ethyl ether, gasoline, petroleum, alcohol, acetone, lacquer solvent, natural gas and atmospheres charged with grain dust, metal dust, carbon black, coal or coke dust. In addition, Catalog Listing EX-AR800, EXA-AR800, EXD-AR, EXD-Q, EXH-AR3, EXQ-800, EXMN-AR, EXMN-AR30, and EXMN-Q are listed for Class I, Group B (hydrogen) atmospheres.

"OP" SPLASH–PROOF

These switches are for use in applications where the splash of oil, water or other liquids might hamper the operation of less adequately protected switches. A gasket between the cover and housing plus an O-ring shaft seal provides the seal for "OP" switches. MICRO SWITCH "OP" switches are **NOT** explosion-proof.

Rotary "OP" switches meet the following NEMA enclosure requirements: Type 1, general purpose; Type 2, drip-tight; Type 3, weather resistant; Type 4, water tight; Type 5, dust tight. Since "Q" plunger actuators are not sealed, it is recommended that the switch be mounted so that liquids will not fall directly on the plunger.

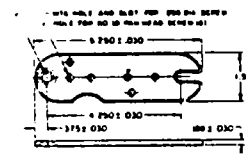
ELECTRICAL RATINGS

Electrical ratings of "EX" and "OP" switches depend on the type of basic switch enclosed in the housing. The ratings are shown on the bottom of page 2 along with the letter keys (A, B, C, D, E, and F) shown in the table of listings on pages 2 and 3.

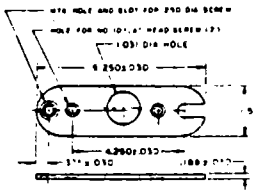
INSTALLING SWITCH

A mounting bracket (MICRO SWITCH Part Number 15PA85-EX) is furnished at no extra cost with each type "OP" and "EX" switch. This permits all roller lever switches to be mounted from top, bottom, back or right end. Plunger switches may be mounted on back, bottom or right end with this standard bracket. For top mounting of plunger switches, bracket 15PA86-EX must be purchased separately. If desired, "OP" and "EX" switches may be directly mounted, omitting the mounting bracket and attaching the switch with 10-32 NF screws of suitable length. "OP" and "EX" switches are interchangeable in mounting.

The double conduit switch also has included an auxiliary bracket which permits two-hole mounting from top, back or bottom. Direct mounting is by means of two 10-32 NF tapped holes on the top, back, or bottom.

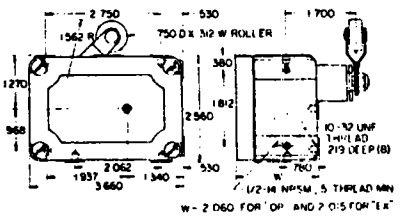


15PA85-EX Fasten bracket to the switch with screws furnished. Bracket may be secured to mounting surface with .250" machine screws.

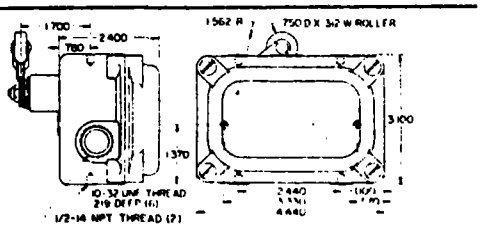


15PA86-EX Fasten bracket to top of switch with screws furnished. Bracket may be secured to mounting surface with .250" machine screws.

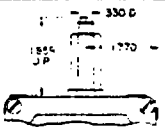
MOUNTING DIMENSIONS



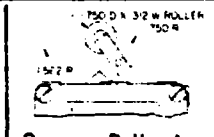
Roller Arm - Single Conduit



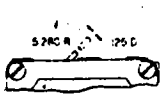
Roller Arm - Double Conduit



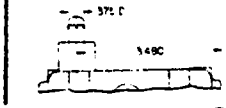
Straight Plunger



One-way Roller Arm



Low Force Rod



Side Plunger, Double Conduit

ADJUSTING ROLLER ARMS

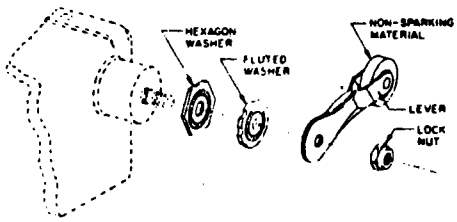
The roller lever assembly is adjustable through 360 degrees at any of 1980 positive lock positions at intervals of approximately 0.2 degree.

To adjust the roller lever to the desired position, hold the hexagon washer with a wrench and loosen the lock nut sufficiently to disengage the serrations. Hold shaft in position by means of the hexagon washer so that no torque will be applied to the internal parts of the unit when the lock nut is tightened or loosened. Failure to do so may result in damage to the enclosed switching mechanism. Excessive tightening will also deform the hexagon serrated washer and cause the lever arm assembly to bind.

Moving the lever one serration forward or backward with respect to the serrations on the fluted washer changes the position of the lever approximately 8.2 degrees. (Note sketch below).

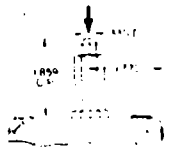
Moving the lever and the fluted washer, as a unit, one serration forward or backward with respect to the serrations on the hexagon washer changes the position of the lever 8 degrees. Moving the lever one serration in one direction, and the lever and fluted washer, as a unit, one serration in the other direction, changes the position of the arm approximately 0.2 degree.

After positioning lever arm, tighten lock nut sufficiently to prevent slippage of arm, but avoid over tightening.



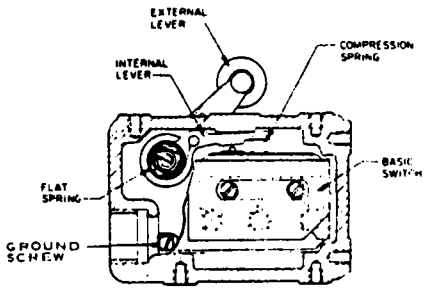
STRAIGHT PLUNGER ACTUATION

DO NOT ACTUATE BY CAMS OR SLIDES or by any other device which will impart side thrust to the plunger. Use straight "push" action in the direction of the plunger motion. DO NOT OIL this plunger mechanism. Sufficient grease of the proper type is assembled in the plunger during manufacture to last the lifetime of the switch. Additional grease, oil, water or fine abrasive may cause jamming or electrical failure.



REPLACING BASIC SWITCH

1. **IMPORTANT** - Disconnect the power supply circuit before opening switch.
2. Remove the cover of the housing, disconnect the lead-in wires, loosen the screws holding the basic switch, and then remove the basic switch.
3. Place the replacement switch in the insulator, insert the screws, and place basic switch in the housing. Switches with "MN" basics have no separate insulator.
4. Tighten the screws and connect the lead-in wires.
5. Be sure the small compression spring is returned to its position between the top of the basic switch and the internal lever (or above the internal lever in the case of the CCW actuated switches).



A ground screw is provided for convenient grounding. See drawing.

ELECTRICAL RATINGS

BASIC SWITCHES		
A UL Listed: 15 amps, 125, 250 or 480 vac; 1/8 hp, 125 vac; 1/4 hp, 250 vac; 1/2 amp, 125 vdc; 1/4 amp, 250 vdc.	C UL Listed: 10 amps, 125 or 250 vac; 0.3 amp, 125 vdc; 0.15 amp, 250 vdc.	E 10 amps ind. and 25 amps res., 28 vdc; 1 amp, 125 vac. UL Listed for 1 amp, 125 vac only.
B UL Listed: 20 amps, 125, 250 or 480 vac; 10 amps, 125 vac "L"; 1 hp, 125 vac, 2 hp, 250 vac; 1/2 amp, 125 vdc; 1/4 amp, 250 vdc.	D UL Listed: 10 amps, 125, 250 or 480 vac. 1/2 amp, 125 vdc; 1/4 amp, 250 vdc.	F UL Listed: 10 amps, 125, 250 or 480 vac; 1/2 hp, 125 vac; 1 hp, 250 vac; 0.8 amp, 125 vdc; 0.4 amp, 250 vdc.

REPLACEMENT PARTS

Pockets illustrated on page 4. Installation instructions (PK 8801 1) are included with each packet.

1 Catalog Listing	2 Description	3 Elec. Rating	4 Basic Switch Unit	5 External Actuator	6 Internal Lever	7 Springs	8 Mounting Bracket
EX-AR	Roller Arm. CW Actuation SPDT. 15 Amp Capacity	A	BZ-2R-P1	6PA5-EX*	33PA1-EX	33PA7-EX	15PA85-EX
EX-AR800	Roller Arm. CW Actuation. SPDT. 15 Amp Capacity UL Class 1, Group B (hydrogen) Atmospheres.	A	BZ-2R-P1	6PA5-EX*	33PA1-EX	33PA7-EX	15PA85-EX
EXA-AR	Roller Arm. CW Actuation. SPDT. 20 Amp Capacity	B	BA-2R-P1	6PA5-EX*	33PA1-EX	33PA6-EX	15PA85-EX
EXD-AR	Roller Arm. CW Actuation. DPDT. 10 Amp Capacity UL Class 1, Group B (hydrogen) Atmospheres.	C	DT-2R4-B6	6PA5-EX*	33PA1-EX	33PA6-EX	15PA85-EX

continued on next page

REPLACEMENT PARTS (con't)

Packets illustrated on page 4. How to install instructions (PK-88011) come with each packet.

1	2	3	4	5	6	7	8
EXMN-AR	Roller Arm. CW Actuation. 2-CKT DB 10 amp. cap.	F	2MN22-L	6PA5-EX *	33PA8-EX	33PA7-EX	15PA85-EX
EXH-AR3	Roller Arm. CW Actuation. SPDT. Hermetically Sealed Basic Switch. UL Class 1, Group B 125 inch lead wires.	E	4HS202	6PA5-EX *	33PA1-EX	33PA6-EX	15PA85-EX
EX-AR20	No external actuator furnished. CW Actuation 15 Amp Capacity. SPDT	A	BZ-2R-P1	Note 1	33PA1-EX	33PA7-EX	15PA85-EX
EX-AR30	Roller Arm. CCW Actuation SPDT 15 Amp Capacity	A	BZ-2R-P1	6PA5-EX *	*	33PA5-EX	15PA85-EX
EXMN-AR30	Roller Arm. CCW Actuation 2-CKT DB 10 amp. cap	F	2MN22-L	6PA5-EX *		33PA5-EX	15PA85-EX
EXH-AR33	Roller Arm. CCW Actuation. SPDT. Hermetically Sealed Basic Switch. UL Class 1, Group B 126 inch Lead Wires	E	4HS203	6PA5-EX *		33PA5-EX	15PA85-EX
EX-AR16	Roller Arm. CW or CCW Actuation. Low Force SPDT. 15 Amp Capacity. No Lever Return Spring No Mounting Bracket.	A	BZ-2RW88-P2	6PA5-EX *			
EX-CR	Cross-roller Arm. CW Actuatipn SPDT. 15 Amp Capacity.	A	BZ-2R-P1	6PA131-EX	33PA1-EX	33PA7-EX	15PA85-EX
EX-AR128	One-way Roller Arm. CW Actuation. SPDT 15 Amp Capacity.	A	BZ-2R-P1	6PA130-EX *	33PA1-EX	33PA7-EX	15PA85-EX
EX-AR1613	Low Force Rod. CW Actuation. SPDT 15 Amp Capacity. No Mounting Bracket.	A	BZ-2RW88-P2	6PA136-EX			
EX-Q	Overtravel Plunger. SPDT. 15 Amp Capacity.	A	BZ-2R-P1	8PA15-EX			Note 2
EX-Q800	Overtravel Plunger. SPDT. 15 Amp Capacity UL Class 1, Group B (Hydrogen) Atmospheres	A	BZ-2R-P1	8PA15-EX			Note 2
EXA-Q	Overtravel Plunger. SPDT. 20 Amp Capacity	B	BA-2R-P1	8PA15-EX			Note 2
EXD-Q	Overtravel Plunger. DPDT. 10 Amp Capacity UL Class 1, Group B (Hydrogen) Atmospheres	C	DT-2R-B6				Note 2
EXMN-Q	Overtravel Plunger. 2-CKT DB 10 amp. cap.	F	2MN1-L				Note 2
EX-N15	Overtravel Plunger. SPDT. 10 Amp. Capacity Elastomer Plunger Boot	D	BZ-2R15-P1	8PA12-EX			Note 2
EX-AR50	Manual Actuator Paddle. SPDT. 15 Amp Capacity.	A	BZ-2R-P1	6PA134-OP		33PA7-EX	15PA85-EX
1EX1	Roller Arm. CW Actuation. SPDT. 15 Amp Capacity ½ inch conduit openings in both ends.	A	BZ-2P-P49	6PA5-EX *	33PA1-EX	33PA7-EX	
2EX1	Roller Arm. CW Actuation. SPDT. 20 Amp Capacity ½ inch conduit openings in both ends.	B	BA-2R-P4	6PA5-EX *	33PA1-EX	33PA6-EX	
4EX1	Roller Arm. CW Actuation. DPDT. 10 Amp Capacity ¾ inch conduit openings in both ends	C	DT-2R4-B6	6PA5-EX *	33PA1-EX	33PA6-EX	
4EX5	Adjustable length Roller Lever. DPDT 10 Amp Capacity.	C	DT-2R4-B6	6PA126-EX	33PA1-EX	33PA6-EX	
6EX2	Roller Arm with Nylon Roller. CW Actuation SPDT. 10 Amp Capacity ¾ inch conduit openings in both ends.	E	1HS102	6PA127-EX *	33PA1-EX	33PA6-EX	
22EX22	Side Plunger. Two SPNC Circuits. 20 Amp Capacity. ½ inch conduit openings in both ends. Bracket Not Furnished.	B	6AS57				
OP-AR	Roller Arm. CW Actuation. SPDT. 15 Amp Capacity	A	BZ-2R-P4	6PA6-OP *	33PA2-OP	33PA7-EX	15PA85-EX
OPA-AR	Roller Arm. CW Actuation. SPDT. 20 Amp Capacity	B	BA-2R-P4	6PA6-OP *		33PA6-EX	15PA85-EX
OPD-AR	Roller Arm. CW Actuation. DPDT. 10 Amp Capacity	C	DT-2R4-A7	6PA6-OP *		33PA6-EX	15PA85-EX
OPMN-AR	Roller Arm. CW Actuation 2-CKT DB 10 amp. cap.	F	2MN22-L	6PA6-OP *	33PA9-OP	33PA7-EX	15PA85-EX
OP-AR20	No External Actuator Furnished. CW Actuation 15 Amp Capacity. SPDT.	A	BZ-2R-P1	Note 3	33PA2-OP	33PA7-EX	15PA85-EX
OP-AR30	Roller Arm. CCW Actuation SPDT. 15 Amp Capacity	A	BZ-2R-P4	6PA6-OP *		33PA5-EX	15PA85-EX
OPD-AR30	Roller Arm. CCW Actuation. DPDT. 10 Amp Capacity. Basic Switch Plunger Held Depressed.	C	DT-2R711-A7	6PA6-OP *		33PA5-EX	15PA85-EX
OPMN-AR30	Roller Arm. CCW Actuation. 2-CKT DB 10 amp. cap.	F	2MN22-L	6PA6-OP *		33PA5-EX	15PA85-EX
OP-AR16	Roller Arm. CW or CCW Actuation. SPDT. 15 Amp Capacity. No Lever Return Spring. No Mounting Bracket.	A	BZ-2Rw88-P5	6PA6-OP			
OP-CR	Cross-Roller Arm. CW Actuation. SPDT. 15 Amp Capacity.	A	BZ-2R-P4	6PA131-EX	33PA2-OP	33PA7-EX	15PA85-EX
OP-Q	Overtravel Plunger. SPDT. 15 Amp Capacity.	A	BZ-2R-P4	8PA7-OP			Note 2
OPA-Q	Overtravel Plunger. SPDT. 20 Amp Capacity.	B	BA-2R-P4				Note 2
OPD-Q	Overtravel Plunger. DPDT. 10 Amp Capacity	C	DT-2R-A7				Note 2
OPMN-Q	Overtravel Plunger. 2-CKT DB 10 amp. cap.	F	2MN1-L				Note 2
OP-AR50	Manual Actuator Paddle. SPDT. 15 Amp Capacity.	A	BZ-2R-P4	6PA134-OP	33PA3-OP	33PA7-EX	15PA85-EX

Note 1: Actuators, Catalog Listings 6PA5-EX, 6PA127-EX, 6PA130-EX(CW), 6PA142(CCW), 6PA131-EX, 6PA136-EX, and 6PA138-EX may be ordered for use with the EX-AR20 listing.

2: For mounting electrical actuator switches from the bottom, back, or end order packet 15PA85-EX and for top mounting order packet 15PA80-EX.

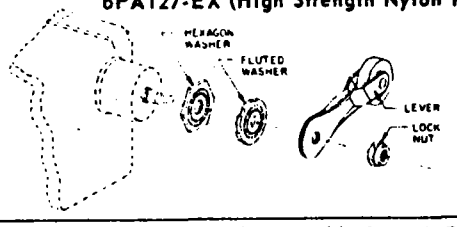
3: Actuator may be bent to obtain 1 degree 2 except 6PA126-EX may be used with the OP-AR20 listing.

4: Actuator, mounting screws, lockwasher, fluted washer, and lock nut for this actuator, is available.

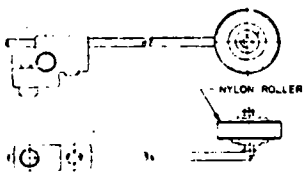
REPLACEMENT PACKETS (ORDER FROM COLUMNS 6, 7 AND 8 ON PAGES 2 AND 3.)

EXTERNAL ACTUATORS – Rotary

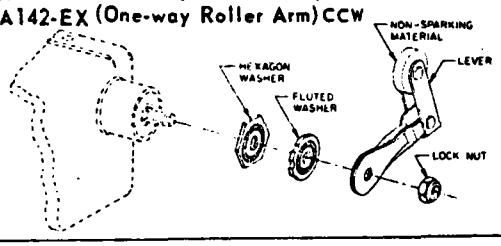
6PA5-EX (Non Sparking roller)
6PA6-OP (Steel Roller)
6PA127-EX (High Strength Nylon Roller)



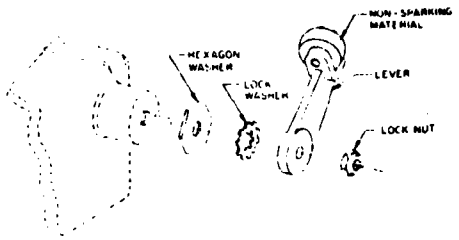
6PA 126 -EX (Adjustable Length Rod)



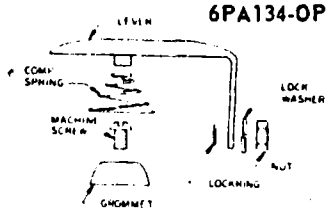
6PA130-EX (One-way Roller Arm) CW
6PA142-EX (One-way Roller Arm) CCW



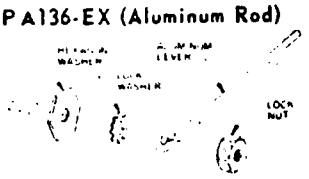
6PA131-EX (Cross-Roller Arm)



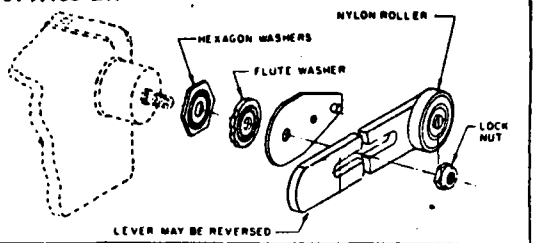
6PA134-OP (Manual Paddle)



6PA136-EX (Aluminum Rod)

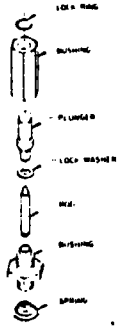


6PA138-EX

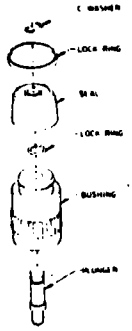


EXTERNAL ACTUATORS – Plunger

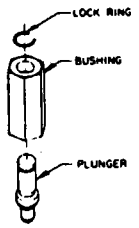
8PA7-OP



8PA12- EX

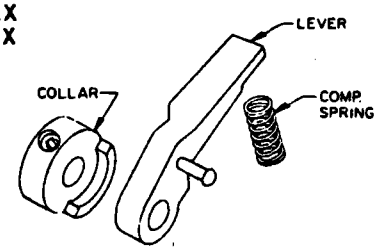


8PA15- EX

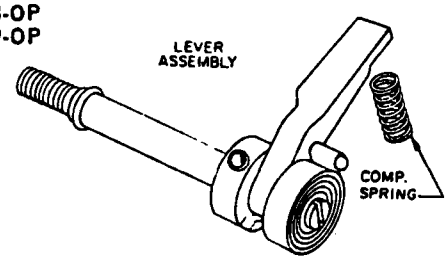


INTERNAL LEVERS – Rotary

33PA1-EX
33PA8-EX

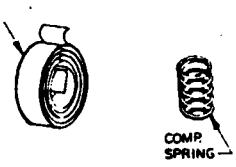


33PA2-OP
33PA3-OP
33PA9-OP



SPRINGS

33PA5-EX
33PA6-EX
33PA7-EX



MICRO SWITCH
FREEPORT, ILLINOIS 61032
A DIVISION OF HONEYWELL

4.1.31-22

IN CANADA: 740 Ellesmere Road, Scarborough, Ontario. INTERNATIONAL: Sales and service offices in all principal cities of the world

MOORE

AUXILIARY INSTRUCTIONS
ROTARY RANGE SPRING ASSEMBLIES FOR MODEL 74 VALVE POSITIONERS

DS-305
Issue: 3
Date: 2/80

GENERAL

This instruction covers the installation and calibration of the range spring assembly kits used in conjunction with the Moore Model 74 Valve Positioner and the customer's rotary valve actuator. For complete information on the Model 74 Valve Positioner, refer to Service Instruction SD74. The table below lists the ranges, rotation, and kit numbers that are available.

INSTALLATION

1. Refer to Figure 1 to identify the parts and installation methods.
2. If a kit without a mounting plate was ordered, the customer can fabricate a plate by using the dimensions shown in Figure 2.
3. The valve actuator shaft must have a diameter of 0.3125" (±0.001). The shaft must pass through the appropriate hole in the mounting plate and into the socket of the range spring assembly which is 5/8" deep.
4. Align the range spring link with the hook on the input diaphragm assembly of the Model 74 Valve Positioner.
5. Align the split clamp so that its slot is 90° from the slot in the range spring socket.
6. Clamp the range spring assembly to the actuator shaft by tightening the split clamp screw. Torque the screw to 15-20 in. lb.
7. The travelling washer rides the span adjustment screw; as a starting point, it should be at the approximate center of the screw.

CALIBRATION

The following procedure replaces the sub-heading "Zero and Span" in the "Calibration" section of SD74.

Zero and Span Adjustments

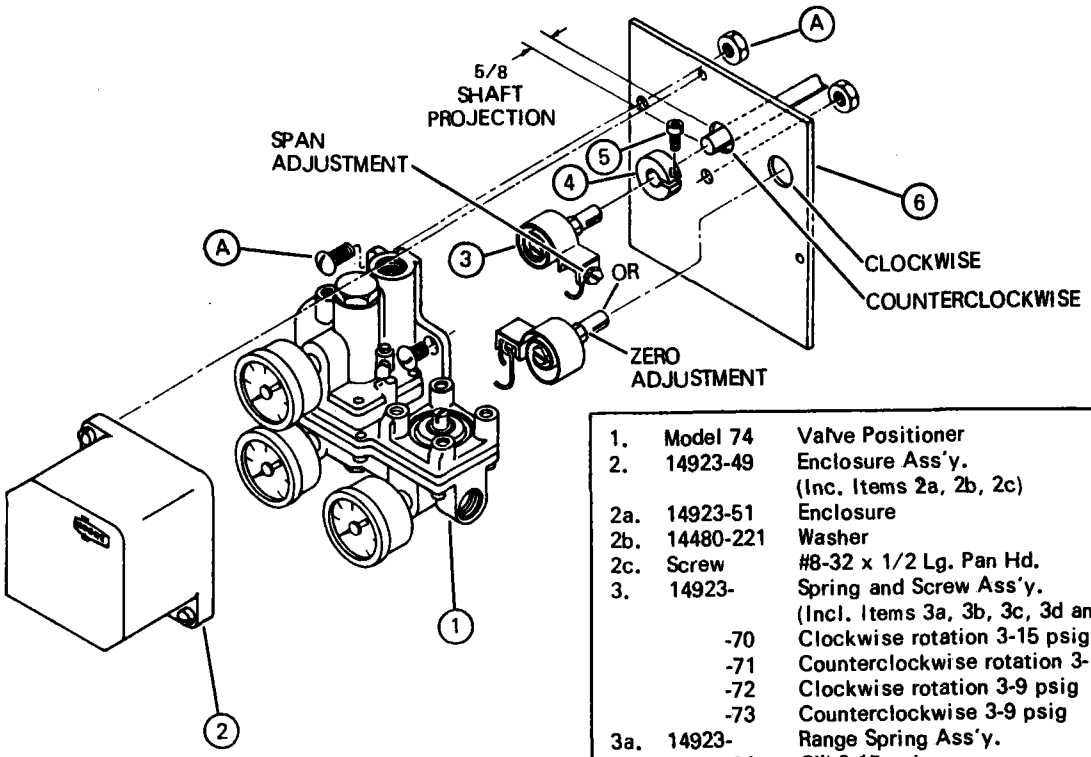
1. Apply the full actuator operating pressure to the positioner supply.
2. Set the instrument input signal to 3 psig.
3. Loosen the split clamp screw slightly; use a 3/8" wrench to turn the zero adjustment until the valve actuator is at its starting point.

   Check the zero by adjusting the input signal below 3 psig; increase the input signal slowly; the actuator should start to move when the input signal crosses 3 psig.
4. Set the input signal to its maximum span pressure (9 or 15 psig).
5. Set the range adjustment screw so that the actuator shaft assumes its maximum rotation.

   Check the span by adjusting the input signal above maximum span pressure; decrease the input signal slowly; the actuator should start to move when the input signal crosses maximum span pressure.
6. Check and reset the zero adjustment if necessary.
7. Repeat steps 2 to 5 as necessary to obtain the desired zero and span settings.

Rotation of actuator	Clockwise		Counterclockwise	
Range	3-9 psig*	3-15 psig	3-9 psig*	3-15 psig
Kit supplied with mounting plate	14923-151	14923-153	14923-101	14923-103
Kit supplied without mounting plate	14923-152	14923-154	14923-102	14923-104

*NOTE: These can also be used for 9-15 psig range; a Suppression Spring (P/N 12517-202) is required.



1.	Model 74	Valve Positioner
2.	14923-49	Enclosure Ass'y. (Inc. Items 2a, 2b, 2c)
2a.	14923-51	Enclosure
2b.	14480-221	Washer
2c.	Screw	#8-32 x 1/2 Lg. Pan Hd.
3.	14923-	Spring and Screw Ass'y. (Incl. Items 3a, 3b, 3c, 3d and 3e)
	-70	Clockwise rotation 3-15 psig
	-71	Counterclockwise rotation 3-15 psig
	-72	Clockwise rotation 3-9 psig
	-73	Counterclockwise 3-9 psig
3a.	14923-	Range Spring Ass'y.
	-61	CW 3-15 psig
	-60	CCW 3-15 psig
	-63	CW 3-9 psig
	-62	CCW 3-9 psig
3b.	14923-57	Travelling Washer
3c.	14923-55	Span Adjustment Screw
3d.	12351-3	Retaining Ring
3e.	14923-56	Link
4.	9202-2	Split Clamp (Incl. Item 5)
5.	Screw	#6-32 x 3/8 Lg. Socket Hd.
6.	14923-52	Mounting Plate (When specified)
A.		Mounting Hardware (Customer supplied)

FIGURE 1

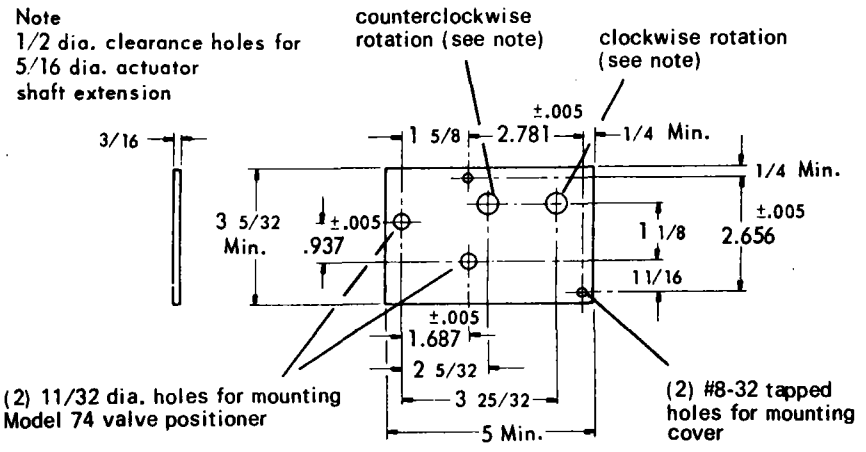


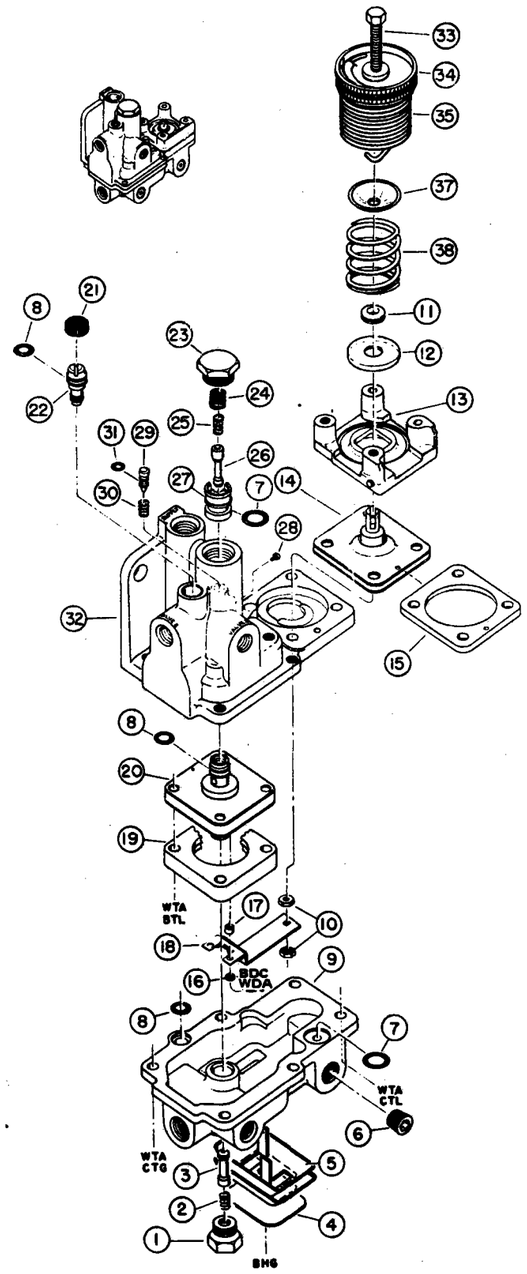
FIGURE 2. MOUNTING PLATE

MOORE PRODUCTS CO.
SPRING HOUSE, PA. 19477

PARTS LIST

MODEL SERIES 74
H/FR VALVE POSITIONERS

Drawing
No. 12372-335



	MODELS	B/M
	74G	12372-74GS8
	74N	12372-74NS8
	74SG	14811-74SGS10
	74SN	14811-74SNS10
	74SG-1	14811-30S4
HI-TEMP. MODELS	74G(M2)	14121-74GN6
	74N(M2)	14121-74NN6
	74SG(M6)	14811-20SGN8
	74SN(M6)	14811-21SNN8

Item No.	Part No.	Description	Req'd.
*1	6751–3	Sealing Screw	1
*2	6750–49	Plunger Spring	1
*3a	12372–107	Plunger	1
*3b	12372–351	Plunger ("S" Models except 74SG–1)	1
4	12372–342	Nameplate	1
5	12372–338	Exhaust Baffle	1
6a	3240	Pipe Plug ("N" Models only)	3
6b	12444–1	0–30 PSI Gauge (Not Shown "G" Models only)	1
6c	12444–2	0–160 PSI Gauge (Not Shown "G" Models only)	2
*7a	2938–3	"O" Ring	2
*7b	2938–143	"O" Ring (Hi–Temp. Models only)	2
*8a	2938–1	"O" Ring	4
*8b	2938–140	"O" Ring (Hi–Temp. Models only)	4
9	12372–152	Housing	1
10	12372–123	Nut	2
11	4951–16	Grommet	1
12	12372–108	Baffle	1
13	12372–112	Housing	1
*14a	12372–116	Diaphragm Ass'y	1
*14b	14121–15	Diaphragm Ass'y (Hi–Temp. Models only)	1
15	12372–97	Diaphragm Ring	1
16a	12372–138	Spacer	2
16b	14811–22	Spacer ("S" Models only)	2
17a	12372–51	Spacer	2
17b	14811–22	Spacer ("S" Models only)	2
18	12372–126	Beam	1
19a	12372–87	Diaphragm Ring	1
19b	14811–8	Diaphragm Ring ("S" Models only)	1
*20a	12372–364	Diaphragm Ass'y	1
*20b	14811–18	Diaphragm Ass'y ("S" Model)	1
*20c	14811–19	Diaphragm Ass'y (Hi–Temp. "S" Model)	1
*20d	14121–8	Diaphragm Ass'y (Hi–Temp.)	1
*21	12372–378	Cap	1

Item No.	Part No.	Description	Req'd.
22	12372–379	Adjusting Screw	1
*23	12372–109	Sealing Screw	1
*24	12372–130	Spring	1
*25	12372–111	Plunger Spring	1
*26a	12372–107	Plunger	1
*26b	12372–351	Plunger ("S" Models except 74SG–1)	1
27	12372–117	Pilot Seat	1
*28	10320–25	Screw	1
*29	12372–155	Cleaning Plunger	1
*30	10320–10	Plunger Spring	1
*31a	2938–16	"O" Ring	1
*31b	2938–144	"O" Ring (Hi–Temp. Models only)	1
32a	12372–159	Housing	1
32b	14811–9	Housing ("S" Models only)	1
33a	12372–273	Zero Screw – 2 3/4 lg. (According to Stroke & Span)	1
33b	12372–274	Zero Screw – 1 7/8 lg. (According to Stroke & Span)	1
33c	12372–292	Zero Screw – 3 3/4 lg. (According to Stroke & Span)	1
33d	12372–296	Zero Screw – 12 13/16 lg. (According to Stroke & Span)	1
33e	12372–303	Zero Screw – 5 lg. (According to Stroke & Span)	1
33f	12372–308	Zero Screw – 8 lg. (According to Stroke & Span)	1
34	12372–384	Range Spring Seat	2
35		Range Spring (As Specified on Order)	1
37	12372–254	Spring Seat (When Req'd.)	1
38		Suppression Spring (When Req'd.–as Specified on Order)	1

CODE		
BDC	#2–56 x 1/4 Lg. Rd. Hd. Screw	2
BHG	#6–32 x 1/2 Lg. Rd. Hd. Screw	1
BTL	#10–32 x 7/8 Lg. Rd. Hd. Screw	6
CTG	#10–32 x 1/2 Lg. Fill. Hd. Screw	4
CTL	#10–32 x 7/8 Lg. Hd. Screw	2
WDA	#2 Lockwasher	2
WTA	#10 Lockwasher	12

* Recommended On-Hand Spare Parts. Always Specify Range, Serial No., or Other Nameplate Information When Ordering Spare Parts.

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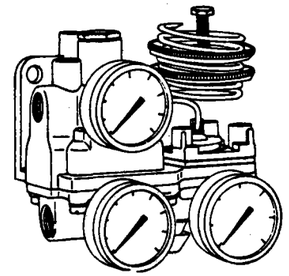
MOORE

SERVICE INSTRUCTIONS
MODEL 74
H/FR (high frequency-response)
VALVE POSITIONER AND MOTION TRANSMITTER

SD74
Issue: 7
Date: 4/80



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PARTS LIST

MOORE PRODUCTS CO., Spring House, Pa. 19477
4.1.31-26

DESCRIPTION

GENERAL INFORMATION

The Model 74 is a two stage, high frequency response valve positioner. It responds to instrument signal changes as small as 0.1% of full range. The dual-output boosters incorporated in the positioner make it ideally suited for double-acting cylinder operators. When one output is supplying air, the other is simultaneously exhausting air. This "push-pull" action provides large differential forces across an actuator to drive the valve to the desired position. When necessary, the positioner is capable of applying a full differential (supply pressure to atmosphere) across the actuator.

The Model 74 is also used as a single-action positioner for spring-type and cushion-load operators. In this case, only one of the positioner outputs is used.

A Model 74S low gain positioner is used on small bore cylinders of limited volume (generally 4" I.D. and smaller). This positioner ensures stabilized control while maintaining a high frequency response.

The Model 74S may also be used as a motion transmitter. It delivers a 3–15 psig output for input motion spans ranging from 1/4" to 48". For this application, a stabilizing restriction is added to the positioner piping. In cases where the stroke is greater than 12" and the transmission line is less than 50 feet, a volume chamber is added to the line to provide proper volume.

The ambient temperature limits for the Model 74 are −40° to +180° F. Special units may be ordered for temperatures up to 400°F.

MODEL DESIGNATION

74 S N

Basic Model Number

S – Low Gain Positioner (Transmitter)
Blank – Standard Positioner (Transmitter)

N – Without Gauges
G – With (3) Gauges

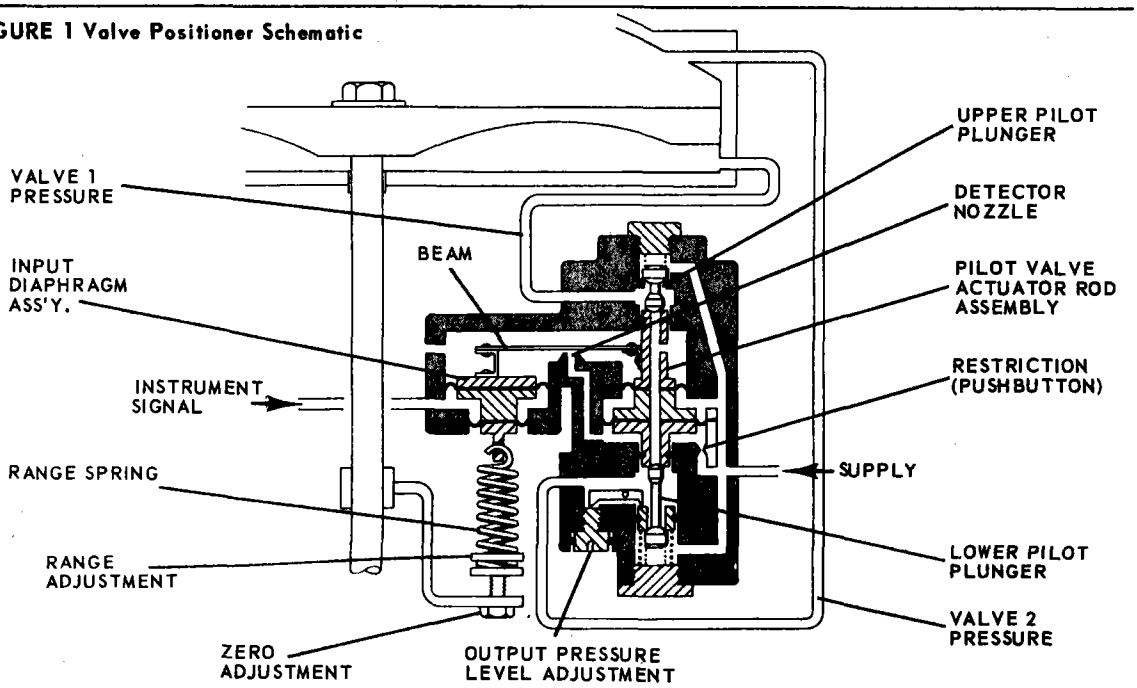
PRINCIPLE OF OPERATION

VALVE POSITIONER

The positioner operates on a force-balance principle. The forces are: Range spring tension and the pressure level of the instrument signal. The two forces oppose each other at the input diaphragm assembly. The positioner will move the valve until the tension of the range spring equals the force of the control instrument signal at the input diaphragm assembly.

Figure 1 shows the positioner connected to a double-acting piston operator. Here a balanced condition exists with the valve at mid-position. When the instrument signal pressure is increased, the resultant force on the input diaphragm assembly exceeds the tension on the range spring and the assembly moves up. The upward movement increases the clearance between the beam and detector nozzle, causing a decrease of pressure in the nozzle circuit. The decreasing pressure unbalances the forces across the lower diaphragm of the pilot valve actuator rod assembly and causes the assembly to move down. The downward movement pushes the lower pilot plunger

FIGURE 1 Valve Positioner Schematic



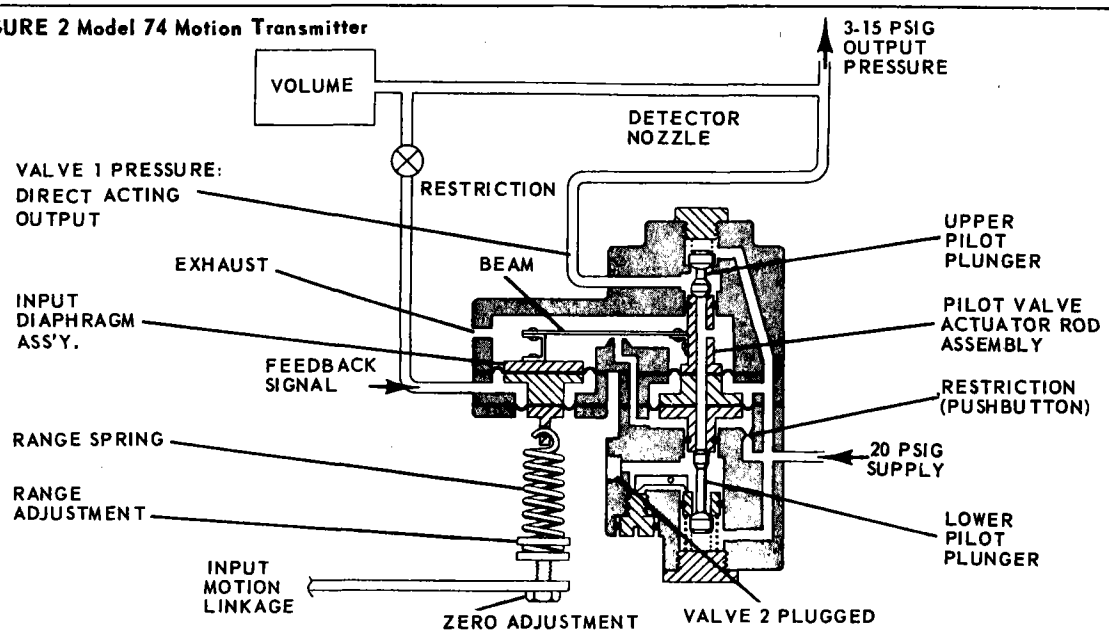
off its supply seat increasing the "Valve 2" pressure. At the same time the upper pilot plunger's exhaust seat, which is part of the pilot valve actuator rod assembly, moves away from the plunger. The "Valve 1" pressure thus decreases as the air is exhausted to atmosphere.

The resultant pressure differential across the valve actuator piston moves the piston downward and thereby increases the range spring tension. As a force-balance condition is approached, "Valve 1" and " "Valve 2" pressures begin to equalize. At balance, the pilot valve actuator rod assembly has moved back to the neutral position where the pilot plungers are neither supplying air to, nor exhausting air from, the piston operator.

A decrease of the instrument signal pressure reverses all of the foregoing actions and results in an upward movement of the actuator piston and valve stem.

On spring-loaded and cushion-loaded operators, only one of the positioner outputs is used; the other is plugged. The Model 74 is then a single-acting positioner, working against the operator spring force or cushion load. The previous principle of operation describing the double-acting positioner applies also to the single-acting positioner.

FIGURE 2 Model 74 Motion Transmitter



MOTION TRANSMITTER (See Figure 2)

The positioner when used as a motion transmitter works on the force-balance principle. The forces are comprised of range spring tension and the feedback signal pressure opposing each other at the input diaphragm assembly. The transmitter will vary the output, which feeds back through a restriction to the input diaphragm assembly. The resultant force balances the force exerted by the range spring tension at the input diaphragm assembly.

Figure 2 shows the motion transmitter connected to an input motion linkage arm. A downward movement of the linkage arm increases tension on the range spring. The resultant downward force exceeds the opposing force of the feedback signal on the input diaphragm assembly, causing the assembly to move down. This movement decreases the clearance between the beam and detector nozzle and causes an increase of pressure in the nozzle circuit. The increase of pressure unbalances the forces across the lower diaphragm of the pilot valve actuator rod assembly and causes the assembly to move upward. This movement pushes the upper pilot plunger off its supply seat, increasing the output pressure.

The output pressure is fed back through the stabilizing restriction into the input diaphragm assembly. This pressure increases until it exerts a force on the input diaphragm assembly equal to that applied by the range spring tension. When in balance, the input diaphragm assembly has moved to a neutral position. The actuator rod assembly has closed the pilot supply, thus maintaining the feedback pressure at the balance level.

When the motion arm moves upward, spring tension decreases and the foregoing actions are reversed. The actuator rod assembly will exhaust the output pressure until it reaches the balance level.

For strokes greater than 12" where the transmitter output tubing is run only a short distance (generally less than 50' for 1/4" O.D. tubing), a volume chamber should be installed in the line to provide stable operation.

The "Valve 1" port is the only one used in the transmitter. The "Valve 2" port is plugged; therefore, the lower pilot plunger has no effect on the transmitter operation.

INSTALLATION

VALVE POSITIONER

Refer to Figure 7 for mounting dimensions and connections. On double-acting positioners, the "Valve 2" pressure must be applied to the actuator so as to extend the range spring and restore rebalance. On single-acting positioners, only one valve connection is used; the other must be plugged. When "Valve 2" connection is used, the pressure from the port must increase range spring tension. When "Valve 1" is used, the pressure must decrease range spring tension.

The two basic mounting positions of the Model 74 position are "normal", where the nameplate is on the bottom, and "inverted", where the nameplate is on the top. Valve design and the desired valve position when the instrument signal is maximum determine whether the Model 74 should be mounted "normal" or "inverted".

The valve positioner must be rigidly mounted to the actuator. The motion take-off arm must be securely mounted.

A regulated supply pressure to the positioner is not normally required. However, clean, oil and moisture free air should be used. An instrument air filter located in the supply line will reduce difficulties which might result from dirty air.

High supply pressures will result in greater forces available to stroke the actuator. The maximum supply pressure is 150 psig. Maximum overload protection is 150 psig at any connection.

In the following tables, Table #1 shows the various positioner-actuator combinations when using a double-acting cylinder operator. Table #2 shows the various positioner-actuator combinations when using single-acting spring-loaded or cushion-loaded actuators. In both the single-acting and double-acting combinations, a fail-safe action is provided.

TABLE #1
Double – Acting Cylinder Operators

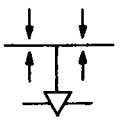
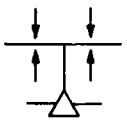
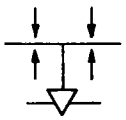
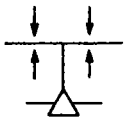
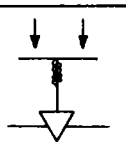
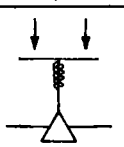
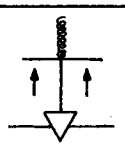
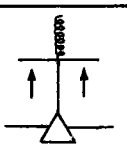
Valve Design				
Valve Action	Down to Close	Up to Close	Down to Close	Up to Close
Maximum Controller Output, Valve	Closes	Opens	Opens	Closes
For Controller Air Failure, Valve	Opens	Closes	Closes	Opens
Positioner Mounting	Inverted	Inverted	Normal	Normal

TABLE #2
Single-Acting Operators

				
Actuator	Top	Top	Bottom	Bottom
Valve Action	Air Closes	Air Opens	Air Opens	Air Closes

Desired Valve Action

Maximum Controller Output, Valve	Closes	Opens	Opens	Closes	Opens	Closes	Closes	Opens
For Controller Air Failure, Valve	Opens	Closes	Closes	Opens	Closes	Opens	Opens	Closes
For Positioner Supply Air Failure Valve	Opens	Opens	Closes	Closes	Closes	Closes	Opens	Opens
Mounting Position	Inverted	Normal	Inverted	Normal	Normal	Inverted	Normal	Inverted
Port to be Connected to Actuator	Valve 2	Valve 1	Valve 2	Valve 1	Valve 2	Valve 1	Valve 2	Valve 1
Port to be Plugged	Valve 1	Valve 2	Valve 1	Valve 2	Valve 1	Valve 2	Valve 1	Valve 2

MOTION TRANSMITTER

The Model 74S, when used as a motion transmitter, should be securely mounted so that the input motion will extend the range spring. The range spring should be mounted directly in line with the input diaphragm assembly stem.

The transmitter is not position sensitive and, therefore, may be mounted in any position that is suitable for proper connection to the input motion mechanism.

The "Valve 1" port serves as the transmitter's output and is teed back through a restriction (Part No. 14411-7) into the "Instrument" port to provide the feedback. The "Valve 2" port is plugged with a 1/4" NPT pipe plug. For input motions greater than 12", where the transmission line is less than 50', a volume chamber (Part No. 4615) is placed in the output line to provide stable operation.

The input motion mechanism must have the power to develop a tensile force on the range spring for proper operation. A force of approximately 13 lbs. is necessary to reach 15 psig output from the transmitter.

A clean, oil and moisture free air supply should be used. The transmitter supply should be regulated at 20 psig.

RANGE AND SUPPRESSION SPRINGS

Figure 3 shows a correctly assembled range spring assembly.

The range spring assembly consists of a range spring, zero adjusting screw and two range spring seats. To assemble, set one spring seat knurled edge down, on the range spring. Start the spring through the hole in the spring seat and turn three revolutions counterclockwise. Set the second seat, knurled edge up, on the spring and turn two revolutions counterclockwise until the cuts on the spring seats align. There should now be one coil between the spring seats.

Attach the range spring hook to the input diaphragm assembly stem. The zero adjusting screw can now be installed through the take-off arm and turned into the range spring seats. After zero and span adjustments are made, turn the upper spring seat clockwise to lock the zero screw (see CALIBRATION, ZERO and SPAN). The cut on the upper spring seat will be approximately 3/4" away from the cut on the lower spring seat when locked.

IMPORTANT

If the positioner is mounted where severe vibration may be encountered, a customer provided 1/4–20 locknut should be installed on the zero screw and tightened down to the upper spring seat (see Figure 3).

For split ranging and for ranges that start at a pressure greater than 3 psig, a suppression spring and seat may be required to suppress the range of the valve positioner. These parts are installed before the range spring is attached to the positioner (see Figure 4).

Stock range and suppression springs are available for valve strokes up to 48". Refer to the selection chart for springs and mounting accessories. For strokes not listed on the chart, consult the factory for parts.

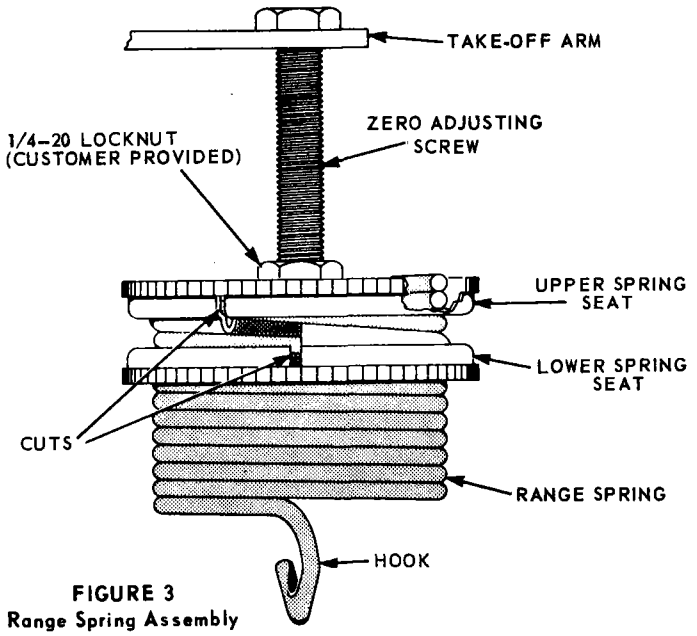


FIGURE 3
Range Spring Assembly

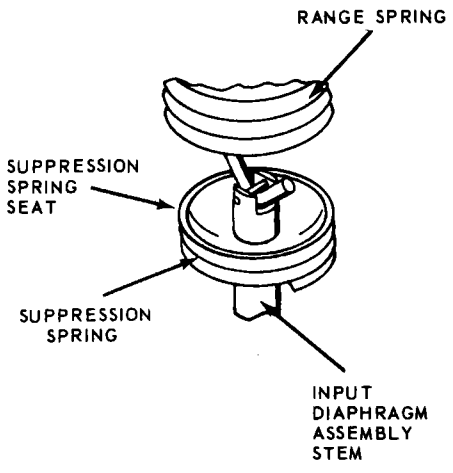


FIGURE 4
Suppression Spring

SD74

Range Spring Selection Chart

NUMBERS (#14995–) ARE FOR RANGE SPRING ASSEMBLIES.
Assemblies contain Range Spring, Seat and Zero Screw.

Range of Strokes (Inches)		Nominal Instrument Pressure Range PSIG				
		3–15	3–9	3–27	0–30	0–15
1/4–1–1/2	Part No.	14995–101	14995–114	14995–104	14995–107	14995–110
	Color Code	Black	Black–Red	Black–Yellow	Black–Orange	Black–Green
1–1/2–2–3/4	Part No.	–102	–115	–105	–108	–111
	Color Code	White	White–Red	White–Yellow	White–Orange	White–Green
2–3/4–4	Part No.	–103	–116	–106	–109	–112
	Color Code	Blue	Blue–Red	Blue–Yellow	Blue–Orange	Blue–Green
4–6	Part No.	–119				
	Color Code	Brown				
6–9	Part No.	–117	–128	–126		
	Color Code	Green	Brown–Red	Green–Yellow		
9–12	Part No.	–120	–129	–127		
	Color Code	Red	Yellow–Red	Green–Red		
12–19	Part No.	–118				
	Color Code	Orange				
48	Part No.	–121				
	Color Code	——				

To obtain suppressed ranges such as 9-15 PSIG, 7-11 PSIG, a suppression spring assembly (spring and seat) must be added. The suppression spring only affects the zero level by the fixed amount shown and has no effect on stroke or span.

Suppression: on PSIG Spring Color Part #	2.5 Black 12517–201	6 Orange 12517–202	11 Red 12517–204	12 Green 12517–205	14 White 12517–206

CALIBRATION

VALVE POSITIONER (See Figures 1 and 3)

The Model 74 Valve Positioner has three calibration adjustments: zero, span and output pressure level. All adjustments should be made with the positioner properly mounted on the control valve for which it is intended.

Zero and Span

1. Apply the full actuator operating pressure to the positioner supply.
2. Set the instrument input signal at its minimum span pressure (3 psig for a 3 to 15 psig range).
3. Loosen the range spring seats and turn the zero adjusting screw until the valve stem just begins to move.
4. Set the instrument input signal at its maximum span pressure (15 psig for a 3 to 15 psig range).
5. The valve should be at its maximum stroke position. If not, turn both seats at the same time to reduce or increase the number of active coils of the spring. The seats should be turned until the valve just begins to move from its maximum stroke position. Then continue turning an additional one-half as many revolutions as originally turned.
6. Recheck and adjust the zero.
7. Repeat steps 2 through 6 until the desired stroke is attained.
8. Lock the zero screw by holding the bottom seat and turning the top seat clockwise approximately 3/4".

NOTE:

Stroke range is continuously adjustable within limits. See the selection chart for additional stroke ranges and their mounting accessories.

Output Pressure Level

The output pressure level adjustment (balance adjustment) permits the pressure in the actuator chambers to be varied as desired. The optimum actuator pressure level setting for equal speed of operation in both directions is approximately 75% of supply pressure. This setting is accomplished as follows.

1. Make certain there is no process force on the valve. (The valve should be removed or isolated from the process.)
2. On positioners without gauges, connect gauges in the "Valve 1" and "Valve 2" lines.
3. Apply the full actuator operating pressure to the positioner supply.
4. Set the instrument input signal to midscale (9 psi for 3 to 15 psig range). Allow the actuator pressures to stabilize.
5. Observing the pressures on the gauges, turn the output level adjustment screw to obtain a reading approximately 75% of supply pressure.

When making this adjustment, sufficient time should be allowed for the pressure to stabilize. Exact matching of the gauge readings should not be expected since the area on one side of the piston may be less, due to the piston stem, thus requiring a slightly higher pressure to balance the opposing force.

On single acting circuits where one of the valve ports is to be plugged, the output pressure level adjustment screw should be turned in two turns clockwise from any balanced operating position in which the output pressures are equal to each other. This places the unused pilot plunger out of operation.

MOTION TRANSMITTER (See Figure 2)

The Model 74S Motion Transmitter has two calibration adjustments, zero and span. The output pressure level adjustment is not used and is turned in to its limit.

Zero and Span

1. With the transmitter mounted in its intended operating position, connect the output ("Valve 1" port) to an accurate test gauge or a mercury column. The "Valve 2" port is plugged.
2. Apply a 20 psig regulated pressure to the supply port.
3. Set the input motion linkage arm to the position where minimum tension is exerted on the range spring.
4. Loosen the spring seats and turn the zero adjusting screw until the output is 3 psig.
5. Set the input motion linkage arm to its maximum tension position.
6. The output should be 15 psig. If not, turn both spring seats at the same time to reduce or increase the number of active coils of the spring. The seats should be turned until the output pressure is 15 psig. Then continue turning an additional one-half as many revolutions as originally turned.
7. Re-zero the unit.
8. Repeat steps 3 through 7 until the transmitter is calibrated.
9. Lock the zero screw by holding the bottom seat and turning the top seat clockwise approximately 3/4".

MAINTENANCE

GENERAL

As with all pneumatic instruments, a clean, oil and moisture free air supply will minimize the maintenance problems. An air filter, such as the Moore Model 2306, should be installed in the supply air line. This filter should be blown down frequently, and the filter element inspected and replaced when necessary.

A spring return pushbutton restriction cleaner has been built into the body of the valve positioner. Pushing this button periodically clears the restriction and will eliminate problems caused by build-up on the restriction. Pushing the button will not interrupt operation of the valve.

A build–up of dirt on the pilot plungers or their seats may cause erratic operation. To clean these, turn off the supply and, remove the sealing screws and drop the plungers out. A pipe cleaner and solvent can be used to clean the plunger seats.

There are several parts that differ between the Models 74 and 74S. These parts cannot readily be marked, and pose identification problems. Figure 8 shows a side by side comparison of the variable parts.

DISASSEMBLY

If it is necessary to disassemble the positioner, refer to the parts list and proceed as follows:

1. Remove the pilot plunger sealing screws, plunger springs and plungers.
2. Remove the six body screws and separate the upper and lower housings.
3. Pull the baffle and grommet off of the input diaphragm assembly stem.
4. Remove the two small screws holding the beam to the output diaphragm assembly. Be careful not to lose the spacers and washers.
5. Remove the nut holding the beam on the input diaphragm assembly and remove the beam.
6. Remove the two screws holding the input diaphragm assembly housing to the upper housing.
7. Separate the diaphragms of the input diaphragm assembly from the input and upper housings.
8. Remove the input housing and slide the input diaphragm assembly out of the upper housing.
9. Remove the four screws holding the output diaphragm assembly to the upper housing.

Caution

There is a blind capillary restriction that cannot be seen until the output diaphragm assembly is removed from the upper housing. This small restriction tube is easily damaged if undue prying or force is used to separate the output diaphragm assembly from the upper housing. See Figure 5 and Step 10 for removal instructions

10. Insert a screwdriver between the upper housing and the output diaphragm assembly at the locations shown by the arrows in Figure 5. Twist the screwdriver in the direction indicated by the arrows. Twist only enough to just move the output diaphragm assembly. Do not pry!
11. Once the output diaphragm assembly is loosened from the upper housing, pull it straight out of the upper housing. A slight wiggling motion may be required.
12. Sometimes the clamping plate will separate from output diaphragm assembly before this assembly is separated from the upper housing. If it does not, separate the clamping plate after the output diaphragm assembly has been removed from the upper housing.
13. Clean and inspect all parts for wear or damage and replace if necessary.

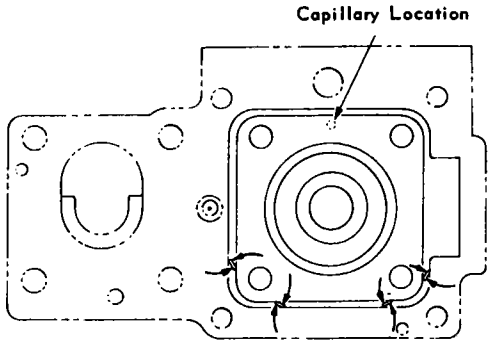


FIGURE 5 Upper Housing & Output Diaphragm

ASSEMBLY

To assemble, reverse the disassembly procedure and take into account the following:

1. Care must be exercised when installing the output diaphragm assembly. The tiny capillary tube must be carfully guided into the small hole in the upper housing. Be sure the capillary is engaged in the hole before installing and tightening the clamping plate.
2. When assembling the diaphragm spacer to the input diaphragm assembly, align the small hole in the lower diaphragm (beam side of the assembly). The small hole in the upper diaphragm (range spring side of the assembly) does not line up with a hole.
3. Slide the input diaphragm assembly into the upper housing so that the small hole in the lower diaphragm and spacer line up with the small hole in the upper housing.
4. Install the beam after the input and output diaphragm assemblies have been installed and securely tightened. Thick and thin spacers for Models 74N and 74G must be installed as noted in Figure 6. Spacers for Models 74SN and 74SG are of equal thickness. Torque the two screws that hold the beam to the Output Diaphragm Assembly to 2.0 – 2.5 in. lbs. Set the height of the beam, per Figure 6, before locking the small jam nuts on the input diaphragm assembly.
5. A complete calibration is required after assembly. This includes zero, span and output pressure level adjustments.

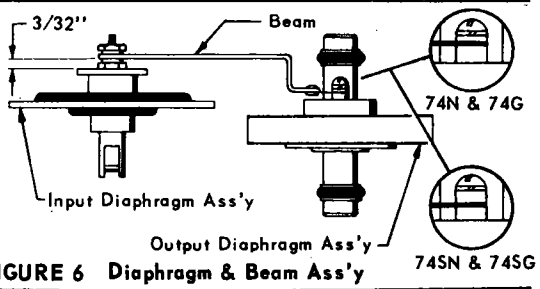


FIGURE 6 Diaphragm & Beam Ass'y

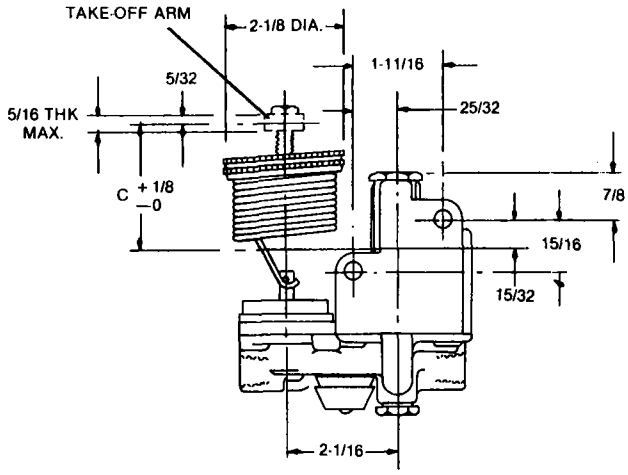
6 P.S.I. INSTR. PRESS. SPAN		12 P.S.I. INSTR. PRESS. SPAN		15 P.S.I. INSTR. PRESS. SPAN		24 P.S.I. INSTR. PRESS. SPAN		30 P.S.I. INSTR. PRESS. SPAN	
STROKE	"C" DIM.	STROKE	"C"DIM.	STROKE	"C"DIM.	STROKE	"C"DIM.	STROKE	"C "DIM.
1/4 - 1-1/2	1-1/2	1/4 - 1-1/2	1-5/16	1-1/4 - 1-1/2	1-9/32	1/4 -1-1/2	1-17/32	1/4 - 1-1/2	1-19/32
1-5/8 - 2-3/4	2-9/32	1-5/8 - 2-3/4	2-7/32	1-5/8 - 2-3/4	2-7/32	1-5/8 - 2-3/4	2-9/32	1-5/8 - 2-3/4	2-9/32
2-7/8 - 4	3-9/32	2-7/8 - 4	3-7/32	2-7/8 - 4	3-5/32	2-7/8 - 4	3-1/4	2-7/8 - 4	3-5/32
4-1/8 - 6-1/2		4-1/8 - 6-1/2	4-1/2						
6-1/8 - 9	5-31/32	6-5/8 - 9	5-3/4			6-1/8 - 9	7-1/2		
9-1/8 - 12	7-23/32	9-1/8 - 12-3/4	8-9/16			9-1/8 - 12	9-5/8		
		12-1/8 - 19	12-1/32			12-1/8 - 19			

"C" DIMENSION FOR SPECIAL STROKES (19" OR LONGER) WITH 3 TO 15 P.S.I. INSTRUMENT PRESSURE RANGE = .68 X STROKE

EXAMPLE: 19" STROKE, C = .68 x 19 = 12.92"

NOTES:

ALL CONNECTIONS 1/4 NPT WITH EXCEPTION OF 1/8 NPT GAUGE CONNECTIONS. INCREASE IN INSTRUMENT AIR CAUSES INCREASE IN PRESSURE AT "VALVE 2" CONNECTION. "VALVE 2" PRESSURE MUST BE APPLIED TO ACTUATOR SO AS TO EXTEND RANGE SPRING AND RESTORE BALANCE.



REAR VIEW

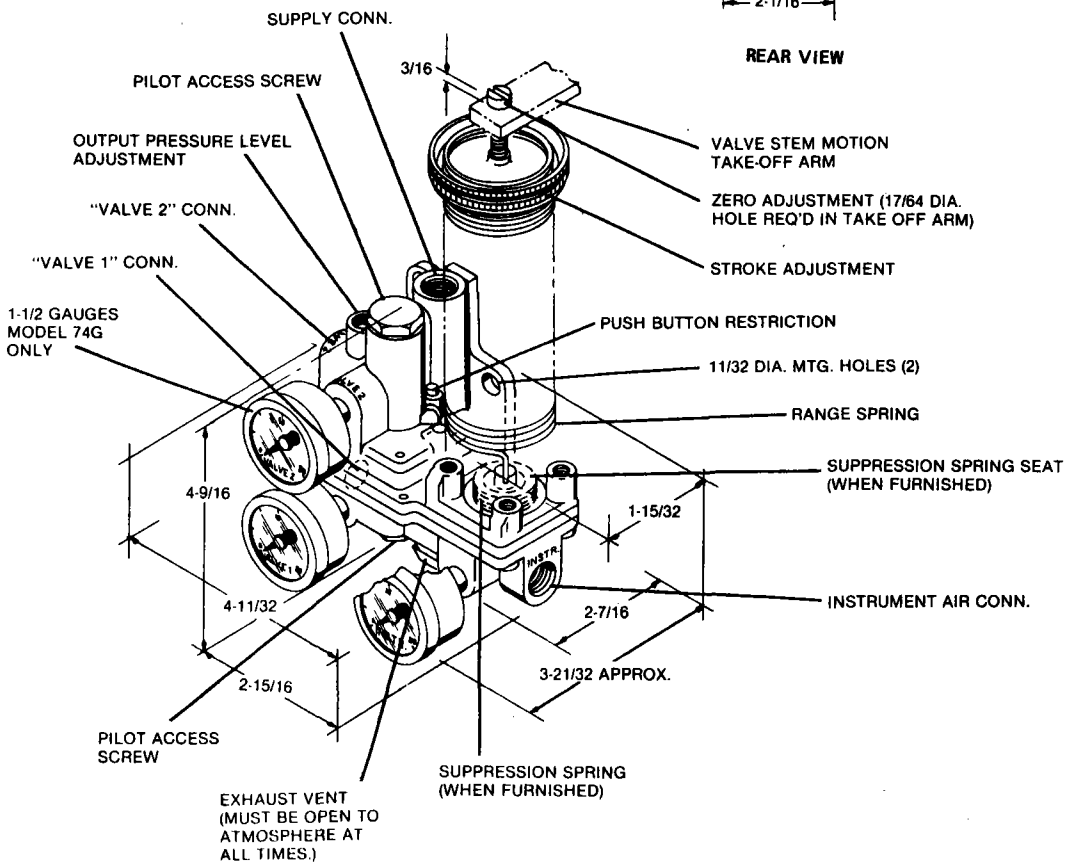
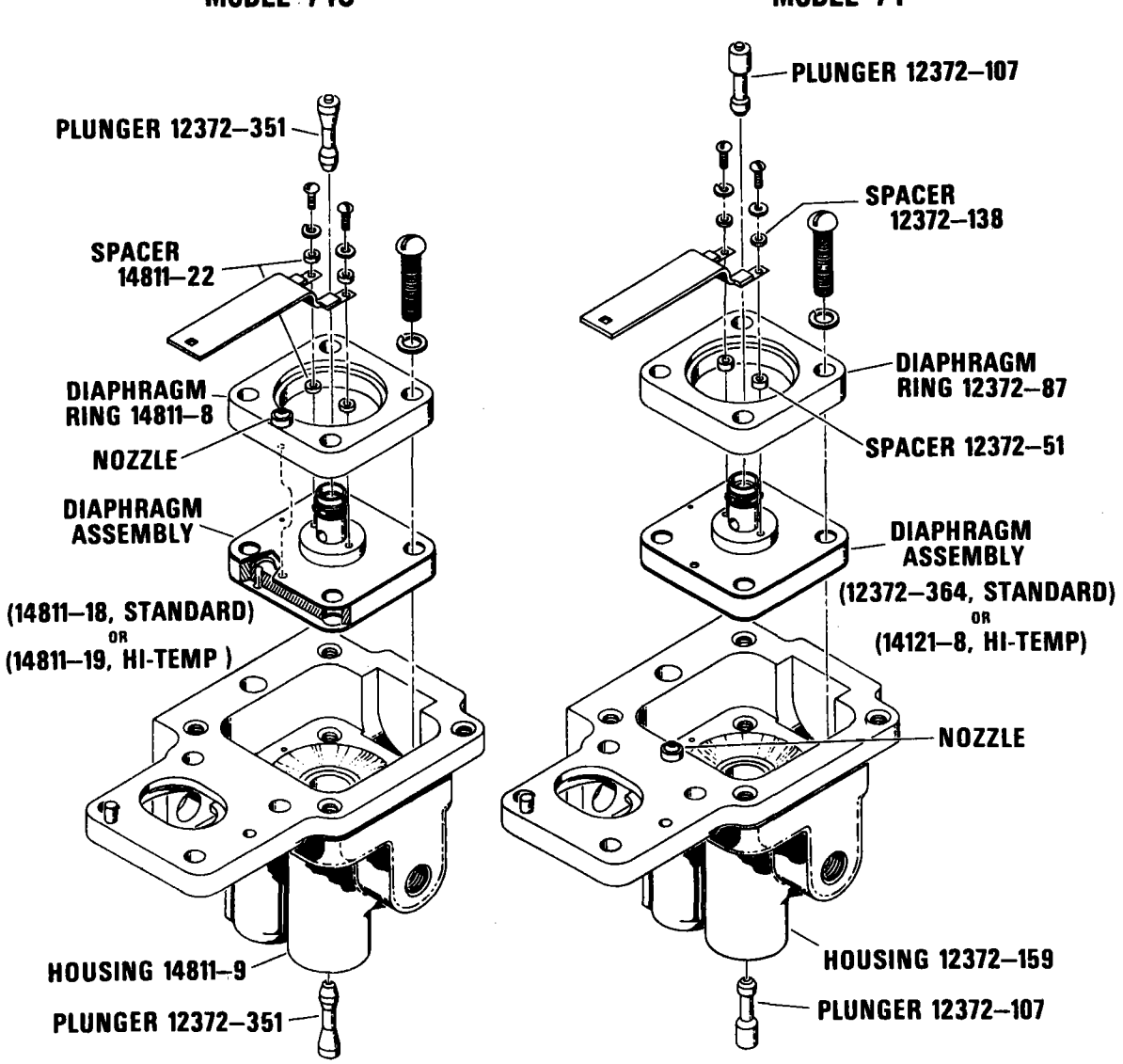


FIGURE 7 Installation Dimensions



PLUNGERS – The plungers differ in shape as can be seen in the illustration.

SPACERS – There are four spacers in each positioner.

Model 74 – The two lower spacers have a thickness of .072". The two upper spacers have a thickness of .031".

Model 74S – All four spacers have a thickness of .057".

DIAPHRAGM RING – The diaphragm rings can be identified by the presence or absence of the positioner nozzle. Model 74S has the diaphragm ring with the nozzle; Model 74 does not.

DIAPHRAGM ASSEMBLY – The diaphragm assemblies are more difficult to identify. The only visual recognition is the presence or absence of a small hole drilled through the metal, diaphragm spacer. The cutaway view for Model 74S locates this hole. Model 74S has the diaphragm spacer with the hole; Model 74 does not.

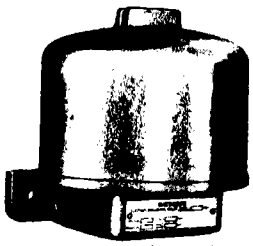
HOUSING – The housings can be identified by the presence or absence of the positioner nozzle. Model 74 has the housing with the nozzle; Model 74S does not.

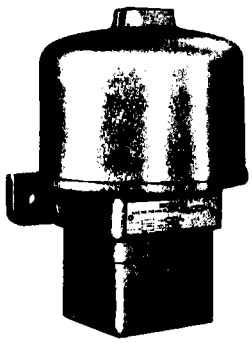
FIGURE 8 Parts Comparison Models 74 & 74S

INSTRUCTION MANUAL

ELECTRO-PNEUMATIC RELAYS
MODELS 443 & 445

Model 443 For Smaller Load Requirements





Model 445 With Integral Pneumatic Booster For High Load Requirements

Robertshaw
CONTROLS COMPANY
Industrial Instrumentation Division
333 N. Euclid Way, Anaheim, CA 92803
TWX 910-591-1176 Telephone (714) 535-8151

NUMBER

1406, Issue 13

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4.1.31-36

The Series 400 Electro-Pneumatic Relays are devices which convert a d-c current signal into a proportional air pressure signal.

The 443 is designed to be used where load volume is small, as in gauges, bellows, receivers, etc.

The 445 unit (443 with pneumatic booster) is used where load volume requirements are high.

Both instruments are designed for use in explosive atmospheres and may be calibrated for either direct or reverse operation.

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Calibration	8
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Removal and Replacement of Parts	19
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SPECIFICATIONS

Input Ranges

Input Current	Input Resistance
1-5 ma dc	2,100 ohms
4-20 ma dc	135 ohms
10-50 ma dc	26 ohms
0-10 vdc	1000 ohms (10 ma span)
0-8 vdc	800 ohms (10 ma span)

Output Range

3 to 15 psig standard
3 to 27 psig available
6 to 30 psig available

Calibration Accuracy

±1/2% of span (limited by linearity) for a 3 to 15 psig range.
±1-1/2% for a 3-27 or 6-30 psig range.
±0.25% for 3-15 psig range (Special order accuracy)

Repeatability

0.1% for 443.
0.1% for 445.

Maximum Overload

100 psig causes no damage to instrument.

Pressure Supply

20 psig for 3 to 15 psig instruments.
35 psig for 6-30 psig instruments.
32 psig for 3-27 psig instruments.

Air Consumption

6 scfh (average) for 443.
20 scfh (steady state) for 445.

Ambient Temperature Range

-40°F to 160°F. Ambient temperature variations of 75°F cause a change in output of less than 1% of span and 1% of zero.

Sensitivity

0.1%.

Supply Variation

1% for 20% supply pressure change (18-22 psi).

Minimum Load Volume

1.5 cubic-inches for (443).

Maximum Air Flow

10 scfh for exhaust, 8 scfh for supply (443).
8 scfm for supply and exhaust (445).

Transient Response

1.8 seconds for a 445 driving a 144 square-inch valve top @ 1-1/2 inch stroke for 98% completion of stroke.

Frequency Response Data

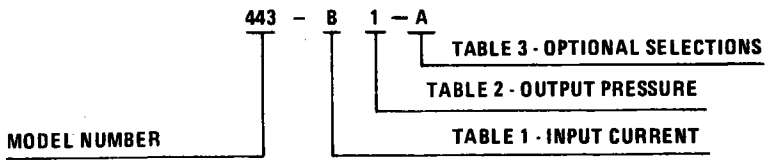
Available on request.

FM and CSA Approvals

Factory Mutual approved for Class I, Div. 1, Group C & D and Class II, Div. 1, Groups E, F, & G Hazardous Locations.

CSA and Factory Mutual approved(Models 443/445-B(1,2,3) and 443/445-B1-A only) as intrinsically safe for Class I, Div. 1, Groups B, C and D if connected to Taylor Instrument Company Model 124S1134 Mulitple Barrier and installed per Robertshaw interconnection drawing 907-600-543.

MODEL NUMBER CODING



E-P RELAY MODEL NUMBER & PRICING
TABLE A

MODEL NO.	DESCRIPTION
443	E-P Relay, delivers 0.135 SCFM air
445	E-P Relay, delivers 8.0 SCFM air

NOTE: Place dash (-) between Table A and Table 1

TABLE 1 – INPUT CURRENT OR VOLTAGE

DESIGNATION	DESCRIPTION
A	Current Input 1-5 ma dc input resistance, 2100 ohms
B	Current Input 4-20 ma dc input resistance, 135 ohms
C	Current Input 10-50 ma dc input resistance, 26 ohms
E	Voltage Input 8 vdc span, temperature compensated (R=800 ohms, I=10 ma) (See Product Specifications for suppression limits)
F	Voltate Input 10 vdc span, temperature compensated (R=1, 000 ohms, I=10 ma) (See Product Specifications for suppression limits)

TABLE 2 – OUTPUT PRESSURE

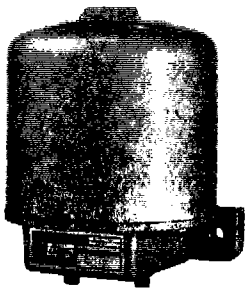
DESIGNATION	DESCRIPTION
1	3 to 15 psig output (20 psi air supply)
2	3 to 27 psig output (35 psi air supply)
3	6 to 30 psig output (35 psi air supply)

TABLE 3 – OPTIONAL SELECTIONS

DESIGNATION	DESCRIPTION
A	High Accuracy, ±0.25% linearity available on designations A, B and C Table 1 and limited only to Designation 1 of Table 2. With certified 5 point calibration data sheet.

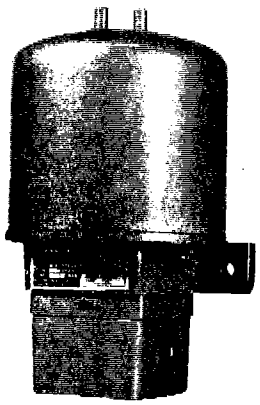
ACCESSORY ITEMS

NEW PART NO.	DESCRIPTION
435-950-097	U-bolt for mounting on 2" pipe



Model 443 For Smaller Load Requirements

Figure 1



Model 445 With Integral Pneumatic Booster For High Load Requirements

Figure 2

PRINCIPLE OF OPERATION

Electro Pneumatic Relay (443)

Direct Action (Increasing input current increases output air pressure). For direct action, the input wires are connected so that the beam will move towards the nozzle on increasing input current. As the beam approaches the nozzle, it closes off the nozzle and allows less air to "bleed" through. As a result, the output pressure increases. The beam will move until the force produced by input current is equalized or rebalanced by the force produced by air pressure acting through the nozzle area, against the beam.

Reverse Action (Increasing input current decreases output air pressure). For reverse action the input wires are connected so that the beam will move away from the nozzle on increasing input current. As the beam moves away from the nozzle it allows more air to "bleed" through the nozzle. As a result the the output air pressure decreases. The beam will continue to move until forces are balanced as described above.

Pneumatic Booster (on 445)

The output from the nozzle circuit (of the 443) is fed directly into the input chamber of the 1 : 1 (pressure ratio) force balance volume booster (see Figure 3). On increasing pressure the stack moves downward, pushing the poppet valve off the supply seat, allowing air to flow until the output pressure matches the input pressure. When the output pressure matches the input pressure the poppet valve is seated, the supply pressure is blocked off and the output pressure remains at its new value. When the input pressure decreases, the stack moves upward, opening the exhaust seat and allowing air to flow out until the output pressure matches the input pressure. When the output pressure again matches the input pressure the poppet valve is seated, thus the exhaust port is blocked off and the output pressure remains at its new value.

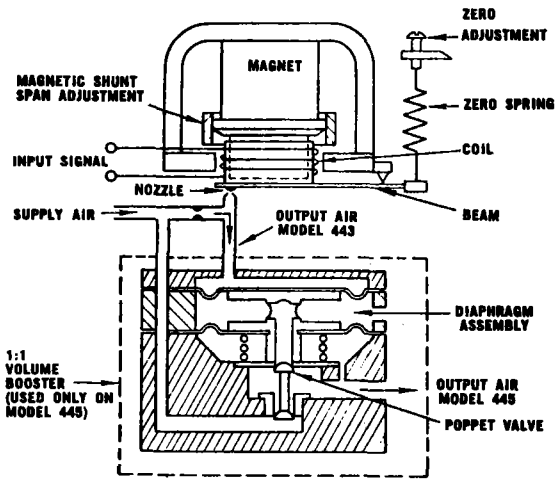
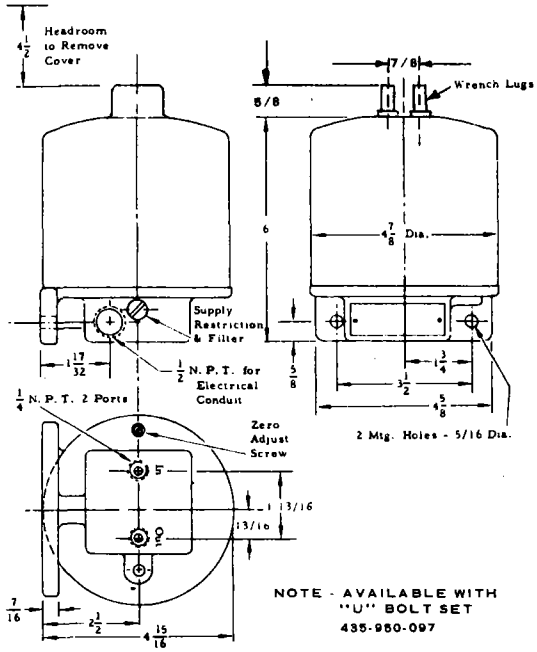
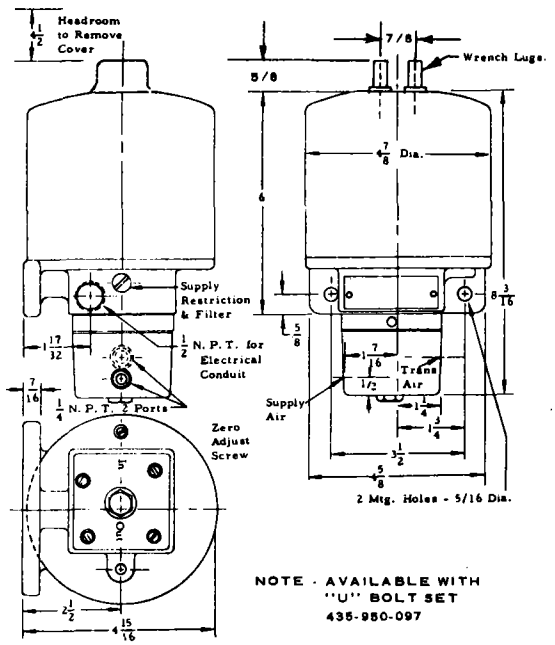


Figure 3 - Principle of Operation



443 GENERAL DIMENSIONS
Figure 4



445 GENERAL DIMENSIONS
Figure 5

INSTALLATION

The Series 400 Electro Pneumatic Relay is designed to be mounted on any vertical surface in any convenient position. Figures 4 and 5 show general dimensions for the 443 and 445.

NOTE: A wire busbar (Part Number 498-601-022) is installed between the + and - terminals for shipping purposes, and must be removed prior to relay installation.

Outdoor Installation

For outdoor installations, consideration must be given to protecting the interior of the housing from contamination by moisture. It is therefore recommended that the instrument be mounted with the air breather (Item 19, Figure 9) in the underneath position. This affords maximum weather protection.

Indoor Installation

For indoor installations the unit can be mounted in any position. If it is mounted in any position other than that prescribed for outdoor installations, it will be necessary to make a slight adjustment to the Zero in order to bring the unit into calibration.

Mounting

Flat Surface. The instrument is provided with two 5/16 inch holes in the mounting pad on 3-1/2 inch centers.

Pipe or Angle Iron. A special U clamping bolt (Part No. 435-950-097) may be ordered to facilitate mounting the instrument to a 2 inch pipe or angle iron member when a suitable flat surface is not available.

Electrical Connections (see Figure 6)

NOTE

Capacitor C1 is used on Models 443/445-A()-() only.

The electrical terminal strip is made accessible when the instrument cover has been removed. A 1/2 inch NPT female port is supplied for conduit connection.
Connect input lines as follows:

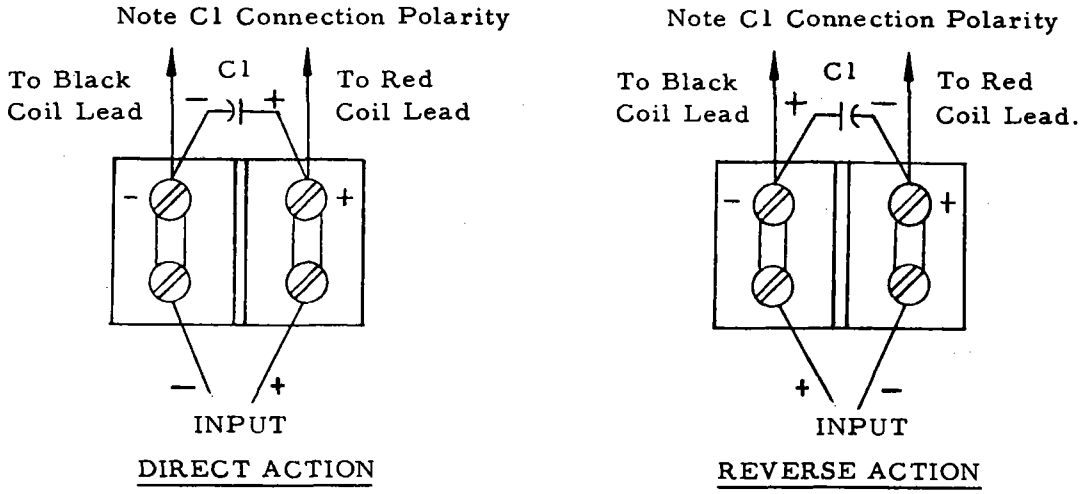
Direct action - Connect (+) input to (+) (red wire) terminal.
Connect (-) input to (-) (black wire) terminal.
Connect Capacitor C1 as shown in Figure 6 for Direct Action.

Reverse action - Connect (+) input to (-) (black wire) terminal.
Connect (-) input to (+) (red wire) terminal.
Connect Capacitor C1 as shown in Figure 6 for Reverse Action.

NOTE: This instrument is a series connected instrument. It will not function correctly if any current device is connected in parallel with the input connections.

Air Connections

Two 1/4 inch NPT female ports are supplied for Output air and Supply air. The In port is for the supply air connection; the Out port is for the output air connection.



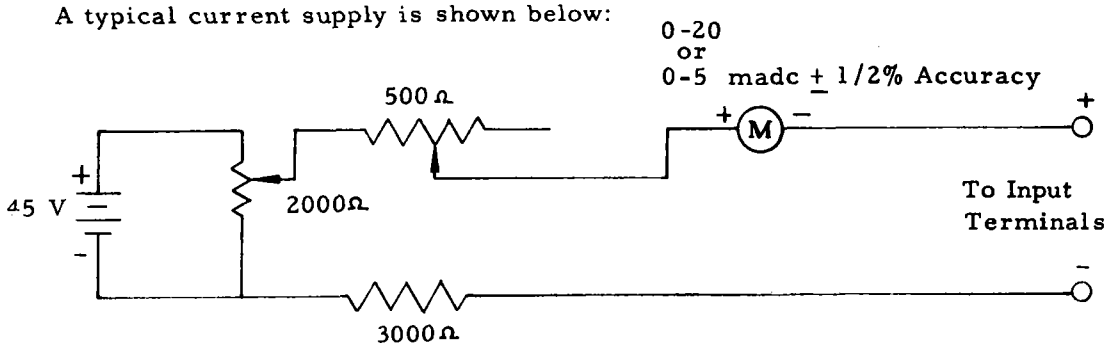
NOTES: 1. Red dot on capacitor C1 identifies (+) lead. Capacitor is used on 1-5 madc units only.
2. Combined resistance of wires from Controller not to exceed 400 ohms (1-5 MADC) or 500 ohms (4-20 MADC).

Figure 6 - External Wiring

CALIBRATION

A low pressure air supply (20 psig) is required for instrument supply pressure. A manometer or accurate (±1/2%) pressure gauge should be used to check the output air pressure.

A typical current supply is shown below:



NOTE: Before attempting to calibrate the instrument, Nozzle and Flapper Alignment should be checked by pressing the beam against the

nozzle to see that the output pressure will rise to within 2 psig of supply pressure. If the pressure does not rise to within 2 psig of supply pressure consult the section - Ball Flapper and Nozzle Alignment - outlined under "Maintenance".

Direct Action

1. Connect positive (+) input to input terminal marked +. Connect negative (-) input to input terminal marked -. On 1-5 madc units, connect capacitor C1 as shown in Figure 6 for Direct Action.
2. Apply 1.0 or 4.0 milliamperes input current as applicable.
3. Adjust the Fine Zero Adjust Screw (Figure 7) unitl output air pressure is 3.0 psig. Clockwise rotation causes output pressure to decrease. If the Fine Zero Adjust Screw does not provide sufficient adjustment, loosen the Coarse Zero Adjust Screw (Figure 7) and increase the tension of the spring and retighten screw. Rezero with the Fine Zero Adjust Screw.
4. Apply 5.0 or 20.0 milliamperes input current as applicable.
5. Output air should increase to 15.0 psig. If it does not, adjust range as follows: Loosen locking screw (Figure 8) and turn adjusting screw (Figure 8) until 15.0 psig is obtained. Retighten locking screws.

NOTE: The output span increases as the magnetic shunt ring is moved away from the magnet.

6. If the range was adjusted in step 5, it will be necessary to repeat steps 1 through 5 until the calibration is within limits, as the adjustment of range has a slight effect on the minimum output pressure.

Reverse Action

1. Connect positive (+) input to input terminal marked -. Connect negative (-) input to input terminal marked +. Connect capacitor C1 per Fig. 6.
2. Apply 1.0 or 4.0 milliamperes input current as applicable.
3. Adjust Zero (Figure 7) until output air pressure is 15.0 psig. Clockwise rotation causes output pressure to decrease. If the Zero Adjust Screw does not provide sufficient adjustment, loosen the Coarse Zero Adjust Screw (Figure 7) and increase the tension of the spring. Retighten screw. Rezero with the Zero Adjust Screw.
4. Apply 5.0 or 20.0 milliamperes input current as applicable.
5. Output air should decrease to 3.0 psig. If it does not, adjust range as follows: Loosen locking screws(Figure 8) and turn adjusting screw (Figure 8) until 3.0 psig is obtained. Retighten locking screws.

NOTE: The output span increases as the magnetic shunt ring is moved away from the magnet.

6. If the range was adjusted in step 5, it will be necessary to repeat steps 1 through 5 until calibration is within limits, as the adjustment of range has a slight effect on the maximum output pressure.

MAINTENANCE

Nozzle, Restrictor, and Flame Arrestors (see Figure 9)

In applications where the instrument air supply is dirty and a high moisture content exists, an occasional cleaning in alcohol, gasoline, or boiling caustic soda will insure superior instrument performance. After cleaning, it is recommended that the filter element (item 53) is changed.

Ball Flapper (see Figure 9)

If the ball flapper on the beam assembly (Item 33) should accumulate any foreign matter, it can be removed with a light brushing of alcohol or gasoline.

BALL FLAPPER AND NOZZLE ALIGNMENT

Loosen four screws (Item 57) which hold the magnet assembly (Item 46) to the case (Item 18).

Reposition the magnet and beam assembly on the case so that the flat on the ball flapper is directly over the nozzle (Item 26).

Manually depress beam against nozzle to align the flat area on the ball flapper with the flat edge on tne nozzle.

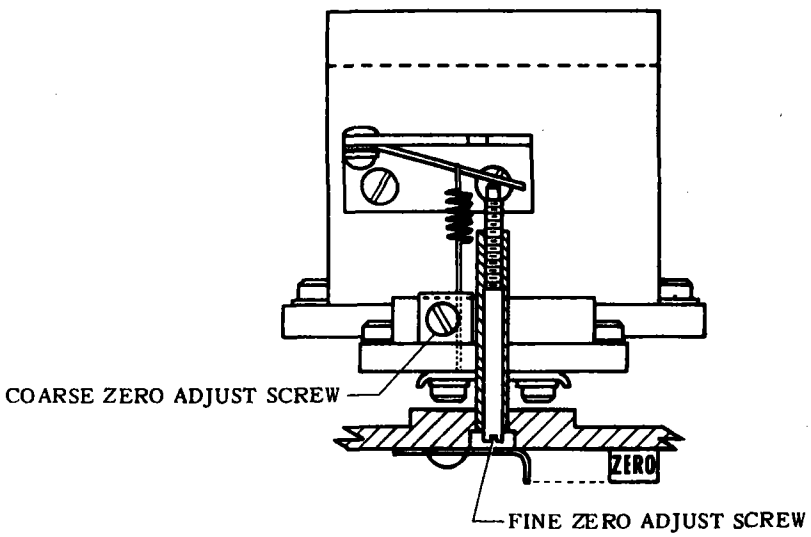


Figure 7 - Zero Adjustment

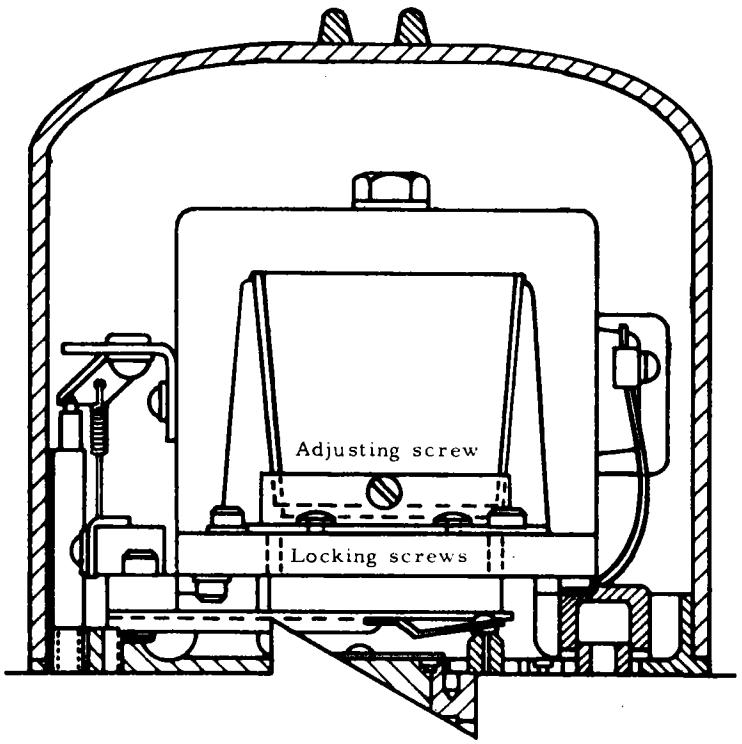


Figure 8 - Fine Span Adjustment

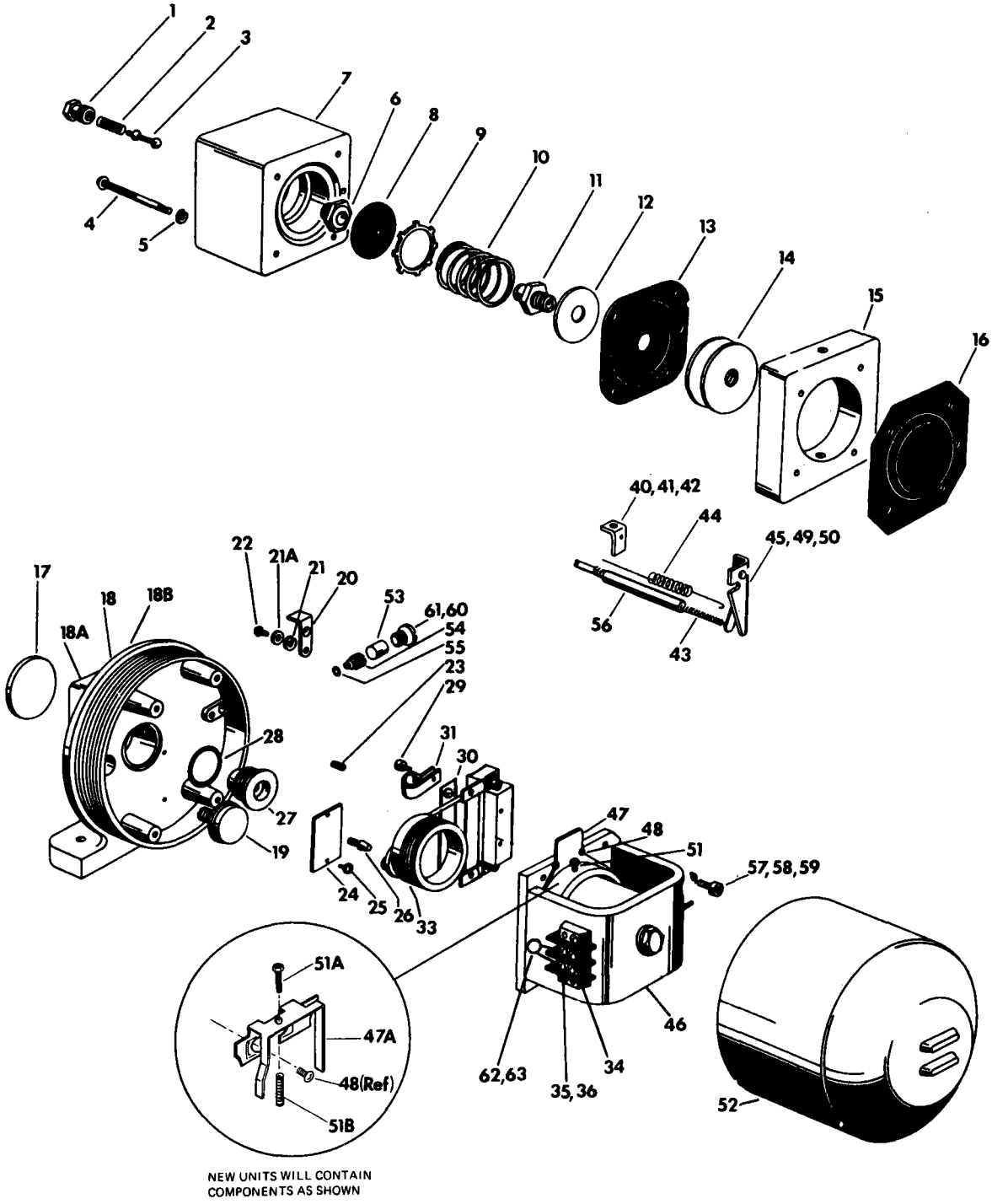


Figure 9 - Exploded View

Index No.	Part Number	Description	Qty Reqd.	Used On
Figure 9		ELECTRO-PNEUMATIC RELAY ASSEMBLY		
		Code: When a part is common to all models, no code letter is entered in the Usage Code column. When a part does not apply to all models, the appropriate code letter as indicated below opposite the main assembly and model number of each ELECTRO-PNEUMATIC RELAY ASSEMBLY is placed opposite the item in the Parts List.		
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-A1 or Model 443-A1-A	1	A
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-A1 or Model 445-A1-A	1	B
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-C1 or Model 443-C1-A	1	C
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-C1 or Model 445-C1-A	1	D
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-B1 or Model 443-B1-A	1	E
		ELECTRO-PNEUMATIC RELAY ASSEMBLY Model 445-B1 or Model 445-B1-A	1	F
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-A2 or Model 443-A2-A	1	G
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-B2 or Model 443-B2-A	1	H
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-C2 or Model 443-C2-A	1	J
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-A2 or Model 445-A2-A	1	K
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-B2 or Model 445-B2-A	1	L

Index No.	Part Number	Description	Qty. Reqd.	Used On
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-C2 or Model 445-C2-A	1	M
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-A3 or Model 443-A3-A	1	N
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-B3 or Model 443-B3-A	1	O
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-C3 or Model 443-C3-A	1	P
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-A3 or Model 445-A3-A	1	Q
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-B3 or Model 445-B3-A	1	R
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-C3 or Model 445-C3-A	1	S
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-E1 or Model 443-E1-A	1	T
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-E1 or Model 445-E1-A	1	U
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-E2 or Model 443-E2-A	1	V
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-E2 or Model 445-E2-A	1	W
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-E3 or Model 443-E3-A	1	X
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-E3 or Model 445-E3-A	1	Y
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-F1 or Model 443-F1-A	1	Z
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-F1 or Model 445-F1-A	1	AA

Index No.	Part Number	Description	Qty. Reqd.	Used On
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-F2 or 443-F2-A	1	BB
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-F2 or Model 445-F2-A	1	CC
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 443-F3 or Model 443-F3-A	1	DD
		ELECTRO-PNEUMATIC RELAY ASSEMBLY, Model 445-F3 or Model 445-F3-A	1	EE
-1	525-950-018	. CAP	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-2	295-950-077	. SPRING	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-3	904-600-760	. DISC POPPET	1	B, D, F, K, L, M, Q, R, S [illegible], W, Y, AA, [illegible], EE
-4	435-950-067-06	. SCREW	4	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-5	447-603-008	. LOCKWASHER, #8	4	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-6	030-950-042	. SUPPLY SEAT	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-7	904-600-783	. BODY	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-8	517-950-006	. DIAPHRAGM	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE

Index No.	Part Number	Description	Qty. Reqd.	Used On
-9	425-950-010-01	. RING, Retaining	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-10	295-950-076	. SPRING	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-11	030-950-043	. BUSHING, Seat	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-12	447-950-046	. WASHER, Disc	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-13	517-950-004	. DIAPHRAGM	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-14	440-950-053	. SPACER, (Ring)	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-15	440-950-054	. SPACER	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-16	517-950-005	. DIAPHRAGM	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
-17	295-950-079-01	. DISC	1	B, K, Q
	295-950-079-03	. DISC	1	D, F, L, M, R, S, U, W, Y, AA, CC, EE
-18	040-950-197	. CASE	1	B, D, F, K, L, M, Q, R, S, U, W, Y, AA, CC, EE
	040-950-196	. CASE	1	A, C, E, G, H, J, N, O, P, T, V, X, Z, BB, DD
-18A	159-950-100	. NAMEPLATE	1	

Index No.	Part Number	Description	Qty. Reqd.	Used On
-18B	435-616-013	. SCREW, Drive 0 x 3/16	2	
-19	525-950-060	. PLUG ASSEMBLY	1	
-20	159-950-093	. COVER (Zero adjust)	1	
-21	447-604-005	. LOCKWASHER (#5)	1	
-21A	447-950-039	. WASHER, Spring	1	
-22	435-616-044	. SCREW, Drive (#4 x 1/4 lg)	1	
-23	435-950-087-01	. SETSCREW	1	
-24	904-600-514	. COVER PLATE	1	
-25	435-616-024	. SCREW, Drive (#2 x 1/4 lg)	2	
-26	555-950-008	. NOZZLE	1	A, B, C, D, E, F, T, U, Z, AA
	555-950-009	. NOZZLE	1	G, H, J, K, L, M, N, O, P, Q, R, S, V, W, X, Y, BB, CC, DD, EE
-27	520-950-007	. FILTER ASSEMBLY	1	
-28	560-602-018	. O-RING	1	
-29	435-950-103-14	. SCREW (#6-32 x 1/4 lg)	2	
-30	020-950-549	. CLAMP	1	
-31	020-950-193-01	. CLAMP	2	
-32	Deleted			
-33	904-600-857-05	. BEAM ASSEMBLY	1	A, B, G, K, Q
	904-600-857-07	. BEAM ASSEMBLY	1	C, D, J, M, P, S
	904-600-857-08	. BEAM ASSEMBLY	1	E, F, H, L, O, R
	904-600-857-09	. BEAM ASSEMBLY	1	T, U, V, W, X, Y, Z, AA, BB, CC, DD, EE
-34	325-950-035	. TERMINAL	1	
-35	435-601-309	. SCREW (#6-32 x 9/16 lg)	2	
-36	447-604-006	. LOCKWASHER (#6)	2	
-37	Deleted			
-38	Deleted			
-39	Deleted			
-40	020-950-009	. CLAMP, Spring	1	
-41	435-602-304	. SCREW (#6-32 x 1/4 lg)	1	
-42	447-604-006	. LOCKWASHER (#6)	1	
-43	435-950-005	. SCREW	1	
-44	295-950-002	. SPRING	1	
-45	295-950-001	. SPRING BRACKET ASSEMBLY	1	
-46	904-600-720	. MAGNET ASSEMBLY	1	

Index No.	Part Number	Description	Qty Reqd.	Used on
-47	904-600-831	. SHUNT ASSEMBLY	1	
-47A	020-950-727	. SHUNT BRACKET	1	Newer units
-48	435-601-406	. SCREW (#8-32 x 3/8 lg)	2	
			2	
-49	435-601-404	. SCREW (#8-32 x 1/4 lg)	2	
-50	447-603-008	. LOCKWASHER (#8)	2	
-51	435-950-237-02	. SCREW (#6-32 x 5/8 lg)	1	
-51A	435-950-272-01	. SCREW (#6-32 x 1 lg)	1	Newer units
-51B	295-950-154	. SPRING	1	Newer units
-52	040-950-070-01	. COVER	1	
-53	520-950-003	. FILTER	1	
-54	435-950-215	. RESTRICTOR (. 020 dia)	1	
-55	560-602-006	. O-RING	1	
-56	150-950-007	. POST	1	
-57	435-950-103-43	. SCREW (#10-32 x 3/4 lg)	4	
-58	447-601-010	. WASHER, FLAT (#10)	4	
-59	447-950-056-22	. LOCKWASHER	4	
-60	525-950-028	. PLUG	1	
-61	560-602-010	. O-RING	1	
-62	035-950-147-04	. CAPACITOR, Solid Tantalum, 10 uf, 35 VDC	1	
-63	326-950-030	. LUG	2	
		OPTIONAL EQUIPMENT		
-64	435-950-097	. U BOLT (2" Pipe Mounting) (not shown)	1	

REMOVAL AND REPLACEMENT OF PARTS

Refer to Figure 9 for item numbers listed below.

Removal

Cover

Counterclockwise rotation of the cover (Item 52) loosens it. Lift straight up and away from instrument.

Magnet Assembly

Disconnect input leads from terminal strip. Remove four 10-32 screws (Item 57), loosen Zero spring (Item 44), and lift magnet assembly (Item 46) away from case.

CAUTION

Under no circumstances should the magnet be disassembled, nor should iron parts be brought in contact with the magnet.

Nozzle

Counterclockwise rotation of the nozzle (Item 26) loosens it.

Filter

(Vent) Clockwise (looking from outside of case) rotation of the filter (Item 19) loosens it.

Restrictor Orifice and Supply Air Filter

Remove plug (Item 60, 61) and pull out filter (Item 53). The restrictor (Item 54) can now be removed by inserting a screwdriver and rotating counterclockwise.

Beam

Disconnect electrical leads from terminal strip. Remove two 6-32 Allen head screws (Item 29). Gently lift beam (Item 33) up and away from the magnet assembly.

Filter (Output Air)

Counterclockwise rotation loosens filter (Item 27).

Zero Adjustment Assembly

Disconnect Zero spring (Item 44).

Poppet

Remove cap screw (Item 1), spring (Item 2), and poppet (Item 3).

Booster Assembly

Remove four screws (Item 4). Remove diaphragm (Item 17) and body spacer (Item 15).

Spacer, Diaphragm and Exhaust Seat

(Items 11-14) Tilt and pull out of seal diaphragm (Item 8). Unscrew exhaust seat (Item 11) from spacer (Item 14), by turning counterclockwise.

Seal Diaphragm

Pry out spring retainer (Item 9) and remove diaphragm (Item 8).

Supply Seat

Turn counterclockwise to remove (Item 6).

Replacement

Follow reverse order of procedures above, paying particular attention to the following:

Restrictor Orifice

Poor seating of the orifice will cause air leakage around it and make proper calibration impossible. Screw the restrictor in against the aluminum base. Be sure that threads are clean.

Beam

Replace moving coil in magnet gap so it is free to move. Be sure coil is concentric with the gap.

Leads from Moving Coil

Be sure that leads are in no way interfering with motion of beam. The leads should be securely fastened beneath the anchoring strip provided, and in such a manner as to relieve all tension on them.

Alignment of Beam and Nozzle

Position the magnet and beam assembly on the case so that the flat on the ball flapper is directly over the nozzle. Manually depress beam against nozzle to align ball flapper to flat on nozzle.

Cleanliness of Filters

Inspect and clean prior to inserting in instrument.

Beam Overtravel Stop

Set stop with output pressure at 3 psig. Turn screw (Item 23) clockwise until a slight increase in output pressure occurs. Back off 1/4 turn.

WARNING

If screw is adjusted improperly (that is, too close to beam) output air pressure will remain near supply pressure regardless of input current or Zero spring setting.

Exhaust Seat

Fit diaphragm into groove on exhaust seat and install the spring, washer, and diaphragm before screwing spacer onto exhaust seat. Check feed back hole for obstruction.

Diaphragms

Be sure holes are lined up with holes in parts and convolution is pointed away from the pressure side.

TROUBLE SHOOTING

Any trouble shooting procedure should start with a visual inspection of the equipment involved. Improper supply pressure and mechanical defects in air connections, electrical connections, etc., are readily observed. Refer to "Removal and Replacement of Parts" to be sure unit is assembled properly. Below are some troubles which may occur and appropriate remedies for each trouble.

1. Errors in calibration:
   a. Changes in calibration will occur if supply air is not proper value; supply air filter or air vent filter may become clogged or leaks may occur in output pressure line.
   b. Beam flexures may be bent.
   c. Ferrous material may be near magnet assembly.
2. Excessive non-linearity:
   a. Check for proper seating of ball flapper and nozzle.
   b. Check supply filter for dirt.
   c. Check for improperly seated supply orifice.
   d. Check for diaphragms poorly centered **(445)**.
3. Excessive hysteresis:
   a. Check for input coil rubbing in gap.
   b. Check for lead wires not being clamped properly to beam.
   c. Check for dirt around nozzle.
4. Large air consumption and low (or no) output pressure **(445)**.
   a. Check for proper seating of poppet.
   b. Check for punctured diaphragm.
   c. Check for loose screws fastening booster.
   d. Check spring under poppet.
5. Poor flow regulation:
   a. Check for plugging of feedback hole.
   b. Check for punctured seal diaphragm.

6. Cannot achieve maximum output pressure:

   a. Check for shorted input coil. Resistance of input coil should be correct for particular input range (see Specifications).
   b. Check for ferrous material near magnet assembly.
   c. Check ball flapper and nozzle alignment. Verify that output will rise to within 2 psig of supply pressure when flapper is manually depressed.
   d. Check for input coil rubbing in gap.

7. No current indication on supply source:

   a. Check continuity of input coil. Resistance of input coil should be correct for particular input range (see Specifications).

INSTALLATION INSTRUCTIONS & PARTS LIST

AIR LINE FILTER

MODEL 2Z435

FORM 5S1521 2433

DAYTON ELECTRIC MANUFACTURING CO. CHICAGO 60648

0180/035/35C 2C

ATTENTION: READ CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THE SPEEDAIRE AIR LINE FILTER. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN FOR FUTURE REFERENCE.

Description

The Speedaire air line filter is designed to remove entrainments in the form of oil, water, and dirt particles from compressed air. A preformed filter element gives maximum filtration with minimal pressure drop. Filtration provided by the unit is recommended for spray painting, air tools and air operated machinery to give the best results and reduce maintenance down time for cleaning or repairing.

Specifications

Maximum supply pressure	150 psig
Maximum flow range	15 CFM
Filter element	Spun-rayon
Ports	¼" NPT
Drain valve	Manual
Dimensions	7½"L x 3"W x 3"D

General Safety Information

Air filters are utilized in a variety of air system applications. Because the air filter and other components (compressor, spray gun, regulators, lubricators, hoses, etc.) make up a high pressure pumping system, the following safety precautions should be observed at all times:

1. Read the instruction manuals for each component carefully before attempting to assemble, disassemble or operate your particular system.
2. Do not exceed the pressure rating of any component in the system.
3. Protect material lines and air lines from damage or puncture.
4. Never point a spray gun at oneself or any other person. Accidental discharge may result in serious injury.
5. Check hoses for weak or worn condition before each use, making certain that all connections are secure.
6. Release all pressures within the system before attempting to service any component.
7. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
8. On engine driven units, check engine oil and fuel levels before starting. **DO NOT ADD GASOLINE TO A HOT ENGINE!**
9. Electric motors must be securely and adequately grounded. This can be accomplished by wiring with a grounded, metal-clad raceway system, by using a separate ground wire connected to the bare metal of the motor frame, or other suitable means.
10. Always disconnect power source before working on or near a motor or its connected load. If the power disconnect point is out-of-sight, lock it in the open position and tag to prevent unexpected application of power.
11. All moving parts should be guarded.
12. Be careful when touching the exterior of an operating motor — it may be hot enough to be painful or cause injury. With modern motors this condition is normal if operated at rated load and voltage — modern motors are built to operate at higher temperatures.
13. Protect the power cable from coming in contact with sharp objects.
14. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces, or chemicals.
15. Make certain that the power source conforms to the requirements of your equipment.
16. Wiping or cleaning rags and other flammable waste materials must be placed in a tightly closed metal container and disposed of later in the proper fashion.

Installation

1. Before assembling hose connectors into filter, apply a small amount of teflon tape or pipe thread sealant to the threads to insure a good seal.
2. Screw hose connectors into inlet and outlet parts and tighten.
3. Attach one end of air hose to outlet connector and other end to spray gun or tool.
4. Connect air supply hose to inlet port and unit is now ready for use.
5. A hook clip is supplied for carrying of filter on belt of operator if operation is to be mobile.
6. After filter has been assembled and placed in a pressurized system, check for air leaks with a combination soap-water solution.

Maintenance

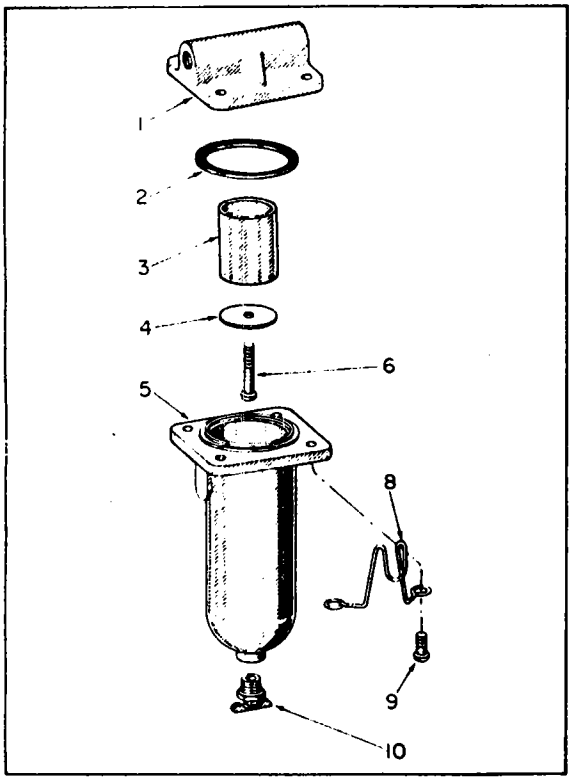
NOTE: Release all pressure in system before servicing.

1. **Drain accumulated moisture daily.** Oil moisture and particles collect in the bottom of the chamber (Ref. No. 5).
2. Drain cock (10) should be opened once a day, permitting some air pressure to expel the accumulated oil and water.
3. Close tightly to prevent leakage.

The filter should be cleaned at regular intervals. To clean filter:

1. Remove four screws (Ref. No. 9) and screw (Ref. No. 6) releasing the filter element.
2. The filter element can be cleaned by immersing in a suitable solvent. If solvent is flammable, exercise caution and keep away from heat or open flame. Use in a well ventilated area.
3. Blow-out with air jet and reassemble.

Replacement Parts List



Ref. No.	Part No.	Description
1	OC-1	Filter top
2	XA-44	Air chamber gasket
3	OC-7	Filter element
4	OC-6	Filter retainer
5	OC-2	Filter chamber
6	*STD-373	Button head machine screw ¼-20 × 1¾" long
8	OC-8	Belt clip
9	*STD-252	Fillister head machine screw #10-24 × ½" long (4 used)
10	*STD-123	Drain cock — ⅛" NPT

*Standard hardware item may be purchased locally.

ORDER REPLACEMENT PARTS THROUGH DEALER FROM WHOM PRODUCT WAS PURCHASED

Please provide following information:
- Model Number
- Serial Number (if any)
- Part Description and Number as shown in Parts List.

If dealer cannot supply, order from:
Dayton Electric Mfg. Co.
Customer Service Dept.
5959 W. Howard St.
Chicago, Illinois 60648

LIMITED WARRANTY

Speedaire air line filter, Model 2Z435 is warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use (rental use excluded), for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be repaired or replaced at Dayton's option. For warranty claim procedures, see "Prompt Disposition" below. This warranty gives purchasers specific legal rights, and purchasers may also have other rights which vary from state to state.

WARRANTY DISCLAIMER. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided in this no warranty or affirmation of fact, express or implied, other than as stated in "LIMITED WARRANTY" above is made or authorized by Dayton and Dayton's liability in all events is limited to the purchase price paid.

Certain aspects of this limited warranty are not applicable to consumer products, e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow limitations on how long an implied warranty lasts, consequently the above limitation may not apply to you, and (c) by law, during the period of this Limited Warranty, any implied warranties of merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

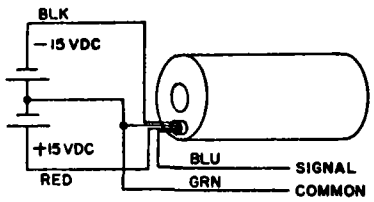
PROMPT DISPOSITION. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within warranty. For any product believed to be defective within warranty, first write or call dealer from whom product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date and number of dealer's invoice, and describing the nature of the defect. If product was damaged in transit to you, file claim with carrier.

DAYTON ELECTRIC MFG. CO., 5959 W. HOWARD STREET, CHICAGO, ILLINOIS 60648

INSTRUCTIONS

Series DC-D, HCD, and HPD

1. Connect the red and green leads (DC-D model) or pins E and D (HCD or HPD models) to a positive 15-volt DC source. As applicable, make certain that the red lead or pin E is positive. Refer to the illustration for this and the following two steps.



Leads (DC-D only)

Red	+15V
Black	-15V
Blue	Output
Green	Common

Connector or solder pins (HCD or HPD)

A	Output, high
B	Chassis ground
C	(Not used)
D	Common
E	+15V
F	-15V

2. Connect the black and green leads (DC-D) or pins F and D (HCD or HPD) to a negative 15-volt DC source. As applicable, make certain that the black lead or pin F is negative.

3. Connect the blue and green leads (DC-D) or pins A and D (HCD or HPD) to a DC readout device. Make certain that the blue lead or pin A, as applicable, is the signal connection.

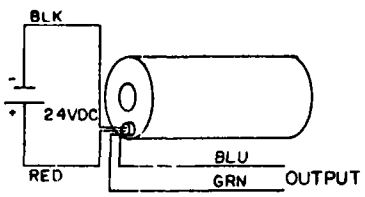
4. Insert core into LVDT, making certain that the end marked with a red dot is pointed away from the connector or lead end.

5. Apply input power.

6. Move the core of the LVDT to the position where the indicated output voltage reads zero. This is the null point of the LVDT and the point from which positive or negative full scale is measured. When the core is moved toward the lead (or pin) end, an increase in positive voltage is produced. Movement in the other direction causes a negative output. In these series of LVDT's, full displacement of the core will cause an output of 10 volts ± 5 percent.

Series HR-DC

1. Connect the red and black leads to a regulated 24-volt DC source. Make certain that red is the positive connection. DO NOT REVERSE POLARITY. Refer to the illustration.



Leads

Red	Positive input
Black	Negative input
Blue	Output
Green	Output

2. Connect the green and blue leads to a DC readout device. Make certain that green is the positive connection.

3. Insert core into LVDT, making certain that the end marked with a red dot is pointed away from the connector or lead end.

4. Apply input power.

5. Move the core of the LVDT to the position where the indicated output voltage is zero. This is the null point of the LVDT and the point from which positive or negative full scale is measured. When the core is moved toward the lead end, an increase in positive voltage results. Similarly, movement in the other direction causes a negative output.

VALTEK

Maintenance Bulletin Number 1

Instructions for unpacking, installation, checkout, troubleshooting and service

Valtek Mark One and Mark Two Control Valves

GENERAL INFORMATION

Whenever possible, the control valve should be installed in an **upright** position. Vertical installation permits easier valve maintenance. This is important to cryogenic applications in order to keep the packing isolated from the flowing medium so that the packing temperature can be maintained close to ambient. Do not insulate the bonnet, especially extension bonnets provided for hot or cold services.

Throttling control valves are usually equipped with valve positioners. Two connections are marked—one for air supply, the other for instrument signal. The actuator and positioner are both suitable for a maximum pressure of 150 psi so the air supply can usually be unregulated, except as noted by sticker on cylinder showing maximum air pressure. An air filter is recommended for installation ahead of the positioner unless the supply air is unusually clean. Air supply and instrument tubing can be ¼" unless ultra high speed operation is required.

To Unpack. . .

1. Packing lists, describing the valve and accessories, are included with each valve shipped. Before installing, be sure to check the list against the material received.
2. When lifting the valve from the shipping box, make sure that any rope or cables used are of sufficient strength, and so positioned to avoid damaging tubing or mounted accessories. Lifting rings are provided on many valves. If not, lift by means of the yoke legs.
3. Be careful to insure that no foreign material enters the valve body prior to its installation in line.
4. In the event of any shipping damage, contact your carrier immediately.
5. If you see any other apparent problems with the valve, contact your Valtek sales representative immediately—he wants to know.

To install. . .

1. **Clean the line of all dirt, welding chips, scale or other foreign material before installing valve.**
2. Double check flow direction to be sure valve is installed correctly. Flow direction is shown by the arrow attached to the body flange. Air-to-open valves (closed on air failure) should be installed so that the flow tends to **close** the valve, except in rare circumstances which will be clearly indicated. Air-to-close valves (open on air failure) should be installed with the flow tending to **open** the valve.

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3. Be sure to provide proper overhead clearance for the actuator to allow for disassembly of the plug from the valve body according to this table:

Valve Size	Clearance Inches	Valve Size	Clearance Inches
½, ¾, 1	3	6	10
1½, 2	5	8	13
3	6	10	14
4	8	12	15

Table 1

To Quick-Check. . .

Prior to startup, check the control valve to insure that it strokes properly—i.e. the valve plug position (shown on the stroke indicator) should change from open to close in a linear fashion.

1. Check for proper stroking by making the proper instrument signal change (such as 3-15, 15-3, 3-9, or 9-15).
2. With the correct signal for a closed valve, the plug should be seated. This can best be observed by changing the signal while putting a finger on the plug stem near a stationary part of the valve to determine when the plug comes off the seat.
3. Check all air connections for leaks.
4. Tighten packing nuts just slightly over hand-tight. The most common packing material is Teflon V-ring.
   Caution: Don't overtighten packing. This can cause excessive packing wear and high stem friction which may impede stem movement.
5. After valve has been in operation a short time, readjust the packing—again just slightly over hand-tight. Other types of packing such as Teflon-asbestos and semi-metallic should be tightened a little more than indicated above.
6. Be sure that the combined actions (direct or reverse) of the controller, positioner and valve will provide control of the variable and will insure required air failure direction of the valve.

To Troubleshoot. . .

If difficulty is suspected with the control valve. . .

1. Make sure valve has sufficient air supply.
2. Check for air leaks anywhere in supply and instrument system, and on valve.
3. Make sure packing isn't too tight.
4. Push restriction nozzle cleanout plunger on positioner several times.
5. Check for proper full-stroke operation as indicated in Quick-Check section.

VALVE SERVICE

An outstanding feature of the Valtek control valve is its ease of servicing. Much of this work can be done without taking the valve out of the line, provided it is in a suitable area.

To Inspect Body. . .

1. If valve is air-to-open, put air under the piston to lift the plug off the seat before taking valve apart.
2. Remove the four or more bonnet bolts and lift the actuator, bonnet and plug out of the valve.
   Caution: Heavy actuators may require a hoist. In all valves great care should be taken to lift the actuator and plug straight out to avoid damage to plug, seat or stem. A lifting ring is provided on large actuators for this purpose. Otherwise, lift by means of the yoke legs.
3. Lift the retainer, seat ring, and gaskets free of the body.
4. Check to see that seating surfaces on both the seat ring and the plug are free of damage to insure a tight shutoff. Make sure that gasket surfaces on the seat ring, bonnet and body are clean.

To Reassemble. . .

1. Install new bonnet and seat gaskets.
2. Install seat ring and seat retainer.
3. Place air under piston in air-to-open valves.
4. Be sure to lower plug squarely into the body to avoid damage.
5. Be sure bonnet, which pilots closely in body, enters the body perfectly squarely.
6. To properly align seat ring and plug, first bring body bolts to finger tightness. Apply air pressure to actuator to seat the plug in seat ring. With air pressure on actuator, tighten each body bolt about 1/6 (one flat) of a turn at a time in a clockwise direction around the bonnet flange. Firmly tighten all bolts evenly and completely, using full wrench force to compress the bonnet gasket and to seat the bonnet metal-to-metal in the body. Proper tightness requires considerable force, however the bottoming of the bonnet metal-to-metal in the body can easily be felt with the wrench.

Caution: Insufficient tightening means that the seat ring gasket does not have enough compression.

7. If the valve is taken out of the line to inspect its body, make sure the flow arrow indicates proper flow direction on reinstallation.

TO REMOVE PLUG. . .

With the valve apart, remove plug by loosening the stem clamp and the gland flange and removing the yoke clamps. The actuator can then be turned off the plug and bonnet, and the plug may be pulled carefully through the packing box.

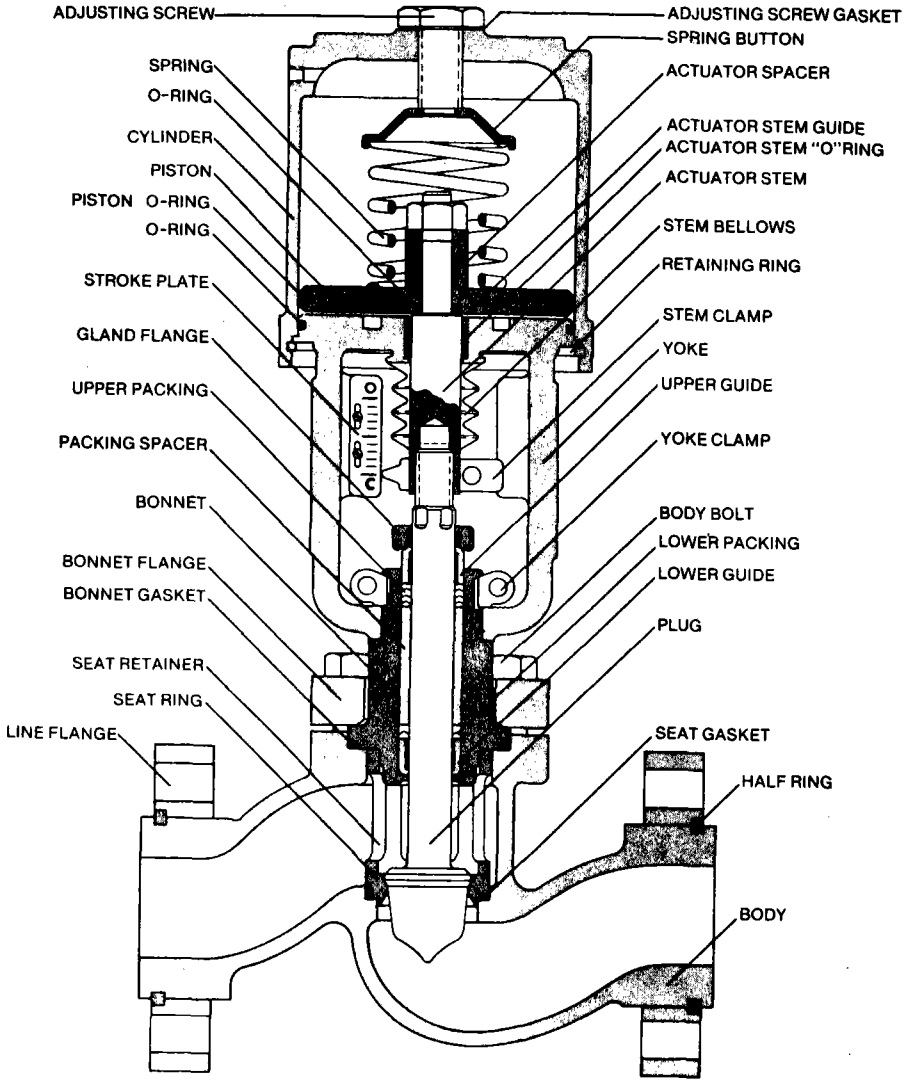
Caution: To avoid scoring guides and stem, be sure to turn the actuator off the plug as explained above.

TO REMACHINE SEAT SURFACES. . .

Remachine the surfaces on **both** parts. The seat angle on the plug is 30 degrees; the seat ring, 33 degrees. Lapping will not be necessary if proper reassembly procedures are followed.

Caution: Protect the stem during turning and insure concentricity of seating surfaces with stem on plug and the outside diameter of the seat ring.

Mark One
Control Valve



TO INSPECT ACTUATOR. . .

The actuator assembly may be removed completely from the valve for shop servicing. If desired, the actuator may be disassembled while still attached to the valve for on-the-spot servicing.

NOTE: For complete handwheel instructions, including push only and continuously connected, see Valtek Maintenance Bulletin No. 5.

To remove actuator, including yoke. . .

1. Make sure the plug is neither on the seat nor against the bonnet and that neither condition occurs while turning the plug. To do this, put air on the appropriate side of the cylinder and release the pressure on the opposite side.
   Caution: Galling of critical surfaces may result if plug is not positioned properly with respect to the seat and bonnet.
2. Loosen the stem clamp and remove the positioner take-off arm.
3. Loosen packing box and remove yoke clamps.
4. Completely turn the actuator off the plug and bonnet.

To disassemble cylinder. . .

1. Disconnect tubing.
2. Relieve spring compression by removing adjusting screw.
   Caution: Spring compression must be relieved before disassembly proceeds.
3. Remove the retaining ring from the groove at the base of the cylinder.
4. Pull the cylinder off the yoke and piston. Some O-ring resistance may be felt and may be substantial on 100 square-inch and larger cylinders.
   Caution: Do not use air pressure to remove cylinder.
5. The piston retainer nut may now be removed.
   Caution: The actuator stem should be held from rotating to avoid damage to the plug and seat, if the actuator is still attached to the valve.

To reassemble cylinder. . .

1. All O-rings should be replaced whenever the actuator is disassembled. O-rings should be lubricated using a silicone lubricant (Dow Corning 55M or equivalent).
2. Make sure all internal parts are thoroughly cleaned and lubricated before reassembly.
3. The cylinder must be carefully assembled to allow the retaining ring groove to be exposed enough to insert the ring.
4. Reinsert retaining ring by feeding it in a little at a time.
5. Replace adjusting screw and gasket. Make sure hole in spring button (on air-to-open) is directly centered under adjusting screw hole.
6. Bring down adjusting screw only enough to provide an air seal with the gasket. Do not overtighten.

To replace actuator, including yoke. . .

1. Lift the plug and turn the actuator back on to the plug.
   Caution: To avoid possible stem and/or seat galling, do not allow the plug to turn.
2. Attach yoke clamps before putting the adjusting screw in.
3. Insert the adjusting screw as described in the cylinder reassembly section. Apply air to the cylinder so pressure is applied to the side of piston opposite the spring, sufficient to move the actuator stem to approximately one half of its stroke.

   NOTE: The amount the plug stem is screwed into the actuator stem is not particularly important on air-to-close valves. It is necessary only to leave two or three threads exposed. On air-to-open valves, however, it is important that the stem engagement be correct.
4. To correctly engage stem, first screw the plug stem into the actuator as far as it will go. Then apply air pressure above the piston to drive it to the bottom of the cylinder. Back the plug stem out of the actuator stem until the plug just touches the seat.
   Caution: Do not turn the plug on the seat.
5. Apply air under the piston to lift the plug off the seat and back the plug stem out of the actuator stem one additional turn. This will establish the proper clearance between the piston and cylinder bottom plate to insure stiff, non slamming valve operation.
6. Apply air over the piston to seat the plug.
7. Slide the stem clamp down approximately even with the bottom of the actuator stem with the stem clamp pointer pointing to "Closed" on the stroke indicator.
8. Reconnect and tighten positioner take-off arm. Proper tightness is important since this adjustment clamps the actuator stem to the plug stem. An adjustable wrench should be used on the outer end of the take-off arm to keep it from turning.

TO REVERSE ACTION. . .

Two changes are required to modify the actuator from an air-to-retract to an air-to-extend configuration.

1. The actuator should be assembled with the spacer and spring under the piston for air-to-extend, with the spring button stored on top of the piston, under the locknut. The spacer and spring (with spring button in position) should be over the piston on an air-to-retract configuration. (See figure 1).
2. The positioner mounting bracket is provided with two sets of mounting holes so the positioner can be mounted for air-to-retract or air-to-extend action by inverting the positioner. The yoke has one set of holes that will serve either configuration. The positioner take-off arm (from the stem clamp) has a bushing so the arm can be positioned for either side of the clamp to get the right extension. The tubing will have to be rerouted if the positioner is inverted. No extra parts are needed and none are discarded.

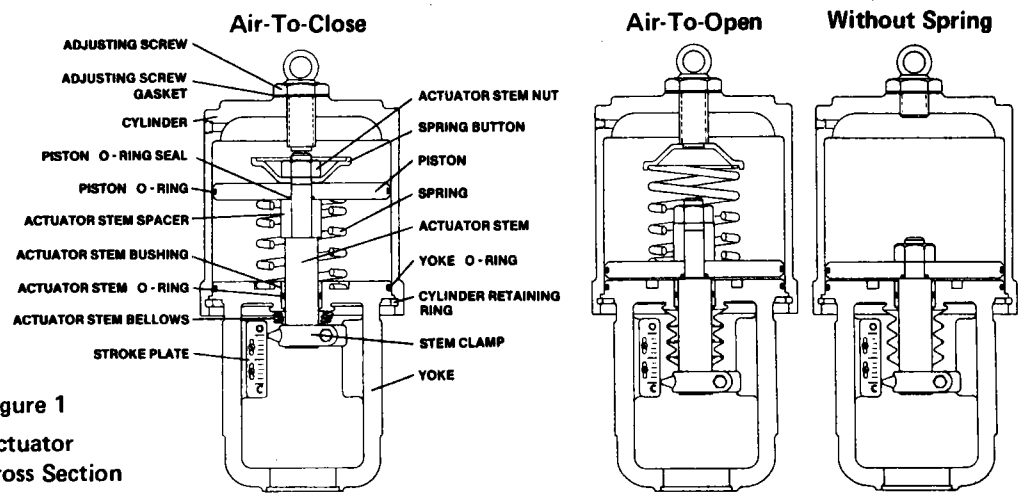


Figure 1

Actuator
Cross Section

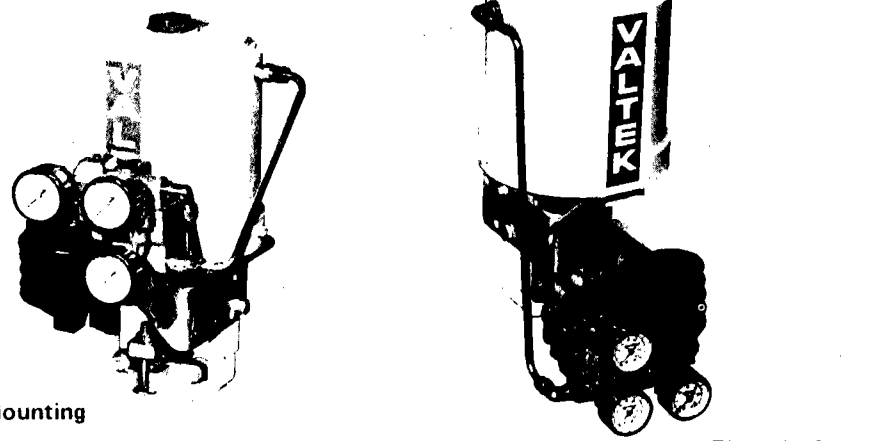


Figure 2

Positioner Mounting

Air-To-Close Flow-To-Open

Positioner Inverted
Valve 2 connection to top of cylinder
Valve 1 connection to bottom of cylinder

Air-To-Open Flow-To-Close

Positioner Normal
Valve 2 connection to bottom of cylinder
Valve 1 connection to top of cylinder

TO REPLACE PACKING. . .

The stem has been polished to a very smooth finish, as has the packing box bore. If the packing is adjusted as described in "Quick-Check" section the packing should seal perfectly for a long time. If replacement is needed, follow these instructions:

1. Remove the bonnet from the valve body and remove the plug.
2. Push out packing, spacer and guides with dowel of the approximate size, from underneath.

   Caution: Effective sealing of the V-ring takes place at the feather edge, so be sure to take care of the edge.
3. Refer to the Typical Packing Configurations illustrations below. Make sure packing configuration shown in the drawing is maintained.

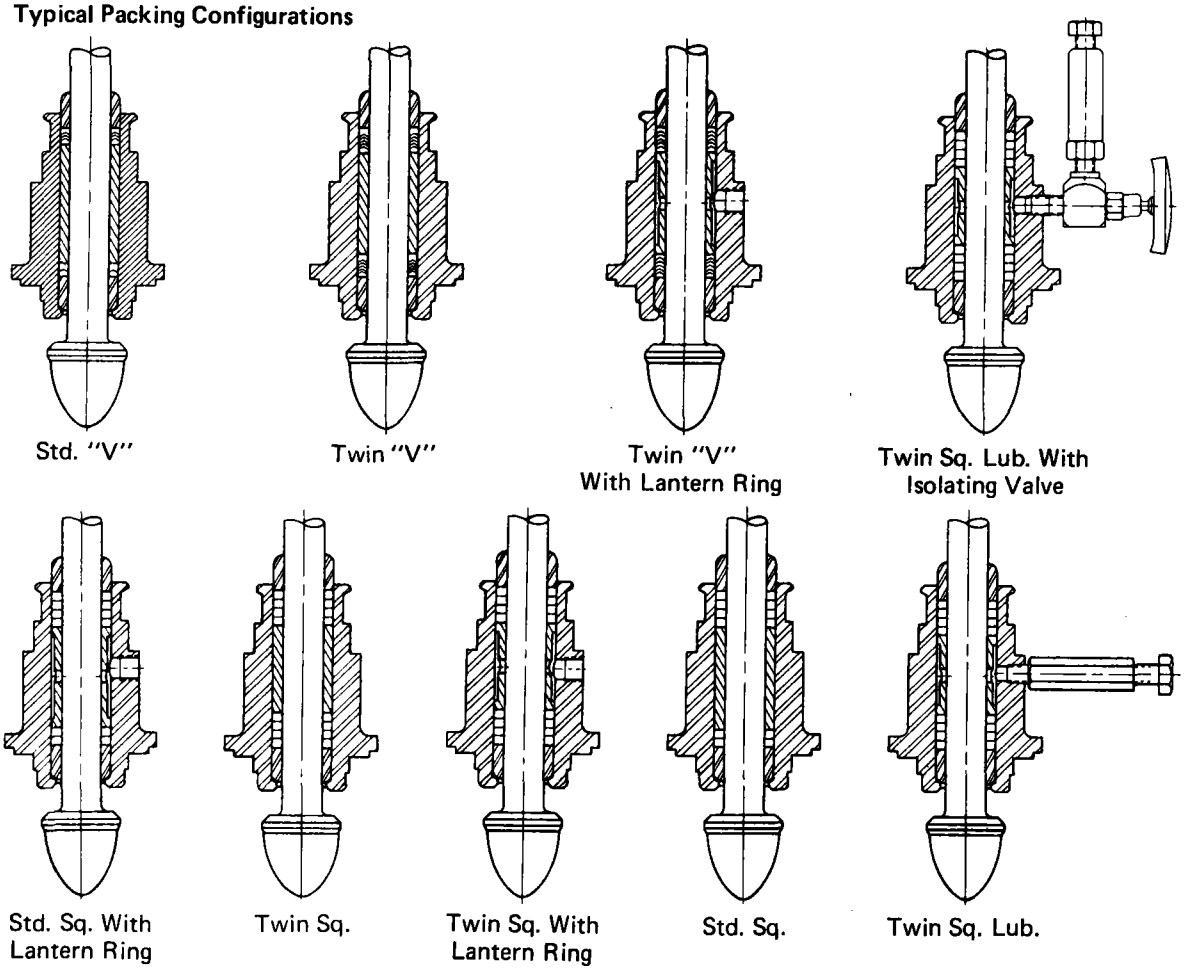
   NOTE: Installing additional V-rings will do no harm (and will probably do no good, either), as long as male and female packing adapters are at the ends of the packing group as shown, and as long as the top guide can enter the box, at least 1/8" on reassembly.

   Different spacer lengths permit a wide variety of packing configurations, such as twin seal and vacuum-pressure packing to be used.
4. Some packings such as Teflon-asbestos with a split will permit installation without taking the valve apart. To install the new packing ring, loosen gland flange and lift top guide.
5. Where grafoil guides are used, the grafoil liner should be replaced each time the valve packing is replaced. Under no circumstances should the valve be rebuilt without the grafoil liner in the guide.

TO TAKE OFF SEPARABLE END FLANGES. . .

File off the peened-up pieces of metal behind the flanges. (The metal has been turned up to prevent the flanges from dropping off during shipment and handling).

Typical Packing Configurations



TO WELD IN VALVES. . .

Use extreme care, avoiding excess heat buildup in valve.

POSITIONER INFORMATION

The Valtek Mark One Valve Positioner, if supplied, does not need a supply regulator and it has external span and zero adjustments. An air filter ahead of the positioner is recommended.

To Make Zero Adjustment. . .

Turn the zero screw which adjusts the initial tension of the range spring. The protecting bellows can be slid back up the take-off arm during the adjustment. (Zero may have to adjusted if linkage or positioner is disturbed).

To Adjust Stroke. . .

Turn the spring seat, after loosening locknut, to reduce or increase the number of active coils on the range spring.

Available stroke ranges in inches are ¼ to 1½, 1½ to 2¾, 2¾ to 4 and 4 to 6. Springs are available for each range.

Instrument Signal Range.

Standard range: 3-15 psi. Ranges of 3-9, 3-27, 6-30, and 0-15 are available for stroke ranges through 4 inch. Suppression to pressure of 2, 5, 6, 9, 11, 12 and 14 psi without affecting range is obtained with a suppression spring assembly installed between the diaphragms and the range spring.

To Adjust Actuator Balance Pressure. . .

1. Turn the output pressure level adjusting screw. This effectively changes the seat-to-seat dimensions between the supply ports on the two pilot plungers, adjusting the nominal output pressure at which the positioner comes to balance.
2. Set the balance pressure at about 80% of supply pressure. Higher pressure in the actuator makes it stiffer, and therefore more stable under variations in stem loading. Good equal speed operation is obtained in both directions with lower balance pressures.

Caution: Make this adjustment carefully and slowly, letting the positioner settle out before going too far. It is good practice to check after a short while to make sure balance pressure doesn't go too far.

To Clean Restriction Nozzle. . .

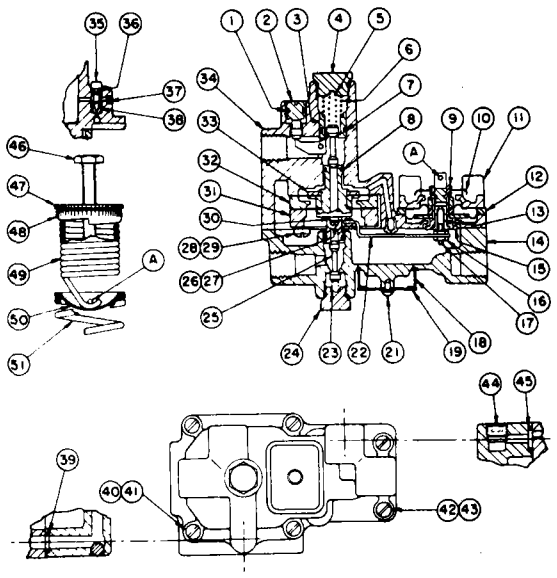
Push the plunger on the outside of the positioner several times. This will overcome occasional difficulties with the positioner that can be traced to dirt in the restriction nozzle. Repeated difficulties may indicate the need for an external filter, which is always recommended.

Mark One Valve Positioner

The following is a parts list for the Mark One positioner.

A positioner repair kit, consisting of parts most commonly required, is available on request.

Positioner Repair Kit



1. O-Ring
2. Adjusting Screw
3. Pilot Seat
4. Adjusting Screw
5. Plunger Spring
6. Spring
7. O-Ring
8. O-Ring
9. Grommet
10. Baffle
11. Instrument Capsule Casting
12. Diaphragm Ring
13. Spring
14. Housing
15. Diaphragm Assembly (Incl. Items 13 & 17)
16. Nut
17. Stud
18. Screen
19. Nameplate
20. #4
21. #4 X 3/16" Long
22. Beam Assembly
23. Plunger Spring
24. Sealing Screw
25. Plunger
26. #2-56NCX3/16" Long, Fillet Head
27. Washer
28. #10-32NCX7/8" Long, Fillet Head
29. #10
30. Spacer
31. Diaphragm Ring
32. Diaphragm Ring
33. Diaphragm Assembly
34. Housing
35. Cleaning Plunger
36. O-Ring
37. Screw
38. Spring
39. O-Ring
40. #10-32NCX1/2" Long, Fillet Head
41. #10
42. #10-32NCX7/8" Long, Fillet Head
43. #10
44a. 0-30 psi Guage, Instrument
44b. 0-160 psi Guage Actuator
45. O-Ring
46a. Zero Adj. Screw, 2-3/4" Lg. (According to Stroke and Span)
46b. Zero Adj. Screw, 1-7/8" Lg. (According to Stroke and Span)
47. Locknut
48. Spring Seat Assembly
49. Range Spring
50. Suppression Spring Seat (when req'd)
51. Suppression Spring (when req'd)

Positioner Operation

The Valtek Mark One Positioner provides high dynamic response, high positioning accuracy, speed and reversibility. It does not need a supply regulator but an air filter is recommended. The positioner is remarkably free from vibration-induced problems.

The positioner schematic shows a Valtek Mark One Positioner connected for double-acting service on a piston actuator. The range spring provides "Feedback" to the positioner. Tension on the range spring will vary as the stem position changes. As the drawing indicates, the spring-loading force is applied directly to the positioner's input capsule.

Control-instrument pressure is applied between the diaphragms in the input capsule. Thus, the input capsule serves as a force-balance member, matching the valve-stem position (as measured by tension on the range spring) to the control-instrument signal.

When the opposing forces balance exactly, the system will be in equilibrium—and the stem will be in the exact position called for by the control instrument. If the opposing forces are not in balance the input capsule will move up or down and, by means of the pilot valves, will change the output pressures, moving the stem until tension on the range spring opposes exactly the control-instrument pressure.

The sequence of operation is as follows: An increase in control-instrument pressure forces the input capsule downward. Displacement of the capsule in turn moves the baffle lever away from the detecting nozzle. This allows air to escape to the atmosphere, decreasing the pressure exerted on the top side of the pilot valve capsule.

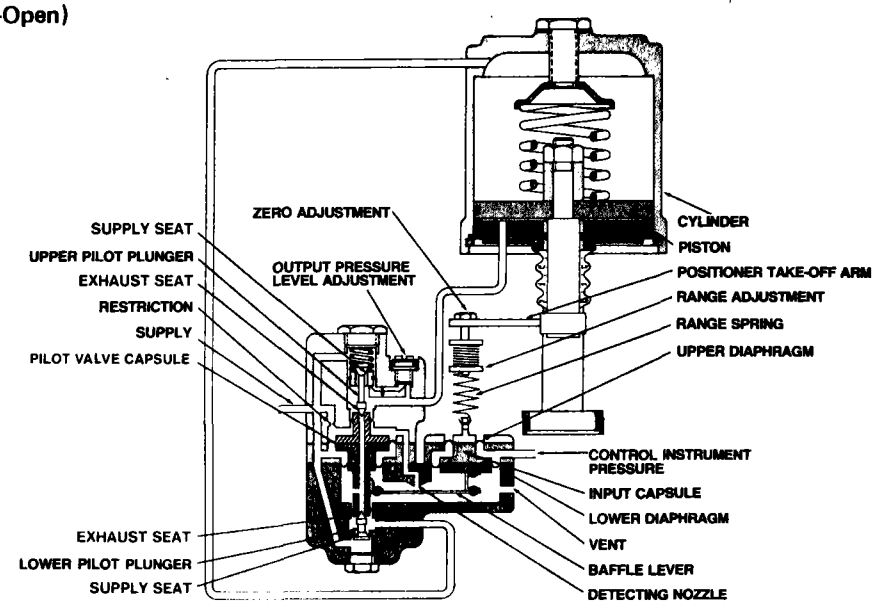
Supply air biases the pilot-valve capsule in an upward direction. As the capsule moves up, it will close off the exhaust seat of the upper pilot plunger--and open the supply seat, applying increased air pressure to the bottom of the actuator. At the same time, the pilot-valve capsule will open the exhaust seat for the lower pilot plunger—thus decreasing pressure to the top of the actuator.

This difference in pressure will drive the piston upward—stretching the range spring—until the spring tension opposes exactly the force resulting from the new control instrument pressure signal. At this point, the baffle lever will be moved toward the detecting nozzle to restore the pressure above the pilot-valve capsule to its equilibrium value. As a force-balance condition is approached, the pilot-valve capsule will be forced back to a neutral position where the pilots are neither supplying air to, nor exhausting air from, their respective sides of the piston.

A decrease in instrument-air pressure reverses the described actions and causes a proportional downward movement of actuator piston and stem.

The input capsule and the pilot-valve capsule are connected to the baffle lever to provide a motion balance negative feedback in the detecting nozzle circuit. Negative feedback insures high gain in the detecting circuit—with no overshoot or instability.

Positioner Schematic
(Air-To-Open)



VALTEK

Maintenance
Bulletin Number **2**

Instructions for checkout, troubleshooting and service

Cylinder Actuator

All actuators are calibrated and set by Valtek at the factory for operation as specified by the customer. But prior to start-up, the customer should recheck each cylinder actuator to insure that no changes have occurred since it left the factory.

To Quick-Check. . .

1. Proper stroking can be checked by applying signals to the actuator and observing the movement. Stroke changes from extended to retracted position should occur linearly with the specified signal change. (See "Stroke Adjustment" section if adjustments are needed.)
2. Zero or starting point can be checked by placing a finger on the actuator stem near a stationary part and changing the signal. The stem should just begin to move at the correct extreme of signal range. (See "Zero Adjustment" section if adjustments are needed.)
3. The combined actions (direct or reverse) of the controller and actuator should be checked to insure proper control of the variable and required air failure direction of the actuator. (See "Reverse Action" section if changes are needed.)

To Troubleshoot. . .

If difficulty is suspected with the actuator. . .

1. Make sure actuator has sufficient air supply.
2. Check for air leaks anywhere in supply and instrument system, and on the actuator.
3. Push restriction nozzle cleanout plunger on positioner several times.
4. Check for proper full-stroke operation as indicated in the "Quick Check" section.

To Disassemble. . .

If it is necessary to take the cylinder off, proceed as follows:

1. Disconnect tubing.
2. Take the entire actuator assembly, including yoke, off the valve or other device, as follows: If mounted on a valve make sure the plug is neither on the seat nor against the bonnet, and that neither condition occurs while turning the plug. (Otherwise galling of seating surfaces on plug and bonnet will result.) This is accomplished by putting air on the appropriate side of the cylinder and exhausting the other. Loosen the stem clamp and remove the positioner take-off arm. Loosen the packing box and remove yoke clamps. Completely turn the actuator off the plug and bonnet.
3. Relieve spring compression by removing the adjusting screw.
4. With two screwdrivers, remove the retaining ring out of the groove at the base of the cylinder.

5. Pull the cylinder off the yoke and piston. Some O-ring resistance may be felt and may be substantial on 100 square-inch and larger cylinders.
   Caution: Do not use air pressure to remove cylinder.
6. The actuator stem nut may now be removed.
   Caution: The actuator stem should be held from rotation to avoid damage to the plug and seat, if the actuator is still attached to the valve.

To Reassemble Actuator. . .

1. All O-rings should be replaced whenever actuator is disassembled. O-rings should be lubricated using a silicone lubricant (Dow Corning 55 M or equivalent.)
2. Make sure all internal parts are thoroughly cleaned and lubricated.
3. The cylinder must be carefully assembled to allow the retaining ring groove to be exposed to insert the ring.
4. Reinsert retaining ring by feeding it in a little at a time.
5. Make sure hole in spring button (on air-to-retract) is directly centered under adjusting screw hole.
6. Screw down adjusting screw only enough to provide an air seal with the gasket. Do not overtighten.
7. Load the cylinder on one side with air to get the actuator stem at about one half its stroke.
8. If mounted on a control valve, turn the actuator back on to the plug, attach yoke clamps, stem clamps and take off arm.
9. Replace tubing and tighten packing box.

Zero Adjustment

If linkage on positioner is disturbed, zero may have to be adjusted by turning the zero adjustment screw, which adjusts the initial tension on the range spring. The protecting bellows can be slid back up on the take-off arm during any adjustment.

Stroke Adjustment

Stroke range is adjusted by turning the inner spring seat, after loosening locknut, to reduce or increase the number of active coils on the range spring.

Instrument Signal Range

Standard range is 3-15 psi. Ranges on 3-9, 3-27, 6-30, and 0-15 are available for stroke ranges through 4 inch. Suppression to pressure of 3, 6, 12 and 15 psi without affecting range is obtained with a suppression spring assembly, installed between the input capsule and the range spring.

Stroke Ranges

Springs are available for stroke ranges of ¼ to 1½, 1½ to 2¾, 2¾ to 4, 4 to 6, 6 to 9, 9 to 12, 12 to 19 and 19 to 48.

To Adjust Actuator Balance Pressure

1. Turn the output pressure level adjusting screw (No. 2). This effectively changes the seat-to-seat dimensions between the supply ports on the two pilot plugers, adjusting the nominal output pressure at which the positioner comes to balance.
2. Set the balance pressure at about 80% of supply pressure. Higher pressure in the actuator makes it stiffer, and therefore more stable under variations in stem loading. Good equal speed operation is obtained in both directions with lower balance pressures.
   Caution: Make this adustment carefully and slowly, letting the positioner settle out before going too far. It is good practice to check after a short while to make sure balance pressure doesn't go too far.

Cleaning Restriction Nozzle

Occasional difficulties with the positioner can be traced to dirt in the restriction nozzle. This can be cleaned externally by pushing the plunger on the outside of the positioner several times (No. 35). Repeated difficulties in this regard may indicate need for external filter, which is always recommended.

To Reverse Action. . .

Two changes are required to modify the actuator from an air-to-retract to an air-to-extend configuration.

1. The actuator should be assembled with the spacer and spring under the piston for air-to-extend with the spring button stored on top of the piston, under the actuator stem nut, figure 1. The spacer and spring should be over the piston on an air-to-retract configuration. The spring button retains and guides the spring from the adjusting screw. See figure 2.
2. The positioner mounting bracket has two sets of mounting holes so that the cylinder action can be reversed by inverting the positioner. One set of holes in the yoke serves either configurations. The positioner take-off arm has a spacer so the take-off arm can be positioned on either side of the stem clamp to fit either configuration. The tubing is rerouted, but no extra parts are needed to reverse the cylinder action and none are discarded. Figure 3 shows the positioner mounted in both positions.

Air-To-Extend

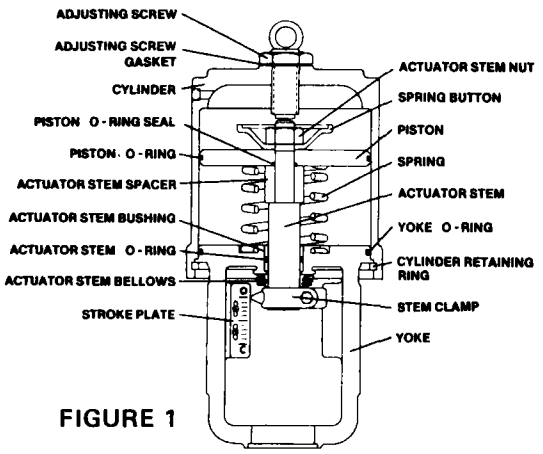


FIGURE 1

Air-To-Retract

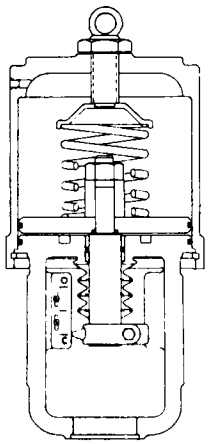


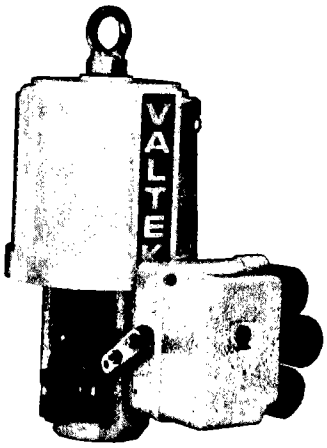
FIGURE 2

FIGURE 3

Positioner Mounting

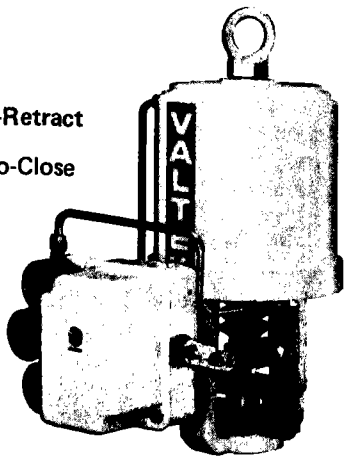
Air-To-Extend

Flow-To-Open

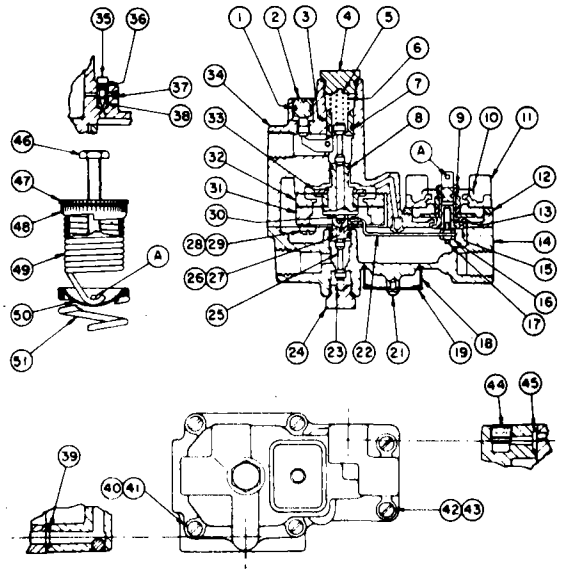


Air-To-Retract

Flow-To-Close



Positioner Repair Kit



1. O-Ring
2. Adjusting Screw
3. Pilot Seat
4. Adjusting Screw
5. Plunger Spring
6. Spring
7. O-Ring
8. O-Ring
9. Grommet
10. Baffle
11. Instrument Capsule Casting
12. Diaphragm Ring
13. Spring
14. Housing
15. Diaphragm Assembly (Incl. Items 13 & 17)
16. Nut
17. Stud
18. Screen
19. Nameplate
20. #4
21. #4 X 3/16" Long
22. Beam Assembly
23. Plunger Spring
24. *Sealing Screw*
25. Plunger
26. #2-56NCX3/16" Long, Fillet Head
27. Washer
28. #10-32NCX7/8" Long, Fillet Head
29. #10
30. Spacer
31. Diaphragm Ring
32. Diaphragm Ring
33. Diaphragm Assembly
34. Housing
35. Cleaning Plunger
36. O-Ring
37. Screw
38. Spring
39. O-Ring
40. #10-32NCX1/2" Long, Fillet Head
41. #10
42. #10-32NCX7/8" Long, Fillet Head
43. #10
44a. 0-30 psi Gauge, Instrument
44b. 0-160 psi Gauge Actuator
45. O-Ring
46a. Zero Adj. Screw, 2-3/4" Lg. (According to Stroke and Span)
46b. Zero Adj. Screw, 1-7/8" Lg. (According to Stroke and Span)
47. Locknut
48. Spring Seat Assembly
49. Range Spring
50. Suppression Spring Seat (when req'd)
51. Suppression Spring (when req'd)

Positioner Operation

The Valtek Mark One Positioner provides high dynamic response, high positioning accuracy, speed and reversibility. It does not need a supply regulator but an air filter is recommended. The positioner is remarkably free from vibration-induced problems.

The positioner schematic shows a Valtek Mark One Positioner connected for double-acting service on a piston actuator. The range spring provides "Feedback" to the positioner. Tension on the range spring will vary as the stem position changes. As the drawing indicates, the spring-loading force is applied directly to the positioner's input capsule.

Control-instrument pressure is applied between the diaphragms in the input capsule. Thus, the input capsule serves as a force-balance member, matching the valve-stem position (as measured by tension on the range spring) to the control-instrument signal.

When the opposing forces balance exactly, the system will be in equilibrium—and the stem will be in the exact position called for by the control instrument. If the opposing forces are not in balance the input capsule will move up or down and, by means of the pilot valves, will change the output pressures, moving the stem until tension on the range spring opposes exactly the control-instrument pressure.

The sequence of operation is as follows: An increase in control-instrument pressure forces the input capsule downward. Displacement of the capsule in turn moves the baffle lever away from the detecting nozzle. This allows air to escape to the atmosphere, decreasing the pressure exerted on the top side of the pilot valve capsule.

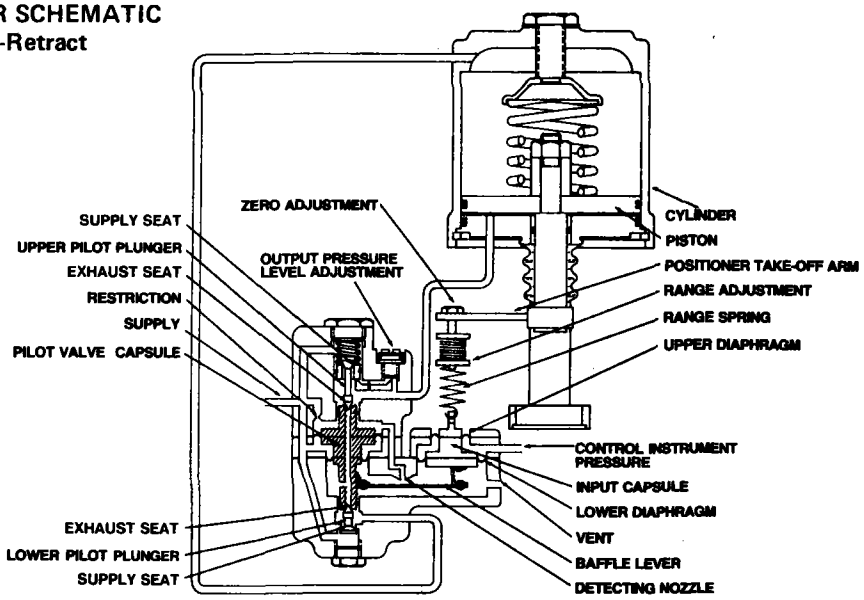
Supply air biases the pilot valve capsule in an upward direction. As the capsule moves up, it will close off the exhaust seat of valve No. 2—and open the supply seat, applying increased air pressure to the bottom of the actuator. At the same time, the pilot valve capsule will open the exhaust seat for valve No. 1,—thus decreasing pressure to the top of the actuator.

This difference in pressure will drive the piston upward—stretching the range spring—until the spring tension opposes exactly the force resulting from the new control instrument pressure signal. At this point, the baffle lever will be moved toward the detecting nozzle to restore the pressure above the pilot valve capsule to its equilibrium valve. As a force-balance condition is approached, the pilot-valve capsule will be forced back to a neutral position where the pilots are neither supplying air to, nor exhausting air from, their respective sides of the piston.

A decrease in instrument-air pressure reverses the described actions and causes a proportional downward movement of actuator piston and stem.

The input capsule and the pilot-valve capsule are connected to the baffle lever to provide a motion balance negative feedback in the detecting nozzle circuit. Negative feedback insures high gain in the detecting circuit—with no overshoot or instability.

POSITIONER SCHEMATIC
Air-To-Retract



VALTEK

Maintenance Bulletin Number 11

Instructions for checkout, service and troubleshooting Valtek Control Valves with

Limit Switches

GENERAL INFORMATION

This bulletin pertains to features unique to valves equipped with limit switches, and must be used in conjunction with the appropriate maintenance bulletin for the basic automatic control valve. Only the mechanical aspects of limit switches are covered in this bulletin.

For electrical or other interior malfunctions, please refer to the appropriate manufacturer's instructions.

Valtek valves can be equipped with limit switches, which are used to signal an open, closed or intermediate valve plug position. Types that can be supplied conform to NEMA designations and are available in single pole-double throw or double pole-double throw.

INSTALLATION

On Valtek valves, limit switches are bracket mounted to the actuator yoke. There are usually two switches per valve: one indicating open position and one indicating closed position. Each switch is actuated by a small tab welded to the stem clamp. Valves with limit switches are installed according to the standard installation procedure for the basic valve.

TROUBLESHOOTING

If switches fail to operate properly and the internal switch is determined to be operating correctly, check the following:

1. Be sure the switches and bracket are tightly mounted.
2. Be sure switch actuator is tight.
3. Be sure switch lever lock nut is tight.
4. After locating the difficulty, readjust switch by following adjustment procedure.

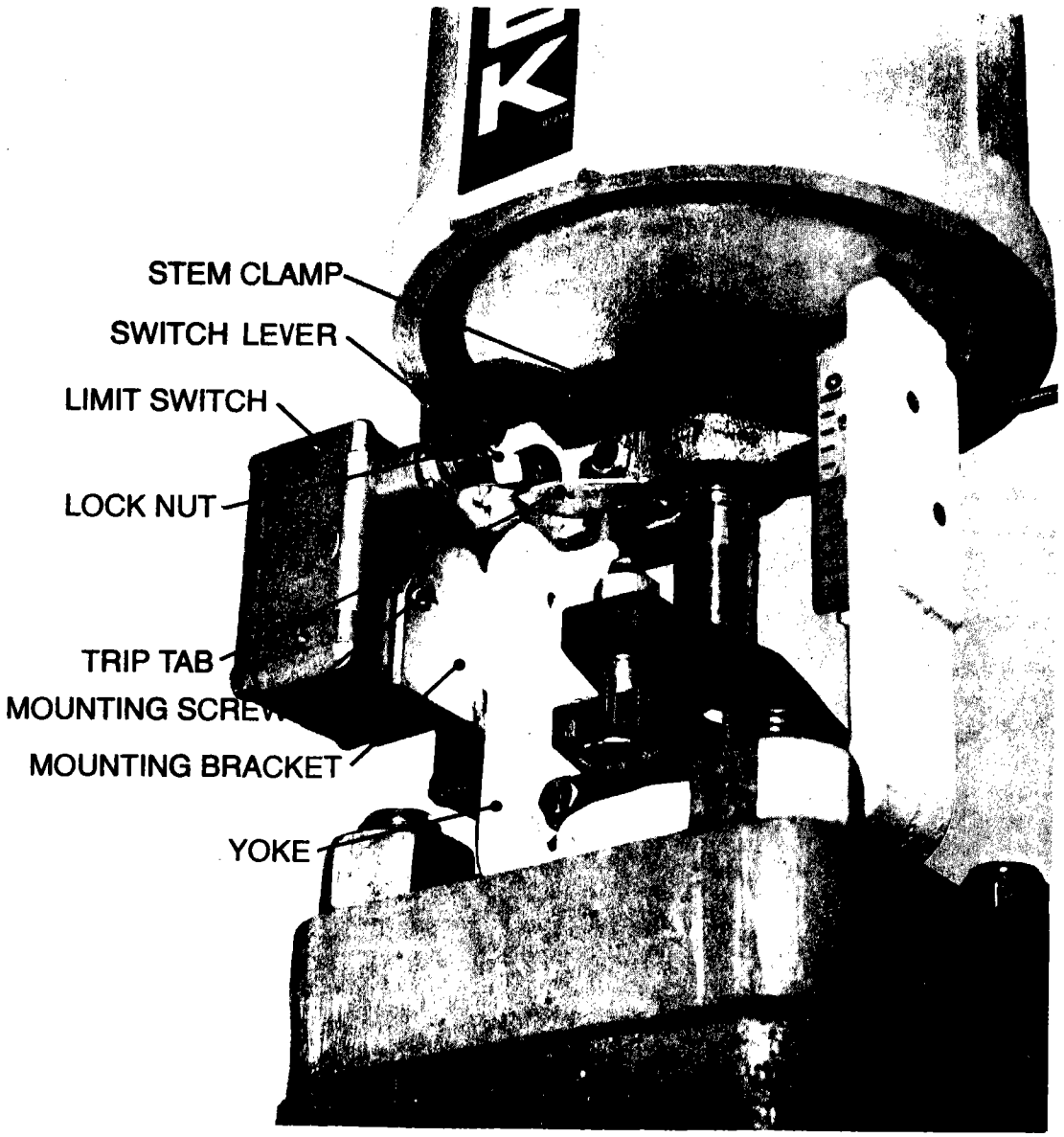
ADJUSTMENT

Limit switches are adjusted at the factory before shipment, and should not require on-site adjustment. Where switches are used on valves with positioners, or if stem clamp is loosened or moved for any reason, switches may have to be readjusted. If readjustment is necessary, follow these steps:

Note: Before adjusting switches, remove the valve from the line or insure that the valve can be stroked without disturbing the process.

1. Cycle the valve to the position the switch must indicate.
2. Loosen the set screw or lock nut holding the switch lever.
3. Move the switch lever to a position so that the switch is tripped just slightly before the valve reaches the position to be indicated. If the switch has a spline shaft to which the switch lever arm is fastened, rotate the arm until the switch just trips, then rotate the arm two more notches on the spline shaft.
4. Retighten the lock nut or set screw.
5. Cycle the valve and check for proper adjustment. Readjust if necessary.

TYPICAL LIMIT SWITCH MOUNTING



4.1.31-76

VALTEK

Maintenance Bulletin Number **14**

Instructions for assembly, disassembly and troubleshooting Valtek Control Valves with

Bonnet Extensions

GENERAL INFORMATION

This bulletin pertains to features unique to valves with bonnet extensions and must be used in conjunction with the appropriate maintenance bulletin for the basic automatic control valve.

Bonnet extensions are used to protect packing from excessive heat or cold which would otherwise inhibit packing and valve performance. They also locate the valve actuator and positioner farther away from the hot or cold valve body, lengthening actuator and positioner life. The standard Valtek bonnet extension is unfinned.

INSTALLATION

Install the valve with the bonnet extension in the vertical position. This insures a stagnated, moderate temperature gas in the bonnet, protecting the packing.

Although thermal insulation may be installed on the valve body and piping, for extreme temperature service, *do not insulate the bonnet or bonnet extension.* The bonnet extension operates in hot service by radiating heat to the surrounding air, and in cryogenic service by collecting heat from the surrounding air.

Valtek valves equipped with bonnet extensions are otherwise installed in the same manner as standard valves.

TROUBLESHOOTING

Problem: Valve does not stroke or binding occurs during stroking.

Solution:

1. Check alignment of the bonnet and bonnet extension. The bonnet and the bonnet extension must be seated metal to metal.
2. Check the bonnet extension for damage. This could cause binding requiring the extension to be replaced.

   Note: Binding can also be caused by excessive packing box compression, erratic air signal to valve, or other conditions not related to the extension bonnet. Refer to the proper Valtek maintenance bulletin for these conditions.

Problem: Leaking occurs at the bonnet and bonnet extension interface.

Solution:

1. Tighten bonnet extension clamp or flange bolts.
2. Replace bonnet extension gasket if leakage persists. Carefully insert the gasket into the bonnet extension. The gasket must seat in the groove machined in the face of the bonnet extension.

   Note: Check the bonnet-bonnet extension interface for damage when changing the gasket.

DISASSEMBLY

The bonnet-bonnet extension assembly may be disassembled by first disassembling the valve as described in the disassembly instructions for the basic valve. With the bonnet disassembled from the valve body, actuator and plug, the extension can be separated from the bonnet by removing the bonnet extension clamp (or flange bolts).

If the bonnet extension disassembly must be made independently, proceed as follows:

Note: Remove the valve from the line or insure that there is atmospheric pressure in the line. Drain all liquids.

1. Supply air to the cylinder to move the actuator stem to approximately mid-stroke.
2. Loosen the stem clamp and gland flange.
3. Remove the yoke clamps. (On bolted yokes, remove the yoke retaining bolts.)
4. Apply air to the cylinder to carefully seat the plug. The actuator-yoke assembly will pop up. Remove the bonnet extension half rings.
5. To remove the actuator from the plug stem, unscrew the actuator assembly by turning it in a counter-clockwise direction. On large actuators, use a hoist to support the actuator. Lift straight up.

   Caution: Do not allow the plug stem to rotate. Flats are machined on the plug stem so it can be held with a wrench.
6. Remove the bonnet extension clamps (or flange bolts and half rings).
7. Lift off bonnet extension.
8. Using the joint packing spacer, push the guide and packing out the top of the bonnet extension. The packing spacer will now slide out.

ASSEMBLY

1. Clean the gasket seating surfaces on the bonnet and bonnet extension.
2. Insert lower guide and packing spacer into bonnet.
3. Place new bonnet extension gasket on top face of bonnet.
4. Place joint packing spacer in bonnet. Slip bonnet extension over joint packing spacer, and mate bottom face of bonnet extension to top face of bonnet. Make sure bonnet extension gasket is properly seated in the groove on the bottom face of the bonnet extension.

   Note: Install packing spacer so that the joint *packing spacer is centered in the joint between the bonnet and the bonnet extension.*
5. Install bonnet extension clamps, making sure the bonnet extension and bonnet are properly aligned. (On bolted bonnet extensions install extension flanges and half rings.)
6. Install packing spacer, packing and upper guide.

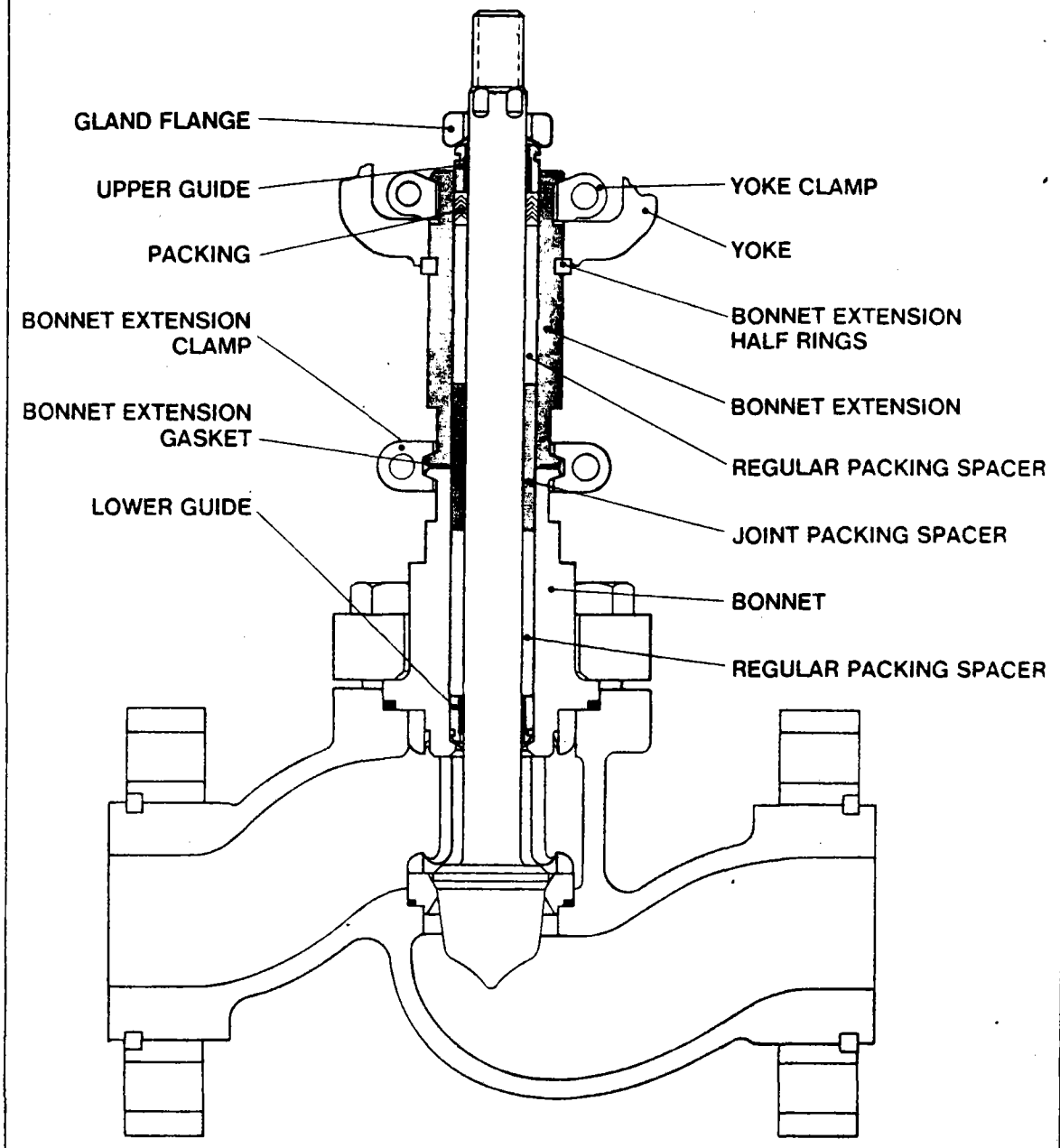
   Note: The valve should now be assembled using the assembly instructions for the basic control valve. If the bonnet extension was disassembled independently, follow the remaining assembly instructions.
7. Place the gland flange over the plug stem.
8. Screw the actuator stem onto the plug stem by rotating the whole actuator assembly.

   Caution: Do not allow the plug stem to rotate on seat.

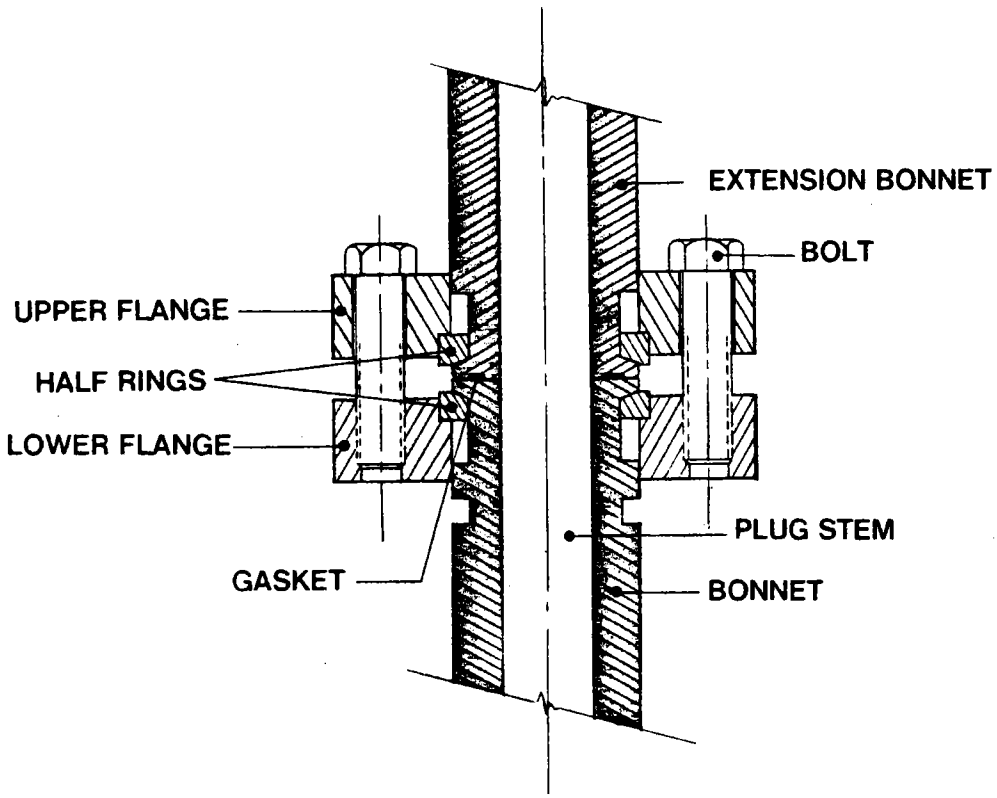
   Note: On air-to-close valves, leave two or three threads exposed. On air-to-open valves, screw the plug stem into the actuator as far as it will go.
9. Install bonnet extension half rings and attach yoke clamps (or yoke retaining bolts). For bolted yokes, clamps and half-rings are not required. Tighten gland flange bolts slightly tighter than finger tight.
10. To correctly engage stem on air-to-open valves, supply air to the top cylinder port to drive the piston to the bottom of the cylinder. Back the plug stem out of the actuator stem until the plug just touches the seat. Supply air to the lower cylinder port to raise the plug to mid-stroke. Back the plug stem out of the actuator stem one additional turn.

    Caution: Do not turn the plug on the seat or bonnet, or damage could result.

STANDARD BONNET EXTENSION ASSEMBLY



BOLTED BONNET EXTENSION JOINT



4.1.33 Thermal Storage Flash Tank to Condenser

4.1.33.1	Identification	Description
	Tag Number	Steam from thermal storage trash tank
	PV-640	to condenser
4.1.33.2	Description	
	Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
	Part No.	D-100-160
	Spec No.	D.O.E. Spec 40I700-13S
	Material:	Body A216 GR WCB
	Weight:	

4.1.33.3 Prescribed Service

Steam

4.1.33.4 Vendor

Copes- Vulcan Inc.

4.1.33.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.33.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.33.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.33.8 Special Tools

None

4.1.33.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.33.10 Acceptance Test

4.1.35 Steam From Receiver Flash Tank to Deaerator

4.1.35.1 Identification	Description
Tag Number	Steam from receiver flash tank to
PV-647B	deaerator DA-901

4.1.35.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
Part No.	D-100-60
Spec No.	D.O.E. Spec 40I700-13S
Material:	Body A217 GR WC9
Weight:	

4.1.35.3 Prescribed Service

Steam

4.1.35.4 Vendor

Copes-Vulcan Inc.

4.1.35.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.35.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.35.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.35.8 Spcecial Tools

None

4.1.35.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.35.10 Acceptance Test

4.1.36 Steam from TSS Flash Tank to Deaerator

4.1.36.1	Identification	Description
	Tag Number	Steam from TSS Flash Tank to Deaerator
	PV-647C	
4.1.36.2	Description	
	Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
	Part No.	CV-600-16R
	Spec No.	D.O.E. Spec 40I700-13S
	Material:	Body A216 WCB
	Weight:	365 lbs

4.1.36.3 Prescribed Service

Steam

4.1.36.4 Vendor

Copes-Vulcan Inc.

4.1.36.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.36.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.36.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.36.8 Special Tools

None

4.1.36.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.36.10 Acceptance Test

4.1.38 Receiver Flash Tank Vent to Condenser

4.1.38.1 Identification	Description
Tag Number	Steam from receiver flash tank vent line to condenser dump through desuper-heater DS-901
PV-1000	

4.1.38.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
Part No.	D-100-400
Spec No.	D.O.E. Spec 40I700-13S
Material:	Body A217 GR WC9
Weight:	

4.1.38.3 Prescribed Service

Steam

4.1.38.4 Vendor

Copes-Vulcan Inc.

4.1.38.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.38.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.38.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.38.8 Special Tools

None

4.1.38.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.38..10 Acceptance Test

4.1.39 Steam Dump Valve

4.1.39.1 Identification	Description
Tag Number	Main steam dump pressure reducing valve
PV-1001	

4.1.39.2 Description

Manufacturer:	Control Components Inc., Irvine, CA
Part No.:	24744-1
Spec No.:	D.O.E. Spec 40I700-12S
Material:	A182-F22
Weight:	2000 lbs

4.1.39.3 Prescribed Service

Steam & condensate

4.1.39.4 Vendor

Control Components Inc.

4.1.39.5 Special Cautions

See Babcock & Wilcox - CCI Maintenance (following)

4.1.39.6 Periodic Service

See Babcock & Wilcox - CCI Maintenance (following)

4.1.39.7 Parts List

See Babcock & Wilcox - CCI Maintenance (following)

4.1.39.8 Special Tools

None

4.1.39.9 Maintenance Instructions

See Babcock & Wilcox - CCI Maintenance (following)

4.1.39.10 Acceptance Tests

See Control Component Inc. Certificate of Conformance (following)

OPERATION and MAINTENANCE INSTRUCTIONS

SELF DRAG® VELOCITY CONTROL ELEMENT

GLOBE or ANGLE
SERVICE FROM 450°F

PART NUMBER

24744-1

SERIAL NUMBER

24744-1-1

FINAL SEP 29 1981

Stearns-Roger

PO# C21700 SEP 22'81

S-R No. E-4 File No. 53

STEARNS AND ROGERS ENGINEERING CORPORATION

6x10 ANSI CLASS 2500

PURCHASE ORDER: 5000C-21700

CCI WORK ORDER: 24744

MANUALS ISSUED: 9-10-81

PREPARED BY: Mary Ann Piantoni

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Babcock & Wilcox
Control Components, Inc.
2567 S.E. MAIN STREET
IRVINE, CALIFORNIA 92714
TELEPHONE: (714) 979-6600

PUBLICATION NO. 0503-2

INTRODUCTION

This manual provides installation, maintenance, and repair instructions for DRAG Valves, manufactured by Control Components International, a division of Babcock & Wilcox, 2567 S.E. Main Street, Irvine, California 92714.

The manual is divided into five sections as follows:

Section I	DESCRIPTION: Includes a description for the assembly with a brief explanation of the principle of operation.
Section II	INSTALLATION: Procedures for pre-installation requirements and installation of the assembly into a system.
Section III	MAINTENANCE: Troubleshooting, cleaning, disassembly, inspection, and assembly procedures.
Section IV	RECOMMENDED SPARE PARTS & ASSEMBLY DRAWINGS: Spare parts recommendations, specifications, and assembly drawings and bills of material for DRAG Valve component parts and accessories.
Section V	ACCESSORIES: Installation and maintenance instructions for accessory assemblies that may be a part of the DRAG Valve.

Instructions in this manual are applicable for globe and angle configurations of the DRAG Valve. Differences in the instructions peculiar to a particular type of body configurations will be noted as required in the text.

SAFETY IS GOOD BUSINESS

DURING THE COURSE OF MAINTENANCE AND INSPECTION ACTIVITIES ON THE CONTROL COMPONENTS EQUIPMENT YOU ARE CAUTIONED TO ADHERE TO THE INSTRUCTIONS CONTAINED IN THIS MANUAL AND TO INSIST UPON STRICT ADHERENCE TO YOUR PLANT SAFETY POLICIES IN ORDER TO AVOID POSSIBLE DAMAGE TO EQUIPMENT AND INJURY TO PERSONNEL.

OUR SERVICE DEPARTMENT IS PREPARED TO DISCUSS SOLUTIONS TO ANY PROBLEMS CONCERNING THE MAINTENANCE AND INSPECTION PROCEDURES APPLICABLE TO THE CONTROL COMPONENTS EQUIPMENT. PLEASE DIRECT ALL INQUIRIES TO:

CONTROL COMPONENTS INTERNATIONAL
2567 S.E. MAIN STREET
IRVINE, CALIFORNIA 92714

ATTENTION: SERVICE MANAGER

TELEPHONE: 714-979-6600

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1-1. GENERAL

1-2. Self DRAG Velocity Control Elements, hereafter called control elements, are designed to control flow of liquid, gas, or steam in a system, reducing vibration, noise, and trim erosion.

1-3. DESCRIPTION

The control element is comprised of a body assembly through which the fluid flows, an actuator assembly to control the flow, and accessory components as required for individual specifications.

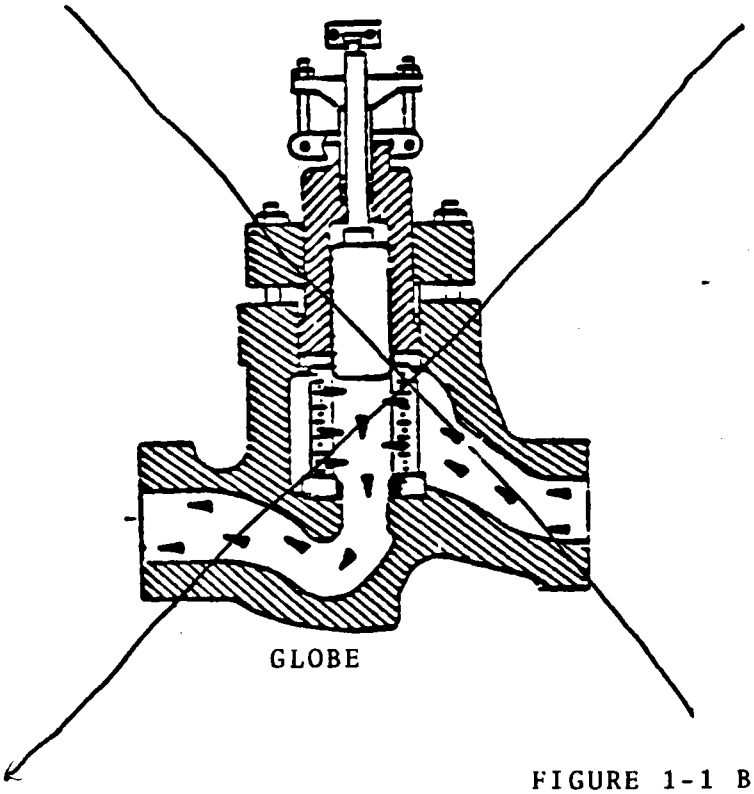
1-4. BODY ASSEMBLY (See figure 1-1)

a. The body assembly is available in two basic configurations, globe and angle, with flow either over-the plug or under-the-plug. When flow is over-the-plug the flow passes through the sides of the disk stack into the bore, to the outlet port. The disk stack will serve as a protective strainer in this flow direction, preventing particles from entering the disk stack and possibly causing damage to internal parts. If the flow is under-the-plug, system flow is into the disk stack bore, through the passages, to the outlet port. An under-the-plug configuration will not strain the material that may cause damage to internal parts.

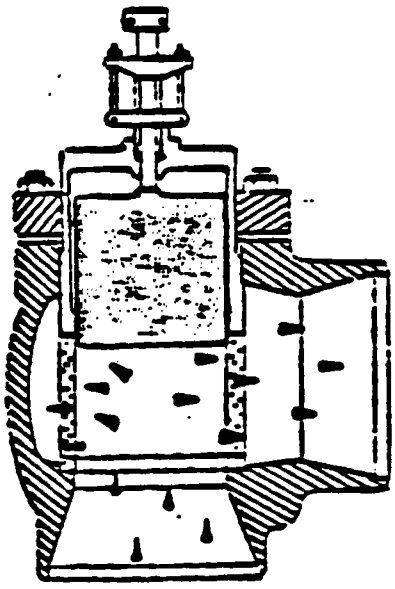
Over-the-plug flow is usually specified for liquids, while under-the-plug flow is normally used for steam or gas applications. In all configurations the plug can be positioned within the disk stack bore to expose more or fewer passages to obtain precise control of flow, from the minimum to the maximum designed flow specifications

b. Internal parts of the body

OVER-THE-PLUG FLOW



GLOBE



ANGLE

FIGURE 1-1 BODY CONFIGURATIONS

1. BODY
2. PLUG ASSEMBLY
3. DISK STACK ASSEMBLY
4. SEAT RING
5. STEM PACKING
6. BALANCE SEALS
7. STEM CONNECTOR
8. BONNET
9. BONNET FLANGE
10. WARMING DISK

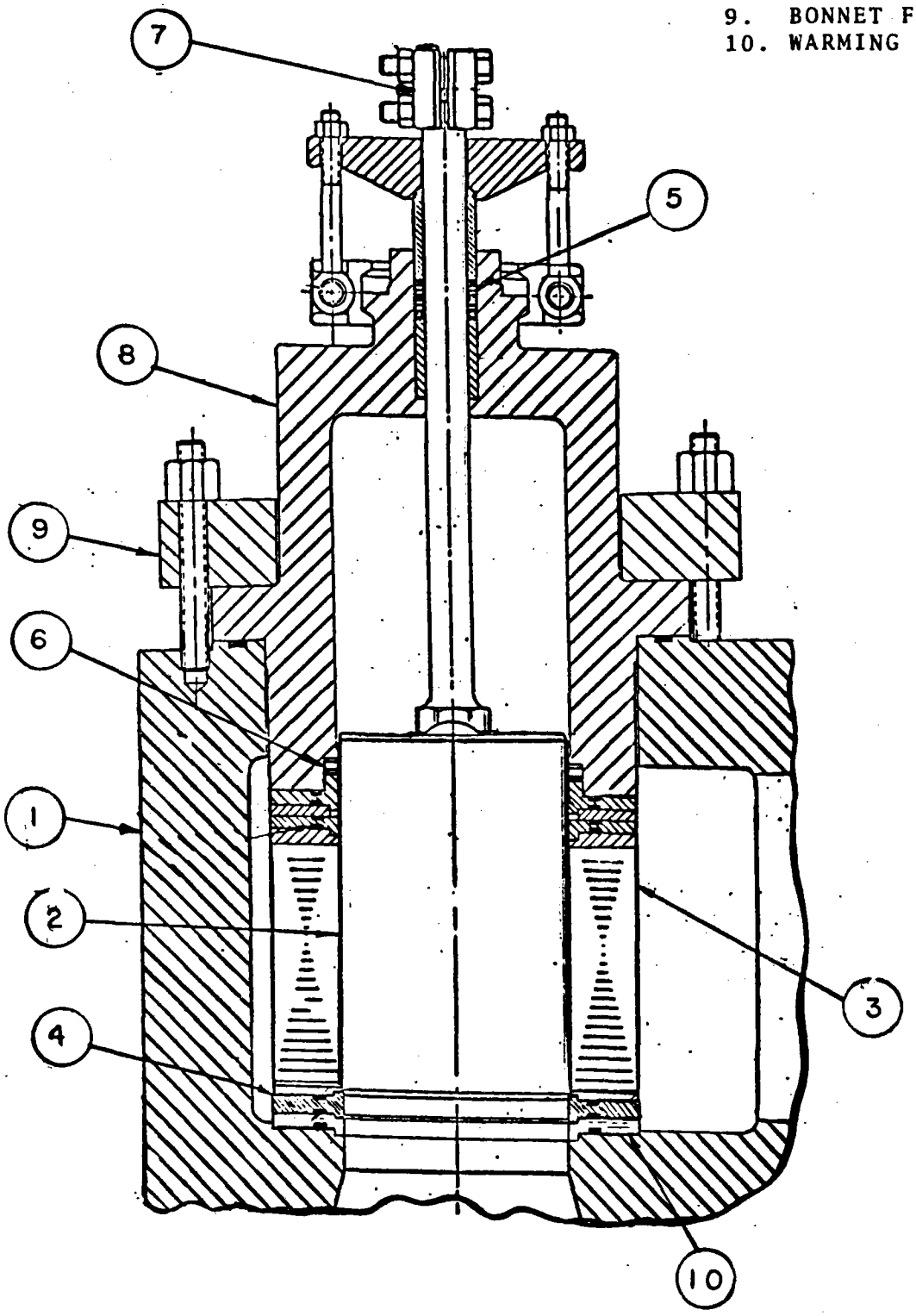
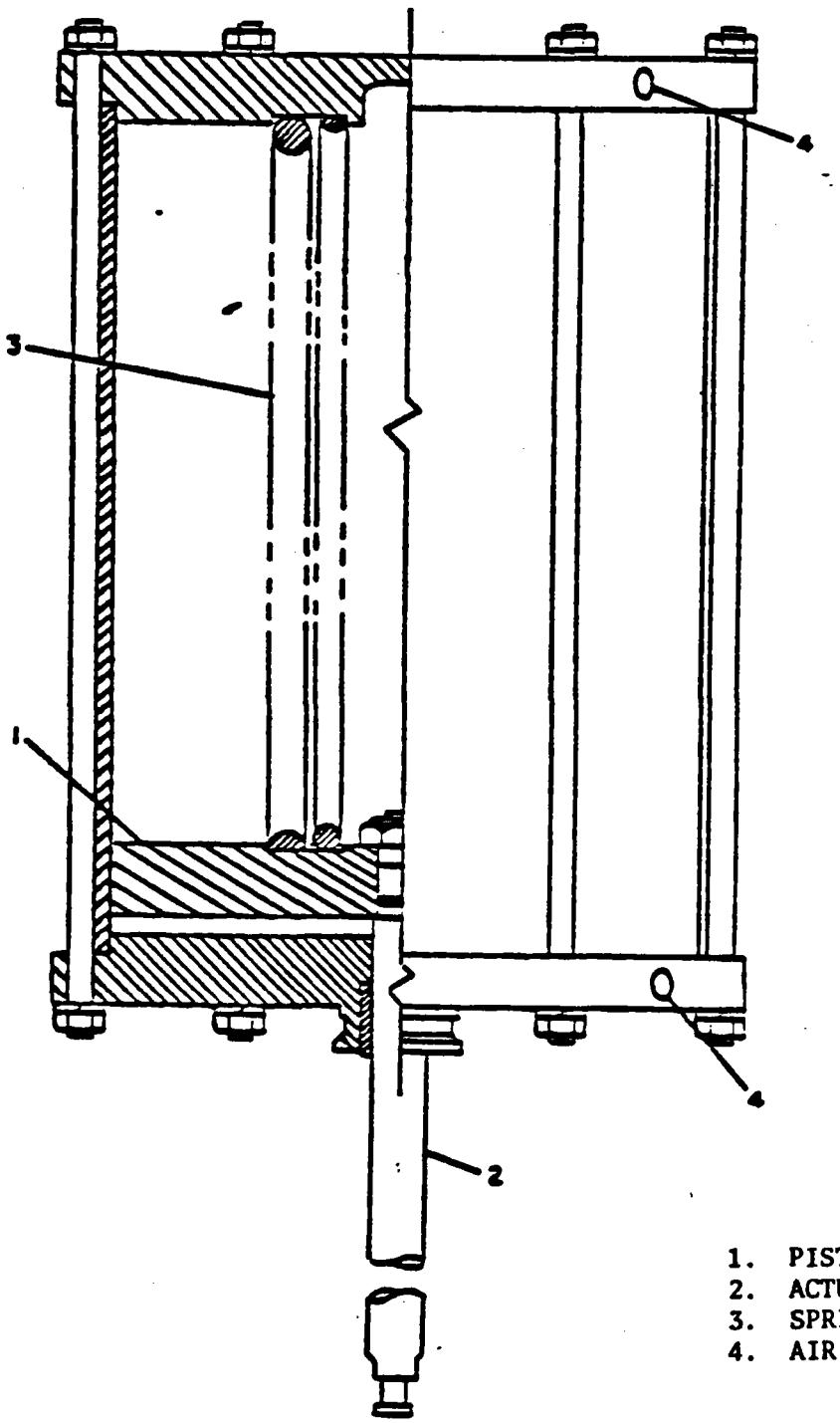


FIGURE 1-1 BODY ASSEMBLY



1. PISTON
2. ACTUATOR SHAFT
3. SPRING
4. AIR PORT

FIGURE 1-3. ACTUATOR ASSEMBLY

assembly are similar in all configurations. Flow through body (1,figure 1-2) is controlled by the position of plug (2) within disk stack (3). Seat ring (4), packings (5), and seal (6) prevent leakage. Stem clamp (7) connects the plug stem to the actuator shaft.

1-5. ACTUATOR ASSEMBLY (See figure 1-3)

a. The acutator assembly is pneumatic operated, connected to the body assembly by a yoke, and to the plug stem by an actuator shaft (2). The actuator assembly extends or retracts the plug assembly within the body assembly by pressure applied to either side of piston (1).

b. Air to position the actuator shaft within the cylinder is received at air port (4), forcing the actuator shaft to move in the appropriate direction This transfers mechanical force through the shaft to re-position the plug within the body assembly. In the event of power failure, springs (3), when supplied, will force piston (1) to move the plug into the specified failure position.

1-6. ACCESSORIES

Refer to Section V for accessory information.

1-7. PRINCIPLE OF OPERATION

a. The disk stack permits changes in flow rate while limiting flow velocity through the control element. The disk stack consists of a number of disks into which labyrinth flow passages have been etched to allow a fixed flow. Impedance in the passages is developed by a series of right-angle turns, with a specific number of turns in each passage to limit the velocity to an acceptable level. Since each disk has a known flow capacity, flow through the control element can be accurately measured and controlled. The position of the plug within the disk stack bore determines flow by exposing more or fewer disk passages.

b. For liquid service,the cross section of the flow passage is constant (see figure 1-4). For gas or steam service, because of changes in specific volume, the cross section of the passage is expanded incrementally to maintain constant velocity through the passage (see figure 1-5).

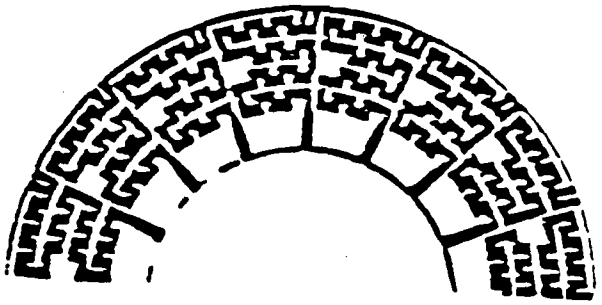


FIGURE 1-4. LIQUID DISK PASSAGES

c. Since a maximum fluid velocity is designed into each disk,the control element can operate at a pre-determined and controlled velocity over the full range of the designed capacity, to minimize high velocity changes, which result in noise, flashing, cavitation, vibration, and erosion.

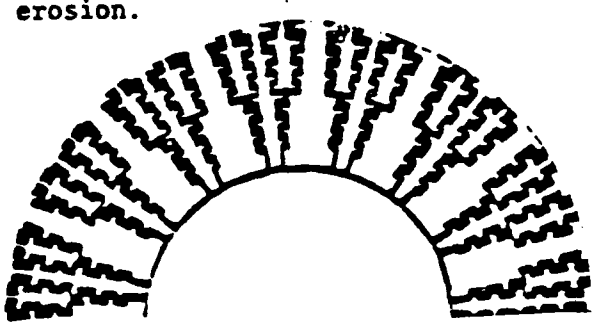


FIGURE 1-5 GAS OR STEM DISK PASSAGES

SECTION II
INSTALLATION

2-1. GENERAL

2-2. Instructions in the following paragraphs describe installation procedures for the control element. Instructions not included are to be performed in accordance with standard acceptable practices as required by local specifications and/or regulations.

2-3. PRE-INSTALLATION

2-4. UNCRATING

a. An envelope containing information pertaining to the control element is attached to each unit prior to shipment. TRANSMIT THIS DATA TO THE PROPER AUTHORITY.

b. Remove the top shipping strap and/or braces and carefully check the equipment against the packing list. Make a note of any loose, damaged, or missing parts. Notify both the freight company and Control Components of any damages. Telephone Control Components Int'l (714) 979-6600.

2-5. HANDLING

The unit is shipped in a container designed to support both the body assembly and the actuator assembly. To remove the control element from the shipping container, place appropriate slings and lift with a hoist.

2-6. FLUSHING

a. When the control element is installed in a system suspected to be contaminated with foreign particles, the system should be flushed to prevent possible damage to the control element. When the system is contaminated, it should be flushed with the disk stack removed from the body assembly and a flushing flange installed. Remove internal parts from the body assembly as described in Section III.

b. A flushing cage can be installed to replace the disk stack assembly if continued operation of the control element is required during the flushing operation. Both a flushing flange and a flushing cage can be purchased from Control Components Int'l.

2-7. CLEANING

The control element has been cleaned, inspected, and sealed at the factory prior to shipment. The protective cover will guard against entry of foreign matter and no additional cleaning should be required. A visual examination of the interior of the body should be made to ensure that the element is free of contaminants.

CAUTION

Use care when lifting or handling the control element to ensure that the accessories and lines are not damaged.

2-8. ALIGNMENT

When removed from the shipping container, the control element can be rotated to the installed position using a hoist and sling.

2-9. INSTALLATION

NOTE

Steps a and b below are applicable for flange connecting control elements only. Proceed to step c for instructions applicable to control elements to be welded into the line. Steps d and e apply to both types of elements.

a. Ensure that seals are positioned between the mating flanges.

CAUTION

Do not mar the the seal surface of the flanges as leakage may result.

b. Position the control element in the line, correctly positioned for direction of flow as indicated by the arrow on the body.

CAUTION

If the internal parts of the control element are not removed prior to installation, ensure that the plug is in the fully open position and that heat sinks are positioned adjacent to areas that are to be welded, to prevent heat damage to seals.

CAUTION
(continued)

Do not use plug or actuator shafts for grounding during welding operations.

c. Position the control element in the line, correctly positioned for direction of flow as indicated by the arrow on the body.

d. Ensure that utilities are available as required.

e. The control element is normally installed in a vertical position. If the assembly is to be installed in a position other than vertical, adequate supports may be required to support the actuator assembly. Request support recommendations from Control Components Int'l.

2-10. PRE-OPERATION

a. Ensure correct utilities are connected and properly adjusted.

b. Ensure the by-pass valve on the actuator assembly is in the AUTOMATIC position (if supplied with a manual override assembly).

c. Ensure the by-pass and control valves in the positioner are in the AUTOMATIC position (if the positioner is supplied).

d. Ensure the accessory components are connected and correctly adjusted. Refer to Section V for applicable instructions.

e. Stroke the control element to ensure proper operation.

f. Inspect all connections for leakage.

SECTION III
MAINTENANCE

3-1. GENERAL

This section provides detailed instructions for troubleshooting, complete disassembly, cleaning, inspection, repair, and assembly. Refer to Section V for maintenance instructions for components not included in this section.

NOTE

Notify Control Components Int'l, Field service Engineering Dept. (714) 979-6600, of any problems that may be encountered during maintenance procedures.

3-2. TROULBLESHOOTING

Troubleshooting procedures are limited to general service discrepancies that could occur during the lifetime of the control element. These procedures are limited in scope as the control element is designed for trouble-free operation and long life. Table 3-1 lists possible troubles, probable causes, and suggested remedial action. Refer to Section V for accessory component troubleshooting procedures as applicable.

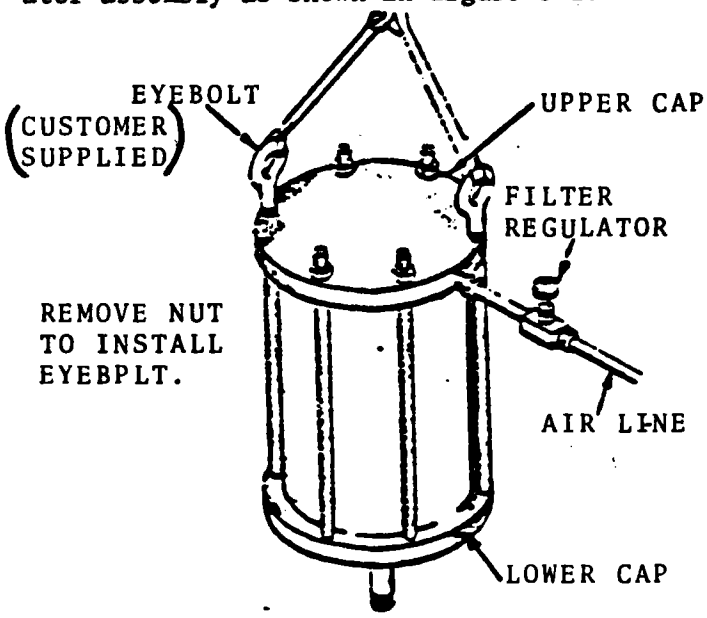
3-3. DISASSEMBLY

3-4. CONTROL ELEMENT (See figure 3-2)

a. Disconnect all utility lines.

b. Remove the manual override assembly and other accessory components as required. Refer to Section V for removal instructions. Do not remove the manual override assembly unless the actuator assembly is to be disassembled.

c. Attach a sling to the actuator assembly as shown in figure 3-1.



Attaching Sling to Actuator Assembly

d. Loosen nuts (6, figure 3-2) until lockwashers (7) are completely relaxed.

e. Install a temporary air line with a manually controlled pressure regulator installed in the line, to the upper cap air port of the actuator assembly (See figure 3-1).

f. Apply sufficient air pressure to the actuator assembly to break bonnet (5, figure 3-2) loose at body assembly (9).

g. Slowly relieve all air pressure from the actuator assembly.

TABLE 3-1. TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE SEAT LEAKAGE UNIT HAS WARMING DISK SEAT LEAKAGE CAN NOT BE CHECKED.		
BONNET LEAKAGE	INSUFFICIENT TORQUE ON BONNET FLANGE NUTS BONNET SEAL SURFACE DAMAGE BODY OR BONNET SEALING SURFACE DAMAGED	TIGHTEN TO SPECIFICATIONS REWORK OR REPLACE DISASSEMBLE AND REPAIR OR REPLACE
STEM PACKING LEAKAGE	LOOSE GLAND FLANGE NUTS DAMAGED PLUG STEM SURFACE INSUFFICIENT OR WORN PACKINGS	TIGHTEN REPLACE PLUG ASSEMBLY REPLACE PACKINGS
PLUG ASSEMBLY SHAFT JUMPING OR STICKING	PLUG ASSEMBLY OR DISK STACK ASSEMBLY GALLED FOREIGN MATERIAL IN DISK STACK BORE RESTRICTED OR INSUFFICIENT AIR SUPPLY DEFECTIVE POSITIONER (IF INSTALLED) PACKINGS NOT PROPERLY INSTALLED	DISASSEMBLE AND EXAMINE EXTENT OF DAMAGE. REPAIR OR REPLACE CLEAN CHECK AIR SUPPLY SEE SECTION V ADJUST OR REPLACE
ELEMENT DOES NOT FOLLOW POSITIONER INPUT SIGNAL	DEFECTIVE ACTUATOR PISTON GALLED PLUG STEM OR PLUG INSUFFICIENT AIR SUPPLY BALANCE SEAL FAILURE	REPLACE PISTON REPLACE PLUG ASSEMBLY CHECK AIR SUPPLY REPLACE BALANCE SEAL

TABLE 3-1. TROUBLESHOOTING (CONTINUED)

TROUBLE	PROBABLE CAUSE	REMEDY
SLOW FLOW THROUGH ELEMENT	DISK STACK PASSAGES CLOGGED	REMOVE AND CLEAN
HISSING SOUND FROM ACTUATOR ASSEMBLY	LOOSE ACTUATOR STUD NUTS	TIGHTEN
	END CAP SEAL LEAKAGE	REPLACE SEAL
	SHAFT SEAL LEAKAGE	REPLACE SEAL

NOTE

Steps h through j are applicable for FAIL CLOSE control elements only. Steps k and l describe procedures for FAIL OPEN type control elements. Steps m through p are applicable for both.

h. Disconnect the temporary air line from the actuator assembly upper cap air port and install in the lower cap air port.

i. Apply sufficient air pressure to the actuator assembly to retract the actuator shaft approximately two (2) inches into the cylinder.

j. Remove stem clamp (2).

k. Apply sufficient air pressure to the actuator assembly upper cap air port to extend the plug assembly to within two (2) inches of the closed position.

l. Remove stem clamp (2).

m. Remove gland flange (3) and yoke clamp (4).

n. Lift the actuator assembly from the body assembly.

o. Slowly relieve all air pressure from the actuator assembly. Disconnect the temporary air line and remove the actuator assembly to a clean work area for disassembly if required.

p. Install stem clamp (2) onto the plug assembly to facilitate lifting internal parts from the body assembly.

3-5. BODY ASSEMBLY (See figure 3-3).

a. Remove the bonnet flange (16) from the body (1).

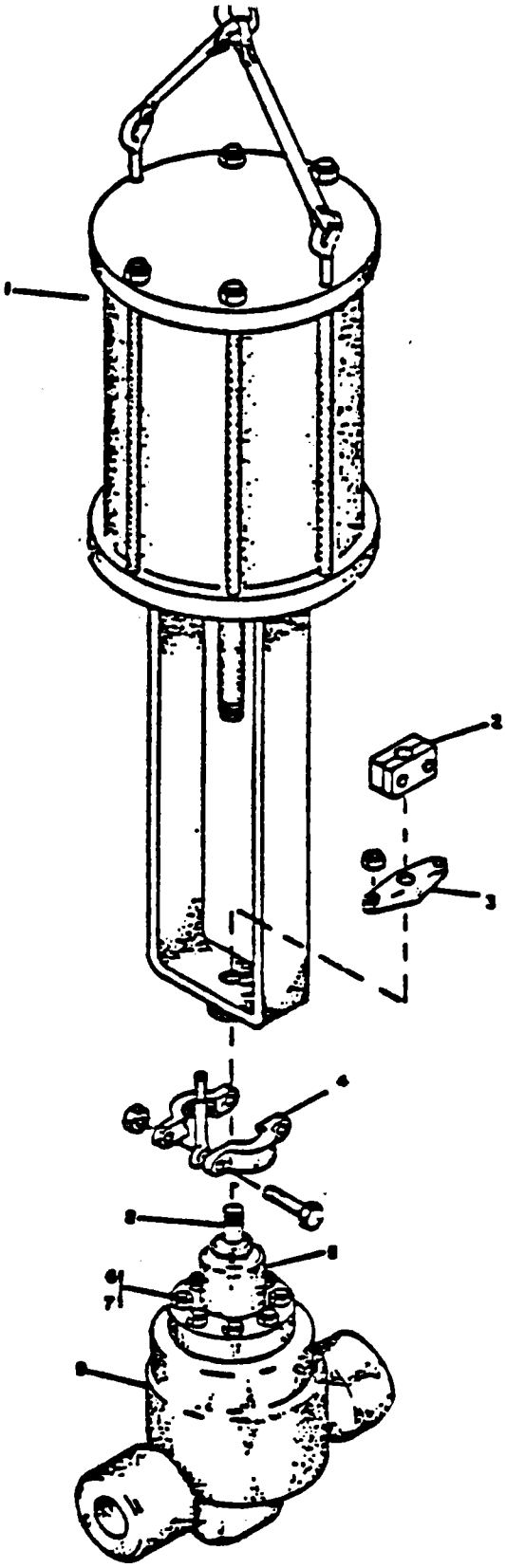
b. Attach the yoke clamp (21) and a sling to the bonnet (12) and remove the bonnet from the body.

c. Remove flexitalic gasket (2) from the body.

d. Remove bushing guide (9), spacer (8) and bushing (7) from the disk stack (5). Remove the seals (2) from the bushing guide, spacer and bushing.

e. Attach the stem connector (23) to the stem and remove the plug assembly (6)

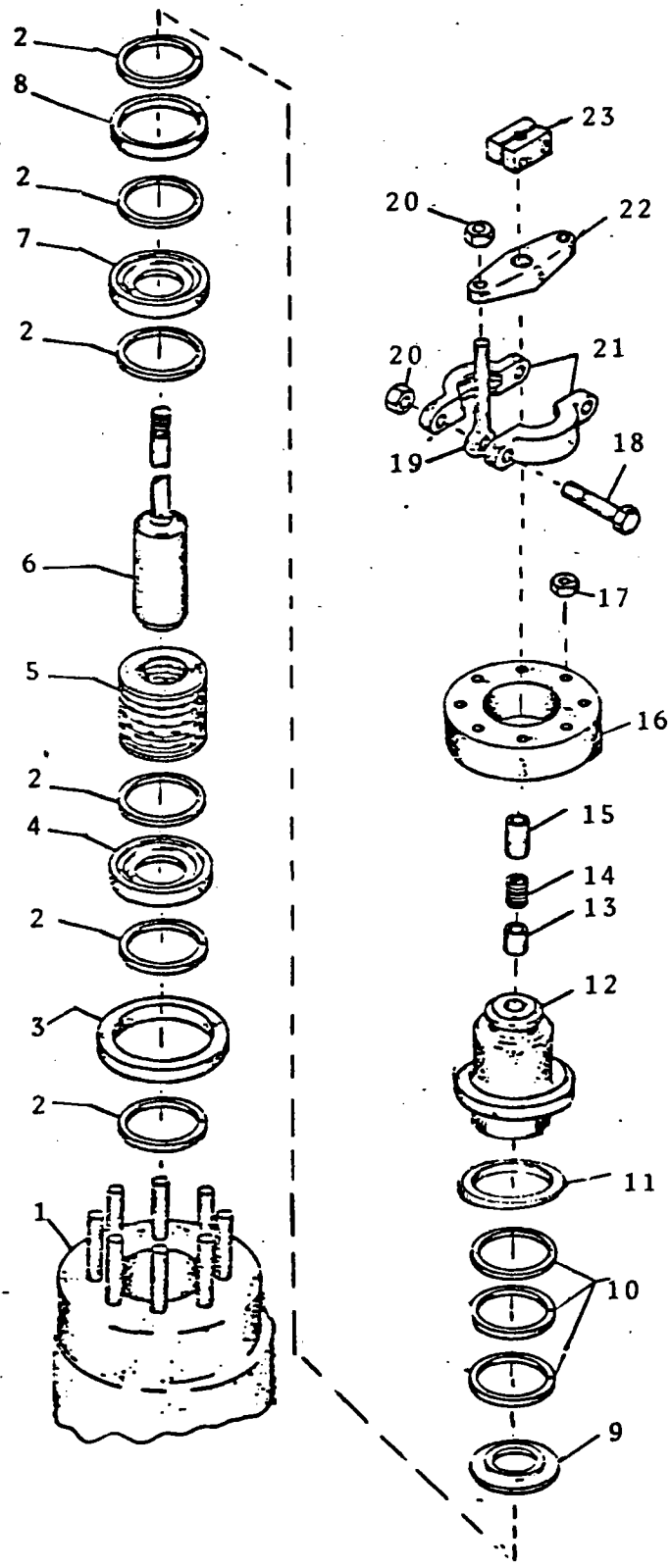
f. Remove the seal spacers (10) and balance seal (10) from the bonnet.



1. ACTUATOR ASSEMBLY
2. STEM CLAMP
3. GLAND FLANGE
4. YOKE CLAMP
5. BONNET
6. NUT
7. LOCKWASHER
8. PLUG ASSEMBLY
9. BODY

FIGURE 3-2. CONTROL ELEMENT

BODY ASSEMBLY



1. BODY & STUDS
2. GASKET, FLEXITALLIC
3. WARMING DISK
4. SEAT RING
5. DISK STACK ASSEMBLY
6. PLUG ASSEMBLY
7. BUSHING
8. SPACER
9. BUSHING GUIDE
10. SPACER & PACKING
11. GASKET, FLEXITALLIC
12. BONNET
13. SPACER
14. STEM PACKING
15. PACKING FOLLOWER
16. BONNET FLANCE
17. HEX NUT
18. HEX HEAD SCREW
19. EYEBOLT
20. HEX NUT
21. YOKE CLAMP
22. PACKING FLANGE
23. STEM CONNECTOR

FIGURE 3-3 BODY ASSEMBLY

g. Remove the packing follower (15) from the bonnet. Using a packing puller, remove packings (14). Remove packing spacer (13) from bonnet.

h. Lift disk stack from the body.

NOTE

WEIGHT OF THE DISK STACK ASSEMBLY MAY NECESSITATE USE OF A SLING AND HOIST TO REMOVE.

i. Remove seat ring (4) from the body.

j. Remove gaskets from the seat ring.

k. Remove the warming disk assembly (3) from the body.

l. Remove seal from the warming disk assembly,

3-6. ACTUATOR ASSEMBLY (SEE FIGURE 3-8)

If a manual override assembly is installed on the upper cap of the actuator assembly, refer to Section V for removal instructions.

WARNING

THE ACTUATOR ASSEMBLY IS SPRING LOADED. USE CARE TO FOLLOW NORMAL SAFETY PROCEDURES AND THE FOLLOWING INSTRUCTIONS WHEN REMOVING THE END CAPS. INJURY TO PERSONNEL OR DAMAGE TO THE ASSEMBLY COULD RESULT FROM IMPROPER DISASSEMBLY.

a. Remove two directly opposite studs (4) from the actuator assembly.

b. Replace the two removed studs with two all-thread studs of a length at least 50% longer than the length of cylinder (3). Allow the excess length of the studs to extend above the upper cap. Install lockwashers under the stud nuts on the lower cap end of the studs and flat washers under the upper cap ends. (See figure 3-9).

c. Remove remaining four studs (4, figure 3-8).

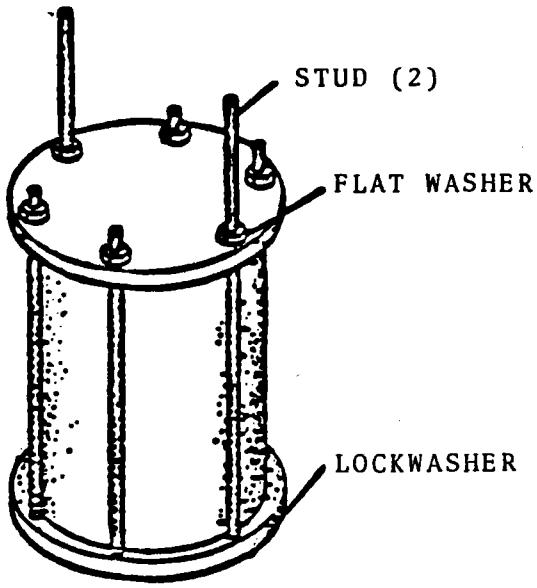


FIGURE 3-9. INSTALLING EXTENSION STUDS

CAUTION

NUTS ON THE EXTENSION STUDS MUST BE REMOVED EVENLY BY INCREMENTS TO PREVENT CANTING THE UPPER CAP.

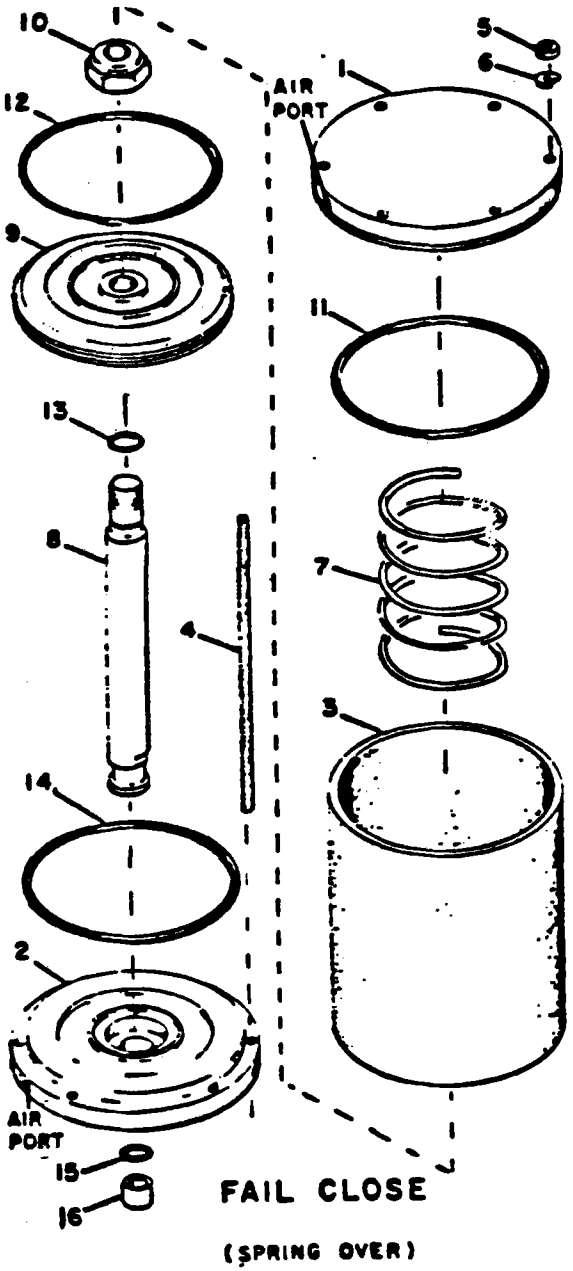
d. Alternately back-off the nuts on the extension studs until all spring tension is relieved. Remove upper cap (1).

e. Remove springs (7) (FAIL CLOSE type actuators only.

f. Tilt cylinder (3) at the top to break sealing tension at the lower cap. Remove the cylinder.

g. Slide actuator shaft (8), with piston (9) attached, from lower cap (2).

h. Remove springs (7). (FAIL OPEN type actuators only).



1.	UPPER CAP	9.	PISTON
2.	LOWER CAP	10.	NUT
3.	CYLINDER	11.	O-RING
4.	STUD	12.	O-RING
5.	NUT	13.	O-RING
6.	LOCKWASHER	14.	O-RING
7.	SPRING	15.	O-RING
8.	ACTUATOR SHAFT	16.	BUSHING

Figure 3-8. Actuator Assembly

NOTE

IF A MANUAL OVERRIDE ASSEMBLY IS INSTALLED ON THE UPPER CAP NUT (10) IS DELETED AND AN EXTENSION SHAFT RETAINS THE PISTON TO THE ACTUATOR SHAFT.

i. Secure the actuator shaft in a vise equipped with soft brass jaws. Remove nut (10), or the extension shaft, and piston (9).

NOTE

SECURE THE SHAFT BY THE MILLED FLATS. IF THE SHAFT DOES NOT HAVE FLATS INSTALL THE STEM CLAMP ONTO THE SHAFT AND CLAMP THE STEM CLAMP IN THE VISE.

3-7. CLEANING

3-8. CLEANING MATERIALS REQUIRED

The following list of materials is used to comply with Control Components Int'l. recommended cleaning requirements. Materials and methods may be changed to meet local conditions and requirements.

Crocus cloth, 200 grit
Brush, non-metalic
Brush, wire
Cleaning cloths
*Solvent
  Ethyl alcohol,
    anhydrous denatured
Methyl alcohol,
  anhydrous purified
Naptha gas,
  chloride free
Acetone,
  technical grade

*Re-distilled solvents must be equivalent to new solvent.

3-9. CLEANING METHODS

WARNING

SOLVENTS MAY BE TOXIC AND/ OR FLAMMABLE, REFER TO THE MANUAFACTURER'S INSTRUCTIONS BEFORE USING. EYE PROTECTION IS REQUIRED WHEN SOLVENTS OR COMPRESSED AIR IS USED.

a. Immerse parts in solvent.

b. Remove stubborn accumulations of dirt from sealing surfaces with a non-metalic brush.

c. Rinse parts with clean solvent.

CAUTION

DO NOT USE ABRASIVES TO CLEAN THE PLUG, STEM, OR BORE OF THE DISK STACK.

d. Remove scale, rust, and minor pitting from the interior of the body using 200 grit crocus cloth or a wire brush.

e. Soak the disk stack assembly in solvent.

f. Direct compressed air through each disk passage, in the reverse direction of flow.

g. Dry parts with cleaning cloths and/or compressed air.

3-10. INSPECTION

a. Visually inspect all threaded parts for damaged threads.

b. Replace the actuator cylinder if the interior surface has been scored or if fibers have separated

from the resin.

c. Examine finished surfaces of parts for damage or wear. Note defect and repair in accordance with instructions in this section.

NOTE

BURRS, NICKS, AND SCRATCHES ARE DEFINED AS MATERIAL RAISED ABOVE NORMAL SURFACES WHICH, IF NOT REMOVED WOULD PREVENT COMPLETE MATING OF PARTS AND SEALING SURFACES. RADIAL SCRATCHES ARE PERMISSIBLE, EXCEPT IN BALANCE SEAL AREAS. PARTS WITH LINEAR DEFECTS SHOULD BE REPLACED. (SEE FIGURE 3-10).

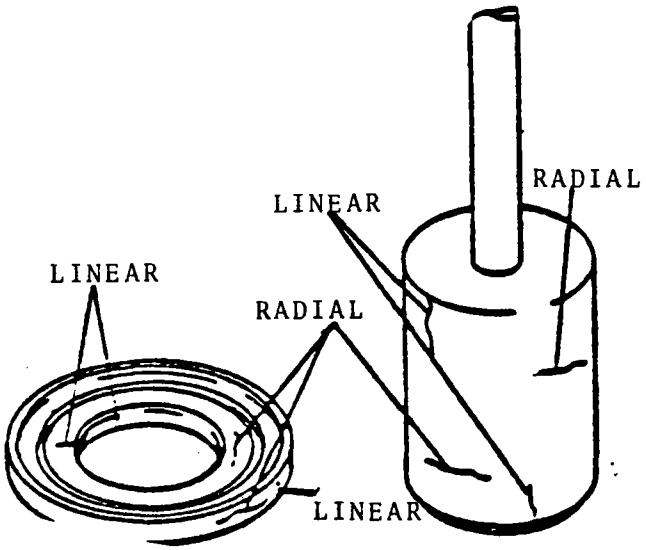


FIGURE 3-10. SURFACE DEFECTS

3-11. REPAIR

3-12. GENERAL

Replace all parts that cannot be repaired by the following procedures.

a. Chase all threads with correct tap or die to remove damage.

b. Polish burrs and corrosion from sealing surfaces using 400 grit crocus cloth.

CAUTION

EXCESS HONING WILL INCREASE THE DISK STACK BORE DIAMETER AND ALTER CHARACTERISTICS OF THE CONTROL ELEMENT.

c. If the disk stack bore is galled, hone the bore using an automatic honing device only. HONE THE BORE ONLY UNTIL THE RAISED PARTICLES ARE REMOVED.

d. Replace the plug assembly if pitted, galled, or worn through the hard surface overlay material.

e. Clean all repaired parts as described in the CLEANING paragraphs.

3-13. SEAT RING REPAIR N A

If the seat ring assembly is constructed with an encapsulated seat, the seat can be replaced as described in the following procedures.

a. Remove seals (2) from seat ring (1). (See figure 3-11).

b. Remove ring (3) from the bottom of the seat ring.

c. Pull retainer (4) from the seat ring and push seat housing (5) from the seat ring.

d. Pry seat (6) from the seat ring. Use care not to damage the machined surfaces.

e. Fold a new seat over itself as shown in figure 3-12 and install in

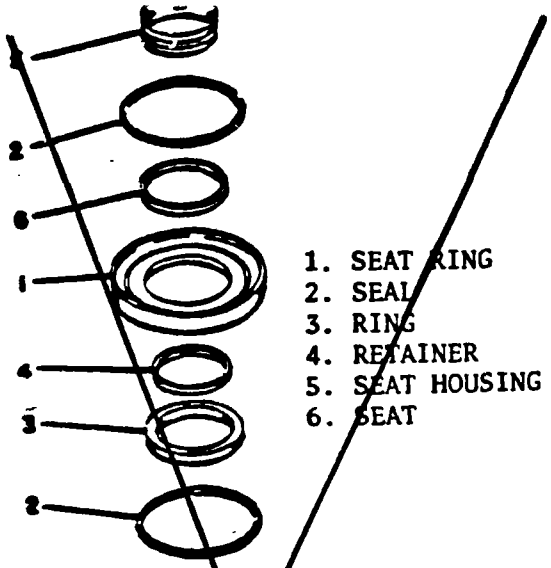


FIGURE 3-11. SEAT RING ASSEMBLY

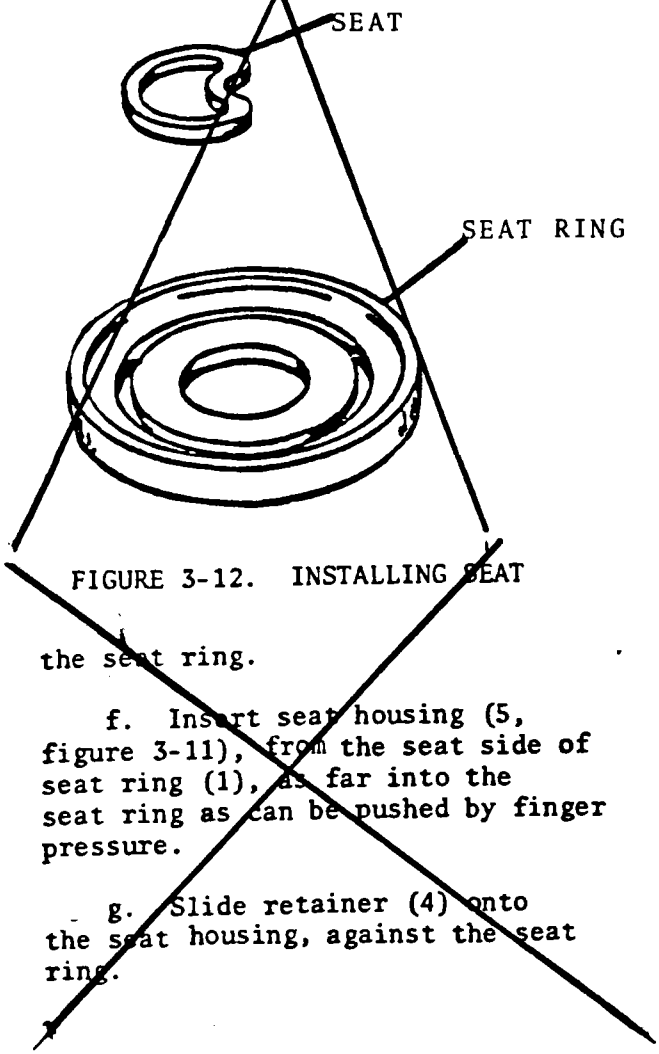


FIGURE 3-12. INSTALLING SEAT

the seat ring.

f. Insert seat housing (5, figure 3-11), from the seat side of seat ring (1), as far into the seat ring as can be pushed by finger pressure.

g. Slide retainer (4) onto the seat housing, against the seat ring.

h. Place the plug, with stem down, into a press assembly as shown in figure 3-13.

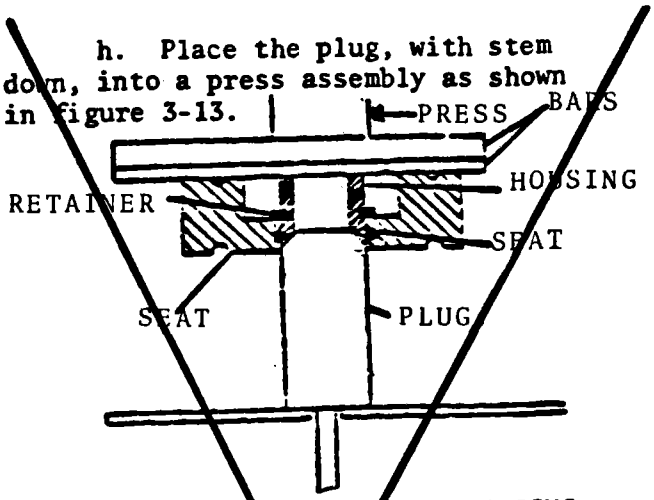


FIGURE 3-13. INSTALLING SEAT HOUSING

i. Place the seat ring assembly on the plug as illustrated.

j. Position metal bars across the seat ring, allowing space to insert a small screwdriver into the seat ring cavity.

k. While pushing on the inside diameter of the retainer with a small screwdriver, slowly press the seat ring onto the seat housing until the retainer enters the groove in the seat housing. Ensure the retainer is completely installed in the groove.

l. Remove the seat ring assembly from the press and install ring (3, figure 3-11) to hold the retainer in place.

3-14. ASSEMBLY

Procedures described in the following paragraphs are applicable for both configurations of control elements. Refer to the drawings shipped with the control element for torque values and other data applicable to a particular control element.

3-15. ACTUATOR ASSEMBLY (See figure 3-14).

a. Apply lubricant, such as Dow Corning number 55, or equivalent, to all o-rings and install as shown in figure 3-14.

NOTE

IF A MANUAL OVERRIDE ASSEMBLY IS INSTALLED ON THE UPPER CAP, REFER TO SECTION V FOR INSTALLATION INSTRUCTIONS.

b. Apply a light coat of lubricant, such as Dow Corning number 55 or equivalent, to the interior surface of cylinder (3). Install the cylinder onto lower cap (2).

NOTE

STEP C IS APPLICABLE FOR FAIL OPEN TYPE ACTUATOR ASSEMBLIES ONLY.

c. Install springs (7) into the cylinder.

d. Secure actuator shaft (8) in a vise equipped with soft brass jaws.

NOTE

SECURE THE ACTUATOR SHAFT BY THE MILLED FLATS. IF THE SHAFT DOES NOT HAVE FLATS, INSTALL THE STEM CLAMP ON THE SHAFT AND CLAMP THE STEM CLAMP IN THE VISE.

e. Secure piston (9) to the actuator shaft.

NOTE

IF A MANUAL OVERRIDE ASSEMBLY IS INSTALLED ON THE UPPER CAP, NUT (10) IS DELETED AND THE PISTON IS SECURED TO THE ACTUATOR SHAFT BY AN EXTENSION SHAFT. APPLY LOCTITE 242 TO THE ACTUATOR SHAFT THREADS BEFORE INSTALLING THE EXTENSION SHAFT.

f. Insert the actuator shaft assembly into the lower cap.

NOTE

STEP H IS APPLICABLE FOR FAIL CLOSE TYPE ACTUATORS ONLY.

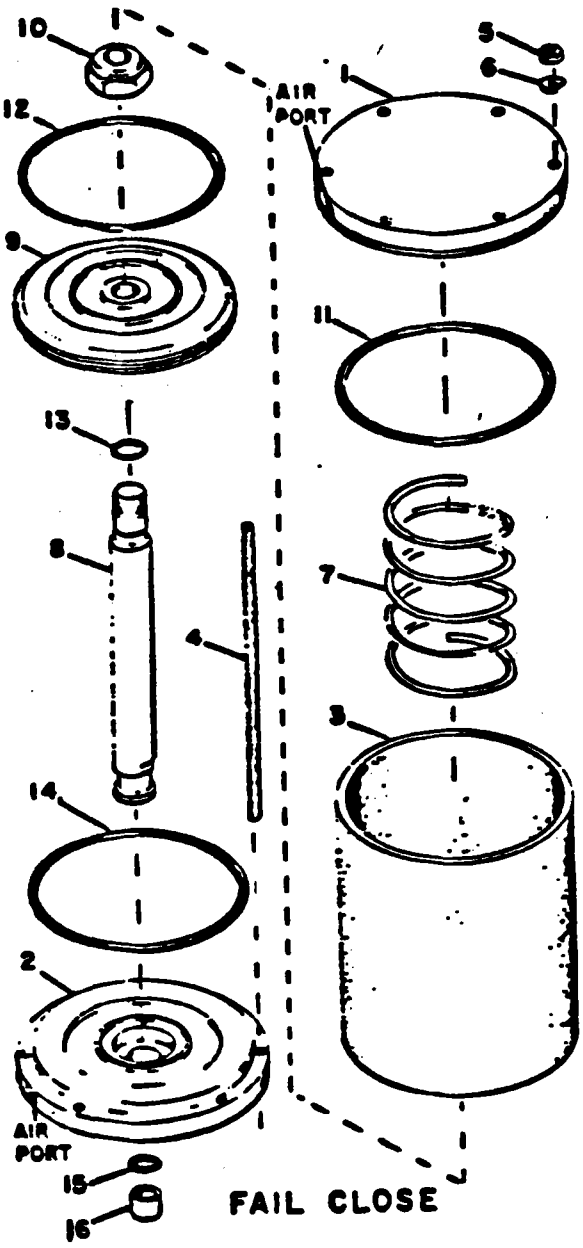
g. Install springs (7) into the cylinder.

h. Install two all-thread studs of a length at least 50% longer than the length of the cylinder into the lower cap. Allow the excess length of the studs to extend from the upper cap end. Install lockwashers under the nuts on the lower cap end of the studs and flat washers under the nuts on the upper cap end. (See figure 3-13).

i. Align the air ports in the lower cap and upper cap (1). Slide the upper cap onto the extension studs.

CAUTION

TIGHTEN THE NUTS EVENLY ON THE EXTENSION STUDS BY INCREMENTS TO PREVENT CANTING THE UPPER CAP. USE CARE TO PREVENT DAMAGE TO O-RINGS WHILE INSTALLING THE UPPER CAP.



1.	UPPER CAP	9.	PISTON
2.	LOWER CAP	10.	NUT
3.	CYLINDER	11.	O-RING
4.	STUD	12.	O-RING
5.	NUT	13.	O-RING
6.	LOCKWASHER	14.	O-RING
7.	SPRING	15.	O-RING
8.	ACTUATOR SHAFT	16.	BUSHING

FIGURE 3-14. ACTUATOR ASSEMBLY

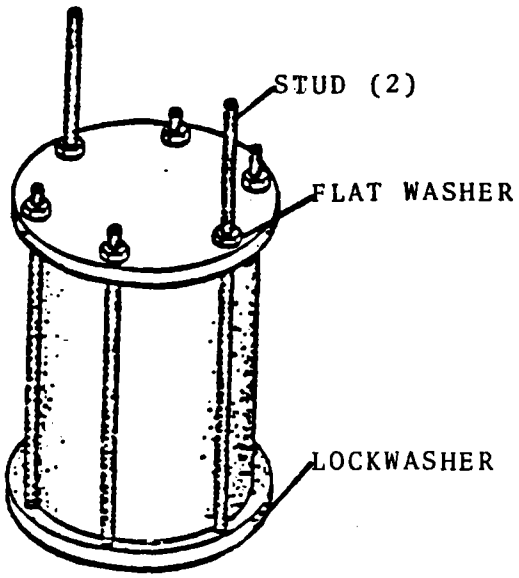


FIGURE 3-15
INSTALLING EXTENSION STUDS

NOTE

STEPS J THROUGH M ARE APPLICABLE IF THE ACTUATOR SHAFT DOES NOT EXTEND THROUGH THE LOWER CAP WHEN THE UPPER CAP IS INSTALLED ON THE EXTENSION STUDS. STEPS N THROUGH P ARE APPLICABLE FOR ALL OTHER ACTUATOR ASSEMBLIES.

j. Raise the cylinder from the lower cap to allow sight of the actuator shaft.

k. Place wood blocks between the lower cap and the cylinder to support the cylinder in the raised position.

l. Using an appropriate length of wooden dowel, guide the actuator shaft into the lower cap while alternately tightening the nuts on the extension studs.

m. Remove the blocks as soon as the shaft is through the lower cap.

n. Continue to tighten the extension stud nuts until the end caps are seated against the cylinder.

o. Install four studs (4,figure 3-14) and tighten the nuts.

p. Remove the two extension studs and replace with the remaining studs (4).

3-16. TEST ASSEMBLED ACTUATOR ASSEMBLY

a. Connect an air line to the lower cap air port and slowly apply 80 psi air pressure. Check for leakage at the bottom seal. Check for air flow at the upper cap air port, indicating piston seal leakage. Vent the air pressure.

b. Remove the air line from the lower cap air port and connect to the upper cap air port. Repeat step a above to test for upper cap leakage.

3-17. BODY ASSEMBLY (SEE FIGURE 3-16)

a. Apply a lubricant, such as petroleum jelly on seals (2) to hold them in place on the warming disk (3), seat ring (4) bushing (7) and bushing spacer (8). Install the seals in the grooves in the respective parts.

b. Install the warming disk in the body (1). Rotate the warming disk several times to ensure it is fully seated in the body recess.

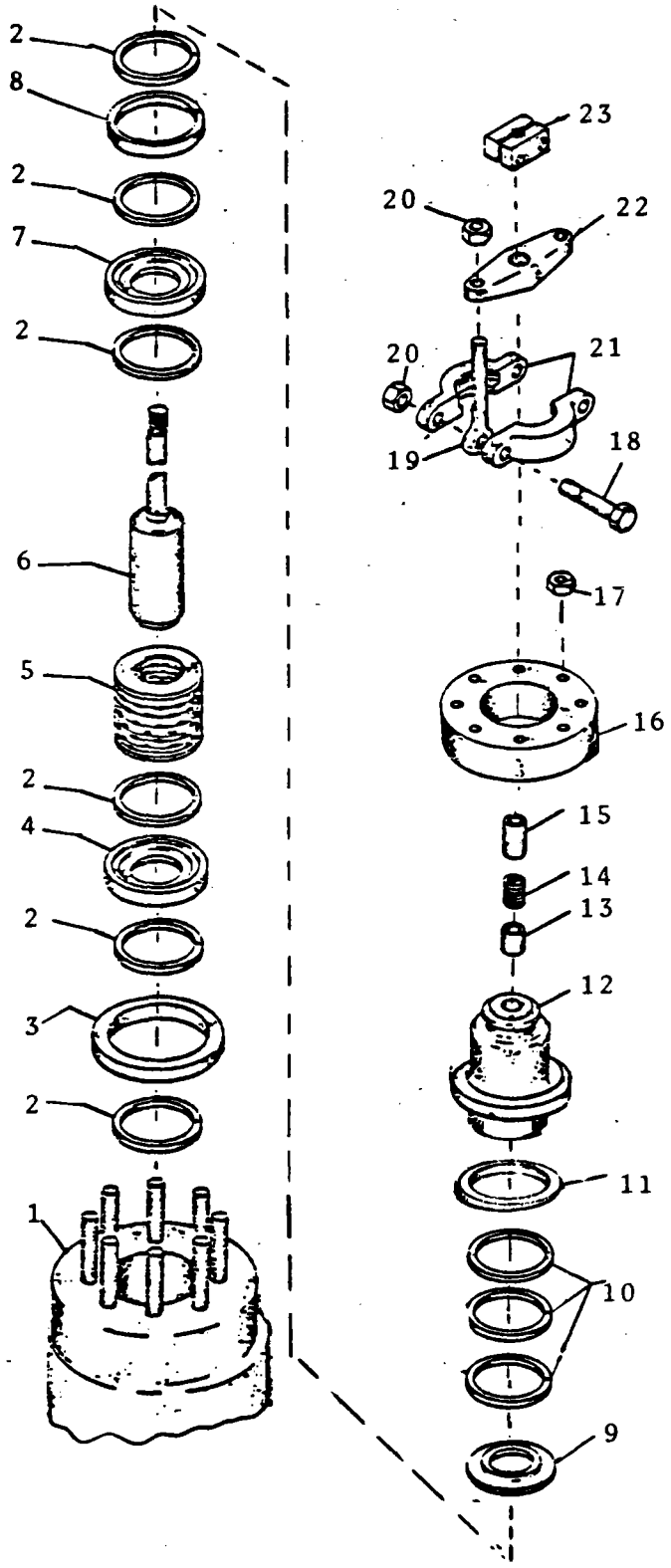
c. Install the seat ring in the body. Ensure the seat ring is seated in the recess of the warming disk.

d. Lower the disk stack (5) into the body until seated on the seat ring. Ensure the disk stack is seated in the recess of the seat ring.

NOTE

WEIGHT OF THE DISK STACK MAY REQUIRE USE OF A HOIST TO INSTALL.

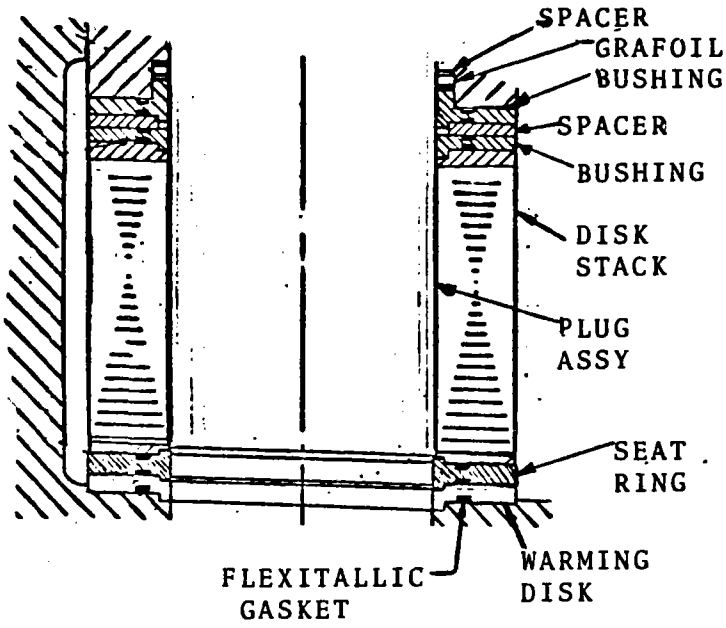
BODY ASSEMBLY



1. BODY & STUDS
2. GASKET, FLEXITALLIC
3. WARMING DISK
4. SEAT RING
5. DISK STACK ASSEMBLY
6. PLUG ASSEMBLY
7. BUSHING
8. SPACER
9. BUSHING GUIDE
10. SPACER & PACKING
11. GASKET, FLEXITALLIC
12. BONNET
13. SPACER
14. STEM PACKING
15. PACKING FOLLOWER
16. BONNET FLANCE
17. HEX NUT
18. HEX HEAD SCREW
19. EYEBOLT
20. HEX NUT
21. YOKE CLAMP
22. PACKING FLANGE
23. STEM CONNECTOR

FIGURE 3-16 BODY ASSEMBLY

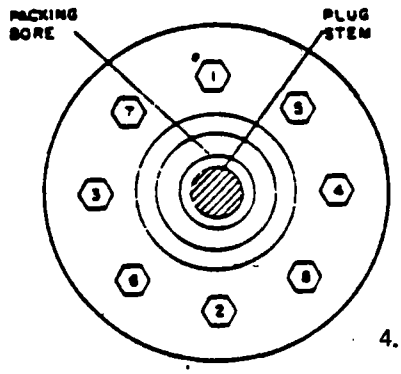
FIGURE 3-17 SEAT RING INSTALLATION



e. Apply Ultragraphite Coat Grade AA Lubricant, manufactured by Bylon Industries, Cleveland, Ohio, on the plug assembly (6, Figure 3-16). Install the stem clamp (23) on the plug assembly. Attach a sling to the plug and carefully lower the plug assembly into the disk stack assembly until bottomed on the seat ring. Remove the stem clamp.

f. Install the bushing, spacer and bushing guide around the plug assembly. Ensure each item is seated in the recess of the preceding part.

g. Apply Ultragraphite Coat, Grade AA lubricant on the balance seal (10).



4.1.39-27

FIGURE 3-19. TORQUE SEQUENCE

CAUTION

DO NOT USE A POINTED TOOL TO INSTALL THE BALANCE SEAL AS DAMAGE TO THE SEALING CAPACITY OF THE SEALS WILL RESULT. THE BALANCE SEALS ARE EASILY BROKEN IF UNEVEN PRESSURE IS APPLIED WHEN INSTALLING.

h. Install one of the balance seal into the recess of the bonnet. Use a ring of the same o.d. as the seal to push the seal into the bonnet recess.

i. Install the balance seal into the recess of the bonnet. Use a ring of the same OD as the seal to push the seal into the bonnet recess.

j. Place the remaining balance seal spacer around the plug assembly.

k. Install the flex gasket (11) in the machined groove on top of the body. Ensure the gasket is sealed in the groove.

l. Install the yoke clamp (21) and a sling on the bonnet. Using care to prevent damage to the balance seal, lower the bonnet into the body cavity.

m. Position the bonnet flange (16) over the bonnet and secure to the body. Tighten the nuts to the torque specified on the assembly drawings. Tighten the nuts alternately by 40 ft-lb increments, using a cross circular pattern as shown in figure 3-19. Ensure the plug stem is centered in the bonnet packing bore while tightening the nuts.

n. Install the packing spacer (13, figure 3-16) into the bonnet.

o. Apply Ultragraphite coat, Grade AA lubricant to the packings (14).

CAUTION

DO NOT USE A POINTED TOOL TO INSTALL THE PACKINGS AS DAMAGE TO THE SEALING CAPACITY OF THE PACKINGS WILL RESULT.

p. Carefully slide two packings, one at a time, over the plug stem and push into the bonnet cavity using the packing sleeve (15) to seat the packings.

NOTE

DO NOT SEAT MORE THAN TWO PACKINGS PER OPERATION OR THE PACKINGS WILL NOT COMPRESS AS REQUIRED.

q. Slide the packing sleeve over the plug stem against the packings.

r. Assemble the yoke clamp to the bonnet and slide the packing flange (22) on to the stem.

s. Tighten the packing flange nut (20) to 30 to 40 ft-lbs torque. This will apply approximately 1000 PSI pressure against the packings, compressing them for maximum sealing.

t. Remove the packing flange and packing sleeve and repeat steps m through t to install the remaining quantity of packings.

u. Remove the yoke clamp. Install the packing sleeve, the yoke, the yoke clamp and the packing flange.

3-18. CONTROL ELEMENT (SEE FIGURE 3-20

a. Connect a sling to actuator assembly (1) as shown in figure 3-20.

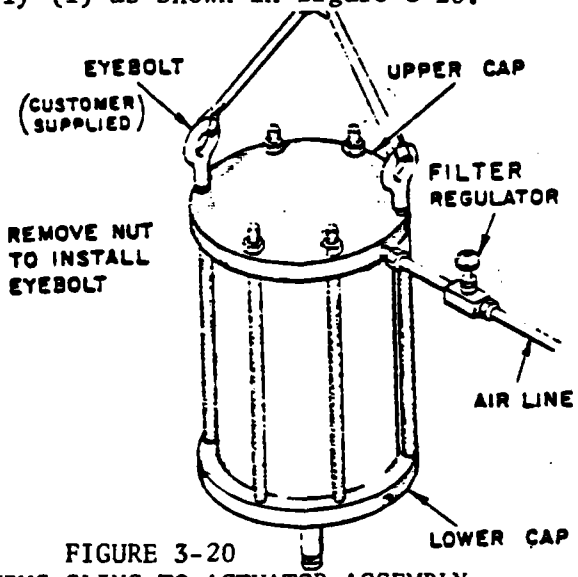
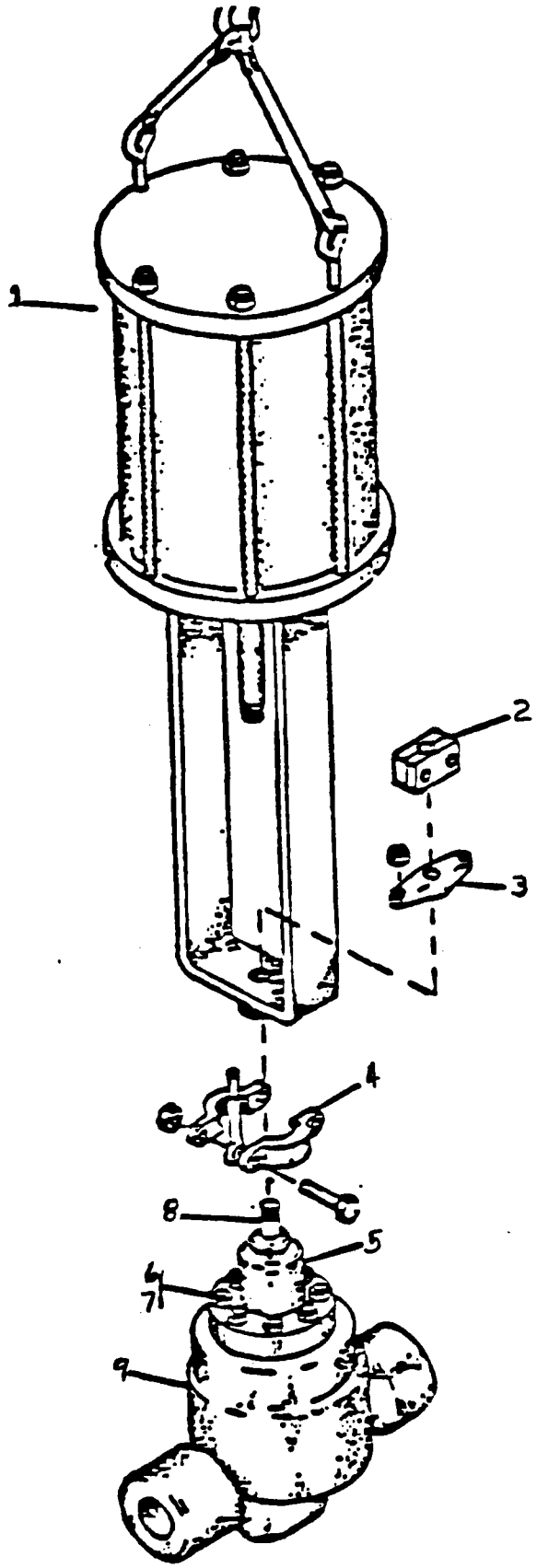


FIGURE 3-20
ATTACHING SLING TO ACTUATOR ASSEMBLY



1. ACTUATOR ASSEMBLY
2. STEM CLAMP
3. GLAND FLANGE
4. YOKE CLAMP
5. BONNET
6. NUT
7. LOCKWASHER
8. PLUG ASSEMBLY
9. BODY

FIGURE 3-21. CONTROL ELEMENT

NOTE

Steps b and c below are applicable for FAIL CLOSE type actuators only. Steps d and e apply to both configurations.

b. Connect a tempory air line, with a hand controlled pressure regulator installed, to the lower cap air port.

c. Slowly apply sufficient air pressure to retract the the actuator shaft approximately two (2) inches into the actuator cylinder.

d. Lower the actuator assembly onto the body assembly adn secure the two units with yoke clamp (4, figure 3-20).

e. Install gland flange (3) and secure with the yoke clamp.

NOTE

Step f is applicable for FAIL CLOSE actuators only. Refer to steps g and h for procedures that apply to FIAL OPEN configurations. Steps i through n are applicable to both types.

f. Slowly relieve all air presssure from the actuator assembly, allowing the actuator shaft to extend into contact with the plug stem.

g. Install an air line, with a manually controlled regulator installed, to the upper cap air port.

h. Apply sufficient air pressure to extend the actuator shaft into contact with the upper cap air port.

i. Install stem clamp (2) to secure the plug stem to the actuator shaft.

j. Slowly relieve all air pressure from the actuator assembly, allowing the internal parts to seek the relaxed level.

k. Install accessory assemblies in accordance with instructions described in Section IV.

l. Remove the temporary air line and install all permanent utility lines.

m. Check operation of the control component.

SECTION IV
RECOMMENDED SPARE PARTS AND ASSEMBLY DRAWINGS

LEVEL 1

Definition: Parts recommended in this level are classified as basic, routine, maintenance parts, and are recommended as the minimal spare parts requirement.

Parts Recommended: Seat Ring, All soft goods, such as Seals, Packings, O-rings, etc. . ., for the body and actuator assemblies.

LEVEL 2*

Definition: Parts recommended in this level are for control elements used in secondary systems and are not considered critical to plant operation, i.e. can be blocked out in the event of an element malfunction while the plant continues to operate.

Parts Recommended: Plug Assembly and all level 1 parts.

LEVEL 3*

Definition: Parts in this level are recommended as spares when the control element performs a function that is critical to plant operation, i.e. plant shut-down will result in the event of an element malfunction.

Parts Recommended: Disc Stack Assembly, and all level 1 and level 2 parts.

**Long lead time items*

Include part number of the item, assembly drawing on which the item is listed and the serial number of the control element when ordering parts.

The following assembly drawing are included in this addendum:

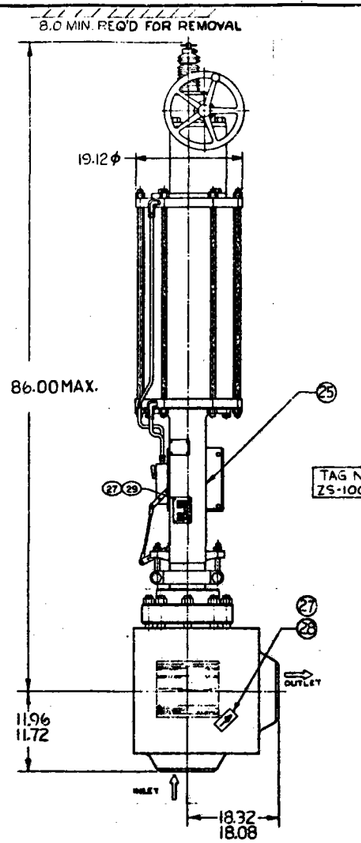
24744-1 - TOP ASSEMBLY

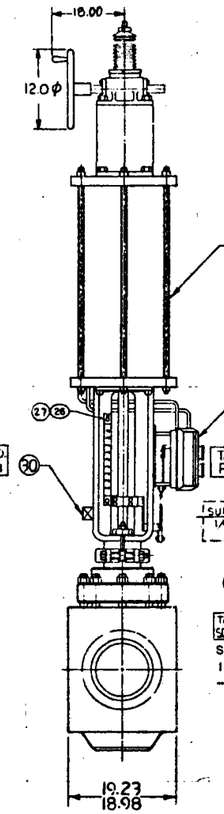
921601099 - BODY ASSEMBLY
730401011 - LIMIT SWITCH ASSEMBLY
730202028 - POSITIONER ASSEMBLY
730111042 - ACTUATOR ASSEMBLY
730305010 - MANUAL OVERRIDE ASSEMBLY
933901010 - CONTROL SCHEMATIC ASSEMBLY

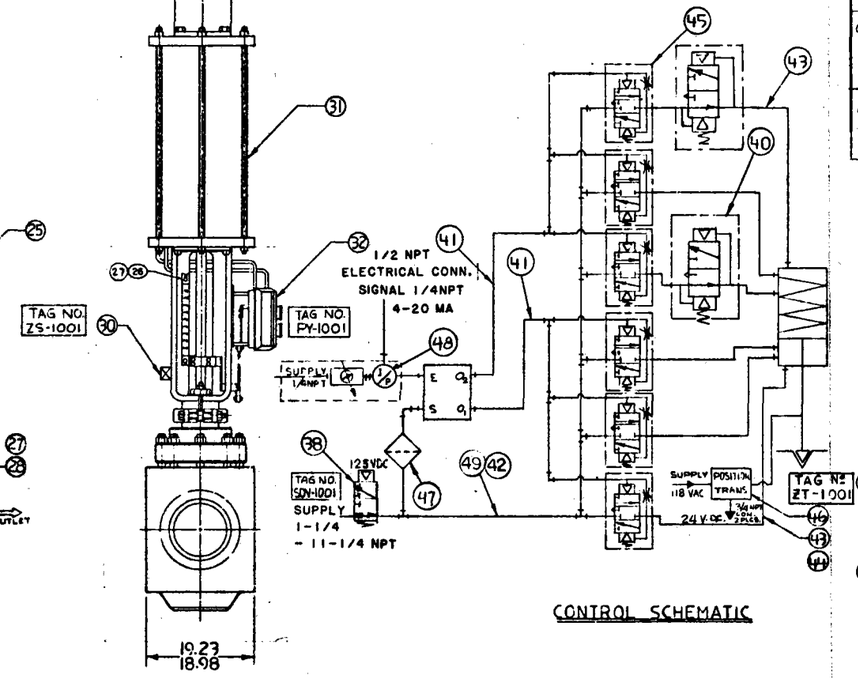
PARTS LIST

NO.	NAME	MATERIAL	QTY	REMARKS
1	BODY	ASTM-A-182-F22	1	
2	BONNET	ASTM-A-182-F22	1	
3	FLANGE, BONNET	ASTM-A-182-F22	1	OR A387-22
4	STUD, BONNET	ASTM-A193-B16	12	
5	NUT, HEX, BONNET	ASTM-A194-3	12	
6	PLUG	ASTM-A182-F11	1	STELLITE #6
7	STEM	INCONEL 718	1	
8	BUSHING	4130/4140	1	
9	WASHER, TAB	300 SERIES S.S.	1	
10	RING, SEAT	ASTM A-182-F11	1	STELLITE #6
11	SPACER	4130/4140		
12	GASKET, FLEXITALLIC	FLEXICARB/300 SERIES	6	
13	DISK STACK	INCONEL 718	1	HEAT TREAT
14	BUSHING, GUIDE	4130/4140	1	
15	SEAL, PLUG	GTN-70	1	OR GT-70
16	SPACER, PLUG SEAL	400 SERIES S.S.	2	
17	PACKING	CARBON WEAVE	3	
18	SPACER, PACKING	INCONEL 718	1	HEAT TREAT
19	PACKING, STEM	GTN-70	4	OR GT-70
20	FOLLOWER, PACKING	300 SERIES S.S.	1	
21	FLANGE, PACKING	CARBON STEEL	1	CAD. PLATE
22	CLAMP, YOKE	CARBON STEEL	2	CAD. PLATE
23	BOLT, PACKING FLANGE	CARBON STEEL	2	
24	CONNECTOR, STEM	300 SERIES S.S.	1	
25	YOKE	CARBON STEEL	1	
26	PLATE, TRAVEL	300 SERIES S.S.	1	
27	SCREW, DRIVE	300 SERIES S.S.	8	
28	LABEL, FLOW	300 SERIES S.S.	1	
29	PLATE, DATA	300 SERIES S.S.	1	
30	LIMIT SWITCH	EA170	1	NAMCO
31	ACTUATOR	200 IN.²	1	
32	POSITIONER	MOORE	1	
33	NUT, HEX	300 SERIES	4	
34	N/A			
35	DISK, WARMING	INCONEL 718	1	
36	GASKET, FLEXITALLIC	FLEXICARB/300 SERIES	1	
37	N/A			
38	VALVE, SOLENOID	ASCO 3-WAY 1¼NPT	1	HT8331A53
39	BOLT	300 SERIES	2	
40	VALVE, QUICK RELEASE	WABCO ¾" NPT	2	
41	TUBING	COPPER	A/R	⅜"ϕ
42	PIPE	BLACK IRON	A/R	1¼"ϕ
43	TUBING	COPPER	A/R	¾"ϕ
44	FITTINGS - TUBING	BRASS	A/R	
45	BOOSTER, VOLUME	FISHER	6	
46	POSITION TRANS.	BAILEY ELECTRIC	1	6614500-R10
47	FILTER	PARKER HANNIFIN	1	07F24A
48	TRANSDUCER	FISHER 546	1	W/REGULATOR
49	FITTINGS - PIPE	BLACK IRON	A/R	

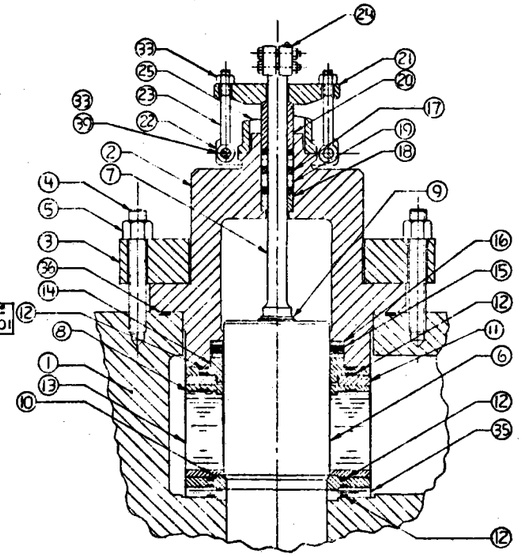
BISHOP GRAPHICS, ACCUPRESS REORDER NO. P 8576



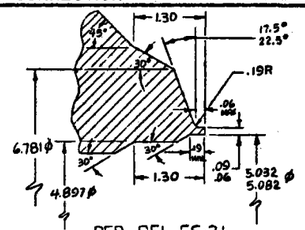
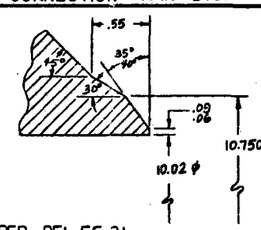




CONTROL SCHEMATIC

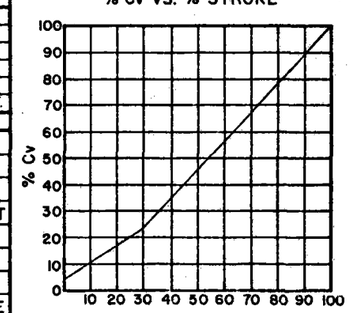


SECTIONED VIEW

INLET CONNECTION 6 IN. SCH. XXS	OUTLET CONNECTION 10 IN. STD.
	
PER PFI ES-21	PER PFI ES-21

	UNITS	FLUID SH STEAM	MIN. Q	NORM. Q	MAX. Q	ADD. COND.
OPER. COND	PPH	FLOW RATE	6500	6500	112300	130000
	PSIA	PRESS. INLET/OUTLET	380/5	1465/7	1465/115	1465/115
	PSI	FLOWING ΔP	375	1458	1350	1350
	°F	TEMPERATURE INLET	440	950	950	650
		SP.GR.@60°F OR MOL.WT.				
	dBA	GUAR. SOUND PRESS. LEVEL	85 dBA @ 5FT	85 dBA @ 5FT.	85 dBA @ 5FT.	85 dBA @ 5FT.

ENGINEERING DATA	MAIN ELEMENT		OPERATOR	
	PRESSURE CLASS	2500 ANSI	TYPE	CCI PNEUMATIC PISTON
	MAX. ALLOWABLE TEMP.	1010 °F	SUPPLY	80-100 PSI AIR
	MAX. PRESSURE @ 100° F	6250 PSI	SIGNAL IN:	4-20 MA. OUT: —
	NUCLEAR CLASS	NA	INCREASING SIGNAL	OPENS ELEMENT
	HYDROTEST PRESSURE	9375 PSI	SHAFT EXTENDS	TO CLOSE ELEMENT
	MAX. C_v @ 100% STROKE	65 Cv.	FAILURE POSITION	CLOSED
	MAX. SEAT LEAKAGE	⚠	NOMINAL STROKE	6 IN ±.50
	MIN. CONT. FLOW	3.0 Cv.	STROKE TIME (SEC.)	.8 OPEN 1.0 CLOSE
	BONNET FLG. NUT TORQUE	1140-1260 FT-LB	VALVE & OPERATOR WEIGHT	2000LB.



⚠ VALVE HAS WARMING DISK, WILL USE APROX. 100-150LB/HR STEAM

NOTES: 1. VALVE TO BE MOUNTED VERTICAL WITH ACTUATOR UP

REVISIONS				
ECO NO	LTR	DESCRIPTION	DATE	APPROVED
02319	-	RELEASED	7/28/80	D.D.
02108	A	REV CONTROL SCHEMATIC & ADDED BUTTWELD	1/31/80	D.D.
03176	B	REVISE ITEM 4,5,37,30,47	7/1/80	[illegible]
1220	C	REVISED ITEM 46, AND TAG NO.	12/1/81	[illegible]
1340	D	ITEM 38 WAS NORMALLY CLOSE AND CHANGE SIGNAL TO 4-20 MA	3/31/81	[illegible]
00355	E	ITEM 8 WAS BUSHING, INC 718; ITEM 34 WAS SPACER, 4130/4140; #12 WAS QTY 6; #42 WAS TUBINGS, 1½" SS; ITEMS 41 & 43 WAS 300 SS	5/22/81	
00574	F	ITEM 32 WAS BAILEY AP5; ADDED ITEMS 42, 48, 49 REVISED SCHEMATIC ITEM 12 QTY WAS 5; ADDED 8 & 11,	9-2-81	DM

CERTIFICATION	
CUSTOMER	STEARNS - ROGER
P.O.	5000-C21700
TAG	PY-1001
PROJECT	SOLAR 1
STATION	PILOT PLANT DAGGET UNIT NA
SIGNED	DATE
CONTRACT NO	

CONTROL COMPONENTS INT. A DIVISION OF BABCOCK & WILCOX IRVINE CALIFORNIA

DRAG® VALVE
6x10 ANSI CLASS 2500
CONDENSER DUMP PRESS REDUCING

PREP	[illegible]	7-22-80
CHK	[illegible]	11-1-80
DSGN	[illegible]	12-1-80
PROJ	[illegible]	7-14-80
APVD	[illegible]	4-14-81

MODEL NO. 12X610

SIZE D | CODE IDENT NO 19562 | DWG NO 24744-1-S

SCALE NONE | TA 001 | SHEET 1 OF 1

4.1.39-33

S-1-44744

BILL OF MATERIAL

Control Components International

☐ STANDARD

☒ SPECIAL

ASSEMBLY NUMBER: 24744-1

W. O./CONTRACT NUMBER

LATEST ASS'Y START DATE — ASS'Y PULL — ASS'Y START

REV. C

RELEASE STATUS — ISSUE — NUMBER — DATE

ASSEMBLY NAME DRAG® VALVE, 6X10, 2500 ANSI

ITEM	ITEM DESCRIPTION	PART NUMBER	ALPHA CODE	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	MATERIAL STATUS SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
	DRAG® VALVE	24744-1										
1	BODY ASSY	921601099		1								
2	BODY MACHINING	320101685		1								
	ASTM-A-182-F22											
3	DISK STACK ASSY	923711061		1								
	INC 718											
4	DISK ASSY WARMING	923711060		1								
	INC 718											
5	POSITIONER ASSY	730202028		1								
	(MOORE)											
6	YOKE ASSEMBLY	724006001		1								
7	PLATE, IDENTIFICATION	131301035		1								
	300 SERIES S.S											
8	LABEL FLOW	132701007		1								
	300 SERIES S.S											

4.1.36-34

BILL OF MATERIAL

Control Components International

☐ STANDARD
☒ SPECIAL

ASSEMBLY NUMBER: 24744-1

ASSEMBLY NAME: DRAG® VALVE

W. O./CONTRACT NUMBER		

LATEST ASS'Y START DATE: ASS'Y PULL ____ ASS'Y START ____

REV.: C

RELEASE STATUS: ISSUE ____ NUMBER ____ DATE ____

ITEM	ITEM DESCRIPTION		PART NUMBER	ALPHA CODE	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
9	SCREW DRIVE (#2 x 1/8)		250040004		6								
	300 SERIES S.S												
10	LIMIT, SWITCH		730401011		1								
	EA 170 NAMCO												
11	ACTUATOR		730111042		1								
	200 IN^2												
12	CONTROL SCHEMATIC ASSY		933901010		1								
13	PLATE, MOUNTING		331302264		1								
	ALUM												
14	SCREWS, HEX HD		250310049		2								
	5/16-18 x 3/4", 300 SS												
15	WASHER, FLAT		251120008		2								
	5/16", 300 SS												
16	WASHER, LOCK		251130034		4								
	5/16" 300 SS												
17	SCREW, HEX HD		197514A8		2								
	3/8-16 x 3/8 300 SS												

4.1.39-35

BILL OF MATERIAL

Control Components International

☐ STANDARD

■ SPECIAL

ASSEMBLY NUMBER: 24744-1

ASSEMBLY NAME DRAG® VALVE, GX10, 2500 ANSI

LATEST ASS'Y START DATE

ASS'Y PULL

ASS'Y START

REV. C

W. O./CONTRACT NUMBER

RELEASE STATUS

ISSUE

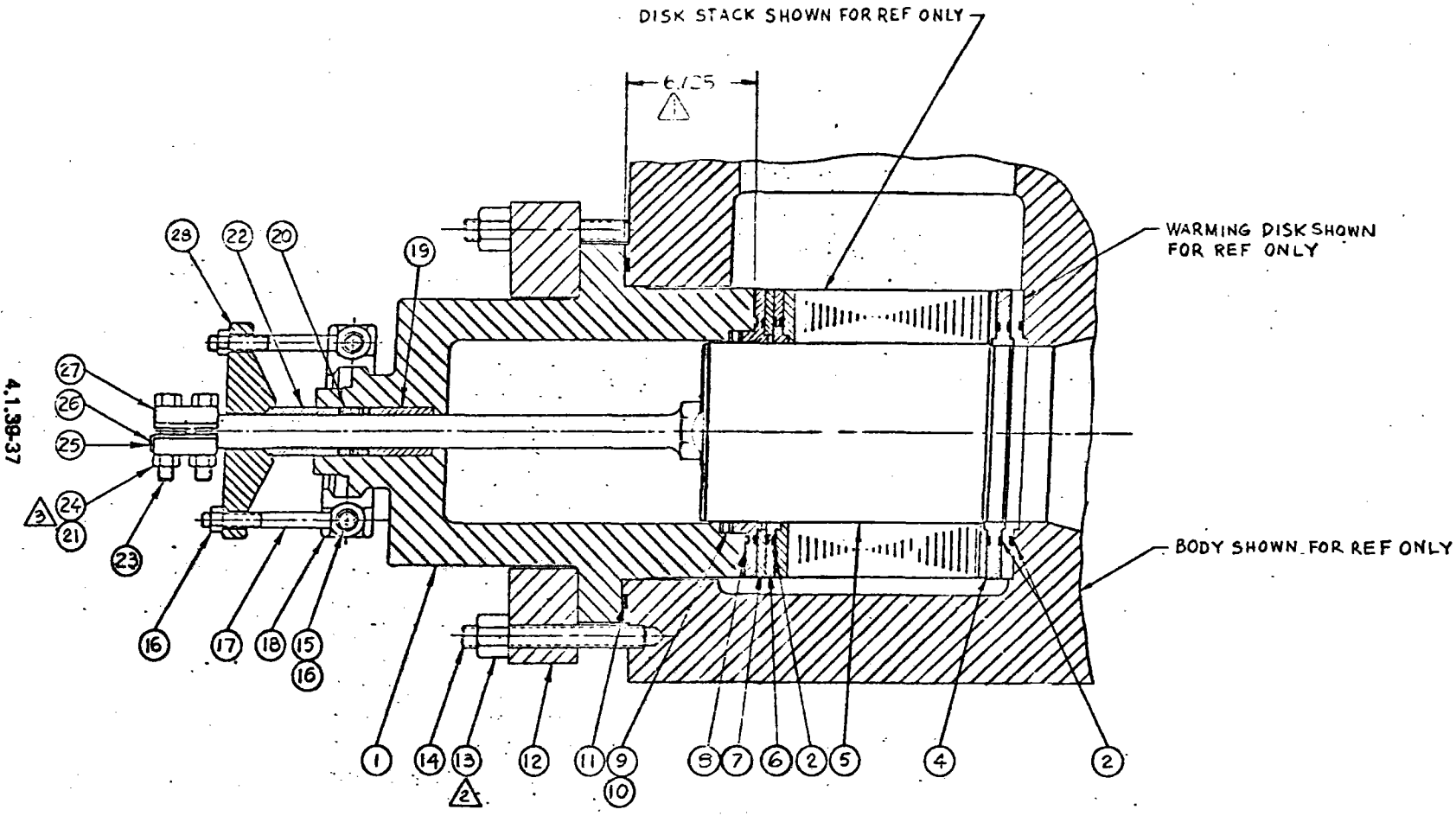
NUMBER

DATE

ITEM	ITEM DESCRIPTION	PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
18	WASHER, LOCK	251130033	2								
	3/8", 300 SS										
19	TRANSDUCER, FISHER	258800004	1								
	4-20 MA, 3-15 PSI										

4.1.39-36

REVISIONS				
ECO NO	LTR	DESCRIPTION	DATE	APPROVED
02721	-	RELEASED		
03858	A	ITEM 7 P/N WAS 131100024	12-22-80	
00359	B	ITEM 14 P/N WAS 123706015 6.125 WAS 6.725	1/26/81	



4.1.39-37

3 TORQUE NUT TO 26/26 FT-LB

2 TORQUE NUT TO 1140/1260 FT-LB

1 STACK UP VALVE TO 6.125 DIM., WITHOUT FLEX. GASKET. MACHINE SURFACE OF ITEM (7) TO MEET DIM. SHOWN.

NOTES:

DO NOT SCALE DRAWING MUST CONFORM TO ES 100 GEOMETRIC SYMBOLS PER ANSI Y14.5 MACHINED SURFACES 125 PER ANSI B46.1 WELDING SYMBOLS PER ANSI Y32.3 OR ASW A2.0 ABBREVIATIONS PER MIL-STD-12	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES ±2° (.0) ±.1 (.00) ±.03 (.000) ±.010 MATERIAL SEE B/M FINISH HEAT TREAT	CONTRACT NO	CONTROL COMPONENTS INTERNATIONAL A DIVISION OF BABCOCK & WILCOX IRVINE, CALIFORNIA
		PREP CHAN PHAN 11/7/80 CHK 11-11-80 DSGN Chan Phan 11/7/80 PROJ 11/15/80 APVD 11-17-80	BODY ASSEMBLY 6x10, 2500 ANSI CLASS
NEXT ASSY 24744-1 USED ON APPLICATION			SIZE C CODE IDENT NO 19562 DWG NO 921601099 SCALE NONE UNIT WT SHEET 1 OF 5

921601099

BILL OF MATERIAL

Control Components International

☐ STANDARD
☑ SPECIAL

W. O./CONTRACT NUMBER: 24744-1

ASSEMBLY NUMBER: 921601099

LATEST ASS'Y START DATE — ASS'Y PULL — ASS'Y START

REV. B

RELEASE STATUS — ISSUE — NUMBER — DATE

ASSEMBLY NAME: BODY ASSY, 6x10, 2500 ANSI CLASS

ITEM	ITEM DESCRIPTION	PART NUMBER	ALPHA CODE	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS: ISSUE	SOURCE: P.O.# S.O.#	DATE DUE: MONTH	DATE DUE: DAY	LOCATION	STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
	BODY ASSY	921601099										
1	BONNET	321401637		1								
	ASTM-A182-F22											
2	GASKET, FLEXITALLIC	255590524		6								
	FLEXICARB/300 S.S											
3	N/A											
4	RING, SEAT	320301556		1								
	ASTM-A182-F11											
5	PLUG ASSY	924102368		1								
	4 IN PLUG, 1.5" STEM											

4.1.39-38

SEE BODY ASSY DWG REV B FOR CHANGES

BILL OF MATERIAL

Control Components International

☐ STANDARD
☒ SPECIAL

W. O./CONTRACT NUMBER: 24744-1

ASSEMBLY NUMBER: 921601099

ASSEMBLY NAME: BODY ASSEMBLY

LATEST ASS'Y START DATE: ASS'Y PULL / ASS'Y START

REV.: B

RELEASE STATUS: ISSUE / NUMBER / DATE

ITEM	ITEM DESCRIPTION		PART NUMBER	ALPHA CODE	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
6	BUSHING		320701178		1								
	4130/4140												
7	SPACER		131101024		1								
	4130/4140												
8	BUSHING, GUIDE		320701179		1								
	4130/4140												
9	PACKING		120807002		1								
	GTN 70												
10	SPACER, BAL. SEAL		320412149		2								
	410												
11	GASKET, FLEXITALLIC		255590472		1								
	FLEXICARB/300 SS												
12	FLANGE, BONNET		321519016		1								
	ASTM-A-182-F22												
13	NUT, HEX HD, (1½-8UNC)		250440062		12								
	ASTM-A-194-3												
14	STUD, (1½-8 x 9.75)		123706015		12								
	ASTM-A-193-B16												

SEE BODY ASSY'S DWG REV BLOCK FOR CHANGES

4.1.39-39

BILL OF MATERIAL

Control Components International

☐ STANDARD
☒ SPECIAL

W. O./CONTRACT NUMBER: 24744-1

ASSEMBLY NUMBER: 921601099

LATEST ASS'Y START DATE — ASS'Y PULL — ASS'Y START

REV. B

RELEASE STATUS — ISSUE — NUMBER — DATE

ASSEMBLY NAME: BODY ASSEMBLY

ITEM	ITEM DESCRIPTION	PART NUMBER	ALPHA CODE	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS: ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
15	SCREW, HEX HD (3/4-10x 6)	250310113		2								
	300 SERIES S.S											
16	NUT, HEX, 3/4 - 10	250440038		4								
	300 SERIES S.S											
17	EYE BOLT, (3/4 - 10 x 6.5)	250390004		2								
	C'STL											
18	CLAMP, YOKE	122101001		2								
	ASTM-A 216 WCB											
19	SPACER, PACKING	120403085		1								
	INCONEL 718											
20	PACKING, STEM	723903005		1								
	GTN 70/GT 70											
21	WASHER, LOCK (1/2)	251130029		4								
	300 SERIES S.S											
22	FOLLOWER, PACKING	122404008		1								
	18-8 S.S.											
23	SCREW, HEX, HD. (1/2-13 x 3)	250310035		4								
	300 SERIES S.S											

REF BODY ASSY'S DWG REV BLOCK FOR CHANGES

4.1.39-40

BILL OF MATERIAL

Control Components International

☐ STANDARD
☒ SPECIAL

ASSEMBLY NUMBER: 921601099

ASSEMBLY NAME BODY ASSEMBLY

W. O./CONTRACT NUMBER: 24744-1

LATEST ASS'Y START DATE — ASS'Y PULL — ASS'Y START

REV. B

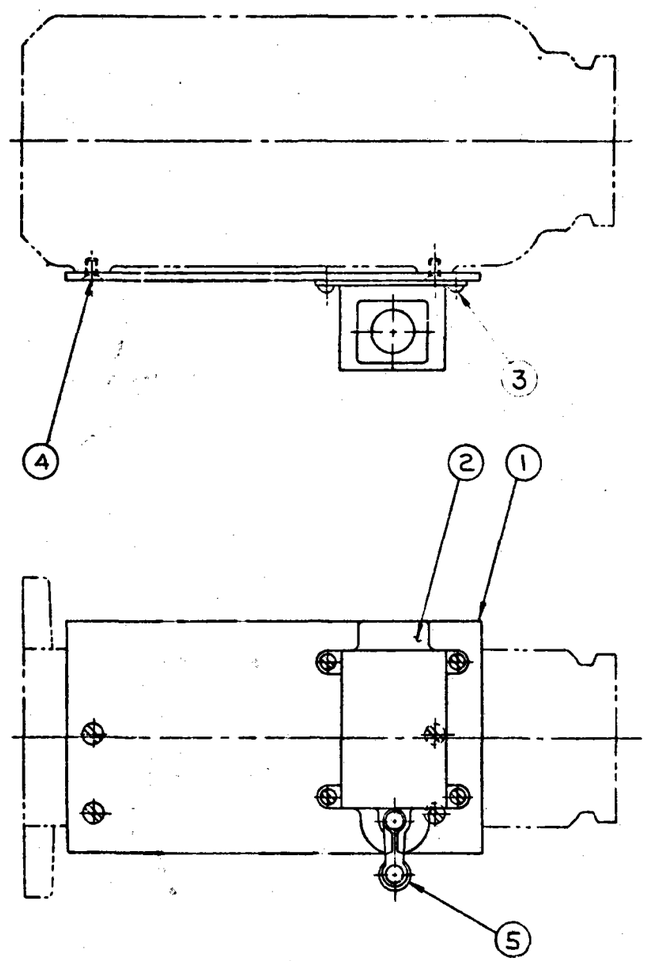
RELEASE STATUS — ISSUE — NUMBER — DATE

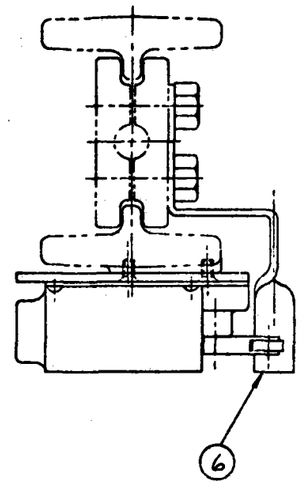
ITEM	ITEM DESCRIPTION	PART NUMBER	ALPHA CODE	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS: ISSUE	SOURCE: P.O. # S.O. #	DATE DUE: MONTH	DATE DUE: DAY	LOCATION	STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
24	NUT, HEX (½-13)	250440035		4								
	300 SERIES S.S											
25	SCREW, DRIVE	250040002		2								
	300 SERIES S.S											
26	PLATE, POINTER	131301017		1								
	300 SERIES S.S											
27	CONNECTOR, STEM	122701003		2								
	300 SERIES S.S											
28	FLANGE, PACKING	122501005		1								
	M/F 120201129											

4.1.39-41

SEE BODY ASSY'S DWG REV BLOCK FOR CHANGES

REVISIONS				
ECO NO	LTR	DESCRIPTION	DATE	APPROVED
33241	—	RELEASED	1/4/72	CDS





PART NO.	REV

DO NOT SCALE DRAWING MUST CONFORM TO ES 100 GEOMETRIC SYMBOLS PER ANSI Y14.5 MACHINED SURFACES 125 PER ASA B46.1 WELDING SYMBOLS PER ANSI Y 32.3 OR AOW A2.0 ABBREVIATIONS PER MIL-STD-12	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES ±2° (.0) ± 1 (.00) ± .03 (.000) ± .010 MATERIAL FINISH HEAT TREAT	CONTRACT NO PREP CHK DSGN PROJ APVD	CONTROL COMPONENTS INC. A SUBSIDIARY OF B-W-COCK & WILCOX IRVINE CALIFORNIA LIMIT SWITCH ASS'Y. SIZE D | CODE IDENT NO 19562 | DWG NO 73040001 SCALE 1/2 | UNIT WT | SHEET 1 OF
NEXT ASSY | USED ON APPLICATION			

☒ STANDARD
☐ SPECIAL

BILL OF MATERIAL
CONTROL COMPONENTS, INC.

CM

W. O./CONTRACT NUMBER

ASSEMBLY NUMBER: 730401011

LATEST ASS'Y START DATE
ASS'Y PULL
ASS'Y START

REV.

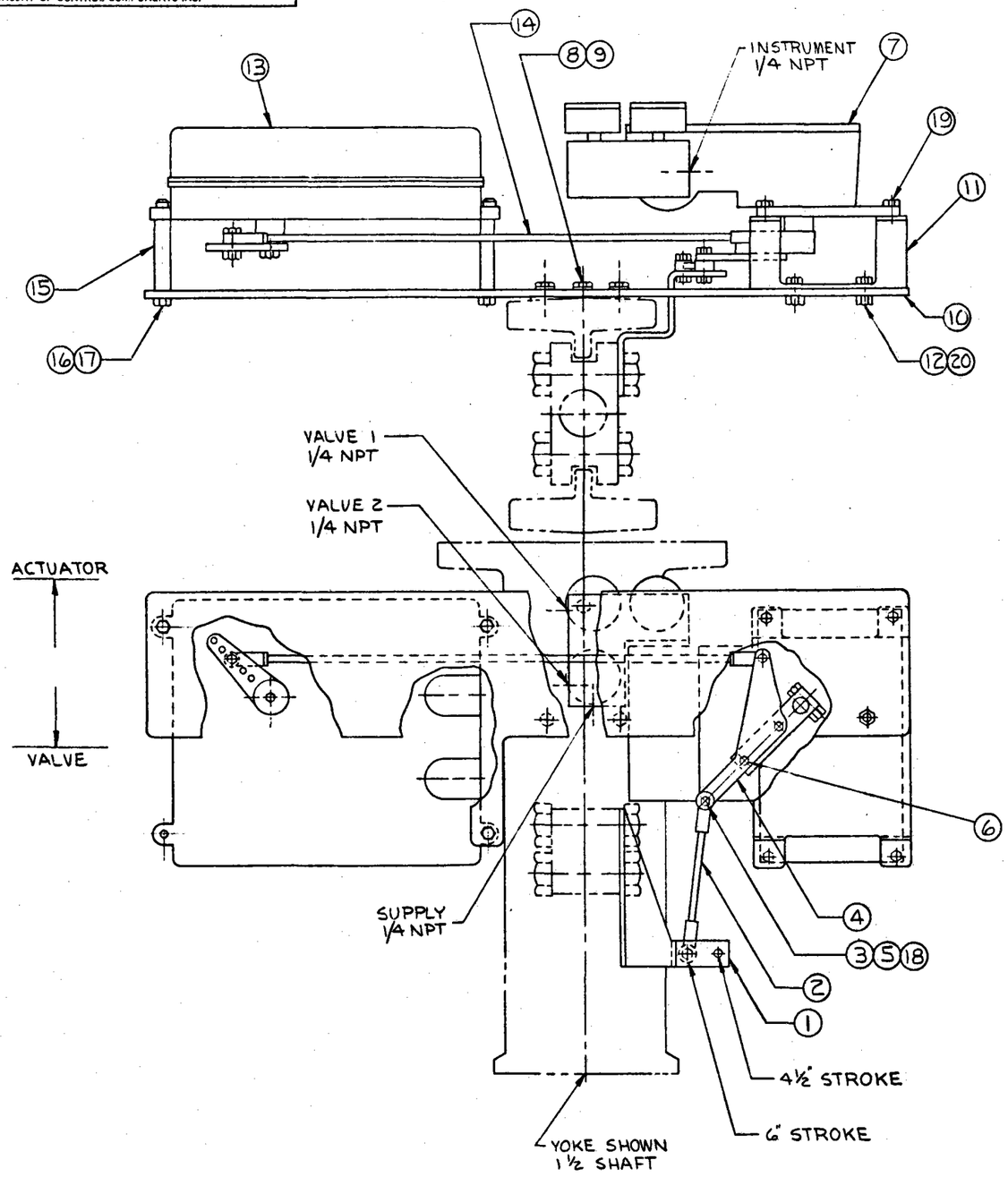
RELEASE STATUS
ISSUE
NUMBER
DATE

ASSEMBLY NAME LIMIT SWITCH ASSEMBLY, 4½-6" STROKE

ITEM	ITEM DESCRIPTION	PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
1	MOUNTING PLATE	331301022	1								
	C'STL.										
2	LIMIT SWITCH	258510026	1								
	NAMCO D2400X										
3	RD. HD. MACH. SCREW (¼-28 X 3/8)	250320029	4								
	STL.										
4	FLAT HD. MACH. SCREW (5/16-18 X 5/8)	250320006	4								
	STL.										
5	LEVER	258930009	1								
6	ARM	130802011	1								
	C'STL.										

4.1.38-44

REVISIONS				
ECO NO	LTR	DESCRIPTION	DATE	APPROVED
52523	–	RELEASED	8/5/75	



PART NO.	REV.

DO NOT SCALE DRAWING	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES ±2° (.0) ±.1 (.00) ±.03 (.000) ±.010	CONTRACT NO
MUST CONFORM TO ES 100 GEOMETRIC SYMBOLS PER ANSI Y14.5 MACHINED SURFACES 125 PER ASA B46.1	MATERIAL	PREP L. BUSH 5/23/75
WELDING SYMBOLS PER ANSI Y 32.3 OR ASW A2.0 ABBREVIATIONS PER MIL-STD-12	FINISH	CHK [illegible] 8-1-75
		DSGN R. MICKENS 8-4-75
		PROJ J. LEONARD 8-4-75
921701018 NEXT ASSY / USED ON APPLICATION	HEAT TREAT	APVD J. LEONARD 8-4-75

CCI CONTROL COMPONENTS INC. A SUBSIDIARY OF BABCOCK & WILCOX IRVINE CALIFORNIA

POSITIONER ASSY. MOORE W/BAILEY ELEC. POS. TRANS.

SIZE	CODE IDENT NO	DWG NO
D	19562	730200028

SCALE | UNIT WT | SHEET 1 OF 1

4.1.39-45

DRAWING NO. 730200028

BILL OF MATERIAL

CONTROL COMPONENTS, INC.

☒ STANDARD
☐ SPECIAL

RM 3-18

W. O./CONTRACT NUMBER

ASSEMBLY NUMBER: 730202028

LATEST ASS'Y START DATE
ASS'Y PULL
ASS'Y START

REV. A

RELEASE STATUS
ISSUE NUMBER
DATE

ASSEMBLY NAME Positioner Assy . Moore W/ Bailey Elect. Pos. Trans. 4½" & 6" Stroke

ITEM	ITEM DESCRIPTION		PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O. # S.O. #	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
1	Arm, Take Off		130801004	1								
	Steel											
2	Linkage Assy		250320045	1								
	18-8											
3	Screw, Hex Hd.		250310094	4								
	18-8 (10-24 UNC X 1)											
4	Lever Extension		131001001	1								
	Alum											
5	Nut, Hex (ESNA)		250470017	4								
	18-8 & Nylon (10-24 UNC) 79NM-04)											
6	Screw, Hex Hd.		250310097	2								
	18-8 (10-24 UNC X 5/8)											
7	Positioner Assy		730201016	1								
	Moore											
8	Screw, Hex Hd.		250310046	3								
	18-8 (5/16 - 18 UNC X 1)											
9	Washer, Lock		251130034	3								
	18-8 (5/16)											

4-1-39-46

BILL OF MATERIAL

CONTROL COMPONENTS, INC.

☒ STANDARD
☐ SPECIAL

ASSEMBLY NUMBER: 730202028

RM 3-18

W. O./CONTRACT NUMBER		

LATEST ASS'Y START DATE — ASS'Y PULL — ASS'Y START

REV. A

RELEASE STATUS — ISSUE — NUMBER — DATE

ASSEMBLY NAME: Positioner Assy. Moore W/Bailey Elect. Pos. Trans. 4½" & 6" Stroke

ITEM	ITEM DESCRIPTION	PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS: ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
10	Plate, Mounting	131301007	1								
	Alum										
11	Bracket, MOORE POSITIONER	330901093	1								
	MODIFIED MOUNTING										
12	Screw, Hex Hd.	250310050	2								
	18-8 (5/16 - 18 UNC 5/8)										
13	Position Transmitter (Elect)	258800003	1								
	Bailey										
14	Linkage Assy	731501001	1								
	18-8										
15	Spacer	131101009	3								
	Alum										
16	Screw, Soc Hd. Cap	250310131	3								
	18-8(¼-20 UNC X 3)										
17	Nut, Hex (ESNA)	250470014	3								
	18-8 & Nylon (¼-20 UNC) (79NE-040)										
18	Nut, Jam	250440048	4								
	18-8 (10-24)										

4.1.38-47

BILL OF MATERIAL

CONTROL COMPONENTS, INC.

☒ STANDARD
☐ SPECIAL

ASSEMBLY NUMBER: 730202028

W. O./CONTRACT NUMBER

RELEASE STATUS

LATEST ASS'Y START DATE

ASS'Y PULL

ASS'Y START

REV. A

ISSUE

NUMBER

DATE

RM 3-18

ASSEMBLY NAME Positioner Assy. Moore W/Bailey Elect. Pos. Trans. 4½" & 6" Stroke

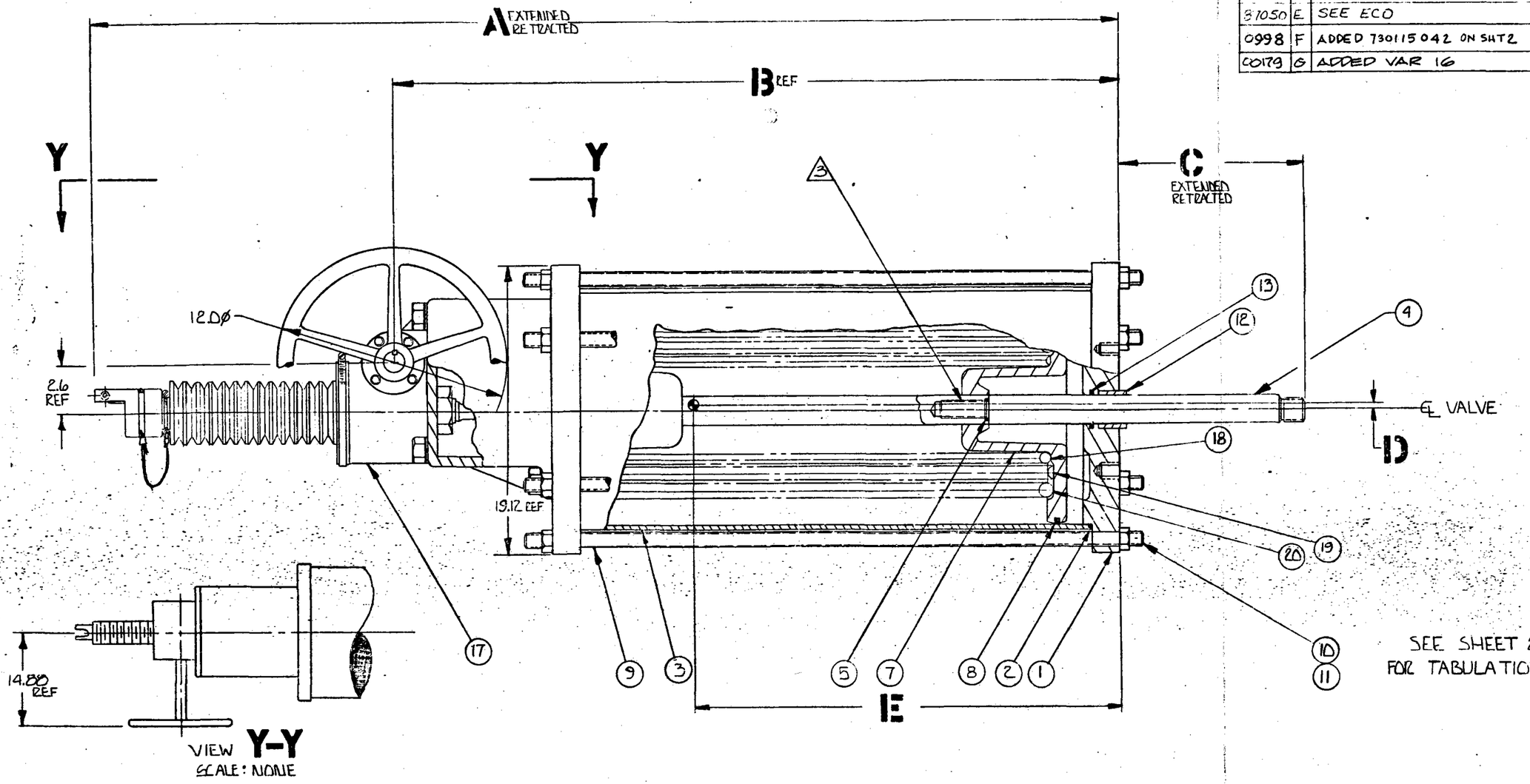
ITEM	ITEM DESCRIPTION	PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
19	Screw, Hex Hd.	250310100	4								
	18-8 (10-32 UNF X 7/8)										
20	Nut, Hex	250440040	2								
	18-8 (5/16 - 18 UNC)										

4.1.39-48

PART NO.	STROKE IN.	UNIT WT LBS	A		B	C		D	E	F	
			EXTENDED	RETRACTED		EXTENDED	RETRACTED			COMPRESS	INSTALLED

REVISIONS

ECO NO	LTR	DESCRIPTION	DATE	APPROVED
7210		RELEASED	11/27/77	[illegible]
75108	A	SEE ECO	[illegible]	[illegible]
75627	B	ADDED VARIATION 12	12/6/77	[illegible]
81507	C	ADDED 13 VARIATION	3/[illegible]	[illegible]
84226	D	SEE ECO	8/8/78	[illegible]
81050	E	SEE ECO	12/29/78	DWS
0998	F	ADDED 730115042 ON SHT 2	5/12/[illegible]	[illegible]
00179	G	ADDED VAR 16		



△1 MAXIMUM OPERATING PRESSURE 150 PSIG.
△2 USE LOC-TITE #242 ON SHAFT THDS.
△3 C G ⊕ CALCULATED WITH ACTUATOR SHAFT IN RETRACTED POSITION
△4 FOR DIS-ASSY AND MAINTENANCE REFER TO MAINTENANCE MANUAL P/N TM-A-001

NOTES:

DO NOT SCALE DRAWING	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES ±2° (.0) ±.1 (.00) ±.03 (.000) ±.010
MUST CONFORM TO ES 100 GEOMETRIC SYMBOLS PER ANSI Y14.5 MACHINED SURFACES 125 PER ASA B46.1	MATERIAL
WELDING SYMBOLS PER ANSI Y 32.3 OR ASW A2.0 ABBREVIATIONS PER MIL-STD-12	FINISH
NEXT ASSY / USED ON	HEAT TREAT
APPLICATION	

CONTRACT NO

PREP	[illegible]	[illegible]
CHK	[illegible]	1-20-77
DSGN	[illegible]	1-20-77
PROJ	[illegible]	1-20-77
APVD	[illegible]	1-20-77

CONTROL COMPONENTS INC.
A SUBSIDIARY OF BABCOCK & WILCOX
IRVINE CALIFORNIA

ACTUATOR ASSY
200 IN² - NORMALLY EXTENDED

SIZE	CODE IDENT NO	DWG NO
D	19562	E 730100042

SCALE — | UNIT WT | SHEET 1 OF 2

4.1.39-49

Form II

PART NO.	STROKE IN.	UNIT WT LBS.	A EXTENDED	A RETRACTED	B	C IN. EXTENDED	C IN. RETRACTED	D C.G.	E C.G.	F LBS SPRING LOAD COMPRESSED	F LBS SPRING LOAD INSTALLED	NO. OF SPRINGS	REV
730101042	12	402.2	66.00	52.50	43.38	15.63	3.63	.29	22.12	6486	3312	3	
730102042	12	340.2	66.00	52.50	43.38	15.63	3.63	.36	24.00	3523	1538	2	
730103042	12	297.2	66.00	52.50	43.38	15.63	3.63	.48	26.00	1392	487	1	
730104042	12	268.0	66.00	52.50	43.38	15.63	3.63	.50	27.89				
730105042	6	241.1	48.00	39.50	31.12	9.63	3.63	.50	20.50				
730106042	6	241.1	48.00	39.50	31.12	9.63	3.63	.50	20.50				
730107042	6	375	48.00	39.50	31.12	9.63	3.63		13.72	6486	4884	3	
730108042	6	318	48.00	39.50	31.12	9.63	3.63		13.03	3523	2521	2	
730109042	6	313	48.00	39.50	31.12	9.63	3.63		13.03	3523	2521	2	
730110042	6	270	48.00	39.50	31.12	9.63	3.63		12.14	1392	930	1	
730111042	6	380	48.00	39.50	31.12	9.63	3.63			6486	4884	3	
730112042	12"	350	66.00	52.50	43.38	15.63	3.63			5695	2825	2	
730113042	12"	297.2	66.00	52.50	43.38	15.63	3.63			2140	1030	1	
730114042	6"	318.	48.00	39.50	31.12	9.63	3.63		13.03	5124	3974	2	
730115042	12	268.0	66.00	52.50	43.38	15.63	3.63	.50	27.89				
730116042	6"	373.0	48.00	39.50	31.12	9.36	3.63		12.82	3523	2521	2	

MAX. STROKE IN.	SHAFT SIZE	QTY. OF SPRINGS & PART NO. 0	1	2	3
6"	1"	730106042		730104042	730107042
	1½"	730105042	730110042	730108042	730111042
				730114042	
				730116042	
12"	1"				
	1½"	730104042	730103042	730102042	730101042
		730115042	730113042	730112042	

CAM

SIZE	CODE IDENT NO.	DWG NO.
C	19562	730100042
SCALE NONE	REV. F	SHEET 2 OF 2

4.1.39-51

☐ STANDARD
☐ SPECIAL

BILL OF MATERIAL
CONTROL COMPONENTS, INC.

CM

W. O./CONTRACT NUMBER

RELEASE STATUS
ISSUE | NUMBER | DATE

ASSEMBLY NUMBER: 730111042

LATEST ASS'Y START DATE
ASS'Y PULL
ASS'Y START

REV. A

ASSEMBLY NAME ACTUATOR ASS'Y, 200 IN², 6" STROKE NORMALLY EXTENDED, 1½ STEM 3 SPRINGS

ITEM	ITEM DESCRIPTION	PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS: ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST — ITEM REFER. NUMBER
1	CAP LOWER (FINAL MACH.)	130301006	1								
	ALUM										
2	O'RING	255520232	2								
	BUNA-N										
3	CYLINDER	130101001	1								
	BLACK AMALGON										
4	SHAFT, ACTUATOR	130503009	1								
	17-4 PH CRES H1150										
5	O'RING	255520069	1								
	BUNA-N										
6											
7	PISTON	130401010	1								
	A356-T61 ALUM (MF130201023)										
8	O'RING	255520307	1								
	BUNA-N										
9	STUD	133101002	6								
	ASTM-A193-B7, ZINC PLATE										

4.1.39-52

BILL OF MATERIAL

CONTROL COMPONENTS, INC.

☐ STANDARD
☐ SPECIAL

W. O./CONTRACT NUMBER

ASSEMBLY NUMBER: 730111042

LATEST ASS'Y START DATE
ASS'Y PULL
ASS'Y START

REV. A

RELEASE STATUS
ISSUE
NUMBER
DATE

ASSEMBLY NAME ACTUATOR ASS'Y, 600 IN², 6" STROKE NORMALLY EXTENDED, 1½" STEM

ITEM	ITEM DESCRIPTION	PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
10	NUT, HEX-REG	250440057	12								
	ASTM-A194-GR2 3/4-10										
11	WASHER, LOCK, 3/4"	251130032	12								
	S.S.										
12	BUSHING	252140006	1								
	OIL-IMPREGNATED BRONZE										
13	O'RING	255520235	1								
	BUNA-N										
14											
15											
16											
17	MANUAL OVERRIDE ASS'Y	730305010	1								
18	SPRING	130701001	1								
	STEEL										

4.1.39-53

☐ STANDARD
☐ SPECIAL

BILL OF MATERIAL
CONTROL COMPONENTS, INC.

W. O./CONTRACT NUMBER

ASSEMBLY NUMBER: 730111042

LATEST ASS'Y START DATE
ASS'Y PULL
ASS'Y START

REV. A

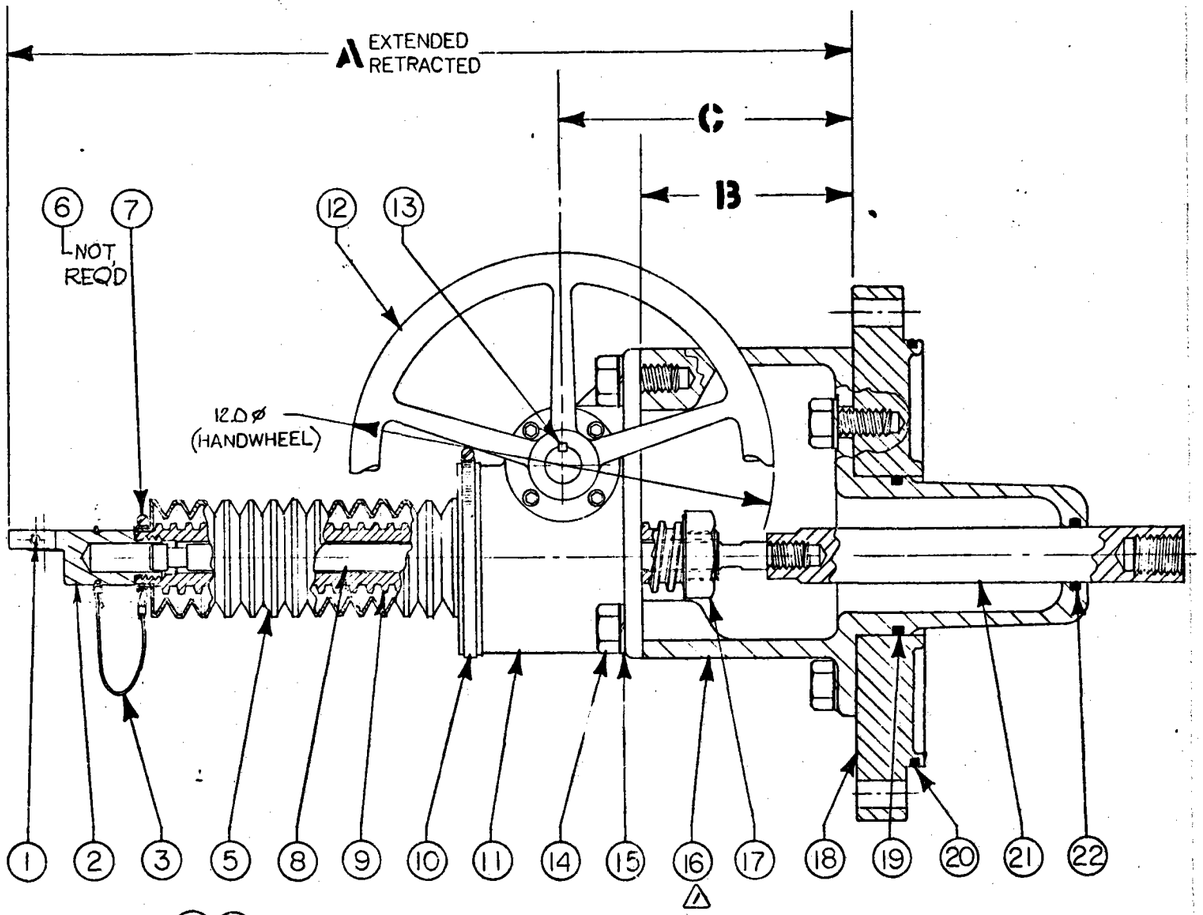
RELEASE STATUS
ISSUE
NUMBER
DATE

ASSEMBLY NAME ACTUATOR ASS'Y, 200 IN², 6" STROKE NORMALLY EXTENDED, 1½" STEM

ITEM	ITEM DESCRIPTION	PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS: ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
19	SPRING	130701002	1								
	STEEL										
20	SPRING	130701003	1								
	STEEL										

4.1.39-54

PART NO.	ACTUATOR SIZE	STROKE	A EXTENDED	A RETRACTED	B	C	APPLICABLE NOTES



REVISIONS			
ECO NO	LTR	DESCRIPTION	DATE
69450	–	RELEASED	1/6
72995	A	ADDED 09 VARIATION	6-
75283	B	SEE ECO	7/12
81409	C	ADDED 10 VAR.	3/-
9329	D	SEE ECO	1-2
92700	E	ADDED 13 VARIATION	9
93518	F	ADDED 14 VARIATION	11/-
93899	G	ADDED 15 VARIATION	11/27
01019	H	ADDED 730316010 TO SHEET 2	5/12

DO NOT SCALE DRAWING		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES ±2° (.0) ±.1 (.00) ±.03 (.000) ±.010	CONTRACT NO	CONTROL COMPONENTS INC. A SUBSIDIARY OF BABCOCK & WILCOX IRVINE CALIFORNIA
MUST CONFORM TO ES 100 GEOMETRIC SYMBOLS PER ANSI Y14.5 MACHINED SURFACES 125 PER ASA B46.1		MATERIAL SEE B/M	PREP C.G.STERUD	MANUAL OVERRIDE ASSEMBLY
WELDING SYMBOLS PER ANSI Y 32.3 OR ASW A2.0 ABBREVIATIONS PER MIL-STD-12		FINISH	CHK	
			DSGN C.G.STERUD	
			PROJ C.G.STERUD	SIZE D | CODE IDENT NO 19562 | DWG NO 730300010
NEXT ASSY	USED ON	HEAT TREAT	APVD C.G.STERUD	SCALE NONE | UNIT WT —— | SHEET 1 OF 2
APPLICATION				

4.1.39-55

730300010

PART NO	ACTUATOR SIZE	STROKE	A EXTENDED	A RETRACTED	B	C	APPLICABLE NOTES
730301010	113 IN²	6"	24.9	16.4	6.0	8.25	
730302010	113 IN²	12"	37.9	23.4	12.0	14.25	
730303010	113 IN²	18"	44.9	30.4	12.0	14.25	
730304010	113 IN²	24"	57.1	32.1	18.0	20.25	
730305010	200 IN²	6"	24.9	16.4	6.0	8.25	
730306010	200 IN²	12"	37.9	23.4	12.0	14.25	
730307010	200 IN²	18"	44.9	30.4	12.0	14.25	
730308010	200 IN²	24"	57.1	32.1	18.0	20.25	
730309010	200 IN²	18"	44.9	30.4	12.0	14.25	⚠1
730310010	200 IN²	24"	57.1	32.1	18.0	20.25	⚠1
730311010	113 IN²	18"	44.9	30.4	12.0	14.25	⚠1
730312010	113 IN²	24"	57.1	32.1	18.0	20.25	⚠1
730313010	200 IN²	12"	36.9	23.4	12.0	14.25	
730314010	113 IN²	6"	24.9	16.4	6.0	8.25	VITON O'RINGS
730315010	200 IN²	6"	24.9	16.4	6.0	8.25	VITON ORINGS
730316010	200 IN²	12"	37.9	23.4	12.0	14.25	

NOTES:

⚠1 USED WITH FLAT PISTON

4.1.39-57

SIZE	CODE IDENT NO	DWG NO
D	19562	730300010
SCALE NONE	REV H	SHEET 2 OF 2

730300010

X STANDARD
☐ SPECIAL

BILL OF MATERIAL
CONTROL COMPONENTS, INC.

ASSEMBLY NUMBER: 730305010

ASSEMBLY NAME: MANUAL OVERRIDE ASSY 200 IN² 6" STROKE

LATEST ASS'Y START DATE: ASS'Y PULL ____ ASS'Y START ____

REV. A

4P 1-5-77

W. O./CONTRACT NUMBER

RELEASE STATUS: ISSUE ____ NUMBER ____ DATE ____

ITEM	ITEM DESCRIPTION		PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST — ITEM REFER. NUMBER
	MANUAL OVERRIDE ASSY		730305010									
1	SCREW-BALL PLUNGER		251520005	1								
	C'STL											
2	COUPLING, JACTUATOR		334901002	1								
	A217 GR WC6 MF 330201023											
3	CABLE ASSY		731901002	1								
	18-8 CRES											
4	LABEL, OPERATING INSTRUCTIONS		332701011	1								
	ALUMINUM											
5	BOOT		334701001	1								
	NEOPRENE & NYLON											
6												
7	CLAMP		251520004	1								
	IDEAL 6202											
8	STEM EXT, UPPER		330503037	1								
	4340 ST'L H.T.											

4.1.38-58

BILL OF MATERIAL
CONTROL COMPONENTS, INC.

PAGE 2 OF 3

☒ STANDARD
☐ SPECIAL

ASSEMBLY NUMBER: 730305010

ASSEMBLY NAME: MANUAL OVERRIDE ASS'Y 200 IN² 6" STROKE

LATEST ASS'Y START DATE: ASS'Y PULL; ASS'Y START: 4P 1-5-77

REV, A

W. O./CONTRACT NUMBER

RELEASE STATUS: ISSUE; NUMBER; DATE

ITEM	ITEM DESCRIPTION	PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
9	SHAFT, SCREW	331503013	1								
	M/F 252780031										
10	CLAMP, HOSE 5 1/4 DIA	251520002	1								
	18-8 CRES										
11	JACTUATOR, MACH SCR	252780030	1								
	DUFF-NORTON										
12	HANDWHEEL ASS'Y	730803003	1								
	DUCTILE IRON										
13	KEY (1/4 X 1/4 X 1 1/2 LG)	133801001	1								
	STL										
14	SCREW, HEX HD CAP	250310060	8								
	STL/CAD										
15	LOCK WASHER (3/4 REG)	251130008	8								
	STL										
16	SPACER, OVERRIDE	131101004	1								
	356-T61 M/F 130201007										
17	NUT, JAM (1 1/2-12 NF)	250440044	1								
	18-8 CRES										

4.1.39-59

BILL OF MATERIAL
CONTROL COMPONENTS, INC.

☒ STANDARD
☐ SPECIAL

4P
1-5-77

PAGE 3 OF 3

W.O./CONTRACT NUMBER

ASSEMBLY NUMBER: 730305010

200 IN² 6" STROKE

LATEST ASS'Y START DATE: ASS'Y PULL / ASS'Y START

REV. A

RELEASE STATUS: ISSUE / NUMBER / DATE

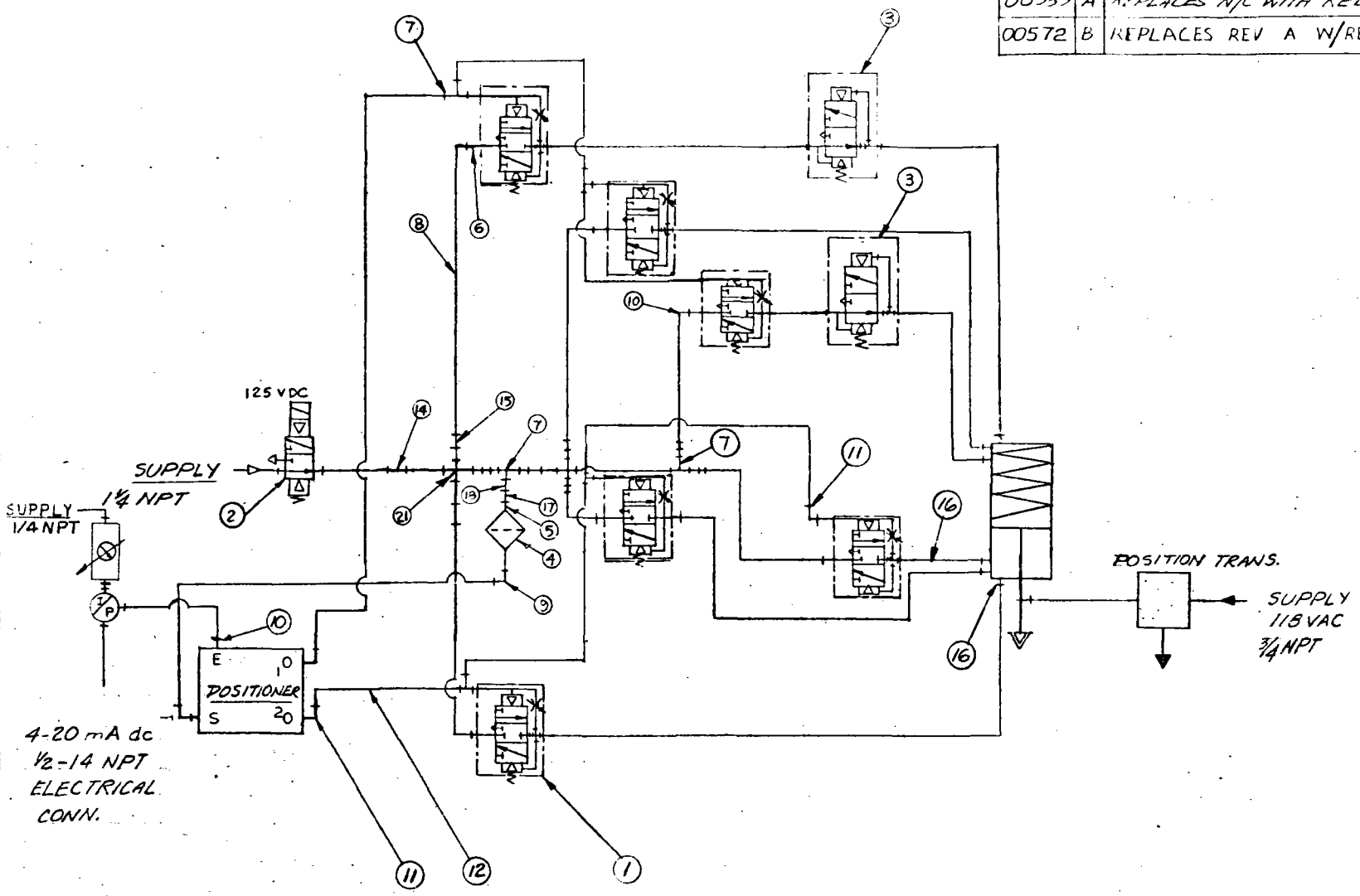
ASSEMBLY NAME: MANUAL OVERRIDE ASSY

ITEM	ITEM DESCRIPTION	PART NUMBER	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
18	CAP, UPPER	130301024	1								
	A216GR WCB M/F 330201022										
19	O-RING	255520167	1								
	BUNA-N										
20	NOT REQUIRED										
21	STEM EXT, LOWER	330501039	1								
	4340 STL										
22	O-RING	255520235	1								
	BUNA-N										
23	SCREW, DRIVE #2×1/8	250041004	4								
	18-8 CRES										

4.1.39-60

REVISIONS

ECO NO	LTR	DESCRIPTION	DATE	APPROVED
00359	A	REPLACES N/C WITH REDRAW	3-9-81	
00572	B	REPLACES REV A W/REDRAW	9-2-81	DM



4.1.39-61

933900010

DO NOT SCALE DRAWING	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES ±2° (.0) ±.1 (.00) ±.03 (.000) ±.010	CONTRACT NO
MUST CONFORM TO ES 100 GEOMETRIC SYMBOLS PER ANSI Y14.5 MACHINED SURFACES 125 PER ANSI B46.1 WELDING SYMBOLS PER ANSI Y32.3 OR ASW A2.0 ABBREVIATIONS PER MIL-STD-12	MATERIAL SEE B/M FINISH HEAT TREAT	PREP 5-26-81 CHK 5/27/81 DSGN 5/27/81 PROJ 5/27/81 APVD 5-29-81
NEXT ASSY: 24744-1 / USED ON APPLICATION		

CONTROL COMPONENTS INTERNATIONAL
A DIVISION OF BABCOCK & WILCOX
IRVINE, CALIFORNIA

CONTROL SCHEMATIC ASSY
200 IN² - FAIL CLOSE W/ VOLUME BOOSTERS

SIZE	CODE IDENT NO	DWG NO
C	19562	933900010

SCALE NONE | UNIT WT | SHEET 1 OF 1

BILL OF MATERIAL

Control Components International

☐ STANDARD
■ SPECIAL

W. O./CONTRACT NUMBER

ASSEMBLY NUMBER: 933901010

LATEST ASS'Y START DATE — ASS'Y PULL — ASS'Y START

REV. B.

RELEASE STATUS — ISSUE — NUMBER — DATE

ASSEMBLY NAME CONTROL SCHEMATIC ASSY, 200 IN^2 FAIL CLOSE W/VOL. BOOSTERS

ITEM	ITEM DESCRIPTION	PART NUMBER	ALPHA CODE	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS: ISSUE	SOURCE: P.O.# S.O.#	DATE DUE: MONTH	DATE DUE: DAY	LOCATION	STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
	CONTROL SCHM. ASSY	933901010										
1	BOOSTER, VOLUME	254370002		6								
	(FISHER 2625-12)											
2	VALVE, SOLENOID	254340168		1								
	3-WAY ASCO HT8331A53											
3	VALVE, QUICK RELEASE	654300001		2								
	WABCO P52935-6											
4	FILTER, AIR LINE	255100012		1								
	(PARKER 07F24A)											
5	NIPPLE, CLOSE, 3/8P	253700005		1								
	BRASS											
6	CONN, MALE 3/4P x 3/4T	253860136		6								
	BRASS											
7	TEE, FEMALE 1 1/4"	253600001		2								
	BLACK IRON											
8	TUBING, 3/4 OD X .049W	847490006		170"								
	COPPER											

4.1.39-62

BILL OF MATERIAL

Control Components International

☐ STANDARD
■ SPECIAL

ASSEMBLY NUMBER 933901010

W. O./CONTRACT NUMBER

LATEST ASS'Y START DATE — ASS'Y PULL — ASS'Y START

REV. A

RELEASE STATUS — ISSUE — NUMBER — DATE

ASSEMBLY NAME CONTROL SCHEMATIC ASSY, 200 IN 2 FAIL CLOSE W/VOL. BOOSTERS

ITEM	ITEM DESCRIPTION	PART NUMBER	ALPHA CODE	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
9	ELBOW, MALE 90°	253860159		1								
	3/8T x 3/8P BRASS											
10	CONN, MALE, 3/8T x 1/4P	253860126		5								
	BRASS											
11	ELBOW, MALE 90°	253860158		2								
	3/8T x 1/4P BRASS											
12	TUBING, 3/8OD x .049W	847490007		240 "								
	COPPER											
13	TEE, RUN MALE	253860207		4								
	1/4P x 3/8T x 3/8T BRASS											
14	ELBOW FEMALE 1 1/4	253600003		5								
	BLACK IRON 45°											
15	ELBOW, MALE 90°	253860167		6								
	3/4T x 3/4P BRASS											
16	NIPPLE, CLOSE, 3/4P	253700007		8								
	BRASS											
17	BUSHING, 3/4MP x 3/8FP	253710087		1								
	BLACK IRON											

4.1.39-63

BILL OF MATERIAL

Control Components International

☐ STANDARD
■ SPECIAL

ASSEMBLY NUMBER: 933901010

ASSEMBLY NAME: CONTROL SCHEMATIC ASSY, 200 IN²

LATEST ASS'Y START DATE: ASS'Y PULL | ASS'Y START

REV.: B

W. O./CONTRACT NUMBER

RELEASE STATUS: ISSUE | NUMBER | DATE

ITEM	ITEM DESCRIPTION	PART NUMBER	ALPHA CODE	QUANTITY EA	QUANTITY TOTAL	MATERIAL STATUS ISSUE	SOURCE: P.O.# S.O.#	DATE DUE MONTH	DATE DUE DAY	LOCATION	LOCATION STOCK AREA	MATERIAL LIST – ITEM REFER. NUMBER
18	BUSHING, 1¼ MP x ¾ FP	253600004		7								
	BLACK IRON											
19	N/A											
20	PIPE, 1¼	844040001		50'								
	BLACK IRON											
21	CROSS, FEMALE 1¼FP	253600005		2								
	BLACK IRON											

4.1.39-64

BISHOP GRAPHICS/ACCUPRESS

SECTION V
ACCESSORY COMPONENTS

This section contains information for accessory components that are a part of the control component.

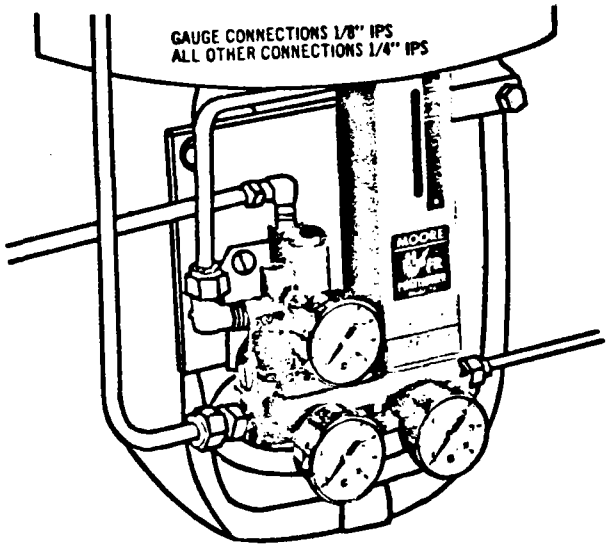
MANUFACTURER	ITEM	PART NUMBER
MOORE	POSITIONER	74G
NAMCO	LIMIT SWITCH	EA170
FISHER	TRANSDUCER I/P	546
BAILEY	ELECTRIC POSITION TRANSMITTER	6614500
FISHER	VOLUME BOOSTER	2625-12
ASCO	3-WAY SOLENOID VALVE	HT8331A53
PARKER	AIR LINE FILTER	07F24A
WABCO	QUICK RELEASE VALVE	P52935-6
DUFF-NORTON	JACTUATOR	M2009

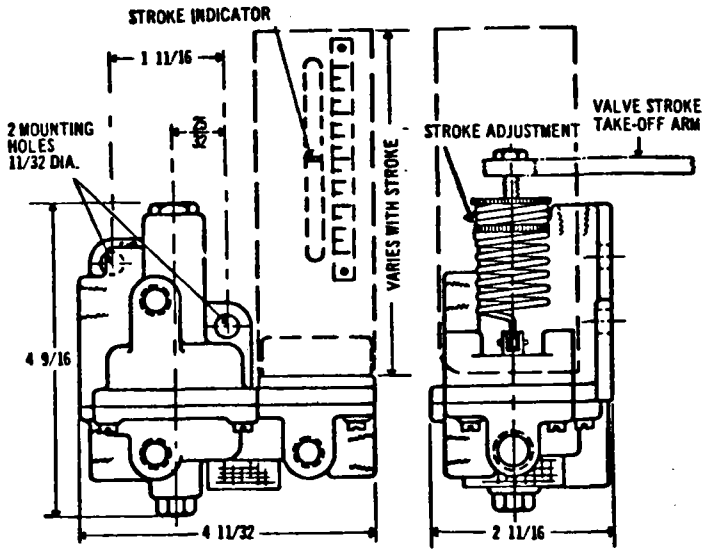
MOORE High Frequency Response

Universal VALVE POSITIONERS

GC-14

Model 74G—includes gauges
Model 74N—without gauges





Moore valve positioners employ the full force of their air supply to drive the piston or diaphragm in a pneumatic actuator to the position called for by a control instrument —and to hold that position, regardless of the forces which tend to change valve position.

UNIVERSAL APPLICATIONS

The model 74 H/FR (high-frequency-response) valve positioner, available with or without gages, is a two-stage, pilot-operated instrument. The pilot circuit is used to activate dual-output boosters—with the dual circuits providing opposite actions. When one circuit is supplying air, the other is exhausting air. This "push-pull" action applies a full differential (supply pressure to atmosphere) across the actuator, in response to an incoming control-instrument signal; driving the valve to the desired position.

Due to the design of the pilot circuit, supply pressure has little or no effect on pilot-valve position. Therefore, a supply pressure regulator is not needed when a model 74 H/FR valve positioner is applied for double-acting service on springless-piston or diaphragm-type actuators.

A model 74 universal positioner may also be used for single-acting service on a spring-loaded actuator. In this case, one or the other of the pilot-booster connections is plugged.

These instruments are truly universal valve positioners. They provide versatility, dynamic performance, and high positioning accuracy. Distinguishing characteristics include:

- *Double-Acting or Single-Acting Service*—from the same instrument.
- *Reversible in the Field*—The action may be reversed in the field.
- *Long Strokes*—A wide choice of continuously adjustable standard stroke ranges.
- *High Dynamic Response*—Extra high capacity pilots insure maximum frequency response and optimum stroking speeds for all sizes of actuators.
- *Span and Zero Adjustments*—Continuously adjustable within range-spring limits.
- *Negative Feedback Pilot Circuit*—This special internal circuit allows the positioner to operate with a push-pull gain of more than 900 (using 100 psi supply)—with no sacrifice in stability.

OPERATING CHARACTERISTICS

Control-air input span: (continuously adjustable)	3-15, 3-9, 3-27, 0-15 and 0-30—including split ranges within these basic ranges.
Valve-stroke range:*	48" maximum ¼" minimum
Supply pressure:	3 psi above full actuator pressure; 150 psi maximum
Maximum overload protection:	150 psi at any connection
Air consumption:	0.2 scfm (in balanced condition, with 20 psi supply)
Response level:	the output is sensitive to changes in control-air pressure as small as 0.1% of full range

* For additional performance data, design specifications, and a range-selection chart, request AD74.

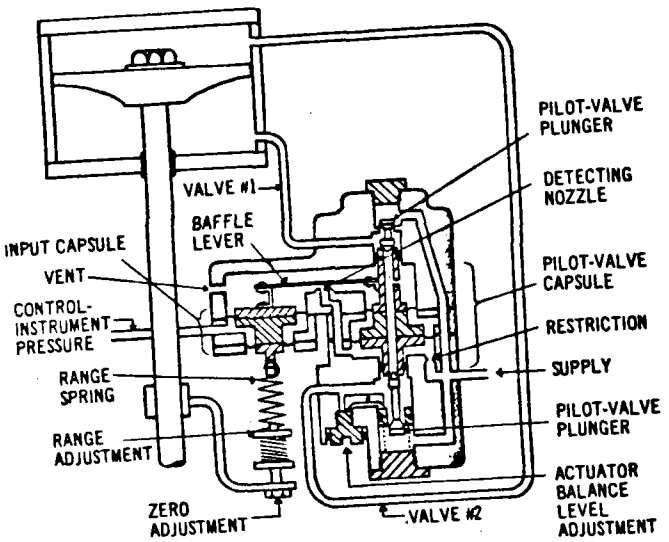
Materials of Construction

Aluminum, brass, stainless steel and neoprene.

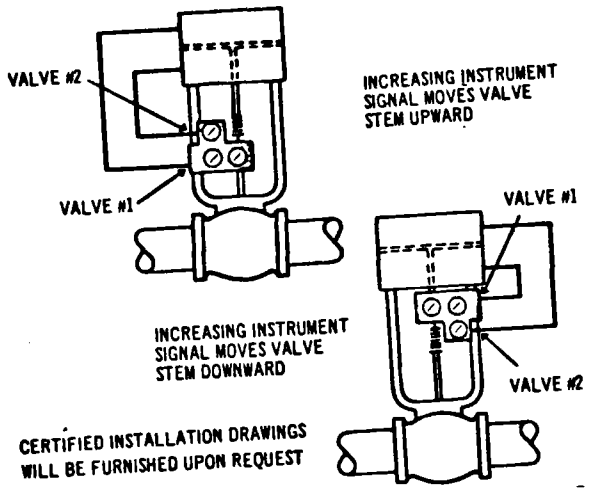
Printed in U.S.A., June 1966

Universal

H/R VALVE POSITIONERS



REVERSIBLE MOUNTING POSITIONS



Model 74 valve positioners, available with or without gauges, operate on a force-balance principle.

Operation

The drawing at the top of this page shows a model 74N positioner, connected for double-acting service on a piston-type valve actuator. The range spring provides "feedback" to the positioner. Tension on the range spring will vary as the valve-stem position changes. As the drawing indicates, the spring-loading force is applied directly to the positioner's input capsule.

Control-instrument pressure is applied between the diaphragms in the input capsule. Thus, the input capsule serves as a force-balance member; matching the valve-stem position (as measured by tension on the range spring) to the control-instrument signal.

When the opposing forces balance exactly, the system will be in equilibrium—and the valve stem will be in the exact position called for by the control instrument. If the opposing forces are not in balance, the input capsule will move up or down. And, by means of the pilot circuit, the dual pilot valves will change the output pressures; moving the valve stem until tension on the range spring opposes exactly the control-instrument pressure.

The sequence of operation is as follows: An increase in control-instrument pressure forces the input capsule upward. Displacement of the capsule, in turn, lifts the baffle lever away from the detecting nozzle. This allows air to escape rapidly to atmosphere; decreasing the pressure exerted on the underside of the pilot-valve capsule.

Supply air biases the pilot-valve capsule in a downward direction. As the capsule moves down, it will close off the exhaust seat—and open the supply seat; hence applying increased air pressure to the top of the actuator. At the same time, the pilot-valve capsule will open the exhaust seat for valve #1; thus decreasing pressure to the bottom of the actuator.

This difference in pressure will drive the piston downward—stretching the range spring—until the spring tension opposes exactly the force resulting from the new control-instrument pressure signal. At this point, the baffle lever will be moved toward the detecting nozzle to restore the pressure below the pilot-valve capsule to its equilibrium value. As a force-balance condition is approached, the pilot-valve capsule will be forced back to a neutral position (where the pilots are neither supplying air to, nor exhausting air from, their respective sides of the piston).

Note: The input capsule and the pilot-valve capsule are connected to the baffle lever to provide a motion-balance negative feedback in the detecting nozzle circuit. And this negative feedback insures high gain in the detecting circuit—with no overshoot or instability.

A decrease in instrument-air pressure reverses the described actions and causes a proportional upward movement of actuator piston and valve stem.

MOORE PRODUCTS CO.

Spring House, Pa.

Manufacturing Subsidiary: Moore Instrument Co., Ltd., Rexdale, Ont.

INSTRUCTIONS FOR THE INSTALLATION, OPERATION, AND MAINTENANCE OF THE MOORE H/FR (HIGH-FREQUENCY RESPONSE) VALVE POSITIONER

Models 74G, 74N

Installation Dwg.	12372-1-N
Parts Dwg.	12372-300
Schematic Diag.	12372-280-N
Selection Chart	12372-275-S

GENERAL INFORMATION

The Moore Model 74 is a two stage, "push-pull", high frequency response valve positioner. It responds to a change in controller output signal by increasing the pressure at one of its valve output ports and decreasing the pressure at the other output port. This makes the Model 74 ideal for double-acting cylinder operators where one side of the piston is loaded and the opposite side is unloaded with a change in controller output. This double action provides large forces to bring the valve to the required position with no sacrifice of stability.

Used with double-acting cylinders, the positioner can provide stroking action in either direction and proper "fail-safe" action on controller output failure. This can be accomplished by selecting the proper valve action (down to close or down to open) and by the proper mounting of the positioner (normal or inverted).

Double - Acting Cylinder Operators

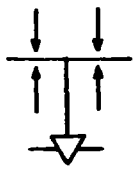
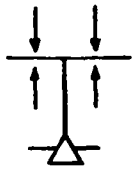
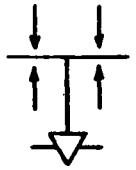
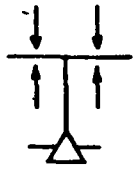
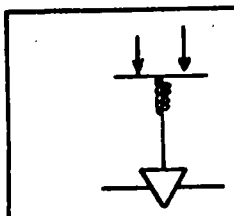
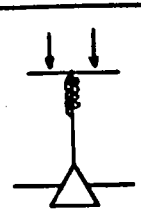
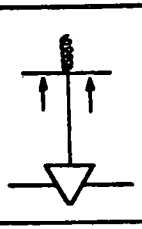
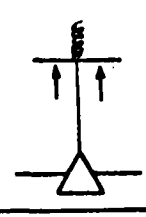
Valve Design				
Valve Action	Down to Close	Up to Close	Down to Close	Up to Close
Maximum Controller Output, Valve	Closes	Opens	Opens	Closes
For Controller Air Failure, Valve	Opens	Closes	Closes	Opens
Positioner Mounting	Inverted	Inverted	Normal	Normal

Fig. #1

Figure #1 shows the various combinations for a double-acting cylinder operator.

The Model 74 can also be used with spring-type diaphragm actuators, in which case, one of the positioner output connections must be plugged with a 1/4" pipe plug. It can be used for top or bottom loading, with "fail-safe" action in either direction, on controller output or valve supply air supply failure. This is accomplished by selection of the valve action, proper mounting, and proper connection of the valve positioner output pressure.

Diaphragm Type or Cushion - Loaded Actuators

				
Actuator Loading	Top	Top	Bottom	Bottom
Valve Action	Air Closes	Air Opens	Air Opens	Air Closes

Desired Valve Action

For Maximum Controller Output	Closed	Open	Open	Closed	Open	Closed	Closed	Open
For Controller Air Failure	Open	Closed	Closed	Open	Closed	Open	Open	Closed
For Positioner Supply Air Failure	Open	Open	Closed	Closed	Closed	Closed	Open	Open
Mounting Position	Inverted	Normal	Inverted	Normal	Normal	Inverted	Normal	Inverted

Port to be Connected to Actuator	Valve 2	Valve 1	Valve 2	Valve 1	Valve 2	Valve 1	Valve 2	Valve 1
Port to be Plugged	Valve 1	Valve 2	Valve 1	Valve 2	Valve 1	Valve 2	Valve 1	Valve 2

Fig. #2

Figure #2 shows the various combinations for diaphragm type or cushion-loaded Actuators.

OPERATION - Refer to Schematic Diagram 12372-280-N

With an increase in instrument signal, the rebalance lever is moved away from the detecting nozzle. This decreases the pressure in the output relay, allowing the center stem of the output relay to move downward. This vents the "Valve 1" output connection to atmosphere and throttles the supply pressure to this output connection. Simultaneously, the supply port is opened to the "Valve 2" output connection; and the exhaust is throttled. This moves the actuator piston downward to rebalance the diaphragm unit. When this rebalance is accomplished, the two plunger valves will throttle, holding the pressures at equilibrium on the actuator piston.

Ranges

The Model 74 is intended to operate with input signal pressures up to 30 psi. Stock range springs are available for strokes up to 12 inches. Refer to selection chart 12372-275-N for proper mounting accessories. For other strokes and ranges, consult the factory.

INSTALLATION

Refer to installation drawing #12372-1-N for mounting dimensions and proper connections for the valve positioner. Note that the "Valve 2" pressure must be applied to the actuator so as to extend the range spring and restore rebalance. If "Valve 2" connection is plugged for use with diaphragm actuators, "Valve 1" pressure must be applied to the actuator so as to shorten the range spring.

The valve positioner must be rigidly mounted to the actuator. The valve stem motion take-off arm must be securely mounted to the actuator stem.

A regulated supply pressure to the positioner is not normally required, but a filter and dripwell should be used to minimize difficulties due to entrained moisture or dirt. Supply pressure can be from 20 psi to 150 psi. With higher supply pressures, greater forces are available to stroke the actuator.

The ambient temperature limits for the Model 74 are -40 to +180 degrees F.

Installation of Range Spring Accessories

The range spring assembly consists of a range spring, zero adjusting screw, a range spring seat, a locknut, and a range spring cover.

Figure #3 illustrates the proper assembly of these components.

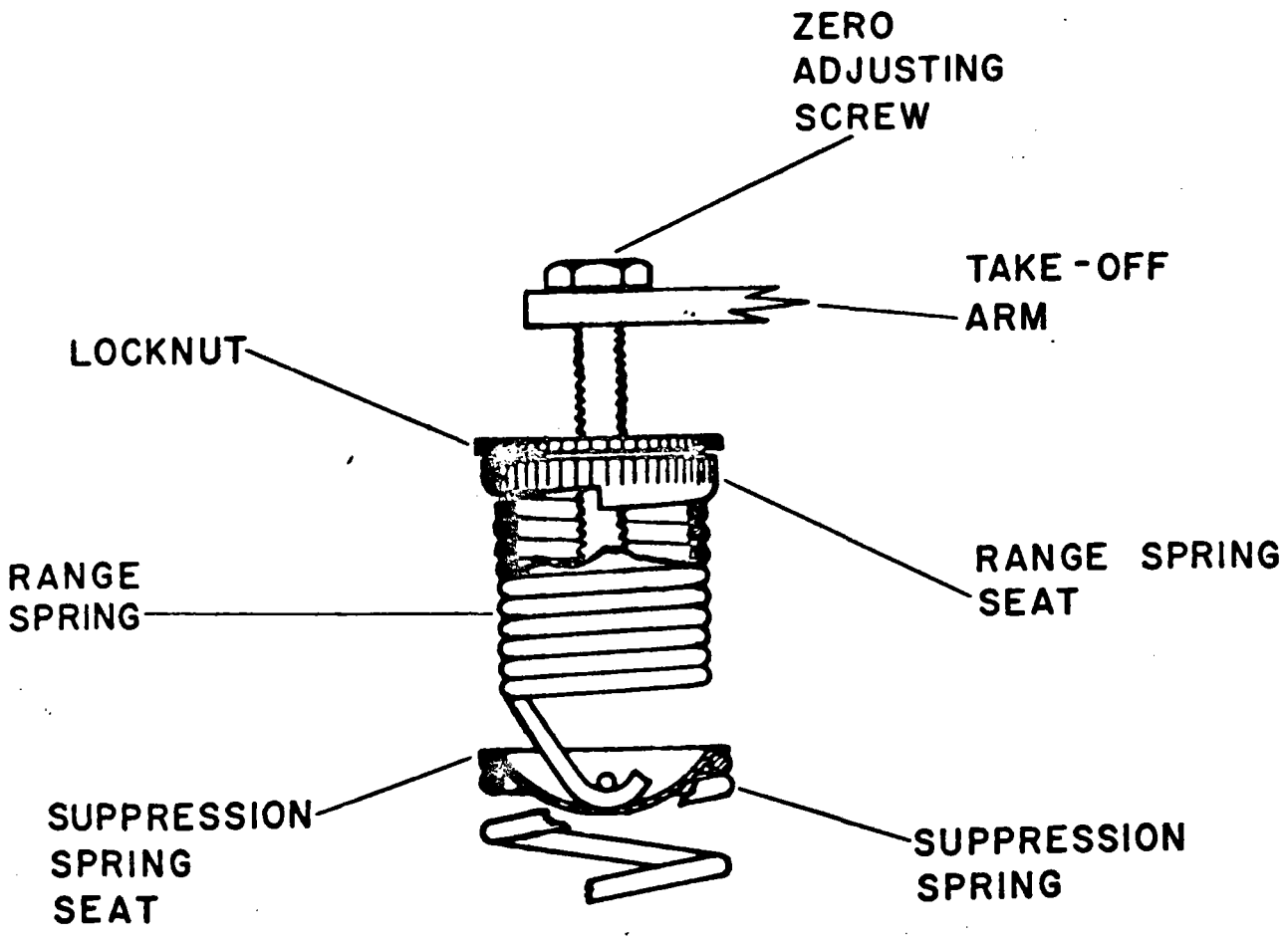


Fig. #3

Installation of Suppression Spring Assembly

In order to suppress the range of the valve positioner (for split ranging and for ranges that start at a pressure higher than 3 psi), a suppression spring and seat may have to be installed. These parts are installed before the range spring is installed on the positioner. Figure #3 illustrates the proper assembly of these parts.

SD74-2

CALIBRATION ADJUSTMENTS

1. Output Pressure Level Adjustment - This adjustment is a slotted screw located on the top of the valve positioner (normal mounting) adjacent to the upper plunger valve retaining nut. Turning this screw clockwise will decrease the output pressure of the valve positioner.

2. Zero Adjustment - This is the screw that connects the range spring to the take-off arm. Loosen the locknut from the range spring, and adjust the screw until the operator begins to move at the correct positioner input pressure. Always tighten the locknut after making this adjustment.

3. Stroke Adjustment - Screw in the spring seat to adjust the number of active coils of the range spring to give the desired stroke. Rezero as above if necessary.

MAINTENANCE

As with all pneumatic instruments, a clean, dry air supply will minimize the maintenance problems. An air filter, such as the Moore Model 2306, should be installed in the supply air line. This filter should be blown down frequently, and the filter element should be inspected and replaced when necessary.

A spring return push-button restriction cleaner has been built into the body of the valve positioner. Pushing this button will clear the restriction.

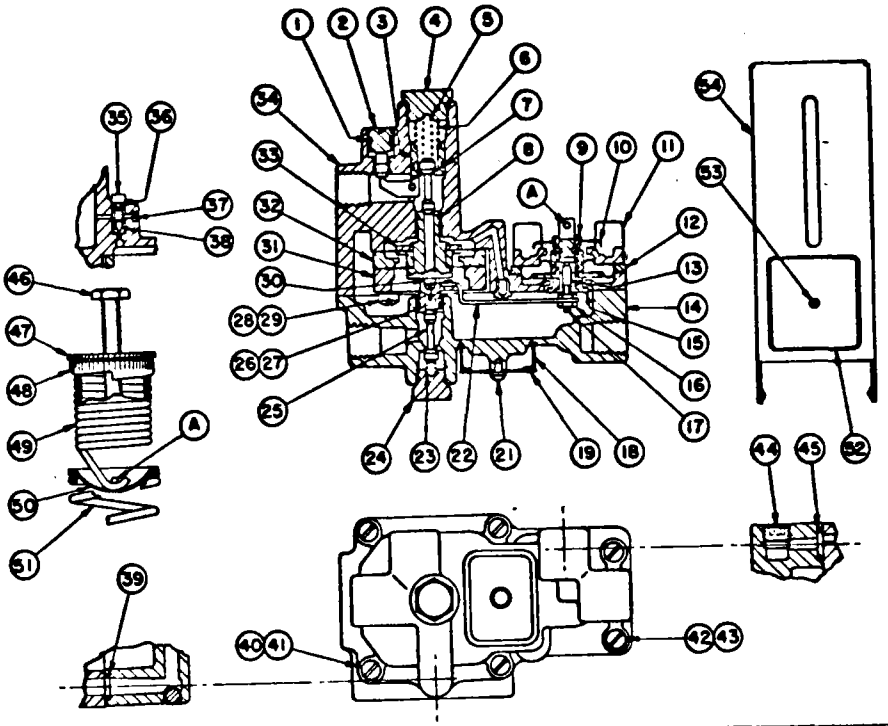
The two pilot plungers located under the retaining nuts can be easily removed for cleaning. Build-up on these plungers or the plunger seats may cause erratic operation. A pipe cleaner and solvent can be used to clean the plunger seats.

MOORE PRODUCTS CO.
SPRING HOUSE, PA.

PARTS LIST
MOORE H/FR (HIGH-FREQUENCY RESPONSE) VALVE POSITIONER
MODELS 74G AND 74N

From Drawing No. 12372-300

B/M 1237252

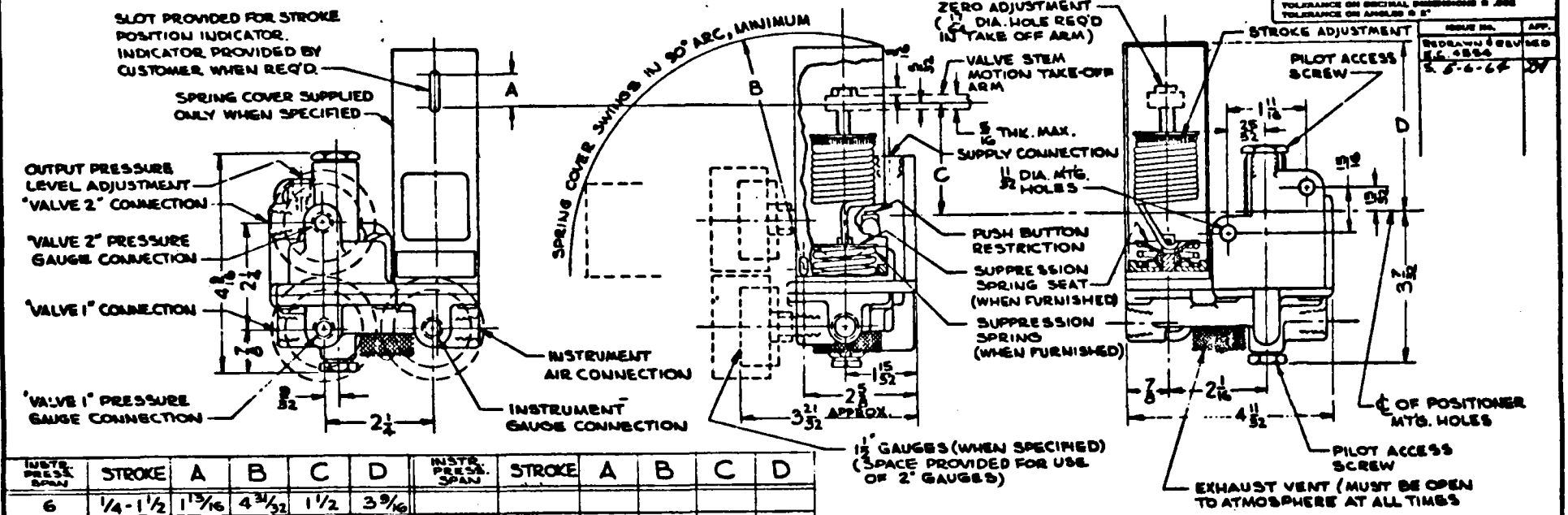


Item No.	Part No.	Description	Req'd
* 1	2938-1	"O" Ring	1
2	12372-129	Adjusting Screw	1
3	12372-117	Pilot Seat	1
* 4	12372-109	Sealing Screw	1
* 5	12372-111	Plunger Spring	1
* 6	12372-130	Spring	1
* 7	2938-3	"O" Ring	2
* 8	2938-1	"O" Ring	1
9	4951-16	Grommet	1
10	12372-108	Baffle	1
11	12372-113	Instrument Capsule Casting	*1
12	12372-97	Diaphragm Ring	*1
*13	12372-269	Spring	1
14	12372-152	Housing	1
*15	12372-116	Diaphragm Assy. (Incl. Items 13 and 17)	2
16	12372-123	Nut	1
17	12372-268	Stud	1
18	12372-251	Screen	1
19	12372-257	Nameplate	1
21	Screw	#6-32 x 1/4 Lg. Truss Hd.	1
22	12372-126	Beam Assy.	1
*23	6750-49	Plunger Spring	1
*24	6751-3	Sealing Screw	2
*25	12372-107	Plunger	2
26	Screw	#2-56 x 3/16" Lg. Rd. Hd.	2
27	12372-138	Washer	6
28	Screw	#10-32 x 7/8" Lg. Fil. Hd.	6
29	Lockwasher	#10	2
30	12372-51	Spacer	1
31	12372-87	Diaphragm Ring	1
32	12372-196	Diaphragm Ring	1
*33	12372-104	Diaphragm Assy.	1

Item No.	Part No.	Description	Req'd
34	12372-159	Housing	1
35	12372-155	Cleaning Plunger	1
*36	2938-16	"O" Ring	1
37	10320-25	Screw	1
38	10320-10	Spring	1
*39	2938-1	"O" Ring	1
40	Screw	#10-32 x 1/2" Lg. Fil. Hd.	4
41	Lockwasher	#10	4
42	Screw	#10-32 x 7/8" Lg. Fil. Hd.	2
43	Lockwasher	#10	2
44a	12372-259	Pipe Plug (Model 74N Only)	3
44b	12444-1	0-30 PSI Gauge, Instrument (Model 74G Only) (Not Shown)	1
44c	12444-2	0-160 PSI Gauge, Valve (Model 74G Only) (Not Shown)	2
*45	2938-3	"O" Ring	1
46a	12372-273	Zero Adj. Screw, 2 3/4" Lg. (According to Stroke and Span)	1
46b	12372-274	Zero Adj. Screw, 1 7/8" Lg. (According to Stroke and Span)	1
47	12372-194	Locknut	1
48	12372-193	Spring Seat Assy.	1
49		Range Spring—As Specified on Order	1
50	12372-254	Suppression Spring Seat (When Required)	1
51		Suppression Spring—As Specified on Order (When Required)	1
52	12372-260	Nameplate	1
53	Screw	#4 x 1/4" Lg. Rd. Hd. Self-Tapp., S.S. 18-18	1
54a	12495-1	Range Spring Cover—Stroke 1/4" to 1 1/2"	1
54b	12495-2	Range Spring Cover —Stroke 1 1/2" to 2 3/4"	1
54c	12495-3	Range Spring Cover—Stroke 2 3/4" to 4"	1
54d	12495-5	Range Spring Cover—Stroke 5 1/4" to 6 1/2"	1

* Recommended On-Hand Spare Parts. Always Specify Model Number and Serial Number of Instrument When Ordering Spare Parts.

Printed in U.S.A.



INSTR. PRESS. SPAN	STROKE	A	B	C	D
6	¼-1½	1 15/16	4 3/32	1½	3 9/16
6	1½-2¾	2 27/32	6 29/32	2 3/32	5 9/16
6	2¾-4	4 1/8	9 1/8	3 5/32	7 27/32
12	¼-1½	1 15/16	4 3/32	1 5/16	3 9/16
12	1½-2¾	2 27/32	6 29/32	2 7/32	5 9/16
12	2¾-4	4 1/8	9 1/8	3 7/32	7 27/32
12	3½-6½	—	—	4½	—
12	4-9	—	—	5¾	—
12	6-12¾	—	—	8 9/16	—
15	¼-1½	1 15/16	4 3/32	1 9/32	3 9/16
15	1½-2¾	2 27/32	6 29/32	2 7/32	5 9/16
15	2¾-4	4 1/8	9 1/8	3 5/32	7 27/32
* 24	¼-1½	1 15/16	4 3/32	1 17/32	3 9/16
* 24	1½-2¾	2 27/32	6 29/32	2 9/32	5 9/16
24	2¾-4	4 1/8	9 1/8	3 1/4	7 27/32
* 30	¼-1½	1 15/16	4 3/32	1 19/32	3 9/16
* 30	1½-2¾	2 27/32	6 29/32	2 9/32	5 9/16
30	2¾-4	4 1/8	9 1/8	3 5/32	7 27/32

* TAKE-OFF ARM TO BE MACHINED TO A THICKNESS OF 3/16" TO PROVIDE RECESS FOR HEAD OF ZERO SCREW WHEN USING MAXIMUM STROKE.

NOTES:
1- ALL CONNECTIONS ¼ N.P.T. WITH EXCEPTION OF ⅛ N.P.T. GAUGE CONNECTIONS.
2- INCREASE IN INSTRUMENT AIR CAUSES INCREASE IN PRESSURE AT "VALVE 2" CONNECTION. "VALVE 2" PRESSURE MUST BE APPLIED TO ACTUATOR SO AS TO EXTEND RANGE SPRING AND RESTORE BALANCE.

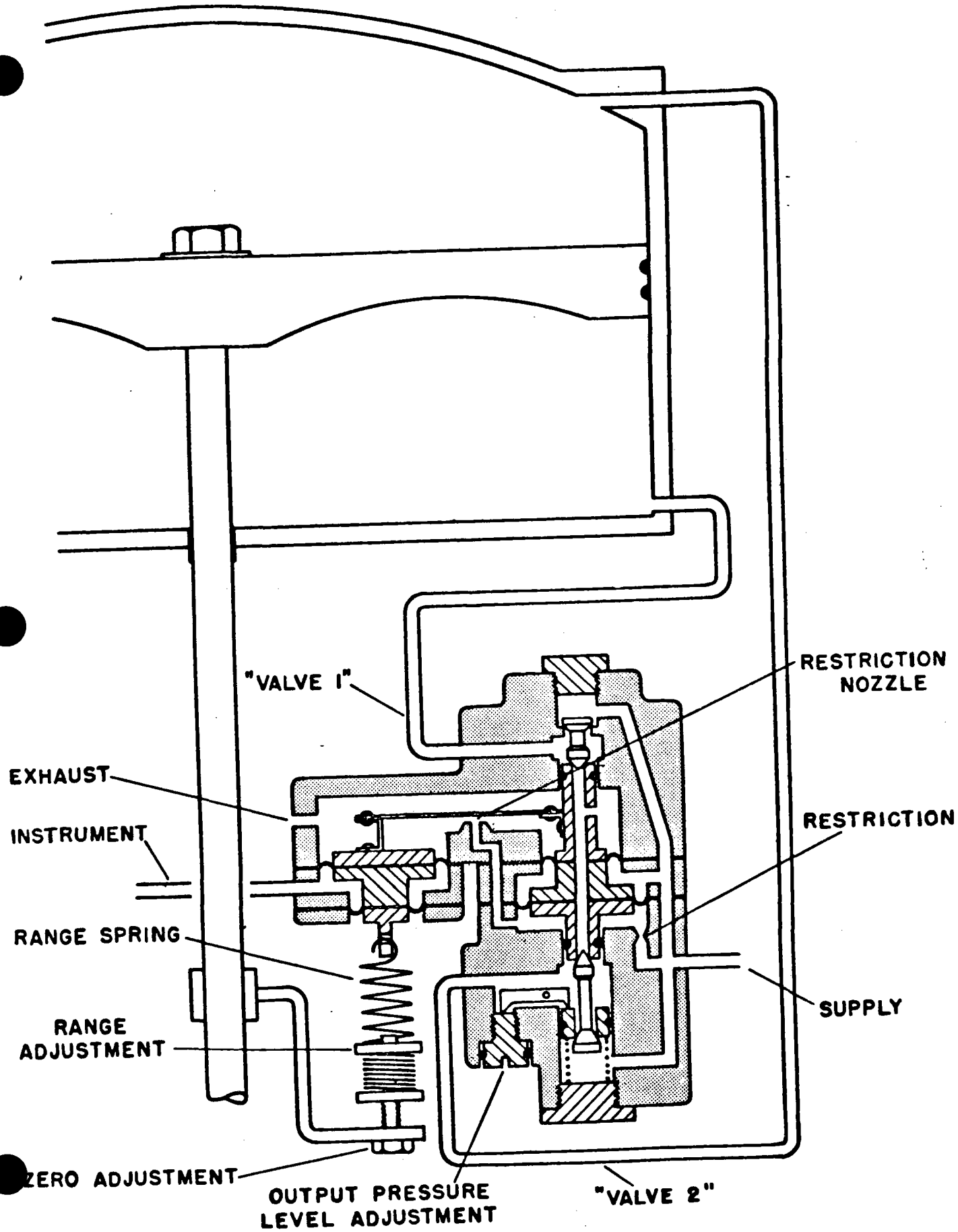
MOORE PRODUCTS CO.
SPRING HOUSE, PA., U.S.A.

INSTALLATION DRWG.

MODEL 74 H/FR POSITIONER

DR'N	CH'D	APP.	DWG. NO.
JM	GS		12372-1-N
SCALE	DATE		
	4-30-64		

4.1.39-74



MODEL 74 SCHEMATIC

FROM DWG. No. 12372-280

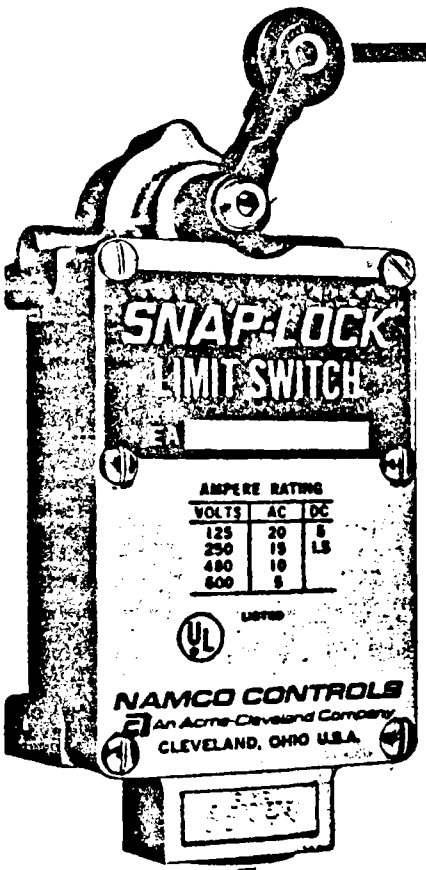
4.1.39-75

NAMCO CONTROLS

WATER-OIL
DUSTTIGHT
Limit Switches

Series EA170

for
heavy duty
application



DOUBLE POLE
DOUBLE THROW

TWO NO
TWO NC

QUICK MAKE
QUICK BREAK

Design Features

Snap-Lock switches have separate enclosures within a single housing for the electrical contacts and terminals on one side and latches, rockers and other parts of the operating mechanism on the other side.

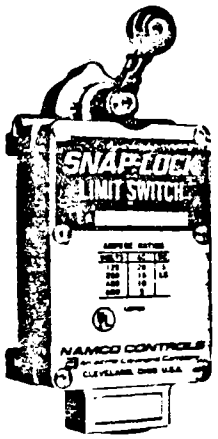
The snap-lock action ensures a quick-make and quick-break of contacts together with locking in either open or closed position.

These switches are heavy duty, machine tool type with double pole, double throw, butt type contacts.

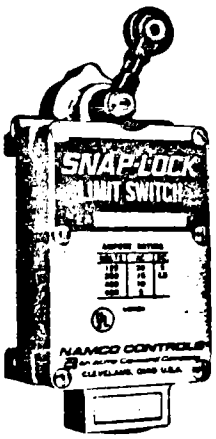
Enclosures are water, oil and dusttight and meet NEMA Type 1, 4, and 13 requirements.

Heavy Duty Namco Limit Switches

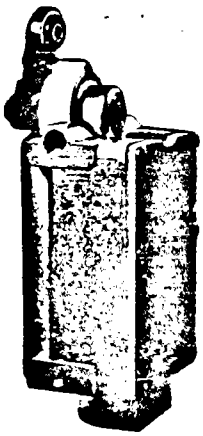
Series EA170-11100 Standard



Series EA170-14100 Short Travel



Series EA170-41100 Reverse Shaft

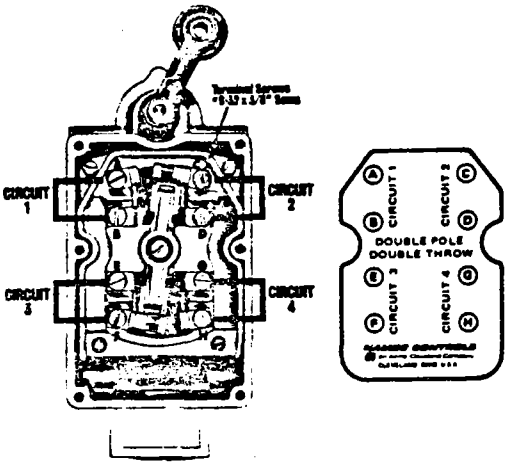


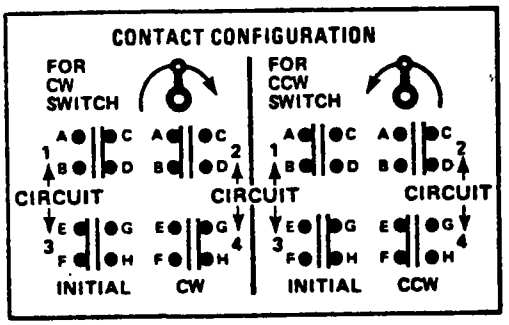
Provide Separate Enclosures for Mechanical and Electrical Sides

MECHANICAL SIDE

The contacts are positively maintained until the latch is disengaged by the return travel of the lever to reset the switch. Switches are normally assembled for clockwise operating lever movement; however, to obtain counter-clockwise operation, simply transfer the return spring to the opposite side of the internal lever. The return spring serves to reset the switch automatically to its original position when the force on the operating lever is removed, but with spring removed the operating lever will remain in either position as actuated.

ELECTRICAL SIDE





The electrical side, completely separated from the mechanical side, provides ample wiring space and readily accessible terminal screws in the molded contact blocks. The contact lever carries self-wiping silver-alloy contacts and is connected directly by a shaft to the latch bar on the mechanical side. Water, oil and dusttight enclosures are assured by the use of proper gasket materials.

How to Order Switches and Replacement Parts

Always order Switch and Operating Lever as **SEPARATE ITEMS**, and use the Ordering Number listed. Refer to Series EL for Operating Levers.

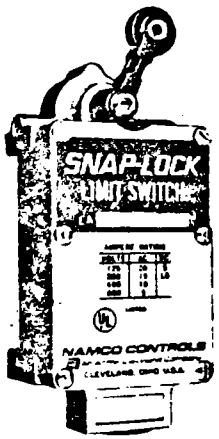
EXAMPLE: To order a Standard Snap-Lock Switch and the operating lever considered as standard, use the catalog numbers as follows:

1 No. EA170-11100 Snap Lock Switch

1 No. EL010-53420 Operating Lever Assembly

Replacement parts and assemblies should also be ordered by catalog number, giving switch numbers for which the parts are desired.

STANDARD



Double pole, double break, double throw, heavy duty limit switch having mechanical travel of 10° to trip and with two normally open and two normally closed circuits.

Can be furnished with standard, style 1 or style 2 mounting.

SPECIFICATIONS

Heavy Duty, Machine Tool Type, Double Pole, Double Throw, Quick Make, Quick Break, Butt Type Contacts.

U-L Listed/File No. E12967

Enclosure is Water, Oil and Dusttight. Meets (NEMA) Type 1, 4, & 13 Requirements.

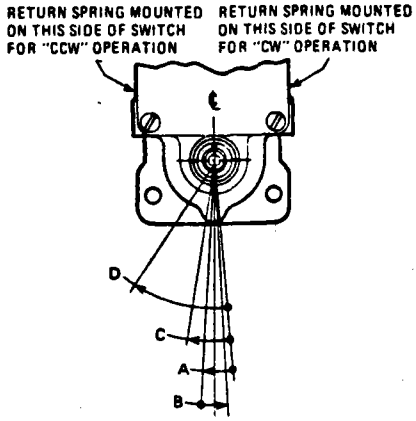
Torque Necessary for Operation of Switch - 30 in. -lb. (Without Return Spring, Item 23, 10 in. -lb.)

External Lever is Adjustable by 7°30' Increments Thru 180°.

Ampere Rating

Volts	AC	DC
125	20	5
250	15	1.5
480	10	
600	5	

OPERATIONAL DATA

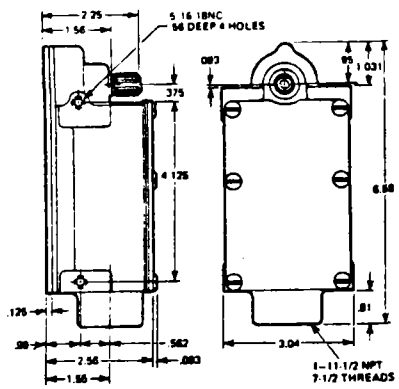


(CW OPERATION SHOWN)

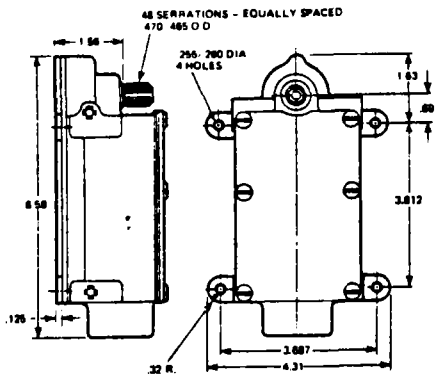
See Page 2 for Contact Configuration

A. Pre-Travel Trip Position . . . 10°
B. Reset Position . . . . . 8°
C. Total Travel . . . . . 37°
D. Recommended Travel . . . 13°

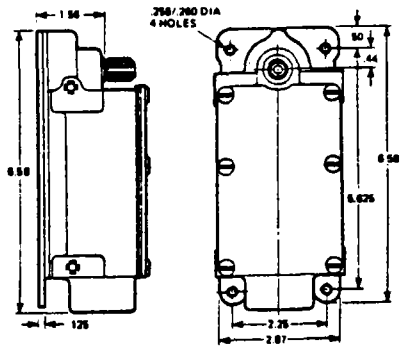
DIMENSIONS and MOUNTINGS



STANDARD MOUNTING



STYLE 1 MOUNTING



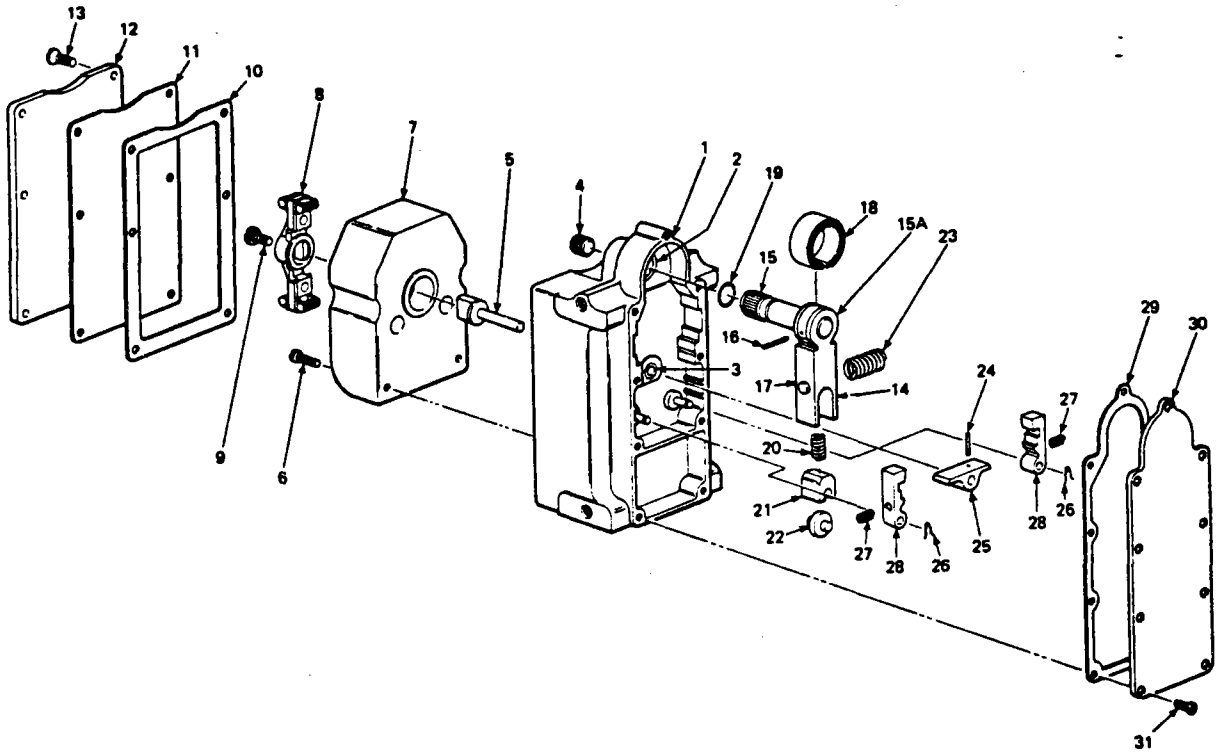
STYLE 2 MOUNTING

ORDERING INFORMATION	ORDERING NUMBERS ①		
Type Mounting	Standard Rotation CW	Opposite Rotation CCW	Without Spring Return
STANDARD MOUNTING	EA170-11100 (D2400X)	EA170-12100 (D2400X-SR)	EA170-13100 (D2400X-WS)
STYLE NO. 1 MOUNTING	EA170-21100 (D2400X-1)	EA170-22100 (D2400X-1-SR)	EA170-23100 (D2400X-1-WS)
STYLE NO. 2 MOUNTING	EA170-31100 (D2400X-2)	EA170-32100 (D2400X-2-SR)	EA170-33100 (D2400X-2-WS)

① Order by New EA Series Numbers (Bold Type) – Previous numbers shown in parentheses for reference only.

SNAP-LOCK
Series EA170-11100/D2400X

Parts List



Item No.	Ordering Numbers ① Reference	Ordering Numbers ① New	Description	Qty.	Item No.	Ordering Numbers ① Reference	Ordering Numbers ① New	Description	Qty.
1	D2405A	EA173-93003	Housing Assy.	1	16	XRP-3/2-12	EF270-62414	Roll Pin	1
2	D1203	EH110-00064	Bushing	1	17	–	EA084-43045	Lever (only)	1
3	D1204	EH110-00104	Bushing	1	18	D1254C	EH160-03204	Torsion Spring	1
4	XPPS-1	EH060-80024	Pipe Plug	1	19	XO-7	EH080-00063	"O" Ring	1
5	D1238E	EA085-93024	Contact Lever Shaft	1	20.	D2449A	EH160-03354	Spring	1
6	SEM-R-6C8	EF429-60014	Contact Block Screw	4	21	D1246C	EA086-20014	Roller Slide	1
7	D2420	EA171-60003	Contact Block Assembly	1	22	D1247B	EA085-73024	Roller	1
8	D2430A	EA178-30004	Lever	1	23	D1256R	EH160-03294	Return Spring	1
9	SEM-P-8C-6BC	EF429-80034	Sems Screw	1	24	XRP-3/2-8	EF270-60804	Roll Pin	1
10	D2468	EA177-90004	Top Cover Gasket	1	25	D1241	EA085-53004	Rocker	1
11	D2412	EA174-00014	Insulator	1	26	D1271	EF460-00014	Retaining Clip	1
12	–	EA177-71027	Top Cover	1	27	D1243	EH160-03164	Latch Spring	2
13	S8-8-C-8	EF089-80030	Top Cover Screw	6	28	D1242G1	EA084-23044	Latch	2
14	–	EA176-10109	Lever Shaft Assembly (includes items 15, 15A, 16, 17 & 18)	1	29	D2466A	EA173-10004	Bottom Cover Gasket	1
					30	D2409-3	EA172-93004	Bottom Cover (std. mtg.)	1
						D2409A-3	EA172-93034	Bottom Cover (style 1 mtg.)	1
						D2409B-3	EA172-93054	Bottom Cover (style 2 mtg.)	1
15	D1251A	EA085-93124	Lever Shaft	1	31	–	EF059-89991	Bottom Cover Screw	9
15A	D1252A	EA084-43054	Spring Lever	1					

① Reference numbers shown are from previous bulletin EA-1700.

REPLACEMENT PARTS KITS

ELECTRICAL REPAIR KIT	EA171-12100	INCLUDES ITEMS 6, 7, 8, 9, 10, 11, & 13
MECHANICAL REPAIR KIT	EA171-11109	INCLUDES ITEMS 5, 24, 25, 26, 27, & 28
LEVER SHAFT KIT	EA171-10109	INCLUDES ITEMS 4, 14, 19, 20, 21, 22, 23, 29, & 31

FISHER® Controls

Instruction Manual

Types 546, 546S and 546ST Electro-Pneumatic Transducers

Form 1783, February 1977

INTRODUCTION

Scope of Manual

This instruction manual pertains only to the installation, operation, and maintenance of the Types 546, 546S, 546ST and Type 82 relay. Refer to the Type 67FR instruction manual for regulator maintenance information.

Purpose

Fisher Type 546, 546S, and 546ST signal transducers receive a milliampere direct current input signal and transmit a proportional pneumatic output pressure. A typical application is in electronic control loops where the final control element, generally a control valve, is pneumatically operated. The input signal, output pressure range, and electrical classification of each transducer is indicated on the nameplate attached to the cover.

The Types 546S and 546ST are models which are approved as being intrinsically safe when used with certain systems. The approved systems are listed in table 2.

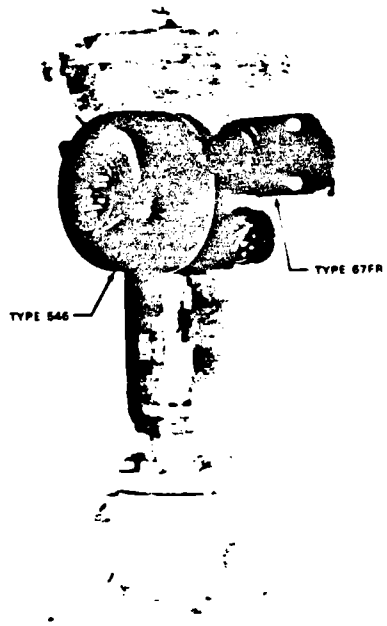


Figure 1. Type 546 Transducer Mounted on Fisher Type 657 Pneumatic Diaphragm Actuator

PRINCIPLE OF OPERATION

Refer to the schematic drawing in figure 2. Assume that the transducer is direct acting. An increase in the dc milliampere signal to the coils increases the magnetic field around the coils. This field increases the magnetic strength in the armature and the magnetic attraction across the air gap between the armature and the pole pieces.

The pole pieces are already polarized by the permanent magnet. The armature polarity is as shown in the schematic. The magnetic attraction will therefore be downward at the nozzle end and upward at the feedback bellows end, resulting in a torque that rotates the armature about the fixed torsion rod to cover the nozzle. The resulting restriction produces an increased pressure in the nozzle, in the upper chamber of the relay, and in the feedback bellows. The relay responds to the increase in nozzle pressure to increase the output pressure to the control valve, the normal output load. The increased pressure in the feedback bellows creates a force which acts on the armature to move it back to an equilibrium position. In this way, the new nozzle pressure is compared to the input current by the force balance principle.

Table 1. Specifications

INPUT SIGNALS*	**Type 546:** ■ 1 to 5 mA dc, ■ 4 to 20 mA dc, ■ 10 to 50 mA dc, ■ 1 to 9 Vdc, or ■ Two-way split range using any half of one of the standard input signal spans **Types 546S and 546ST:** ■ 4 to 20 mA dc or ■ Two-way split range using any half of the 16 mA dc span
INTERNAL RESISTANCE OF TORQUE MOTOR	**1 to 5 mA dc Input Signal:** ■ 2500 ±120 ohms (standard) or ■ 12,000 ± 50 ohms (temperature compensated circuit) **4 to 20 mA dc Input Signal:** 176 ± 10 ohms **10 to 50 mA dc Input Signal:** 90 ± 10 ohms **1 to 9 Vdc Input Signal:** 1300 ± 50 ohms (temperature compensated circuit)
OUTPUT SIGNALS*	**Ranges:*** ■ 3 to 15 psig, ■ 6 to 30 psig, or ■ 3 to 27 psig **Action:** Type 546 is field reversible between ■ direct and ■ reverse (Types 546S and 546ST available with either direct or reverse action, but cannot be reversed in the field)
SUPPLY PRESSURE*	**Recommended:** 5 psi higher than upper range limit of output signal **Maximum:** 50 psig
MAXIMUM STEADY-STATE AIR CONSUMPTION*	**20 psig Supply:** 0.35 scfm **35 psig Supply:** 0.50 scfm
MAXIMUM SUPPLY AIR DEMAND	**20 psig Supply:** 8.0 scfm **35 psig Supply:** 11.5 scfm
PERFORMANCE†	**Reference Accuracy:*** ±0.75% of output signal span **Independent Linearity:*** ±0.50% of output signal span **Open Loop Gain:*** 26 **Frequency Response:*** Gain is attenuated 3 dB at 20 Hz with Type 546 output signal piped to a typical instrument bellows with 12 inches of 1/4-inch tubing
OPERATIVE AMBIENT TEMPERATURE	−40 to +150°F
ELECTRICAL CLASSIFICATION	See table 2
APPROXIMATE WEIGHT	9 pounds (transducer only)

*These terms are defined in SAMA Standard PMC 20.1-1973
†Except where indicated, values obtained using the Type 546 with a 4 to 20 mA dc input signal, a 20 psig supply pressure, and a Fisher Type 657 pneumatic diaphragm actuator at an ambient temperature of 75°F

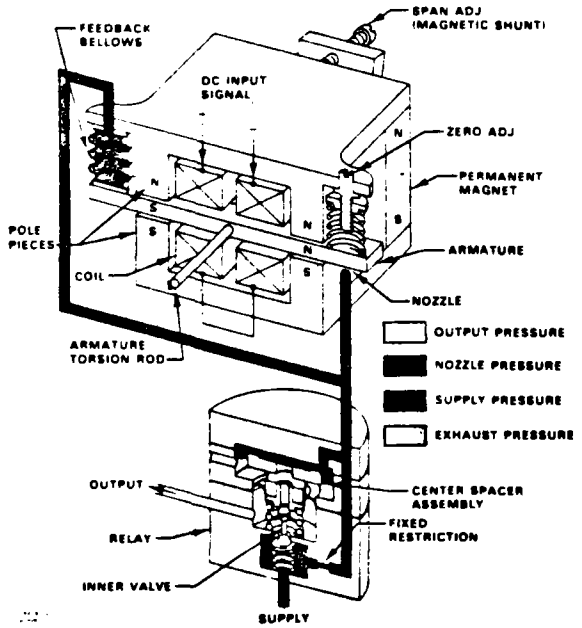


Figure 2. Type 546 Transducer Schematic

The relay operates in this manner. The nozzle pressure acts on the large top diaphragm to force the center spacer assembly (mounted between the two diaphragms) downward against the inner valve, closing the exhaust port and opening the supply port. Supply air then flows through the open port to the output load. The output pressure continues to increase until the relay diaphragm assembly is pushed back by the force of the pressure acting on the small diaphragm to its original position and the inner valve is closed again.

When a decreasing dc signal is received, the magnetic attraction across the air gap is reduced. The armature rotates to uncover the nozzle and decrease the pressure in the nozzle, relay and feedback bellows. The relay diaphragm assembly moves upward and the exhaust port opens to bleed the output pressure to atmosphere. The output decreases until the diaphragm assembly is forced back to its original position and the exhaust port is closed again. The reduced pressure in the feedback bellows diminishes the force to return the armature to the equilibrium position.

Reverse acting transducers operate in a similar manner except that when the dc input signal increases, the output pressure from the relay decreases. Conversely, a decreasing input signal increases the output pressure.

Table 2. Electrical Classifications

Type Number	Electrical Classification	Division I Hazardous Locations	Approved Systems (if applicable)
Units Manufactured in Marshalltown, Iowa			
546	CSA Listed as Explosion Proof	Class I, Group D	. . .
546S	CSA Listed as Intrinsically Safe	Class I, Groups C and D	Fisher Type AC301 Intrinsic Safety Barrier; with or without Type 43M or 44M meters
		Class I, Groups C and D	Taylor zener barriers rated 30 V or less, 120 ohms or more, with or without Type 43M meter (Dwg. 23A3881)
		Class I, Groups B, C, and D	Taylor zener barriers rated 30 V or less, 300 ohms or more, with or without Type 43M meter (Dwg. 23A3881)
		Class I, Groups A, B, C, and D	Fisher Type AC303 Intrinsic Safety Barrier with or without Type 43M or 44M meter; wire per instruction form 4828 and Dwg. 31A8820
	FM Listed as Intrinsically Safe	Class I, Group D	Leeds and Northup* (System Dwg. ID-883-1 and ID-883-2)
		Class I, Groups C and D	Fischer and Porter* ESL System 24
			Taylor intrinsically safe barrier 124S931, 124S932, 124S1254, or 124S1264 (Fisher Dwg 22A3640, Taylor Dwg. ISL-92900-30, instructions 17B207 and 1B-17E209)
		Class I, Groups B, C, and D	Taylor intrinsically safe barriers 124S1134, 124S1144 (Fisher Dwg. 22A3640, Taylor Dwg. ISL-92900-30, instructions IB-17E209)
		Class I, Groups A, B, C, and D	Bristol* Metatronic 2000 control loop configurations, control loops 1 through 6 (instructions SS-B299)
			Leeds and Northup*; connection to be made through a non-hazardous area (part number 316569 or 316747; direction book 177849)
	BASEEFA Listed as Instrinsically Safe†	Group IIB	A pair of BASEEFA Certified EX (ia) IIC 28 volt 300 ohm shunt zener diode barriers, of like polarity, or a BASEEFA Certified EX (ia) IIC Dual 28 volt 300 ohm shunt zener diode barrier each 'half' of like polarity; safe area apparatus, unspecified except that it must not be supplied from nor contain a source of potential with respect to earth in excess of 250 volts RMS or 250 volts DC under both normal and abnormal working conditions; permissible interconnecting cable (Fisher Dwg. 13A9814 or 13A9815)
		Group IIC, temperature class T4	Any BASEEFA EX (ia) IIC 28 volt 300 ohm shunt zener diode barrier; safe area apparatus, unspecified except that it must not be supplied from nor contain a source of potential with respect to earth in excess of 250 volts RMS or 250 volts DC, under both normal and abnormal working conditions; permissible interconnecting cable
546ST	CSA Listed as Intrinsically Safe	Class I, Groups B, C, and D	Foxboro Co. Ltd. Spec 200, with or without Type 43M or 44M meter
	UL Listed as Intrinsically Safe	Class I, Groups C and D	Bailey Meter* Type 766600 AAAX1 (instructions 4576K16-00A2)
		Class I, Groups B, C, and D	Beckman* (instructions 015-082291)
			Fisher Type AC303 Intrinsic Safety Barrier, with or without Type 43M meter, instruction manual form 4828)
Units Manufactured in Woodstock, Ontario, Canada			
546 and 546S	CSA Listed as Explosion Proof	Class I, Group D	. . .
546S	CSA Listed as Intrinsically Safe	Class I, Groups C and D	Bailey Meter* Type 766600 AAAX1 (instruction 4576K16-002A)
			Fisher Type AC301 Intrinsic Safety Barrier; may be used singly or in pairs (split range applications), with or without approved meters
			Taylor intrinsically safe barriers 124S931, 124S932, 124S1254, or 124S1264 (Taylor instructions ISL-92900-30 or Fisher Dwg. 22A3640)
		Class I, Groups B, C, and D	Taylor intrinsically safe barriers 124S1134 or 124S1144 (Taylor instructions ISL-92900-30 or Fisher Dwg. 22A3640)
		Class I, Groups A, B, C, and D	Fisher Type AC303 Intrinsic Safety Barriers
546ST	CSA Listed as Intrinsically Safe	Class I, Groups B, C, and D	Foxboro Co., Ltd., Spec 200; may be used singly or in pairs (split range applications) with or without approved meters

*Certification received by named company

† Please note the additional conditions for BASEEFA certification

1 Installation must conform to the approved drawing number and the BASEEFA 'Installation Conditions' Issue 4, dated September 1, 1975

2 The capacitance, and inductance or inductance-to-resistance (L/R) ratio of the cable connected to the transducer shall not exceed

Group	Capacitance µF	Inductance mH	or (L/R) ratio mH/OHM
IIC	0.13	4.2	85
IIB	0.5	12.0	160
IIA	1.0	35.0	470

3 If screened cable is used, the screen must be earthed (grounded) in the safe area, and insulated from frame and earth (ground) in the hazardous area

INSTALLATION

WARNING

The Type 546 transducer, like most other devices of this type, bleeds to atmosphere. If a combustible, toxic, or otherwise hazardous gas is used as the supply source, locate the transducer in a well-ventilated area. Accummulated gas may create an explosion hazard or locally poisonous condition with the possibility of personal injury or equipment damage.

Mounting

When a control valve is ordered and it is specified that a Type 546 be mounted on the actuator, the factory-mounted transducer will be connected to the actuator with the necessary tubing and adjusted for the conditions specified on the order.

If the transducer is purchased separately for mounting on a control valve already in service, all the necessary mounting parts will be furnished. This includes the output tubing and the appropriate bracket for bolting the unit to an actuator boss with tapped holes or for fastening it to the diaphragm casing.

If preferred, mounting parts can be supplied for mounting the transducer on a 2-inch diameter pipestand, a flat surface, or a bulkhead. No output tubing will be supplied for these remote mounting methods unless a specific length and size is ordered. The recommended tubing size is 3/8-inch outside diameter. Tubing length between the transducer output and the final control element should be as short as possible to minimize its effect on control loop stability.

Pneumatic Connections

The Type 546 transducer is normally furnished with a Type 67FR filter regulator mounted on the transducer case. A pressure gauge on the regulator shows the supply pressure to the transducer.

Note

The supply source must be clean, dry, noncorrosive air or gas at an unfailing pressure at least 5 psi higher than the upper limit of the transducer output pressure range. This means that for an output pressure range of 3 to 15 psi the supply pressure should be at least 20 psi; for a 6 to 30 psi range, the supply pressure should be at least 35 psi. The supply to the Type 67FR regulator should not be more than 250 psi at a maximum temperature of 150°F.

1. Connect the nearest supply source to the 1/4-inch NPT "IN" connection on the filter regulator (if furnished) or to the 1/4-inch NPT "SUPPLY" connection in the transducer case (if regulator is not furnished).

2. Run 3/8-inch O.D. tubing from the 1/4-inch NPT "OUTPUT" opening in the transducer case to the input connection on the pneumatic actuator or valve positioner. This connection will be made at the factory if the unit is shipped mounted on an actuator as shown in figure 1.

Electrical Connections

The electrical connections are made in the transducer case. A 1/2-inch NPT conduit connection is provided in the bottom of the case. Use a suitable conduit seal for hazardous locations. The wires that carry the milliampere signal from the controller are connected to the terminal strip (key 53, figure 6). The terminal strip is marked "+" and "−" to indicate the positive and negative terminals. For a direct acting unit (i.e., increasing current produces an increasing output pressure), connect the positive wire from the controller to the positive terminal of the transducer and the negative wire to the negative terminal. For a reverse acting unit (i.e., increasing current produces a decreasing output pressure), connect the positive wire from the controller to the negative terminal and the negative wire to the positive terminal. Typical circuit drawings are shown in figure 3.

Note

An anti-seize compound should be used on the case-cover threads (marked "AS," in figure 5) to prevent the threads from galling.

ADJUSTMENTS

Assuming the filter regulator has been adjusted to provide the proper supply pressure to the transducer, there are two adjustments incorporated into the Type 546. They are the zero adjustment and the span adjustment (figure 4). The zero adjustment is used to set the output pressure so that it corresponds to the proper value of the input signal. For example, if the output range is 3 to 15 psi and the input range is 1 to 5 mA dc and the unit is direct acting, the zero adjustment would be used to set the output pressure at 3 psi when the input signal is 1 mA. The span adjustment is used to set the span of the output pressure so that full output pressure change results from a full change in the

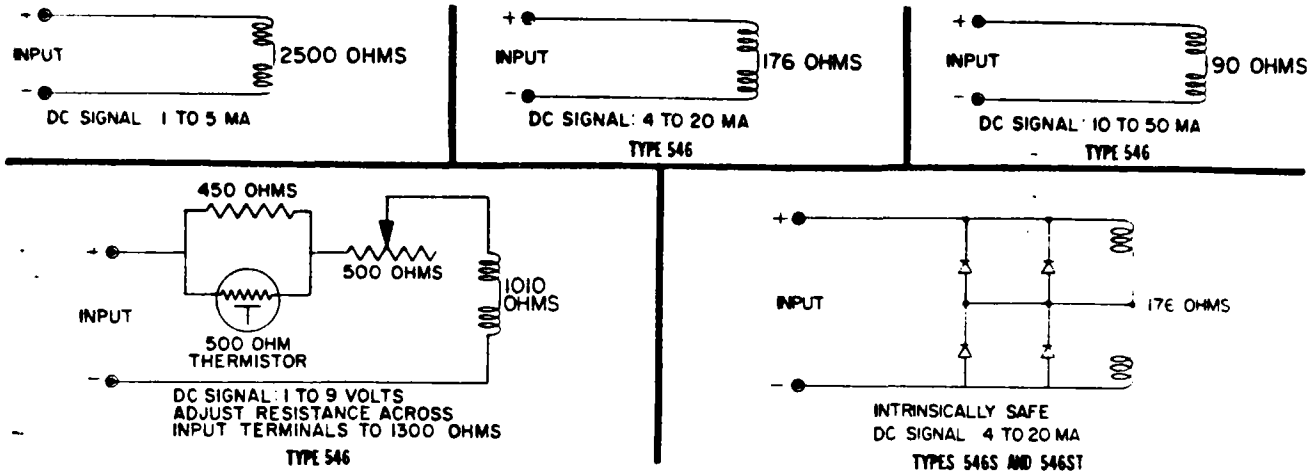


Figure 3. Typical Circuit Drawings

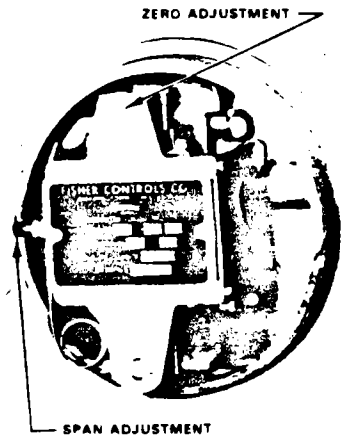


Figure 4. Zero and Span Adjustments (Cover Removed)

input signal. For example, if the conditions were as stated in the previous example, the span adjustment would be used to make the output pressure change 12 psi when the input signal is changed from 1 to 5 mA.

The span adjustment will affect the zero, therefore any span adjustment should be followed by an adjustment to the zero. Provide a suitable gauge to measure pressure.

Zero Adjustment

The zero adjustment is accomplished by changing the length and force of a spring which acts directly on the armature opposite the nozzle. Tuning the adjusting screw clockwise as indicated by the arrow will compress the spring and increase the output pressure for a given input signal.

Span Adjustment

The span adjustment is accomplished by positioning a piece of magnetic material toward or away from the permanent magnet to shunt away or add to the magnetic flux in the armature air gap. Thus, the amount of torque produced in the armature will vary accordingly. Turning the adjusting screw clockwise will pull the magnetic material away from the magnet and increase the span. A label indicates the direction in which an adjustment must be made to increase the span.

The span adjustment is only a vernier type and is not designed to create a very large change in output pressure over its full range of adjustment. Normally, however, the adjustment range will be sufficient to set the transducer properly.

If it is not sufficient, refer to the "Span Adjustment Alignment" section under "Troubleshooting."

PRECAUTIONS

There are several precautions to be observed when working on the Type 546 transducer. If it is known that either the torque motor or relay needs to be replaced for any reason, please replace the entire transducer.

1. The torque motor assembly which consists of permanent magnets, pole pieces, top and bottom pole piece plates, etc., should never be disassembled because the level of magnetism in the magnets will decrease, and will not return upon reassembly. Consequently, you will be unable to obtain proper span. So, if it is known that the torque motor (and/or relay) are faulty, replace the entire transducer with a new one and return the faulty unit to the factory for repairs. Figure 6 shows the torque motor and associated parts. Those key numbers that are shaded indicate the parts that should not be disassembled from the torque motor.

Table 3. Feedback Bellows Output Pressure Range, PSI

TYPE OF OPERATION	INPUT SIGNAL DC	BELLOWS SIZE		
		Full	Half	Quarter
Full Range	1 - 5 mA 4 - 20 mA 10 - 50 mA 1 - 9 volts*	3 - 15	6 - 30	...
Two-Way Split Range	1 - 5 mA	...	...	3 - 15
	4 - 20 mA 10 - 50 mA 1 - 9 volts*	...	3 - 15	6 - 30

*Temperature compensated circuit

2. Some parts in the Type 82 relay (figure 7) require very careful factory alignment. For this reason, do not remove the six screws (key 76, not shown) which hold relay body, casing spacer, and casing (keys 60, 61, and 62) together. Shaded key numbers indicate those parts that should not be disassembled from the relay assembly.

3. When working on or calibrating the Type 546 transducer, be careful not to lay it on a steel work bench as this will affect the magnetic properties and prohibit correct adjustments.

OPERATIONAL CHANGES

To Change Output Pressure Range

If it is ever required to change the output pressure range from 3 to 15 psi to 6 to 30 psi or vice-versa, the feedback bellows (key 57, figure 6) must be changed. To do this, proceed as follows:

1. Loosen the locknut (key 31).

2. Remove the bellows screw (key 56).

3. Pull bellows assembly out. The armature is slotted to allow removal of the bellows.

4. Inspect O-ring (key 36). Replace, if necessary.

5. Choose proper bellows as outlined in table 3. Install new bellows assembly. Make sure that the O-ring is in place.

6. Install bellows screw and tighten. Be sure bellows is not skewed in any direction. Tighten locknut.

7. Reset the span and zero adjustments.

To Reverse the Action

No special parts are required to reverse the action of the Type 546 transducer. The direction of armature rotation with a change in input current is dependent upon the direction of the current flow. Therefore, by simply reversing the input leads to the transducer, the opposite action can be obtained. Whenever the action is changed, it is necessary to re-zero the transducer as outlined in the section "Adjustments."

Note

The Type 546S or 546ST cannot be reversed in the field because the protective diodes across the coils will effectively short the reverse input current signal. Do not attempt to reverse a Type 546S or 546ST. There is no danger, but the unit will not operate.

Split Range Operation

Type 546 transducers are suitable for two-way split range operation wherein the milliampere output signal of a single controller is split between two transducers electrically connected in series. Each transducer receives half of the signal and transmits a full output pressure range of 3 to 15 psi or 6 to 30 psi to the control valve. Since the Type 546 operates on only one-half of the normal input span, it is necessary to change the feedback bellows to compensate for the shorter span. Refer to the section "To Change Output Pressure Range", and change the bellows as described there. The tabulation of available bellows indicates what bellows will be required for your conditions. Please note that simply interchanging bellows in the Type 546 cannot provide a three-way split range. Reset the span and zero adjustments to the split range values.

TROUBLESHOOTING

The first step in all troubleshooting is to isolate the source of the difficulty. Improper supply pressure and mechanical defects in air and electrical connections should be apparent upon visual examination. The following points may serve as a guide in isolating any trouble that might occur.

Electrical

1. Check the controller output. Make sure that it is reaching the transducer.

2. Check the electrical signal. It should be the same as the range stamped on the nameplate.

3. Check the resistance of the transducer circuit to see that it coincides with the value stamped on the nameplate.

4. Check terminal lugs for proper connections. If reverse action is being obtained, simply reverse the input leads and re-zero the transducer (except on Type 546S or 546ST).

Pneumatic

1. Check adjustments for proper settings.

2. Check supply pressure. Make sure that it is at least 5 psi higher than the upper limit of the output pressure range.

3. Check the Type 67FR filter regulator for an accumulation of moisture in the dripwell. Drain off through petcock. Clean filter element, if necessary.

4. Make sure that there are no sharp bends in the copper capillary feedback tubing because they will restrict the opening and the pressure feedback to the bellows will be too slow. The transducer will cycle.

5. The nozzle is large enough (0.070 inch diameter) to minimize clogging. **Do not attempt to remove the nozzle for cleaning** because this cannot be done without disassembling the torque motor. However, if the nozzle is clogged, remove the entire torque motor assembly from the case by removing four screws (key 9, figure 5). Then run a wire through the nozzle from the underside of the assembly.

6. Check the flame arresters (figure 5) to see if they need cleaning. To do this, the entire torque motor assembly as shown in figure 6 has to be removed from the case. If flame arresters are dirty, clean by blowing them out with air pressure.

7. Check the torque motor assembly for metal chips in the air gap between the armature and the pole pieces. Chips in the air gap will limit armature travel and reduce the flux across the air gap which will shorten the span and cause erratic operation. Blow out any chips with low pressure air.

8. Perform a manual check on the operation of the transducer as follows: Hook up a suitable pressure gauge to measure the output pressure.

8.1 Force the baffle (key 18, figure 6) against the nozzle. The output pressure should build up to approximately the supply pressure. If it does not, check for a leak in the pneumatic system or a burr on the nozzle lip. If the nozzle is at fault, replace entire Type 546 with a new one.

8.2 Force baffle away from the nozzle. The output pressure should drop off to less than 0.5 psi. If it does not, the small flame arrester in the nozzle path probably needs cleaning. See Item 6 above.

9. If all else fails, check the Type 82 relay. The relay can be taken off the transducer easily by loosening the two screws (key 68, figure 7) that hold it to the case. Check the inner valve for nicks, cuts, or damage. Remove and inspect the 0.017-inch diameter primary restriction (key 67, figure 7) to see that it is not clogged. Check for leaks at casing joints by using a soap suds solution. Check the flow of air out the vent opening. With the supply air on, there will always be a slight flow of air out the vent. Excessive amount of air escaping indicates that the diaphragms are ruptured. Since the relay sections should not be separated and it must be matched to a torque motor, order both a torque motor and relay.

Input—Output Linearity

For proper operation and satisfactory linearity between the input signal and output pressure, the armature (key 40, figure 6) must be centered between the faces of the pole pieces (key 49, figure 6). The armature is centered and aligned at the factory but rough handling or unauthorized tampering with the transducer may move the armature off center.

For a check on the linearity of the transducer, hook up an accurate test pressure gauge to measure the output pressure, and an accurate test milliammeter to measure the input signal. Vary the input signal over the full range and observe and note the output pressure. Plot a calibration curve of input versus output and determine the linearity. If it is beyond acceptable limits, align the armature as described below.

The baffle screw (key 18, figure 6) can be adjusted to position the armature. Loosen the locknut and then turn the baffle screw slightly. Turning it out of the armature will move the armature away from the nozzle. Sight the armature alignment by eye to see that it is centered between pole piece faces. Be careful when loosening or tightening the baffle screw locknut so that the coils of the zero adjustment spring (key 17, figure 6) are not stretched by the wrench.

CAUTION

Never loosen all four cap screws (key 26, figure 6) at the same time. Realignment once this is done will most likely require factory equipment and skills. It may be possible to loosen two screws on one side only and move the entire support assembly (key 41, figure 6) to improve alignment, but this is not recommended.

Span Adjustment Alignment

If it is impossible to set the required span, additional span adjustment can be obtained by shifting the entire span

adjustment assembly (key 55, figure 6) at the flexure pivot end. The alignment procedure is as follows: Refer to figure 6.

1. Disconnect the external lead wires from the terminal mounted bracket assembly (key 53).

2. Shut off the supply pressure.

3. Loosen four machine screws (key 9, figure 5) that hold the torque motor assembly to the case. Remove entire torque motor assembly from case.

4. Loosen the two flexure pivot screws (figure 6) that hold the flexure pivot to the torque motor assembly base.

5. Slide span adjustment assembly in or out as required. Sliding it in toward the base decreases the span; sliding it out away from the base increases the span.

6. Tighten flexure pivot screws. Replace torque motor assembly and tighten screws (key 9, figure 5). Make sure that O-ring (key 37) is in place. Connect external lead wires and open air supply.

7. Make final adjustment of span with the span adjustment screw (key 24).

Miscellaneous Alignment

Feedback Bellows and Zero Spring

Erratic operation can be caused by a skewed feedback bellows (key 57, figure 6) or zero spring (key 17, figure 6). The bellows and zero spring must be straight, but they are difficult to straighten without taking the torque motor apart. Since the torque motor should never be disassembled in the field, return the entire transducer to the factory for repair.

Torque Motor Frame

Through shock of rough handling, the top of the torque motor can become twisted with respect to the frame. If you notice this, send the entire transducer back to the factory for repairs.

Armature Travel Stop

The armature travel stop (key 52, figure 6) must be in place to prevent over-stressing the armature torsion rod due to over-travel. The clearance between the armature and travel stop should be 0.015 inch.

Two screws at the base of the travel stop can be loosened if an adjustment is necessary.

Coils

The coil assembly (key 42, figure 6) consists of a plastic bobbin wound with wire. The coils do not attach to the armature itself and therefore, they must not touch the armature or armature movement will be restricted. If this problem exists, send the transducer back to the factory for repairs.

MAINTENANCE

Maintenance of the Type 546 transducer consists of limited relay disassembly and replacement of the feedback bellows. Do not attempt any repairs of the torque motor assembly.

Relay

As noted in the "Precautions" section, relay disassembly is limited primarily to removal of the inner valve and restriction plug assembly. A new relay (figure 7) should be ordered if repair would require separating the relay body (key 60), casing spacer (key 61), and relay casing (key 62).

1. The relay can be removed without disrupting the transducer mounting. Referring to figure 7, loosen the two mounting screws (key 68) and remove the relay from the transducer. Be careful that the four O-rings are not lost.

2. Remove two screws (key 77) that hold the inner valve spring seat (key 64), and inner valve (key 63) in place. Take these parts out.

3. Unscrew the restriction plug orifice assembly (key 67).

4. Inspect all O-rings (keys 73, 72, 74, and 75), the inner valve, and other parts for wear or damage. Note that the inner valve seat is an insert in the body. If this part is bad, replace the relay and torque motor.

5. After checking and clearing the fixed restrictions (0.017-inch diameter) in the restriction assembly and in the relay body, make sure that the O-ring (key 75) is good and in place. Then replace the restriction assembly into the relay.

6. Replace the inner valve and inner valve spring. Secure them in place with the spring seat and two screws.

7. Make sure all O-rings (keys 72, 73, and 74) are good and in place then fasten the relay to the transducer case.

Feedback Bellows

Instructions for replacing the feedback bellows are found in the "To Change Output Pressure Range" section, page 6.

SERIAL NUMBER

A serial number is assigned to each transducer and it is stamped on the nameplate attached to the cover. Always refer to this serial number when communicating with your Fisher representative about this equipment and when ordering spare parts. Also, please include the complete eleven-character part numbers from the following parts list when ordering spare parts.

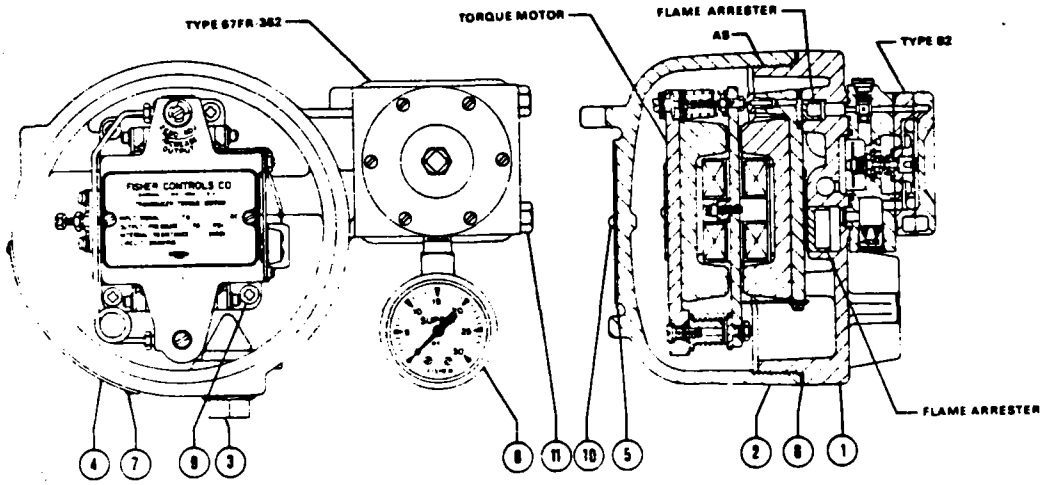


Figure 5. Type 546 Transducer

PARTS LIST

In the torque motor assembly drawing (figure 6) and the relay assembly drawing (figure 7), there are many shaded key numbers. The shading is to indicate that these parts should not be disassembled and that they are not available as individual items. Consequently, there are not part numbers shown for these parts in the list below.

Type 546, 546S & 546ST Transducers (figure 5)

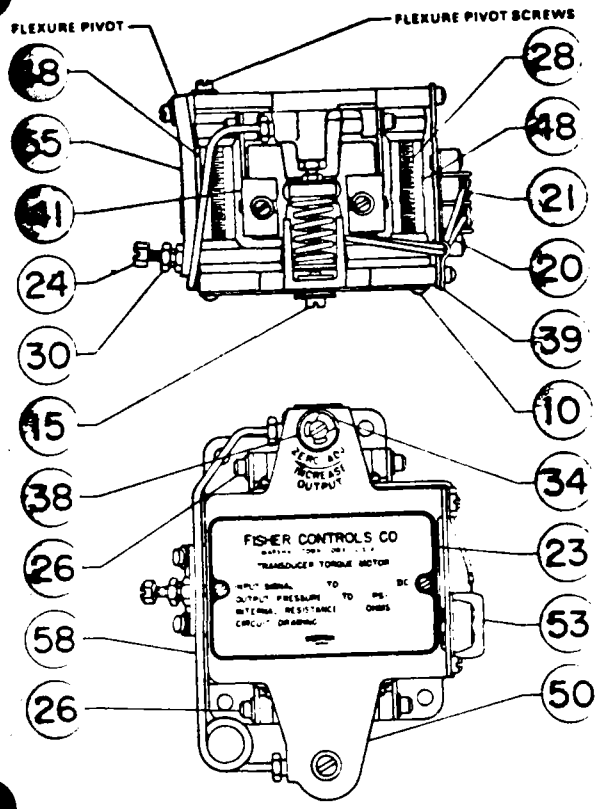
Key	Description	Part Number
1	Transducer Case Ass'y	1P4210 000A2
2	Case Cover, aluminum	3P4213 000A2
3	Pipe Plug, cast iron	1A3619 19012
4	Tagging Plate (optional), SST	1R4851 38992
5	Nameplate, aluminum	1P4263 11032
6*†	O-Ring, nitrile	1D4448 06992
7	Drive Screw, steel pl (2 req'd)	1A3092 28982
8	Gauge, use with filter regulator only	
	Integral mounted regulator	
	0-30 PSI	1R4730 99012
	0-60 PSI	1R4731 99012
	Nipple mounted regulator	
	0-30 PSI	1C2211 99012
	0-60 PSI	1C3586 99012
9	Machine Screw, brass Cd pl (4 req'd)	1P4265 14022
10	Screw, steel pl	1C9419 28982
11	Cap Screw, steel (2 req'd) use with integral mounted filter regulator only	1C3988 24052
12*	O-Ring, nitrile, use with integral mounted filter regulator only	1E5914 06992
13	Pipe Nipple, steel, use with nipple mounted filter regulator only	1C6789 26232

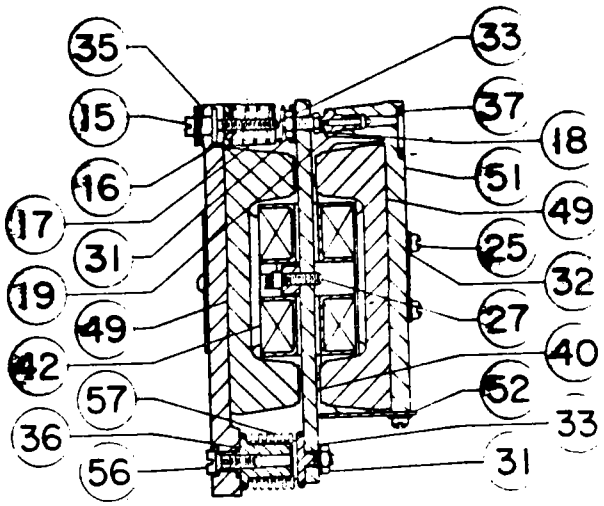
Torque Motor (figure 6)

Key	Description	Part Number
10	Screw	
15	Adjusting Screw	
16	Spring Seat	
17	Spring-Zero Adjustment	
18	Baffle	
19	Nozzle	
20	Hook-Up Wire Ass'y	
21	Hook-Up Wire Ass'y	
22	Hook-Up Wire (not shown)	
23	Nameplate	
24	Span Adjustment Screw	1P4251 38992
25	Machine Screw	
26	Cap Screw	
27	Cap Screw	
28	Machine Screw	
30	Hex Nut, steel pl	1A3303 28982
31	Hex Nut, brass Cd pl (2 req'd)	1N1073 18992
32	Washer	
33	Washer, brass Cd pl	1P4253 15052
34	Washer	
35	Washer	
36*	O-Ring, nitrile	1D6875 06992
37*	O-Ring, nitrile	1C7822 06992
38	E-Ring	
39	Cable Clamp	
40	Armature	
41	Coil Support	
42	Coil Ass'y	
48	Magnet	
49	Pole Piece	
50	Top Pole Piece Plate	
51	Bottom Pole Piece Plate	
52	Travel Stop	
53	Terminal Mounting Bracket Ass'y	
55	Span Adjustment Ass'y	
56	Bellows Screw, Brass Cd pl	1D3976 14022
57*	Bellows Ass'y	
	Full Size, 27/32" O.D.	1U3958 000A2
	Half Size, 1/2" O.D.	1U3975 000A2
	Quarter Size, 3/8" O.D.	1R6521 000A2
58	Tubing Ass'y, Brass/copper	1P4242 000A2

*Recommended spare part

† For units manufactured before April, 1977, the replacement part is an asbestos cover gasket, part number 1P4264 04032.

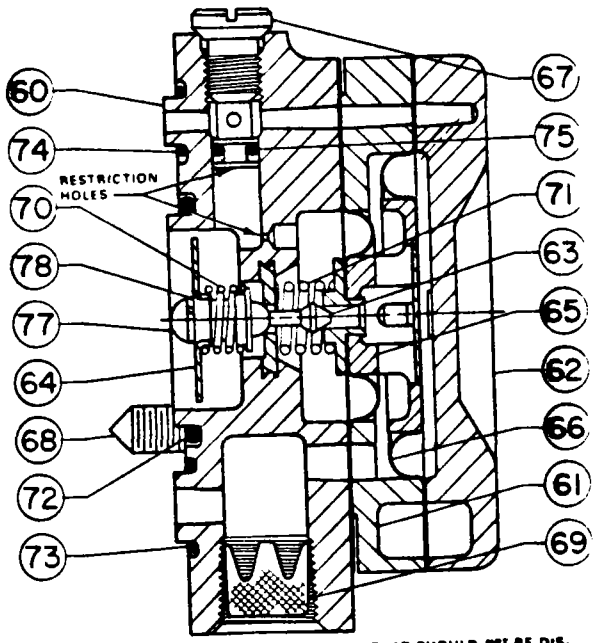




NOTE SHADED KEY NUMBERS INDICATE PARTS THAT SHOULD *NOT* BE DIS ASSEMBLED FROM THE TORQUE MOTOR

Figure 6. Torque Motor Assembly

Key	Description	Part Number
	Type 82 Relay (figure 7)	
	Type 82 relay, entire assembly	AP4208 X00B2
60	Relay Body, aluminum/brass	
61	Casing Spacer, aluminum	
62	Relay Casing, aluminum	
63	Inner Valve, brass	1P4195 14012
64	Spring Seat, brass	1P4196 15102
65	Lower Diaphragm Ass'y	
66	Upper Diaphragm, nitrile	
67	Restriction Ass'y	1UB160 000A2
68	Relay Mtg. Screw, steel Cd pl (2 req'd)	1P4203 24102
69	Screen, Monel†	0L0783 43062
70	Spring, SST	1P4204 37022
71	Spring Relay, steel Cd pl	
72*	O-Ring, nitrile	1P4206 06992
73*	O-Ring, nitrile (2 req'd)	1P4207 06992
74*	O-Ring, nitrile	1D6875 06992
75*	O-Ring, nitrile	1D1346 06992
76	Machine Screw, steel pl (6 req'd) not shown	
77	Machine Screw, steel pl (2 req'd)	1A5120 28982
78	Lockwasher, steel pl (2 req'd)	1H2671 28982



NOTE SHADED KEY NUMBERS INDICATE PARTS THAT SHOULD *NOT* BE DIS-ASSEMBLED FROM THE RELAY.

Figure 7. Type 82 Relay

*Recommended spare part

†Trademark of International Nickel Co

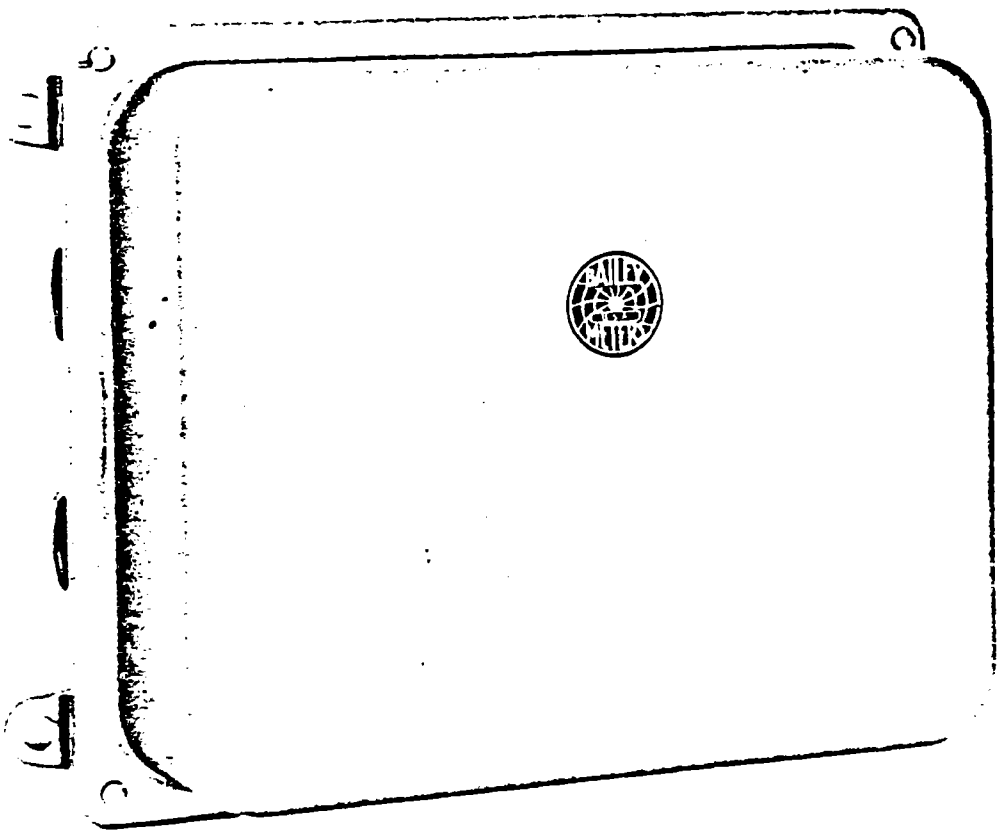
Bailey

SECTION
E88-1

PRODUCT INSTRUCTIONS

ELECTRIC POSITION TRANSMITTER

PART NO. 6614500-□



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4.1.39-90

FORM IE88-1-568

Bailey

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CROSS REFERENCES

Instrument or Equipment	Instruction Section
Type RC Electric Control Drive (Model A)	E81-2
Type RD Electric Control Drive (Model A)	E81-3
Type RC Electric Control Drive (Model B)	E81-2-1
Type RD Electric Control Drive (Model B)	E81-3-1

Bailey Babcock & Wilcox

Product Specification
E88-1

ELECTRONIC POSITION TRANSMITTER

Produces an electric DC signal in a predetermined relationship to the mechanical position of a movable device. Output signal can be used for position indication or control. Also used in Bailey Electric Control Drives (see Product Specifications E81-2 and E81-3).

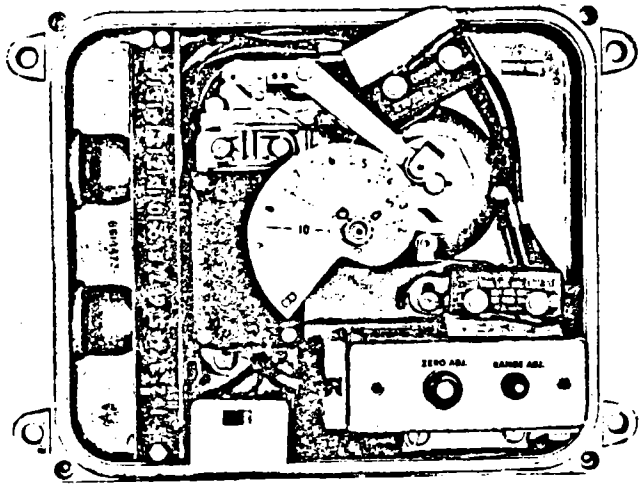


FIGURE 1 — Electronic Position Transmitter, Part No. 6614500-□.

Features

● **Flexible Characterization.** Characterizing cams establish practically any desired relationship between output signal and input lever travel. Three standard characterizing cams are included with each transmitter. Characteristics of these cams are illustrated in Figure 2. Uncut cam is available when special characterization is required.

● **Output Flexibility.** Transmitter can be adjusted for a wide variety of output signal ranges compatible with most electronic control systems.

● **Weatherproof Enclosure.** Enclosure can be made weatherproof if the conduit holes are connected with seal-tight fittings or plugged with pipe plugs.

● **Minimum Maintenance.** Transmitter requires only a calibration check once a year and lubrication every two years.

● **Temperature Compensation.** Temperature-compensating circuitry makes transmitter independent of normal ambient temperature changes.

● **Optional Microswitches.** Light-duty and heavy-duty microswitches open or close at preset positions of mechanical input for alarm, indication, control, etc. Transmitter can include up to four microswitches. Available combinations are listed in Table II.

SPECIFICATIONS

TABLE I

Input	Mechanical position.
Output	Any 7.5v to 45v span between the limits of ±22.5v DC.
Normal Operating Conditions*	Ambient Temperature: 20 to 160F. Ambient Temperature Effect: less than 0.15% of output span per 100F change.
Power Requirements	118v ±10v, 50/60Hz ±5Hz; 13.0 VA, 0.70 PF. Supply Voltage Effect: output signal varies directly with the input supply voltage. Supply Frequency Effect: 0.5% of output span per Hz change.
Output Impedance	With transistorized demodulator: 200 ohms. With diode demodulator: 2000 ohms.
Output Loading	With transistorized demodulator: 30K ohms minimum. With diode demodulator: 100K ohms minimum.
Output Ripple	With transistorized demodulator: less than 150mv peak-to-peak. With diode demodulator: less than 100mv peak-to-peak.
Standard Cams (A, B, & C)	Require 90° rotation for full rise.
Field Cam Shaping	Full rise for any input rotation up to 90° (maximum drive arm rotation) that does not exceed maximum permissible cam follower rate of rise.
Microswitches	Single-pole, double-throw. Light duty: 0.1a at 125v DC; 15a at 120, 240, or 480v AC, non-inductive load. Heavy duty: 10a at 125v DC, non-inductive load.
Enclosure	Die-cast aluminum with pressed-steel cover; pearlesk gray, baked-enamel finish.
NEC Classification	General purpose.
Enclosure Classification	Supplied as dusttight. Meets weatherproof requirements if conduit holes are connected with seal-tight fittings or plugged with pipe plugs.

*As defined by SAMA Standard RC20.

Quotation/Ordering Information

To receive a quotation or to place an order, specify Part Number of Electronic Position Transmitter (Table II).

E88-1 Electronic Position Transmitter

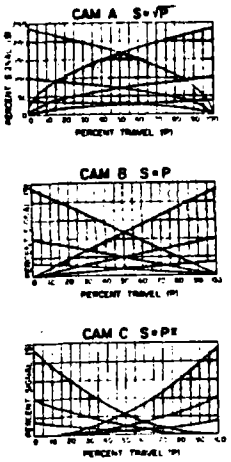
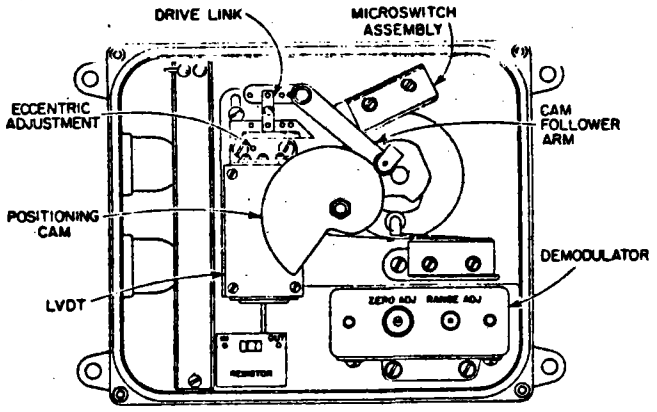


FIGURE 2 — Characteristic curves showing range over which standard cams A, B, and C can be calibrated. In the field, standard cams can be modified or uncut cams can be shaped to provide other desired relationships between input rotation and output signal.

STANDARD ELECTRONIC POSITION TRANSMITTERS

TABLE II

Number of Microswitches		Position Transmitter Part Number	
Light Duty	Heavy Duty	With Diode Demodulator	With Transistorized Demodulator
0	0	6614500-1	6614500-7
2	0	6614500-2	6614500-8
0	2	6614500-3	6614500-9
4	0	6614500-4	6614500-10
2	2	6614500-5	6614500-11



Principle of Operation

The positioning cam is attached to the drive arm. The mechanical input moves the drive arm and the positioning cam. Rotation of the cam moves the cam follower arm and the drive link, changing the position of the core in the LVDT (linear variable differential transformer). A change in core position varies the inductive coupling between the windings of the LVDT, producing an AC voltage change. The demodulator converts this AC voltage change into a DC output signal. The output is a function (of the mechanical input) determined by the shape of the positioning cam.

The drive link can be adjusted to vary the core stroke length for a given rotation of the cam. The eccentric adjustment varies the position of the LVDT coils with respect to the core to determine the range values. Range adjustment varies the span. These three adjustments provide a wide range of output signals (any 7.5v to 45v span between limits of ±22.5v DC).

EXTERNAL AND MOUNTING DIMENSIONS: Current drawings supplied on request.

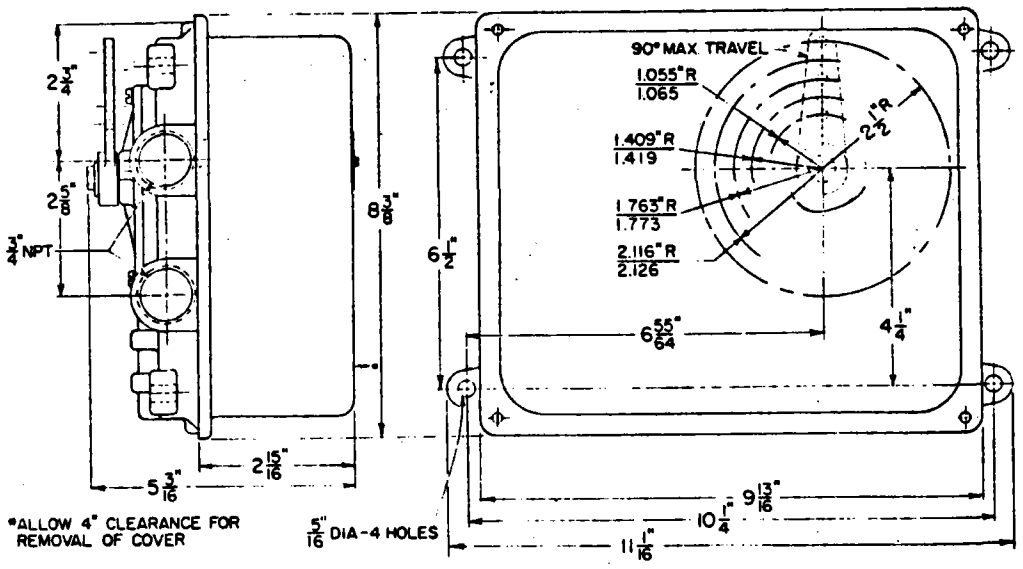


FIGURE 3—Bailey Electronic Position Transmitter.

Bailey Meter Company
a subsidiary of Babcock & Wilcox, U.S.A.

Bailey Meter Australia Pty. Ltd., Regents Park, N.S.W., Australia
Bailey Meter Company Ltd., Pointe-Claire, Quebec, Canada
Bailey Meter GMBH, Mannheim, West Germany
Bailey Japan Company, Ltd., Tokyo, Japan
Representatives in Other Principal Cities

Form No. CE88-1
12M — Litho in U.S.A.
August, 1968

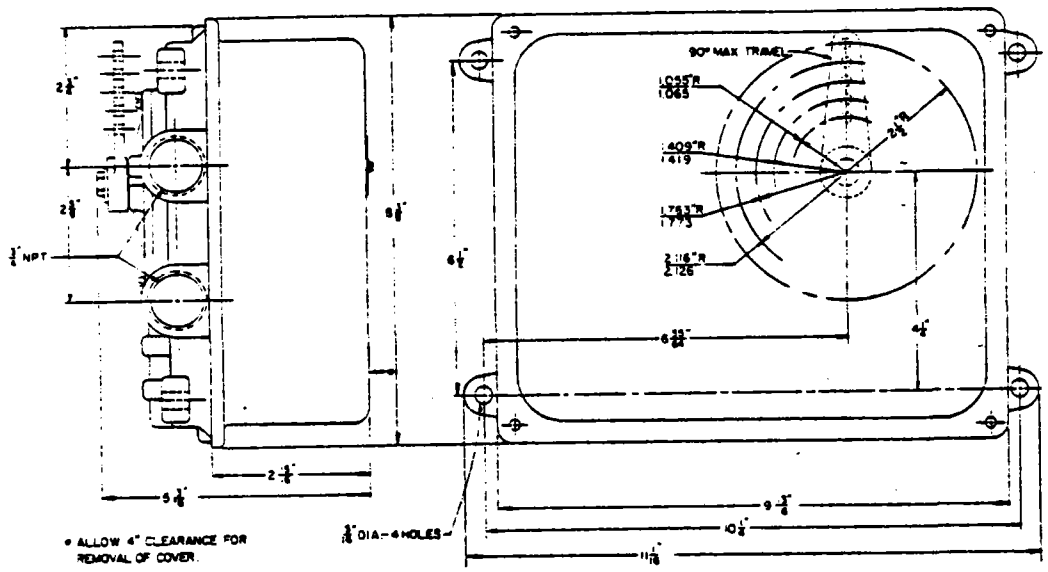


FIGURE 1 - Electric Position Transmitter Mounting Dimensions

INSTALLATION

If the Position Transmitter is included as part of a Bailey Electric Control Drive or Electric Valve Actuator, the unit will be mounted on the drive or valve and wired as shown in the applicable instruction section. Refer to "Cross References" on page 2.

If the Position Transmitter is used separately:

1. Locate Transmitter where ambient temperature will not exceed 140F.

2. Mount Transmitter securely on actuating device. Dimensions are given in Figure 1.

3. Connect linkage to Transmitter drive arm. Figures 2 and 3 show typical installations. Maximum drive arm rotation is 90°.

4. Connect power supply to terminals 1 and 2 (see Figure 4). Power supply must be 118 volts, 60 Hz AC, 1% regulated, harmonically neutralized.

5. Output signal is taken from Transmitter terminals 3 and 4 (see Figure 4). Connect output leads in accordance with system wiring diagram.

ADJUSTMENT AND CALIBRATION

Calibration of the Electric Position Transmitter consists of adjusting the linkage from the actuating device so that the positioning cam rotates thru full range for full travel of the actuating unit and adjusting the Demodulator so that the DC output voltage signal corresponds to the cam position.

The normal DC output signal is ±10 volts. Some variation in positioning cam rotation is permitted by the Demodulator range and zero adjustments. In addition, an adjustable linkage is provided between the cam follower arm and the core of the linear variable differential transformer (LVDT). This is used to match the output range to systems at other than ±10 volts by varying the length of the core stroke for a given rotation of the cam. If the Position Transmitter is to be used with other than a ±10 volt output, refer to "Calibration for Special Outputs" on page 8.

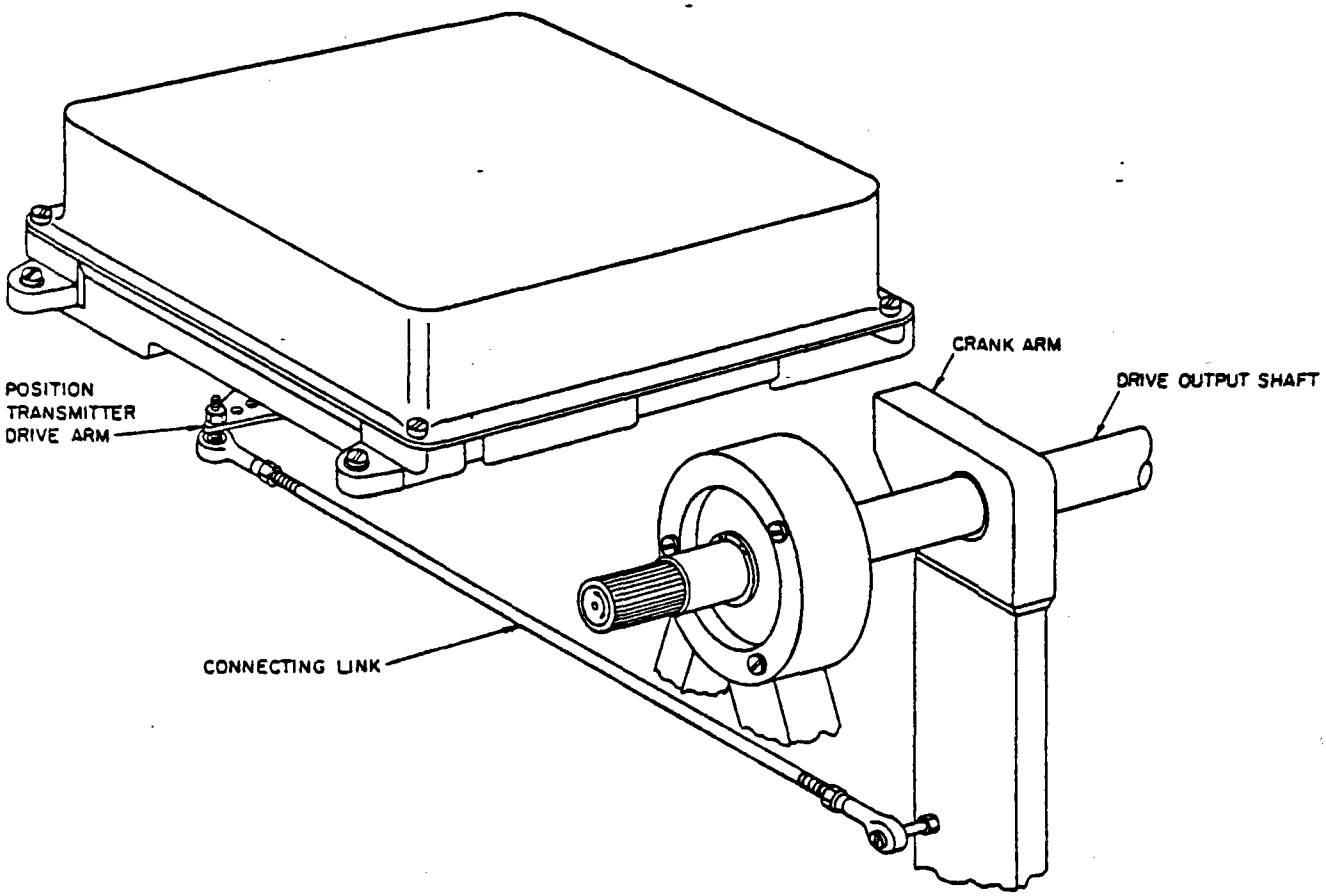


FIGURE 2 - Typical Installation on Control Drive

CALIBRATION FOR ±10 VOLT OUTPUT

Before making any adjustments to adapt the Position Transmitter to a particular application as described under "Cam Characteristic Adjustment", check to insure the proper operation of the Position Transmitter and actuating unit.

The Position Transmitter is shipped with the B cam in position with the black side facing out. This is the standard arrangement. In this condition, terminal 4 will become more positive with respect to terminal 3 as the drive arm is rotated counterclockwise when viewed from the front of the instrument. (The positioning cam will rotate in a clockwise direction.) If the service for which the Position Transmitter is intended requires reversed polarity, the leads at terminals 3 and 4 may be interchanged. If the service requires a standard polarity but the actuating device will turn the drive arm in a clockwise direction, the positioning cam may be reversed on the hub (red side facing out). For an installation requiring a clockwise rotation of the drive arm and reversed polarity, the po-

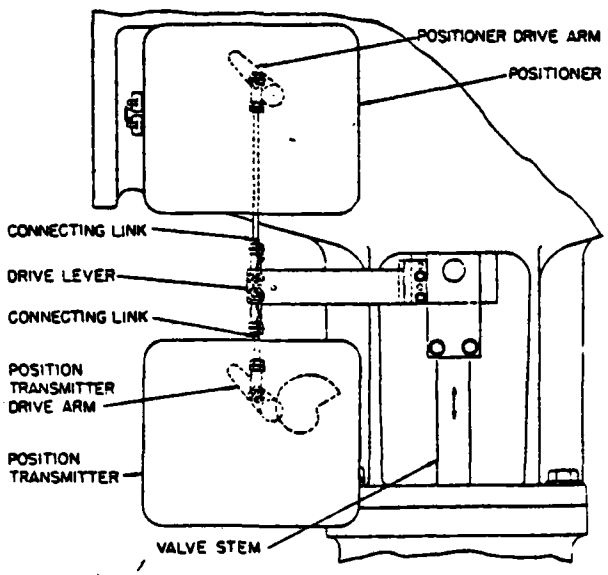


FIGURE 3 - Typical Installation on Control Valve

sitioning cam is turned on the hub (red side out) and the leads to terminals 3 and 4 are interchanged.

Refer to Figure 4 for the adjustments mentioned below. The adjustments described are for a unit with the standard arrangement. If the particular Position Transmitter is arranged for one of the variations described above, the movements and positions may be opposite to those described in the following procedure.

1. Use B, straight line, positioning cam which has been shipped in place in Position Transmitter.

2. Disconnect linkage from actuating unit.

3. Disconnect any external output leads from terminal strip (terminals 3 and 4). Connect a DC voltmeter across terminals 3 and 4. (Connect voltmeter "+" lead to terminal 4.) Use a voltmeter with a 100,000 ohm/volt movement, readable to 0.1 volt.

4. Supply power (118 volts DC) to terminal strip terminals 1 and 2. Position Transmitter circuit must be energized for at least one hour to allow LVDT to reach operating temperature before attempting to calibrate unit.

5. Rotate Position Transmitter drive arm until cam follower arm rests on 5 on the positioning cam (corresponding to midtravel position of actuating device).

6. Output voltage should be zero volts. If not, turn Demodulator zero adjustment until zero volt output is obtained.

NOTE: Demodulator zero adjustment should not be turned to an extreme position to correct large deviations at midrange. If this is necessary to obtain zero volts; set zero adjustment screw in approximately its midtravel position, loosen LVDT coil locking screws (Figure 4) and reposition coil by turning eccentric adjustment screw until zero volt output is obtained. Tighten locking screws.

7. Rotate Position Transmitter drive arm so that cam follower arm rests on zero mark on cam and note output voltage. Rotate drive arm so that cam follower arm rests on 10 mark on cam and note output voltage. Voltage change should be 20 volts total (-10 to +10 volts DC). If change is not exactly 20 volts, turn Demodulator range adjustment screw until 20 volts total change is obtained.

8. Repeat steps 5, 6, and 7 until output voltage is -10, 0 and +10 volts DC when cam follower arm rests on 0, 5, and 10 marks, respectively, on positioning cam.

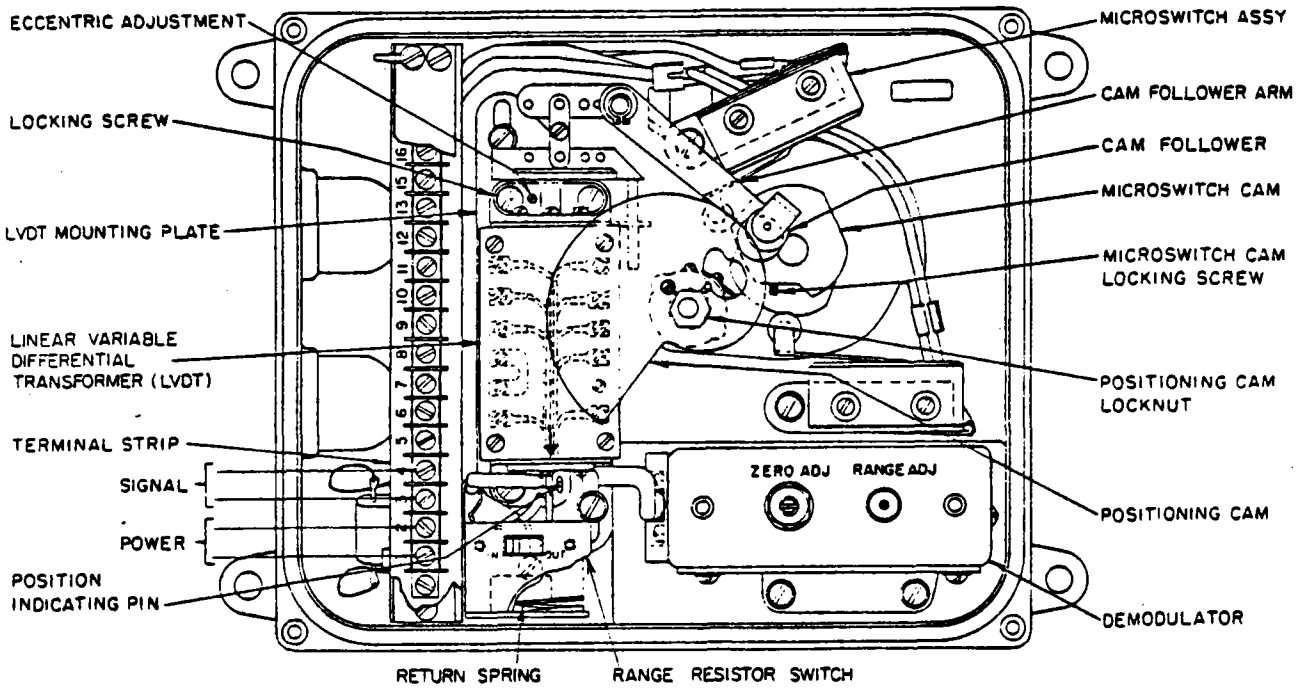


FIGURE 4 - Electric Position Transmitter

9. With actuating device in closed position, rotate Position Transmitter drive arm so that cam follower rests on zero mark of positioning cam.

10. Connect linkage from actuating device to Position Transmitter. Operate actuating device thru a full cycle to make certain that positioning cam rotation corresponds to actuating device position. Adjust linkage and operating lever or drive lever position as required to obtain correct operation.

CAM CHARACTERISTIC ADJUSTMENT

This adjustment involves selecting or shaping the proper positioning cam in order to obtain that characteristic of actuating device travel vs. DC output signal which will afford the desired characteristic of the controlled medium.

Positioning cams A, B, and C are furnished with each Position Transmitter. The Position Transmitter is shipped from the factory with the B positioning cam in place. The A and C cams are attached inside of the Position Transmitter case. The characteristics for which the positioning cams are shaped are listed in Table A. Figure 5 shows a family of curves for each cam.

If a control system involves but a single Control Drive or Valve Actuator, it is probable that the B, straight line, cam will be satisfactory. However, one of the other cams may be used to provide a more uniform controlled medium vs. DC voltage signal characteristic and provide stable control over a wide range.

NOTE: The definition of "controlled medium" as used here is the rate of action of that being controlled. Thus, if the device is being used to position a damper or regulate the speed of a fan, "controlled medium" is the rate of air flow.

For a Control Drive or Valve Actuator which is an integral part of a complex control system, the cams provide a selection of characteristics which should provide close paralleling of the controlled medium vs. DC voltage signal characteristic.

Refer to "Characterized Cams" below for the method of selecting or shaping the proper positioning cam for a Control Drive or Valve Actuator which is to be part of a complex control system.

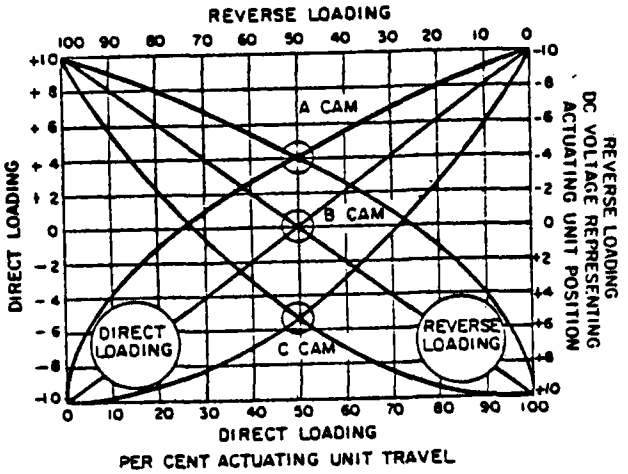


FIGURE 5 - Cam Characteristic Curves

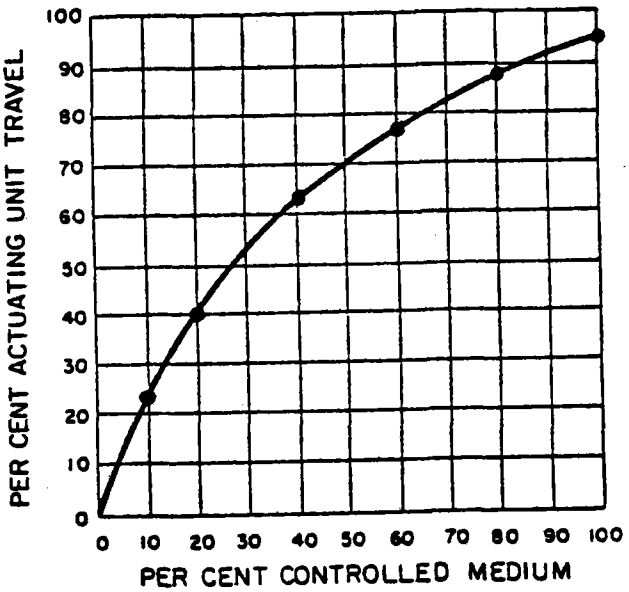


FIGURE 6 - Actuating Unit Characteristic

Positioning Cam	Drive Lever Rotation (R) vs. Output Signal (V)
A	Square Root ($V = \sqrt{R}$)
B	Straight Line ($V = R$)
C	Square ($V = R^2$)

TABLE A - Positioning Cam Functions

sitioning cam is turned on the hub (red side out) and the leads to terminals 3 and 4 are interchanged.

Refer to Figure 4 for the adjustments mentioned below. The adjustments described are for a unit with the standard arrangement. If the particular Position Transmitter is arranged for one of the variations described above, the movements and positions may be opposite to those described in the following procedure.

1. Use B, straight line, positioning cam which has been shipped in place in Position Transmitter.

2. Disconnect linkage from actuating unit.

3. Disconnect any external output leads from terminal strip (terminals 3 and 4). Connect a DC voltmeter across terminals 3 and 4. (Connect voltmeter "+" lead to terminal 4.) Use a voltmeter with a 100,000 ohm/volt movement, readable to 0.1 volt.

4. Supply power (118 volts DC) to terminal strip terminals 1 and 2. Position Transmitter circuit must be energized for at least one hour to allow LVDT to reach operating temperature before attempting to calibrate unit.

5. Rotate Position Transmitter drive arm until cam follower arm rests on 5 on the positioning cam (corresponding to midtravel position of actuating device).

6. Output voltage should be zero volts. If not, turn Demodulator zero adjustment until zero volt output is obtained.

NOTE: Demodulator zero adjustment should not be turned to an extreme position to correct large deviations at midrange. If this is necessary to obtain zero volts; set zero adjustment screw in approximately its midtravel position, loosen LVDT coil locking screws (Figure 4) and reposition coil by turning eccentric adjustment screw until zero volt output is obtained. Tighten locking screws.

7. Rotate Position Transmitter drive arm so that cam follower arm rests on zero mark on cam and note output voltage. Rotate drive arm so that cam follower arm rests on 10 mark on cam and note output voltage. Voltage change should be 20 volts total (-10 to +10 volts DC). If change is not exactly 20 volts, turn Demodulator range adjustment screw until 20 volts total change is obtained.

8. Repeat steps 5, 6, and 7 until output voltage is -10, 0 and +10 volts DC when cam follower arm rests on 0, 5, and 10 marks, respectively, on positioning cam.

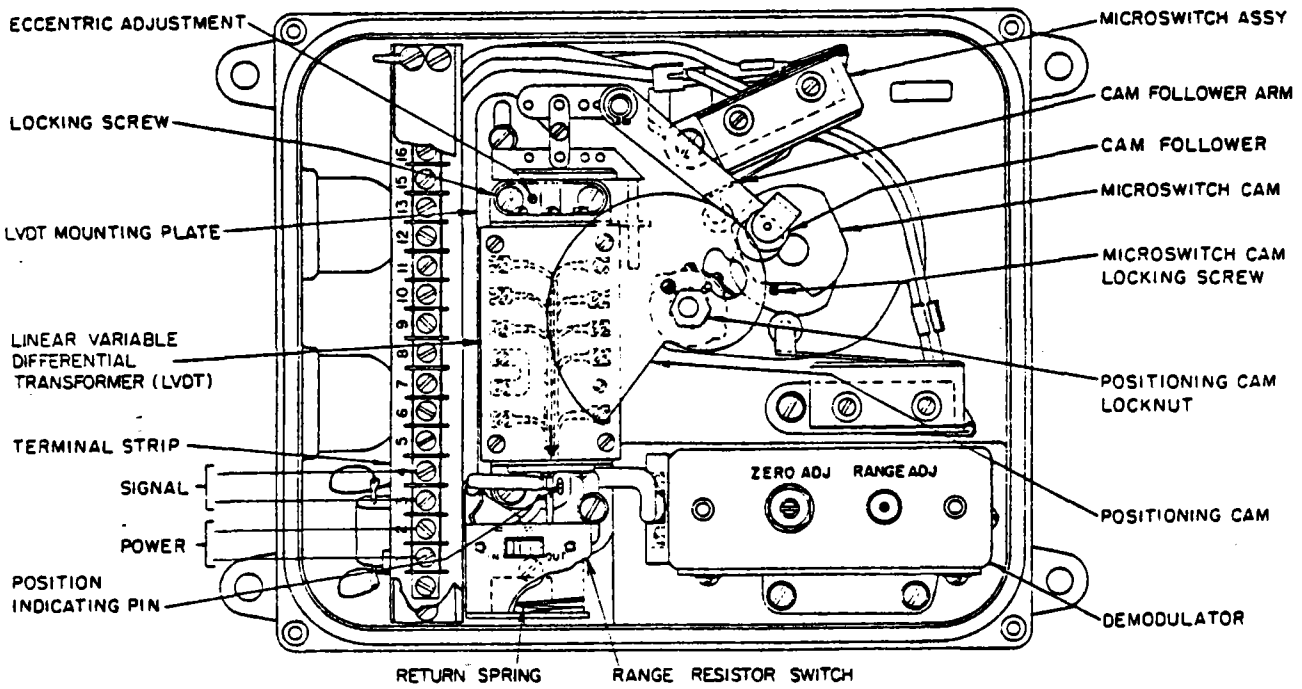


FIGURE 4 - Electric Position Transmitter

9. With actuating device in closed position, rotate Position Transmitter drive arm so that cam follower rests on zero mark of positioning cam.

10. Connect linkage from actuating device to Position Transmitter. Operate actuating device thru a full cycle to make certain that positioning cam rotation corresponds to actuating device position. Adjust linkage and operating lever or drive lever position as required to obtain correct operation.

CAM CHARACTERISTIC ADJUSTMENT

This adjustment involves selecting or shaping the proper positioning cam in order to obtain that characteristic of actuating device travel vs. DC output signal which will afford the desired characteristic of the controlled medium.

Positioning cams A, B, and C are furnished with each Position Transmitter. The Position Transmitter is shipped from the factory with the B positioning cam in place. The A and C cams are attached inside of the Position Transmitter case. The characteristics for which the positioning cams are shaped are listed in Table A. Figure 5 shows a family of curves for each cam.

If a control system involves but a single Control Drive or Valve Actuator, it is probable that the B, straight line, cam will be satisfactory. However, one of the other cams may be used to provide a more uniform controlled medium vs. DC voltage signal characteristic and provide stable control over a wide range.

NOTE: The definition of "controlled medium" as used here is the rate of action of that being controlled. Thus, if the device is being used to position a damper or regulate the speed of a fan, "controlled medium" is the rate of air flow.

For a Control Drive or Valve Actuator which is an integral part of a complex control system, the cams provide a selection of characteristics which should provide close paralleling of the controlled medium vs. DC voltage signal characteristic.

Refer to "Characterized Cams" below for the method of selecting or shaping the proper positioning cam for a Control Drive or Valve Actuator which is to be part of a complex control system.

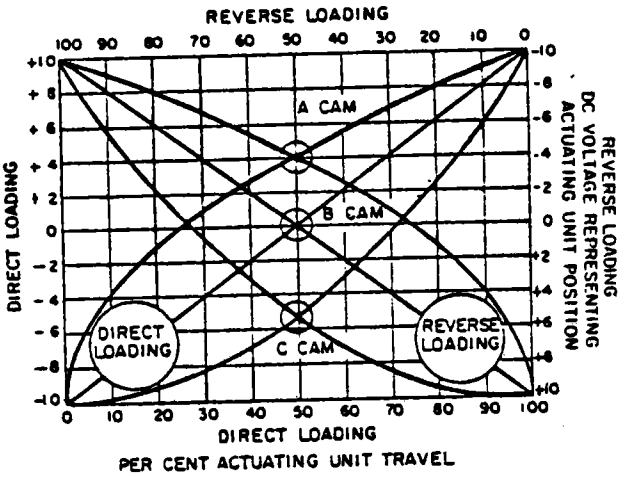


FIGURE 5 - Cam Characteristic Curves

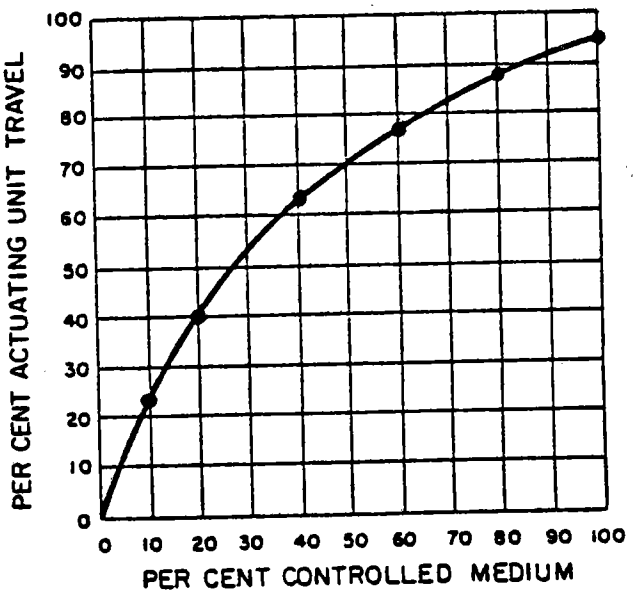


FIGURE 6 - Actuating Unit Characteristic

Positioning Cam	Drive Lever Rotation (R) vs. Output Signal (V)
A	Square Root ($V = \sqrt{R}$)
B	Straight Line ($V = R$)
C	Square ($V = R^2$)

TABLE A - Positioning Cam Functions

CHARACTERIZED CAMS

In order to match the inherent characteristics of the auxiliary (fan, damper, pulverizer, etc.), to that of a similar auxiliary, control valve, etc., it is usually most practical to reduce the controlled medium vs. drive lever travel characteristic of each device in the system to a straight line relationship with regard to the DC output voltage signal representing the drive lever position.

The straight line relationship is established by calibrating the Position Transmitter with respect to the correct positioning cam by the following method:

1. Use B, straight line cam. Determine actual controller medium vs. drive lever travel characteristic. (Figure 6 is a typical drive characteristic curve.)

2. Decide upon controlled medium vs. DC voltage output signal representing drive lever position characteristic desired (Figure 7, if a linear characteristic is desired).

3. Take values for per cent drive lever travel from step 1 and for DC output voltage from step 2 and plot a curve for per cent drive lever travel vs. DC output voltage representing drive lever position. (Figure 8 is a typical cam characteristic curve.)

4. Compare curve made in step 3 with curves shown in Figure 5. Select positioning cam whose characteristic curve most closely matches drive lever travel vs. DC output signal voltage characteristic determined in step 3.

5. If necessary, use Demodulator range and zero adjustments to match drive lever travel vs. DC output signal voltage characteristic more accurately.

6. If required characteristic cannot be matched by above procedure, or if a more exact characteristic is required, alter shape of cam as described under "Cam Shaping Method" below.

CAM SHAPING METHOD

To assist in alteration, the cams are marked with radial lines spaced for equal drive lever travel increments and concentric lines spaced for equal DC output voltage increments.

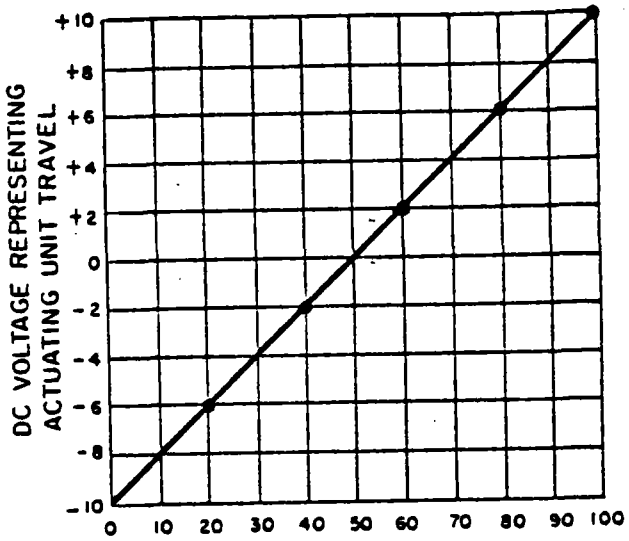


FIGURE 8 - DESIRED CONTROL

FIGURE 7 - Desired Control

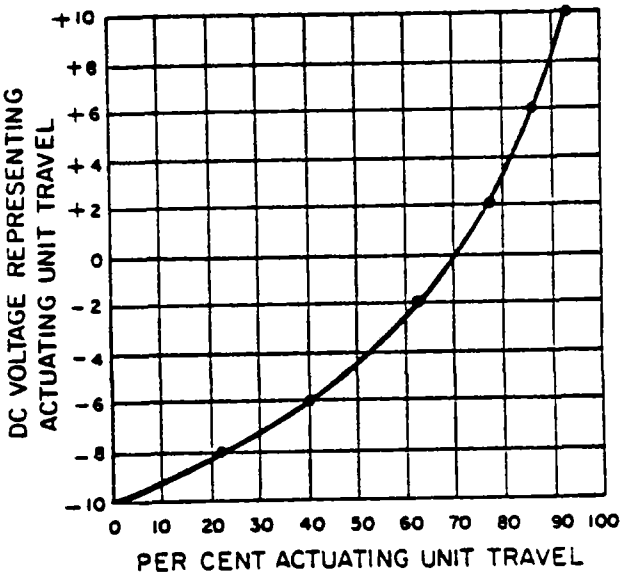


FIGURE 9 - CAM CHARACTERISTIC

FIGURE 8 - Cam Characteristic

Alter the cam shape in the following manner:

1. On cam selected in step 4 under "Characterized Cams" above, locate for each increment of DC voltage representing drive lever position (concentric lines) that drive lever travel (radial lines) required for specific DC voltage signal as determined in step 3 above. Refer to Figure 9 for method of locating these points on positioning cam.

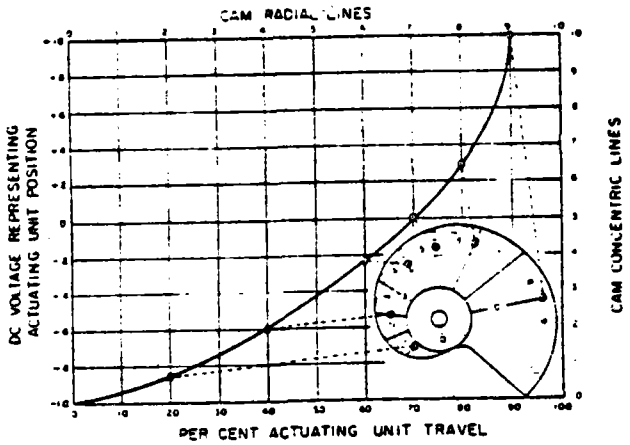


FIGURE 9 - Cam Shaping Points

NOTE: Before starting any cam cutting procedure, make certain that cutting will involve removal of cam material, rather than building up. If desired characteristic plotted lies between that of A and B positioning cams (Figure 5), A cam should be cut etc.

2. A curve drawn thru points located on cam in step 1 is desired cam shape. Either alter cam or cut a new cam to this shape.

CAUTION: There is danger of cam follower arm becoming locked when cam shape has too steep a rise. When a cam shape is required that includes such a rise, it is necessary to introduce sufficient angularity in linkage from actuating device to Position Transmitter to allow a less radical cam shape.

CALIBRATION FOR SPECIAL OUTPUTS

An adjustable linkage is provided between the cam follower arm and the core of the LVDT (linear variable differential transformer). This linkage is shown in Figure 10. The linkage permits a variation in the length of the core stroke for a given rotation of the cam. Varying the position in which the drive link is mounted changes the length of the core stroke and the resulting output range. In conjunction with the adjustment to shift the LVDT coil position, a wide range of output signal vs. cam rotation combinations may be obtained.

Table B is a chart of output voltage plotted against Positioner drive arm rotation. The correct position of the adjustable drive link for a particular combination can be determined by following the procedure outlined below.

NOTE: An example is given in Table B indicating a -5 to +5 volt output range required for an input shaft rotation of 60 degrees.

1. Draw lines parallel to horizontal axis corresponding to maximum and minimum desired voltages. (Dotted lines on Table B.)

2. Draw a line passing thru zero and intersecting lines drawn in step 1 so that horizontal distance between intersections is equal to Positioner drive arm travel required. (Line A-B on Table B.)

3. Extend this line until it intersects a bracket. (Point C on Table B.) Bracket number indicates correct hole for connecting link. Area

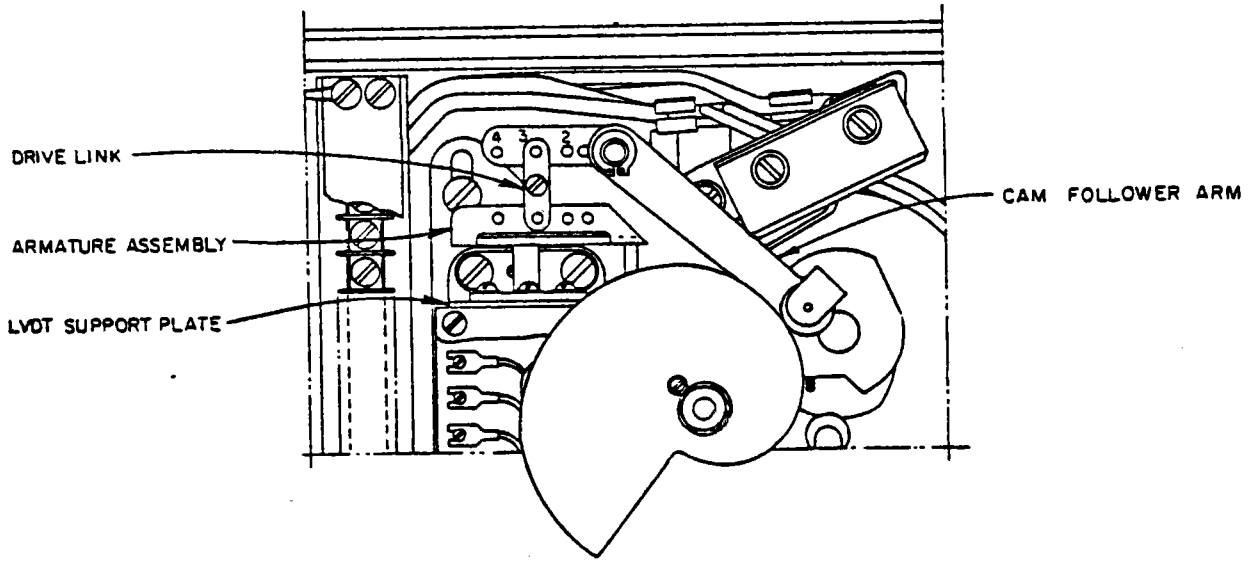


FIGURE 10 - Adjustable LVDT Linkage

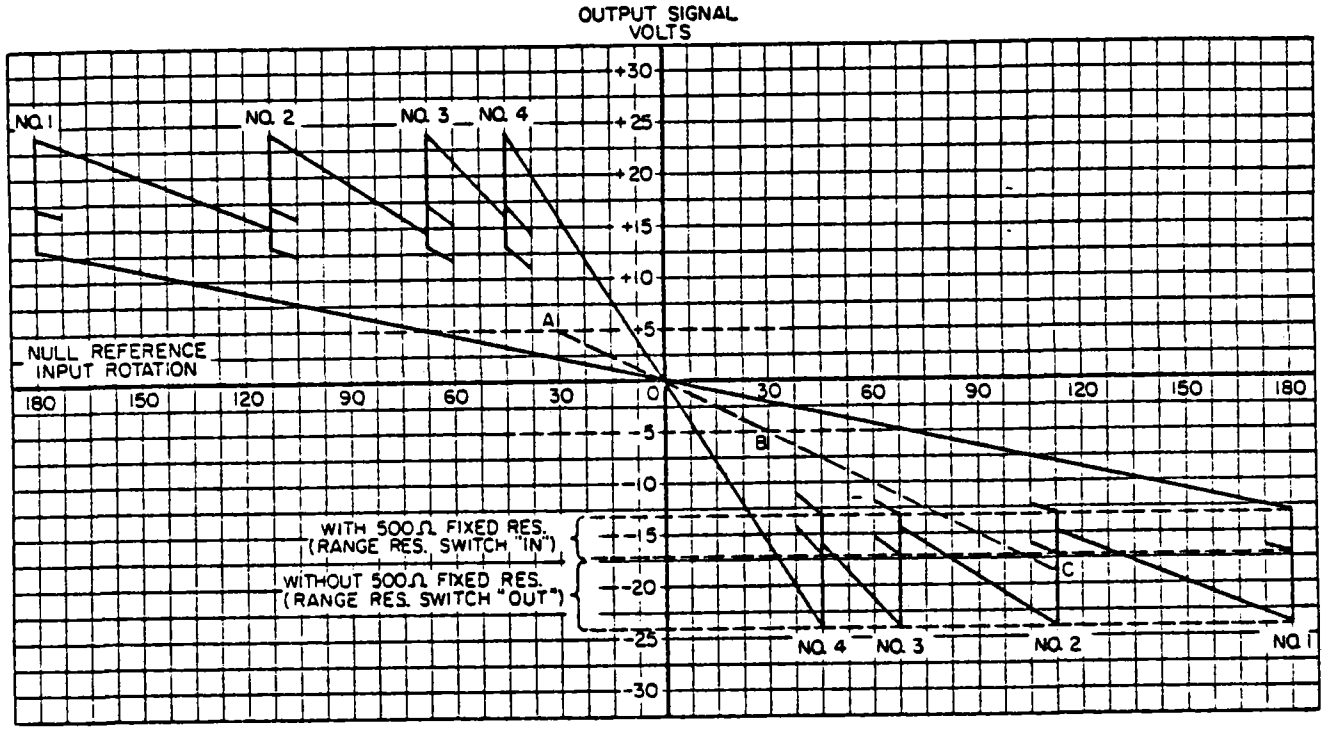


TABLE B - OUTPUT VOLTAGE CHART

of intersection within bracket determines whether or not 500 ohm range resistor is required. (Refer to Figures 4 and 11 for location of range resistor switch.) Position switch to required position.

4. Position Transmitter can now be calibrated following procedure outlined under "Calibration for ±10 Volt Output" on page 4 with following exceptions:

a. When calibrating Position Transmitter, LVDT must be zeroed with cam follower arm positioned to point on positioning cam which now corresponds to zero volts output. This will not necessarily be 5 as stated in step 5 of standard calibration procedure.

b. Maximum and minimum output voltages required in step 7 will change. New required range values must be substituted.

MICROSWITCH ADJUSTMENT

The Position Transmitter may include up to four microswitches. Available combinations and microswitch types are listed in Table C. The microswitches are operated by a cam driven arm. To adjust a microswitch to open or close at a given actuating device position, loosen the microswitch cam locking screw (see Figure 4), turn the microswitch cam to the required position, and retighten the cam locking screw.

Position Transmitter with Diode Demodulator Part Number	Switches	Position Transmitter with Transistorized Demodulator Part Number	Switches
6614500-1	None	6614500-7	None
6614500-2	2AC	6614500-8	2AC
6614500-3	2DC	6614500-9	2DC
6614500-4	4AC	6614500-10	4AC
6614500-5	2AC, 2DC	6614500-11	2AC, 2DC
6614500-6	4DC	6614500-12	4DC

TABLE C - MICROSWITCH COMBINATIONS AND TYPES

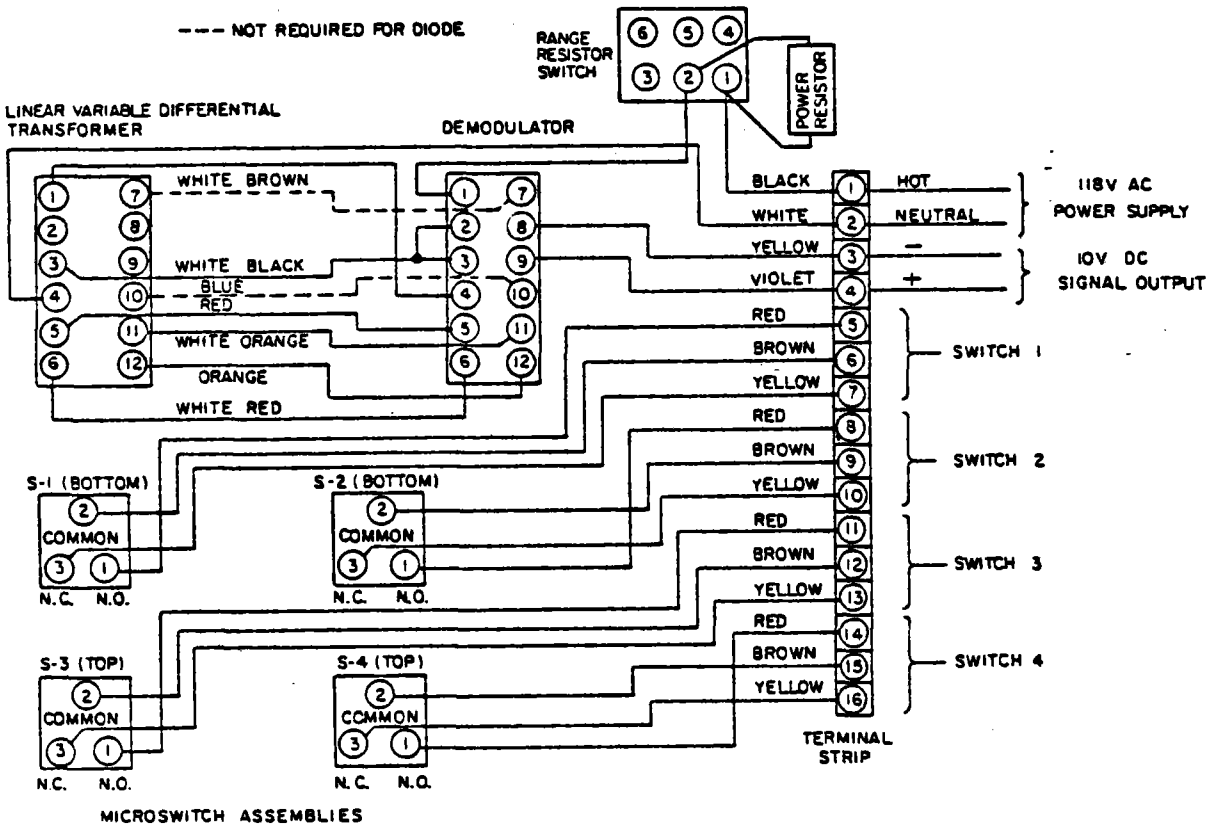


FIGURE 11 - Position Transmitter Wiring

TROUBLESHOOTING

GENERAL

Check the calibration of the Position Transmitter at least once each year. Change the grease in the gear case once every two or three years. Fill the gear case about half full with grease (such as Vulcanlube, Grade No. 1). Rotate the gears to work the grease into the teeth.

Do not oil moving parts of linear variable differential transformer core positioning linkage. Oil may cause sticking of parts or promote dirt accumulation interfering with proper operation.

DEMODULATOR

If difficulty with the Demodulator is suspected, the unit may be checked as follows:

1. Connect a DC voltmeter across output leads at Position Transmitter terminal block terminals 3 and 4 (refer to Figure 11). Supply 118 volts AC to Transmitter (terminal block terminals 1 and 2). Set zero adjustment in approximately midtravel position.

2. With cam follower on zero mark of positioning cam, output should be approximately -10 volts DC (±0.3 volts). Note voltage reading.

3. Interchange leads to terminals 5 and 12 and to terminals 6 and 11 on LVDT assembly (see Figure 11).

4. Output voltage should change polarity but remain within 0.15 volts of original value. If output remains within this limit, Demodulator is satisfactory and may be returned to service. If output does not remain within this limit, Demodulator assembly must be replaced (refer to Replacement Parts).

To replace Demodulator (refer to Figure 14):

a. Remove two screws holding mounting bracket (Item 16) to housing and lift Demodulator clear of housing.

b. Remove leads from Demodulator terminals. Remove mounting bracket from Demodulator by removing screws (23).

c. Attach mounting bracket to new Demodulator, reconnect leads and attach mounting bracket to housing. Refer to "Adjustment and Calibration" on page 3 to recalibrate Position Transmitter.

LINEAR VARIABLE DIFFERENTIAL TRANSFORMER

If difficulty with the LVDT is suspected, check the continuity of all transformer windings with an ohmmeter. If any windings are found to be shorted or open, the LVDT unit must be replaced (see "Replacement Parts").

To replace LVDT (refer to Figure 14):

a. Disconnect adjustable link (Item 83) from LVDT armature assembly (Item 52). Collapse return spring (Item 20) and free spring retainer (Item 18) from end of armature assembly. Remove leads from LVDT terminals.

b. Remove two screws (Item 21) and lift LVDT, with adjustment plate (Item 50) attached, from housing.

c. Unscrew three screws (Item 25) holding armature assembly to LVDT and remove armature. Remove bottom bearing plate (Item 53) from LVDT.

d. Release LVDT assembly from adjustment plate (Item 50) by removing three locking screws (Item 40). (Take care not to lose small eccentric, Item 45). Remove LVDT from mounting bracket by removing four countersunk screws passing thru bracket.

e. Install new LVDT following above procedure in reverse order. Place LVDT in about midtravel position on adjustment plate. Refer to "Adjustment and Calibration" on page 3 to recalibrate Position Transmitter.

DESCRIPTION OF OPERATION

Refer to Figure 4. The mechanical input to the Electric Position Transmitter is supplied by an adjustable linkage from the controlled device. As the controlled device changes position, the linkage rotates the Positioner drive arm. The drive arm is geared to the positioning cam. Rotation of the positioning cam moves the cam follower arm and the core drive link, changing the position of the movable core within the linear variable differential transformer (LVDT) coil assembly. The change in core position causes a corresponding change in LVDT AC output to the Demodulator. The Demodulator transmits a DC output signal which is proportional to the new position of the controlled device. (The return spring forces the cam follower arm against the positioning cam so that the movable core is accurately positioned.)

Two variations of the Demodulator are available: a transistorized Demodulator, Part Number 6614655-□, and a diode Demodulator, Part Number 6614900-□. The operation of the Demodulator circuits is described below.

DESCRIPTION OF TRANSISTORIZED DEMODULATOR CIRCUIT OPERATION

Figure 12 is a schematic of the LVDT and transistorized Demodulator circuit. The LVDT has four secondary windings. Secondaries A and B are the output signal windings; secondaries C and D are the Demodulator transistor bias supply windings. The transistorized Demodulator has an output impedance of less than 150 ohms. (The minimum permissible resistance load is 30,000 ohms.)

The Demodulator uses four silicon transistors (Q1 thru Q4) biased so that they alternately conduct in pairs, providing a rectified fullwave, low impedance, DC signal. The transistor collector bias voltage from the LVDT C and D windings is correctly phased and of the proper amount to bias the transistors. Since the C and D secondaries are connected in series, this voltage remains constant.

The voltage output from secondary A is connected to the upper diode-transistor circuit half and that from secondary B to the lower circuit half. Each half consists of two transistors and four diodes. The transistors are biased to operate on alternate half-cycles. This causes the rectified secondary A voltage to appear across R4 and R3, and the rectified secondary B voltages to appear across R5 and R3. The difference between these voltages is zero when the LVDT core is positioned at its electrical center. Motion of the core produces an increase in the voltage of the windings toward which the core moves. A DC output voltage equal to the difference between the demodulated secondary A and B voltages will appear at the Demodulator output.

Output signal ripple is attenuated by choke L1 and capacitor C1 to less than 200 mv peak.

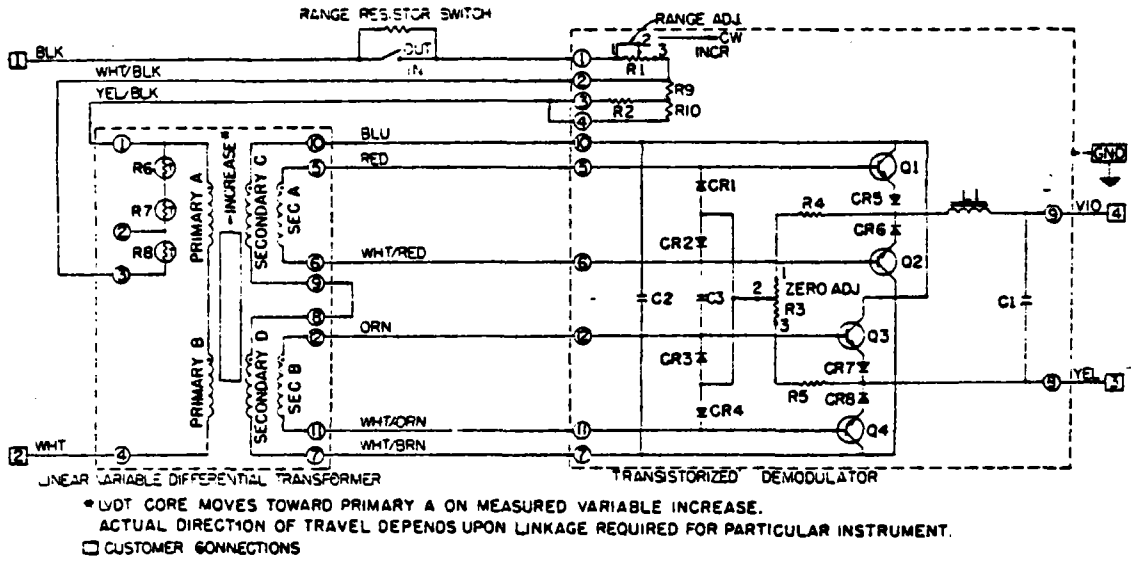


FIGURE 12 - Schematic of LVDT and Transistorized Demodulator Circuit

Capacitors C2 and C3, across bias supply secondaries, eliminate high frequency oscillations.

The zero (or balance) adjustment, R3, shifts the DC output voltage in either a positive or negative direction as required for calibration.

The thermistor shunt resistor, R2, is connected in parallel with the temperature compensating thermistors, R6, R7, and R8.

The range adjustment, R1, and the range resistor switch are in series with the LVDT primary windings and are used to vary the primary current during calibration to obtain the correct output voltage.

The transistorized Demodulator, Part No. 6614655-□, is encapsulated in plastic to protect the unit from moisture damage. Demodulator range and zero adjustment screws are provided (see Figure 4).

DESCRIPTION OF DIODE DEMODULATOR CIRCUIT OPERATION

Figure 13 is a schematic of the LVDT and diode Demodulator circuit. The LVDT has four secondary windings. Secondaries A and B are the output signal windings; secondaries C and D are not used with the diode version of the Demodulator. The diode Demodulator has an output impedance of 3,000 ohms. (The minimum permissible resistance load is 100,000 ohms.)

Secondary A is connected to the upper diode bridge network and secondary B is connected to the lower diode bridge. The output of the upper bridge appears across resistors R4 and R3. The output of the lower bridge appears across resistors R5 and R3. The polarity and magnitude of the DC output signal varies with the position of the movable core within the LVDT coil. When the LVDT core is positioned at its electrical center, the voltages of secondaries A and B will be equal and no DC output voltage will result. A shift in LVDT core position will cause a voltage increase in the windings toward which the core moves. A DC voltage equal to the difference between the voltages of the A and B secondaries will appear at the Demodulator output.

On an increase in the measured variable, the LVDT core will move toward secondary A (increasing secondary A voltage). When the secondary A voltage is larger than the voltage of secondary B, the upper output terminal will be positive with respect to the lower output terminal.

The output signal ripple is attenuated by capacitors C1 and C2 and by the choke, L1. The thermistor shunt resistor, R2, is connected in parallel with the temperature compensating thermistors, R6, R7, and R8.

The zero (or balance) adjustment, R3, shifts the DC output voltage in either direction as required for calibration. The range adjustment, R1, and range resistor switch are in series with the LVDT primary windings and are used to vary the primary current during calibration to obtain the correct output voltage.

The diode Demodulator, Part No. 6614900-□ is encapsulated in plastic to protect the unit from moisture damage. Demodulator range and zero adjustment screws are provided (Figure 4).

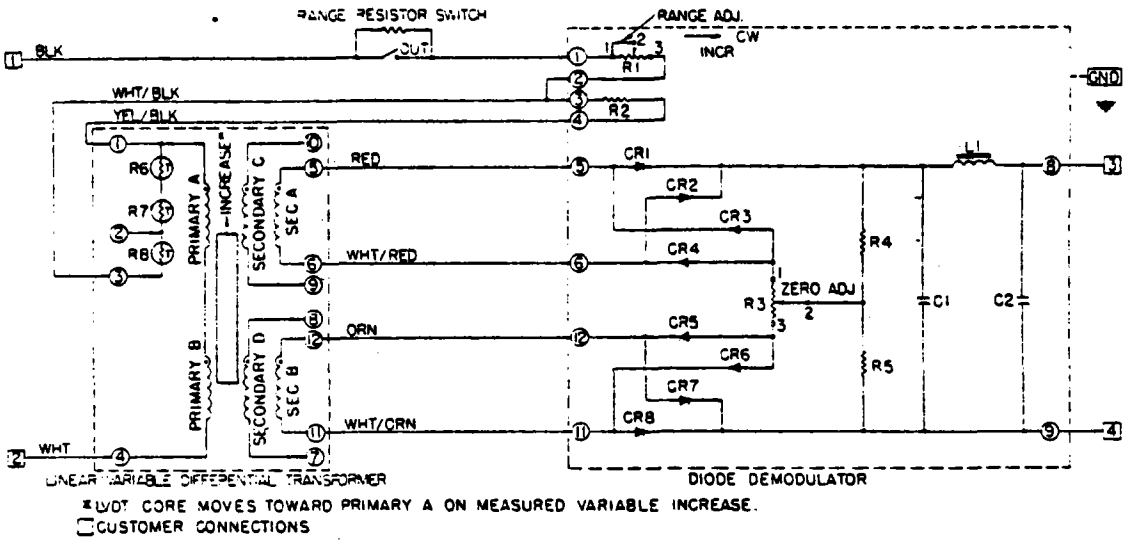


FIGURE 13 - Schematic of LVDT and Diode Demodulator Circuit

REPLACEMENT PARTS

Figure 14 is a parts drawing of the Position Transmitter. This drawing will generally be applicable to the assemblies furnished. However, there may be individual differences in specific units because of:

a. Design changes made since the printing of this instruction section.

b. Special design of the equipment furnished, to make it suitable for a special application.

Therefore, when ordering parts, assure the receipt of correct replacements for the equipment by specifying on the order:

1. The full Part Number of the equipment for which parts are desired.

2. The Parts Drawing on which each part is illustrated. (The Parts Drawing Number is given in the title for the Figure.)

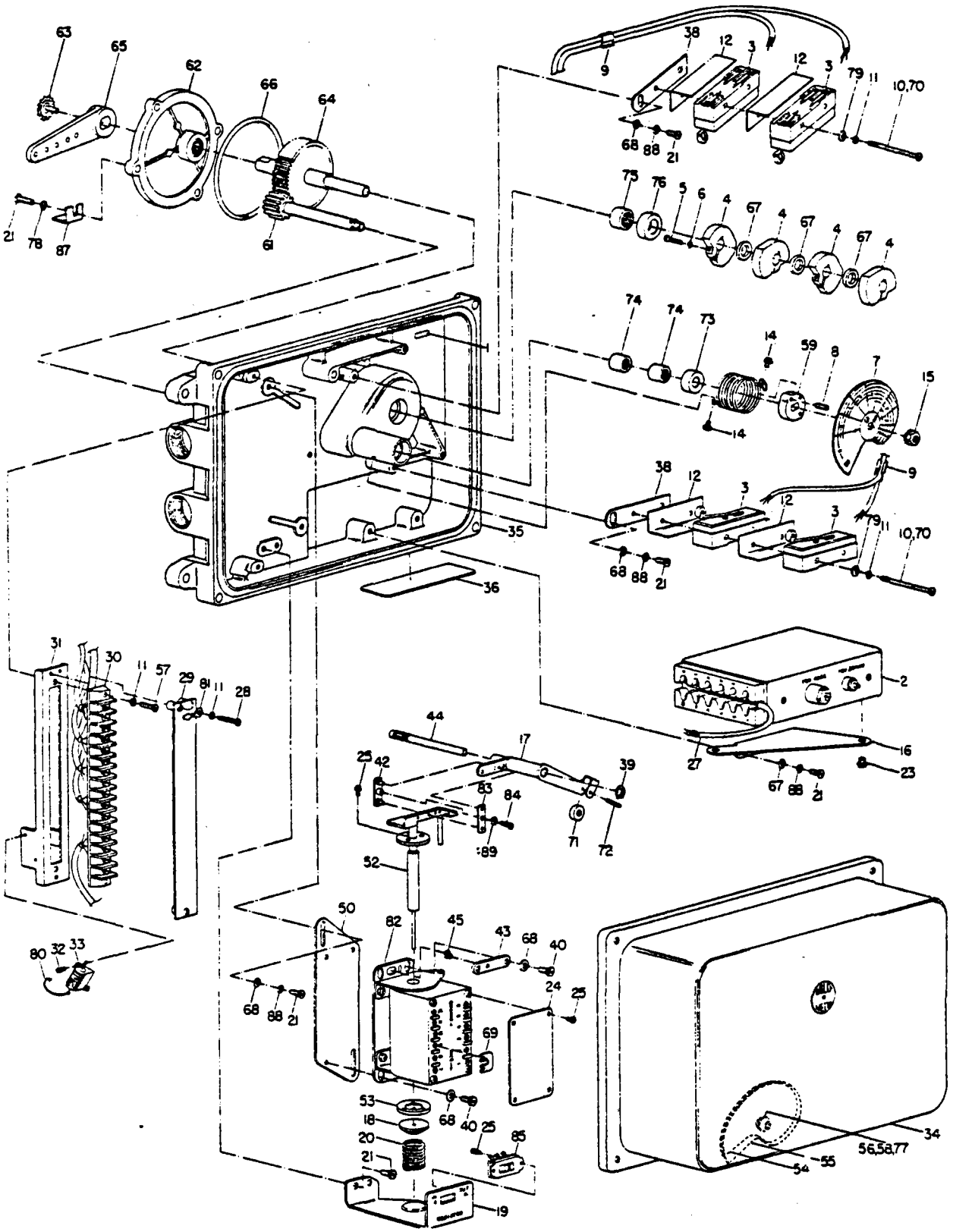


FIGURE 14 - Parts Drawing E92-21,

4.1.39-105

ITEM	PART NO.	NAME
1	SEE NOTE	CODE LABEL
2	SEE TABLE	±10V DEMODULATOR
3	SEE TABLE	SWITCH HARNESS ASSY
4	6614403-1	SWITCH CAM, SEE TABLE
5	4-40x5/8	HEX SOC HD CAP SCREW, SEE TABLE
6	NO.4 MED	LOCKWASHER. SEE TABLE
7	6617956-1	STRAIGHT LINE CAM
8	197165-1	SET SCREW
9	197413-1	CABLE CLIP. SEE TABLE
10	6-32x1	PAN HD SCR. SEE TABLE
11	NO. 6 MED	LOCKWASHER, SEE TABLE
12	667097-1	SWITCH INSULATOR, SEE TABLE
13	1943204-1	SPRING ASSEMBLY
14	4-40x3/16	PAN HD SCREW
15	1/4-20	EXT LKWASH HEX KEPS
16	6614502-1	DEMODULATOR BRKT
17	6614047-1	CAM ARM
18	6613983-1	SPRING RETAINER
19	6614505-1	SPRING SUPPORT
20	6613984-1	RETURN SPRING
21	10-32x1/2	PAN HD MACH SCREW SEE TABLE
22		
23	10-32x1/4	PAN HD EXT SEMS. 2 REQD
24	6614052-1	LVDT INSULATOR
25	4-40x3/16	PAN HD EXT SEMS. 14 REQD
27	6614498-1	LVDT-DEM. HARNESS
28	6-32x5/8	PAN HD SCREW. 3 REQD
29	6614515-1	DESIGNATION PLATE ASSY
30	1942184-5	TERMINAL BLOCK
31	6613989-1	TERM. BLK. SPT PLATE
32	2-56x3/16	PAN HD EXT SEMS, 2 REQD
33	1943424-9	POWER RESISTOR
34	6613960-1	COVER ASSY
35	6614473-1	CASE
36	---	NAMEPLATE (SPECIFY ENGRAVING)
37	6614522-1H	SEALING CORD 32 IN. REQD
38	6613977-1	SWITCH PLATE, SEE TABLE
39	197223-1	RETAINER RING
40	10-32x5/16	PAN HD EXT SEMS, 3 REQD
42	6613967-1	DRIVE LINK
43	666296-1	ECCENTRIC RET. PLATE
44	6613969-1	CAM ARM SHAFT
45	666297-1	ECCENTRIC
50	6614504-1	ADJUSTMENT PLATE
52	6614050-1	ARMATURE ASSY
53	1943240-3	BEARING
54	5311449-1	SQUARE ROOT CAM
55	5311341-1	SQUARE CAM
56	NO. 10-32	HEX NUT
57	6-32x1/2	PAN HD SCREW, 2 REQD
58	NO. 10 SAE	WASHER
59	1943261-1	CAM HUB
61	6613981-1	CAM SHAFT & PINION ASSY
62	5312314-1	COVER & REAR BEARING
63	197227-1	SPECIAL HEX SEMS
64	6613966-1	GEAR & SHAFT ASSY
65	5311686-1	POS DRIVE ARM
66	5312316-1	SEALING TUBE
67	19934-31	SPACER. SEE TABLE
68	19734-28	SMALL WASH. SEE TABLE
69	6613979-1	JUMPER TERMINAL (NOT REQD FOR DIODE UNITS)
70	6-32x1-3/4	PAN HD SCR, SEE TABLE
71	6614051-1	CAM ROLLER
72	3/32x7/16	ROLL PIN, SST
73	5312313-2	GREASE & OIL SEAL
74	5311421-1	NEEDLE BEARING. 2 REQD
75	5311421-7	NEEDLE BEARING
76	5312313-1	GREASE & OIL SEAL
77	NO. 10 MED	SAE LOCKWASHER
79	NO. 6 SAE	WASHER. SEE TABLE
80	BMCO.#140	LEADWIRE. 1-1/2 INCH REQD
81	1941342-3	SOLDERLESS TERMINAL
82	6615452-3	COIL & SUPPORT ASSY
83	6619635-1	CLAMP PLATE
84	2-56x3/16	PAN HD MACH SCREW
85	6614157-1	LOAD RES. SWITCH
87	6619634-1	STOP
88	1100-00	SHKPRF LOCKWASHER, SEE TABLE
89	NO. 2	LOCKWASHER

NOTE: SPECIFY NUMBER ON CODE LABEL WHEN ORDERING PARTS.

TRANSMITTER PART NO.	DEMODULATOR ITEM 2	SWITCHES	ITEM 3 (IN SW POS.)				NUMBER REQUIRED ITEMS LISTED BELOW									
			S-1	S-2	S-3	S-4	4, 5, 6, 12	9	10	11	21	38	67	68	70	79	88
6614500-1	6614900-2 (DIODE)	NONE	---	---	---	---	--	1	--	4	10	--	--	3	--	--	10
6614500-2		2AC	6614056-1	6614056-3	---	---	2	3	4	8	12	2	1	5	--	4	12
6614500-3		2DC	6614056-2	6614056-4	---	---	2	3	4	8	12	2	1	5	--	4	12
6614500-4		4AC	6614056-1	6614056-3	6614056-1	6614056-3	4	4	--	8	12	2	3	5	4	4	12
6614500-5		2AC & 2DC	6614056-1	6614056-3	6614056-2	6614056-4	4	4	--	8	12	2	3	5	4	4	12
6614500-6		4DC	6614056-2	6614056-4	6614056-2	6614056-4	4	4	--	8	12	2	3	5	4	4	12
6614500-7	6614655-6 (TRANSISTOR)	NONE	---	---	---	---	--	1	--	4	10	--	--	3	--	--	10
6614500-8		2AC	6614056-1	6614056-3	---	---	2	3	4	8	12	2	1	5	--	4	12
6614500-9		2DC	6614056-2	6614056-4	---	---	2	3	4	8	12	2	1	5	--	4	12
6614500-10		4AC	6614056-1	6614056-3	6614056-1	6614056-3	4	4	--	8	12	2	3	5	4	4	12
6614500-11		2AC & 2DC	6614056-1	6614056-3	6614056-2	6614056-4	4	4	--	8	12	2	3	5	4	4	12
6614500-12		4DC	6614056-2	6614056-4	6614056-2	6614056-4	4	4	--	8	12	2	3	5	4	4	12

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4.1.39-107

FISHER® Controls

Instruction Manual

Type 2625 Volume Booster

Form 5122, April 1979

INTRODUCTION

Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts information for the Type 2625 volume booster (shown in figure 1). Refer to separate instruction manuals for information regarding the control valve, actuator, and other accessories.

Description

The Type 2625 volume booster is normally used on control valve actuators to increase stroking speed in response to sudden changes from the output of a pneumatic valve positioner. The booster features a bypass that can be adjusted to respond to small output changes, and yet allow the unit to deliver high-volume output pressure for rapid stroking when signal changes exceed the deadband limit.

Specifications

Specifications for the Type 2625 volume booster are listed in table 1.

INSTALLATION

WARNING

Personal injury or system damage may result if a volume booster is installed without adequate protection from physical damage, or where service conditions could exceed booster or other equipment ratings. Exceeding the pressure specifications in table 1 may cause leakage, part damage, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas.

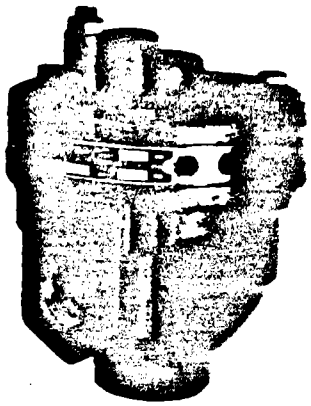


Figure 1. Type 2625 Volume Booster

Mounting

The Type 2625 volume booster is typically nipple-mounted between the air supply source and the actuator, and may be used with piston or diaphragm actuators. Many actuators will require special casing or cylinder connections and modifications to take full advantage of the booster capacity.

Pressure Connections

The input signal connection is 1/4-inch NPT; the supply and output connections are 3/4-inch NPT. Connections to the volume booster should be made as indicated in figure 2. Connections for two typical applications are shown in figure 3. Ensure that the piping is of proper size to meet the

Table 1. Specifications

PORT SIZES*	**Supply Port:** ■ 3/8-inch (9.5 mm) or ■ 1/2-inch (12.7 mm) **Exhaust Port:** ■ 3/32-inch (2.4 mm), ■ 3/8-inch (9.5 mm), or ■ 1/2-inch (12.7 mm)
SUPPLY PRESSURE RANGES	Must not exceed maximum pressure rating of actuator **Up to 40 psig (2.8 bar):** Normally used with diaphragm actuators **Up to 150 psig (10.3 bar):** Normally used with piston actuators
MAXIMUM INPUT SIGNAL PRESSURE	150 psig (10.3 bar)
FIXED INPUT TO OUTPUT PRESSURE RATIO	1 to 1
MINIMUM DEADBAND WIDTH	1 psig (0.7 bar) or 5 percent of positioner output span, whichever is greater
OPERATIVE TEMPERATURE LIMITS†	**With Standard Elastomers:** −40 to 160°F (−40 to 71°C) **With High Temperature Elastomers:** 0 to 300°F (−18 to 149°C)
CONNECTIONS	**Input Signal:** 1/4-inch NPT **Supply and Output:** 3/4-inch NPT
MAXIMUM FLOW COEFFICIENTS	See table 2
APPROXIMATE WEIGHT	5 lb (2.3 kg)

*May be used in any combination.
†This term defined in ISA Standard S51.1-1976.

*Table 2. Maximum Flow Coefficients**

PORT SIZE COMBINATIONS				SUPPLY PORT COEFFICIENTS			EXHAUST PORT COEFFICIENTS		
Supply Port		Exhaust Port							
In.	mm	In.	mm	C_v	C_g	C_1	C_v	C_g	C_1
3/8	9.5	3/32	2.4	3.74	113	30.2	0.23	8.05	35.0
		3/8	9.5	3.74	113	30.2	2.29	80.2	35.0
		1/2	12.7	3.74	113	30.2	2.52	88.2	35.0
1/2	12.7	3/32	2.4	5.32	171	32.1	0.24	8.43	35.1
		3/8	9.5	5.32	171	32.1	2.30	80.7	35.0
		1/2	12.7	5.32	171	32.1	2.53	88.5	35.0
Standard Type 3570 Valve Positioner				0.25	8.8	35.2	0.25	8.8	35.2
Standard Type 3582 Valve Positioner				0.17	6.0	35.3	0.24	8.4	35.0

*Consult your Fisher representative for special stroking speed requirements

capacity demands of the booster and that the actuator is equipped with properly sized input connections.

Supply Pressure

Supply pressure must be clean dry air or non-corrosive gas and may be filtered if desired.

WARNING

Because the Type 2625 volume booster has no provision for venting exhaust away from the unit, flammable or otherwise hazardous gas should not be used as a supply medium unless the unit is in a well-ventilated area. Accumulated gas may create an explosion hazard, with the possibility of personal injury or equipment damage.

Exhaust Ports

The actuator exhausts air to the atmosphere through exhaust ports in the side of the unit. They should be kept free of any obstructions or foreign materials that might clog them.

OPERATING INFORMATION

The only operating requirement of the volume booster pertains to the adjustment of the bypass valve for stable actuator performance. Although systems have different characteristics and may require different adjusting techniques, if the actuator is to be used for throttling control, the following procedure is recommended.

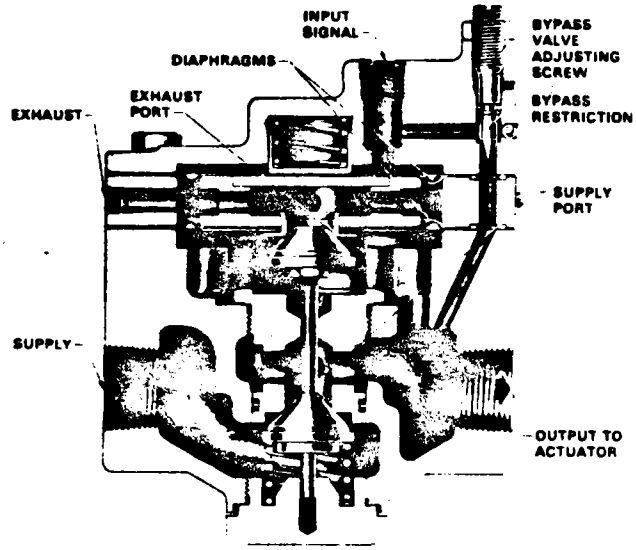


Figure 2. Sectional View of Type 2625 Volume Booster

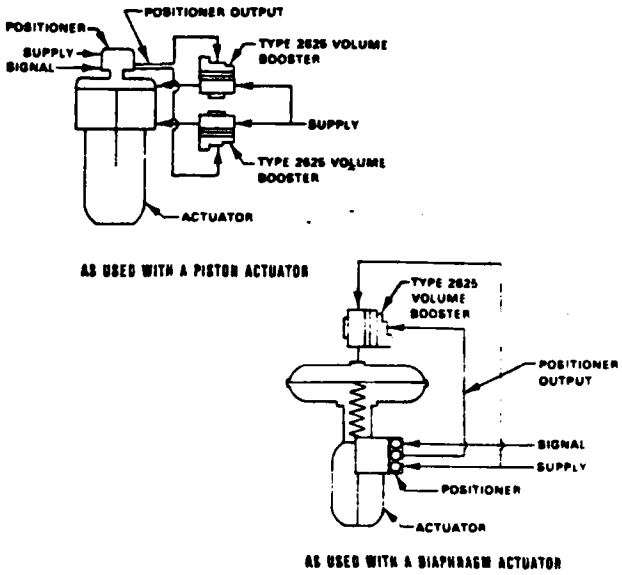


Figure 3. Typical Installations

Prior to operation, turn the bypass valve adjusting screw (see figure 2) four or five turns counterclockwise from the fully closed position. With the actuator in operation, slowly turn the adjusting screw clockwise and make the necessary adjustments until the booster operates in response to large changes in the input signal, yet allows small changes to move the actuator without initiating booster operation.

If the actuator is to be used for on-off control, the bypass valve should be closed (adjusting screw turned fully clockwise).

PRINCIPLE OF OPERATION

Refer to figures 2 and 3. Because of the bypass restriction, large input signal changes will register on the booster input diaphragm sooner than in the actuator. A large, sudden change in the input signal will cause a pressure differential to exist between the input signal and the output of the booster. When this occurs, the diaphragms move to open either the supply port or the exhaust port, whichever action is required to reduce the pressure differential. The port remains open until the difference between booster input and output pressures returns to within the deadband limits of the booster (as determined by the setting of the bypass valve). With the bypass valve adjusted for stable operation, signals having small magnitude and rate changes passes through the bypass restriction and into the actuator without initiating booster operation.

MAINTENANCE

WARNING

Maintenance requires that the volume booster be taken out of service, making certain precautions necessary to avoid injury and equipment damage. To avoid possibility of personal injury or equipment damage, disconnect or bypass any pressure lines to the booster, and vent any pressure locked in the unit before beginning maintenance.

Diaphragm Assembly Replacement

Key numbers refer to figure 4.

1. Remove the six cap screws (key 15) from the perimeter of the spring case assembly (key 3) and lift off the assembly, taking care not to lose the upper spring (key 8) or the spring seat (key 9).

2. Lift out the upper diaphragm (key 6), the diaphragm assembly (key 5), which includes the lower diaphragm, and the O-rings (key 14). Inspect these parts for damage and replace if necessary.

3. Replace the O-rings (key 14), the diaphragm assembly (key 5), and the upper diaphragm (key 6).

CAUTION

To ensure proper operation of the bypass valve, make certain that the pressure registration passage to the restriction (key 11) is not covered.

4. Insert the spring (key 8) and spring seat (key 9) into the spring case (key 3) and replace this assembly on the diaphragm, taking care that the restriction passage is oriented properly.

5. Replace the six cap screws (key 15) and tighten them in a criss-cross manner. To avoid damage to the diaphragms, do not over-tighten the screws.

Valve Assembly Replacement

Key numbers refer to figure 4.

1. Remove the six cap screws (key 15) from the perimeter of the spring case assembly (key 3) and lift off the assembly, taking care not to lose the upper spring (key 8) or the spring seat (key 9).

2. Lift out the upper diaphragm (key 6), the diaphragm assembly (key 5), which includes the lower diaphragm, and the O-rings (key 14).

3. Unscrew the body cap (key 4), taking care not to lose the lower spring (key 10).

4. Unscrew the valve assembly (key 7) from the body and inspect it for damage. Prior to threading the replacement valve assembly into the body, coat the threads and the O-ring (key 7D) with a suitable lubricant.

5. Replace the lower spring (key 10) and body cap (key 4).

6. Replace the O-rings (key 14), the diaphragm assembly (key 5), and the diaphragm (key 6).

CAUTION

To ensure proper operation of the bypass valve, make certain that the pressure registration passage to the restriction (key 11) is not covered.

7. Insert the spring (key 8) and spring seat (key 9) into the spring case (key 3) and replace this assembly on the diaphragm, taking care that the restriction passage is oriented properly.

8. Replace the six cap screws (key 15) and tighten them in a criss-cross manner. To avoid damage to the diaphragms, do not over-tighten the screws.

PARTS ORDERING

Whenever corresponding with the sales representative about this equipment, mention the serial number of the unit. This serial number can be found on the nameplate (key 16, figure 4). When ordering replacement parts, also state the complete eleven-character part number of each part required as found in the following parts list.

PARTS LIST

Key	Description	Part Number
1	Body	
	Aluminum (Std)	4V1962 07012
	Brass	4V1962 X0012
2	Diaphragm Spacer	
	Aluminum (Std)	2V1963 09032
	Brass	2V1963 X0012
3	Spring Case Assembly	
	Bronze/440C (Std)	1V3747 000A2
	Brass	1V3747 X0012
4	Body Cap, brass	1V1965 14012
5*	Diaphragm Assembly	
	Nitrile on nylon (standard)	
	With blocked exhaust	1V4056 000A2
	With 3/32-inch (2.4 mm) exhaust	1V4054 000A2
	With 3/8-inch (9.5 mm) exhaust	1V4055 000A2
	With 1/2-inch (12.7 mm) exhaust	1V3624 000A2
	Brass	
	With 3/8-inch (9.5 mm) exhaust	1V4055 X00A2
	Viton† on Nomex† (high temperature)	
	With blocked exhaust	1V4056 X0012
	With 3/32-inch (2.4 mm) exhaust	1V4054 X0022
	With 3/8-inch (9.5 mm) exhaust	1V4055 X0012
	With 1/2-inch (12.7 mm) exhaust	1V3624 X0022
6*	Upper Diaphragm	
	Nitrile on nylon (standard)	2V1977 02052
	Viton on Nomex (high temperature)	2V8267 X0012
7*	Valve Assembly	
	Standard	
	3/8-inch (9.5 mm) supply port	1V1998 000A2
	1/2-inch (12.7 mm) supply port	1V1997 000A2
	High temperature	
	3/8-inch (9.5 mm) supply port	1V1998 X0012
	1/2-inch (12.7 mm) supply port	1V1997 X0012

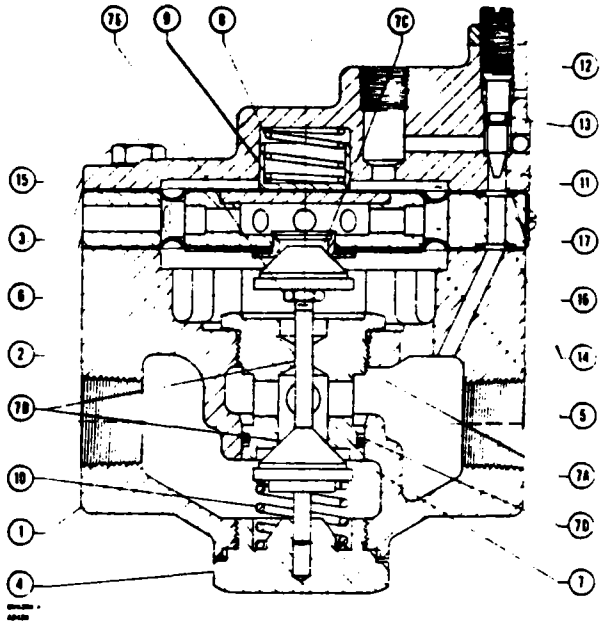


Figure 4. Type 2625 Volume Booster Assembly Drawing

Key	Description	Part Number
7A	Seat ring, brass	
	3/8-inch (9.5 mm) supply port	2V1978 14012
	1/2-inch (12.7 mm) supply port	2V1979 14012
7B	Lower Valve and Stem	
	Aluminum (standard)	1V1981 000A2
	416 SST, aluminum/Viton (high temperature)	1V8264 X0012
7C	Upper Valve	
	Aluminum/nitrile (standard)	1V1984 70972
	Aluminum/Viton (high temperature)	1V8265 X0012
7D	O-ring	
	Aluminum/nitrile (standard)	1P4206 06992
	Aluminum/Viton (high temperature)	1V5776 06382
7E	Hex nut, steel	1A8396 28982
8	Upper Spring	
	40 psi (2.8 bar) max, steel	1V6005 27012
	150 psi (10.3 bar) max, steel	1V1986 27122
9	Spring Seat	1V1987 35032
10	Lower Spring	
	40 psi (2.8 bar) max, steel	1V6004 27012
	150 psi (10.3 bar) max, steel	1V1988 27122
11	Restriction, 303 SST	1V1989 35032
12	Hex Nut, steel	1A8803 24122
13*	O-ring	
	Nitrile (standard)	1C8546 06992
	Viton (high temperature)	1V8268 06382
14*	O-ring (2 req'd)	
	Nitrile (standard)	1H2923 06922
	Viton (high temperature)	1N1162 06382
15	Cap Screw, steel (6 req'd)	1A3525 24052
16	Nameplate, SST	1V4059 38992
17	Drive Screw, SST	1A3682 28982

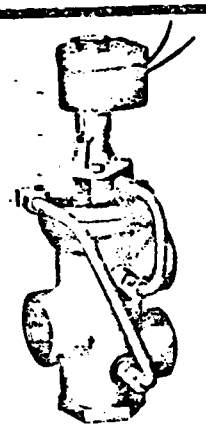
*Recommended spare part
†Trademark of DuPont Co

ASCO® Red-Hat®

8331

3 Way Solenoid Valves

for Air, Water and Light Hydraulic Oil
1¼", 1½" and 2" N.P.T.



GENERAL DESCRIPTION

These large, high flow capacity 3 way bronze body valves are actuated by a 3 way Red-Hat® Pilot Valve. The valves must be mounted with the solenoid vertical and upright. A minimum pressure is required for operation.

APPLICATIONS

Bulletin 8331 Valves are used to alternately apply and exhaust pressure from a vessel, cylinder or diaphragm chamber such as is required in the operation of diaphragm motor valves, sewage ejectors, air lifts, etc.

SPECIFICATIONS

Operation: Two types are available:

(a) Normally Closed — when solenoid is de-energized, flow is from cylinder to exhaust connection. When solenoid is energized, flow is from pressure to cylinder connection.

(b) Normally Open — when solenoid is de-energized, flow is from pressure to cylinder connection. When solenoid is energized, flow is from cylinder to exhaust connection.

Pipe Sizes: 1¼", 1½" and 2" N.P.T.

Valve Body: Bronze.

Valve Seat: Resilient.

Solenoid Construction: Internal parts in contact with fluid are of 300 and 400 Series Stainless Steel.

Solenoid Enclosures: Two types available:

(a) General Purpose (NEMA 1).

(b) Explosion-Proof and Watertight (NEMA 4, 7 and 9).

Electrical: Standard Voltages: 24, 120, 240, 480 volts, A-C, 60 Hz (or 50 Hz in 110 volt multiples). 6, 12, 24, 120, 240 volts, D-C. Other voltages available when required.

Coil: Continuous Duty Molded Class A.

Temperature: Fluid: To 200°F. **Ambient:** Nominal Range, 32°F. to 77°F. (104°F. occasionally — see page 17 in Engineering Information Section.)

Installation: Solenoid must be mounted vertical and upright.

Approvals: For UL listings and CSA approvals refer to page 2.

SPECIFICATIONS

BRONZE BODY, SOFT SEATING FOR GENERAL PURPOSE SERVICE

Pipe Size (Ins.)	Orifice Size (Ins.)	Operating Pressure Differential (P.S.I.) Air, Water, Light Hydraulic Oil ② Minimum	Operating Pressure Differential (P.S.I.) Air, Water, Light Hydraulic Oil ② Maximum	Safe Body Working Pressure (P.S.I.)	Max. ① A-C Fluid Temp. °F.	Cv Flow Factor	General Purpose Solenoid Enclosure Catalog Number	General Purpose Solenoid Enclosure Optional Feature Ref.	Explosion-Proof—Watertight Solenoid Enclosure Catalog Number	Explosion-Proof—Watertight Solenoid Enclosure Optional Feature Ref.	Watt Rating A-C	Watt Rating D-C	Class of Coil Insulation	Approx. Ship. Wt. (Lbs.)
NORMALLY CLOSED OPERATION														
1¼	1¼	10	250	300	200	19	8331A29	I	8331A45	II	15.4	16.8	A	20
1½	1¼	10	250	300	200	19	8331A30	I	8331A46	II	15.4	16.8	A	20
2	2	15	250	300	200	41	8331A31	I	8331A47	II	15.4	16.8	A	35
NORMALLY OPEN OPERATION														
1¼	1¼	10	300	300	200	19	8331A37	I	8331A53	II	15.4	16.8	A	20
1½	1¼	10	300	300	200	19	8331A38	I	8331A54	II	15.4	16.8	A	20
2	2	20	300	300	200	41	8331A39	I	8331A55	II	15.4	16.8	A	35

Notes: ① Maximum D-C Fluid Temperature is 180°F. ② Rated at 300 S.S.U.

OPTIONAL FEATURE REFERENCE ③ Description and ordering information are located on pages 99-100.

Optional Feature Ref.	Class F Molded Coil	Class H Hi-Temp. Coil	Dual Voltage Coil Class A	Dual Voltage Coil Class F	Spade Terminal Coil ② Class A	Spade Terminal Coil ② Class F	Open Yoke Solenoid Frame	½" Conduit Adapter	½" Threaded Conduit Hub	Strain Relief Conn.	Splice Box Solenoid Enclosure
I	1C	2C	3C	4C	5C	—	7C	9	10	11	12C
II	1C	2C	3C	4C	—	—	—	—	STD	—	—

Notes: ① Manual Operator, Rainproof and Watertight (Submersible) Enclosures available, refer to pages 99-100.
② Use only with Open Yoke Solenoid Frame or Splice Box Solenoid Enclosure.

ELECTRICAL INFORMATION

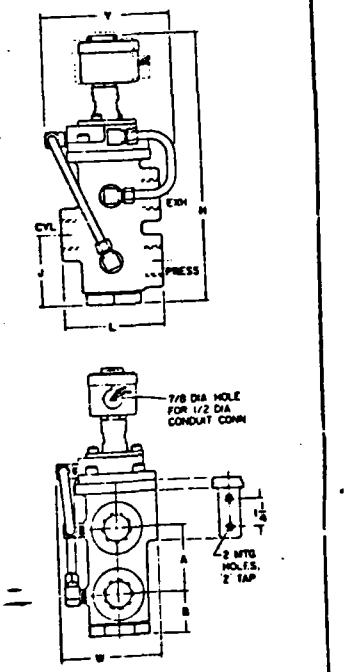
Standard Coil and Class of Insulation	Watt Rating and Power Consumption D-C Watts	A-C Watts	A-C VA Holding	A-C VA Inrush	Spare Coil Part No. A-C	Spare Coil Part No. D-C
A	16.8	15.4	27	47.4	96-817	96-671

ORDERING INFORMATION

IMPORTANT: We must have PIPE SIZE, CATALOG NUMBER, VOLTAGE and HERTZ, operating pressure and media handled. Use strainers with solenoid valves.

DIMENSIONS (in inches)

(Explosion-Proof and Watertight Solenoid Enclosure shown dotted-in, details available on request.)



Pipe Size (Ins.)	A	B	N	J	L	W	Y	Z
1¼	3	1 13/16	12	3 1/16	4 1/2	4 5/16	5 3/4	3/8-16
1½								
2	5 1/16	2 1/16	15 1/4	4 15/32	5 1/8	5 13/32	6	3/8-20

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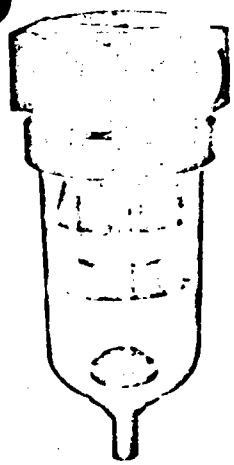


Features:

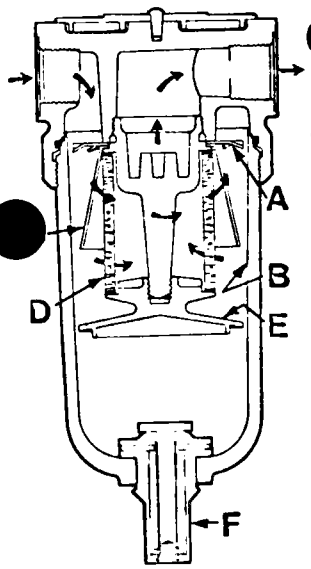
- Excellent water removal efficiency.
- Unique deflector plate and shroud creates a swirling of the air stream insuring maximum water and dirt separation.
- Large filter element surface guarantees low pressure drop and increased element life.
- Push-N-Drain requires only finger tip touch to drain. Optional automatic filter drain available.

Application:

The Parker 07 series filters are designed to remove airborne solid contaminants, pipe scale, rust, pipe dope, etc., which may plug small orifices or cause excessive wear and premature failure of pneumatic components.

Filter Selection:

1. Determine maximum system flow requirements.
2. Determine maximum allowable pressure drop at rated flow in SCFM.
3. Refer to flow chart and select filter pipe size by choosing curve that offers minimum pressure drop at desired flow in SCFM.



Operation:

FIRST STAGE FILTRATION

Air enters at inlet port and flows through deflector plate **(A)** which causes a swirling action. Liquids and coarse particles are forced to the bowl interior wall **(B)** by the centrifugal action of the swirling air. They then carry down the bowl wall by the force of gravity. Shroud **(C)** assures that the proper swirling action occurs and that the air does not pass directly through the filter element **(D)** until the large particles and liquids are removed. The baffle **(E)** separates the lower portion of the bowl into a "quiet zone" where the removed liquid and particles collect, unaffected by the swirling air, and are therefore not reentrained into the flowing air.

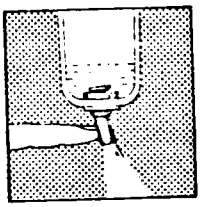
SECOND STAGE FILTRATION

After liquids and large particles are removed in the first stage of filtration, the air flows through element **(D)** where smaller particles are filtered out and retained. The filtered air then passes downstream.

Collected liquids and particles in the "quiet zone" should be drained before their level reaches a height where they would be reentrained in the flowing air. This can be accomplished by the manual drain **(F)** which is actuated by pushing the side from any direction.

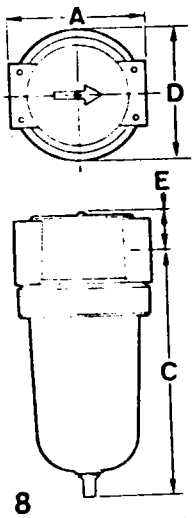
Filters with automatic drains dump the liquids as they reach a predetermined height in the quiet zone. Rising liquid causes the float to lift which pressurizes a diaphragm shifting the mechanism, expelling the liquids under pressure. The unit closes when the liquids have been expelled. See page 3 for detailed drain operation.

Push 'N' Drain™ control requires only a fingertip touch to drain condensate, even in hard to reach places. Push 'N' Drain is standard.

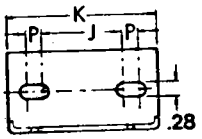


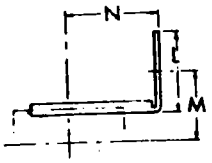
Materials of Construction:

BODY: Aluminum. **ELEMENTS:** (40M) Plastic (25M) Sintered Bronze (5M) Plastic. **DEFLECTOR, SHROUD HOLDER, BAFFLE:** Plastic. **SEALS:** Buna N. **BOWLS:** Polycarbonate and Aluminum. **SIGHT GAUGE:** Nylon. **MANUAL DRAIN:** Body—Buna N, Stem—Brass.



Dimensions:



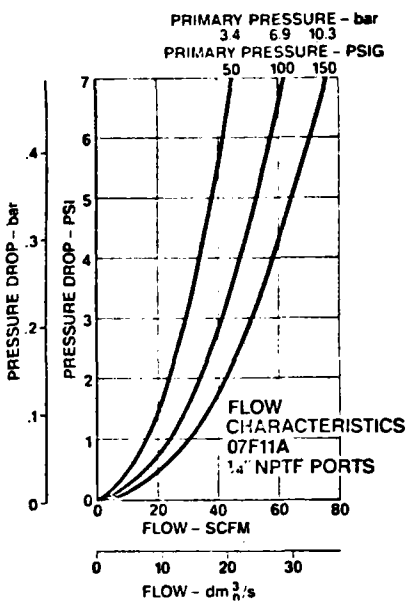


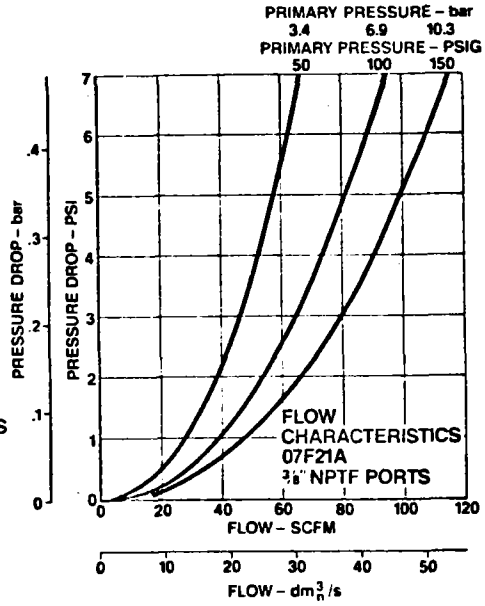
Mounting Bracket

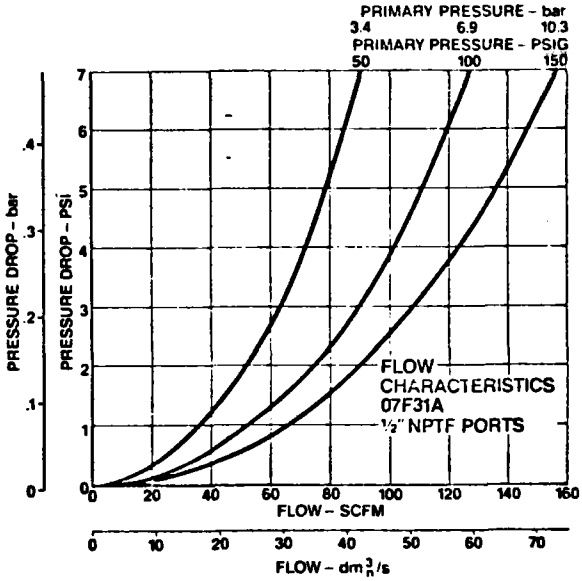
Model	Port Size (NPT)	A	C	"C" with Auto. Drain	D	E	WT.
07F	¼", ⅜", ½"	3.24	6.96	6.96	3.03	.96	1.5 lb.
		82 mm	177 mm	177 mm	77 mm	24 mm	68 kg
07F	¾"	3.50	6.96	6.96	3.03	.96	1.5 lb.
		89 mm	177 mm	177 mm	77 mm	24 mm	68 kg

	J	K	L	M	N	P	KIT
inches	1.28	3.93	1.75	1.64	2.18	.94	PS209
mm	33	100	44	42	55	24	
inches	1.28	3.93	1.75	1.64	2.18	.94	PS209
mm	33	100	44	42	55	24	

Filters: Performance Characteristics







Specifications:

PRESSURE AND TEMPERATURE RATINGS:
For filters with polycarbonate bowl
150 PSI at 125°F (10.3 bar at 52°C) or less
For filters with metal bowl with sight gauge
250 PSI at 175°F (17 bar at 80°C) or less

AUTOMATIC FLOAT DRAIN:
Operating range 10-250 PSIG
(0.7 to 17 bar)

BOWLS AVAILABLE:
Transparent polycarbonate
Metal bowl with or without sight gauge.

BOWL CAPACITY:
8 ounce

FILTER ELEMENTS:
40 micron standard
5 micron optional
25 micron optional

DRAINS:
Manual Push-N-Drain standard
Automatic drain optional
(Interchangeable for field conversion)

CAUTION:
Polycarbonate bowls, being transparent and tough, are ideal for use with Filters and Lubricators. They are suitable for use in normal industrial environments, but should not be located in areas where they could be subjected to an impact blow, nor temperatures outside of the rated range. As with most plastics, some chemicals can cause damage. Polycarbonate bowls should not be exposed to chlorinated hydro-carbons, ketones, esters and certain alcohols. They should not be used in air systems where compressors are lubricated with fire-resistant fluids such as phosphate ester and di-ester types. Metal bowls resist the action of most such solvents but should not be used where strong acids or bases are present or in salt laden atmospheres. Consult the factory for specific recommendations where these conditions exist.

[illegible] are recommended for use with [illegible] bowls

Ordering Information:

07F	3	1	A	*

Port Size
1 – ¼" NPTF
(2) – ⅜" NPTF
3 – ½" NPTF
4 – ¾" NPTF

Bowl Options
Polycarbonate Bowl
1. Manual drain
2. Manual drain with bowl guard
5. Automatic drain
6. Automatic drain with bowl guard

Metal Bowl
3. Metal bowl with manual drain
(4) Sight gauge, manual drain
7. Metal bowl with automatic drain
8. Sight gauge, automatic drain

Element
(A) 40 micron
B. 5 micron
C. 25 micron

NOTE: Shaded units are not standard stock items.

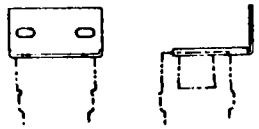
*Engineering Change Designator will be entered at factory.

Accessories:

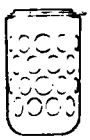
Model	07F
Automatic Drain Kit	PS506
Filter Element Kits	
40 Micron	PS201
25 Micron	PS202
5 Micron	PS203
40 Micron Cartridge Kit	PS204
Polycarbonate Bowl Kits	
Manual Drain	PS205
Automatic Drain	PS243
Metal Bowl Kits	
Manual Drain	PS247
Sight Gauge Manual Drain	PS208
Bowl Guard Kits	
With Spring Ring	PS207
Mounting Bracket Kits	
With (4) Self Tapping Screws	PS209


Automatic Drain


Filter Elements


Mounting Bracket


Metal Bowl


Bowl Guard

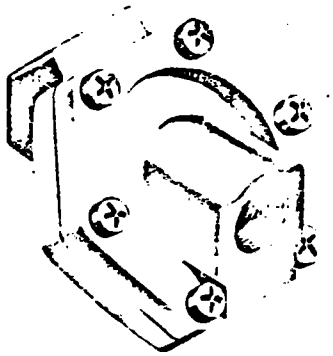
WABCO

FLUID POWER DIVISION

QUICK RELEASE VALVE

FOR INSTANT RESPONSE IN AIR CIRCUITS

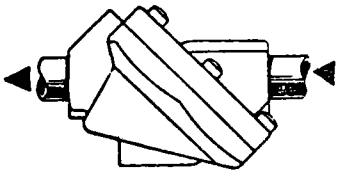
The Quick Release Valve speeds the exhausting of your air cylinders, clutches or other pneumatic devices. It vents air pressure close to the operated device instead of back through the control valve. Equipment cycling or release times are reduced for increased output.

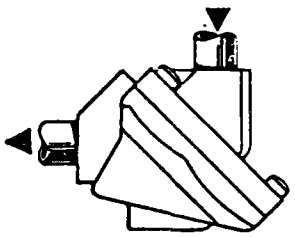


Features

- GREATER SENSITIVITY—Gives instant reponse because venting starts at the slightest reduction of pressure from the control valve.
- LARGE CAPACITY—Large internal air passages exhaust air quickly for top speed of your operation.
- QUIET OPERATION—Special diaphragm design eliminates chattering usually associated with exhaust valves.
- LONG OPERATING LIFE—Has only one wearing part—a rugged, oil-resistant diaphragm. Body is corrosion resistant.
- REDUCED WEIGHT—Built of aluminum, they are light enough to be supported by piping alone. (Mounting brackets optional on smaller sizes.)

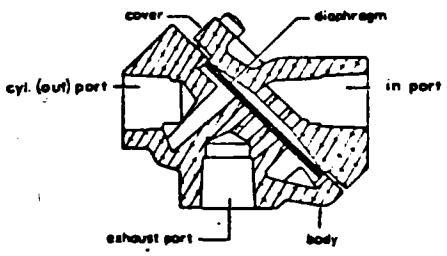
MOUNTING FLEXIBILITY—For in-line or right angle piping





An especially desirable feature is that the inlet port may be assembled on the valve in one of two positions. This allows the inlet and outlet ports to be mounted on the same center line, or at right angles to each other. This added flexibility simplifies many mounting problems.

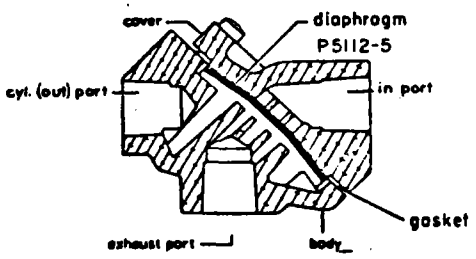
OPERATION



Air pressure entering the inlet port forces the diaphragm against the exhaust port, closing it. Air pressure also deflects the rim of the diaphragm to open a direct passage around the diaphragm to the outlet port.

When air pressure at the inlet port is reduced, a differential in the pressure acting on the diaphragm is created. This differential in pressure lifts the diaphragm from the exhaust port and seats it on the inlet port. This opens the exhaust port, allows air to flow freely from the outlet port to atmosphere, and closes the inlet port.

Should outlet air pressure drop below inlet pressure, the differential in pressure seats the diaphragm on the exhaust port, stopping further exhaust.



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SPECIFICATIONS

Maximum Temperature—+160 F. (200 F. intermittent exposure)
Maximum Working Pressure—200 psi (¼" & ⅜") 150 psi (½", ¾" & 1")
MATERIAL—Die cast aluminum body. Snythetic rubber diaphragm.
MODELS—The ¼" and ⅜" (Fig. 1, below) models are normally mounted directly in the piping. A mounting bracket is furnished as an accessory, if required. (See Figure 2.) The ½", ¾" and 1" models (Fig. 3) have an integral mounting bracket.

ORDER REFERENCE

PORT SIZE	PIECE NUMBER	DESCRIPTION	WEIGHT	DRAWING NUMBER
1/4"	P52935-2	Less Mounting Bracket	10 oz.	BP52935
1/4"	*P52935-21	L/Mtg. Bkt., Cover Rotated 180°	10 oz.	BP52935
1/4"	P52935-22	With Mounting Bracket	12 oz.	BP53068
3/8"	P52935-3	Less Mounting Bracket	9-3/4 oz.	BP52935
3/8"	*P52935-31	L/Mtg. Bkt., Cover Rotated 180°	9-3/4 oz.	BP52935
3/8"	P52935-32	With Mounting Bracket	11-3/4 oz.	BP53068
1/2"	P52935-4	With Integral Mounting Bracket	1 lb., 7 oz.	CP54976
3/4"	P52935-6	With Integral Mounting Bracket	2 lb., 14 oz.	CP54977
1"	P52935-8	With Integral Mounting Bracket	3 lb., 5 oz.	CP54977

*Dimensions not shown.

DIMENSIONS

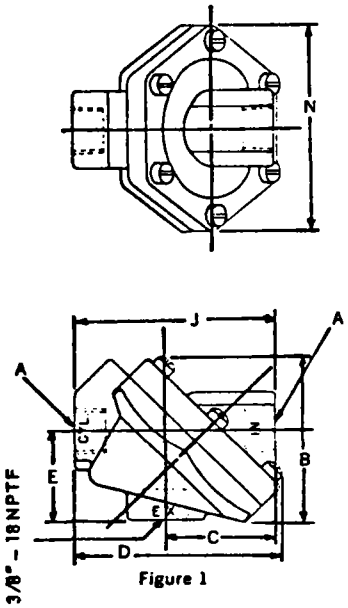


Figure 1

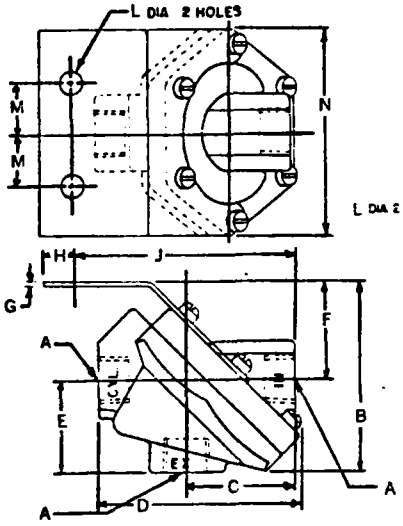


Figure 2

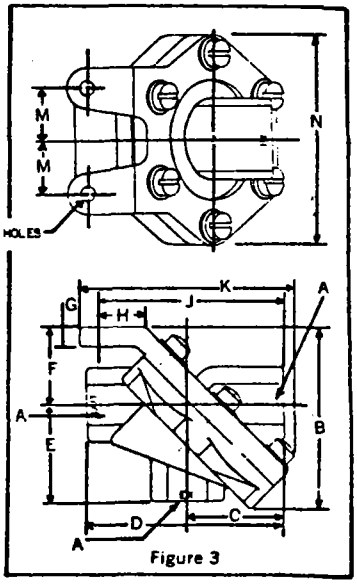


Figure 3

Piece Number	Fig. No.	A Dryseal NPTF	B	C	D	E	F	G	H	J	K	L	M	N
P52935-2	1	¼ - 18	2 13/32	1¾	3 1/32	1 11/32	..	..	..	3	..	..	..	3
P52935-3	1	⅜ - 18												
P52935-22	2	¼ - 18	1 29/32	1¾	3 1/32	1 11/32	1 7/16	1/16	½	3¼	..	11/32	¾	3
P52935-32	2	⅜ - 18												
P52935-4	3	½ - 14	3 15/32	1¾	3 11/16	1 29/32	1½	⅜	⅞	3 7/16	4⅛	9/32	1	3 15/16
P52935-6	3	¾ - 14	4 13/16	2 11/16	5¼	2 21/32	2 1/16	7/16	1⅛	5	5½	13/32	1½	5½
P52935-8	3	1 - 11½												

WABCO FLUID POWER DIVISION AMERICAN-STANDARD, INC.
1953 MERCER ROAD • LEXINGTON, KENTUCKY 40505

AS-87.03

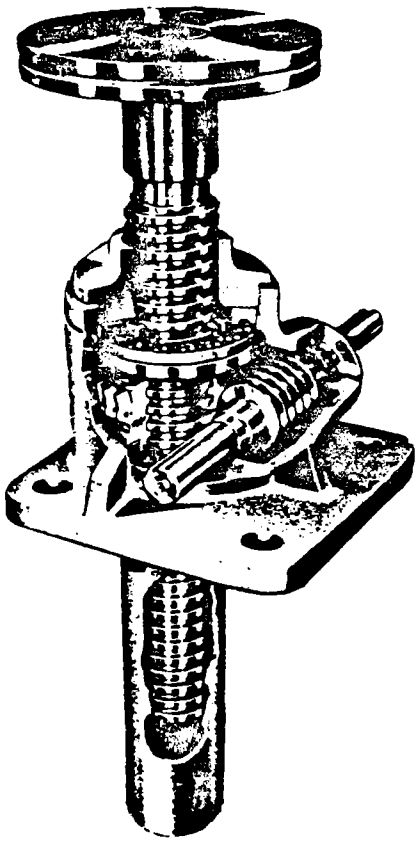
Printed in U.S.A.
Rev. Apr., 1973

M2009

1800 and 4800 SERIES

MAINTENANCE MANUAL

WITH PARTS BREAKDOWN



MACHINE SCREW JACTUATOR®

Duff-Norton

Amstar

GENERAL

This manual contains instructions for maintenance of the Worm Gear Jactuator. It contains descriptions of and procedures for disassembly, cleaning, inspection, rebuild and assembly of the Jactuator.

In order to insure that the jacks give good service over a period of years, the following precautions should be taken.

1. Select a jack that has a rated capacity greater than the maximum load that may be imposed on it.

2. The structure on which the jacks are mounted should have ample strength to carry the maximum load, and should be rigid enough to prevent undue deflection or distortion of the jack supporting members.

3. It is essential that the jacks are carefully aligned during installation so that the lifting screws are perfectly plumb and the connecting shafts are exactly in line with the worm shafts. After the jacks, shafting, gear boxes, etc., are coupled together, it should be possible to turn the main drive shaft by hand. If there are no signs of binding or misalignment, the jacking system is then ready for normal operation.

4. The worm gear jacks should have a greater raise than is needed in the actual installation. Should it be necessary to operate the jacks at the extreme limits of travel, it should be done cautiously.

CAUTION: Do not allow jack travel to go beyond catalog closed height of jack or serious damage to internal jack mechanism may result. Refer to table of specifications for closed height of respective units.

5. The worm shaft speed for these jacks should not exceed 500 RPM for heavy loads, or 1200 RPM for light loads of one-fourth (or less) of the jack capacity.

6. The lifting screw should not be permitted to accumulate dust and grit on the threads. If possible, lifting screws should be returned to closed position when not in use.

7. When using an 1800 Series Jactuator a periodic check of backlash of the lifting screw thread is recommended to check wear of the worm gear internal threads. The normal backlash on a new unit of this type is approximately .010 inch. Backlash of 50% or more of the thread thickness indicates the need to replace the worm gear.
The 4800 Series Anti-backlash Jactuator is designed to be adjusted for minimum backlash, approximately .002 inch. The worm gear and anti-backlash nut is manufactured to have a clearance between their surfaces of 1/2 the thread thickness. When adjustments have been made to the point where all this clearance is gone, 50% of the thread thickness is gone and therefore indicates replacement is necessary.

8. Unless otherwise specified, Jactuator and gear boxes are shipped packed with grease which should be sufficient for one month of normal operation. For normal operation the Jactuator and gear boxes should be lubricated about once a month, using one of the following Extreme Pressure greases or their equivalent:

Socony Mobile Oil Co.	Mobilplex E.P. #1
Texaco	Texaco E.P. #1
Gulf Oil Corp.	Gulf Crown E.P. #1
Shell Oil Co.	Shell Alvania E.P. #1

For severe service conditions, the Jactuator should be lubricated more frequently using one of the above greases (daily to weekly depending on conditions). If duty is heavy, an automatic lubrication system is strongly recommended. If ambient temperatures exceed 200°F, consult lubricant manufacturers.

CAUTION: The Jactuator shown in this manual are intended for industrial use only and should not be used to lift, support or otherwise transport human cargo. However, under certain favorable conditions where a larger capacity Jactuator and a high safety factor (about 8:1) is employed Duff-Norton Engineering may approve such applications.

NOTE: For loads of from 25% to 100% of jack capacity, torque requirements are approximately proportioned to the load, except for very light loads.

Table 1. 1800 Series Table of Specifications

2000 Series

Jack No.		1802	1805	1810	1815	1820	1825	1835	1850	1875	1899	18150
Capacity, Tons		2	5	10	15	20	25	35	50	75	100	150
Diameter Of Lifting Screw Inches		1 .250 Pitch Acme	1½ .375 Pitch Square	2 .500 Pitch Square	2¼ .500 Pitch Square	2½ .500 Pitch Square	3-3/8 .666 Pitch Square	3¾ .666 Pitch Square	4½ .666 Pitch Square	5 .666 Pitch Square	6 .750 Pitch Square	7 1.000 Pitch Square
Closed Height, Inches		5¼	7	7¼	8	9¼	11	12	13	16½	24	24
Base Size, Inches		3½ x 7	6 x 8	7½ x 8¾	7¾ x 9¼	8¾ x 11	10¼ x 13¾	10¼ x 15½	9¾ x 19¾	14 x 23	20¾ x 24½	20¾ x 24½
Worm Gear Ratios	Std. Ratio	6:1	6:1	8:1	8:1	8:1	10-2/3:1	10-2/3:1	10-2/3:1	10-2/3:1	12:1	12:1
	Optional	24:1	24:1	24:1	24:1	24:1	32:1	32:1	32:1	32:1	36:1	36:1
Turns of Worm For 1" Raise	Std. Ratio	24	16	16	16	16	16	16	16	16	16	12
	Optional	96	64	48	48	48	48	48	48	48	48	36
Maximum H. P. Per Jack	Std. Ratio	1	2	3	3	3	6	6	13½	13½	25	25
	Optional	½	¾	1½	1½	1½	2½	2½	6	6	11	11
Torque At Full Load* (In. Lbs.)	Std. Ratio	120	450	950	1,430	2,050	3,360	4,600	7,500	11,800	16,000	28,100
	Optional	50	185	490	820	1,170	1,900	2,750	4,200	6,600	8,600	15,500
Jack Efficiency Rating (Percentage)	Std. Ratio	23.2	22.1	22.0	20.2	18.8	16.4	15.2	13.8	12.6	13.0	14.1
	Optional	13.3	12.1	14.0	12.9	12.0	9.2	8.5	8.3	7.6	8.0	8.6
Weight With Base Raise Of 6" (Pounds)		17	35	52	66	93	181	240	410	610	1200	1350
Weight For Each Additional 1" Raise (Pounds)		.33	.85	1.4	1.5	2.6	3.5	4.1	5.5	6.7	9.0	12.6

*For loads of from 25% to 100% of Jack Capacity. Torque requirements are approximately proportional to the load.

Table 2. 4800 Series Table of Specifications

Jack No.		4802	4805	4810	4815	4820	4825	4835	4850	4875	4899	48150
Capacity, Tons		2	5	10	15	20	25	35	50	75	100	150
Torque at Full Load (In. Lbs.)	Std. Ratio	135	500	1045	1573	2255	3700	5060	8250	13000	17600	30900
	Optional	55	205	540	905	1290	2090	3025	4620	7260	9460	17050
Jack Efficiency Rating (Percentage)	Std. Ratio	19.6	19.9	19.8	18.0	17.6	13.4	13.7	12.4	11.3	11.7	12.7
	Optional	11.9	10.9	12.6	11.0	10.8	8.3	7.7	7.3	6.8	7.2	7.7
Closed Height (Inches)		5¼	7	7¼	8	9¼	12	13	14	18½	26½	26½
Weight With Base Raise of 6" (Pounds)		18	37	55	70	101	197	250	440	675	1325	1475

NOTE: Additional specifications are same as for Series 1800. See table 1.

Table 3. Decimal Ratio Table of Specifications

Jack No.	1802	1805	1810	1815	1820	1825
Capacity, Tons	2	5	10	15	20	25
Diameter Of Lifting Screw (Inches)	1 .250 Pitch Acme	1½ .250 Pitch Acme	2 .250 Pitch Acme	2¼ .250 Pitch Acme	2½ .250 Pitch Acme	3-3/8 .320 Pitch Square
Worm Gear Ratio	25:1	25:1	25:1	25:1	25:1	32:1
Turns of Worm For 1" Raise	100	100	100	100	100	100
Torque At Full Load (In. Lbs.)	48	175	370	640	925	1500
Jack Efficiency Rating (Percentage)	13.2	9.1	8.6	7.5	6.9	5.3
Maximum H. P. Per Jack	½	¾	1½	1½	1½	2½

NOTE: All other data for these models are the same as shown in table 1.

GENERAL REBUILD PROCEDURE

1. Tag critical parts to facilitate reassembly.
2. Mark mating surfaces to insure proper meshing.
3. Clean and lubricate parts as required.
4. All seals must be replaced at time of rebuild.
5. All screws, washers and other small common parts must be replaced if mutilated in any way.
6. Replace damaged or frozen lubrication fittings with new fittings.

TOOLS REQUIRED

Bearing puller or press and common hand tools.

DISASSEMBLY (See figure 1)

1. Remove bottom pipe (4) from shell (3) (upright models) or shell cap (2) (inverted models) or base plate as applicable.
2. FOR ALL MODELS EXCEPT 100 AND 150 TON—Loosen and remove set screws (1) in cap (2) and remove cap from shell (3).
   FOR 100 AND 150 TON MODELS—Loosen the lock screw in the shell and unscrew (counter-clockwise) the base plate from the shell.

NOTE: It may be necessary to break shell cap or base plate loose with a hammer.

3. Grasp the lifting screw (5) and pull the screw, worm gear (6A) or worm gear and nut assembly (6B) on anti-backlash unit, and top bearing (7) from the shell (3).
4. Unscrew worm gear (6A) or worm gear and nut assembly (6B) from lifting screw (5) and slip off the shell cap (2).
5. Remove top load bearing (7) which may be attached to either shell cap (2) or worm gear (6A) or anti-backlash nut.

CAUTION: Use only a wooden mallet to tap bearings loose.

6. Remove bottom load bearing (8) which may be attached to either the shell (3) (base plate for 100 and 150 ton models) or worm gear (6A).
7. Remove four cap screws (9) from each of the two worm flanges (11) and remove flanges.

NOTE: Take care not to lose the flange shims (12).

8. Press oil seal (13) out of flange (11).
9. Remove worm (14) and worm bearings (15) from shell (3) by striking one end of worm with a wooden or lead mallet.
10. *Remove worm bearings (15) from worm (14) with bearing puller or press.

*NOTE: *This step will not be necessary if worm and worm bearings are not damaged.*

11. If jack is keyed, remove screw in shell cap (shell on 100 and 150 ton models) and tap key out of keyway.

CLEANING

1. Use degreasing solvent, paint thinner or dry cleaning solvent to remove grease or oil from all parts.

CAUTION: Remove grease from unit and do not reuse old grease.

WARNING: Provide adequate ventilation during the use of cleaning agents; avoid prolonged breathing of fumes and contact with skin.

2. Use clean water or soap solution of 1/4 pound of soap chips to one gallon of hot water for general cleaning of painted surfaces.
3. Dry parts thoroughly with moisture-free compressed air.

NOTE: Before installing new parts, remove any rust preventive, protection grease, etc.

INSPECTION (See figure 1)

1. Make a visual inspection of shell (3) for broken, cracked or distorted areas. Check threads of all bores for burrs or broken threads.
2. Check shell cap (2), base plate, bottom pipe (4), lifting screw (5), worm gear (6A) or worm gear and nut assembly (6B) for burrs or scratches on their working or mating surfaces.
3. Check fit between lifting screw thread and internal thread in worm gear. If fit is excessively loose, replace worm gear or lifting screw as required. Replace worm gear and nut assembly as a set (4800 Series).
4. Check small common components (screws, etc.) and replace as required.
5. Check bearings (7), (8) and (15) for seizure, galling or play and replace as required.

ASSEMBLY (See figure 1)

1. Press worm bearings (15) onto worm shaft (14) making sure that bearings are seated properly against shoulder.

NOTE: When tapered roller bearings are used, the small end of the cone should point to the worm end.

2. Position worm shaft end (14) in shell (3).

NOTE: If tapered roller bearings are used, tap worm bearing cups into place in the shell.

3. Press oil seals (13) into worm flange (11).

NOTE: The sealing element should point inward.

4. Position worm flanges (11) with shims (12) and bolt in place.

5. Position bottom load bearing (8) (top load bearing (7) on 100 and 150 ton models) into shell (3).

6. Install worm gear (6A) or worm gear and nut assembly (6B) in shell (3).

CAUTION: Strike each end of worm shaft sharply with a wooden mallet to seat bearing properly. Recheck flange bolts for tightness. Worm should turn freely with minimum drag and end play. If too much end play is present, remove shims as required. If worm does not turn freely, add shims as required.

7. Install top load bearing (7) (bottom load bearing (8) for 100 and 150 ton models) on worm gear (6A) or worm gear and nut assembly (6B).

8. Fill housing fully with grease.

9. FOR ALL MODELS EXCEPT 100 AND 150 TON – Install cap (2) and screw down until tight.

NOTE: Shell cap flange does not necessarily have to bear against top of shell, there will usually be a gap. This will put a slight drag on worm. If worm is hard to turn, back off slightly on shell cap.

FOR ALL 100 AND 150 TON MODELS – Install base plate and screw down base plate until tight.

NOTE: This should put a slight drag on the worm. If the worm is hard to turn, back off slightly on the base plate. Be sure base plate does not project past base surface of housing.

10. Spot-drill and lock shell cap set screws in place (lock screw on 100 and 150 ton models).

NOTE: If new parts have been installed, it may be necessary to respot holes for these screws.

11. FOR ALL MODELS EXCEPT 100 AND 150 TON – Screw bottom pipe (4) into shell (3) (upright models) or into shell cap (2) (inverted models).

FOR 100 AND 150 TON MODELS – Screw bottom pipe into base plate (upright models) or into shell (inverted models).

12. Brush lifting screw (5) with a light film of grease and install in jack. On inverted models, install guide bushing (16) and then install lifting screw (5).

13. If jack is keyed, install key in shell cap (2) (shell for 100 and 150 ton models) and bolt in place.

14. Operate unit to insure proper functioning of all components prior to reinstallation.

1800 AND 4800 SERIES JACTUATOR (MACHINE SCREW)

FIGURE NO.	PART NAME	NO. REQ.
1	SCREW, Set (All models except 100 and 150 ton)	2
2	CAP, Shell (All models except 100 and 150 ton)	1
3	SHELL, Jactuator	1
4	PIPE, Bottom	1
* 5	SCREW ASSEMBLY, Lifting	1
6A	WORM GEAR	1
6B	WORM GEAR AND ANTI-BACKLASH NUT ASSEMBLY (Mfgd and sold in sets only)	1
7	BEARING, Top Load	1
8	BEARING, Bottom Load	1
9	SCREW, Cap	8
10	WASHER, Lock	8
11	FLANGE. Worm	2
12	SHIM, Flange	2
13	SEAL, Oil	2
14	WORM	1
15	BEARING, Worm	2
16	BUSHING, Guide (inverted model only)	1
17	FITTING, Grease	As Req.
18	NAMEPLATE	1
19	SCREW, Lock (100 and 150 ton only)	1
20	PLATE, Base (100 and 150 ton only)	1

When ordering spare parts be sure to include:

1. The nameplate model number of your jactuator.
2. Figure number and name of part.

* Item 5 is modified by CCI per specific requirements. Order a new part, when required, from Control Components Inc.

Anti-Backlash Nut Function

As shown in figure A the worm gear (2) and anti-backlash nut (3) are pinned together with guide pins. The threads in the anti-backlash nut work in opposition to the threads in the worm gear as they engage the threads of the lifting screw (1). Adjustment of backlash is made by running down on the shell cap of the Jactuator. This forces the anti-backlash nut threads into closer contact, reducing clearance and thus reducing backlash.

Anti-Backlash Nut Adjustment

1. To minimize backlash remove the two set screws (4) and tighten down on shell cap until the desired backlash is obtained. Respot top of shell through set screw holes, then replace set screws and tighten to prevent shell cap backing off.
2. To avoid binding and excessive wear, do not adjust lifting screw backlash to less than 0.002 inch.
3. The clearance (A) designed into the worm gear and anti-backlash nut set is one-half the thread thickness. When adjustments have been made to use all this clearance replace the worm gear and anti-backlash nut as a set.

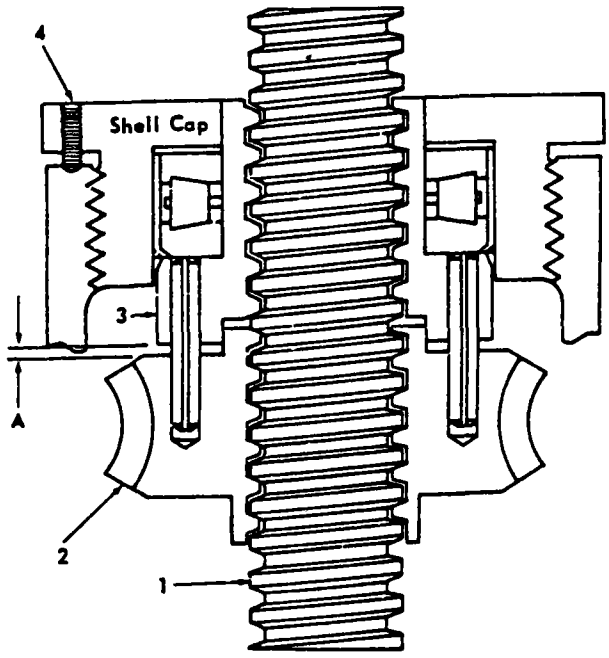
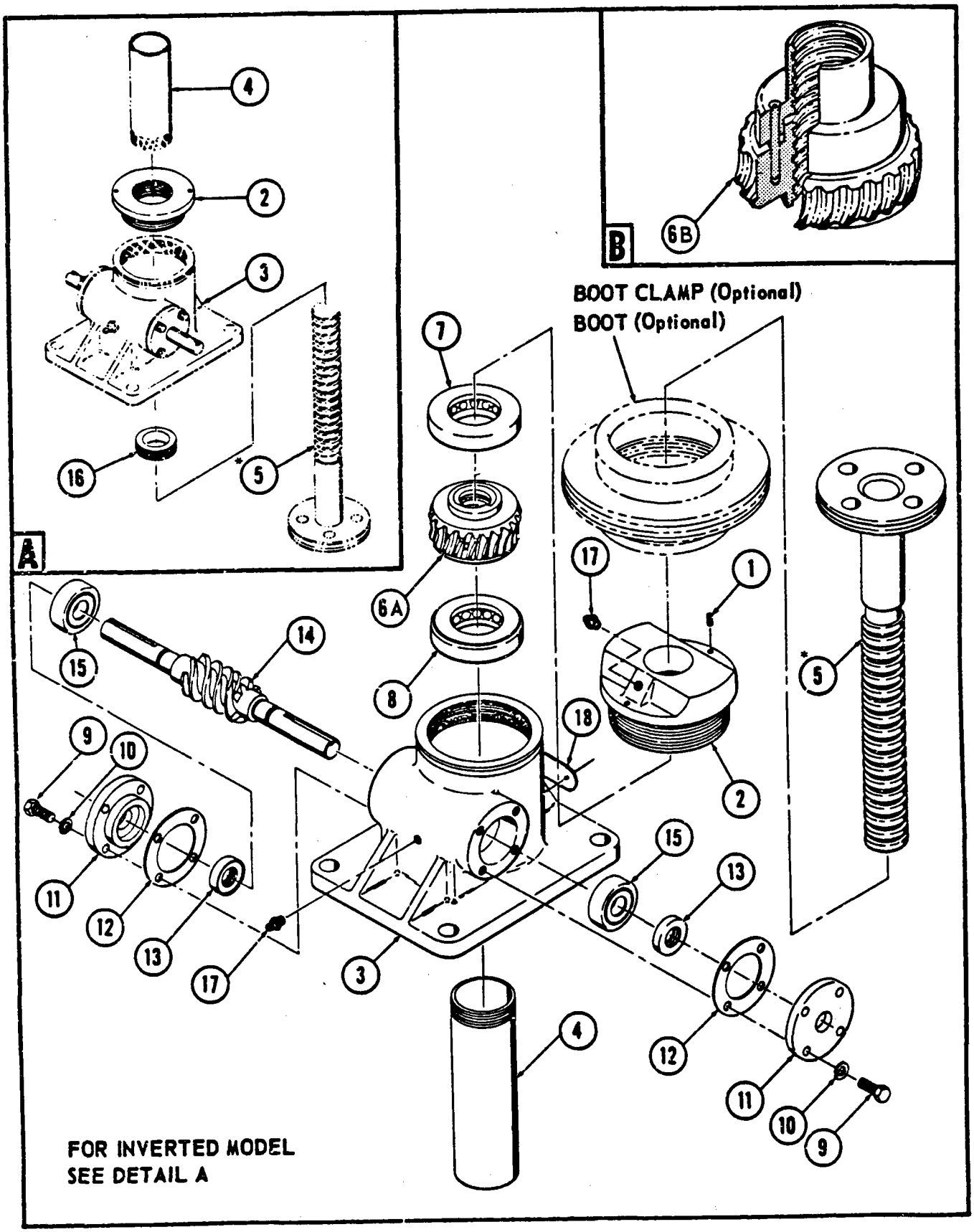
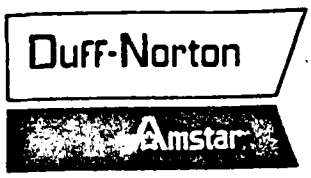


Figure A. Anti-Backlash Nut Adjustment

*Patent No. 3,323,777

CIRCLED NUMBERS REFER TO FIGURE NUMBERS ON PAGE 6





Duff-Norton Company, P.O. Box 1719, Charlotte, North Carolina 28201 (704) 588-0300
The Canadian Duff-Norton Co., Ltd., 15 Lockport Avenue, Toronto 540, Ontario (416) 239-3525

Branch Offices:
744 Broad St., Newark, N.J. 07102 (201) 622-1810
3002 Liberty Avenue, Pittsburgh, Pa. 15201 (412) 391-5544
801 Pratt Boulevard, Elk Grove Village (Chicago), Illinois 60007 (312) 439-8866
150 Park Lane, Crocker Industrial Park, Brisbane (San Francisco), Calif. 94005 (415) 467-3060

4.1.39-126

5.4.10

SK-2389
Litho in U.S.A.

DIRAG
WELDO
(CONTIR
ELEME

QA DATA PACKAGE

4.1.38-127

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6. Plug
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   c. Hardfacing Certified Mill Test Report

7. Seat Ring
   a. Certified Mill Test Report
   b. L.P.I.
   c. Hardfacing Certified Mill Test Report

8. Bolting
   a. Certified Mill Test Report

Babcock & Wilcox

Control Components, Inc.
2567 S.E. Main Street, Irvine, California 92714
Telephone: (714) 979-6600
Telex: 68-5500

DATE July 17, 1981

CERTIFICATION OF CONFORMANCE

CUSTOMER NAME STEARNS-ROGERS

CUSTOMER P.O. # 5000-C21700

VALVE TAG # PV-1001

C.C.I. WORK ORDER # 24744

C.C.I. PART NUMBER 24744-1

VALVE S/N 24744-1-1

Control Components, Inc., certifies items furnished have been manufactured in accordance with applicable specifications in effect on the date of manufacture.

SKIP TALLMAN
Q.A. ENGINEER

BABCOCK & WILCOX

CONTROL COMPONENTS INT'L.

HYDROSTATIC, SEAT LEAKAGE & PERFORMANCE TEST REPORT

Customer: STEARNS - ROGER

P.O. No. 5000-C21700 — Part Name: DRAG VALVE

CCI S/N 24744-1-1 — Tag No. PV-1001

Drawing No. 24744-1-S — Rev. D — Spec. No. JP-5D 511, 519, 506, 505, 508 REV. D, C, B, B, A, A

HYDROSTATIC:

Pressure 9375 PSIG — Time 3 MIN.

Gauge No. CCI-635 — Range 0-15,000 PSI.

Last Calibration Date 6-12-81 — Graduation 100 PSI.

CCI Inspector Alex Alfieri — Date 7/9 — Results accept

Customer Inspector _____ — Date _____

Authorized Nuclear Inspector _____ — Date _____

SEAT:

Pressure N/A PSIG — Time N/A MIN.

Allowable Leakage _____ CC/MIN — Fluid TREATED WATER

Actual Leakage _____ CC/MIN. — Gauge No. _____

Range _____ PSI. — Graduation _____ PSI

Last Calibrated Date _____ — Measuring Instrument GRAD. CYL.

Inspector _____ — Date _____

Customer Inspector _____ — Date _____

PERFORMANCE:

Supply: Actual 80 PSI. — Required 80-100 PSI.

Gauge/Meter No. CCI-1103 — Range 0-200 PSI

Last Calibration Date 12-27-80 — Graduation 2 PSI.

Stroke: Actual 6.437 IN. — Required 6 ± .25 IN. NOM.

Signal: Full Open: Actual 19.5 MA — Required 20 MA

Full Close: Actual 4.3 MA — Required 4 MA

Failure Mode: Closed ☒ Open ☐ In Place ☐ On Loss of Signal ☐ Power ☒ Both ☐ Acceptable ☒ Unacceptable ☐

Override: Acceptable ☒ Unacceptable ☐ N/A ☐

LEAK TEST 80 PSI ACCEPTABLE ☒ UNACCEPTABLE ☐

STROKE TIME: Actual ____ Sec. to Open — Required .8 Sec. to Open

Actual ____ Sec. to Close — Required 1.0 Sec. to Close

CCI Inspector J. Carruchet — Date 7-16-81

Customer Inspector _____ — Date _____

Test Performed By: M. Crandall, MC Testing — Date 7-9-81 7/13/81

Remarks: (HYDRO) SOLENOID GROUND TESTED

D-1331 Rev. 2 ACCEPTED 7-16-81

LOS ANGELES

EARLE M. JORGENSEN CO.

STEEL
FORGE DIVISION
10650 SO. ALAMEDA STREET • PHONE 567-1122 (Area Code 213)
MAILING ADDRESS: P.O. Box 54633
LOS ANGELES, CALIFORNIA 90054

INVOICE NO.

SHIPPED 1-6-81
TYPED BY GILDA TIME

DELIVERY RECEIPT
TEST REPORT

INVOICE NO. 7082 FL

7082 FL OK

CUSTOMER P.O. NO.	DATE ENTERED	ENT'D. BY	ORDERED BY
05416D	10/15/80	GH	LARRY

Body

34-125670-3
CONTROL COMPONENTS
2567 S E MAIN ST
IRVINE CA 92713

SHIP TO

Material Accepted
A182 F22
JAN 13 1981
C.C.I.-Q.A.

SHIP VIA: TRUCK	WILL CALL	CARRIER	F.O.B.	DEST. FREIGHT PPD.	OUR PLANT FREIGHT COLL.	O/P PREPAID CHARGE FRT.	O/P COLLECT ALLOW FRT.
X		COOK		X			

QUANTITY AND DESCRIPTION	WEIGHT	HEAT NO.
ASTM A 182 F22 FORGED OVERSIZE TO ALLOW FOR FINISH NORMALIZE AND TEMPER TO OBTAIN 75000 TENSILE 45000 YIELD 20% ELONGATION 30% REDUCTION OF AREA (156/207 BHN), SAW CUT GRAY WITH GREEN STRIPE 212103		
1 ONLY 19.25 X 21.88 X 28-1/2	3920#	A1-21373
MECH TESTING REQD AND INCL IN PRICE MARK WITH PO# 05416D, EMJ, 7082FL, HT#___ FIN SIZE, A 182-F22		

4.1.3B-132

CENTURY

CERTIFIED TEST REPORT

We certify that the material covered by this report has been inspected and tested in accordance with the applicable requirements described herein and test results are on file subject to examination.

By _____
TEST REPORT CLERK

SUBSCRIBED AND SWORN TO BEFORE ME THIS

15 DAY OF JANUARY 19 81

_____
NOTARY PUBLIC

OFFICIAL SEAL
MICHAEL MORRIONE
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
My Commission Expires June 21, 1982

NUCLEAR ORDERS ONLY

ASME Quality System Certificate Number N-1707

Expires _____

HEAT NO.	YIELD	TENSILE	ELONG. % IN INCHES	% RED. IN AREA
A1-21373	57400	94800	21	55.5
ACTUAL	PHYSICALS IN LONGITUDINAL DIRECTION.			

C	MN	P	S	SIL	NI	CR	MO	V	CU		G/S	MILL	HEAT NO.
.09	.41	.012	.019	.18		2.36	.95	.024			5	EMJ SEA	21373

HARDENABILITY -- ROCKWELL "C"

1	4	5	8	10	16	20	32

EARLE M. JORGENSEN CO.

FORGE DIVISION

CERTIFICATION OF HEAT TREATMENT

DATE 12-30-80

CUSTOMER
ADDRESS CONTROL COMPONENTS

THIS IS TO CERTIFY THAT YOUR MATERIAL SHOWN BELOW WAS PROCESSED AS FOLLOWS:

PURCHASE ORDER NO.	OUR FD NO.	MATERIAL GRADE	DESCRIPTION
5416D	7082 FL	F22	19.25" x 21.88" x 28 1/2"
PART NUMBER		QUANTITY: 1 w/TEST	HEAT NO. A1-21373

TREATMENT	TEMPERATURE	TIME AT TEMPERATURE	COOLING METHOD	RESULTS
NORMALIZE	1700° F	20 HOURS.	STILL AIR	
ANNEAL				
STRESS RELIEVE OR TEMPER	1240°F	20 HOURS	STILL AIR	187/192 SURFACE BHN

REMARKS:

Material Accepted
AMS 6382 F22
JAN 15 1981
C.C.I. Q.A.

OFFICIAL SEAL
FLORENCE REESE
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
My Commission Expires Aug. 26, 1983

SUBSCRIBED AND SWORN TO BEFORE ME

THIS 6 DAY OF JANUARY 19 81

Florence Reese NOTARY PUBLIC

STATE OF CALIFORNIA, LOS ANGELES COUNTY

MY COMMISSION EXPIRES

4.1.39-133

EARLE M. JORGENSEN CO.

BY [signature]

HI

VALVE BODY

REFERENCE PROCEDURE IP-157

24744-1-002

PART NO. 32010168S

"A"

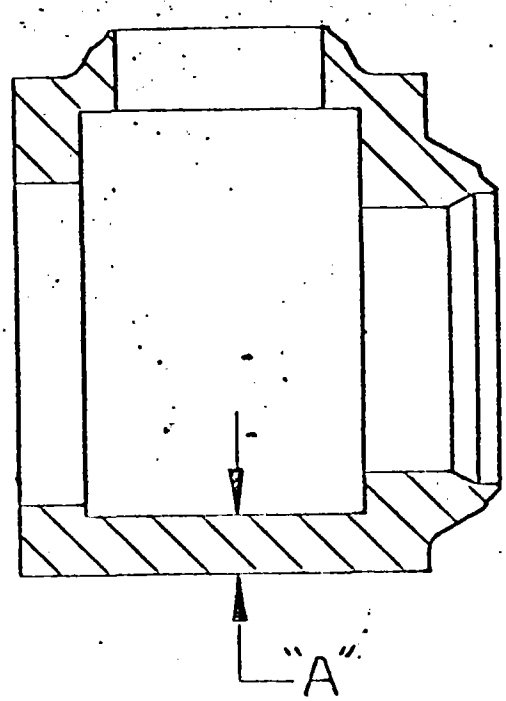
MIN. WALL PER B/P 3.51 HEAT NO. 21373 SERIAL NO. N/A

ACTUAL 0° 3.710

ACTUAL 90° 3.535

ACTUAL 180° 3.545

ACTUAL 290° 4.54



Submit the completed form to Quality Assurance Engineering. Do not keep with the Traveler.

Inspector [signature] Date 5/15/81

Q.A. Review _____ Date _____

Measurement method used (Mechanical)/Ultrasonic* (Circle one).

*Ultrasonic measurements are made using a panametrics ultrasonic thickness gauge with digital readout, Model #5221, with an accuracy of ± 1/2%.

Bonnet

AJAX Forging and Casting Co.

1350 JARVIS AVENUE
FERNDALE, MICH. 48220
AREA CODE (313) 564-4990

11-21-74

MATERIAL CERTIFICATION

CUSTOMER NAME Control Components, Inc.
PURCHASE ORDER NO. 32353 Req 13892 DATE 10-1-74
AJAX SHOP ORDER NO. 46-55233 DATE 11-21-74

ITEM NO. 1 - 2 Pcs MATERIAL F - 22 HEAT NO. 44316

DESCRIPTION
24" x 36" x 23" Cube
Finished Sides
Annealed
Rough Forging Only

CHEMISTRY

Carb.	Mn.	Ph.	S.	Si.	Cr.
.12	.32	.015	.020	.37	2.10

W.	Ni.	Mo.	V.	Cu.	Others
		1.03			

SPECIFICATION REFERENCE

ASTM A 182 - F - 22 and CCI 351

We certify that this material has been heat treated according to the indicated specification and does meet the requirements as commercially tested and indicated on the back of this certification.

DOCUMENTATION
RECEIVED/OK
A182-F22
DEC 11 1974
C.C.I. - Q.C.

AJAX Forging and Casting Co.

L E Peterson

4.1.39-135

SPECIFICATIONS AND TEST RESULTS

	REQUIRED	TEST 1	TEST 2	TEST 3	TEST 4
HARDNESS – B.H.N.		156	153		
TENSILE STRENGTH – P.S.I.	70,000	74,535	73,531		
YIELD STRENGTH – P.S.I.	40,000	52,005	48,509		
ELONGATION – % IN 2"	20	33.5	32.2		
REDUCTION OF AREA %	30	68.9	68.2		
CHARPY – FT. LBS. AT _____ °F					
ETCH					
HARDENABILITY TEST 1/2" SLICE; 30 MIN. @ 1750 °F AIR COOL					

HEAT TREAT PROCESSES RECORD

	MAX. TEMP. °F	TIME CYCLE	FURNACE NO.	B.H.N. CHECKED
ANNEAL				
NORMALIZE				
HEAT TREAT				
AIR QUENCH				
OIL QUENCH				
WATER QUENCH				
FIRST TEMPER				
SECOND TEMPER				
THIRD TEMPER				
FIRST AGING				
SECOND AGING				
DEEP FREEZE				

BONNET

REFERENCE PROCEDURE IP-157

PART NO. 44744-1 / 321401637

"A"

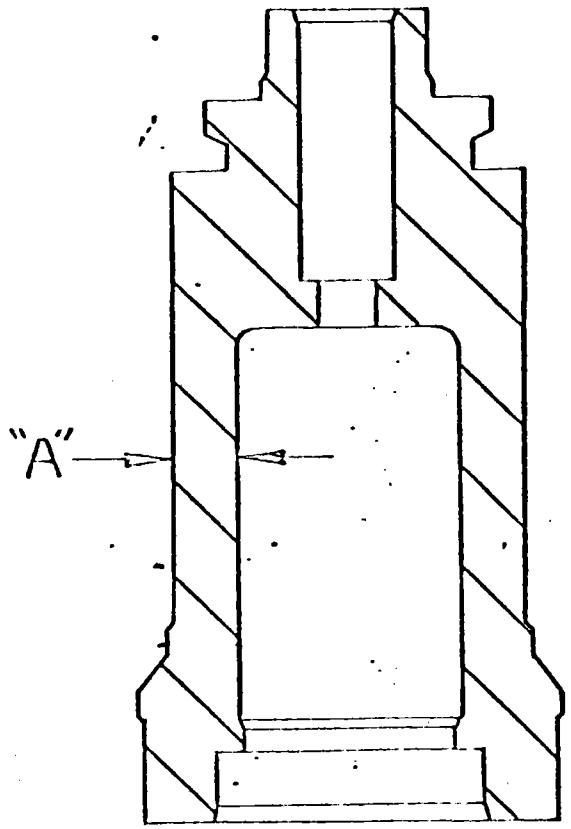
MIN. WALL PER B/P .88 HEAT NO. 44316 SERIAL NO. —

ACTUAL 0° 2.370

ACTUAL 90° 2.365

ACTUAL 180° 2.367

ACTUAL 290° 2.365



Submit the completed form to Quality Assurance Engineering. Do not keep with the Traveler.

Inspector Alex. Altieri Date 6/5/81

Q.A. Review _____ Date _____

Measurement method used (Mechanical)/Ultrasonic* (Circle one)

*Ultrasonic measurements are made using a panametrics ultrasonic thickness gauge with digital readout, Model #5221, with an accuracy of ± 1/2%.

CHARLES E. LARSON & SONS, INC. — OPEN DIE FORGINGS

Bonnet Flange

TO Babcock & Wilcox
Control Components, Inc.
Irvine, California

CUSTOMER ORDER NO.	DATE SHIPPED	HEAT NO.	SPECIFICATION-GRADE
05415-D	2-27-81	125752	PS-604, Para. 3.0, Rev.F ASTM A-182 F22

ITEM	QUANTITY	DESCRIPTION
1	1-	843150014 Roller forging made, normalized & tempered 11" Dia. x 19" Long
2	1-	843158038 Ditto Ring- 17"OD x 7-3/4"ID x 4-1/2" Long

The forgings were heated to 1700°F, 1 Hour, Air-cooled.
The forgings were re-heated to 1300°F, 7 Hours, Air-cooled.

Material Accepted
A182 F22
MAR 10 1981
C.C.I.-Q.A.

REPORTED LADLE ANALYSIS

C	Mn	P	S	Si	Ni	Cr	Mo	V	Cu	Co	Cb
.14	.50	.010	.020	.23		2.27	.98				

Ta	Al	Sn	Fe	Ti	B	Pb	W

MECHANICAL PROPERTIES

HARDNESS	TENSILE (PSI)	YIELD (PSI)	%ELONG. IN 2"	%RED. IN AREA	ULTRASONIC TEST RESULTS
197 BHN	92,250	72,000	25%	75%	

GRAIN SIZE

JOMINY HARDENABILITY BY 1/16"

1	2	3	4	5	6	7	8	9	10	12	14	16	20	24	28	3

SUBSCRIBED AND SWORN TO BEFORE ME

27th. DAY OF Feb., 1981

NOTARY PUBLIC

CHARLES E. LARSON & SONS, INC.
Asst. Sec. & Treas.

FORGERS OF CARBON, ALLOY, STAINLESS & TOOL STEELS, COPPER, MONEL, INCONEL, HIGH TEMPERATURE & EXOTIC METALS

MIN .88

"A"

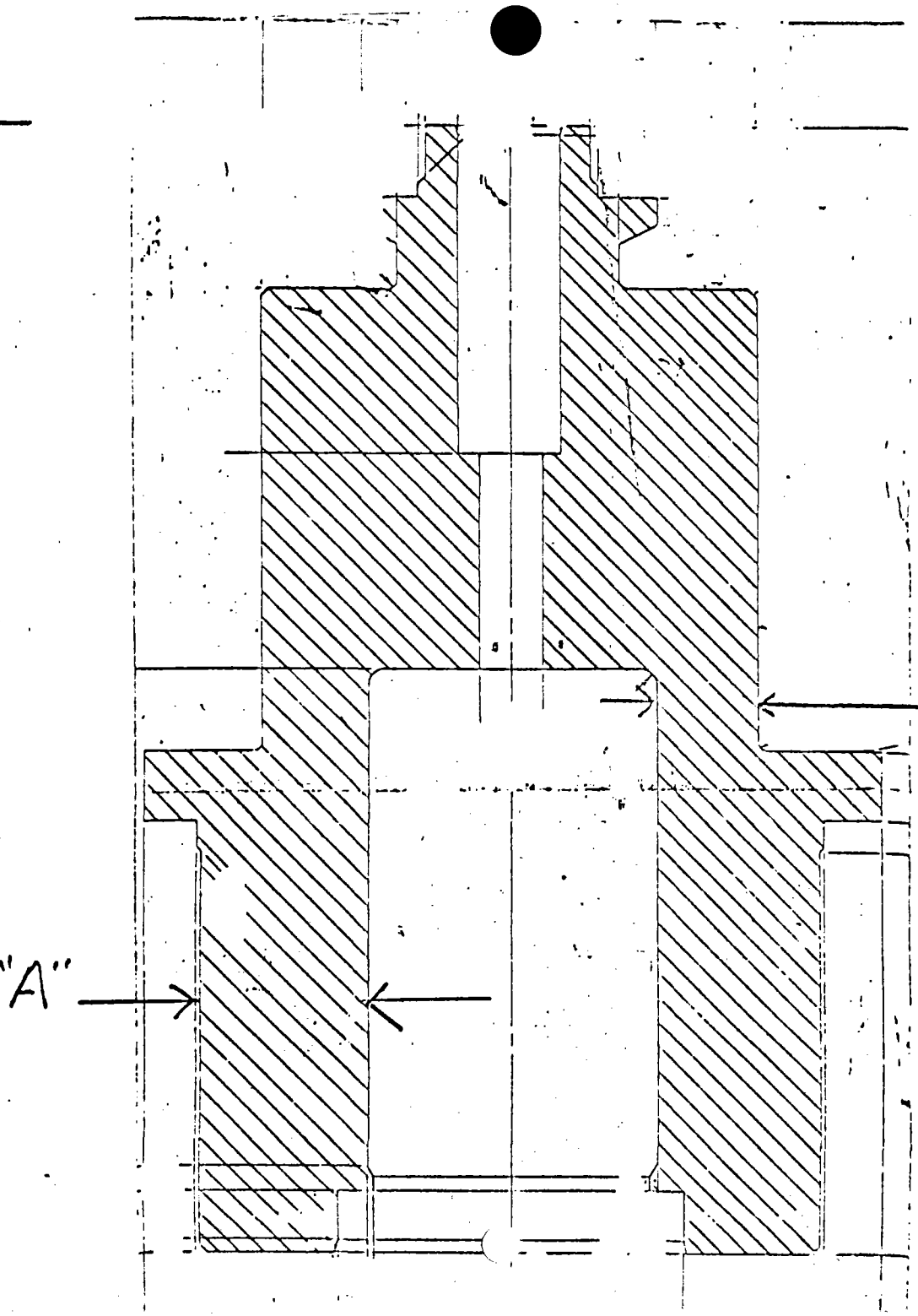
90° 2.394

120° 2.394

270° 2.3945

360° 2.3945

4.1.39-139



MIN .88

"B"

90° 1.957

180° 1.957

270° 1.9575

360° 1.9575

WO 24744-1-013

PN 3214016 37

HT 12-5752

S. Bearing

4/3/81

Mechanical Drop.

TWX
910-221-1357

CHARLES E. LARSON & SONS
OPEN DIE FORGINGS

CHICAGO, ILL. 6065

Plug
RECEIVED
OCT 1 8 1980
PURCHASING

TO Babcock & Wilcox
Control Components, Inc.
Irvine, CA.

Material Accepted
A182 F11
OCT 1 8 1980
C.C.I. Q.A.

CUSTOMER ORDER NO.	DATE SHIPPED	HEAT NO.	SPECIFICATION-GRADE
04260-D	9-29-80	218858	ASTM A-182 F11

ITEM	QUANTITY	DESCRIPTION
1	2-	843150155 Bar forgings made, normalized & tempered 4½" Dia. x 72" Long
2	6-	843150012 Ditto Bars- 9" Dia. x 72" Long
3	4-	843150159 Ditto Bars- 12½" Dia. x 72" Long

The forgings were heated to 1700°F/2 Hrs./Aircooled.
The forgings were tempered to 1300°F/9 Hrs./Aircooled.

"This certification affirms that the contents of the report are correct & accurate & that all test results and operations performed by us or our sub-contractors are in compliance with the requirements of the applicable material specifications."

REPORTED LADLE ANALYSIS

C	Mn	P	S	Si	Ni	Cr	Mo	V	Cu	Co	Cb
.14	.51	.009	.013	.70		1.31	.48				

Ta	Al	Sn	Fe	Ti	B	Pb	W

MECHANICAL PROPERTIES

HARDNESS	TENSILE (PSI)	YIELD (PSI)	%ELONG. IN 2"	%RED. IN AREA
149 BHN	72,500	46,500	34%	72%

ULTRASONIC TEST RESULTS

GRAIN SIZE	JOMINY HARDENABILITY BY 1/16"																
	1	2	3	4	5	6	7	8	9	10	12	14	16	20	24	28	32

SUBSCRIBED AND SWORN TO BEFORE ME
THIS 29th DAY OF Sept. 1980

NOTARY PUBLIC

4.1.39-140

CHARLES E. LARSON & SONS, INC.

[illegible] EXPIRES OCTOBER 10, 1981

[illegible] COX COMPANY
CONTROL COMPONENTS INT'L.

LIQUID PENETRANT/MAGNETIC PARTICLE
NON DESTRUCTIVE EXAMINATION REPORT

Customer _____ P. O. No. 04260

CCI WO# 24744-1-042 SN 1

Part Name PLUG Part No. 3206016007 XX Heat No. 218758

No. of Pieces 1 Op. No. 80 Spec. No. NDE 102 Rev. C PS6005 E-27

Rejected 0 Accepted 1 NCMR No. _____

Comments _____

☑ Dye Penetrant Penetrant Brand Name MET-L-CHEK Batch No. 1000

☐ Flourescent Penetrant Remover Brand Name H_2O Batch No. N/A

Developer Brand Name MET-L-CHEK Batch No. 1099

☐ Magnetic Particle: ☐ Wet Method ☐ Dry Method ☐ Visable

☐ Flourescent ☐ Continuous ☐ Residual

Magnetization Method: ☐ DC ☐ AC ☐ Rectified

Demagnetization Required: ☐ Yes ☐ No

☐ Electro Magnetic Yoke Amperes _____

☐ Head (Clamps) Amperes _____

☐ Central Conductor Amperes _____

☐ Longitudinal (Coil) Amperes _____

☐ Prod Amperes _____

Surface Condition:

☐ Pre-Overlay ☐ Rough Machined ☑ Finish Machined ☑ Weld

☐ Weld Detail ☐ As Cast ☐ Heat Treat

Test Performed By _____ ASNT LEVEL II Stamp _____ Date 3/25/81

Witnessed By _____ ASNT LEVEL _____ Stamp _____ Date _____

Customer _____ Stamp _____ Date _____

Authorized Nuclear Inspector _____ Stamp _____ Date _____

CERTIFIED REPORT OF TESTS

SALES NO. | B/O | SUF | DATE SHIPPED | CUSTOMER REFERENCE

REPORT NO. 00237 | PAGE OF PAGES

HIGH TECHNOLOGY MATERIALS DIV.
WEAR TECHNOLOGY DIVISION
CABOT CORPORATION
1020 WEST PARK AVENUE
KOKOMO, INDIANA 46901

HARD FACE ALLOY SUPPLY CO
8351 SECURA WAY
SANTA FE SPRINGS CA 90670

SHIP TO

CONTROL COMPONENTS INT
P.O 02833A
2-23-81

PRODUCT DESCRIPTION

HAYNES STELLITE ALLOY
ALLOY NO.6 PLASMA WELD POWDER

SPECIFICATION	QUANTITY ORDERED	QUANTITY SHIPPED
		1000 LBS

HEAT NUMBER	HEAT SUFFIX	LBS	Al	B	C	Cb+Ta	Co	Cr	Cu	Fe	Mn	Mo	Ni	P	S	Si	Ti	V	W
1060	3901	-1			1.19		BAL	28.57		2.27	.36	1.0	2.33			1.09			5.21
1060	3901	-4			1.19		BAL	28.57		2.27	.36	1.0	2.53			1.09			5.21

TENSILE TEST AT ROOM TEMPERATURE					TENSILE TEST AT ELEVATED TEMPERATURE						STRESS RUPTURE				
ULTIMATE	1% YIELD	0.2% YIELD	% ELONG IN	% RA	TEST TEMP°	ULTIMATE	1% YIELD	0.2% YIELD	% ELONG IN	% RA	TEST TEMP°	STRESS	HOURS	% ELONG IN	% RA

4.1.39-142

ANNEALED HARDNESS	AGED HARDNESS	GRAIN SIZE

POWDER MATERIAL AS SUPPLIED MEETS THE CHEMISTRY REQUIREMENTS OF R Co Cr - A COMPOSITION AS DEFINED BY AWS 5.13.

Material Accepted
Lot #6
FEB 24 1981
C.C.I.-Q.A.

CERTIFIED BY

J.D. Baas
1-27-81 bc

T-335 1-27-8
001 13

Cert #237

STELLITE DIVISION
CABOT CORPORATION
13808 E. IMPERIAL HWY. SANTA FE SPRINGS, CALIF. 90670
213/921-4455

Date: 1-27-
Certification No.: 127-
Customer No.: 7755
S. O. No.: 36309

[illegible]
[illegible]
SANTA FE SPRINGS, CA 90670

[illegible]
C.O. 702333A

ITEM	PRODUCT NAME	LOT	HEAT	F-MIX	C-MIX	WEIGHT
	STELLITE alloy 6 Plasma Weld Surfacing Powder		3201-1			1020

CHEMICAL ANALYSIS - WEIGHT PERCENT

ITEM	B	C	Co	Cr	Fe	Mn	Mo	NI	P	S	SI	W	OTHERS
		1.19	Bal.	28.57	2.27	.36	.10	2.33			1.02	5.21	

The analysis shown conforms to the chemistry requirements of AWS A5.13-70 Type [illegible].

4.1.39-143

Material Accepted
FEB 17 1981
C.C.I.-Q.A.

Stellite Powder

STELLITE DIVISION
CABOT CORPORATION

Manager, Quality Control

BABCOCK & WILCOX
CONTROL COMPONENTS INTERNATIONAL

Work Order Number 24744-1-042 Serial Number 1

Part Name Plug Operation Number 25

Part Number 32060160 7XX Revision N/C

NCMR# (If Applicable) _____

FABRICATION ASSEMBLY REPORT

	DESCRIPTION	PART NUMBER	MATERIAL	HEAT NUMBER
1	Plug	843150155	F 11	21858
2				
3				
4				
5				
6				
7				

WELD NUMBER (IP-154)	1	2	3	4	5
Welder	[illegible]				
Stamp Number	P				
Weld Procedure & Rev.	(G) WS-277-84-P				
Filler Metal Type	Stellite 6				
Filler Metal Heat No.	237				
Flux Heat Number					

Ready for Weld: Inspector Yvonne (QC) Date 2.25.81

VISUAL WELD INSPECTION REPORT

Weld Type					
Weld Surface	Overlay				
Undercut					
Reinforcement					
Root of Weld					

The above weldment has been inspected and conforms to IP-154 INSPECTOR G. Shepard (QC) DATE 3-25-81

White copy of Fabrication Ass'y Record to QAE.

INSPECTOR _____ DATE _____

Yellow copy of Fabrication Ass'y Record to Final Insp.

INSPECTOR G. Shepard (QC) DATE 3-25-81

TWX
910 221-1357

CHARLES E. LARSON & SONS
OPEN DIE FORGINGS

Seal Ring

RECEIVED
OCT 07 1980
PURCHASING

TO Babcock & Wilcox
Control Components, Inc.
Irvine, CA.

Material Accepted
A182 F11
OCT 1 5 1980
C.C.I. Q.A.

CUSTOMER ORDER NO.	DATE SHIPPED	HEAT NO.	SPECIFICATION-GRADE
04260-D	9-29-80	218858	ASTM A-182 F11

ITEM	QUANTITY	DESCRIPTION
1	2-	843150155 Bar forgings made, normalized & tempered 4½" Dia. x 72" Long
2	6-	843150012 Ditto Bars- 9" Dia. x 72" Long
3	4-	843150159 Ditto Bars- 12½" Dia. x 72" Long

The forgings were heated to 1700°F/2 Hrs./Aircooled.
The forgings were tempered to 1300°F/9 Hrs./Aircooled.

"This certification affirms that the contents of the report are correct & accurate & that all test results and operations performed by us or our sub-contractors are in compliance with the requirements of the applicable material specifications."

REPORTED LADLE ANALYSIS

C	Mn	P	S	Si	Ni	Cr	Mo	V	Cu	Co	Cb
.14	.51	.009	.013	.70		1.31	.48				

Ta	Al	Sn	Fe	Ti	B	Pb	W

MECHANICAL PROPERTIES

HARDNESS	TENSILE (PSI)	YIELD (PSI)	%ELONG. IN 2"	%RED. IN AREA
149 BHN	72,500	46,500	34%	72%

ULTRASONIC TEST RESULTS

GRAIN SIZE	JOMINY HARDENABILITY BY 1/16"															
	1	2	3	4	5	6	7	8	9	10	12	14	16	20	24	28	32

SUBSCRIBED AND SWORN TO BEFORE ME
THIS 29th DAY OF Sept. 1980

NOTARY PUBLIC

MY COMMISSION EXPIRES OCTOBER 10, 1981

CHARLES E. LARSON & SONS, INC.

FORGERS OF CARBON, ALLOY, STAINLESS & TOOL STEELS, COPPER, MONEL, INCONEL, HIGH TEMPERATURE & EXOTIC METALS

BABCOCK & WILCOX COMPANY
CONTROL COMPONENTS INT'L.

LIQUID PENETRANT/MAGNETIC PARTICLE
NON DESTRUCTIVE EXAMINATION REPORT

Customer _____ P. O. No. 04260

CCI WO# 24744-1-OAS SN 1

Part Name SEAT RING Part No. 320.301 556 XX Heat No. 218858

No. of Pieces 1 Op. No. 55 Spec. No. NOE 102 REV E PS605 E-9

Rejected -0- Accepted 1 NCMR No. _____

Comments _____

☒ Dye Penetrant — Penetrant Brand Name MET-L-CHEK Batch No. 1000

☐ Flourescent Penetrant — Remover Brand Name H_2O Batch No. N/A

Developer Brand Name MET-L-CHEK Batch No. 1097

☐ Magnetic Particle: ☐ Wet Method ☐ Dry Method ☐ Visable

☐ Flourescent ☐ Continuous ☐ Residual

Magnetization Method: ☐ DC ☐ AC ☐ Rectified

Demagnetization Required: ☐ Yes ☐ No

☐ Electro Magnetic Yoke Amperes _____

☐ Head (Clamps) Amperes _____

☐ Central Conductor Amperes _____

☐ Longitudinal (Coil) Amperes _____

☐ Prod Amperes _____

Surface Condition:

☐ Pre-Overlay ☐ Rough Machined ☒ Finish Machined ☒ Weld

☐ Weld Detail ☒ As Cast ☐ Heat Treat

t Performed By _____ ASNT LEVEL II Stamp _____ Date 4-4-87

Witnessed By _____ ASNT LEVEL II Stamp _____ Date _____

Customer _____ Stamp _____ Date _____

4.1.39-146

Authorized Nuclear Inspector _____ Stamp _____ Date _____

Cast #433

REPORT NO.

PAGE OF PAGES

Dated 5/29/80

STELLITE DIV., CABOT CORP
L.A.S.C.
1220 WEST WALNUT STREET
COMPTON, CA. 90220

SHIP TO

PRODUCT DESCRIPTION

NO. 6 PLASMA WELD SURFACE POWDER

SPECIFICATION

QUANTITY ORDERED	QUANTITY SHIPPED
1460 LB	1460 LB

HEAT NUMBER	HEAT CODE		Al	B	C	V	Cb+Ta	Co	Cr	Cu	Fe	Mn	Mo	Ni	P	S	Si	Ti	V	W
3789					1	22		BAL	28	04	2	28	40	24	2	47	1	09		4	93

TENSILE TEST AT ROOM TEMPERATURE

ULTIMATE	1% YIELD	0.2% YIELD	% ELONG IN	% RA

TENSILE TEST AT ELEVATED TEMPERATURE

TEST TEMP°	ULTIMATE	1% YIELD	0.2% YIELD	% ELONG IN	% RA

STRESS RUPTURE

TEST TEMP°	STRESS	HOURS	% ELONG IN	% RA

4.1.39-147

ANNEALED HARDNESS	AGED HARDNESS	GRAIN SIZE

CERTIFIED BY

M B Sentak

June 10, 1980 mf

PRODUCT MEETS CHEMICAL COMPOSITION OF RCOCR-A IN COMPLIANCE WITH AWS 5.13 SPECIFICATION

Material Accepted #6
OCT 5 1980
C.C.I.-Q.A.
AWS 5.13
Class ENiCrFe-3

BABCOCK & WILCOX
CONTROL COMPONENTS INTERNATIONAL

Work Order Number 24744-1-015 Serial Number 1
Part Name SEAT RING Operation Number 25
Part Number 320301556 XX Revision N/C
NCMR# (If Applicable) —

FABRICATION ASSEMBLY REPORT

	DESCRIPTION	PART NUMBER	MATERIAL	HEAT NUMBER
1	SEAT RING	320301556 XX	A-182-F11	218858
2				
3				
4				
5				
6				
7				

WELD NUMBER (IP-154)	1	2	3	4	5
Welder	G. Hoogerwerf				
Stamp Number	(M)				
Weld Procedure & Rev. (J)	277-C4-SR				
Filler Metal Type	Stellite 6				
Filler Metal Heat No.	233				
Flux Heat Number	—				

Ready for Weld: Inspector S. Henning (QC) Date 1/29/81

VISUAL WELD INSPECTION REPORT

Weld Type					
Weld Surface					
Undercut					
Reinforcement					
Root of Weld					

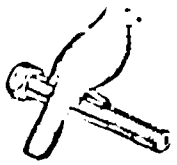
The above weldment has been inspected and conforms to IP-154 INSPECTOR [signature] (QC) DATE 4.6.81
White copy of Fabrication Ass'y Record to QAE.

INSPECTOR _____ DATE _____
Yellow copy of Fabrication Ass'y Record to Final Insp.

INSPECTOR [signature] (QC) DATE 4.6.81

Carpenter

INDUSTRIAL PRODUCTS CORPORATION



Ht B22
Nut

3873 WEST OQUENDO + (TOLL FREE) 800 634 6861
PHONE (NEVADA) 702 739 1968
LAS VEGAS, NEVADA 89118

Material Accepted
A194 GR 3
APR 9 1981
PB
C.C.I.-Q.A.

TO:

Control Components
2567 S.E. Main St.
Irvine, CA 92705

DATE TYPED: 4-2-81
DATE SHIPPED: 4-2-81
CUSTOMER P.O. NO.: 05964A
C.I. NO.: 22973
BACK ORDER NO.: N/A
ITEM NO.: 1
QUANTITY ORDERED: 12
QUANTITY SHIPPED: 12

CERTIFICATION

MATERIAL DESCRIPTION: Heavy Hex Nuts SIZE: 1-1/2 - 8

SPECIFICATION: ASTM A194 Gr. 3 HEAT NO.: 8052739 MARKING &/OR CODE:

CHEMISTRY		NUTS		CHARPY IMPACT STRENGTH	@ MLE	% SHEAR AREA
C	.196	PROCESS	Hot Forged			
Mn	.57	PROOF LOAD TM	N/A			
P	.006	HARDNESS	33/34 RC			
S	.009	HARDNESS AFTER				
Si	.38	24 HOURS	269 BHN			
Ni		~~NORMALIZING~~ TEMPERING	Actual	AVE.		
Cr	4.52	TEMPERATURE	1100°F	*PROCESSING		
Mo	.49	STUDS & BOLTS		NDE:		
V		TENSILE		MT		
AL.		STRENGTH		PT		
FE.		YIELD		UT		
Cu		STRENGTH		RT		
		PROOF LOAD		*PLATING PER		
		ELONGATION				
		% IN 2"		*COATING PER		
		% REDUCTION AREA				
		HARDNESS		*HEAT TREATING PER		
		MINIMUM TEMPERING				
		TEMPERATURE		*RECORDS ON FILE		

OTHER REQUIREMENTS: P/N 250440062. Trace Letter B22.
Per PS 604 Para. 3.0. Rev. F.

We hereby certify that the foregoing data is a true copy of the [illegible] furnished us by the producing mill or the data resulting from tests performed.

AUTHORIZED AGENT

REVIEWED BY 4-2-81 DATE

4.1.39-149

Cardinal

INDUSTRIAL PRODUCTS CORPORATION

HT 623
Stud

3673 WEST OQUENDO + (TOLL FREE) 800-634-6861
PHONE (NEVADA) 702-739-1968
LAS VEGAS, NEVADA 89118

TO:

Control Components
2567 S.E. Main St.
Irvine, CA 92705

Material Accepted
A193 B16
APR 9 1981
C.C.I. Q.A.

DATE TYPED: 1-14-81
DATE SHIPPED: 4-1-81
CUSTOMER P.O. NO.: 05964A
C.I. NO.: 22973
BACK ORDER NO.: N/A
ITEM NO.: 2
QUANTITY ORDERED: 12
QUANTITY SHIPPED: 12

CERTIFICATION

MATERIAL DESCRIPTION: A/T Studs SIZE: 1-1/2 - 8 X 8-1/4"

SPECIFICATION: ASTM A193 B16 HEAT NO.: 8099419 MARKING &/OR CODE:

CHEMISTRY	
C	.42
Mn	.59
P	.006
S	.023
Si	.30
Ni	
Cr	.98
Mo	.52
V	.28
AL.	
FE.	
Cu	

NUTS	
PROCESS	
PROOF LOAD TM	
HARDNESS	
HARDNESS AFTER 24 HOURS	
MINIMUM TEMPERING TEMPERATURE	
STUDS & BOLTS	
TENSILE STRENGTH	138,000
YIELD STRENGTH	128,100
PROOF LOAD	
ELONGATION % IN 2"	20.0
% REDUCTION AREA	58.6
HARDNESS	29 RC
MINIMUM TEMPERING TEMPERATURE	1200°F

CHARPY IMPACT STRENGTH	@ MLE	% SHEAR AREA
AVE.		

*PROCESSING	
NDE:	
MT	
PT	
UT	
RT	
*PLATING PER	
*COATING PER	
*HEAT TREATING PER	
*RECORDS ON FILE	

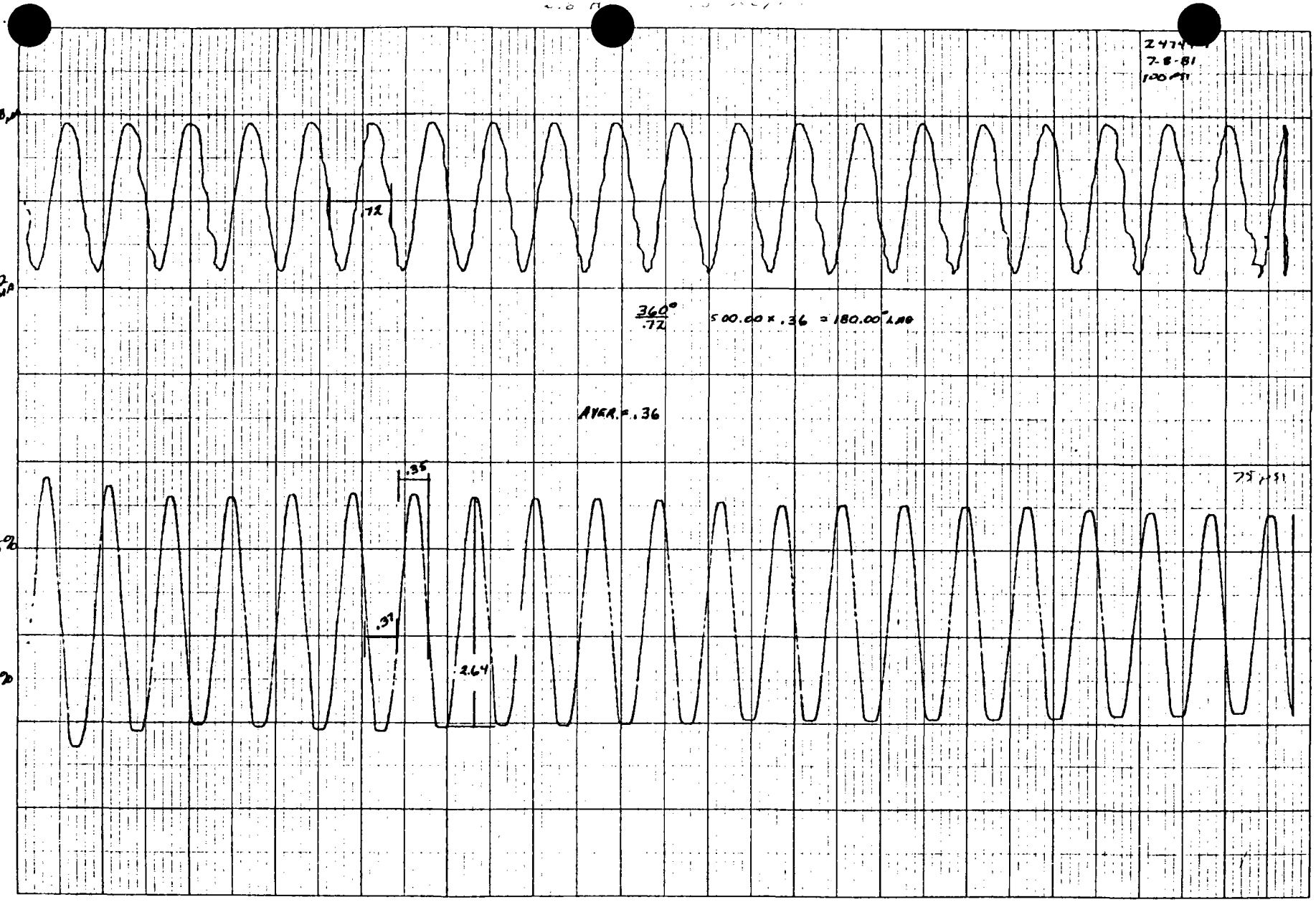
OTHER REQUIREMENTS: P/N 123705015 Rev. F, Trace Letter B23.
Per PS 604 Para. 3.0, Rev. F,

We hereby certify that the foregoing data is a true copy of the data furnished us by the producing mill or the data resulting from tests performed.

AUTHORIZED AGENT

REVIEWED BY DATE

4.1.39-150


Z474
7-8-81
100 PSI
128 PSI
112 PSI
.72
360°/.72
500.00 x .36 = 180.00° LAG
AVER. = .36
.35
.37
2.64
55%
45%

Babcock & Wilcox

Control Components, Inc.
2567 S.E. Main Street, Irvine, California 92714
Telephone: (714) 979-6600
Telex: 685500

CONTROL COMPONENTS, INC.
SUBSIDIARY OF BABCOCK & WILCOX
IRVINE, CALIFORNIA

VALVE ACTUATOR HYSTERISIS TEST PROCEDURE AND REPORT

Valve Serial No. 1 Date 7-8-81

Part Number 24744-1 Tag No. PV-1001

Customer STEARNS-ROGER

Operator Type 200 ^{2}/$_{IN.}$ PNUEMATIC Supply Pressure 120 PSIG

Signal: Full Open 20 MA Full Close 4 MA

Stroke Length 6.0 IN. NOM. Positioner MOORE

Data

Signal	Actual Stroke	SPEED SEC.	START POSITION		Position
	0		0		Closed
4-6.6 MA	10%	.41	0%	TO	10% Open
6.6-4 MA	10%	.10	10%		0% Open
11.2-12.8 MA.	10%	.24	45%		55% Open
12.8-11.2 MA.	10%	.13	55%		45% Open
					50% Open
					60% Open
					90% Open
4-20 MA.	100% @ STEP	.68	0%		10" Open
	80%		90%		90" Open
	80%		10%		Full Open
4-20 MA.	100%	.72	0%		10% Closed
					20% Closed
					30% Closed
					40% Closed
					50% Closed
					60% Closed
					70% Closed
					80% Closed
					90% Closed
20-4 MA.	100%	.90	100%		Full Closed

Test Performed By Ricky Hanks C. E. FILE Stearns-Roger

Witnessed By John D. Burg IMI C21700 JUL 30 '81

S-R No. E-4 File No. 54

FINAL JUL 30 1981

Babcock & Wilcox

Control Components, Inc.
2567 S.E. Main Street, Irvine, California 92714
Telephone: (714) 979-6600
Telex: 68-5500

CONTROL COMPONENTS, INC.
SUBSIDIARY OF BABCOCK & WILCOX
IRVINE, CALIFORNIA

VALVE ACTUATOR HYSTERISIS TEST PROCEDURE AND REPORT

Valve Serial No. 1 Date 7-8-81

Part Number 24744-1 Tag No. PV-1001

Customer STEARNS-ROGER

Operator Type 200² IN. PNUEMATIC Supply Pressure 100 PSIG

Signal: Full Open 20 MA Full Close 4 MA

Stroke Length 6.0 IN. NOM. Positioner MOORE

Data

Signal	Actual Stroke	SPEED SEC.	START POSITION		Position
	0		0		Closed
4-6.6 MA	10%	.43	0%	TO	10% Open
6.6-4MA	10%	.09	10%		0% Open
11.2-12.8 MA	10%	.27	45%		55% Open
12.8-11.2 MA	10%	.20	55%		45% Open
					50% Open
					60% Open
4-20 MA	100% @ STEP	.75	0%		90% Open
18.4-5.6 MA	80%	.61	90%		10" Open
5.6-18.4MA	80%	.50	10%		90" Open
4-20 MA	100%	.80	0%		Full Open
					10% Closed
					20% Closed
					30% Closed
					40% Closed
					50% Closed
					60% Closed
					70% Closed
					80% Closed
					90% Closed
20-4 MA	100%	.92	100%		Full Closed

Test Performed By Ricky Hanks

Witnessed By John D. Fry

Babcock & Wilcox

Control Components, Inc.
2567 S.E. Main Street, Irvine, California 92714
Telephone: (714) 979-6600
Telex: 68-5500

CONTROL COMPONENTS, INC.
SUBSIDIARY OF BABCOCK & WILCOX
IRVINE, CALIFORNIA

VALVE ACTUATOR HYSTERISIS TEST PROCEDURE AND REPORT

Valve Serial No. 1 Date 7-8-81

Part Number 24744-1 Tag No. PV-4001

Customer STEARNS-ROGER

Operator Type 200 ^{2}IN. PNUEMATIC Supply Pressure 80 PSIG

Signal: Full Open 20 MA Full Close 4 MA

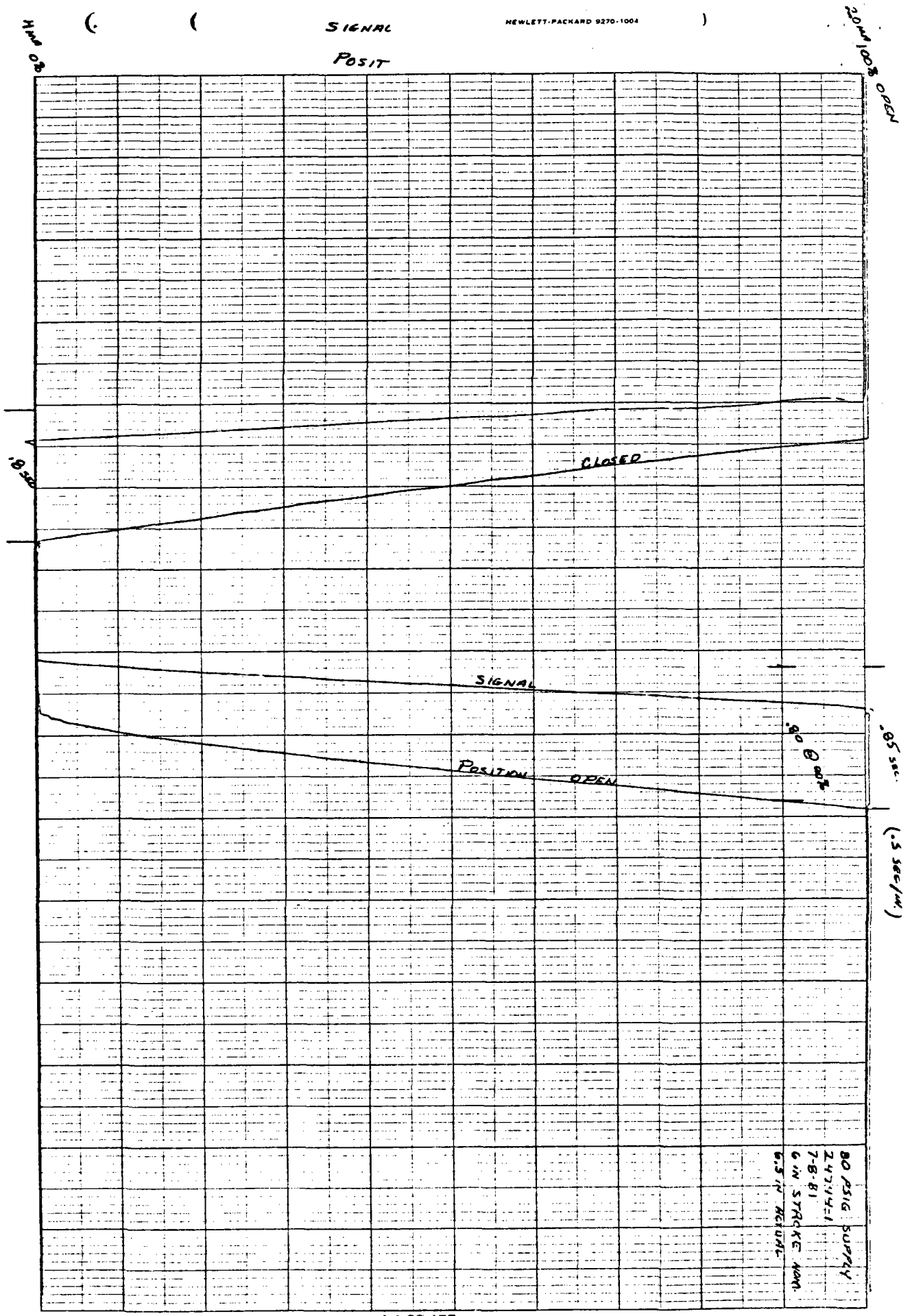
Stroke Length 6" NOM. Positioner MOORE

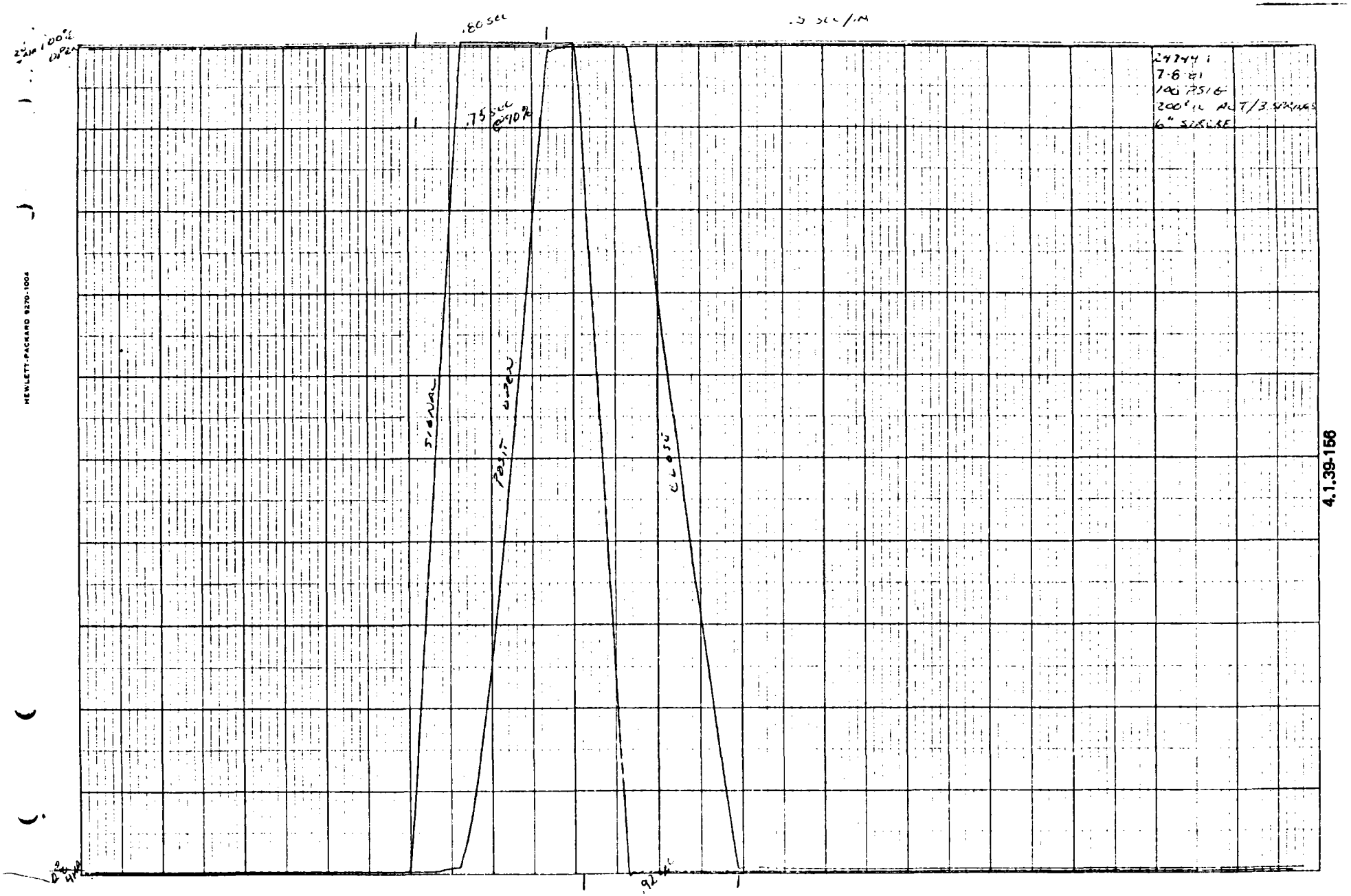
Data

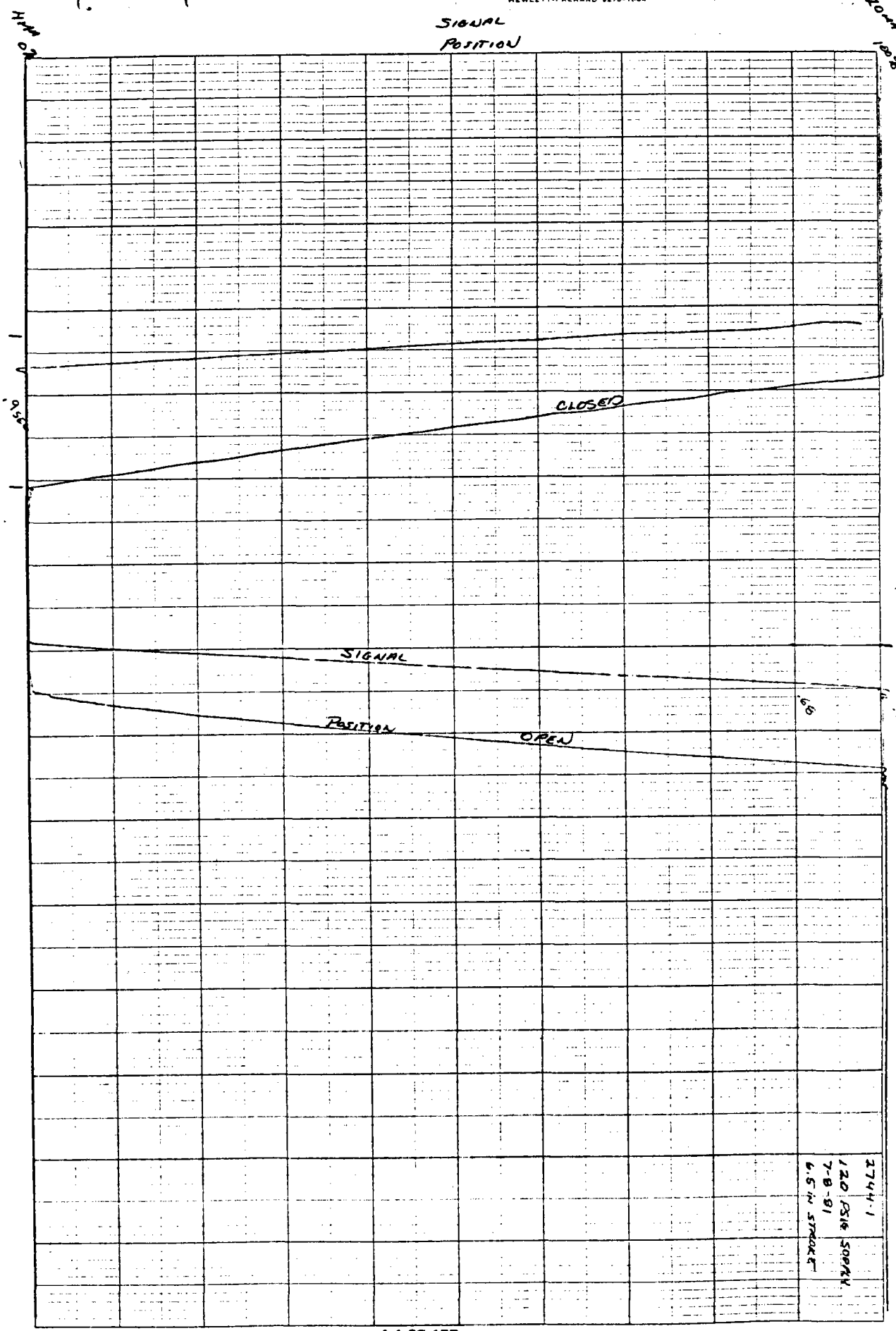
Signal	Actual Stroke	SPEED SEC.	START POSITION		Position
	0		0		Closed
4-6.6 MA.	10%	.46	0%	TO	10% Open
6.6-4 MA.	10%	.11	10%		0% Open
11.2-12.8 MA	10%	.25	45%		55% Open
12.8-11.2 MA	10%	.14	55%		45% Open
					50% Open
					60% Open
4-20 MA	100% @ STEP	.80	0%		90% Open
	80%		90%		10" Open
	80%		10%		90" Open
4-20 MA.	100%	.85	0%		Full Open
					10% Closed
					20% Closed
					30% Closed
					40% Closed
					50% Closed
					60% Closed
					70% Closed
					80% Closed
					90% Closed
20MA-4MA	100%	.80	100%		Full Closed

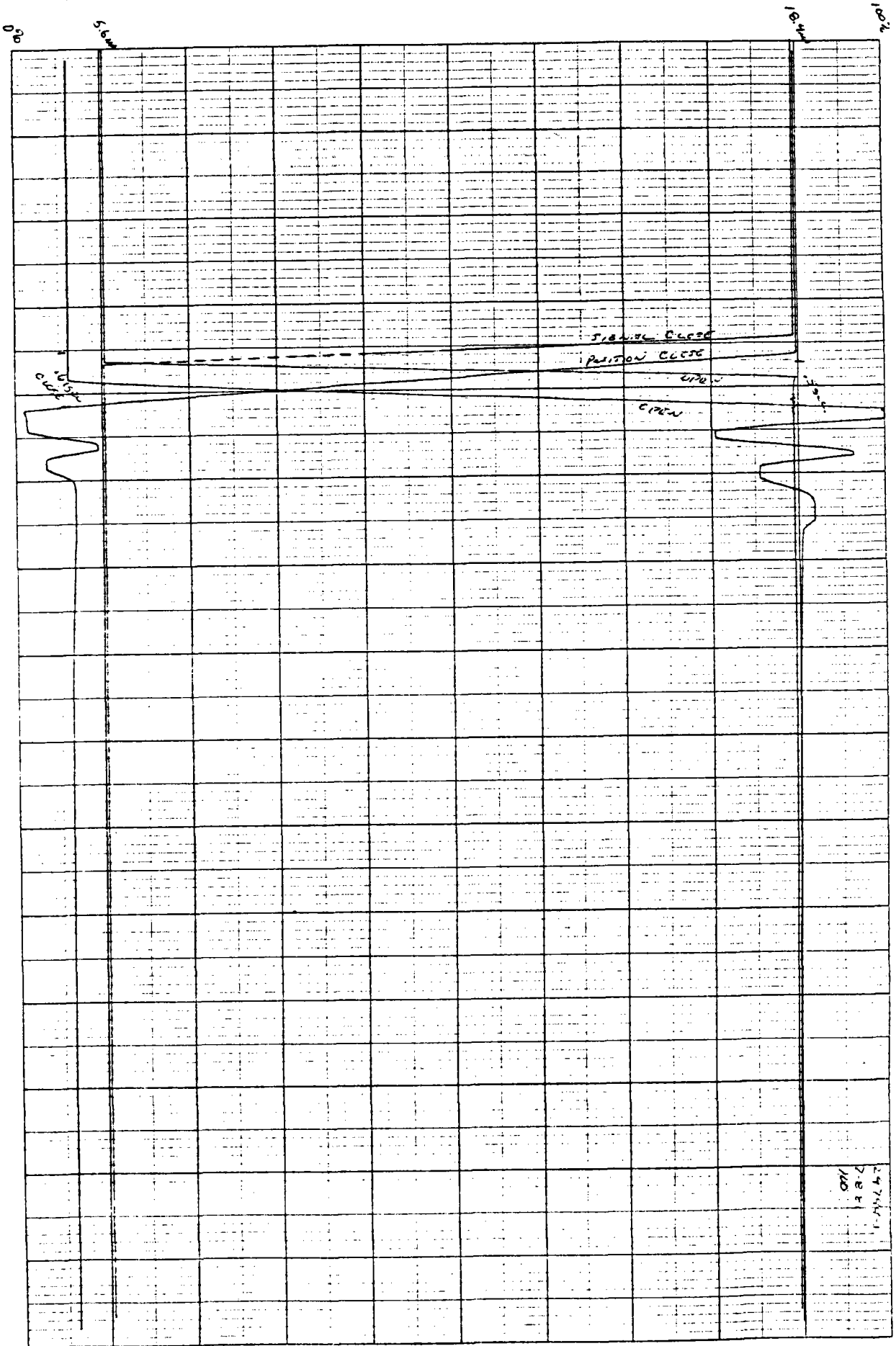
Test Performed By Kirby Hanks

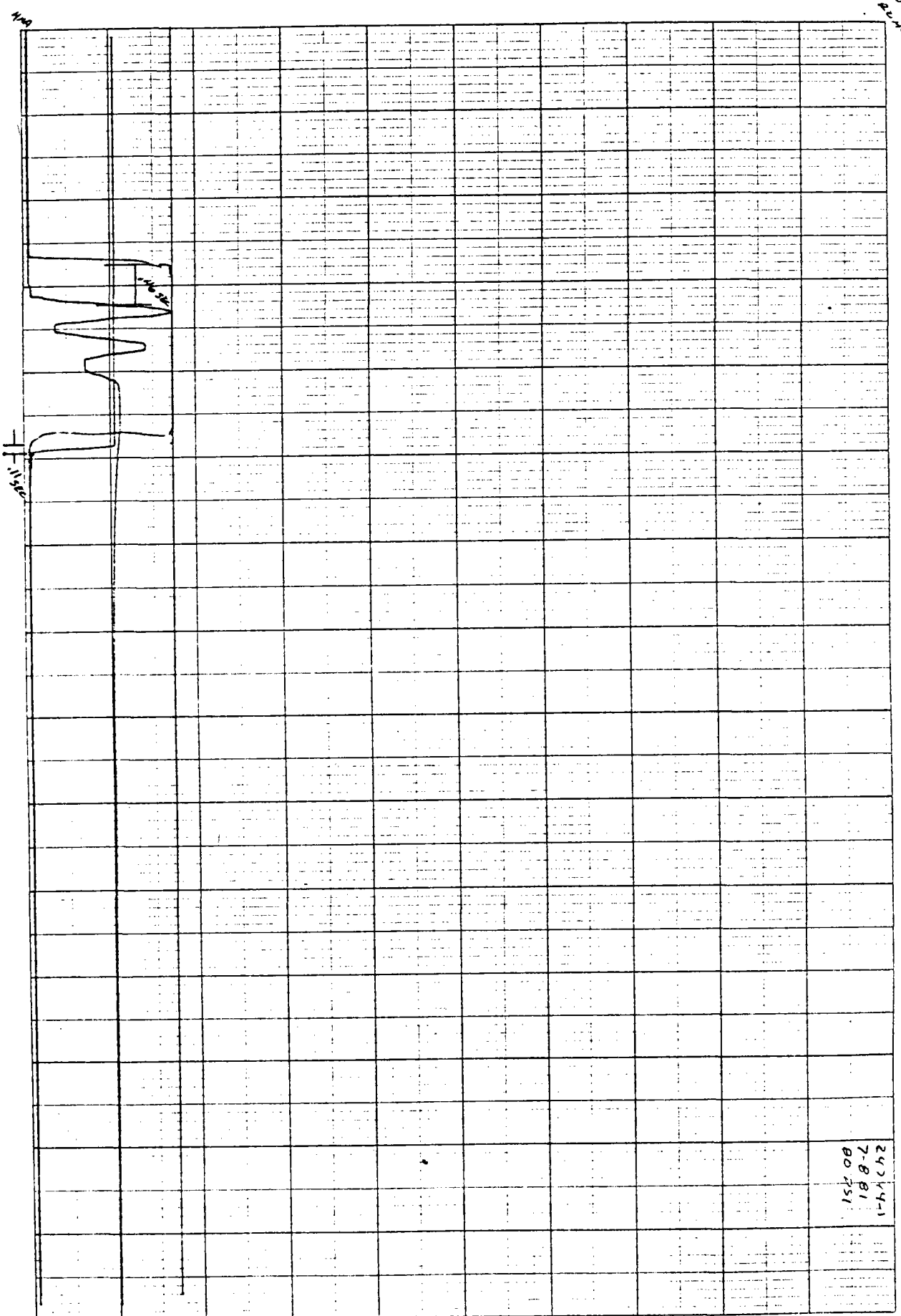
Witnessed By J. D. Bryp

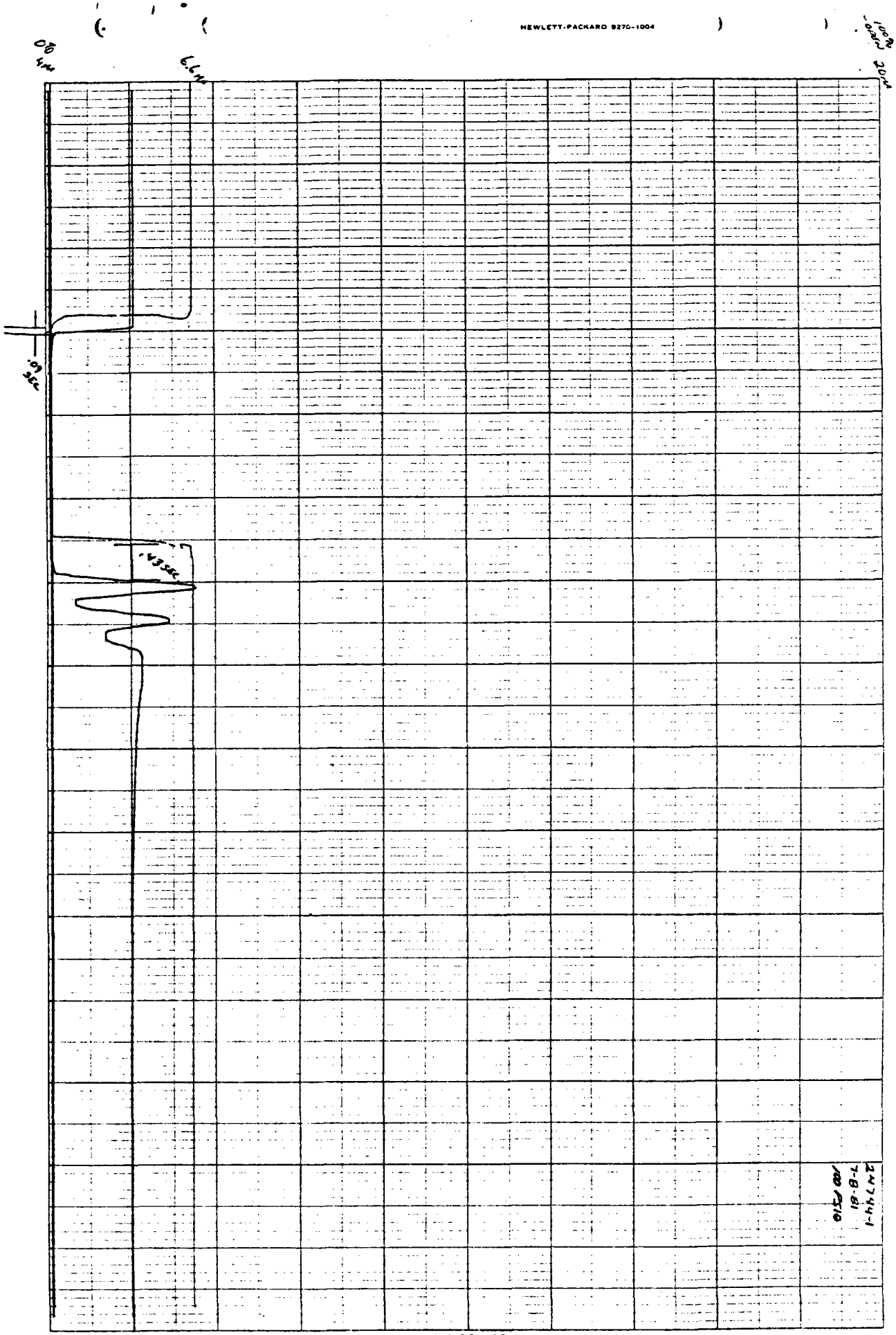

SIGNAL
HEWLETT-PACKARD 9270-1004
POSIT
20 MM 100% OPEN
CLOSED
SIGNAL
POSITION OPEN
.95 sec.
(.5 sec/in)
80 PSIG SUPPLY
7-8-81
6 IN STROKE NOM.
6.5 IN ACTUAL

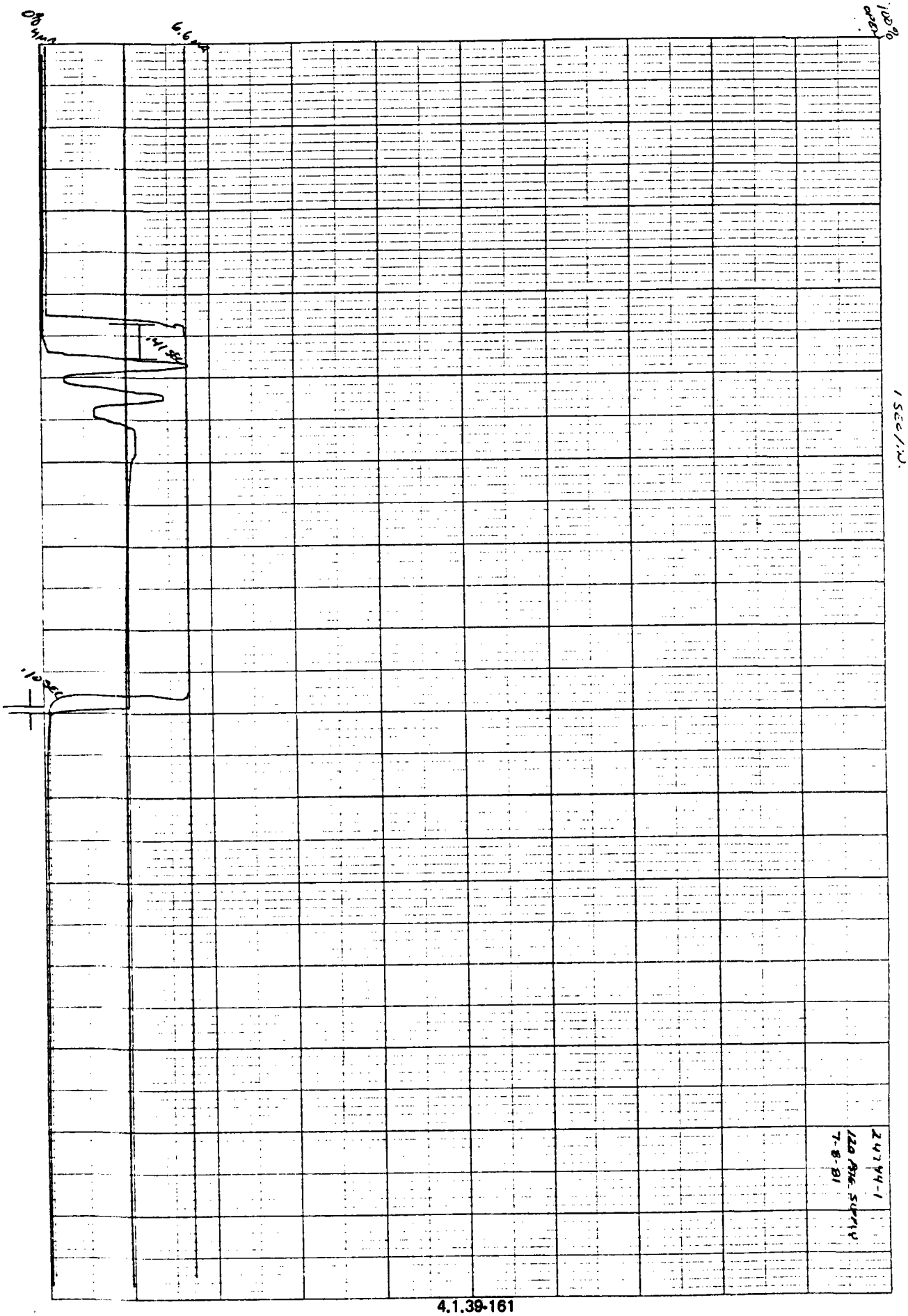

.80 sec
.75 sec @ 10%
STROKE
RETURN
CLOSE
.92 sec
24744 i
7.8 gl
100 PSIG
200° F AUT/3 STRINGS
6" SUBSEA


SIGNAL
POSITION
CLOSED
SIGNAL
POSITION
OPEN
2744-1
120 PSIG SUPPLY
7-8-81
6.5 in STROKE


0.0
5.6
16.4
100
STRIKE CLOSE
POSITION CLOSE
CLOSE
OPEN
1 sec/in

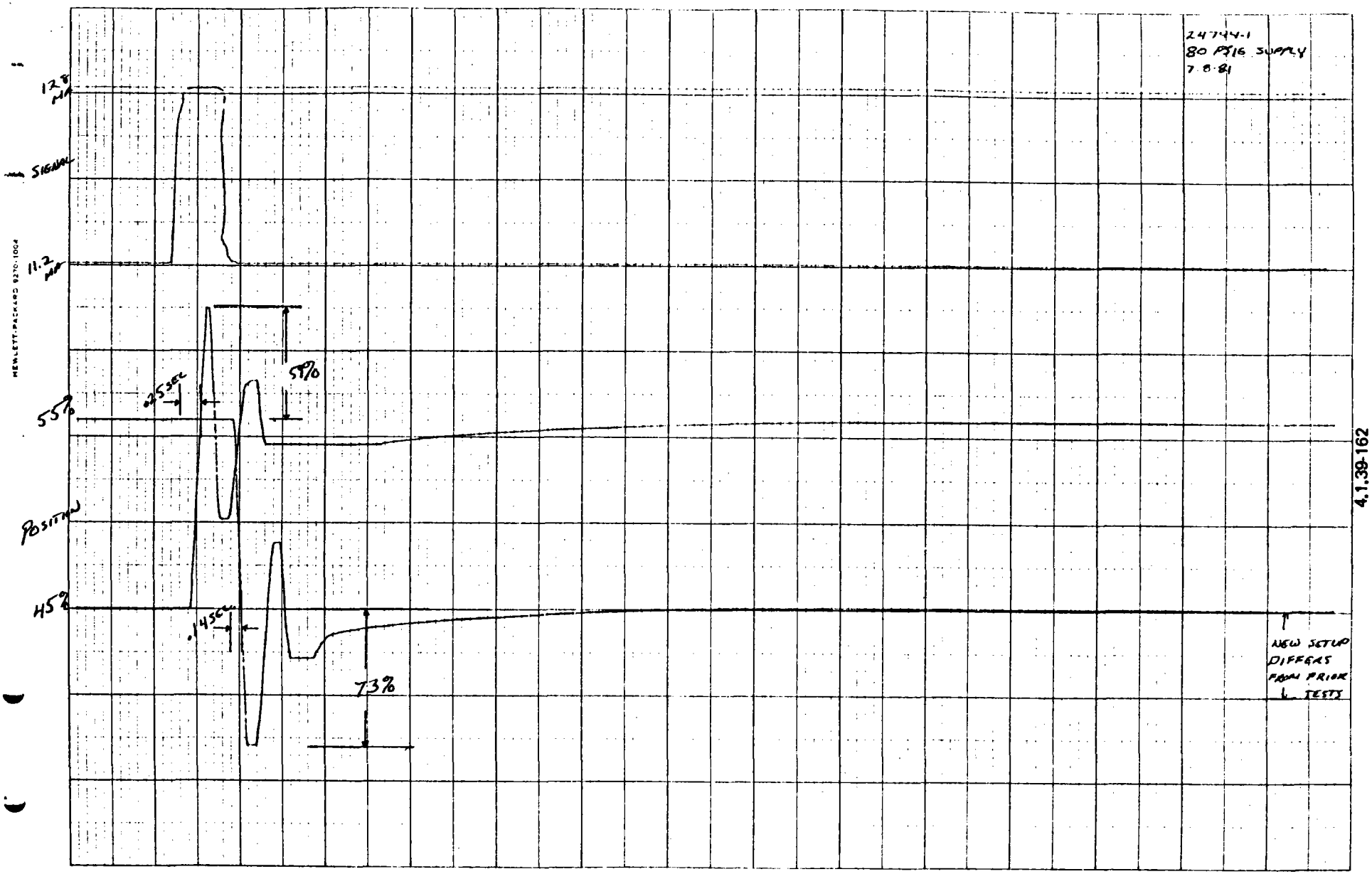



HEWLETT-PACKARD 9270-1004
50 MM
66 MM
20 MM
.09 SEC
.93 SEC
1 SEC/IN
24744-1
7-8-81



24744-1
120 VAC SUPPLY
7-8-81

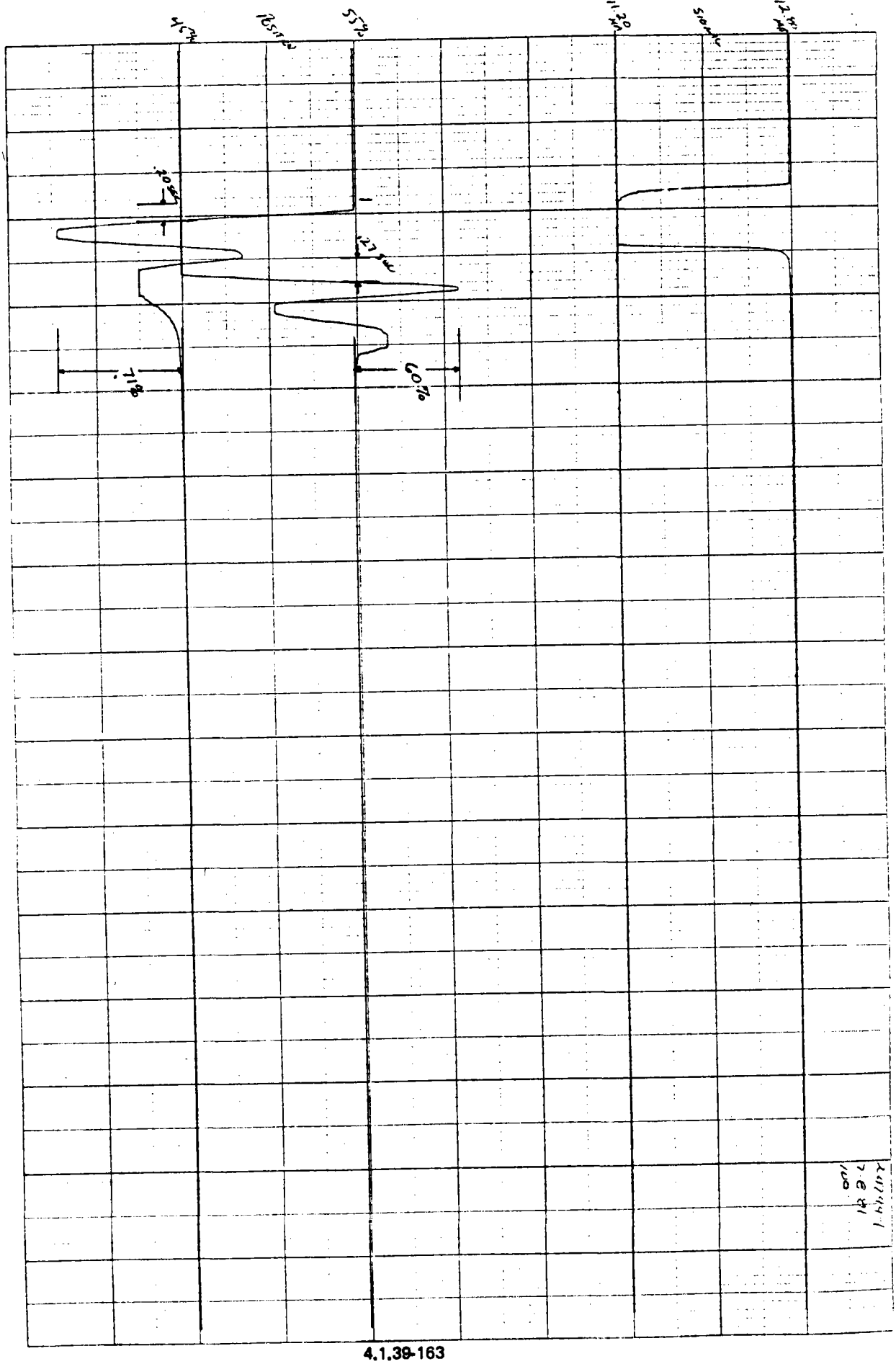
1 SEC / IN.

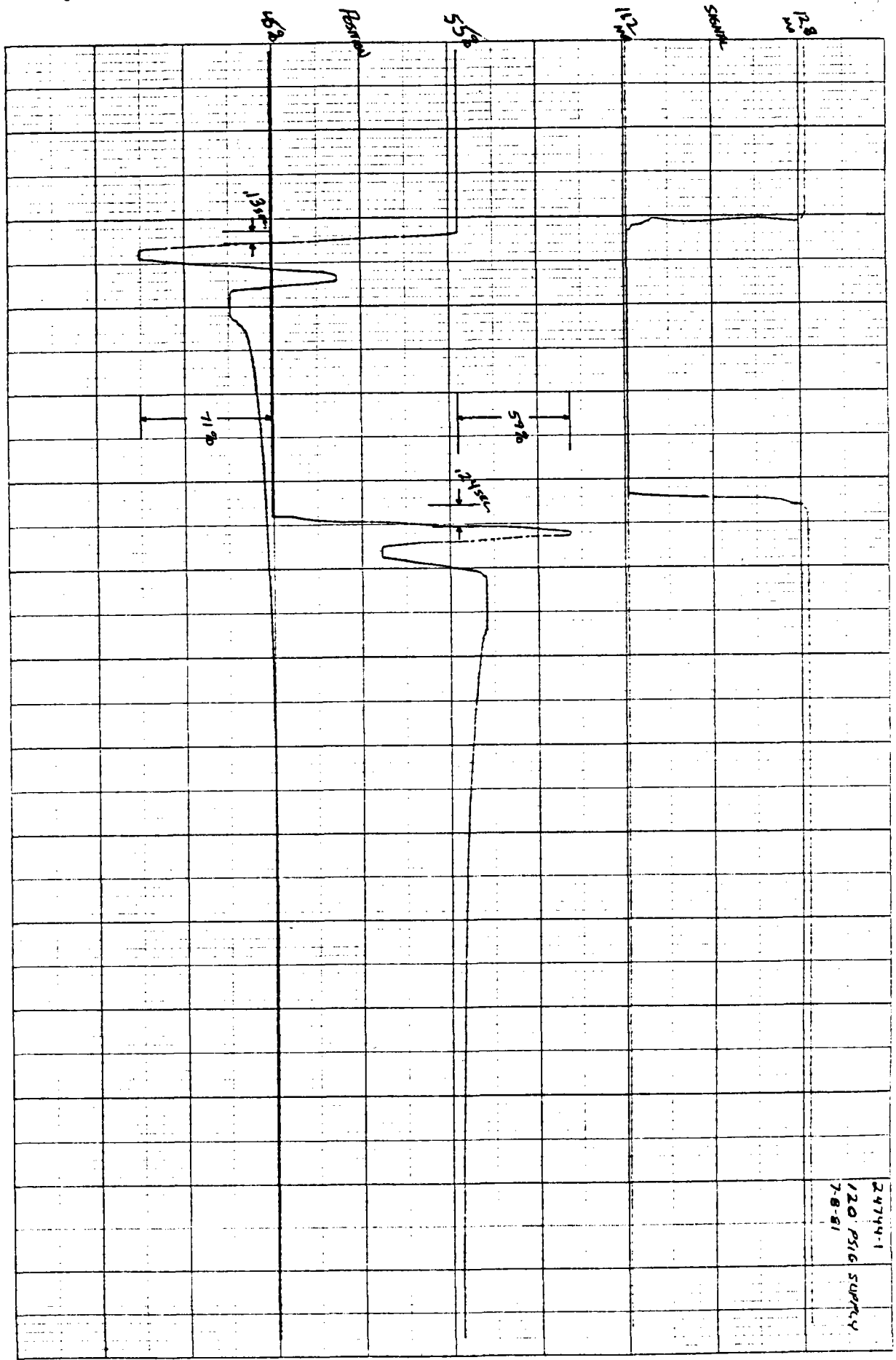


4.1.39-162

1.

HEWLETT-PACKARD 8270-1004




HEWLETT-PACKARD 9270-1004
Boston
Seattle
12.8 ms
1.12 ms
55.8
46.8
1.38 sec
71 ms
59 ms
1.24 sec
24744-1
120 PSIG SUPPLY
7-8-81

Babcock & Wilcox
Control Components International

TITLE	Specification No. : TP-508
VALVE ACTUATOR DYNAMIC RESPONSE	Revision : 0
SINE WAVE TEST	Date Effective : 1/8/80
	Page 5 of 5

FREQUENCY RESPONSE DATA SHEET

W.O. 24744-1-1 DATE 7-8-81

VALVE P/N 24744-1 ACTUATOR P/N

CUSTOMER STEARNS-ROGER VALVE S/N 1

TAG NO. PV-1001 SUPPLY, 100 PSI RECORDING DEVICE X-Y RECORDER

FREQ. Hz	AMPLITUDE INCHES	AMPLITUDE RATIO	db	LENGTH OF ONE SIGNAL CYCLE	DEGREES PER IN.	DIFFERENCE IN SIGNAL & OUTPUT INCHES	DEGREES PHASE LAG
.001	2.07	—	—	—	—	—	—
.02	2.14	1.03	+.29	5.00	72.0	.165	11.88
.05	1.985	.96	-.35	3.82	94.07	.121	11.38
.10	1.86	.90	-.93	9.95	36.18	.375	15.37
.20	1.93	.93	-.61	.989	364.0	.193	25.11
.30	1.74	.84	-1.51	3.31	108.76	.285	31.0
.60	2.37	1.14	+1.18	3.32	108.43	.44	47.71
1.0	3.30	1.59	+4.05	2.00	180.00	.325	58.50
1.3	3.40	1.64	+4.31	1.53	235.29	.18	42.35
1.6	4.14	2.00	+6.02	1.24	290.32	.155	45.0
2.0	6.14	2.97	+9.44	1.00	360.00	.37	133.2
2.5	4.53	2.19	+6.80	.80	450.0	.42	189.0
2.8	2.64	1.27	+2.11	.72	500.0	.36	180.0
2.9	1.81	.87	-1.17	.70	514.29	.38	195.43
3.0	1.17	.57	-4.86	.65	553.85	.35	193.85
3.2	.27	.13	-17.69	.62	580.65	.385	223.55

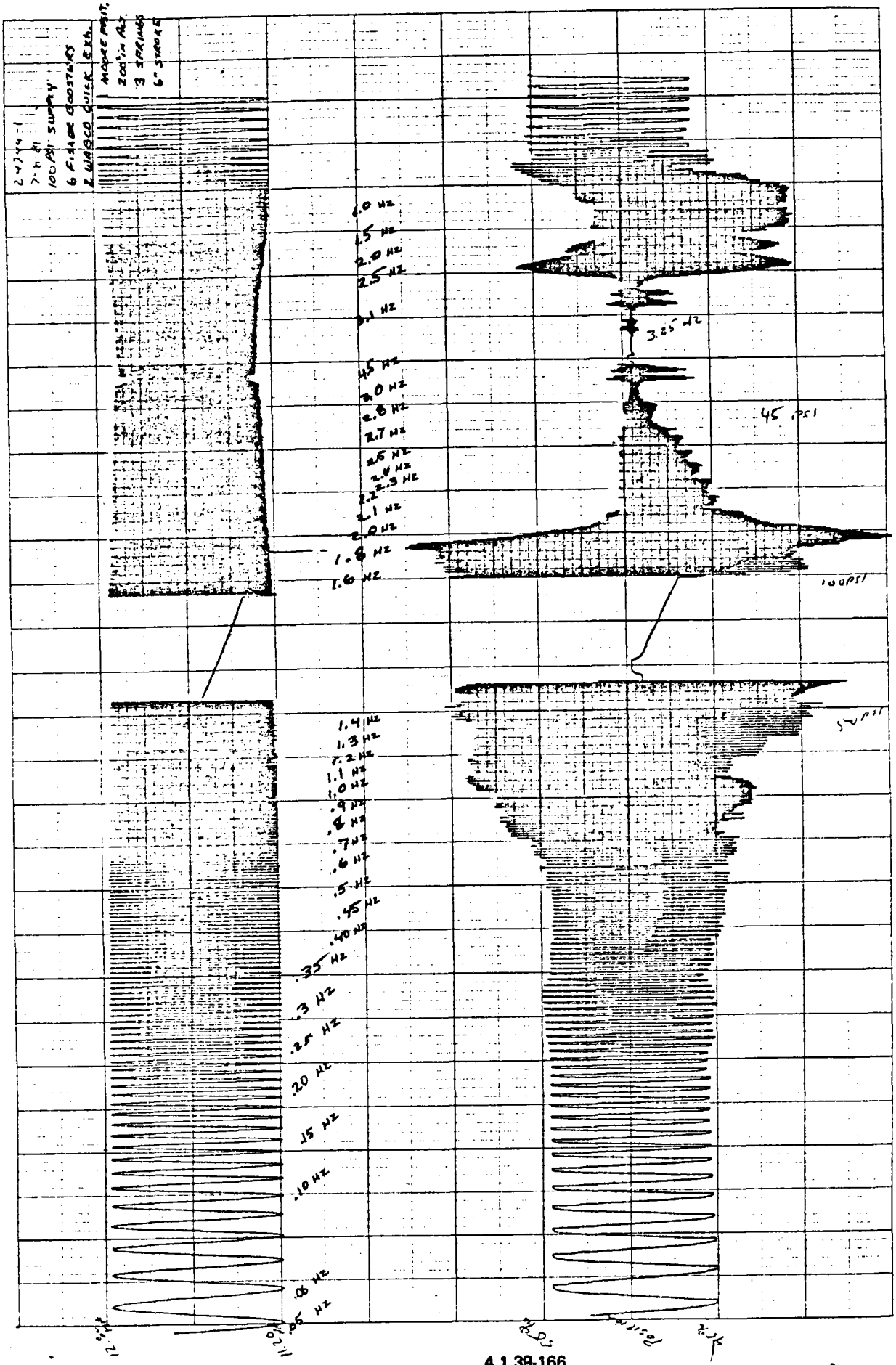
TEST PERFORMED BY Ricky Hanks 7-8-81

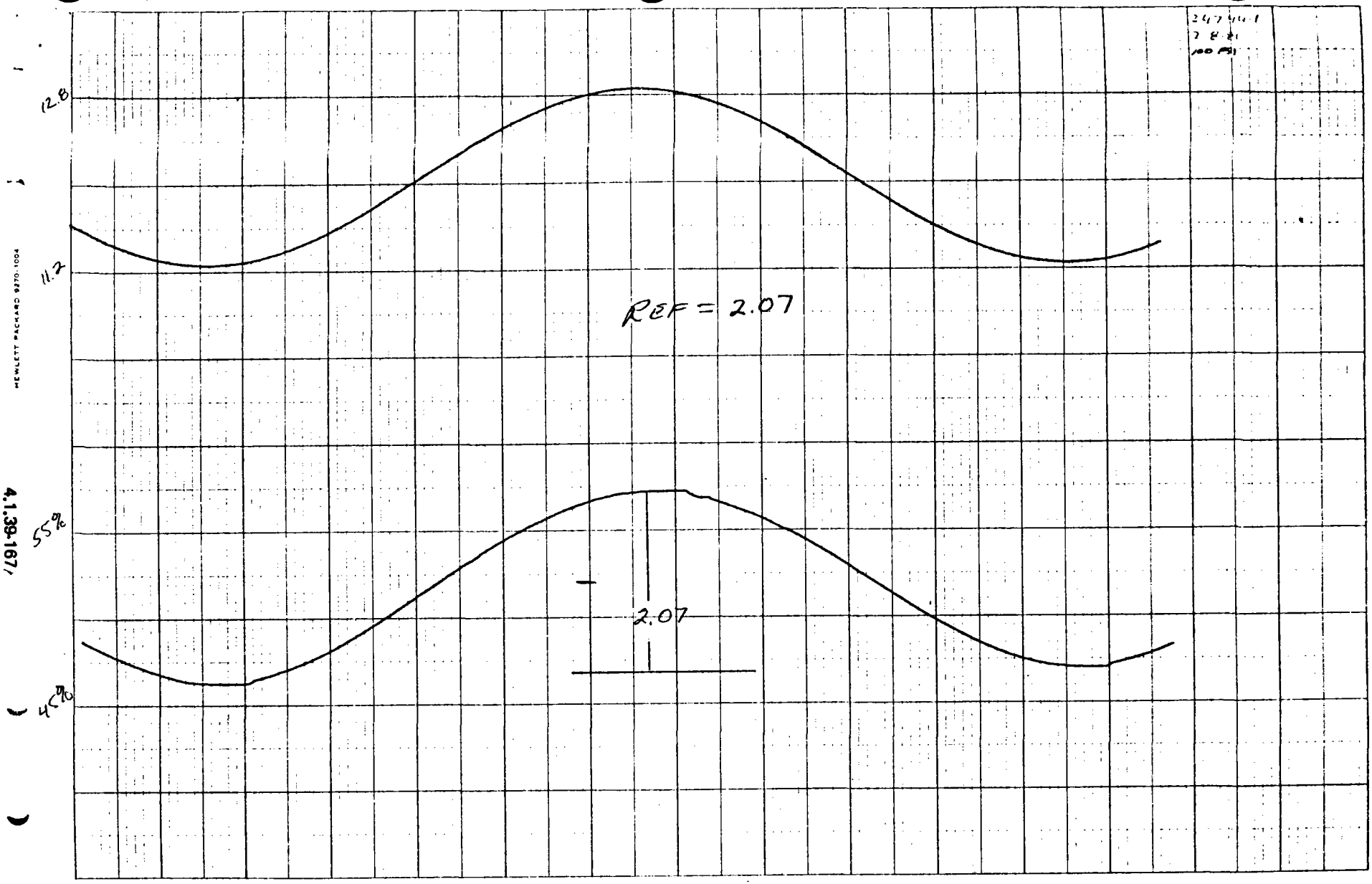
CCI INSPECTOR APPROVAL J D Bup (Project Eng.)

CUSTOMER INSPECTOR APPROVAL

ACTION REQUIRED, IF ANY

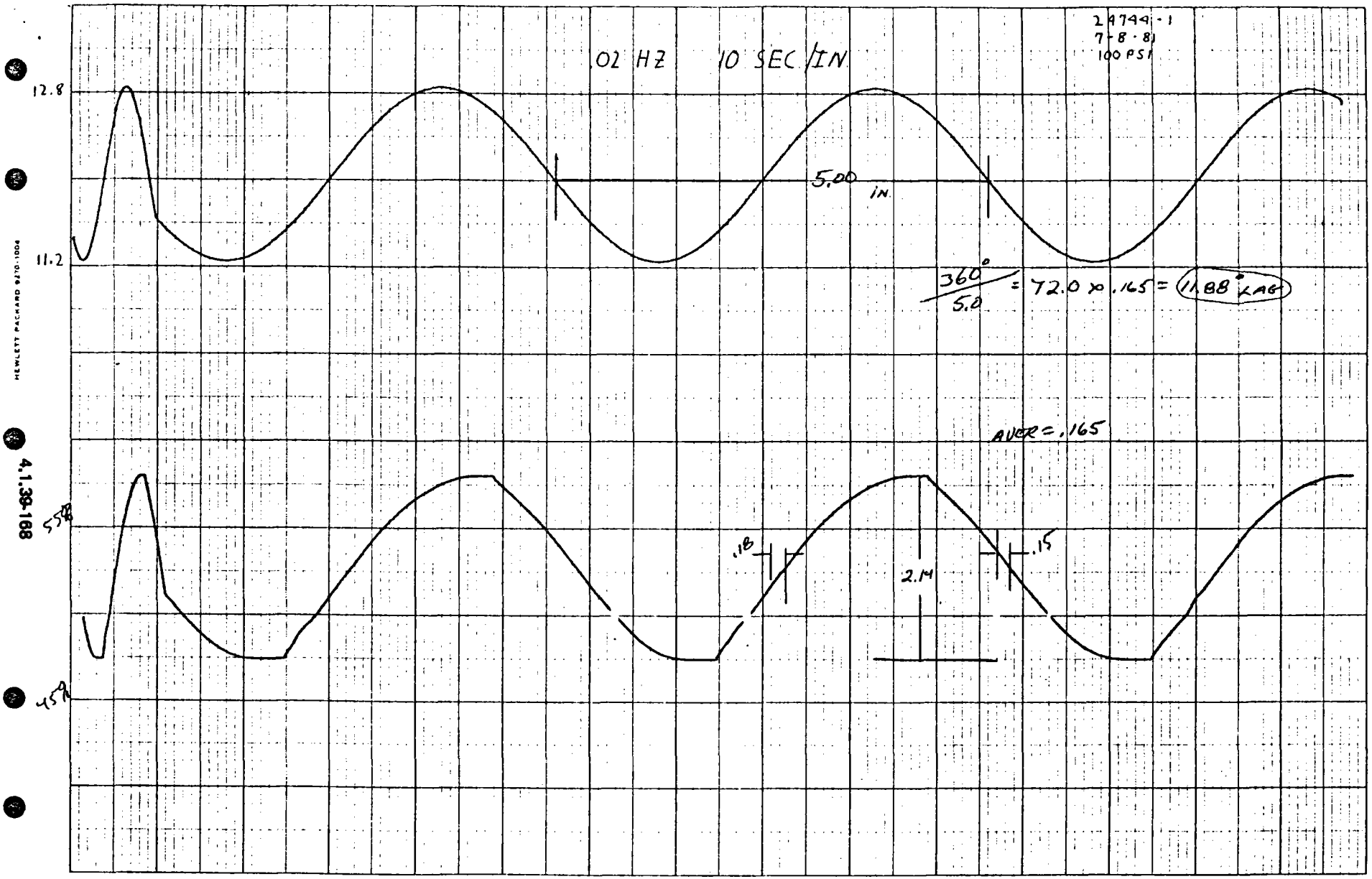
OC-277 9 75

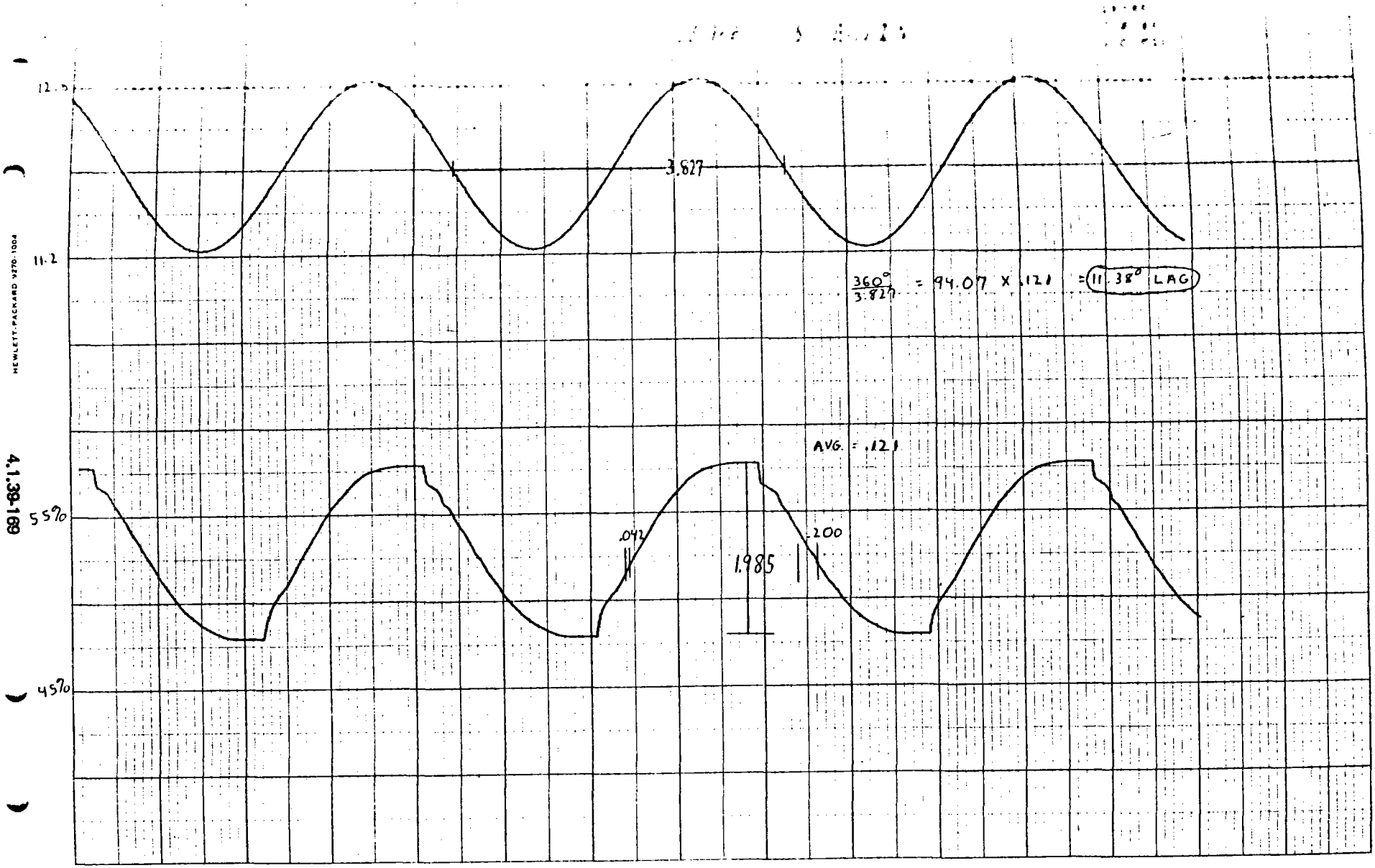




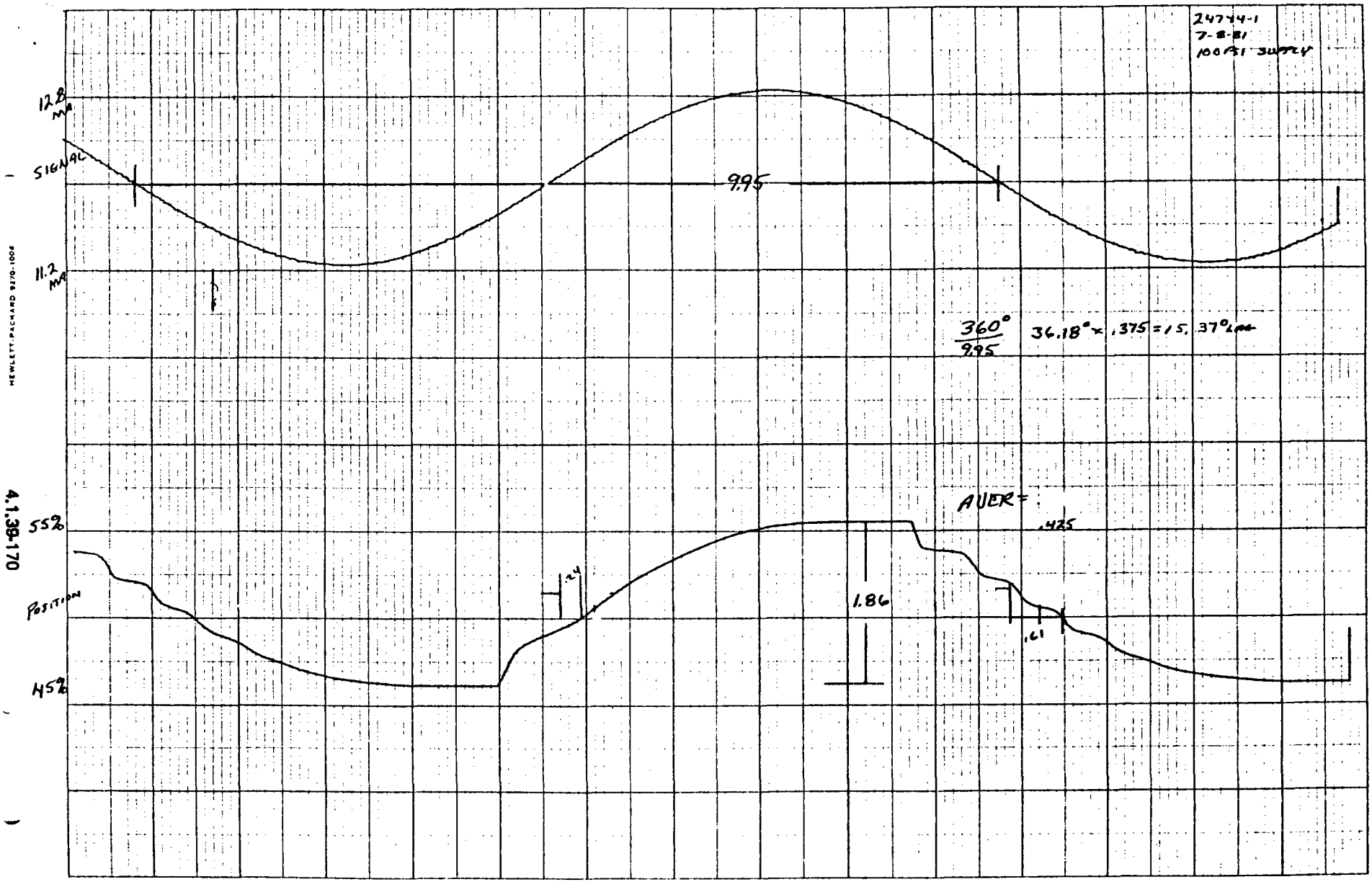
HEWLETT PACKARD 8270-1004

4.1.39-167

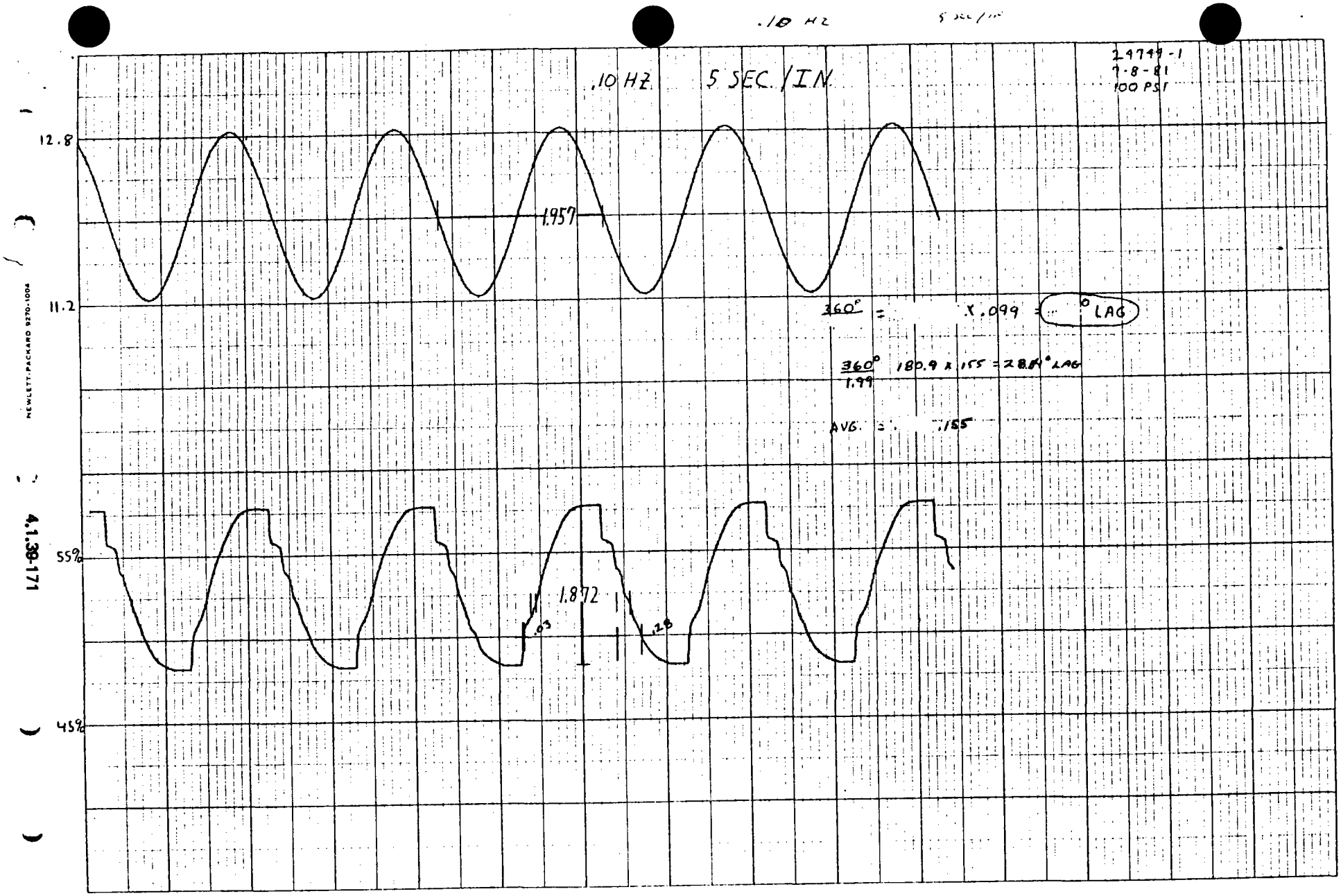

.02 HZ 10 SEC/IN
24744-1
7-8-81
100 PSI
12.8
11.2
5.00 IN.
360°/5.0 = 72.0 x .165 = (11.88° LAG)
AVGR = .165
.18
2.14
.15
55%
45%
4.1.39-168
HEWLETT PACKARD 9170-1004

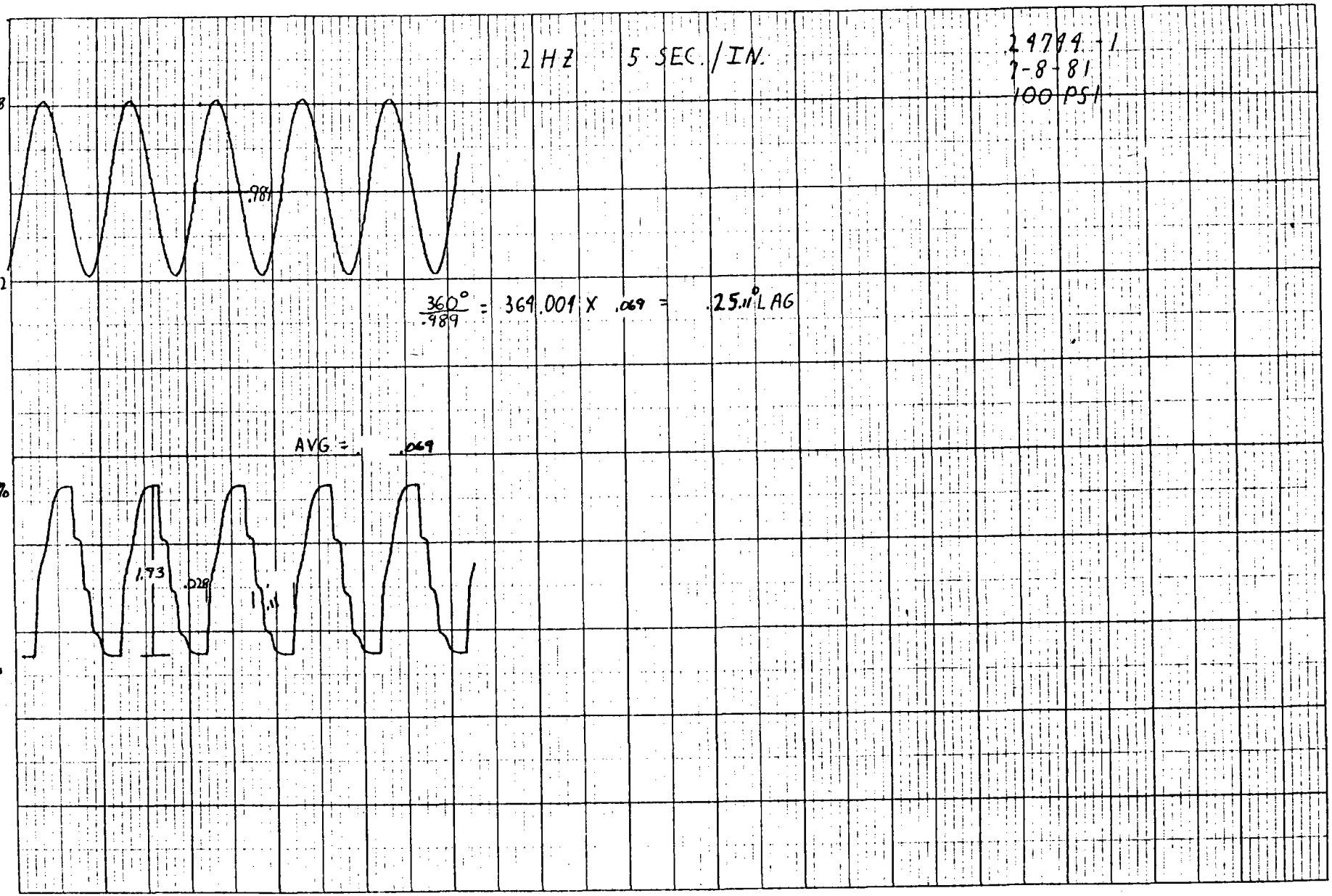

12.5
11.2
3.827
$\frac{360^\circ}{3.827}$ = 94.07 X .121 = 11.38° LAG
AVG. = .121
55%
45%
.042
1.985
.200
HEWLETT-PACKARD 9270-1004
4.1.38-189

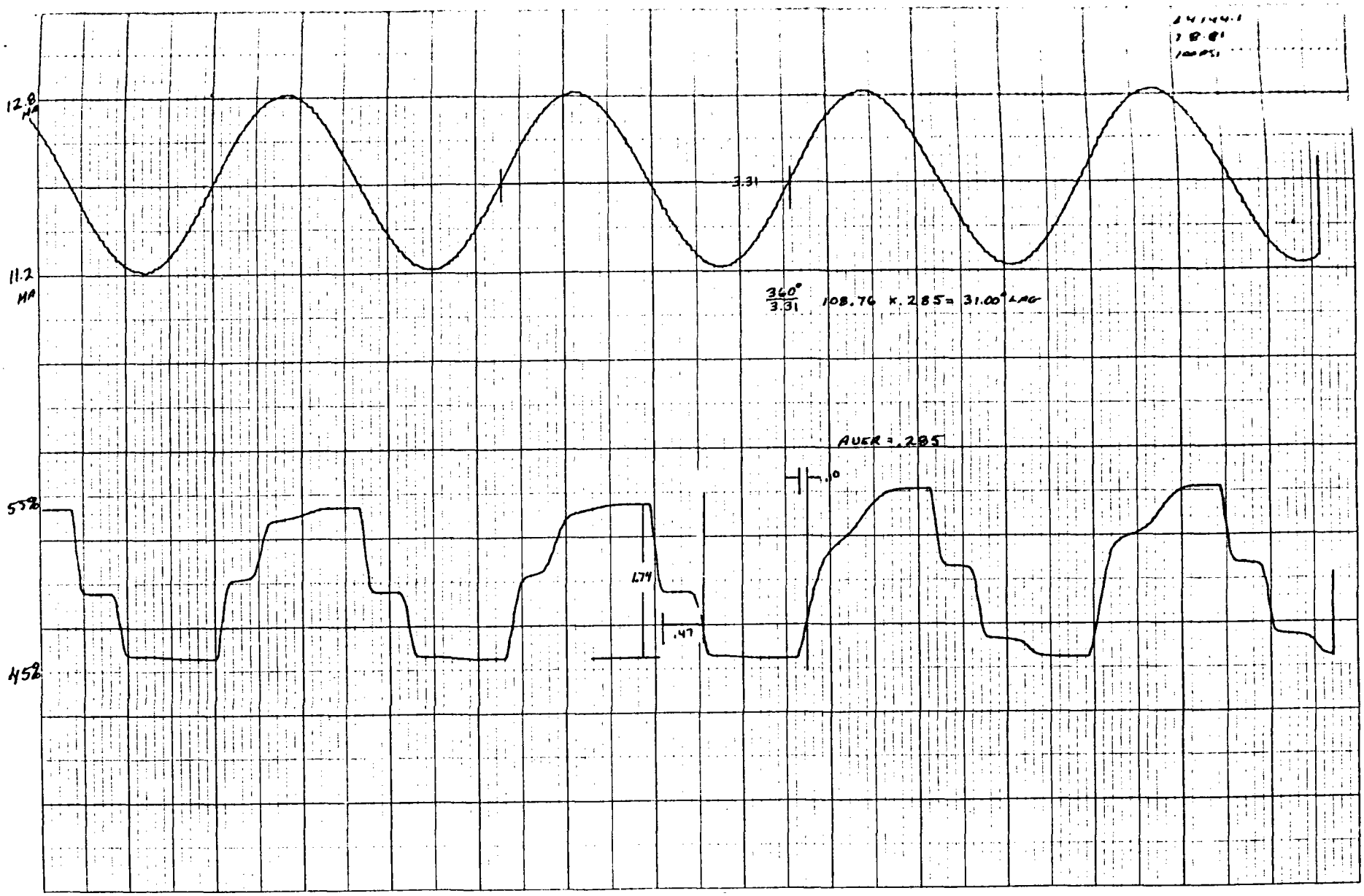
1 SEC/IN .1 HZ

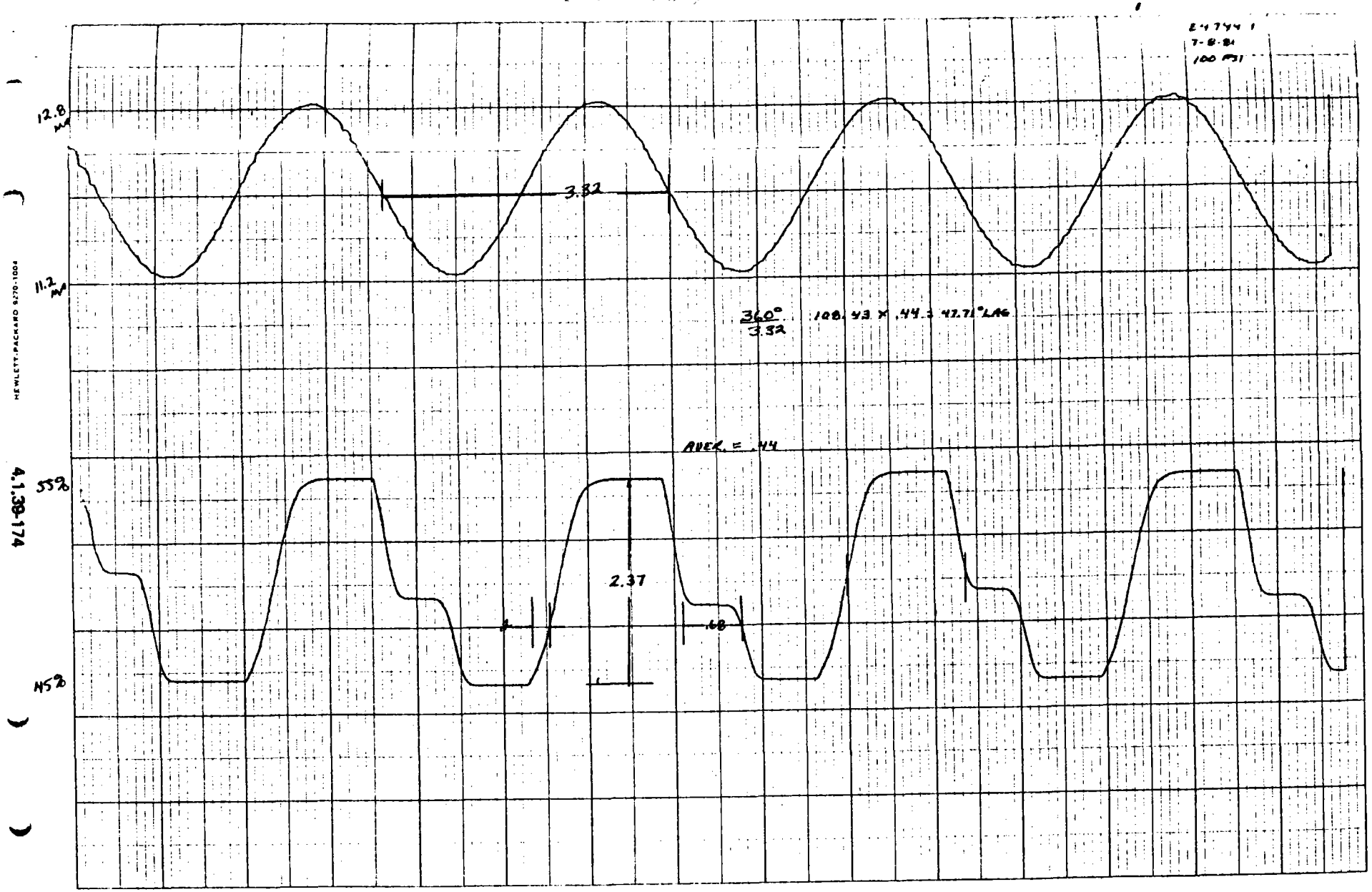


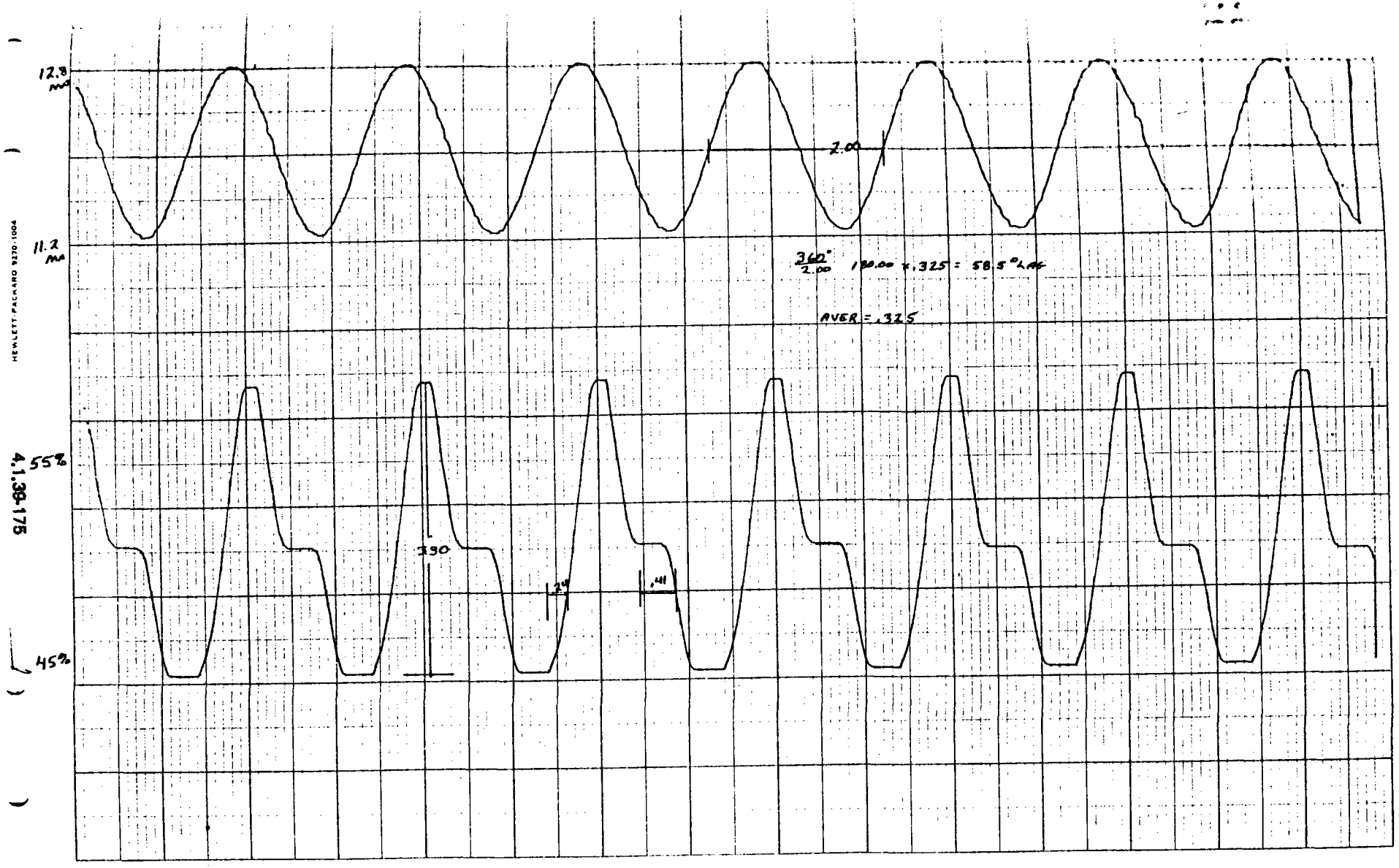
4.1.38-170


.10 HZ
5 SEC/IN
24749-1
7-8-81
100 PSI
12.8
11.2
1.957
360° = X .099 = ° LAG
360° / 1.99 180.9 x .155 = 28.04° LAG
AVG. = .155
55%
45%
1.872
.03
.28
4.1.38-171
NEWLETT-PACKARD 9270-1004


.2 HZ
5 SEC./IN.
24794-1
7-8-81
100 PSI
12.8
11.2
.981
360°/.989 = 369.001 X .069 = 25.11° LAG
AVG = .069
55%
45%
1.73
.028
1.11
4.1.39-172

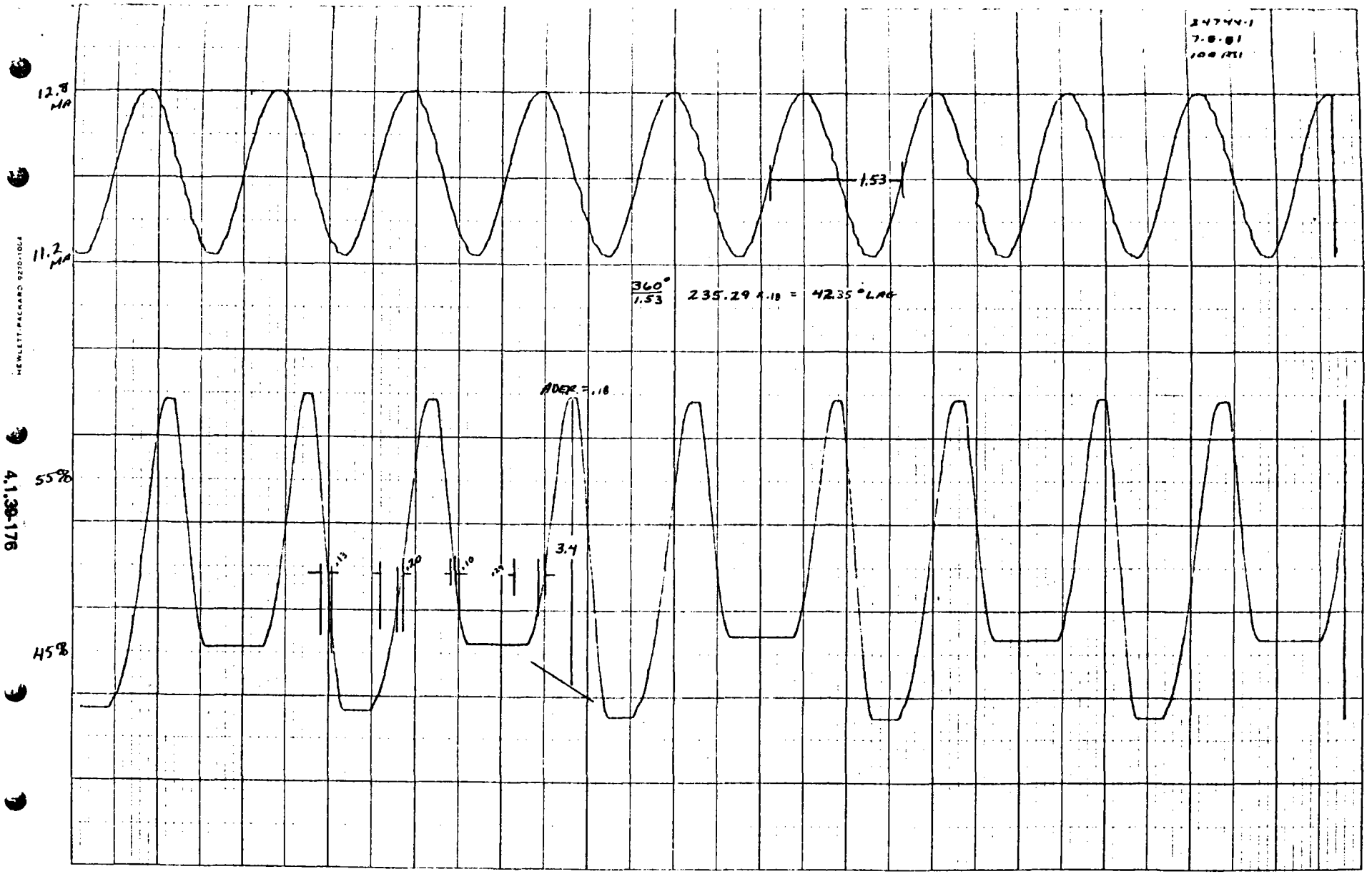


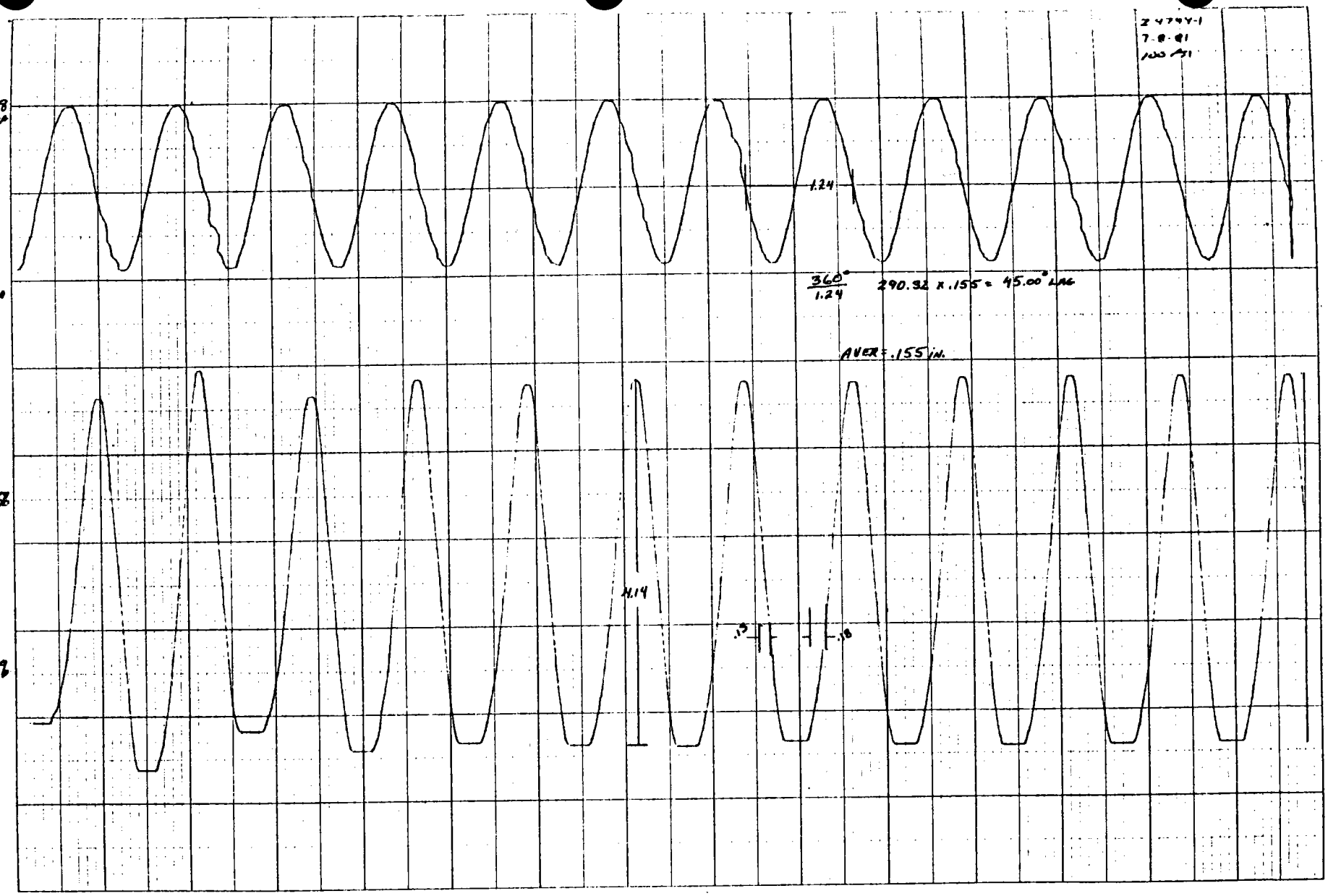

E-4744 1
7-8-84
100 MV
12.8 MV
11.2 MV
3.32
360°/3.32 108.43 X .44 = 47.71° LAG
AVER. = .44
559
452
2.37
.68
HEWLETT-PACKARD 9270-1004
4.1.39-174

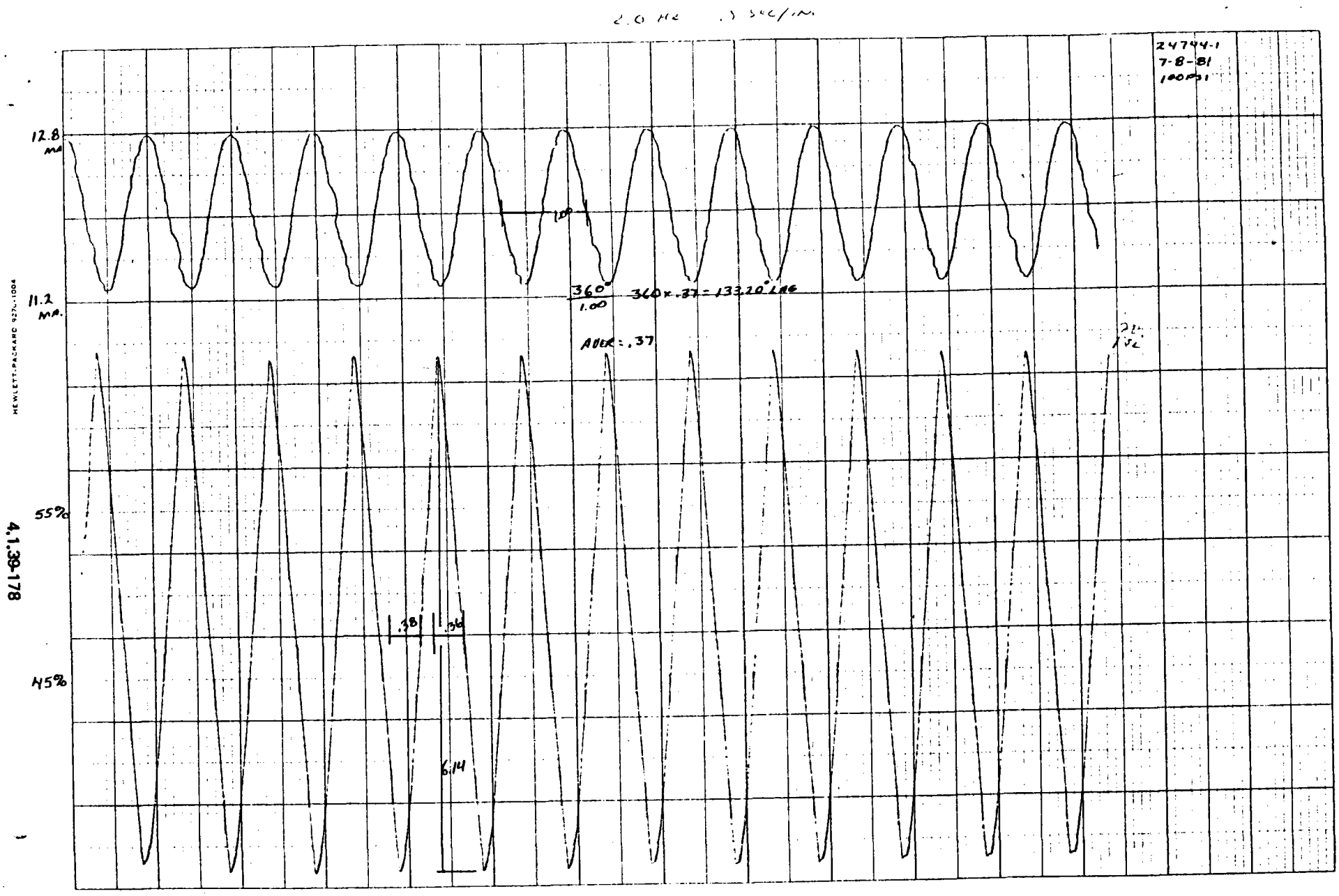


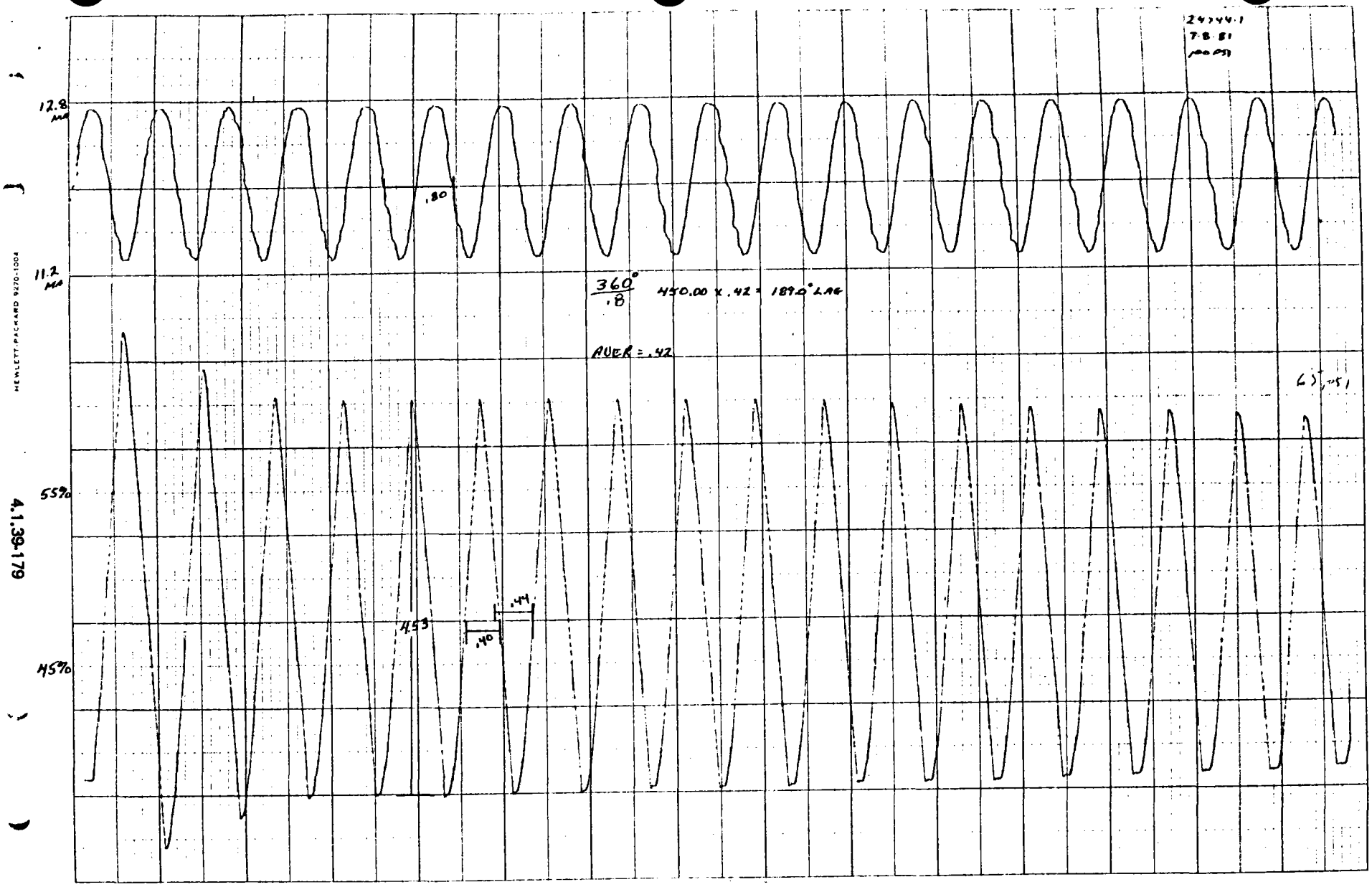
HEWLETT-PACKARD 9270-1004

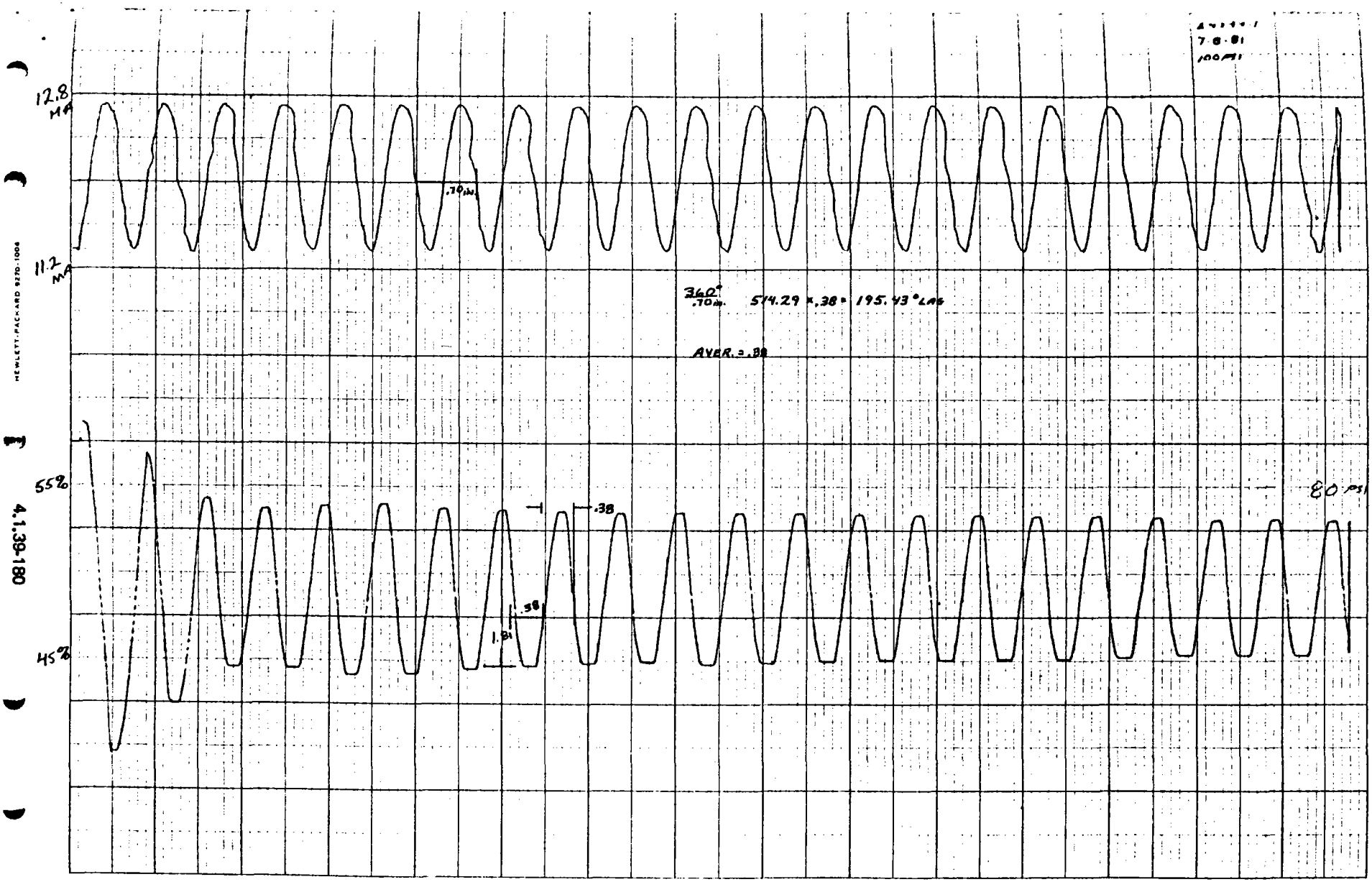
4.1.38-175

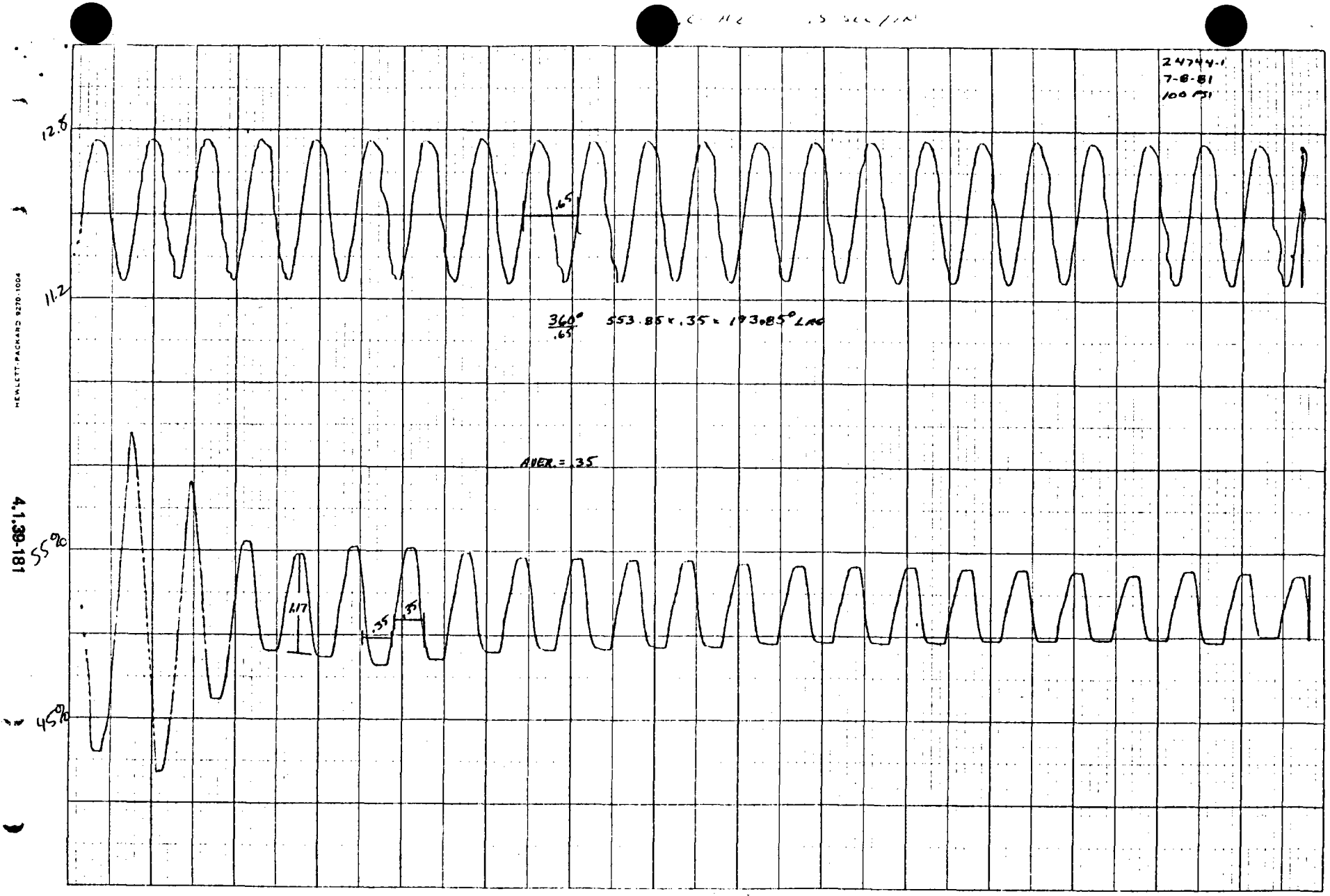

12.8 MA
11.2 MA
55%
45%
1.53
360°/1.53 235.29 x .18 = 42.35° LAG
ADER = .18
1.13
1.20
.10
.3
3.4
4.1.38-176
HEWLETT-PACKARD 9270-1004

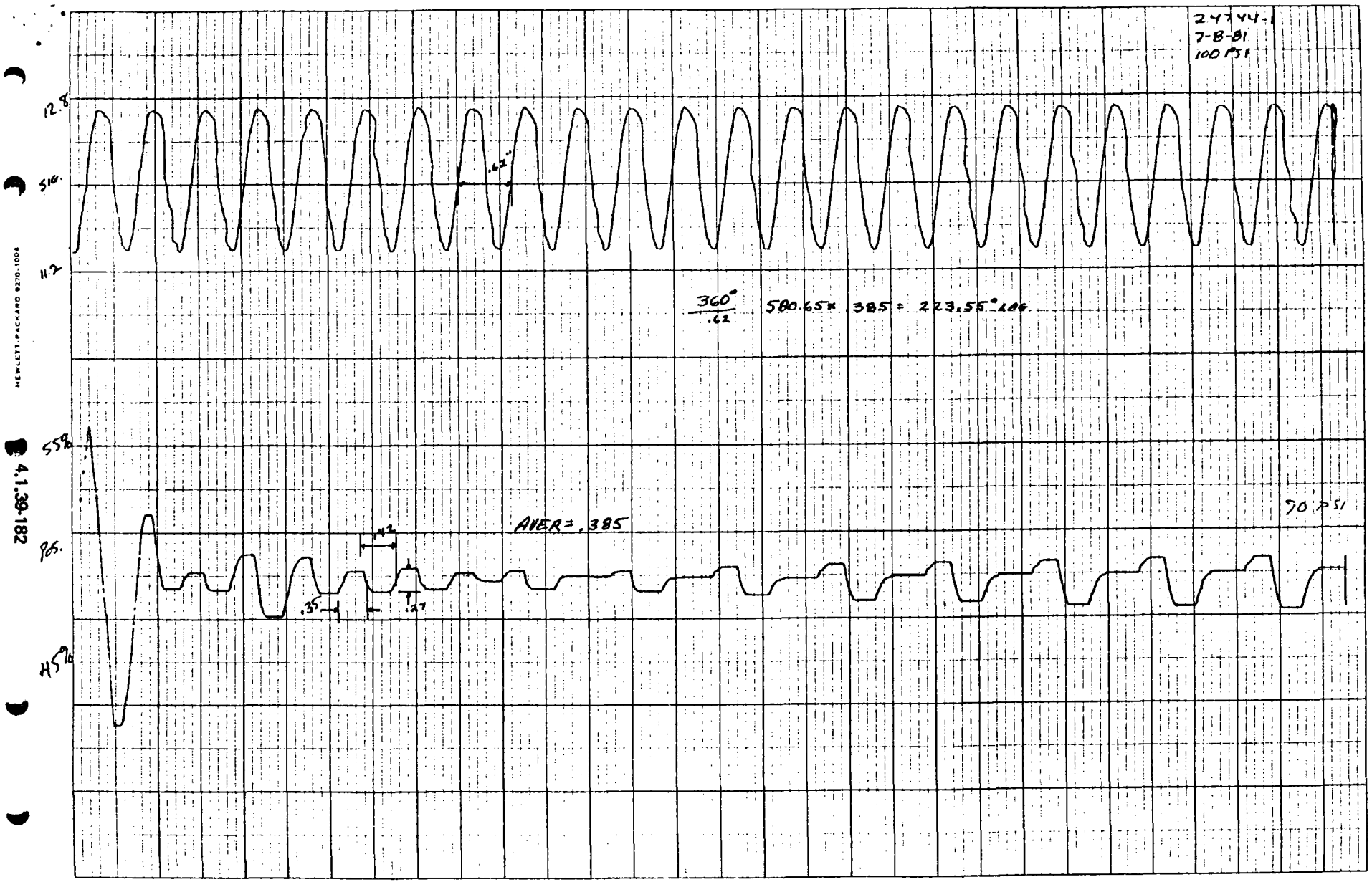

Z 4794-1
7-8-91
1000 PSI
12.8 MA
11.2 MA
1.24
360°/1.24 290.32 x .155 = 45.00° LAG
AVER = .155 in.
558
458
4.1.38-177
NEWLETT-PACKARD 9270-1004


2.0 Hz .1 sec/in.
24744-1
7-8-81
100 psi
12.8 ma
11.2 ma.
55%
45%
1.00
360°/1.00 360 x .37 = 133.20° Lag
ADER = .37
.38
.36
6.14
HEWLETT-PACKARD 9270-1004
4.1.39-178


12.8 mA
11.2 mA
55%
45%
.80
360°/.8 450.00 x .42 = 189.0° LAG
AVER = .42
.44
.40
4.1.39-179


12.8 MA
11.2 MA
55%
45%
.70 in.
.38
1.81
.38
360°
.70 in.
514.29 x .38 = 195.43 °LAG
AVER. = .38
80 PSI
HEWLETT-PACKARD 9270-1004
4.1.39-180


24744-1
7-8-81
100 PSI
12.8
11.2
.65
360°/.65 553.85 x .35 = 193.85° LAG
APER. = .35
55%
45%
.117
.35
.35
HEWLETT-PACKARD 9270-1004
4.1.39-181


24744-1
7-8-81
100 MSI
12.8
5.10
11.2
.62"
360°/.62 580.65 × .385 = 223.55°
55%
AVER = .385
70 PSI
.42
.35
.27
POS.
HS%
4.1.39-182
HEWLETT-PACKARD 9270-1004

Babcock & Wilcox
Control Components International

TITLE	Specification No. : TP-508
VALVE ACTUATOR DYNAMIC RESPONSE	Revision : 0
SINE WAVE TEST	Date Effective : 1/8/80
	Page 5 of 5

FREQUENCY RESPONSE DATA SHEET

W.O. 24744-1-1 DATE 7-8-81

VALVE P/N 24744-1 ACTUATOR P/N ____

CUSTOMER STEARNS-ROGER VALVE S/N 1

TAG NO. PV-1001 SUPPLY: 80 PSIG RECORDING DEVICE X-Y RECORDER

FREQ. Hz	AMPLITUDE INCHES	AMPLITUDE RATIO	db	LENGTH OF ONE SIGNAL CYCLE	DEGREES PER IN.	DIFFERENCE IN SIGNAL & OUT-PUT INCHES	DEGREES PHASE LAG
.001	2.07	———	—	———	———	———	———
.2	1.96	.95	-.47	4.95	72.73	.38	27.64
1.0	2.6	1.26	+1.98	2.0	180.0	.16	28.80
1.6	4.17	2.01	+6.08	1.27	283.46	.145	41.10
2.0	5.83	2.82	+8.99	1.00	360.0	.37	133.20

CUSTOMER REQUIREMENTS

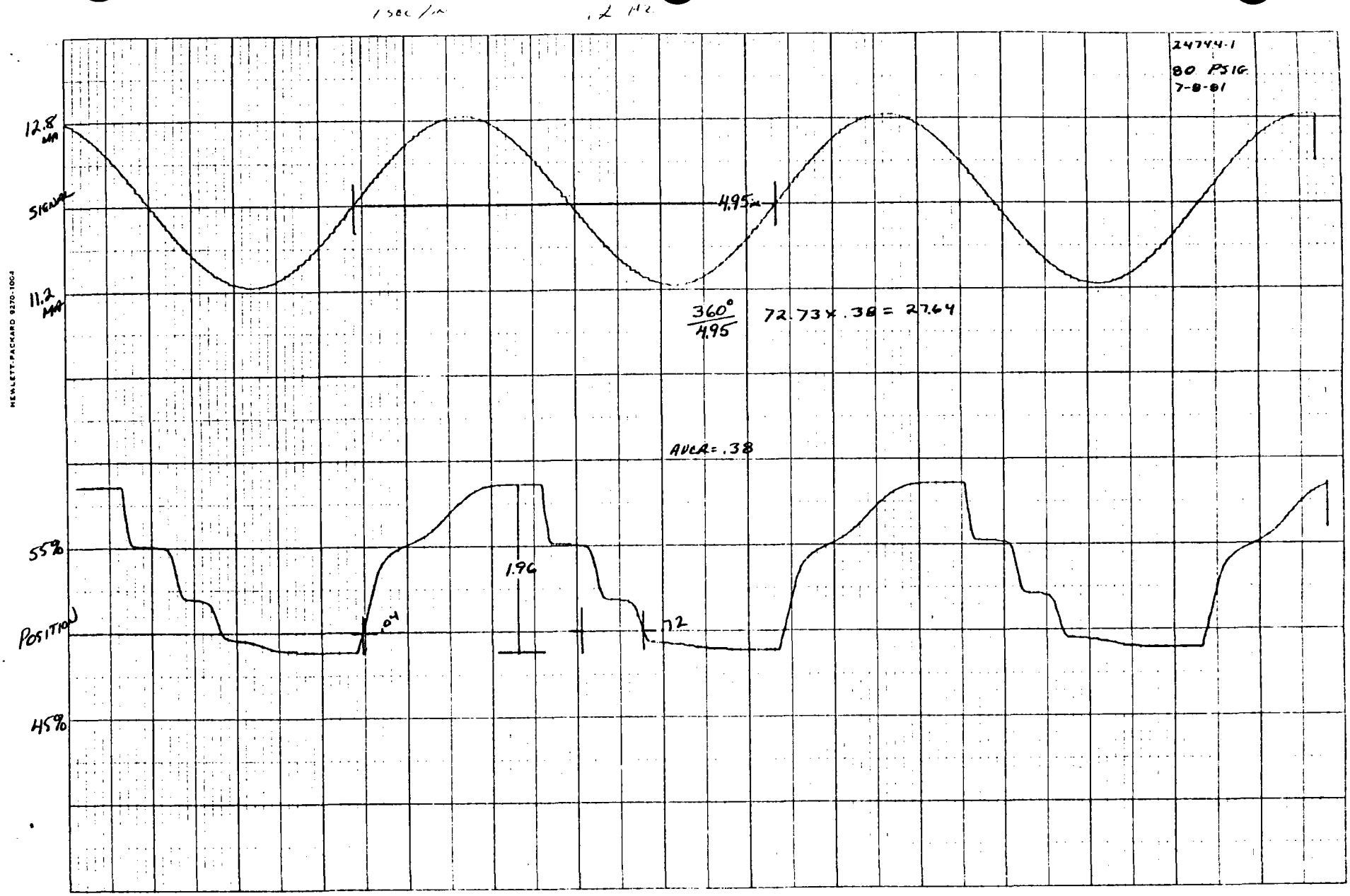
TEST PERFORMED BY Ricky Hanks

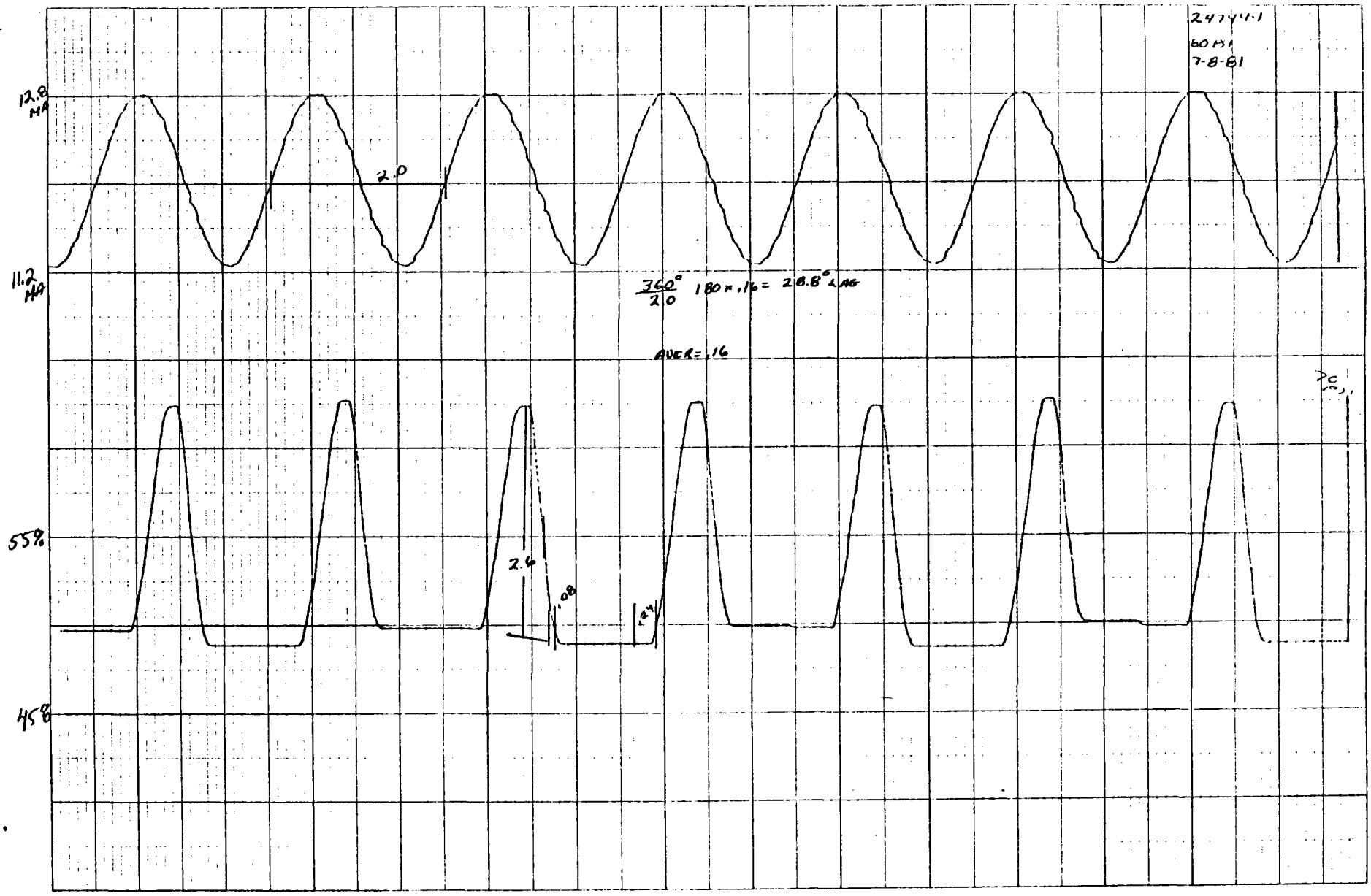
CCI INSPECTOR APPROVAL J D Burge (Project Engr.)

CUSTOMER INSPECTOR APPROVAL ____

ACTION REQUIRED, IF ANY ____

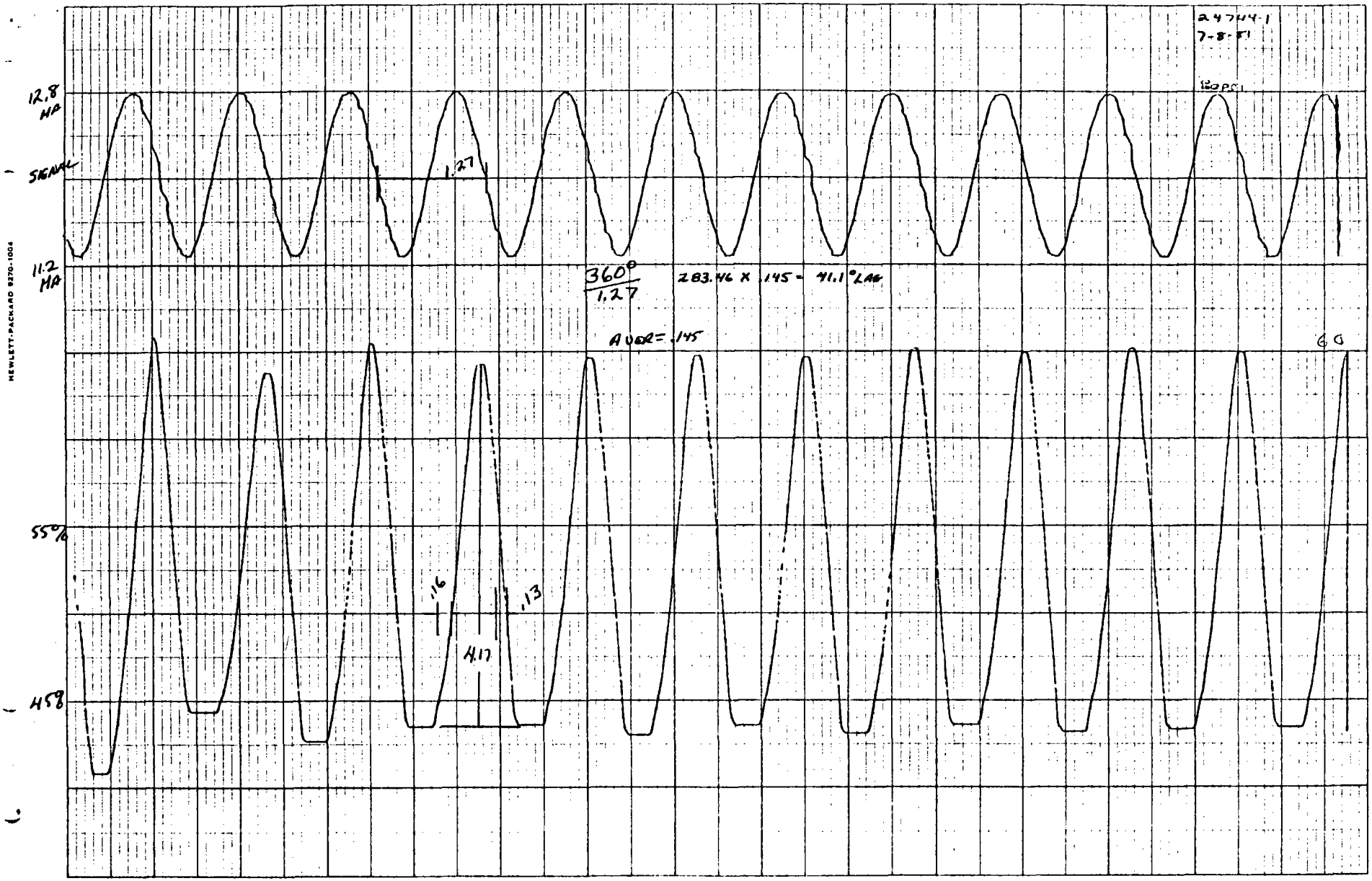
OC 277 9 79

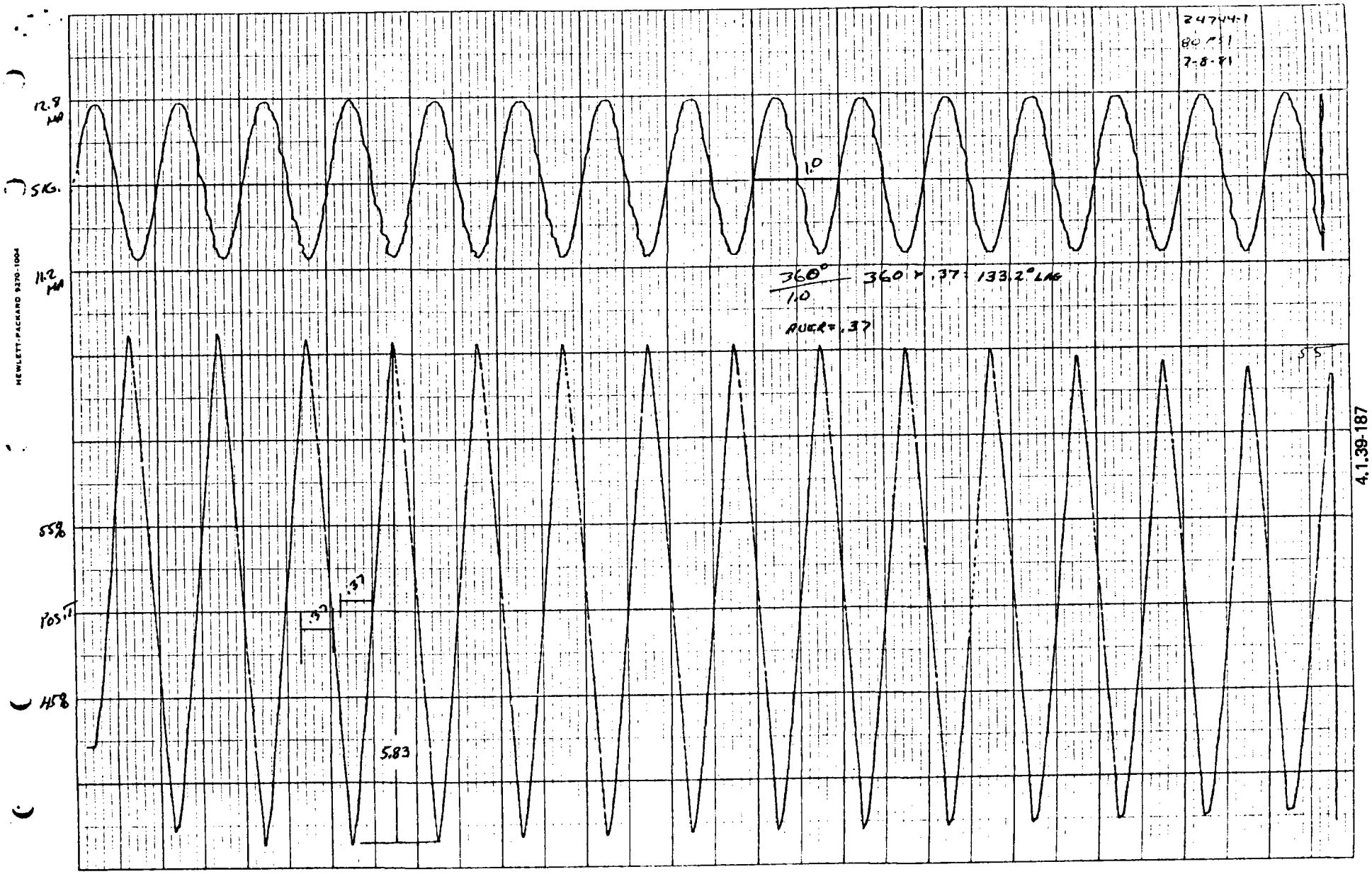

1 sec/in
.2 Hz
24744-1
80 PSIG
7-8-91
12.8 MA
SIGNAL
11.2 MA
4.95in
360°/4.95
72.73 x .38 = 27.64
AVG = .38
55%
POSITION
45%
1.96
.04
.72
HEWLETT-PACKARD 9270-1064
4.1.39-184



HEWLETT-PACKARD 9270-1004

4.1.39-185


1.6 Hz .5 sec/in
24744-1
7-8-81
12 P.C.
12.8 MA
SIGNAL
11.2 MA
1.27
360°/1.27
283.46 X .145 = 41.1° LAG
AVGR = .145
55%
45%
.16
.13
4.17
6 G
HEWLETT-PACKARD 9270-1004
4.1.39-186


20 HZ
.5 SEC/IN
24744-1
80 PSI
7-8-81
12.8 MA
5KG.
11.2 MA
1.0
360°/1.0 360 × .37 = 133.2° LAG
RUER = .37
55%
POS.1
45%
.37
.37
5.83
S S
HEWLETT-PACKARD 9270-1004
4.1.39-187

Babcock & Wilcox
Control Components International

TITLE	Specification No. : TP-508
VALVE ACTUATOR DYNAMIC RESPONSE	Revision : 0
SINE WAVE TEST	Date Effective : 1/8/80
	Page 5 of 5

FREQUENCY RESPONSE DATA SHEET

W.O. 24744-1-1 DATE 7-8-81

VALVE P/N 24744-1 ACTUATOR P/N _____

CUSTOMER STEARNS-ROGER VALVE S/N 1

TAG NO. PV-1001 SUPPLY: 120 PSIG RECORDING DEVICE X-Y RECORDER

FREQ. Hz	AMPLITUDE INCHES	AMPLITUDE RATIO	db	LENGTH OF ONE SIGNAL CYCLE	DEGREES PER IN.	DIFFERENCE IN SIGNAL & OUTPUT INCHES	DEGREES PHASE LAG
.001	2.07	—	—	—	—	—	—
.2	1.90	.92	-.74	4.98	72.29	.49	35.42
1.0	3.14	1.52	+3.62	1.99	180.9	.25	45.23
1.6	3.45	1.67	+4.44	1.24	290.32	.15	43.55
2.0	5.80	2.80	+8.95	1.00	360.0	.165	59.40

CUSTOMER REQUIREMENTS

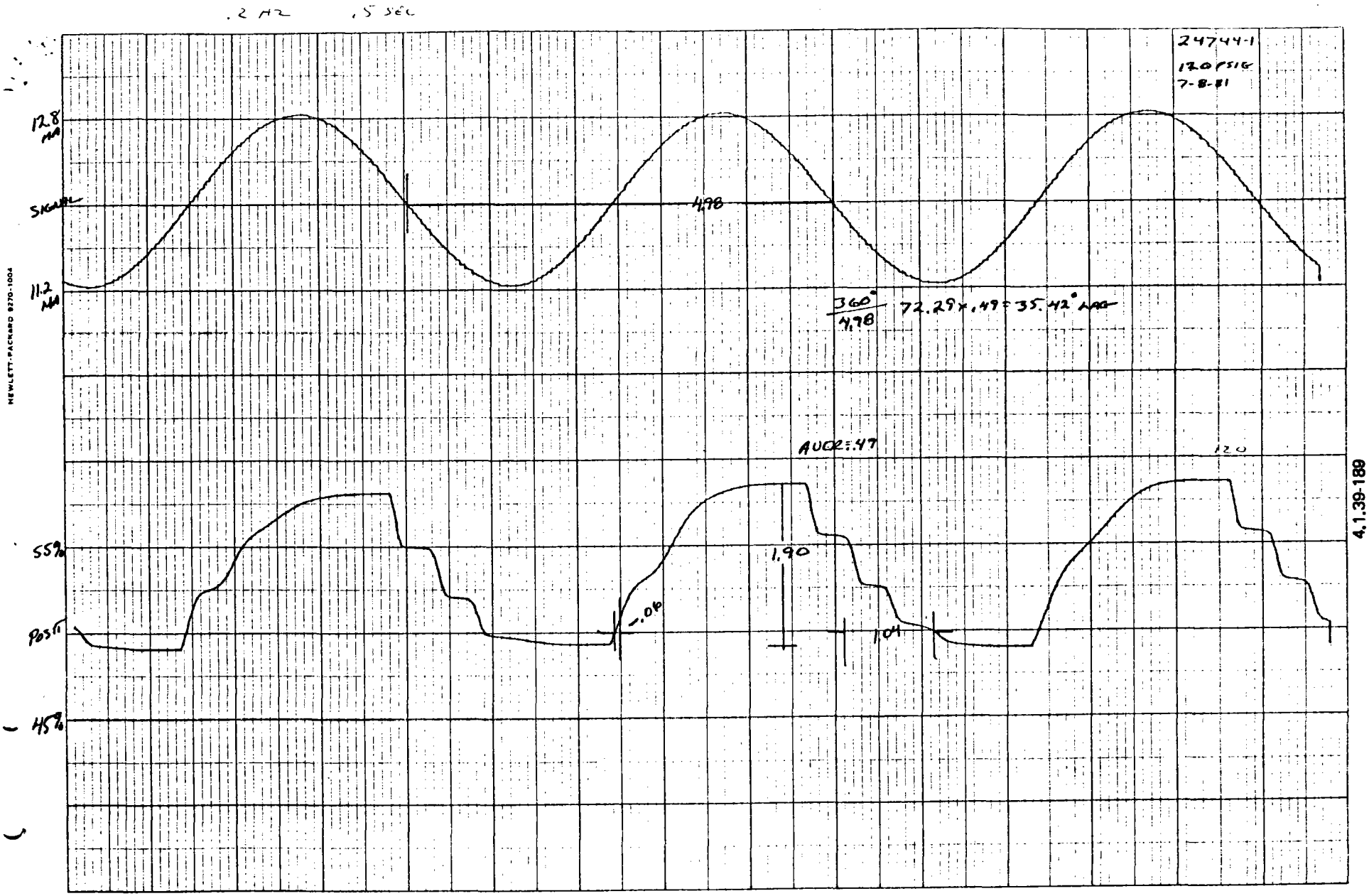
TEST PERFORMED BY Ricky Hanks

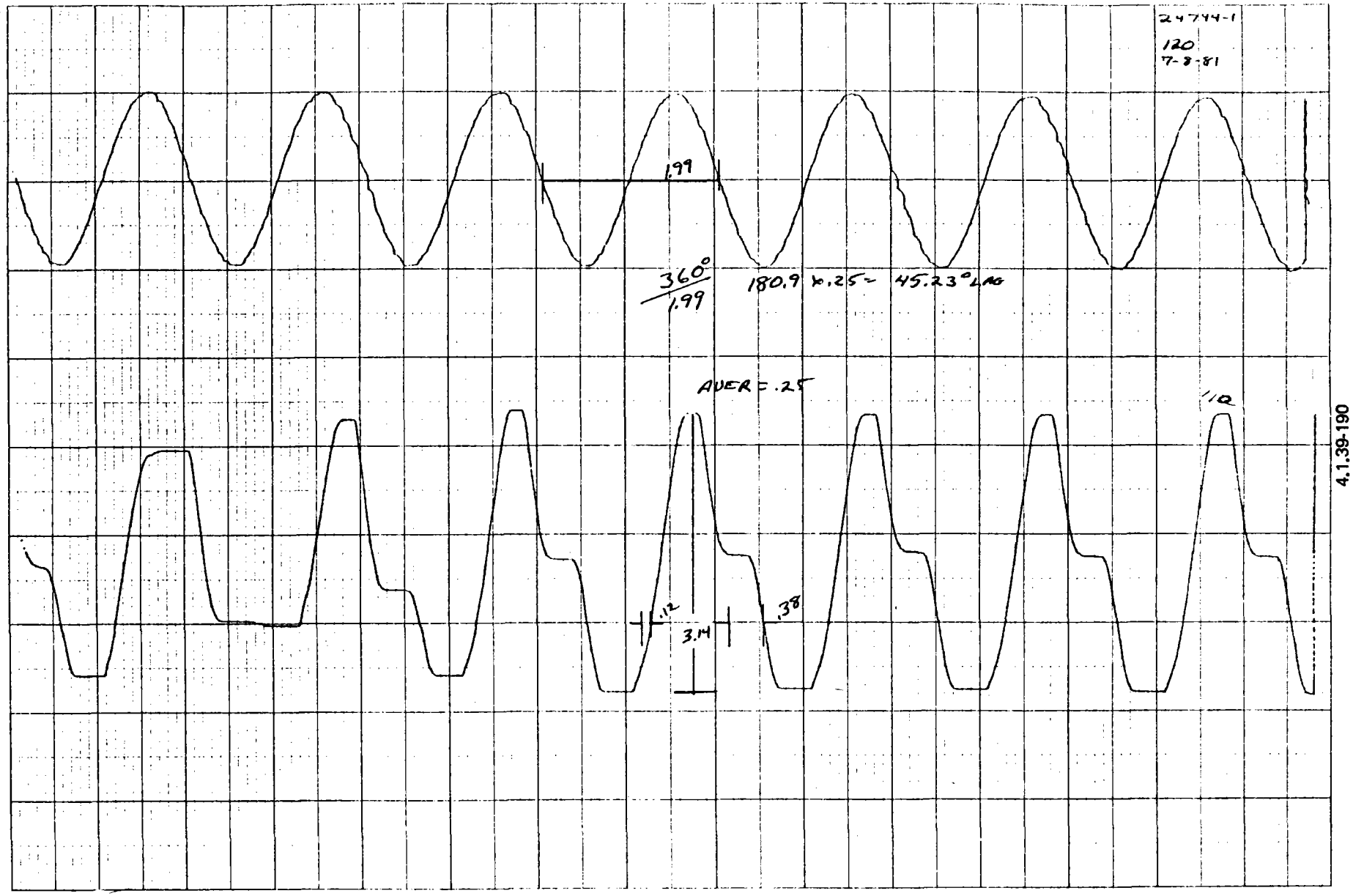
CCI INSPECTOR APPROVAL J D Bray (Field Service)

CUSTOMER INSPECTOR APPROVAL _____

ACTION REQUIRED, IF ANY _____

OC-277 9-79

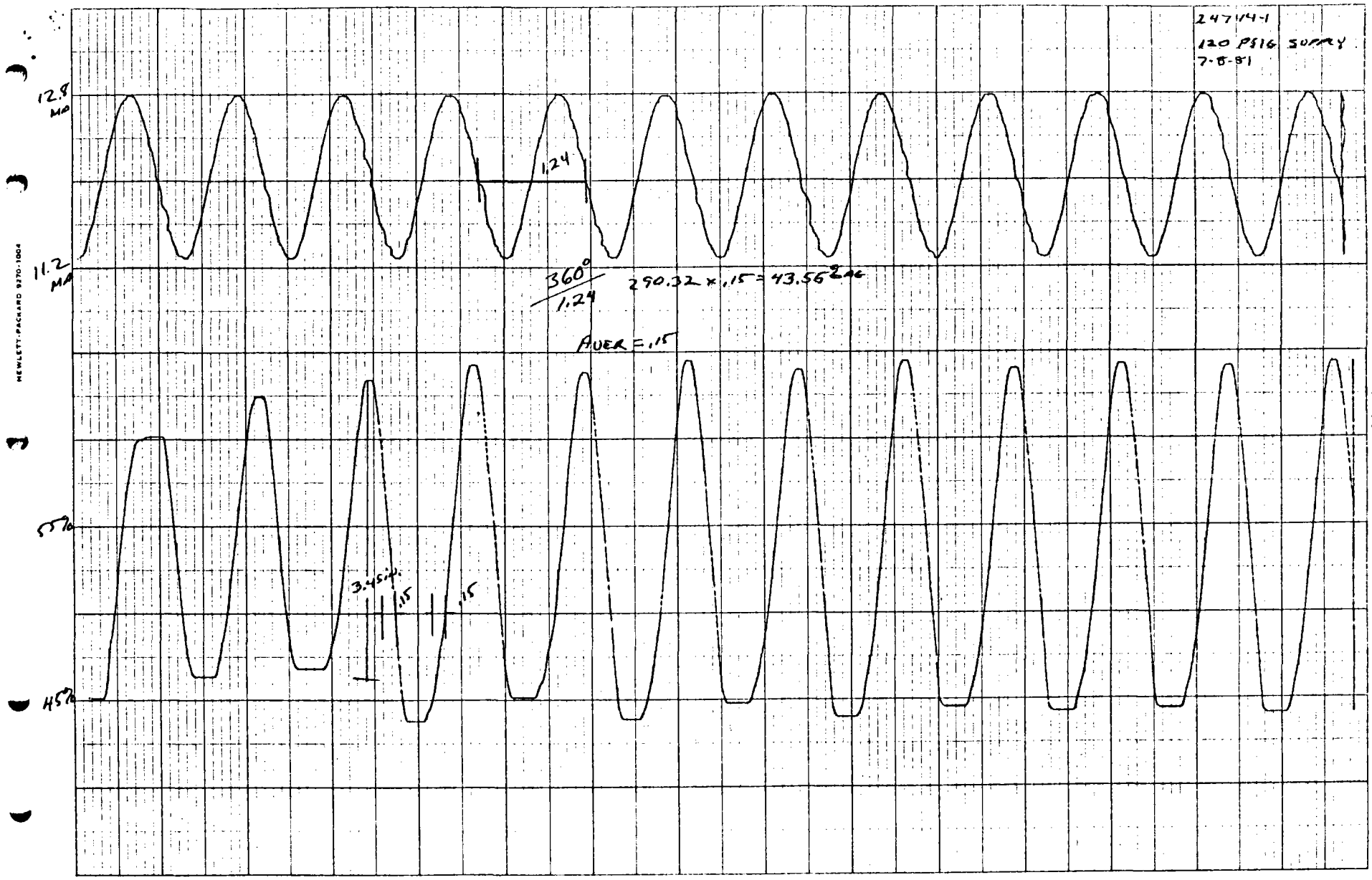

.2 HZ
.5 SEC
24744-1
120 PSIG
7-8-81
12.8 MA
SIGNAL
11.2 MA
4.98
360°/4.98 72.29 x .49 = 35.42°
AUGR: .47
120
55%
POSN
45%
1.90
-.06
1.04
NEWLETT-PACKARD 9270-1004
4.1.39-189

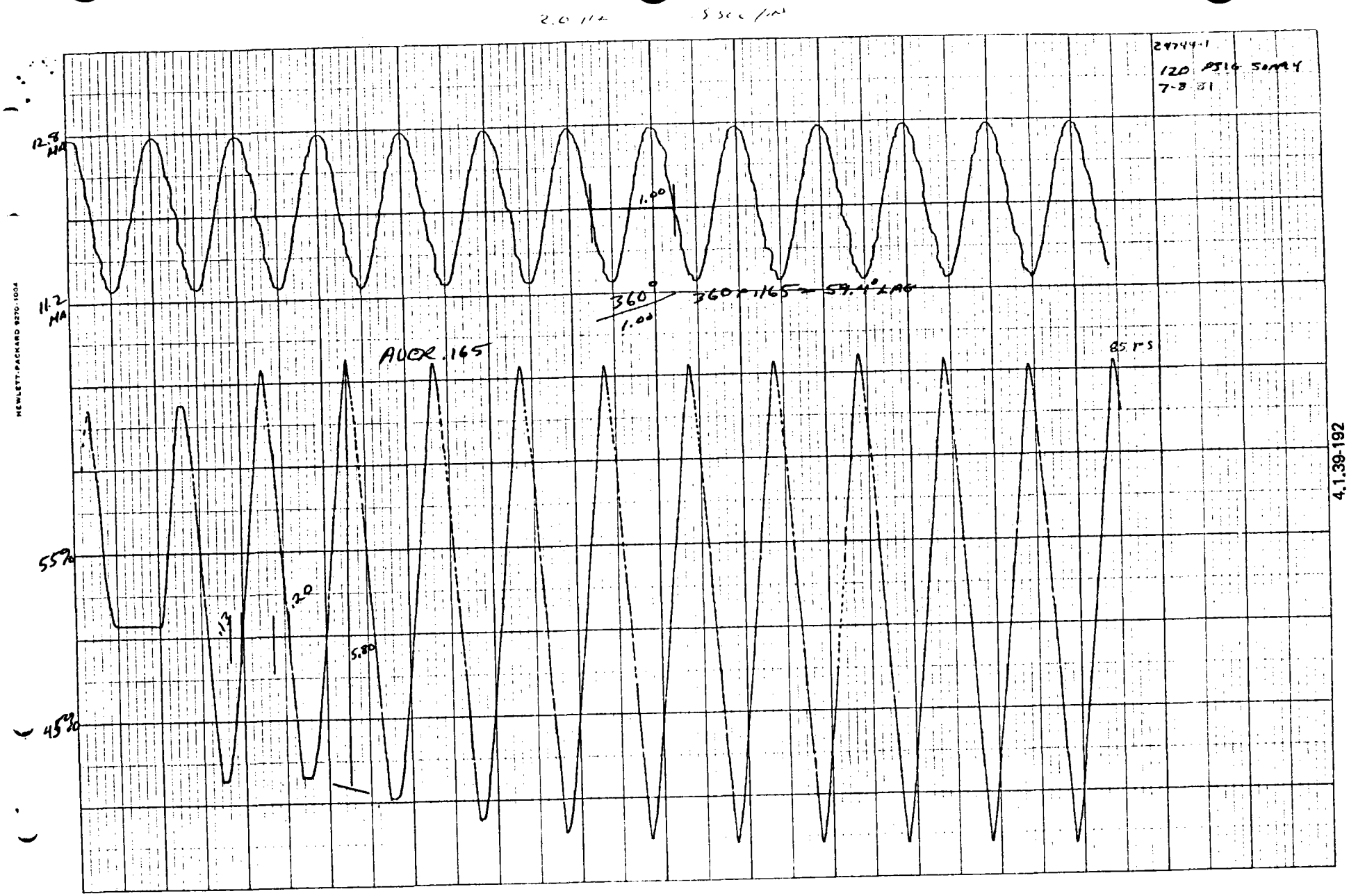


HEWLETT-PACKARD 9270-1004

4.1.39-190

1.6 HZ .5 IN/MIN.


247144-1
120 PSIG SUPPLY
7-8-81
12.8 MA
11.2 MA
1.24
360°/1.24
290.32 x .15 = 43.56 SQ IN
AVER = .15
5%
45%
3.45 in.
.15
.15
HEWLETT-PACKARD 9270-1004
4.1.30-191



Stearns-Roger

P.O. BOX 5888
DENVER, COLORADO 80217

#C-21700-1048

TO: McDonnell Douglas Astronautics Company
5301 Bolsa Avenue
Huntington Beach, California 92647

DATE: 13 August 81
PROJECT NAME: Solar One
PROJECT NO.: C-21700 6A
VENDOR NO.:
ITEM: Final Vendor Drawings

ATTENTION: Mr. R.J. Perkins

GENTLEMEN:

ENCLOSED ARE (PRINTS)(~~SEPIAS~~) XXXXX OF THE FOLLOWING VENDOR DRAWINGS:

NO. ENCL.	Stearns-Roger No.	REV. NO.	STATUS: REVIEWED (*) - SUBMIT CERTIFIED FINAL COPIES	REVIEWED (*) COMMENTS AS NOTED - CORRECT & RETURN CERTIFIED FINAL COPIES	REVISE PER COMMENTS RESUBMIT FOR REVIEW	FINAL	FOR INFORMATION	OTHER-SEE REMARKS	REMARKS:
1P	E-4 (File No. 55)					X			VENDOR DRAWING

njc

(*) REVIEWED SUBJECT TO CONDITIONS OF THE CONTRACT

CC: JAH
GHM
CFFile
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Yours truly,
STEARNS-ROGER

J.A. Hopson, Project Engineer

PLEASE SIGN THE DUPLICATE COPY OF THIS TRANSMITTAL AND RETURN IT TO US FOR OUR RECORDS:

SIGNED _____ DATE _____

4.1.40 Aux Desuper Heater Control Valve

4.1.40.1 Identification	Description
Tag Number	
PV-1003	Aux Desuperheater Control Valve to Deaerator DA-301

4.1.40.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn
Part No.	Type D-100-40
Spec No.	D.O.E. Spec 40I700-12S
Material:	Body: A217, GR WC9
Weight:	260 lbs

4.1.40.3 Prescribed Service

Steam, 1451 psig, 950°

4.1.40.4 Vendor

Copes-Vulcan Inc.

4.1.40.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.57

4.1.40.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.57

4.1.40.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.57

4.1.40.8 Special Tools

None

4.1.40.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.57

4.1.40.10 Acceptance Tests

4.1.41 Aux Steam Control Valve

4.1.41.1 Identification	Description
Tag Number	Aux steam control valve to
PV-1005	AOV-1008 and DS-902

4.1.41.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
Part No.	D-100-40
Spec No.	D.O.E. Spec 40I700-12S
Material:	Body: A216 GR, WCB
Weight:	128 lbs

4.1.41.3 Prescribed Service

Steam, 360 psig, 525°

4.1.41.4 Vendor

Copes-Vulcan Inc.

4.1.41.5 Special Cautions

See C.V.I. Instruction Manual in Maintenance Section 4.1.57

4.1.41.6 Periodic Service

See C.V.I. Instruction Manual in Maintenance Section 4.1.57

4.1.41.7 Parts List

See C.V.I. Instruction Manual in Maintenance Section 4.1.57

4.1.41.8 Special Tools

None

4.1.41.9 Maintenance Instructions

See C.V.I. Instruction Manual in Maintenance Section 4.1.57

4.1.4.1.10 Acceptance Tests

4.1.42 Modulating Valves

4.1.42.1 Identification Tag Number	Description
PV-1703	Raw water pump recirculating control valve

4.1.42.2 Description of Information

Similar to FV-1007 (Section 4.1.4). See Copes-Vulcan Instruction Manual in Maintenance Section 4.1.55.

4.1 Modulating Control Valve

4.1.43 Feedwater Bypass Valve

4.1.43.1 Identification Tag Number — Description

PV-2002 — Feedwater Bypass Valve

4.1.43.2 Description

Manufacturer	:	Valtek, Springville, Utah
Part Number	:	Mark two body, mark one actuator
Rocketdyne Specification No.	:	SP42-003 (following)
Material	:	Body: Carbon Steei
Weight	:	95 lb

4.1.43.3 Prescribed Service

Water

4.1.43.4 Vendor

Valtek, Springville, Utah

4.1.43.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.43.6 Periodic Service

none

4.1.43.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.43.8 Special tools

none

4.1.43.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.43.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18900-001 TAG NO. PV-2002

1." MARK II BODY SUB-ASSEMBLY
1500# 2.00" SPUD 0.56" STEM DIA.
INLINE, STD SEAL, FLOW OVER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY MK 2 IN-LINE, 1", 1500#.....	1	...029289.042.041		
12	YOKE HALF-RING, 2.25 X 1.75, 0.25 THI	2	...001047.029.002		
20	SEAT RING, 1", CV 12.....	1	...004237.825.000	**	321.27
30	SEAT RETAINER, 1", 1500#.....	1	...003183.150.000		
40	BONNET, 1", 2.00" SPUD.....	1	...003180.029.041		
50	PLUG, 1", LIN.....	1	...005669.833.000	** T B A	
55	SEAT GASKET, SPIRAL, 1.88 X 1.50.....	1	...003184.832.000	** T B A	
58	BONNET GASKET, SPIRAL, 2.50 X 2.12...	1	...001228.832.000	**	5.36
70	BONNET FLANGE, 1", 1500#.....	1	...004065.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.....	2	...001133.150.000		
80	GLAND FLANGE, 0.56" STEM, 2.00" SPUD.	1	...008454.150.000		
83	GUIDE, 0.56" STEM.....	1	...001044.825.000		
87	GUIDE, 0.56" STEM.....	1	...001044.433.000		
88	PACKING SET, STD SQUARE, 0.56" STEM..	1	...024238.929.000	** T B A	
93	PKG SPR, 0.56" STEM, 3.00 L.....	1	...020912.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L.....	2	...001116.010.002		
108	BONNET FLANGE STUD, 7/8"-9, 3.75 L...	4	...002385.012.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
114	BONNET FLANGE NUT, 7/8"-9, H D.....	4	...001908.014.002		
117	PACKING BOX NUT, 3/8"-16.....	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18.....	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18900-001 TAG NO. PV-2002

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
8" H D SPRING, AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 25 SQ. INCH, 2.00" SPUD.....	1	...017655.300.040		
202	CYLINDER, 25 SQ. INCH, 8/12" H D SPRI	1	...016682.609.008		
210	ADJUSTING SCREW, 8" H D, 25 SQ. INCH.	1	...005306.029.002		
211	ACTUATOR STEM, 25 SQ. INCH, H D.....	1	...005431.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 25 SQ. INCH.....	1	...001004.601.003		
227	SPRING BUTTON, 25 SQ. INCH, H D.....	1	...003924.029.040		
229	SPRING, 25 SQ. INCH, 8" H D.....	1	...003613.006.040		
235	TAKE-OFF ARM, 25 SQ. INCH.....	1	...001214.029.002		
236	SPACER, TAKE-OFF ARM, 25 SQ. INCH....	1	...001215.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 1-1/2" STROKE.	1	...007267.652.000		
240	TAKE-OFF ARM, POTENTIOMETER, 25 SQ. I	1	...030004.029.002		
247	BELLOWS, STEM, 25 SQ. INCH.....	1	...015498.652.000	**	3.93
248	GASKET, ADJUSTING SCREW, 25 SQ. INCH.	1	...001501.655.000	**	.40
249	CLAMP, STEM, BAILEY.....	1	...019979.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017665.431.000		
256	RETAINING RING, 25 SQ. INCH, CYLINDER	1	...016680.029.014		
270	SPRING CAP O-RING.....	1	...005393.650.000	**	1.91
271	PISTON O-RING.....	1	...001114.650.000	**	2.81
272	PISTON STEM O-RING.....	1	...001112.650.000	**	.21
274	YOKE O-RING.....	1	...001114.650.000	**	2.81
275	ACTUATOR STEM O-RING.....	1	...001113.650.000	**	.30
280	POSITIONER, 74SG1.....	1	...018085.999.000		
290	BRACKET, POSITIONER, 25 SQ. INCH.....	1	...001188.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 25 SQ. INCH..	1	...019985.029.040		
298	GAUGE, 0-30 PSI.....	1	...001294.999.000		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
~~303~~	~~SOLENOID, HT8320A173, 125 VDC.....~~	~~3~~	~~...025604.999.000~~		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
322	L V D T, 500 MR-DC.....	1	...022697.999.000		
325	SPRING CAP, 25 SQ. INCH, 8" H D SPRIN	1	...005288.300.040		
326	GUIDE, SPRING, 25 SQ. INCH.....	1	...003618.029.040		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 5/8"-11.....	1	...001120.013.002		
400	PLATE, VALTEK, 25 SQ. INCH.....	2	...001229.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18900-001 TAG NO. PV-2002

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
8" H D SPRING, AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002	
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002	
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002	
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE.....	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, 4.00 L.....	1	...030132.029.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER SP42-003
G. J. Krall	Rockwell International Corporation Rocketdyne Division Canoga Park, California	TYPE EQUIPMENT
APPROVALS		DATE 3-26-81
S.H. Spencer 3/27/81 G.A. Oberlin 3/27/81	SPECIFICATION	SUPERSEDES SPEC. DATED: 7-9-80
		REV. LTR. E / PAGE 1 of 7

TITLE

BYPASS VALVE, WATER, RECEIVER

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	RWBV (COMPONENT SHALL BE TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
LINE FLUID:	WATER
VALVE OPERATING PRESSURE:	2185 PSIG MAX @ 600°F
AIR SUPPLY PRESSURE:	125 ± 25 PSIG
TEMPERATURE:	LINE FLUID: 600°F MAX AMBIENT: 16 TO 113°F
ANSI CLASS:	1500 LB
END CONNECTIONS:	LINE: 1" BUTT WELD, SCHED. 80 PIPE INSTRUMENT AIR: 1/4 NPT (F)
BODY FORM:	GLOBE, IN-LINE, TOP ENTRY
VALVE Cv:	10 TO 14
BODY MATERIAL:	TO BE COMPATIBLE WITH LINE FLUID AND WELDABLE TO ASTM A106 GRADE B PIPE
BONNET TYPE:	STANDARD
TRIM TYPE:	LINEAR
ACTUATOR TYPE:	PNEUMATIC WITH TRAVEL INDICATOR FAIL CLOSED
PACKING & GASKET MATERIAL:	TO BE COMPATIBLE WITH LINE FLUID AND TEMPERATURE
INTERNAL LEAKAGE:	.01% OF RATED Cv MAXIMUM

EXTERNAL LEAKAGE: NO VISIBLE LEAKAGE

ACCESSORIES: THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1:

ELECTRO-PNEUMATIC TRANSDUCER

PNEUMATIC INPUT: 20 PSIG ± 2 PSI
ELECTRICAL INPUT SIGNAL: 4- 20 MA DC CONTROL RANGE
PNEUMATIC OUTPUT SIGNAL: 3 - 15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE
ELECTRICAL ENCLOSURE: WEATHERTIGHT (NEMA TYPE 3)
ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2" THREADED CONDUIT CONNECTION

LVDT

TYPE: DC/DC
VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PER CENT OR BETTER THROUGHOUT VALVE LIFT.
ENCLOSURE: WEATHERTIGHT (NEMA TYPE 3)
ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2" THREADED CONDUIT CONNECTION

POSITIONER

INSTRUMENT SIGNAL: 3-15 PSIG
PRESSURE GAUGES (3 REQD): INSTR. SIGNAL, UPPER & LOWER CYLINDER PRESSURE

ϕ

ACCESSORIES: (CONT'D)

REGULATOR

TYPE:	AIRSET WITH OUTLET PRESSURE GAUGE
INLET PRESSURE:	125 ± 25 PSIG
OUTLET PRESSURE:	20 PSIG ± 2 PSI

FILTER

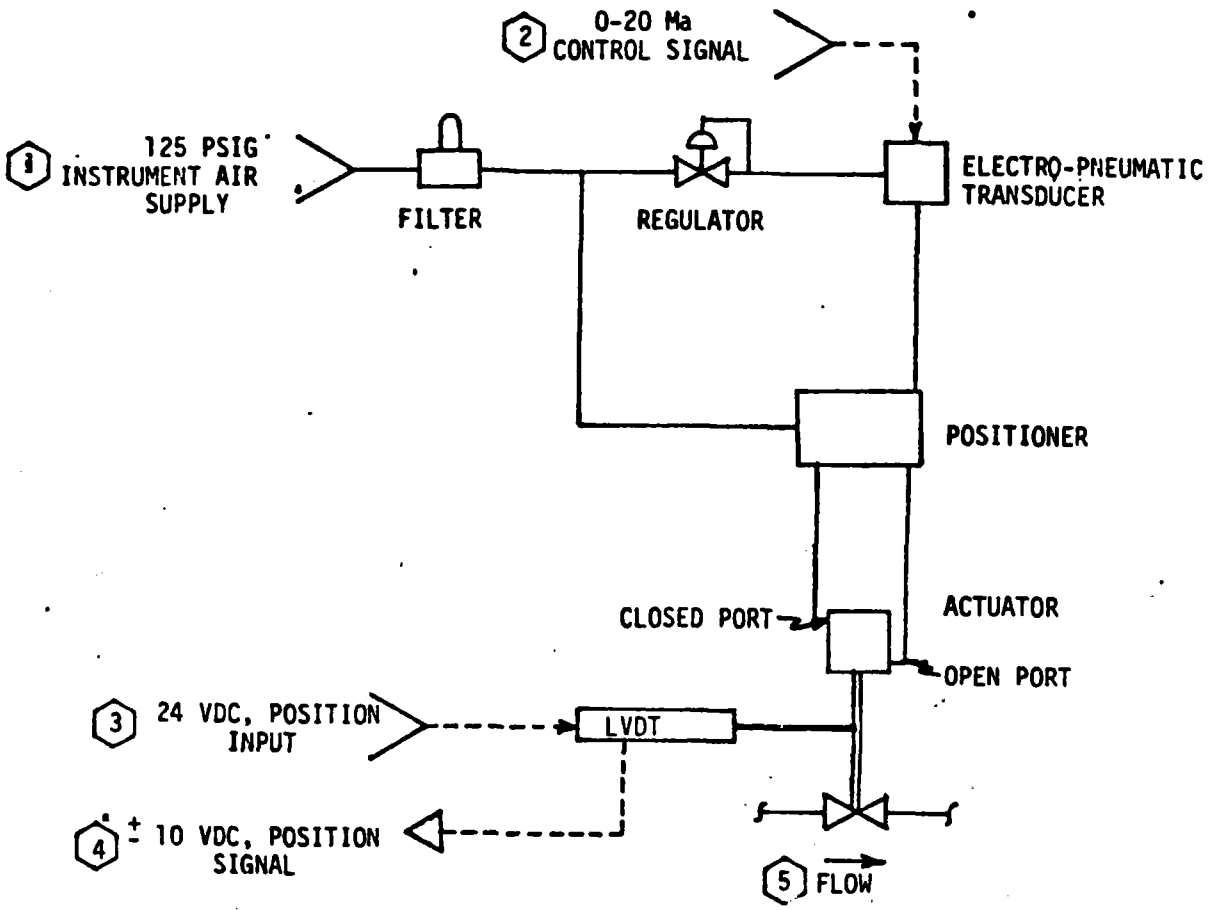
ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

DESIGN FEATURES:

1. THE MAXIMUM DIMENSIONS FOR THE VALVE INCLUDING THE ACCESSORY COMPONENTS ARE SHOWN IN FIGURE 2. ANY DIMENSIONS OUTSIDE OF THOSE NOTED ARE TO BE NEGOTIATED.
2. AFTER INSTALLATION, THE VALVE BODY WILL BE INSULATED BY ROCKETDYNE SUCH THAT THE VALVE BODY TEMPERATURE WILL STABILIZE AT A MAXIMUM TEMPERATURE OF 600°F.
3. POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 0 TO 100 PER CENT OF VALVE OPERATING LIFT.
4. THE VALVE MUST BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.

PREPARATION FOR DELIVERY:

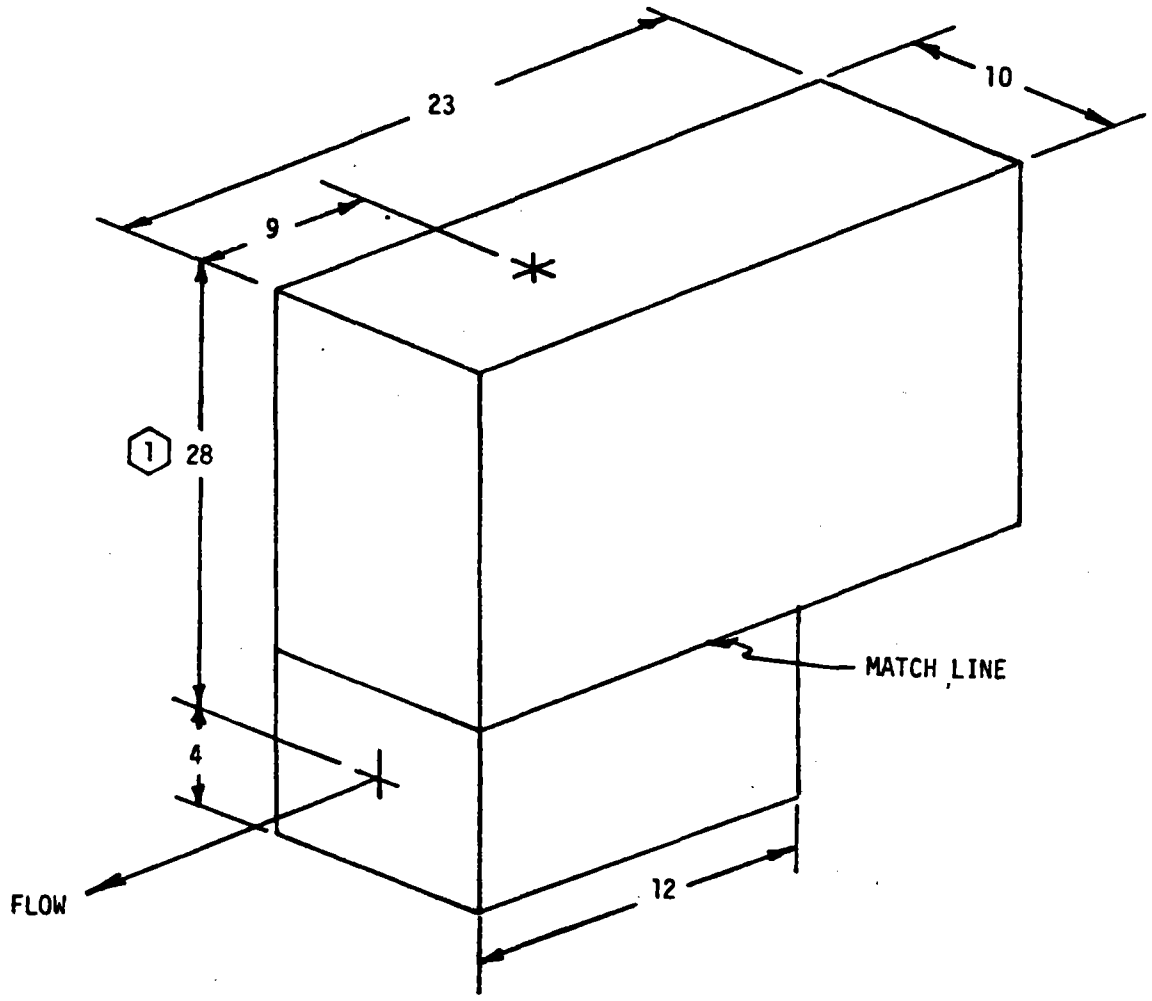
1. THE VALVE IS TO BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
2. THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE), AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. POSITION
4. SIGNAL
5. FLOW

Ø FIGURE 1



NOTES:
1. ALL DIMENSION ARE IN INCHES
(1) 2. MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

4.1 Modulating Control Valves

4.1.44 Flash Tank Steam Pressure Control Valve

4.1.44.1 Identification Tag Number — Description

PV-2906 — Flash Tank Steam Pressure Control

4.1.44.2 Description

Manufacturer	:	Valtek, Springville, Utah
Part Number	:	Mark one body, mark one actuator
Rocketdyne Specification No.	:	SP42-012 (following)
Material	:	Body: Chrome Moly
Weight	:	610 lb

4.1.44.3 Prescribed Service

Steam

4.1.44.4 Vendor

Valtek, Springville, Utah

4.1.44.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.44.6 Periodic Service

none

4.1.44.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.44.8 Special Tools

none

4.1.44.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.44.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18365-001 TAG NO. PV-2906

4." MARK I BODY SUB-ASSEMBLY
1500# 3.38" SPUD 1.50" STEM DIA.
BONNET/W EXTN, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 4", 1500#.....	1	...017092.025.041		
13	EXTN BONNET HALF-RING, 3.75 X 3.00, 0	2	...003984.150.000		
20	SEAT RING, 4", CV 195.....	1	...001210.825.000	**	484.05
30	SEAT RETAINER, 4", 1500#.....	1	...003051.150.000		
40	BONNET, 4", 3.38" SPUD.....	1	...004005.150.000		
41	BONNET EXTN, 1.50" STEM, 3.38" SPUD..	1	...016503.150.000		
43	FLANGE, BONNET EXTN, 3.38" SPUD.....	1	...003985.150.000		
50	PLUG EXTD, 4", LIN.....	1	...006870.834.000	**	T B A
55	SEAT GASKET, SPIRAL, 4.87 X 4.50.....	1	...001242.868.000	**	31.81
58	BONNET GASKET, SPIRAL, 5.68 X 5.18...	1	...001240.868.000	**	3.62
60	EXTN BONNET GASKET, SPIRAL, 3.12 X 2.	1	...016493.868.000	**	30.35
70	BONNET FLANGE, 4", 1500#.....	1	...004006.150.000		
80	GLAND FLANGE, 1.50" STEM, 3.38" SPUD.	1	...001969.029.041		
83	GUIDE, 1.50" STEM.....	1	...001967.825.000		
86	GUIDE LINER, 1.50" STEM, GRAFOIL.....	3	...009472.842.000	**	11.01
87	GUIDE RETAINER, 1.50" STEM, GRAFOIL..	1	...009475.150.000		
88	PACKING SET, STD SQUARE, 1.50" STEM..	1	...024246.929.000	**	T B A
93	PKG SPR, 1.50" STEM, 4.00 L.....	1	...020903.150.000		
94	PKG SPR, 1.50" STEM, 4.00 L.....	1	...020903.150.000		
95	PKG SPR, 1.50" STEM, 4.00 L.....	1	...020903.150.000		
96	PKG SPR, 1.50" STEM, 1.00 L.....	1	...020902.150.000		
97	PKG SPR, 1.50" STEM, 0.50 L.....	1	...004684.150.000		
98	PKG SPR, 1.50" STEM, 0.25 L.....	1	...020933.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/8"-11, 2.25 L.....	4	...001283.015.002		
108	BONNET FLANGE STUD, 1-1/4"-8, 5.50 L.	8	...003680.195.000		
109	PACKING BOX STUD, 5/8"-11, 5.50 L....	2	...003892.012.002		
110	STUD, 3/4"-10, 3.75 L.....	8	...005741.195.000		
114	BONNET FLANGE NUT, 1-1/4"-8, H D.....	8	...002383.195.000		
117	PACKING BOX NUT, 5/8"-11, H D.....	4	...005110.014.002		
120	NUT, 3/4"-10, H D.....	8	...002281.195.000		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18365-001 TAG NO. PV-2906

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD 2.5" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 100 SQ. INCH, 3.38" SPUD.....	1	...017681.300.040		
202	CYLINDER, 100 SQ. INCH, STANDARD.....	1	...001307.609.008		
210	ADJUSTING SCREW, 100/200 SQ. INCH....	1	...001711.029.002		
211	ACTUATOR STEM, 100/200 SQ. INCH, 3.38	1	...002437.159.000		
213	STROKE PLATE, 2-1/2" STROKE.....	1	...001252.603.000		
225	PISTON, 100 SQ. INCH.....	1	...001311.601.003		
227	SPRING BUTTON, 100/200 SQ. INCH.....	1	...003713.029.040		
228	SPACER, 100 SQ. INCH, 2.62/3.38" SPUD	1	...008272.029.040		
229	SPRING, 100/200 SQ. INCH.....	1	...001331.006.040		
235	TAKE-OFF ARM, 100 SQ. INCH, 3.38/4.75	1	...001841.029.002		
236	SPACER, TAKE-OFF ARM, 100 SQ. INCH...	1	...001842.029.002		
237	RANGE SPRING, 3-15.....	1	...007436.999.000		
239	BELLOWS, RANGE SPRING, 6" STROKE.....	1	...006829.652.000	**	7.68
240	TAKE-OFF ARM, POTENTIOMETER.....	1	...019434.029.002		
242	ARM, ADJUSTING, TRANSDUCER.....	1	...026368.159.000		
247	BELLOWS, STEM, 100/200 SQ. INCH.....	1	...015526.652.000	**	6.43
248	GASKET, ADJUSTING SCREW, 100/200 SQ.	1	...001631.655.000	**	.83
249	CLAMP, STEM, TRIP.....	1	...003443.300.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017740.431.000		
256	RETAINING RING, 100 SQ. INCH, CYLINDE	1	...001403.029.014		
271	PISTON O-RING.....	1	...001313.650.000	**	6.26
272	PISTON STEM O-RING.....	1	...001312.650.000	**	.28
274	YOKE O-RING.....	1	...001313.650.000	**	6.26
275	ACTUATOR STEM O-RING.....	1	...001718.650.000	**	.83
280	POSITIONER, 746.....	1	...006744.999.000		
290	BRACKET, POSITIONER, 100 SQ. INCH....	1	...001726.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...015710.029.040		
294	BRACKET, POTENTIOMETER, 100 SQ. INCH.	1	...028555.029.040		
296	BRACKET, LIMIT SWITCH, MICRO.....	1	...017755.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
303	SOLENOID, HT8320A173, 120 VDC.....	1	...026274.999.000		
305	LIMIT SWITCH, OPAR, MICRO.....	1	...002478.999.000		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
320	L V D T, 2000 HR-DC.....	1	...022261.999.000		
345	STEM CLAMP LOCKNUT, 1/2"-13.....	1	...006806.013.002		
348	ACTUATOR STEM LOCKNUT, 1-1/8"-7.....	1	...001357.013.002		
400	PLATE, VALTEK, 100/200 SQ. INCH.....	2	...001404.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 3/8"-16, 1.00	2	...001713.010.002		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18365-001 TAG NO. PV-2906

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD 2.5" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002	
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002	
409	TUBE FITTING, 1/4", STRAIGHT.....	*	...001572.402.002	
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002	
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019548.029.040	
426	COVER, L V D T, 4" STROKE.....	1	...019549.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	1	...004698.010.002	
433	JAM NUT, 1/4"-20.....	2	...005473.013.002	
434	JAM NUT, 3/8"-16.....	1	...004733.013.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

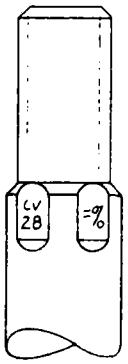
VALTEK

MARK ONE

Standard Materials of Construction
Estimating Shipping Weights

Part Identification

Whenever we can, we visibly number the part with ink or etching equipment. This identifies the part number and material used. On the plug stem flats we etch Cv, flow characteristic, part number, and material.



Name Plate

Valves are equipped with stainless steel name plates. An example is illustrated below.

Standard Materials of Construction

Part	Material
Body & Bonnet	Cast Iron, Ductile Iron, Steel, 304, 304L, 316, 316L, 347 Stainless Steel, Bronze, Alloy 20, Hastelloy 'B' and 'C', Nickel, Monel, Inconel, Chrome - Moly, and Titanium.
Separable Line & Bonnet Flanges	Steel
Retaining Rings	Zinc Plated Steel
Plug	316 Stainless Steel, or same as Alloy body
Retainer	316 Stainless Steel, or same as Alloy body
Seat Ring	316 Stainless Steel or same as Alloy body
Guides	Bronze, Glass loaded Teflon, Grafoil, Stellite
Packing	Teflon V-Ring, Teflon Asbestos, Graphite Asbestos, and Grafoil.
Packing Spacer	316 Stainless Steel, or same as Alloy body
Seat Ring and Bonnet Gaskets	Stainless Steel and asbestos spiral wound or Teflon
Body Bolts	Zinc Plated Steel
Gland Flange	Precision Cast Stainless Steel
Gland Flange Nuts & Bolts	Zinc Plated Steel
Yoke Clamp Bolts	Zinc Plated Steel
Yoke Clamp	Precision Cast Stainless Steel

Estimating Shipping Weights

Globe and Angle, Flanged Valves with Cylinder Actuators and Positioners

Size In.	Weight in Pounds 150#	300#	600#	900#	1500#	2500#	Add For Std. Ext. Bonnet
½ - ¾	40	40	40				5
1	50	50	50	100	120	150	5
1½	65	65	65	170	180	210	5
2	75	75	75	200	220	300	5
3	160	170	180	400	430	500	15
4	240	250	265	590	610	940	20
6	360	570	600	1000	1170	1400	40
8	590	790	830				65
10	1050	1405	1600				90

Add 30# for diaphragm actuators on ½ - 2" valves.

Add for oversize cylinder actuators.

Original size	Oversize	Add
25	50	30#
50	100	90#
100	200	125#

PREPARED BY	FSCM NO. 02602	NUMBER SP42-012
P. E. Debrunner	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	TYPE Equipment
APPROVALS		DATE 12-2-80
	SPECIFICATION	SUPERSEDES SPEC. DATED: 5-20-80
		REV. LTR. C
		PAGE 1 of 6

TITLE

CONTROL VALVE, STEAM PRESSURE, FLASH TANK

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	RFSPCV (COMPONENT SHALL BE SO TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
LINE FLUID:	STEAM
VALVE OPERATING PRESSURE:	600 PSIG MAX @ 960°F
AIR SUPPLY PRESSURE:	125 ± 25 PSIG
TEMPERATURE:	LINE FLUID: 960°F MAX AMBIENT: 16 TO 113°F
ANSI CLASS:	900 LB
END CONNECTIONS:	LINE: 4" BUTT WELD, SCHED. 80 PIPE INSTRUMENT AIR: 1/4 NPT (F)
BODY FORM:	GLOBE, IN-LINE, TOP ENTRY
VALVE Cv:	180 to 210
BODY MATERIAL:	TO BE COMPATIBLE WITH LINE FLUID AND WELDABLE TO ASTM A335, GRADE P22 PIPE
TRIM TYPE:	LINEAR
ACTUATOR TYPE:	PNEUMATIC WITH TRAVEL INDICATOR OPEN (ELECTRICAL FAILURE) OPEN (PNEUMATIC FAILURE)
PACKING & GASKET MATERIAL:	TO BE COMPATIBLE WITH LINE FLUID AND TEMPERATURE
INTERNAL LEAKAGE:	.01% OF RATED Cv MAXIMUM

EXTERNAL LEAKAGE: NO VISIBLE LEAKAGE.

ACCESSORIES: THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1:

ELECTRO-PNEUMATIC TRANSDUCER

PNEUMATIC INPUT: 20 PSIG ± 2 PSI
ELECTRICAL INPUT SIGNAL: 4- 20 MA DC (CONTROL RANGE)
PNEUMATIC OUTPUT SIGNAL: 3 - 15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE
ELECTRICAL ENCLOSURE: NEMA TYPE 3
ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2" THREADED CONDUIT CONNECTION

LVDT

TYPE: DC/DC
VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PER CENT OR BETTER THROUGHOUT VALVE LIFT.
ENCLOSURE: NEMA TYPE 3
ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2" THREADED CONDUIT CONNECTION

POSITIONER

INSTRUMENT SIGNAL: 3-15 PSIG
PRESSURE GAUGES (3 REQD): INSTR. SIGNAL, UPPER & LOWER CYLINDER PRESSURE

SOLENOID VALVE

TYPE: 3-WAY, N.C.
VOLTAGE: 120 VDC
SOLENOID ENCLOSURE: NEMA TYPE 3-
ELECTRICAL CONNECTION: 6" LONG LEADS THROUGH 1/2" THREADED CONDUIT CONNECTION

ACCESSORIES:

POSITION SWITCH 28 VDC, 2 AMPS, ONE SPDT SWITCH FOR INDICATION OF CLOSED POSITION OF VALVE

REGULATOR

TYPE:	AIRSET WITH OUTLET PRESSURE GAUGE
INLET PRESSURE:	125 ± 25 PSIG
OUTLET PRESSURE:	20 PSIG ± 2 PSI

FILTER

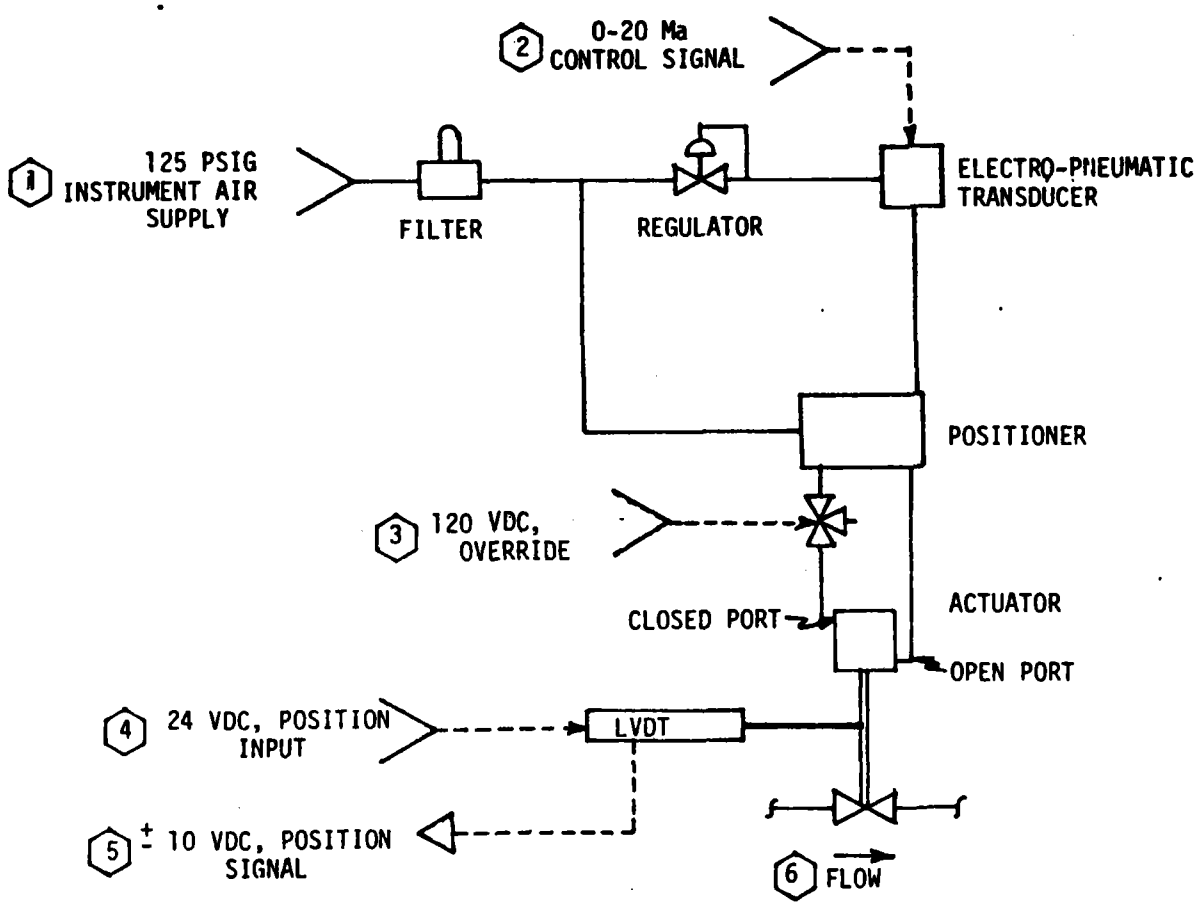
ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

DESIGN FEATURES:

1. THE MAXIMUM DIMENSIONS FOR THE VALVE INCLUDING THE ACCESSORY COMPONENTS ARE SHOWN IN FIGURE 2. ANY DIMENSIONS OUTSIDE OF THOSE NOTED ARE TO BE NEGOTIATED.
2. AFTER INSTALLATION, THE VALVE BODY WILL BE INSULATED. BY ROCKETDYNE SUCH THAT THE VALVE BODY TEMPERATURE WILL STABILIZE AT A MAXIMUM TEMPERATURE OF 960°F.
3. POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 100 TO 0 PER CENT OF VALVE OPERATING LIFT RESPECTIVELY.
4. THE VALVE MUST BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.

PREPARATION FOR DELIVERY:

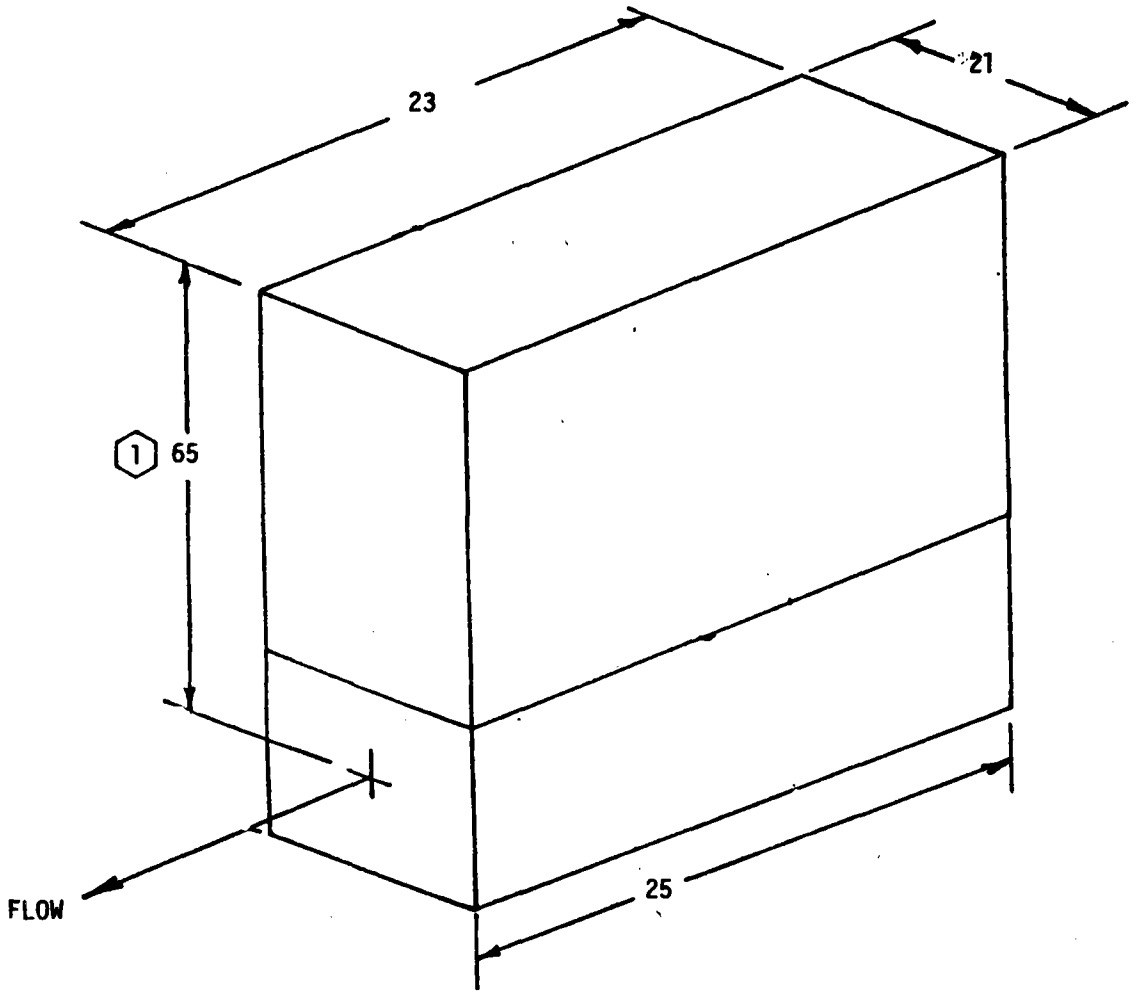
1. THE VALVE IS TO BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
2. THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE), AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE
4. POSITION
5. SIGNAL
6. FLOW

FIGURE 1



NOTES:
1. ALL DIMENSION ARE IN INCHES
(1) 2. MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

4.1 Modulating Control Valves

4.1.45 Steam Trap Water Pressure Control Valves

4.1.45.1 Identification Tag Number — Description

PV-3110	Steam Trap Water Pressure Control Valve
PV-3111	Steam Trap Water Pressure Control Valve

4.1.45.2 Description

Manufacturer	:	Valtek, Springville, Utah
Part Number	:	Mark one body, mark one actuator
Rocketdyne Specification No.	:	SP42-064 (following)
Material	:	Body: Carbon Steel
Weight	:	610 lb

4.1.45.3 Prescribed Service

Water

4.1.45.4 Vendor

Valtek, Springville, Utah

4.1.45.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.45.6 Periodic Service

none

4.1.45.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.45.8 Special Tools

none

4.1.45.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.45.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19151-001 TAG NO. PV-3110 & 3111

4." MARK I BODY SUB-ASSEMBLY
900# 3.38" SPUD 1.50" STEM DIA.
BONNET/W EXTN, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 4", 900/1500#.....	1	...007627.001.041		
13	EXTN BONNET HALF-RING, 3.75 X 3.00, 0	4	...003984.029.002		
20	SEAT RING, 4", CV 4.7.....	1	...029704.831.000	** T B A	
30	SEAT RETAINER, 4", 1500#.....	1	...003051.150.000		
40	BONNET, 4", 3.38" SPUD.....	1	...004005.029.041		
41	BONNET EXTN, 1.50" STEM, 3.38" SPUD..	1	...016503.029.041		
43	FLANGE, BONNET EXTN, 3.38" SPUD.....	1	...003985.029.041		
50	PLUG EXTD, 4", =%.....	1	...029703.833.000	** T B A	
55	SEAT GASKET, SPIRAL, 4.87 X 4.50.....	1	...001242.832.000	**	6.43
58	BONNET GASKET, SPIRAL, 5.68 X 5.18...	1	...001240.832.000	**	8.13
60	EXTN BONNET GASKET, SPIRAL, 3.12 X 2.	1	...016493.826.000	**	7.49
70	BONNET FLANGE, 4", 1500#.....	1	...004006.018.041		
80	GLAND FLANGE, 1.50" STEM, 3.38" SPUD.	1	...001969.029.041		
83	GUIDE, 1.50" STEM.....	1	...001967.825.000		
87	GUIDE, 1.50" STEM.....	1	...001967.433.000		
88	PACKING SET, STD SQUARE, 1.50" STEM..	1	...024246.926.000	**	17.33
93	PKG SPR, 1.50" STEM, 4.00 L.....	1	...020903.150.000		
94	PKG SPR, 1.50" STEM, 4.00 L.....	1	...020903.150.000		
95	PKG SPR, 1.50" STEM, 4.00 L.....	1	...020903.150.000		
96	PKG SPR, 1.50" STEM, 1.00 L.....	1	...020902.150.000		
97	PKG SPR, 1.50" STEM, 0.50 L.....	1	...004684.150.000		
98	PKG SPR, 1.50" STEM, 0.25 L.....	1	...020933.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/8"-11, 2.25 L.....	4	...001283.015.002		
108	BONNET FLANGE STUD, 1-1/4"-8, 5.50 L.	8	...003680.195.000		
109	PACKING BOX STUD, 5/8"-11, 5.50 L....	2	...003892.012.002		
110	STUD, 3/4"-10, 4.50 L.....	8	...015173.012.002		
114	BONNET FLANGE NUT, 1-1/4"-8, H D.....	8	...002383.195.000		
117	PACKING BOX NUT, 5/8"-11, H D.....	4	...005110.014.002		
120	NUT, 3/4"-10, H D.....	8	...002281.014.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19151-001 TAG NO.

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD .75" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 100 SQ. INCH, 3.38" SPUD.....	1	...017681.300.040		
202	CYLINDER, 100 SQ. INCH, STANDARD.....	1	...001307.609.008		
210	ADJUSTING SCREW, 100 SQ. INCH, 3/4" S	1	...008763.029.002		
211	ACTUATOR STEM, 100/200 SQ. INCH, 3.38	1	...002437.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 100 SQ. INCH.....	1	...001311.601.003		
227	SPRING BUTTON, 100/200 SQ. INCH.....	1	...003713.029.040		
228	SPACER, 100 SQ. INCH, 2.62/3.38" SPUD	1	...008272.029.040		
229	SPRING, 100/200 SQ. INCH.....	1	...001331.006.040		
235	TAKE-OFF ARM, 100 SQ. INCH, 3.38/4.75	1	...001841.029.002		
236	SPACER, TAKE-OFF ARM, 100 SQ. INCH...	1	...001842.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 6" STROKE.....	1	...006829.652.000	**	7.68
240	TAKE-OFF ARM, POTENTIOMETER.....	1	...019434.029.002		
247	BELLOWS, STEM, 100/200 SQ. INCH.....	1	...015526.652.000	**	6.43
248	GASKET, ADJUSTING SCREW, 100/200 SQ.	1	...001631.655.000	**	.83
249	CLAMP, STEM, BAILEY.....	1	...019465.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017740.431.000		
256	RETAINING RING, 100 SQ. INCH, CYLINDE	1	...001403.029.014		
271	PISTON O-RING.....	1	...001313.650.000	**	6.26
272	PISTON STEM O-RING.....	1	...001312.650.000	**	.28
274	YOKE O-RING.....	1	...001313.650.000	**	6.26
275	ACTUATOR STEM O-RING.....	1	...001718.650.000	**	.83
280	POSITIONER, 74G.....	1	...006744.999.000		
290	BRACKET, POSITIONER, 100 SQ. INCH....	1	...001726.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
297	BRACKET, POTENTIOMETER, 100 SQ. INCH.	1	...028555.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
303	SOLENOID, HT8321A6 , 115 VAC.....	1	...		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
~~311~~	~~VALVE, CHECK.....~~	~~1~~	~~...019231.402.000~~		
~~312~~	~~VALVE, SWITCHING.....~~	~~1~~	~~...004873.999.000~~		
~~313~~	~~VALVE, LOCK-UP.....~~	~~1~~	~~...002774.999.000~~		
~~314~~	~~VOLUME TANK, 22 CAL.....~~	~~1~~	~~...016307.029.040~~		
~~315~~	~~VALVE, LOCK-UP.....~~	~~1~~	~~...017396.999.000~~		
321	GAUGE, 0-30 PSI.....	1	...001294.999.000		
322	L V D T, 500 HR-DC.....	1	...022697.999.000		
345	STEM CLAMP LOCKNUT, 1/2"-13.....	1	...006806.013.002		
348	ACTUATOR STEM LOCKNUT, 1-1/8"-7.....	1	...001357.013.002		
400	PLATE, VALTEK, 100/200 SQ. INCH.....	2	...001404.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19151-001 TAG NO.

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD .75" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
402	SCREW, DRIVE, #4.....	4	...007516.012.002	
403	MOUNTING BRACKET BOLT, 3/8"-16, 1.00	2	...001713.010.002	
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002	
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002	
409	TUBE FITTING, 1/4", STRAIGHT.....	*	...001572.402.002	
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002	
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE.....	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, TRANSDUCER.....	1	...026368.159.000	

* AS REQUIRED
** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER SP42-064
J. K. CHENG J.C.	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	TYPE EQUIPMENT
APPROVALS E.G. Spencer 4/22/80 J. H. Absalon 4/21/80	**SPECIFICATION**	DATE 8-19-80
		SUPERSEDES SPEC. DATED: 4-28-80
		REV. LTR. B / PAGE 1 of 6

TITLE

STEAM TRAP CONTROL VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TTWPCV-1 AND -2 (COMPONENTS SHALL BE TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
BODY TYPE:	GLOBE, IN-LINE
END CONNECTIONS:	4 INCH BUTT WELD
PIPE MATERIAL:	ASTM A106 GRADE B, SCHEDULE 80
BODY MATERIAL:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ANSI RATING:	900 LB CLASS
LINE FLUID:	WATER
MAXIMUM INLET PRESSURE @ TEMPERATURE:	1550 PSIG @ 675°F INLET, 135 PSIG @ 360°F OUTLET
AMBEINT TEMPERATURE:	16° TO 113°F
TRIM FLOW CHARACTERISTIC:	EQUAL PERCENTAGE
FLOW COEFFICIENT:	Cv = 4.7 ± 10%
INTERNAL LEAKAGE:	MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY
EXTERNAL LEAKAGE:	NONE VISIBLE
ACTUATOR:	PNEUMATIC WITH TRAVEL INDICATOR
FAIL SAFE POSITION:	CLOSED (ELECTRICAL FAILURE) CLOSED (PNEUMATIC FAILURE)
INSTRUMENT AIR SUPPLY:	125 ± 25 PSIG
PACKING & GASKET MATERIAL:	COMPATIBLE WITH LINE FLUID AND TEMPERATURE

ACCESSORIES:

THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1 ON PAGE 5:

- ELECTRO-PNEUMATIC TRANSDUCER

  PNEUMATIC INPUT: 20 PSIG ± 2 PSI
  ELECTRICAL INPUT SIGNAL: 4-20 MA DC (CONTROL RANGE)
  PNEUMATIC OUTPUT SIGNAL: 3-15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE.

  ELECTRICAL ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- LVDT

  TYPE: DC/DC
  VOLTAGE: 24 VDC EXCITATION, ±10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PER CENT OR BETTER THROUGHOUT VALVE LIFT.

  ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- POSITIONER

  INSTRUMENT SIGNAL: 3-15 PSIG
  PRESSURE GAUGES (3 REQD): INSTRUMENT SIGNAL, UPPER AND LOWER CYLINDER PRESSURE

- REGULATOR

  TYPE: AIRSET WITH OUTLET PRESSURE GAUGE
  INLET PRESSURE: 125 ± 25 PSIG
  OUTLET PRESSURE: 20 PSIG ± 2 PSI

ACCESSORIES: (CONT'D)

- FILTER

  ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

- SOLENOID VALVE

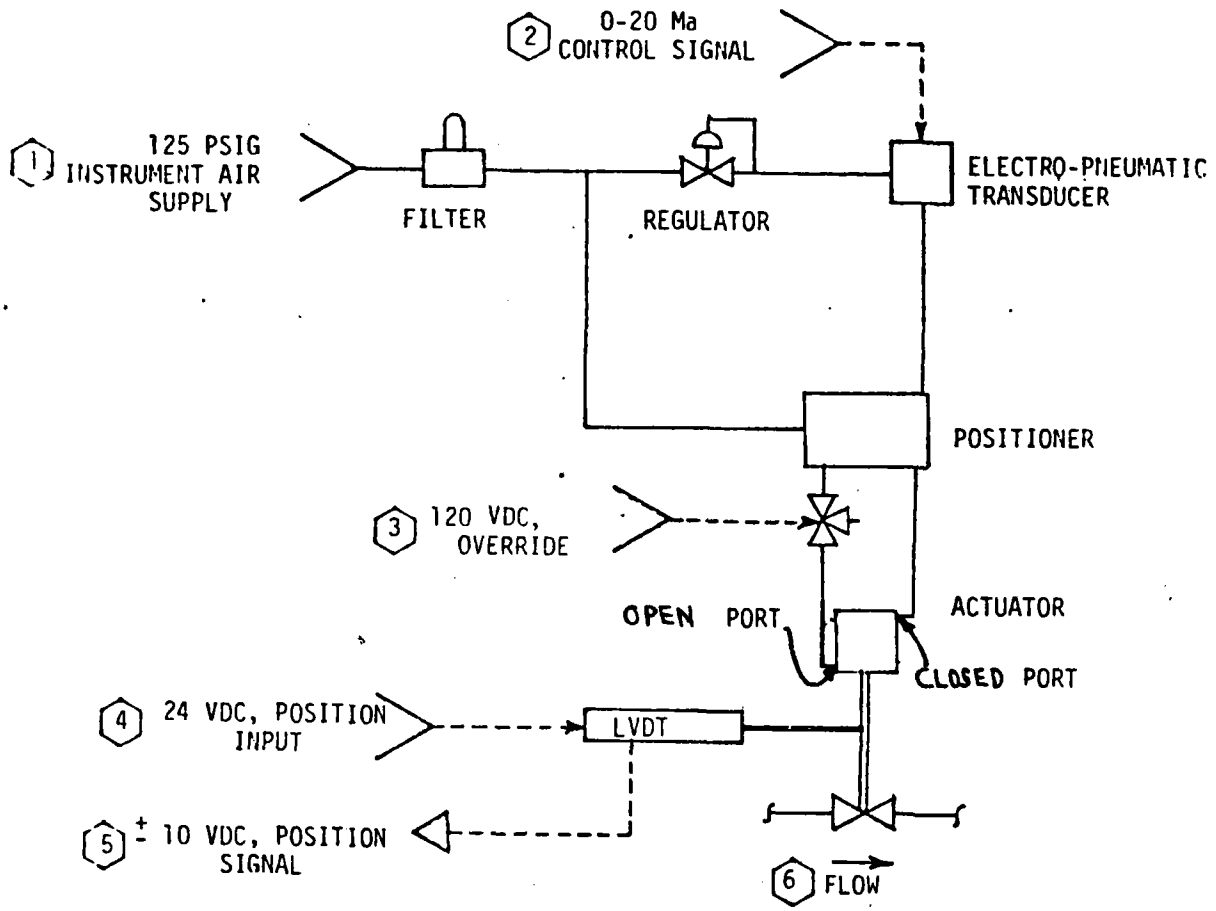
  3-WAY, 120 VAC 60HZ FOR OVERRIDE OF THE POSITIONER TO CLOSE THE VALVE WHEN THE SOLENOID IS DE-ENERGIZED.

MAXIMUM ENVELOPE DIMENSIONS: REFER TO FIGURE 2 ON PAGE 6

CLEANING AND PACKAGING: VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE) AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

DESIGN FEATURES:

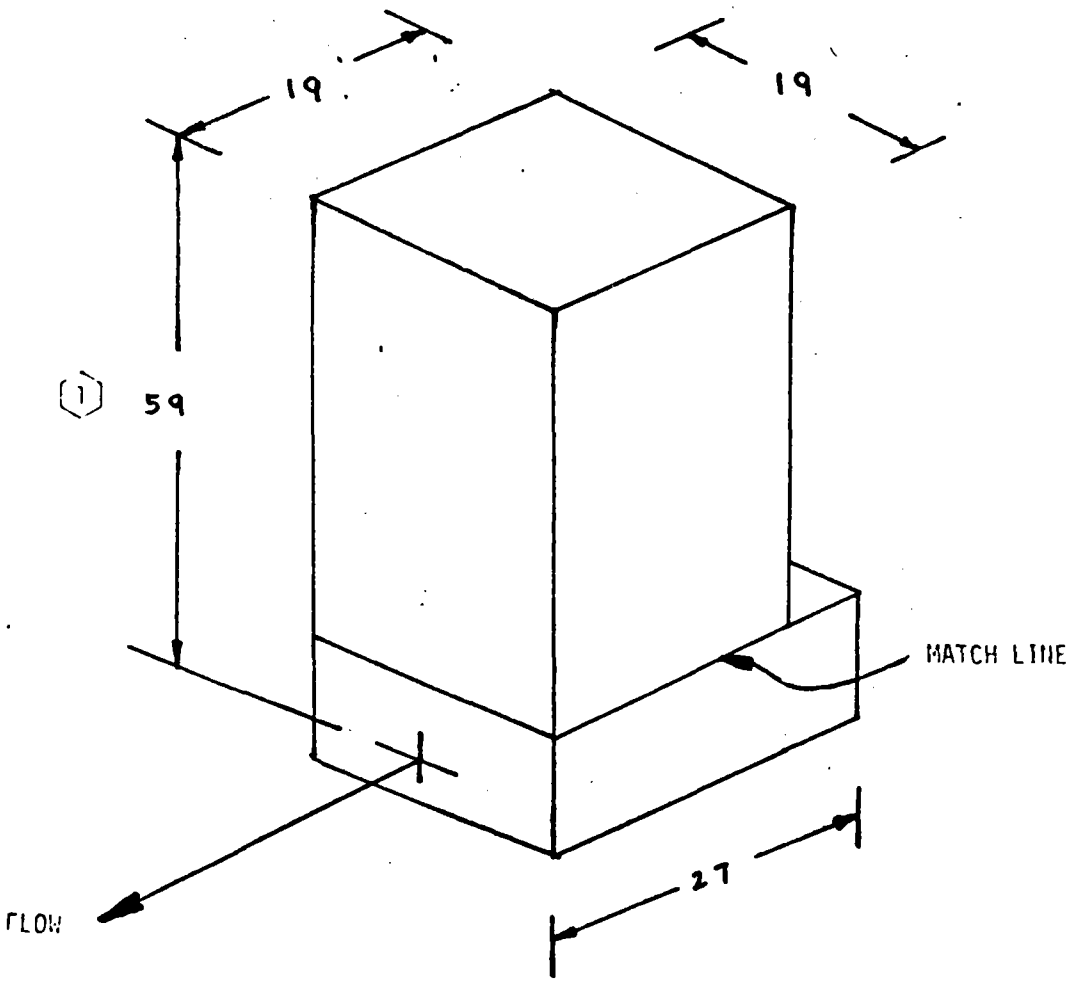
- ELECTRICAL COMPONENTS ARE TO HAVE WEATHERTIGHT ENCLOSURES (NEMA TYPE 3). ENCLOSURES SHALL BE EQUIPPED WITH A 1/2 INCH THREADED CONDUIT CONNECTION.
- ALL THE ACCESSORY COMPONENTS SHALL BE MOUNTED ON AND PROPERLY CONNECTED TO THE VALVE AS PER FIGURE 1, AND SHALL BE READILY REMOVABLE FOR SERVICING.
- THE VALVE SHALL BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
- VALVE SHALL BE DESIGNED TO PERMIT 3 1/2 INCH THICK INSULATION WITH ALL THE ACCESSORIES MOUNTED.
- THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
- POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 0 TO 100 PER CENT OF VALVE OPERATING LIFT RESPECTIVELY.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE
4. POSITION
5. SIGNAL
6. FLOW

FIGURE 1



NOTES: 1. ALL DIMENSION ARE IN INCHES
(1) 2. MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

4.1 Modulating Control Valves

4.1.46 Boiler Oil Control Valve

4.1.46.1 Identification Tag Number — Description

PV-3702	Boiler Oil Control Valve
PV-3802	Boiler Oil Control Valve

4.1.46.2 Description

Manufacturer	:	Valtek, Springville, Utah
Part Number	:	Mark one body, mark one actuator
Rocketdyne Specification No.	:	SP42-063 (following)
Material	:	Body: Carbon Steel
Weight	:	590 lb

4.1.46.3 Prescribed Service

Oil

4.1.46.4 Vendor

Valtek, Springville, Utah

4.1.46.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.46.6 Periodic Service

none

4.1.46.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.46.8 Special Tools

none

4.1.46.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.46.10 Acceptance Tests

See mfg maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19241-002 TAG NO. PV-3702 & 3802

8." MARK I BODY SUB-ASSEMBLY
150# 3.38" SPUD 1.50" STEM DIA.
STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 8", 150#.....	1	...005033.001.041		
20	SEAT RING, 8", CV 330.....	1	...007372.150.000	** T B A	
30	SEAT RETAINER, 8", 600#.....	1	...001772.150.000		
40	BONNET, 8", 3.38" SPUD.....	1	...002188.029.041		
50	PLUG, 8", LIN.....	1	...029801.150.000	** T B A	
55	SEAT GASKET, SPIRAL, 8.25 X 7.88.....	1	...001798.832.000	**	12.47
58	BONNET GASKET, SPIRAL, 9.00 X 8.50...	1	...001799.826.000	**	16.95
70	BONNET FLANGE, 8", 150#.....	1	...002191.018.041		
80	GLAND FLANGE, 1.50" STEM, 3.38" SPUD.	1	...001969.029.041		
82	GUIDE LINER, 1.50" STEM, GRAFOIL.....	3	...009472.842.000	**	11.01
83	GUIDE RETAINER, 1.50" STEM, GRAFOIL..	1	...009475.150.000		
86	GUIDE LINER, 1.50" STEM, GRAFOIL.....	3	...009472.842.000	**	11.01
87	GUIDE RETAINER, 1.50" STEM, GRAFOIL..	1	...009475.150.000		
88	PACKING SET, STD SQUARE, 1.50" STEM..	1	...024246.929.000	** T B A	
93	PKG SPR, 1.50" STEM, 4.00 L.....	1	...020903.150.000		
94	PKG SPR, 1.50" STEM, 0.50 L.....	1	...004684.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/8"-11, 2.25 L.....	4	...001283.015.002		
108	BONNET FLANGE STUD, 3/4"-10, 3.25 L..	8	...002298.012.002		
109	PACKING BOX STUD, 5/8"-11, 5.50 L....	2	...003892.012.002		
114	BONNET FLANGE NUT, 3/4"-10, H D.....	8	...002281.014.002		
117	PACKING BOX NUT, 5/8"-11, H D.....	4	...005110.014.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST

REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19241-002 TAG NO.

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD 2.5" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 100 SQ. INCH, 3.38" SPUD.....	1	...017681.300.040		
202	CYLINDER, 100 SQ. INCH, STANDARD.....	1	...001307.609.008		
210	ADJUSTING SCREW, 100/200 SQ. INCH....	1	...001711.029.002		
211	ACTUATOR STEM, 100/200 SQ. INCH, 3.38	1	...002437.159.000		
213	STROKE PLATE, 2-1/2" STROKE.....	1	...001252.603.000		
225	PISTON, 100 SQ. INCH.....	1	...001311.601.003		
227	SPRING BUTTON, 100/200 SQ. INCH.....	1	...003713.029.040		
228	SPACER, 100 SQ. INCH, 2.62/3.38" SPUD	1	...008272.029.040		
229	SPRING, 100/200 SQ. INCH.....	1	...001331.006.040		
235	TAKE-OFF ARM, 100 SQ. INCH, 3.38/4.75	1	...001841.029.002		
236	SPACER, TAKE-OFF ARM, 100 SQ. INCH...	1	...001842.029.002		
237	RANGE SPRING, 3-15.....	1	...007436.999.000		
239	BELLOWS, RANGE SPRING, 6" STROKE.....	1	...006829.652.000	**	7.68
240	TAKE-OFF ARM, POTENTIOMETER.....	1	...019434.029.002		
247	BELLOWS, STEM, 100/200 SQ. INCH.....	1	...015526.652.000	**	6.43
248	GASKET, ADJUSTING SCREW, 100/200 SQ.	1	...001631.655.000	**	.83
249	CLAMP, STEM, BAILEY.....	1	...019465.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017740.431.000		
256	RETAINING RING, 100 SQ. INCH, CYLINDE	1	...001403.029.014		
271	PISTON O-RING.....	1	...001313.650.000	**	6.26
272	PISTON STEM O-RING.....	1	...001312.650.000	**	.28
274	YOKE O-RING.....	1	...001313.650.000	**	6.26
275	ACTUATOR STEM O-RING.....	1	...001718.650.000	**	.83
280	POSITIONER, 74G.....	1	...006744.999.000		
290	BRACKET, POSITIONER, 100 SQ. INCH....	1	...001726.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
297	BRACKET, POTENTIOMETER, 100 SQ. INCH.	1	...028555.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
303	SOLENOID, HT8321A6 , 115 VAC.....	1	...		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, T-25.....	1	...009339.999.000		
321	GAUGE, 0-30 PSI.....	1	...001294.999.000		
322	L V D T, 2000 HR-DC.....	1	...022261.999.000		
345	STEM CLAMP LOCKNUT, 1/2"-13.....	1	...006806.013.002		
348	ACTUATOR STEM LOCKNUT, 1-1/8"-7.....	1	...001357.013.002		
400	PLATE, VALTEK, 100/200 SQ. INCH.....	2	...001404.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 3/8"-16, 1.00	2	...001713.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
409	TUBE FITTING, 1/4", STRAIGHT.....	*	...001572.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19241-002 TAG NO.

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD 2.5" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002	
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019548.029.040	
426	COVER, L V D T, 4" STROKE.....	1	...019549.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	----NEEDS ENGINEERING.....	1	...010000.999.000	
433	ARM, ADJUSTING, TRANSDUCER.....	1	...026368.159.000	

* AS REQUIRED
** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER SP42-063
J. K. CHENG J.K.	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	TYPE EQUIPMENT
APPROVALS		DATE 8-18-80
E.G. Spence 8/22/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 1-25-80
J. D. Absalon 8/25/80		REV. LTR. A / PAGE 1 of 6

TITLE

THERMAL FLUID CONTROL VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	THFIV-1 AND -2, TBFFCV-1 AND -2 (COMPONENTS SHALL BE TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
BODY TYPE:	GLOBE, IN-LINE
END CONNECTIONS:	8 INCH BUTT WELD
PIPE MATERIAL:	ASTM A106 GRADE B, SCHEDULE 40
BODY MATERIAL:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ANSI RATING:	150 LB CLASS
LINE FLUID:	OIL (CALORIA HT43, DENSITY = 40.3 LB/CU FT @ 600°F)
MAXIMUM INLET PRESSURE @ TEMPERATURE:	115 PSIG @ 600°F
AMBIENT TEMPERATURE:	16° TO 113°F
TRIM FLOW CHARACTERISTIC:	LINEAR
FLOW COEFFICIENT:	Cv = 398 ± 10% FOR THFIV-1 AND -2, Cv = 323 ± 10% FOR TBFFCV-1 AND -2.
INTERNAL LEAKAGE:	MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY
EXTERNAL LEAKAGE:	NONE VISIBLE
ACTUATOR:	PNEUMATIC WITH TRAVEL INDICATOR
FAIL SAFE POSITION:	OPEN (ELECTRICAL FAILURE) OPEN (PNEUMATIC FAILURE)
INSTRUMENT AIR SUPPLY:	125 ± 25 PSIG

PACKING & GASKET MATERIAL: COMPATIBLE WITH LINE FLUID AND TEMPERATURE

ACCESSORIES: THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1 ON PAGE 5:

- ELECTRO-PNEUMATIC TRANSDUCER

  PNEUMATIC INPUT: 20 PSIG ± 2 PSI
  ELECTRICAL INPUT SIGNAL: 4-20 MA DC (CONTROL RANGE)
  PNEUMATIC OUTPUT SIGNAL: 3-15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE

  ELECTRICAL ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- LVDT

  TYPE: DC/DC
  VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PER CENT OR BETTER THROUGHOUT VALVE LIFT.

  ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- POSITIONER

  INSTRUMENT SIGNAL: 3-15 PSIG
  PRESSURE GAUGES (3 REQD): INSTRUMENT SIGNAL, UPPER AND LOWER CYLINDER PRESSURE

- REGULATOR

  TYPE: AIRSET WITH OUTLET PRESSURE GAUGE
  INLET PRESSURE: 125 ± 25 PSIG
  OUTLET PRESSURE: 20 PSIG ± 2 PSI

ACCESSORIES: (CONT'D)

- FILTER

  ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

- SOLENOID VALVE

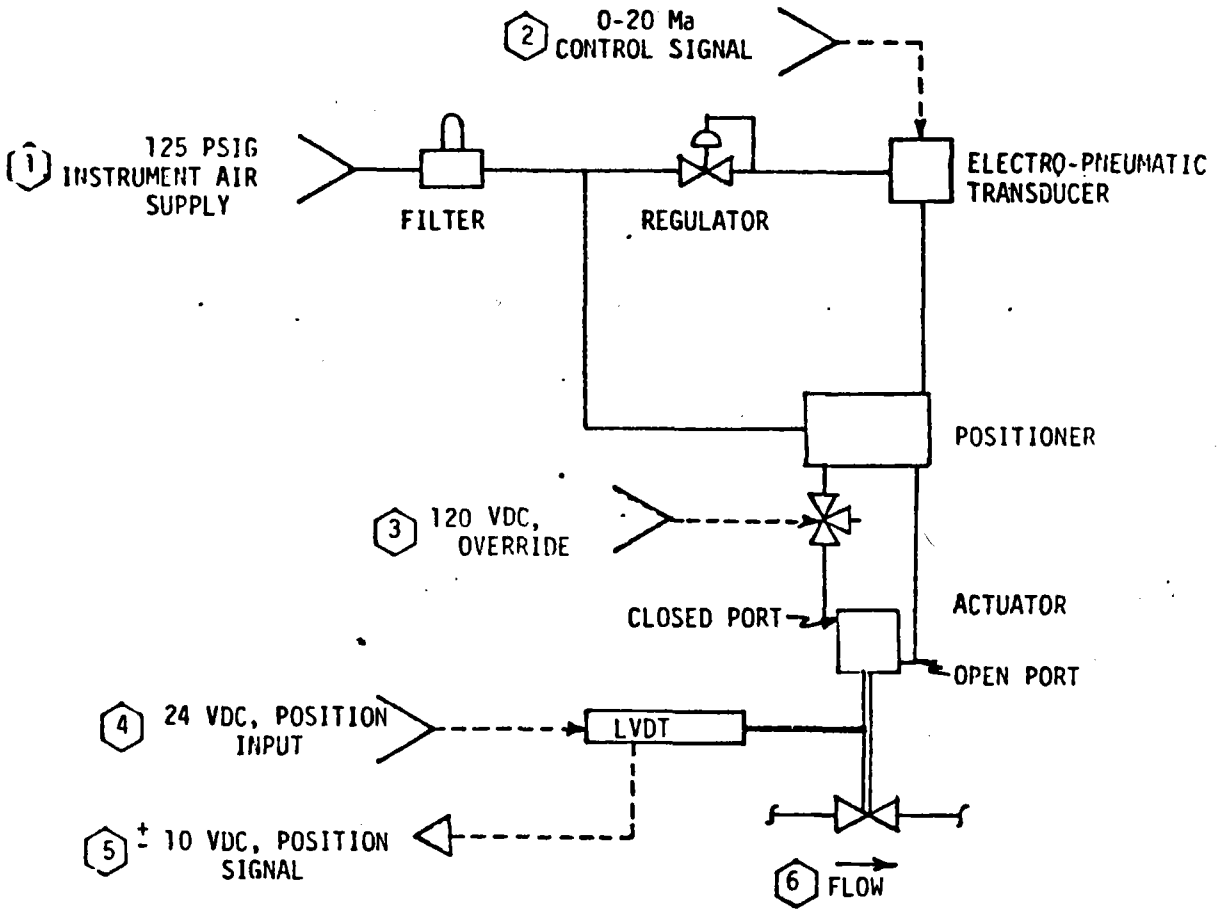
  3-WAY, 120 VAC 60 HZ FOR OVERRIDE OF THE POSITIONER TO OPEN THE VALVE WHEN THE SOLENOID IS DE-ENERGIZED.

MAXIMUM ENVELOPE DIMENSIONS: REFER TO FIGURE 2 ON PAGE 6

CLEANING AND PACKAGING: VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE) AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

DESIGN FEATURES:

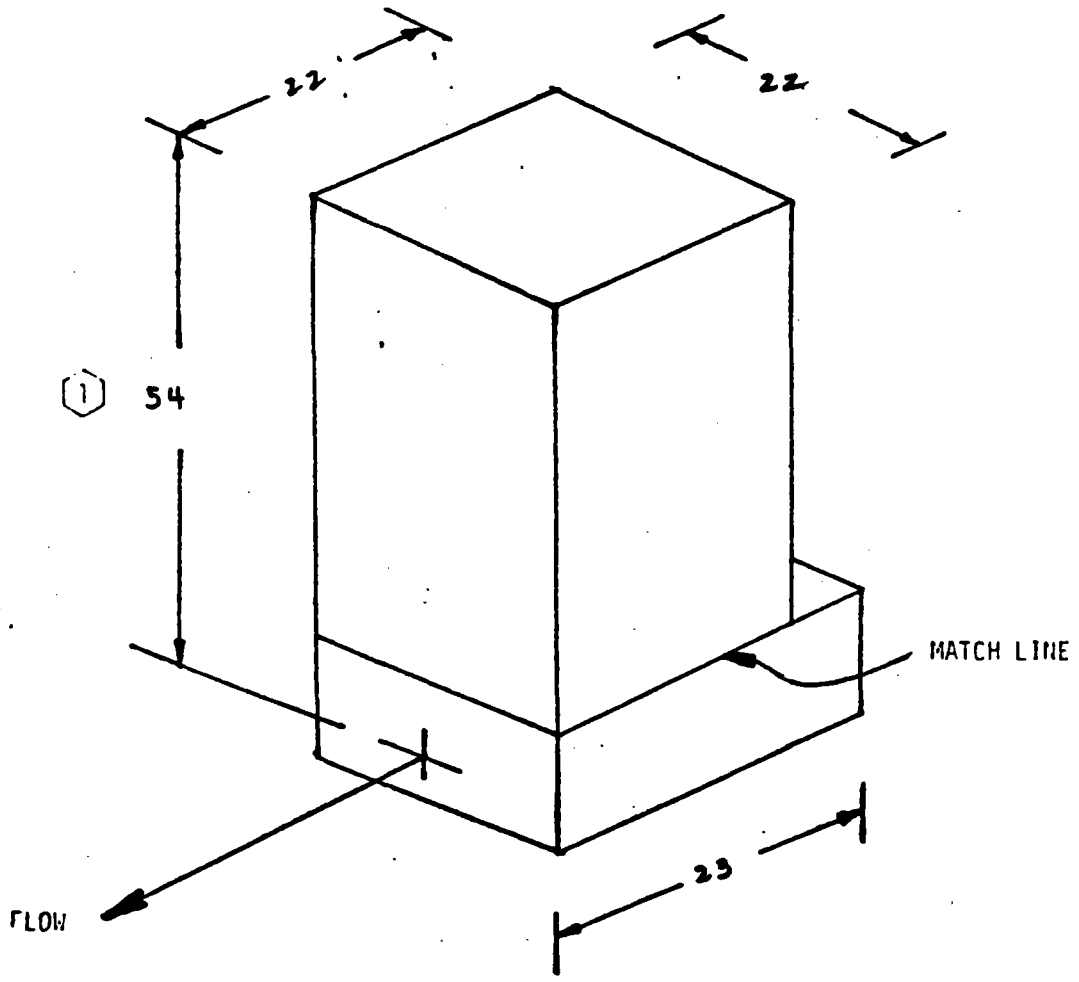
- ELECTRICAL COMPONENTS ARE TO HAVE WEATHERTIGHT ENCLOSURES (NEMA TYPE 3). ENCLOSURES SHALL BE EQUIPPED WITH A 1/2 INCH THREADED CONDUIT CONNECTION.
- ALL THE ACCESSORY COMPONENTS SHALL BE MOUNTED ON AND PROPERLY CONNECTED TO THE VALVE AS PER FIGURE 1, AND SHALL BE READILY REMOVALE FOR SERVICING.
- THE VALVE SHALL BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
- VALVE SHALL BE DESIGNED TO PERMIT 3 1/2 INCH THICK INSULATION WITH ALL THE ACCESSORIES MOUNTED.
- THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
- POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 100 TO 0 PER CENT OF VALVE OPERATING LIFT RESPECTIVELY.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE
4. POSITION
5. SIGNAL
6. FLOW

FIGURE 1



NOTES:
1. ALL DIMENSION ARE IN INCHES
(1) 2. MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

4.1 Modulating Control Valves

4.1.47 Auxiliary Pump Oil Control Valve

4.1.47.1 Identification

Tag Number	Description
PV-3910	Auxiliary Pump Oil Control Valve

4.1.47.2 Description

Manufacturer	:	Valtek, Springville, Utah
Part Number	:	Mark one body, mark one actuator
Rocketdyne Specification No.	:	SP42-069 (following)
Material	:	Body: Carbon Steel
Weight	:	240 lb

4.1.47.3 Prescribed Service

oil

4.1.47.4 Vendor

Valtek, Springville, Utah

4.1.47.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.47.6 Periodic Service

none

4.1.47.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.47.8 Special Tools

none

4.1.47.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.47.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19087-001 TAG NO. PV-3910

4." MARK I BODY SUB-ASSEMBLY
150# 2.62" SPUD 1.12" STEM DIA.
STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 4", 150/600#.....	1	...001199.001.041		
10	END FLANGE, 4", 150#.....	2	...001200.018.041		
11	END FLANGE HALF-RING, 5.80 X 4.56, 0.	4	...001203.029.002		
20	SEAT RING, 4", CV 110.....	1	...004682.150.000	**	190.44
30	SEAT RETAINER, 4", 600#.....	1	...001218.150.000		
40	BONNET, 4", 2.62" SPUD.....	1	...001249.029.041		
50	PLUG, 4", =%.....	1	...001510.150.000	**	444.76
55	SEAT GASKET, SPIRAL, 4.87 X 4.50.....	1	...001242.832.000	**	6.43
58	BONNET GASKET, SPIRAL, 5.68 X 5.18...	1	...001240.832.000	**	8.13
70	BONNET FLANGE, 4", 600#.....	1	...001216.018.041		
76	HALF-CLAMP, YOKE, 2.62" SPUD.....	2	...001790.150.000		
80	GLAND FLANGE, 1.12" STEM, 2.62/2.88"	1	...001788.150.000		
82	GUIDE LINER, 1.12" STEM, GRAFOIL.....	2	...007601.842.000	**	10.41
83	GUIDE RETAINER, 1.12" STEM, GRAFOIL..	1	...007844.150.000		
86	GUIDE LINER, 1.12" STEM, GRAFOIL.....	2	...007601.842.000	**	10.41
87	GUIDE RETAINER, 1.12" STEM, GRAFOIL..	1	...007844.150.000		
88	PACKING SET, STD SQUARE, 1.12" STEM..	1	...024244.929.000	**	T B A
93	PKG SPR, 1.12" STEM, 2.00 L.....	1	...020905.150.000		
94	PKG SPR, 1.12" STEM, 1.00 L.....	1	...005264.150.000		
95	PKG SPR, 1.12" STEM, 0.50 L.....	1	...007314.150.000		
96	PKG SPR, 1.12" STEM, 0.25 L.....	1	...020904.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 3/8"-16, 2.00 L.....	2	...001860.010.002		
108	BONNET FLANGE STUD, 1-1/8"-8, 4.88 L.	4	...001570.012.002		
109	PACKING BOX BOLT, CARRIAGE, 1/2"-13..	2	...005207.009.002		
114	BONNET FLANGE NUT, 1-1/8"-8, H D.....	4	...001571.014.002		
117	PACKING BOX NUT, 1/2"-13.....	2	...001730.013.002		
118	YOKE LOCKNUT, 3/8"-16.....	2	...003834.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST

REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19087-001 TAG NO.

50 SQ. INCH CYLINDER ACTUATOR
2.62" SPUD 2." STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 50 SQ. INCH, 2.62" SPUD.....	1	...017668.300.040		
202	CYLINDER, 50 SQ. INCH, STANDARD.....	1	...016689.609.008		
210	ADJUSTING SCREW, 50 SQ. INCH, 2" STRO	1	...001190.029.002		
211	ACTUATOR STEM, 50 SQ. INCH, 2.62" SPU	1	...001191.159.000		
213	STROKE PLATE, 2" STROKE.....	1	...001253.603.000		
225	PISTON, 50 SQ. INCH.....	1	...001174.601.003		
227	SPRING BUTTON, 50 SQ. INCH.....	1	...007727.029.040		
228	SPACER, 50 SQ. INCH.....	1	...001177.029.040		
229	SPRING, 50 SQ. INCH.....	1	...001235.006.040		
235	TAKE-OFF ARM, 50 SQ. INCH.....	1	...001281.029.002		
236	SPACER, TAKE-OFF ARM, 50 SQ. INCH....	1	...001282.029.002		
237	RANGE SPRING, 3-15.....	1	...007436.999.000		
239	BELLOWS, RANGE SPRING, 3" STROKE.....	1	...006828.652.000		
240	TAKE-OFF ARM, POTENTIOMETER.....	1	...009897.029.000		
247	BELLOWS, STEM, 50 SQ. INCH.....	1	...015507.652.000	**	4.69
248	GASKET, ADJUSTING SCREW, 50 SQ. INCH,	1	...001435.655.000	**	.62
249	CLAMP, STEM, BAILEY.....	1	...019982.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017677.431.000		
256	RETAINING RING, 50 SQ. INCH, CYLINDER	1	...016688.029.014		
271	PISTON O-RING.....	1	...001182.650.000	**	4.93
272	PISTON STEM O-RING.....	1	...001183.650.000	**	.23
274	YOKE O-RING.....	1	...001184.650.000	**	4.00
275	ACTUATOR STEM O-RING.....	1	...001181.650.000	**	.37
280	POSITIONER, 74G.....	1	...006744.999.000		
290	BRACKET, POSITIONER, 50 SQ. INCH.....	1	...001227.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 50 SQ. INCH..	1	...019923.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
303	SOLENOID, HT8320A173, 115 VAC.....	1	...009336.999.000		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
311	L V D T, 1000 HR-DC.....	1	...022708.999.000		
321	GAUGE, 0-30 PSI.....	1	...001294.999.000		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 7/8"-9.....	1	...001192.013.002		
400	PLATE, VALTEK, 50 SQ. INCH.....	2	...001236.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
409	TUBE FITTING, 1/4", STRAIGHT.....	*	...001572.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST

REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19087-001

TAG NO.

50 SQ. INCH CYLINDER ACTUATOR
2.62" SPUD 2." STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002	
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019542.029.040	
426	COVER, L V D T, 4" STROKE.....	1	...019549.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, TRANSDUCER.....	1	...026368.159.000	

* AS REQUIRED
** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER
J. K. CHENG		SP42-069
APPROVALS	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	TYPE EQUIPMENT
8/22/80		DATE 8-18-80
8/25/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 5-5-80
		REV. LTR. B / PAGE 1 of 6

TITLE

AUXILIARY FLUID PRESSURE CONTROL VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TFAPCV (COMPONENT SHALL BE TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
BODY TYPE:	GLOBE, IN-LINE
END CONNECTIONS:	4 INCH RF FLANGE
BODY MATERIAL:	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
ANSI RATING:	150 LB CLASS
LINE FLUID:	OIL (CALORIA HT43,DENSITY = 40.3 LB/CU FT @ 600F)
MAXIMUM INLET PRESSURE @ TEMPERATURE	115 PSIG @ 600°F
AMBIENT TEMPERATURE:	16° TO 113°F
TRIM FLOW CHARACTERISTIC:	EQUAL PERCENTAGE
FLOW COEFFICIENT:	Cv = 114 ± 10%
INTERNAL LEAKAGE:	MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY
EXTERNAL LEAKAGE:	NONE VISIBLE
ACTUATOR:	PNEUMATIC WITH TRAVEL INDICATOR
FAIL SAFE POSITION:	OPEN (ELECTRICAL FAILURE) OPEN (PNEUMATIC FAILURE)
INSTRUMENT AIR SUPPLY:	125 ± 25 PSIG
PACKING & GASKET MATERIAL:	COMPATIBLE WITH LINE FLUID AND TEMPERATURE
ACCESSORIES:	THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1 ON PAGE 5:

ACCESSORIES: (CONT'D)

- ELECTRO-PNEUMATIC TRANSDUCER

  PNEUMATIC INPUT: 20 PSIG ± 2 PSI
  ELECTRICAL INPUT SIGNAL: 4-20 MA DC (CONTROL RANGE)
  PNEUMATIC OUTPUT SIGNAL: 3-15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE

  ELECTRICAL ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- LVDT

  TYPE: DC/DC
  VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PERCENT OR BETTER THROUGHOUT VALVE LIFT.
  ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- POSITIONER

  INSTRUMENT SIGNAL: 3-15 PSIG
  PRESSURE GAUGES (3 REQD): INSTRUMENT SIGNAL, UPPER & LOWER CYLINDER PRESSURE

- REGULATOR

  TYPE: AIRSET WITH OUTLET PRESSURE GAUGE
  INLET PRESSURE: 125 ± 25 PSIG
  OUTLET PRESSURE: 20 PSIG ± 2 PSI

- FILTER

  ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

ACCESSORIES: (CONT'D)

- SOLENOID VALVE

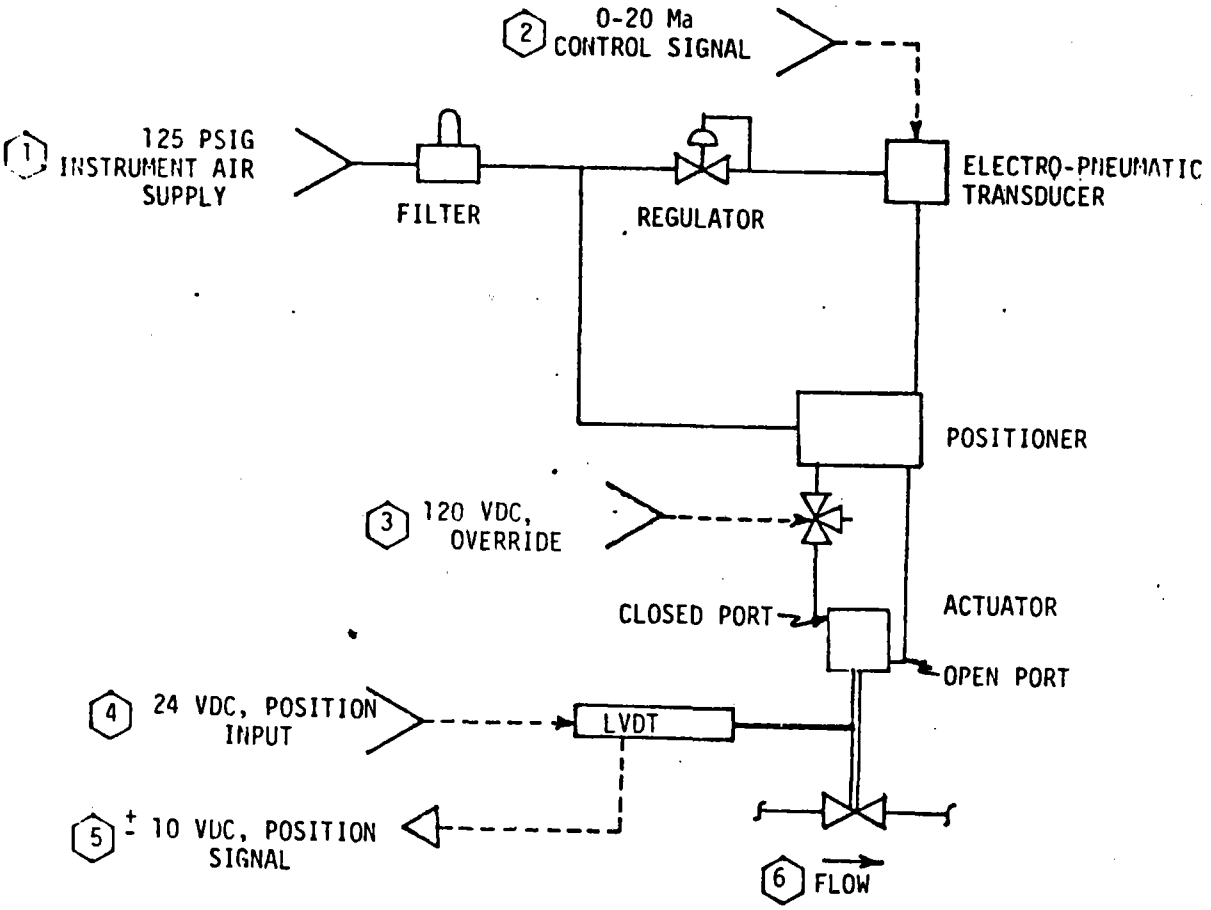
  3-WAY, 120 VAC 60 HZ FOR OVERRIDE OF THE POSITIONER TO OPEN THE VALVE WHEN THE SOLENOID IS DE-ENERGIZED.

MAXIMUM ENVELOPE DIMENSIONS: REFER TO FIGURE 2 ON PAGE 6

CLEANING AND PACKAGING: VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE) AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

DESIGN FEATURES:

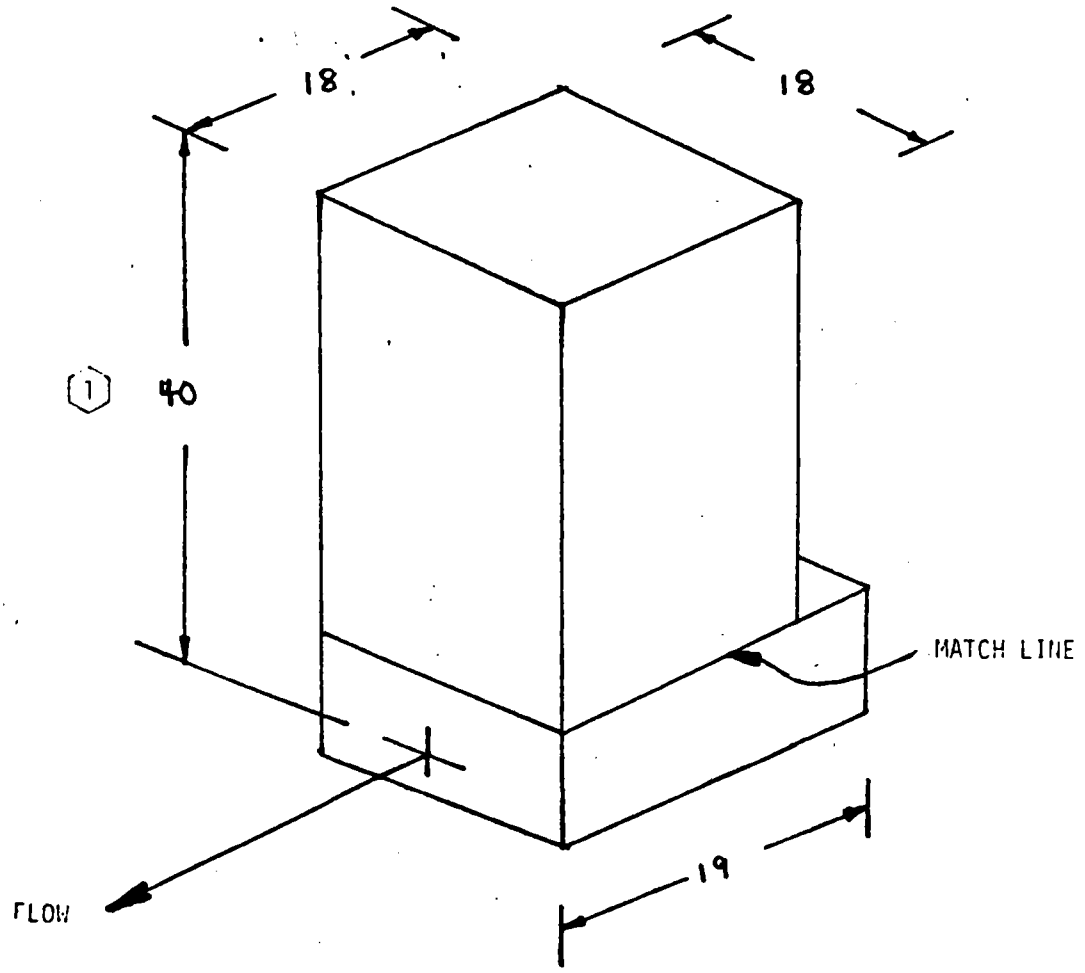
- ELECTRICAL COMPONENTS ARE TO HAVE WEATHERTIGHT ENCLOSURES (NEMA TYPE 3). ENCLOSURES SHALL BE EQUIPPED WITH A 1/2 INCH THREADED CONDUIT CONNECTION.
- ALL THE ACCESSORY COMPONENTS SHALL BE MOUNTED ON AND PROPERLY CONNECTED TO THE VALVE AS PER FIGURE 1, AND SHALL BE READILY REMOVABLE FOR SERVICING.
- THE VALVE SHALL BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
- VALVE SHALL BE DESIGNED TO PERMIT 3 INCH THICK INSULATION WITH ALL THE ACCESSORIES MOUNTED.
- THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
- POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 100 TO 0 PERCENT OF VALVE OPERATING LIFT RESPECTIVELY.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE
4. POSITION
5. SIGNAL
6. FLOW

FIGURE 1



NOTES:
1. ALL DIMENSION ARE IN INCHES
(1) 2. MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

4.1.48 Steam Dump Desuperheater Cond. Control Valve

4.1.48.1 Identification	Description
Tag Number	Condensate control to Desuperheater DS-901 (TV-1002) and DS-902 (TV-1004)
TV-1002 TV-1004	

4.1.48.2 Description

Manufacturer:	Copes-Vulcan Inc., Lake City, Penn.
Part No.	CV-600-4D
Spec No.	D.O.E. Spec 40I700-13S
Material:	Body A217 GR WC9 (TV-1002) Body A216 GR WCB (TV-1004)
Weight:	105 lbs (TV-1002) 100 lbs (TV-1004)

4.1.48.3 Prescribed Service

Condensate

4.1.48.4 Vendor

Copes-Vulcan Inc.

4.1.48.5 Special Cautions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.48.6 Periodic Service

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.48.7 Parts List

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.48.8 Special Tools

None

4.1.48.9 Maintenance Instructions

See Section 4.1.55 (C.V.I. Instruction Manual)

4.1.48.10 Acceptance Test

4.1 Modulating Control Valves

4.1.49 Boiler Panel Water Temperature Control Valve

4.1.49.1 Identification

Tag Number	Description
TV-2301 thru 2303	Boiler Panel Water Temperature Control Valve
TV-2401 thru 2403	Boiler Panel Water Temperature Control Valve
TV-2501 thru 2503	Boiler Panel Water Temperature Control Valve
TV-2601 thru 2603	Boiler Panel Water Temperature Control Valve
TV-2701 thru 2703	Boiler Panel Water Temperature Control Valve
TV-2801 thru 2803	Boiler Panel Water Temperature Control Valve

4.1.49.2 Description

Manufacturer : Valtek, Springville, Utah

Part Numver : 1 inch mark two body, mark one actuator

Rocketdyne Specification No. : SP42-002 (following)

Material : Body: Carbon Steel

Weight : 95 lb

4.1.49.3 Prescribed Service

water

4.1.49.4 Vendor

Valtek, Springville, Utah

4.1.49.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.49.6 Periodic Service

none

4.1.49.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.49.8 Special Tools

none

4.1.49.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.49.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-001 TAG NO. TV-2301 & 2803

1." MARK II BODY SUB-ASSEMBLY
1500# 2.00" SPUD 0.56" STEM DIA.
INLINE, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY MK 2 IN-LINE, 1", 1500#.....	1	...029289.042.041		
12	YOKE HALF-RING, 2.25 X 1.75, 0.25 THI	2	...001047.029.002		
20	SEAT RING, 1", CV 0.6 & 1.....	1	...004981.825.000	**	321.27
30	SEAT RETAINER, 1", 1500#.....	1	...003183.150.000		
40	BONNET, 1", 2.00" SPUD.....	1	...003180.029.041		
50	PLUG, 1", LIN.....	1	...029226.833.000	** T B A	
55	SEAT GASKET, SPIRAL, 1.88 X 1.50.....	1	...003184.832.000	** T B A	
58	BONNET GASKET, SPIRAL, 2.50 X 2.12...	1	...001228.832.000	**	5.36
70	BONNET FLANGE, 1", 1500#.....	1	...004065.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.....	2	...001133.150.000		
80	GLAND FLANGE, 0.56" STEM, 2.00" SPUD.	1	...008454.150.000		
83	GUIDE, 0.56" STEM.....	1	...001044.825.000		
87	GUIDE, 0.56" STEM.....	1	...001044.433.000		
88	PACKING SET, STD SQUARE, 0.56" STEM..	1	...024238.929.000	** T B A	
93	PKG SPR, 0.56" STEM, 3.00 L.....	1	...020912.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L.....	2	...001116.010.002		
108	BONNET FLANGE STUD, 7/8"-9, 4.25 L...	4	...005076.012.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
114	BONNET FLANGE NUT, 7/8"-9, H D.....	4	...001908.014.002		
117	PACKING BOX NUT, 3/8"-16.....	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18.....	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-001 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 25 SQ. INCH, 2.00" SPUD.....	1	...017655.300.040		
202	CYLINDER, 25 SQ. INCH, STANDARD.....	1	...016681.609.008		
210	ADJUSTING SCREW, 25 SQ. INCH, 3/4" ST	1	...001286.029.002		
211	ACTUATOR STEM, 25 SQ. INCH, 2.00" SPU	1	...001134.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 25 SQ. INCH.....	1	...001004.601.003		
227	SPRING BUTTON, 25 SQ. INCH, 1-1/2" ST	1	...003860.029.040		
228	SPACER, 25 SQ. INCH.....	1	...001009.604.003		
229	SPRING, 25 SQ. INCH.....	1	...015264.062.040		
235	TAKE-OFF ARM, 25 SQ. INCH.....	1	...001214.029.002		
236	SPACER, TAKE-OFF ARM, 25 SQ. INCH....	1	...001215.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 1-1/2" STROKE.	1	...007267.652.000		
240	TAKE-OFF ARM, POTENTIOMETER, 25 SQ. I	1	...030004.029.002		
247	BELLOWS, STEM, 25 SQ. INCH.....	1	...015498.652.000	**	3.93
248	GASKET, ADJUSTING SCREW, 25 SQ. INCH.	1	...001501.655.000	**	.40
249	CLAMP, STEM, BAILEY.....	1	...019979.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017665.431.000		
256	RETAINING RING, 25 SQ. INCH, CYLINDER	1	...016680.029.014		
271	PISTON O-RING.....	1	...001114.650.000	**	2.81
272	PISTON STEM O-RING.....	1	...001112.650.000	**	.21
274	YOKE O-RING.....	1	...001114.650.000	**	2.81
275	ACTUATOR STEM O-RING.....	1	...001113.650.000	**	.30
280	POSITIONER, 74SG1.....	1	...018085.999.000		
290	BRACKET, POSITIONER, 25 SQ. INCH.....	1	...001188.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 25 SQ. INCH..	1	...019985.029.040		
298	GAUGE, 0-30 PSI.....	1	...001294.999.000		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
322	L V D T, 500 HR-DC.....	1	...022697.999.000		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 5/8"-11.....	1	...001120.013.002		
400	PLATE, VALTEK, 25 SQ. INCH.....	2	...001229.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002		

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* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-001 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
411	TUBING, 1/4"	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L	2	...019546.010.002	
430	TERMINAL	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40	4	...004698.010.002	
433	ARM, ADJUSTING, 4.00 L	1	...030132.029.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-002 TAG NO. TV-2302 & 2802

1." MARK II BODY SUB-ASSEMBLY
1500# 2.00" SPUD 0.56" STEM DIA.
INLINE, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY MK 2 IN-LINE, 1", 1500#.....	1	...029289.042.041		
12	YOKE HALF-RING, 2.25 X 1.75, 0.25 THI	2	...001047.029.002		
20	SEAT RING, 1", CV 0.6 & 1.....	1	...004981.825.000	**	321.27
30	SEAT RETAINER, 1", 1500#.....	1	...003183.150.000		
40	BONNET, 1", 2.00" SPUD.....	1	...003180.029.041		
50	PLUG, 1", LIN.....	1	...029225.833.000	** T B A	
55	SEAT GASKET, SPIRAL, 1.88 X 1.50.....	1	...003184.832.000	** T B A	
58	BONNET GASKET, SPIRAL, 2.50 X 2.12...	1	...001228.832.000	**	5.36
70	BONNET FLANGE, 1", 1500#.....	1	...004065.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.....	2	...001133.150.000		
80	GLAND FLANGE, 0.56" STEM, 2.00" SPUD.	1	...008454.150.000		
83	GUIDE, 0.56" STEM.....	1	...001044.825.000		
87	GUIDE, 0.56" STEM.....	1	...001044.433.000		
88	PACKING SET, STD SQUARE, 0.56" STEM..	1	...024238.929.000	** T B A	
93	PKG SPR, 0.56" STEM, 3.00 L.....	1	...020912.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L.....	2	...001116.010.002		
108	BONNET FLANGE STUD, 7/8"-9, 4.25 L...	4	...005076.012.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
114	BONNET FLANGE NUT, 7/8"-9, H D.....	4	...001908.014.002		
117	PACKING BOX NUT, 3/8"-16.....	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18.....	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-002 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 25 SQ. INCH, 2.00" SPUD.....	1	...017655.300.040		
202	CYLINDER, 25 SQ. INCH, STANDARD.....	1	...016681.609.008		
210	ADJUSTING SCREW, 25 SQ. INCH, 3/4" ST	1	...001286.029.002		
211	ACTUATOR STEM, 25 SQ. INCH, 2.00" SPU	1	...001134.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 25 SQ. INCH.....	1	...001004.601.003		
227	SPRING BUTTON, 25 SQ. INCH, 1-1/2" ST	1	...003860.029.040		
228	SPACER, 25 SQ. INCH.....	1	...001009.604.003		
229	SPRING, 25 SQ. INCH.....	1	...015264.062.040		
235	TAKE-OFF ARM, 25 SQ. INCH.....	1	...001214.029.002		
236	SPACER, TAKE-OFF ARM, 25 SQ. INCH....	1	...001215.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 1-1/2" STROKE.	1	...007267.652.000		
240	TAKE-OFF ARM, POTENTIOMETER, 25 SQ. I	1	...030004.029.002		
247	BELLOWS, STEM, 25 SQ. INCH.....	1	...015498.652.000	**	3.93
248	GASKET, ADJUSTING SCREW, 25 SQ. INCH.	1	...001501.655.000	**	.40
249	CLAMP, STEM, BAILEY.....	1	...019979.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017665.431.000		
256	RETAINING RING, 25 SQ. INCH, CYLINDER	1	...016680.029.014		
271	PISTON O-RING.....	1	...001114.650.000	**	2.81
272	PISTON STEM O-RING.....	1	...001112.650.000	**	.21
274	YOKE O-RING.....	1	...001114.650.000	**	2.81
275	ACTUATOR STEM O-RING.....	1	...001113.650.000	**	.30
280	POSITIONER, 74SG1.....	1	...018085.999.000		
290	BRACKET, POSITIONER, 25 SQ. INCH.....	1	...001188.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 25 SQ. INCH..	1	...019985.029.040		
298	GAUGE, 0-30 PSI.....	1	...001294.999.000		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
322	L V D T, 500 HR-DC.....	1	...022697.999.000		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 5/8"-11.....	1	...001120.013.002		
400	PLATE, VALTEK, 25 SQ. INCH.....	2	...001229.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-002 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
411	TUBING, 1/4"	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L	2	...019546.010.002	
430	TERMINAL	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40	4	...004698.010.002	
433	ARM, ADJUSTING, 4.00 L	1	...030132.029.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-003 TAG NO. TV-2303 & 2801

1." MARK II BODY SUB-ASSEMBLY
1500# 2.00" SPUD 0.56" STEM DIA.
INLINE, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY MK 2 IN-LINE, 1", 1500#.....	1	...029289.042.041		
12	YOKE HALF-RING, 2.25 X 1.75, 0.25 THI	2	...001047.029.002		
20	SEAT RING, 1", CV 0.6 & 1.....	1	...004981.825.000	**	321.27
30	SEAT RETAINER, 1", 1500#.....	1	...003183.150.000		
40	BONNET, 1", 2.00" SPUD.....	1	...003180.029.041		
50	PLUG, 1", LIN.....	1	...029227.833.000	** T B A	
55	SEAT GASKET, SPIRAL, 1.88 X 1.50.....	1	...003184.832.000	** T B A	
58	BONNET GASKET, SPIRAL, 2.50 X 2.12...	1	...001228.832.000	**	5.36
70	BONNET FLANGE, 1", 1500#.....	1	...004065.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.....	2	...001133.150.000		
80	GLAND FLANGE, 0.56" STEM, 2.00" SPUD.	1	...008454.150.000		
83	GUIDE, 0.56" STEM.....	1	...001044.825.000		
87	GUIDE, 0.56" STEM.....	1	...001044.433.000		
88	PACKING SET, STD SQUARE, 0.56" STEM..	1	...024238.929.000	** T B A	
93	PKG SPR, 0.56" STEM, 3.00 L.....	1	...020912.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L.....	2	...001116.010.002		
108	BONNET FLANGE STUD, 7/8"-9, 4.25 L...	4	...005076.012.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
114	BONNET FLANGE NUT, 7/8"-9, H D.....	4	...001908.014.002		
117	PACKING BOX NUT, 3/8"-16.....	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18.....	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-003 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 25 SQ. INCH, 2.00" SPUD.....	1	...017655.300.040		
202	CYLINDER, 25 SQ. INCH, STANDARD.....	1	...016681.609.008		
210	ADJUSTING SCREW, 25 SQ. INCH, 3/4" ST	1	...001286.029.002		
211	ACTUATOR STEM, 25 SQ. INCH, 2.00" SPU	1	...001134.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 25 SQ. INCH.....	1	...001004.601.003		
227	SPRING BUTTON, 25 SQ. INCH, 1-1/2" ST	1	...003860.029.040		
228	SPACER, 25 SQ. INCH.....	1	...001009.604.003		
229	SPRING, 25 SQ. INCH.....	1	...015264.062.040		
235	TAKE-OFF ARM, 25 SQ. INCH.....	1	...001214.029.002		
236	SPACER, TAKE-OFF ARM, 25 SQ. INCH....	1	...001215.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 1-1/2" STROKE.	1	...007267.652.000		
240	TAKE-OFF ARM, POTENTIOMETER, 25 SQ. I	1	...030004.029.002		
247	BELLOWS, STEM, 25 SQ. INCH.....	1	...015498.652.000	**	3.93
248	GASKET, ADJUSTING SCREW, 25 SQ. INCH.	1	...001501.655.000	**	.40
249	CLAMP, STEM, BAILEY.....	1	...019979.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017665.431.000		
256	RETAINING RING, 25 SQ. INCH, CYLINDER	1	...016680.029.014		
271	PISTON O-RING.....	1	...001114.650.000	**	2.81
272	PISTON STEM O-RING.....	1	...001112.650.000	**	.21
274	YOKE O-RING.....	1	...001114.650.000	**	2.81
275	ACTUATOR STEM O-RING.....	1	...001113.650.000	**	.30
280	POSITIONER, 74SG1.....	1	...018085.999.000		
290	BRACKET, POSITIONER, 25 SQ. INCH.....	1	...001188.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 25 SQ. INCH..	1	...019985.029.040		
298	GAUGE, 0-30 PSI.....	1	...001294.999.000		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
322	L V D T, 500 HR-DC.....	1	...022697.999.000		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 5/8"-11.....	1	...001120.013.002		
400	PLATE, VALTEK, 25 SQ. INCH.....	2	...001229.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-003 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE.....	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, 4.00 L.....	1	...030132.029.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-004 TAG NO. TV-2401 & 2703

1." MARK II BODY SUB-ASSEMBLY
1500# 2.00" SPUD 0.56" STEM DIA.
INLINE, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY MK 2 IN-LINE, 1", 1500#.....	1	...029289.042.041		
12	YOKE HALF-RING, 2.25 X 1.75, 0.25 THI	2	...001047.029.002		
20	SEAT RING, 1", CV 0.6 & 1.....	1	...004981.825.000	**	321.27
30	SEAT RETAINER, 1", 1500#.....	1	...003183.150.000		
40	BONNET, 1", 2.00" SPUD.....	1	...003180.029.041		
50	PLUG, 1", LIN.....	1	...029228.833.000	** T B A	
55	SEAT GASKET, SPIRAL, 1.88 X 1.50.....	1	...003184.832.000	** T B A	
58	BONNET GASKET, SPIRAL, 2.50 X 2.12...	1	...001228.832.000	**	5.36
70	BONNET FLANGE, 1", 1500#.....	1	...004065.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.....	2	...001133.150.000		
80	GLAND FLANGE, 0.56" STEM, 2.00" SPUD.	1	...008454.150.000		
83	GUIDE, 0.56" STEM.....	1	...001044.825.000		
87	GUIDE, 0.56" STEM.....	1	...001044.433.000		
88	PACKING SET, STD SQUARE, 0.56" STEM..	1	...024238.929.000	** T B A	
93	PKG SPR, 0.56" STEM, 3.00 L.....	1	...020912.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L.....	2	...001116.010.002		
108	BONNET FLANGE STUD, 7/8"-9, 4.25 L...	4	...005076.012.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
114	BONNET FLANGE NUT, 7/8"-9, H D.....	4	...001908.014.002		
117	PACKING BOX NUT, 3/8"-16.....	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18.....	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-004 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 25 SQ. INCH, 2.00" SPUD.....	1	...017655.300.040		
202	CYLINDER, 25 SQ. INCH, STANDARD.....	1	...016681.609.008		
210	ADJUSTING SCREW, 25 SQ. INCH, 3/4" ST	1	...001286.029.002		
211	ACTUATOR STEM, 25 SQ. INCH, 2.00" SPU	1	...001134.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 25 SQ. INCH.....	1	...001004.601.003		
227	SPRING BUTTON, 25 SQ. INCH, 1-1/2" ST	1	...003860.029.040		
228	SPACER, 25 SQ. INCH.....	1	...001009.604.003		
229	SPRING, 25 SQ. INCH.....	1	...015264.062.040		
235	TAKE-OFF ARM, 25 SQ. INCH.....	1	...001214.029.002		
236	SPACER, TAKE-OFF ARM, 25 SQ. INCH....	1	...001215.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 1-1/2" STROKE,	1	...007267.652.000		
240	TAKE-OFF ARM, POTENTIOMETER, 25 SQ. I	1	...030004.029.002		
247	BELLOWS, STEM, 25 SQ. INCH.....	1	...015498.652.000	**	3.93
248	GASKET, ADJUSTING SCREW, 25 SQ. INCH,	1	...001501.655.000	**	.40
249	CLAMP, STEM, BAILEY.....	1	...019979.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017665.431.000		
256	RETAINING RING, 25 SQ. INCH, CYLINDER	1	...016680.029.014		
271	PISTON O-RING.....	1	...001114.650.000	**	2.81
272	PISTON STEM O-RING.....	1	...001112.650.000	**	.21
274	YOKE O-RING.....	1	...001114.650.000	**	2.81
275	ACTUATOR STEM O-RING.....	1	...001113.650.000	**	.30
280	POSITIONER, 74SG1.....	1	...018085.999.000		
290	BRACKET, POSITIONER, 25 SQ. INCH.....	1	...001188.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 25 SQ. INCH..	1	...019985.029.040		
298	GAUGE, 0-30 PSI.....	1	...001294.999.000		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
322	L V D T, 500 MR-DC.....	1	...022697.999.000		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 5/8"-11.....	1	...001120.013.002		
400	PLATE, VALTEK, 25 SQ. INCH.....	2	...001229.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST

REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-004

TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE.....	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, 4.00 L.....	1	...030132.029.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-005 TAG NO. TV-2402 & 2702

1." MARK II BODY SUB-ASSEMBLY
1500# 2.00" SPUD 0.56" STEM DIA.
INLINE, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY MK 2 IN-LINE, 1", 1500#.....	1	...029289.042.041		
12	YOKE HALF-RING, 2.25 X 1.75, 0.25 THI	2	...001047.029.002		
20	SEAT RING, 1", CV 1.5.....	1	...004064.825.000	**	321.27
30	SEAT RETAINER, 1", 1500#.....	1	...003183.150.000		
40	BONNET, 1", 2.00" SPUD.....	1	...003180.029.041		
50	PLUG, 1", LIN.....	1	...029287.833.000	** T B A	
55	SEAT GASKET, SPIRAL, 1.88 X 1.50.....	1	...003184.832.000	** T B A	
58	BONNET GASKET, SPIRAL, 2.50 X 2.12...	1	...001228.832.000	**	5.36
70	BONNET FLANGE, 1", 1500#.....	1	...004065.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.....	2	...001133.150.000		
80	GLAND FLANGE, 0.56" STEM, 2.00" SPUD.	1	...008454.150.000		
83	GUIDE, 0.56" STEM.....	1	...001044.825.000		
87	GUIDE, 0.56" STEM.....	1	...001044.433.000		
88	PACKING SET, STD SQUARE, 0.56" STEM..	1	...024238.929.000	** T B A	
93	PKG SPR, 0.56" STEM, 3.00 L.....	1	...020912.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L.....	2	...001116.010.002		
108	BONNET FLANGE STUD, 7/8"-9, 4.25 L...	4	...005076.012.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
114	BONNET FLANGE NUT, 7/8"-9, H D.....	4	...001908.014.002		
117	PACKING BOX NUT, 3/8"-16.....	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18.....	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST

REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-005

TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 25 SQ. INCH, 2.00" SPUD.....	1	...017655.300.040		
202	CYLINDER, 25 SQ. INCH, STANDARD.....	1	...016681.609.008		
210	ADJUSTING SCREW, 25 SQ. INCH, 3/4" ST	1	...001286.029.002		
211	ACTUATOR STEM, 25 SQ. INCH, 2.00" SPU	1	...001134.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 25 SQ. INCH.....	1	...001004.601.003		
227	SPRING BUTTON, 25 SQ. INCH, 1-1/2" ST	1	...003860.029.040		
228	SPACER, 25 SQ. INCH.....	1	...001009.604.003		
229	SPRING, 25 SQ. INCH.....	1	...015264.062.040		
235	TAKE-OFF ARM, 25 SQ. INCH.....	1	...001214.029.002		
236	SPACER, TAKE-OFF ARM, 25 SQ. INCH....	1	...001215.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 1-1/2" STROKE.	1	...007267.652.000		
240	TAKE-OFF ARM, POTENTIOMETER, 25 SQ. I	1	...030004.029.002		
247	BELLOWS, STEM, 25 SQ. INCH.....	1	...015498.652.000	**	3.93
248	GASKET, ADJUSTING SCREW, 25 SQ. INCH.	1	...001501.655.000	**	.40
249	CLAMP, STEM, BAILEY.....	1	...019979.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017665.431.000		
256	RETAINING RING, 25 SQ. INCH, CYLINDER	1	...016680.029.014		
271	PISTON O-RING.....	1	...001114.650.000	**	2.81
272	PISTON STEM O-RING.....	1	...001112.650.000	**	.21
274	YOKE O-RING.....	1	...001114.650.000	**	2.81
275	ACTUATOR STEM O-RING.....	1	...001113.650.000	**	.30
280	POSITIONER, 74SG1.....	1	...018085.999.000		
290	BRACKET, POSITIONER, 25 SQ. INCH.....	1	...001188.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 25 SQ. INCH..	1	...019985.029.040		
298	GAUGE, 0-30 PSI.....	1	...001294.999.000		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-81.....	1	...029535.999.000		
322	L V D T, 500 HR-DC.....	1	...022697.999.000		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 5/8"-11.....	1	...001120.013.002		
400	PLATE, VALTEK, 25 SQ. INCH.....	2	...001229.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST

REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-005 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
411	TUBING, 1/4"	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L	2	...019546.010.002	
430	TERMINAL	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40	4	...004698.010.002	
433	ARM, ADJUSTING, 4.00 L	1	...030132.029.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-006 TAG NO. TV-2403, 2503, 2601, 2701

1." MARK II BODY SUB-ASSEMBLY
1500# 2.00" SPUD 0.56" STEM DIA.
INLINE, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY MK 2 IN-LINE, 1", 1500#.....	1	...029289.042.041		
12	YOKE HALF-RING, 2.25 X 1.75, 0.25 THI	2	...001047.029.002		
20	SEAT RING, 1", CV 1.5.....	1	...004064.825.000	**	321.27
30	SEAT RETAINER, 1", 1500#.....	1	...003183.150.000		
40	BONNET, 1", 2.00" SPUD.....	1	...003180.029.041		
50	PLUG, 1", LIN.....	1	...029286.833.000	** T B A	
55	SEAT GASKET, SPIRAL, 1.88 X 1.50.....	1	...005184.832.000	** T B A	
58	BONNET GASKET, SPIRAL, 2.50 X 2.12...	1	...001228.832.000	**	5.36
70	BONNET FLANGE, 1", 1500#.....	1	...004065.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.....	2	...001133.150.000		
80	GLAND FLANGE, 0.56" STEM, 2.00" SPUD.	1	...008454.150.000		
83	GUIDE, 0.56" STEM.....	1	...001044.825.000		
87	GUIDE, 0.56" STEM.....	1	...001044.433.000		
88	PACKING SET, STD SQUARE, 0.56" STEM..	1	...024238.929.000	** T B A	
93	PKG SPR, 0.56" STEM, 3.00 L.....	1	...020912.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L.....	2	...001116.010.002		
108	BONNET FLANGE STUD, 7/8"-9, 4.25 L...	4	...005076.012.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
114	BONNET FLANGE NUT, 7/8"-9, H D.....	4	...001908.014.002		
117	PACKING BOX NUT, 3/8"-16.....	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18.....	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST

REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-006

TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 25 SQ. INCH, 2.00" SPUD.....	1	...017655.300.040		
202	CYLINDER, 25 SQ. INCH, STANDARD.....	1	...016681.609.008		
210	ADJUSTING SCREW, 25 SQ. INCH, 3/4" ST	1	...001286.029.002		
211	ACTUATOR STEM, 25 SQ. INCH, 2.00" SPU	1	...001134.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 25 SQ. INCH.....	1	...001004.601.003		
227	SPRING BUTTON, 25 SQ. INCH, 1-1/2" ST	1	...003860.029.040		
228	SPACER, 25 SQ. INCH.....	1	...001009.604.003		
229	SPRING, 25 SQ. INCH.....	1	...015264.062.040		
235	TAKE-OFF ARM, 25 SQ. INCH.....	1	...001214.029.002		
236	SPACER, TAKE-OFF ARM, 25 SQ. INCH....	1	...001215.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 1-1/2" STROKE.	1	...007267.652.000		
240	TAKE-OFF ARM, POTENTIOMETER, 25 SQ. I	1	...030004.029.002		
247	BELLOWS, STEM, 25 SQ. INCH.....	1	...015498.652.000	**	3.93
248	GASKET, ADJUSTING SCREW, 25 SQ. INCH.	1	...001501.655.000	**	.40
249	CLAMP, STEM, BAILEY.....	1	...019979.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017665.431.000		
256	RETAINING RING, 25 SQ. INCH, CYLINDER	1	...016680.029.014		
271	PISTON O-RING.....	1	...001114.650.000	**	2.81
272	PISTON STEM O-RING.....	1	...001112.650.000	**	.21
274	YOKE O-RING.....	1	...001114.650.000	**	2.81
275	ACTUATOR STEM O-RING.....	1	...001113.650.000	**	.30
280	POSITIONER, 74SG1.....	1	...018085.999.000		
290	BRACKET, POSITIONER, 25 SQ. INCH.....	1	...001188.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 25 SQ. INCH..	1	...019985.029.040		
298	GAUGE, 0-30 PSI.....	1	...001294.999.000		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
322	L V D T, 500 MR-DC.....	1	...022697.999.000		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 5/8"-11.....	1	...001120.013.002		
400	PLATE, VALTEK, 25 SQ. INCH.....	2	...001229.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-006 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
411	TUBING, 1/4"	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L	2	...019546.010.002	
430	TERMINAL	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40	4	...004698.010.002	
433	ARM, ADJUSTING, 4.00 L	1	...030132.029.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-007 TAG NO. TV-2501, 2502, 2602, 2603

1." MARK II BODY SUB-ASSEMBLY
1500# 2.00" SPUD 0.56" STEM DIA.
INLINE, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY MK 2 IN-LINE, 1", 1500#.....	1	...029289.042.041		
12	YOKE HALF-RING, 2.25 X 1.75, 0.25 THI	2	...001047.029.002		
20	SEAT RING, 1", CV 1.5.....	1	...004064.825.000	**	321.27
30	SEAT RETAINER, 1", 1500#.....	1	...003183.150.000		
40	BONNET, 1", 2.00" SPUD.....	1	...003180.029.041		
50	PLUG, 1", LIN.....	1	...029285.833.000	** T B A	
55	SEAT GASKET, SPIRAL, 1.88 X 1.50.....	1	...003184.832.000	** T B A	
58	BONNET GASKET, SPIRAL, 2.50 X 2.12...	1	...001228.832.000	**	5.36
70	BONNET FLANGE, 1", 1500#.....	1	...004065.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.....	2	...001133.150.000		
80	GLAND FLANGE, 0.56" STEM, 2.00" SPUD.	1	...008454.150.000		
83	GUIDE, 0.56" STEM.....	1	...001044.825.000		
87	GUIDE, 0.56" STEM.....	1	...001044.433.000		
88	PACKING SET, STD SQUARE, 0.56" STEM..	1	...024238.929.000	** T B A	
93	PKG SPR, 0.56" STEM, 3.00 L.....	1	...020912.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L.....	2	...001116.010.002		
108	BONNET FLANGE STUD, 7/8"-9, 4.25 L...	4	...005076.012.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
114	BONNET FLANGE NUT, 7/8"-9, H D.....	4	...001908.014.002		
117	PACKING BOX NUT, 3/8"-16.....	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18.....	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-007 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 25 SQ. INCH, 2.00" SPUD.....	1	...017655.300.040		
202	CYLINDER, 25 SQ. INCH, STANDARD.....	1	...016681.609.008		
210	ADJUSTING SCREW, 25 SQ. INCH, 3/4" ST	1	...001286.029.002		
211	ACTUATOR STEM, 25 SQ. INCH, 2.00" SPU	1	...001134.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 25 SQ. INCH.....	1	...001004.601.003		
227	SPRING BUTTON, 25 SQ. INCH, 1-1/2" ST	1	...003860.029.040		
228	SPACER, 25 SQ. INCH.....	1	...001009.604.003		
229	SPRING, 25 SQ. INCH.....	1	...015264.062.040		
235	TAKE-OFF ARM, 25 SQ. INCH.....	1	...001214.029.002		
236	SPACER, TAKE-OFF ARM, 25 SQ. INCH....	1	...001215.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 1-1/2" STROKE.	1	...007267.652.000		
240	TAKE-OFF ARM, POTENTIOMETER, 25 SQ. I	1	...030004.029.002		
247	BELLOWS, STEM, 25 SQ. INCH.....	1	...015498.652.000	**	3.93
248	GASKET, ADJUSTING SCREW, 25 SQ. INCH.	1	...001501.655.000	**	.40
249	CLAMP, STEM, BAILEY.....	1	...019979.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017665.431.000		
256	RETAINING RING, 25 SQ. INCH, CYLINDER	1	...016680.029.014		
271	PISTON O-RING.....	1	...001114.650.000	**	2.81
272	PISTON STEM O-RING.....	1	...001112.650.000	**	.21
274	YOKE O-RING.....	1	...001114.650.000	**	2.81
275	ACTUATOR STEM O-RING.....	1	...001113.650.000	**	.30
280	POSITIONER, 74SG1.....	1	...018085.999.000		
290	BRACKET, POSITIONER, 25 SQ. INCH.....	1	...001188.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...009531.029.040		
297	BRACKET, POTENTIOMETER, 25 SQ. INCH..	1	...019985.029.040		
298	GAUGE, 0-30 PSI.....	1	...001294.999.000		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-81.....	1	...029535.999.000		
322	L V D T, 500 HR-DC.....	1	...022697.999.000		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 5/8"-11.....	1	...001120.013.002		
400	PLATE, VALTEK, 25 SQ. INCH.....	2	...001229.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18899-007 TAG NO.

25 SQ. INCH CYLINDER ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE.....	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, 4.00 L.....	1	...030132.029.002	

* AS REQUIRED
** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER
P. E. Debrunner	Rockwell International Corporation Rocketdyne Division Canoga Park, California	SP42-002
APPROVALS		TYPE
4-24-80		EQUIPMENT
		DATE
		22 APRIL 1980
		SUPERSEDES SPEC. DATED:
		19 DEC. 79
		REV. LTR. A / PAGE 1 of 7

SPECIFICATION

TITLE

CONTROL VALVE, TEMPERATURE, BOILER WATER, RECEIVER

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	SEE TABLE 1 (COMPONENTS SHALL BE SO IDENTIFIED)
FUNCTION:	MODULATING VALVE
LINE FLUID:	WATER
VALVE OPERATING PRESSURE:	2200 PSIG MAX @ 600°F
AIR SUPPLY PRESSURE:	125 ± 25 PSIG
TEMPERATURE:	LINE FLUID: 600°F MAX AMBIENT: 16 TO 113°F
ANSI CLASS:	1500 LB
END CONNECTIONS:	LINE: 1" BUTT WELD, SCHED. 80 PIPE INSTRUMENT AIR: 1/4 NPT (F)
BODY FORM:	GLOBE, IN-LINE, TOP ENTRY
VALVE Cv:	SEE TABLE 1
BODY MATERIAL:	TO BE COMPATIBLE WITH LINE FLUID AND WELDABLE TO ASTM A106, GRADE B PIPE
BONNET TYPE:	STANDARD
TRIM TYPE:	LINEAR
ACTUATOR TYPE:	PNEUMATIC WITH TRAVEL INDICATOR FAIL OPEN
PACKING & GASKET MATERIAL:	TO BE COMPATIBLE WITH LINE FLUID AND TEMPERATURE
INTERNAL LEAKAGE:	.01 % OF RATED Cv MAXIMUM

EXTERNAL LEAKAGE: NO VISIBLE LEAKAGE

ACCESSORIES: THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1:

ELECTRO-PNEUMATIC TRANSDUCER

PNEUMATIC INPUT: 20 PSIG ± 2 PSI
ELECTRICAL INPUT SIGNAL: 4- 20 MA DC CONTROL RANGE
PNEUMATIC OUTPUT SIGNAL: 3 - 15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE
ELECTRICAL ENCLOSURE: WEATHERTIGHT (NEMA TYPE 3)
ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2" THREADED CONDUIT CONNECTION

LVDT

TYPE: DC/DC
VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PER CENT OR BETTER THROUGHOUT VALVE LIFT.
ENCLOSURE: WEATHERTIGHT (NEMA TYPE 3)
ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2" THREADED CONDUIT CONNECTION

POSITIONER

INSTRUMENT SIGNAL: 3-15 PSIG
PRESSURE GAUGES (3 REQD): INSTR. SIGNAL, UPPER & LOWER CYLINDER PRESSURE

ACCESSORIES: (CONT'D)

REGULATOR

TYPE:	AIRSET WITH OUTLET PRESSURE GAUGE
INLET PRESSURE:	125 ± 25 PSIG
OUTLET PRESSURE:	20 PSIG ± 2 PSI

FILTER

ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

DESIGN FEATURES:

1. THE MAXIMUM DIMENSIONS FOR THE VALVE INCLUDING THE ACCESSORY COMPONENTS ARE SHOWN IN FIGURE 2. ANY DIMENSIONS OUTSIDE OF THOSE NOTED ARE TO BE NEGOTIATED.
2. AFTER INSTALLATION, THE VALVE BODY WILL BE INSULATED BY ROCKETDYNE SUCH THAT THE VALVE BODY TEMPERATURE WILL STABILIZE AT A MAXIMUM TEMPERATURE OF 600°F.
3. POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 100 TO 0 PER CENT OF VALVE OPERATING LIFT RESPECTIVELY.
4. THE VALVE MUST BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.

PREPARATION FOR DELIVERY:

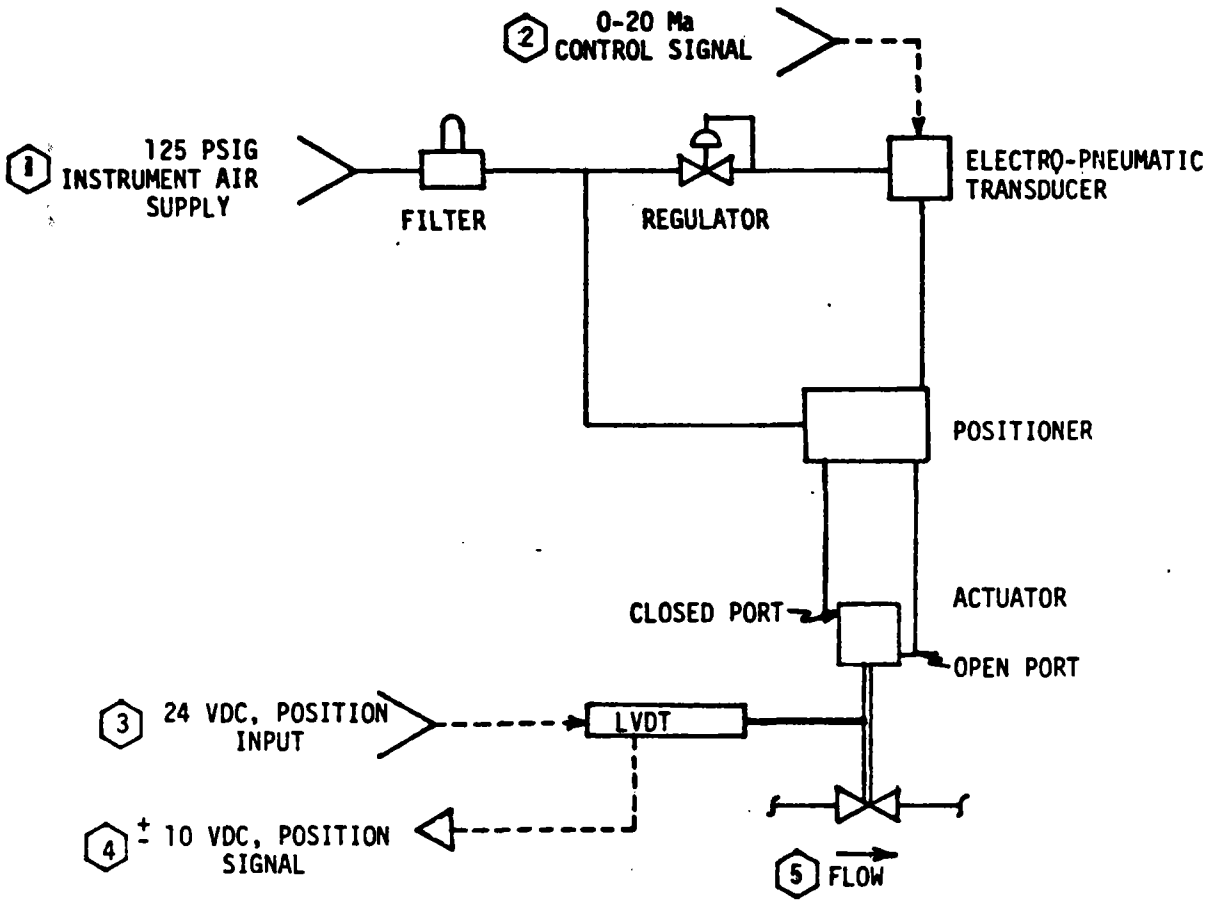
1. THE VALVE IS TO BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
2. THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE), AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.

B MOUNTING & SUPPORT PROVISIONS:

1. THE LENGTH OF THE BONNET STUDS SHOULD BE 3/8 INCH LONGER THAN STANDARD.
2. A BOLT HOLE PATTERN WHICH MATCHES THE PATTERN FOR THE BONNET BOLT HOLES SHOULD BE ADDED TO THE VALVE BODY BOTTOM SURFACE.

TABLE 1

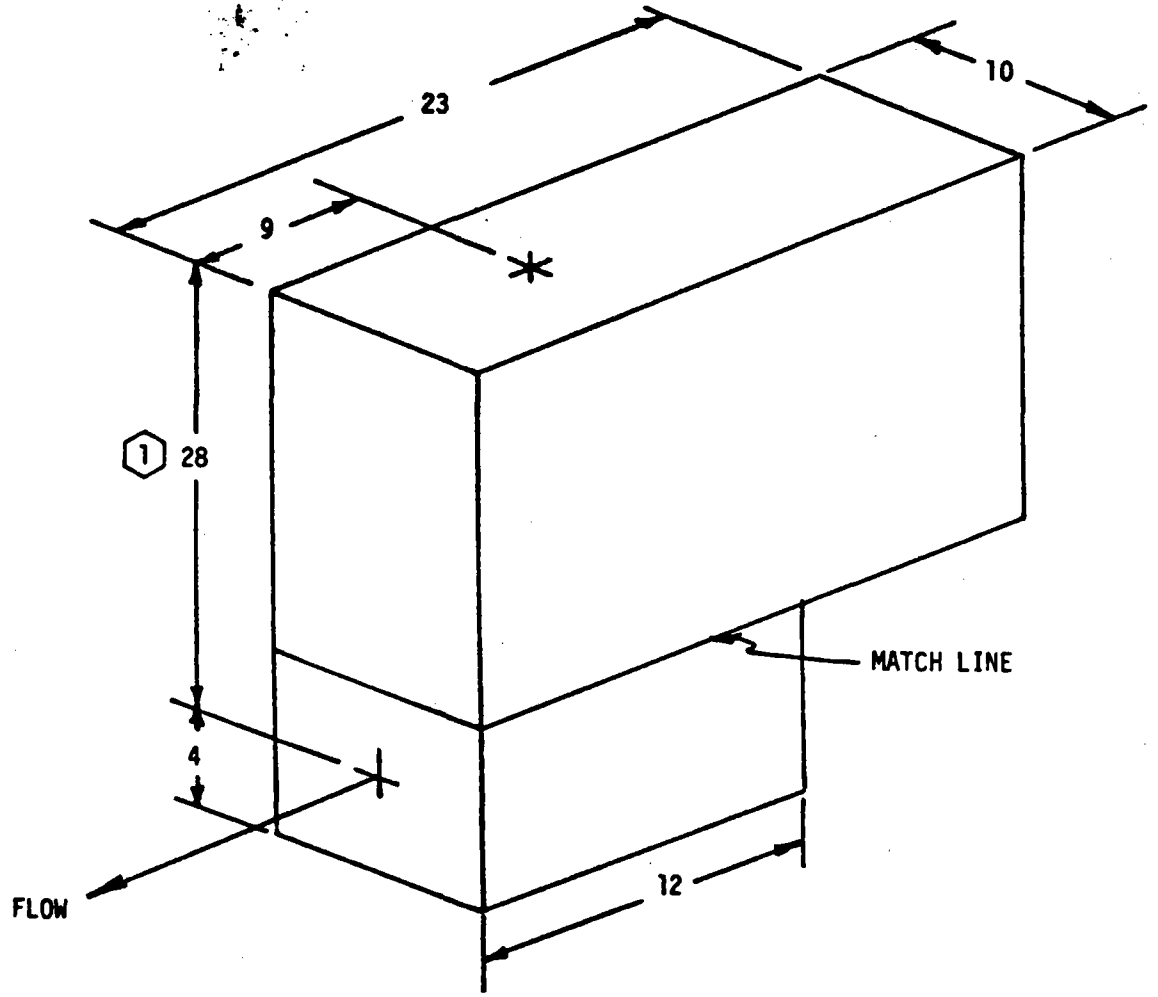
TAG NO.	Cv (±3% TOLERANCE)
RBWTCV-04	0.78
RBWTCV-05	0.96
RBWTCV-06	1.18
RBWTCV-07	1.42
RBWTCV-08	1.62
RBWTCV-09	1.77
RBWTCV-10	1.85
RBWTCV-11	1.85
RBWTCV-12	1.77
RBWTCV-13	1.77
RBWTCV-14	1.85
RBWTCV-15	1.85
RBWTCV-16	1.77
RBWTCV-17	1.62
RBWTCV-18	1.42
RBWTCV-19	1.18
RBWTCV-20	0.96
RBWTCV-21	0.78



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. POSITION
4. SIGNAL
5. FLOW

FIGURE 1



NOTES:
1. ALL DIMENSION ARE IN INCHES
(1) 2. MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

4.1 Modulating Control Valves

4.1.50 Desuperheater Water Control Valve

4.1.50.1 Identification Tag Number | Description

TV-3105 | Desuperheater Water Control Valve

4.1.50.2 Description

Manufacturer : Valtek, Springville, Utah

Part Number : Mark one body, mark one actuator

Rocketdyne Specification No. : SP42-067 (following)

Material : Body: Carbon Steel

Weight: : 180 lb

4.1.50.3 Prescribed Service

water

4.1.50.4 Vendor

Valtek, Springville, Utah

4.1.50.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.50.6 Periodic Service

none

4.1.50.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.50.8 Special Tools

none

4.1.50.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.50.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19088-001 TAG NO. TV-3105

1.5" MARK I BODY SUB-ASSEMBLY
1500# 2.62" SPUD 0.88" STEM DIA.
STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 1-1/2", 1500#.....	1	...006490.001.041		
12	YOKE HALF-RING, 3.00 X 2.25, 0.38 THI	2	...001440.029.002		
20	SEAT RING, 1-1/2" & 2", CV 2.5.....	1	...018112.158.000	** T B A	
23	LIMITING GASKET RING.....	1	...001573.029.000		
30	SEAT RETAINER, 1-1/2" & 2", 1500/2500	1	...001560.150.000		
40	BONNET, 1-1/2" & 2", 2.62" SPUD.....	1	...001559.029.041		
50	PLUG, 1-1/2" & 2", LIN.....	1	...006446.158.000	** T B A	
55	SEAT GASKET, SPIRAL, 2.50 X 2.12.....	1	...001027.832.000	**	5.36
58	BONNET GASKET, SPIRAL, 3.25 X 2.88...	1	...001110.832.000	**	5.36
70	BONNET FLANGE, 1-1/2" & 2", 1500#....	1	...001568.018.041		
76	HALF-CLAMP, YOKE, 2.62" SPUD.....	2	...001790.150.000		
80	GLAND FLANGE, 0.88" STEM, 2.62" SPUD.	1	...001655.150.000		
83	GUIDE, 0.88" STEM.....	1	...001021.825.000		
87	GUIDE, 0.88" STEM.....	1	...001021.433.000		
88	PACKING SET, STD SQUARE, 0.88" STEM..	1	...024242.929.000	**	5.14
93	PKG SPR, 0.88" STEM, 3.00 L.....	1	...020907.150.000		
94	PKG SPR, 0.88" STEM, 3.00 L.....	1	...020907.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 3/8"-16, 2.00 L.....	2	...001860.010.002		
108	BONNET FLANGE STUD, 1-1/8"-8, 4.88 L.	4	...001570.012.002		
109	PACKING BOX BOLT, CARRIAGE, 1/2"-13..	2	...005207.009.002		
114	BONNET FLANGE NUT, 1-1/8"-8, H D.....	4	...001571.014.002		
117	PACKING BOX NUT, 1/2"-13.....	2	...001730.013.002		
118	YOKE LOCKNUT, 3/8"-16.....	2	...003834.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19088-001 TAG NO. TV-3105

100 SQ. INCH CYLINDER ACTUATOR
2.62" SPUD .75" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 100 SQ. INCH, 2.62" SPUD.....	1	...017679.300.040		
202	CYLINDER, 100 SQ. INCH, STANDARD.....	1	...001307.609.008		
210	ADJUSTING SCREW, 100 SQ. INCH, 3/4" S	1	...008763.029.002		
211	ACTUATOR STEM, 100 SQ. INCH, 2.62" SP	1	...001817.159.000		
213	STROKE PLATE, 3/4" STROKE.....	1	...001156.603.000		
225	PISTON, 100 SQ. INCH.....	1	...001311.601.003		
227	SPRING BUTTON, 100/200 SQ. INCH.....	1	...003713.029.040		
228	SPACER, 100 SQ. INCH, 2.62/3.38" SPUD	1	...008272.029.040		
229	SPRING, 100/200 SQ. INCH.....	1	...001331.006.040		
235	TAKE-OFF ARM, 100 SQ. INCH, 2.62/2.88	1	...001364.029.002		
236	SPACER, TAKE-OFF ARM, 100 SQ. INCH...	1	...001365.029.002		
237	RANGE SPRING, 3-15.....	1	...007437.999.000		
239	BELLOWS, RANGE SPRING, 6" STROKE.....	1	...006829.652.000	**	7.68
240	TAKE-OFF ARM, POTENTIOMETER, 8.12 L..	1	...029842.029.002		
247	BELLOWS, STEM, 100/200 SQ. INCH.....	1	...015560.652.000	**	5.81
248	GASKET, ADJUSTING SCREW, 100/200 SQ.	1	...001631.655.000	**	.83
249	CLAMP, STEM, BAILEY.....	1	...019465.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017719.431.000		
256	RETAINING RING, 100 SQ. INCH, CYLINDE	1	...001403.029.014		
271	PISTON O-RING.....	1	...001313.650.000	**	6.26
272	PISTON STEM O-RING.....	1	...001312.650.000	**	.28
274	YOKE O-RING.....	1	...001313.650.000	**	6.26
275	ACTUATOR STEM O-RING.....	1	...001337.650.000	**	.57
280	POSITIONER, 746.....	1	...006744.999.000		
290	BRACKET, POSITIONER, 100 SQ. INCH....	1	...001360.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
297	BRACKET, POTENTIOMETER, 100/200 SQ. I	1	...021899.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
303	SOLENOID, HT8321A6, 115 VAC.....	1	...		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
311	L V D T, 500 HR-DC.....	1	...022697.999.000		
321	GAUGE, 0-30 PSI.....	1	...001294.999.000		
345	STEM CLAMP LOCKNUT, 3/8"-16.....	1	...003834.013.002		
348	ACTUATOR STEM LOCKNUT, 1-1/8"-7.....	1	...001357.013.002		
400	PLATE, VALTEK, 100/200 SQ. INCH.....	2	...001404.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 5/16"-18, 0.75	2	...001290.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
409	TUBE FITTING, 1/4", STRAIGHT.....	*	...001572.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19088-001 TAG NO.

100 SQ. INCH CYLINDER ACTUATOR
2.62" SPUD .75" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002	
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
413	STICKER, 100 PSI MAX.....	1	...009563.675.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019542.029.040	
426	COVER, POTENTIOMETER, 4" STROKE.....	1	...019544.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, TRANSDUCER.....	1	...026368.159.000	

* AS REQUIRED
** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER
J. K. CHENG	Rockwell International Corporation Rocketdyne Division Canoga Park, California	SP42-067
APPROVALS E. C. Spencer 8/22/80 K. G. Absalan 8/25/80	**SPECIFICATION**	TYPE EQUIPMENT
		DATE 8-18-80
		SUPERSEDES SPEC. DATED: 4-14-80
		REV. LTR. B
		PAGE 1 of 6

TITLE

DESUPERHEATER WATER CONTROL VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TDWTCV (COMPONENT SHALL BE TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
BODY TYPE:	GLOBE, IN-LINE
END CONNECTIONS:	1 1/2 INCH SOCKET WELD
PIPE MATERIAL:	ASTM A106 GRADE B, SCHEDULE 160
BODY MATERIAL:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ANSI RATING:	1500 LB CLASS
LINE FLUID:	WATER
MAXIMUM INLET PRESSURE @ TEMPERATURE:	2185 PSIG @ 600°F
AMBIENT TEMPERATURE:	16° TO 113°F
TRIM FLOW CHARACTERISTIC:	LINEAR
FLOW COEFFICIENT:	Cv = 2.75 ± 10%
INTERNAL LEAKAGE:	MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY.
EXTERNAL LEAKAGE:	NONE VISIBLE
ACTUATOR:	PNEUMATIC WITH TRAVEL INDICATOR
FAIL SAFE POSITION:	CLOSED (ELECTRICAL FAILURE) CLOSED (PNEUMATIC FAILURE)
INSTRUMENT AIR SUPPLY:	125 ± 25 PSIG
PACKING & GASKET MATERIAL:	COMPATIBLE WITH LINE FLUID AND TEMPERATURE

ACCESSORIES:

THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1 ON PAGE 5:

- ELECTRO-PNEUMATIC TRANSDUCER

  PNEUMATIC INPUT: 20 PSIG ± 2 PSI
  ELECTRICAL INPUT SIGNAL: 4-20 MA DC (CONTROL RANGE)
  PNEUMATIC OUTPUT SIGNAL: 3-15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE.
  ELECTRICAL ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- LVDT

  TYPE: DC/DC
  VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PERCENT OR BETTER THROUGHOUT VALVE LIFT.
  ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- POSITIONER

  INSTRUMENT SIGNAL: 3-15 PSIG
  PRESSURE GAUGES (3 REQD): INSTRUMENT SIGNAL, UPPER & LOWER CYLINDER PRESSURE

- REGULATOR

  TYPE: AIRSET WITH OUTLET PRESSURE GAUGE
  INLET PRESSURE: 125 ± 25 PSIG
  OUTLET PRESSURE: 20 PSIG ± 2 PSI

ACCESSORIES: (CONT'D)

- FILTER

  ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

- SOLENOID VALVE

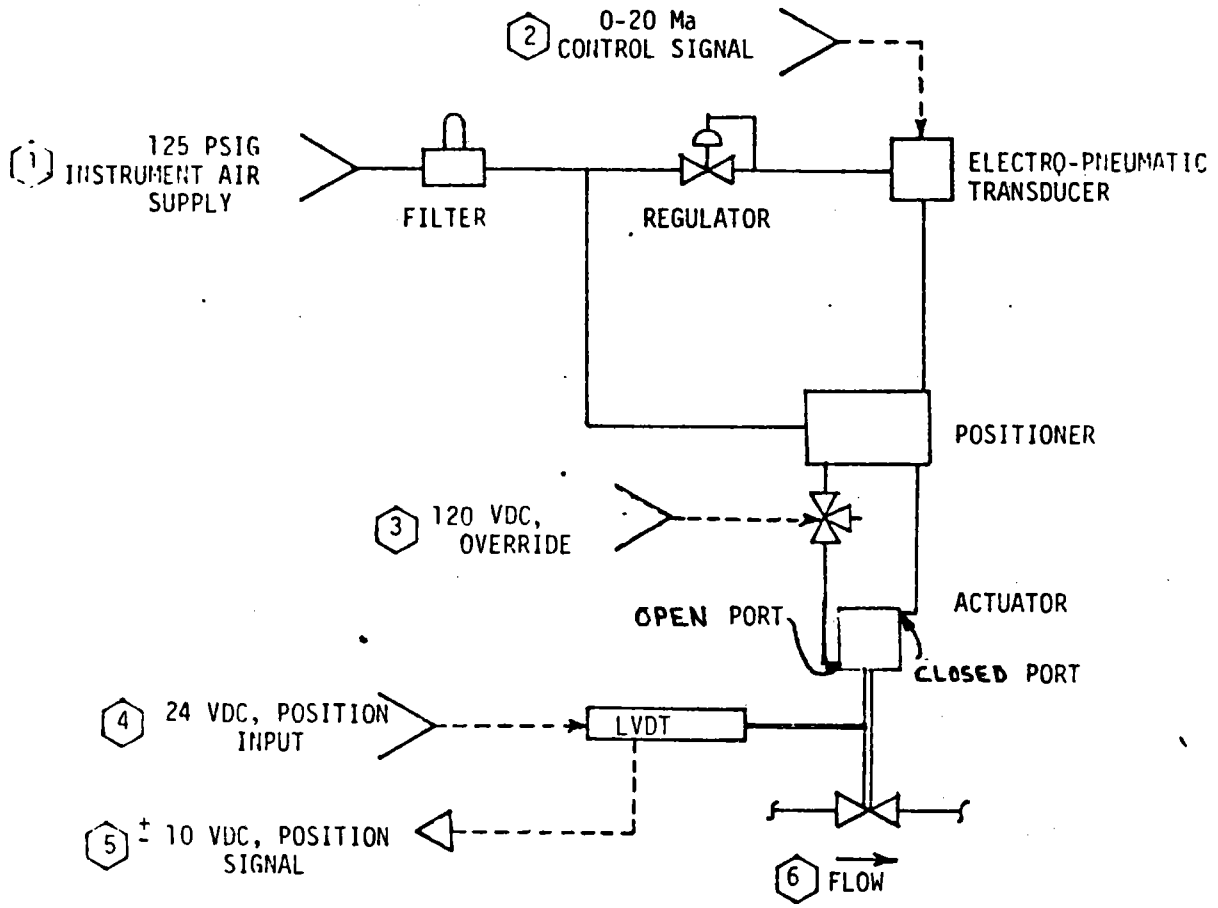
  3-WAY, 120 VAC 60 HZ FOR OVERRIDE OF THE POSITIONER TO CLOSE THE VALVE WHEN THE SOLENOID IS DE-ENERGIZED.

MAXIMUM ENVELOPE DIMENSIONS: REFER TO FIGURE 2 ON PAGE 6

CLEANING AND PACKAGING: VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE) AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

DESIGN FEATURES:

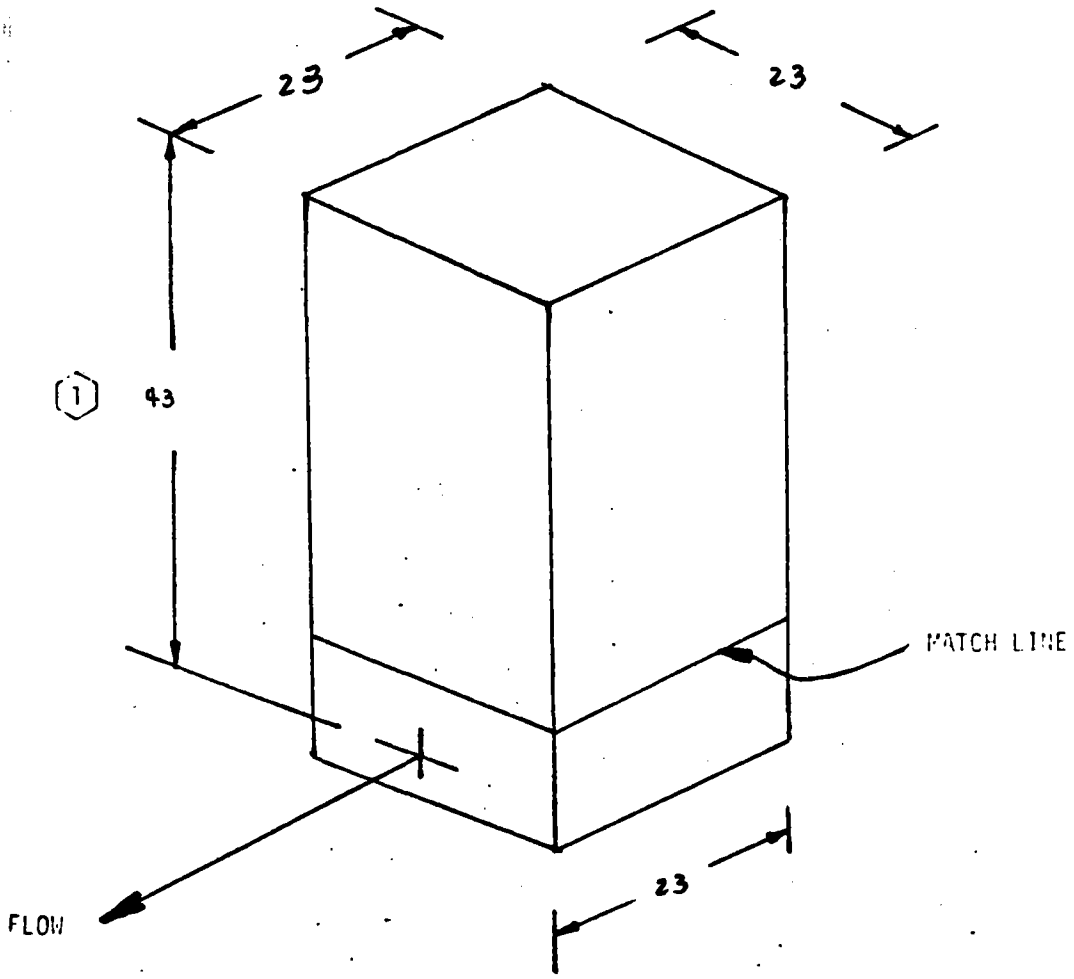
- ELECTRICAL COMPONENTS ARE TO HAVE WEATHERTIGHT ENCLOSURES (NEMA TYPE 3). ENCLOSURES SHALL BE EQUIPPED WITH A 1/2 INCH THREADED CONDUIT CONNECTION.
- ALL THE ACCESSORY COMPONENTS SHALL BE MOUNTED ON AND PROPERLY CONNECTED TO THE VALVE AS PER FIGURE 1, AND SHALL BE READILY REMOVABLE FOR SERVICING.
- THE VALVE SHALL BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
- VALVE SHALL BE DESIGNED TO PERMIT 2 INCH THICK INSULATION WITH ALL THE ACCESSORIES MOUNTED.
- THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
- POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 0 TO 100 PERCENT OF VALVE OPERATING LIFT RESPECTIVELY.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE
4. POSITION
5. SIGNAL
6. FLOW

FIGURE 1



NOTES:
1. ALL DIMENSION ARE IN INCHES
2. ⌀ (1) MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

4.1 Modulating Control Valves

4.1.51 Condenser Oil Temperature Control Valve

4.1.51.1 Identification Tag Number | Description

Identification Tag Number	Description
TV-3410	Condenser Oil Temperature Control Valve
TV-3411	Condenser Oil Temperature Control Valve

4.1.51.2 Description

Manufacturer : Valtek, Springville, Utah

Part Number : Mark one body, mark one actuator

Rocketdyne Specification No. : SP42-063 (following)

Material : Body: Carbon Steel

Weight : 590 lb

4.1.51.3 Prescribed Service

oil

4.1.51.4 Vendor

Valtek, Springville, Utah

4.1.51.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.51.6 Periodic Service

none

4.1.51.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.51.8 Special Tools

none

4.1.51.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.51.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19241-001 TAG NO. TV-3410 & 3411

8." MARK I BODY SUB-ASSEMBLY
150# 3.38" SPUD 1.50" STEM DIA.
STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 8", 150#.....	1	...005033.001.041		
20	SEAT RING, 8", CV 400.....	1	...002206.150.000	**	485.59
30	SEAT RETAINER, 8", 600#.....	1	...001772.150.000		
40	BONNET, 8", 3.38" SPUD.....	1	...002188.029.041		
50	PLUG, 8", LIN.....	1	...029800.150.000	** T B A	
55	SEAT GASKET, SPIRAL, 8.25 X 7.88.....	1	...001798.832.000	**	12.47
58	BONNET GASKET, SPIRAL, 9.00 X 8.50...	1	...001799.826.000	**	16.95
70	BONNET FLANGE, 8", 150#.....	1	...002191.018.041		
80	GLAND FLANGE, 1.50" STEM, 3.38" SPUD.	1	...001969.029.041		
82	GUIDE LINER, 1.50" STEM, GRAFOIL.....	3	...009472.842.000	**	11.01
83	GUIDE RETAINER, 1.50" STEM, GRAFOIL..	1	...009475.150.000		
86	GUIDE LINER, 1.50" STEM, GRAFOIL.....	3	...009472.842.000	**	11.01
87	GUIDE RETAINER, 1.50" STEM, GRAFOIL..	1	...009475.150.000		
88	PACKING SET, STD SQUARE, 1.50" STEM..	1	...024246.929.000	** T B A	
93	PKG SPR, 1.50" STEM, 4.00 L.....	1	...020903.150.000		
94	PKG SPR, 1.50" STEM, 0.50 L.....	1	...004684.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/8"-11, 2.25 L.....	4	...001283.015.002		
108	BONNET FLANGE STUD, 3/4"-10, 3.25 L..	8	...002298.012.002		
109	PACKING BOX STUD, 5/8"-11, 5.50 L....	2	...003892.012.002		
114	BONNET FLANGE NUT, 3/4"-10, H D.....	8	...002281.014.002		
117	PACKING BOX NUT, 5/8"-11, H D.....	4	...005110.014.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19241-001 TAG NO.

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD 3." STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 100 SQ. INCH, 3.38" SPUD.....	1	...017681.300.040		
202	CYLINDER, 100 SQ. INCH, STANDARD.....	1	...001307.609.008		
210	ADJUSTING SCREW, 100 SQ. INCH, 3" STR	1	...001356.029.002		
211	ACTUATOR STEM, 100/200 SQ. INCH, 3.38	1	...002437.159.000		
213	STROKE PLATE, 3" STROKE.....	1	...001258.603.000		
225	PISTON, 100 SQ. INCH.....	1	...001311.601.003		
227	SPRING BUTTON, 100/200 SQ. INCH.....	1	...003713.029.040		
228	SPACER, 100 SQ. INCH, 2.62/3.38" SPUD	1	...008272.029.040		
229	SPRING, 100/200 SQ. INCH.....	1	...001331.006.040		
235	TAKE-OFF ARM, 100 SQ. INCH, 3.38/4.75	1	...001841.029.002		
236	SPACER, TAKE-OFF ARM, 100 SQ. INCH...	1	...001842.029.002		
237	RANGE SPRING, 3-15.....	1	...007441.999.000		
239	BELLOWS, RANGE SPRING, 6" STROKE.....	1	...006829.652.000	**	7.68
240	TAKE-OFF ARM, POTENTIOMETER.....	1	...019434.029.002		
247	BELLOWS, STEM, 100/200 SQ. INCH.....	1	...015526.652.000	**	6.43
248	GASKET, ADJUSTING SCREW, 100/200 SQ.	1	...001631.655.000	**	.83
249	CLAMP, STEM, BAILEY.....	1	...019465.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017740.431.000		
256	RETAINING RING, 100 SQ. INCH, CYLINDE	1	...001403.029.014		
271	PISTON O-RING.....	1	...001313.650.000	**	6.26
272	PISTON STEM O-RING.....	1	...001312.650.000	**	.28
274	YOKE O-RING.....	1	...001313.650.000	**	6.26
275	ACTUATOR STEM O-RING.....	1	...001718.650.000	**	.83
280	POSITIONER, 746.....	1	...006744.999.000		
290	BRACKET, POSITIONER, 100 SQ. INCH....	1	...001726.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
297	BRACKET, POTENTIOMETER, 100 SQ. INCH.	1	...028555.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
303	SOLENOID, HT8321A6 115 VAC.....	1	...		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
321	GAUGE, 0-30 PSI.....	1	...001294.999.000		
322	L V D T, 2000 HR-DC.....	1	...022261.999.000		
345	STEM CLAMP LOCKNUT, 1/2"-13.....	1	...006806.013.002		
348	ACTUATOR STEM LOCKNUT, 1-1/8"-7.....	1	...001357.013.002		
400	PLATE, VALTEK, 100/200 SQ. INCH.....	2	...001404.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 3/8"-16, 1.00	2	...001713.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
409	TUBE FITTING, 1/4", STRAIGHT.....	*	...001572.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19241-001 TAG NO.

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD 3." STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002	
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019548.029.040	
426	COVER, L V D T, 4" STROKE.....	1	...019549.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, TRANSDUCER.....	1	...026368.159.000	

* AS REQUIRED
** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER
J. K. CHENG J.K.C.	Rockwell International Corporation Rocketdyne Division Canoga Park, California	SP42-063
APPROVALS		TYPE
E.G. Spencer 8/22/80		EQUIPMENT
J. A. Graham 8/19/80		DATE
	SPECIFICATION	8-18-80
		SUPERSEDES SPEC. DATED:
		1-25-80
		REV. LTR. A / PAGE 1 of 6

TITLE

THERMAL FLUID CONTROL VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	THFIV-1 AND -2, TBFFCV-1 AND -2 (COMPONENTS SHALL BE TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
BODY TYPE:	GLOBE, IN-LINE
END CONNECTIONS:	8 INCH BUTT WELD
PIPE MATERIAL:	ASTM A106 GRADE B, SCHEDULE 40
BODY MATERIAL:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ANSI RATING:	150 LB CLASS
LINE FLUID:	OIL (CALORIA HT43, DENSITY = 40.3 LB/CU FT @ 600°F)
MAXIMUM INLET PRESSURE @ TEMPERATURE:	115 PSIG @ 600°F
AMBIENT TEMPERATURE:	16° TO 113°F
TRIM FLOW CHARACTERISTIC:	LINEAR
FLOW COEFFICIENT:	Cv = 398 ± 10% FOR THFIV-1 AND -2, Cv = 323 ± 10% FOR TBFFCV-1 AND -2.
INTERNAL LEAKAGE:	MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY
EXTERNAL LEAKAGE:	NONE VISIBLE
ACTUATOR:	PNEUMATIC WITH TRAVEL INDICATOR
FAIL SAFE POSITION:	OPEN (ELECTRICAL FAILURE) OPEN (PNEUMATIC FAILURE)
INSTRUMENT AIR SUPPLY:	125 ± 25 PSIG

PACKING & GASKET MATERIAL: COMPATIBLE WITH LINE FLUID AND TEMPERATURE

ACCESSORIES: THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1 ON PAGE 5:

- ELECTRO-PNEUMATIC TRANSDUCER

  PNEUMATIC INPUT: 20 PSIG ± 2 PSI
  ELECTRICAL INPUT SIGNAL: 4-20 MA DC (CONTROL RANGE)
  PNEUMATIC OUTPUT SIGNAL: 3-15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE

  ELECTRICAL ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- LVDT

  TYPE: DC/DC
  VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PER CENT OR BETTER THROUGHOUT VALVE LIFT.

  ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- POSITIONER

  INSTRUMENT SIGNAL: 3-15 PSIG
  PRESSURE GAUGES (3 REQD): INSTRUMENT SIGNAL, UPPER AND LOWER CYLINDER PRESSURE

- REGULATOR

  TYPE: AIRSET WITH OUTLET PRESSURE GAUGE
  INLET PRESSURE: 125 ± 25 PSIG
  OUTLET PRESSURE: 20 PSIG ± 2 PSI

ACCESSORIES: (CONT'D)

- FILTER

  ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

- SOLENOID VALVE

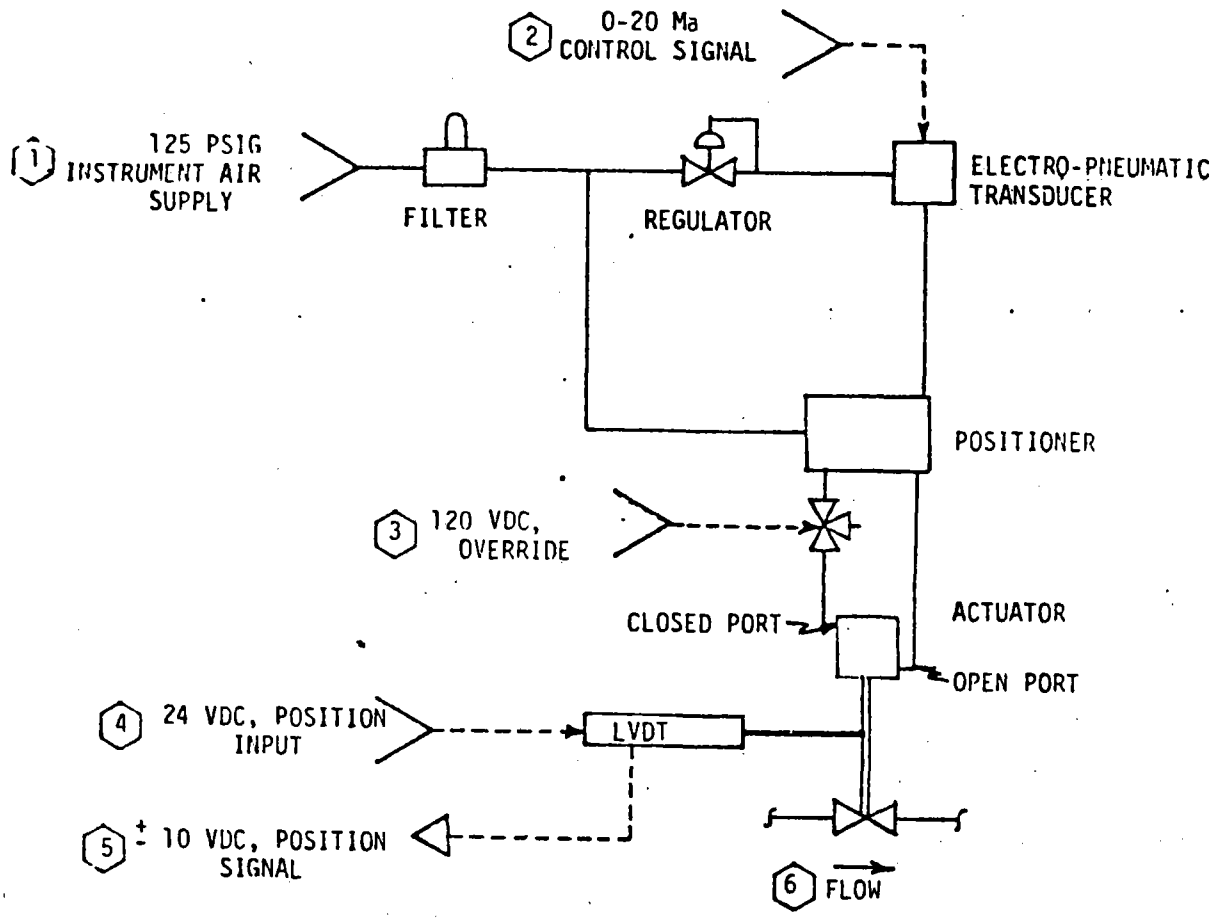
  3-WAY, 120 VAC 60 HZ FOR OVERRIDE OF THE POSITIONER TO OPEN THE VALVE WHEN THE SOLENOID IS DE-ENERGIZED.

MAXIMUM ENVELOPE DIMENSIONS: REFER TO FIGURE 2 ON PAGE 6

CLEANING AND PACKAGING: VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE) AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

DESIGN FEATURES:

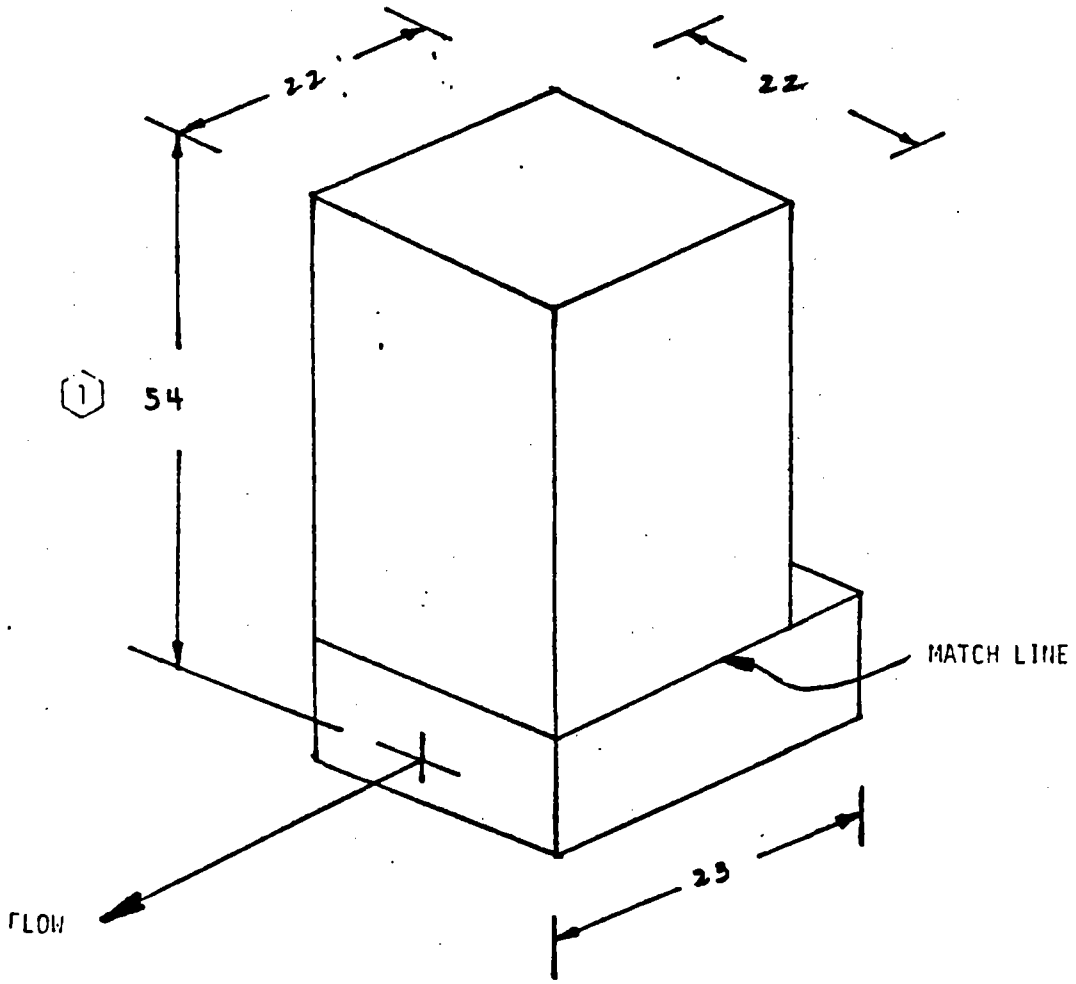
- ELECTRICAL COMPONENTS ARE TO HAVE WEATHERTIGHT ENCLOSURES (NEMA TYPE 3). ENCLOSURES SHALL BE EQUIPPED WITH A 1/2 INCH THREADED CONDUIT CONNECTION.
- ALL THE ACCESSORY COMPONENTS SHALL BE MOUNTED ON AND PROPERLY CONNECTED TO THE VALVE AS PER FIGURE 1, AND SHALL BE READILY REMOVALE FOR SERVICING.
- THE VALVE SHALL BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
- VALVE SHALL BE DESIGNED TO PERMIT 3 1/2 INCH THICK INSULATION WITH ALL THE ACCESSORIES MOUNTED.
- THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
- POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 100 TO 0 PER CENT OF VALVE OPERATING LIFT RESPECTIVELY.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE
4. POSITION
5. SIGNAL
6. FLOW

FIGURE 1



NOTES: 1. ALL DIMENSION ARE IN INCHES
(1) 2. MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

4.1 Modulating Control Valves

4.1.52 Superheater Oil Control Valve

4.1.52.1 Identification Tag Number	Description
TV-3710	Superheater Oil Control Valve
TV-3810	Superheater Oil Control Valve

4.1.52.2 Description

Manufacturer	:	Valtek, Springville, Utah
Part Number	:	Mark one body, mark one actuator
Rocketdyne Specification No.	:	SP42-068 (following)
Material	:	Body: Carbon Steel
Weight	:	590 lb

4.1.52.3 Prescribed Service

oil

4.1.52.4 Vendor

Valtek, Springville, Utah

4.1.52.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.52.6 Periodic Service

none

4.1.52.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.52.8 Special Tools

none

4.1.52.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.52.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19089-001 TAG NO. TV-3710
TV-3810

8." MARK I BODY SUB-ASSEMBLY
150# 3.38" SPUD 1.50" STEM DIA.
STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 8", 150# ISA.....	1	...023624.001.041		
20	SEAT RING, 8", CV 110.....	1	...005099.150.000	**	485.59
30	SEAT RETAINER, 8", 600#.....	1	...001772.150.000		
40	BONNET, 8", 3.38" SPUD.....	1	...002188.029.041		
50	PLUG, 8", LIN.....	1	...016892.150.000	**	T B A
55	SEAT GASKET, SPIRAL, 8.25 X 7.88.....	1	...001798.832.000	**	12.47
58	BONNET GASKET, SPIRAL, 9.00 X 8.50...	1	...001799.832.000	**	13.42
70	BONNET FLANGE, 8", 150#.....	1	...002191.018.041		
80	GLAND FLANGE, 1.50" STEM, 3.38" SPUD.	1	...001969.029.041		
82	GUIDE LINER, 1.50" STEM, GRAFOIL.....	3	...009472.842.000	**	11.01
83	GUIDE RETAINER, 1.50" STEM, GRAFOIL..	1	...009475.150.000		
86	GUIDE LINER, 1.50" STEM, GRAFOIL.....	3	...009472.842.000	**	11.01
87	GUIDE RETAINER, 1.50" STEM, GRAFOIL..	1	...009475.150.000		
88	PACKING SET, STD SQUARE, 1.50" STEM..	1	...024246.929.000	**	T B A
93	PKG SPR, 1.50" STEM, 4.00 L.....	1	...020903.150.000		
94	PKG SPR, 1.50" STEM, 0.50 L.....	1	...004684.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 5/8"-11, 2.25 L.....	4	...001283.015.002		
108	BONNET FLANGE STUD, 3/4"-10, 3.25 L..	8	...002298.012.002		
109	PACKING BOX STUD, 5/8"-11, 5.50 L....	2	...003892.012.002		
114	BONNET FLANGE NUT, 3/4"-10, H D.....	8	...002281.014.002		
117	PACKING BOX NUT, 5/8"-11, H D.....	4	...005110.014.002		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19089-001 TAG NO.

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD 2." STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 100 SQ. INCH, 3.38" SPUD.....	1	...017681.300.040		
202	CYLINDER, 100 SQ. INCH, STANDARD.....	1	...001307.609.008		
210	ADJUSTING SCREW, 100 SQ. INCH, 2" STR	1	...001710.029.002		
211	ACTUATOR STEM, 100/200 SQ. INCH, 3.38	1	...002437.159.000		
213	STROKE PLATE, 2" STROKE.....	1	...001253.603.000		
225	PISTON, 100 SQ. INCH.....	1	...001311.601.003		
227	SPRING BUTTON, 100/200 SQ. INCH.....	1	...003713.029.040		
228	SPACER, 100 SQ. INCH, 2.62/3.38" SPUD	1	...008272.029.040		
229	SPRING, 100/200 SQ. INCH.....	1	...001331.006.040		
235	TAKE-OFF ARM, 100 SQ. INCH, 3.38/4.75	1	...001841.029.002		
236	SPACER, TAKE-OFF ARM, 100 SQ. INCH...	1	...001842.029.002		
237	RANGE SPRING, 3-15.....	1	...007436.999.000		
239	BELLOWS, RANGE SPRING, 6" STROKE.....	1	...006829.652.000	**	7.68
240	TAKE-OFF ARM, POTENTIOMETER.....	1	...019434.029.002		
247	BELLOWS, STEM, 100/200 SQ. INCH.....	1	...015526.652.000	**	6.43
248	GASKET, ADJUSTING SCREW, 100/200 SQ.	1	...001631.655.000	**	.83
249	CLAMP, STEM, BAILEY.....	1	...019465.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017740.431.000		
256	RETAINING RING, 100 SQ. INCH, CYLINDE	1	...001403.029.014		
271	PISTON O-RING.....	1	...001313.650.000	**	6.26
272	PISTON STEM O-RING.....	1	...001312.650.000	**	.28
274	YOKE O-RING.....	1	...001313.650.000	**	6.26
275	ACTUATOR STEM O-RING.....	1	...001718.650.000	**	.83
280	POSITIONER, 74G.....	1	...006744.999.000		
290	BRACKET, POSITIONER, 100 SQ. INCH....	1	...001726.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
297	BRACKET, POTENTIOMETER, 100 SQ. INCH.	1	...028555.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
303	SOLENOID, HT8321A6 115 VAC.....	1	..		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
321	GAUGE, 0-30 PSI.....	1	...001294.999.000		
322	L V D T, 1000 HR-DC.....	1	...022708.999.000		
345	STEM CLAMP LOCKNUT, 1/2"-13.....	1	...006806.013.002		
348	ACTUATOR STEM LOCKNUT, 1-1/8"-7.....	1	...001357.013.002		
400	PLATE, VALTEK, 100/200 SQ. INCH.....	2	...001404.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
403	MOUNTING BRACKET BOLT, 3/8"-16, 1.00	2	...001713.010.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002		
409	TUBE FITTING, 1/4", STRAIGHT.....	*	...001572.402.002		

* AS REQUIRED
** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19089-001 TAG NO.

100 SQ. INCH CYLINDER ACTUATOR
3.38" SPUD 2." STROKE
AIR-TO-CLOSE

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
410	TUBE FITTING, 1/4", ELBOW.....	*	...001244.402.002	
411	TUBING, 1/4".....	*	...001245.466.002	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019542.029.040	
426	COVER, L V D T, 4" STROKE.....	1	...019549.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, TRANSDUCER.....	1	...026368.159.000	

* AS REQUIRED
** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER
J. K. CHENG	Rockwell International Corporation Rocketdyne Division Canoga Park, California	SP42-068
APPROVALS 8/22/80		TYPE EQUIPMENT
		DATE R-18-80
	SPECIFICATION	SUPERSEDES SPEC. DATED: 5-5-80
		REV. LTR. B / PAGE 1 of 6

TITLE

SUPERHEATER FLUID CONTROL VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TSFTCV-1 AND -2 (COMPONENTS SHALL BE TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
BODY TYPE:	GLOBE, IN-LINE
END CONNECTIONS:	8 INCH RF FLANGE
BODY MATERIAL:	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
ANSI RATING:	150 LB CLASS
LINE FLUID:	OIL (CALORIA HT43, DENSITY = 40.3 LB/CU FT @ 600 F)
MAXIMUM INLET PRESSURE @ TEMPERATURE:	115 PSIG @ 600°F
AMBIENT TEMPERATURE:	16° TO 113°F
TRIM FLOW CHARACTERISTIC:	LINEAR
FLOW COEFFICIENT:	Cv = 114 $\pm$ 10%
INTERNAL LEAKAGE:	MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY
EXTERNAL LEAKAGE:	NONE VISIBLE
ACTUATOR:	PNEUMATIC WITH TRAVEL INDICATOR
FAIL SAFE POSITION:	OPEN (ELECTRICAL FAILURE) OPEN (PNEUMATIC FAILURE)
INSTRUMENT AIR SUPPLY:	125 $\pm$ 25 PSIG
PACKING & GASKET MATERIAL:	COMPATIBLE WITH LINE FLUID AND TEMPERATURE

ACCESSORIES:

THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1 ON PAGE 5:

- ELECTRO-PNEUMATIC TRANSDUCER

  PNEUMATIC INPUT: 20 PSIG ± 2 PSI
  ELECTRICAL INPUT SIGNAL: 4-20 MA DC (CONTROL RANGE)
  PNEUMATIC OUTPUT SIGNAL: 3-15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE
  ELECTRICAL ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- LVDT

  TYPE: DC/DC
  VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PERCENT OR BETTER THROUGHOUT VALVE LIFT
  ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- POSITIONER

  INSTRUMENT SIGNAL: 3-15 PSIG
  PRESSURE GAUGES (3 REQD): INSTRUMENT SIGNAL, UPPER & LOWER CYLINDER PRESSURE

- REGULATOR

  TYPE: AIRSET WITH OUTLET PRESSURE GAUGE
  INLET PRESSURE: 125 ± 25 PSIG
  OUTLET PRESSURE: 20 PSIG ± 2 PSI

- FILTER

  ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

ACCESSORIES: (CONT'D)

- SOLENOID VALVE

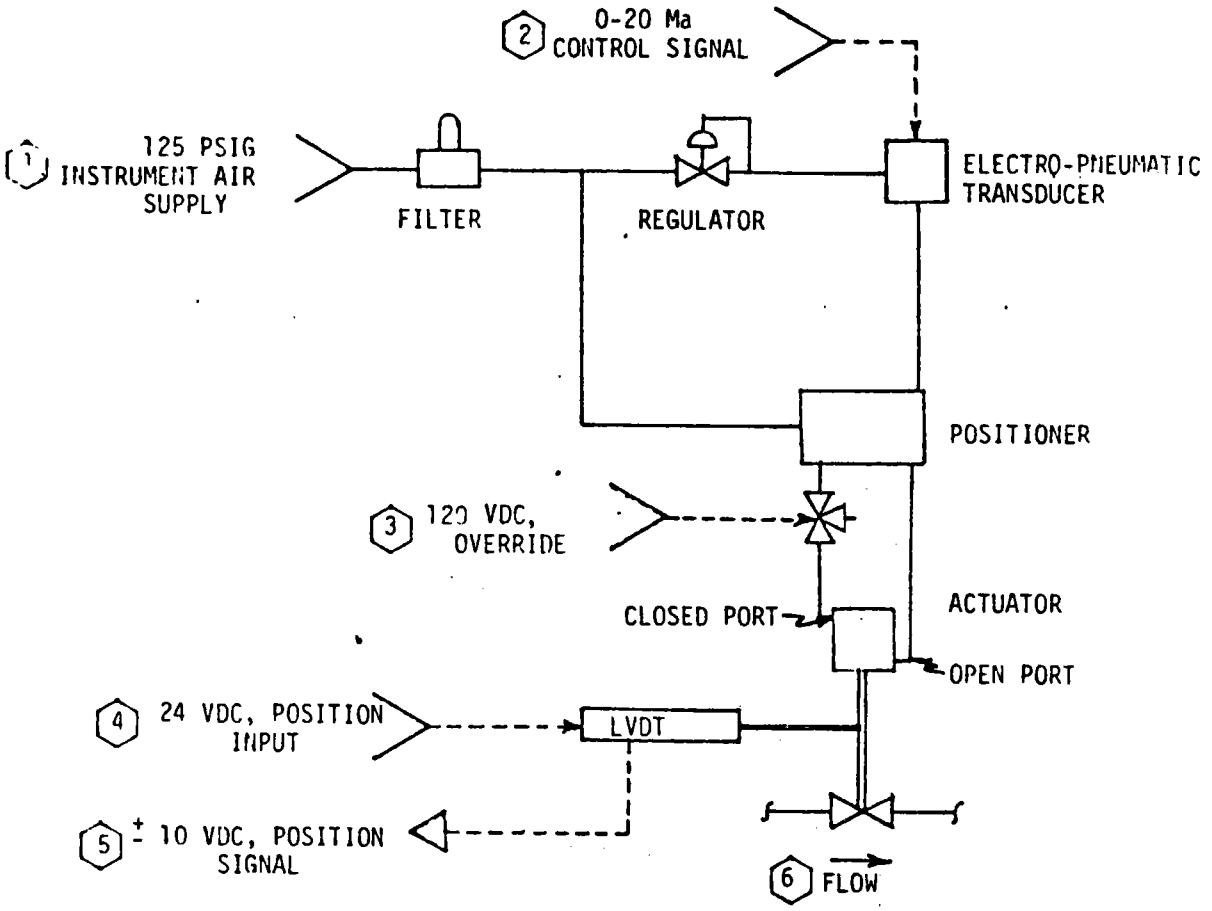
  3-WAY, 120 VAC 60 HZ FOR OVERRIDE OF THE POSITIONER TO OPEN THE VALVE WHEN THE SOLENOID IS DE-ENERGIZED.

ϕ MAXIMUM ENVELOPE DIMENSIONS: REFER TO FIGURE 2 ON PAGE 6

CLEANING AND PACKAGING: VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE) AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

DESIGN FEATURES:

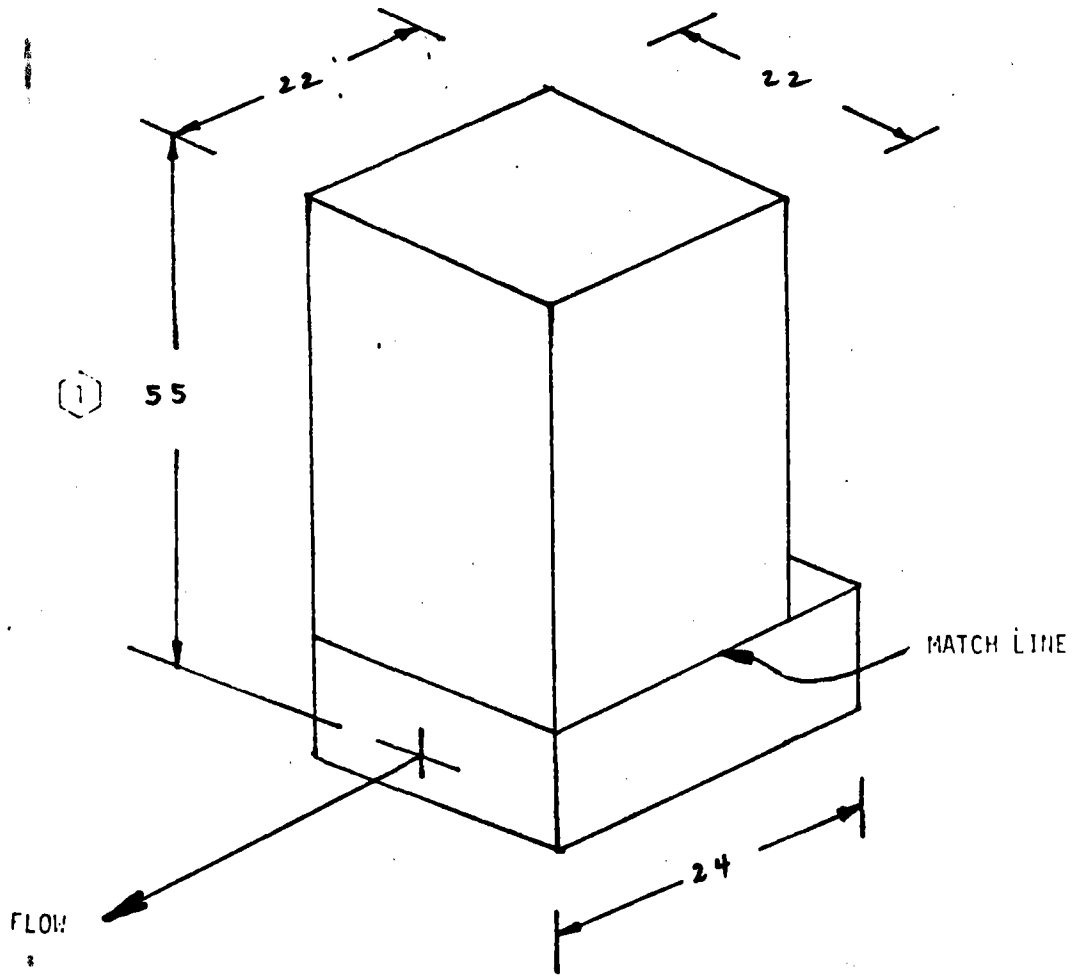
- ELECTRICAL COMPONENTS ARE TO HAVE WEATHERTIGHT ENCLOSURES (NEMA TYPE 3). ENCLOSURES SHALL BE EQUIPPED WITH A 1/2 INCH THREADED CONDUIT CONNECTION.
- ALL THE ACCESSORY COMPONENTS SHALL BE MOUNTED ON AND PROPERLY CONNECTED TO THE VALVE AS PER FIGURE 1, AND SHALL BE READILY REMOVABLE FOR SERVICING.
- THE VALVE SHALL BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
- VALVE SHALL BE DESIGNED TO PERMIT 3 1/2 INCH THICK INSULATION WITH ALL THE ACCESSORIES MOUNTED.
- THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
- POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 100 TO 0 PERCENT OF VALVE OPERATING LIFT RESPECTIVELY.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE
4. POSITION
5. SIGNAL
6. FLOW

FIGURE 1



NOTES:
1. ALL DIMENSION ARE IN INCHES
(1) 2. MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

4.1 Modulating Control Valves

4.1.53 Downcomer Steam Inlet Valve

4.1.53.1 Identification Tag Number — Description

UV-2905 — Downcomer Steam Inlet Valve

4.1.53.2 Description

Manufacturer	:	Valtek, Springville, Utah
Part Number	:	6 inch mark one body, mark one actuator
Rocketdyne Specification No.	:	SP42-013 (following)
Material	:	Body: Chrome Moly
Weight	:	1565 lb

4.1.53.3 Prescribed Service

Steam

4.1.53.4 Vendor

Valtek, Springville, Utah

4.1.53.5 Special Cautions

See mfg. maintenance manuals (See paragraph 4.1.31.11)

4.1.53.6 Periodic Service

none

4.1.53.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.53.8 Special Tools

none

4.1.53.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.53.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO. 1
SEP 26, 1980, SLSGAIL

SERIAL NO. V18680-001 TAG NO. UV-2905

6." MARK I BODY SUB-ASSEMBLY
2500# 4.75" SPUD 2.00" STEM DIA.
BONNET/W EXTN, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 6", 2500#.....	1	...029108.025.041		
13	EXTN BONNET HALF-RING, 7.25 X 4.25, O	4	...015747.150.000		
20	SEAT RING, 6", CV 240.....	1	...004968.827.000		
30	SEAT RETAINER, 6", 2500#.....	1	...005011.150.000		
40	BONNET, 6", 4.75" SPUD.....	1	...017560.150.000		
41	BONNET EXTN, 2.00" STEM, 4.75" SPUD..	1	...029110.150.000		
43	FLANGE, BONNET EXTN, 4.75" SPUD.....	1	...016546.150.000		
50	PLUG EXTD, 6", LIN.....	1	...029109.834.000		
55	SEAT GASKET, SPIRAL, 6.50 X 6.00.....	1	...005008.868.000	** T B A	
58	BONNET GASKET, SPIRAL, 7.50 X 7.00...	1	...009372.868.000	**	
60	EXTN BONNET GASKET, SPIRAL, 4.25 X 3.	1	...007826.868.000	**	38.82
70	BONNET FLANGE, 6", 2500#.....	1	...004824.150.000		
80	GLAND FLANGE, 2.00" STEM, 4.75" SPUD.	1	...005406.029.041		
83	GUIDE, 2.00" STEM.....	1	...001586.825.000		
87	GUIDE, 2.00" STEM.....	1	...001586.433.000		
88	PACKING SET, STD SQUARE, 2.00" STEM..	1	...024248.929.000	** T B A	
93	PKG SPR, 2.00" STEM, 4.00 L.....	4	...005019.150.000		
94	PKG SPR, 2.00" STEM, 2.00 L.....	1	...020931.150.000		
95	PKG SPR, 2.00" STEM, 0.50 L.....	1	...020929.150.000		
96	PKG SPR-TUBE, 2.00" STEM, 10.62 L....	1	...005005.150.000		
97	PKG SPR, 2.00" STEM, 2.00 L.....	1	...020931.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 3/4"-10, 2.75 L.....	6	...007572.195.000		
108	BONNET FLANGE STUD, 1-3/4"-8, 8.25 L.	8	...004823.195.000		
109	PACKING BOX STUD, 3/4"-10, 6.00 L....	2	...005323.012.002		
110	STUD, 3/4"-10, 4.50 L.....	8	...015173.217.000		
114	BONNET FLANGE NUT, 1-3/4"-8, H D.....	8	...004826.195.000		
117	PACKING BOX NUT, 3/4"-10, H D.....	4	...002281.014.002		
120	NUT, 3/4"-10, H D.....	8	...002281.217.000		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO. 1
SEP 26, 1980, SLSGAIL

SERIAL NO. V18680-001 TAG NO.

300 SQ. INCH CYLINDER ACTUATOR
4.75" SPUD 2.5" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 300 SQ. INCH, 4.75" SPUD.....	1	...017580.300.040		
202	CYLINDER, 300 SQ. INCH, 8" STROKE....	1	...015794.609.008		
210	ADJUSTING SCREW, 300 SQ. INCH, 2-1/2"	1	...018369.029.002		
211	ACTUATOR STEM, 300 SQ. INCH, 3.38" SP	1	...017582.159.000		
213	STROKE PLATE, 2-1/2" STROKE.....	1	...001252.603.000		
225	PISTON, 300 SQ. INCH.....	1	...015788.601.003		
227	SPRING BUTTON, 300 SQ. INCH.....	1	...017581.029.040		
228	SPACER, 300 SQ. INCH.....	1	...017584.029.040		
229	SPRING, 100/200 SQ. INCH.....	1	...001331.006.040		
235	TAKE-OFF ARM, 300 SQ. INCH.....	1	...015744.029.002		
236	SPACER, TAKE-OFF ARM, 300 SQ. INCH...	2	...017940.029.002		
237	RANGE SPRING, 3-15.....	1	...007436.999.000		
239	BELLOWS, RANGE SPRING, 6" STROKE.....	1	...006829.652.000	**	7.68
240	TAKE-OFF ARM, POTENTIOMETER, 11.75 L.	1	...029721.029.002		
247	BELLOWS, STEM, 300/400 SQ. INCH.....	1	...021013.652.000	**	6.12
248	GASKET, ADJUSTING SCREW, 100/200 SQ.	1	...001631.655.000	**	.83
249	CLAMP, STEM, TRIP.....	1	...030020.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017675.431.000		
256	RETAINING RING, 300 SQ. INCH, CYLINDE	1	...015757.029.014		
271	PISTON O-RING.....	1	...015755.650.000	**	19.91
272	PISTON STEM O-RING.....	1	...004920.650.000	**	2.91
274	YOKE O-RING.....	1	...015755.650.000	**	19.91
275	ACTUATOR STEM O-RING.....	1	...004922.650.000	**	2.01
280	POSITIONER, 746.....	1	...006744.999.000		
290	BRACKET, POSITIONER, 300 SQ. INCH....	1	...017566.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...015710.029.040		
294	BRACKET, POTENTIOMETER, 300 SQ. INCH.	1	...030071.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
302	GAUGE, 0-30 PSI.....	1	...001294.999.000		
303	SOLENOID, HT8321A6, 120 VDC.....	1	...030260.999.000		
305	LIMIT SWITCH, OPAR, MICRO.....	1	...002478.999.000		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-B1.....	1	...029535.999.000		
311	L V D T, 2000 HR-DC.....	1	...022261.999.000		
321	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
~~322~~	~~VALVE, SWITCHING.....~~	~~1~~	~~...004073.999.000~~		
345	STEM CLAMP LOCKNUT, 1/2"-13.....	1	...006806.013.002		
348	ACTUATOR STEM LOCKNUT, 2"-12.....	1	...015746.013.002		
400	PLATE, VALTEK, 100/200 SQ. INCH.....	2	...001404.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST

REVISION NO. 1
SEP 26, 1980, SLSGAIL

SERIAL NO. V18680-001

TAG NO.

300 SQ. INCH CYLINDER ACTUATOR
4.75" SPUD 2.5" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002	
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002	
411	ENCLOSURE, ELECTRICAL, BOX.....	1	...029230.999.000	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019548.029.040	
426	COVER, POTENTIOMETER, L V D T.....	1	...029723.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, TRANSDUCER.....	1	...026368.159.000	

** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER
G. J. KRALL	Rockwell International Corporation Rocketdyne Division Canoga Park California	SP42-013
APPROVALS		TYPE: Equipment
E. G. Spencer 12/15/81		DATE: 12-15-81
J. D. Watkins 12/15/81		SUPERSEDES SPEC. DATED: 7-18-81
		REV. LTR. D / PAGE 1 of 6

SPECIFICATION

TITLE

INLET VALVE, STEAM, RECEIVER DOWNCOMER

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	RDSIV (COMPONENT SHALL BE SO TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
LINE FLUID:	STEAM
VALVE OPERATING PRESSURE:	1765 PSIG MAX @ 1010°F
AIR SUPPLY PRESSURE:	125 ± 25 PSIG
TEMPERATURE:	LINE FLUID: 1010°F MAX AMBIENT: 16 TO 113°F
ANSI CLASS:	2500 LB
END CONNECTIONS:	LINE: 6" BUTT WELD, SCHED. XXS PIPE INSTRUMENT AIR: 1/4 NPT (F)
BODY FORM:	GLOBE, IN-LINE, TOP ENTRY
VALVE Cv:	220 TO 260
BODY MATERIAL:	TO BE COMPATIBLE WITH LINE FLUID AND WELDABLE TO ASTM A335, GRADE P22 PIPE
TRIM TYPE:	LINEAR
ACTUATOR TYPE:	PNEUMATIC WITH TRAVEL INDICATOR CLOSED (ELECTRICAL FAILURE) CLOSED (PNEUMATIC FAILURE)
PACKING & GASKET MATERIAL:	TO BE COMPATIBLE WITH LINE FLUID AND TEMPERATURE
INTERNAL LEAKAGE:	.01% OF RATED Cv MAXIMUM

EXTERNAL LEAKAGE: NO VISIBLE LEAKAGE

ACCESSORIES: THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1:

ELECTRO-PNEUMATIC TRANSDUCER

PNEUMATIC INPUT: 20 PSIG ± 2 PSI
ELECTRICAL INPUT SIGNAL: 4- 20 MA DC (CONTROL RANGE)
PNEUMATIC OUTPUT SIGNAL: 3 - 15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE
ELECTRICAL ENCLOSURE: NEMA TYPE 3
ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2" THREADED CONDUIT CONNECTIONS

LVDT

TYPE: DC/DC
VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PER CENT OR BETTER THROUGHOUT VALVE LIFT.
ENCLOSURE: NEMA TYPE 3
ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2" THREADED CONDUIT CONNECTION

POSITIONER

INSTRUMENT SIGNAL: 3-15 PSIG
PRESSURE GAUGES (3 REQD): INSTR. SIGNAL, UPPER & LOWER CYLINDER PRESSURE

SOLENOID VALVE

TYPE: 3-WAY - N.C.
VOLTAGE: 120 VDC
SOLENOID ENCLOSURE: NEMA TYPE 3
ELECTRICAL CONNECTION: 6" LONG LEADS THROUGH 1/2" THREADED CONDUIT CONNECTION

ACCESSORIES (CONT'D):

POSITION SWITCH

28 VDC, 2 amps, two SPDT switches for indication of open and closed position of valve.

REGULATOR

TYPE:	AIRSET WITH OUTLET PRESSURE GAUGE
INLET PRESSURE:	125 ± 25 PSIG
OUTLET PRESSURE:	20 PSIG ± 2 PSI

FILTER

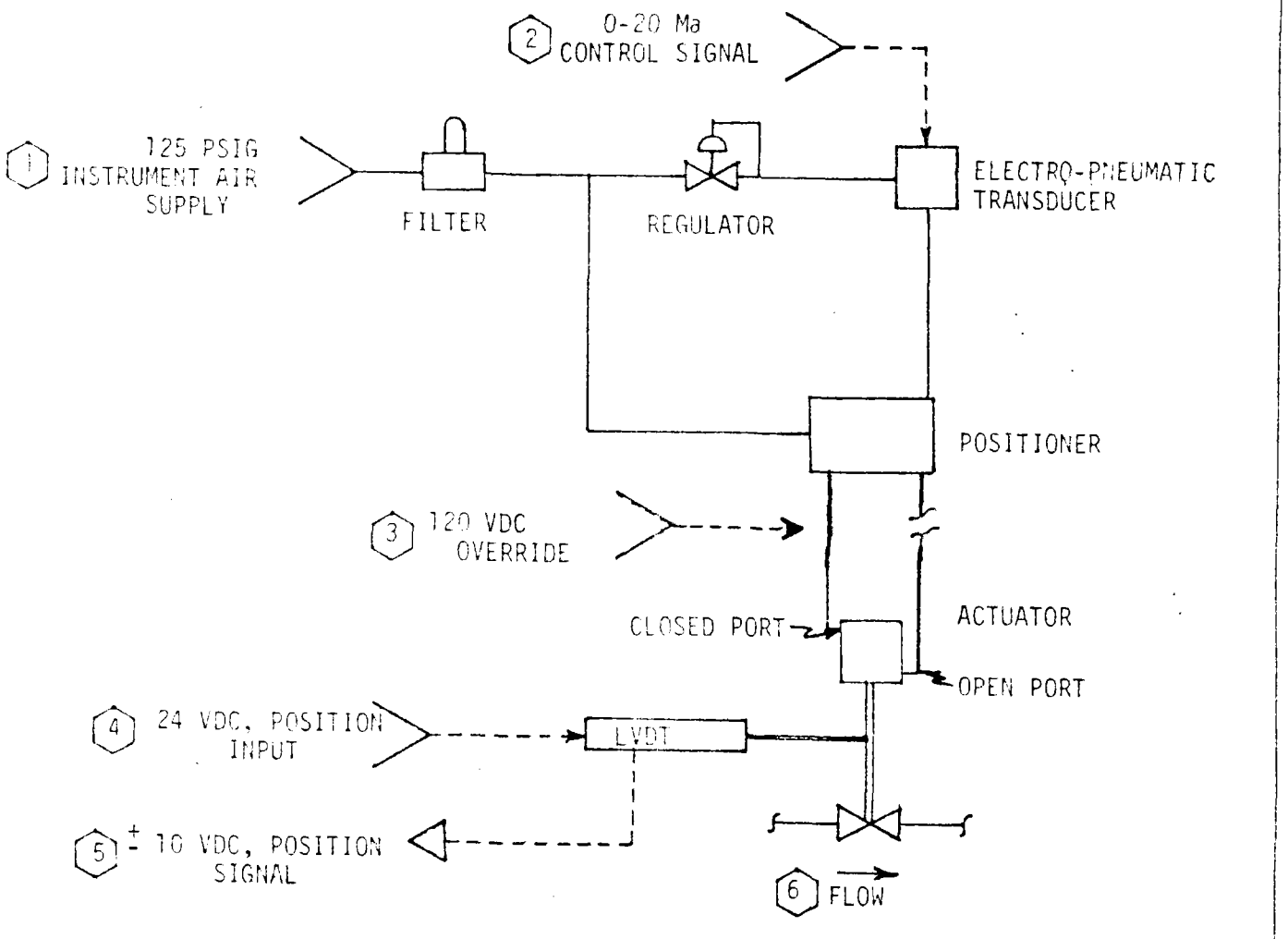
ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

DESIGN FEATURES:

1. THE MAXIMUM DIEMNSIONS FOR THE VALVE INCLUDING THE ACCESSORY COMPONENTS ARE SHOWN IN FIGURE 2. ANY DIMENSIONS OUTSIDE OF THOSE NOTED ARE TO BE NEGOTIATED.
2. AFTER INSTALLATION, THE VALVE BODY WILL BE INSULATED BY ROCKETDYNE SUCH THAT THE VALVE BODY TEMPERATURE WILL STABILIZE AT A MAXIMUM TEMPERATURE OF 1010°F.
3. POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 0 TO 100 PER CENT OF VALVE OPERATING LIFT RESPECTIVELY.
4. THE VALVE MUST BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.

PREPARATION FOR DELIVERY:

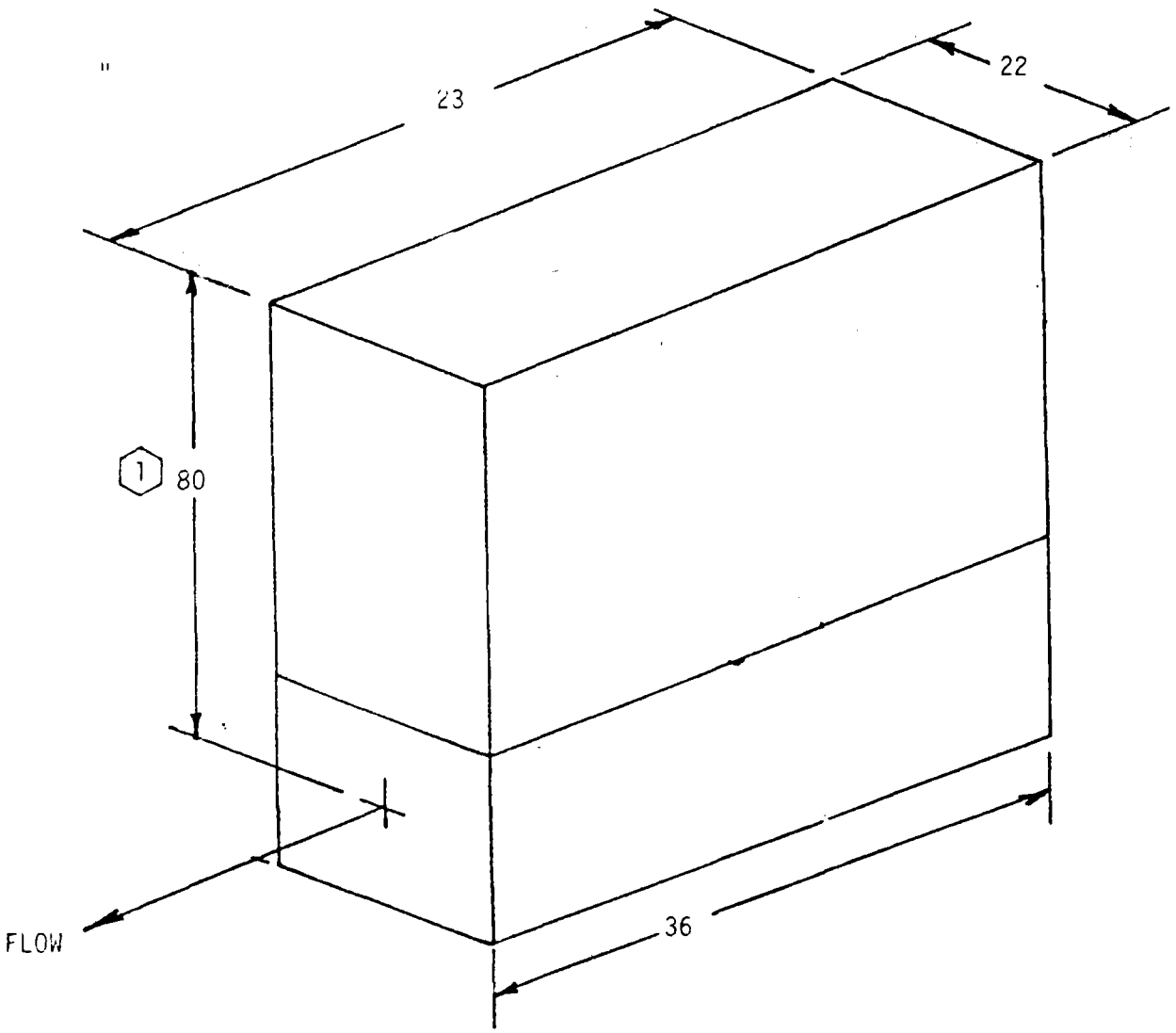
1. THE VALVE IS TO BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
2. THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE), AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMIANTION DURING SHIPMENT AND STORAGE.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE - SEE DETAIL FIGURE 3
4. POSITION
5. SIGNAL
6. FLOW

FIGURE 1



NOTES: 1. ALL DIMENSION ARE IN INCHES

(1) 2. MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

OVERRIDE SOLENOIDS (Detail)

OBJECTIVE: To override the positioner to close the valve regardless of control signal to I-P transducer (positioner). Also with electrical failure valve must fail closed.

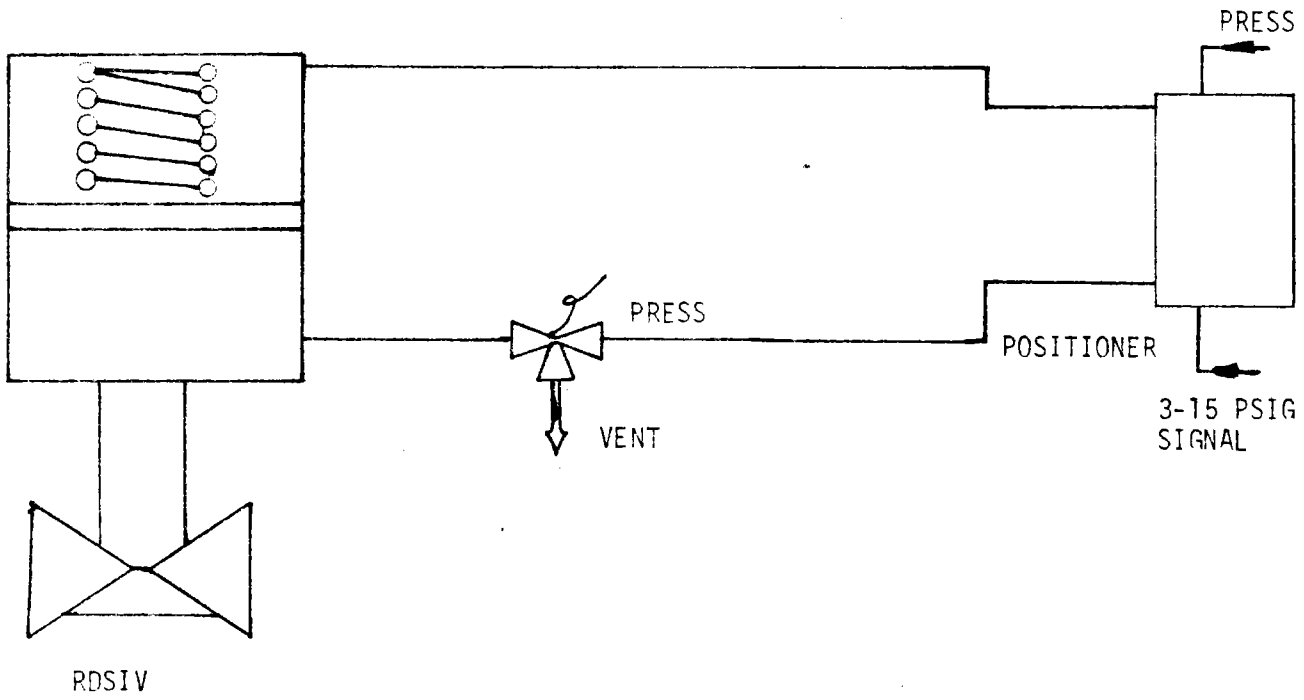


FIGURE 3

4.1 Modulating Control Valves

4.1.54 Desuperheater Inlet Steam Control Valve

4.1.54.1 Identification Tag Number | Description

UV-3102 | Desuperheater Inlet Steam Control Valve

4.1.54.2 Description

Manufacturer : Valtek, Springville, Utah

Part Number : Mark one body, mark one actuator

Rocketdyne Specification No. : SP42-065 (following)

Material : Body: Chrome Moly

Weight : 1525 lb

4.1.54.3 Prescribed Service

steam

4.1.54.4 Vendor

Valtek, Springville, Utah

4.1.54.5 Special Cautions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.54.6 Periodic Service

none

4.1.54.7 Parts List

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.54.8 Special Tools

none

4.1.54.9 Maintenance Instructions

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

4.1.54.10 Acceptance Tests

See mfg. maintenance bulletins (See paragraph 4.1.31.11)

VALTEK PARTS LIST REVISION NO. 1
SEP 26, 1980, SLSGAIL

SERIAL NO. V19090-001 TAG NO. UV-3102

6." MARK I BODY SUB-ASSEMBLY
2500# 4.75" SPUD 2.00" STEM DIA.
BONNET/W EXTN, STD SEAL, FLOW UNDER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 6", 2500#.....	1	...029108.025.041		
13	EXTN BONNET HALF-RING, 7.25 X 4.25, 0	4	...015747.150.000		
20	SEAT RING, 6", CV 240.....	1	...004968.827.000		
30	SEAT RETAINER, 6", 2500#.....	1	...005011.150.000		
40	BONNET, 6", 4.75" SPUD.....	1	...017560.150.000		
41	BONNET EXTN, 2.00" STEM, 4.75" SPUD..	1	...029110.150.000		
43	FLANGE, BONNET EXTN, 4.75" SPUD.....	1	...016546.150.000		
50	PLUG EXTD, 6", LIN.....	1	...029109.834.000		
55	SEAT GASKET, SPIRAL, 6.50 X 6.00.....	1	...005008.868.000	** T B A	
58	BONNET GASKET, SPIRAL, 7.50 X 7.00...	1	...009372.868.000	**	
60	EXTN BONNET GASKET, SPIRAL, 4.25 X 3.	1	...007826.868.000	**	38.82
70	BONNET FLANGE, 6", 2500#.....	1	...004824.150.000		
80	GLAND FLANGE, 2.00" STEM, 4.75" SPUD.	1	...005406.029.041		
83	GUIDE, 2.00" STEM.....	1	...001586.825.000		
87	GUIDE, 2.00" STEM.....	1	...001586.433.000		
88	PACKING SET, STD SQUARE, 2.00" STEM..	1	...024248.929.000	** T B A	
93	PKG SPR, 2.00" STEM, 4.00 L.....	4	...005019.150.000		
94	PKG SPR, 2.00" STEM, 2.00 L.....	1	...020931.150.000		
95	PKG SPR, 2.00" STEM, 0.50 L.....	1	...020929.150.000		
96	PKG SPR-TUBE, 2.00" STEM, 10.62 L....	1	...005005.150.000		
97	PKG SPR, 2.00" STEM, 2.00 L.....	1	...020931.150.000		
105	SCREW, DRIVE, #4.....	2	...007516.012.002		
107	YOKE BOLT, 3/4"-10, 2.75 L.....	6	...007572.195.000		
108	BONNET FLANGE STUD, 1-3/4"-8, 8.25 L.	8	...004823.195.000		
109	PACKING BOX STUD, 3/4"-10, 6.00 L....	2	...005323.012.002		
110	STUD, 3/4"-10, 4.50 L.....	8	...015173.217.000		
114	BONNET FLANGE NUT, 1-3/4"-8, H D.....	8	...004826.195.000		
117	PACKING BOX NUT, 3/4"-10, H D.....	4	...002281.014.002		
120	NUT, 3/4"-10, H D.....	8	...002281.217.000		
126	PLATE, FLOW ARROW, MK 1 & 2.....	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO. 1
SEP 26, 1980, SLSGAIL

SERIAL NO. V19090-001 TAG NO.

300 SQ. INCH CYLINDER ACTUATOR
4.75" SPUD 2.5" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, 300 SQ. INCH, 4.75" SPUD.....	1	...017580.300.040		
202	CYLINDER, 300 SQ. INCH, 8" STROKE....	1	...015794.609.008		
210	ADJUSTING SCREW, 300 SQ. INCH, 2-1/2"	1	...018369.029.002		
211	ACTUATOR STEM, 300 SQ. INCH, 3.38" SP	1	...017582.159.000		
213	STROKE PLATE, 2-1/2" STROKE.....	1	...001252.603.000		
225	PISTON, 300 SQ. INCH.....	1	...015788.601.003		
227	SPRING BUTTON, 300 SQ. INCH.....	1	...017581.029.040		
228	SPACER, 300 SQ. INCH.....	1	...017584.029.040		
229	SPRING, 100/200 SQ. INCH.....	1	...001331.006.040		
235	TAKE-OFF ARM, 300 SQ. INCH.....	1	...015744.029.002		
236	SPACER, TAKE-OFF ARM, 300 SQ. INCH...	2	...017940.029.002		
237	RANGE SPRING, 3-15.....	1	...007436.999.000		
239	BELLOWS, RANGE SPRING, 6" STROKE.....	1	...006829.652.000	**	7.68
240	TAKE-OFF ARM, POTENTIOMETER, 11.75 L.	1	...029721.029.002		
247	BELLOWS, STEM, 300/400 SQ. INCH.....	1	...021013.652.000	**	6.12
248	GASKET, ADJUSTING SCREW, 100/200 SQ.	1	...001631.655.000	**	.83
249	CLAMP, STEM, BAILEY.....	1	...019355.029.040		
251	PLATE, TAG.....	1	...002223.153.000		
252	SERIAL PLATE.....	1	...002438.153.000		
253	BUSHING, STEM.....	2	...017675.431.000		
256	RETAINING RING, 300 SQ. INCH, CYLINDE	1	...015757.029.014		
271	PISTON O-RING.....	1	...015755.650.000	**	19.91
272	PISTON STEM O-RING.....	1	...004920.650.000	**	2.91
274	YOKE O-RING.....	1	...015755.650.000	**	19.91
275	ACTUATOR STEM O-RING.....	1	...004922.650.000	**	2.01
280	POSITIONER, 74G.....	1	...006744.999.000		
290	BRACKET, POSITIONER, 300 SQ. INCH....	1	...017566.029.040		
292	BRACKET, AIR FILTER.....	1	...001844.029.040		
293	BRACKET, TRANSDUCER.....	1	...015710.029.040		
294	BRACKET, POTENTIOMETER, 300 SQ. INCH.	1	...030098.029.040		
300	AIR FILTER, SPEEDAIRE 2Z435.....	1	...001438.999.000		
301	U-BOLT, AIR FILTER.....	1	...002425.029.002		
302	GAUGE, 0-30 PSI.....	1	...001294.999.000		
303	SOLENOID, HT8321A6 120	1	...		
309	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
310	TRANSDUCER, ROBERTSHAW #443-81.....	1	...029535.999.000		
311	L V D T, 2000 HR-DC.....	1	...022261.999.000		
321	AIRSET, 0-120 PSI, 1/4" NPT.....	1	...003090.999.000		
~~322~~	~~VALVE, SWITCHING.....~~	~~1~~	~~...004873.999.000~~		
345	STEM CLAMP LOCKNUT, 1/2"-13.....	1	...006806.013.002		
348	ACTUATOR STEM LOCKNUT, 2"-12.....	1	...015746.013.002		
400	PLATE, VALTEK, 100/200 SQ. INCH.....	2	...001404.675.000		
401	SCREW, PAN HEAD, #4-40.....	2	...001118.012.002		
402	SCREW, DRIVE, #4.....	4	...007516.012.002		
404	POSITIONER BOLT, 5/16"-18, 0.75 L....	2	...001290.010.002		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST REVISION NO. 1
SEP 26, 1980, SLSGAIL

SERIAL NO. V19090-001 TAG NO.

300 SQ. INCH CYLINDER ACTUATOR
4.75" SPUD 2.5" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
405	POSITIONER NUT, 5/16"-18.....	2	...001157.013.002	
409	ENCLOSURE, ELECTRICAL, BOX.....	1	...029230.999.000	
412	CLAMP, RANGE SPRING, BELLOWS.....	1	...008567.679.000	
425	BASE, POTENTIOMETER, L V D T.....	1	...019548.029.040	
426	COVER, POTENTIOMETER, L V D T.....	1	...029723.029.040	
427	BRACKET, POTENTIOMETER, L V D T.....	1	...019550.029.040	
428	BOLT, 1/4"-20, 0.62 L.....	2	...019546.010.002	
430	TERMINAL.....	1	...006692.999.000	
431	MOUNTING CLIP, POTENTIOMETER.....	2	...019665.402.000	
432	SCREW, ROUND HEAD, #4-40.....	4	...004698.010.002	
433	ARM, ADJUSTING, TRANSDUCER.....	1	...026368.159.000	

** RECOMMENDED SPARE PART

PREPARED BY	FSCM NO. 02602	NUMBER
J. K. CHENG J.C.	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	SP42-065
APPROVALS		TYPE EQUIPMENT
E.G. Spencer 4/30/80		DATE 4-28-80
J. D. Osborn 4/30/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 1-25-80
		REV. LTR. A / PAGE 1 of 6

TITLE

DESUPERHEATER STEAM PRESSURE CONTROL VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TDSIV (COMPONENT SHALL BE TAG IDENTIFIED)
FUNCTION:	MODULATING VALVE
BODY TYPE:	GLOBE, IN-LINE
END CONNECTIONS:	6 INCH BUTT WELD
PIPE MATERIAL:	ASTM A335 GRADE P22, SCHEDULE XXS
BODY MATERIAL:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ANSI RATING:	2500 LB CLASS
LINE FLUID:	STEAM
MAXIMUM INLET PRESSURE @ TEMPERATURE:	1775 PSIG @ 985°F
AMBIENT TEMPERATURE:	16° TO 113°F
TRIM FLOW CHARACTERISTIC:	LINEAR
Ø FLOW COEFFICIENT:	Cv = 272
INTERNAL LEAKAGE:	MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY
EXTERNAL LEAKAGE:	NONE VISIBLE
ACTUATOR:	PNEUMATIC WITH TRAVEL INDICATOR
FAIL SAFE POSITION:	CLOSED (ELECTRICAL FAILURE) CLOSED (PNEUMATIC FAILURE)
INSTRUMENT AIR SUPPLY:	125 ± 25 PSIG
PACKING & GASKET MATERIAL:	COMPATIBLE WITH LINE FLUID AND TEMPERATURE

ACCESSORIES:

THE FOLLOWING ACCESSORIES SHALL BE VALVE MOUNTED AND PLUMBED ACCORDING TO FIGURE 1 ON PAGE 5:

- ELECTRO-PNEUMATIC TRANSDUCER

  PNEUMATIC INPUT: 20 PSIG ± 2 PSI
  ELECTRICAL INPUT SIGNAL: 4-20 MA DC (CONTROL RANGE)
  PNEUMATIC OUTPUT SIGNAL: 3-15 PSIG DIRECTLY PROPORTIONAL TO INPUT SIGNAL CONTROL RANGE
  ELECTRICAL ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTIONS: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- LVDT

  TYPE: DC/DC
  VOLTAGE: 24 VDC EXCITATION, ± 10 VDC OUTPUT SIGNAL, LINEARITY TO BE ± 2 PER CENT OR BETTER THROUGHOUT VALVE LIFT.
  ENCLOSURE: WEATHERPROOF (NEMA TYPE 3)
  ELECTRICAL CONNECTION: TERMINAL STRIP AND 1/2 INCH THREADED CONDUIT CONNECTION

- POSITIONER

  INSTRUMENT SIGNAL: 3-15 PSIG
  PRESSURE GAUGES (3 REQD): INSTRUMENT SIGNAL UPPER & LOWER CYLINDER PRESSURE

- REGULATOR

  TYPE: AIRSET WITH OUTLET PRESSURE GAUGE
  INLET PRESSURE: 125 ± 25 PSIG
  OUTLET PRESSURE: 20 PSIG ± 2 PSI

- FILTER

  ALL INSTRUMENT AIR SHALL BE FILTERED TO 25 MICRONS ABSOLUTE OR BETTER WITH REPLACEABLE ELEMENT.

ACCESSORIES: (CONT'D)

- SOLENIOD VALVE

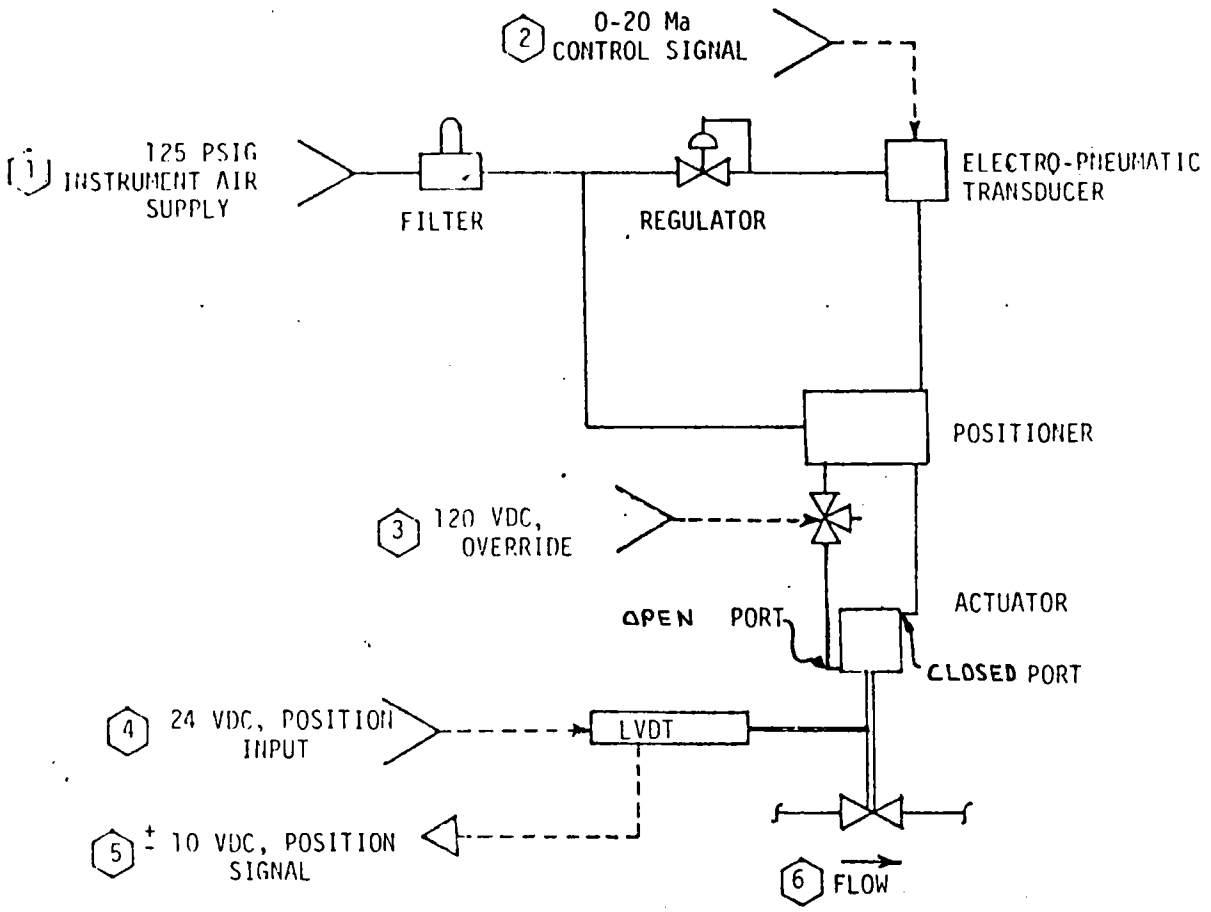
  3-WAY, 120 VAC 60 HZ FOR OVERRIDE OF THE POSITIONER TO CLOSE THE VALVE WHEN THE SOLENOID IS DE-ENERGIZED

MAXIMUM ENVELOPE DIMENSIONS: REFER TO FIGURE 2 ON PAGE 6

CLEANING AND PACKAGING: VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE) AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

DESIGN FEATURES:

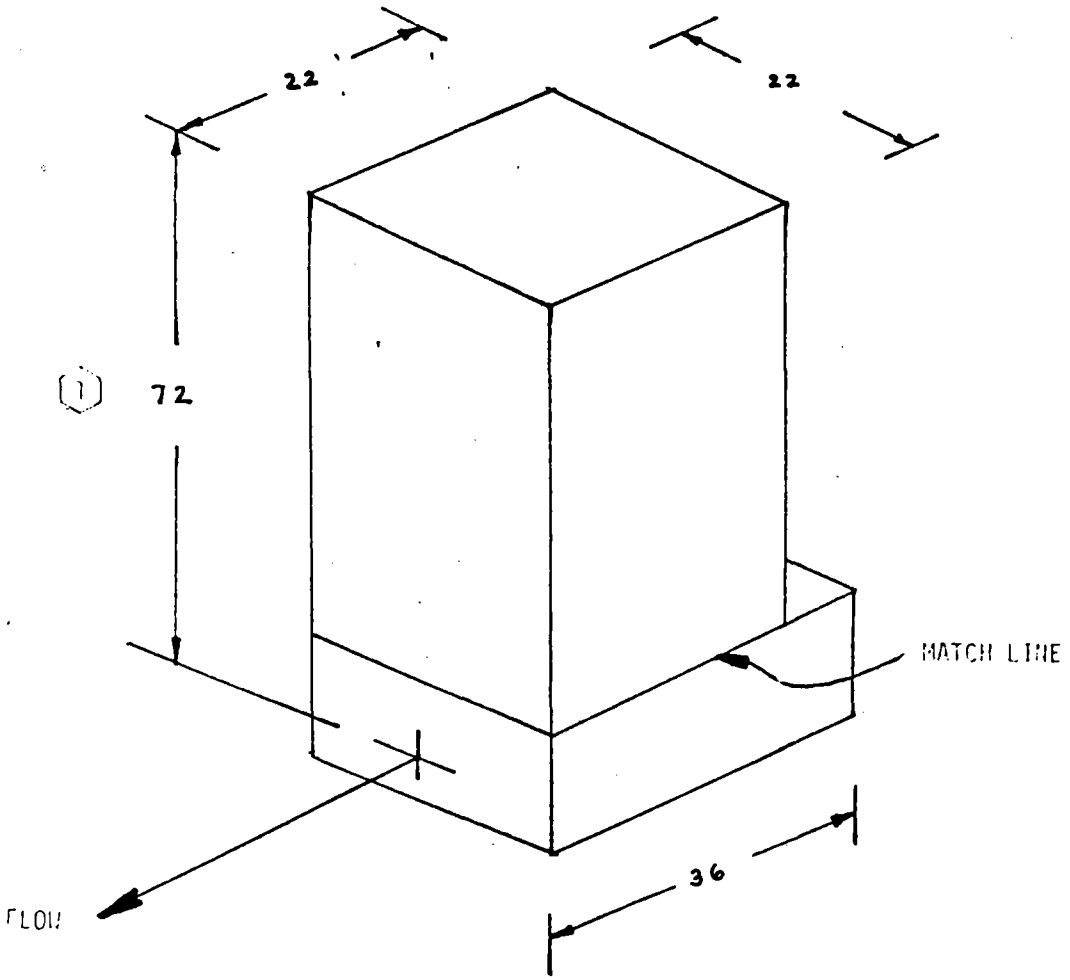
- ELECTRICAL COMPONENTS ARE TO HAVE WEATHERTIGHT ENCLOSURES (NEMA TYPE 3). ENCLOSURES SHALL BE EQUIPPED WITH A 1/2 INCH THREADED CONDUIT CONNECTION.
- ALL THE ACCESSORY COMPONENTS SHALL BE MOUNTED ON AND PROPERLY CONNECTED TO THE VALVE AS PER FIGURE 1, AND SHALL BE READILY REMOVABLE FOR SERVICING.
- THE VALVE SHALL BE DELIVERED FULLY ADJUSTED AND READY FOR OPERATION WHEN CONNECTED TO A 0 TO 20 MA DC CONTROL SIGNAL AND 125 PSIG INSTRUMENT AIR SUPPLY.
- VALVE SHALL BE DESIGNED TO PERMIT 4 1/2 INCH THICK INSULATION WITH ALL THE ACCESSORIES MOUNTED.
- THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
- POSITIONER INPUT OF 3 TO 15 PSIG SHALL CORRESPOND WITH 0 TO 100 PER CENT OF VALVE OPERATING LIFT RESPECTIVELY.



INTERFACE IDENTIFICATION: THE FOLLOWING INTERFACES ARE TO BE PERMANENTLY IDENTIFIED AS NOTED.

1. AIR
2. CONTROL
3. OVERRIDE
4. POSITION
5. SIGNAL
6. FLOW

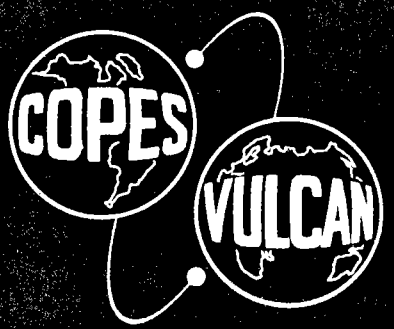
FIGURE 1



NOTES:
1. ALL DIMENSION ARE IN INCHES
2. (1) MAXIMUM DIMENSION FOR ACTUATOR REMOVAL

FIGURE 2

INSTRUCTION MANUAL



COPES-VULCAN

Lake City, Pennsylvania 16423

One of the White Consolidated Industries

WCI

P.O. BOX 577
LAKE CITY, PENNSYLVANIA 16423
PHONE: 814/774-3151
TELEX: 91-4414

COPES-VULCAN

One of the White Consolidated Industries

Stearns-Rogers

PO: C21700 FEB 11 '82

S&R No. E5 File No. 58

C.V. JOB: 8010-14896 &
8064-16895

CUSTOMER ORDER: 5002C21700

FINAL FEB 1 1982

CUSTOMER: Stearns-Rogers Inc.
4500 Cherry Creek Drive
Denver, Colorado 80217

ULTIMATE USER: Dept. of Energy
Solar I Pilot Plant
Daggett, California

EQUIPMENT: Copes-Vulcan D-100 & CV600 Control Valves

INSTALLATION OPERATION & MAINTENANCE INSTRUCTIONS

C.V. INSTRUCTION MANUAL
REPLACEMENT PRICE - $58.00

(Prices not firm. Price invoiced will be that obtaining at time of shipment.)

NOTE:

BE SURE THIS INSTRUCTION MANUAL REACHES THE PERSONNEL RESPONSIBLE FOR THE OPERATION, INSTALLATION, AND MAINTENANCE OF THIS EQUIPMENT.

THIS MANUAL HAS BEEN PREPARED FOR USE BY COMPETENT AND KNOWLEDGEABLE PERSONNEL. IT IS IMPORTANT THAT THIS EQUIPMENT NOT BE INSTALLED, OPERATED OR MAINTAINED WITHOUT READING, UNDERSTANDING, AND FOLLOWING THE PROPER COPES-VULCAN PROCEDURES, OTHERWISE PERSONAL INJURY OR EQUIPMENT DAMAGE MAY RESULT.

COPES-VULCAN, INC.
One of the White Consolidated Industries

TABLE OF CONTENTS

for

CV JOBS #8010-14896 & 8064-16895

GENERAL INFORMATION ---------- FORM 60:37:30

SECTION 1.0 D-100 CONTROL VALVES

ENDS DRAWINGS
Table of Dimensions for Socket Weld Ends --------- L-82917
Butt Weld Ends Detail ---------- B-147468

VALVE DRAWINGS
1-1/2" - 150# D-100-40 CONTROL VALVE, TAG: FV-1007
Valve Assembly Drawing ---------- E-195626
Data Specification Sheet ---------- 1 of 1

2" - 2500# D-100-40 CONTROL VALVE, TAG: FV-1006
Valve Assembly Drawing ---------- E-195621
Data Specification Sheet ---------- 1 of 1

2-1/2" - 900# D-100-60 CONTROL VALVE, TAG: PV-647B
Valve Assembly Drawing ---------- E-195761
Data Specification Sheet ---------- 1 of 1

4" - 300# D-100-100 CONTROL VALVE, TAG: AOV-1008
Valve Assembly Drawing ---------- E-195617
Data Specification Sheet ---------- 1 of 1

12" - 300# D-100-160 CONTROL VALVE, TAG: PV-640
Valve Assembly Drawing ---------- E-196350
Data Specification Sheet ---------- 1 of 1

8" - 600# D-100-400 CONTROL VALVE, TAG: PV-1000
Valve Assembly Drawing ---------- E-196349
Data Specification Sheet ---------- 1 of 1

ACCESSORY KIT DRAWINGS ---------- L-190313
L-195622
E-195933
L-195948
E-196756
E-196780

OPERATION INSTRUCTIONS
D-100-40 Diaphragm Operated Valve Instructions - FORM 01:P110:37
D-100 Diaphragm Operated Valve Instructions ---- FORM 01:P13:37
Procedure for Assembly of D-100 Valves --------- PROCEDURE #1.2.187

OPERATOR DRAWINGS

D-100-40 (RA) Operator Assembly Drawing ----------	L-169655 (Shts. 1 & 2)
D-100-60 Operator Assembly Drawing ----------	L-136416 (Shts. 1, 5 & 6)
D-100-100 Operator Assembly Drawing ----------	L-136417 (Shts. 1, 5 & 6)
D-100-160 Operator Assembly Drawing ----------	L-136419 (Shts. 1, 5 & 6)
D-100-400 Operator Assembly Drawing ----------	L-184331 (Shts. 1 & 2) mk'd.
Manual Operator Assembly Drawing ----------	L-137933
Manual Operator Assembly Drawing ----------	L-139991
Manual Operator Assembly for D-100-400 Valve -----	E-181361

HARDWARE PACK ASSEMBLY DRAWINGS ---------- L-169710
L-169765
L-169766
L-169773
L-191246 mk'd.

TRIM DRAWINGS

Single Seat Small Cascade Trim Drawing ----------	S-140526
Single Seat Modified Parabolic Trim Drawing ------	S-140575
Single Seat Quick Opening Trim Drawing ----------	S-140577
Balanced Hush II Trim Layout Drawing ----------	SK-DES-9677-D
Tandem Hush Trim Layout Drawing ----------	SK-DES-9674-E

RECOMMENDED SPARE PARTS LIST FOR D-100 CONTROL VALVES

SECTION 1.1 CV600 CONTROL VALVES

ENDS DRAWINGS

Table of Dimensions for Socket Weld Ends ---------	L-82917
Butt Weld Ends Details ----------	B-147468
	B-147468 mk'd.
	B-147468 mk'd.

VALVE ASSEMBLY DRAWINGS

1-1/2" - 150# CV600-40 (DA) CONTROL VALVE, TAG: TV-1004

Valve Assembly Drawing ----------	E-195845
Data Specification Sheet ----------	1 of 1

1-1/2" - 300# CV600-40 (DA) CONTROL VALVE, TAG: TV-1002

Valve Assembly Drawing ----------	E-195844
Data Specification Sheet ----------	1 of 1

1-1/2" - 600# CV600-40 (RA) CONTROL VALVE, TAG: AOV-1009

Valve Assembly Drawing ----------	E-195846
Data Specification Sheet ----------	1 of 1

2" - 150# CV600-40 (RA) CONTROL VALVE, TAG: LV74D-2

Valve Assembly Drawing ----------	E-195849
Data Specification Sheet ----------	1 of 1

TABLE OF CONTENTS (continued)
CV JOBS #8010-14896 & 8064-16895

1-1/2" - 600# CV600-60 (RA) CONTROL VALVE, TAG: LV-74A
Valve Assembly Drawing ---------- E-195852
Data Specification Sheet ---------- 1 of 1

2" - 600# CV600-60 (RA) CONTROL VALVE, TAG: LV-74C
Valve Assembly Drawing ---------- E-195850
Data Specification Sheet ---------- 1 of 1

4" - 150# CV600-100 (RA) CONTROL VALVE, TAG: LV-74B
Valve Assembly Drawing ---------- E-195851
Data Specification Sheet ---------- 1 of 1

4" - 150# CV600-100 (RA) CONTROL VALVE, TAG: LV74D-1
Valve Assembly Drawing ---------- E-195848
Data Specification Sheet ---------- 1 of 1

4" - 300# CV600-160 (RA) CONTROL VALVE, TAG: PV-647C
Valve Assembly Drawing ---------- E-195847
Data Specification Sheet ---------- 1 of 1

ACCESSORY KIT DRAWINGS ---------- L-189624 mk'd.
M-189658
M-189702 mk'd.
L-189727 mk'd.
L-189728 mk'd.
L-189729 mk'd.
L-189730 mk'd.
E-196328
E-196396
L-196440

OPERATION INSTRUCTIONS
CV600 Diaphragm Operated Valve Instructions ------ FORM 01:P126:37
Procedure for Assembly of CV600 Valve & Actuators

OPERATOR DRAWINGS
CV600-40 (DA) Operator Assembly Drawing ---------- L-189959 (Shts. 1 & 5)
CV600-40 (RA) Operator Assembly Drawing ---------- L-189960 (Shts. 1, 3 & 5)
CV600-60 (RA) Operator Assembly Drawing ---------- L-189962 (Shts. 1 & 3)
CV600-100 (RA) Operator Assembly Drawing --------- L-189964 (Shts. 1, 7 & 11)
CV600-160 (RA) Operator Assembly Drawing --------- L-189966 (Shts. 1 & 5)
Manual Actuator Assembly Drawing ---------- L-187022

TRIM DRAWINGS
Single Seat Modified Parabolic Trim Drawing ------ L-186122
Single Seat Unbalanced Port Throttle Trim Drawing - L-186123
Single Seat CAV-B9 Trim Drawing ---------- L-186124
Single Seat Groove Tip Trim Drawing ---------- L-186125
Unbalanced Single Seat Trim Drawing ---------- L-186885 (Shts. 1 & 2)

RECOMMENDED SPARE PARTS LIST FOR CV600 CONTROL VALVES

TABLE OF CONTENTS (continued)
CV JOBS #8010-14896 & 8064-16895

SECTION 1.2 VENDOR INSTRUCTIONS

ASCO 8302 SOLENOID VALVE INSTRUCTIONS
Drawing ---------- HVA-206-973
Parts List

ASCO STROKE CHART, FORM V-5940

ASCO GENERAL PURPOSE & EXPLOSION PROOF WATERTIGHT SOLENOID INSTRUCTIONS, FORM V5381

BAILEY AP5 VALVE POSITIONER INSTRUCTIONS

ITT-HAMMEL-DAHL-CONOFLOW FH-60 AIRPAK INSTRUCTIONS

LVDT TYPE VALVE POSITION TRANSMITTER INSTRUCTIONS -- FORM 01:P85:37

MICRO SWITCH 1CX42 LIMIT SWITCH INSTRUCTIONS

MOORE SD61H BOOSTER RELAY INSTRUCTIONS

GENERAL INFORMATION

No control system will operate satisfactorily if it is not properly installed, operated and maintained.

These instructions outline the correct procedure. Follow them closely to be sure of best operating results, trouble free operation and long service life.

We want your Copes-Vulcan equipment to give you the best possible service. If you ever have any questions about operation, maintenance or related problems, please feel free to write to us.

Check the Material

Do not start installation until material has been carefully checked against the list furnished by Copes-Vulcan. Be sure the unpacked material is for the boiler on which it is to be installed.

A WORD OF CAUTION

Carelessness in repairing steam or air control equipment can cause serious injuries. Accidents can be prevented by taking simple precautions.

Always get permission and a release from the proper authority before starting to repair any equipment. Use proper lifting equipment for heavy equipment. Do not attempt repairs beyond your ability.

Before repairing any equipment operated by steam or air, make sure all supply valves have been closed, tagged or locked. If steam or air supply lines must be energized, for purpose of test, use extreme caution.

Ordering Repair Parts

In ordering parts, always give the following:

Name and number of parts as found on the parts list drawing.

Serial number as found on the brass name plate attached to the unit.

If your company name has changed since your Copes-Vulcan equipment was ordered, please give the old name. This is the name listed in Copes-Vulcan files.

Parts prices are not listed in this booklet. A quotation will be submitted on request or we will bill for them at the lowest prevailing prices.

Material & Workmanship Guarantee

Copes-Vulcan guarantees the control equipment for a period of one year from date of shipment against defects in material and workmanship and will replace any defective parts F.O.B. Lake City, Pennsylvania, if such parts be returned to the Copes-Vulcan plant with shipping charges prepaid.

Copes-Vulcan Service Policy

Copes-Vulcan maintains a staff of competent Service Engineers strategically placed in territories about the United States and Canada. These Engineers are available on receipt of a written purchase order to provide the following types of service:

1. Supervision of erection.
2. Make initial start-up of equipment.
3. Assist in repair or maintenance.
4. Instruction of operating and maintenance personnel.

Service Engineers regularly inspect all installations of Copes-Vulcan equipment on water tube boilers. There is no charge to the user for these inspections, however, they are scheduled at Copes-Vulcan's convenience. Usually when an Engineer is in a specific area he will, time permitting, schedule inspection calls on all customers in that area.

Copes-Vulcan service makes sure that its equipment performs at peak efficiency and that the user's operators are taught preventive maintenance to assure effective operation at lowest possible cost.

Requests for emergency service calls will be handled as quickly as possible if addressed to Copes-Vulcan's MANAGER OF SERVICE. Such calls are generally made at the customer's expense, at a fixed per-diem rate plus traveling expenses.

INSTALLATION AND MAINTENANCE INSTRUCTIONS

3-WAY DIRECT ACTING SOLENOID VALVES
NORMALLY CLOSED, NORMALLY OPEN AND UNIVERSAL OPERATION
1/8, 1/4, 3/8 AND 1/2" NPT — METAL TO METAL SEATING

BULLETINS
8300
8302
8315

ASCO

FORM NO. V-5941

DESCRIPTION

Bulletin 8300's are 3-way, direct acting solenoid valves having only four moving parts - a core, a lever and two poppet type valve discs. Valves are supplied with stainless steel seats and discs and valve bodies of brass, steel or stainless steel construction. Standard valves have a General Purpose, NEMA Type 1 Solenoid Enclosure. Bulletin 8315 valves are identical to Bulletin 8300 valves except they are designed for higher temperature service.

Bulletin 8302's are the same as Bulletins 8300 except the solenoids are equipped with an enclosure which is designed to meet NEMA Type 4 Watertight, NEMA Type 7 (C or D) Hazardous Locations - Class I, Groups C or D and NEMA Type 9 (E, F or G) Hazardous Locations - Class II, Groups E, F or G. Installation and Maintenance Instructions for the Explosion-Proof/Watertight Solenoid Enclosure are shown on Form No. V-5381.

OPERATION

Normally Closed (Suffix Letter "F")

Solenoid De-energized: Flow is from Cylinder Connection (1) to Exhaust Connection (3). Pressure Connection (2) is closed.

Solenoid Energized: Flow is from Pressure Connection (2) to Cylinder Connection (1). Exhaust Connection (3) is closed.

Normally Open (Suffix Letter "G")

Solenoid De-energized: Flow is from Pressure Connection (3) to Cylinder Connection (1). Exhaust Connection (2) is closed.

Solenoid Energized: Flow is from Cylinder Connection (1) to Exhaust Connection (2). Pressure Connection (3) is closed.

Universal (Suffix Letter "U")

Solenoid De-energized: Flow is from Connection (3) to Connection (1) or Connection (1) to Connection (3). Connection (2) is closed.

Solenoid Energized: Flow is from Connection (1) to Connection (2) or Connection (2) to Connection (1). Connection (3) is closed.

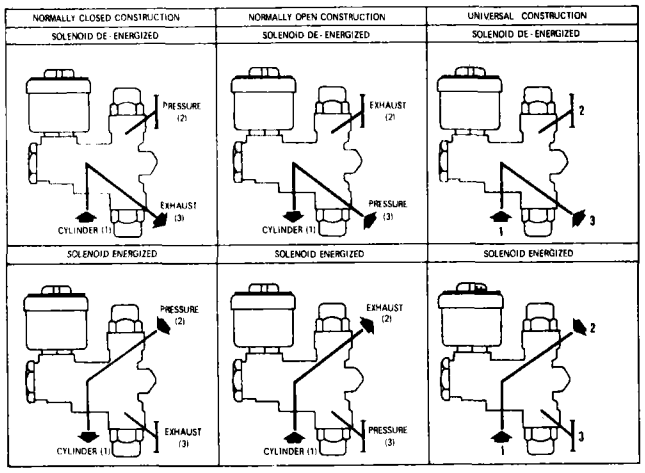
NOTE: Operation forms are identified by catalog suffix letters as follows:
Suffix Letter "F" Normally Closed Operation
Suffix Letter "G" Normally Open Operation
Suffix Letter "U" Universal Operation

CHANGING OPERATION FORMS

Universal valves (U) may be used for any operation form without internal changes. However, normally closed (F) and normally open (G) valves cannot be used for a different operation form unless internal parts (upper and lower springs) are changed. Consult factory for new internal parts and nameplate for proper valve identification. Refer to **"NEW SPRING INSTALLATION"** Section when changing operation forms.

IMPORTANT: No minimum operating pressure is required.

FLOW DIAGRAMS



NOTE: PORT MARKINGS 1, 2 AND 3 CORRESPOND DIRECTLY TO A, B, AND C.

MANUAL OPERATOR (Optional)

Valves with Suffix "MO" after catalog number are provided with a manual operator which allows operation when desired or during an interruption of electrical power. To actuate valve manually, push knob upward and rotate one half (1/2) turn. Valve will now be in same position as when solenoid is energized. To disengage manual operator, rotate manual operator approximately one half (1/2) turn until guide pin in manual operator stem engages slots in stuffing box bonnet and drops down. CAUTION: For valve to operate electrically, manual operator stem must be fully retracted.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

POSITIONING

Valve must be mounted with the solenoid vertical and upright.

MOUNTING

For mounting bracket mounting dimensions, refer to Figure 3.

PIPING

Connect piping to valve according to markings on valve body. The form of flow is indicated by the Suffix Letters ("F," "G" or "U") following the valve catalog number on nameplate. Refer to flow diagrams provided. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter the valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening pipe, do not use valve as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point.

IMPORTANT: For protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending on the service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with Local and National Electrical Codes. Housings for all solenoids are provided with connections or accommodations for 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap or clip. CAUTION: When metal retaining clip disengages, it will spring upward. Rotate enclosure to desired position. Replace retaining cap or clip before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid base-sub-assembly, core/spring sub-assembly or core.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the hand for only an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power and depressurize valve before making repairs. It is necessary to remove valve from pipe line for repairs.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, operate the valve at least once a month to insure proper opening and closing.
3. Periodic inspection (*depending on medium and service conditions*) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic click signifies solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open-circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open-circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check pressure at the solenoid valve. Pressure to the valve must not exceed that stamped on nameplate.
5. **Incorrect Pressure Connection:** Refer to valve catalog suffix letter on nameplate and flow diagrams.
6. **Excessive Leakage:** Disassemble valve and clean all parts and passageways. Leakage between the seats and discs is usually caused by lodgement of foreign material on the valve seating surfaces. The foreign material, *though not present upon examination*, may have damaged the seating surfaces enough to cause leakage. Leakage thru the stainless steel (metal to metal) seats can usually be corrected by regrinding and lapping (see section on grinding and lapping). If leakage should still exist, the seating surfaces may be worn more than grinding and/or lapping can correct. In that case, replace both seats and discs. NOTE: New seats and discs must be checked and adjusted for proper stroke where necessary. Refer to paragraphs on **"NEW SEAT AND DISC INSTALLATION"** under **"INSTALLATION OF NEW SPARE PARTS KIT"** Section.

COIL REPLACEMENT (Refer to Figure 4)

Turn off electrical power supply and disconnect coil lead wires.

1. Remove retaining cap or clip, nameplate and solenoid cover. CAUTION: When metal retaining clip disengages, it will spring upward.
2. Slip yoke containing coil, sleeves and insulating washers off the solenoid base sub-assembly. For D-C Construction, a fluxplate over the coil replaces the yoke and sleeves. Insulating washers are omitted when a molded coil is used.
3. *Reassemble in reverse order of disassembly* paying careful attention to exploded view provided for identification and placement of parts.

CAUTION: Solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit. Place an insulating washer at each end of coil, if required.

ASCO Valves ASCO

Form No. V-5941 PRINTED IN U.S.A. 1978 Automatic Switch Co. FLORHAM PARK, NEW JERSEY 07932

VALVE DISASSEMBLY FOR GENERAL CLEANING AND INSPECTION

(Refer to Figure 4)

Depressurize valve and turn off electrical power supply. It is strongly recommended that the valve be removed from the pipe line for ease of maintenance. If it is not practical to remove the valve from the pipe line and resetting of stroken is required or a new Spare Parts Kit is to be installed, consult factory for special bonnet tools which are available. When consulting the factory, be sure to include the valve catalog number and serial number from the nameplate on the valve.

1. Disassemble valve in an orderly fashion paying careful attention to exploded view provided for identification of parts.
2. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. CAUTION: When metal retaining clip disengages, it will spring upward. For Explosion-Proof/Watertight Enclosure, refer to Installation and Maintenance Instructions Sheet, Form No. V-5381.
3. Unscrew solenoid base sub-assembly and remove bonnet gasket. For Explosion-Proof/Watertight Enclosure, a special bonnet adapter wrench is available, Order No. 102-649-1.
4. Unscrew disc guide caps (both ends) and remove disc guide cap gaskets, upper and lower springs and discs. CAUTION: Tag springs and discs as they are not interchangeable and must be returned to the original location. Tag upper and lower for ease of identification.
5. Remove end cap, end cap gasket and slip core/spring sub-assembly (A-C Construction) or core (D-C Construction) off the end of the valve lever and lift it out through solenoid base sub-assembly opening.
6. Inspect upper and lower valve seats but do not remove from valve body unless installing a complete Spare Parts Kit.
7. Clean all parts thoroughly and replace worn or damaged parts with a complete Spare Parts Kit. If a Spare Parts Kit is required, refer to section on **"INSTALLATION OF NEW SPARE PARTS KIT"** for complete rebuild. **IMPORTANT: Install all new parts. Do not retain any old parts when rebuilding valve. If only partial installation is made, valve malfunction may occur.**

VALVE REASSEMBLY

1. Reassemble in reverse order of disassembly paying careful attention to exploded view provided for identification and placement of parts.
2. Lubricate all gaskets with Dow Corning's Valve Seal silicone lubricant or an equivalent high grade silicone grease.
3. Replace core/spring sub-assembly (A-C Construction) or core (D-C Construction) through solenoid base sub-assembly opening and engage with lever.
4. Install end cap gasket and end cap. Torque end cap to 55 ± 5 foot-pounds [74.6 ± 6.8 newton meters].
5. Replace bonnet gasket and solenoid base sub-assembly. Torque solenoid base sub-assembly to 175 ± 25 inch-pounds [19.8 ± 2.8 newton meters].
6. Replace solenoid enclosure and retaining cap or clip.
7. Install valve discs. If lapping is required, refer to **"LAPPING SEATS AND DISCS"** Section.
8. For stroke setting requirements (adjustment of valve discs) refer to **"NEW SEAT AND DISC INSTALLATION"** Paragraphs under **"INSTALLATION OF NEW SPARE PARTS KIT"** Section.
9. Install upper and lower springs. Refer to **"NEW SPRING INSTALLATION"** Section.
10. Replace disc guide cap gaskets and disc guide caps (both ends). Torque disc guide caps to 180 ± 15 inch-pounds [20.3 ± 1.7 newton meters].
11. After maintenance, operate the valve a few times to be sure of proper opening and closing. A metallic click signifies that the solenoid is operating.

NEW SPRING INSTALLATION (Refer to Figures 1 and 4)

When it is desired to change to a different form of flow or operating conditions, new upper and lower springs corresponding to the new requirements must be installed. Depressurize valve and turn off electrical supply. Remove the two disc guide caps and old springs. Install new springs in their proper location as indicated on the factory labeled tags. Replace disc guide caps and torque to 180 ± 15 inch-pounds [20.3 ± 1.7 newton meters]. The smaller diameter end of the Type "38" body springs faces the discs.

NOTE: The lower spring is always the weaker of the two and should always be located at the bottom. If the springs are installed in the wrong position, the valve will not function properly.

A method to determine which spring is the weaker is by placing the two springs on the shaft of a screwdriver or similar tool and compressing them. The spring which compresses to the "L" dimension (Figure 1) first is the weaker of the two springs and should be placed on the bottom.

MANUAL OPERATOR DISASSEMBLY AND REASSEMBLY

(Refer to Figure 4)

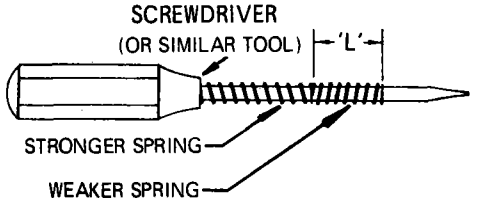
1. Unscrew stuffing box bonnet from valve body. (Be certain manual operator stem is fully retracted). Remove the manual operator intact.
2. Remove gasket from stuffing box bonnet.
3. Press or drive out knob/stem pin from operating knob and stem. CAUTION: When removing knob/stem pin from knob/stem sub-assembly, do not let parts fly apart.
4. Remove spring and slide stem out of stuffing box bonnet. CAUTION: Before sliding stem thru stuffing box bonnet, be certain there are no burrs on stem from removing knob/stem pin. Do not damage captive gasket seat ("O"-ring) in stuffing box sub-assembly.
5. All parts are now accessible for cleaning.
6. Reassemble in reverse order of disassembly paying careful attention to exploded view provided for identification and placement of parts.
7. Torque stuffing box bonnet to 16 ± 3 foot-pounds [22.7 ± 4.1 newton meters].

SPARE PARTS KITS

Spare Parts Kits and Coils are available for ASCO valves. Parts marked with an asterisk (*) are supplied in Spare Parts Kits.

ORDERING INFORMATION FOR SPARE PARTS KITS

When Ordering Spare Parts Kits or Coils, Specify Valve Catalog Number, Serial Number and Voltage.



BODY TYPE	'L' DIM.
'37'	3/4"
'38'	1-3/16"

Figure 1. Method to Determine Weaker Spring

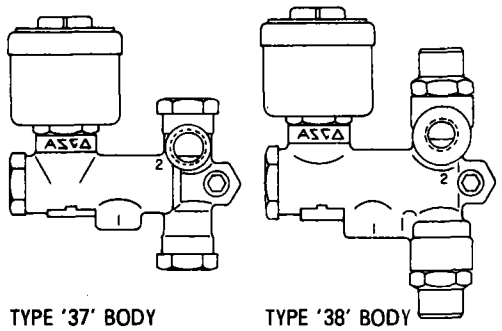


Figure 2. Identification of Body Type

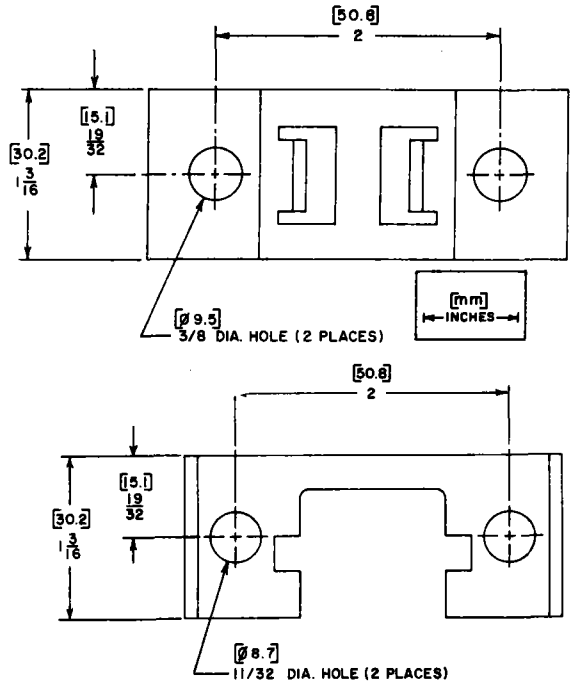
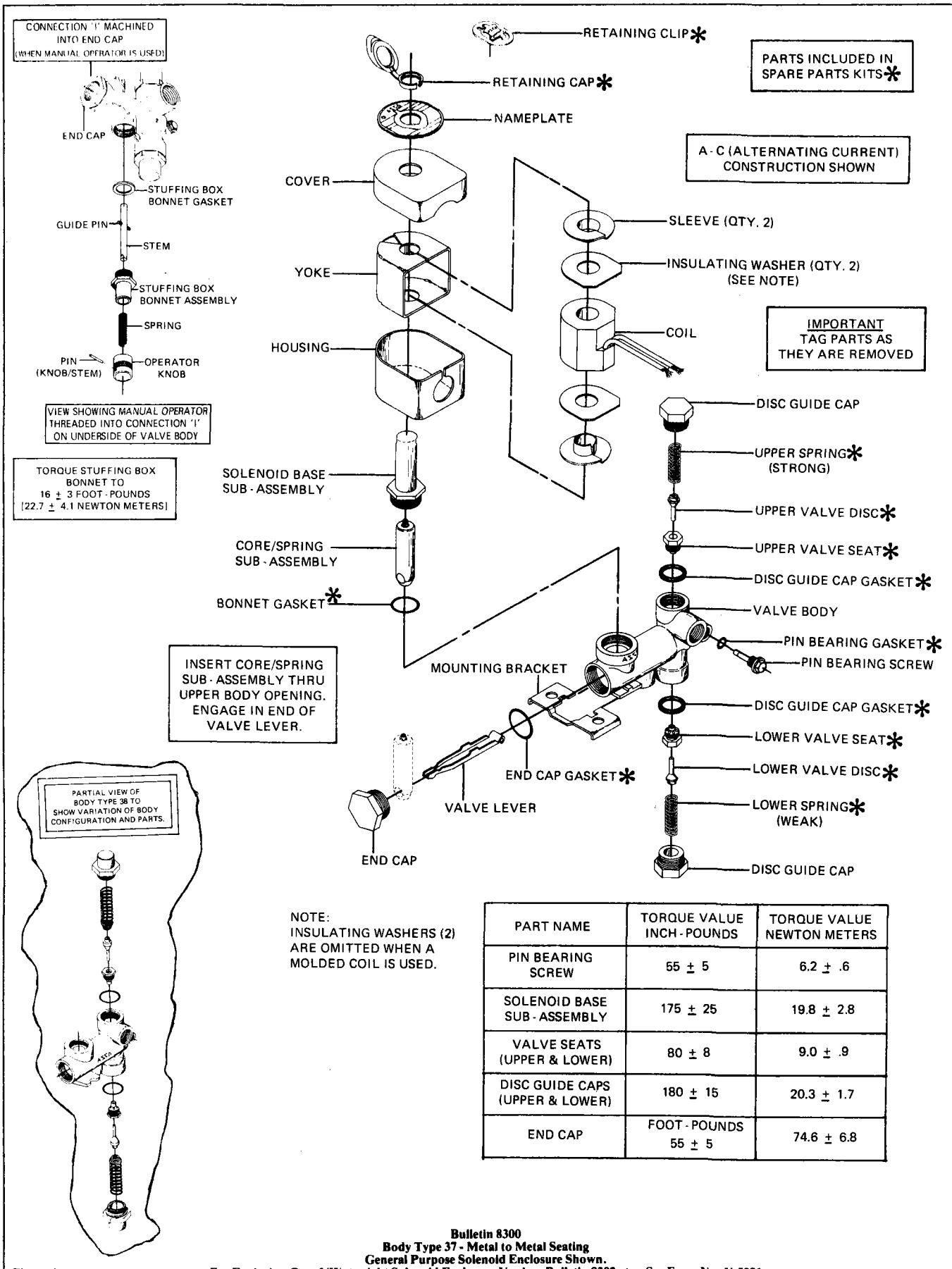


Figure 3. Mounting Bracket Dimensions



NOTE:
INSULATING WASHERS (2) ARE OMITTED WHEN A MOLDED COIL IS USED.

PART NAME	TORQUE VALUE INCH-POUNDS	TORQUE VALUE NEWTON METERS
PIN BEARING SCREW	55 ± 5	6.2 ± .6
SOLENOID BASE SUB-ASSEMBLY	175 ± 25	19.8 ± 2.8
VALVE SEATS (UPPER & LOWER)	80 ± 8	9.0 ± .9
DISC GUIDE CAPS (UPPER & LOWER)	180 ± 15	20.3 ± 1.7
END CAP	FOOT-POUNDS 55 ± 5	74.6 ± 6.8

Bulletin 8300
Body Type 37 - Metal to Metal Seating
General Purpose Solenoid Enclosure Shown.
For Explosion-Proof/Watertight Solenoid Enclosure Used on Bulletin 8302 etc., See Form No. V-5381

Figure 4.

LAPPING SEATS AND DISCS

Depressurize valve and proceed in the following manner:

CAUTION: Tag upper and lower springs and upper and lower discs as they are not interchangeable and must be returned to original locations.

1. Apply a small amount of fine grinding compound to the beveled seating surface of the disc and insert the disc in the proper valve seat (do not remove seat from body). A fine grade of grinding compound Grit Size 900 is recommended. NOTE: If new seats and discs are being installed, lap them before installation in the valve. Be sure to install seats and discs in mated sets.
2. Use a screwdriver in the slot provided in the disc and grind by rotating the disc back and forth using light pressure. After an evenly lapped surface has been obtained, repeat the grinding operation on the other disc.
3. Wipe all parts clean of grinding compound.
4. Reassemble parts in reverse order of disassembly replacing discs and springs in original positions. Be sure the weaker spring is located at the bottom and stronger spring at the top. If discs or springs are incorrectly reassembled, the valve will not function properly. To determine the weaker spring, refer to **"NEW SPRING INSTALLATION"** Section.

INSTALLATION OF NEW SPARE PARTS KITS

Depressurize valve and turn off electrical power supply. Disassemble valve in an orderly fashion paying careful attention to exploded views provided for identification of parts. For ease of maintenance, valve should be removed from the pipe line. Spare Parts Kits include springs for all three forms of flow (F, G and U). Check the catalog number suffix on the nameplate to determine which form of flow you have. For example, a Form "F" valve is normally closed operation. When the correct springs have been chosen, immediately discard remaining two (2) sets of springs to avoid any difficulty.

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. CAUTION: When metal retaining clip disengages, it will spring upward. For Explosion-Proof/Watertight Solenoid Enclosure, refer to Form V-5381 for disassembly.
2. Unscrew solenoid base sub-assembly and remove bonnet gasket. For Explosion-Proof/Watertight Solenoid Enclosure, a special wrench is required to remove the the solenoid base sub-assembly. Wrench adapter Order No. 102-649-1.
3. Unscrew disc guide cap (both ends) and remove disc guide cap gaskets, upper and lower springs and discs.
4. Remove upper and lower valve seats using a 1/2 inch thin wall socket wrench.
5. Remove end cap and end cap gasket. Slip core/spring sub-assembly (A-C Construction) or core (D-C Construction) off the end of the valve lever and lift out through the solenoid base sub-assembly opening.
6. Remove pin bearing screw and pin bearing gasket.
7. Slide valve lever out through the end cap opening of the valve body.
8. All parts are now accessible for replacement. Clean all internal passageways. Install a complete Spare Parts Kit. **IMPORTANT: Install all new parts. Do not retain any old parts when rebuilding valve.**
9. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.
10. Lubricate all gaskets with Dow Corning's Valve Seal silicone lubricant or an equivalent high grade silicone grease.
11. Insert valve lever and replace pin bearing gasket and pin bearing screw through the valve lever. Torque pin bearing screw to 55 ± 5 inch-pounds [6.2 ± .6 newton meters].
12. Position core/spring sub-assembly (A-C Construction) or core (D-C Construction) thru solenoid base sub-assembly opening and engage with valve lever. Install end cap gasket and end cap. Torque end cap to 55 ± 5 foot-pounds [74.6 ± 6.8 newton meters].
13. Replace bonnet gasket and solenoid base sub-assembly. Torque solenoid base sub-assembly to 175 ± 25 inch-pounds [19.8 ± 2.8 newton meters].
14. The stainless steel seats and discs (metal to metal seating) provided in the Spare Parts Kit have already been coined, however, lapping of the seats and discs is required. Refer to **"LAPPING SEATS AND DISCS"** Section. When lapping is complete, be sure to install seats and discs in mated sets.
15. Install upper and lower valve seats using a small amount of pipe compound on the seat threads to avoid possible leakage. Torque upper and lower valve seats to 80 ± 8 inch-pounds [9.0 ± .9 newton meters].
16. Replace solenoid enclosure and retaining cap or clip. For Explosion-Proof/Watertight Solenoid Enclosures, refer to Form No. V-5381.

NEW SEAT AND DISC INSTALLATION

17. New upper and lower seats and discs cannot be installed without making some minor adjustments. It is important that the stroke of the valve discs be set carefully in order to obtain the proper orifice opening and reliable operation of the valve. Check valve nameplate for the catalog number and refer to "Stroke Chart," Form No. V-5940 for stroke setting requirements. Refer to Figure 5 for the method of measuring the stroke. Spaces are provided on this sheet for your calculations.
18. Place the valve in a vertical and upright position. Install new upper disc and use a depth gauge to measure distances. NOTE: Solenoid and core/spring sub-assembly or core must be assembled in valve when strokes are measured.
19. With valve de-energized, measure Dimension "A." Dimension "A" is from the top of the valve body to the top of the upper disc as illustrated in Figure 5. _____
20. With valve energized, measure Dimension "B." Dimension "B" is from the top of the valve body to the top of the upper disc as illustrated in Figure 5. _____
21. Dimension "A" – "B" = upper disc stroke. _____

    The differences between the two distances "A" minus "B" is the upper disc stroke. If the stroke is more than can be allowed in the "Stroke Chart," Form No. V-5940 (according to catalog number and body type), the end of the upper disc which contacts the valve lever must be ground off until the proper stroke is obtained. After grinding, the end of the disc stem must be crowned slightly and polished smooth.
22. Replace upper valve spring (strong spring), disc guide cap with disc guide cap gasket attached. Torque disc guide cap to 180 ± 15 inch-pounds [20.3 ± 1.7 newton meters].
23. Turn valve upside-down to install lower disc and follow the same procedure used in setting the upper disc stroke to set the lower disc stroke. In general, more adjustment grinding) of disc stem is required to set lower disc stroke.
24. With valve energized, measure Dimension "C." _____
25. With valve de-energized, measure Dimension "D." _____
26. Dimension "C" – "D" = lower stem stroke. _____
27. When the strokes have been set in accordance with Figure 5 and the "Stroke Chart," Form No. V-5940, a gap will automatically be obtained between the lower disc stem and the lever when the solenoid is energized. This gap will assure proper operation of the valve.
28. Replace lower valve spring (weak spring), disc guide cap with disc guide cap gasket attached. Torque disc guide cap to 180 ± 15 inch-pounds [20.3 ± 1.7 newton meters].
29. After maintenance, operate the valve a few times to be sure of proper opening and closing. A metallic click signifies that the solenoid is operating.

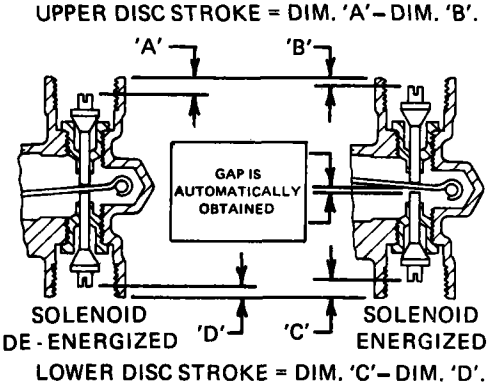
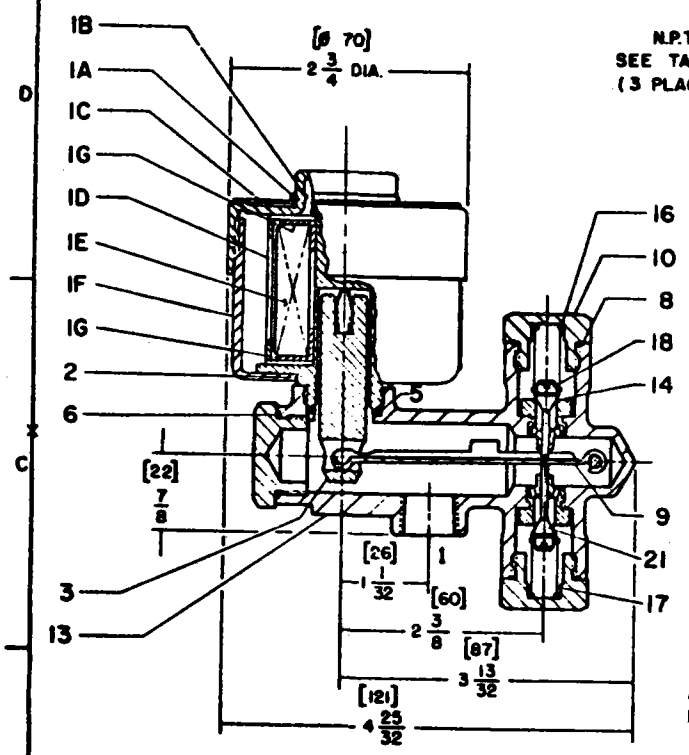
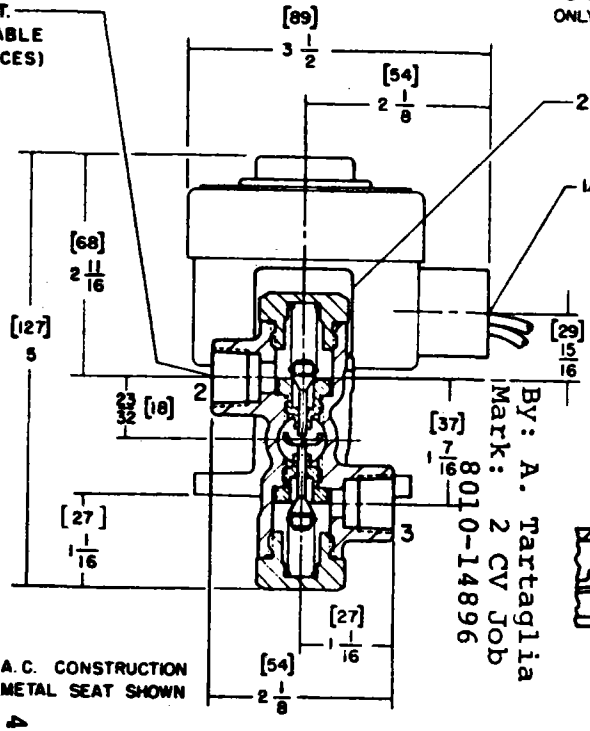
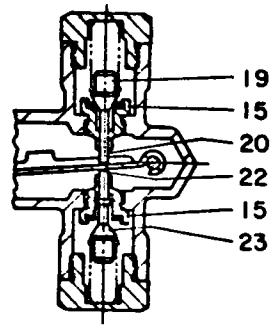


Figure 5. Method of Stroke Measurement

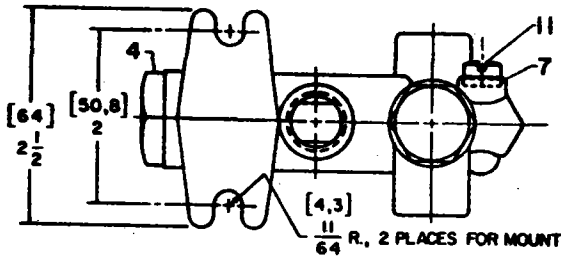




A.C. CONSTRUCTION
METAL SEAT SHOWN



RESILIENT SEAT CONSTRUCTION



NOTES:
1. CATALOG NUMBERS SPECIFYING THIS NOTE AVAILABLE IN A.C. CONSTRUCTION ONLY.

CERTIFIED FOR DIMENSIONS
AUTOMATIC SWITCH COMPANY
Cust.Order 009802
ASCO SO 65007J
Item: 1
Cat. No. HB8302A81 F
Voltage: 120/60
Date: 11/10/80
By: A. Tartaglia
Mark: 2 CV Job 8010-14896
4 CV Job 8010-16895

ITEM	NAME	QTY
1A	RETAINING RING	1
1B	RETAINER	1
1C	NAMEPLATE	1
1D	YOKE	1
1E	COIL	1
1F	COVER/HOUSING SUB-ASSEMBLY	1
1G	SLEEVE (A.C.)	2
2	SOL BASE SUB-ASSEM	1
3	CORE ASSEMBLY	1
4	END CAP	1
5	GASKET, (BODY-BONNET)	1
6	GASKET, (END CAP)	1
7	GASKET, (BEARING)	1
8	GASKET, (DISC GUIDE CAP)	2
9	LEVER	2
10	DISC GUIDE CAP	2
11	BEARING SCREW	1
13	VALVE BODY	1
* 14	SEAT (METAL CONSTR.)	2
* 15	SEAT SUB-ASSEM (RESIL. CONSTR.)	2
* 16	SPRING, UPPER	1
* 17	SPRING, LOWER	1
* 18	DISC, UPPER (METAL)	1
* 19	DISC, UPPER (RESIL.)	1
* 20	STEM, UPPER (RESIL.)	1
* 21	DISC, LOWER (METAL)	1
* 22	STEM, LOWER (RESIL.)	1
* 23	DISC, LOWER (RESIL.)	1
24	LABEL	1

PARTS LIST
GIVE FULL NAMEPLATE DATA AND ASSEM DWG NO WHEN ORDERING PARTS. * INDICATES ITEMS SUPPLIED IN SPARE PART KIT

CATALOG NUMBER	N.P.T.	ORIFICE	SEAT CONSTR.	COIL WATTAGE	A.C. SPARE PARTS KIT	D.C. SPARE PARTS KIT	NET WT.
8302A82-R	3/8	1/4 [6,4]	RESILIENT	20 A.C. (CL. F)	FV-162-749	FV-162-750	[1,2 kg] 2.75 LBS.
8302A81-R	1/4						
8302D25-R	1/4	3/16 [4,8]		33 D.C. (CL. H)	FV-208-169	FV-162-748	
8302D4 (NOTE 1)	3/8	1/4 [6,4]	METAL	28 A.C. (CL. H)	FV-164-653		
8302D26 (NOTE 1)	1/4						
8302A82	3/8			20 A.C. (CL. F)	FV-103-804	FV-103-805	
8302A81	1/4						
8302D25	1/4	3/16 [4,8]		33 D.C. (CL. H)	FV-103-802	FV-103-803	
8302D1	1/8						
8302D24	1/8	1/8 [3,2]			FV-103-800	FV-103-801	

	NORM. CLOSED PRESSURE AT "2"	NORM. OPEN PRESSURE AT "3"	UNIVERSAL PRESS. AT ANY CONN.
SOLENOID ENERGIZED	PRESS 2, CYL 1, 3 EXH	EXH 2, CYL 1, 3 PRESS	2, 1, 3
SOLENOID DE-ENERGIZED	PRESS 2, CYL 1, 3 EXH	EXH 2, CYL 1, 3 PRESS	2, 1, 3
ANSI SYMBOL	2 3	3 2	2 3

VALVE MUST BE MOUNTED WITH SOLENOID VERTICAL AND UPRIGHT

6 SIDES

THIRD ANGLE PROJECTION

BULLETIN 8302 — 3 WAY SOLENOID VALVE
PIPE-PORT CONN (SEE TABLE) — BODY MATL BRASS
ORIFICE DIA (SEE TABLE) — SEATING (SEE TABLE)
ENCLOSURE NEMA TYPE 4(WATERTIGHT)7C AND 7D(EXPLOSION-PROOF)AND 9E, 9F AND 9G(DUST-IGNITION-PROOF)
WATTS (SEE TABLE)

Automatic Switch Co.

HVA-206-973

4.1.55-17

AUTOMATIC SWITCH COMPANY
Florham Park, New Jersey

DATE: Novmeber 10, 1980

ASCO S.O.

RECOMMENDED SPARE PARTS LIST:

FOR ASCO SOLENOID VALVE CATALOG NUMBER: 8302A81F

VOLTAGE: 120/60 **DRAWING NO:** HVA-206-973

QUANTITY	PART NAME	PART NUMBER	LIST PRICE
1	COIL:	99-257-1D	29.50
	SPARE PARTS KIT:	103-804	31.50

The above prices are LIST EACH less your standard trade discount. Prices quoted are F.O.B. Florham Park, New Jersey. Terms are net cash thirty days. Shipment of the above can be made within 3 to 4 weeks after receipt of the order. For complete parts list and for parts included in spare parts kits, refer to the above drawing number. When ordering parts, please specify the valve catalog and serial numbers as shown on the nameplate and the part name and item number as listed on the above drawing. Minimum billing charge is $30.00 net.

Form V.Sls. 2855

INSTALLATION AND MAINTENANCE INSTRUCTIONS

STROKE CHART
A-C SERVICE
"THIS STROKE CHART SUPERSEDES ALL PREVIOUS PUBLICATIONS"

BULLETINS
8300
8302 200-926
8315 200-929
200-921 200-930
200-924 200-939
200-925 200-940

ASCO

FORM NO. V-5940R1

DESCRIPTION

This stroke chart for A-C service is used in conjunction with Installation and Maintenance Instructions, Form Nos. V-5941 and V-5942. Refer to "NEW SEAT AND DISC INSTALLATION" Paragraph on Form Nos. V-5941 and V-5942.

IMPORTANT: For resilient seated valves (Suffix "R" in catalog number) all parts supplied in the Spare Parts Kit must be installed in order to obtain the proper stroke as indicated in the chart below.

Pipe Size	General Purpose Solenoid Enclosure	Explosion-Proof Watertight Solenoid Enclosure	Orifice Size	For Body Type Refer To Figure 2 on Form Numbers V5941 & V5942	Metal to Metal Construction Stroke		Resilient Construction Catalog No. Suffix "R" ① Stroke	
					Upper Disc	Lower Disc	Upper Disc	Lower Disc
1/8	8300C55, 8300D55 ② 8300C3, 8300D3 830080 8300C6 ③	8302C24, 8302D24 ② 8302C1, 8302D1 830280 8302C3 ③	1/8 3/16 1/4 1/4	37	.062 ±.005	.047 ±.005	.060 $^{+.005}_{-.000}$	.040 $^{+.005}_{-.000}$
1/4	8300C58, 8300D58 200-921-1 ③ 830081, 8300A81 8300C61, 8300D61 ③ 8315C2, 8315D2 ② ③ 200-921-2 ③	8302C25, 8302D25 200-924-1 ③ 830281, 8302A81 8302C26, 8302D26 ③ 8315C22, 8315D22 ② ③ 200-924-2 ③	3/16 3/16 1/4 1/4 1/4 1/4					
3/8	8300C102 200-921-3 ③ 830082, 8300A82 8300C9, 8300D9 ③ 8315C3, 8315D3 ② ③ 200-921-4 ③	8302C5 200-924-3 ③ 830282, 8302A82 8302C4, 8302D4 ③ 8315C23, 8315D23 ② ③ 200-924-4 ③	3/16 3/16 1/4 1/4 1/4 1/4					
	8300C64, 8300D64 200-925-1 ③	8302C27, 8302D27 200-926-1 ③	5/16 5/16	38	.072 ±.005	.058 ±.005	.070 $^{+.005}_{-.000}$	.050 $^{+.005}_{-.000}$
	8300C72, 8300D72 ② 8315C6 ② ③	8302C31, 8302D31 ② 8315C26 ② ③	3/8 3/8	38	.101± .005	.078 ±.005	—	—
1/2	8300C68, 8300D68 8315C5 ② ③ 200-925-2 ③	8302C29, 8302D29 8315C28 ② ③ 200-926-2 ③	5/16 5/16 5/16	38	.072 ± .005	.058 ± .005	.070 $^{+.005}_{-.000}$	.050 $^{+.005}_{-.000}$
	8300C76, 8300D76 ② 8315C7 ② ③	8302C33, 8302D33 ② 8315C30 ② ③	3/8 3/8	38	.101 ± .005	.078 ± .005	—	—
3/8 Steel Body	8300A32, 8300B32 200-939-1 ② ③ 830083, 8300A83 8300A41, 8300B41 ③ 200-939-2 ② ③	8302A8, 8302B8 200-940-1 ② ③ 830283, 8302A83 8302A46, 8302B46 ③ 200-940-2 ② ③	3/16 3/16 1/4 1/4 1/4	38	.072 ± .005	.058 ± .005	—	—
	8300A89, 8300B89 200-939-3 ② ③	8302A38, 8302B38 200-940-3 ② ③	5/16 5/16	38	.072± .005	.058 ± .005	.070 $^{+.005}_{-.000}$	.050 $^{+.005}_{-.000}$
	8300A97, 8300B97 ②	8302A42, 8302B42 ②	3/8	38	.101 ± .005	.078 ± .005	—	—
1/2 Steel Body	8300A203, 8300B203 8315A12 ② ③ 200-939-4 ② ③	8302A203, 8302B203 8315A29 ② ③ 200-940-4 ② ③	5/16 5/16 5/16	38	.072 ± .005	.058 ± .005	.070 $^{+.005}_{-.000}$	.050 $^{+.005}_{-.000}$
	8300A204, 8300B204 ② 8315A14 ② ③	8302A204, 8302B204 ② 8315A31 ② ③	3/8 3/8	38	.101 ± .005	.078 ± .005	—	—
1/2 St.St. Body	8300A403, 8300B403 ② 200-929-1 ② ③	8302A403, 8302B403 ② 200-930-1 ② ③	5/16 5/16	38	.072 ± .005	.058 ± .005	—	—
	8300A404, 8300B404 ②	8302A404, 8302B404 ②	3/8	38	.101 ± .005	.078 ± .005	—	—

NOTES:

① Example: Catalog No. 8300D3R (Resilient) stroke setting would be .060 $^{+.005}_{-.000}$ for upper disc and .040 $^{+.005}_{-.000}$ for lower disc.

② No Resilient Construction.

③ Available in A-C (Alternating Current) Construction only.

Form No. V-5940R1 PRINTED IN U.S.A. 1979 Automatic Switch Co.

ASCO Valves

FLORHAM PARK, NEW JERSEY 07932

STROKE CHART
D-C SERVICE
"THIS STROKE CHART SUPERSEDES ALL PREVIOUS PUBLICATIONS"

ASCO

FORM NO. V-5940R1

DESCRIPTION

This stroke chart for D-C service is used in conjunction with Installation and Maintenance Instructions, Form Nos. V-5941 and V-5942. Refer to "NEW SEAT AND DISC INSTALLATION" Paragraph on Form Nos. V-5941 and V-5942.

IMPORTANT: For resilient seated valves (Suffix "R" in catalog number) all parts supplied in the Spare Parts Kit must be installed in order to obtain the proper stroke as indicated in the chart below.

Pipe Size	General Purpose Solenoid Enclosure	Explosion-Proof Watertight Solenoid Enclosure	Orifice Size	For Body Type Refer To Figure 2 on Form Numbers V5941 & V5942	Metal to Metal Construction Stroke		Resilient Construction Catalog No. Suffix "R" (1) Stroke	
					Upper Disc	Lower Disc	Upper Disc	Lower Disc
1/8	8300C55, 8300D55 (2)	8302C24, 8302D24 (2)	1/8	37	.047±.005	.031±.005	$.051^{+.005}_{-.000}$	$.031^{+.005}_{-.000}$
	8300C3, 8300D3	8302C1, 8302D1	3/16					
	830080	830280	1/4					
	8300C6 (3)	8302C3 (3)	1/4					
1/4	8300C58, 8300D58	8302C25, 8302D25	3/16					
	830081, 8300A81	830281, 8302A81	1/4					
	8300C61, 8300D61 (3)	8302C26, 8302D26 (3)	1/4					
	8315C2, 8315D2 (2)(3)	8315C22, 8315D22 (2)(3)	1/4					
3/8	8300C102	8302C5	3/16					
	830082, 8300A82	830282, 8302A82	1/4					
	8300C9, 8300D9 (3)	8302C4, 8302D4 (3)	1/4					
	8315C3, 8315D3 (2)(3)	8315C23, 8315D23 (2)(3)	1/4					
	8300C64, 8300D64	8302C27, 8302D27	5/16	38	.072±.005	.058±.005	$.070^{+.005}_{-.000}$	$.050^{+.005}_{-.000}$
	8300C72, 8300D72 (2)	8302C31, 8302D31 (2)	3/8	38	$.072^{+}_{-}.005$	.058±.005	—	—
	8315C6 (2)(3)	8315C26 (2)(3)	3/8					
1/2	8300C68, 8300D68	8302C29, 8302D29	5/16	38	.072±.005	.058±.005	$.070^{+.005}_{-.000}$	$.050^{+.005}_{-.000}$
	8315C5 (2)(3)	8315C28 (2)(3)	5/16					
	8300C76, 8300D76 (2)	8302C33, 8302D33 (2)	3/8	38	$.072^{+}_{-}.005$	.058±.005	—	—
	8315C7 (2)(3)	8315C30 (2)(3)	3/8					
3/8 Steel Body	8300A32, 8300B32	8302A8, 8302B8	3/16	38	.072±.005	.058±.005	—	—
	830083, 8300A83	830283, 8302A83	1/4					
	8300A41, 8300B41 (3)	8302A46, 8302B46 (3)	1/4					
	8300A89, 8300B89	8302A38, 8302B38	5/16	38	.072±.005	.058±.005	$.070^{+.005}_{-.000}$	$.050^{+.005}_{-.000}$
	8300A97, 8300B97 (2)	8302A42, 8302B42 (2)	3/8	38	.072±.005	.058±.005	—	—
1/2 Steel Body	8300A203, 8300B203	8302A203, 8302B203	5/16	38	.072±.005	.058±.005	$.070^{+.005}_{-.000}$	$.050^{+.005}_{-.000}$
	8315A12 (2)(3)	8315A29 (2)(3)	5/16					
	8300A204, 8300B204 (2)	8302A204, 8302B204 (2)	3/8	38	.072±.005	.058±.005	—	—
	8315A14 (2)(3)	8315A31 (2)(3)	3/8					
1/2 St.St. Body	8300A403, 8300B403 (2)	8302A403, 8302B403 (2)	5/16	38	.072±.005	.058±.005	—	—
	8300A404, 8300B404 (2)	8302A404, 8302B404 (2)	3/8					

NOTES:

(1) Example: Catalog No. 8300D3R (Resilient) stroke setting would be $.051^{+.005}_{-.000}$ for upper disc and $.031^{+.005}_{-.000}$ for lower disc.

(2) No Resilient Construction.

(3) Available in A-C (Alternating Current) Construction only.

Form No. V-5940R1 PRINTED IN U.S.A. 1979 Automatic Switch Co.

ASCO Valves
FLORHAM PARK, NEW JERSEY 07932

ASCO

INSTALLATION AND MAINTENANCE INSTRUCTIONS

GENERAL PURPOSE AND EXPLOSION PROOF WATERTIGHT SOLENOIDS

CATALOG NOS.
80171 80173
80172 80174

ASCO

Form No. V5381R2

DESCRIPTION

Catalog Nos. 80171 and 80172 solenoids are equipped with a NEMA Type 1 General Purpose Solenoid Enclosure. When installed just as a solenoid and not attached to an ASCO valve, the core has a 1/4-28 UNF-2B tapped hole, 3/8 full thread.

Catalog Nos. 80173 and 80174 solenoids are equipped with an enclosure which is designed to meet NEMA Type 4 - Watertight, NEMA Type 7 (C or D) Hazardous Locations - Class I, Group C or D, and NEMA Type 9 (E, F or G) Hazardous Locations - Class II, Group E, F or G. When installed just as a solenoid and not attached to an ASCO valve, the core has a 1/4-28 UNF-2B tapped hole, 3/8 full thread.

OPERATION

When solenoid is energized, core seats in solenoid base sub-assembly. **IMPORTANT:** *Initial return* force for the core, whether developed by spring, pressure or weight, must exert a minimum force of 1 pound, 12 ounces for A-C Construction and 5 ounces for D-C Construction to overcome residual magnetism created by the solenoid.

INSTALLATION

Check nameplate for correct catalog number, voltage, wattage and service.

IMPORTANT: For the protection of the solenoid valve or operator, install a strainer or filter suitable for the service involved in the inlet side as close to the valve or operator as possible. Periodic cleaning is required depending on the service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with Local and National Electrical Codes. For Catalog Nos. 80173 and 80174, electrical fittings must be approved for use in the approved hazardous locations. Housings for all solenoids are made with connections for 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap or clip. **CAUTION: When metal retaining clip disengages, it will spring upward.** Rotate to desired position. Replace retaining cap or clip before operating. The explosion-proof/watertight solenoid enclosure may be rotated by loosening the cover. Rotate to desired position. Tighten cover before operating. Torque cover to 135 ± 10 inch pounds.

NOTE: Alternating Current (A-C) and Direct Current (D-C) Solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid, not just the coil.

CAUTION: Care must be taken not to mar the upper core surface.

SOLENOID ENCLOSURE ASSEMBLY

Catalog 80171, 80172 solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoids.

Catalog 80173, 80174 solenoids must be assembled in the following manner:

1. The solenoid enclosure must be completely disassembled. For disassembly, see the instructions given in "Coil Replacement" paragraph.
2. After disassembly, the solenoid base sub-assembly is placed inside the housing over the assembly location.
3. The assembly is then tightened in place by means of two (2) slots in the bonnet adjacent to the tube on the solenoid base sub-assembly. Use special adapter wrench (Order No. 102-649-1). Exercise care during tightening procedure to prevent deforming or raising of bonnet surface adjacent to slots.
4. The yoke assembly containing the coil, sleeves and insulating washers is then slipped over the solenoid base sub-assembly. (For D.C. service the yoke, coil and insulating washers). The retainer is then placed on top of the solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
5. The cover is threaded onto the housing. Tightening is accomplished by means of a hex shaped boss on cover. Torque cover to 135 ± 10 inch pounds.

SOLENOID TEMPERATURE

Standard solenoids are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched by hand only for an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power supply and depressurize unit before making repairs on solenoid.

CLEANING

A periodic cleaning of all solenoid valves and operators is desirable. The time between cleanings will vary, depending on the media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive leakage or noise will indicate that cleaning is required.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve or operator as free from dirt and foreign material as possible.
2. While in service, energize solenoid at least once a month to insure proper operation.
3. Periodic inspection (depending on service conditions) of internal solenoid parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check electrical system by energizing the solenoid. A metallic click signifies that solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across coil leads. Voltage must be at least 85% of nameplate rating.

COIL REPLACEMENT

Turn off electrical power supply and disconnect coil lead wires. Proceed in the following manner:

Catalog Numbers 80171 and 80172 General Purpose Solenoid Enclosure. (Refer to Figure 1)

1. Remove retaining cap or clip, nameplate and cover. **CAUTION: When metal retaining clip disengages, it will spring upward.**
2. Slip yoke containing coil, sleeves and insulating washers off solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used. For D-C service, the yoke and sleeves are omitted. They are replaced by a single flux washer over the coil.
3. Coil is now accessible for replacement. Reassemble in reverse order of disassembly paying careful attention to exploded views provided in Figure 1.

Catalog Numbers 80173 and 80174 Explosion-proof/Watertight Solenoid Enclosure (Refer to Figure 2)

1. Unsrew housing cover with retaining ring and nameplate attached. Two wrenching flats are provided to hold the housing securely in place while the cover is being removed or replaced.
2. Slip yoke containing coil, sleeves and insulating washers off solenoid base sub-assembly. For D-C service, the sleeves are omitted. Insulating washers are omitted when a molded coil is used.
3. Coil is now accessible for replacement. Reassemble in reverse order of disassembly paying careful attention to exploded views provided in Figure 2.
4. Torque cover to 135 ± 10 inch pounds.

CAUTION: Solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit. Place insulating washers at each end of coil if required.

NOTE: Catalog Numbers 80173 and 80174 — Installation and maintenance of explosion-proof equipment requires more than ordinary care to insure safe performance. All finished surfaces of the solenoid are constructed to provide a flameproof seal. Be sure that the surfaces are wiped clean before replacing. If watertight as well as explosion-proof is a requirement, grease the joints of the explosion-proof/watertight solenoid with Exxon Company, U.S.A. Nebula EP2 grease or equivalent. A high grade silicone grease similar to Dow Corning's Valve Seal may also be used.

ASCO Valves

ASCO

Form No. V-5381R2 PRINTED IN U.S.A. 1975 Automatic Switch Co. FLORHAM PARK, NEW JERSEY 07932

4.1.55-21

ASCO Valves
Automatic Switch Co.
FLORHAM PARK, NEW JERSEY 07932
Form No. V-5381R2 PRINTED IN U.S.A. 1975
4.1.55-22

ORDERING INFORMATION FOR SPARE PARTS

For Spare Parts Specify Serial Number, Catalog Number, Voltage And Individual Parts By Name.

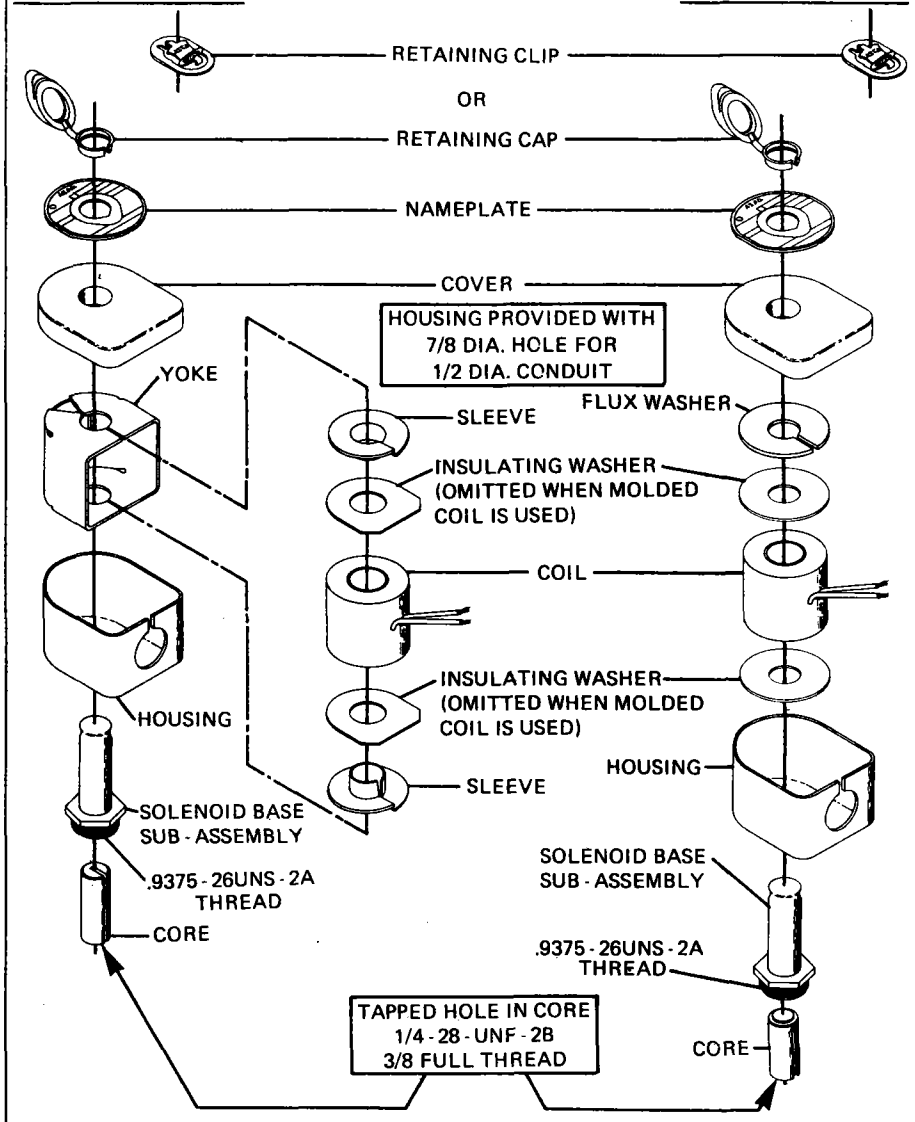


Figure 1. CATALOG NOS. 80171, 80172
GENERAL PURPOSE

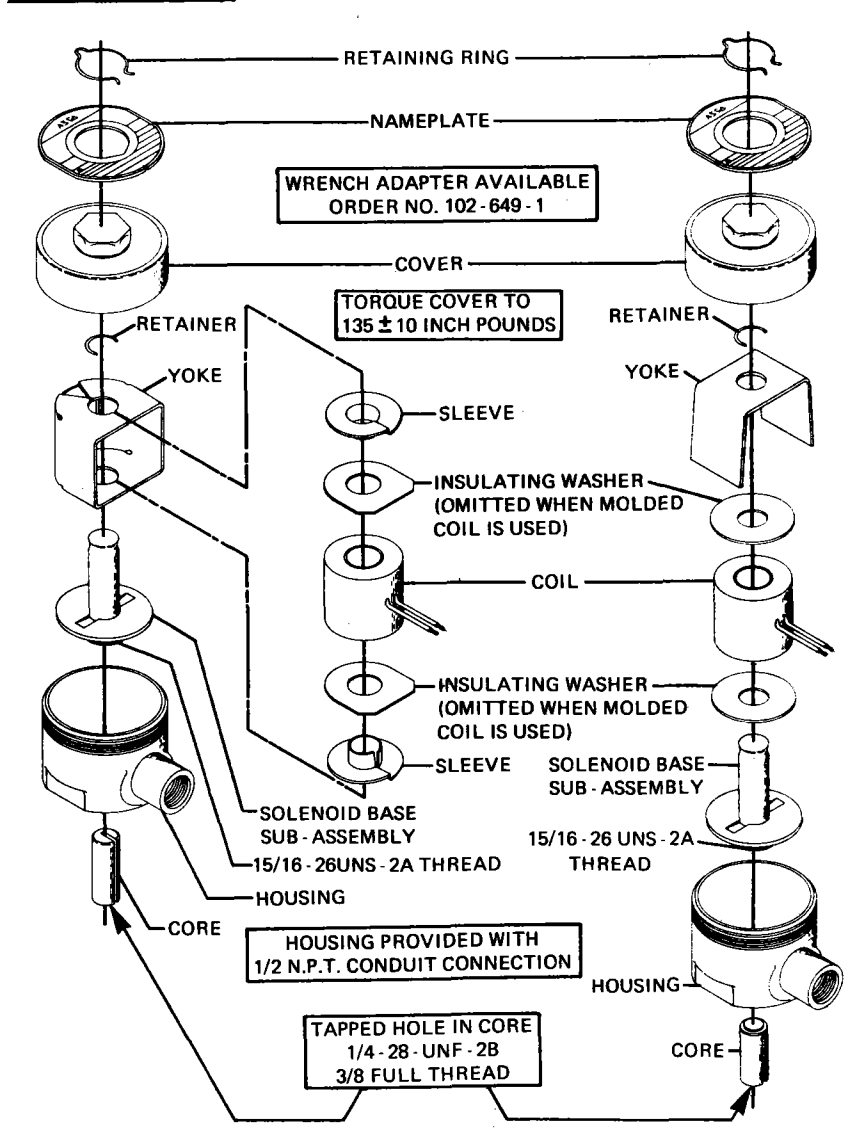


Figure 2. CATALOG NOS. 80173, 80174
EXPLOSION-PROOF/WATERTIGHT

ITT HAMMEL DAHL CONOFLOW

175 Post Road, Warwick, Rhode Island 02888
Telephone 401/781-6200 Telex 927726

Instructions and Parts List

HDC 13024-1
Filter Regulator Combination
Model FH-60 Airpak
Effective 5/1/77

INSTRUCTIONS
Model FH-60 Airpak Filter Regulator Combination

Airpak Installation

Unit has four 1/4" N.P.T. connections. The upstream inlet is stamped "In" and the aspirated outlet is stamped "Out" directly underneath the connections. The two remaining taps (stamped "G") are reduced pressure outlets which can be used as gauge connections.

Airpak Maintenance

All air connections should be periodically checked for leakage. Adjusting knob (12) should be kept lubricated with dry lubricant.

Filter

To clean filter (8), remove cap nut (24) and slide off bowl (9). Remove nut (10), filter plate (22) and filter (8). Filter element may be cleaned by rinsing in a solvent such as gasoline, naphtha, carbon tetrachloride, etc and blowing dry with air stream directed on inside of filter cylinder.

To replace filter (8), put retaining plate (20) against body (18), and install filter (8) and filter plate (22) by threading nut (10) on bolt (21). Inspect "O"-rings (19 & 23) for defects and replace if necessary. Attach bowl (9) by threading cap nut (24) on bolt (21). An effective seal will be made by merely making cap nut (24) finger tight.

At periodic intervals, the dripwell should be cleared by opening draincock (11) while unit is in line under pressure.

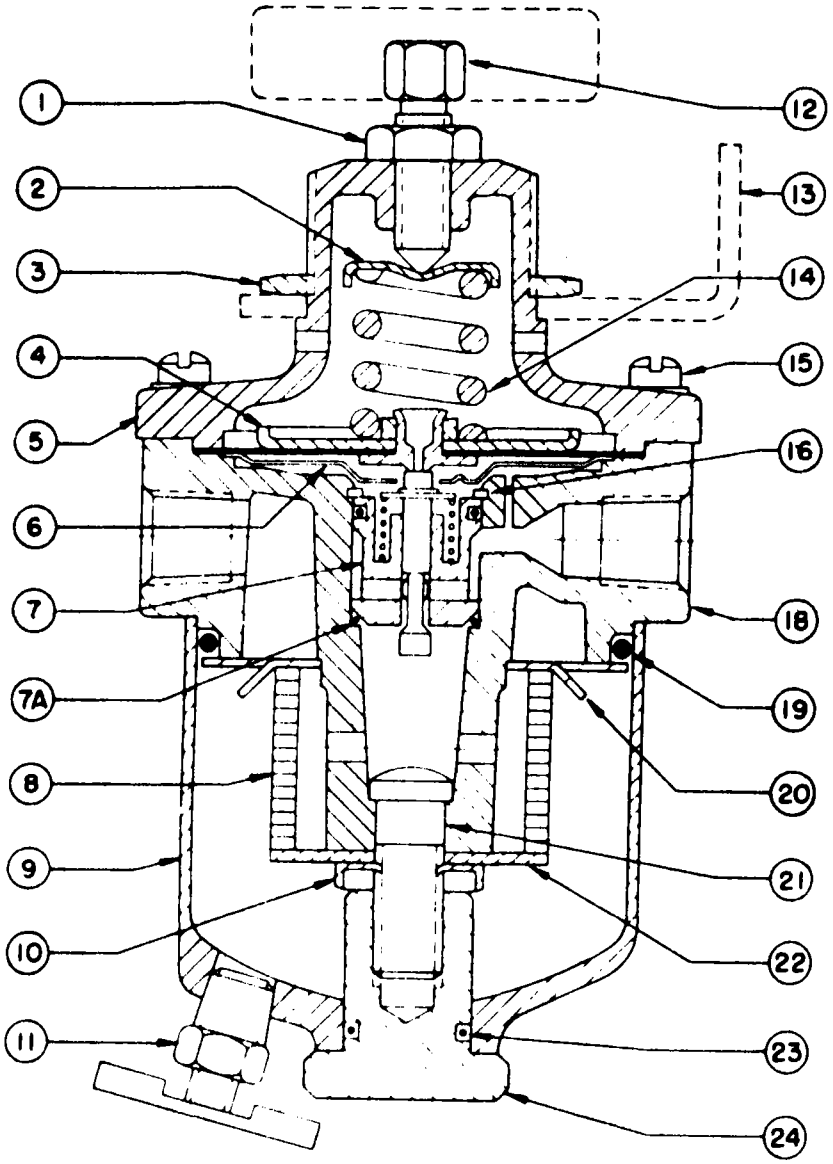
Diaphragm and Nozzle Replacement

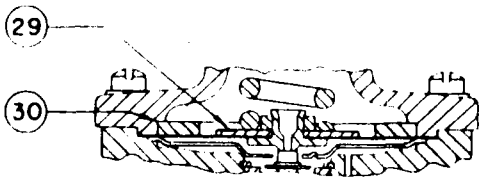
Periodic replacement of diaphragm assembly (4) and nozzle assembly (7) is recommended for service where unit is on stream continuously and consistent, high accuracy regulation is required. Frequency of replacement will depend on the nature of the service, cleanliness and moisture content of the air, etc.

To replace diaphragm assembly (4), loosen adjusting knob (12) until spring (14) tension is relieved, remove eight screws (15) and lift off bonnet (5), spring plate (2), spring (14), and diaphragm assembly (4). Place new diaphragm assembly (4) on body (18) with diaphragm plate up, and reassemble.

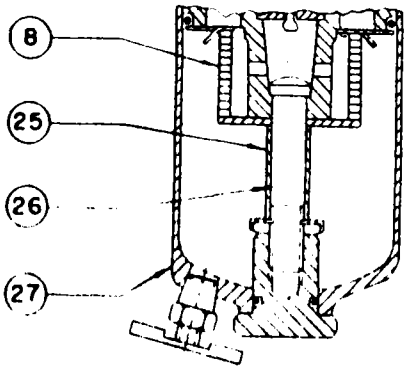
To replace nozzle assembly (7), remove diaphragm assembly (4) as above, and filter as described in section entitled "Filter". Remove baffle plate (6) and retaining ring (16). Then, by pushing up bolt (21), entire nozzle sub-assembly (7) will come out. Before installing nozzle sub-assembly (7), inspect "O"-rings (7A) and replace if necessary. Push in nozzle sub-assembly (7), replace retaining ring (16) and baffle plate (6). Replace diaphragm sub-assembly (4) and filter as previously described.

†FH-60XT-K1
(0-25, 0-60 psi)

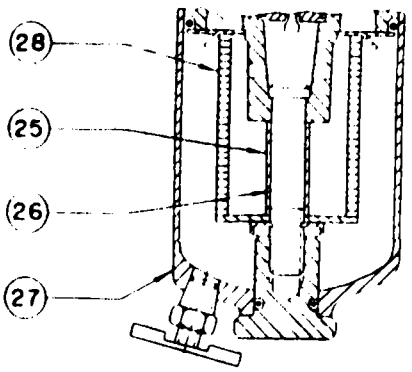




†Section showing diaphragm
sub-assembly of 0-125 psi range



FH-60XT-K2
(All ranges)



FH-60XT-K3
(All ranges)

Parts List

Item no.	No. req'd.	Description	Part no.
1	1	Hex. jam nut (FH-60XT-K only)	5/16" - 24
2	1	Spring plate	H-610
3	1	Locknut	H-29-1
*4	1	Diaphragm sub-assembly (0-25, 0-60 psi) consisting of: Diaphragm, seat, seat nut, plate	H-696
5	1	Bonnet	H-606
6	1	Baffle plate	H-693
*7	1	Nozzle sub-assembly consisting of: Item 7A, plus plug, plug spring, spring button, retaining washer, nozzle	H-698
7A	2	"O"-ring	05-10-015
*8	1	Filter (FH-60XT-K1 & 2)	07-15-01
9	1	Bowl (FH-60XT-K1)	H-645
10	1	Nut	04-45-03
11	1	Draincock	H-648
12	1	Knob (FH-60XT-K)	H-321
		Handwheel (FH-60XT-H)	H-328
13	1	Wall mounting bracket	H-411
14	1	Spring (0-25 psi)	H-172
		Spring (0-60 or 0-125 psi)	H-76
15	8	Fillister head screw	10 - 32 x 5/8" lg.
16	1	Retaining ring	04-68-01
18	1	Body	H-603
*19	1	"O"-ring	05-10-227
20	1	Retaining plate	H-649
21	1	Bolt (FM-60XT-K1)	H-639
22	1	Filter plate	H-622
*23	1	"O"-ring	05-10-015
24	1	Cap nut	H-624
25	1	Spacer (FH-60XT-K2 & 3)	H-667
26	1	Bolt (FH-60XT-K2 & 3)	H-639-1
27	1	Bowl (FH-60XT-K2 & 3)	H-645-1
*28	1	Filter (FH-60XT-K3)	07-15-02
*29	1	Diaphragm sub-assembly (0-125 psi) consisting of: Diaphragm, seat, seat nut, plate	H-697
30	1	Restricting plate (0-125 psi)	H-629
31	2	Pipe plug (not shown)	1/4" N.P.T.
32	1	Gauge (not shown) 0-30 psi	07-16-02
		" 0-60 psi	07-16-03
		" 0-160 psi	07-16-05

*Recommended spare parts

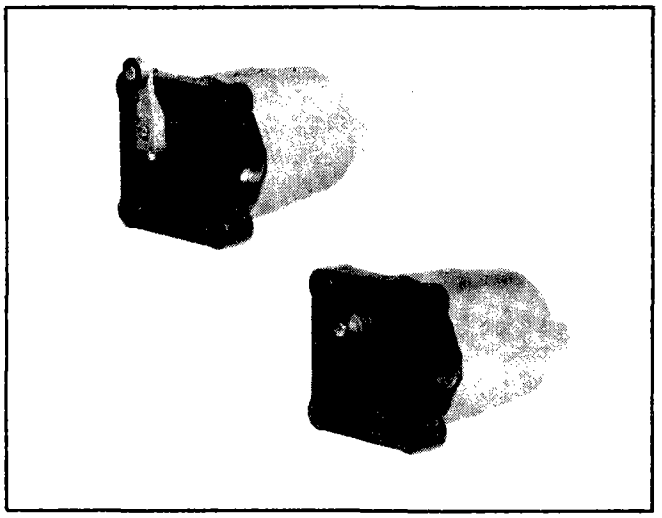
INSTALLATION AND SERVICE INSTRUCTIONS
CX EXPLOSION PROOF, WEATHER PROOF SWITCHES

GENERAL INFORMATION

CX switches meet the following NEMA standards for hazardous locations: Type 7, Class I, Groups C and D; and Type 9, Class II, Groups E, F and G. CX listings beginning with numbers 14, 16, 24, 26, 36 or 46 (e.g. 14CX1) also meet NEMA Class I, Group B. The enclosures are water, dust and oiltight, conforming to NEMA 1, 3, 4 and 13. Most CX switches are UL and CSA listed.

LEVER POSITIONING

Move lever to desired position. Securely tighten cap or set screw. Cap screws require 1/8" hex socket wrenches. Set screws require 3/32" hex socket wrenches. Both are provided in Adjusting Tool Kit LSZ4005. Adjustable length levers require a 1/8" hex key wrench, as well.

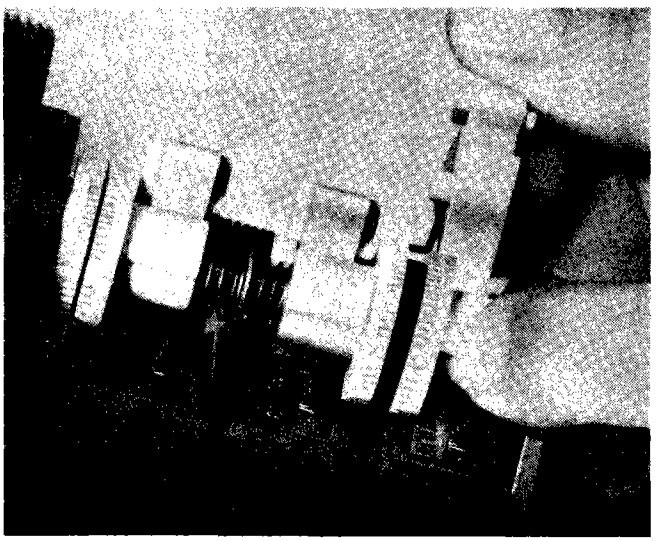


CAM ADJUSTMENT

Pretravel, overtravel, and actuation sequencing can be adjusted and/or modified in the field. No tools are required.

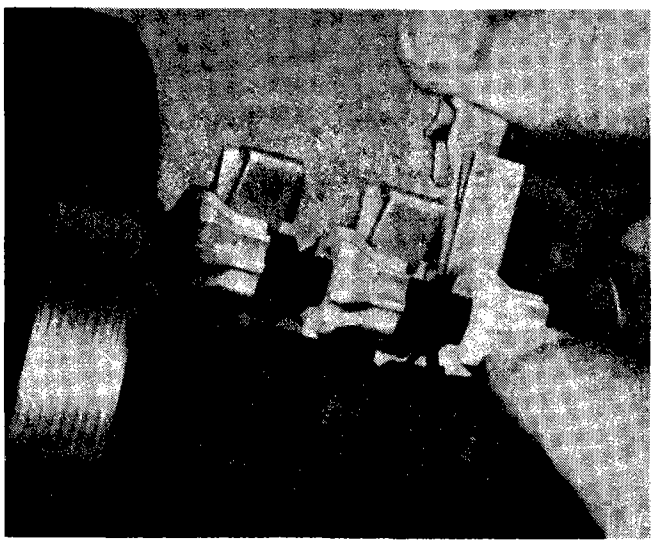
Rotary Types

1. Lift cam follower.
2. Move cam wheel axially to disengage teeth on wheel from teeth on shaft disc.
3. Turn cam wheel to desired position. Turning in direction of shaft rotation advances operate point. Pretravel **decreases** and overtravel thereby **increases**. Each notch on the cam wheel represents an operating point change of 6°. The symbols on the cam wheel simplify changing rotation from clockwise to counterclockwise to center neutral, or vice versa. If the switch operates on clockwise **and** counterclockwise rotation, the pointer on the cam follower lines up with symbol △ or symbol ⚠ on the cam wheel. When symbol △ lines up, pretravel of 15° max. is obtained. When symbol ⚠ lines up, 80° max. pretravel is obtained. Operation is in the direction of the inclined surface of the symbol when ◿ or ◺ lines up with the pointer on the cam follower.
4. When cam wheel has been rotated to desired location, release cam wheel to engage with mating shaft disc.
5. Release cam follower.



Plunger Types

1. Lift cam follower.
2. Turn cam wheel to be adjusted to desired position. Each notch on the wheel represents a change in operation point of 0,116 mm (.0045 in.). Moving the cam wheel in the direction away from the base housing advances the operate point. Pretravel **decreases** and overtravel thereby **increases**.
3. Release cam wheel.
4. Release cam follower.



CX Wiring Methods

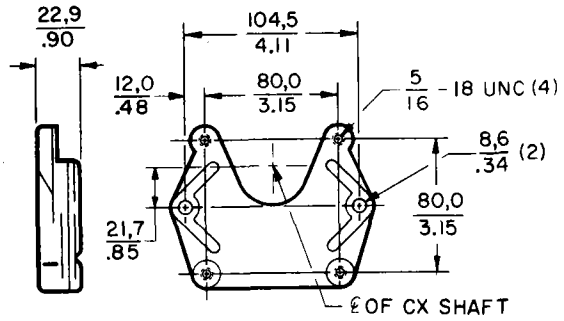
MICRO SWITCH recommends that conduit be installed per NEC articles 501-4 and 501-5.

OPERATING CHARACTERISTICS

	Rotary Actuation		Plunger Actuation
	11CX 21CX 12CX 22CX 13CX 29CX 16CX	14CX 24CX	31CX 36CX 32CX 41CX 33CX 42CX
Pretravel, Max.	15°	20°	2,5mm (.10 in.)
Differential Travel, Max.	10°*	15°	0,4mm (.02 in.)
Overtravel, Min.	90°	85°	4,75mm (.19 in.)

*Individual switch differential travel is 5°.

MOUNTING ADAPTER - 15PA148-CX



Available for adapting CX to existing 2 hole mount.

REPLACEMENT PARTS

Replacement Switch Assemblies

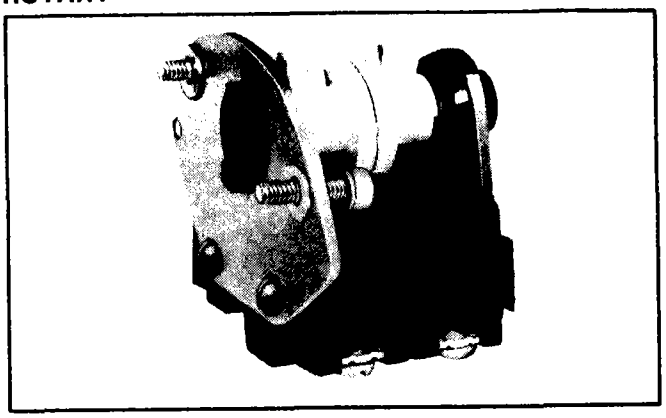
Assemblies are available which contain the components subject to mechanical or electrical wear. Included are basic switches, cam wheels, cam followers and springs. The assemblies are factory adjusted to have the same switching characteristics as new complete switches. Replacement assemblies carry the same catalog listings as complete switches, except that the first digit is replaced by 9 for rotary swtiches and 10 for plunger switches.

Example:

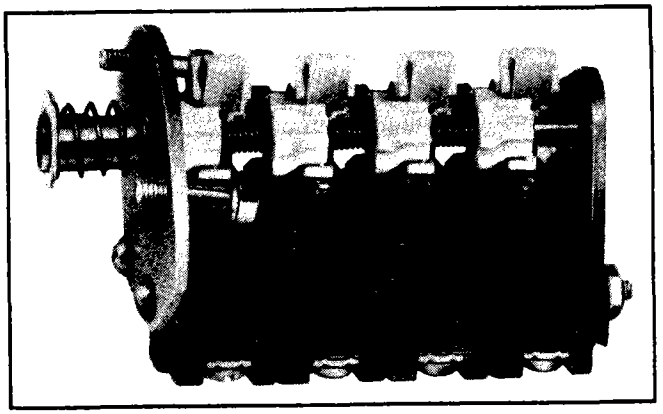
Rotary switch	12CX5
Replacement	92CX5

Plunger switch	36CX2
Replacement	106CX2

ROTARY



PLUNGER

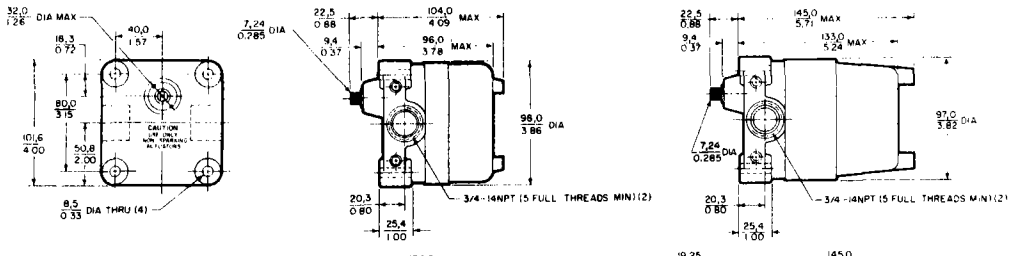


Replacement Levers

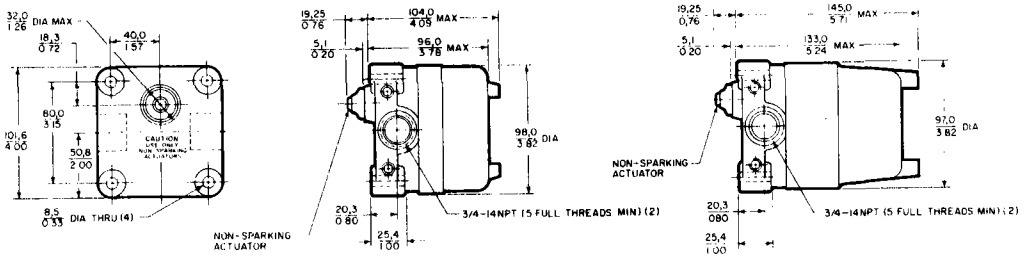
To order replacement levers, order the part number which is metal stamped on either the lever or the hub. **Only non-sparking levers can be used to retain the explosion-proof properties.**

MOUNTING DIMENSIONS

ROTARY



PLUNGER



MOORE PRODUCTS CO.

SPRING HOUSE, PA.

INSTRUCTIONS FOR THE INSTALLATION, OPERATION & MAINTENANCE OF THE MOORE F/R BOOSTER RELAY

MODEL 61H

Installation Dwg: 10342-1-N
Parts List Dwg: 10342-8

GENERAL INFORMATION

Designed to meet high-speed control applications, the Model 61H Relay produces a high volume boosting action. Although its primary purpose was for use with valve positioners, tests have shown that it can be used by itself for the high volume of air it can control.

The relay contains an integral stabilizing by-pass valve, eliminating the need for an externally piped by-pass. The by-pass opening is controlled by a screwdriver adjustment in the body of the relay. Opening this valve improves the stability of the positioner-relay-actuator circuit.

INSTALLATION

Refer to Installation Dwg. #10342-1-N which gives all necessary mounting dimensions. In conjunction with a valve positioner, the relay is connected to the output of the positioner. The air connections are 1/4" IPS. This same drawing contains a schematic diagram of the relay.

SUPPLY PRESSURE

Supply pressures up to 100 PSI can be used. In any case, the supply pressure must be 3 PSI above the maximum output pressure required.

The maximum input pressure is 100 PSI.

Ambient temperature limits are minus 40°F to plus 180°F.

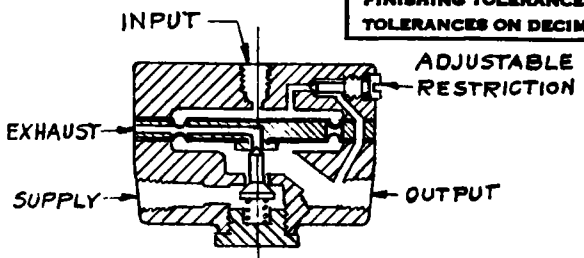
LUBRICATION

No lubrication of any sort is required.

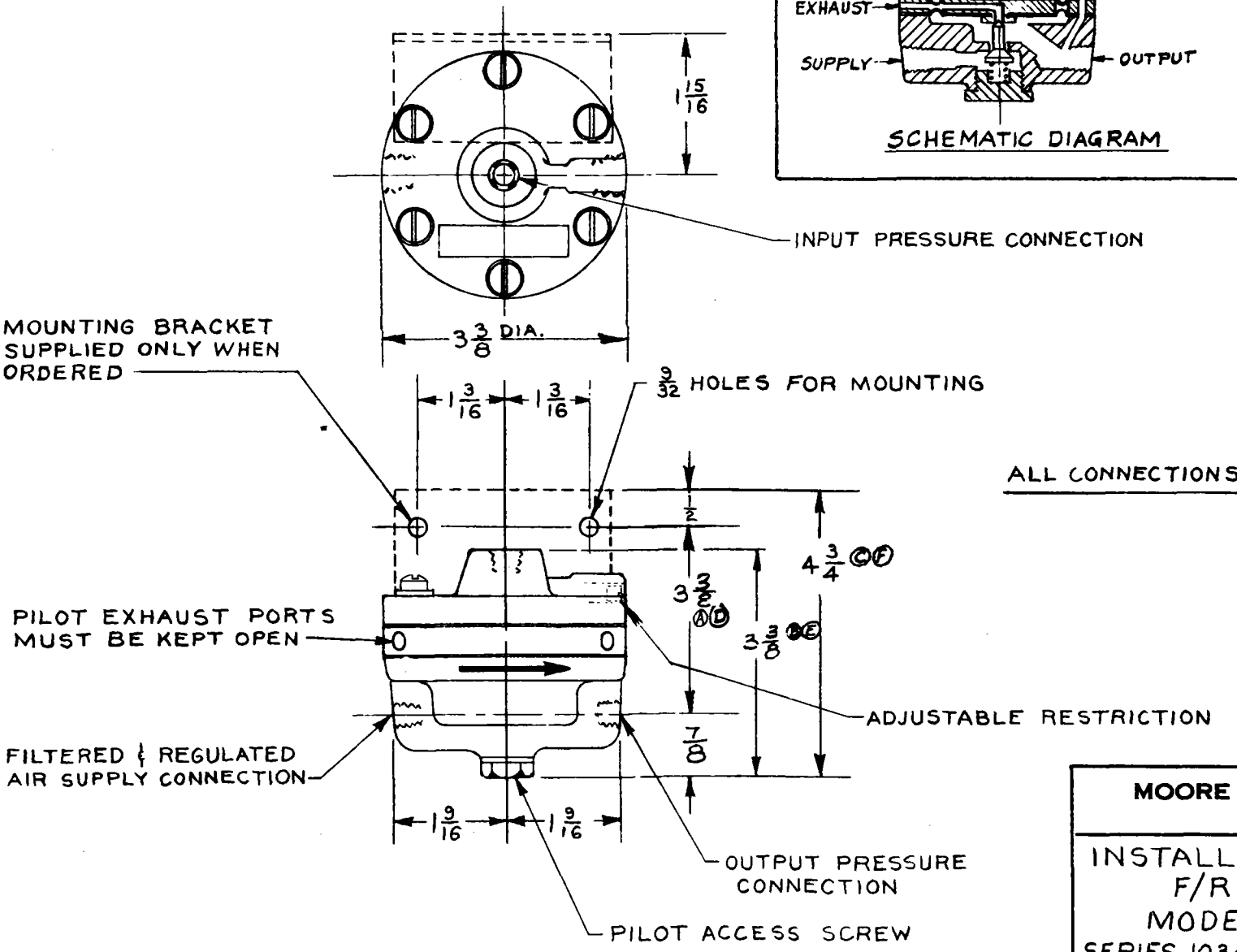
SD61H-1
Issue 6/24/69

FINISHING TOLERANCES ON FRACTIONAL DIM. ± 1/64
TOLERANCES ON DECIMAL DIMENSIONS ± .002

ISSUE No.	APP.
1. 9-10-56 SCHEMATIC ADDED	EXM
2. 9-17-56 REVISED EC 3911	DV
3. 4-28-58 SCHEMATIC SHOWED FLAT DIAPHRAGMS	DV
4. 12-4-58 (A) WAS 3 3/16 (B) WAS 3 5/8 (C) WAS 4 3/4 EC 4284	DV
5. 8-22-61 (D) WAS 2 3/4 (E) WAS 3 3/32 (F) WAS 4 1/8	EXM
6 6-22-62	DV



SCHEMATIC DIAGRAM



ALL CONNECTIONS ARE 1/4 I.P.S.

4.1.55-30

MOORE PRODUCTS CO.

INSTALLATION DRAWING F/R BOOSTER MODEL 61H

SERIES 10342S1 TO 10342S13 INCL.

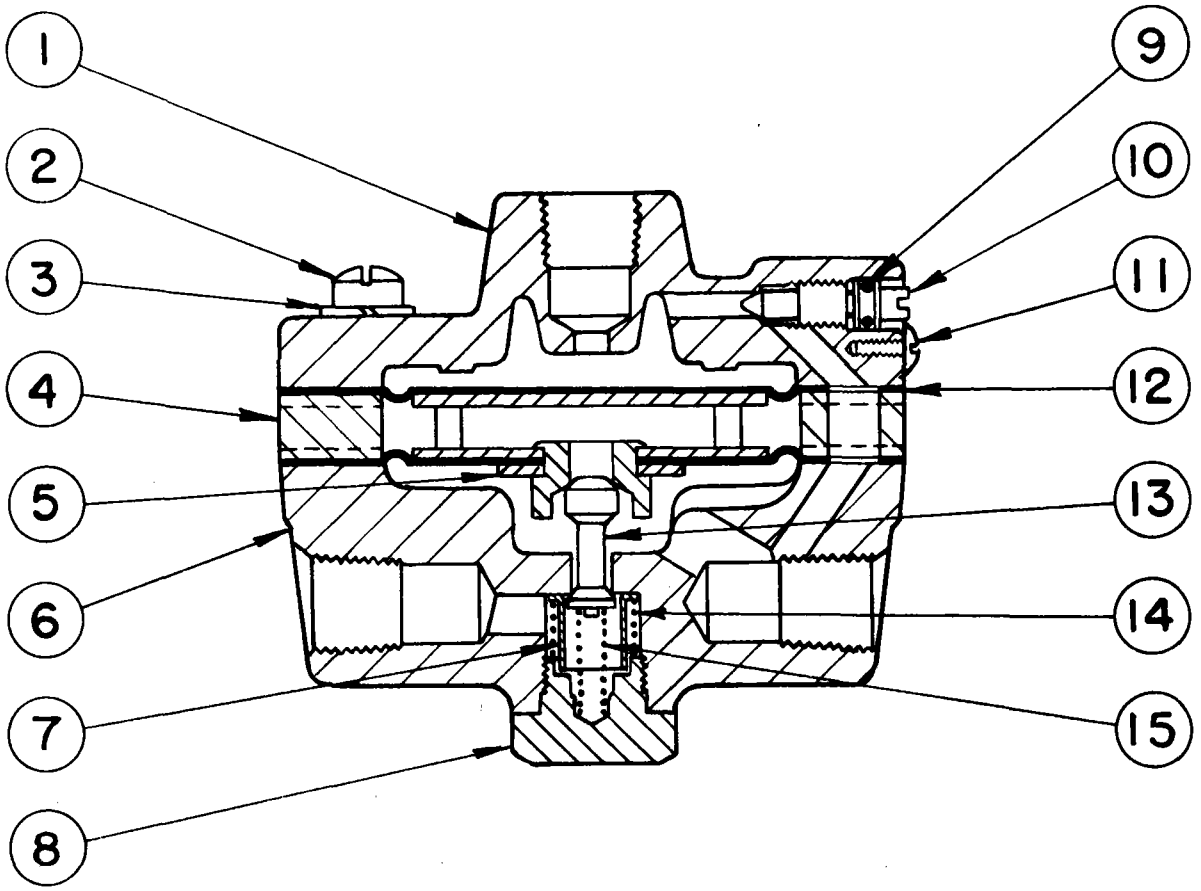
DR'N	CH'D	APP.	DWG. NO.
PH	RWS		10342-1-N
SCALE HALF	DATE 9-7-56		

MOORE PRODUCTS CO
SPRING HOUSE, PA.

PARTS LIST
MOORE F/R BOOSTER RELAY—MODEL 61H

From Drawing
No. 10342-8

B/M 10342515



Item No.	Part No.	Description	Req'd
1	10342-58	Top Housing	1
2	Screw	1/4-20 x 1 1/8" Lg. Fill. Hd. Stl. W.N.P.	6
3	Lockwasher	1/4" Stl. W.N.P.	6
4	8377-17	Exhaust Ring	1
* 5	10342-85	Diaphragm Assy.	1
6	10342-40	Bottom Forging Assy.	1
7	10342-27	Pilot Screen	1
8	10342-25	Retaining Screw	1
* 9	2938-21	"O" Ring	1
*10	10342-11	Restriction Screw	1
11	Screw	6-32 x 1/4" Lg. Truss Hd. Stl. W.N.P.	1
*12	10342-88	Diaphragm	1
*13	8377-70	Plunger	1
14	10342-26	Compression Spring	1
15	2881-11	Plunger Spring	1

* Recommended On-Hand Spare Parts. Always Specify Model and Serial Numbers of Instrument When Ordering Spare Parts.

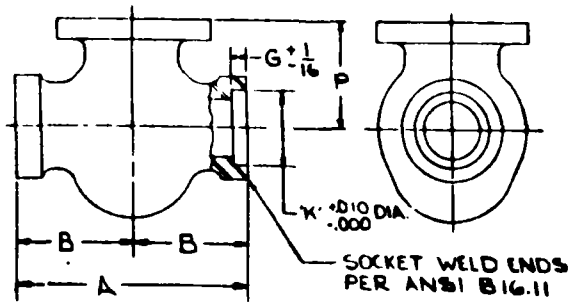
Printed in U. S. A.

6/69

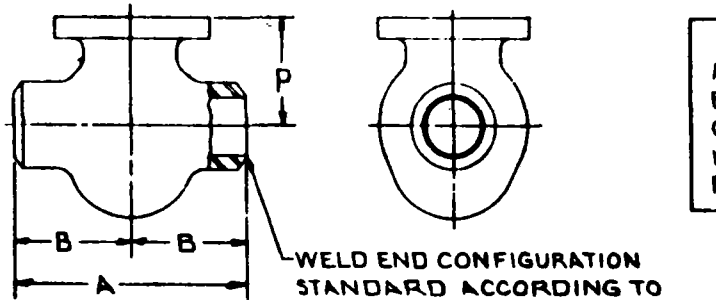
VALVE SIZE	150#, 300#, 400#, 600# & 900# PRESSURE STANDARDS					1500# PRESSURE STANDARD					2500# PRESSURE STANDARD				
	A	B	G	K	P	A	B	G	K	P	A	B	G	K	P
3/4	7 5/8	3 13/16	9/16	1.065	4 1/16	7 5/8	3 13/16	9/16	1.065	4 1/16	8 1/2	4 1/4	9/16	1.065	4 1/16
1	7 3/4	3 7/8	9/16	1.330	3 15/16	7 3/4	3 7/8	9/16	1.330	3 15/16	8 1/2	4 1/4	9/16	1.330	3 15/16
1 1/4	8 3/8	4 3/16	9/16	1.675	3 15/16	8 3/8	4 3/16	9/16	1.675	3 15/16	8 1/2	4 1/4	3/16	1.675	3 15/16
1 1/2	9 1/4	4 5/8	9/16	1.915	4 3/16	9 1/4	4 5/8	9/16	1.915	4 3/16	10 1/4	5 1/8	9/16	1.915	4 3/16
2	11 1/2	5 3/4	11/16	2.406	4 9/32	11 1/2	5 3/4	11/16	2.406	4 9/32	12 1/2	6 1/4	11/16	2.406	4 9/32
2 1/2	11 1/2	5 3/4	11/16	2.906	6 1/4	11 1/2	5 3/4	11/16	2.906	6 1/4	12 1/2	6 1/4	11/16	2.906	6 1/4
3	12 1/2	6 1/4	11/16	3.535	6 21/32	12 1/2	6 1/4	11/16	3.535	6 21/32	15	7 1/2	11/16	3.535	6 21/32
4	14 1/2	7 1/4			6 27/32	14 1/2	7 1/4			6 27/32	16	8			6 27/32
5	17	8 1/2			8 3/32	18 1/2	9 1/4			8 3/32	20	10			8 3/32
6	20	10			9 3/32	22	11			9 3/32	24	12			9 3/32
8	24	12			10 1/4	27	13 1/2			10 1/4	30	15			10 1/4
10	30	15			15	34	17			15	40	20			15
12	36	18			19	38	19			19	44	22			19

NOTE:

1. FOR THE FLANGED AND SCREWED END VALVE BODY DIMENSIONS SEE FORM 2671.



SOCKET WELD ENDS



BUTT WELD ENDS

KEY

A-FACE TO FACE
B-CENTER TO FACE
G-DEPTH OF SOCKET
K-DIAMETER OF SOCKET
P-CENTER TO BONNET FLANGE

NO.	DATE	REVISION	BY	CHK
4	10 12 71	CHANGED G & K DIM TO B16.11, ENG CHG. 5110	E.V	UFS
3	3 24 71	CHANGED 'G' & 'K' DIM. TO B16.5, ENG CHG. 5084	GRB	DGK
2	2 11 69	REMOVED 4" G & K DIMN. 9/16" & 4 9/16"; 12"-1500# A & B DIMN. WHERE 36 & 18 ENG CHG. 3535	NEM	
1	7 [illegible]	REMOVED 1500# FROM 150# THRU 300# COLUMN; ADDED 600# & 2500# COLUMNS, ENG CHG 3414	NEM	

MASTER ASS'Y | SUB ASS'Y

BLAW-KNOX COMPANY
COPES-VULCAN DIVISION
ERIE, PENNSYLVANIA

TABLES OF DIMENSIONS

VALVE BODIES

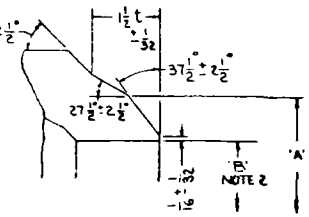
SOCKET AND BUTT WELD ENDS

DRAWN MATTSON DATE 11-29-62
CHECKED [illegible] DATE 1-11-63
APPR ____ DATE ____
JOB NO
SCALE ~
DWG. NO. L-82912 REV. 4

4.1.55-34

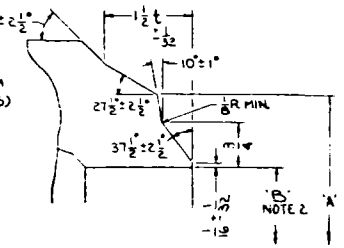
NOMINAL PIPE SIZE	SCHEDULE NO.	A TOL. SEE NOTE 4	B SEE NOTES 2 & 5	t NOTE 1	1 1/2 t
2 1/2	40	2 7/8	2.469	0.203	5/16
	80		2.323	0.276	7/16
	160		2.125	0.375	9/16
	XXS		1.771	0.552	7/8
3	40	3 19/32	3.068	0.216	3/8
	80		2.900	0.300	1/2
	160		2.624	0.438	11/16
	XXS		2.300	0.600	15/16
3 1/2	40	4	3.548	0.226	3/8
	80		3.364	0.318	1/2
4	40	4 5/8	4.026	0.237	3/8
	80		3.826	0.337	9/16
	120		3.624	0.438	11/16
	160		3.438	0.531	13/16
	XXS		3.152	0.674	1-1/16
5	40	5 11/16	5.047	0.258	7/16
	80		4.813	0.375	9/16
	120		4.563	0.500	3/4
	160		4.313	0.625	15/16
	XXS		4.063	0.750	1-1/8
6	40	6 25/32	6.065	0.280	7/16
	80		5.761	0.432	11/16
	120		5.501	0.562	7/8
	160		5.189	0.719	1-1/8
	XXS		4.897	0.864	1-5/16
8	40	8 25/32	7.981	0.322	1/2
	60		7.813	0.406	5/8
	80		7.625	0.500	3/4
	100		7.439	0.594	15/16
	120		7.189	0.719	1-1/8
	140		7.001	0.812	1-1/4
	XXS		6.875	0.875	1-5/16
	160		6.813	0.906	1-3/8
10	40	10 15/16	10.020	0.365	9/16
	60		9.750	0.500	3/4
	80		9.564	0.594	15/16
	100		9.314	0.719	1-1/8
	120		9.064	0.844	1-5/16
	140		8.750	1.000	1-1/2
	160		8.500	1.125	1-11/16
12	STD	12 31/32	12.000	0.375	9/16
	40		11.938	0.406	5/8
	XS		11.750	0.500	3/4
	60		11.626	0.562	7/8
	80		11.376	0.688	1-1/16
	100		11.064	0.844	1-5/16
	120		10.750	1.000	1-1/2
	140		10.500	1.125	1-11/16
	160		10.126	1.312	2
14	STD	14 1/4	13.250	0.375	9/16
	40		13.124	0.438	11/16
	XS		13.000	0.500	3/4
	60		12.814	0.594	15/16
	80		12.500	0.750	1-1/8
	100		12.126	0.938	1-7/16
	120		11.814	1.094	1-11/16
	140		11.500	1.250	1-7/8
	160		11.188	1.406	2-1/8

FIG. 1
(FIG. 2a FROM ANSI B16.25)



FOR WALL THICKNESS (t) 3/16 TO 7/8 IN. INCLUSIVE, OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

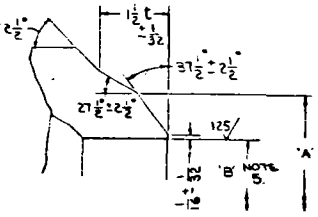
FIG. 2
(FIG 2b FROM ANSI B16.25)



FOR WALL THICKNESS (t) GREATER THAN 7/8 IN., OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

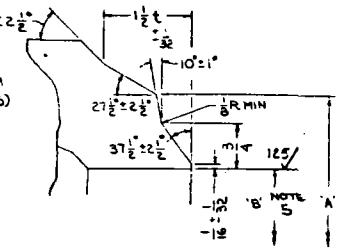
VALVE BODY BUTT WELD END DETAIL WHEN USING HYDRAULIC PRESS FOR HYDROSTATIC TEST

FIG. 3
(FIG. 2a FROM ANSI B16.25)



FOR WALL THICKNESS (t) 3/16 TO 7/8 IN. INCLUSIVE, OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

FIG. 4
(FIG. 2b FROM ANSI B16.25)



FOR WALL THICKNESS (t) GREATER THAN 7/8 IN., OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

NOTES:

1. t - NOMINAL WALL THICKNESS OF PIPE.
2. TOLERANCE FOR DIMENSION 'B' (RUBBER PLATES)
   10" VALVE SIZE AND SMALLER = ± 1/32
   12" VALVE SIZE AND LARGER = ± 1/16
3. 250 ALL MACHINED SURFACES EXCEPT WHERE NOTED.
4. TOLERANCE FOR DIMENSION 'A' (VALVES) =
   5" VALVE SIZE AND SMALLER + 3/32, - 1/32
   6" VALVE SIZE AND LARGER +5/32, - 1/32.
5. TOLERANCE FOR 'B' DIMENSION WHEN USING TEST PLUG IS
   0 - 3.999 DIA. + .002, -.000
   4.000 - 15.999 DIA. = +.003, -.000
   16.000 DIA. AND ABOVE +.004, -.000.

VALVE BODY BUTT WELD END DETAIL WHEN USING TEST PLATES FOR HYDROSTATIC TEST

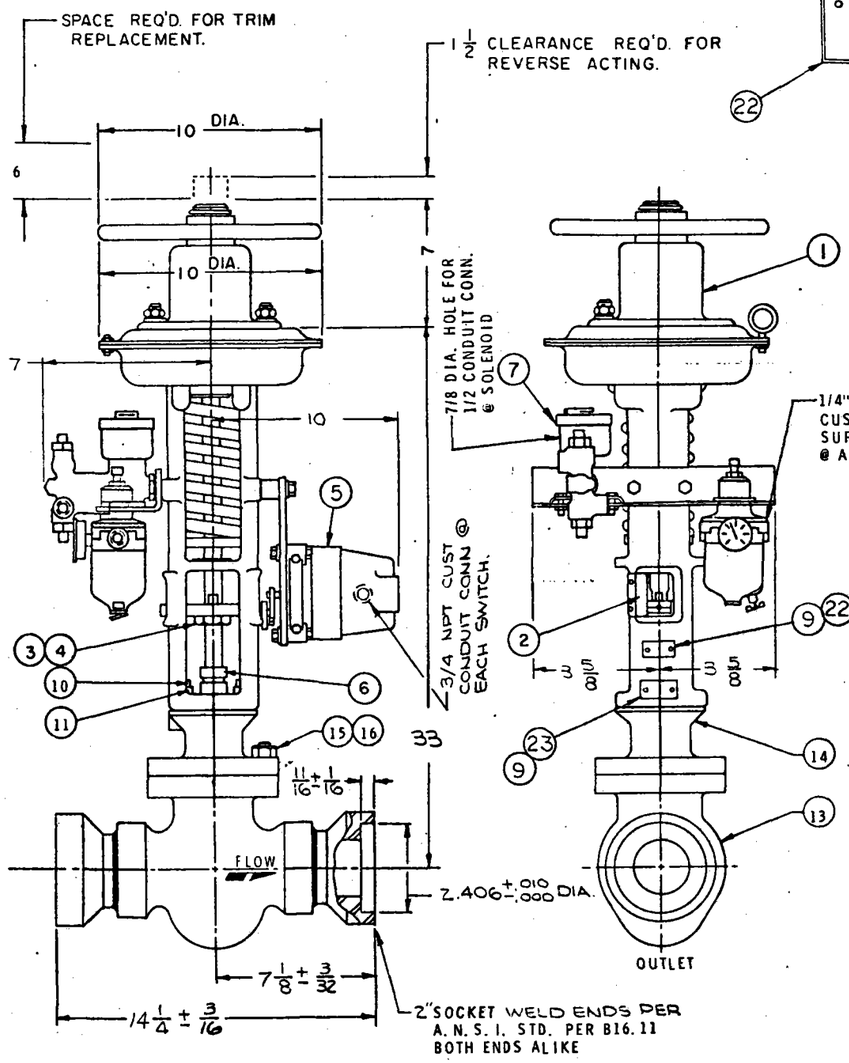
COPES-VULCAN, INC.

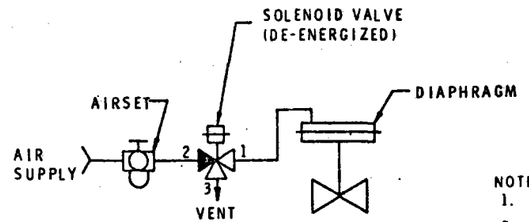
VALVE BODY
BUTT WELD END DETAILS
PER A.N.S.I. B16.25 & B16.5
FOR: WITHOUT BACKING RING OR WITH SPLIT BACKING RING

DRAWN ___ DATE ___ JOB ___
CHECKED ___ DAT ___
APPD ___ DATE ___ SCALE ___

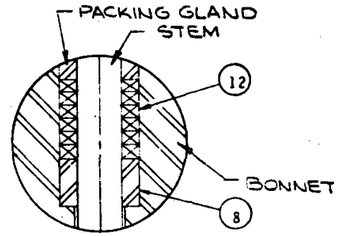
DWG NO B-147468 REV 4

4.1.55-35

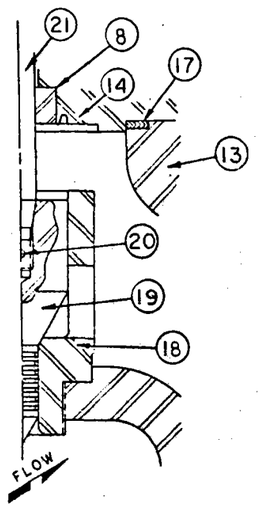




PIPING SCHEMATIC



STUFFING BOX DETAIL



TRIM DETAIL

COPES-VULCAN
ONE OF THE WHITE CONSOLIDATED INDUSTRIES INC.
STEARNS-ROGERS
PURCHASE ORDER _____
TAG NUMBER _____
SPECIAL TAG

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	169655-5	4	ACTUATOR ASSEMBLY			L-169655	SPRING P/N 168238
2	1	169554	3	INDICATOR PLATE	BRASS	ASTM-B36	S-169554	
3	1	1898	3	LOCKWASHER	STEEL	COM'L		1/2" DIA.
4	1	1894	3	JAM NUT	STEEL	COM'L		1/2"- 13 UNC.
5	1	195622	5	ACCESSORY KIT	MICRO SWITCH		L-195622	MOD. # 1CX42
6	1	168239	3	PACKING GLAND	CRES	ASTM-A479	M-168239	TYPE 410
7	1	195948	5	ACCESSORY KIT	CONOFLOW AIRSET, ASCO SOLENOID		L-195948	
8	2	193919	5	GUIDE BUSHING	CRES	ASTM-A276	S-193919	TYPE 420(MALCOMIZED)
9	4	64341	3	DRIVE SCREW	STEEL	COM'L		CAD. PLATED
10	2	41387	3	SOC. HD. CAP SCREW	STEEL	COM'L		1/2"-13UNC x 1" LG.
11	2	168242	3	HOLD DOWN CLAMP	STEEL	SAE-1015	S-168242	
*12	1	172418	3	PACKING SET	GRAPH-ASB	COM'L		
13	1	195627	5	VALVE BODY ASSEMBLY		NOTE -9	L-195627	
14	1	195949	5	BONNET	STEEL	ASTM-A217	L-195949	GR. WC9
15	4	172946-Q	2	BODY STUD	STEEL	ASTM-A193	L-168285	GR. B16
16	4	170599-Q	2	BODY NUT	STEEL	ASTM-A194	M-170423	GR. 4
*17	1	89790	3	BODY GASKET	ASB-SST	COM'L		
*18	1	———	—	CAGE	CRES	ASTM-A276	M-96200 MKD.	TYPE 420 (MALCOMIZED)
*19	1	———	—	PLUG	CRES	ASTM-A276	M-131048 MKD.	TYPE 420 (MALCOMIZED)
*20	1	96226	3	ROLL PIN	CRES	COM'L.		TYPE-420
*21	1	———	—	STEM	CRES	ASTM-A276	L-169976MKD	TYPE-316, COND. B
22	1	195618	5	SPECIAL TAG	CRES	COM'L	M-195618	TYPE 304
23	1	163704	3	TRIM NAME PLATE	CRES	ASTM-B36	M-163704	

NOTES:
1. FOR MAX. Cv 4.1 SET VALVE TRAVEL AT 1 +1 -⅛ INCHES.
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CVI PROC. 1.2.187.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CVI PART NO. 167395) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. MAXIMUM TEMPERATURE IS 950° F.
8. APPROXIMATE VALVE WEIGHT IS _____ LBS.
9. BODY MAT'L: STEEL ASTM-A217 GR. WC9
   REDUCER MAT'L: STEEL ASTM-A182 GR. F22

TAG NO. FV-1007
APPLICATION: ATOMIZING STEAM TO DESUPERHEATER

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	■
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	■
AIR LOCK VALVE	
LIMIT SWITCH (QTY. 2)	■
LUBRICATOR	
SOLENOID VALVE (QTY. 1)	■
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	■
BOOSTER RELAY	
REF: SK-DEG-9619-M	
PART CODE 6	

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

VALVE ASSEMBLY
1 1/2 CLASS 1500
MODEL D-100-40 ACTUATOR

DFTSMN T. S.	DATE 3-55	JOB NO. 8010-14896	
CHECKED K-H	DATE 1-1956	SCALE NONE	
APP'D L.R.S.	DATE 1-26-56	DWG. NO. E - 195526	REV. 1

DEPARTMENT OF ENERGY
STEARN-ROGERS PROJECT NO. C-21700
SOLAR ONE
P. O. NO. 5002C21700

NO.	DATE	REVISIONS	BY	CHK.
1	2-4-8	ITEM 8 WAS STELLITED G-B	FNK	AT

4.1.55-37

R[illegible] PROCESSING

ONTROL VALVE SPECIFICATIONS

COPES VULCAN

SHEET 1 of 1

*DATE 10-16-80

*NAME LRS

C.V.I. JOB NO. 8010 - 14896

Use med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen. * Indicates information Required to Process Order.

US [illegible]OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1. ITEM NO. 4 * QUANTITY 1
2. *TYPE D-100 DRAWING E-195626
3. *INLET PIPE 2" SCHED. 80 * OUTLET PIPE 2" SCHED. 80
4. TAGGING FV-1007
5. APPLICATION ATOMIZING STM TO DESUPERHTR DS-901

PE[illegible]ATING CONDITIONS

6. *Fluid — Water ☐ Steam ☑ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7.	*Max. Flow Condition	1300	380	90	954
8.	*Normal Flow Condition	—	—	—	—
9.	*Minimum Flow Condition	6	—	—	—
10.	*Shutoff Condition	—	600		

A[illegible]E BODY

11. *Size 1½" *ANSI Class 1500 ☑ Standard ☐ Special
12. *Material ☐ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☑ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13. *Style ☑ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☐ Butt Weld B16.25 Fig.
☑ Socket Weld B16.11 ☐ Other — See Notes:

A[illegible]E BONNET

15. *Type ☐ Standard ☑ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16. Packing ☑ Graph Asb. ☐ Teflon Asb. ☐ Other
☑ Malcomized
17. *Material ☐ Hardened 410 S.S. ☑ Hardened 420 S.S. ☐ Special
18. *Type ☑ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other
19. Characteristic ☐ Mod. Parabolic ☐ Quick Open ☐ Special
☑ Cascade ☐ Mod. Equal %
20. Cv Factor Required by Specs. 3.6

A[illegible]E ACTUATOR

21. *Type ☑ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22. *Model D-100-40
23. *Action ☐ Spring Opening ☑ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

C[illegible]SSORIES

25. *Handwheel ☑ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ☑ No
27. *Limit Switches Mfr. MICRO Type 1CX-A2 Qty. 2
28. *Solenoid Valve Mfr. ASCO Type HB8302A81F Qty. 1
29. *Booster Relay Mfr. — Type Qty.
30. *E/P Transducer Mfr. — Type Qty.

P[illegible]TIONER

31. *Mfr. NONE Type
32. *Accessories ☐ By-Pass ☐ Gauges
33. *Input Range ☐ 3-15 ☐ Others - (Specify)
34. *Action ☐ Direct ☐ Reverse
35. *Air Set ☑ Yes ☐ No *Gauges ☑ Yes ☐ No Qty.

SPECIAL REQUIREMENTS

36. *X-ray ASME ☐ ☐ Other - (Specify)
37. *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
39. *"N" Stamp ☐ Yes ☑ No Class ☐ 1 ☐ 2 ☐ 3
40. *Noise Limit ☑ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.

*Type ☐ Press. ☐ Temp.

☐ Other (Specify)

*Control Form: ☐ Prop ☑ Prop. + Reset

☐ Prop. + External Reset

*Scale Range

*Output Range

☐ 3-15 Psi ☐ Other (Specify)

*Capillary Length

*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS 600 PSIA @ 960°F
2. BODY & BONNET MATERIAL - ASTM A217 GRADE WC9
3. SWAGELOK FLARELESS FITTINGS REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.
4. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976.
5. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL
6. HYDRO SHELL TEST PER ANSI B16.34
7. INLET REDUCER AND OUTLET EXPANDER REQ'D - 1½" x 2" W/ 2" END HAVING SOCKET WELD CONNECTION - MATERIAL ASTM A185 - P22
8. STEEL FRAME & YOKE REQ'D.
9. REDUCER & EXPANDER TO BODY WELD REQUIRE LP INSPECTION
10. Cv REQ'D BY SPEC. REFLECTS ADDITION OF 25% REQUIREMENT.
11. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO AND SEAT LEAKAGE TESTS.
12. S.S. IDENT TAGS REQ'D.

TO BE COMPLETED BY C.V.I. ENGINEERING

Actuator Spring: 168238

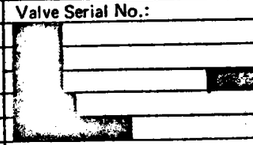
Precompression (No Valve Pressure) Psi: 14 PSIG

Air to Full Travel (No Valve Pressure) Psi: 80 PSIG

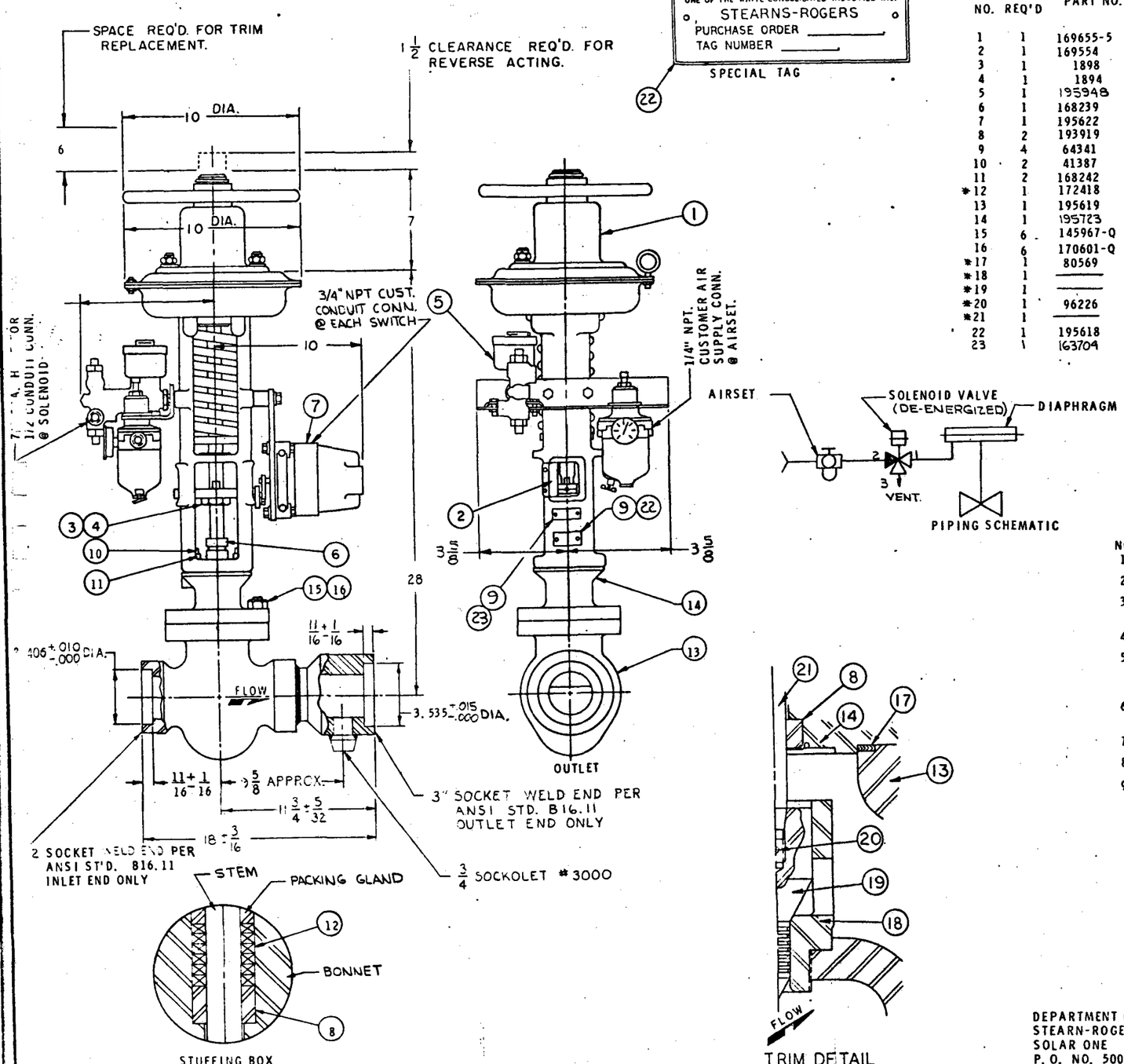
Trim Size: # 8 CASCADE Travel: 1" ± 1/8"

Max. Cv of Trim: 4.1 @ 1" ± 1/8" TRAVEL

Valve Serial No.:



COPES-VULCAN
ONE OF THE WHITE CONSOLIDATED INDUSTIES INC.
STEARNS-ROGERS
PURCHASE ORDER _____
TAG NUMBER _____



STUFFING BOX DETAIL

TRIM DETAIL

PIPING SCHEMATIC

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	169655-5	4	ACTUATOR ASSEMBLY			L-169655	SPRING P/N 168238
2	1	169554	3	INDICATOR PLATE	BRASS	ASTM-B36	S-169554	
3	1	1898	3	LOCKWASHER	STEEL	COM'L		1/2" DIA.
4	1	1894	3	JAM NUT	STEEL	COM'L		1/2"-13 UNC.
5	1	195948	5	ACCESSORY KIT	AIRSET & ASCO SOLENOID		L-195948	
6	1	168239	3	PACKING GLAND	CRES	ASTM-A479	M-168239	TYPE-410
7	1	195622	5	ACCESSORY KIT	MICRO SWITCHES		L-195622	MOD. # 1CX42
8	2	193919	5	GUIDE BUSHING	CRES	ASTM-A276	S-193919	TYPE 420 (MALCOMIZED)
9	4	64341	3	DRIVE SCREW	STEEL	COM'L		CAD. PLATED
10	2	41387	3	SOC. HD. CAP SCREW	STEEL	COM'L		1/2"-13 x 1" LG.
11	2	168242	3	HOLD DOWN CLAMP	STEEL	SAE-1015	S-168242	
*12	1	172418	3	PACKING SET	GRAPH-ASB	COM'L		CRANE 1871
13	1	195619	5	VALVE BODY ASS'Y.		NOTE - 10	L-195619	
14	1	195723	5	BONNET	STEEL	ASTM-A 217	L-195723	GR. WC9
15	6	145967-Q	2	BODY STUD	STEEL	ASTM-A193	L-168285	GR. 16
16	6	170601-Q	2	BODY NUT	STEEL	ASTM-A194	M-170423	GR. A
*17	1	80569	3	BODY GASKET	ASB-SST	COM'L		
*18	1	———	—	CAGE	CRES	ASTM-A 276	M-175360 MKD.	TYPE 420 (MALCOMIZED)
*19	1	———	—	PLUG	CRES	ASTM-A 276	M-175350 MKD.	TYPE 420 (MALCOMIZED)
*20	1	96226	3	ROLL PIN	CRES	ASTM-A276		TYPE-420
*21	1	———	—	STEM	CRES	ASTM-A276	L-169976 MKD.	TYPE-316, COND. B
22	1	195618	5	SPECIAL TAG	CRES	COM'L	M-195618	TYPE-304
23	1	163704	3	TRIM NAME PLATE	BRASS	ASTM-B36	M-163704	

NOTES :
1. FOR MAX. Cv 2.9 SET VALVE TRAVEL AT 1 1/8 INCHES.
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED. 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CVI PROC. 1.2.187.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CVI PART NO. 167395___) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. MAXIMUM TEMPERATURE IS 950° F.
8. APPROXIMATE VALVE WEIGHT IS _____ LBS.
9. BODY MAT'L.: STEEL, ASTM-A217, GR. WC9
   REDUCER MAT'L.: STEEL, ASTM-A182, GR.F11 .

DEPARTMENT OF ENERGY
STEARN-ROGERS PROJECT NO. C-21700
SOLAR ONE
P. O. NO. 5002C21700

TAG NO. FV-1006
APPLICATION: ATOMIZING STEAM TO DESUPERHEATER

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	■
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	■
AIR LOCK VALVE	
LIMIT SWITCH (QTY. 2)	■
LUBRICATOR	
SOLENOID VALVE (QTY. 1)	■
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	■
BOOSTER RELAY	
PART CODE -6	

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

VALVE ASSEMBLY
2 CLASS 2500
MODEL D-100-40 ACTUATOR

DFTSMN T.S. DATE 11-5-
CHECKED J.C.H. DATE 11-5-
APP'D L.B.S. DATE 11-20-
JOB NO. S010-14896
SCALE NONE

DWG. NO. E - 195621 REV. 1

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.
1	1-55	ADD 3 PC SHIPPING REVISED BONNET END & INCREASED END TO CVI PART ITEM 9 WAS HANDLES GB STELLITE.	GSC	DHW															

4.1.55-39

RD R PROCESSING

ONTROL VALVE SPECIFICATIONS

L med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
* Indicates information Required to Process Order.

COPES VULCAN

SHEET 1 of 1

*DATE 10-16-80
*NAME LRS
C.V.I. JOB NO. 8010-14896

US OMER STEARN-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1. ITEM NO. 3 *QUANTITY 1
2 *TYPE D-100 DRAWING E-195621
3 *INLET PIPE 2" SCHED. 160 *OUTLET PIPE 3" SCHED. 160
4. TAGGING FV-1006
5 APPLICATION ATOMIZING STM TO DESUPERHTR DS-901

PE ATING CONDITIONS

6. *Fluid – Water ☐ Steam ☑ Gas ☐ Oil ☐ Other ☐

	Units	Flow	PPH	Inlet P1	PS/A	Outlet P2	PSIA	Temp.	°F
7	*Max. Flow Condition	4040		1465		170		950	
8.	*Normal Flow Condition	—		—		—		—	
9.	*Minimum Flow Condition	0		—		—		—	
10	*Shutoff Condition	—		1780					

A E BODY

11. *Size 2 *ANSI Class 2500 ☑ Standard ☐ Special
12 *Material ☐ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ② ☑ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13. *Style ☑ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☐ Butt Weld B16.25 Fig.
☑ Socket Weld B16.11 ☐ Other – See Notes:

A E BONNET

15. *Type ☐ Standard ☑ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16 Packing ☑ Graph Asb. ☐ Teflon Asb. ☐ Other
R ☑ Malcomized
17. *Material ☐ Hardened 410 S.S. ☑ Hardened 420 S.S. ☐ Special
18. *Type ☑ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other
1 Characteristic ☐ Mod. Parabolic ☐ Quick Open ☐ Special
☑ Cascade ☐ Mod. Equal %
2 Cv Factor Required by Specs. 2.78

A E ACTUATOR

21. *Type ☑ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22 *Model D-100-40
2 *Action ☐ Spring Opening ☑ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

C SSORIES

2 *Handwheel ☑ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ☑ No
27. *Limit Switches Mfr. MICRO Type ICX-42 Qty. 2
2 *Solenoid Valve Mfr. ASCO Type Qty.
2 *Booster Relay Mfr. — Type Qty.
30. *E/P Transducer Mfr. — Type Qty.

O TIONER

3 *Mfr. NONE Type
32. *Accessories ☐ By-Pass ☐ Gauges
3 *Input Range ☐ 3-15 ☐ Others - (Specify)
3 *Action ☐ Direct ☐ Reverse
3 *Air Set ☑ Yes ☐ No *Gauges ☑ Yes ☐ No Qty.

PECIAL REQUIREMENTS

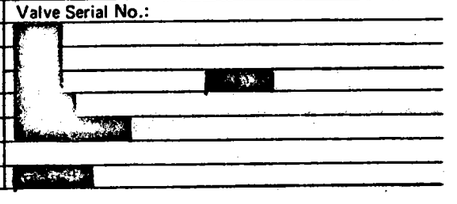
3 *X-ray ASME ☐ ☐ Other - (Specify)
3 *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
3 *"N" Stamp ☐ Yes ☑ No Class ☐ 1 ☐ 2 ☐ 3
4 *Noise Limit ☑ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ☑ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:
1. DESIGN PRESS 1780 PSIA @ 1010°F
2. BODY AND BONNET MATERIAL: ASTM A217 GRADE WC9
3. SWAGELOK FLARELESS FITTING REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING
4. TIGHT SHUT OFF CLASS IV-LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA 1.2.4 OF ANSI B16.34-1976
5. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
6. HYDRO SHELL TEST PER ANSI B16.34
7. EXPANDER REQ'D ON OUTLET - 2" x 3" SCH 160 ASTM A182-F11
8. STEEL FRAME & YOKE REQ'D
9. EXPANDER TO BODY WELD REQUIRES LP INSPECTION. EXPANDER SHALL HAVE SOCKET WELD END ON 3" END
10. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.
11. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO AND SEAT LEAKAGE TESTS.
12. S.S. IDENT TAG REQ'D.
13. VOLUME TANK REQ'D. FOR .8 SEC. STROKE TIME TO OPEN.
14. 3/4", 3000# SOC-O-LET REQ'D.

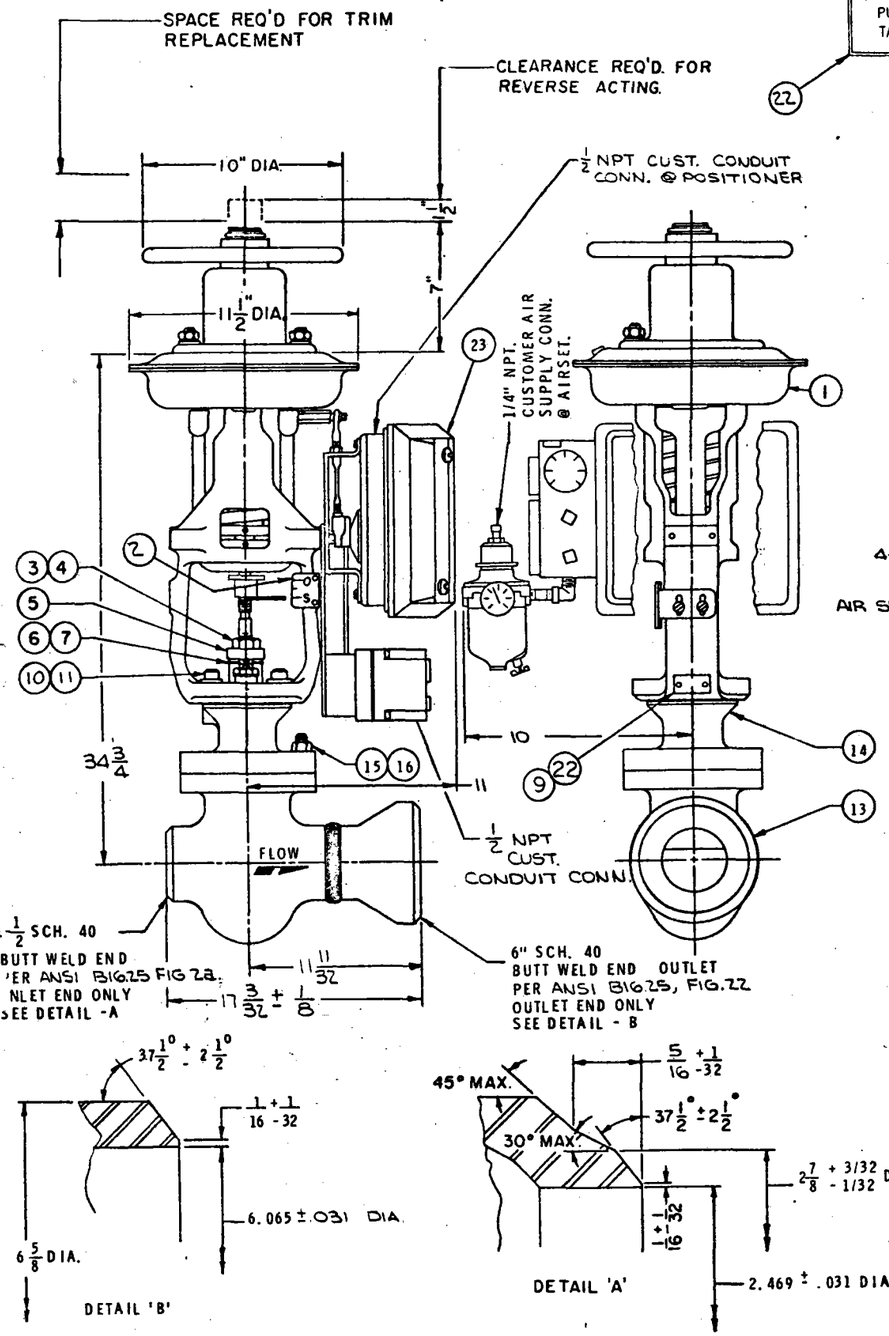
TO BE COMPLETED BY C.V.I. ENGINEERING

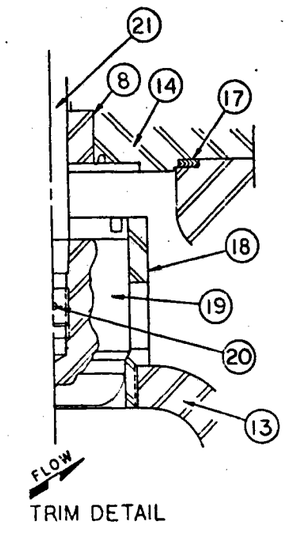
Actuator Spring: 16823B
Precompression (No Valve Pressure) Psi: 14 PSIG
Air to Full Travel (No Valve Pressure) Psi: 80 PSIG
Trim Size: #7 CASCADE Travel: 1" ± 1/8"
Max. Cv of Trim: 2.9 @ 1" ± 1/8"
Valve Serial No.:



Form No. 705176 R-2
Rev. 1/17/77

4.1.55-40





LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS	DWG. NO.	REMARKS
1	1	136416-5	4	ACTUATOR ASSEMBLY			L-136416	SPRING P/N 130905
2	1	78625	3	INDICATOR PLATE	BRASS	ASTM-B36	S-78625	
3	2	137477	3	STUD	STEEL	SAE-4140	S-137477	5/8-11 x 3 3/4 LG.
4	2	1923	3	HEX NUT	STEEL	COM'L		5/8 - 11
5	1	137236	3	GLAND FOLLOWER	STEEL	COM'L	M-137236	
6	1	137604	3	PACKING GLAND	CRES	ASTM - A479	S-137604	TYPE - 410
7	1	18263	3	SNAP RING	STEEL	COM'L		
8	2	169762 - G	3	GUIDE BUSHING	CRES	ASTM - A479	S-169762	TYPE - 410
9	2	64341	3	DRIVE SCREW	STEEL	COM'L		CAD PLATED
10	4	137776	3	SOC. HD. CAP SCREW	STEEL	COM'L.		5/8 - 11 x 1 1/8 LG.
11	2	137475	3	HOLD DOWN CLAMP	STEEL	SAE - 1015	S-137476	
* 12	1	172419	3	PACKING SET	GRAPH - ASB	COM'L		
13	1	195762	5	VALVE BODY ASSEMBLY		NOTE - 9	L-195762	
14	1	82001	3	BONNET	STEEL	ASTM - A 217	L-81999	GR. WC9
15	6	84138	3	BODY STUD	STEEL	ASTM - A193	L-168285	GR. B7
16	6	90369	3	BODY NUT	STEEL	ASTM - A194	M-170423	GR. 2H
* 17	1	80568	3	BODY GASKET	ASB-SST	COM'L		
* 18	1	160010-G	5	CAGE	CRES	ASTM - A479	M-160010	TYPE 410
* 19	1	139725-G	3	PLUG	CRES	ASTM - A 479	M-139725	TYPE 410
* 20	1	96227	3	ROLL PIN	CRES	COM'L.		TYPE - 420
* 21	1	———	—	STEM	CRES	ASTM - A276	L-168281 MKD	TYPE - 316, COND. B
22	1	195618	5	SPECIAL TAG	CRES	COM'L.	M-195618	TYPE - 304
23	1	195933	5	ACCESSORY KIT		NOTE-10	E-195933	

NOTES:

1. FOR MAX. Cv 17.4 SET VALVE TRAVEL AT 1" $^{+1}_{-\frac{1}{8}}$ INCH.
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CVI PROC. 1.2.187.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CVI PART NO. 75514) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES, AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. MAXIMUM FLUID TEMPERATURE IS 660° F.
8. APPROXIMATE TOTAL VALVE WEIGHT IS _____ LBS.
9. BODY MAT'L: STEEL, ASTM-A217 GR. WC9
   REDUCER MAT'L.: STEEL ASTM-A182 GR. F22.
10. ACCESSORY KIT ITEM # 23 CONSISTS OF:
    BAILEY AP-5 POSITIONER CONOFLOW
    FH60-XT-K1 AIRSET, L.V.D.T.
    POSITION TRANSMITTER.

TAG NO. PV-647B.

APPLICATION: RS FLASH TK TO DEAERATOR

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	■
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	■
AIR LOCK VALVE	
LIMIT SWITCH	
LUBRICATOR	
SOLENOID VALVE	
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	■
BOOSTER RELAY	
POSITIONER TRANSMITTER	■
PART CODE - 6	

COPES-VULCAN, INC.
A Unit of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA. U.S.A.

VALVE ASSEMBLY
2½ CLASS 900
MODEL D-100-60 ACTUATOR

DFTSMN T.S. DATE 1-5-82 JOB NO. S010-14896
CHECKED [illegible] DATE 2-2-82 SCALE NONE
APPD. [illegible] DATE [illegible]

DWG. NO. E-195761 REV. 1

DEPARTMENT OF ENERGY
STEARN-ROGERS PROJECT NO. C-21700
SOLAR ONE
P. O. NO. 5002C21700

NO.	DATE	REVISIONS	BY	CHK.
	2-2-82	COMPLETED NOTE-1	T.F.M.	GG.

4.1.55-41

RD_R PROCESSING

ON^ROL VALVE SPECIFICATIONS

Use med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
* Indicates information Required to Process Order.

COPES VULCAN

SHEET 1 of 1
*DATE 10-16-80
*NAME LRS
C.V.I. JOB NO. 8010-14896

US)MER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1. ITEM NO. 12 * QUANTITY 1
2. *TYPE D-100 DRAWING E-195761
3. 'INLET PIPE 2½" SCHED. 40 * OUTLET PIPE 6" SCHED. 40
4. TAGGING PV-647B
5. APPLICATION RS FLASH TK TO DEAERATOR

PE ATING CONDITIONS

6. *Fluid – Water ☐ Steam ☑ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P_1 PSIA	Outlet P_2 PSIA	Temp. °F
7	*Max. Flow Condition	6285	375	50	585
8.	*Normal Flow Condition	6285	375	50	660
9.	*Minimum Flow Condition	800	380	20	439
10	*Shutoff Condition	–	360		

AL E BODY

11. *Size 2½" *ANSI Class 900 ☑ Standard ☐ Special
12. *Material ☐ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☑ Other (See Notes) ③
☐ A105 ☐ F304 ☐ F316
13. *Style ☑ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☑ Butt Weld B16.25 Fig.
☐ Socket Weld B16.11 ☐ Other – See Notes:

AL E BONNET

15. *Type ☐ Standard ☑ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16 Packing ☑ Graph Asb. ☐ Teflon Asb. ☐ Other

RI ☐ Malcomized

17. *Material ☑ Hardened 410 S.S. ☐ Hardened 420 S.S. ☐ Special
18. *Type ☑ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other
19. Characteristic ☑ Mod. Parabolic ☐ Quick Open ☐ Special
☐ Cascade ☐ Mod. Equal %
20 Cv Factor Required by Specs. 15.3

AI E ACTUATOR

21. *Type ☑ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22 *Model D-100-60
23 *Action ☐ Spring Opening ☑ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

CI SSORIES

25 *Handwheel ☑ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ☑ No
27 *Limit Switches Mfr. — Type Qty.
28 *Solenoid Valve Mfr. — Type Qty.
29. *Booster Relay Mfr. — Type Qty.
30. POSITION TRANSMITTER C-V Type LVDT Qty. 1

DS TIONER

31 *Mfr. BAILEY Type APS
32. *Accessories ☐ By-Pass ☑ Gauges
33 *Input Range ☐ 3-15 ☑ Others - (Specify) 4-20 ma
34 *Action ☑ Direct ☐ Reverse
35. *Air Set ☑ Yes ☐ No *Gauges ☑ Yes ☐ No Qty. 1

PECIAL REQUIREMENTS

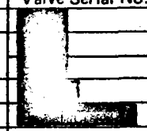
36 *X-ray ASME ☐ ☐ Other - (Specify)
37 *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
39 *"N" Stamp ☐ Yes ☑ No Class ☐ 1 ☐ 2 ☐ 3
40 *Noise Limit ☑ Yes ☐ No 90 DBA at 5 Feet

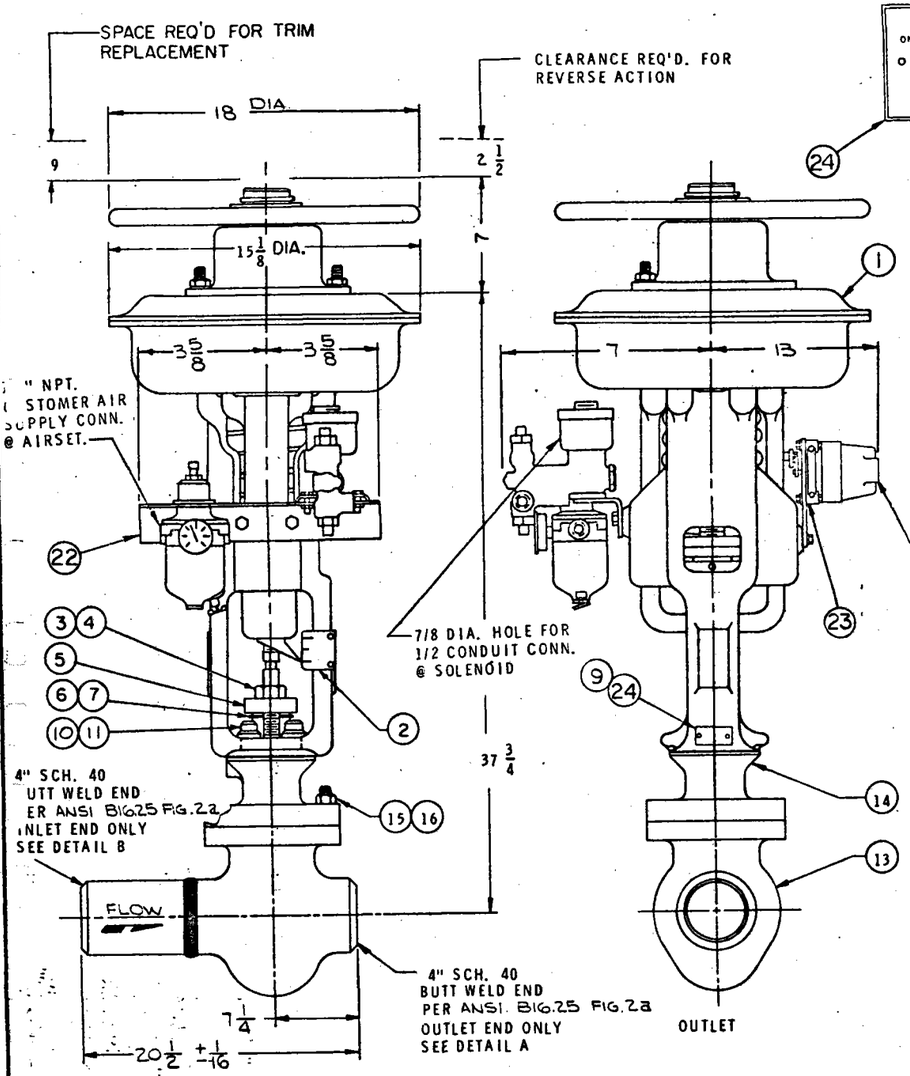
Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ☑ Prop. + Reset
☐ Prop + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:
1. DESIGN PRESS. 600 PSIA @ 960°F
2. BODY & BONNET MATERIAL: ASTM A217 GRADE WC9
3. SWAGELOK FLAREGLESS FITTINGS REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.
4. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976
5. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
6. HYDRO SHELL TEST PER ANSI B16.34
7. ALLOY OUTLET EXPANDER REQ'D. 2½" x 6" - MAT'L ASTM A182 GR. F22
8. STEEL FRAME & YOKE REQ'D.
9. ALLOY EXPANDER TO ALLOY BODY WELDING REQUIRES RADIOGRAPHIC INSPECTION.
10. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT
11. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO & SEAT LEAKAGE TESTS.
12. S.S. IDENT TAG REQ'D.

TO BE COMPLETED BY C.V.I. ENGINEERING

Actuator Spring: 130905
Precompression (No Valve Pressure) Psi: 22 PSIG
Air to Full Travel (No Valve Pressure) Psi: 80 PSIG
Trim Size: 1" Travel: 1" ± 1/8"
Max. Cv of Trim: 17.4 @ 1" ± 1/8" TRAVEL
Valve Serial No.:





LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	136417-5	4	ACTUATOR ASSEMBLY			L-136417	SPRING P/N 130906
2	1	81640	3	INDICATOR PLATE	BRASS	ASTM-B36	S-81640	
3	2	137477	3	STUD	STEEL	SAE-4140	S-137477	5/8-11 x 3 3/4 LG.
4	2	1923	3	HEX NUT	STEEL	COM'L		5/8 - 11
5	1	137236	3	GLAND FOLLOWER	STEEL	COM'L	M-137236	
6	1	137604	3	PACKING GLAND	CRES	ASTM-A479	S-137604	TYPE - 410
7	1	18263	3	SNAP RING	STEEL	COM'L		
8	1	169762-G	3	GUIDE BUSHING	CRES	ASTM-A479	S-169762	TYPE - 410
9	2	64341	3	DRIVE SCREW	STEEL	COM'L		CAD. PLATED
10	4	137776	3	SOC. HD. CAP SCREW	STEEL	COM'L.		5/8-11 x 1 1/8 LG.
11	2	137475	3	HOLD DOWN CLAMP	STEEL	SAE-1015	S-137475	
* 12	1	137596	3	PACKING SET	GRAPH-ASB	COM'L		CRANE 2 CRJ
13	1	195616	5	VALVE BODY ASS'Y.	NOTE - 9		L-195616	
14	1	81932	3	BONNET	STEEL	ASTM-A217	L-81930	GR. WC9
15	4	84146	3	BODY STUD	STEEL	ASTM-A193	L-168285	GR. B7
16	4	90313	3	BODY NUT	STEEL	ASTM-A194	M-170423	GR. 2H
* 17	1	79784	3	BODY GASKET	ASB-SST	COM'L		
* 18	1	187226-G	3	CAGE	CRES	ASTM-A479	M-187226	TYPE - 410
* 19	1	188986-G	3	PLUG	CRES	ASTM-A479	M-188986	TYPE - 410
* 20	1	96227	3	ROLL PIN	CRES	COM'L.		TYPE-420
* 21	1	170537	3	STEM	CRES	ASTM-A276	L-168282	TYPE-316, COND. B
22	1	195948	5	ACCESSORY KIT- CONOFLOW AIRSET, ASCO SOLENOID, L-195948				
23	1	190313	5	ACCESSORY KIT	MICRO SWITCHES		L-190313	MOD. #1CX-42
24	1	195618	5	SPECIAL TAG	CRES	COM'L.	M-195618	TYPE-304

NOTES:

1. FOR MAX. Cv 190 SET VALVE TRAVEL AT 2" ± 1/8 INCH.
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CVI PROC. 1.2.187.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CVI PART NO. 80811) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES, AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. MAXIMUM FLUID TEMPERATURE IS 460° F.
8. APPROXIMATE TOTAL VALVE WEIGHT IS _____ LBS.
9. BODY MAT'L.: ASTM-A217, GR. WC9
   NIPPLE MAT'L.: ASTM-A106, GR. B

TAG NO. AOV-1008
APPLICATION: ADMISSION STEAM TO DESUPERHEATER

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	■
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	
AIR LOCK VALVE	
LIMIT SWITCH (QTY. 2)	■
LUBRICATOR	
SOLENOID VALVE (QTY. 1)	■
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	■
BOOSTER RELAY	
PART CODE - 6	

DEPARTMENT OF ENERGY
STEARN-ROGERS PROJECT NO. C-21700
SOLAR ONE
P. O. NO. 5002C21700

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

VALVE ASSEMBLY
4 CLASS 300
MODEL D-100-100 ACTUATOR

DFTSMN TS DATE 12-15-83 JOB NO. 8010-14896
CHECKED KPH DATE 12-15-83 SCALE NONE
APP'D LRS DATE 12-15-83

DWG. NO. E-195617 REV. 0

NO.	DATE	REVISIONS	BY	CHK.

4.1.55-43

RD R PROCESSING

ONTROL VALVE SPECIFICATIONS

U med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
Indicates information Required to Process Order.

COPES VULCAN

SHEET 1 of 1
*DATE 10-16-80
*NAME LRS
C.V.I. JOB NO. 8010-14896

US OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1. ITEM NO. 1 *QUANTITY 1
2. *TYPE D-100 DRAWING E-195617
3. *INLET PIPE 4" SCHED. 40 *OUTLET PIPE 4" SCHED. 40
4. TAGGING AOV-1008
5. APPLICATION ADMISSION STEAM TO DESUPERHEATER

PE ATING CONDITIONS

6. *Fluid – Water ☐ Steam ☑ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7.	*Max. Flow Condition	3765	72	70	460
8.	*Normal Flow Condition	3765	72	70	460
9.	*Minimum Flow Condition	0	72	70	460°
10	*Shutoff Condition	–	75		

AI E BODY

11. *Size 1" *ANSI Class 300 ☑ Standard ☐ Special
12. *Material ☐ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ② ☑ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13. *Style ☑ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☑ Butt Weld B16.25 Fig.
☐ Socket Weld B16.11 ☐ Other – See Notes:

AI E BONNET

15. *Type ☑ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16 Packing ☑ Graph Asb. ☐ Teflon Asb. ☐ Other
RI ☐ Malcomized
17. *Material ☑ Hardened 410 S.S. ☐ Hardened 420 S.S. ☐ Special
18. *Type ☑ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other
19 Characteristic ☐ Mod. Parabolic ☑ Quick Open ☐ Special
☐ Cascade ☐ Mod. Equal %
20 Cv Factor Required by Specs. 145.6

AI E ACTUATOR

21. *Type ☑ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22. *Model D-100-100
23 *Action ☐ Spring Opening ☑ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

CC SSORIES

25 *Handwheel ☑ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ☑ No
27 *Limit Switches Mfr. MICRO Type ICX-42 Qty. 2
28 *Solenoid Valve Mfr. ASCO Type HB8302A81F Qty. 1
29. *Booster Relay Mfr. — Type Qty.
30. *E/P Transducer Mfr. — Type Qty.

PS TIONER

31 *Mfr. NONE Type
32. *Accessories ☐ By-Pass ☐ Gauges
33 *Input Range ☐ 3-15 ☐ Others - (Specify)
34 *Action ☐ Direct ☐ Reverse
35. *Air Set ☑ Yes ☐ No *Gauges ☑ Yes ☐ No Qty. 1

PECIAL REQUIREMENTS

36 *X-ray ASME ☐ ☐ Other - (Specify)
37 *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
39 *"N" Stamp ☐ Yes ☑ No Class ☐ 1 ☐ 2 ☐ 3
40 *Noise Limit ☑ Yes ☐ No 90 DBA at 5 Feet

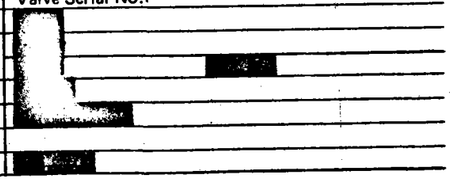
Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ☑ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS 90 PSIA @ 860°F.
2. BODY & BONNET MATERIAL: ASTM A217 GRADE WC9
3. SWAGELOK FLARELESS FITTINGS REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.
4. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976
5. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
6. HYDRO SHELL TEST PER ANSI B16.34
7. CARBON STEEL STUB END REQ'D FOR INLET ONLY - MT'L IS ASTM A106, GRADE B
8. STEEL FRAME & YOKE REQ'D.
9. CARBON STEEL STUB TO ALLOY BODY WELDING REQUIRES RADIOGRAPHIC INSPECTION
10. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.
11. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO AND SEAT LEAKAGE TESTS.
12. S.S. IDENT TAG REQ'D
13. EXTRA RISERS & GATING REQ'D.

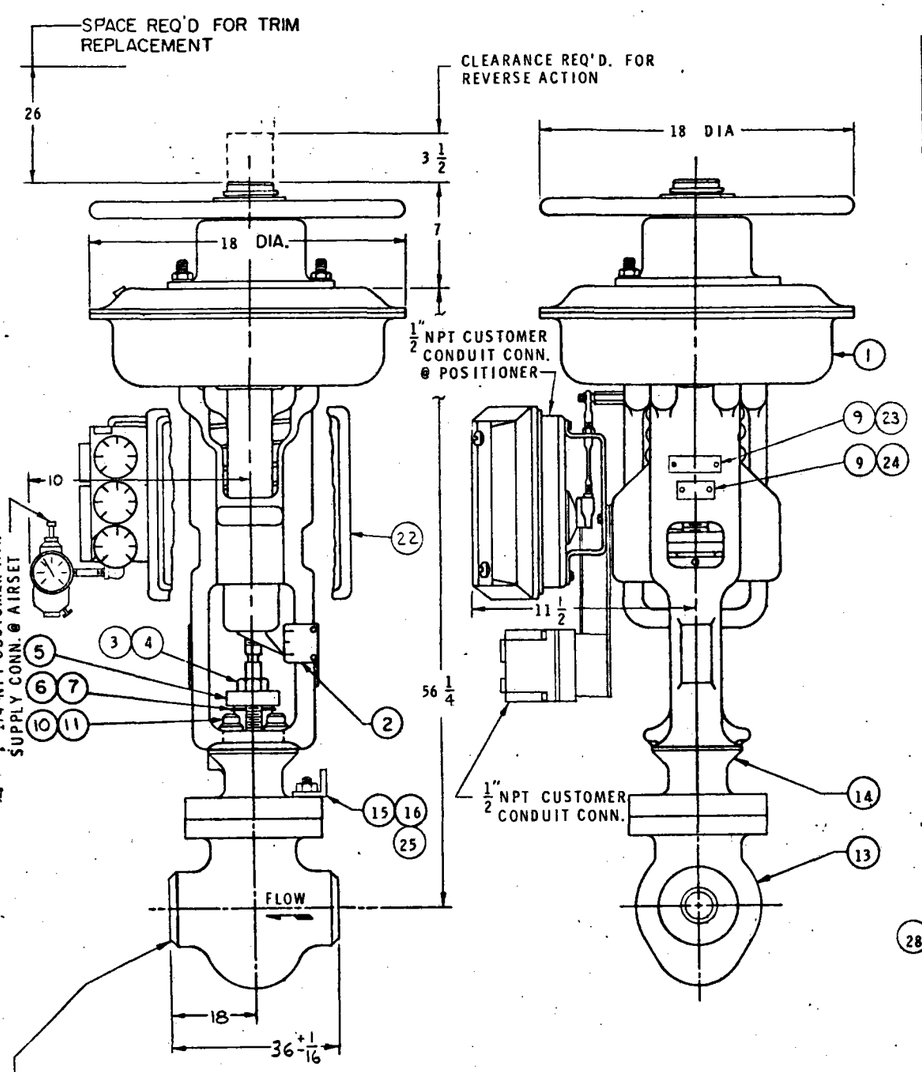
TO BE COMPLETED BY C.V.I. ENGINEERING

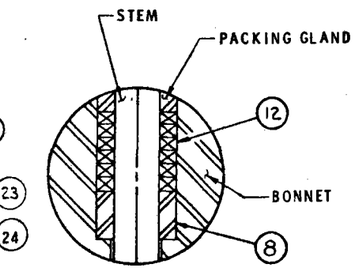
Actuator Spring: 130906
Precompression (No Valve Pressure) Psi: 29 PSIG
Air to Full Travel (No Valve Pressure) Psi: 80 PSIG
Trim Size: 4" Travel: 2" ± 1/8"
Max. Cv of Trim: 190 @ 2" ± 1/8"
Valve Serial No.:

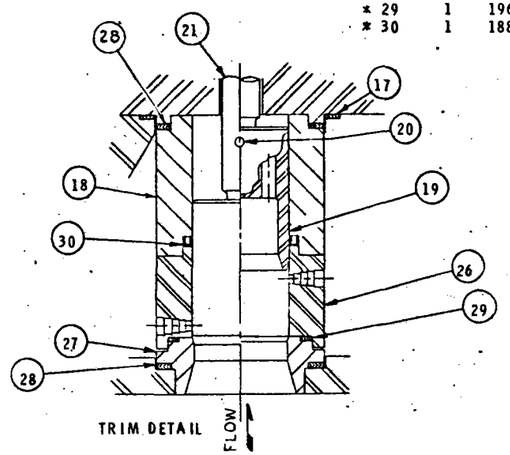


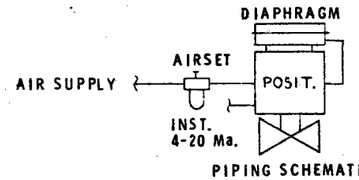
orm No. 705176 R-2
ev. 1/17/77

4.1.55-44

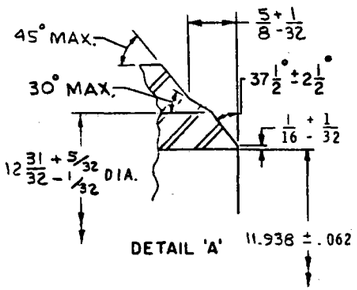








PIPING SCHEMATIC



COPES-VULCAN
ONE OF THE WHITE CONSOLIDATED INDUSTRIES INC.
STEARNS-ROGERS
PURCHASE ORDER _____
TAG NUMBER _____

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	136419-5	4	ACTUATOR ASSEMBLY			L-136419	SPRING P/N 133292
2	1	83659	3	INDICATOR PLATE	BRASS	ASTM-B36	S-83659	
3	2	137477	3	STUD	STEEL	SAE-4140	S-137477	5/8-11 x 3 3/4 LG.
4	2	1923	3	HEX NUT	STEEL	COM'L		5/8 - 11
5	1	137236	3	GLAND FOLLOWER	STEEL	COM'L	M-137236	
6	1	137603	3	PACKING GLAND	CRES	ASTM-A479	S-137603	TYPE - 410
7	1	18263	3	SNAP RING	STEEL	COM'L		
8	1	169763-G	3	GUIDE BUSHING	CRES	ASTM-A479	S-169763	TYPE - 410
9	4	64341	3	DRIVE SCREW	STEEL	COM'L		CAD. PLATED
10	4	137776	3	SOC. HD. CAP SCREW	STEEL	COM'L		5/8-11 x 1 1/8 LG.
11	2	137475	3	HOLD DOWN CLAMP	STEEL	SAE-1015	S-137475	
* 12	1	137598	3	PACKING SET	GRAPH-ASB	COM'L		CRANE 2 CRJ
13	1	166389-R	5	VALVE BODY	STEEL	ASTM-A216	E-166389	GR. WCB
14	1	194374	5	BONNET	STEEL	ASTM-A216	L-194374	GR. WCB
15	16	84891	3	BODY STUD	STEEL	ASTM-A193	L-168285	GR. B7
16	16	41321	3	BODY NUT	STEEL	ASTM-A194	M-170423	GR. 2H
* 17	1	164701	3	BODY GASKET	ASB-SST	COM'L		
* 18	1	196724	5	CAGE SPACER	CRES	ASTM-A276	L-196724	TYPE-420
* 19	1	196721	5	PLUG	CRES	ASTM-A276	L-196721	TYPE-420
* 20	1	96342	3	ROLL PIN	CRES	COM'L		TYPE-420
* 21	1	192508	3	STEM	CRES	ASTM-A276	L-192499	TYPE-316, COND. B
22	1	195933	5	ACCESSORY KIT	SEE NOTE-10		E-195933	
23	1	195618	5	SPECIAL TAG	CRES	COM'L	M-195618	TYPE-304
24	1	177673	3	TRIM NAMEPLATE	BRASS	COM'L	M-177673	
25	2	167360	5	LIFTING LUG	STEEL	COM'L	M-167360	
* 26	1	196720	5	CYLINDER ASSEMBLY	CRES	ASTM-A276	L-196720	TYPE-420
* 27	1	196722	5	SEAT RING	CRES	ASTM-A276	L-196722	TYPE-420
* 28	2	166670	2	TRIM GASKET (OUTER)	ASB-SST	COM'L		
* 29	1	196728-Q	2	TRIM GASKET (INNER)	ASB-SST	COM'L		
* 30	1	188143	2	VARISEAL	TURCITE ®	COM'L		MOD. NO. 108M08000P42

NOTES:

1. FOR WIRING SCHEMATIC SEE DWG. SK-A-14896-M
2. FOR MAX. Cv 142 SET VALVE TRAVEL AT 2-1/4±1/8 INCH.
3. REQUIRED AIR TO OPERATE 80 PSI.
4. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
5. ASSEMBLE VALVE PER CVI PROC. I. 2. 187.
6. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CVI PART NO. 80815) IS ALSO RECOMMENDED.
7. ALL DIMENSIONS ARE IN INCHES, AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
8. MAXIMUM FLUID TEMPERATURE IS 358° F.
9. APPROXIMATE TOTAL VALVE WEIGHT IS _____ LBS.
10. ACCESSORY KIT ITEM #22 CONSISTS OF: BAILEY AP-5 POSITIONER, CONOFLOW FH60-XT-K1 AIRSET, L.V.D.T. POSITION TRANSMITTER

TAG NO. PV-640
APPLICATION: TS FLASH TK PRESS

DEPARTMENT OF ENERGY
STEARN-ROGERS PROJECT NO. C-21700
SOLAR ONE
P. O. NO. 5002 C21700

NO.	DATE	REVISIONS	BY	CHK
	6-8-81	COMPLETED B/M	TS	DS
	9-1-81	ITEM # 3 WAS PER SK-C-16936-G REMOVED REDUCERS, END TO END DIMN. = 36 3/16	CM	KH.

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	
AIR LOCK VALVE	
LIMIT SWITCH	
LUBRICATOR	
SOLENOID VALVE	
CONTROLLER	
PILOT POSITIONER	
AIR SET (CONOFLOW QTY. 1)	
BOOSTER RELAY	
POSITION TRANSMITTER (QTY. 1)	
PART CODE-6	

TRIM LAYOUT

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

VALVE ASSEMBLY
12" CLASS 300
MODEL D100-160 ACTUATOR

DFTSMN G.S.C.	DATE 7-7-81	JOB NO.	5010-14536
CHECKED [illegible]	DATE 7-31-81	SCALE	NONE
APP'D. [illegible]	DATE 8-1-81		

DWG. NO. E-196350 REV. 2

4.1.55-45

SHEET 1 of 1

*DATE 10-16-80

*NAME LRS

C.V.I. JOB NO. 8010-14896

R[..]R PROCESSING

[..]ROL VALVE SPECIFICATIONS

Use med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
* Indicates information Required to Process Order.

COPES VULCAN

US [..]MER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1 ITEM NO. 11 * QUANTITY 1
2 *TYPE D-100 DRAWING E-196350
3. *INLET PIPE 6" SCHED. 40 * OUTLET PIPE 10" SCHED. 40
4. TAGGING PV-640
5 APPLICATION TS FLASH TK PRESS

PE[..]ATING CONDITIONS

6. *Fluid – Water ☐ Steam ◪ Gas ☐ Oil ☐ Other ☐

Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7 *Max. Flow Condition	30,822	142	62.3	355
8. *Normal Flow Condition	12'500	143	24	355
9. *Minimum Flow Condition	605	150	2	358
10 *Shutoff Condition	–	150		

A[..]E BODY

11. *Size 12" *ANSI Class 300 ◪ Standard ☐ Special
12 *Material ◪ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☐ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13. *Style ◪ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ◪ Butt Weld B16.25 Fig.
☐ Socket Weld B16.11 ☐ Other – See Notes:

A[..]E BONNET

15. *Type ◪ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16 Packing ◪ Graph Asb. ☐ Teflon Asb. ☐ Other
R[..] ☐ Malcomized
17. *Material ☐ Hardened 410 S.S. ◪ Hardened 420 S.S. ☐ Special
18 *Type ◪ Single ☐ Double ☐ Tandem ◪ Balanced
☐ Cylinder ◪ Hush® ☐ Flash® ☐ Other
19. Characteristic ☐ Mod. Parabolic ☐ Quick Open ☐ Special
☐ Cascade ☐ Mod. Equal %
20 Cv Factor Required by Specs. 141.6

A[..]E ACTUATOR

21. *Type ◪ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22 *Model D-100 – 160
23 *Action ☐ Spring Opening ◪ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

C[..]SSORIES

25 *Handwheel ◪ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ◪ No
27 *Limit Switches Mfr. — Type Qty.
28 *Solenoid Valve Mfr. — Type Qty.
29. *Booster Relay Mfr. — Type Qty.
30. POSITION TRANSMITTER C-V Type LVDT Qty. 1

P[..]TIONER

31 *Mfr. BAILEY Type AP5
32. *Accessories ☐ By-Pass ◪ Gauges
33 *Input Range ☐ 3-15 ◪ Others - (Specify) 4-20 ma
34 *Action ◪ Direct ☐ Reverse
35. *Air Set ◪ Yes ☐ No *Gauges ◪ Yes ☐ No Qty.

SPECIAL REQUIREMENTS

36 *X-ray ASME ☐ ☐ Other - (Specify)
37. *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
39 *"N" Stamp ☐ Yes ◪ No Class ☐ 1 ☐ 2 ☐ 3
40 *Noise Limit ◪ Yes ☐ No 90 DBA at 5 Feet

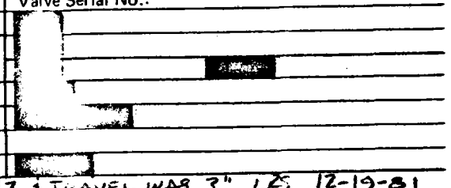
Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ◪ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS 180 PSIA @ 520°F
2. SWAGELOK FLAREGLESS FITTINGS REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING
3. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976
4. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
5. HYDRO SHELL TEST PER ANSI B16.34
6. CARBON STEEL EXPANDERS & REDUCERS REQ'D. – 6x12 AND 12x10 – MATERIAL ASTM A234, Gr. WPB
7. STEEL FRAME & YOKE REQ'D.
8. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.
9. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO AND SEAT LEAKAGE TESTS.
10. S.S. IDENT TAG REQ'D.

TO BE COMPLETED BY C.V.I. ENGINEERING

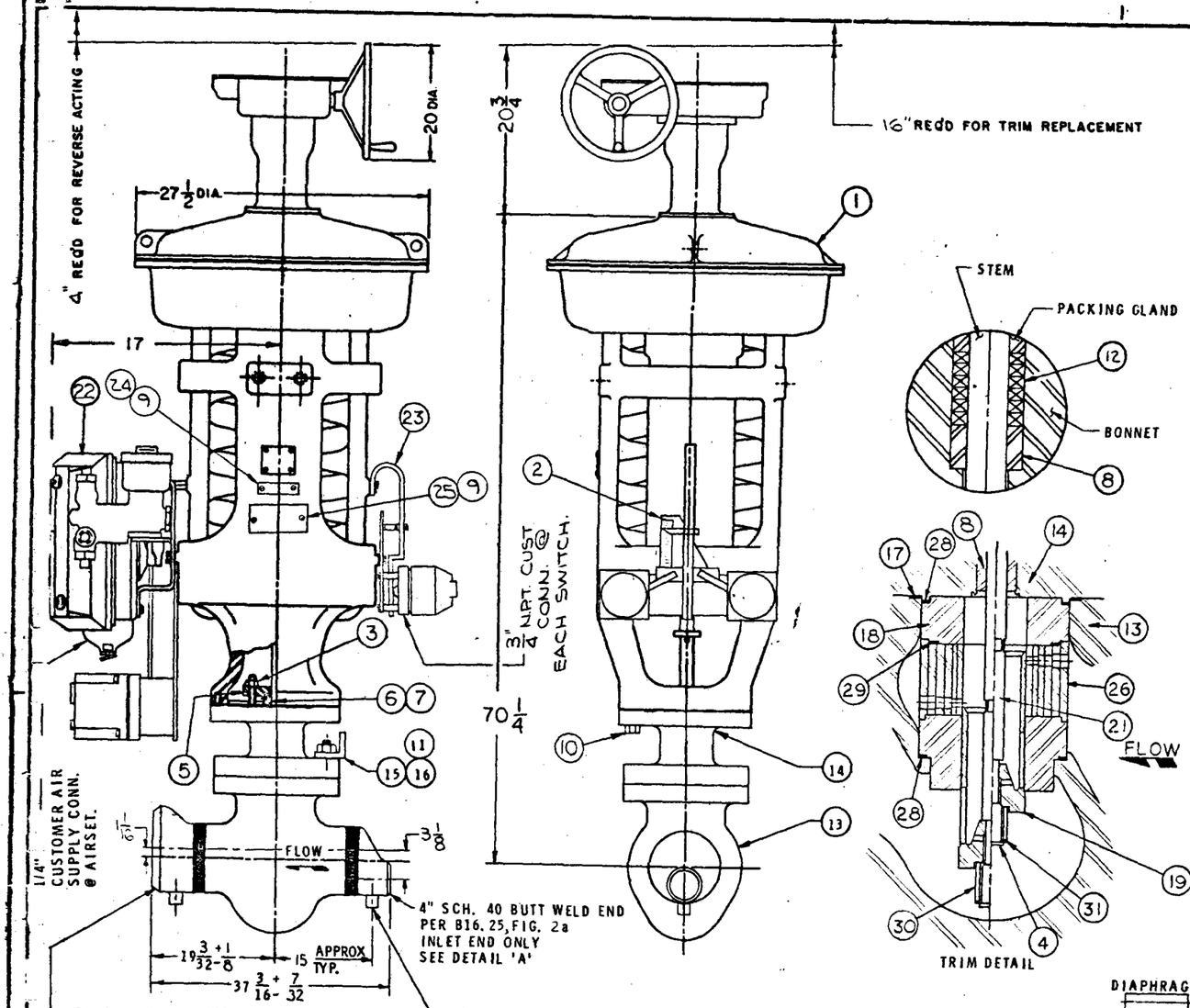
Actuator Spring: 133292
Precompression (No Valve Pressure) Psi: 24 PSIG
Air to Full Travel (No Valve Pressure) Psi: 80 PSIG
Trim Size: 12" HUSH Travel: 2¼" ± ⅛"
Max. Cv of Trim: 142 @ 2¼" ± ⅛" TRAVEL
Valve Serial No.:

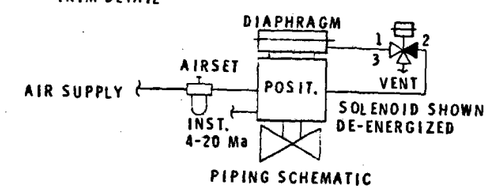


REV. 1 - P2 FOR MAX FLOW WAS 7, CV REQ'D WAS 147 & TRAVEL WAS 3" LRS 12-19-81

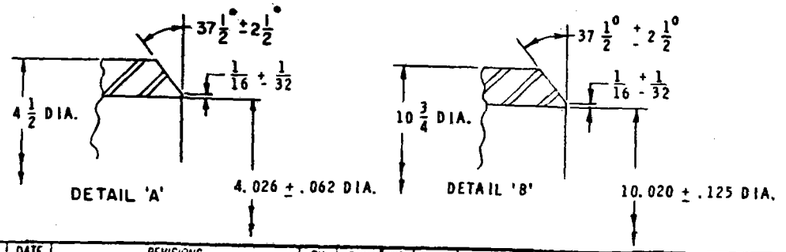
Form No. 705176 R-2
Rev. 1/17/77

4.1.55-46





PIPING SCHEMATIC



LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	———	—	ACTUATOR ASSEMBLY			L-184331 MKD	SPRING P/N 163568 163567
2	1	163699	3	INDICATOR PLATE	BRASS	ASTM-B36	S-163699	
3	2	130136	3	STUD & NUT	STEEL	SAE-4140	S-130136	
*4	1	196706	5	INNER PLUG	CRES	ASTM-A276	L-196706	TYPE-420 MALC.
5	1	129774	3	GLAND FOLLOWER	STEEL	COM'L	M-129774	
6	1	129923	3	PACKING GLAND	CRES	ASTM-A479	S-129923	TYPE - 410
7	1	31246	3	SNAP RING	STEEL	COM'L		
8	2	195493	3	GUIDE BUSHING	CRES	ASTM-A276	M-195493	TYPE - 420
9	4	64341	3	DRIVE SCREW	STEEL	COM'L		CAD. PLATED
10	8	130140	3	HEX. HD. CAP SCREW	STEEL	COM'L		1⅛-8UN x 2½ LG
11	2	149572	3	LIFTING LUG	STEEL	COM'L	M-149572	
* 12	1	172421	3	PACKING SET	GRAPH-ASB	COM'L		CRANE 187-I
13	1	———	—	VALVE BODY ASSEMBLY	SEE NOTE-11		SK-B-14896-E	
14	1	196713	5	BONNET	STEEL	ASTM-A217	L-196713	GR. WC9
15	8	169751-Q	2	BODY STUD	STEEL	ASTM-A453	L-168285	GR. 660
16	8	170616-Q	2	BODY NUT	STEEL	ASTM-A194	M-170423	GR. 6
* 17	1	164715	3	BODY GASKET	ASB-SST	COM'L	10-5/8 I.D.x 9-3/8 O.D. x .175 THK.	
* 18	1	———	—	CAGE SPACER	CRES	ASTM-A276	L-190391-MKD	TYPE-420, MALC
* 19	1	196707	5	PLUG	CRES	ASTM-A276	L-196707	TYPE-420, MALC.
* 20	1	96227	3	ROLL PIN	CRES	ASTM-A276		TYPE-420
* 21	1	———	—	STEM	CRES	ASTM-A276	L-191403 MKD	TYPE-316, COND. B
22	1	196780	5	ACCESSORY KIT	SEE NOTE-10		E-196780	
23	1	196756	5	ACCESSORY KIT-MICRO SWITCHES MODEL #ICX-42			E-196756	
24	1	177673	3	TRIM NAMEPLATE	BRASS	COM'L	M-177673	
25	1	195618	5	SPECIAL TAG	CRES	COM'L	M-195618	TYPE-304
*26	1	196705	5	CYLINDER ASSEMBLY	CRES	ASTM-A296	L-196705	GR. CA 40 MALC.
*27	1	———	—	SEAT RING	CRES	ASTM-A276	L-190393-MKD	TYPE-420 MALC.
*28	2	167419	2	TRIM GASKET (OUTER)	ASB-SST	COM'L	9-3/16 O.D. x 8-5/16 I.D. x .175 THK	
*29	1	197010-Q	2	TRIM GASKET (INNER)	ASB-SST	COM'L	8-7/8 O.D. x 8 I.D. x .175 THK.	
*30	1	166706	2	SPRING	STEEL	ALLOY #A286	S-166706	
*31	1	166715	5	SPRING RING	CRES	ASTM-A479	S-166715	TYPE 410

NOTES:

1. FOR WIRING SCHEMATIC SEE DWG. SK-A-14896-M
2. FOR MAX. Cv 1003 SET VALVE TRAVEL AT 3 3/4 ± 1/8 INCH.
3. REQUIRED AIR TO OPERATE 80 PSI.
4. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
5. ASSEMBLE VALVE PER CVI PROC. 1.2.187.
6. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CVI PART NO. 129528) IS ALSO RECOMMENDED.
7. ALL DIMENSIONS ARE IN INCHES, AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
8. MAXIMUM FLUID TEMPERATURE IS 954° F.
9. APPROXIMATE TOTAL VALVE WEIGHT IS _____ LBS.
10. ACCESSORY KIT ITEM #22 CONSISTS OF:
    BAILEY AP-5 POSITIONER, CONOFLOW
    FH60-XT-K1 AIRSET, L.V.D.T.
    POSITION TRANSMITTER, ASCO HB8302 SOLENOID VALVE
11. BODY MAT'L: STEEL, ASTM-A217, GR. WC9
    OUTLET AND INLET REDUCER MAT'L. STEEL, ASTM-A182, GR. F5

TAG NO. PV-1000
APPLICATION: RS FLASH TK TO COND. DUMP DESUPER HEATER

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	
AIR LOCK VALVE	
LIMIT SWITCH (MICRO QTY. 2)	
COOLING EXTENSION BONNET	
SOLENOID VALVE (ASCO QTY. 1)	
CONTROLLER	
PILOT POSITIONER	
AIR SET (CONOFLOW QTY. 1)	
BOOSTER RELAY	
POSITION TRANSMITTER (QTY. 1)	
PART CODE 6	

COPES-VULCAN
ONE OF THE WHITE CONSOLIDATED INDUSTRIES INC.
STEARNS-ROGERS
PURCHASE ORDER _____
TAG NUMBER _____

DEPARTMENT OF ENERGY
STEARN-ROGERS PROJECT NO. C-21700
SOLAR ONE
P. O. NO. 5002C21700

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA. U.S.A.

VALVE ASSEMBLY
8" CLASS 600
MODEL D100-400 ACTUATOR

DFTSMN G.S.C.	DATE 1-7-81	JOB NO. 8010-14896	
CHECKED DJW	DATE 1-23-81	SCALE NONE	
APP'D. [illegible]	DATE [illegible]		

DWG. NO. E-196349 REV. 0

NO.	DATE	REVISIONS	BY	CHK

4.1.55-47

RE R PROCESSING

ONTROL VALVE SPECIFICATIONS

COPES VULCAN

SHEET 1 of 1

*DATE 10-16-80

*NAME LRS

C.V.I. JOB NO. 8010-14896

med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
* Indicates information Required to Process Order.

US OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1 ITEM NO. 13 * QUANTITY 1
2 *TYPE D-100 DRAWING E-196349
3 *INLET PIPE 4" SCHED. 40 * OUTLET PIPE 10" SCHED. 40
4. TAGGING PV-1000
5 APPLICATION RS FLASH TK TO COND. DUMP DESUPERHTR

PE ATING CONDITIONS

6. *Fluid – Water ☐ Steam ☑ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P_1 PSIA	Outlet P_2 PSIA	Temp. °F
7	*Max. Flow Condition	40,000	380	37	954
8.	*Normal Flow Condition	40,000	380	31	567
9.	*Minimum Flow Condition	4,000	380	10	440
10	*Shutoff Condition	—	600		

A 'E BODY

11. *Size 8" *ANSI Class 600 ☑ Standard ☐ Special
12 *Material ☐ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☑ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13 *Style ☑ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☑ Butt Weld B16.25 Fig.
☐ Socket Weld B16.11 ☐ Other – See Notes:

A 'E BONNET

15. *Type ☐ Standard ☑ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16 Packing ☑ Graph Asb. ☐ Teflon Asb. ☐ Other
RI ☑ Malcomized
17. *Material ☐ Hardened 410 S.S. ☑ Hardened 420 S.S. ☐ Special
18. *Type ☐ Single ☐ Double ☑ Tandem ☐ Balanced
☐ Cylinder ☑ Hush® ☐ Flash® ☐ Other
1 Characteristic ☐ Mod. Parabolic ☐ Quick Open ☐ Special
☐ Cascade ☐ Mod. Equal %
2 Cv Factor Required by Specs. 100.2

A /E ACTUATOR

21. *Type ☑ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22 *Model D-100-400
2 *Action ☐ Spring Opening ☑ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

C SSORIES

2 *Handwheel ☑ Top Mount ☐ Side Mount ☐ None
26 *Airlock ☐ Yes ☑ No
2 *Limit Switches Mfr. MICRO Type 1CK-42 Qty. 2
2 *Solenoid Valve Mfr. ASCO Type HB8302A81F Qty. 1
2 *Booster Relay Mfr. — Type Qty.
30. POSITION TRANSMITTER C-V Type LVDT Qty. 1

TIONER

3 *Mfr. BAILEY Type APS
32. *Accessories ☐ By-Pass ☑ Gauges
3 *Input Range ☐ 3-15 ☑ Others - (Specify) 4-20 ma
3 *Action ☑ Direct ☐ Reverse
3 *Air Set ☑ Yes ☐ No *Gauges ☑ Yes ☐ No Qty. 1

PECIAL REQUIREMENTS

3 *X-ray ASME ☐ ☐ Other - (Specify)
3 *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
3 *"N" Stamp ☐ Yes ☑ No Class ☐ 1 ☐ 2 ☐ 3
4 *Noise Limit ☑ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ☑ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS 600 PSIA @ 960°F (RATED AT 725 PSIA @ 960°F PER ANS B16.34)
2. BODY & BONNET MATERIAL: ASTM A217, GRADE WC9
3. SWAGELOK FLAGLESS FITTING REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.
4. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976
5. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
6. HYDRO SHELL TEST PER ANSI B16.34
7. EXPANDER AND REDUCERS REQ'D 4"×8" AND 8"×10" – MATERIAL IS ASTM A182-F5 – ECCENTRIC
8. STEEL FRAME & YOKE REQ'D.
9. ALLOY STEEL EXPANDER & REDUCER TO ALLOY BODY WELDING REQUIRES RADIOGRAPHIC INSPECTION.
10. C_v REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.
11. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO & SEAT LEAKAGE TESTS.
12. S.S. IDENT TAGS.
13. QTY 2 OF 3/4"-3000# SOC-O-LETS REQ'D.

TO BE COMPLETED BY C.V.I. ENGINEERING

Actuator Spring: 163568 & 163567
Precompression (No Valve Pressure) Psi: 30 PSIG
Air to Full Travel (No Valve Pressure) Psi: 80 PSIG
Trim Size: 8" HUSH TANDEM Travel: 3 3/4" ± 1/8"
Max. Cv of Trim: 100.2 @ 3 3/4" ± 1/8" TRAVEL
Valve Serial No.:

[redacted]

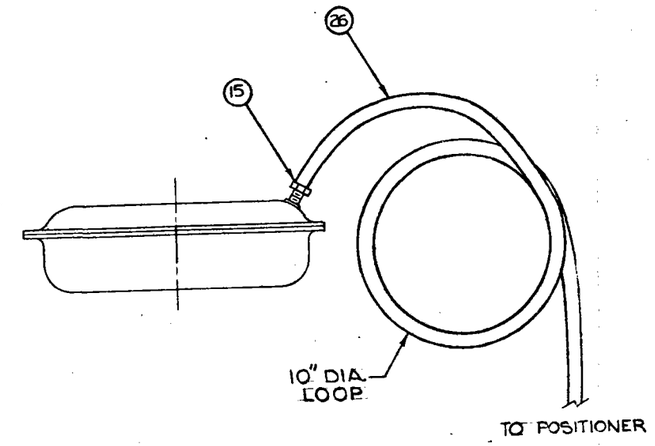
Form No. 705176 R-2
Rev. 1/17/77

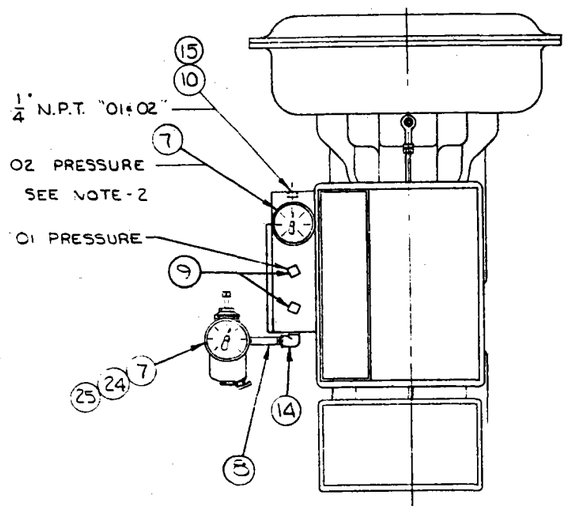
REV. 1 - ACTUATOR WAS 160 LRS 12-16-81

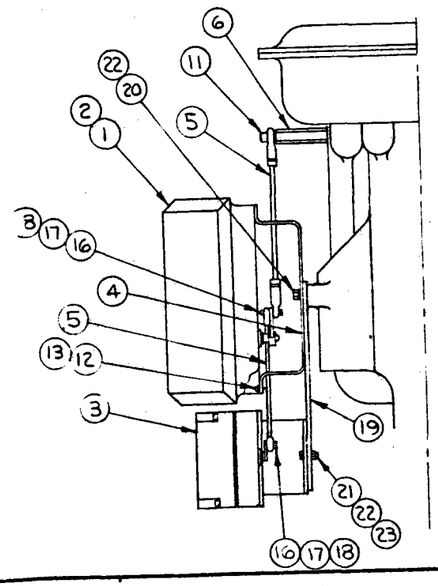
4.1.55-48

LIST OF MATERIALS

ITEM NO.	NO REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG NO.	REMARKS
1	1	159681	3	POSITIONER ASS'Y.				BAILEY AP5
2	1	NOTE-1	—	CAM				
3	1	161153	5	POSITION TRANSMITTER			L-161153	COPES LVDT
4	1	177717	3	MOUNTING BRACKET	STEEL	COM'L.	L-177717	.120 THK.
5	2	33456	3	CONNECTING LINK ASS'Y.				
6	1	183542	5	CONTROL ARM	STEEL	ASTM-A108	S-183542	
7	2	130599	3	VALVE GAUGE				0-100 PSIG.
8	1	41181	3	NIPPLE	STEEL	COM'L.		1/4" NPT x 3" LG
9	2	5488	3	PIPE PLUG	STEEL	COM'L.		1/8" N.P.T.
10	1	79557	3	PIPE PLUG	STEEL	COM'L.		1/4" N.P.T.
11	1	14926	3	SOC. HD. CAP SCREW	STEEL	COM'L.		#10-24UNC x 5/8" LG.
12	4	V-5754	3	SOC. HD CAP SCREW	STEEL	COM'L.		1/4"-20 UNC x 1" LG.
13	4	4329	3	LOCKWASHER	STEEL	COM'L.		1/4"
14	1	34809	3	STREET ELBOW	STEEL	COM'L.		1/4" NPT
15	2	14527	5	STREET CONNECTOR	BRASS	COM'L.		3/8" O.D. x 1/4" NPT
16	2	39914	3	RD. HD MACH. SCREW	STEEL	COM'L.		#10-32 UNF x 1-1/4" LG
17	2	41319	3	HEX NUT	STEEL	COM'L.		#10-32 UNF
18	2	35467	3	LOCKWASHER	STEEL	COM'L.		#10
19	1	161933	5	MOUNTING BRACKET	STEEL	COM'L.	M-161933	1/4" THK.
20	2	41358	3	HEX HD CAP SCREW	STEEL	COM'L.		5/16"-18 UNC x 1 1/2" LG.
21	2	4548	3	HEX HD CAP SCREW	STEEL	COM'L.		5/16"-18 UNC x 3/4" LG.
22	4	59404	3	LOCKWASHER	STEEL	COM'L.		5/16"
23	2	13803	3	HEX NUT	STEEL	COM'L.		5/16"-18UNC
24	1	136645	3	AIRSET			S-136645	CONOFLOW
25	1	34716	3	BUSHING	BRASS	COM'L.		1/4" x 1/8"
26	4	50141	3	COPPER TUBING	COPPER	COM'L.		3/8" O.D.







REVISIONS					
NO.	DESCRIPTION	REV BY	CK'D BY	DATE	APPD
1	CORRECTED TITLE BLOCK INFORMATION	T. Rak	[illegible]	5-6-81	—
2	DELETED HOSE ASS'Y AND ADDED COOPER TUBING	RR	[illegible]	4-1-81	

NOTES:

1. AS CALLED FOR ON SHOP ORDER.
2. PRESSURE CONNECTIONS:
   01 = OUTPUT - D.A. POSITIONER
   02 = OUTPUT - R.A. POSITIONER
3. DIRECT ACTING POSIT. - CONNECT 01 TO ACTUATOR & PLUG 02.
   REVERSE ACTING POSIT. - CONNECT 02 TO ACTUATOR & PLUG 01
4. THE CONTROL RODS SUPPLIED WITH THE POSITION AND TRANSMITTER MAY REQUIRE CUTTING TO LENGTH TO SUIT THE APPLICATION.

COPES-VULCAN, INC.
A Div. of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA U.S.A.

FOR: D-100-60, 100 & 160 ACTUATORS WITH
(1) BAILEY AP5 POSITIONER
(1) L.V.D.T. POSITION TRANSMITTER
(1) CONOFLOW AIRSET

ACCESSORY KIT

E 195761			
MASTER ASSY	SUB ASSY		
JOB NO. S-D10-1496			
REPRO FROM E-183365			
	PART CODE 5		

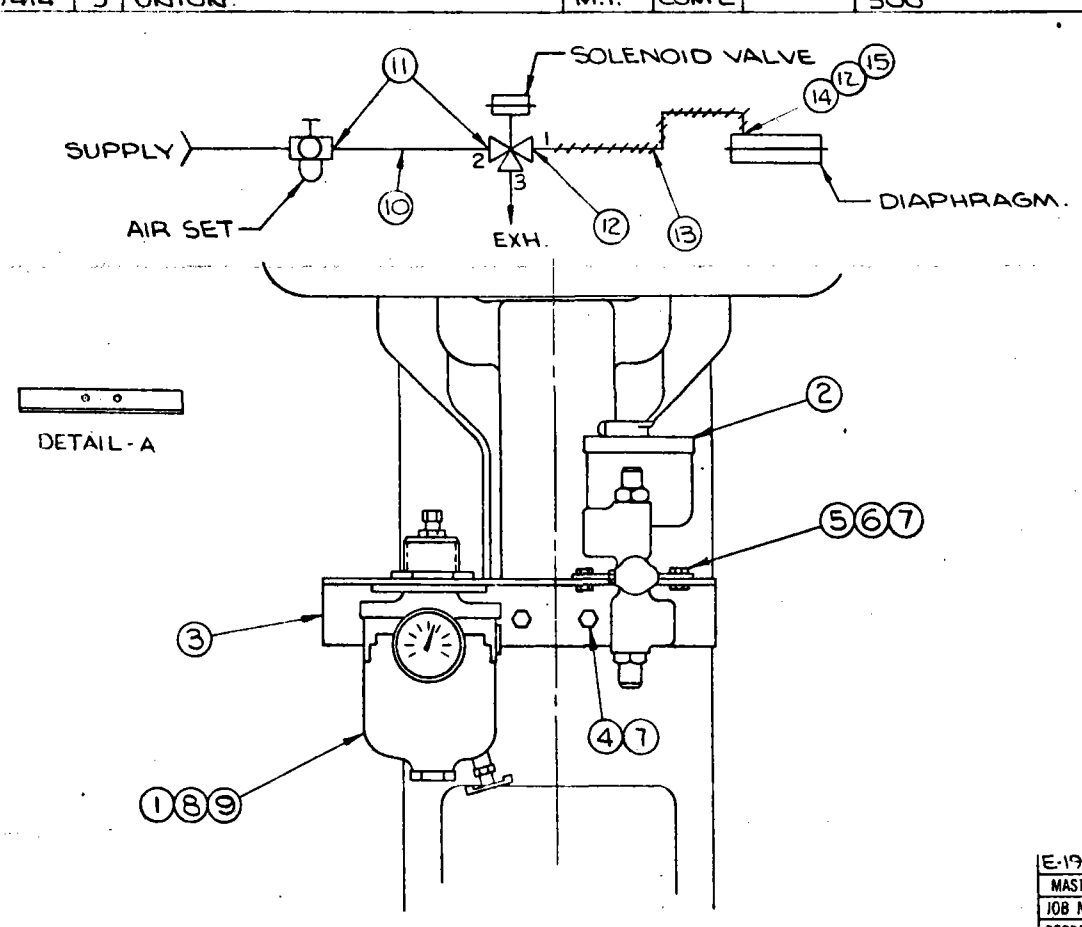
DFTSMN T.S.	DATE 4-15-81	APP'D	DSGN ____ DATE ____
CHECKED A.E.	DATE 4-15-81		MFG. ____ DATE ____
APP'D L.R.C.	DATE 4-15-81		____ DATE ____
SCALE ~	DWG. NO. E-195933		REV. 2

LIST OF MATERIALS

ITEM NO.	NO REQ.	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPEC.	DWG. NO.	REMARKS
1	1	136645	3	AIR SET	——	——	S-136645	CONOFLOW FH60-XT-K1
2	1	NOTE-1	—	ASCO SOLENOID VALVE	——	——	——	SERIES 8302
3	1	173760	5	MOUNTING BRACKET	STEEL	ASTM-A36	M-173760	——
4	2	4548	3	HEX. HD. CAP SCR.	STEEL	COM'L.	——	5/16"-18 UNC X 3/4" LG.
5	2	21424	3	HEX. HD. CAP SCR.	STEEL	COM'L.	——	5/16"-18 UNC X 1" LG.
6	2	13803	3	HEX. NUT	STEEL	COM'L.	——	5/16"-18 UNC.
7	4	59404	3	LOCKWASHER	STEEL	COM'L.	——	5/16" SPRING TYPE
8	1	34716	3	BUSHING	STEEL	COM'L.	——	1/4" MALE X 1/8" FEMALE
9	1	130597	3	GAUGE	——	——	——	0-100 PSI.
10	1'	50141	3	TUBING	COPPER	COM'L	——	3/8" O.D.
11	2	NOTE-1	—	TUBE ELBOW	BRASS	COM'L	——	3/8" X 1/4" N.P.T.
12	2	34809	3	STREET ELBOW	STEEL	COM'L	——	1/4" x 1/4" N.P.T.
13	1	131326	3	HOSE ASSEMBLY	——	——	——	PARKER NO 83.
14	1	41181	3	NIPPLE	STEEL	COM'L	——	1/4" NPT x 3" LG
15	1	19414	3	UNION.	M.I.	COM'L	——	300#

NO.	DESCRIPTION	REV. BY	CK'D BY	DATE	APPD

NOTES:
1. AS CALLED FOR ON SHOP ORDER.
2. FOR 40" ACTUATORS, FLIP MOUNTING BRACKET, ITEM 3 AS SHOWN IN DETAIL-A



UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
BREAK CORNERS 1/64 MAX.
FILLETS ARE 1/64 TO 1/32 R
✓ INDICATES 250 FINISH
TOLERANCES ARE:

DIMENSION	UNDER 6	6 - 18	OVER 18
DECIMALS	± .005	± .005	± .010
FRACTIONS	± 1/64	± 1/32	± 1/16

TOLERANCE ON ANGLES ± 2°

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: D-100 ACTUATORS. (1) ONE ASCO SOLENOID VALVE AND (1) AIR-SET CONOFLOW.

ACCESSORY KIT.

E-195617
MASTER ASSY | SUB ASSY
108 NO. 8010-14896
REPRO FROM L-190319
PART CODE 5

DFTSMN T.S. DATE 11-17-82
CHECKED KRH DATE 11-17-82
APP'D: LKS DATE 11-17-82
APPD
DSGN. _____ DATE _____
MFG. _____ DATE _____
_____ DATE _____

SCALE ~ | DWG. NO. L-195948 | REV. 0

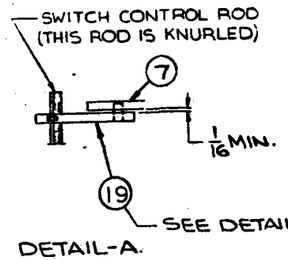
4.1.55-52

LIST OF MATERIAL'S.

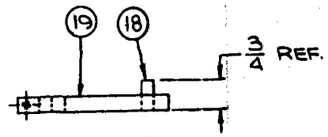
ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
	2	NOTE-1	—	MICRO SWITCH				MOD# ICX-42
	1	196757	5	MOUNT. PLATE	STEEL	ASTM-A36	E-196757	
	1	NOTE-1	—	INDICATOR PL.	BRASS	COM'L		
4	2	4548	3	HEX HD CAP SCR	STEEL	COM'L		5/16"-18 UNC X 3/4" LG.
5	8	196761	5	SPACER	STEEL	ASTM-A 108	S-196761	
	2	129722	3	LOCKING BAR	ALUM	6063-T6	S-129722	
	1	196760	5	GUIDE BAR	STEEL	ASTM-A 36	M-196760	
8	1	129745	3	INDICATOR POINTER	ALUM.	COM'L	S-129745	
9	4	142580	3	HEX HD. CAP SCR	STEEL	COM'L		1/4"-20 UNC x 7/8 LG.
	4	90913	3	HEX NUT	STEEL	COM'L		1/4"-20 UNC
	1	139692	3	SPRING PIN	STEEL	COM'L		3/16 x 1/2" LG.
	1	4467	3	HEX HD. CAP SCR	STEEL	COM'L.		3/8-16 UNC x 3/4" LG.
13	1	14775	3	LOCKWASHER	STEEL	COM'L		3/8 SPRING TYPE
14	1	196758	5	TAKE OFF ARM	ALUM	COM'L	M-196758	
	8	13803	3	HEX NUT	STEEL	COM'L		5/16-18 UNC
	8	143475	—	HEX HD CAP SCR	STEEL	COM'L	NOTE-4	5/16-18 UNC X 4" LG.
17	2	174585	3	PAN HD. MACH. SCR	STEEL	COM'L		#8-32 UNC X 5/8" LG.
18	2	196331	5	DOWEL PIN	STEEL	COM'L	S-196331	
19	2	196759	5	OPERATING ARM	STEEL	ASTM-A108	M-196759	
20	2	64341	3	DRIVE SCR	STEEL	COM'L		#4 X 3/16 LG. RD. HD.
	10	59404	3	LOCKWASHER	STEEL	COM'L		5/16" SPRING TYPE
22								
23								
4								
5								
26								
27								
28								
29								
30								

REVISIONS					
NO.	DESCRIPTION	REV. BY	CK'D BY	DATE	APP'D

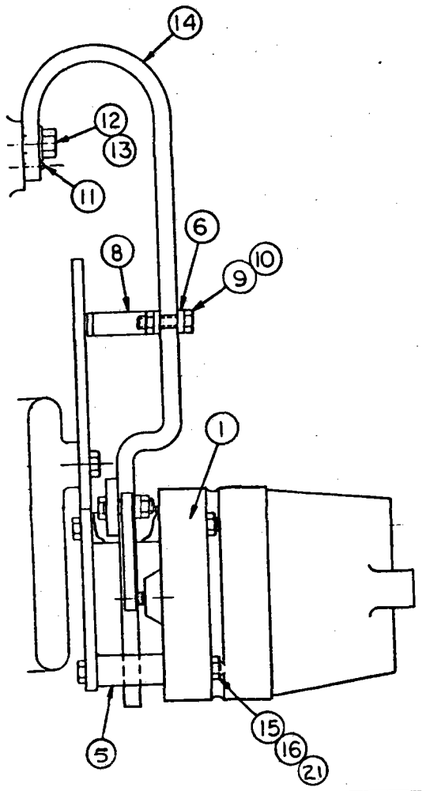
NOTES:
1. AS CALLED FOR ON SHOP ORDER.
2. DRILL #37 (.104) DIA 2 HOLES AT ASSEMBLY.
3. SWITCH LEVER TO BE ADJUSTED IN CONJUNCTION WITH VALVE TRAVEL OR APPLICATION.
4. CUT TO LENGTH TO SUIT.

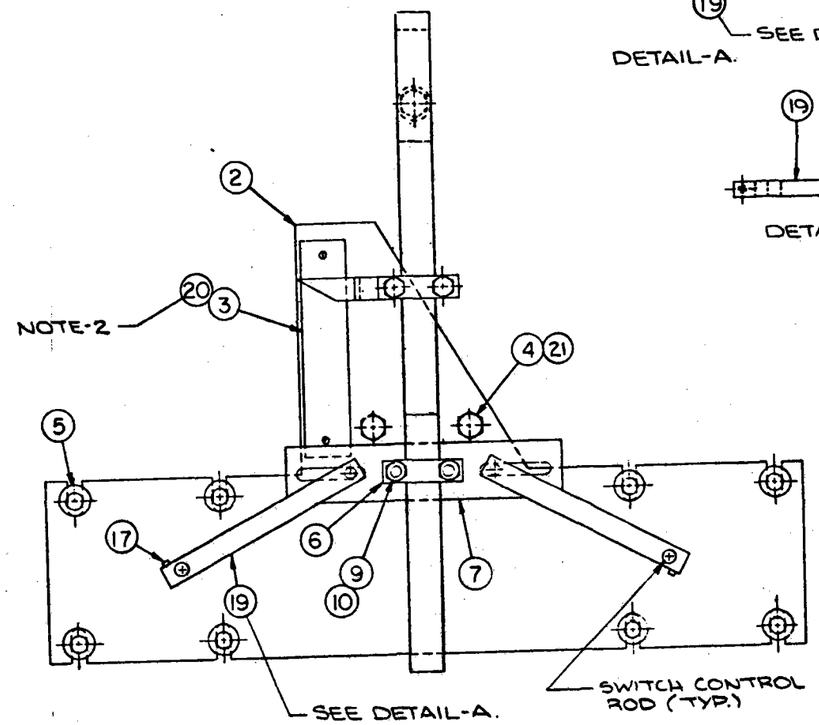


DETAIL-A.



DETAIL-B.





REF: SK-DES-9679-E

UNLESS OTHERWISE SPECIFIED			
DIMENSIONS ARE IN INCHES			
BREAK CORNERS 1/64 MAX.			
FILLETS ARE 1/64 TO 1/32 R			
✓ INDICATES 250 FINISH			
TOLERANCES ARE:			
DIMENSION	UNDER 6	6 - 18	OVER 18
DECIMALS	± .005	± .005	± .010
FRACTIONS	± 1/64	± 1/32	± 1/16
TOLERANCE ON ANGLES ± 2½°			

COPES-VULCAN, INC.
Div. of the Wilcox Consolidated Industries
LAKE CITY ERIE CO.), PA. U.S.A.

FOR: D-100-400 ACTUATOR WITH 2 MICRO SWITCHES MOD# ICX-42.

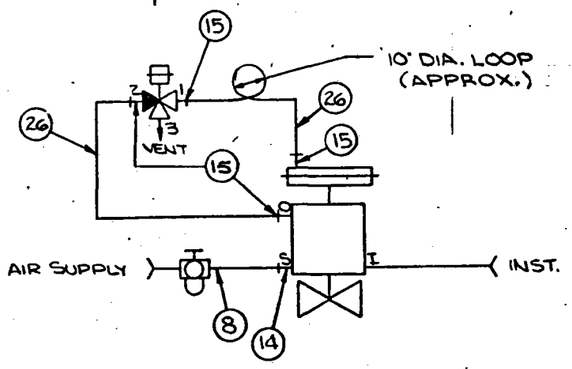
ACCESSORY KIT.

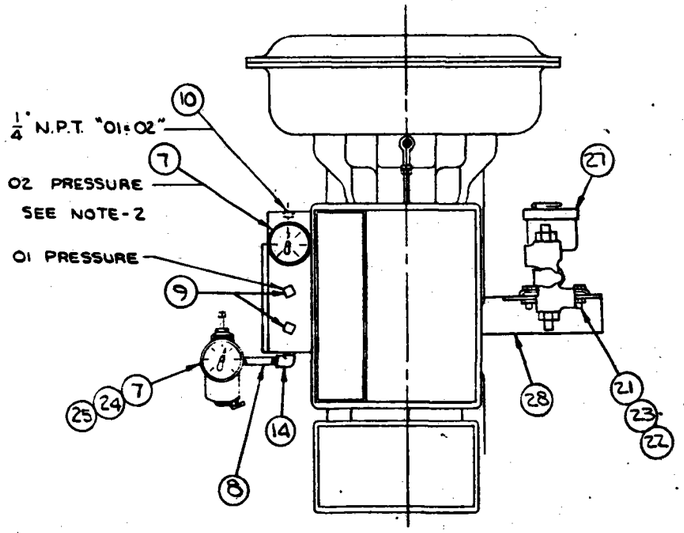
E-196249		DFTSMN T.S.	DATE	DSGN. JNR	DATE 3-3-61
MASTER ASSY	SUB ASSY	CHECKED	DATE	MFG.	DATE
JOB NO. SC10-1425		APP'D	DATE		DATE
REPTD FROM		PART CODE 5	SCALE	DWG. NO. E-196756	REV. 0

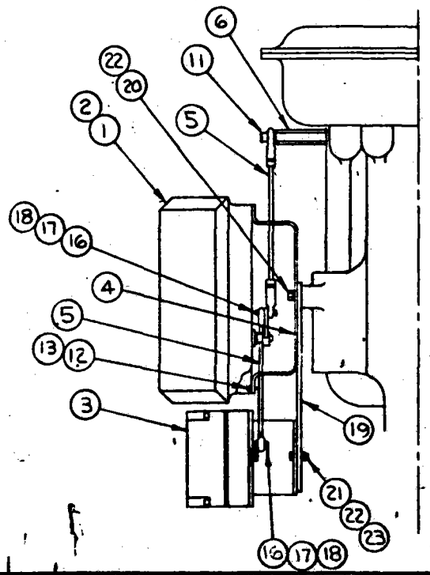
4.1.55-53

LIST OF MATERIALS

ITEM NO.	NO REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG NO.	REMARKS
	1	189681	3	POSITIONER ASS'Y.				BAILEY AP5
	1	NOTE-1	—	CAM				
3	1	161153	5	POSITION TRANSMITTER			L-161153	COPES LVDT
4	1	177717	3	MOUNTING BRACKET	STEEL	COM'L.	L-177717	.120 THK.
	2	33456	3	CONNECTING LINK ASS'Y.			M-133456	
	1	182000	5	CONTROL ARM	STEEL	ASTM-A108	S-182000	
7	2	130599	3	VALVE GAUGE				0-100 P.S.I.G.
8	1	41181	3	NIPPLE	STEEL	COM'L.		1/4" NPT x 3" LG
	2	5488	3	PIPE PLUG	STEEL	COM'L.		1/8" N.P.T.
	1	79557	3	PIPE PLUG	STEEL	COM'L.		1/4" N.P.T.
11	1	14926	3	SOC. HD. CAP SCREW	STEEL	COM'L.		#10-24UNC x 5/8" LG.
12	4	V-5754	3	SOC. HD CAP SCREW	STEEL	COM'L.		1/4"-20 UNC x 1" LG.
	4	4329	3	LOCKWASHER	STEEL	COM'L.		1/4"
	1	34809	3	STREET ELBOW	STEEL	COM'L.		1/4" NPT
15	4	NOTE-1	-	TUBE ELBOW	BRASS	COM'L		1/4" x 3/8 O.D. TUBE
16	2	39914	3	RD. HD MACH. SCREW	STEEL	COM'L.		#10-32 UNF x 1-1/4" LG
	2	41319	3	HEX NUT	STEEL	COM'L.		#10-32 UNF
18	2	35467	3	LOCKWASHER	STEEL	COM'L.		#10
19	1	161933	5	MOUNTING BRACKET	STEEL	COM'L.	M-161933	1/4" THK.
20	2	41358	3	HEX HD CAP SCREW	STEEL	COM'L		5/16"-18 UNC-1 1/2" LG.
	4	4548	3	HEX HD CAP SCREW	STEEL	COM'L.		5/16"-18 UNC-3/4" LG.
22	6	59404	3	LOCKWASHER	STEEL	COM'L.		5/16"
23	4	13803	3	HEX NUT	STEEL	COM'L.		5/16 - 18UNC
	1	136645	3	AIRSET			S-136645	CONOFLOW
	1	34716	3	BUSHING	BRASS	COM'L.		1/4" x 1/8"
26	9.0'	51412	3	TUBING	COPPER	COM'L		3/8 O.D.
27	1	NOTE-1	—	SOLENOID VALVE				ASCO 8302
	1	141334	5	MOUNT BRKT.	STEEL	ASTM-A7	M-141334	







REVISIONS

NO	DESCRIPTION	REV BY	CK'D BY	DATE	APP'D

NOTES:

1. AS CALLED FOR ON SHOP ORDER.
2. PRESSURE CONNECTIONS:
   01 - OUTPUT - D.A. POSIT. SUPPLY R.A. POSIT.
   02 - OUTPUT - R.A. POSIT. SUPPLY D.A. POSIT.
3. DIRECT ACTING POSIT. - CONNECT 01 TO ACTUATOR & PLUG 02.
   REVERSE ACTING POSIT. - CONNECT 02 TO ACTUATOR & PLUG 01
4. THE CONNECTING LINK ASS'Y. (ITEM 5) MAY REQUIRE CUTTING TO LENGTH TO SUIT THE APPLICATION.

COPES-VULCAN, INC.
Div. of The Marley Cooling Tower Co.
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: D-100-400 ACTUATOR.

(1) BAILEY AP5 POSITIONER
(1) LVDT POSITION TRANSMITTER
(1) CONOFLOW AIRSET
(1) ASCO SOLENOID VALVE.

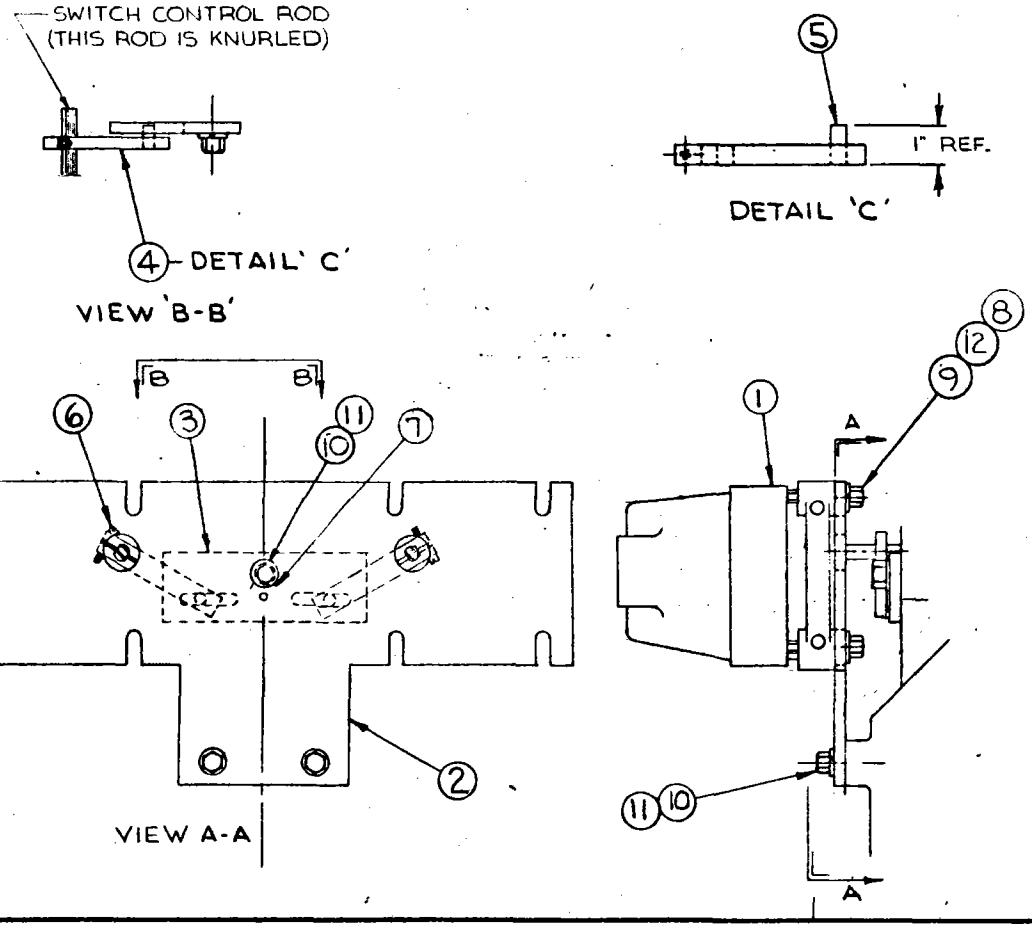
ACCESSORY KIT

E-196349			
MASTER ASSY	SUB ASSY		
JOB NO 8010-1496			
REPRO FROM E-196933			
	PART CODE 5		

DFTSMN TS	DATE 8-[illegible]	DSGN. JNR	DATE 7-23-81
CHECKED D.W	DATE 7-[illegible]	MFG.	DATE
APP'D	DATE		DATE
SCALE	DWG. NO. E-196780		REV. 0

4.1.55-55

ITEM No	No REQ'D	PART No.	PART CODE	DESCRIPTION	MAT'L.	MATERIAL SPECS.	DWG. NO.	REMARKS
1	2	NOTE-1	–	POSITION SWITCH				MICRO ICX-42
2	1	190310	5	MOUNTING PLATE	STEEL	ASTM-A36	L-190310	1/4" THK.
3	1	190311	5	GUIDE BAR	STEEL	ASTM-A108	M-190311	
4	2	190312	5	OPERATING ARM	STEEL	ASTM-A108	M-190312	
5	2	100471	5	DOWEL PIN	STEEL	COM'L	S-100471	
6	2	174583	3	PAN HD. MACH. SCR.	STEEL	COM'L.		8-32 UNC × 5/8" LG.
7	1	139692	3	SPRING PIN	STEEL	COM'L.		3/16" × 1/2" LG.
8	4	90913	3	HEX NUT	STEEL	COM'L.		1/4"
9	8	60052	3	LOCKWASHER	STEEL	COM'L.		1/4" SPRING TYPE
10	3	21424	3	HEX HD. CAP SCR.	STEEL	COM'L.		5/16"-18 UNC × 1" LG.
11	3	59404	3	LOCKWASHER	STEEL	COM'L.		5/16" SPRING TYPE
12	8	19537	3	HEX HD. CAP SCR.	STEEL	COM'L.		1/4"-20 UNC × 2 1/4" LG.



REVISIONS NO.	DESCRIPTION	REV BY	APP'D BY	DATE	APPD

NOTES :

1. AS CALLED FOR ON SHOP ORDER.

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
BREAK CORNERS 1/64 MAX.
FILLETS ARE 1/64 TO 1/32 R
✓ INDICATES 250 FINISH
TOLERANCES ARE:

DIMENSION	UNDER 6	6 - 18	OVER 18
DECIMALS	± .005	± .005	± .010
FRACTIONS	± 1/64	± 1/32	± 1/16

TOLERANCE ON ANGLES ± 2½°

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

D-100-160 DIRECT ACTING ACTUATOR WITH (2) TWO MICRO SWITCHES ICX-42

ACCESSORY KIT

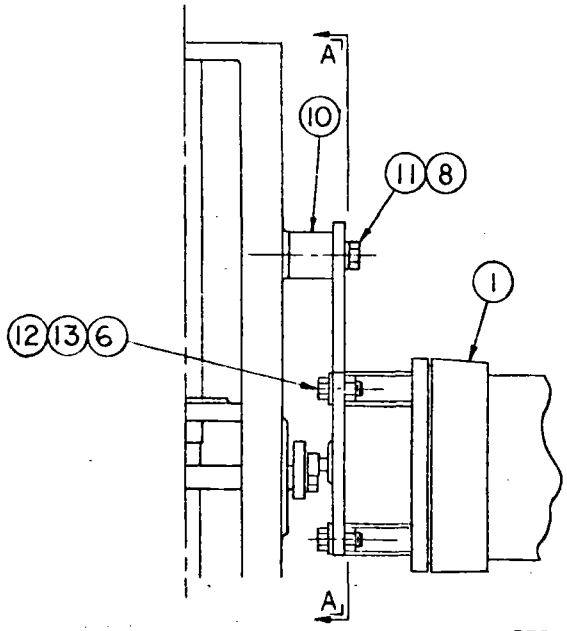
E-187152		DFTSMN TS DATE 8/3/7	DSGN. JNR DATE 5-18
MASTER ASSY	SUB ASSY	CHECKED GG DATE 8/24/7	MFG. DATE
JOB NO. 7910-98543		APP'D WMS DATE 8/30	DATE
REPRO FROM L-184344		SCALE ~	DWG. NO. L-190313 REV O
PART CODE 5			

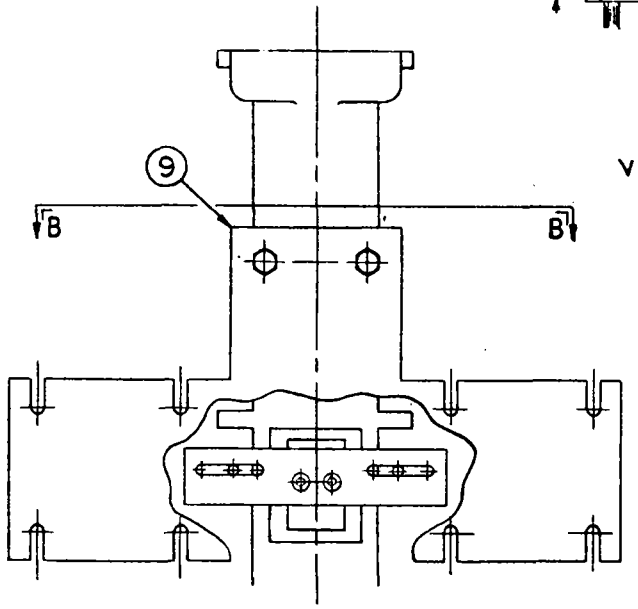
4.1.55-49

LIST OF MATERIALS

ITEM NO.	NO. REQ'D.	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L SPEC.	DWG. NO.	REMARKS
1	2	NOTE-1	—	MICRO SWITCH				MOD.# ICX42.
2	1	195623	5	TORQUE ARM	STEEL	ASTM-A108	M-195623	
3	1	195624	5	GUIDE BAR	STEEL	ASTM-A108	M-195624	
4	2	190312	5	OPERATING ARM	STEEL	ASTM-A108	M-190312	
5	2	190471	5	DOWEL PIN	STEEL	COM'L	S-190471	
6	10	[illegible]	3	LOCKWASHER	STEEL	COM'L		1/4" SPRING TYPE
7	2	2[illegible]7	3	[illegible] HD. CAP SCR.	STEEL	COM'L.		1/4"-20 UNC X 3/4" LG.
8	2	59404	3	LOCKWASHER	STEEL	COM'L		5/16" SPRING TYPE.
9	1	190310	5	MOUNT. BRKT	STEEL	ASTM-A36	L-190310	1/4" THK.
10	1	195625	5	SPACER	STEEL	ASTM-A108	M-195625	
11	2	32376	3	HEX HD CAP SCR	STEEL	COM'L.		5/16"-18 UNC X 2" LG
12	8	19537	3	HEX HD. CAP SCR	STEEL	COM'L.		1/4"-20 UNC X 2 1/4" LG.
13	8	90913	3	HEX NUT	STEEL	COM'L.		1/4"-20 UNC.
14	2	174583	3	PAN HD. MACH. SCR.	STEEL	COM'L		8-32 UNC X 5/8" LG.
15								
16								
17								
18								
19								
20								

NOTES:
1. AS CALLED FOR ON SHOP ORDER.
2. ADJUST TO 1/32" MIN.





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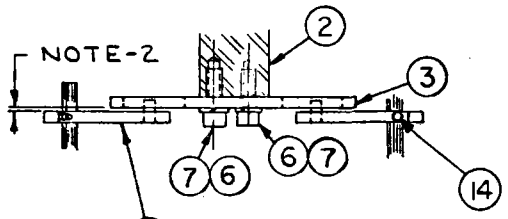

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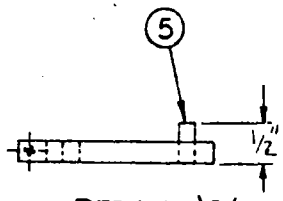


DETAIL 'C'

NO.	DATE	REVISIONS	BY	CHK.
1	2-24-81	ADDED ITEM # 14, ADDED MOD.# ICX43	T. FINK	KH

NO.	DATE	REVISIONS	BY	CHK.

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA U.S.A.

FOR: D-100-40 ACTUATOR WITH 2 MICRO SWITCHES
MOD NO'S.- ICX42; ICX43

ACCESSORY KIT.

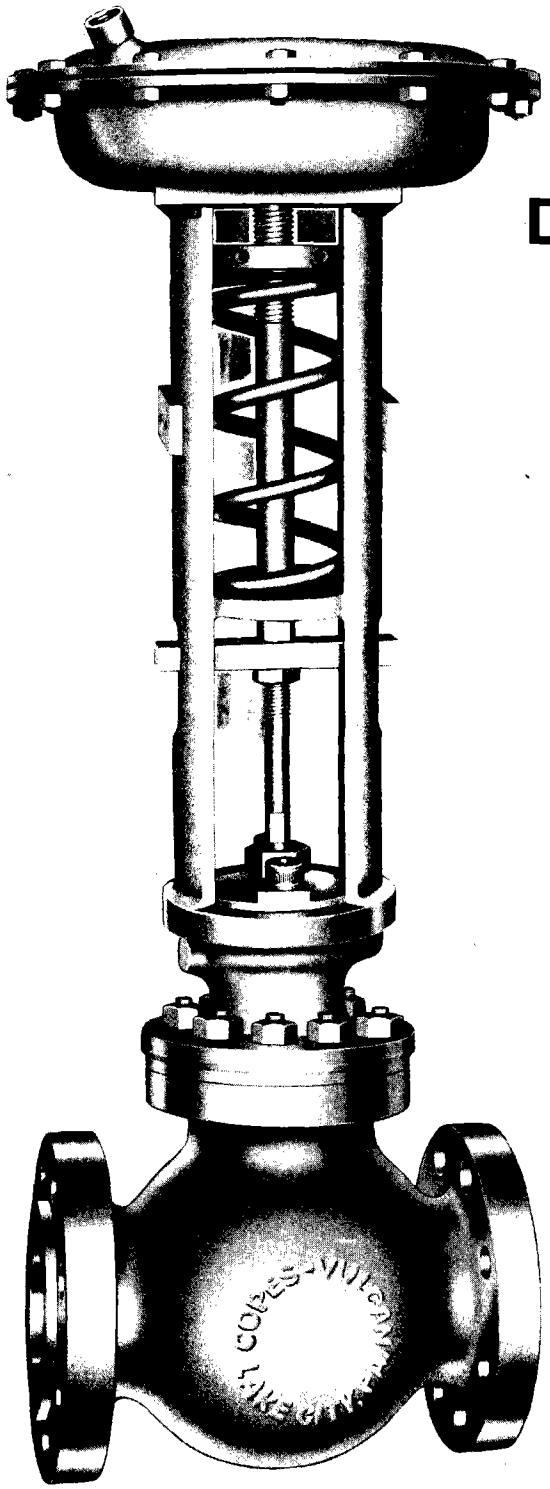
E-195621
MASTER SUB ASS'Y.
REPRO FROM
PART CODE 5

DFTSMN T.S. DATE 10-23-80
CHECKED KH DATE 11-19-80
APP'D: LRS DATE 11-26-80
JOB NO. 8010-14896
SCALE —

DWG. NO. L-195622 REV. 1

4.1.55-50

INSTRUCTIONS



FOR

TYPE D-100-40

DIAPHRAGM-OPERATED CONTROL VALVE

FORM #01:P110:37

COPES-VULCAN, Inc.

Lake City, Pennsylvania 16423

One of the White Consolidated Industries

WCI

TYPE D-100-40 DIAPHRAGM OPERATED CONTROL VALVE

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Section 1
INSTALLATION

The following instructions should be read carefully before installing the D-100-40 operator and valve.

Check the piping size connecting the valve in the system. It should be large enough to allow the major pressure drop to occur at the valve.

Whenever possible the D-100-40 valve should be mounted with the operator located above the valve. However, if necessary, the valve may be installed either vertically or horizontally in a line.

Never clamp the valve body in a vise, since permanent distortion may occur, resulting in a damaged valve.

Check the valve installation to assure that the flow enters the valve at the end marked *'inlet'*.

1.1 VALVES WITHOUT POSITIONERS

Only one (1) air line connection is required for the D-100-40 valve when the valve is utilized without a positioner. Irrespective of operator action, i.e. reverse or direct, the operator cover is provided with a 1/4" N.P.T. tapped hole to receive the control signal pressure line connection. 1/4" O.D. copper tubing is recommended for the control signal pressure line.

NOTE: Maximum air to the diaphragm chamber should not exceed 100 psig.

1.2 VALVES WITH POSITIONERS

Two (2) air line connections are required for the D-100-40 valve with a positioner. (1) A clean, dry air supply (40 psi or higher) should be connected to an air filter and pressure-reducing valve. The output from the air-reducing valve should then be connected to the positioner at the 3/8" tee marked *'supply'*. 3/8" O.D. copper tubing is recommended for this air supply line. The air supply pressure-reducing valve should then be adjusted for the necessary pressure to the positioner (not to exceed 100 psi). (2) The control signal pressure line should be connected to the positioner at the 3/8" N.P.T. opening marked *'instrument'*. 1/4" O.D. copper tubing is recommended for the control signal pressure line.

Section 2
DESCRIPTION OF OPERATION

The operating range of the D-100-40 valve is the difference in air pressure required to drive the valve through its full stroke. This operating range is determined by the range spring rating. The standard spring ratings are 20 psi and 12 psi. The 20 psi rating is factory adjusted for a standard operating range of 5 psi to 25 psi. The 12 psi rating is factory adjusted for a standard range of 3 psi to 15 psi. The operating range may be raised or lowered by adjusting the spring compression nut.

A handwheel operator, positioner and limit switches are available as optional equipment of the D-100-40 valve.

2.1 VALVES WITH POSITIONERS

The D-100-40 assembly may be designated as reverse or direct action. The action of the D-100-40 assembly is determined by the individual action of the valve trim, valve top-works and positioner. Changing the action of any one of the individual components will change the action of the assembly. Changing the action of any two of the individual components results in no change of the assembly action.

Refer to the attached table for the resulting assembly actions for various component arrangements.

The pneumatic controller signal is directed to the D-100-40 valve positioner at the port marked *'instrument'*. A change in the pneumatic controller signal results in an output pressure change from the positioner. This change is directed to the diaphragm chamber of the valve actuator causing the valve to be repositioned. As the valve is repositioned a linkage attached from the valve yoke to the positioner causes a feedback force to be exerted on the positioner bellows resulting in a

counterbalance of the pneumatic controller signal. The circuit is designed to result in a continued loading change on the valve's diaphragm by the positioner until the valve has actually repositioned itself and has rebalanced the initial pneumatic signal change. This arrangement provides fast, accurate, positive positioning of the valve.

2.2 VALVES WITHOUT POSITIONERS

The action of the D-100-40 assembly without a positioner is determined by the individual action of the valve trim and valve topworks. Changing of any one of the individual components will change the action of the assembly.

Refer to the attached table for the resulting assembly actions for various components arrangements.

The pneumatic control signal is directed to the diaphragm chamber of the D-100-40 valve. An increase in the pneumatic controllers signal increases the pressure on the valve diaphragm causing the valve to reposition itself until the range spring is compressed sufficiently to establish equilibrium. Since the counterforce exerted by the range spring varies proportionally to the distance compressed, linear increases in the diaphragm pressure result in a linear repositioning of the valve stem.

An expansion loop must be provided in the tubing to reverse-acting operators, since the diaphragm chamber moves an amount equal to the valve stroke.

Section 3
ASSEMBLY

3.1 DIRECT ACTING

In a direct acting operator, the lower seat of the range spring is supported by the frame and the upper seat applies its force to the spring adjuster to force the stem upward. The spring adjuster is screwed down over the valve stem, and the upper part of the valve stem is screwed in to the stem retainer, which in turn is attached to the diaphragm plate by means of four (4) machine screws. The stem is prevented from turning in the retainer by means of a spring pin through the retainer and into the stem, the lower diaphragm cover is held to the frame by two (2) capscrews, and the two (2) diaphragm covers are held together by twelve (12) capscrews and nuts. Attached to the lower end of the valve stem is the torque bar, into which the trim stem assembly is screwed. In the absence of, or loss of, air to the diaphragm chamber, the spring exerts its force upward against the spring retainer to force the stem upward and the valve into the open position.

An increase in pneumatic loading pressure drives the diaphragm plate, stem and retainer downward toward the closed position, when the pressure is sufficient to overcome the counterforce of the spring.

3.2 REVERSE ACTING

In a reverse-acting operator, the upper seat of the range spring is supported by the spring retainer and the lower seat applies its force to the spring adjuster which is screwed onto the lower end of the stem. The upper end of the stem is screwed, through the lower diaphragm cover, into the stem retainer, which is, in turn, secured to the lower diaphragm cover by two (2) capscrews. The stem is prevented from turning in the retainer by means of a spring pin inserted through the stem and into the retainer, the diaphragm plate is secured to the operator frame by means of four (4) standoffs and capscrews which extend through the holes in the lower diaphragm cover. The two (2) diaphragm covers are held together by twelve (12) capscrews and nuts. Attached to the lower end of the valve stem is the torque bar, into which the trim stem assembly is screwed.

In the absence of, or upon loss of, air pressure to the diaphragm chamber, the spring exerts its force downward against the spring adjuster to force the stem downward and the valve into the closed position. An increase in pneumatic loading pressure moves the diaphragm chamber in the upward direction (the diaphragm plate is stationary), as well as the stem to which it is connected. When the counterforce of the spring is completely overcome the valve is fully open.

Section 4
ACTION IDENTIFICATION
(See Figure 1)

4.1 DIRECT ACTING VALVE

A valve is direct acting when it closes with valve stem movement toward the valve body and opens with valve stem movement away from the valve body.

4.2 REVERSE ACTING VALVE

A valve is reverse acting when it opens with valve stem movement toward the valve body and closes with valve stem movement away from the valve body.

4.3 DIRECT ACTING TOPWORKS

A topworks is direct acting when an increase in the diaphragm loading pressure causes the valve stem to move toward the valve body.

4.4 REVERSE ACTING TOPWORKS

A topworks is reverse acting when an increase in the diaphragm loading pressure causes the valve stem to move away from the valve body.

4.5 DIRECT ACTING POSITIONER

A positioner is direct acting when an increase in the pneumatic input signal causes an increase in the positioner output pressure.

4.6 REVERSE ACTING POSITIONER

A positioner is reverse acting when an increase in the pneumatic input signal causes a decrease in the positioner output pressure and a decrease in the pneumatic input signal causes an increase in the positioner output pressure.

4.7 DIRECT ACTING ASSEMBLY

An assembly is direct acting when an increase in the pneumatic input signal causes the valve closing.

4.8 REVERSE ACTING ASSEMBLY

An assembly is reverse acting when an increase in the pneumatic input signal causes valve closing.

Section 5
D-100-40 VALVE ACTION TABLES

5.1 WITH POSITIONER

TOP	TRIM	POSITIONER	ASSEMBLY
DA	DA	DA	DA
DA	RA	RA	DA
DA	DA	RA	RA
DA	RA	DA	RA
RA	RA	RA	RA
RA	RA	DA	DA
RA	DA	DA	RA
RA	DA	RA	DA

5.2 WITHOUT POSITIONER

TOP	TRIM	ASSEMBLY
DA	DA	DA
DA	RA	RA
RA	DA	RA
RA	RA	DA

Section 6
STEM ADJUSTMENT

Stem adjustment should be made before other adjustments, such as valve travel indicator plates, positioner linkages or limit switches (if included). The following applies to all lengths of strokes, with "A" representing stroke as designated on applicable drawings.

6.1 DIRECT ACTING (normally open)

1. With no pressure in the diaphragm chamber, adjust the stem to be approximately "A" inches from the seat. Adjust the stroke by screwing the trim stem in or out of the operator stem, as required.

2. Apply air pressure into the diaphragm chamber until the plunger seats. Note the actual stroke.

3. Vent air from the diaphragm and readjust until the actual stroke is exactly "A" inches.

4. The stem is thus limited in the open position by the diaphragm plate, with attached stem, contacting the upper diaphragm cover, and in the closed position by the plunger seating in the cage.

5. Use the stem lockwasher and jam nut to secure the stem in the desired position.

6.2 REVERSE ACTING (normally closed)

1. Apply air pressure to full stroke the diaphragm chamber, and adjust the stem in the yoke to be approximately "A" inches from the seat. Adjust the stroke by screwing the trim stem in or out of the operator stem, as required.

2. Vent air from chamber and note actual stroke.

3. Repressurize diaphragm chamber and readjust stem until actual stroke is exactly the designated "A" inches.

4. The stroke is thus limited in the closed position by the plug seating in the cage and in the open position by the lower diaphragm chamber contacting the (stationary) diaphragm plate.

5. Use the stem lockwasher and jam nut to secure the stem in the desired position.

Section 7
MAINTENANCE

7.1 PACKING REPLACEMENT

Under normal operating conditions the main valve stem packing should be replaced once a year. (Obtain part number from valve data sheet.)

1. Check replacement packing for proper size and type.

2. Shut off the valve to prevent leakage during the removal of the old packing.

3. Remove gland follower by screwing it out of the stuffing box; slide it up the stem and wire in place.

4. Remove the old packing with a packing hook and make sure the stuffing box is clean. Compressed air directed into the box may be used for cleaning.

5. Open the replacement packing in the direction of the bias cut and insert one (1) ring around the stem and tamp into the stuffing box. Each succeeding packing ring should be oriented so that its split is rotated 90° (clockwise) from the ring immediately below it.

6. Replace the packing gland and screw it into the stuffing box.

7.2 DIAPHRAGM

The main valve diaphragm should be inspected once a year and the diaphragm replaced as required. (Obtain part number from operator assembly drawing.)

7.3 POSITIONER (optional)

Refer to the attached positioner instructions for maintenance procedure.

7.4 FITTINGS

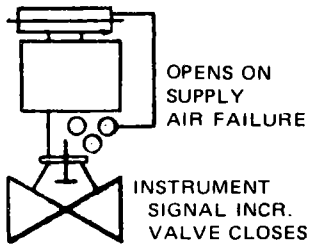
Under normal operation the valve fittings should be inspected once a year and the fittings should be cleaned, reground or replaced as required. More frequent inspection and servicing of the valve fittings may be required for severe operating conditions.

Figure 1
CVI D-100 ARRANGEMENTS

DIRECT-ACTING ASSEMBLIES

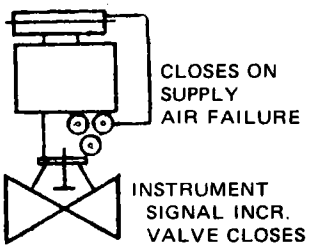
REVERSE-ACTING ASSEMBLIES

(1)



DIRECT TOP
DIRECT POSITIONER
DIRECT FITTING

(2)



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REVERSE POSITIONER
DIRECT FITTING

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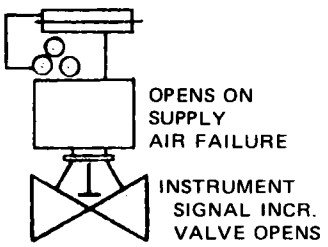
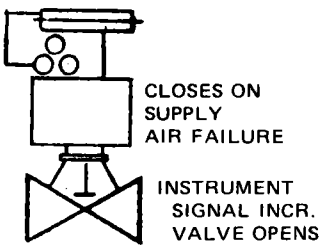


DIRECT TOP
REVERSE POSITIONER
DIRECT FITTING

(6)



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DIRECT FITTING

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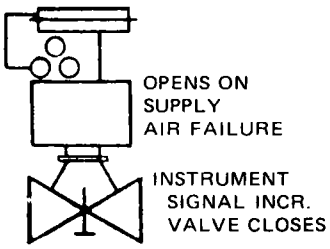

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DIRECT POSITIONER
REVERSE FITTING

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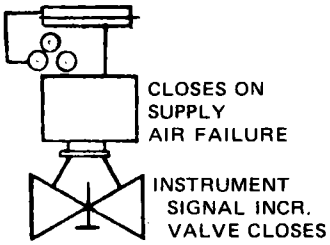

DIRECT TOP
REVERSE POSITIONER
REVERSE FITTING

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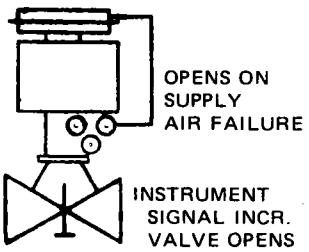

REVERSE TOP
REVERSE POSITIONER
REVERSE FITTING

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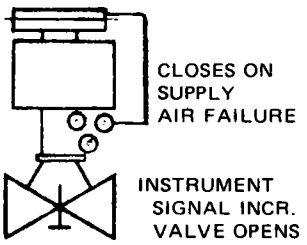
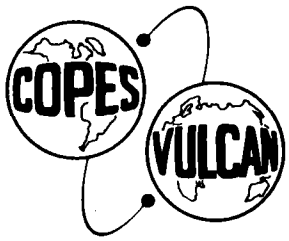


DIRECT TOP
DIRECT POSITIONER
REVERSE FITTING

MAXIMUM AIR TO DIAPHRAGM - 100 PSIG

MAXIMUM OPERATOR STROKE:

D-100-40 . . . 2 INCHES



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Lake City, Pennsylvania 16423

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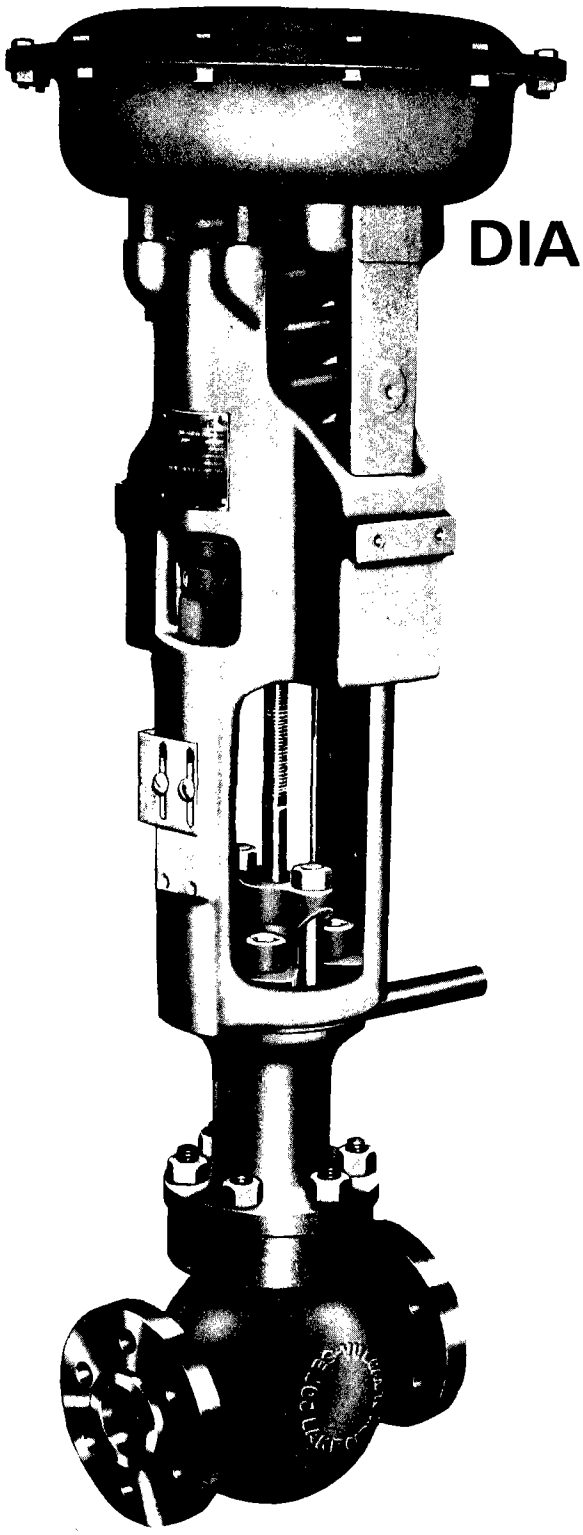
INSTRUCTIONS



FOR
TYPE D-100
DIAPHRAGM-OPERATED CONTROL VALVE

FORM #01:P13:37

COPES-VULCAN

Lake City, Pennsylvania 16423

One of the White Consolidated Industries

WCI

TYPE D-100 DIAPHRAGM-OPERATED CONTROL VALVE

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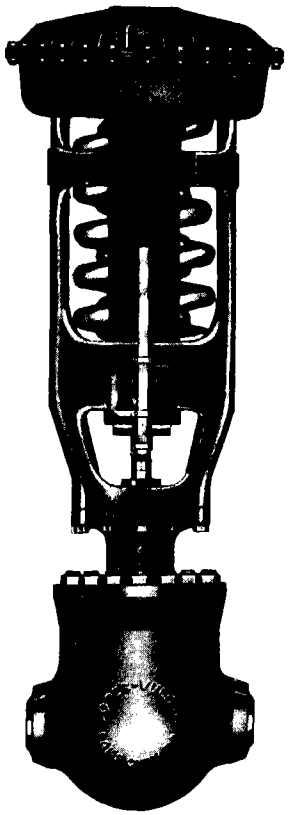
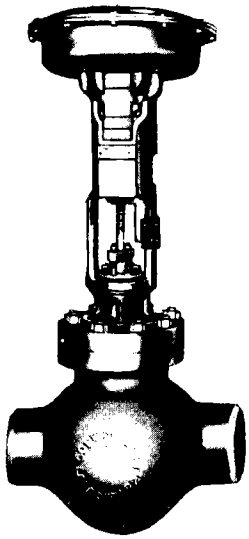


D-100-400



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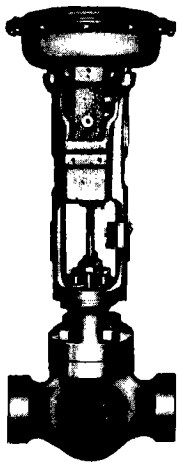
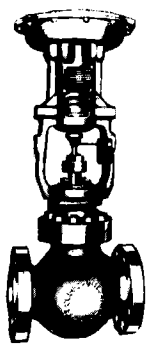


D-100-100



D-100-60

Section 1
GENERAL INFORMATION

1-1. INTRODUCTION

These instructions outline the correct procedure for installation, operation, and maintenance of the D-100 series control valves. These valve assemblies basically consist of the valve body with its internals, and the diaphragm operator. A handwheel operator, positioner, and limit switches are available as optional equipment of the D-100 valve.

1-2. VALVE OPERATOR SIZE DESIGNATION

The D-100 valve series includes four (4) operator sizes. The number following the basic designation, D-100, indicates the effective area of the diaphragm: 60, 100, 160, or 400 square inches.

1-3. CONTROL VALVE TERMINOLOGY

Valve Assembly Action

The valve assembly action may be defined as the interaction of the valve operator plus the valve trim (plus the positioner, if used.) This assembly action may be either 'direct' or 'reverse'. Each of the components' action may be reversed, and changing the action of any one of them will change the action of the assembly. Reversing the action of two (2) of these components will result in no change in the action of the assembly. See CV D-100 Arrangements, p. 8.

Direct-Acting Valve Trim

Valve trim is direct-acting when it closes with valve stem movement toward the valve body and opens with valve stem movement away from the valve body.

Reverse-Acting Valve Trim

Valve trim is reverse-acting when it opens with valve stem movement toward the valve body and closes with valve stem movement away from the valve body.

Direct-Acting Operator

An operator is direct-acting when an increase in the diaphragm loading pressure causes the valve stem to move toward the valve body.

Reverse-Acting Operator

An operator is reverse-acting when an increase in the diaphragm loading pressure causes the valve stem to move away from the valve body.

Direct-Acting Positioner

A positioner is direct-acting when an increase in the pneumatic input signal causes an increase in the positioner output pressure.

Reverse-Acting Positioner

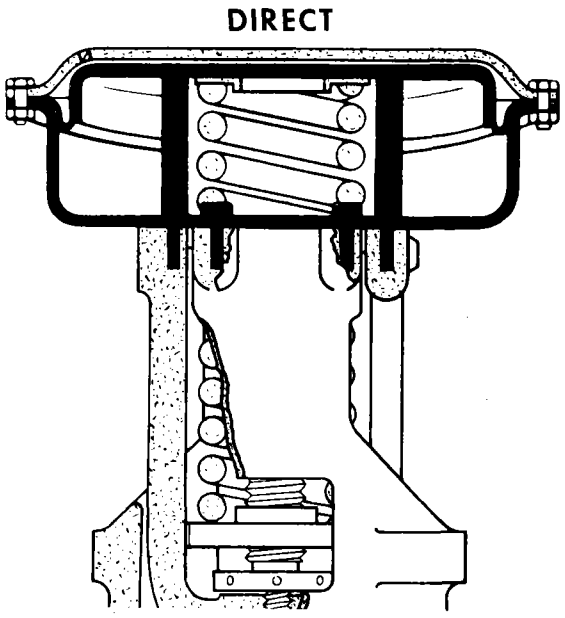
A positioner is reverse-acting when an increase in pneumatic input signal causes a decrease in the positioner output pressure.

Direct-Acting Valve Assembly

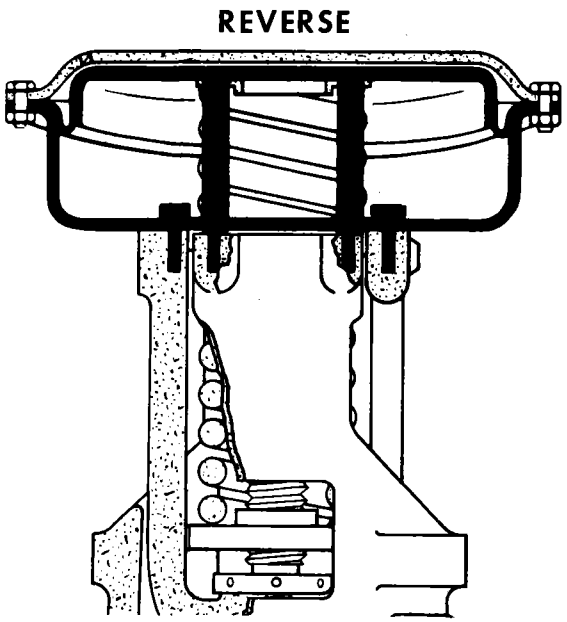
An assembly is direct-acting when an increase in the instrument input signal causes valve closing (in a valve with direct-acting trim.)

Reverse-Acting Valve Assembly

An assembly is reverse-acting when an increase in the instrument signal causes valve opening (in a valve with direct-acting trim.)



VALVE OPEN



VALVE CLOSED

Section 2
INSTALLATION

2-1. RECEIVING

Do not initiate installation until the material has been carefully checked against the list furnished by Copes-Vulcan. Be sure that the unpacked material is for the boiler on which it is to be installed, and check the D-100 diaphragm valve size and type for correctness. Check the piping size connecting the valve to the system. It should be large enough to allow the major pressure drop to occur at the valve. Check the valve installation to assure that the flow properly enters the valve at the end marked 'inlet'.

Whenever possible the D-100 valve should be mounted with the operator located above the valve. However, if necessary, the valve may be installed either vertically or horizontally in a line.

2-2. VALVE ASSEMBLIES WITHOUT POSITIONERS

Only one air line connection is required for the D-100 valve when the valve is utilized without a positioner. Irrespective of operator action, i.e. direct or reverse, the operator cover is provided with a 1/4" NPT tapped hole (3/4" for D-100-400) to receive the control signal pressure line connection. 1/4" O.D. copper tubing is recommended for the control signal pressure line. NOTE: Maximum air pressure to the diaphragm should not exceed 100 psig.

2-3. VALVE ASSEMBLIES WITH POSITIONERS

Two air line connections are required for the D-100 valve with a positioner. (1) A clean dry air supply should be connected to an air filter and pressure reducing valve. (See data sheet for maximum air supply required.) The output from the air reducing valve should then be connected to the positioner at the 3/8" tee marked 'supply'. 3/8" O.D. copper tubing is recommended for this air supply line. The air supply pressure reducing valve should then be adjusted for the necessary pressure to the positioner. (Not to exceed 100 psi.) (2) The control signal pressure line should be connected to the positioner at the 3/8" NPT opening marked 'instrument'. 1/4" O.D. copper tubing is recommended for the control signal pressure line.

2-4. STEM ADJUSTMENT

Stem adjustment should be made before continuing on to other adjustments, such as valve travel indicator plate, limit switches and positioner linkages (if included). The following applies to all sizes of actuators: *With "A" representing valve stroke in inches* as designed for the valve, stem adjustment should be made by turning it up or down in the yoke.

Direct-Acting: (Normally Open)

1. With no pressure in the diaphragm chamber, adjust the stem in the yoke to be approximately "A" inches from the seat by turning the stem up or down in the yoke.
2. Apply air pressure into the diaphragm chamber until the plug seats itself in the cage. Note the actual stroke distance.
3. Vent air from the diaphragm chamber and re-adjust until the actual stroke is exactly "A" inches.
4. The stem is thus limited in the open position by the upper seating surface of the yoke striking the fixed operator base, and then in the closed position by the plug seating in the cage.

Reverse-Acting: (Normally Closed)

1. Apply air pressure to full stroke the diaphragm chamber, and adjust the stem in the yoke to be approximately "A" inches from the seat.
2. Vent air from the chamber and note the actual stroke.
3. Repressurize the diaphragm chamber and re-adjust the stem until the actual stroke is exactly the designed "A" inches.
4. The stroke is thus limited in the closed position by the plug seating in the cage and in the open position by the actuator base contacting the lower lip of the diaphragm plate.

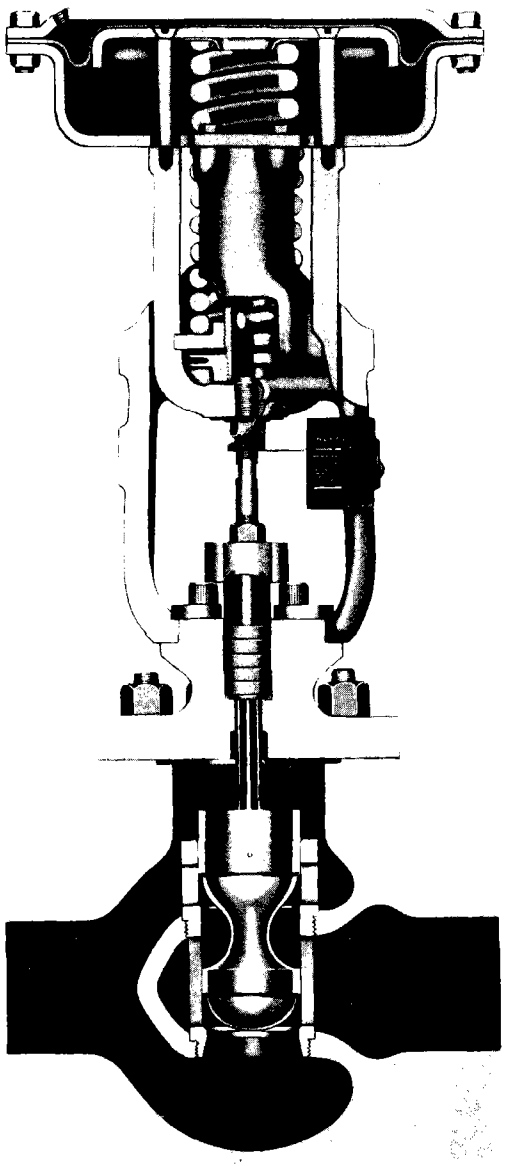
2-5. VALVE SPRING ADJUSTMENT

From the valve specification sheet obtain the required air pressure to begin the lift of the plug from the seat. Adjust the spring adjusting screw until the stem begins to move with the required air pressure.

The spring was properly adjusted at the factory and only minor adjustments should be necessary unless the operator has been disassembled. Turn the spring adjustment screw clockwise (looking down) to increase the spring force.

Section 3
OPERATION

Note: The following is a general and theoretical statement of the operational principles of the valve range spring and operator. Actual operating conditions will require adjustments which might change some variable factors, such as the operating range of the range spring.



3-1. VALVE RANGE SPRING AND OPERATOR

Theory of Operation: Direct-Acting

The controlling pressure which drives a valve through the full length of its stroke is stated as a "range" or "span" of air pressure, such as 12 psi or 20 psi. The valve "range spring" determines this span. The valve range spring "rating" (compression force per inch) is, in turn, calculated and ordered according to the service conditions of the valve, primarily the unbalanced force which the valve will encounter. (Unbalanced force = the greatest pressure exerted against valve trim under service conditions.) IMPORTANT: In direct-acting valves, Copes-Vulcan spring ratings are calculated so that the minimum rating and precompression are applied to most service conditions.

The spring rating is so determined that, in a direct-acting operator and under ideal conditions, a slight increase in air pressure (usually 3 psig at the bottom of the range) will start to move the valve trim in a downward direction. At this point, the range spring will start to oppose the force exerted by the loading in the diaphragm chamber in order to control the valve stem movement. With full loading of the diaphragm chamber, the counterforce of the range spring will be overcome to the point where the valve trim (direct-acting) will close.

Spring Adjustment

Since valves seldom operate under the ideal conditions assumed above, the valve spring is provided with an adjustment, the spring "compression nut," which in effect raises or lowers (as a whole) the span through which the valve operates. This spring compression nut must be so adjusted that actual valve stem travel begins to occur at the specified diaphragm pressure.

With Reverse-Acting Operator

In a reverse-acting operator, the range spring will be the force seating the valve plug and the loading of the diaphragm chamber will overcome the spring force. Since in this condition the spring must withstand the pressure of service, the range spring force must necessarily be much greater than that used for a direct-acting operator.

Instrument Control Ranges

Instrument control ranges are standardized at spans of 3 to 15 psig, 5 to 25 psig, 3 to 27 psig and 0 to 30 psig. Valve ranges are set to coincide with instrument control ranges (normally) through a valve positioner.

3-2. VALVES WITH POSITIONERS

The pneumatic controller output signal is directed to the D-100 valve positioner at the port marked 'instrument'. A change in the pneumatic controller signal results in an output pressure change from the positioner. This change is directed to the diaphragm chamber of the valve operator causing the valve to be repositioned. As the valve is repositioned a linkage attached from the valve yoke to the positioner causes a feedback force to be exerted on the positioner bellows resulting in a counterbalance of the pneumatic controller signal. Thus we have a position feedback system. Each segment of instrument loading demands a specific valve throttling position.

3-3. VALVES WITHOUT POSITIONERS

The pneumatic control signal is directed to the diaphragm chamber of the D-100 valve assembly. An increase in the pneumatic controller's signal increases the pressure on the valve diaphragm causing the stem and plug to reposition itself until the range spring is sufficiently compressed to establish equilibrium. Because the counterforce exerted by the range spring varies proportionately to the distance compressed, linear increases in the diaphragm movement result in a linear repositioning of the valve stem and plug.

An expansion loop must be provided in the tubing to reverse-acting operators because the diaphragm chamber moves an amount equal to the valve stroke.

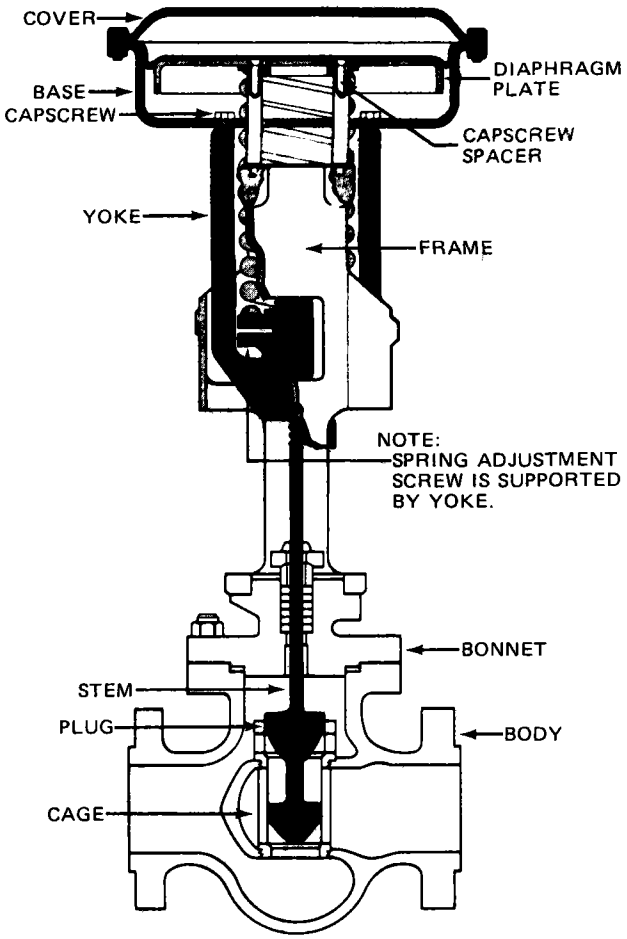
3-4. DIRECT-ACTING OPERATOR

In the case of a direct-acting operator, the lower seat of the range spring is supported (through the spring adjusting screw and nut) by the frame which is fixed to the bonnet. The upper seat of the range spring applies its compressed force to the diaphragm plate. The diaphragm plate is connected by long cap screws and spacers to the yoke. The yoke, in turn, is assembled to the valve stem. The operator cover and base are fixed to the upper seat of the frame. Thus the spring force will maintain the interconnected diaphragm plate, yoke, stem and plug in the open position on loss of air.

3-5. REVERSE-ACTING OPERATOR

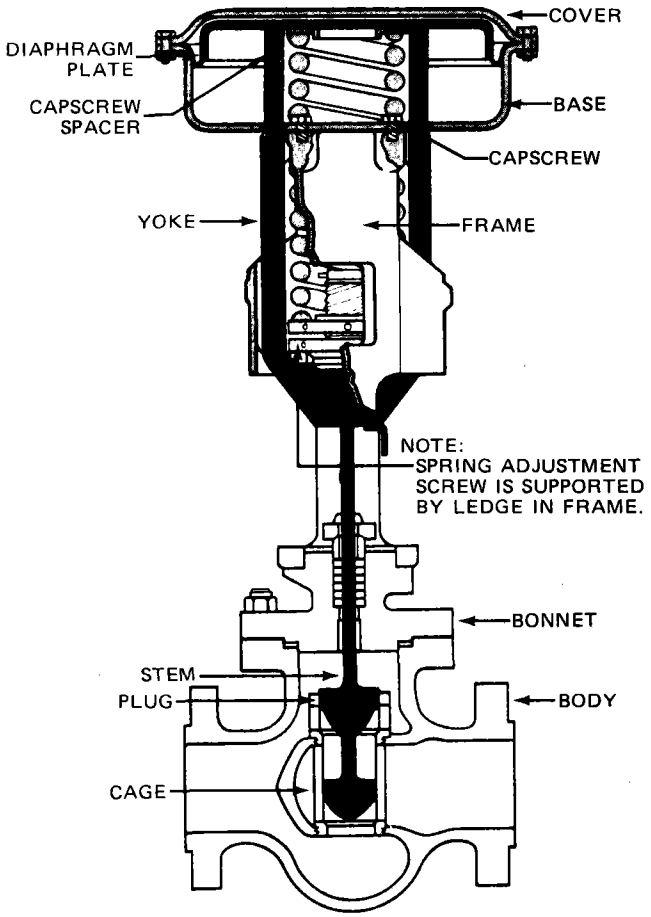
In the case of a reverse-acting operator, the diaphragm plate is connected by long cap screws and spacers to the frame, which is fixed to the bonnet (and is thus stationary). The operator base and cover are assembled to the yoke, which in turn is assembled to the valve stem and plug. The upper seating surface of the compression spring is fixed against the diaphragm plate and the lower seating surface of the spring rests on the adjusting screw and nut. Thus the spring, through the adjusting screw and nut, is supported at the lower seat by the yoke, so that the compressed force of the spring is placed against the diaphragm plate (which is stationary) and against the yoke, stem and plug assembly to force the plug toward the closed position.

VALVE FULL OPEN



REVERSE ACTING

VALVE FULL OPEN



DIRECT ACTING

Section 4
MAINTENANCE

4-1. CHANGING ACTION

CAUTION: D-100-400 Only

Although the valve operator is reversible, the change cannot be field accomplished. Special equipment is required to remove the springs.

Forces in the proximity of 33,000# are involved in operator assembly. This force is exerted throughout the valve.

DO NOT ATTEMPT TO DISMANTLE.

The D-100-400 uses one spring or a combination of up to three springs in order to achieve the necessary spring range.

Direct to Reverse

If the valve has already been installed in a line, isolate it from the system and depressurize the diaphragm chamber of the operator and the valve body before attempting to change the action. Otherwise, proceed as follows:

1. Before changing the valve action from direct to reverse, consult Copes-Vulcan to determine the ability of the existing range spring to overcome the new unbalanced force across the internal valve fittings.
2. Back off the spring adjusting screw to the full extent of its travel to relieve the tension on the range spring.
3. Loosen and remove the bolts from the cover assembly and place aside the cover and diaphragm.
4. Remove the diaphragm plate by taking out the long cap screws and spacers.
5. Remove the cap screws and lockwashers holding the base in place, and rotate the base 90 degrees.
6. Replace the screws and lockwashers.
7. Align the diaphragm plate with the four remaining holes and fasten it securely to the frame.

NOTE: Two long studs (approximately 10") may be needed to precompress the spring enough so that the cap screws may be threaded into the frame. Accomplish this by screwing these long studs with nuts through the diaphragm plate into the frame. By successively tightening the nuts on these long studs to the diaphragm plate, the range spring will be sufficiently compressed to allow the threading of two of the cap screws through the diaphragm plate into the frame.

8. Once two of the cap screws are in place, back off the nuts and remove the studs so that the other two cap screws may be screwed into place.
9. Replace the diaphragm and cover, and secure in place.
10. Readjust the spring adjusting screw.

Reverse to Direct

If the valve has already been installed in a line, isolate it from the system and depressurize the diaphragm chamber and valve body before attempting to change the action. Otherwise, proceed as follows:

NOTE: The following procedure must be observed exactly as stated in order to relieve any existing residual range spring tension on the reverse action operator.

1. Back off the spring adjusting screw to the full extent of its travel.
2. Loosen and remove the cap screws from the cover assembly and set aside the cover and diaphragm.
3. Remove two opposing cap screws and spacers that hold the diaphragm plate to the frame and replace them with two similar studs of twice the length of the originals.
4. Once these long studs are securely fastened into the frame, tighten them with a washer and nut to the diaphragm plate.
5. Back off the remaining two cap screws so that the residual tension of the range spring is contained by the two long studs.
6. Evenly back off the two nuts until all the pressure has been relieved.
7. Remove the cap screws and lockwashers that hold the base in place and rotate the base 90 degrees.
8. Replace the screws and lockwashers, align the base plate with the remaining four holes and securely fasten it to the yoke.
9. Replace the diaphragm and bolt the cover into place.
10. Readjust the spring adjusting nut.

4-2. PACKING REPLACEMENT

Under normal operating conditions the main valve stem packing should be replaced once a year.

1. Check the replacement packing for proper size type and number of rings.

2. Shut off the valve to prevent leakage during the removal of the old packing.
3. Remove the two gland follower holding nuts from their studs and remove the old packing.
4. Open the replacement packing in the direction of the bias cut and insert one ring around the stem and tamp into the stuffing box. Each succeeding packing ring should be oriented so that its split is rotated 90 degrees (clockwise) from the ring immediately below it. The packing gland may be used to tamp the packing rings into place.
5. Replace the gland, gland follower and gland follower nuts.
6. Alternating between the two follower nuts, tighten the nuts down one at a time. Do not tighten the follower nuts excessively as excessive valve stem friction may result.

4-3. DIAPHRAGM

The main valve diaphragm should be inspected once a year and the diaphragm replaced as required.

4-4. POSITIONER

Refer to the attached positioner instruction for maintenance procedure.

4-5. TRIM

Under normal operation the valve trim should be inspected once a year and cleaned, reground or replaced as required. More frequent inspection and servicing of the valve trim may be required for severe operating conditions.

4-6. HYDRAULIC DAMPER

A hydraulic damper is available as accessory equipment for the D-100 reversible diaphragm operator series. It is designed to stabilize the diaphragm-operated valve when the internals are subjected to high frequency pulsation induced into the control fluid from an outside source.

When there is instability from within the valve, the operator tends to move against the air loading signal. With the damper, however, in order for the valve to stroke, the hydraulic fluid must be transfered across a restriction. The speed with which this transfer can occur is limited by orifice size and quantity of fluid. In this way the valve cannot react instantaneously to a force change.

The hydraulic damper may be assembled to the diaphragm operator by first removing the cover from the cover assembly. Then place the chamber separator over the diaphragm and fasten with cap screws and nuts. Screw a stud into the lower diaphragm plate and place a post over the stud. Place the upper diaphragm and the upper diaphragm plate over the stud. Bolt the chamber to the chamber separator. Place a seal washer over the stud and fasten with a nut or handwheel stump. Bolt the cover to the chamber with a gasket between them.

To fill the chamber with hydraulic fluid, place the operator in a horizontal position with the holes for the pipe plug facing up.

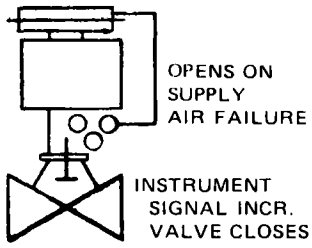
Fill the chamber through both holes with the hydraulic fluid until all the air has been exhausted from the chamber. After all the air has been exhausted, plug one hole and attach a hose from the second hole to a controlled air supply.

Pressurize the chamber to 20 psi. This will form the diaphragm to its proper contour. Add hydraulic fluid again until full. Repeat the pressurizing process. Finally, remove one (1) cubic inch of fluid and plug openings. NOTE: Ethylene glycol is used as the hydraulic fluid due to its anti-freezing and non-corrosive properties.

Section 5
CV D-100 ARRANGEMENTS

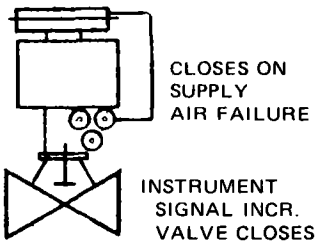
DIRECT-ACTING ASSEMBLIES

(1)



DIRECT TOP
DIRECT POSITIONER
DIRECT FITTING

(2)



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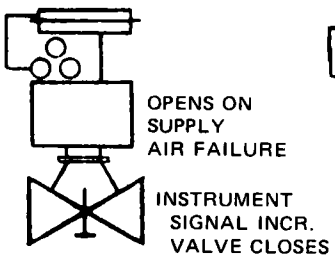

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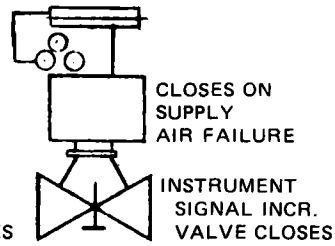

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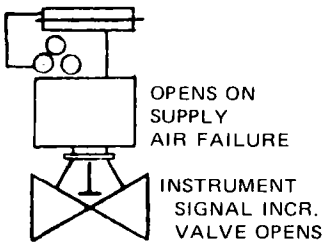
REVERSE-ACTING ASSEMBLIES

(5)



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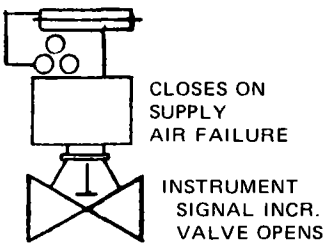

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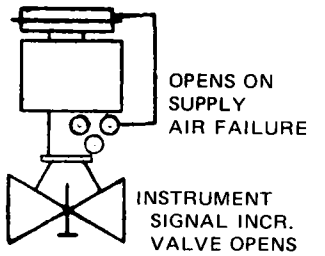

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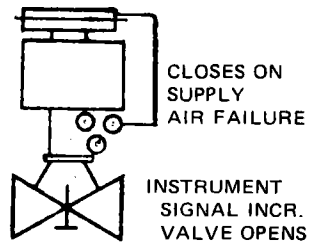

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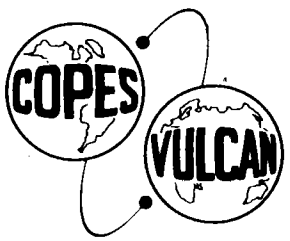


COPES-VULCAN

Lake City, Pennsylvania 16423

One of the White Consolidated Industries

WCI

PC—4M—Rev. 12/79

PRINTED IN U.S.A. - 1980

1. PURPOSE

The purpose of this procedure is to eastablish instructions for the proper assembly of valves to the D-100 Diaphragm Actuators.

2. SCOPE

This procedure describes the assembly of Valves, Bonnets, Studs, Plugs, Stems, Cages, Stem Locks and 60, 100, 160 and 400 sq. in. D-100 Type Actuators.

3. DEFINITION

"a" shall be defined as the stroke of the valve as indicated on Shop Order for each particular valve.

4. PROCEDURE

4.1 Bonnet and Packing Gland Studs

The following assembly method shall be used for all studs which are to be threaded into the body and bonnet.

4.1.1 Degrease the tapped stud holes. Degrease the threads on the studs.

4.1.2 At assembly, apply Loctite Sealant grade AV 87 or Loctite 271 to the stud thread. Do not apply Loctite to the stud thread which will accept the nut.

4.1.3 Screw the studs into body or bonnet soon after Loctite is applied. The nuts on the studs should be tightened to the bonnet or packing gland follower to seat the stud threads before the sealant hardens.

4.2 CAGE

Apply Crane Anti-Seize Thread Compound S-4395 (CVI Part No. 95123) to the threads of the cage, screw the cage in the valve body using the following tightening torques:

VALVE SIZE (INCHES)	CAGE TIGHTENING TORQUE (FT. LBS.)
3/4	125
1	175
1 1/4	230
1 1/2	260
2	375
3	560
4	775
5	975
6	1160
8	1575
10	1980
12	2380
14	2800
16	3200

4.3 Plug and Stem Assembly

Coat-taper junction threads and taper with Crane Anti-Seize Compound S-4395 before assembly.

The Plug (Plunger) shall be screwed on the Stem (Spindle) before pinning using the following torques:

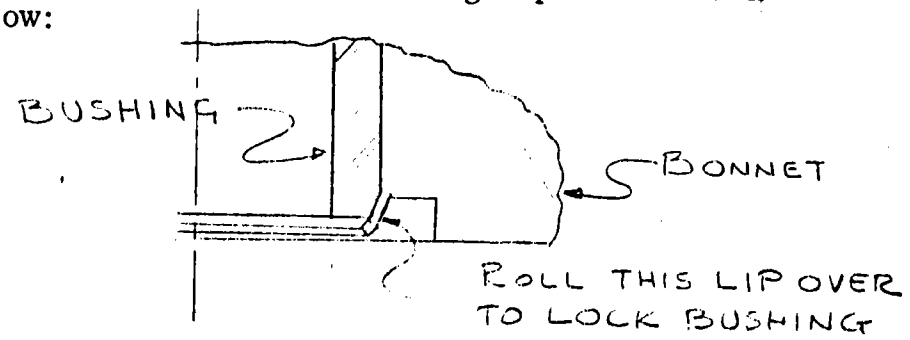
1/2" taper junction	25 ft. lbs
3/4" taper junction	50 ft. lbs
1" taper junction	100 ft. lbs
1-1/4" taper junction	200 ft. lbs
1-1/2" taper junction	300 ft. lbs
2" taper junction	400 ft. lbs

After the hole has been drilled through the assembly, care must be taken to insure that the spring pin is centered.

4.4 Actuator, Bonnet and Body Assembly

4.4.1 Cooling Fin and Extention Bonnet Assembly

All cooling fins and extention bonnets require a stem guide bushing in the bottom of the bonnet. The bushing is to be pressed (interference fit) into the bonnet and the lip rolled over to lock the bushing in place as shown below:



4.4.2 Small Actuator - Bonnet Assemblies

Fasten the bonnet to the actuator. Screw the Stem-Plug assembly through the Bonnet and into the Yoke. Screw the Cage into the Body. Lower the Actuator-Bonnet assembly into the Body-Cage assembly.

4.4.3 Large Actuator - Bonnet Assemblies

Assemble the Body, Cage, Bonnet, and Stem-Plug Assembly as a subassembly. Fasten the Actuator to the Bonnet. Screw the Stem into the Yoke.

4.4.4 Limits of the Procedure

The Small Actuator Method (Para. 4.4.2) shall be used in all cases except when the size of the Actuator and Bonnet prevent it from being lowered into the Body-Cage Subassembly without damage to the fittings, in which case the Large Actuator Method (Para. 4.4.3) shall be used.

4.4.5 Assembly of Stuffing Box

Place in the bottom of the bonnet's stuffing box a stem guide bushing. On top of thebushing place the required number of packing rings, each ring individually seated. Tighten the nuts on the packing gland studs to sufficiently tighten to eliminate leakage. Avoid over tightening packing. Further packing instructions are contained in Procedure 1.2.199.

4.5 Diaphragm Actuator

The stem should be adjusted first by screwing in or out of the yoke. After the proper stroke has been achieved, all other adjustments should be made such as travel indicator plates, limit switches and positioner linkages.

4.5.1 Direct Acting (normally open)

With no pressure in the diaphragm chamber adjust the stem in the yoke to be approximately "a" inches from the seat.

Apply air pressure into the diaphragm chamber until the plug seats. Note the actual stroke.

Vent air from chamber and readjust until actual stroke is exactly "a" as per Shop Order.

The stroke is thus limited in the open position by the yoke striking the base and in the closed position by the plug seating in the cage.

4.5.2 Reverse Acting (normally closed)

With air pressure in the diaphragm chamber (given on Shop Order) and the valve open, adjust the stem in the yoke to be approximately "a" inches from the seat. The Actuator should be at full stroke with the diaphragm plate against the base, except on the D-100-400 the stroke of the Actuator will not exceed 3".

Vent air from chamber and note actual stroke. Repressurize diaphragm chamber and readjust stem until actual stroke is exactly "a" as per shop orders. The stroke is thus limited in the closed position by the plug seating in the cage and in the open position by the diaphragm plate striking the diaphragm base (bottom of chamber).

4.6 BONNET NUTS

After applying Crane Anti-Seize thread compound S-4395 (CVI Part No. 95123) to the threads and nut contact area, the following tightening torques shall be applied to the nuts securing the bonnet to the body:

STUD THREAD SIZE	*TIGHTENING TORQUE (FT.LBS) HYDROSTATIC TEST	TIGHTENING TORQUE (FT. LBS) DESIGN COND. (20,000 PSI STUD STRESS)
1/2 - 13 UNC	46	23
5/8 - 11 UNC	90	45
3/4 - 10 UNC	155	78
7/8 - 9 UNC	250	125
1 - 8 UNC	375	178
1-1/8 - 8 UN	540	271
1-1/4 - 8 UN	750	378
1-3/8 - 8 UN	1050	525
1-1/2 - 8 UN	1375	690
1-5/8 - 8 UN	1775	890
1-3/4 - 8 UN	3000	1500
2 - 8 UN	3400	1700
2-1/4 - 8 UN	5000	2475
2-1/2 - 8 UN	6800	3400
2-3/4 - 8 UN	9200	4600

* per ASME Boiler and Pressure Vessel Code Section VIII, Appendix S, 1968.

4.7 ACTUATOR TO BONNET ASSEMBLY

The following torques are to be used in tightening the capscrews or nuts which hold the actuator to the bonnet.

ACTUATOR SIZE	SCREW OR NUT SIZE	TIGHTENING TORQUE (FT. LBS)
D-100-60	5/8-11 UNC	60
D-100-100	5/8-11 UNC	60
D-100-160	5/8-11 UNC	60
D-100-400	1 - 8 UNC	180

4.8 ADJUSTMENT OF STEM LOCK

D-100-60, -100, -160

Screw the Stem Lock Bar on the Stem before the Stem is screwed into the Yoke. After the Stem is adjusted, turn the Stem Lock Bar until the distance between the Stem Lock and Yoke is in accordance with the Assembly Drawing and the holes in the Stem Lock Bar are aligned with the holes in the Yoke. Place the Indicator Arm on the bottom of the Stem Lock Bar and screw 2 screws through the Stem Lock and into the Yoke with the torque listed on the Assembly Drawing.

4.9 TANDEM TRIM (GENERATION III)

4.9.1 Lapping of the seats is generally not required unless the seating surfaces have obvious imperfections.

4.9.2 The travel of the Inner Plug is important. Travels larger or smaller than specified can cause field problems.

An initial assembly is required of the plug bushing screwed in without the spring to measure the inner plug travel.

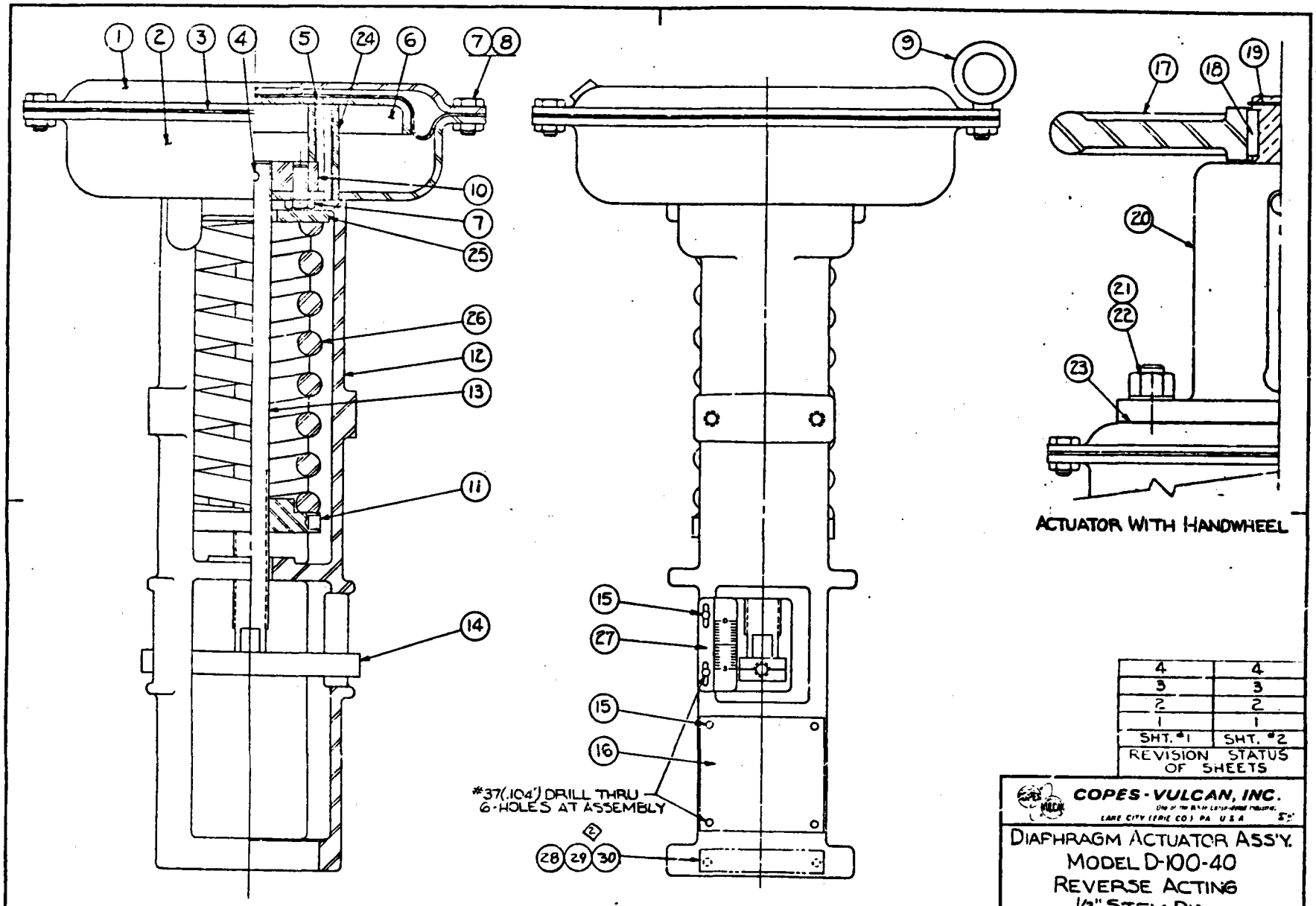
VALVE SIZE	REQUIRED INNER VALVE TRAVEL
4"	1/4" + 1/16"
5", 6" & 8"	3/8" ∓ 1/16"
10" & Larger	1/2" ∓ 1/16"

4.9.3 After the inspection of Para. 4.9.2, assemble the plug, inner plug, spring, spring ring and plug bushing. Torque the plug bushing into the plug with about 100 FT. LB of torque. Place the lock pin in one of the two holes in the top of the plug. Choose the hole next to the plug bushing diameter and weld the lock pin to the plug bushing.

4.10 Actuator

Diaphragm Cover to Base screws and nuts:

D-100-60: Torque units to 10-11 ft.lbs.
D-100-100 and -160: Torque units to 18-20 ft.lbs.
D-100-400 and -280: Torque units to 50-55 ft.lbs.



ACTUATOR WITH HANDWHEEL

4	4
3	3
2	2
1	1
SHT. #1	SHT. #2
REVISION STATUS OF SHEETS	

COPES-VULCAN, INC.
LAKE CITY (ERIE CO.) PA. U.S.A.

DIAPHRAGM ACTUATOR ASS'Y.
MODEL D-100-40
REVERSE ACTING
1/2" STEM DIA.

NO	DATE	REVISIONS	BY	CHK.
1	2-11-76	ADDED REVISION STATUS OF SHEETS. PER ENG. CHG. #5754	G.C.	
2	12-16-76	ADDED ITEMS 28, 29, 30 TO BILL OF MAT'L. E.C. 5802	MTR	
3	1-4-78	UPDATED REV. STATUS BLOCK. PER ENG. CHG. 5989	EP	
4	10-3-79	UPDATED REV. STATUS BLOCK ENG. CHG. 6297	G.S.C.	

DRAWN B.M. DATE 8-20-74
CHECKED B.M. DATE 8-29-74
APPR. DATE
JOB NO. —
SCALE —

PART CODE 4 | DWG. NO. L-169655 | SHT. 1 OF 2 | REV. 4

4.1.55-82

LIST OF MATERIAL

ITEM NO.	NUMBER REQUIRED A	B	C	D	PART NO.	PART CODE	DESCRIPTION	DWG. NO.	MATL.	MATL. SPEC.	REMARKS
1	1		1		168217	3	DIAPHRAGM COVER	L-168217	STEEL	SAE 1008	
		1		1	169658	3	DIAPHRAGM COVER	L-169658	STEEL	SAE 1008	
2	1	1	1	1	168218	3	DIAPHRAGM BASE	L-168218	STEEL	SAE 1008	
3	1	1	1	1	167395	3	DIAPHRAGM	L-167395	BUNAN		
4	1	1	1	1	40772	3	SPRING PIN		STEEL	COML.	3/16" X 2" LG.
5	4	4	4	4	6088	3	FLAT HD. MACH. SCREW		STEEL	COML.	5/16" x 2 3/4" LG.
6	1	1	1	1	168219	3	DIAPHRAGM PLATE	L-168219	STEEL	SAE 1008	
7	14	14	14	14	4548	3	HEX. HD. CAP SCREW		STEEL	COML.	5/16" x 3/4" LG.
8	12	12	12	12	13803	3	HEX. NUT		STEEL	COML.	5/16"-18
9	2	2	2	2	139380	3	EYE BOLT		STEEL	COML.	5/16"-18
10	1	1	1	1	165223	3	STEM RETAINER	M-168223	STEEL	ASTM A108	
11	1	1	1	1	168222	3	SPRING ADJUSTER	M-168222	STEEL	ASTM A108	
12	1	1			168316-C	3	FRAME	E-168316	C. IRON	ASTM A 48	CL. 35
			1	1	168316-R	3	FRAME	E-168316	STEEL	ASTM A216	WC-B
13	1	1	1	1	168221	3	STEM	M-168221	STEEL	ASTM A108	CAD. PLATED
14	1	1	1	1	168240	3	TORQUE BAR	M-168240	STEEL	ASTM A108	
15	6	6	6	6	64341	3	DRIVE SCREW		STEEL	COML.	*4 x 3/16" LG.
16	1	1	1	1	174703	3	IDENTIFICATION PLATE	M-174703	BRASS	ASTM B36	
17		1		1	86786-N	3	HANDWHEEL	L-86786	ALUM.	COML.	
18		1		1	32783	3	KEY		STEEL	COML.	1/2" SQ x 1" LG.
19		1		1	31339	3	RETAINING RING		STEEL	COML.	
20		1		1	137933	3	MANUAL OPER. ASS'Y.	L-137933			
21		6		6	2619	3	HEX NUT		STEEL	COML.	1/2"-13
22		6		6	1898	3	LOCKWASHER		STEEL	COML.	
23		1		1	78688	3	GASKET	S-78688	GARLOCK	COML.	
24	4	4	4	4	168249	3	STAND-OFF	S-168249	STEEL	ASTM A53	3/8" SCH. 40
25	1	1	1	1	168241	3	SPRING RETAINER	M-168241	STEEL	SAE 1015	
26	1	1	1	1	168238	3	SPRING (MAX. FORCE)	S-168238	STEEL	AISI 5160	
ONE OF THE FOLLOWING TO BE CALLED FOR ON THE SHOP ORDER WRITE-UP											
27	1	1	1	1	169554	3	INDICATOR PLATE	S-169554	BRASS	ASTM B-36	1" STROKE
	1	1	1	1	169556	3	INDICATOR PLATE	S-169556	BRASS	ASTM B-36	3/4" STROKE
	1	1	1	1	169557	3	INDICATOR PLATE	S-169557	BRASS	ASTM B36	1/2" STROKE
CAV-B9 TRIM, HUSHTRIM, OR CASCADE NAME PLATE TO BE USED ONLY WHEN CALLED FOR ON SHOP ORDER WRITE UP											③
28	1	1	1	1	177674	3	CAV-B9 TRIM NAME PLATE	M-177674	BRASS	ASTM B-36	
	1	1	1	1	177673	3	HUSHTRIM NAME PLATE	M-177673	BRASS	ASTM B-36	②
	1	1	1	1	163704	3	CASCADE NAME PLATE	M-163704	BRASS	ASTM B-36	
29	2	2	2	2	64341	3	DRIVE SCREW		STEEL	COM'L.	*4-3/16" LG.
CALL FOR T. F. FOLLOWING WHEN ACTUATOR IS USED ON A SERIES 'R' VALVE AND WHEN CALLED FOR ON SHOP ORDER WRITE-UP											②
30	1	1	1	1	163703	3	SERIES 'R' IDENT PL.	M-163703	BRASS	ASTM B-36	
29	2	2	2	2	64341	3	DRIVE SCREW		STEEL	COM'L.	*4-3/16" LG.

ASSEMBLY P/N

169655-2 - CAST IRON CONSTRUCTION WITHOUT HANDWHEEL OPERATOR - USE COL. A

169655-3 - CAST IRON CONSTRUCTION WITH HANDWHEEL OPERATOR - USE COL. B

169655-4 - CAST STEEL CONSTRUCTION WITHOUT HANDWHEEL OPERATOR - USE COL. C

169655-5 - CAST STEEL CONSTRUCTION WITH HANDWHEEL OPERATOR - USE COL. D

NOTES:

1. .187 +.005 -.000 DRILL THRU STEM RETAINER & STEM ITEMS 10 & 13 AT ASSEMBLY.
2. ASSEMBLE SCREWS ITEM 5 AND 4 SCREWS ITEM 7 TO STEM RETAINER WITH LOCTITE.
3. ASSEMBLE ITEMS 11 & 13 WITH CRANE COMPOUND 425A CVI P/N 95123 ON THREADS.
4. EYE BOLTS ITEM 9 TO BE 180° APART.
5. ITEM NO. 3 IS A RECOMMENDED SPARE PART.

4.1.55-83

NO	DATE	REVISIONS	BY	CHK.
1	1-1976	ITEM #4 P/N WAS 96342 & ADDED REMARKS & ITEM #16 P/N WAS 78701. PER ENG. CHG. #5754	G.C.	[illegible]
2	12-16-76	ADDED ITEMS 28, 29, 30, TO BILL OF MAT'L. E.C. 5882	M.R.	J.V.
3	1-4-78	ITEM 28 CHGD. FLASH TRIM TO CAV-B9 TRIM. ENG. CHG. 5959	EP	WH

ENG. CHG. 6292 rel 10-11-78

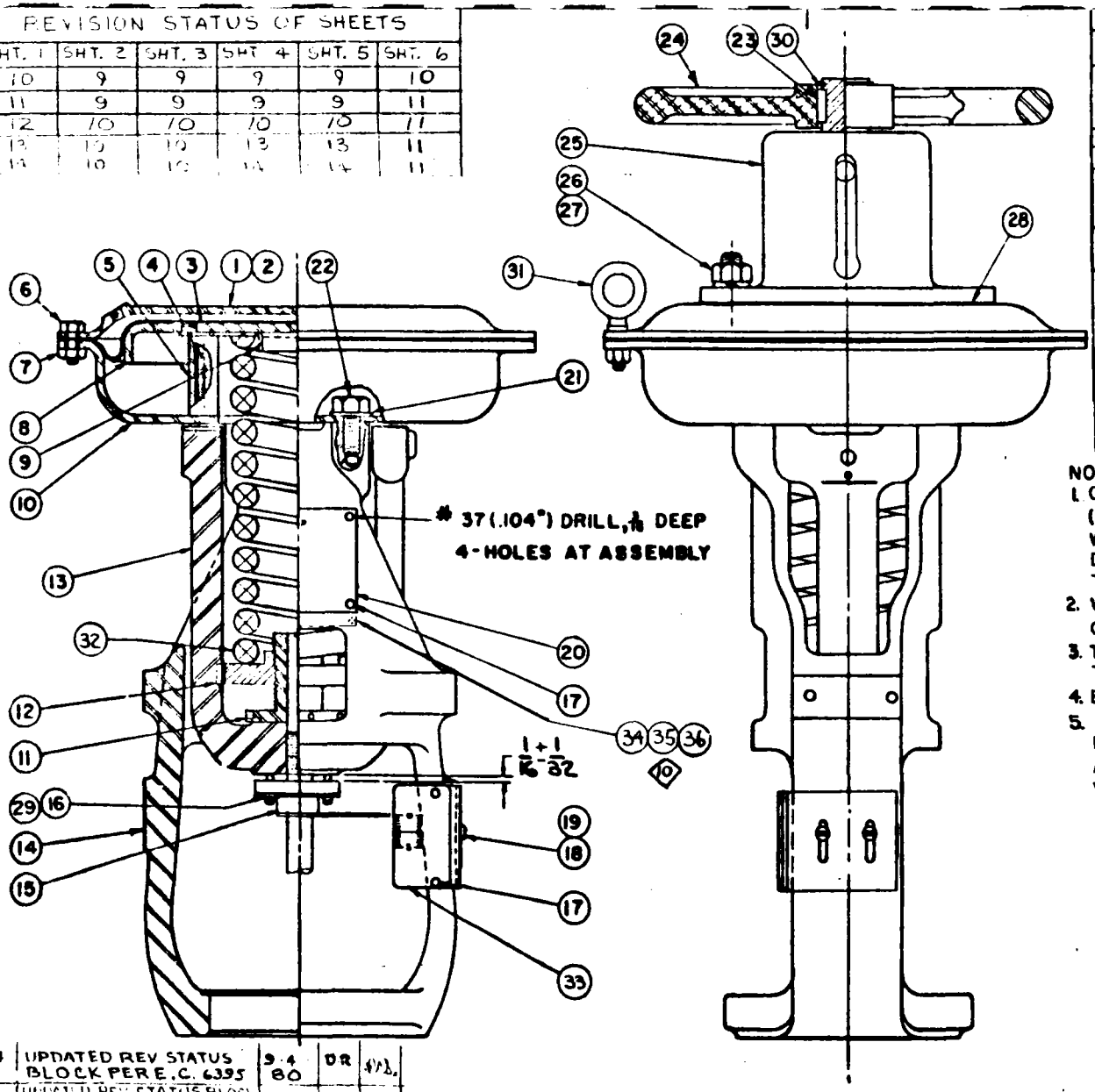
4 - ITEM 17 P/N WAS 86786 C.S.

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY ERIE CO.) PA. U.S.A.

DIAPHRAGM ACTUATOR ASS'Y.
MODEL D-100-40
REVERSE ACTING
1/2 STEM DIA.

DRAWN B.M.	DATE 8-20-74	JOB	—
CHECKED [illegible]	DATE 8-23-74	NO.	
APPR. [illegible]	DATE 8-26-74	SCALE	—
PART CODE 1	DWG. NO. L-169655	SHT. 2 OF 2	REV. 4

REVISION STATUS OF SHEETS					
SHT. 1	SHT. 2	SHT. 3	SHT. 4	SHT. 5	SHT. 6
10	9	9	9	9	10
11	9	9	9	9	11
12	10	10	10	10	11
13	10	10	13	13	11
14	10	10	14	14	11



REVISION					
NO.	DESCRIPTION	DATE	REV BY	CK'D BY	APPROVAL
1	PART NO. 11 WAS 96231, 12 WAS 96232, 19 WAS 77845, MAT'L ITEM 24 WAS DUCT. IRON, PER ENG. CHG. 4417	5-7-68	ROT	M	
2	ITEM # 25 WAS L-92324	5-21-68	GK		
3	ADDED ITEM 43, PER ENG. CHG. #4674	9-27-68	WAR		
4	ITEM # 96231 WAS ITEM # 137609 ITEM # 96232 WAS ITEM # 137612 ITEM NO. 25 WAS 137733 ADDED ITEM NO. 31	6-13-69	JTD		
5	ADDED NOTE 5; PER ENG CHG # 4818.	7-18-69	E.C.C.	BM	
6	ADD SHTS. 3 THRU 6 ENG CHG. 4984, RE-DRAWN	9-11-70	DGK	NPL	
7	ITEM # 11 WAS # 96231, & ITEM # 12 WAS # 96232. PER ENG CHG. # 5048	3-31-71	DGK	WEA	
8	ADDED NOTE 18; PER ENG CHG # 5332	11-29-72	JWM	WFA	
9	ITEMS 13 1/4 MAT'L SPEC WAS com ITEMS 1, 8, 9, & 10 MAT'L SPEC WAS ASTM-A 365 PER ENG CHG # 5578	11-25-74	TR		

NOTE:

1. ON REVERSE ACTING UNITS, DIAPHRAGM PLATE (ITEM 8) MUST BE ATTACHED TO FRAME (ITEM 14) WITH SCREWS (ITEM 4) AND SPACERS (ITEM 5). ON DIRECT ACTING UNITS, DIAPHRAGM PLATE IS ATTACHED TO YOKE (ITEM 13) BY THE SAME METHOD.
2. WHEN ASSEMBLING ITEMS 11 & 12 USE CRANE COMPOUND 425A, CVD PART NO. 95123, ON THREADS
3. TIGHTEN SCREWS, ITEM 29 TO 15 LBS. FT OF TORQUE.
4. EYE BOLTS TO BE 180° APART
5. REMOVE EYE BOLTS (ITEM 31) AND REPLACE WITH CAP SCREWS (ITEM 6) ON ALL OPERATOR ASSEMBLIES WHEN USED ON VALVES LARGER THAN 5" BEFORE SHIPPING.

NO	REVISION	DATE	BY	CK'D
14	UPDATED REV STATUS BLOCK PER E.C. 6395	9-4-80	DR	WB.
13	UPDATED REV. STATUS BLOCK PER ENG. CHG. 6292	10-3-79	G.S.C.	PAL
12	SPRING ADJUSTING NUT MAT'L WAS CAST BRONZE PER ENG. CHG. 6008,	4-21-78	T.S.	BM
11	UPDATED REV. STATUS BLOCK. ENG. CHG. 5089.	1-4-78	EP	WFA
10	ADDED ITEMS 34, 35, 36 TO BILL OF MAT'L. E.C. 5882	12-16-76	AT.R	JWM

STEEL CONSTRUCTION

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

DIAPHRAGM OPERATOR ASSEMBLY

MODEL D-100-60

3/4" STEM SIZE

DRAWN KASPER	DATE 9-11-70	JOB NO.	
CHECKED [illegible]	DATE 9-16-70	SCALE	
APPR. [illegible]	DATE [illegible]		

DWG. NO. L-13641C | SHT 1 OF 6 | REV. 14

PART CODE 4

4.1.55-84

ITEM NO.	NO REQD WT HANDWHEEL	NO REQD	PART NO.	DESCRIPTION	MAT'L	MAT'L SPEC.	DWG. NO.	REMARKS	PART CODE
1									
2	1		86776	COVER ASSEMBLY			M-86776		3
3	1		75514	DIAPHRAGM	BUNA 'N' RUBBER		L-75514	1/16 THICK WITH FABRIC	3
4	4		77943	SOCKET FLAT HD. CAP SCREW	STEEL	COM'L.		3/8-16 UNC x 3" LG.	3
5	4		77836	SPACER	SCH. 40 PIPE	ASTM A-53	S-77836	3/8" DIA., GRADE 'A'	3
6	10		4548	HEX. HD. CAP SCREW	STEEL	COM'L.		5/16 - 18 UNC x 3/4 LG.	3
7	12		13603	HEX. NUT	STEEL	COM'L.		5/16 - 18 UNC	3
8	1		77836	DIAPHRAGM PLATE	C. STEEL	AISI 1008-1010	L-77836		3
9	1		77837	SPRING GUIDE	C. STEEL	AISI 1008-1010	S-77837		3
10	1		77835	DIAPHRAGM BASE	C. STEEL	AISI 1008-1010	L-77835		3
11	1		137609	SPRING ADJUSTING SCREW	C. STEEL	AISI C12L14	M 137609		3
12	1		137612D	SPRING ADJUSTING NUT	DUCTILE IRON	ASTM-A-536	M-137612	GR: 65-45-12	3
13	1		137605R	YOKE	CAST STL	ASTM A-216	E-137605	GR. WCB	3
14	1		129142R	FRAME	CAST STL	ASTM A-216	E-129142	GR. WCB	3
15	1		133451	INDICATOR ARM	C. STEEL	COM'L	M-133451	16 GAUGE (.0598)	3
16	1		133006	STEM LOCK BAR	STEEL	SAE 4140	S-133006	3/8" THK. PLATE, ANNEALED	3
17	6		84341	ROUND HD. DRIVE SCREW	STEEL	COM'L.		#4, 3/16 LG.	3
18	2		88578	ROUND HD. MACHINE SCREW	STEEL	COM'L.		5/16-18 UNC x 1/2 LG.	3
19	1		77845	INDICATOR PLATE BRACKET	C. STEEL	COM'L	M-77845	12 GAUGE (.104")	3
20	1		78701	IDENTIFICATION PLATE	BRASS SHEET	ASTM B36	M-78701	22 GAUGE (.0313")	3
21	4		14225	LOCKWASHER	STEEL	COM'L		3/8 SPRING TYPE	3
22	4		4467	HEX. HD. CAP SCREW	STEEL	COM'L.		3/8-16 UNC x 3/4 LG.	3
23	1		32783	KEY, (RBE)	STEEL	COM'L.		1/4" SQ. x 1" LG.	3
24	1		86786-N	HANDWHEEL	ALUM. ALLOY	COM'L GRADE	L-86786	GRADE-43F	3
25	1		139991	MANUAL OPERATOR ASSY			L-139991		3
26	6		3819	HEX. NUT	STEEL	COM'L.		1/2" - 13 UNC	3
27	6		1806	LOCKWASHER	STEEL	COM'L.		1/2" SPRING TYPE	3
28	1		78688	GASKET	GARLOCK #900		S-78688	1/16" THICK	3
29	2		3571	SOC. HEAD CAP SCREW	STEEL	COM'L		3/8"-16UNC x 1-1/4 LG.	3
30	1		31339	RETAINING RING	STEEL	COM'L.		WALDES #5100-125	3
31	2		139380	EYE BOLT	STEEL	COML.			3
32	1		130905	SPRING MAX. FORCE 1" STROKE	STEEL	AISI 6150	S-130905	3 1/2 O.D. 1/16 DIA WIRE, 19 COILS	3

ITEM NO.	NO REQD	NO REQD	PART NO.	DESCRIPTION			DWG. NO.	REMARKS

NOTE:

15. ITEM NO. 3 IS RECOMMENDED SPARE PART.
16. OPERATOR ASSEMBLY PART NO. 136416-5.
17. ASSEMBLE OPERATOR IN THE REVERSE ACTING MODE.

NO	DATE	REVISIONS	BY	CHK.
13	10-3-79	ITEM 24 P/N WAS 86786 PER ENG. CHG. 6292	G.S.C.	Rel.
10	4-21-78	SPRING ADJUSTING NUT MAT'L. WAS CAST BRONZE PER. ENG. CHG. 6048	T.S.	BM

PART CODE 4

STEEL CONSTRUCTION

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA. U.S.A.

DIAPHRAGM OPERATOR ASSEMBLY
MODEL D-100-GO
3/4" STEM SIZE

REVERSE ACTING OPERATOR - WITH HANDWHEEL

DRAWN KASPER DATE 9-11-79 JOB NO
CHECKED DATE SCALE
APPR. DATE

DWG. NO. L-136416 SHT. 5 OF 5 REV. 13

FORM D-1

4.1.55-85

ITEM NO.	NO REQD	PART NO.	DESCRIPTION	MAT'L	MAT'L SPEC.	DWG. NO.	REMARKS	PART CODE
ONE OF THE FOLLOWING TO BE USED ONLY WHEN CALLED FOR ON THE SHOP ORDER								
32	1	77847	SPRING 3-15#, 1/2" STROKE	STEEL	AISI-6150	S-77847	3 1/2 O.D. 5/8 DIA WIRE 1440#/IN.	3
	1	77848	SPRING 6-30#, 1/2" STROKE	STEEL	AISI-6150	S-77848	3 1/2 O.D. 3/4 DIA WIRE 2880#/IN.	3
	1	77849	SPRING 3-15#, 3/4" STROKE	STEEL	AISI 6150	S 77849	3 1/4 O.D. 9/16 DIA WIRE 960#/IN	3
	1	77850	SPRING 6-30#, 3/4" STROKE	STEEL	AISI-6150	S-77850	3 1/2 O.D. 11/16 DIA WIRE 1920#/IN	3
	1	77847	SPRING 6-30#, 1" STROKE	STEEL	AISI-6150	S 77847	3 1/2 O.D. 5/8 DIA WIRE 1440#/IN	3
ONE OF THE FOLLOWING TO BE CALLED FOR ON THE SHOP ORDER								
33	1	78623	INDICATOR PLATE 1/2" STROKE	BRASS	ASTM B36	S 78623		3
	1	96514	INDICATOR PLATE 5/8" STROKE	BRASS	ASTM B36	S 96514		3
	1	78624	INDICATOR PLATE 3/4" STROKE	BRASS	ASTM B36	S 78624		3
	1	96515	INDICATOR PLATE 1/8" STROKE	BRASS	ASTM B36	S 96515		3
	1	78625	INDICATOR PLATE 1" STROKE	BRASS	ASTM B36	S 78625		3

4.1.5586

CAV B9 TRIM, HUSHTRIM OR CASCADE NAMEPLATE TO BE USED ONLY WHEN CALLED FOR ON SHOP ORDER. WRITE UP								
34	1	117614	CAV-B9 TRIM NAME PL	BRASS	ASTM B36	M-117614		3
	1	117613	HUSHTRIM NAME PL	BRASS	ASTM B36	M-117613		3
	1	163704	CASCADE NAME PL	BRASS	ASTM B36	M-163704		3
35	2	64341	DRIVE SCREW	STEEL	COM'L		#4 - 3/16" LG.	3

9 10

CALL FOR THE FOLLOWING WHEN ACTUATOR IS USED ON A SERIES 'R' VALVE & WHEN CALLED FOR ON SHOP ORDER WRITE UP.								
36	1	163703	SERIES 'R' IDENT. PL	BRASS	ASTM B36	M-163703		3
35	2	64341	DRIVE SCREW	STEEL	COM'L		#4 - 3/16" LG.	3

10

NOTE:
18 ITEMS 32 & 33 ARE REPLACEMENT PARTS AND ARE NOT PART OF THE STANDARD OPERATOR PACKS.

NO.	REVISION	DATE	BY	CK'D
11	ITEM 34 CHG'D. FLASH TRIM TO CAV-B9 TRIM. PER ENG. CHG. 5989.	1-3-78	EP	[illegible]
10	ADDED ITEMS 34,35,36 TO BILL OF MATL E.C. 5882	12-16-76	MTR	JVK

PART CODE 4

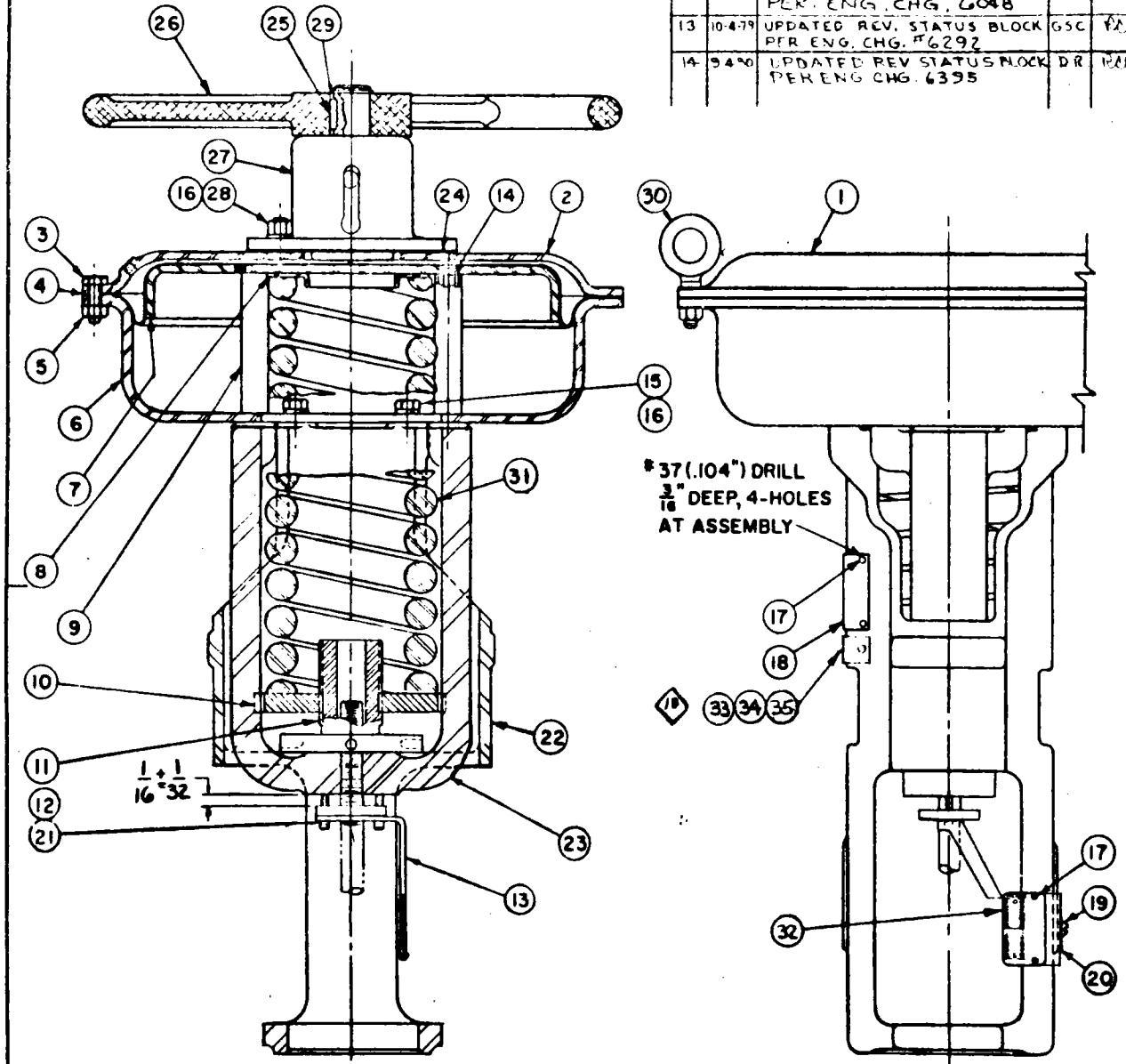
COPES-VULCAN, INC.
LAKE CITY (ERIE CO.) PA U.S.A.

DIAPHRAGM OPERATOR ASSEMBLY
MODEL D-100-60
CAST STEEL CONSTRUCTION
3/4" STEM SIZE

DRAWN D. KASPER DATE 6-25-70
CHECKED [illegible] DATE 9-16-70
APPR. [illegible] DATE 9-11-70
JOB NO.
SCALE
DWG. NO. L-136416 SH [illegible] OF 6 REV. 11

NO.	DATE	REVISIONS	BY	CHK.
12	4-20-78	SPRING ADJUSTING NUT MAT'L. WAS CAST BRONZE PER ENG. CHG. 6048	T.S.	BM
13	10-4-79	UPDATED REV. STATUS BLOCK PER ENG. CHG. #6292	GSC	[illegible]
14	9-4-80	UPDATED REV STATUS BLOCK PER ENG CHG. 6395	DR	[illegible]

REVISION NO.	DESCRIPTION	DATE	REV BY	CK'D BY	APPROVAL
1	ITEM NO. 10 WAS 96234, 11 WAS 96233, 13 WAS 133452, 20 WAS 77845, MAT'L. ITEM 26 WAS ALUM., PER ENG CHG 4417	3-7-68	RVT	[illegible]	
2	ITEM # 27 WAS L-92324	5-27-68	GK	[illegible]	
3	ADDED ITEM 46 ENG. CHG. #4674	9-30-68	V.B.R.	[illegible]	
4	ITEM # 96233 WAS ITEM # 136711 ITEM # 96234 WAS ITEM # 137610 ITEM NO. 27 WAS 137933 ADDED ITEM 30	6-13-69	J.T.Q.	[illegible]	
5	ADDED NOTE 5; PER ENG CHG # 4818	7-21-69	E.C.C.	BM	
6	ADD. SHTS. 3 THRU 6 ENG. CHG. 4984 RE-DRAWN	9-11-70	DGK	NML	
7	ITEM # 10 WAS M-96234 & # 11 WAS M 96233 PER ENG CHG # 5086	3-31-71	DGK	WEB	
8	ADDED NOTE 18; PER ENG CHG # 5332	11-29-72	JMM	WEB	
9	ITEMS 22 & 23 MAT'L SPEC WAS COM'L PER ENG. CHG # 5578	11-25-74	TR	JWV	
10	ADDED ITEMS 33, 34, 35, TO BILL OF MAT'L, E.C. # 5892	12-16-77	WTA	JWV	
11	UPDATED REV. STATUS BLOCK, PER ENG. CHG. 5989.	1-3-78	EP	WTA	



NOTES:

1. ON REVERSE ACTING UNITS, DIAPHRAGM PLATE (ITEM 7) MUST BE ATTACHED TO FRAME (ITEM 22) WITH SCREWS (ITEM 14) AND SPACERS (ITEM 9). ON DIRECT ACTING UNITS, DIAPHRAGM PLATE IS ATTACHED TO YOKE (ITEM 23) BY THE SAME METHOD.
2. WHEN ASSEMBLING ITEMS 10 & 11 USE CRANE COMPOUND 425A, CVD PART NO. 95123, ON THREADS.
3. TIGHTEN SCREWS, ITEM 21 TO 20 LBS. FT OF TORQUE.
4. EYE BOLTS TO BE 180° APART.
5. REMOVE EYE BOLTS (ITEM 30) AND REPLACE WITH CAP SCREWS (ITEM 3) ON ALL OPERATOR ASSEMBLIES WHEN USED ON VALVES LARGER THAN 5" BEFORE SHIPPING.

14	10	10	14	14	11
13	10	10	13	13	11
12	10	10	10	10	11
11	9	9	9	9	11
10	9	9	9	9	10
SHT. 1	SHT. 2	SHT. 3	SHT. 4	SHT. 5	SHT. 6

REVISION STATUS OF SHEETS

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
BREAK CORNERS 1/64 MAX.
FILLETS ARE 1/64 TO 1/32 R
√ INDICATES 250 FINISH
TOLERANCES ARE:

DIMENSION	UNDER 6	6-18	OVER 18
DECIMALS	± .005	± .005	± .010
FRACTIONS	± 1/64	± 1/32	± 1/16

TOLERANCE ON ANGLES ± 2½°

PART CODE 4

STEEL CONSTRUCTION

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

DIAPHRAGM OPERATOR ASSEMBLY

MODEL D-100-100

34 STEM SIZE

DRAWN KASPER	DATE 9-11-70	JOB NO.	
CHECKED NML	DATE 9-16-70		
APPR. ECS	DATE 9-11-70	SCALE	

DWG. NO. L-136417 SHT. 1 OF 6 REV. 14

FOLIO-1

4.1.55-87

ITEM NO.	NO REQ'D WITH HANDWHEEL	NO REQ'D	PART NO.	DESCRIPTION	MAT'L	MAT'L SPEC.	DWG. NO.	REMARKS	PART CODE
1									
2	1		81624	COVER ASSEMBLY			M-81624		3
3	10		4377	HEX. HEAD CAP SCREW	STEEL	COM'L		3/8-16 UNC x 1-1/4" LG.	3
4	1		80811	DIAPHRAGM	BUNA "N" RUBBER		M-80811	1/16" THICK WITH FABRIC	3
5	13		41380	HEX. NUT	STEEL	COM'L		3/8 - 16 UNC	3
6	1		80809	BASE	C. STEEL	AISI 1008-1010	M-80809		3
7	1		80810	DIAPHRAGM PLATE	C. STEEL	AISI 1008-1010	M-80810		3
8	1		80840	SPRING GUIDE	C. STEEL	AISI 1008-1010	S-80840		3
9	4		80848	SPACER	SCH. 80 PIPE	ASTM A-120	S-80848	1/2" DIA., GRADE A	3
10	1		137610D	SPRING ADJUSTMENT NUT	DUCTILE IRON	ASTM A-536	M-137610	GR. 65-45-12	3
11	1		137611	SPRING ADJUSTMENT SCREW	DUCTILE IRON	COM'L GRADE	M-137611		3
12	1		133006	STEM LOCK BAR	STEEL	SAE 4140	S-133006	3/8" THK. PLATE, ANNEALED	3
13	1		139452	INDICATOR ARM	C. STEEL	COM'L	M-139452		3
14	4		81677	SOCKET FLAT HD. CAP SCREW	STEEL	COM'L		1/2" x 13 UNC x 3" LG.	3
15	4		4373	HEX. HEAD CAP SCREW	STEEL	COM'L		1/2"-13 UNC x 1" LG.	3
16	10		1000	LOCKWASHER	STEEL	COM'L		1/2" SPRING TYPE	3
17	6		84341	ROUND HD. DRIVE SCREW	STEEL	COM'L		#4, 3/16" LG.	3
18	1		78701	IDENTIFICATION PLATE	BRASS SHEET	ASTM B 36	M-78701	22 GAUGE (.0313")	3
19	3		69578	ROUND HD. MACHINE SCREW	STEEL	COM'L		5/16-18 UNC x 1/2" LG.	3
20	1		77845	INDICATOR PLATE BRACKET	C. STEEL	COM'L	M-77845		3
21	2		3571	SOC. HEAD CAP SCREW	STEEL	COM'L		3/8 - 16 UNC x 1-1/4" LG	3
22	1		129145-R	FRAME	CAST STL	ASTM A-216	E-129143	GR. WCB	3
23	1		137607R	YOKE	CAST STL	ASTM A-216	E 137607	GR. WCB	3
24	1		78688	GASKET	GARLOCK 3900		S-78688	1/16" THICK	3
25	1		32783	KEY, (RBE)	STEEL	COM'L		1/4" SQ. x 1" LG.	3
26	1		81623 N	HANDWHEEL	ALUM.	COM'L	L-81623	GR-43F	3
27	1		139991	MANUAL OPERATOR ASSY.			L-139991		3
28	6		2610	HEX. NUT	STEEL	COM'L		1/2" - 13 UNC	3
29	1		31330	RETAINING RING	STEEL	COM'L		WALDES #5100-125	3
30	2		139381	EYE BOLT	STEEL	COML.			3
31	1		130906	SPRING MAIN POPPET, 2" STROKE	STEEL	AISI CHQ VALVE SPRING WIRE	S-130906	5 3/16 O.D. x .177 DIA. WIRE 22874 #/in	3

ITEM NO.	NO REQ'D WITH HANDWHEEL	NO REQ'D	PART NO.	DESCRIPTION	MAT'L	MAT'L SPEC.	DWG. NO.	REMARKS

4.1.55-88

NOTE:

15. ITEM NO. 4 IS RECOMMENDED SPARE PART.
16. OPERATOR ASSEMBLY PART NO. 136417-5.
17. ASSEMBLE OPERATOR IN THE REVERSE ACTING MODE.

NO.	DATE	REVISIONS	BY	CHK.
13	10-4-79	ITEM #26, P/N 81623-N WAS 81623 & MAT'L. ALUM. WAS ALUM. ALLOY. ENG. CHG #6292	G. S. C.	RDJ.
14	4-10-18	SPRING ADJUSTING NUT MAT'L WAS CAST BRONZE PER. ENG. CHG. 6048	T.S.	BM

PART CODE 4

STEEL CONSTRUCTION

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

DIAPHRAGM OPERATOR ASSEMBLY
MODEL D-100-100
3/4" STEM SIZE
REVERSE ACTING OPERATOR-WITH HANDWHEEL

DRAWN KASPER	DATE 9-11-70	JOB NO.	
CHECKED [illegible]	DATE 9-16-70	SCALE	
APPR. [illegible]	DATE 9-17-70		
DWG. NO. L-136417	SHT 5 OF 6	REV. 13	

FOLD-L

ITEM NO.	QTY REQD	PART NO.	DESCRIPTION	MAT'L	MAT'L SPEC.	OWG NO.	REMARKS	CODE
ONE OF THE FOLLOWING TO BE USED ONLY WHEN CALLED FOR ON THE SHOP ORDER								
31	1	81637	SPRING 3.15# 3/4" STROKE	STEEL	ASTM A313 TYPE 302	S-81637	5 O.D. 7/8 DIA. WIRE 400"/IN	3
	1	81629	SPRING 6.30#, 3/4" STROKE	STEEL	ASTM A313 TYPE 302	S-81629	5 O.D. 7/8 DIA. WIRE 800"/IN	3
	1	81652	SPRING 3.15#, 1" STROKE	STEEL	AISI 9254	S-81652	4 3/8 O.D. 13/16 DIA. WIRE 1200"/IN	3
	1	81632	SPRING 6.30#, 1" STROKE	STEEL	ASTM A313 TYPE 302	S-81632	5 O.D. 7/8 DIA. WIRE 2400"/IN	3
	1	81672	SPRING 3.15#, 1 1/4" STROKE	STEEL	ASTM A313 TYPE 302	S-81672	4 3/8 O.D. 3/4 DIA. WIRE 900"/IN	3
	1	81674	SPRING 6.30#, 1 1/4" STROKE	STEEL	ASTM A313 TYPE 302	S-81674	5" O.D. 7/8 DIA. WIRE 1800"/IN	3
	1	81635	SPRING 3.15#, 1 1/2" STROKE	STEEL	ASTM A313 TYPE 302	S-81635	4 3/8 O.D. 3/4 DIA. WIRE 900"/IN	3
	1	81637	SPRING 6.30#, 1 1/2" STROKE	STEEL	ASTM A313 TYPE 302	S-81637	5 O.D. 7/8 DIA. WIRE 1800"/IN	3
	1	81652	SPRING 6.30#, 2" STROKE	STEEL	AISI 9254	S-81652	4 7/8 O.D., 13/16 DIA. WIRE 1200"/IN	3
ONE OF THE FOLLOWING TO BE CALLED FOR ON THE SHOP ORDER								
32	1	78624	INDICATOR PLATE 1/4" STROKE	BRASS	ASTM B36	S-78624		3
	1	78625	INDICATOR PLATE 1" STROKE	BRASS	ASTM B36	S-78625		3
	1	81676	INDICATOR PLATE 1 1/4" STROKE	BRASS	ASTM B36	S-81676		3
	1	81634	INDICATOR PLATE 1 1/2" STROKE	BRASS	ASTM B36	S-81634		3
	1	81640	INDICATOR PLATE 2" STROKE	BRASS	ASTM B36	S-81640		3
CAV B9 TRIM, HUGHTRIM, OR CASCADE NAME PLATE TO BE USED ONLY WHEN CALLED FOR ON SHOP ORDER WRITE UP								
33	1	111674	CAV-B9 TRIM NAME PL	BRASS	ASTM B36	M-111674		3
	1	111673	HUGHTRIM NAME PL	BRASS	ASTM B36	M-111673		3
	1	163704	CASCADE NAME PL	BRASS	ASTM B36	M-163704		3
34	2	64341	DRIVE SCREW	STEEL	COM'L		# 4 x 3/16" LG.	3
CALL FOR THE FOLLOWING WHEN ACTUATOR IS USED ON A SERIES 'R' VALVE & WHEN CALLED FOR ON SHOP ORDER WRITE UP								
35	1	163703	SERIES 'R' IDENT. PL	BRASS	ASTM B36	M-163703		3
34	2	64341	DRIVE SCREW	STEEL	COM'L		# 4 x 3/16" LG.	3

4.1.55-89

NOTE:
18. ITEMS 31 & 32 ARE REPLACEMENT PARTS & ARE NOT PART OF THE STANDARD OPERATOR PACKS.

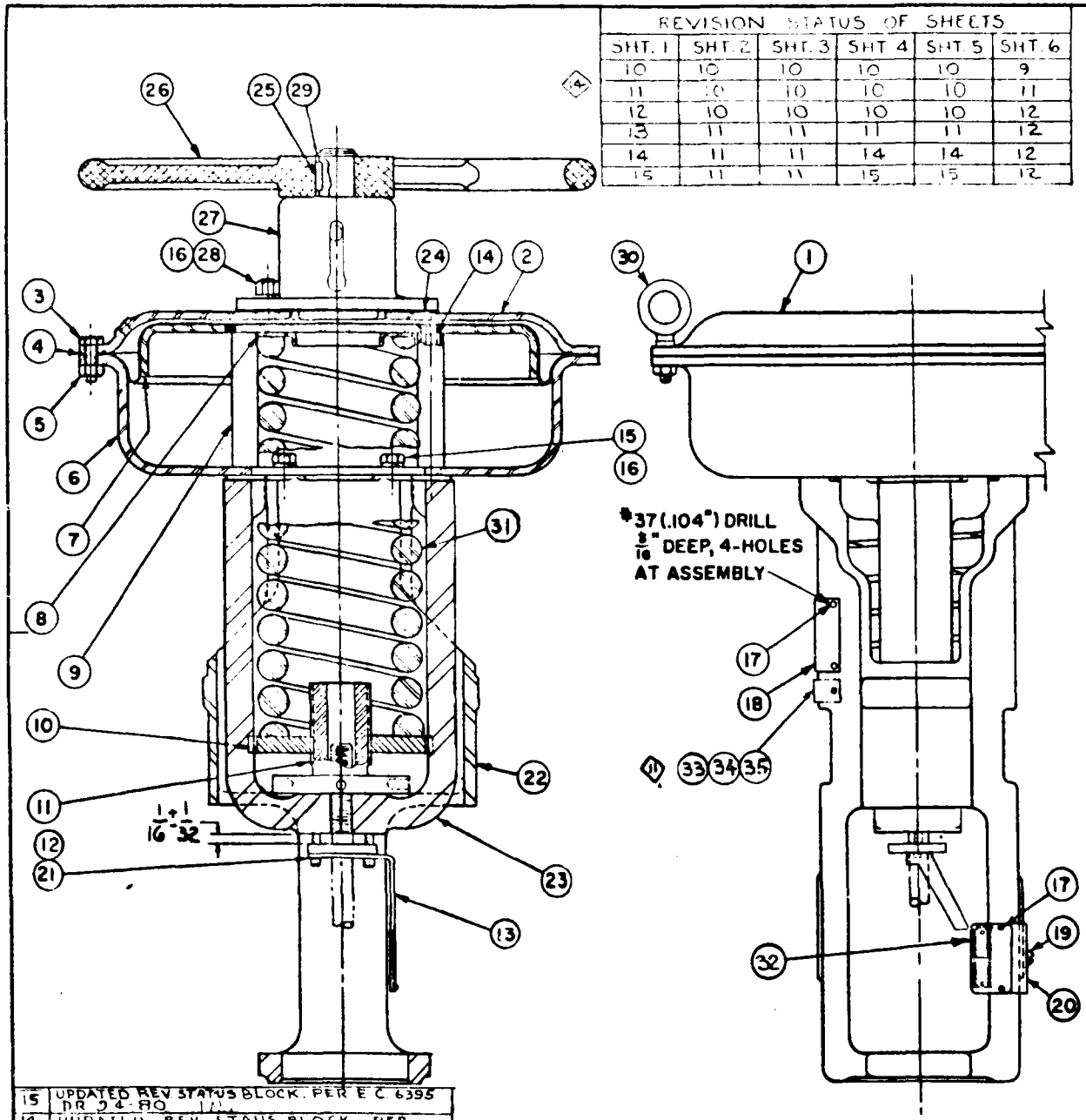
NO	REVISION	DATE	BY	CK'D
11	ITEM # 33 CH'GD. FLASH TRIM TO CAV-B9 TRIM PER ENG. CHG. 5989.	1-3-78	EP	WSA
10	ADDED 33,34,35, TO BILL OF MAT'L E.C. 5882	12-16-76	HTR	JWV

PART CODE 4

COPES-VULCAN, INC.
LAKE CITY (ERIE CO.), PA U.S.A.

DIAPHRAGM OPERATOR ASSEMBLY
MODEL D-100-100
CAST STEEL CONSTRUCTION
3/4" STEM SIZE

DRAWN D KASPER DATE 6 25 70 | JOB NO.
CHECKED NCM DATE 5/16/78
APPR. EOS DATE 9-17-70 | SCALE 1/2
DWG. NO. L-136417 | SHT. 6 OF 6 | REV. 11



REVISION STATUS OF SHEETS					
SHT. 1	SHT. 2	SHT. 3	SHT 4	SHT. 5	SHT. 6
10	10	10	10	10	9
11	10	10	10	10	11
12	10	10	10	10	12
13	11	11	11	11	12
14	11	11	14	14	12
15	11	11	15	15	12

REVISION					
NO.	DESCRIPTION	DATE	REV. BY	CK'D BY	APPROVAL
1	ITEM 7 WAS 80814, 10 WAS 96234, 11 WAS 96233, 13 WAS 133452, 20 WAS 77845, MAT'L WAS ALUM. ADDED ITEMS 38 THRU 41, ENG. CHG 4417	5-7-68	RST		
2	ITEM # 27 WAS L-92324	5-27-68	GK		
3	ADDED ITEM 42 ENG CHG #4674	9-30-68	RM		
4	ITEM # 11-96233 WAS ITEM # 137611 ITEM # 10-96234 WAS ITEM # 137610 ITEM NO. 27 WAS 137933 ADDED ITEM 30	6-15-69	JTD		
5	ADDED NOTE 3, PER ENG CHG # 4818	7-21-69	ECC		
6	ADD SHTS. 3 THRU 6 ENG CHG 4984 RE-DRAWN	9-11-70	DGK		
7	ITEM # 10 WAS M-96234 (# 11 WAS M-96233 PER ENG. CHG. # 5086	3-8-71	DGK		
8	ADDED NOTE 18, PER ENG CHG # 5332	11-29-72	JMM		
9	ITEMS 22 & 23 MAT'L SPEC. WAS COM'L PER ENG. CHG # 5578	11-25-74	TR		
10	ADDED REV. STATUS OF SHTS PER ENG. CHG. # 5821.	6-22-76	GC		
11	ADDED ITEMS 33, 34, 35 TO TO BILL OF MAT'L ENG 5882	8-16-76	HTR		

NOTES:

1. ON REVERSE ACTING UNITS, DIAPHRAGM PLATE (ITEM 7) MUST BE ATTACHED TO FRAME (ITEM 22) WITH SCREWS (ITEM 14) AND SPACERS (ITEM 9). ON DIRECT ACTING UNITS, DIAPHRAGM PLATE IS ATTACHED TO YOKE (ITEM 23) BY THE SAME METHOD.
2. WHEN ASSEMBLING ITEMS 10 & 11 USE CRANE COMPOUND 425A, CVD PART NO 95123, ON THREADS.
3. TIGHTEN SCREWS, ITEM 21 TO 20 LBS. FT. OF TORQUE.
4. EYE BOLTS TO BE 180° APART
5. REMOVE EYE BOLTS (ITEM 30) AND REPLACE WITH CAP SCREWS (ITEM 3) ON ALL ACTUATOR ASSEMBLIES WHEN USED ON VALVES LARGER THAN 5" BEFORE SHIPPING.

15	UPDATED REV STATUS BLOCK. PER E.C. 6395 DR 3-4-80 LH.
14	UPDATED REV. STAUS BLOCK. PER ENG. CHG. #6292 G.S.C. 10-3-79 LH.
13	SPRING ADJUSTING NUT MATL. WAS CAST BRONZE PER ENG. CHG. 6046 T.S. 4-20-78 RM
12	UPDATED REV. STATUS BLOCK, PER ENG. CHG. 5989. EP 1-3-78 USA
NO	REVISIONS

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
BREAK CORNERS 1/64 MAX.
FILLETS ARE 1/64 TO 1/32 R
√ INDICATES 250 FINISH
TOLERANCES ARE:

DIMENSION	UNDER 6	6-18	OVER 18
DECIMALS	± .005	± .005	± .010
FRACTIONS	± 1/64	± 1/32	± 1/16

TOLERANCE ON ANGLES ± 2½°

PART CODE 4

STEEL CONSTRUCTION

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

DIAPHRAGM ACTUATOR ASSEMBLY MODEL D-100-160

1" STEM SIZE

DRAWN KASPER	DATE 9-11-70	JOB NO.	
CHECKED NEAL	DATE 9-16-70		
APPR. FOS	DATE 9-17-70	SCALE	

DWG. NO. L-136419 SHT 1 OF 6 REV 15

FOLIO-L

4.1.55-90

ITEM NO.	NO REQD WITH MACHINE	NO REQD	PART NO.	DESCRIPTION	MAT'L	MAT'L SPEC.	DWG NO.	REMARKS	PART CODE
1									
2	1		81626	COVER ASSEMBLY			M-81626		3
3	22		4377	HEX. HEAD CAP SCREW	STEEL	COM'L.		3/8 - 16 UNC x 1-1/4" LG.	3
4	1		80815	DIAPHRAGM	BUNA 'N' RUBBER		L-80815	1/16" THICK WITH FABRIC	3
5	24		41300	HEX NUT	STEEL	COM'L.		3/8 - 16 UNC	3
6	1		80813	BASE	C. STEEL	AISI 1008-1010	M-80813		3
7	1		137259	DIAPHRAGM PLATE	C. STEEL	AISI 1008-1010	L-137259		3
8	1		80849	SPRING GUIDE	C. STEEL	AISI 1008-1010	S-80849		3
9	4		80847	SPACER	STEEL	ASTM-A-120	S-80847	1/2 SCH. 40 PIPE	3
10	1		137610-D	SPRING ADJUSTMENT NUT	DUCTILE IRON	ASTM-A-536	M-137610	GR. 65-45-12	3
11	1		137611	SPRING ADJUSTMENT SCREW	DUCT. IRON	COM'L. GRADE	M-137611		3
12	1		137581	STEM LOCK BAR	STEEL	SAE-4140	S-137581	3/8 THK. PLATE, ANNEALED	3
13	1		139452	INDICATOR ARM	C. STEEL	COM'L	M-139452		3
14	4		81678	SOCKET FLAT HD. CAP SCREW	STEEL	COM'L.		1/2 - 13 UNC x 5 3/4 LG.	3
15	4		4373	HEX. HD. CAP SCREW	STEEL	COM'L.		1/2 - 13 UNC x 1" LG.	3
16	10		1900	LOCKWASHER	STEEL	COM'L.		1/2" SPRING TYPE	3
17	6		84341	ROUND HD. DRIVE SCREW	STEEL	COM'L.		#4, 3/16" LG.	3
18	1		78701	IDENTIFICATION PLATE	BRASS SHEET	ASTM B36	M-78701	22 GAUGE (.0313")	3
19	2		80878	ROUND HD. MACHINE SCREW	STEEL	COM'L.		5/16"-18 UNC x 1/2" LG.	3
20	1		77845	INDICATOR PLATE BRACKET	C. STEEL	COM'L.	M-77845		3
21	2		3571	SOC HEAD CAP SCREW	STEEL	COM'L.		3/8-16 UNC x 1-1/4" LG.	3
22	1		129209R	FRAME	CAST STL.	ASTM A-216	E-129809	GR. WCB	3
23	1		137606R	YOKE	CAST STL.	ASTM A-216	E-137606	GR. WCB	3
24	1		79888	GASKET	GARLOCK #900		S-79888	1/16" THICK	3
25	1		32783	KEY (RBE)	STEEL	COM'L.		1/4" SQ. x 1" LG.	3
26	1		81623-N	HANDWHEEL	ALUM.	COM'L.	L-81623	GR 43F	3
27	1		139991	MANUAL OPERATOR ASSY.			L-139991		3
28	8		3618	HEX. NUT	STEEL	COM'L.		1/2"-13 UNC	3
29	1		31330	RETAINING RING	STEEL	COM'L.		WALDES #5100-125	3
30	2		139381	EYE BOLT	STEEL	COML.			3
31	1		133292	SPRING MAX. FORCE, 3" STROKE	STEEL	AISI 6150 SAE 5160	M-133292	5" O.D., 1 1/4" DIA. WIRE, 1560 #/IN.	3

ITEM NO.	NO REQD	NO. REQD	PART NO.	DESCRIPTION			DWG NO.	REMARKS

NOTE:

15. ITEM NO. 4 IS RECOMMENDED SPARE PART.
16. ACTUATOR ASSEMBLY PART NO. 136419-5.
17. ASSEMBLE ACTUATOR IN THE REVERSE ACTING MODE.

NO	DATE	REVISION	BY	CHK.
14	10-3-79	ITEM #26, P/N 81623-N WAS 81623 & MAT'L. ALUM. WAS ALUM. ALLOY. PER ENG. CHG. #6292	GSC	RDL
11	4-20-78	SPRING ADJUSTING NUT MATL. WAS CAST BRONZE PER. ENG. CHG. 6048	T.S.	GM
10	6-22-76	ITEM #3, NO. REQ'D. WAS 10, & ITEM #5, NO. REQ'D. WAS 12. PER ENG. CHG. #5821.	GC.	RDL

4.1.55-91

PART CODE 4

STEEL CONSTRUCTION

COPES-VULCAN, INC.
A Div. of the Henry Pratt Co.
LAKE CITY (ERIE CO.), PA. U.S.A.

DIAPHRAGM ACTUATOR
ASSEMBLY
MODEL D-100-160
1" STEM SIZE
REVERSE ACTING ACTUATOR - WITH HANDWHEEL

FOLD - L

DRAWN PAPER DATE 9-11-70
CHECKED MAL DATE 9-16-70
APPR AOS DATE 9-17-70
JOB NO
SCALE
DWG NO L-136419 SHT. 5 OF 6 REV 14

ITEM NO	NO. REQD	PART NO.	DESCRIPTION	MAT'L	MAT'L. SPEC.	DWG. NO.	REMARKS	PART CODE
ONE OF THE FOLLOWING TO BE USED ONLY WHEN CALLED FOR ON THE SHOP ORDER								
	1	137613	SPRING G-30[#]. 3" STROKE	STEEL	AISI 6150 SAE 5160	M-137613	$5\frac{3}{16}$ O.D. $\frac{3}{32}$ DIA WIRE 1280[#]/IN	3
	1	83656	SPRING 3-15[#]. $2\frac{1}{2}$" STROKE	STEEL	AISI 9254	S-83656	$4\frac{1}{8}$ O.D. $\frac{13}{16}$ DIA. WIRE 768[#]/IN	3
	1	83657	SPRING G-30[#] $2\frac{1}{2}$" STROKE	STEEL	AISI 9254	S-83657	$5\frac{1}{4}$ O.D. DIA WIRE [illegible]/IN.	3
	1	81639	SPRING 3-15[#]. 2" STROKE	STEEL	AISI 6150 SAE 5160	S-81639	5 O.D $\frac{7}{8}$ DIA. WIRE 960[#]/IN	3
	1	81641	SPRING G 30[#] 2" STROKE	STEEL	AISI 6150 SAE 5160	S 81641	$5\frac{3}{8}$ O.D. $1\frac{1}{16}$ DIA WIRE 1920[#]/IN	3
	1	130907	SPRING MAX. FORCE 2" STROKE	STEEL	AISI 6150 SAE 5160	S-130907	$5\frac{3}{4}$ O.D. $1\frac{1}{4}$ DIA. WIRE 3600[#]/IN	3
31								
ONE OF THE FOLLOWING TO BE CALLED FOR ON THE SHOP ORDER								
	1	78625	INDICATOR PLATE 1" STROKE	BRASS	ASTM B36	S-78625		3
	1	81676	INDICATOR PLATE $1\frac{1}{4}$" STROKE	BRASS	ASTM B36	S-81676		3
	1	81634	INDICATOR PLATE $1\frac{1}{2}$" STROKE	BRASS	ASTM-B36	S 81634		3
	1	81640	INDICATOR PLATE 2" STROKE	BRASS	ASTM-B36	S-81640		3
32	1	83659	INDICATOR PLATE $2\frac{1}{2}$" STROKE	BRASS	ASTM B36	S-83659		3
	1	133293	INDICATOR PLATE 3" STROKE	BRASS	ASTM B36	S-133293		3
CAV-B9 TRIM, HUSHTRIM, OR CASCADE NAME PLATE TO BE USED ONLY WHEN CALLED FOR ON SHOP ORDER WRITE UP								
33	1	177674	CAV-B9 TRIM NAME PL	BRASS	ASTM B36	M-177674		3
	1	177673	HUSHTRIM NAME PL	BRASS	ASTM B36	M-177673		3
	1	163704	CASCADE NAME PL	BRASS	ASTM B36	M-163704		3
34	2	64341	DRIVE SCREW	STEEL	COM'L.		# 4 - 3/16" LG.	3
CALL FOR THE FOLLOWING WHEN ACTUATOR IS USED ON A SERIES 'R' VALVE & WHEN CALLED FOR ON SHOP ORDER WRITE UP								
35	1	163703	SERIES 'R' IDENT. PL	BRASS	ASTM B36	M-163703		3
34	2	64341	DRIVE SCREW	STEEL	COM'L		# 4 - 3/16" LG.	3

4.1.55-92

NOTE:
18. ITEMS 31 & 32 ARE REPLACEMENT PART'S AND NOT PART OF THE STANDARD ACTUATOR PACKS.

NO.	DATE	REVISION	BY	CH'K.
12	1-3-78	ITEM 33, CH'GD. FLASH TRIM TO CAV-B9 TRIM. PER ENG. CHG. 5989.	EP	[illegible]
11	12-16-76	ADDED ITEMS 33, 34, 35 TO BILL OF MAT'L E.C. 5882	HTR	J.V.V.

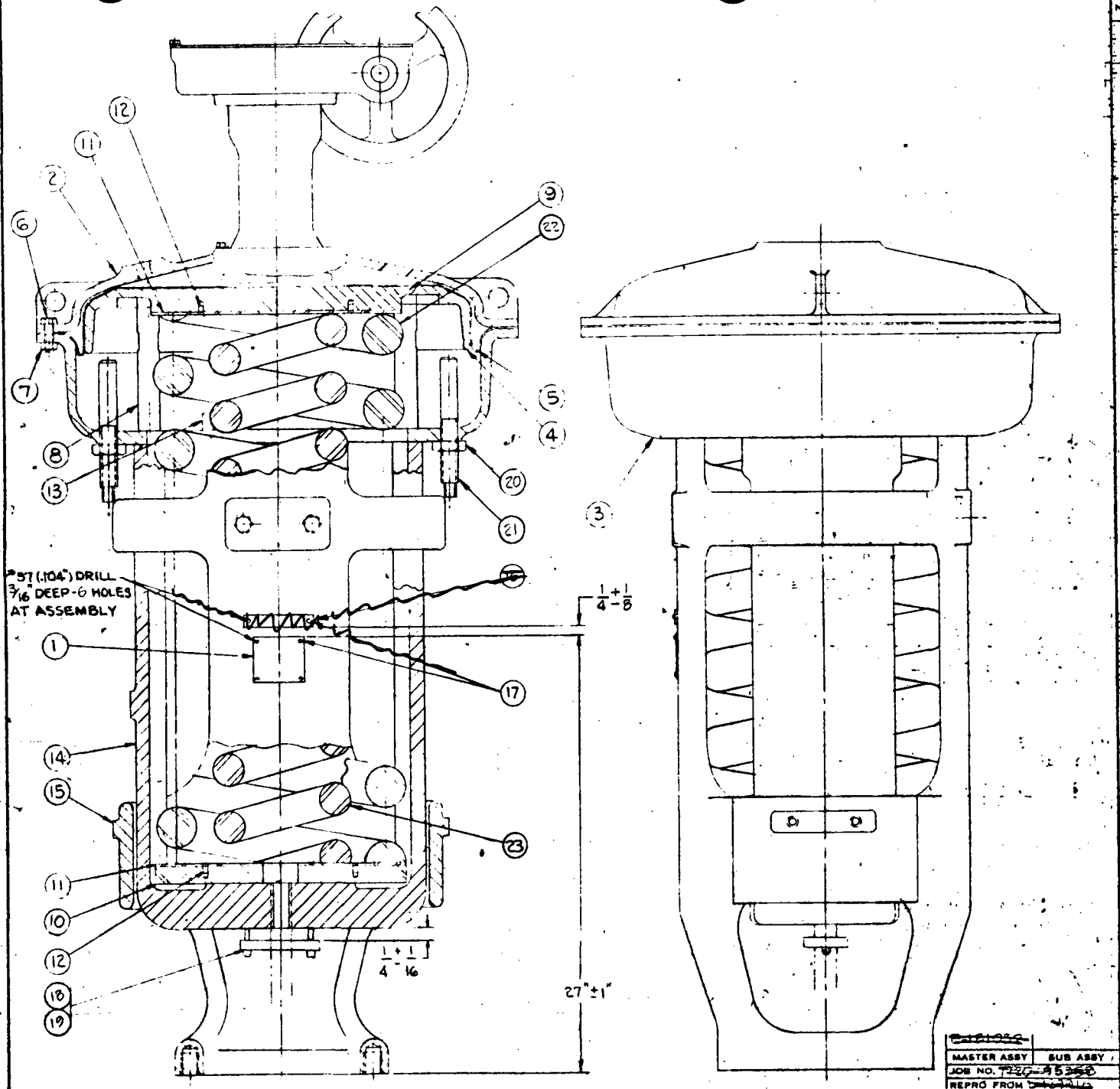
PART CODE 4

COPES-VULCAN, INC.
LAKE CITY (ERIE CO.) PA. U.S.A.

DIAPHRAGM ACTUATOR ASSEMBLY
MODEL D-100-160
CAST STEEL CONSTRUCTION
1" STEM SIZE

DRAWN D. KASPER DATE 6-25-70
CHECKED N.C.H. DATE 9-16-70
APPR. F.O.S. DATE 9-17-70
JOB NO.
SCALE

DWG. NO. L-136419 SHT. 6 OF 6 REV. 12



NO.	DESCRIPTION	BY	CK'D. BY	DATE

8010-14896

JOB NO. _____

MKD. BY T.S. DATE 2-10-81

CK'D. BY DJW DATE 2-10-81

SHOP ORDER

ITEM NO. 6

SHOP ORDER

CHANGE NO. 4

SEE L-184331 SHT. 2 FOR LIST OF MATERIAL AND NOTES.

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

CAST STEEL CONSTRUCTION

DIAPHRAGM ACTUATOR ASSEMBLY

MODEL D-100-400

DFTSMN	DATE 6-6-79	APPD. J.N.R.	DATE 8-9-79
CHECKED	DATE 7-6-79	MFG. N.G.B.	DATE 8-10-79
	DATE	QC. DM	DATE 8-14-79

MASTER ASSY | SUB ASSY

JOB NO. 7220-45368

REPRO FROM

FOLIO L | PART CODE

SCALE — | DWG. NO. L-184331 | SHT 1 OF 2 | REV.

MKD

4.155-93

ITEM NO.	NO REQD	PART NO.	DESCRIPTION	MAT'L	MAT'L SPEC.	DWG. NO.	PART CODE	REMARKS
1	1	~~M7288~~	IDENTIFICATION PLATE	~~BRASS~~	COM'L	~~M-190034~~	~~5~~	TYPE 18-8
2	1	181361	MANUAL OPERATOR ASSY.	BRASS		E-181361	5	M-190034
3	1	178367	BASE	STEEL	ASTM A-216	E-178367	5	GR. WCB
4	1	178366	DIAPHRAGM PLATE	STEEL	ASTM A-216	E-178366	5	GR. WCB
5	1	129328	DIAPHRAGM	BUNA "N" RUBBER		E-129328	3	1/16" THK. WITH FABRIC
6	24	41350	1/2"-13 UNC CAP SCREW	STEEL	COM'L		3	2" LG. HEX. HD.
7	24	2619	1/2"-13 UNC HEX NUT	STEEL	COM'L		3	
8	9	129776	DIAPHRAGM POST	STEEL	AISI-1114L	M-129776	3	1-1/4" RD.
9	4	129915	3/4"-10 UNC CAP SCREW	STEEL	COM'L		3	1-3/4" LG. FLAT SOC. HD.
10	1	129780	SPRING PLATE	STEEL	ASTM-A-7	M-129780	3	1" THK
11	2	129775	SPRING GUIDE	STEEL	COM'L	M-129775	3	1/8" THK.
12	4	35033	1/4" DIA. SPRING PIN	STEEL	COM'L		3	3.4" LG.
13	4	129914	1"-8 UNC CAP SCREW	STEEL	COM'L		3	1-3/4" LG. SOCKET HD.
14	1	181374	YOKE	STEEL	ASTM A-216	D-181374	5	GR. WCB
15	1	181383	FRAME	STEEL	ASTM A-216	D-181383	5	GR. WCB
16	~~1~~	~~M7288~~	~~I.D. NAME PLATE~~	~~BRASS~~	~~COM'L~~	~~M-190034~~	~~5~~	~~TYPE 304~~
17	8-4	64341	DRIVE SCREW	STEEL	COM'L.		3	3/16 LG. ROUND HD.
18	1	133004	STEM LOCK BAR	STEEL	SAE 4140	S-133004	3	1/2" THK. ANNEALED
19	2	35796	SOC. HD. CAP SCREW	STEEL	COM'L.		3	1/2"-13UNC x 1 1/2 LG.
20	2	41342	HEX LOCK NUT	STEEL	COM'L.		3	1"-8UNC HEAVY STD.
21	2	146091	ADJUSTING SCREW	STEEL	SAE 1112	M-146091	3	
22	1	163568	OUTER SPRING	ALLOY STEEL	AISI 5160 OR 6150	S-163568	3	3400#/IN.
23	1	163567	INNER SPRING	ALLOY STEEL	AISI 5160 OR 6150	S-163567	3	850#/IN.

4.1.55-94

ASSEMBLY PROCEDURE & NOTES:

1. PLACE THE YOKE (ITEM #14) INSIDE OF THE FRAME (ITEM #15). SCREW THE DIAPHRAGM POSTS (ITEM #8) INTO THE YOKE (DIRECT ACTING) OR FRAME (REVERSE ACTING) WITH 200 TO 300 FT. LBS. TORQUE. PLACE THE BASE (ITEM #3) OVER THE DIAPHRAGM POSTS AND ONTO THE ~~YOKE OR FRAME~~ SCREW THE BASE TO THE FRAME (DIRECT ACTING) ~~OR YOKE (REVERSE ACTING)~~ WITH 1" CAP SCREWS (ITEM #13) WITH 200 TO 300 FT. LBS. OF TORQUE.
2. SECURE A SPRING GUIDE (ITEM #11) TO BOTH THE SPRING PLATE (ITEM #10) AND THE DIAPHRAGM PLATE (ITEM #4) WITH 2 SPRING PINS (ITEM #12) EACH. DRILL TWO 1/4" DIA. HOLES THROUGH BOTH THE SPRING GUIDE AND THE SPRING PLATE OR DIAPHRAGM PLATE 7/8 DEEP ON ABOUT AN 8-1/2" DIA. CIRCLE, EACH SPRING PIN ABOUT 180° APART. DRIVE THE SPRING PINS IN UNTIL THEY ARE FLUSH WITH THE TOP OF THE SPRING GUIDE.
3. PLACE THE SPRING PLATE-SPRING GUIDE INSIDE THE YOKE & FRAME AND PLACE ON IT THE REQUIRED SPRINGS. PLACE THE DIAPHRAGM PLATE-SPRING GUIDE ON TOP OF THE SPRINGS. PLACE ON TOP OF THE DIAPHRAGM PLATE THE SPRING COMPRESSOR ASSEMBLY PER DRAWING L-130389. EQUALLY INCREASE THE PRESSURE IN THE AIR CYLINDERS UNTIL THE DIAPHRAGM PLATE CONTACTS THE DIAPHRAGM POSTS. DO NOT EXCEED 1000 PSI. EITHER AIR OR WATER WITH A RUST INHIBITOR MAY BE USED. SCREW THE FLAT SOCKET HEAD CAP SCREWS (ITEM #9) THROUGH THE DIAPHRAGM PLATE AND INTO THE DIAPHRAGM POST WITH 150 TO 200 FT. LBS. OF TORQUE. REMOVE THE SPRING COMPRESSOR ASSEMBLY.
4. PLACE THE DIAPHRAGM (ITEM #5) ON TOP OF THE DIAPHRAGM PLATE. PLACE THE THREE PROJECTIONS ON THE UNDERSIDE OF THE DIAPHRAGM INTO THE HOLES IN THE DIAPHRAGM PLATE. PRESS THE DIAPHRAGM INTO A ROLLED CONVOLUTION BETWEEN THE BASE AND DIAPHRAGM PLATE. PLACE A COVER (ITEM # 2) OVER THE DIAPHRAGM AND FASTEN WITH CAP SCREWS AND NUTS (ITEMS 6 & 7) TO A TORQUE OF 35 - 45 FT. LBS.
5. INDICATOR PLATE WILL BE CALLED OUT FOR ON SHOP ORDER.
6. ATTACH THE IDENTIFICATION PLATE (ITEM #1) ~~AND THE I.D. STAMP PLATE (ITEM #16)~~ TO THE FRAME WITH DRIVE SCREWS (ITEM #17) AS SHOWN ON SHT. #1.
7. THE SPRINGS ARE NOT ADJUSTABLE AND SETTINGS, IF ANY, MUST BE MADE BY CHANGING THE STEM POSITION.
8. TIGHTEN SCREWS (ITEM #19) TO 50 LBS. FT. OF TORQUE.

8010-14896

JOB NO. _____

CKD. BY T.S. DATE 2-10-81

CKD. BY DJW DATE 2-10-81

SHOP ORDER ITEM NO. 6

SHOP ORDER CHANGE NO. 4

SEE L-184331 SHEET 1 FOR ASSEMBLY VIEWS

CAST STEEL CONSTRUCTION

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

DIAPHRAGM ACTUATOR ASSEMBLY MODEL D-100-400

FOLIO

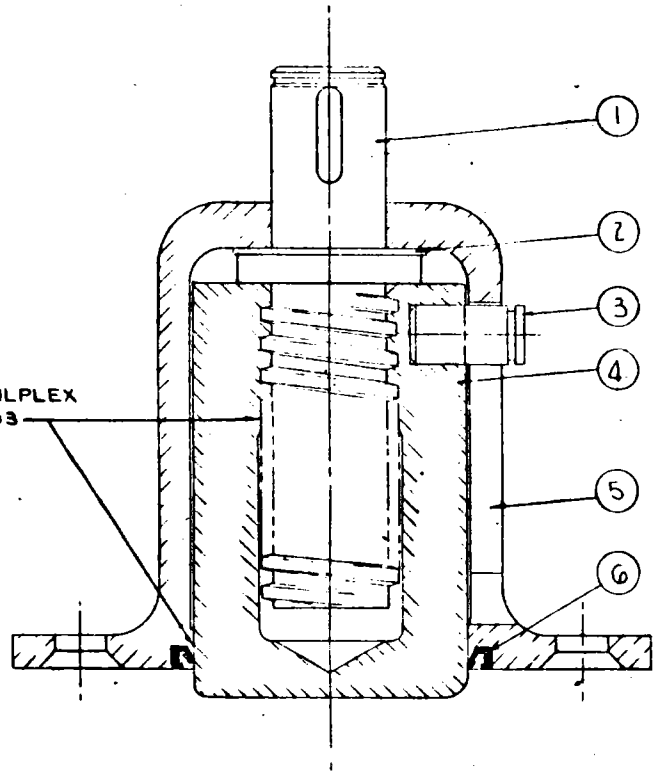
DRAWN	DATE 6-27-79	JOB NO.	7720-95388
CHECKED	DATE 7-12-79	SCALE	~
APPR. JNR, NSF, DM	DATE 8-14-79		
DWG. NO. L-184331	SHT. 2 OF 2	REV.	

LIST OF MATERIAL

ITEM NO	NO PER ASSY	PART NO	DESCRIPTION	MATL	MATL SPEC.	DWG NO	REMARKS
1	1	137932	SCREW	STEEL	AISI-12L14	M-137932	LEDLOY 300
2	1	92302	THRUST WASHER	COMM			GARLOCK NO. DU-18
3	1	92339	RETAINING PIN	SST	ASTM-A-276	S-92339	TYPE 304
4	1	137930	NUT	SEMI STL		M-137930	3½ DIA CAST BAR
5	1	137931	HOUSING	CAST IRON	ASTM-A-48	M-137931	
6	1	92303	SEAL	COMM			GARLOCK NO. 92×6308

REVISION

NO.	DESCRIPTION	DATE	REV. BY	CK'D BY	APPROVAL
1	ITEM 5 PART NO. WAS 137931 PER ENG. CHNG 4758	5-6-69	RL	JVV	



4.1.55-95

L-137723
L-137722
L-137643
L-136419
L-136418
L-136417
L-136416

MASTER ASS'Y. | SUB ASS'Y.

FOLIO-L

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 2°

MATERIAL-

STOCK NO.

AMOUNT REQ'D.

PART CODE -3

BLAW-KNOX COMPANY
COPES-VULCAN DIVISION
ERIE, PENNSYLVANIA

FOR MODEL D-150 DIAPH OPERATOR

MANUAL OPERATOR ASSEMBLY

DRAWN GAK DATE 5-27-68
CHECKED LYNN DATE 5-29-68
APPR. JNR DATE 5-29-68

JOB NO.

SCALE

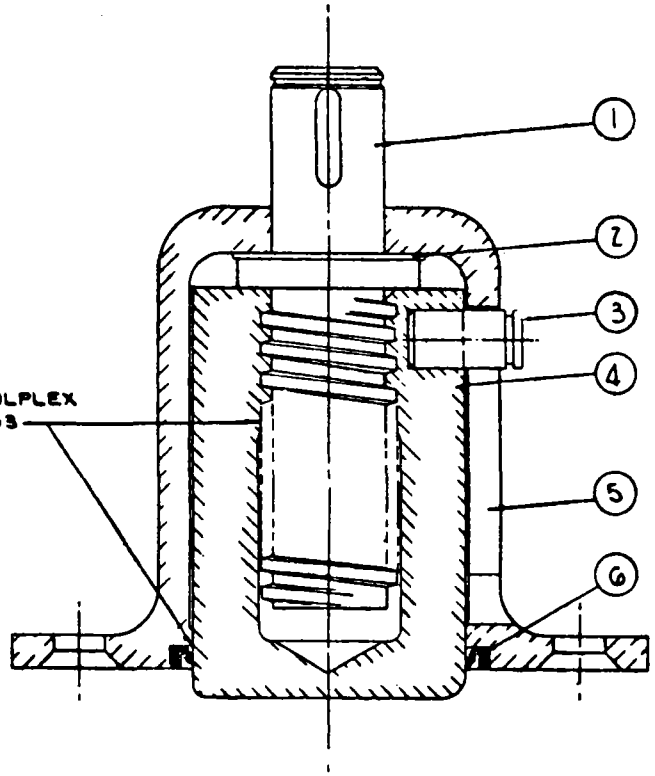
DWG. NO. L-137933 REV. 1

LIST OF MATERIAL

ITEM NO	NO REQ	PART NO	DESCRIPTION	MAT'L	MAT'L SPEC	DWG NO	REMARKS
1	1	137932	SCREW	STEEL	A151-12L14	M-137932	LEDLOY 300
2	1	92302	THRUST WASHER	COMM.			GARLOCK NO. DU-18
3	1	92339	RETAINING PIN	SST	ASTM-A 276	S-92339	TYPE 304
4	1	137930	NUT	SEMI ST'L		M-137930	3½ DIA. CAST BAR
5	1	137931-N	HOUSING	CAST AL.	COM'L GR.	M-137931	TYPE 314 F
6	1	92303	SEAL	COMM			GARLOCK NO. 92×6308

REVISION

NO.	DESCRIPTION	DATE	REV. BY	CK'D BY	APPROVAL
1.	REDRAWN & ITEM 4 WAS PT. NO 137030. PER ENG. CHG. "5515	9-25-74	TR	J.V.V.	



4.1.55-96

L-137723
L-137722
L-137643
L-136419
L-136418
L-136417
L-136416

MASTER ASS'Y. | SUB ASS'Y.

FOLD—L

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 2°

MATERIAL -

STOCK NO.

AMOUNT REQ'D.

PART CODE 3

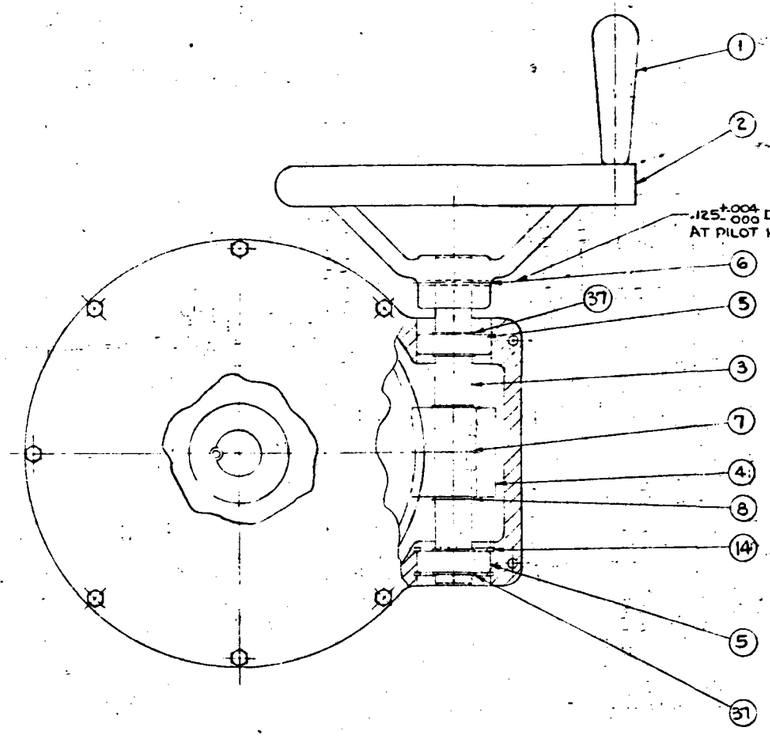
BLAW-KNOX COMPANY
COPES-VULCAN DIVISION
ERIE, PENNSYLVANIA

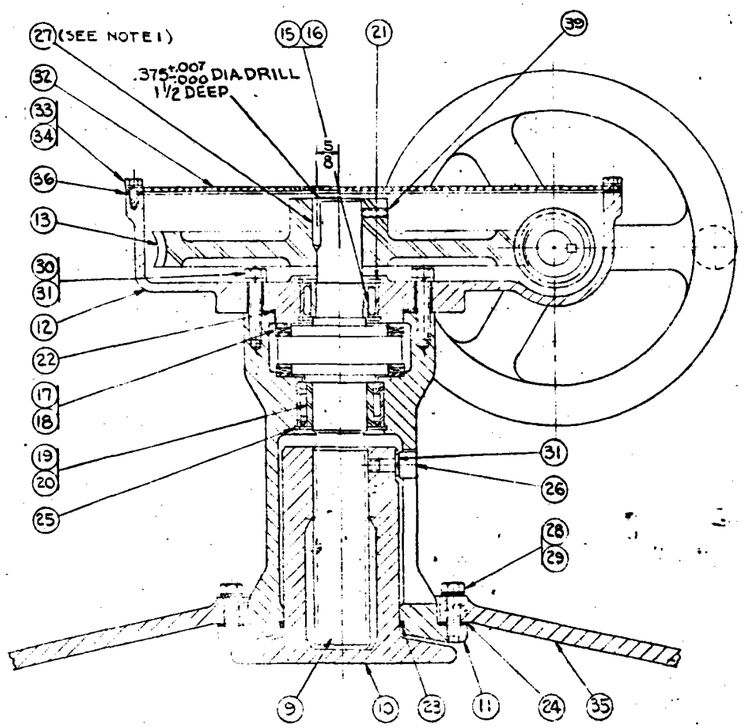
FOR MODEL D-100 DIAPH OPERATORS

MANUAL OPERATOR ASSEMBLY

DRAWN GAK DATE 5-27-68
CHECKED LWH-N DATE 5-27-68
APPR. JNR DATE 5-29-68
JOB NO.
SCALE

DWG. NO. L-139991 REV. 1





LIST OF MATERIAL

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
1	1	129400	3	HANDLE	STEEL	COM'L.		BALCRANK H-63003-C
2	1	129299	3	HANDWHEEL	ALUM ALLOY	ASTM-B-26	L-129299	ALLOY 43F
3	1	129627	3	SHAFT	STEEL	AISI-1141	M-129627	1" DIA. C.F.
4	1	129401	3	WORM	STEEL	COM'L.		MORSE # 6W4-R
5	2	129613	3	BEARING	STEEL	COM'L.		NEW DEPARTURE # 2-9505
6	1	129403	3	SPRING P.N.	STEEL	COM'L.		ESNA # 53-028-115-2000
7	1	32783	3	KEY	STEEL	COM'L.		IRBE 1/4 SQ. X 1" LG.
8	2	V-5903	3	RETAINING RING	STEEL	COM'L.		TRUARC # 5100-100
9	1	170626	3	DRIVE SCREW	STEEL	1141-1L41	L-170626	3/4 DIA. C.F.
10	1	170624	3	DRIVE NUT	DUCT. IRON	ASTM-A-536	M-170624	GRADE 65-45-12
11	1	170625	3	GUIDE	DUCT. IRON	ASTM A-536	L-170625	GRADE 65-45-12
12	1	129310	3	GEAR HOUSING	CAST IRON	ASTM-A-48	E-129310	CLASS 35
13	1	129635	3	WORM GEAR	CAST IRON		S-129635	BUY PART # 129402
14	2	129624	3	RETAINING RING	STEEL	COM'L		TRUARC # 5000-206
15	1	129615	3	BEARING INNER RING	STEEL	COM'L.		McGILL # MI-21-N
16	1	129614	3	BEARING OUTER RING ASS'Y.	STEEL	COM'L.		McGILL # MR-26-N
17	2	129619	3	NEEDLE THRUST BEARING	STEEL	COM'L.		TORRINGTON # NTA-4458
18	4	129620	3	THRUST RACE	STEEL	COM'L.		TORRINGTON # TRE-4458
19	1	129617	3	BEARING INNER RING	STEEL	COM'L.		McGILL # MI-25-45
20	1	129616	3	BEARING OUTER RING ASS'Y	STEEL	COM'L.		McGILL # MR-30-S
21	2	129625	3	RETAINING RING	STEEL	COM'L.		TRUARC # 5000-218
22	1	129623	3	O RING	BUNA N	COM'L.		PARKER # 2-43
23	1	43486	3	O RING	BUNA N	COM'L.		PARKER # 2-236
24	1	129629	3	GASKET	NITRILE RUBBER		S-129629	1/8 THK., 80 DUROMETER
25	1	129626	3	RETAINING RING	STEEL	COM'L.		TRUARC # 5000-244
26	1	129618	3	CAMROL BEARING	STEEL	COM'L.		McGILL # CF-3/4-S
27	1	59835	3	SPRING PIN	STEEL	COM'L.		ESNA # 59-277-375-1500
28	8	129621	3	STAT-O-SEAL WASHER	STEEL & BUNA N	COM'L.		PARKER # 600-001-3/8
29	8	129775	3	HEX HEAD CAP SCREW	STEEL	SAE GRADE # 5		3/8-16 X 1 1/4 LG.
30	12	129773	3	HEX HEAD CAP SCREW	STEEL	SAE GRADE # 5		3/8-16 X 1 3/4 LG.
31	13	14223	3	SPRING LOCKWASHER	STEEL	COM'L.		3/8"
32	1	129630	3	GEAR COVER	ALUM ALLOY	3003-H14	M-129630	1/8" THK.
33	9	4843	3	HEX HEAD CAP SCREW	STEEL	COM'L.		1/4-20 X 1/2 LG.
34	9	60032	3	SPRING LOCKWASHER	STEEL	COM'L.		1/4"
35	1	181362	5	COVER	STEEL	ASTM A-216	M-181362	GR. WCB
36	1	129632	3	GASKET	NITRILE RUBBER		M-129632	1/16" THK., 80 DUROMETER
37	4	31348	3	RETAINING RING	STEEL	COM'L.		TRUARC # 5100-98
38	A.R.	16459	3	GREASE		COM'L.		MOBILPLEX EP # 1
39	1	1966	3	SET SCREW, CUP POINT	STEEL	COM'L.		5/8-16 UNC X 3/8 LG.

REVISION					
NO.	DESCRIPTION	DATE	REV. BY	CK'D. BY	APPROVAL

1. a. PLACE WORM GEAR (ITEM # 13) ON DRIVE SCREW (ITEM # 9) DRILL .375 HOLE BETWEEN GEAR AND DRIVE SCREW.
   b. DRIVE SPRING PIN (ITEM # 27) INTO HOLE. CENTER WORM GEAR ON WORM. TIGHTEN SET SCREW (ITEM # 39) INTO SHAFT.
2. APPLY LOCKTITE BEARING COMPOUND TO THE STEM OF THE HANDLE (ITEM # 1) PER PROCEDURE 1.2.175 AND PRESS INTO THE HANDWHEEL (ITEM # 2)
3. APPLY LIBERAL AMOUNTS OF MOBILPLEX EP # 1 GREASE (ITEM # 38) TO THE NEEDLE BEARINGS (ITEMS # 16, 17 & 20), AND THE WORM GEAR TEETH (ITEM # 13) AND A LIGHT COAT TO THE THREADS ON THE DRIVE SCREW (ITEM # 9).
4. TIGHTENING TORQUES:
   a. ITEM # 29 (34-36 FT. LBS.)
   b. ITEM # 30 (22-27 FT. LBS.)
   c. ITEM # 33 (50-60 IN. LBS.)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS ± 1/64, DECIMALS ± .005, ANGLES ± 2 1/2°

MATERIAL-

STOCK NO.

AMOUNT REQ'D.

PART CODE 3

POLIO-E

BLAW-KNOX COMPANY
COPES-VULCAN DIVISION
ERIE, PENNSYLVANIA

FOR: MODEL D-100-400 ACTUATOR

MANUAL ACTUATOR ASSEMBLY

3-STROKE

		JOB NO.
DRAWN	DATE	
CHECKED	DATE	
APPR.	DATE	

DWG. NO. E-

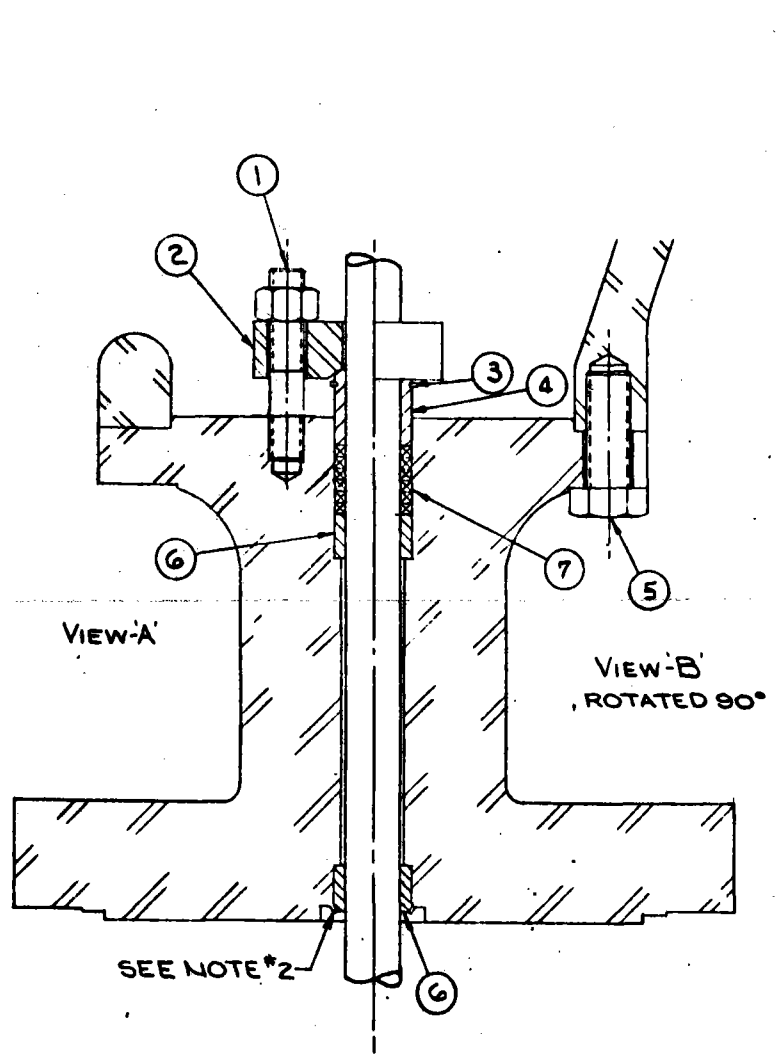
REPRD: E-179634

E-180111 MASTER ASS'Y | L-16560 SUB ASS'Y.

4.1.55-97

LIST OF MATERIAL

ITEM NO.	NO REQ.	PART NO	PART CODE	DESCRIPTION	DWG NO.	MAT'L	MAT'L SPEC	REMARKS
1	2	130136	3	STUD WITH ONE HEX NUT	S-130136	STEEL	COM'L	
2	1	129774	3	GLAND FOLLOWER	M-129774	STEEL	ASTM-A7	
3	1	31246	3	SNAP RING		STEEL	COM'L	WALDES 177
4	1	129923	3	PACKING GLAND	S-129923	SST	TYPE 410	
5	8	130140	3	HEX. HD. CAP SCREW		STEEL	COM'L	1"-8 UNC-2½ LG
6	2	195493	8	STEM GUIDE BUSHING	M-195493	SST	ASTM-A276	TYPE 420
* 7	1 SET	172421	3	PACKING SET		GPH. IMPREG. ASB		16 10.X1 3/8 OD X



NOTE
1. * RECOMMENDED SPARE PART.
2. ROLL LIP PER C.V. PROC. 1.2.187.

4.1.55-98

NO.	DATE	REVISIONS	BY	CHK.
1	10-9-80	ITEM #6 PT. NO. WAS 169764-K PER ENG. CHG. 6454	G.S.C.	RCJ.

NO.	DATE	REVISIONS	BY	CHK.

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA. U.S.A.

FOR; COOLING EXTENSION BONNET
SERVICE 850°F TO 1050°F

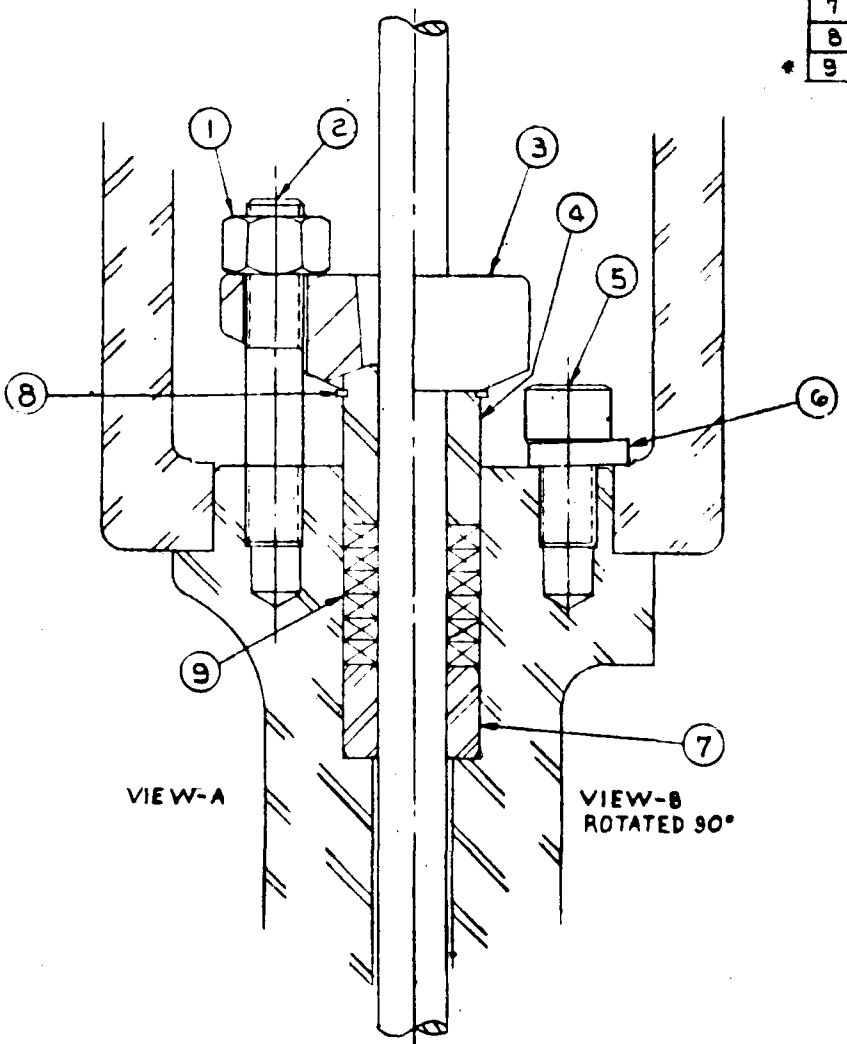
HARDWARE PACK ASSEMBLY
MODEL D-100-400
STANDARD 6 RING PACKING.

DFTSMN TROSESKI	DATE 12-4-75	APPD	DSGN. _____ DATE _____
CHECKED WFD	DATE 12-13-76		MFG. _____ DATE _____
APPD WJWS	DATE 12-13-76		_____ DATE _____

SCALE X | DWG. NO. L-169710 | REV. 1

LIST OF MATERIAL

ITEM NO.	NO. REQ	PART NO	PART CODE	DESCRIPTION	DWG NO	MAT'L	MAT'L SPEC	REMARKS
1	2	1923	3	HEX NUTS		STEEL	COM'L	
2	2	137477	3	STUD	S-137477	STEEL	SAE 4140	
3	1	137236	3	GLAND FOLLOWER	M-137236	STEEL	COM'L	
4	1	137604	3	PACKING GLAND	S-137604	SST.	TYPE 410	
5	4	137776	3	SOC. HD CAP SCREW		STEEL	COM'L	BUY PART
6	2	137475	3	HOLD DOWN CLAMP	S-137475	STEEL	SAE 1015-1020	
7	1	169762-G	3	STEM GUIDE BUSHING	S-169762	SST	TYPE 410	
8	1	18263	3	SNAP RING		STEEL	COM'L	
* 9	1SET	137596	3	PACKING SET		GPH. IMPREG. ASB.		3/4 I.D. x 1 1/8 O.D. x 7/16



NOTE
1. * RECOMMENDED SPARE PART

4.1.55-99

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: SERVICE UP TO 600°F

HARDWARE PACK ASSEMBLY
MODEL D-100-60 ACTUATOR
O RING PACKING

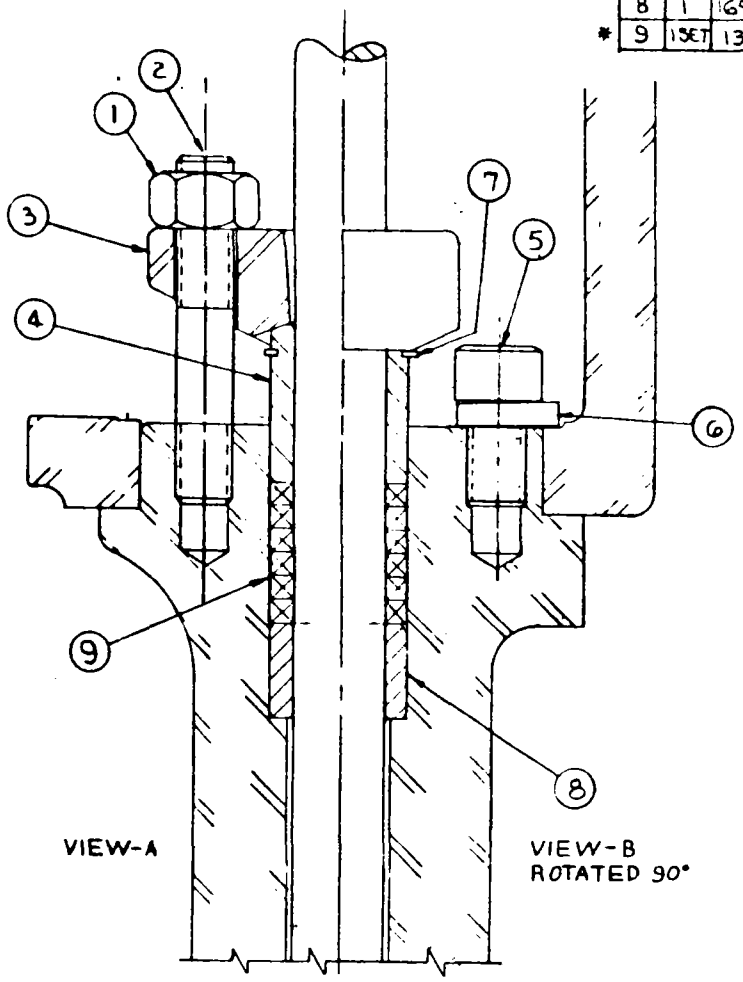
DFTSMN TRoesser	DATE 10-17-75	DSGN.	DATE
CHECKED WEA	DATE 2-13-76	MFG.	DATE
APPD WTWS	DATE 2-13-76		DATE

PART CODE 3 | SCALE 1/4 | DWG. NO. L-169765 | REV. 0

4.1.55-100

LIST OF MATERIAL

ITEM NO	NO REQ	PART NO	PART CODE	DESCRIPTION	DWG NO	MATL	MAT'L SPEC	REMARKS
1	2	1923	3	HEX NUTS		STEEL	COM'L	
2	2	137477	3	STUD	S-137477	STEEL	SAE 4140	
3	1	137236	3	GLAND FOLLOWER	M-137236	STEEL	COM'L	
4	1	137603	3	PACKING GLAND	S-137603	SST	TYPE 410	
5	2	137776	3	SOC HD. CAP SCREW		STEEL	COM'L	3/8-11UNC x 1 1/2 LG
6	2	137475	3	HOLD DOWN CLAMP	S-137475	STEEL	SAE 1015-1020	
7	1	18263	3	SNAP RING		STEEL	COM'L	
8	1	169763G	3	STEM GUIDE BUSHING	S-169763	SST.	TYPE 410	
* 9	1 SET	137598	3	PACKING SET		GPH. IMPREG. ASB		1"ID x 1 1/2"OD x 1/4"TK



VIEW-A

VIEW-B
ROTATED 90°

NOTE
1. * RECOMMENDED SPARE PART

COPES-VULCAN, INC.
LAKE CITY, ERIE CO. PA. U.S.A.

FOR; SERVICE UP TO 600°F

HARDWARE PACK ASSEMBLY
MODEL D-100-160 ACTUATOR
STANDARD O RING PACKING.

DFTSMN TROMBSKI	DATE 11-3-75	DSGN	DATE
CHECKED [illegible]	DATE 2-3-76	MFG	DATE
APPD [illegible]	DATE 2-13-76		DATE

APPD

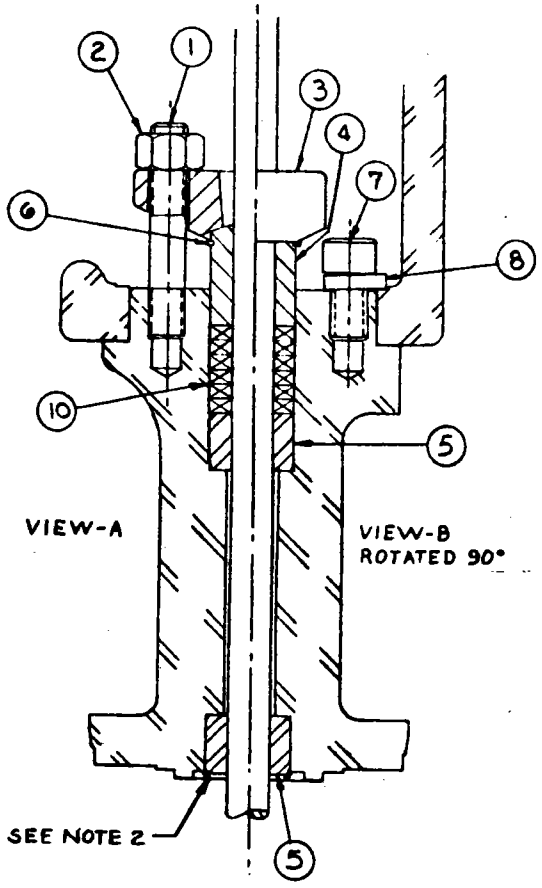
SCALE 1/4 | DWG. NO. L-168[illegible]6 | REV. O

PART CODE 3

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.

LIST OF MATERIAL

ITEM NO	NO. REQ	PART NO.	PART CODE	DESCRIPTION	DWG NO.	MAT'L	MAT'L SPEC	REMARKS
1	2	137477	3	STUD	S-137477	STEEL	SAE 4140	
2	2	1923	3	HEX NUTS		STEEL	COM'L	
3	1	137236	3	GLAND FOLLOWER	M-137236	STEEL	COM'L	
4	1	137604	3	PACKING GLAND	S-137604	SST	TYPE 410	
5	2	195494	3	STEM GUIDE BUSHING	M-195494	SST	ASTM-A276	TYPE 420
6	1	18263	3	SNAP RING		STEEL	COM'L	
7	4	137776	3	SOC. HD. CAP SCREW		STEEL	COM'L	5/8"-11UNC x 1 1/8" LG
8	2	137475	3	HOLD DOWN CLAMP	S-137475	STEEL	SAE-1015 1020	
* 9	1SET	172419	3	PACKING SET		GPH. IMPREG. ASB		5/8" I.D. x 1 1/2" OD x 1/2"



NOTE
1. * RECOMMENDED SPARE PART
2. ROLL LIP PER C.V. PROC. 1.2.187.

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.
1	10-9-80	ITEM #5 PT. NO. WAS 169762-X PER ENG. CHG. 6454	G.S.C.	Rel.					

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: COOLING EXTENSION BONNET
SERVICE 850°F TO 1050°F
HARDWARE PACK ASSEMBLY
MODEL D-100-60. ACT
STD. 6 RING PACKING.

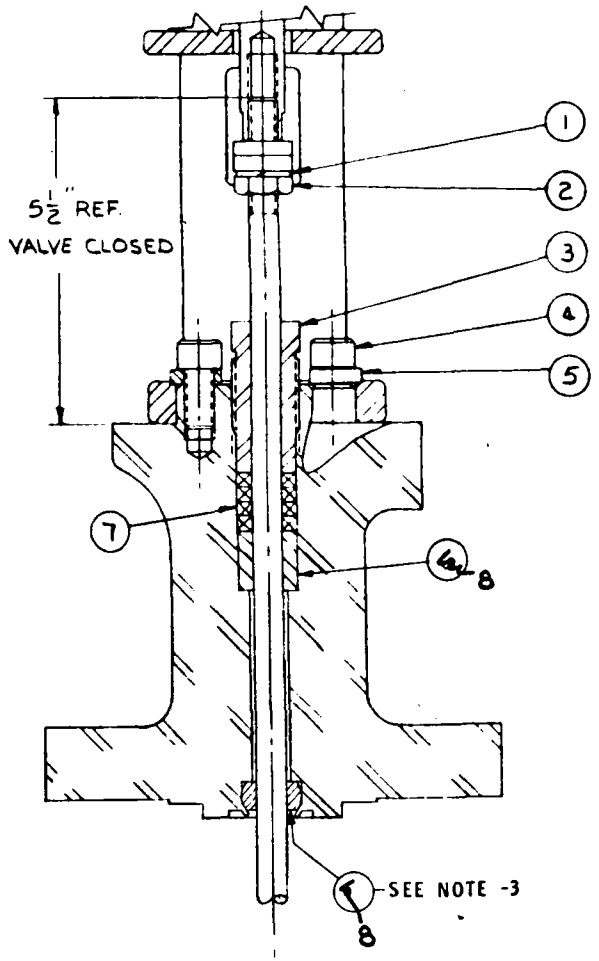
DFTSMN J. Rosek	DATE 1-30-76	DSGN.	DATE
CHECKED WP	DATE 2-13-76	MFG.	DATE
APPD WJW'S	DATE 2-13-76		DATE

PART CODE 3 | SCALE 1/4 | DWG. NO. L-169773 | REV. 1

4.1.55-101

LIST OF MATERIAL

ITEM NO	NO REQ.	PART NO.	PART CODE	DESCRIPTION	DWG NO	MAT'L	MAT'L SPEC	REMARKS
1	1	1898	3	LOCKWASHER		STEEL	COM'L	½" DIA.
2	1	1894	3	JAM NUT		STEEL	COM'L	½"-13UNC
3	1	168239	3	PACKING GLAND	M-168239	SST	AISI 410	
4	2	41387	3	SOC. HD. CAP SCREW		STEEL	COM'L	½"-13 X 1" LG
5	2	168242	3	HOLD DOWN CLAMP	S-168242	STEEL	SAE 1020	
~~6~~	~~2~~	~~170051~~	~~3~~	~~GUIDE BUSHING~~	~~S-170051~~	~~SST~~	~~TYPE 420~~	
* 7	1SET	~~NOTE #~~	2	PACKING SET 4 RINGS		~~NOTE #~~		1"OD. X ½"ID X ¼"
8	2	193919	5	GUIDE BUSHING	S-193919	CRES	ASTM-A276	TYPE 420



NOTE
1. * RECOMMENDED SPARE PART
~~2. EACH PACKING SET HAS 187-1 TOP & BOTTOM RINGS WITH JOHN CRANE 1625 RINGS IN-BETWEEN.~~
3. ROLL LIP PER C.V. PROC. 1.2.187.
4. AS CALLED FOR ON SHOP ORDER.

8010-14896
JOB NO.
MKD. BY T. FINK DATE 2-4-81
CHKD BY K.H. DATE 2-4-81

SHOP ORDER
CHANGE NO. 3

SHOP ORDER
ITEM NO. 3 & 2

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA U.S.A.

FOR; SERVICE ~~UP TO 600°F~~ OVER 850°F TO 1050°F.

HARDWARE PACK ASSEMBLY
MODEL D-100-40 ACTUATOR

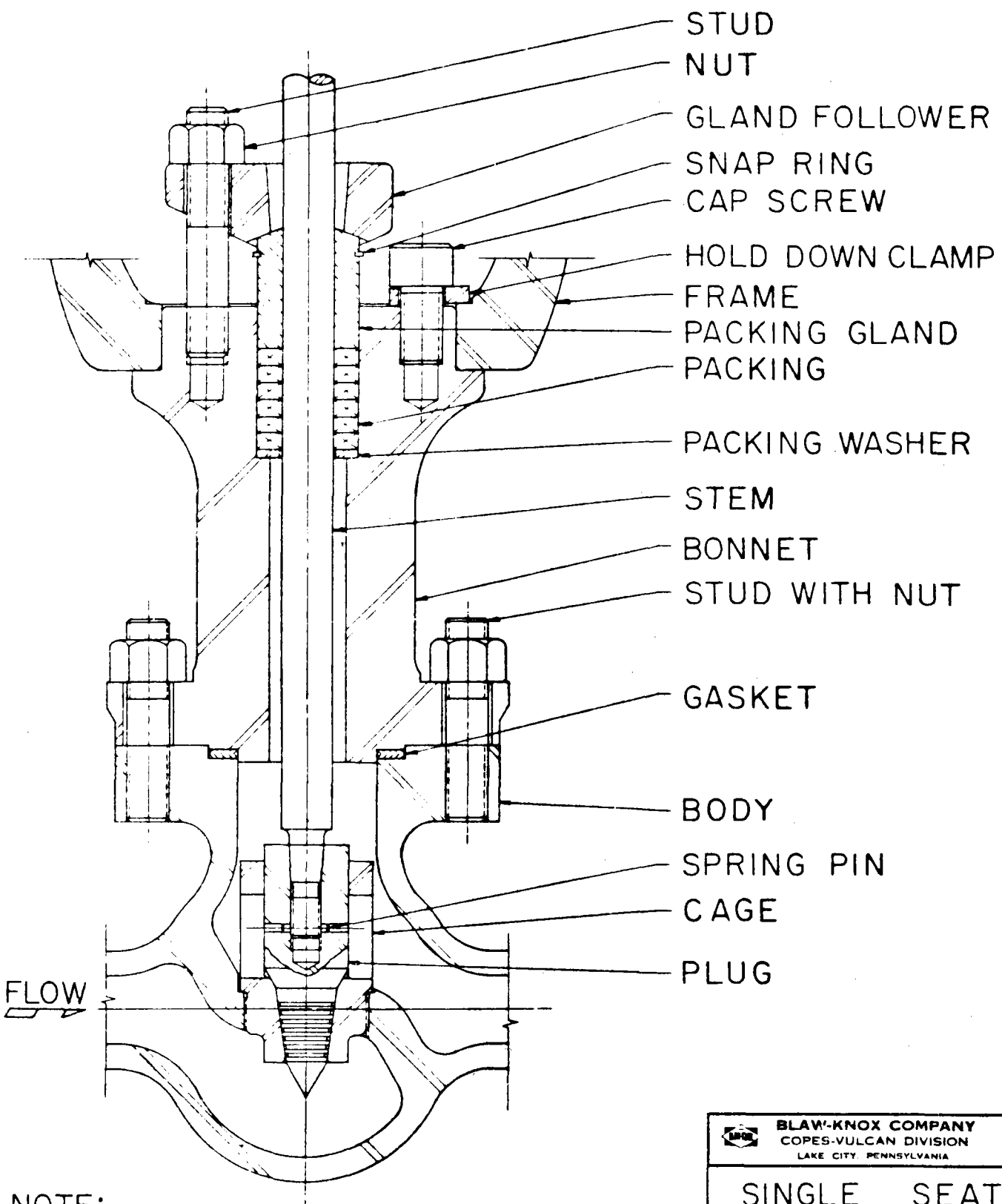
NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.

E-195621
E-195626
E-190TH
MASTER ASSY | SUB ASSY
JOB NO. 7910-02138
REPRO FROM L-174081

DFTSMN	DATE	APPD	DSGN JNB	DATE 10-30-79
CHECKED DJM	DATE 10-29-79		MFG.	DATE
APPD	DATE			DATE

SCALE ~~X~~ DWG. NO. L-191246-MKD REV. C

4.1.55-102



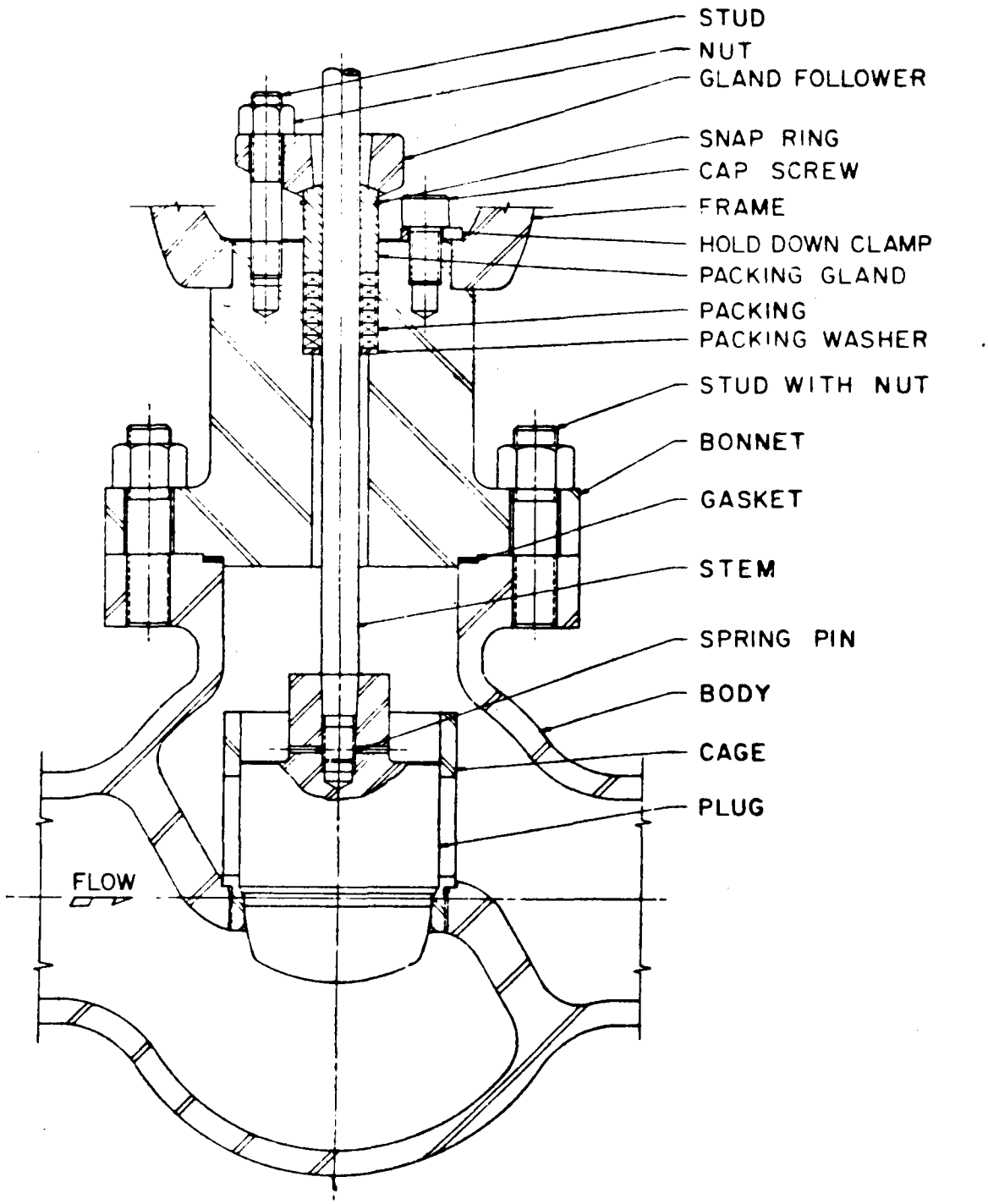
NOTE:
IF LUBRICATOR OR LEAKOFF CONNECTION IS REQUIRED SEE THE FOLLOWING SHEET.

BLAW-KNOX COMPANY
COPES-VULCAN DIVISION
LAKE CITY, PENNSYLVANIA

SINGLE SEAT SMALL CASCADE TRIM

DRAWN	JWS	DATE	12-18-68
CHECKED	MCM	DATE	1-23-69
APPR.	FOS	DATE	1-23-69

DWG. NO S-140526 REV.

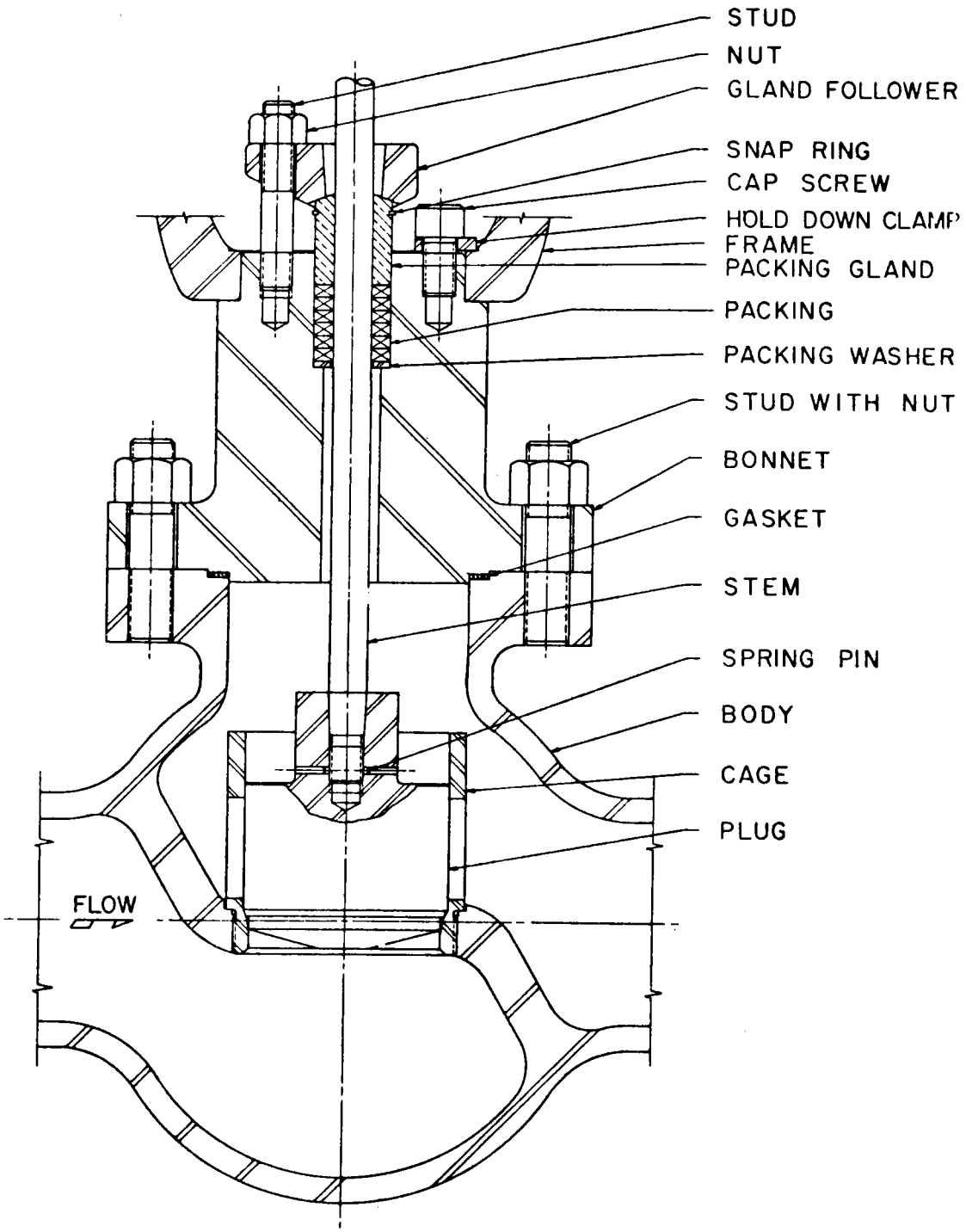


NOTE:
IF LUBRICATOR OR LEAKOFF CONNECTION IS REQUIRED SEE THE FOLLOWING SHEET.

BLAW-KNOX COMPANY
COPES-VULCAN DIVISION

STANDARD
MOD. PARABOLIC
SINGLE SEAT TRIM

DWG. NO. S-140575 REV.

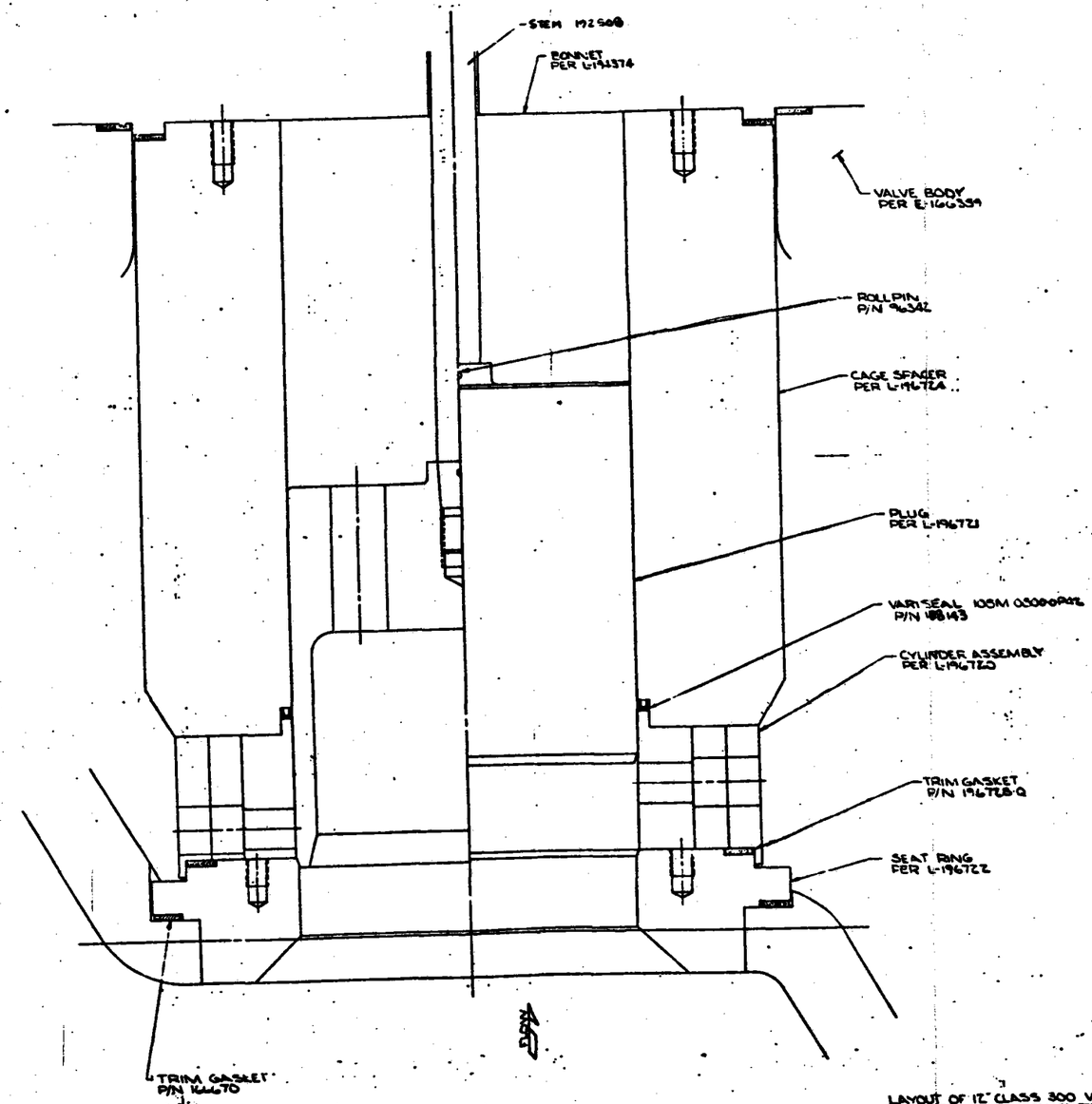


NOTE:
IF LUBRICATOR OR LEAKOFF CONNECTION IS REQUIRED SEE THE FOLLOWING SHEET.

BLAW-KNOX COMPANY
COPES-VULCAN DIVISION
ERIE, PENNSYLVANIA

STANDARD
QUICK OPENING
TRIM

DRAWN	WMS	DATE 2-24-68	JOB NO.
CHECKED	MEM	DATE 2-28-69	
APPD	JDS	DATE 1-28-69	SCALE
DWG NO. S-140577			REV.

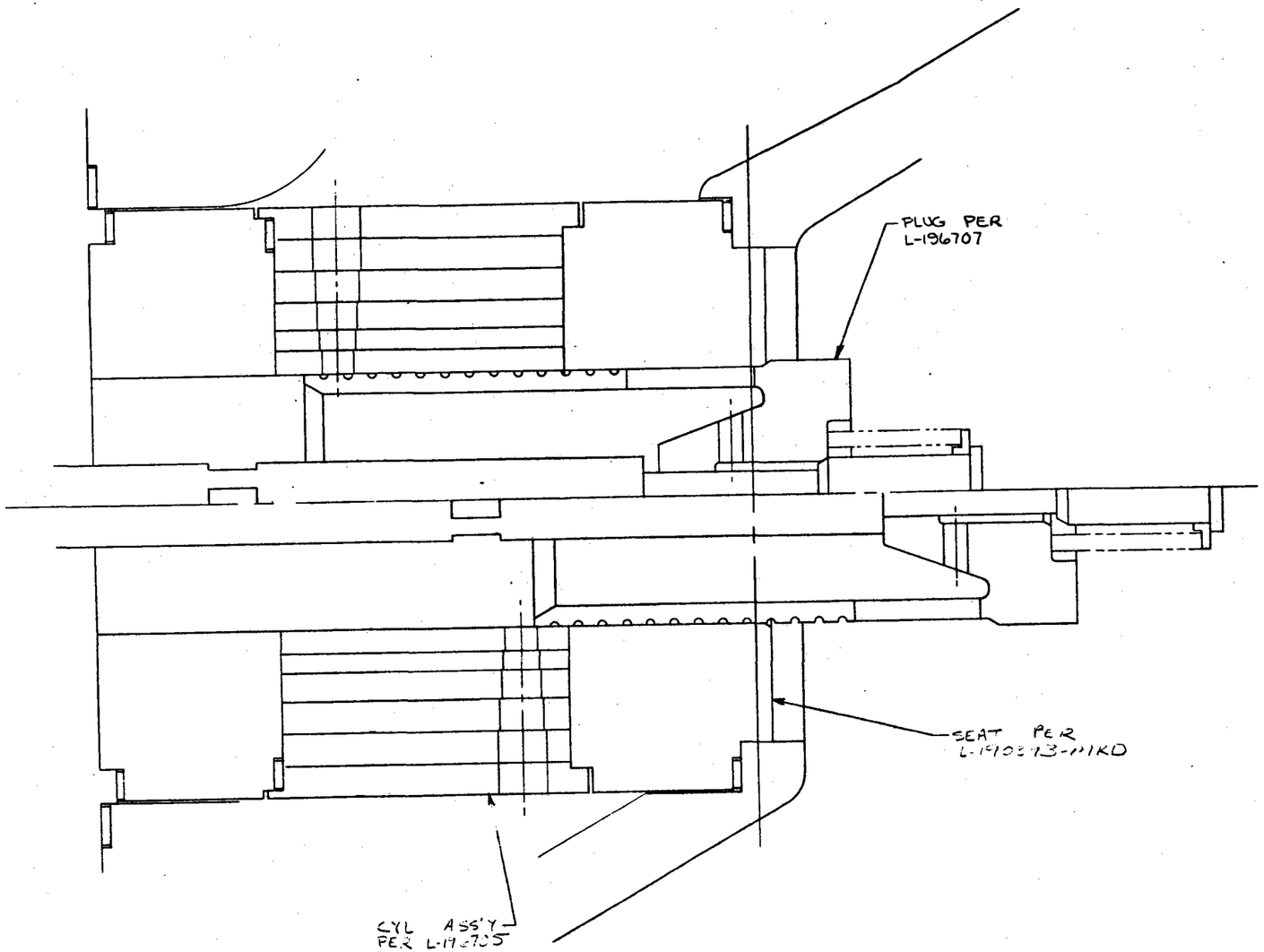


LAYOUT OF 12" CLASS 300 VALVE, W/ 10 BALANCED HUSH II TRIM

SCALE: FULL TRAVEL: 12"
DWN: BD 1-30-81
CHK:
APPR: JNR 2-23-81
JOB NO. 8010-1489%
MAIN ASSY. E-196350

SK-DES-9677-D REV. 0

REVISIONS					
NO.	DESCRIPTION	REV BY	CK'D BY	DATE	APPD



MATERIAL

STOCK NO. AMOUNT REQ'D

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
BREAK CORNERS 1/64 MAX.
FILLETS ARE 1/64 TO 1/32 R
✓ INDICATES 250 FINISH
TOLERANCES ARE:

DIMENSION	UNDER 6	6 - 18	OVER 18
DECIMALS	± .005	± .005	± .010
FRACTIONS	± 1/64	± 1/32	± 1/16

TOLERANCE ON ANGLES ± 2½°

COPES-VULCAN, INC.
Div. of The White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR 8 CLASS 600 VALVE /D.N.-400
ACTUATOR # 8 THROTTLING FLUSH TRIM

TRIM LAYOUT

DFTSMN	DATE	APPD	DSGN.	DATE 2-25-91
CHECKED	DATE 2-25-91		MFG.	DATE
	DATE			DATE

SCALE DWG. NO. SK-DES-9614-E REV. 0

E-19649
MASTER ASSY | SUB ASSY
JOB NO. 3-10-19
REPRO FROM
PART CODE

4.1.55-109

COPES-VULCAN, INC.
One of the White Consolidated Industries

RECOMMENDED SPARE PARTS LIST
COPES-VULCAN D-100 CONTROL VALVES
CV JOBS #8010-14896 & 8064-16895

VALVE'S TAG: FV-1007
1-1/2" - 150# D-100-40 CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	167395
Packing Set	172418
Body/Bonnet Gasket	89790
Cage	Per Drawing M-96200 Mk'd.
Stem	Per Drawing L-169976 Mk'd.
Guide Bushing	193919
Plug	Per Drawing M-131048 Mk'd.
Roll Pin	96226
Handwheel Operator Gasket	78688
Handwheel Operator Seal	92343

VALVE'S TAG: FV-1006
2" - 2500# D-100-40 CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	167395
Packing Set	172418
Body/Bonnet Gasket	80569
Cage	Per Drawing M-175360 Mk'd.
Stem	Per Drawing L-169976 Mk'd.
Guide Bushing	193919
Plug	Per Drawing M-175350 Mk'd.
Roll Pin	96226
Handwheel Operator Gasket	78688
Handwheel Operator Seal	92343

VALVE'S TAG: PV-647B
2-1/2" - 900# D-100-60 CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	75514
Packing Set	172419
Body/Bonnet Gasket	80568
Cage	160010-G
Stem	Per Drawing L-168281 Mk'd.
Guide Bushing	169762-G
Plug	139725-G
Roll Pin	96227
Handwheel Operator Gasket	78688
Handwheel Operator Seal	92343

RECOMMENDED SPARE PARTS LIST (continued)
CV JOBS #8010-14896 & 8064-16895

VALVE'S TAG: AOV-1008
4" - 300# D-100-100 CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	80811
Packing Set	137596
Body/Bonnet Gasket	79784
Cage	187226-G
Stem	170537
Guide Bushing	169762-G
Plug	188986-G
Roll Pin	96227
Handwheel Operator Gasket	78688
Handwheel Operator Seal	92343

VALVE'S TAG: PV-640
12" - 300# D-100-160 CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	80815
Packing Set	137598
Body/Bonnet Gasket	164701
Inner Trim Gasket	196728-Q
Outer Trim Gasket	166670
Cylinder Assembly	196720
Cage Spacer	196724
Stem	192508
Guide Bushing	169763-G
Plug	196721
Roll Pin	96342
Handwheel Operator Gasket	78688
Handwheel Operator Seal	92343
Seat Ring	196722
Variseal	188143

VALVE'S TAG: PV-1000
8" - 600# D-100-400 CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	129328
Packing Set	172421
Body/Bonnet Gasket	164715
Inner Trim Gasket	197010-Q
Outer Trim Gasket	167419
Cylinder Assembly	196705
Cage Spacer	Per Drawing L-190391 Mk'd.
Stem	Per Drawing L-191403 Mk'd.
Guide Bushing	195493
Plug	196707
Spring	166706

continued

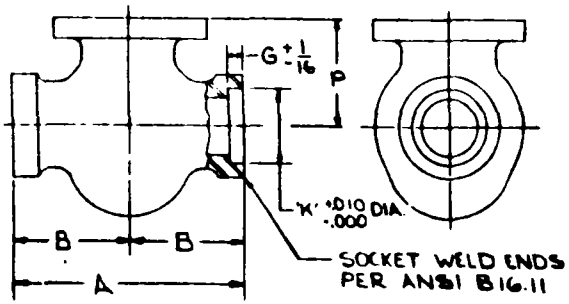
RECOMMENDED SPARE PARTS LIST (continued)
CV JOBS #8010-14896 & 8064-16895

DESCRIPTION	PART NUMBER
Spring	166706
Spring Ring	166715
Inner Plug	196706
Roll Pin	96227
Handwheel Operator Gasket	129629
Handwheel Operator Gasket	129632
Handwheel Operator 'O' Ring	129623
Handwheel Operator 'O' Ring	149486
Handwheel Operator Bearing	129613
Seat Ring	Per Drawing L-190393 Mk'd.

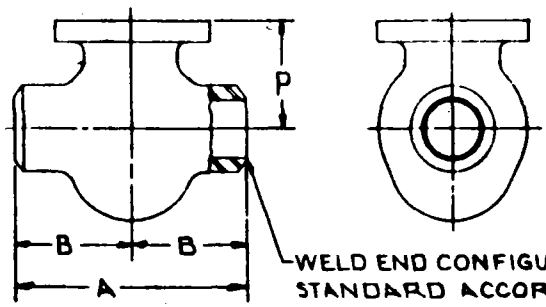
VALVE SIZE	150#, 300#, 400#, 600# & 900# PRESSURE STANDARDS					1500# PRESSURE STANDARD					2500# PRESSURE STANDARD				
	A	B	G	K	P	A	B	G	K	P	A	B	G	K	P
3/4	7 5/8	3 13/16	9/16	1.065	4 1/16	7 5/8	3 13/16	9/16	1.065	4 1/16	8 1/2	4 1/4	9/16	1.065	4 1/16
1	7 3/4	3 7/8	9/16	1.330	3 15/16	7 3/4	3 7/8	9/16	1.330	3 15/16	8 1/2	4 1/4	9/16	1.330	3 15/16
1 1/4	8 3/8	4 3/16	9/16	1.675	3 15/16	8 3/8	4 3/16	9/16	1.675	3 15/16	8 1/2	4 1/4	9/16	1.675	3 15/16
1 1/2	9 1/4	4 5/8	9/16	1.915	4 3/16	9 1/4	4 5/8	9/16	1.915	4 3/16	10 1/4	5 1/8	9/16	1.915	4 3/16
2	11 1/2	5 3/4	11/16	2.406	4 9/32	11 1/2	5 3/4	11/16	2.406	4 9/32	12 1/2	6 1/4	11/16	2.406	4 9/32
2 1/2	11 1/2	5 3/4	11/16	2.906	6 1/4	11 1/2	5 3/4	11/16	2.906	6 1/4	12 1/2	6 1/4	11/16	2.906	6 1/4
3	12 1/2	6 1/4	11/16	3.535	6 21/32	12 1/2	6 1/4	11/16	3.535	6 21/32	15	7 1/2	11/16	3.535	6 21/32
4	14 1/2	7 1/4			6 27/32	14 1/2	7 1/4			6 27/32	16	8			6 27/32
5	17	8 1/2			8 3/32	18 1/2	9 1/4			8 3/32	20	10			8 3/32
6	20	10			9 3/32	22	11			9 3/32	24	12			9 3/32
8	24	12			10 1/4	27	13 1/2			10 1/4	30	15			10 1/4
10	30	15			15	34	17			15	40	20			15
12	36	18			19	38	19			19	44	22			19

NOTE:

1. FOR THE FLANGED AND SCREWED END VALVE BODY DIMENSIONS SEE FORM 2671.



SOCKET WELD ENDS



BUTT WELD ENDS

KEY

A-FACE TO FACE
B-CENTER TO FACE
G-DEPTH OF SOCKET
K-DIAMETER OF SOCKET
P-CENTER TO BONNET FLANGE

NO.	DATE	REVISION	BY	CHK
4	10 12 71	CHANGED G & K DIM TO B16.11, ENG CHG. 5170	E.V	UES
3	1 24 71	CHANGED 'G' & 'K' DIM. TO B16.5, ENG CHG. 5084	FRB	DGK
2	2 11 64	REMOVED 4" G & K DIMN. 5/16" & 4 5/16"; 12"-1500# A & B DIMN. WHERE 3/4 & 18 ENG CHG. 3535	NEM	
1	7 16	REMOVED 1500# FROM 150# THRU 900# COLUMN; ADDED 1500# & 2500# COLUMNS ENG. CHG. 3414	NEM	

MASTER ASS'Y | SUB ASS'Y

BLAW-KNOX COMPANY
COPES-VULCAN DIVISION
ERIE, PENNSYLVANIA

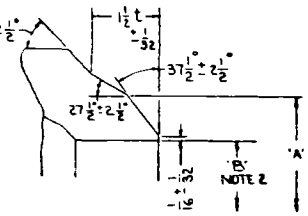
TABLES OF DIMENSIONS
VALVE BODIES
SOCKET AND BUTT WELD ENDS

DRAWN MATTSON DATE 11-29-62
CHECKED JACKSON DATE 1-11-63
APPR ____ DATE ____
JOB NO ____
SCALE ~
DWG. NO L-82917 REV. 4

4.1.55-114

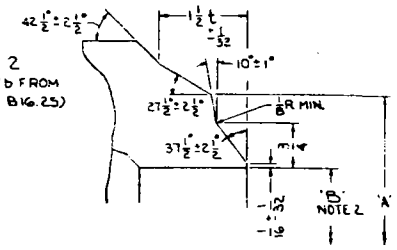
NOMINAL PIPE SIZE	SCHEDULE NO.	A TOL. SEE NOTE 4	B SEE NOTES 2 & 5	t NOTE 1	1 1/2 t
2 1/2	40	2 7/8	2.469	0.203	5/16
	80		2.323	0.276	7/16
	160		2.125	0.375	9/16
	XXS		1.771	0.552	7/8
3	40	3 19/32	3.068	0.216	3/8
	80		2.900	0.300	1/2
	160		2.624	0.438	11/16
	XXS		2.300	0.600	13/16
3 1/2	40	4	3.548	0.226	5/8
	80		3.364	0.318	1/2
4	40	4 5/8	4.026	0.237	3/8
	80		3.826	0.337	9/16
	120		3.624	0.438	11/16
	160		3.438	0.531	13/16
	XXS		3.152	0.674	1-1/16
5	40	5 11/16	5.047	0.258	7/16
	80		4.813	0.375	9/16
	120		4.563	0.500	3/4
	160		4.313	0.625	15/16
	XXS		4.063	0.750	1-1/8
6	40	6 25/32	6.065	0.280	7/16
	80		5.761	0.432	11/16
	120		5.501	0.562	7/8
	160		5.189	0.719	1-1/8
	XXS		4.897	0.864	1-5/16
8	40	8 25/32	7.981	0.322	1/2
	60		7.813	0.406	5/8
	80		7.625	0.500	3/4
	100		7.439	0.594	15/16
	120		7.189	0.719	1-1/8
	140		7.001	0.812	1-1/4
	XXS		6.875	0.875	1-5/16
	160		6.813	0.906	1-3/8
10	40	10 15/16	10.020	0.365	9/16
	60		9.750	0.500	3/4
	80		9.564	0.594	15/16
	100		9.314	0.719	1-1/8
	120		9.064	0.844	1-5/16
	140		8.750	1.000	1-1/2
	160		8.500	1.125	1-11/16
12	STD	12 31/32	12.000	0.375	9/16
	40		11.938	0.406	5/8
	XS		11.750	0.500	3/4
	60		11.626	0.562	7/8
	80		11.376	0.688	1-1/16
	100		11.064	0.844	1-5/16
	120		10.750	1.000	1-1/2
	140		10.500	1.125	1-11/16
	160		10.126	1.312	2
14	STD	14 1/4	13.250	0.375	9/16
	40		13.124	0.438	11/16
	XS		13.000	0.500	3/4
	60		12.814	0.594	15/16
	80		12.500	0.750	1-1/8
	100		12.126	0.938	1-7/16
	120		11.814	1.094	1-11/16
	140		11.500	1.250	1-7/8
	160		11.188	1.406	2-1/8

FIG. 1
(FIG. 2a FROM ANSI B16.25)



FOR WALL THICKNESS (t) 3/16 TO 7/8 IN. INCLUSIVE, OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

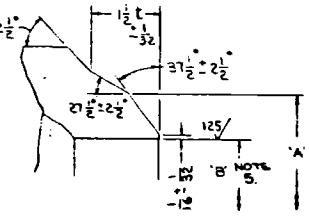
FIG. 2
(FIG. 2b FROM ANSI B16.25)



FOR WALL THICKNESS (t) GREATER THAN 7/8 IN., OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

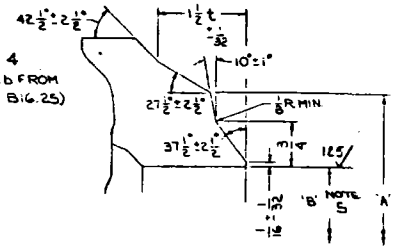
VALVE BODY BUTT WELD END DETAIL WHEN USING HYDRAULIC PRESS FOR HYDROSTATIC TEST

FIG. 3
(FIG. 2a FROM ANSI B16.25)



FOR WALL THICKNESS (t) 3/16 TO 7/8 IN. INCLUSIVE, OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

FIG. 4
(FIG. 2b FROM ANSI B16.25)



FOR WALL THICKNESS (t) GREATER THAN 7/8 IN., OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

NOTES:

1. t = NOMINAL WALL THICKNESS OF PIPE.
2. TOLERANCE FOR DIMENSION 'B': (RUBBER PLATES)
   10" VALVE SIZE AND SMALLER = ± 1/32
   12" VALVE SIZE AND LARGER = ± 1/16
3. 250 ALL MACHINED SURFACES EXCEPT WHERE NOTED.
4. TOLERANCE FOR DIMENSION 'A' (VALVES) =
   5" VALVE SIZE AND SMALLER + 3/32, - 1/32
   6" VALVE SIZE AND LARGER +5/32, - 1/32.
5. TOLERANCE FOR 'B' DIMENSION WHEN USING TEST PLUG IS
   0 - 3.999 DIA. + +.002, -.000
   4.000 - 15.999 DIA. = +.003, -.000
   16.000 DIA. AND ABOVE +.004, -.000.

VALVE BODY BUTT WELD END DETAIL WHEN USING TEST PLATES FOR HYDROSTATIC TEST

COPES-VULCAN, INC.

VALVE BODY
BUTT WELD END DETAILS
PER A.N.S.I. B16.25 & B16.5
FOR: WITHOUT BACKING RING OR WITH SPLIT BACKING RING

DRAWN ____ DATE ____
CHECKED ____ DATE ____
APPR. ____ DATE ____ SCALE ____

DWG NO. B-147468 REV 4

NO.	DATE	REVISIONS	BY	CHK
3	6/11	ADDED 4.1.55-115		

4.1.55-115

NOMINAL PIPE SIZE	SCHEDULE NO.	A TOL. SEE NOTE-4	B SEE NOTES 2 & 5	t NOTE 1	1½ t
2 ½	40	2 7/8	2.469	0.203	5/16
	80		2.323	0.276	7/16
	160		2.125	0.375	9/16
	XXS		1.771	0.552	7/8
3	40	3 19/32	3.068	0.216	3/8
	80		2.900	0.300	1/2
	160		2.624	0.438	11/16
	XXS		2.300	0.600	15/16
3 ½	40	4	3.548	0.226	3/8
	80		3.364	0.318	1/2
4	40	4 5/8	4.026	0.237	3/8
	80		3.826	0.337	9/16
	120		3.624	0.438	11/16
	160		3.438	0.531	13/16
	XXS		3.152	0.674	1-1/16
5	40	5 11/16	5.047	0.258	7/16
	80		4.813	0.375	9/16
	120		4.563	0.500	3/4
	160		4.313	0.625	15/16
	XXS		4.063	0.750	1-1/8
6	40	6 25/32	6.065	0.280	7/16
	80		5.761	0.432	11/16
	120		5.501	0.562	7/8
	160		5.189	0.719	1-1/8
	XXS		4.897	0.864	1-5/16
8	40	8 25/32	7.981	0.322	1/2
	60		7.813	0.406	5/8
	80		7.625	0.500	3/4
	100		7.439	0.594	15/16
	120		7.189	0.719	1-1/8
	140		7.001	0.812	1-1/4
	XXS		6.875	0.875	1-5/16
	160		6.813	0.906	1-3/8
10	40	10 15/16	10.020	0.365	9/16
	60		9.750	0.500	3/4
	80		9.564	0.594	15/16
	100		9.314	0.719	1-1/8
	120		9.064	0.844	1-5/16
	140		8.750	1.000	1-1/2
	160		8.500	1.125	1-11/16
12	STD	12 31/32	12.000	0.375	9/16
	40		11.938	0.406	5/8
	XS		11.750	0.500	3/4
	60		11.626	0.562	7/8
	80		11.376	0.688	1-1/16
	100		11.064	0.844	1-5/16
	120		10.750	1.000	1-1/2
	140		10.500	1.125	1-11/16
	160		10.126	1.312	2
14	STD	14 1/4	13.250	0.375	9/16
	40		13.124	0.438	11/16
	XS		13.000	0.500	3/4
	60		12.814	0.594	15/16
	80		12.500	0.750	1-1/8
	100		12.126	0.938	1-7/16
	120		11.814	1.094	1-11/16
	140		11.500	1.250	1-7/8
	160		11.188	1.406	2-1/8

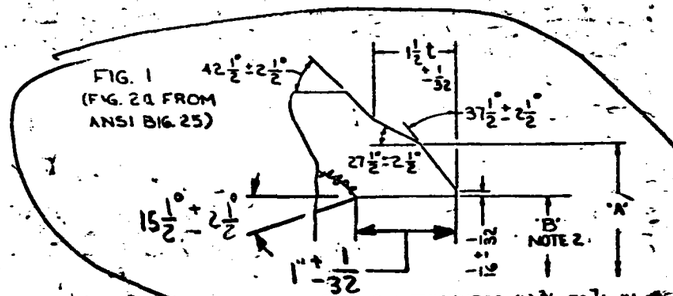


FIG. 1
(FIG. 2a FROM ANSI B16.25)

FOR WALL THICKNESS (t) 3/16 TO 7/8 IN. INCLUSIVE, OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

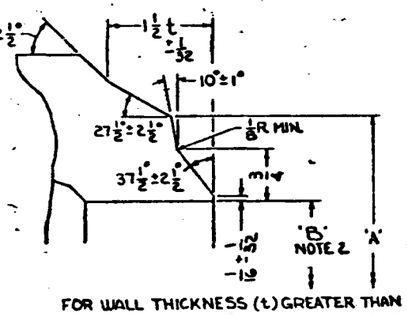


FIG. 2
(FIG. 2b FROM ANSI B16.25)

FOR WALL THICKNESS (t) GREATER THAN 7/8 IN., OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

VALVE BODY BUTT WELD END DETAIL WHEN USING HYDRAULIC PRESS FOR HYDROSTATIC TEST

SHOP ORDER
ITEM NO. 5

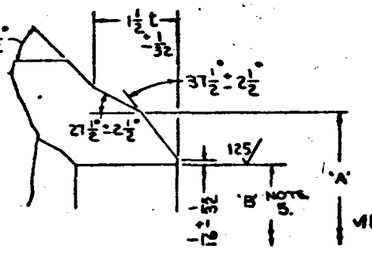


FIG. 3
(FIG. 2a FROM ANSI B16.25)

FOR WALL THICKNESS (t) 3/16 TO 7/8 IN. INCLUSIVE, OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

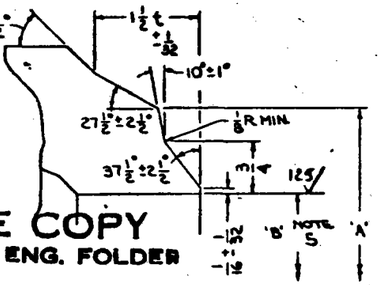


FIG. 4
(FIG. 2b FROM ANSI B16.25)

FOR WALL THICKNESS (t) GREATER THAN 7/8 IN., OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

ENG. FILE COPY
MUST REMAIN IN ENG. FOLDER

NOTES:

1. t = NOMINAL WALL THICKNESS OF PIPE.
2. TOLERANCE FOR DIMENSION 'B' (RUBBER PLATES)
   10" VALVE SIZE AND SMALLER = + 1/32
   ~~12" VALVE SIZE AND LARGER = 3/16~~
3. 250 ALL MACHINED SURFACES EXCEPT WHERE NOTED.
4. TOLERANCE FOR DIMENSION 'A' (VALVES) =
   5" VALVE SIZE AND SMALLER + 3/32, - 1/32
   ~~6" VALVE SIZE AND LARGER +5/32, -1/32~~
5. ~~TOLERANCE FOR 'B' DIMENSION WHEN USING TEST PLUG =~~
   ~~6" - 8" O.D. +.008, -.000~~
   ~~10" - 14" O.D. +.009, -.000~~
   ~~16.000 O.D. AND ABOVE +.004, -.000~~

VALVE BODY BUTT WELD END DETAIL WHEN USING TEST PLATES FOR HYDROSTATIC TEST

JOB NO. 8064-16895

MKD. BY GDM DATE 1-22-81

~~KD.~~ BY DJW DATE 1-22-81

BOTH ENDS ALIKE

NO.	DATE	REVISIONS	BY	CHK.
1	[illegible]	ADDED TOLERANCE 1/32 TO 1½ t DIM. PER ENG CHG #25180	J.A.	[illegible]
2	8/27/75	ADDED B16.5 TO DWG. TITLE	JJG	DJW

NO.	DATE	REVISIONS	BY	CHK.
3	2-6-79	UPDATED 'A' & 'B' TOL & ADDED NOTES 4 & 5.	T.S.	GG.

NO.	DATE	REVISIONS	BY	CHK.

NO.	DATE	REVISIONS	BY	CHK.

PART CODE 5 MASTER ASSY. SUB ASSY.

COPES-VULCAN, INC.
LAKE CITY ERIE CO. PA. U.S.A.

VALVE BODY
BUTT WELD END DETAILS
PER A.N.S.I. B16.25 & B16.5
FOR: WITHOUT BACKING RING OR WITH SPLIT BACKING RING

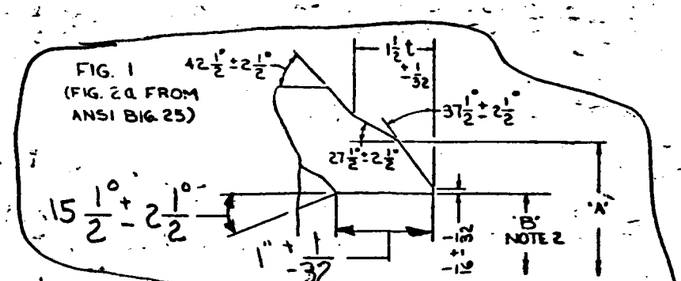
DRAWN FWG DATE 1-22-81 JOB NO
CHECKED DATE
APPR DATE 6-4-81 SCALE

DWG. NO. B-14746 E MKD. REV. 2

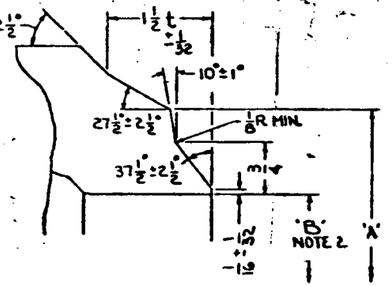
FOLD

4.1.55-117

NOMINAL PIPE SIZE	SCHEDULE NO.	A TOL. SEE NOTE-4	B SEE NOTES 2 & 5	t NOTE 1	$1\frac{1}{2}$ t
2 1/2	40	$2\frac{7}{8}$	2.469	0.203	5/16
	80		2.323	0.276	7/16
	160		2.125	0.375	9/16
	XXS		1.771	0.552	7/8
3	40	$3\frac{19}{32}$	3.068	0.216	3/8
	80		2.900	0.300	1/2
	160		2.624	0.438	11/16
	XXS		2.300	0.600	15/16
3 1/2	40	4	3.548	0.226	3/8
	80		3.364	0.318	1/2
4	40	$4\frac{5}{8}$	4.026	0.237	3/8
	~~80~~		~~3.826~~	~~0.337~~	~~7/16~~
	120		3.624	0.438	11/16
	160		3.438	0.531	13/16
	XXS		3.152	0.674	1-1/16
5	40	$5\frac{11}{16}$	5.047	0.258	7/16
	80		4.813	0.375	9/16
	120		4.563	0.500	3/4
	160		4.313	0.625	15/16
	XXS		4.063	0.750	1-1/8
6	40	$6\frac{25}{32}$	6.065	0.280	7/16
	80		5.761	0.432	11/16
	120		5.501	0.562	7/8
	160		5.189	0.719	1-1/8
	XXS		4.897	0.864	1-5/16
8	40	$8\frac{25}{32}$	7.981	0.322	1/2
	60		7.813	0.406	5/8
	80		7.625	0.500	3/4
	100		7.439	0.594	15/16
	120		7.189	0.719	1-1/8
	140		7.001	0.812	1-1/4
	XXS		6.875	0.875	1-5/16
	160		6.813	0.906	1-3/8
10	40	$10\frac{15}{16}$	10.020	0.365	9/16
	60		9.750	0.500	3/4
	80		9.564	0.594	15/16
	100		9.314	0.719	1-1/8
	120		9.064	0.844	1-5/16
	140		8.750	1.000	1-1/2
	160		8.500	1.125	1-11/16
12	STD	$12\frac{31}{32}$	12.000	0.375	9/16
	40		11.938	0.406	5/8
	XS		11.750	0.500	3/4
	60		11.626	0.562	7/8
	80		11.376	0.688	1-1/16
	100		11.064	0.844	1-5/16
	120		10.750	1.000	1-1/2
	140		10.500	1.125	1-11/16
	160		10.126	1.312	2
14	STD	$14\frac{1}{4}$	13.250	0.375	9/16
	40		13.124	0.438	11/16
	XS		13.000	0.500	3/4
	60		12.814	0.594	15/16
	80		12.500	0.750	1-1/8
	100		12.126	0.938	1-7/16
	120		11.814	1.094	1-11/16
	140		11.500	1.250	1-7/8
	160		11.188	1.406	2-1/8



FOR WALL THICKNESS (t) 3/16 TO 7/8 IN. INCLUSIVE, OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.



FOR WALL THICKNESS (t) GREATER THAN 7/8 IN., OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

VALVE BODY BUTT WELD END DETAIL WHEN USING HYDRAULIC PRESS FOR HYDROSTATIC TEST

ENG. FILE COPY
MUST REMAIN IN ENG. FOLDER

SHOP ORDER
ITEM NO. 8

FOR WALL THICKNESS (t) 3/16 TO 7/8 IN. INCLUSIVE, OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

FOR WALL THICKNESS (t) GREATER THAN 7/8 IN., OUTSIDE & INSIDE CONTOUR FOR USE WITH SPLIT BACKING RING OR WITHOUT BACKING RING.

NOTES:

1. t = NOMINAL WALL THICKNESS OF PIPE.
2. TOLERANCE FOR DIMENSION 'B' (RUBBER PLATES)
   10" VALVE SIZE AND SMALLER = + 1/32
   ~~12" VALVE SIZE AND LARGER = + 1/16~~
3. 250/ ALL MACHINED SURFACES EXCEPT WHERE NOTED.
4. TOLERANCE FOR DIMENSION 'A' (VALVES) =
   5" VALVE SIZE AND SMALLER + 3/32, - 1/32
   ~~6" VALVE SIZE AND LARGER +5/32, -1/32.~~
5. ~~TOLERANCE FOR 'B' DIMENSION WHEN USING TEST PLUG -15~~
   ~~0 - 3.999 DIA. + .002, - .000~~
   ~~4.000 - 15.999 DIA. + .005, - .000~~
   ~~16.000 DIA. AND ABOVE +.006, - .000.~~

"BOTH ENDS ALIKE"

VALVE BODY BUTT WELD END DETAIL WHEN USING TEST PLATES FOR HYDROSTATIC TEST

JOB NO. 8064-16895

MKD. BY G.D.M. DATE 1-23-81

CKD. BY DJW DATE 1.23.81

COPES-VULCAN, INC.
LAKE CITY (ERIE CO.) PA. U.S.A.

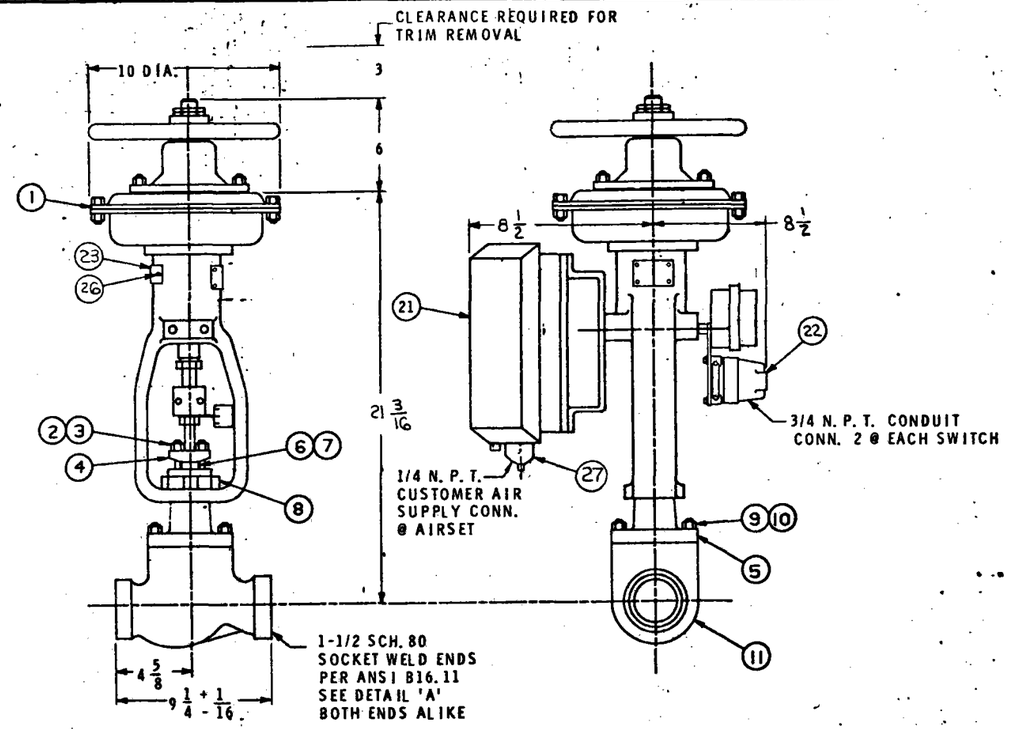
VALVE BODY
BUTT WELD END DETAILS
PER A.N.S.I. B16.25 & B16.5
FOR: WITHOUT BACKING RING OR WITH SPLIT BACKING RING

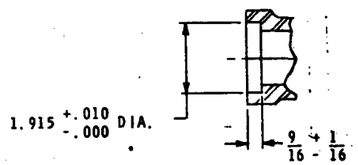
DRAWN [illegible] DATE [illegible] JOB NO.
CHECKED [illegible] DATE [illegible]
APPR [illegible] DATE 6-4-81 SCALE NONE

DWG. NO. B-147468 MKD REV. X

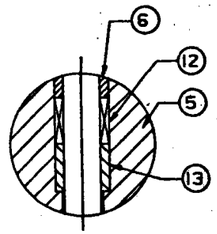
NO.	DATE	REVISIONS	BY	CHK.
1	2-3-79	ADDED TOLER. = 1/32 TO 1/2 DIM. PER ENG CHG #55-40	J.R.	[illegible]
2	9-21-79	ADDED B16.5 TO DWG. TITLE	JJB	J.J.
3	2679	UPDATED 'A & C' TOL & ADDED NOTES-4 & 5.	T.S	GG.

PART CODE [illegible] MASTER ASSY. SUB ASSY.

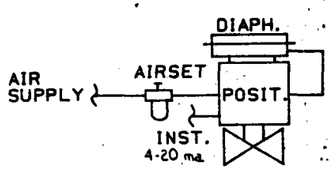




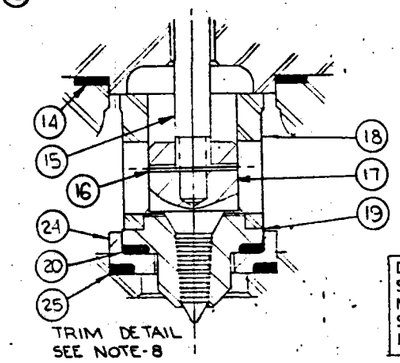
DETAIL 'A'



STUFFING BOX DETAIL



PIPING SCHEMATIC



TRIM DETAIL SEE NOTE-8

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	189959-5	4	ACTUATOR ASSEMBLY			L-189959	
2	2	184683	3	PACKING STUD	STEEL	ASTM - A193	S-184683	GR.B7
3	2	186209	3	PACKING NUT	STEEL	ASTM - A194		GR.2H
4	1	184681-R	3	PACKING FLANGE	STEEL	ASTM - A216	M-184681	GR. WCB
5	1	184408-R	3	BONNET	STEEL	ASTM - A216	L-187244	GR WCB
6	1	184682-H	3	PACKING FOLLOWER	CRES	ASTM - A582	M-184682	TYPE 416, COND. H
7	1	V-5903	3	SNAP RING	STEEL	COM'L.		
8	1	184680	3	ACTUATOR CLAMP	DU. IRON	ASTM - A536	M-184680	GR.65-45-12
9	6	185370	3	BODY STUD	STEEL	ASTM - A193	M-185368	GR.B7
10	6	170581	3	BODY NUT	STEEL	ASTM - A194	M-170423	GR.2H
11	1	185647-R	3	VALVE BODY	STEEL	ASTM-A216	L-185647	GR. WCB
* 12	1	172417	3	PACKING SET	GRAPH-ASB	COM'L.		
13	1	185112-H	3	GUIDE BUSHING	CRES	ASTM - A582	S-185112	TYPE 416, COND. H
* 14	1	185377	3	BODY GASKET	ASB-SST.	COM'L.	3-1/8 O. D. x 2-3/8 I. D. x .125 THK	
* 15	1	186973	3	STEM	CRES	ASTM - A276	M-183561	TYPE 316, GR.8
* 16	1	188238	3	ROLL PIN	CRES	ASTM - A276		TYPE 420
* 17	1	———	—	PLUG	CRES	ASTM - A276	M-192208 MKD.	TYPE 420
* 18	1	196957	5	CAGE	CRES	ASTM - A276	M-196957	TYPE 420
* 19	1	———	—	SEAT RING	CRES	ASTM - A276	M-192136 MKD.	TYPE 420
* 20	1	185382	3	TRIM GASKET	ASB-SST.	COM'L.	1-7/8 O.D. x1-5/16 I.D. x .175 THK.	
21	1	———	—	ACCESSORY KIT: (1) BAILEY AP5 POSITIONER.			L-189727 MKD.	
22	1	196328	5	ACCESSORY KIT	NOTE-9		E-196328	
23	1	195618	5	IDENTIFICATION PLATE	CRES	COM'L	M-195618	TYPE 304
* 24	1	———	—	SEAT SPACER	CRES	ASTM-A276	M-192204 MKD.	TYPE 420
* 25	1	185383	3	TRIM GASKET	ASB-SST	COM'L	2-1/4 O.D. x 1-11/16 I.D. x .175 THK.	
26	2	64341	3	DRIVE SCREW	STEEL	COM'L		CAD. PLATED
27	1	———	—	ACCESSORY KIT: (1) CONOFLOW AIRSET			L-189624 MKD.	

NOTES

1. FOR MAX. C_V 2.9 SET VALVE TRAVEL AT 1 ±.13 INCHES
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CV PROC. 1.2.276.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CV PART NO. 185987 1 IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. DESIGN PRESSURE AND TEMPERATURE IS 160 P.S.I. AT 135°F.
8. FLOW IS UNDER THE SEAT. TRIM TYPE IS SINGLE SEAT #7 UNBALANCED CASCADE.
9. ACCESSORY KIT (ITEM #22) CONSIST OF (1) C-V LVDT TYPE POSITION TRANSMITTER & (2) MICRO TYPE 1CX-42 LIMIT SWITCHES.

SPEC. SHT. NO.:
APPLICATION: CONDENSATE CONTROL TO DESUPERHEATER DS-902.

TAG NO'S: TV-1004
VALVE WEIGHT: 100 LBS.

DEPT. OF ENERGY
STEARNS-ROGER PROJECT
NO. C-21700
SOLAR ONE
P. O. NO.: 5002C21700

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	
AIR LOCK VALVE	
LIMIT SWITCH (QTY. 2)	■
LUBRICATOR	
SOLENOID VALVE	
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	■
BOOSTER RELAY	
POSITION TRANSMITTER (QTY. 1)	■
PART CODE -6	

COPES-VULCAN, INC.
A Div. of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA U.S.A.

SERIES CV-600 VALVE ASSEMBLY WITH MOD CV-600-4D ACTUATOR

1-1/2" CLASS 150

DFTSMN C.M.M. DATE 11-3-81
CHECKED D.W. DATE 11-6-81
APPD. J.B.S. DATE 11-7-81

JOB NO. 8064-16895
CONT. REF. 8010-14896
DO NOT SCALE DWG.

SCALE NONE | DWG. NO. E-195845 | REV. 3

NO.	DATE	REVISIONS	BY	CHK.
1	11-23-81	COMPLETED B/M, ADDED ITEM #27	GDM	PJW
2	12-30-81	ITEM #18 CAGE WAS PER M-184654 MKD	T.S.	DJW

NO.	DATE	REVISIONS	BY	CHK.
3	3-26-81	ADDED VALVE WEIGHT	K.B.	

4.1.55-121

RL_R PROCESSING

DN TROL VALVE SPECIFICATIONS

SHEET 1 of 1

*DATE 10-16-80

*NAME LRS

C.V.I. JOB NO. 8069-16895

Use med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
* Indicates information Required to Process Order.

US OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL

1 ITEM NO. 14 *QUANTITY 1

2 *TYPE CV-600 DRAWING

3. *INLET PIPE 1½" SCHED. 80 *OUTLET PIPE 1½" SCHED. 80

4. TAGGING TV-1004

5 APPLICATION CONDENSATE CONTROL TO DESUPERHTR DS-902

PE ATING CONDITIONS

6. *Fluid – Water ◪ Steam ☐ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7	*Max. Flow Condition	2292	107	90	121
8.	*Normal Flow Condition	—	—	—	—
9.	*Minimum Flow Condition	62	147	35	109
10	*Shutoff Condition	—	160		

AL E BODY

11. *Size 1½" *ANSI Class 150 ◪ Standard ☐ Special

12 *Material ◪ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☐ Other (See Notes)
☐ A105 ☐ F304 ☐ F316

13. *Style ◪ Globe ☐ Angle ☐ 3-Way

14 *Ends ☐ Flanged B16.5 ☐ Butt Weld B16.25 Fig.
◪ Socket Weld B16.11 ☐ Other – See Notes:

AL E BONNET

15. *Type ◪ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat

16 Packing ◪ Graph Asb. ☐ Teflon Asb. ☐ Other
RI ☐ Malcomized

17. *Material ☐ Hardened 410 S.S. ◪ Hardened 420 S.S. ☐ Special

18 *Type ◪ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other

19. Characteristic ☐ Mod. Parabolic ☐ Quick Open ☐ Special
◪ Cascade ☐ Mod. Equal %

20 Cv Factor Required by Specs. 1.4

A E ACTUATOR

21. *Type ◪ Diaphragm ☐ Lever ☐ Piston ☐ Electric

22 *Model CV-600-4 DA

23 *Action ◪ Spring Opening ☐ Spring Closing
☐ Locks in Position ☐ See Notes

24. Air Press. Available 80 PSIG

C SSORIES

25 *Handwheel ◪ Top Mount ☐ Side Mount ☐ None

26. *Airlock ☐ Yes ◪ No

27 *Limit Switches Mfr. MICRO Type 1CX-42 Qty. 2

28 *Solenoid Valve Mfr. — Type Qty.

29. *Booster Relay Mfr. Type Qty.

30 POSITION TRANSMITTER C-V Type LVDT Qty. 1

TIONER

31 *Mfr. BAILEY Type AP5

32. *Accessories ☐ By-Pass ◪ Gauges

33 *Input Range ☐ 3-15 ◪ Others - (Specify) 4-20 ma

34 *Action ☐ Direct ◪ Reverse

35. *Air Set ◪ Yes ☐ No *Gauges ◪ Yes ☐ No Qty. 1

PECIAL REQUIREMENTS

36 *X-ray ASME ☐ ☐ Other - (Specify)

37. *Special Tests (NDT) ☐ See Notes:

38. *Special Engr. ☐ See Notes:

39 *"N" Stamp ☐ Yes ◪ No Class ☐ 1 ☐ 2 ☐ 3

40 *Noise Limit ◪ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.

*Type ☐ Press. ☐ Temp.

☐ Other (Specify)

*Control Form: ☐ Prop ◪ Prop. + Reset

☐ Prop. + External Reset

*Scale Range

*Output Range

☐ 3-15 Psi ☐ Other (Specify)

*Capillary Length

*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS. 160 PSIA @ 135°F.
2. SWAGELOK FLARELESS FITTING REQ'D. TUBING IS ⅜" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING
3. TIGHT SHUT-OFF CLASS IV-LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976.
4. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
5. HYDRO SHELL TEST PER ANSI B16.34
6. STEEL FRAME & YOKE REQ'D.
7. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.
8. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO AND SEAT LEAKAGE TESTS.
9. S.S. IDENT TAGS.

TO BE COMPLETED BY C.V.I. ENGINEERING

Actuator Spring: 185952

Precompression (No Valve Pressure) Psi: 7 PSIG

Air to Full Travel (No Valve Pressure) Psi: 80 PSIG

Trim Size: #7 CASCADE Travel: 1" ± 1/8"

Max. Cv of Trim: 2.90 @ 1" ± 1/8"

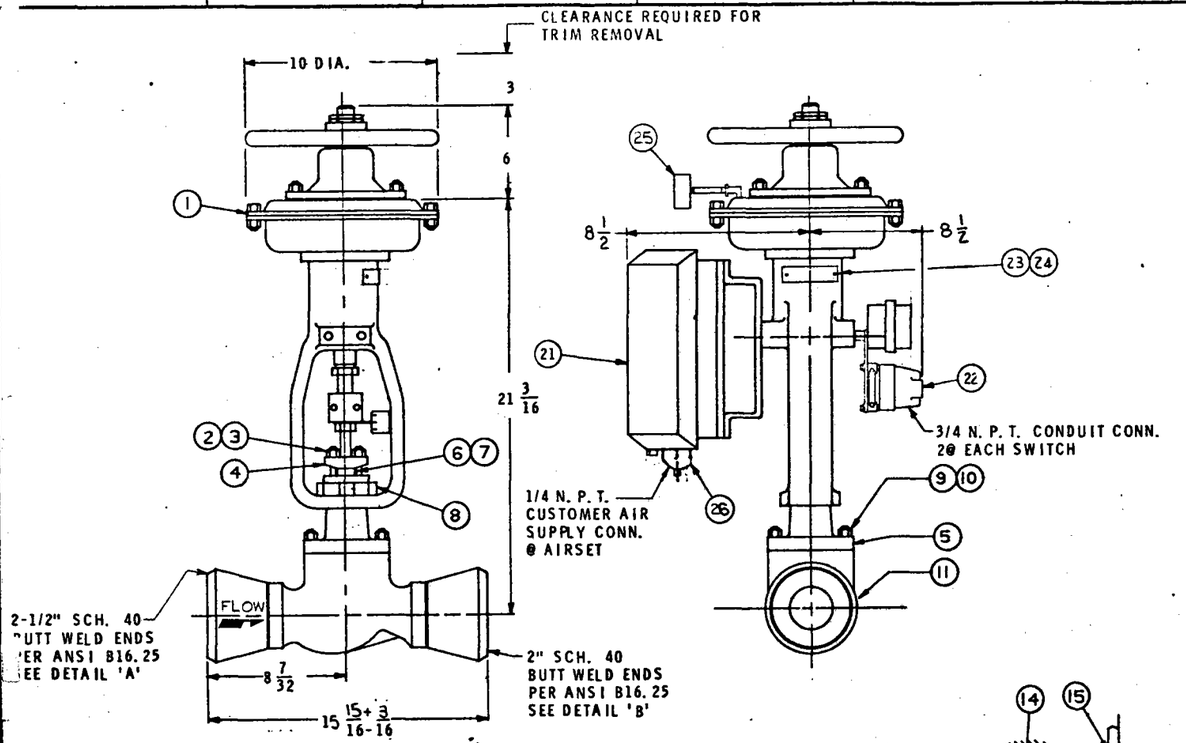
Valve Serial No.:

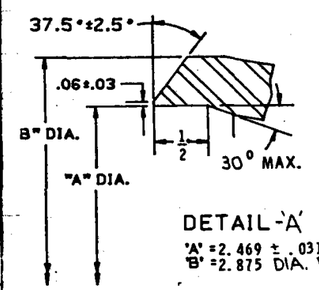
[redacted]

Form No. 705176 R-2
Rev. 1/17/77

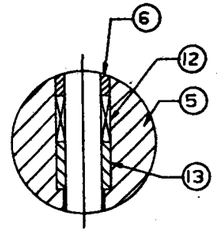
REV. 1 - CHANGE TRIM MATERIAL FROM 410 LRS 12-16-80

4.1.55-122

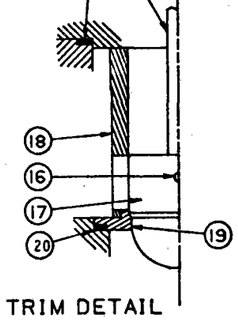




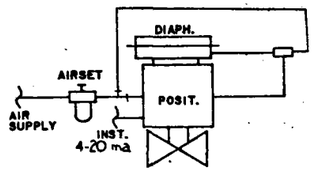
DETAIL-'A'
'A' = 2.469 ± .031 DIA.
'B' = 2.875 DIA. REF.



STUFFING BOX DETAIL

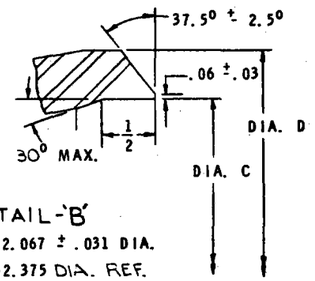


TRIM DETAIL
SEE NOTE-8



BOOSTER RELAY

PIPING SCHEMATIC



DETAIL-'B'
'C' = 2.067 ± .031 DIA.
'D' = 2.375 DIA. REF.

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	189959-5	4	ACTUATOR ASSEMBLY			L-189959	
2	2	184683	3	PACKING STUD	STEEL	ASTM - A193	S-184683	GR.B7
3	2	186209	3	PACKING NUT	STEEL	ASTM - A194		GR.2H
4	1	184681-R	3	PACKING FLANGE	STEEL	ASTM - A216	M-184681	GR. WCB
5	1	———	—	BONNET	STEEL	ASTM - A217	L-187244-MKD.	GR. WC9
6	1	184682-H	3	PACKING FOLLOWER	CRES	ASTM - A582	M-184682	TYPE 416, COND. H
7	1	V-5903	3	SNAP RING	STEEL	COM'L.		
8	1	184680	3	ACTUATOR CLAMP	DU. IRON	ASTM - A536	M-184680	GR.65-45-12
9	6	185370	3	BODY STUD	STEEL	ASTM - A193	M-185368	GR.B7
10	6	170581	3	BODY NUT	STEEL	ASTM - A194	M-170423	GR.2H
11	1	196219	5	VALVE BODY ASSEMBLY	SEE NOTE-9		L-196219	
* 12	1	172417	3	PACKING SET	GRAPH-ASB	COM'L.		
13	1	185112-H	3	GUIDE BUSHING	CRES	ASTM - A582	S-185112	TYPE 416, COND. H
* 14	1	185377	3	BODY GASKET	ASB-SST.	COM'L.	3-1/8 O.D. x 2-3/8 I.D. x .125 THK.	
* 15	1	186973	3	STEM	CRES	ASTM - A276	M-183561	TYPE 316, GR.B
* 16	1	188238	3	ROLL PIN	CRES	ASTM - A276		TYPE 420
* 17	1	184966-G	3	PLUG	CRES	ASTM - A479	M-184966	TYPE 410
* 18	1	184695-XG	3	CAGE	CRES	ASTM - A296	M-184695	GR. CA6NM
* 19	1	185071-G	3	SEAT RING	CRES	ASTM - A479	M-185071	TYPE 410
* 20	1	185383	3	TRIM GASKET	ASB-SST.	COM'L.	2-1/4" I.D. x 1-11/16 I.D. x .175 THK.	
21	1	———	—	ACCESSORY KIT: (1) BAILEY AP5 POSITIONER			L-189727MKD	
22	1	196328	5	ACCESSORY KIT SEE NOTE-10			E-196328	
23	1	195618	5	CUSTOMER NAMEPLATE	CRES	COM'L	M-195618	TYPE 304
24	2	64341	3	DRIVE SCREW	STEEL	COM'L	-	CAD. PLATED
25	1	189658	3	ACCESSORY KIT: (1) MOORE BOOSTER RELAY			M-189658	
26	1	———	—	ACCESSORY KIT: (1) CONOFLOW AIRSET			L-189624MKD	

NOTES

1. FOR MAX. C_V 30 SET VALVE TRAVEL AT 1" ±.13 INCHES
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CV PROC. 1.2.276.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CV PART NO. 185987 1) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. DESIGN PRESSURE AND TEMPERATURE IS 160 P.S.I. AT 135°F.
8. FLOW IS UNDER THE SEAT. TRIM TYPE IS FULL SIZE, MODIFIED PARABOLIC, POSITIONER CAMMED FOR MODIFIED EQUAL PERCENTAGE VALVE CHARACTERISTIC.
9. VALVE BODY MAT'L.: STEEL, ASTM-A217, GR. WC9
   REDUCER MAT'L.: STEEL, ASTM-A234, GR. WP11
10. ACCESSORY KIT (ITEM "22) CONSISTS OF (1) CV. TYPE LVDT POSITION TRANSMITTER & (2) MICRO TYPE 1CX-42 LIMIT SWITCHES.

DEPT. OF ENERGY
STEARNS-ROGER PROJECT
NO. C-21700
SOLAR ONE
P. O. NO.: 5002C21700

SPEC. SHT. NO.:
APPLICATION: CONDENSATE CONTROL TO DESUPERHEATER DS-901.

TAG NO'S: TV-1002
VALVE WEIGHT: 105 LBS.

ACCESSORIES
DIRECT ACTING ACTUATOR
REVERSE ACTING ACTUATOR
DIRECT ACTING POSITIONER
REVERSE ACTING POSITIONER
HANDWHEEL
AIR LOCK VALVE
LIMIT SWITCH (QTY. 2)
LUBRICATOR
SOLENOID VALVE
CONTROLLER
PILOT POSITIONER
AIR SET (QTY. 1)
BOOSTER RELAY
POSITION TRANSMITTER (QTY. 1)
PART CODE - 6

COPES-VULCAN, INC.
A Division of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

SERIES CV-600 VALVE ASSEMBLY WITH MOD CV-600-4D ACTUATOR

1-1/2" CLASS 300

DFTSMN [illegible]	DATE 3-25	JOB NO. 8064-16895
CHECKED DJW	DATE 4-6-81	CONT. REF. 8010-14896
APPD. LRS	DATE 4-7-81	DO NOT SCALE DWG.
SCALE NONE	DWG. NO. E-195844	REV. 2

NO.	DATE	REVISIONS	BY	CHK.
1	4-14-81	ADDED ITEM # 25 & 26	GFM	DJW
2	3-25-81	ADDED VALVE WEIGHT	K.B.	DJW

4.1.55-123

RE R PROCESSING

CONTROL VALVE SPECIFICATIONS

Use med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen. * Indicates Information Required to Process Order.

COPES VULCAN

SHEET 1 of 1

*DATE 10-16-80

*NAME LRS

C.V.I. JOB NO. 8069-16895

US OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1 ITEM NO. 15 *QUANTITY 1

2 *TYPE CV-600 DRAWING

3. *INLET PIPE 2½" SCHED. 40 *OUTLET PIPE 2" SCHED. 40

4. TAGGING TV-1002

5 APPLICATION CONDENSATE CONTROL TO DESUPERHTR DS-901

PE ATING CONDITIONS

6. *Fluid – Water ◪ Steam ☐ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7	*Max. Flow Condition	27,281	126	112	121
8.	*Normal Flow Condition	27,281	126	112	121
9.	*Minimum Flow Condition	170	140	125.3	102
10	*Shutoff Condition	–	160		

AL E BODY

11. *Size 1½" *ANSI Class 300 ◪ Standard ☐ Special

12 *Material ☐ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ② ◪ Other (See Notes)
☐ A105 ☐ F304 ☐ F316

13. *Style ◪ Globe ☐ Angle ☐ 3-Way

14. *Ends ☐ Flanged B16.5 ◪ Butt Weld B16.25 Fig.
☐ Socket Weld B16.11 ☐ Other – See Notes:

AL E BONNET

15. *Type ◪ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat

16 Packing ◪ Graph Asb. ☐ Teflon Asb. ☐ Other

RI ☐ Malcomized

17. *Material ◪ Hardened 410 S.S. ☐ Hardened 420 S.S. ☐ Special

18 *Type ◪ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other

19. Characteristic ☐ Mod. Parabolic ☐ Quick Open ☐ Special
☐ Cascade ◪ Mod. Equal % ③

2 Cv Factor Required by Specs. 18.3

A E ACTUATOR

21. *Type ◪ Diaphragm ☐ Lever ☐ Piston ☐ Electric

22 *Model CV-600-4DA

23 *Action ◪ Spring Opening ☐ Spring Closing
☐ Locks in Position ☐ See Notes

24. Air Press. Available 80 PSIG

CC SSORIES

25 *Handwheel ◪ Top Mount ☐ Side Mount ☐ None

26. *Airlock ☐ Yes ◪ No

27 *Limit Switches Mfr. MICRO Type 1 CX-42 Qty. 2

28 *Solenoid Valve Mfr. Type Qty.

29. *Booster Relay Mfr. MOORE Type 61H Qty. 1

30. POSITION TRANSMITTER C-V Type LVDT Qty. 1

DS TIONER

31 *Mfr. BAILEY Type AP5

32. *Accessories ☐ By-Pass ◪ Gauges

33 *Input Range ☐ 3-15 ◪ Others - (Specify) 4-20 MA

34 *Action ☐ Direct ◪ Reverse

35. *Air Set ◪ Yes ☐ No *Gauges ◪ Yes ☐ No Qty.

PECIAL REQUIREMENTS

36 *X-ray ASME ☐ ☐ Other - (Specify)

37 *Special Tests (NDT) ☐ See Notes:

38. *Special Engr. ☐ See Notes:

39 *"N" Stamp ☐ Yes ◪ No Class ☐ 1 ☐ 2 ☐ 3

40 *Noise Limit ◪ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.

*Type ☐ Press. ☐ Temp.

☐ Other (Specify)

*Control Form: ☐ Prop ☐ Prop. + Reset

☐ Prop. + External Reset

*Scale Range

*Output Range

☐ 3-15 Psi ☐ Other (Specify)

*Capillary Length

*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS 160 PSIA @ 135°F
2. BODY AND BONNET MAT'L: ASTM A217 GR. WC9
3. PLUG SHALL HAVE MODIFIED PARABOLIC CHARACTERISTIC. SQUARE ROOT RELATIONSHIP CAM IN BAILEY AP5 WILL GIVE MODIFIED EQUAL PERCENTAGE TO MEET EQUAL PENCENTAGE REQUIREMENT.
4. SWAGELOK FLARELESS FITTING REQ'D. ⅜"O.D COPPER TUBING REQ'D.
5. AIRSET W/ FILTER, GAUGE & DRIPWELL
6. HYDRO SHELL TEST PER ANSI B16.34
7. TIGHT SHUT-OFF CLASS IV LEAKAGE
8. STEEL FRAME & YOKE REQ'D.
9. REDUCERS REQ'D - 1½"x 2½" AND 1½" x 2" - ALLOY BODY TO REDUCER REQUIRES L.P. INSPECTION.
10. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT
11. VALVE SHALL BE FLUSHED AFTER HYDRO & SEAT LEAKAGE TEST WITH DEMINERALIZED WATER.
12. S.S. IDENT TAGS REQ'D.
13. REDUCER & EXPANDER MATERIAL IS ASTM A234, GR WP11
14. STROKE TIME OF .8 SEC. TO OPEN REQ'D.

TO BE COMPLETED BY C.V.I. ENGINEERING

Actuator Spring: 185952

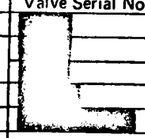
Precompression (No Valve Pressure) Psi: 7 PSIG

Air to Full Travel (No Valve Pressure) Psi: 80 PSIG

Trim Size: 1½" Travel: 1" ± 1/8"

Max. Cv of Trim: 30 @ 1" ± 1/8" TRAVEL

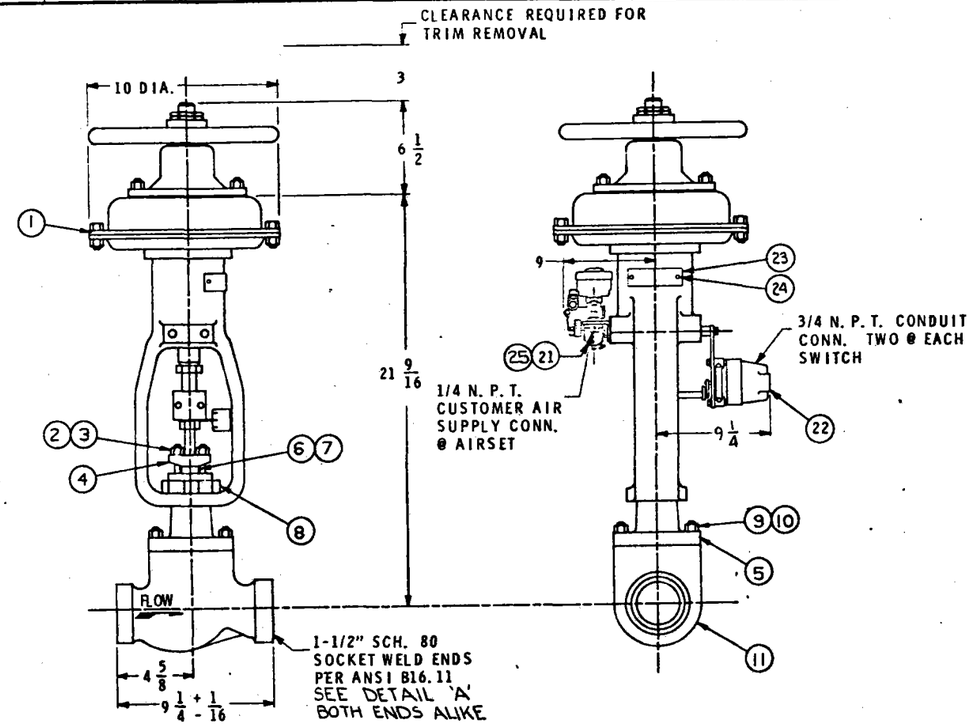
Valve Serial No.:

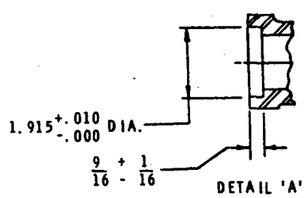


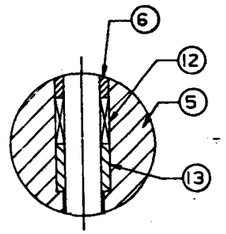
Form No. 705176 R-2
Rev. 1/17/77

REV. 1 - DELETE ASCO SOLENOID AND ADD MOORE BOOSTER RELAY LRS 12-16-80
REVISE NOTE 14 TO DELETE REFERENCE TO SOLENOID VALVE.

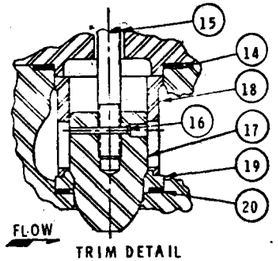
4.1.55-124



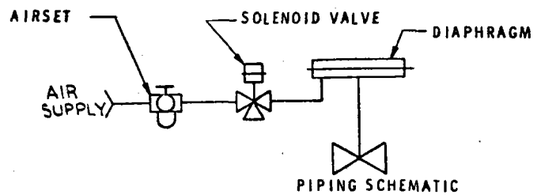




STUFFING BOX DETAIL



TRIM DETAIL
SEE NOTE - 8



PIPING SCHEMATIC

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	189960-3	4	ACTUATOR ASSEMBLY			L-189960	
2	2	184683	3	PACKING STUD	STEEL	ASTM - A193	S-184683	GR.B7
3	2	186209	3	PACKING NUT	STEEL	ASTM - A194		GR.2H
4	1	184681-R	3	PACKING FLANGE	STEEL	ASTM - A216	M-184681	GR. WCB
5	1	184409-R	3	BONNET	STEEL	ASTM - A216	L-187244	GR. WCB
6	1	184682-H	3	PACKING FOLLOWER	CRES	ASTM - A582	M-184682	TYPE 416, COND. H
7	1	V-5903	3	SNAP RING	STEEL	COM'L.		
8	1	184680	3	ACTUATOR CLAMP	DU. IRON	ASTM - A536	M-184680	GR.65-45-12
9	8	185370	3	BODY STUD	STEEL	ASTM - A193	M-185368	GR.B7
10	8	170581	3	BODY NUT	STEEL	ASTM - A194	M-170423	GR.2H
11	1	185650-R	3	VALVE BODY	STEEL	ASTM - A216	L-185650	GR. WCB
* 12	1	172417	3	PACKING SET	GRAPH-ASB	COM'L.		
13	1	185112-H	3	GUIDE BUSHING	CRES	ASTM - A582	S-185112	TYPE 416, COND. H
* 14	1	185377	3	BODY GASKET	ASB-SST.	COM'L.		3-1/8"O. D. x2-3/8" I. D. x. 125 THK.
* 15	1	186973	3	STEM	CRES	ASTM - A276	M-183561	TYPE 316, GR.B
* 16	1	188238	3	ROLL PIN	CRES	ASTM - A276		TYPE 420
* 17	1	184966-G	3	PLUG	CRES	ASTM - A479	M-184966	TYPE 410
* 18	1	184695-XG	3	CAGE	CRES	ASTM - A296	M-184695	GR. CA6NM
* 19	1	185071-G	3	SEAT RING	CRES	ASTM - A479	M-185071	TYPE 410
* 20	1	185383	3	TRIM GASKET	ASB-SST.	COM'L.	2-1/4"O. D. x1-11/16" I. D. x. 175THK	
21	1		—	ACCESSORY KIT: (1) ASCO HB8302A81F SOLENOID			M-189702 MKD	
22	1	196396	5	ACCESSORY KIT: (2) MICRO ICX-42 SWITCHES			E-196396	
23	1	195618	5	IDENTIFICATION PLATE	CRES	COM'L	M-195618	TYPE 304
24	2	G4341	3	DRIVE SCREW	STEEL	COM'L		CAD. PLATED
25	1		—	ACCESSORY KIT: (1) CONOFLOW AIRSET. L-189624 MKD.				

NOTES

1. FOR MAX. C_V 30 SET VALVE TRAVEL AT 1±.13 INCHES
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CV PROC. 1.2.276.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CV PART NO.185987) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. DESIGN PRESSURE AND TEMPERATURE IS 90 P.S.I. AT 460°F.
8. FLOW IS UNDERTHE SEAT. TRIM TYPE IS FULL SIZE WITH MODIFIED PARABOLIC CHARACTERISTICS.

SPEC. SHT. NO.:
APPLICATION: AUX STEAM TO BLANKET TS.

TAG NO'S: AOV-1009
VALVE WEIGHT: 90 LBS.

DEPT. OF ENERGY
STEARNS-ROGER PROJECT
NO. C-21700
SOLAR ONE
P. O. NO.: 5002C21700

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	
AIR LOCK VALVE	
LIMIT SWITCH (QTY. 2)	■
LUBRICATOR	
SOLENOID VALVE (QTY. 1)	■
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	■
BOOSTER RELAY	
PART CODE---6	

COPES-VULCAN, INC.
A Div. of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA U.S.A.

SERIES CV-600 VALVE ASSEMBLY WITH MOD CV-600-4R ACTUATOR
1-1/2" CLASS 600

DFTSMN B/M DATE 1-22-81
CHECKED D.J.W. DATE 1-26-81
APPD. L.R.S. DATE 1-27-81
JOB NO. 8064-16895
CONT. REF. 8010-14896
DO NOT SCALE DWG.
SCALE NONE
DWG. NO. E-195846
REV. 2

NO.	DATE	REVISIONS	BY	CHK.
1	1-22-81	COMPLETED B/M ADDED ITEM #25	GDM	DJW
2	3-26-81	ADDED VALVE WEIGHT	KB	GS.

4.1.55-125

R[R PROCESSING

ONTROL VALVE SPECIFICATIONS

SHEET 1 of 1

*DATE 10-16-80

*NAME LKS

C.V.I. JOB NO. 8064-16895

L med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
* Indicates information Required to Process Order.

US OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1. ITEM NO. 2 * QUANTITY 1
2 *TYPE CV-600 DRAWING
3 *INLET PIPE 1½" SCHED. 80 * OUTLET PIPE 1½" SCHED. 80
4. TAGGING AOV-1009
5 APPLICATION AUX. STEAM TO BLANKET TS

PE ATING CONDITIONS

6. *Fluid – Water ☐ Steam ◪ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PS/A	Outlet P2 PS/A	Temp. °F
7	*Max. Flow Condition	400	75	74	345
8.	*Normal Flow Condition	400	75	74	345
9.	*Minimum Flow Condition	0	75	–	345
10	*Shutoff Condition	–	75		

A /E BODY

11. *Size 1½" *ANSI Class 600 ☐ Standard ☐ Special
12 *Material ◪ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☐ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13. *Style ◪ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☐ Butt Weld B16.25 Fig.
◪ Socket Weld B16.11 ☐ Other – See Notes:

A /E BONNET

15. *Type ◪ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16 Packing ◪ Graph Asb. ☐ Teflon Asb. ☐ Other
RI ☐ Malcomized
17. *Material ◪ Hardened 410 S.S. ☐ Hardened 420 S.S. ☐ Special
18. *Type ◪ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other
19 Characteristic ◪ Mod. Parabolic ☐ Quick Open ☐ Special
☐ Cascade ☐ Mod. Equal %

20 Cv Factor Required by Specs. 19.7

A /E ACTUATOR

21. *Type ◪ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22. *Model CV-600-4RA
2 *Action ☐ Spring Opening ◪ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

C SSORIES

25 *Handwheel ◪ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ◪ No
27. *Limit Switches Mfr. MICRO Type ICX-42 Qty. 2
2 *Solenoid Valve Mfr. ASCO Type HB8302A81F Qty. 1
2 *Booster Relay Mfr. — Type Qty.
30. *E/P Transducer Mfr. — Type Qty.

O. TIONER

3 *Mfr. NONE Type
32. *Accessories ☐ By-Pass ☐ Gauges
3 *Input Range ☐ 3-15 ☐ Others - (Specify)
3 *Action ☐ Direct ☐ Reverse
3 *Air Set ◪ Yes ☐ No *Gauges ◪ Yes ☐ No Qty. 1

PECIAL REQUIREMENTS

3 *X-ray ASME ☐ ☐ Other - (Specify)
3 *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
3 *"N" Stamp ☐ Yes ◪ No Class ☐ 1 ☐ 2 ☐ 3
4 *Noise Limit ◪ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ◪ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

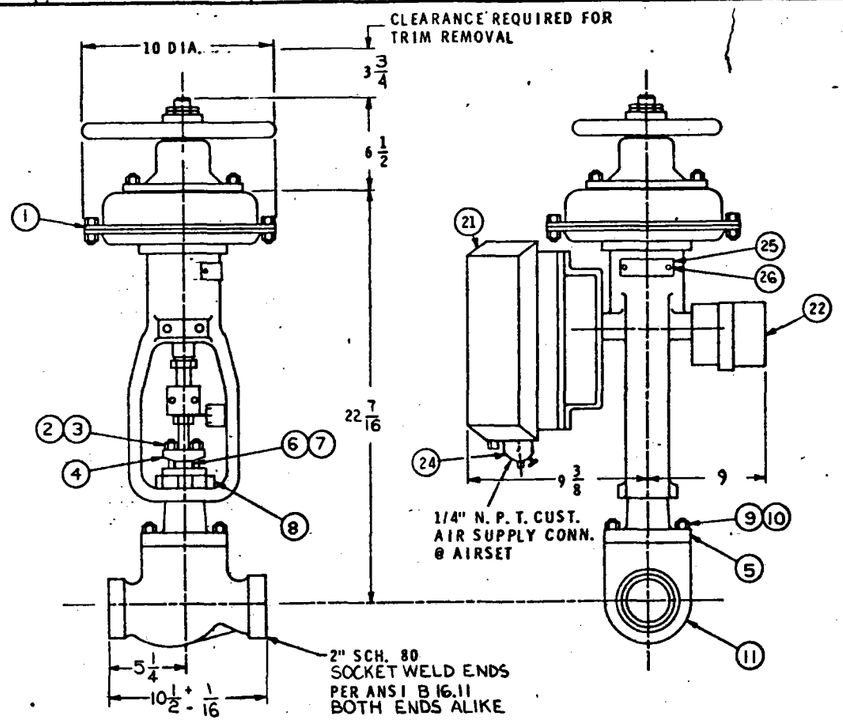
NOTES:
1. DESIGN PRESS 90 PS/A @ 460°F
2. SWAGELOK FLARELESS FITTINGS REQ'D TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.
3. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976
4. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
5. HYDRO SHELL TEST PER ANSI B16.34
6. STEEL FRAME & YOKE REQ'D.
7. Cv REQ'D BY SPEC. REFLECTS ADDITION OF 25% REQUIREMENT.
8. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO & SEAT LEAKAGE TESTS.
9. S.S. IDENT TAG REQ'D.

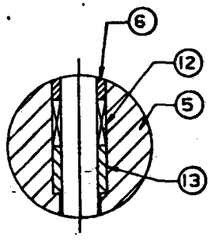
TO BE COMPLETED BY C.V.I. ENGINEERING

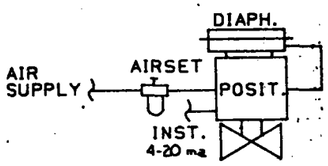
Actuator Spring: 185953
Precompression (No Valve Pressure) Psi: 21 PSIG
Air to Full Travel (No Valve Pressure) Psi: 80 PSIG
Trim Size: 1½" Travel: 1" ± 1/8"
Max. Cv of Trim: 30 @ 1" ± 1/8" TRAVEL
Valve Serial No.:

REV. 1 - TRIM WAS QUICK OPEN 12-16-80 LRS

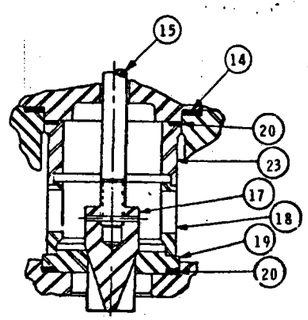
Form No. 705176 R-2
Rev. 1/17/77







PIPING SCHEMATIC



TRIM DETAIL
SEE NOTE - 8

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	189960-5	4	ACTUATOR ASSEMBLY			L-189960	
2	2	184683	3	PACKING STUD	STEEL	ASTM - A193	S-184683	GR.B7
3	2	186209	3	PACKING NUT	STEEL	ASTM - A194		GR.2H
4	1	184681-R	3	PACKING FLANGE	STEEL	ASTM - A216	M-184681	GR. WCB
5	1	184222-S	3	BONNET	STEEL	ASTM - A217	L-187240	GR. WCG
6	1	184682-H	3	PACKING FOLLOWER	CRES	ASTM - A582	M-184682	TYPE 416, COND. H
7	1	V-5903	3	SNAP RING	STEEL	COM'L.		
8	1	184680	3	ACTUATOR CLAMP	DU. IRON	ASTM - A536	M-184680	GR.65-45-12
9	8	185370	3	BODY STUD	STEEL	ASTM - A193	M-185368	GR.B7
10	8	170581	3	BODY NUT	STEEL	ASTM - A194	M-170423	GR.2H
11	1	185653-S	3	VALVE BODY	STEEL	ASTM - A217	L-185653	GR-WCG
* 12	1	172417	3	PACKING SET	GRAPH-ASB	COM'L.		
13	1	185112-H	3	GUIDE BUSHING	CRES	ASTM - A582	S-185112	TYPE 416, COND. H
* 14	1	185378	3	BODY GASKET	ASB-SST.	COM'L.	3-3/4 O. D. x 3-1/16 I. D. x .125 THK.	
* 15	1	186974	3	STEM	CRES	ASTM - A276	M-183561	TYPE 316, GR.B
* 16	1	188238	3	ROLL PIN	CRES	ASTM - A276		TYPE 420
* 17	1	196956	5	PLUG	CRES	ASTM - A276	M-196956	TYPE-420
* 18	1	196942	5	CAGE	CRES	ASTM - A276	M-196942	TYPE-420
* 19	1	———	—	SEAT RING	CRES	ASTM - A276	M-185191 MKD.	TYPE 420
* 20	2	185384	3	TRIM GASKET	ASB-SST.	COM'L.	2-15/16 O. D. x 2-7/16 I. D. x .175 THK.	
21	1	———	—	ACCESSORY KIT: (1) BAILEY AP5 POSITIONER			L-189728 MKD.	
22	1	196441	5	ACCESSORY KIT: (1) C-V POSITION TRANSMITTER			L-196440	TYPE LVDT
* 23	1	———	—	BALANCING CYLINDER	CRES	ASTM-A276	M-185516 MKD	TYPE 420
* 24	1	———	—	ACCESSORY KIT (1) CONOFLOW AIRSET				
25	1	195618	5	IDENTIFICATION PLATE	CRES	COM'L	M-195618	TYPE 304
26	2	64341	3	DRIVE SCREW	COM'L	COM'L		CAD. PLATED

NOTES

1. FOR MAX. Cv 2.9 SET VALVE TRAVEL AT 1 1/8.13 INCHES
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CV PROC. 1.2.276.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CV PART NO. 185987) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. DESIGN PRESSURE AND TEMPERATURE IS 200 P.S.I. AT 400 °F.
8. FLOW IS UNDER THE SEAT. TRIM TYPE IS SINGLE SEAT UNBALANCED GROOVE TIP SIZE 'C'.

SPEC. SHT. NO.:
APPLICATION: TSS FLASH TANK DRAIN TO CONDENSOR.

TAG NO'S: LV740-2
VALVE WEIGHT: 132 LBS.

DEPT. OF ENERGY
STEARNS-ROGER PROJECT
NO. C-21700
SOLAR ONE
P. O. NO.: 5002C21700

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	■
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	■
AIR LOCK VALVE	
LIMIT SWITCH	
LUBRICATOR	
SOLENOID VALVE	
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	■
BOOSTER RELAY	
POSITION TRANSMITTER (QTY. 1)	■
PART CODE -6	

COPES-VULCAN, INC.
A Div. of the Aloyco Corporation Industries
LAKE CITY (ERIE CO.) PA. U.S.A.

SERIES CV-600 VALVE ASSEMBLY
WITH MOD CV-600-4R ACTUATOR
2" CLASS 150

DFTSMN BLM DATE 1-5-81
CHECKED DJW DATE 1-5-81
APPD LRS DATE 1-7-81
SCALE NONE
JOB NO. 8064416895
CONT. REF. 8010-14896
DO NOT SCALE DWG.
DWG. NO. E-195849
REV. 3

NO.	DATE	REVISIONS	BY	CHK.
1	12-28-81	COMPLETED B/M, TRIM WAS #7 CASCADE.	DPM	DJW
2	2-26-81	ITEM-17 WAS PER M-185155 MKD	"	DJW
2 CONTD	2-26-81	MAT'L. WAS ASTM-A743, GR. CA-40; ITEM-18 WAS PER M-185515 MKD MAT'L. WAS ASTM-A743, GR. CA-40.	"	DJW
3	3-26-81	DELETED NIPPLES & ADDED WEIGHT & FACE TO FACE WAS 12 3/4	K.B.	66.

4.1.55-127

RL_R PROCESSING

DN ROL VALVE SPECIFICATIONS

Use med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
* Indicates information Required to Process Order.

COPES VULCAN

SHEET 1 of 1

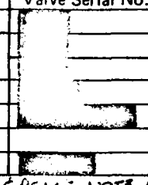
*DATE 10-16-80
*NAME LRS
C.V.I. JOB NO. 8069-16895

US OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1	ITEM NO. 9		* QUANTITY 1						Controller *Mfr.	
2	*TYPE CV-600		DRAWING						*Type ☐ Press. ☐ Temp.	
3.	*INLET PIPE 2"		SCHED. 80	* OUTLET PIPE 2"		SCHED. 80			☐ Other (Specify)	
4.	TAGGING LV74 D-2								*Control Form: ☐ Prop ☑ Prop. + Reset	
5	APPLICATION TSS FLASH TK DRN TO COND								☐ Prop. + External Reset	
PE	ATING CONDITIONS								*Scale Range	
6.	*Fluid – Water ☑	Steam ☐	Gas ☐	Oil ☐	Other ☐				*Output Range	
	Units	Flow PPH	Inlet P1 PSIA		Outlet P2	PSIA	Temp. °F		☐ 3-15 Psi ☐ Other (Specify)	
7	*Max. Flow Condition	4000	164		4		358		*Capillary Length	
8.	*Normal Flow Condition	4000	164		4		358		*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No	
9.	*Minimum Flow Condition	133	164		1		358			
10	*Shutoff Condition	–	198.8						NOTES:	
AL	E BODY								1. DESIGN PRESSURE 200 PSIA @ 400°F	
11.	*Size 2"	*ANSI Class 150	☐ Standard		☐ Special				2. SWAGELOK FLAKELESS FITTINGS REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.	
12	*Material	☐ WCB ☑ WC6	☐ C5	☐ CF8	☐ CF8M	☐ Other (See Notes)			3. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED C_v PER PARA. 4.2.1 OF ANSI B16.34-1976	
		☐ A105	☐ F304		☐ F316				4. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.	
13.	*Style	☑ Globe	☐ Angle		☐ 3-Way				5. HYDRO SHELL TEST PER ANSI B16.34	
14	*Ends	☐ Flanged B16.5			☐ Butt Weld B16.25 Fig.				6. CARBON STEEL NIPPLES REQ'D. - MAT'L ASTM A234 GR. WPB	
		☑ Socket Weld B16.11			☐ Other – See Notes:				7. STEEL FRAME & YOKE REQ'D.	
AL	E BONNET								8. C_v REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.	
15.	*Type ☑ Standard	☐ Cooling Extension	☐ Leakoff or water seal	☐ Backseat					9. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO & SEAT LEAKAGE TESTS.	
16	Packing	☑ Graph Asb.	☐ Teflon Asb.	☐ Other					10. S.S. IDENT TAGS REQ'D.	
RI		☐ Malcomized							11. TRIM IS GROOVE TIP - C	
17.	*Material	☐ Hardened 410 S.S.	☑ Hardened 420 S.S.	☐ Special					12. ALLOY STEEL BODY TO CARBON STEEL NIPPLES REQUIRE LP INSPECTION	
18	*Type	☑ Single ☐ Double	☐ Tandem	☐ Balanced						
		☐ Cylinder ☐ Hush®	☐ Flash®	☐ Other						
19.	Characteristic	☐ Mod. Parabolic	☐ Quick Open	☑ Special (11)						
		☐ Cascade	☐ Mod. Equal %							
20	Cv Factor Required by Specs. 2.16									
A	E ACTUATOR									
21.	*Type ☑ Diaphragm	☐ Lever	☐ Piston	☐ Electric						
22	*Model CV-600-4RA									
23	*Action ☐ Spring Opening		☑ Spring Closing							
	☐ Locks in Position		☐ See Notes							
24.	Air Press. Available 80 PSIG									
C	SSORIES									
25	*Handwheel	☑ Top Mount	☐ Side Mount	☐ None						
26.	*Airlock	☐ Yes	☑ No							
27	*Limit Switches Mfr. —	Type		Qty.						
28	*Solenoid Valve Mfr. —	Type		Qty.						
29.	*Booster Relay Mfr. —	Type		Qty.						
30	POSITION TRANSMITTER C-V	Type LVDT		Qty. 1						
PC	TIONER									
31	*Mfr. BAILEY	Type AP5								
32.	*Accessories	☐ By-Pass	☑ Gauges							
33	*Input Range	☐ 3-15	☑ Others - (Specify) 4-20 ma							
34	*Action	☑ Direct	☐ Reverse							
35.	*Air Set ☑ Yes ☐ No	*Gauges ☑ Yes ☐ No	Qty. 1							
PE	IAL REQUIREMENTS									
36	*X-ray ASME ☐	☐ Other - (Specify)								
37	*Special Tests (NDT)	☐ See Notes:								
38.	*Special Engr.	☐ See Notes: 4.1.55-128								
39	*"N" Stamp	☐ Yes ☑ No	Class ☐ 1 ☐ 2 ☐ 3							
40	*Noise Limit	☑ Yes ☐ No 90	DBA at 5 Feet							

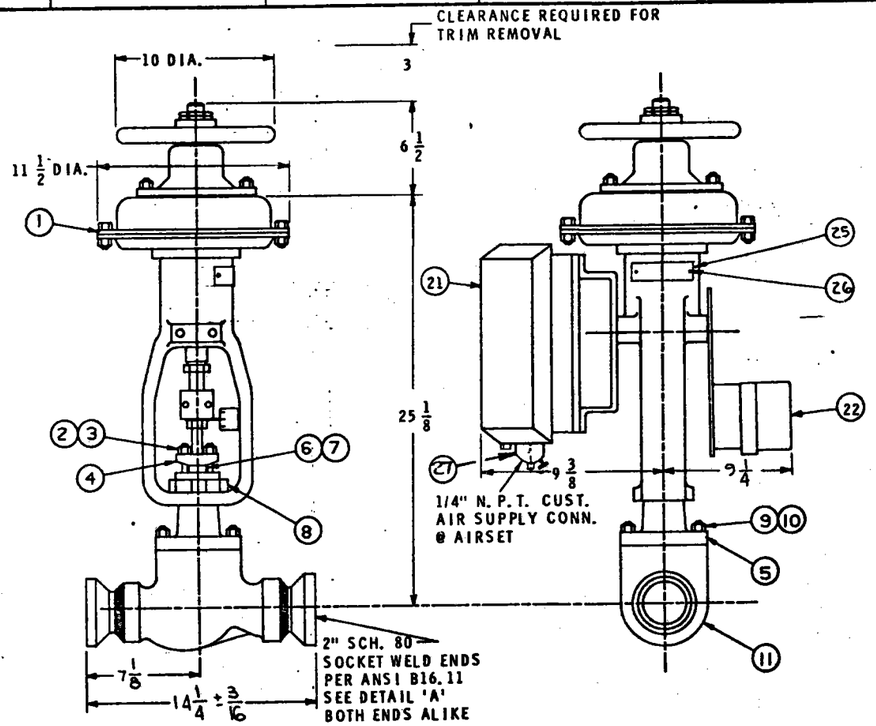
TO BE COMPLETED BY C.V.I. ENGINEERING

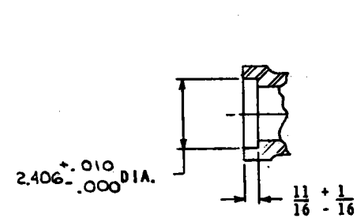
Actuator Spring: 189077
Precompression (No Valve Pressure) Psi: 7 PSIG
Air to Full Travel (No Valve Pressure) Psi: 80 PSIG
Trim Size: C GROOVE TIP Travel: 1" ±1/8"
Max. Cv of Trim: 2.5 1" ±1/8" TRAVEL
Valve Serial No.:



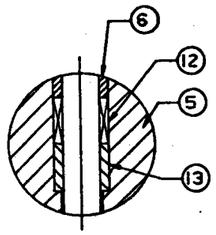
Form No. 705176 R-2
Rev. 1/17/77

REV. 1 - CHANGE BODY SIZE FROM 1" & MT'L FROM WCB & REVISE NOTE 6 - WAS REDUCERS LRS 12-16-80
REV. 2 - CHANGE TRIM - WAS #7 CASCADE LRS 1-14-81 REV. 3 - ADD NOTE 12. LRS 1-29-81

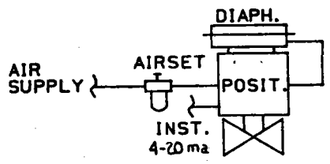




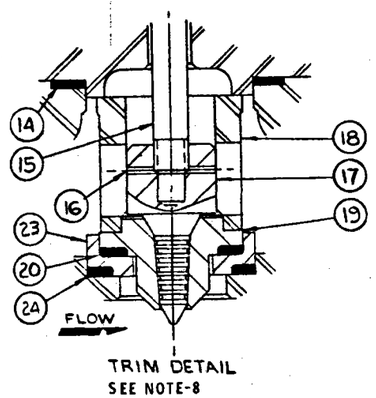
DETAIL 'A'



STUFFING BOX DETAIL



PIPING SCHEMATIC



TRIM DETAIL
SEE NOTE-8

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
				ACTUATOR ASSEMBLY			L-189962	
1	1	189962-3	4					
2	2	184683	3	PACKING STUD	STEEL	ASTM - A193	S-184683	GR.B7
3	2	186209	3	PACKING NUT	STEEL	ASTM - A194		GR.2H
4	1	184681-R	3	PACKING FLANGE	STEEL	ASTM - A216	M-184681	GR. WCB
5	1	184409-R	3	BONNET	STEEL	ASTM - A216	L-187244	GR. WCB
6	1	184682-H	3	PACKING FOLLOWER	CRES	ASTM - A582	M-184682	TYPE-416, COND. H
7	1	5903	3	SNAP RING	STEEL	COM'L.		
8	1	184680	3	ACTUATOR CLAMP	DU. IRON	ASTM - A536	M-184680	GR.65-45-12
9	8	185370	3	BODY STUD	STEEL	ASTM - A193		GR.B7
10	8	170581	3	BODY NUT	STEEL	ASTM - A194		GR.2H
11	1	———	—	VALVE BODY ASS'Y.	SEE NOTE-9		SK-R-16895-L	
* 12	1	172417	3	PACKING SET	GRAPH-ASB	COM'L.		
13	1	185112-H	3	GUIDE BUSHING	CRES	ASTM - A582	S-185112	TYPE 416, COND. H
* 14	1	185377	3	BODY GASKET	ASB-SST.	COM'L.		
* 15	1	186974	3	STEM	CRES	ASTM - A276	M-183561	TYPE 316, GR.B
* 16	1	188238	3	ROLL PIN	CRES	ASTM - A276		TYPE 420
* 17	1	———	—	PLUG	CRES	ASTM - A276	M-192210MKD	TYPE 420
* 18	1	196957	5	CAGE	CRES	ASTM - A276	M-196957	TYPE 420
* 19	1	———	—	SEAT RING	CRES	ASTM - A276	M-192138 MKD.	TYPE 420
* 20	1	185382	3	TRIM GASKET	ASB-SST.	COM'L.		
21	1	———	—	ACCESSORY KIT: (1) BAILEY AP5 POSITIONER,			L-189728 MKD.	
22	1	196441	5	ACCESSORY KIT: (1) C-V POSITION TRANSMITTER			L-196440	TYPE LVDT
23	1	———	—	SEAT SPACER	CRES	ASTM-A276	M-192204 MKD.	TYPE-420
* 24	1	185383	3	TRIM GASKET	ASB-SST	COM'L.		
25	1	195618	5	IDENTFICATION PLATE	CRES	COM'L	M-195618	TYPE 304
26	2	64341	3	DRIVE SCREW	STEEL	COM'L		
27	1	———	—	ACCESSORY KIT: (1) CONOFLOW AIRSET			L-189624 MKD.	

NOTES

1. FOR MAX. Cv 9.9 SET VALVE TRAVEL AT 1" ±.13 INCHES
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CV PROC. 1.2.276.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CV PART NO. 185988 1) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. DESIGN PRESSURE AND TEMPERATURE IS 666 P.S.I. AT 486°F.
8. FLOW IS UNDER THE SEAT. TRIM TYPE IS "7 UNBALANCED CASCADE.
9. VALVE BODY MAT'L: STEEL, ASTM-A216, GR. WCB
   REDUCER MAT'L: STEEL, ASTM-A234, GR. WPB

SPEC. SHT. NO.:
APPLICATION: RS FLASH TANK DRAIN TO NO. 2 HTR.

TAG NO'S: LV-74A
VALVE WEIGHT: 118 LBS.

DEPT. OF ENERGY
STEARNS-ROGER PROJECT
NO. C-21700
SOLAR ONE
P. O. NO: 5002C21700

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	
AIR LOCK VALVE	
LIMIT SWITCH	
LUBRICATOR	
SOLENOID VALVE	
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	
BOOSTER RELAY	
POSITION TRANSMITTER (QTY. 1)	
PART CODE -6	

COPES-VULCAN, INC.
LAKE CITY (ERIE CO.) PA. U.S.A.

SERIES CV-600 VALVE ASSEMBLY WITH MOD CV-600-6R ACTUATOR

1-1/2" CLASS 600

NO.	DATE	REVISIONS	BY	CHK.
	1-16-81	COMPLETED B/M	T.S	DJW
2	2-26-81	TEM-18 WAS PER M-184694 MKD	[illegible]	DJW
3	3-26-81	ADDED VALVE WEIGHT	K.B.	GG.

DFTSMN [illegible] DATE [illegible]
CHECKED DJW DATE [illegible]
APPD. LRS DATE [illegible]

JOB NO. 8064-16895
CONT. REF. 8010-14896
DO NOT SCALE DWG.

SCALE NONE | DWG. NO. E-195852 | REV. 3

RDER PROCESSING

ON ROL VALVE SPECIFICATIONS

COPES VULCAN

SHEET 1 of 1

*DATE 10-16-80

*NAME LRS

C.V.I. JOB NO. 8069-16895

Use med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
*Indicates information Required to Process Order.

US.OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1. ITEM NO. 5 *QUANTITY
2. *TYPE CV-600 DRAWING
3. *INLET PIPE 2" SCHED. 80 *OUTLET PIPE 2" SCHED. 80
4. TAGGING LV-74A
5. APPLICATION RS FLASH TANK DRN TO NO. 2 HTR.

PE..ATING CONDITIONS

6. *Fluid – Water ☑ Steam ☐ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7	*Max. Flow Condition	23,800	528	50/154	467
8.	*Normal Flow Condition	23,800	528	50/154	467
9	*Minimum Flow Condition	4,000	445	20	439
10	*Shutoff Condition	–	666		

ALVE BODY

11. *Size 1½" *ANSI Class 600 ☑ Standard ☐ Special
12. *Material ☑ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☐ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13. *Style ☑ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☐ Butt Weld B16.25 Fig.
☑ Socket Weld B16.11 ☐ Other – See Notes:

ALVE BONNET

15. *Type ☑ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16. Packing ☑ Graph Asb. ☐ Teflon Asb. ☐ Other

RI

☐ Malcomized
17. *Material ☐ Hardened 410 S.S. ☑ Hardened 420 S.S. ☐ Special
18. *Type ☑ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other
19. Characteristic ☐ Mod. Parabolic ☐ Quick Open ☐ Special
☑ Cascade ☐ Mod. Equal %
20. Cv Factor Required by Specs. 7.2

AL..E ACTUATOR

21. *Type ☑ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22. *Model CV-600-6RA
23. *Action ☐ Spring Opening ☑ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

C SSORIES

25. *Handwheel ☑ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ☑ No
27. *Limit Switches Mfr. — Type Qty.
28. *Solenoid Valve Mfr. — Type Qty.
29. *Booster Relay Mfr. — Type Qty.
30. POSITION TRANSMITTER C-V Type LVDT Qty. 1

TIONER

31. *Mfr. BAILEY Type AP5
32. *Accessories ☐ By-Pass ☑ Gauges
33. *Input Range ☐ 3-15 ☑ Others - (Specify) 4-20 ma
34. *Action ☑ Direct ☐ Reverse
35. *Air Set ☑ Yes ☐ No *Gauges ☑ Yes ☐ No Qty. 1

PE IAL REQUIREMENTS

36. *X-ray ASME ☐ ☐ Other - (Specify)
37. *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
39. *"N" Stamp ☐ Yes ☑ No Class ☐ 1 ☐ 2 ☐ 3
40. *Noise Limit ☑ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ☑ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS 666 PSIA @ 486°F
2. SWAGELOK FLARELESS FITTINGS REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING
3. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976
4. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
5. HYDRO SHELL TEST PER ANSI B16.34
6. CARBON STEEL REDUCER & EXPANDER REQ'D - 1½" x 2" w/ 2" END HAVING SOCKET - MAT'L ASTM A234-GR.WPB.
7. STEEL FRAME & YOKE REQ'D.
8. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.
9. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO AND SEAT LEAKAGE TESTS.
10. S.S. IDENT TAGS REQ'D.

TO BE COMPLETED BY C.V.I. ENGINEERING

Actuator Spring: 185956

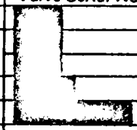
Precompression (No Valve Pressure) Psi: 21 PSIG

Air to Full Travel (No Valve Pressure) Psi: 80 PSIG

Trim Size: # 11 Travel: 1" ± 1/8"

Max. Cv of Trim: 9.9 @ 1" ± 1/8" TRAVEL

Valve Serial No.:



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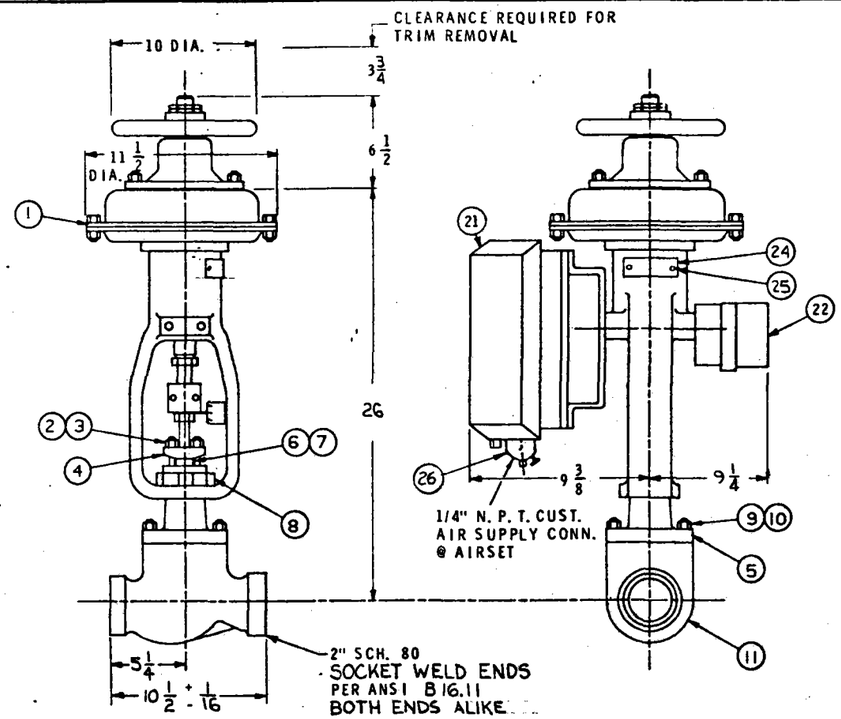
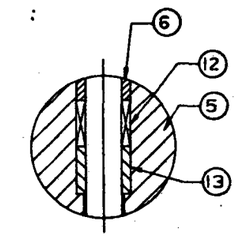
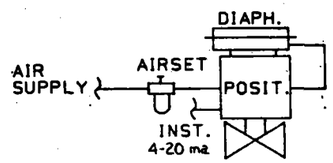


LIST OF MATERIALS

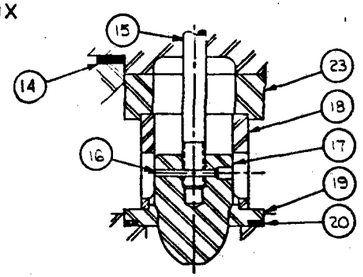
ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	189962-3	4	ACTUATOR ASSEMBLY	———	———	L-189962	———
2	2	184683	3	PACKING STUD	STEEL	ASTM - A193	S-184683	GR.B7
3	2	186209	3	PACKING NUT	STEEL	ASTM - A194	———	GR.2H
4	1	184681-R	3	PACKING FLANGE	STEEL	ASTM - A216	M-184681	GR. WCB
5	1	184223-S	3	BONNET	STEEL	ASTM - A217	L-187240	GR. WC6
6	1	184682-H	3	PACKING FOLLOWER	CRES	ASTM - A582	M-184682	TYPE 416, COND. H
7	1	V-5903	3	SNAP RING	STEEL	COM'L.	———	———
8	1	184680	3	ACTUATOR CLAMP	DU. IRON	ASTM - A536	M-184680	GR.65-45-12
9	10	185370	3	BODY STUD	STEEL	ASTM - A193	M-185368	GR.B7
10	10	170581	3	BODY NUT	STEEL	ASTM - A194	M-170423	GR.2H
11	1	185656-S	3	VALVE BODY	STEEL	ASTM - A217	L-185656	WC6
* 12	1	172417	3	PACKING SET	GRAPH-ASB	COM'L.	———	———
13	1	185112-H	3	GUIDE BUSHING	CRES	ASTM - A582	S-185112	TYPE 416, COND. H
* 14	1	185378	3	BODY GASKET	ASB-SST.	COM'L.	3-3/4 O. D. x 3-1/16 I. D. x .125 THK.	
* 15	1	186975	3	STEM	CRES	ASTM - A276	M-183561	TYPE 316, GR.B
* 16	1	188238	3	ROLL PIN	CRES	ASTM - A276	———	TYPE 420
* 17	1	———	—	PLUG	CRES	ASTM - A276	M-182315 MKD.	TYPE 420
* 18	1	196957	5	CAGE	CRES	ASTM - A276	M-196957	TYPE 420
* 19	1	———	—	SEAT RING	CRES	ASTM - A276	M-185263 MKD.	TYPE 420
* 20	1	185384	3	TRIM GASKET	ASB-SST.	COM'L.	2-15/16 O. D. x 2-7/16 I. D. x .175	
21	1	———	—	ACCESSORY KIT: (1) BAILEY AP5 POSITIONER,			L-189278 MKD.	———
22	1	196441	5	ACCESSORY KIT: (1) C-V POSITION TRANSMITTER			L-196440	TYPE LVDT
23	1	185679-R	3	CAGE SPACER	STEEL	ASTM-A575	S-185679	SAE 1045
24	1	195618	5	CUSTOMER NAMEPLATE	CRES	COM'L	M-195618	TYPE 304
25	2	64341	3	DRIVE SCREW	STEEL	COM'L	———	CAD. PLATED
26	1	———	—	ACCESSORY KIT: (1) CONOFLOW AIRSET			L-189624 MKD.	



STUFFING BOX DETAIL



PIPING SCHEMATIC



TRIM DETAIL SEE NOTE-8

NOTES

1. FOR MAX. Cv 17.5 SET VALVE TRAVEL AT 1" ±.13 INCHES
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CV PROC. 1.2.276.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CV PART NO. 185988 1) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. DESIGN PRESSURE AND TEMPERATURE IS 673 P.S.I. AT 486°F.
8. FLOW IS UNDER THE SEAT. TRIM TYPE IS REDUCED TRIM WITH MODIFIED PARABOLIC CHARACTERISTICS.

SPEC. SHT. NO.:
APPLICATION: RS FLASH TANK DRAIN TO CONDENSOR.

TAG NO'S: LV-74C
VALVE WEIGHT: 120 LBS.

DEPT. OF ENERGY
STEARNS-ROGER PROJECT
NO. C-21700
SOLAR ONE
P. O. NO. 5002C21700

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	■
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	■
HANDWHEEL	■
AIR LOCK VALVE	
LIMIT SWITCH	
LUBRICATOR	
SOLENOID VALVE	
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	■
BOOSTER RELAY	
POSITION TRANSMITTER (QTY. 1)	■
PART CODE -6	

COPES-VULCAN, INC.
LAKE CITY (ERIE CO.) PA. U.S.A.

SERIES CV-600 VALVE ASSEMBLY WITH MOD CV-600-6R ACTUATOR

2" CLASS 600

NO.	DATE	REVISIONS	BY	CHK.
1	1-6-81	COMPLETED S/M & ADDED ITEM # 26	EDM	DJW
2	2-26-81	ITEM # 18, CAGE WAS PER M-184694 MKD.	T.S.	DJW
3	3-26-81	DELETED NIPPLES & ADDED VALVE WEIGHT & FACE TO FACE WAS 14 1/4"	K.B.	CC

DFTSMN BJM DATE 1-5
CHECKED DJW DATE 1-6-81
APPD LES DATE 1-7-81
SCALE NONE

JOB NO. 8064-16895
CONT. REF. 8010-14896
DO NOT SCALE DWG.

DWG. NO. E-195850 REV. 3

4.1.55-131

RD..3 PROCESSING

ON"3OL VALVE SPECIFICATIONS

Use med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen.
* Indicates information Required to Process Order.

COPES VULCAN

SHEET 1 of 1
*DATE 10-16-80
*NAME LRS
C.V.I. JOB NO. 8069-16895

US)MER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1. ITEM NO. 7 *QUANTITY 1
2. *TYPE CV-600 DRAWING
3. *INLET PIPE 2" SCHED. 80 *OUTLET PIPE 2" SCHED. 80
4. TAGGING LV-74C
5. APPLICATION RS FLASH TK DRN TO CONDENSER

PE ATING CONDITIONS

6. *Fluid – Water ■ Steam ☐ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7	*Max. Flow Condition	40,000	532	82	467
8.	*Normal Flow Condition	16,189	566	82	467
9.	*Minimum Flow Condition	4,000	572	82	467
10	*Shutoff Condition	—	673		

AL E BODY

11. *Size 2" *ANSI Class 600 ☐ Standard ☐ Special
12. *Material ☐ WCB ■ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☐ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13. *Style ■ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☐ Butt Weld B16.25 Fig.
■ Socket Weld B16.11 ☐ Other – See Notes:

AL E BONNET

15. *Type ■ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16 Packing ■ Graph Asb. ☐ Teflon Asb. ☐ Other
RI ☐ Malcomized
17. *Material ☐ Hardened 410 S.S. ■ Hardened 420 S.S. ☐ Special
18 *Type ■ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other
19. Characteristic ■ Mod. Parabolic ☐ Quick Open ☐ Special
☐ Cascade ☐ Mod. Equal %
20 Cv Factor Required by Specs. 11.9

AI E ACTUATOR

21. *Type ■ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22 *Model CV-600-6RA
23 *Action ☐ Spring Opening ■ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

CC SSORIES

25 *Handwheel ■ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ■ No
27 *Limit Switches Mfr. — Type Qty.
28 *Solenoid Valve Mfr. — Type Qty.
29. *Booster Relay Mfr. — Type Qty.
30. POSITION TRANSMITTER C-V Type LVDT Qty. 1

OS TIONER

31. *Mfr. BAILEY Type AP5
32. *Accessories ☐ By-Pass ■ Gauges
33 *Input Range ☐ 3-15 ■ Others - (Specify) 4-20 ma
34 *Action ■ Direct ☐ Reverse
35. *Air Set ■ Yes ☐ No *Gauges ■ Yes ☐ No Qty.

PE IAL REQUIREMENTS

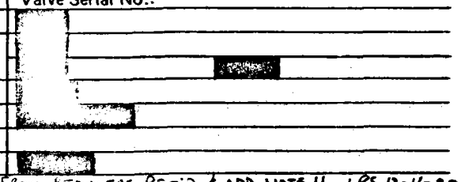
36 *X-ray ASME ☐ ☐ Other - (Specify)
37. *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
39 *"N" Stamp ☐ Yes ■ No Class ☐ 1 ☐ 2 ☐ 3
40 *Noise Limit ■ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ■ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:
1. DESIGN PRESS 673 PSIA @ 486°F
2. SWAGELOK FLAREGLESS FITTINGS REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.
3. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976
4. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
5. HYDRO SHELL TEST PER ANSI B16.34
6. CARBON STEEL NIPPLES REQ'D. - MAT'L ASTM A234 GR WPB
7. STEEL FRAME & YOKE REQ'D.
8. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.
9. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO AND SEAT LEAKAGE TESTS.
10. S.S. IDENT TAGS REQ'D.
11. ALLOY BODY TO CARBON STEEL NIPPLE REQUIRES LP INSPECTION.

TO BE COMPLETED BY C.V.I. ENGINEERING

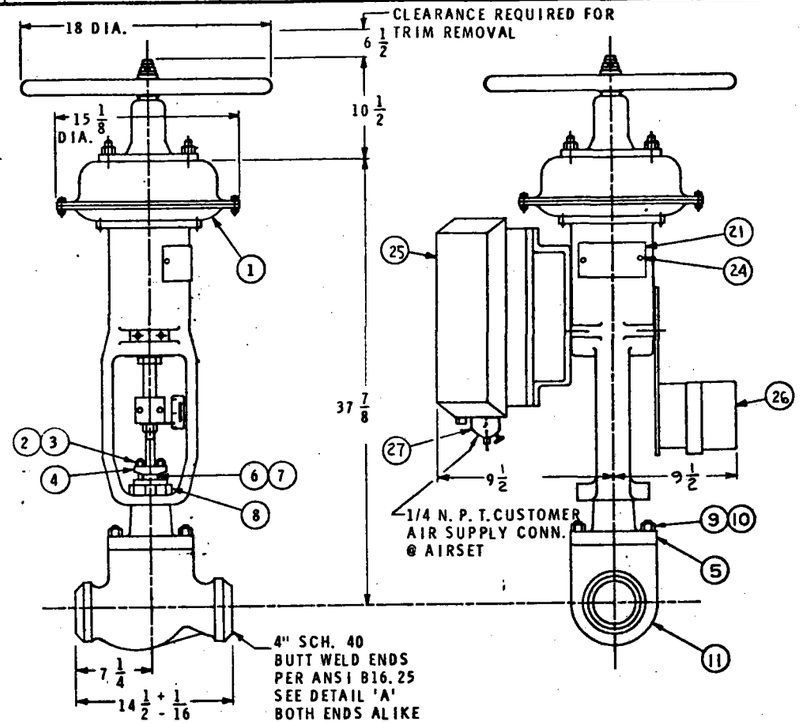
Actuator Spring: 185956
Precompression (No Valve Pressure) Psi: 26
Air to Full Travel (No Valve Pressure) Psi: 80
Trim Size: 3/4" MOD. PARA. Travel: 3/4" ± 1/8"
Max. Cv of Trim: 12.0 @ 3/4" ± 1/8" TRAVEL
Valve Serial No.:

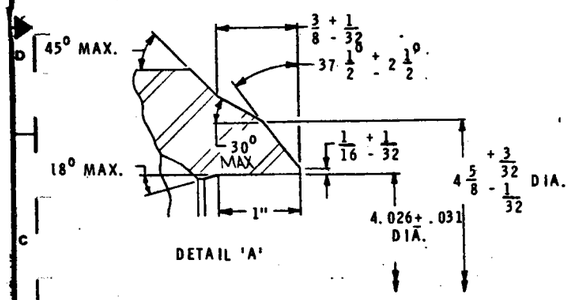


orm No. 705176 R-2
ev. 1/17/77

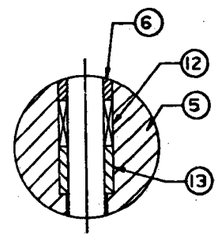
REV. 1 - CHANGE BODY SIZE FROM 1½", CHANGE NOTE 6 FROM REDUCERS REQ'D & ADD NOTE 11 LPS 12-16-80
CHANGE BODY & BONNET MAT'L FROM WCB AND CHANGE TRIM FROM CASCADE

4.1.55-132

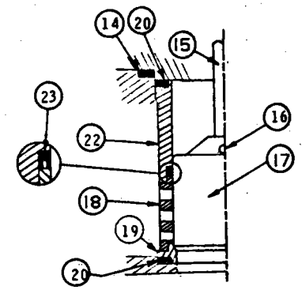




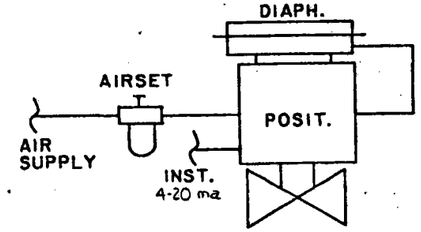
DETAIL 'A'



STUFFING BOX DETAIL



TRIM DETAIL
SEE NOTE - 8



PIPING SCHEMATIC

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	189964-11	4	ACTUATOR ASSEMBLY			L-189964	
2	2	184889	3	PACKING STUD	STEEL	ASTM - A193	S-184889	GR.B7
3	2	184890	3	PACKING NUT	STEEL	ASTM - A194		GR.2H
4	1	182872-R	3	PACKING FLANGE	STEEL	ASTM - A216	M-182872	GR. WCB
5	1	184382-R	3	BONNET	STEEL	ASTM - A216	L-187927	GR. WCB
6	1	184097-H	3	PACKING FOLLOWER	CRES	ASTM - A582	M-184097	TYPE 416, COND. H
7	1	31339	3	SNAP RING	STEEL	COM'L.		
8	1	183165	3	ACTUATOR CLAMP	DU. IRON	ASTM - A536	M-183165	GR.65-45-12
9	8	185372	3	BODY STUD	STEEL	ASTM - A193	M-185368	GR.B7
10	8	170582	3	BODY NUT	STEEL	ASTM - A194	M-170423	GR.2H
11	1	185618-R	3	VALVE BODY	STEEL	ASTM-A216	L-185618	GR. WCB
* 12	1	186199	3	PACKING SET	GRAPH-ASB	COM'L.		
13	1	184686-H	3	GUIDE BUSHING	CRES	ASTM - A582	S-184686	TYPE 416, COND. H
* 14	1	185380	3	BODY GASKET	ASB-SST.	COM'L.	5-3/4 O.D. x 5 I.D. x .125 THK.	
* 15	1	185401	3	STEM	CRES	ASTM - A276	M-183560	TYPE 316, GR.B
* 16	1	96228	3	ROLL PIN	CRES	ASTM - A276		TYPE 420
* 17	1	196943	5	PLUG	CRES	ASTM - A276	M-196943	TYPE-420
* 18	1	———	—	CAGE	CRES	ASTM - A276	L-186866 MKD.	TYPE 420
* 19	1	———	—	SEAT RING	CRES	ASTM - A276	M-182804 MKD.	TYPE 420
* 20	2	185386	3	TRIM GASKET	ASB-SST.	COM'L.	4-7/8 I.D. x 4-1/4 I.D. x .175 THK.	
21	1	195618	5	IDENTIFICATION PLATE	CRES	COM'L	M-195618	
*22	1	———	—	BALANCING CYLINDER	CRES	ASTM-A276	M-183587 MKD.	TYPE 420
*23	1	185398	3	TEFLON SEAL	TURCITE®	COM'L.	VARISEAL MOD. 106M04000P42	
24	2	64341	3	DRIVE SCREW	STEEL	COM'L		
25	1	———	—	ACCESSORY KIT: (1) BAILEY AP5 POSITIONER			L-189729 MKD.	
26	1	196441	5	ACCESSORY KIT: (1) C-V POSITION TRANSMITTER			L-196440	TYPE LVDT'
27	1	———	—	ACCESSORY KIT: (1) CONOFLOW AIRSET			L-189624 MKD.	

NOTES

1. FOR MAX. C_V 83 SET VALVE TRAVEL AT 1.5±.13 INCHES
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CV PROC. 1.2.276.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CV PART NO. 185989) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. DESIGN PRESSURE AND TEMPERATURE IS 192 P.S.I. AT 400°F.
8. FLOW IS UNDER THE SEAT. TRIM TYPE IS FULL SIZE SINGLE SEAT BALANCED CAV-B9.

SPEC. SHT. NO.:
APPLICATION: TSS FLASH TANK DRAIN TO NO. 2 HTR.

TAG NO'S: LV-74B
VALVE WEIGHT: 290 LBS.

DEPT. OF ENERGY
STEARNS-ROGER PROJECT
NO. C-21700
SOLAR ONE
P. O. NO.: 5002C21700

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	
AIR LOCK VALVE	
LIMIT SWITCH	
LUBRICATOR	
SOLENOID VALVE	
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	■
BOOSTER RELAY	
POSITION TRANSMITTER (QTY.1)	■
PART CODE -6	

COPES-VULCAN, INC.
A DIV. OF THE WYMAN GORDON INDUSTRIES
LAKE CITY (ERIE CO.), PA. U.S.A.

SERIES CV-600 VALVE ASSEMBLY WITH MOD CV-600-10R ACTUATOR
4" CLASS 150

DFTSMN RJM DATE 1-22-81
CHECKED DJW DATE 1-26-81
APPD. RS DATE 1-27-81
SCALE NONE
JOB NO. 8064-16895
CONT. REF. 8010-14896
DO NOT SCALE DWG.
DWG. NO. E-195851 REV. 3

NO.	DATE	REVISIONS	BY	CHK.
1	1-22-81	COMPLETED B/M. ADDED ITEM # 27	GDM	DJW
2	2-26-81	ITEM-17 WAS PERM-185499 MED M.S.T.L. WAS ASTM A 43-GR CA-40		DJW
3	3-26-81	ADDED VALVE WEIGHT	K.B.	

4.1.55-133

RD.R PROCESSING

ON ROL VALVE SPECIFICATIONS

Use med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen. Indicates information Required to Process Order.

COPES VULCAN

SHEET 1 of 1

*DATE 10-16-80

*NAME LRS

C.V.I. JOB NO. 8064-16895

US. OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1. ITEM NO. 6 *QUANTITY 1
2. *TYPE CV-600 DRAWING
3. *INLET PIPE 4" SCHED. 40 *OUTLET PIPE 4" SCHED. 40
4. TAGGING LV-74B
5. APPLICATION TSS FLASH TK DRN TO No. 2 HTR

PE ATING CONDITIONS

6. *Fluid – Water ☑ Steam ☐ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7	*Max. Flow Condition	117,500	152	42.5/134.8	358
8.	*Normal Flow Condition	117,500	152	42.5/134.8	358
9	*Minimum Flow Condition	5,679	157	20	358
10	*Shutoff Condition	–	172		

AL. E BODY

11. *Size 4" *ANSI Class 150 ☑ Standard ☐ Special
12. *Material ☑ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☐ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13. *Style ☑ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☑ Butt Weld B16.25 Fig.
☐ Socket Weld B16.11 ☐ Other – See Notes:

AL.E BONNET

15. *Type ☑ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16. Packing ☑ Graph Asb. ☐ Teflon Asb. ☐ Other
RI ☐ Malcomized
17. *Material ☐ Hardened 410 S.S. ☑ Hardened 420 S.S. ☐ Special
18. *Type ☑ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other
19. Characteristic ☐ Mod. Parabolic ☐ Quick Open ☑ Special CAV-B9
☐ Cascade ☐ Mod. Equal %
20. Cv Factor Required by Specs. 82.2

A 'E ACTUATOR

21. *Type ☑ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22. *Model CV-600-10 RA
23. *Action ☐ Spring Opening ☑ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

C SSORIES

25. *Handwheel ☑ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ☑ No
27. *Limit Switches Mfr. — Type Qty.
28. *Solenoid Valve Mfr. — Type Qty.
29. *Booster Relay Mfr. — Type Qty.
30. POSITION TRANSMITTER C-V Type LVDT Qty. 1

DS IONER

31. *Mfr. BAILEY Type AP5
32. *Accessories ☐ By-Pass ☑ Gauges
33. *Input Range ☐ 3-15 ☑ Others - (Specify) 4-20ma
34. *Action ☑ Direct ☐ Reverse
35. *Air Set ☑ Yes ☐ No *Gauges ☑ Yes ☐ No Qty. 1

PECIAL REQUIREMENTS

36. *X-ray ASME ☐ ☐ Other - (Specify)
37. *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
39. *"N" Stamp ☐ Yes ☑ No Class ☐ 1 ☐ 2 ☐ 3
40. *Noise Limit ☑ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ☑ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS 192 PSIA @ 400°F
2. SWAGELOK FLARELESS FITTINGS REQ'D TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.
3. TIGHT SHUT-OFF CLASS IV. LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976.
4. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
5. HYDRO SHELL TEST PER ANSI B16.34
6. STEEL FRAME & YOKE REQ'D.
7. Cv REQUIRED BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.
8. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO AND SEAT LEAKAGE TESTS.
9. S.S. IDENT TAG REQ'D.

TO BE COMPLETED BY C.V.I. ENGINEERING

Actuator Spring: 189080
Precompression (No Valve Pressure) Psi: 7PSIG
Air to Full Travel (No Valve Pressure) Psi: 80PSIG
Trim Size: 4" Travel: 1½"±1/8"
Max. Cv of Trim: 83 @ 1½" ± 1/8"
Valve Serial No.:

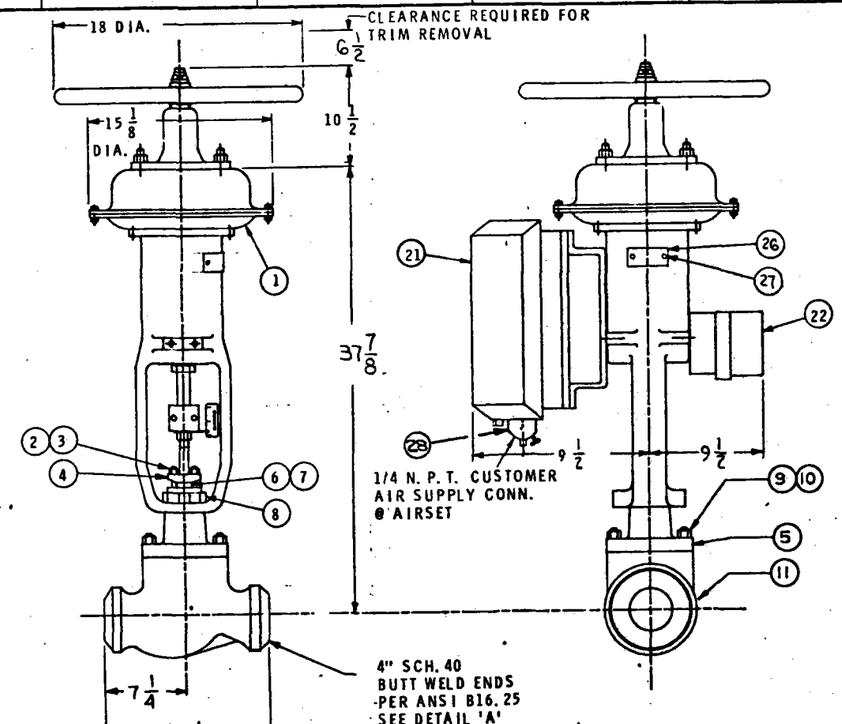
[redacted]

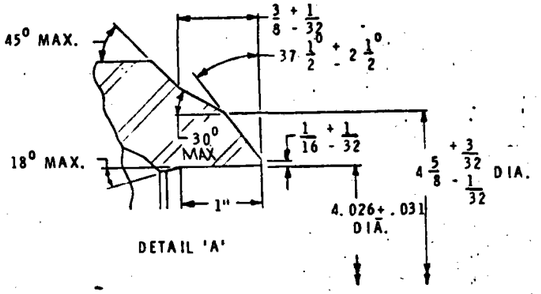
[redacted]

REV. 1 - CHANGE TRIM MATERIAL FROM 410 LLS 12-16-80

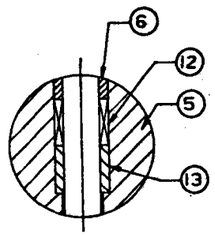
orm No. 705176 R-2
ev. 1/17/77

4.1.55-134

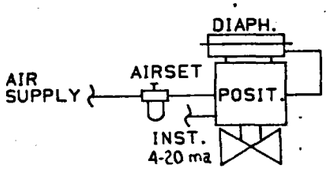




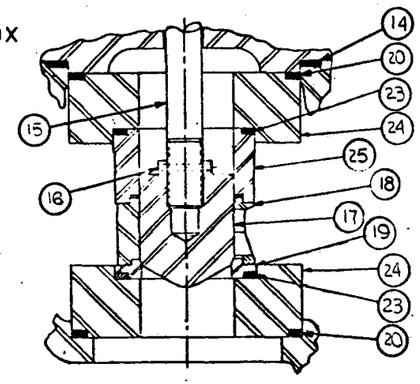
DETAIL 'A'



STUFFING BOX DETAIL



PIPING SCHEMATIC



FLOW

TRIM DETAIL SEE NOTE-8

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	189964-7	4	ACTUATOR ASSEMBLY			L-189964	
2	2	184889	3	PACKING STUD	STEEL	ASTM - A193	S-184889	GR.B7
3	2	184890	3	PACKING NUT	STEEL	ASTM - A194		GR.2H
4	1	182872-R	3	PACKING FLANGE	STEEL	ASTM - A216	M-182872	GR. WCB
5	1	184382-R	3	BONNET	STEEL	ASTM - A216	E-187246	GR. WCB
6	1	184097-H	3	PACKING FOLLOWER	CRES	ASTM - A582	M-184097	TYPE 416, COND.H
7	1	31339	3	SNAP RING	STEEL	COM'L.		
8	1	183165	3	ACTUATOR CLAMP	DU. IRON	ASTM - A536	M-183165	GR.65-45-12
9	8	185372	3	BODY STUD	STEEL	ASTM - A193	M-185368	GR.B7
10	8	170582	3	BODY NUT	STEEL	ASTM - A194	M-170423	GR.2H
11	1	185618-R	3	VALVE BODY	STEEL	ASTM-A216	L-185618	GR. WCB
* 12	1	186199	3	PACKING SET	GRAPH-ASB	COM'L.		
13	1	184686-H	3	GUIDE BUSHING	CRES	ASTM - A582	S-184686	TYPE 416, COND. H
* 14	1	185380	3	BODY GASKET	ASB-SST.	COM'L.	5-3/4 O.D. x 5 I.D. x .125 THK.	
* 15	1	187740	3	STEM	CRES	ASTM - A276	M-183560	TYPE 316, GR.B
* 16	1	96228	3	ROLL PIN	CRES	ASTM - A276		TYPE 420
* 17	1	——	—	PLUG	CRES	ASTM - A276	M-186026 MKD.	TYPE 420
* 18	1	196942	5	CAGE	CRES	ASTM - A276	M-196942	TYPE 420
* 19	1	——	—	SEAT RING	CRES	ASTM - A276	M-185514 MKD.	TYPE-420
* 20	2	185386	3	TRIM GASKET	ASB-SST.	COM'L.	4- 7/8 O.D. x 4 1/4 I.D. x .175 THK.	
21	1	——	—	ACCESSORY KIT: (1) BAILEY AP5 POSITIONER,			L-189729 MKD.	
22	1	196441	5	ACCESSORY KIT: (1) C-V POSITION TRANSMITTER			L-196440	TYPE LVDT
23	2	185384	3	TRIM GASKET	ASB-SST	COM'L	2 15/16 O.D. x 2 7/16 I.D. x .175 THK.	
24	2	185851-R	3	REDUCER BUSHING	STEEL	ASTM-A515	M-185851	SAE-1045
25	1	——	—	BALANCING CYLINDER	CRES	ASTM-A276	M-185516 MKD.	TYPE-420
26	1	195618	5	CUSTOMER TAG	CRES	COM'L	M-195618	TYPE 304
27	2	64341	3	DRIVE SCREW	STEEL	COM'L		
28	1	——	—	ACCESSORY KIT: (1) CONOFLOW AIRSET			L-189624 MKD.	

NOTES

1. FOR MAX. C_V TO SET VALVE TRAVEL AT 1 ±.13 INCHES
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CV PROC. 1.2.276.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CV PART NO. 185989 1 IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. DESIGN PRESSURE AND TEMPERATURE IS 200 P.S.I. AT 400°F.
8. FLOW IS UNDER THE SEAT. TRIM TYPE IS SINGLE SEAT UNBALANCED PORT THROTTLING WITH MODIFIED EQUAL PERCENT CHARACTERISTIC.

SPEC. SHT. NO.:
APPLICATION: TSS FLASH TANK DRAIN TO CONDENSOR.

TAG NO'S: LV 74D-1
VALVE WEIGHT: 290 LBS.

DEPT. OF ENERGY
STEARNS-ROGER PROJECT
NO. C-21700
SOLAR ONE
P. O. NO.: 5002C21700

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	
AIR LOCK VALVE	
LIMIT SWITCH	
LUBRICATOR	
SOLENOID VALVE	
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	
BOOSTER RELAY	
POSITION TRANSMITTER (QTY. 1)	
PART CODE -6	

COPES-VULCAN, INC.
A Unit of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA. U.S.A.

SERIES CV-600 VALVE ASSEMBLY WITH MOD CV-600-10R ACTUATOR

4" CLASS 150

DFTSMN BTM DATE 11-19-80	JOB NO. 8064-16895	
CHECKED DJW DATE 1-5-81	CONT. REF. 8010-14896	
APPD LRS DATE 1-7-81	DO NOT SCALE DWG.	
SCALE NONE	DWG. NO. E-195848	REV. 3

NO.	DATE	REVISIONS	BY	CHK.
1	1-23-81	COMPLETED B/M, ADDED ITEM # 28	DOM	DJW
2	2-26-81	ITEM # 18, CAGE WAS PER M-185515 MKD	T.S	DJW
3	3-26-81	ADDED VALVE WEIGHT	K.B.	∞

4.1.55-135

RI R PROCESSING

ONTROL VALVE SPECIFICATIONS

L med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen. indicates information Required to Process Order.

COPES VULCAN

SHEET 1 of 1

*DATE 10-16-80

*NAME LRS

C.V.I. JOB NO. 8069-16895

US OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1. ITEM NO. 8 *QUANTITY 1
2. *TYPE CV-600 DRAWING
3. *INLET PIPE 4" SCHED. 40 *OUTLET PIPE 4" SCHED. 40
4. TAGGING LV 79D-1
5. APPLICATION TSS FLASH TK DRN TO COND

PE ATING CONDITIONS

6. *Fluid – Water ◪ Steam ☐ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7	*Max. Flow Condition	117,500	159	109.2	358
8.	*Normal Flow Condition	117,500	159	109.2	358
9.	*Minimum Flow Condition	4,000	164	1	358
10	*Shutoff Condition	–	198.8		

A 'E BODY

11. *Size 4" *ANSI Class 150 ☐ Standard ☐ Special
12. *Material ◪ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☐ Other (See Notes) ☐ A105 ☐ F304 ☐ F316
13. *Style ◪ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ◪ Butt Weld B16.25 Fig. ☐ Socket Weld B16.11 ☐ Other – See Notes:

A 'E BONNET

15. *Type ◪ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16. Packing ◪ Graph Asb. ☐ Teflon Asb. ☐ Other
RI ☐ Malcomized
17. *Material ☐ Hardened 410 S.S. ◪ Hardened 420 S.S. ☐ Special
18. *Type ◪ Single ☐ Double ☐ Tandem ☐ Balanced ☐ Cylinder ☐ Hush® ☐ Flash® ☐ Other
19. Characteristic ☐ Mod. Parabolic ☐ Quick Open ☐ Special ☐ Cascade ◪ Mod. Equal % (11)
20. Cv Factor Required by Specs. 69.6

A 'E ACTUATOR

21. *Type ◪ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22. *Model CV-600-10 RA
23. *Action ☐ Spring Opening ◪ Spring Closing ☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

C SSORIES

25. *Handwheel ◪ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ◪ No
27. *Limit Switches Mfr. — Type Qty.
28. *Solenoid Valve Mfr. — Type Qty.
29. *Booster Relay Mfr. — Type Qty.
30. POSITION TRANSMITTER C-V Type LVDT Qty. 1

DS TIONER

31. *Mfr. BAILEY Type AP5
32. *Accessories ☐ By-Pass ◪ Gauges
33. *Input Range ☐ 3-15 ◪ Others - (Specify) 4-20 ma
34. *Action ◪ Direct ☐ Reverse
35. *Air Set ◪ Yes ☐ No *Gauges ◪ Yes ☐ No Qty. 1

PECIAL REQUIREMENTS

36. *X-ray ASME ☐ ☐ Other - (Specify)
37. *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
39. *"N" Stamp ☐ Yes ◪ No Class ☐ 1 ☐ 2 ☐ 3
40. *Noise Limit ◪ Yes ☐ No 90 DBA at 5 Feet

Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ◪ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS 200 PSIA @ 400°F
2. SWAGELOK FLARELESS FITTINGS REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.
3. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976
4. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIPWELL.
5. HYDRO SHELL TEST PER ANSI B16.34
6.
7. STEEL FRAME & YOKE REQ'D
8. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT
9. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO AND SEAT LEAKAGE TESTS.
10. S.S. IDENT TAG REQ'D.
11. TRIM SHALL BE SINGLE SEAT UNBALANCED PORT THROTTLING WHICH HAS A FLOW CHARACTERISTIC SIMILAR TO MODIFIED EQUAL %.

TO BE COMPLETED BY C.V.I. ENGINEERING

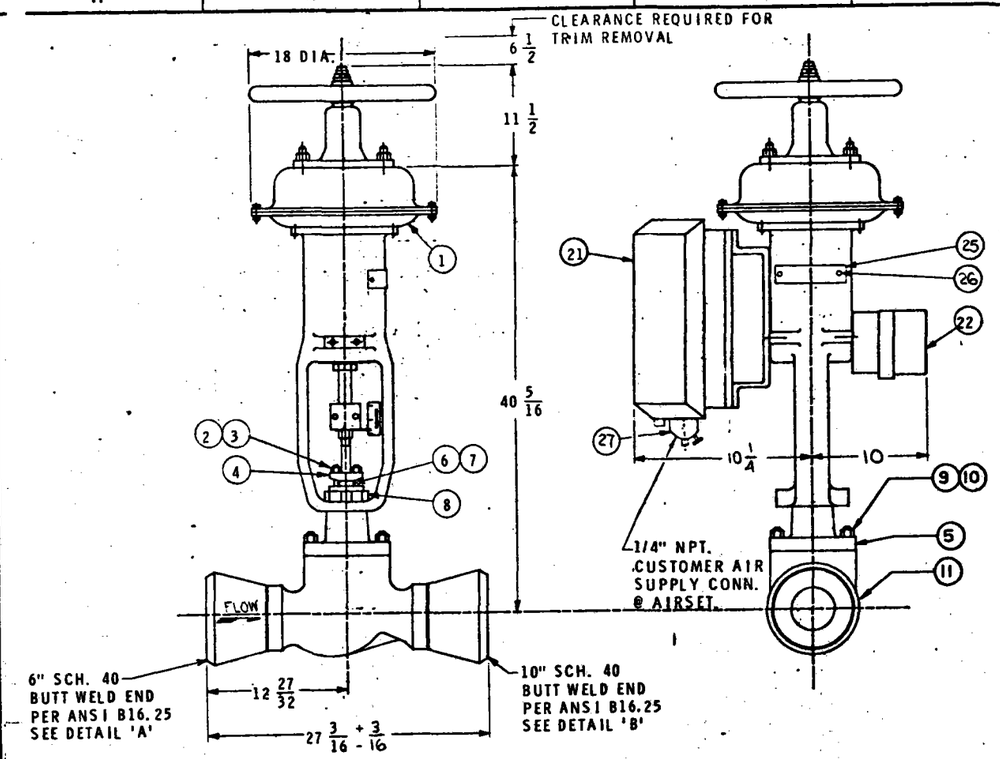
Actuator Spring: 189081
Precompression (No Valve Pressure) Psi: 19 PSIG
Air to Full Travel (No Valve Pressure) Psi: 80 PSIG
Trim Size: 2" PORT THROTTLE Travel: 1" ± 1/8"
Max. Cv of Trim: 70 @ 1" ± 1/8" TRAVEL
Valve Serial No.:
Plug:
Cage:
Stem: Packing:
Gasket:
Accessory Kit:

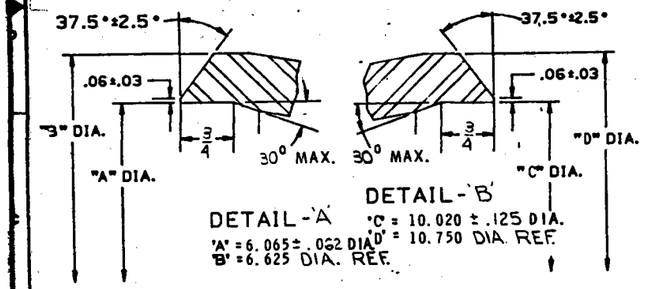
WEIGHT

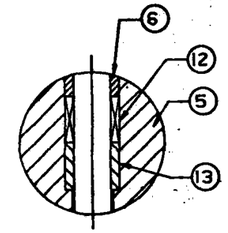
m No. 705176 R-2
v. 1/17/77

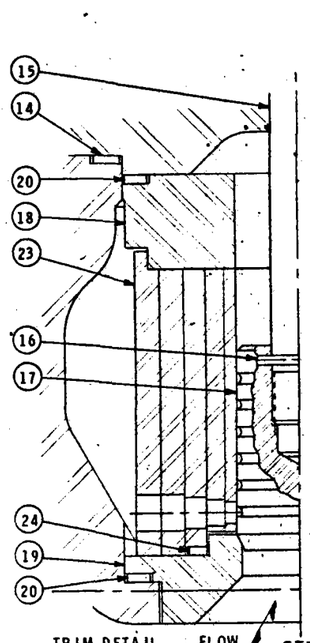
REV. 1 - DELETE NOTE 6 & CHANGE BODY SIZE FROM 3" & REVISE NOTE 11 - TRIM WAS MOD. PAR. CHANGE TRIM MTL FROM 410 12-16-80 LRS

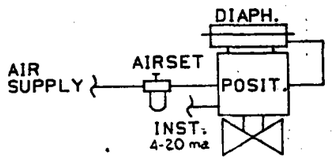
4.1.55-136











PIPING SCHEMATIC

LIST OF MATERIALS

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPECS.	DWG. NO.	REMARKS
1	1	189966-5	4	ACTUATOR ASSEMBLY			L-189966	
2	2	184889	3	PACKING STUD	STEEL	ASTM - A193	L-184889	GR.B7
3	2	184890	3	PACKING NUT	STEEL	ASTM - A194		GR.2H
4	1	182872-R	3	PACKING FLANGE	STEEL	ASTM - A216	M-182872	GR. WCB
5	1	184382-R	3	BONNET	STEEL	ASTM - A216	E-187246	GR. WCB
6	1	184097-H	3	PACKING FOLLOWER	CRES	ASTM - A582	M-184097	TYPE 416, COND. H
7	1	31339	3	SNAP RING	STEEL	COM'L.		
8	1	183165	3	ACTUATOR CLAMP	DU. IRON	ASTM - A536	M-183165	GR.65-45-12
9	8	185372	3	BODY STUD	STEEL	ASTM - A193	M-185368	GR.B7
10	8	170582	3	BODY NUT	STEEL	ASTM - A194	M-170423	GR.2H
11	1	196274	5	VALVE BODY ASS'Y.	NOTE-9		L-196274	
* 12	1	186199	3	PACKING SET	GRAPH-ASB	COM'L.		
13	1	184686-H	3	GUIDE BUSHING	CRES	ASTM - A 582	S-184686	TYPE 416, COND. H
* 14	1	185380	3	BODY GASKET	ASB-SST.	COM'L.		5-3/4"O. D. x5"I. D. x .125 THK.
* 15	1	185401	3	STEM	CRES	ASTM - A276	M-183560	TYPE 316, GR.B
* 16	1	96228	3	ROLL PIN	CRES	ASTM - A276		TYPE 420
* 17	1	196273	5	PLUG	CRES	ASTM - A276	M-196273	TYPE 420
* 18	1	196269	5	CAGE SPACER	CRES	ASTM - A276	L-196269	TYPE 420
* 19	1	196270	5	SEAT RING	CRES	ASTM - A276	M-196270	TYPE 420
* 20	2	185386	3	TRIM GASKET	ASB-SST.	COM'L.		4-7/8"O. D. x4-1/4"I. D. x .175 THK.
21	1		—	ACCESSORY KIT: (1) BAILEY AP5 POSITIONER,			L-189730-MKD	
22	1	196443	5	ACCESSORY KIT: (1) C-V POSITION TRANSMITTER				TYPE LVDT
* 23	1	196272	5	CYLINDER ASSEMBLY	CRES	ASTM-A276	L-196272	TYPE 420
* 24	1	185384	3	TRIM GASKET	ASB-SST	COM'L		2-15/16"I. D. x2-7/16"I. D. x .175 THK.
25	1	195618	5	CUSTOMER NAMEPLATE	CRES	COM'L	M-195618	TYPE 304
26	2	Q4341	3	DRIVE SCREW	STEEL	COM'L		CAD. PLATED
27	1			ACCESSORY KIT: (1) CONOFLOW		AIRSET	L-189624-MKD	

NOTES

1. FOR MAX. C_V 47 SET VALVE TRAVEL AT 3±.13 INCHES
2. REQUIRED AIR TO OPERATE 80 PSI.
3. AIR PRESSURE IN THE DIAPHRAGM CHAMBER MUST NOT EXCEED 100 PSIG TO PREVENT COMPONENT DAMAGE.
4. ASSEMBLE VALVE PER CV PROC. 1.2.276.
5. RECOMMENDED SPARE PARTS ARE MARKED WITH AN ASTERISK (*) ON THE "LIST OF MATERIALS". A DIAPHRAGM (CV PART NO. 185990) IS ALSO RECOMMENDED.
6. ALL DIMENSIONS ARE IN INCHES AND ARE REFERENCE UNLESS OTHERWISE SPECIFIED.
7. DESIGN PRESSURE AND TEMPERATURE IS 180 P.S.I. AT 535°F.
8. FLOW IS UNDER THE SEAT. TRIM TYPE IS SINGLE SEAT FULL SIZE UNBALANCED HUSH.
9. VALVE BODY MAT'L: STEEL, ASTM-A216.GR.WCB
   INLET REDUCER MAT'L: STEEL, ASTM-A234, GR.WPB.
   OUTLET REDUCER MAT'L.: STEEL, ASTM-A234, GR.WPB

SPEC. SHT. NO.:
APPLICATION: TS FLASH TANK

TAG NO'S: PV-647C
APPROX. VALVE WEIGHT 365 LBS.

DEPT. OF ENERGY
STEARNS-ROGER PROJECT
NO. C-21700
SOLAR ONE
P. O. NO.: 5002C21700

ACCESSORIES	
DIRECT ACTING ACTUATOR	
REVERSE ACTING ACTUATOR	
DIRECT ACTING POSITIONER	
REVERSE ACTING POSITIONER	
HANDWHEEL	
AIR LOCK VALVE	
LIMIT SWITCH	
LUBRICATOR	
SOLENOID VALVE	
CONTROLLER	
PILOT POSITIONER	
AIR SET (QTY. 1)	
BOOSTER RELAY	
POSITION TRANSMITTER (QTY. 1)	
PART CODE -6	

COPES-VULCAN, INC.
A Div. of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA U.S.A.

SERIES CV-600 VALVE ASSEMBLY WITH MOD CV-600-16R ACTUATOR

4" CLASS 300

DFTSMN [illegible]	DATE [illegible]	JOB NO. 8064-16595
CHECKED DJW	DATE 1-6-81	CONT. REF. 8010-14896
APPD. LRS	DATE 1-7-81	DO NOT SCALE DWG.
SCALE NONE	DWG. NO. E-195847	REV. 2

NO.	DATE	REVISIONS	BY	CHK.
	12-1-81	ADDED ITEM 27 ADDED OUTLET REDUCER MATERIAL	BDM	DJW
1	3-11-81	REVISED OUTLET REDUCER		
2	CONT	MATERIAL FROM A-185 GR F5 TO A-234, GR WPB, ADDED VALVE WEIGHT.	BD	

4.1.55-137

SHEET 1 of 1

R PROCESSING

ROL VALVE SPECIFICATIONS

COPES VULCAN

*DATE 10-16-80
*NAME LRS
C.V.I. JOB NO. 8064-16895

... med. hard (#2 or 2½) pencil with firm pressure or blue-black or black ink. Do not use ball point pen. * Indicates information Required to Process Order.

US OMER STEARNS-ROGER ULTIMATE USER DEPT. OF ENERGY STATION SOLAR I DAGGETT, CAL.

1 ITEM NO. 10 *QUANTITY 1
2 *TYPE CV-600 DRAWING
3. *INLET PIPE 6" SCHED. 40 *OUTLET PIPE 10" SCHED. 40
4. TAGGING PV-647C
5 APPLICATION TS FLASH TANK

PE ATING CONDITIONS

6. *Fluid – Water ☐ Steam ☑ Gas ☐ Oil ☐ Other ☐

	Units	Flow PPH	Inlet P1 PSIA	Outlet P2 PSIA	Temp. °F
7	*Max. Flow Condition	12500	194	50	356
8.	*Normal Flow Condition	12,500	149	20	358
9.	*Minimum Flow Condition	605	150	20	358
10	*Shutoff Condition	–	130		

A E BODY

11. *Size 4" *ANSI Class 300 ☑ Standard ☐ Special
12 *Material ☑ WCB ☐ WC6 ☐ C5 ☐ CF8 ☐ CF8M ☐ Other (See Notes)
☐ A105 ☐ F304 ☐ F316
13. *Style ☑ Globe ☐ Angle ☐ 3-Way
14. *Ends ☐ Flanged B16.5 ☑ Butt Weld B16.25 Fig.
☐ Socket Weld B16.11 ☐ Other – See Notes:

A E BONNET

15. *Type ☑ Standard ☐ Cooling Extension ☐ Leakoff or water seal ☐ Backseat
16 Packing ☑ Graph Asb. ☐ Teflon Asb. ☐ Other
R ☐ Malcomized
17. *Material ☐ Hardened 410 S.S. ☑ Hardened 420 S.S. ☐ Special
18 *Type ☐ Single ☐ Double ☐ Tandem ☐ Balanced
☐ Cylinder ☑ Hush® ☐ Flash® ☐ Other
19 Characteristic ☐ Mod. Parabolic ☐ Quick Open ☐ Special
☐ Cascade ☐ Mod. Equal %
20 Cv Factor Required by Specs. 47

A E ACTUATOR

21. *Type ☑ Diaphragm ☐ Lever ☐ Piston ☐ Electric
22 *Model CV-600-16RA
23 *Action ☐ Spring Opening ☑ Spring Closing
☐ Locks in Position ☐ See Notes
24. Air Press. Available 80 PSIG

C SSORIES

25 *Handwheel ☑ Top Mount ☐ Side Mount ☐ None
26. *Airlock ☐ Yes ☑ No
27 *Limit Switches Mfr. —— Type Qty.
28 *Solenoid Valve Mfr. —— Type Qty.
29. *Booster Relay Mfr. — Type Qty.
30. POSITION TRANSMITTER C-V Type LVDT Qty. 1

O TIONER

31 *Mfr. BAILEY Type AP-5
32. *Accessories ☐ By-Pass ☑ Gauges
33 *Input Range ☐ 3-15 ☑ Others - (Specify) 4-20 ma
34 *Action ☑ Direct ☐ Reverse
35. *Air Set ☑ Yes ☐ No *Gauges ☑ Yes ☐ No Qty.

PECIAL REQUIREMENTS

36 *X-ray ASME ☐ ☐ Other - (Specify)
37 *Special Tests (NDT) ☐ See Notes:
38. *Special Engr. ☐ See Notes:
39 *"N" Stamp ☐ Yes ☑ No Class ☐ 1 ☐ 2 ☐ 3
*Noise Limit ☑ Yes ☐ No 90 DBA at 5 Feet

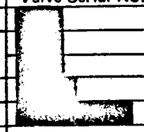
Controller *Mfr.
*Type ☐ Press. ☐ Temp.
☐ Other (Specify)
*Control Form: ☐ Prop ☐ Prop. + Reset
☐ Prop. + External Reset
*Scale Range
*Output Range
☐ 3-15 Psi ☐ Other (Specify)
*Capillary Length
*Air Set ☐ Yes ☐ No Gauges ☐ Yes ☐ No

NOTES:

1. DESIGN PRESS 180 PSIA @ 535°F
2. SWAGELOK FLARELESS FITTINGS REQ'D. TUBING IS 3/8" O.D. SEAMLESS ANNEALED COPPER REFRIGERATION TUBING.
3. TIGHT SHUT-OFF CLASS IV - LEAKAGE SHALL NOT EXCEED .01% OF RATED Cv PER PARA. 4.2.4 OF ANSI B16.34-1976
4. AIRSET HAS INTEGRAL GAUGE, FILTER AND DRIP WELL.
5. HYDRO SHELL TEST PER ANSI B16.34
6. CARBON STEEL INLET REDUCER REQ'D. - 6"x4" - MATERIAL ASTM A234 GR. WPB
7. STEEL FRAME & YOKE REQ'D.
8. Cv REQ'D BY SPEC REFLECTS ADDITION OF 25% REQUIREMENT.
9. VALVE SHALL BE FLUSHED WITH DEMINERALIZED WATER AFTER HYDRO & SEAT LEAKAGE TESTS.
10. S.S. IDENT TAGS REQ'D.
11. ALLOY STEEL OUTLET EXPANDER REQ'D - 4"x10" - MATERIAL ASTM A185-FS - WELD OF EXPANDER TO BODY REQUIRES RADIOGRAPHIC EXAMINATION.

TO BE COMPLETED BY C.V.I. ENGINEERING

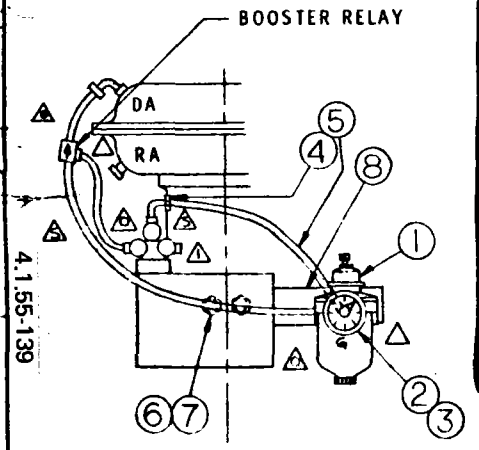
Actuator Spring: 189062
Precompression (No Valve Pressure) Psi: 6 PSIG
Air to Full Travel (No Valve Pressure) Psi: 80 PSIG
Trim Size: 4" Travel: 3" ± 1/8"
Max. Cv of Trim: 47 @ 3" ± 1/8" TRAVEL
Valve Serial No.:



(4) MOUNTED TO ACTUATOR WITH POSITIONER & BOOSTER RELAY

PARTS LIST NO. 189657

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8" x 1/4"
4	6	NOTE-1 ~~14850~~	ELBOW 1/4" NPT x 3/8" TUBE
5	4.5'	50141	COPPER TUBING 3/8" O.D. (3 PCS. REQ'D)
6	2	59404	LOCKWASHER 5/16"
7	2	4548	HEX HD. CAP SCREW 5/16"-18x3/4" LG.
8	1	135835	BRACKET M-135835



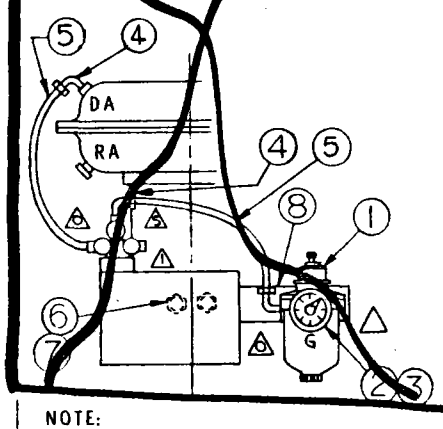
NOTE:
BOOSTER RELAY PARTS CALLED FOR ON ACCESSORY KIT DWG. M-189658. ADDITIONAL NOTES AND INSTRUCTIONS SAME AS ON ARRANGEMENT (3).

NOTE:
1. AS CALLED FOR ON SHOP ORDER

(3) MOUNTED TO ACTUATOR WITH POSITIONER

PARTS LIST NO. 189656

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8" x 1/4"
4	4	14850	ELBOW 1/4" NPT x 3/8" TUBE
5	3.0'	50141	COPPER TUBING 3/8" O.D. (2 PCS. REQ'D)
6	2	59404	LOCKWASHER 5/16"
7	2	4548	HEX HD. CAP SCREW 5/16"-18x3/4" LG.
8	1	135835	BRACKET M-135835



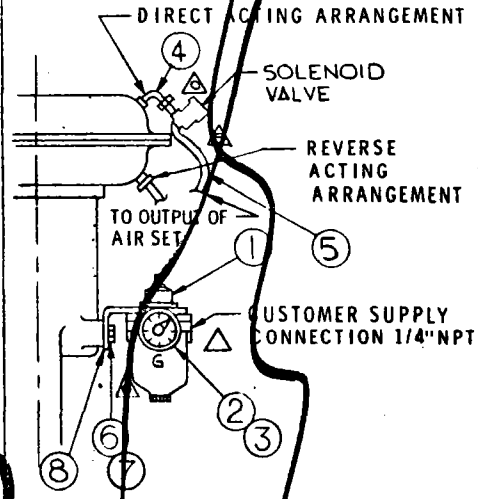
NOTE:
MOORE POSITIONER SHOWN IN SKETCH IS IN INVERTED POSITION. SEE POSITIONER ACCESSORY KIT DWGS. FOR OTHER ARRANGEMENTS. BAILEY AP-2 & AP-5 POSITIONERS ALSO AVAILABLE.

INSTRUCTIONS:
BRACKET & AIR SET MAY BE ASSEMBLED TO EITHER SIDE OF YOKE. IF LIMIT SWITCHES ARE PRESENT USE THE SAME MTG. SCREWS. THE BRACKET MAY BE MOUNTED IN ANY POSITION NECCESSARY TO MAINTAIN PROPER CLEARANCES.

(2) MOUNTED TO ACTUATOR WITH SOLENOID

PARTS LIST NO. 189655

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8"x1/4"
4	2	14850	ELBOW 1/4" NPT x 3/8" TUBE
5	1.5'	50141	COPPER TUBING 3/8" O.D.
6	2	59404	LOCKWASHER 5/16"
7	2	4548	HEX HD. CAP SCREW 5/16"-18x3/4" LG.
8	1	137340	BRACKET M-137340

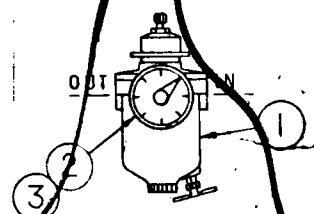


INSTRUCTIONS:
ASSEMBLE PARTS TO ACTUATOR AS SHOWN IN SKETCH.
SOLENOID PARTS ARE CALLED FOR ON ACCESSORY KIT DWG. M-189671 OR M-189702.

(1) NOT MOUNTED

PARTS LIST NO. 189654

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8" x 1/4"



INSTRUCTIONS:
ASSEMBLE BUSHING AND GAUGE TO AIR SET AND PACKAGE UNMOUNTED WITH VALVE FOR SHIPMENT.

JOB NO. 8064-16895
MKD. BY BHM DATE 1-14-81
CKD. BY DJW DATE 1-19-81

SHOP ORDER
LEGEND: ITEM NO. 1
- △ INSTRUMENT CONNECTION
- △ SUPPLY CONNECTION
- △ OUTLET CONNECTION
- △ INPUT CONNECTION

COPES-VULCAN, INC.
One of the Wilcox Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: CV600 SERIES VALVES

STD. MOUNTING ARRANGEMENTS FOR CONOFLOW AIR SET MODEL FH-60XT-K1

NO.	DATE	REVISIONS	BY	CHK.

NO.	DATE	REVISIONS	BY	CHK.

DFTSMN JHR DATE 5-22-79 JOB NO.
CHECKED [illegible] DATE 5-29-79 SCALE
APP'D ARP DATE 5-30-79

REPRO FROM
PART CODE 5

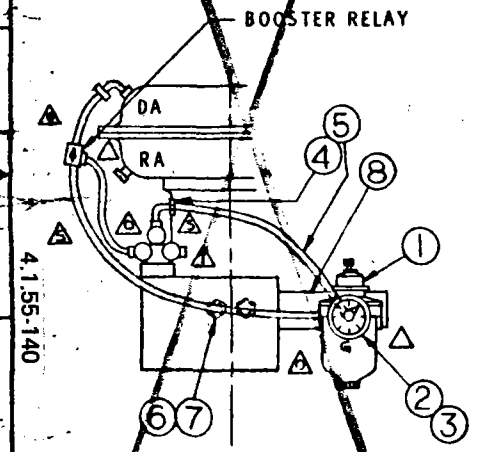
DWG. NO. L-189624-MKD REV. 2

4.1.55-139

(4) MOUNTED TO ACTUATOR WITH POSITIONER & BOOSTER RELAY

PARTS LIST NO. 189657

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8" x 1/4"
4	6	14850	ELBOW 1/4" NPT x 3/8" TUBE
5	4.5'	50141	COPPER TUBING 3/8" O.D. (3 PCS. REQ'D)
6	2	59404	LOCKWASHER 5/16"
7	2	4548	HEX HD. CAP SCREW 5/16"-18x3/4" LG.
8	1	135835	BRACKET M-135835



NOTE:
BOOSTER RELAY PARTS CALLED FOR ON ACCESSORY KIT DWG. M-189658. ADDITIONAL NOTES AND INSTRUCTIONS SAME AS ON ARRANGEMENT (3).

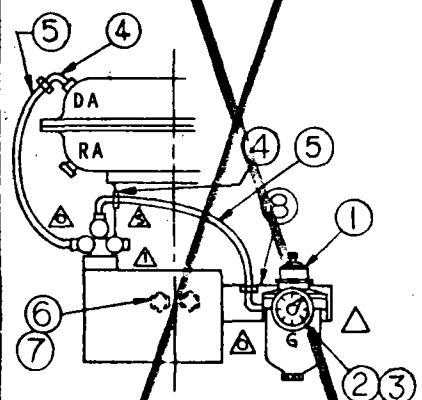
NOTE
1. AS CALLED FOR ON SHOP ORDER.

4.1.55-140

(3) MOUNTED TO ACTUATOR WITH POSITIONER

PARTS LIST NO. 189656

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8" x 1/4"
4	4	14850	ELBOW 1/4" NPT x 3/8" TUBE
5	3.0'	50141	COPPER TUBING 3/8" O.D. (2 PCS. REQ'D)
6	2	59404	LOCKWASHER 5/16"
7	2	4548	HEX HD. CAP SCREW 5/16"-18x3/4" LG.
8	1	135835	BRACKET M-135835



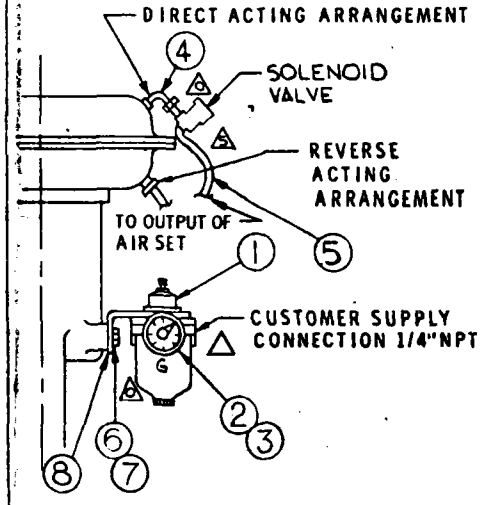
NOTE:
MOORE POSITIONER SHOWN IN SKETCH IS IN INVERTED POSITION. SEE POSITIONER ACCESSORY KIT DWGS. FOR OTHER ARRANGEMENTS. BAILEY AP-2 & AP-5 POSITIONERS ALSO AVAILABLE.

INSTRUCTIONS:
BRACKET & AIR SET MAY BE ASSEMBLED TO EITHER SIDE OF YOKE. IF LIMIT SWITCHES ARE PRESENT USE THE SAME MTG. SCREWS. THE BRACKET MAY BE MOUNTED IN ANY POSITION NECCESSARY TO MAINTAIN PROPER CLEARANCES.

(C) MOUNTED TO ACTUATOR WITH SOLENOID

PARTS LIST NO. 189655

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8"x1/4"
4	2	NOTE-1	ELBOW 1/4" NPT x 3/8" TUBE
5	1.5'	50141	COPPER TUBING 3/8" O.D.
6	2	59404	LOCKWASHER 5/16"
7	2	4548	HEX HD. CAP SCREW 5/16"-18x3/4" LG.
8	1	137340	BRACKET M-137340



INSTRUCTIONS:
ASSEMBLE PARTS TO ACTUATOR AS SHOWN IN SKETCH.
SOLENOID PARTS ARE CALLED FOR ON ACCESSORY KIT DWG. M-189671 OR M-189702. M-189702 MKD.

8064-16895
JOB NO.

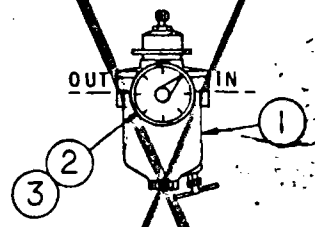
MKD. BY T.S. DATE 1-14-81
CKD. BY DJW DATE 1-22-81

SHOP ORDER
ITEM NO. 3

(1) NOT MOUNTED

PARTS LIST NO. 189654

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2		130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8" x 1/4"



INSTRUCTIONS:
ASSEMBLE BUSHING AND GAUGE TO AIR SET AND PACKAGE UNMOUNTED WITH VALVE FOR SHIPMENT.

LEGEND:
- INSTRUMENT CONNECTION
- SUPPLY CONNECTION
- OUTLET CONNECTION
- INPUT CONNECTION

NO	DATE	REVISIONS	BY	CHK.
12				

NO.	DATE	REVISIONS	BY	CHK.

REPRO FROM
PART CODE

COPES-VULCAN, INC.
One of the Wheelabrator Corporation
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: CV600 SERIES VALVES

STD. MOUNTING ARRANGEMENTS FOR CONOFLOW AIR SET MODEL FH-60XT-K1

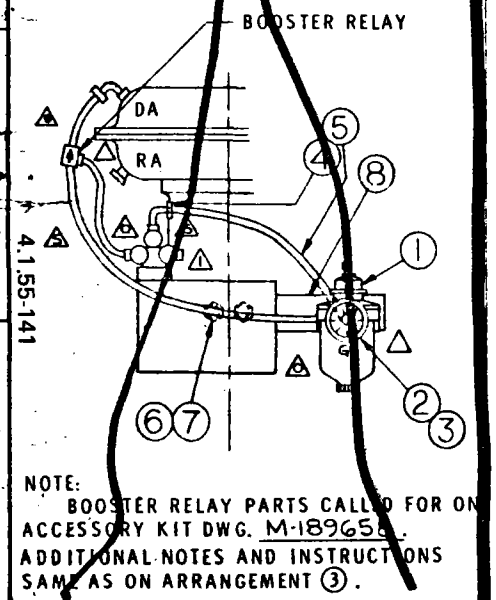
DFTSMN	JHR	DATE 5-22-79	JOB NO.
CHECKED	[illegible]	DATE 5-29-79	SCALE
APP'D	ARP	DATE 5-30-79	

DWG. NO. L-189624 MKD. REV. 0

(2) MOUNTED TO ACTUATOR WITH POSITIONER & BOOSTER RELAY

PARTS LIST NO. 189657

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	13664	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8" x 1/4"
4	6	14850	ELBOW 1/4" NPT x 3/8" TUBE
5	4.5'	50141	COPPER TUBING 3/8" O.D. (3 PCS. REQ'D)
6	2	59404	LOCKWASHER 5/16"
7	2	4548	HEX HD. CAP SCREW 5/16"-18x3/4" LG.
8	1	135835	BRACKET M-135835

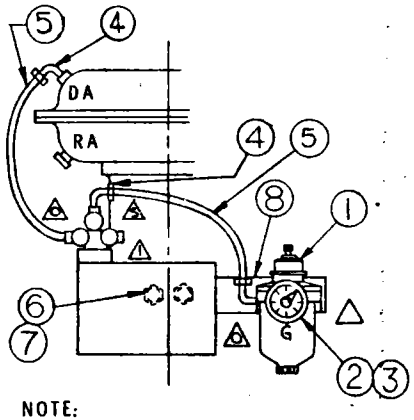


NOTE:
BOOSTER RELAY PARTS CALLED FOR ON ACCESSORY KIT DWG. M-189658. ADDITIONAL NOTES AND INSTRUCTIONS SAME AS ON ARRANGEMENT (3).

(3) MOUNTED TO ACTUATOR WITH POSITIONER

PARTS LIST NO. ~~189656~~

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8" x 1/4"
4	4	~~14850~~ NOTE-1	ELBOW 1/4" NPT x 3/8" TUBE
5	3.0'	50141	COPPER TUBING 3/8" O.D. (2 PCS. REQ'D)
6	2	59404	LOCKWASHER 5/16"
7	2	4548	HEX HD. CAP SCREW 5/16"-18x3/4" LG.
8	1	135835	BRACKET M-135835



NOTE:
MOORE POSITIONER SHOWN IN SKETCH IS IN INVERTED POSITION. SEE POSITIONER ACCESSORY KIT DWGS. FOR OTHER ARRANGEMENTS. BAILEY AP-2 & AP-5 POSITIONERS ALSO AVAILABLE.

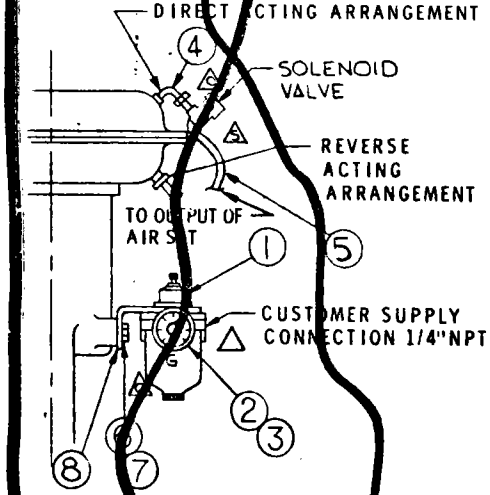
INSTRUCTIONS:
BRACKET & AIR SET MAY BE ASSEMBLED TO EITHER SIDE OF YOKE. IF LIMIT SWITCHES ARE PRESENT USE THE SAME MTG. SCREWS. THE BRACKET MAY BE MOUNTED IN ANY POSITION NECCESSARY TO MAINTAIN PROPER CLEARANCES

NOTE:
1. AS CALLED FOR ON SHOP ORDER

(4) MOUNTED TO ACTUATOR WITH SOLENOID

PARTS LIST NO. 189655

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8"x1/4"
4	2	14850	ELBOW 1/4" NPT x 3/8" TUBE
5	1.5'	50141	COPPER TUBING 3/8" O.D.
6	2	59404	LOCKWASHER 5/16"
7	2	4548	HEX HD. CAP SCREW 5/16"-18x3/4" LG.
8	1	13734	BRACKET M-137340



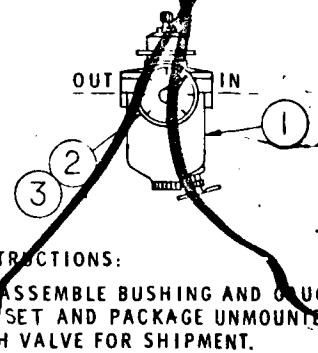
INSTRUCTIONS:
ASSEMBLE PARTS TO ACTUATOR AS SHOWN IN SKETCH.
SOLENOID PARTS ARE CALLED FOR ON ACCESSORY KIT DWG. M-189671 OR M-189702

SHOP ORDER ITEM NO. 2,4,5,6, 7,8,9

(1) NOT MOUNTED

PARTS LIST NO. 189654

ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	136645	AIR SET
2	1	130599	GAUGE 0-100 PSI
3	1	34716	BUSHING 1/8" x 1/4"



INSTRUCTIONS:
ASSEMBLE BUSHING AND GAUGE TO AIR SET AND PACKAGE UNMOUNTED WITH VALVE FOR SHIPMENT.

JOB NO. 8064-16895

MKD. BY GDM DATE 1-21-81

CKD. BY DJW DATE 1-21-81

LEGEND:
- INSTRUMENT CONNECTION
- SUPPLY CONNECTION
- OUTLET CONNECTION
- INPUT CONNECTION

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: CV600 SERIES VALVES

STD. MOUNTING ARRANGEMENTS FOR CONOFLOW AIR SET MODEL FH-60XT-K1

NO.	DATE	REVISIONS	BY	CHK.

NO.	DATE	REVISIONS	BY	CHK.

DFTSMN JHR DATE 5-22-79
CHECKED WSA DATE 5-29-79
APP'D ARP DATE 5-30-79
JOB NO.
SCALE

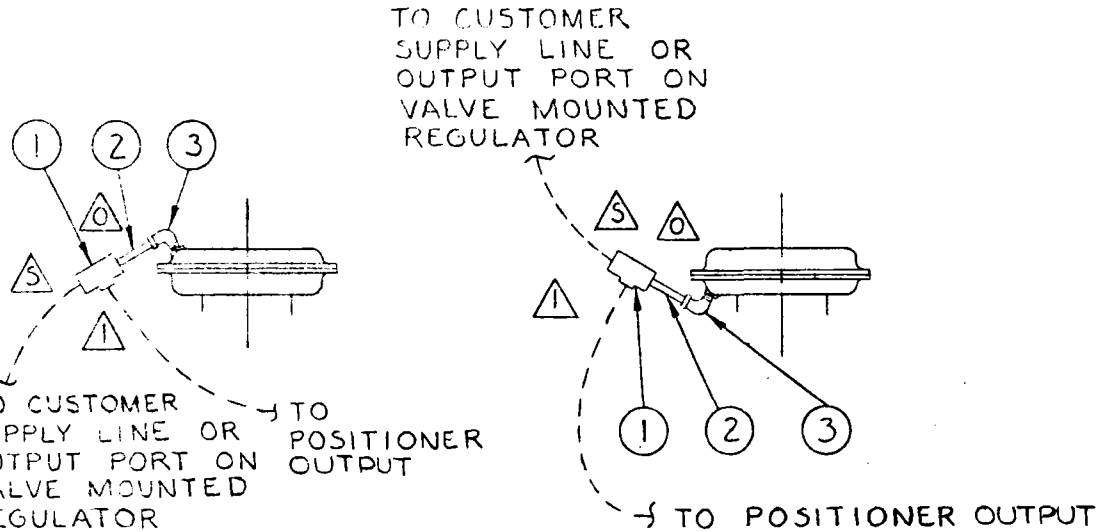
REPRO FROM
PART CODE X

DWG. NO. L-189624-MKD. REV. 0

4.155-141

LIST OF MATERIALS

ITEM NO.	QTY.	PART NO.	PART CODE	DESCRIPTION	REMARKS
1	1	71546	3	MOORE BOOSTER	MODEL 61-H
2	1	[illegible]	3	NIPPLE	1/4" X 3" LONG
3	1	6359	3	STREET ELL	1/4"



MOUNTED ON DIRECT ACTING ACTUATOR

MOUNTED ON REVERSE ACTING ACTUATOR

LEGEND :

- (S) SUPPLY CONNECTION
- (I) INPUT CONNECTION
- (O) OUTPUT CONNECTION

REVISIONS				
NO.	DESCRIPTION	REV. BY	CK'D. BY	DATE
1	P/N 41181 WAS 68292 PER ENG CHG. 6256	D.R.	WEA	7-18-79

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
BREAK CORNERS 1/64 MAX.
FILLETS ARE 1/64 TO 1/32 R
√ INDICATES 250 FINISH
TOLERANCES ARE:

DIMENSION	UNDER 6	6-18	OVER 18
DECIMALS	± .005	± .005	± .010
FRACTIONS	± 1/64	± 1/32	± 1/16

TOLERANCE ON ANGLES ± 2½°

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR : CV600 SERIES VALVE

MOORE BOOSTER RELAY ACCESSORY KIT

DFTSMN G S C	DATE 5-29-79	APPD. DSGN. ARP	DATE 5-31-79
CHECKED WEA	DATE 5-30-79	MFG.	DATE
	DATE		DATE

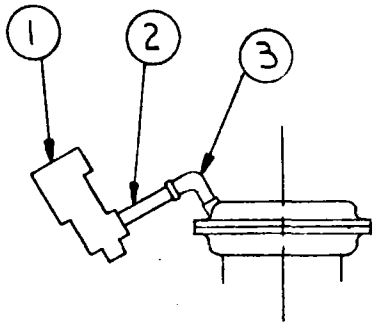
MASTER ASSY / SUB ASSY	
JOB NO.	
REPRO FROM	
PART CODE 3	SCALE ~ DWG. NO. M-189658 REV. 1

4.1.55-142

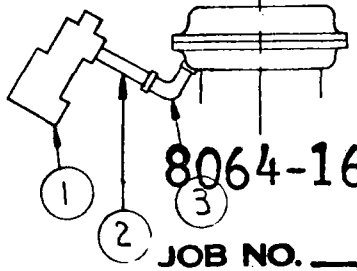
LIST OF MATERIAL

ITEM NO.	QTY	PART NO.	PART CODE	DESCRIPTION	REMARKS
1	1	~~M4546~~	~~3~~	ASCO SOLENOID VALVE	MOD. ~~8302C26~~
2	1	4-1181	3	NIPPLE	1/4" x 3" LONG
3	1	6359	3	STREET ELL	1/4"

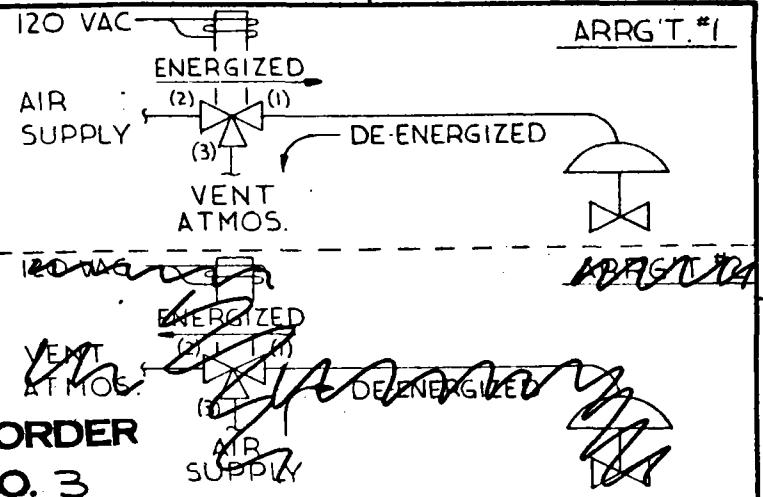
AS CALLED FOR ON SHOP ORDER HB8302A81F



MOUNTED ON DIRECT ACTING ACTUATOR



MOUNTED ON REVERSE ACTING ACTUATOR



SHOP ORDER ITEM NO. 3

8064-16895

JOB NO. _____

MKD. BY T.S. DATE 1-14-81

~~MKD.~~ BY DJW DATE 1-22-81

~~DIRECT ACTUATOR~~ ~~ACTION~~	~~ARRG'T #~~
~~CLOSE-ENERGIZED~~	~~1~~
~~CLOSE-DE-ENERGIZED~~	~~2~~
~~OPEN-ENERGIZED~~	~~2~~
~~OPEN-DE-ENERGIZED~~	~~1~~

REVERSE ACTUATOR ACTION	ARRG'T. #
~~CLOSE-ENERGIZED~~	~~2~~
~~CLOSE-DE-ENERGIZED~~	~~1~~
OPEN ENERGIZED	1
~~OPEN-DE-ENERGIZED~~	~~2~~

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: CV600 SERIES VALVE

ASCO SOLENOID VALVE

ACCESSORY KIT

NO	DATE	REVISIONS	BY	CHK
~~1~~	~~7-18-80~~	~~P/N 4181 WAS 6829 PER ENG CHG C25C~~	~~DR~~	~~WW~~

DFTSMN R.S DATE 5-31-79 JOB NO. _____
CHECKED WES DATE 6-5-79 SCALE ~~1~~
APPD. ARP DATE 6-5-79

REPRO FROM _____ PART CODE ~~3~~

DWG. NO. M-189702 REV. ~~1~~

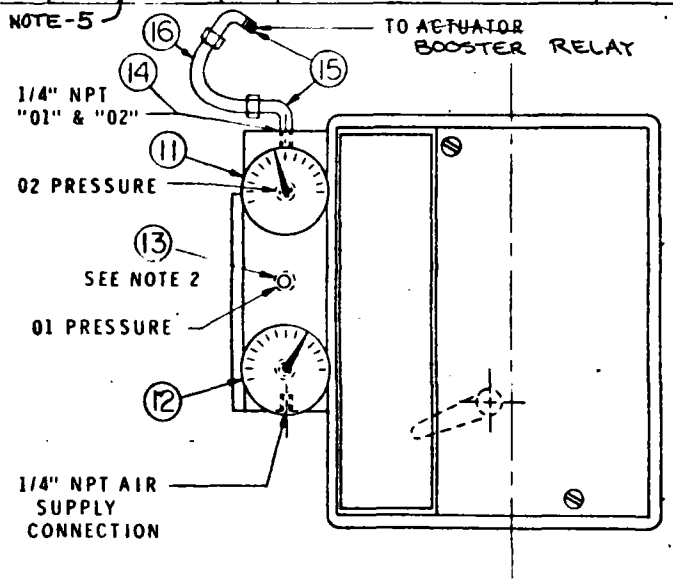
4.1.55-143

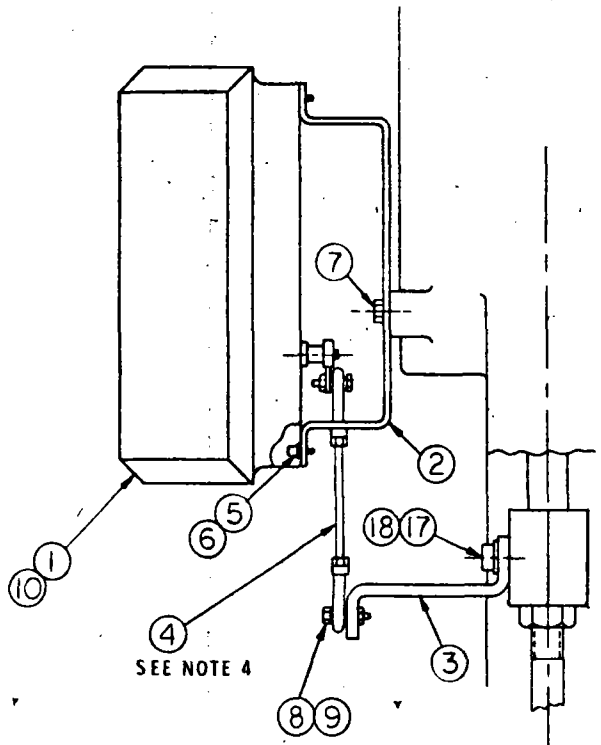
MKD

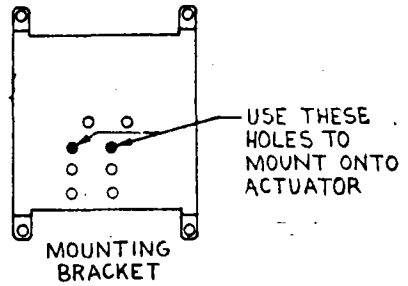
ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L	MAT'L SPEC.	DWG. NO.	REMARKS
1	1	189681	3	POSITIONER				BAILEY AP5
2	1	177717	3	MOUNTING BRACKET	STEEL	COM'L	L-177717	.120 THICK
3	1	189719	3	CONTROL BRACKET	STEEL	ASTM-A108	M-189719	
4	1	133456	3	CONNECTING LINK ASS'Y.			M-133456	
5	4	5754	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		1/4"-20 UNC x 1" LG.
6	4	60052	3	LOCKWASHER	STEEL	COM'L		1/4"
7	2	4862	3	HEX HEAD CAP SCREW	STEEL	COM'L		5/16"-18 UNC x 5/8" LG.
8	2	5645	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		#10-24 UNC x 1" LG.
9	2	5650	3	HEX NUT	STEEL	COM'L		#10-24 UNC
10	1	NOTE-1		CAM				HALF RISE CAM (1/2"-2" TRAVEL)
11	1	~~130599~~	→	VALVE GAUGE				0-100 PSI
12	1	~~129670~~	→	INSTRUMENT GAUGE				0-30 PSI
13	1	5488	3	PIPE PLUG	STEEL	COM'L		1/8" NPT
14	1	79557	3	PIPE PLUG	STEEL	COM'L		1/4" NPT
15	2	~~14850~~	→	TUBE ELBOW	BRASS	~~PARKER66BTX~~		3/8" O.D. x 1/4" IPT
16	1.5'	50141	3	TUBING	COPPER			3/8 O.D.
17	1	41383	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		3/8"-16-UNC x 1/2" LG.
18	1	188769	3	WASHER	STEEL	COM'L		13/32" I.D. x 13/16" O.D. x 1/16" THK

NOTE-1

NOTE-5







NOTES:

1. FURNISHED WITH POSITIONER.
2. PRESSURE CONNECTIONS:
   01-OUTPUT-D.A. POSITIONER
   02-OUTPUT-R.A. POSITIONER
3. DIRECT ACTING POSIT.-CONNECT 01 TO ACTUATOR & PLUG 02
   REVERSE ACTING POSIT.-CONNECT 02 TO ACTUATOR, & PLUG 01
4. THE CONTROL ROD SUPPLIED WITH THE POSITIONER SHOULD BE CUT TO 2-5/8" LONG.
5. AS CALLED FOR ON SHOP ORDER.

JOB NO. 8064-16895
MKD. BY BTM DATE 1-19-81
CKD. BY DJW DATE 1-19-81
SHOP ORDER
ITEM NO. 1,7

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: 40 " & 60 " D.A. CV-600 ACTUATORS

ACCESSORY KIT
BAILEY AP-5 POSITIONER

NO.	DATE	REVISIONS	BY	CHK.
1	7-18-79	ITEM NO. 6 P/N WAS 34943 (#10-24 UNF x 7/8" LG HEX HEAD CAP SCREW) ITEM NO. 8 P/N WAS 41319 (#10-32 UNF HEX NUT) PER ENG. CHG. 6256	DR	WEA

NO.	DATE	REVISIONS	BY	CHK.

REF:
SK-DES-9218-M
SK-DES-9220-M

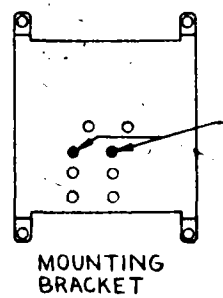
REPRO FROM
PART CODE 5

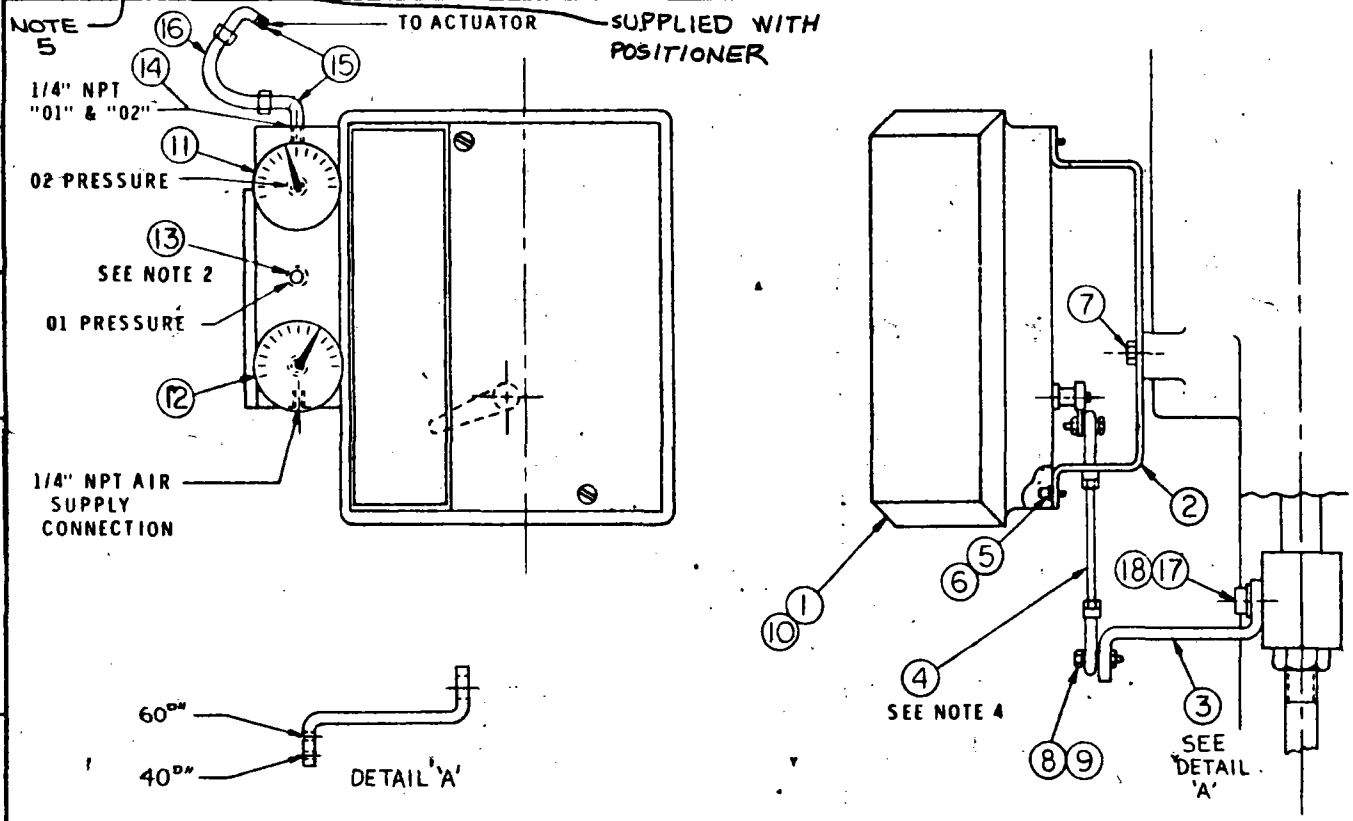
DFTSMN JHR DATE 6-6-79
CHECKED WEA DATE 6-12-79
VSC DATE 6-12-79
JOB NO.
SCALE

DWG. NO. L-189727-MKD REV: 1

4.1.55-144

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT	MAT SPEC.	NOTES	REMARKS
1	1	189681	3	POSITIONER				BAILEY AP5
2	1	177717	3	MOUNTING BRACKET	STEEL	COM'L	L-177717	.120 THICK
3	1	189720	3	CONTROL BRACKET	STEEL	ASTM-A108	M-189720	
4	1	133456	3	CONNECTING LINK ASS'Y.				
5	4	5754	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		1/4"-20 UNC x 1" LG.
6	4	60052	3	LOCKWASHER	STEEL	COM'L		1/4"
7	2	4862	3	HEX HEAD CAP SCREW	STEEL	COM'L		5/16"-18 UNC x 5/8" LG.
8	2	5645	3	SOC HEAD CAP SCREW	STEEL	COM'L		#10 - 24 UNC x 1" LG.
9	2	5650	3	HEX NUT	STEEL	COM'L		#10 - 24 UNC
10	1	NOTE-1		CAM				HALF RISE CAM (½"-2" TRAVEL)
11	1	~~130299~~	3	VALVE GAUGE				0-100 PSI
12	1	~~124670~~	3	INSTRUMENT GAUGE				0-30 PSI
13	1	5488	3	PIPE PLUG	STEEL	COM'L		1/8" NPT
14	1	79557	3	PIPE PLUG	STEEL	COM'L		1/4" NPT
15	2	~~74830~~	=	TUBE ELBOW	BRASS	~~PARKERIZED~~		3/8" O.D. x 1/4" NPT
16	1.5'	50141	3	TUBING	COPPER			3/8 O.D.
17	1	41383	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		3/8"-16-UNC x 1/2" LG.
18	1	188769	3	WASHER	STEEL	COM'L		13/32" I.D. x 13/16" O.D. x 1/16" THK





NOTES:

1. FURNISHED WITH POSITIONER.
2. PRESSURE CONNECTIONS:
   01-OUTPUT-D. A. POSITIONER
   02-OUTPUT-R. A. POSITIONER
3. DIRECT ACTING POSIT. -CONNECT 01 TO ACTUATOR & PLUG 02
   REVERSE ACTING POSIT. -CONNECT 02 TO ACTUATOR, & PLUG 01
4. THE CONTROL ROD SUPPLIED WITH THE POSITIONER SHOULD BE CUT TO 2-5/8" LONG.
5. AS CALLED FOR ON SHOP ORDER.

8064-16895
JOB NO.
CKD. BY T.S. DATE 1-16-81
CKD. BY DJW DATE 1-22-81
SHOP ORDER
ITEM NO. 4, 6, 9

COPES-VULCAN, INC.
One of the Wheatley Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: 40" & 60" R.A. CV-600 ACTUATORS

ACCESSORY KIT,
BAILEY AP-5 POSITIONER

NO.	DATE	REVISIONS	BY	CHK.
4	7-6-79	~~ITEM NO 9 PER WAG 3981 (10-24 ONLY 5/8 LG HEX HEAD CAP SCREW IT PLUG 8 WAS USED ON 2 SIZES)~~	~~DK~~	~~DJW~~

NO.	DATE	REVISIONS	BY	CHK.

REF:
SK-DES-9219-M
SK-DES-9221-M

REPRO FROM
PART CODE =

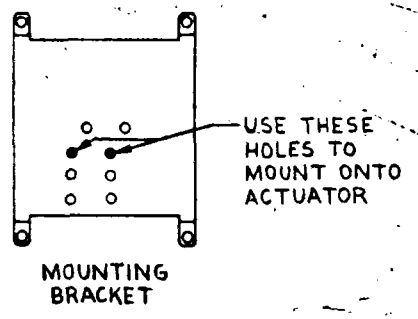
DFTSMN JHR DATE 6-6-79
CHECKED DJW DATE 6-12-79
JSC DATE 6-12-79
JOB NO.
SCALE

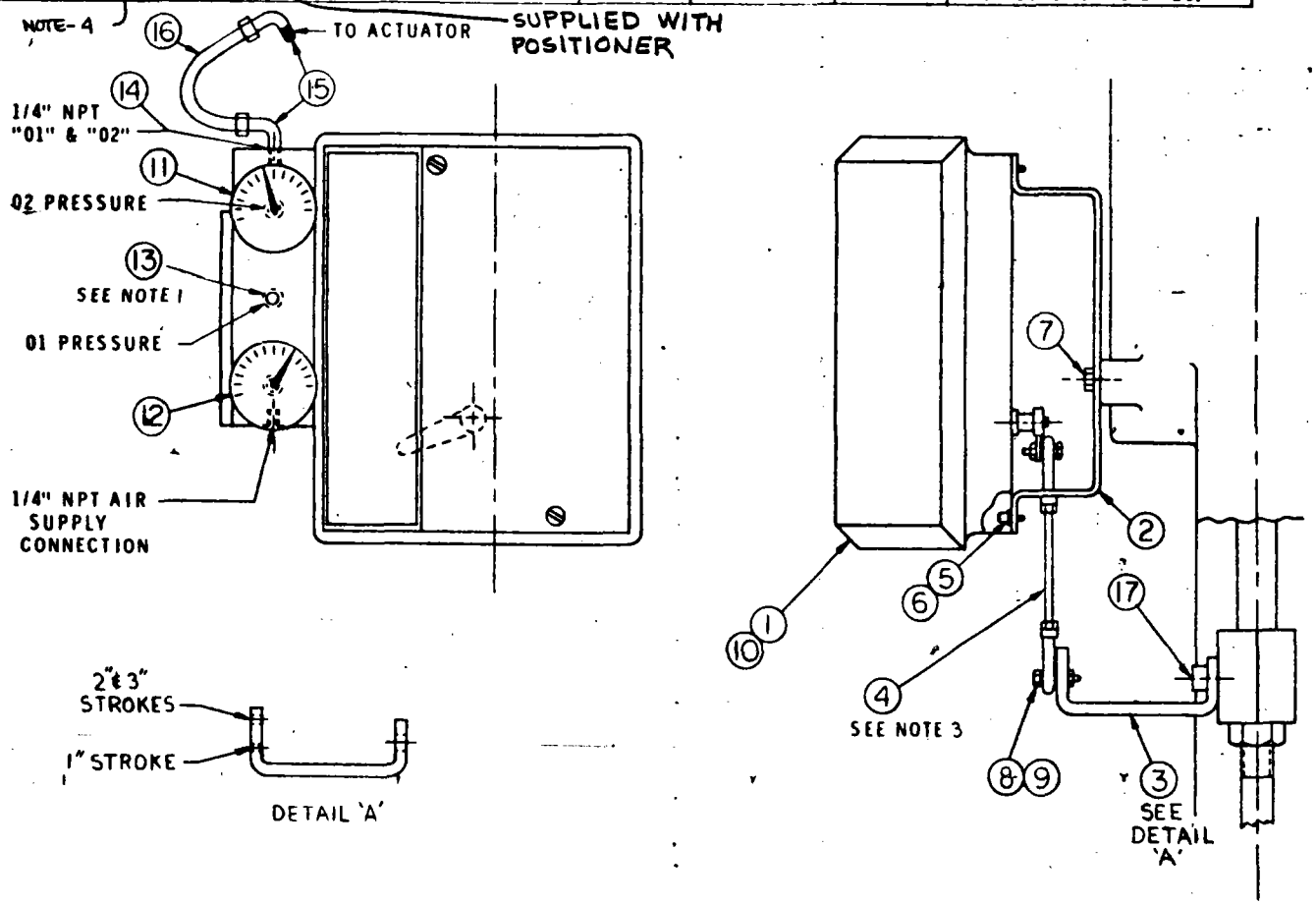
DWG. NO. L-189728 REV. =

CMKD

4.1.55-145 B

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MATL	MATL SPEC.	DWG. NO.	REMARKS
1	1	189681	3	POSITIONER				BAILEY AP5
2	1	177717	3	MOUNTING BRACKET	STEEL	COM'L	L-177717	.120 THICK
3	1	189721	3	CONTROL BRACKET	STEEL	ASTM-A108	M-189721	
4	1	133456	3	CONNECTING LINK ASS'Y.				
5	4	5754	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		1/4"-20 UNC x 1" LG.
6	4	60052	3	LOCKWASHER	STEEL	COM'L		1/4"
7	2	4862	3	HEX HEAD CAP SCREW	STEEL	COM'L		5/16"-18 UNC x 5/8" LG.
8	2	5645	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		#10 - 24 UNC x 1" LG.
9	2	5650	3	HEX NUT	STEEL	COM'L		#10 - 24 UNC
10	1	178454	3	CAM				FULL RISE CAM (1"-4" TRAVEL)
11	1	~~130389~~	~~3~~	VALVE GAUGE				0-100 PSI
12	1	~~129679~~	~~3~~	INSTRUMENT GAUGE				0-30 PSI
13	1	5488	3	PIPE PLUG	STEEL	COM'L		1/8" NPT
14	1	79557	3	PIPE PLUG	STEEL	COM'L		1/4" NPT
15	2	~~14858~~	~~3~~	TUBE ELBOW	BRASS	~~PARKER/MCRDX~~		3/8" O.D. x 1/4" IPT
16	2	50141	3	TUBING	COPPER			3/8 O.D.
17	1	41383	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		3/8"-16-UNC x 1/2" LG.





NOTES:

1. PRESSURE CONNECTIONS:
   01-OUTPUT-D. A. POSITIONER
   02-OUTPUT-R. A. POSITIONER
2. DIRECT ACTING POSIT. -CONNECT 01 TO ACTUATOR & PLUG 02
   REVERSE ACTING POSIT. -CONNECT 02 TO ACTUATOR, & PLUG 01
3. THE CONTROL ROD SUPPLIED WITH THE POSITIONER SHOULD BE CUT TO 2-5/8" LONG.
4. AS CALLED FOR ON SHOP ORDER.

JOB NO. 8064-16895
MKD. BY BLM DATE 1-15-81
CKD. BY DJW DATE 1-22-81
SHOP ORDER
ITEM NO. 5, 8

COPES-VULCAN, INC.
One of the Waste Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: 100 "(D. A. & R. A.) AND 160 "(D. A. ONLY) CV- 600 ACTUATORS

ACCESSORY KIT
BAILEY AP-5 POSITIONER

NO.	DATE	REVISIONS	BY	CHK
1	7-10-79	ITEM NO 8 P/N WAS 3993 (3/8-32 UNFX 7/8 LG. HEX HEAD CAP SCREW) ITEM NO 9 P/N WAS 4131 (#10-32 UNF HEX NUT PLATED CHR. 6276)	D.G.	LVS

NO.	DATE	REVISIONS	BY	CHK.

REF: SK-DES-9222-M
SK-DES-9223-M
SK-DES-9224-M

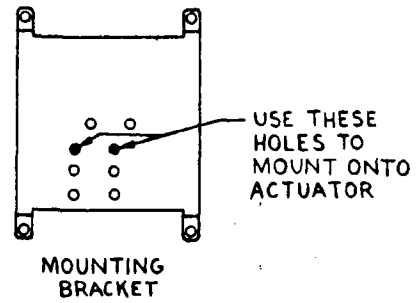
REPRO FROM
PART CODE 3

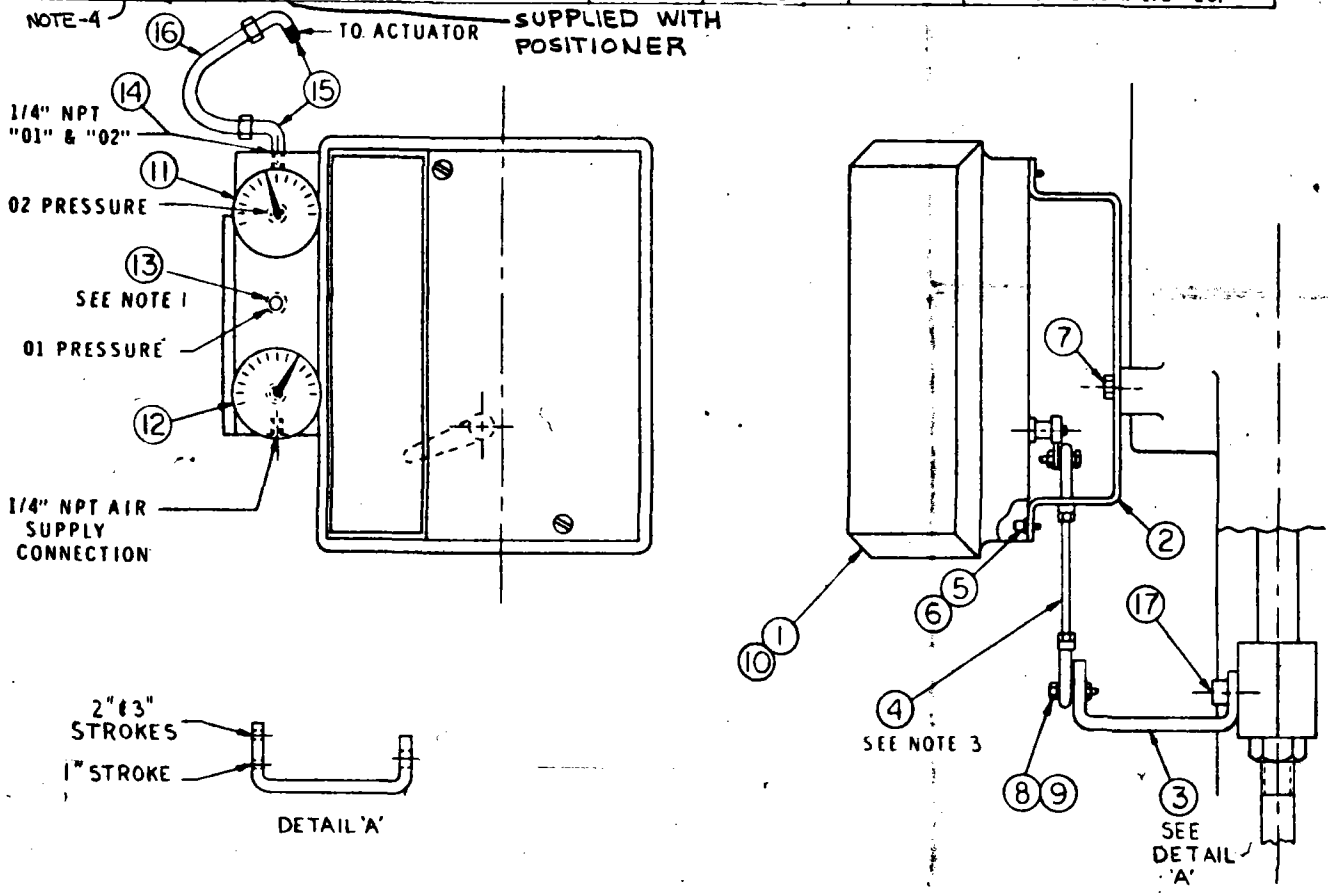
DFTSMN JHR DATE 6-5-79
CHECKED WEA DATE 6-12-79
JSC DATE 6-12-79
JOB NO.
SCALE

DWG. NO. L-189729 MKD REV. 1

4.1.55-146

NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MATERIAL	SPEC.	DWG.	REMARKS
1	1	189681	3	POSITIONER				BAILEY AP5
2	1	177717	3	MOUNTING BRACKET	STEEL	COM'L	L-177717	.120 THICK
3	1	189722	3	CONTROL BRACKET	STEEL	ASTM-A108	M-189722	
4	1	133456	3	CONNECTING LINK ASS'Y.			M-133456	
5	4	5754	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		1/4"-20 UNC x 1" LG.
6	4	60052	3	LOCKWASHER	STEEL	COM'L		1/4"
7	2	4862	3	HEX HEAD CAP SCREW	STEEL	COM'L		5/16"-18 UNC x 5/8" LG.
8	2	5645	3	SOC HEAD CAP SCREW	STEEL	COM'L		#10 - 24 UNC x 1" LG.
9	2	5650	3	HEX NUT	STEEL	COM'L		#10 - 24 UNC
10	1	178454	3	CAM				FULL RISE CAM (1"-4" TRAVEL)
11	1	~~130299~~	~~3~~	VALVE GAUGE				0-100 PSI
12	1	~~129670~~	~~3~~	INSTRUMENT GAUGE				0-30 PSI
13	1	5488	3	PIPE PLUG	STEEL	COM'L		1/8" NPT
14	1	79557	3	PIPE PLUG	STEEL	COM'L		1/4" NPT
15	2	~~14850~~	~~3~~	TUBE ELBOW	BRASS	~~PARKER/CRTX~~		3/8" O.D. x 1/4" IPT
16	2	50141	3	TUBING	COPPER			3/8 O.D.
17	1	41383	3	SOCKET HEAD CAP SCREW	STEEL	COM'L		3/8"-16-UNC x 1/2" LG.





NOTES:

1. PRESSURE CONNECTIONS:
   01-OUTPUT-D. A. POSITIONER
   02-OUTPUT-R. A. POSITIONER
2. DIRECT ACTING POSIT. -CONNECT 01 TO ACTUATOR & PLUG 02
   REVERSE ACTING POSIT. -CONNECT 02 TO ACTUATOR, & PLUG 01
3. THE CONTROL ROD SUPPLIED WITH THE POSITIONER SHOULD BE CUT TO 2-5/8" LONG.
4. AS CALLED FOR ON SHOP ORDER.

JOB NO. 8064-16895
MKD BY GDM DATE 1-21-81
CHD BY DJW DATE 1-21-81

SHOP. ORDER
ITEM NO. 2

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA U.S.A.

FOR: 160 " R. A. CV-600 ACTUATORS

ACCESSORY KIT
BAILEY AP-5 POSITIONER

NO.	DATE	REVISIONS	BY	CHK
+	7-18-79	ITEM NO 2 P/N WAS 3991310-32 UNF x 3/8 LG. HEX HEAD CAP SCREW) ITEM NO 3 P/N WAS 4131940-32 UNF HEX NUT) PER ENG CHG L2558	DR	DJW

NO.	DATE	REVISIONS	BY	CHK

REF: SK-DES-9225-M
REPRO FROM
PART CODE 3

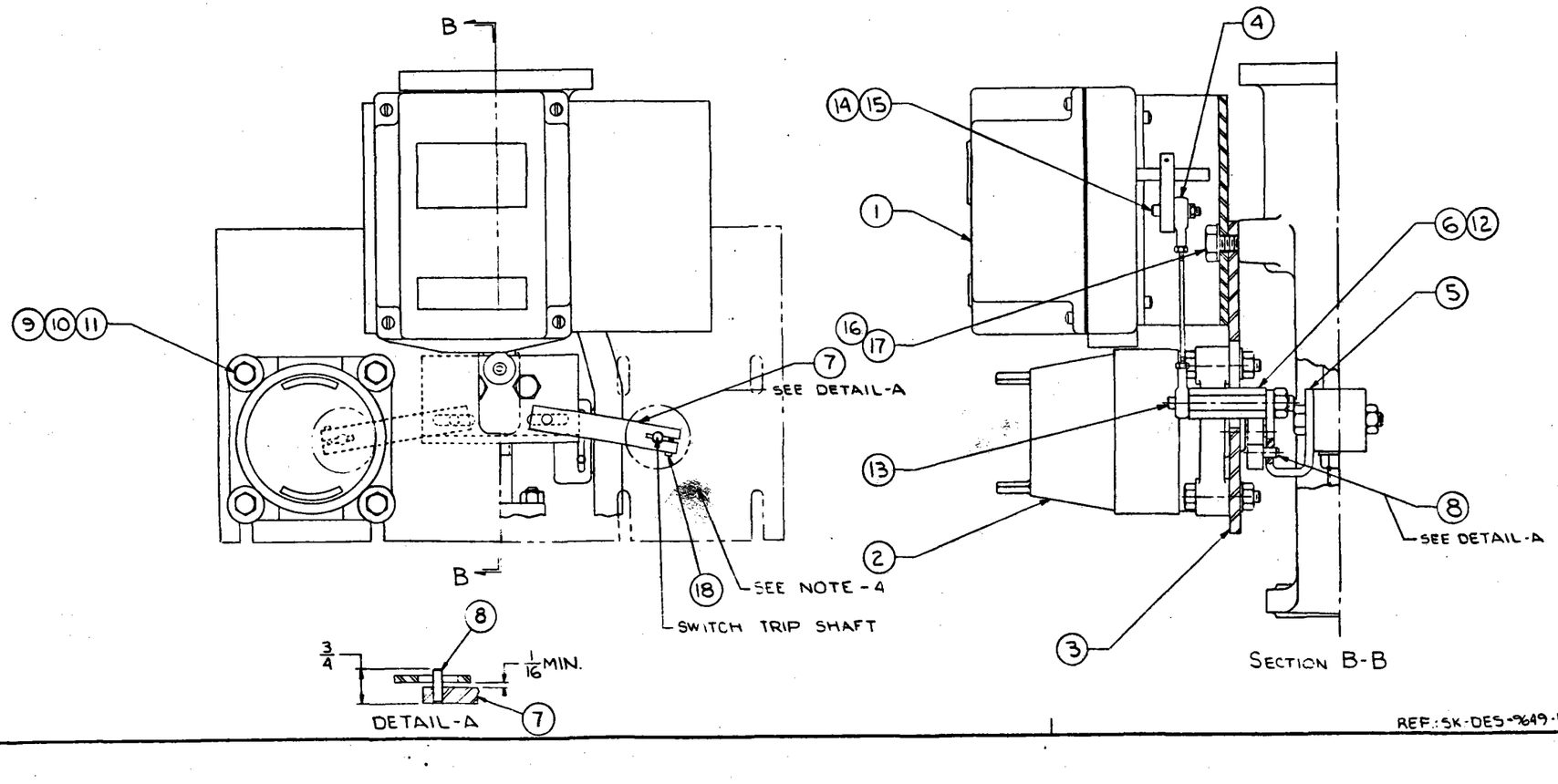
DFTSMN JHR DATE 6-6-79
CHECKED DJW DATE 6-12-79
JSC DATE 6-12-79
JOB NO.
SCALE

DWG. NO. L-189730-MKD REV. +

4.1.55-147 B

LIST OF MATERIALS

ITEM NO.	NO. REQ'D.	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
1	1	161153	5	POSITION TRANSMITTER			L-161153	COPES TYPE LVDT
2	2	NOTE-1	—	MICRO SWITCH				MODEL* 1CX42
3	1	196330	5	MOUNTING PLATE	STEEL	ASTM-A36	L-196330	1/4" THK.
4	1	133456	3	CONNECTING LINK ASS'Y.			M-133456	NOTE-2
5	1	196329	5	TRIP BRKT.	STEEL	COM'L.	L-196329	3/16" THK.
6	1	196487	5	CONTROL ARM	STEEL	ASTM-A108	S-196487	
7	2	190312	5	OPERATING ARM	STEEL	ASTM-A108	M-190312	
8	2	196331	5	DOWEL PIN	STEEL	COM'L.	S-196331	
9	8	79537	3	HEX HD. CAP SCR.	STEEL	COM'L.		1/4"-20 UNC x 2-1/4" LG.
10	8	41333	3	HEX NUT	STEEL	COM'L.		1/4"-20 UNC
11	8	60052	3	LOCK WASHER	STEEL	COM'L.		1/4"-SPRING TYPE
12	1	17596	3	HEX NUT	STEEL	COM'L.		3/8"-16 UNC
13	1	14926	3	SOC. HD. CAP SCR.	STEEL	COM'L.		#10-24 UNF X 5/8 LG.
14	1	62193	3	RD. HD MACH. SCR.	STEEL	COM'L.		#10-32 UNF x 3/4" LG.
15	1	41319	3	HEX NUT	STEEL	COM'L.		#10-32 UNF
16	2	40920	3	HEX HD. CAP SCREW	STEEL	COM'L.		5/16"-18 UNC x 1 1/4" LG.
17	2	59404	3	LOCK WASHER	STEEL	COM'L.		5/16"-SRRING TYPE
18	2	174583	3	PAN HD. MACH. SCREW	STEEL	COM'L.		#8-32UNC x 5/8" LG.
19								
20								



REVISIONS					
NO	DESCRIPTION	REV. BY	CK'D BY	DATE	APPD

NOTES:

1. AS CALLED FOR ON SHOP ORDER
2. THE CONNECTING LINK ASSEMBLY (ITEM-4) MAY REQUIRE CUTTING TO LENGTH TO SUIT THE APPLICATION
3. POSITION TRANSMITTER OPERATION TO BE ADJUSTED AND ALIGNED BY SLIDING THE UNIT ON ITS MTG. SLOT AND ROTATING THE LINKAGE ARM ON ITS SHAFT.
4. RIGHT SWITCH REMOVED TO SHOW DETAIL OF ARM.

MATERIAL

STOCK NO. AMOUNT REQ'D

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
BREAK CORNERS 1/64 MAX.
FILLETS ARE 1/64 TO 1/32 R
✓ INDICATES 250 FINISH
TOLERANCES ARE:

DIMENSION	UNDER 6	6 - 18	OVER 18
DECIMALS	± .005	± .005	± .010
FRACTIONS	± 1/64	± 1/32	± 1/16

TOLERANCE ON ANGLES ± 2½°

COPES-VULCAN, INC.
A div. of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

FOR: 40" D.A. CV-600 ACTUATORS

ACCESSORY KIT

2-MICRO SWITCHES MODEL* 1CX42, & 1-COPES LVDT POSITION TRANSMITTER

E-195844
MASTER ASSY | SUB ASSY
JOB NO 8064-16895
REPRO FROM
PART CODE 5

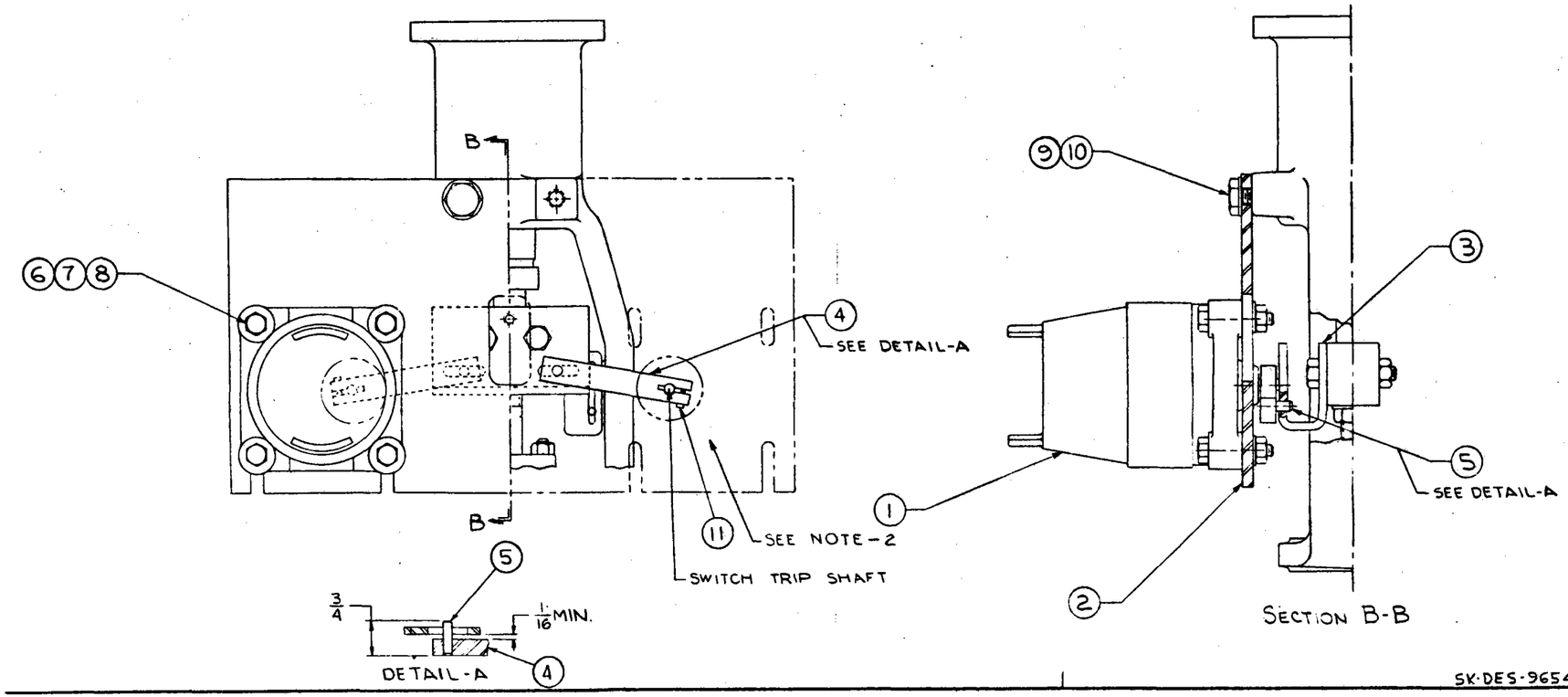
DFTSMN G D M DATE 1-5-81
CHECKED D J W DATE 1-21-81
DATE
APPD
DSGN. J.N. DATE 1-21-81
MFG. DATE
DATE

SCALE NONE | DWG. NO. E-196328 | REV. 0

REF.: SK-DES-9649-E

LIST OF MATERIALS

ITEM NO.	NO. REQ'D.	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
1	2	NOTE-1	—	MICRO SWITCH				MODEL* 1CX42
2	1	196330	5	MOUNTING PLATE	STEEL	ASTM-A36	L-196330	1/4" THK.
3	1	196397	5	TRIP BRKT.	STEEL	COM'L.	L-196397	3/16" THK.
4	2	190312	5	OPERATING ARM	STEEL	ASTM-A108	M-190312	
5	2	196331	5	DOWEL PIN	STEEL	ASTM-A108	S-196331	
6	8	79537	3	HEX HD. CAP SCR.	STEEL	COM'L.		1/4"-20UNC x 2-1/4" LG.
7	8	41333	3	HEX NUT	STEEL	COM'L.		1/4"-20UNC
8	8	60052	3	LOCK WASHER	STEEL	COM'L.		1/4" SPRING TYPE
9	2	21424	3	HEX HD. CAP SCR.	STEEL	COM'L.		5/16"-18UNC x 1" LG.
10	2	59404	3	LOCK WASHER	STEEL	COM'L.		5/16" SPRING TYPE
11	2	174583	3	PAN HD. MACH. SCR.	STEEL	COM'L.		#8-32UNC x 5/8" LG.
12								
13								
14								
15								
16								
17								
18								
19								
20								



SK-DES-9654-L

REVISIONS					
NO.	DESCRIPTION	REV. BY	CK'D BY	DATE	APPD

NOTES:

1. AS CALLED FOR ON SHOP ORDER
2. RIGHT SWITCH REMOVED TO SHOW DETAIL OF ARM.

MATERIAL

STOCK NO. AMOUNT REQ'D

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
BREAK CORNERS 1/64 MAX.
FILLETS ARE 1/64 TO 1/32 R
✓INDICATES 250 FINISH
TOLERANCES ARE:

DIMENSION	UNDER 6	6 - 18	OVER 18
DECIMALS	± 005	± 005	± 010
FRACTIONS	± 1/64	± 1/32	± 1/16

TOLERANCE ON ANGLES ± 2½°

COPES-VULCAN, INC.
A div. of the WHITE Corporation for Industries
LAKE CITY (ERIE CO.) PA. U.S.A.

FOR: 40" R.A. CV-600 ACTUATORS

ACCESSORY KIT

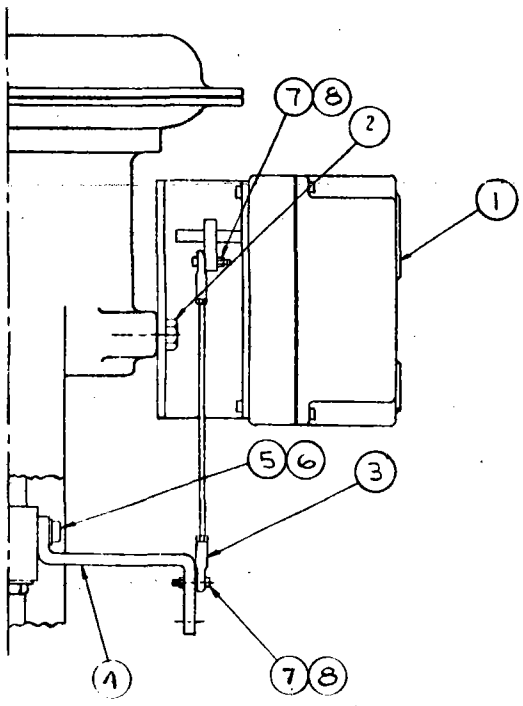
2-MICRO SWITCHES MODEL* 1CX42

MASTER ASSY	SUB ASSY	DFTSMN GDM	DATE 1-5-81	DSGN. [illegible]R	DATE 1-27-81
JOB NO 8064-16895		CHECKED DJW	DATE 1-30-81	MFG.	DATE
REPRO FROM			DATE		DATE
	PART CODE 5	SCALE	DWG. NO. E-196396		REV. 0

ITEM NO.	NO REQ'D.			PART NO.	PART CODE	DESCRIPTION	MATERIAL	MATERIAL SPEC.	DWG. NO.	REMARKS
1	1	1	1	161153	5	POSITION TRANSMITTER			L-161153	COPES TYPE LVDT
2	2	2	2	4862	3	HEX HD. CAP SCREW	STEEL	COM'L		5/16-18UNC x 5/8 LG.
3	1	1	1	133456	3	CONNECTING LINK ASS'Y.			M-133456	NOTE-1
4	1			189720	3	CONTROL BRACKET	STEEL	ASTM-A36	M-189720	
		1		189719	3		STEEL	ASTM-A36	M-189719	
			1	196444	5		STEEL	ASTM-A36	M-196444	
5	1	1	1	41383	3	SOC. HD. CAP SCREW	STEEL	COM'L.		3/8"-16UNC x ½" LG.
6	1	1	1	188769	3	LOCKWASHER	STEEL	COM'L.		3/8" SPRING TYPE
7	2	2	2	5645	3	SOC. HD. CAP SCREW	STEEL	COM'L.		#10-24UNC x 1" LG.
8	2	2	2	5650	3	HEX NUT	STEEL	COM'L.		#10-24UNC

NOTE:
1. THE CONNECTING LINK ASSEMBLY (ITEM-3) MAY REQUIRE CUTTING TO LENGTH TO SUIT THE APPLICATION

196443
196442
196441



REF: SK-DES-9659-M
SK-DES-9660-M
SK-DES-9661-M
SK-DES-9662-M

196443	160°" R.A. ACT.
196442	40, 60, 100°" D.A. ACT.
196441	40, 60, 100°" R.A. ACT. 160°" D.A. ACT.

ACCESSORY KIT PART NUMBERS

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.) PA U.S.A.

FOR: CV-600 ACTUATORS

LVDT POSITION TRANSMITTER ACCESSORY KIT

NO.	DATE	REVISIONS	BY	CHK.

NO.	DATE	REVISIONS	BY	CHK.

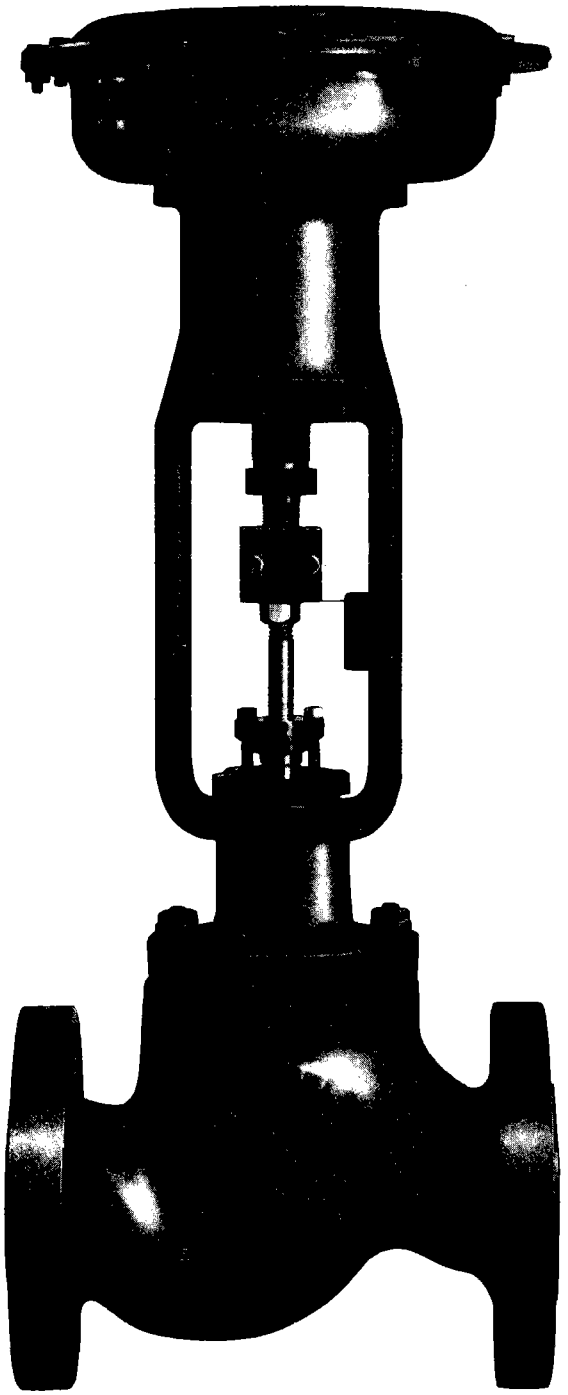
DFTSMN GDM DATE 11-5-81
CHECKED DJW DATE 11-21-81
APP'D. JNK DATE 11-21-81
JOB NO. 8064-16895
SCALE NW

REPRO FROM L-187130
PART CODE 5

DWG. NO. L-196440 REV. 0

4.1.55,152 B

INSTRUCTIONS



CV600
Control Valve Series

DIAPHRAGM-ACTUATED CONTROL VALVE

FORM #01:P126:37

COPES-VULCAN
One of the White Consolidated Industries
WCI
P. O. Box 577 · Lake City, Pa. 16423

4.1.55-153

CV600 DIAPHRAGM ACTUATED CONTROL VALVE

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SECTION 1
INSTALLATION

Reference Figure 1 for installation dimensions.

The following instructions should be read carefully before installing the CV600 Control Valve Assembly.

Check the piping size connecting the valve in the system. It should be large enough to allow the major pressure drop to occur at the valve.

Whenever possible, the CV600 Control Valve Assembly should be mounted with the actuator located above the valve. However, if necessary, the valve may be installed either vertically or horizontally in a line.

Never clamp the valve body in a vise, since permanent distortion may occur, resulting in a damaged valve.

Check the valve installation to assure that the flow enters the valve at the end marked *'inlet'.*

1.1 VALVES WITHOUT POSITIONERS

Only one (1) air line connection is required for the CV600 valve when the valve is utilized without a positioner. Irrespective of actuator action, i.e., reverse or direct, the actuator cover is provided with a 1/4" N.P.T. tapped hole to receive the control signal pressure line connection. 1/4" O.D. copper tubing is recommended for the control signal pressure line.

NOTE: Maximum air to the diaphragm chamber should not exceed 80 psig.

1.2 VALVES WITH POSITIONERS

Two (2) air line connections are required for the CV600 valve with a positioner.

1. A clean, dry air supply (40 psig or higher) should be connected to an air filter and pressure reducing valve. The output from the air reducing valve should then be connected to the positioner at the 1/4" N.P.T. port marked *'supply'.* 3/8" O.D. copper tubing is recommended for this air supply line. The air supply pressure reducing valve should then be adjusted for the necessary pressure to the positioner (not to exceed 80 psig).

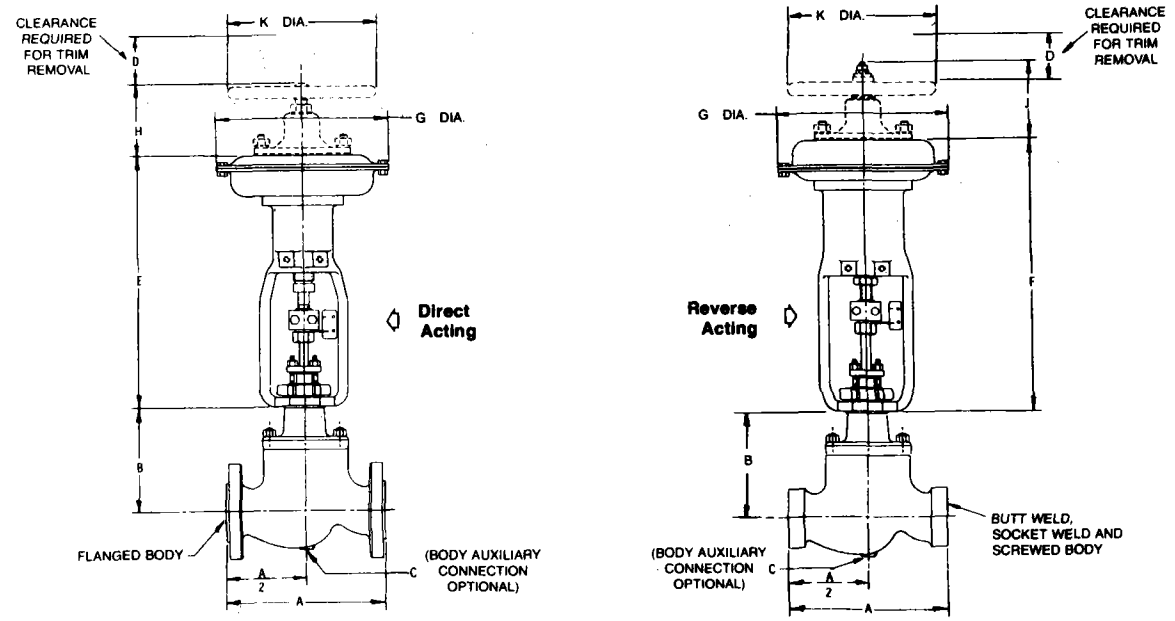
2. The control signal pressure line should be connected to the positioner at the 1/4" N.P.T. port marked *'instrument'.* 1/4" O.D. copper tubing is recommended for the control signal pressure line.

SECTION 2
DESCRIPTION OF OPERATION

The operating range of the CV600 valve is the difference in air pressure required to drive the valve through its full stroke. This operating range is determined by the range spring rating. The standard spring ratings are 24 psig and 12 psig. The 24 psig rating is factory adjuted for a standard operating range of 6 psig to 30 psig. The 12 psig rating is factory adjusted for a standard range of 3 psig to 15 psig. A 20 psig to 40 psig range spring is also available as standard on reverse-acting actuators. The operating range may be raised or lowered by adjusting the spring compression nut.

A handwheel actuator, positioner and limit switches are available as optional equipment of the CV600 valve.

FIGURE 1
DIMENSIONS

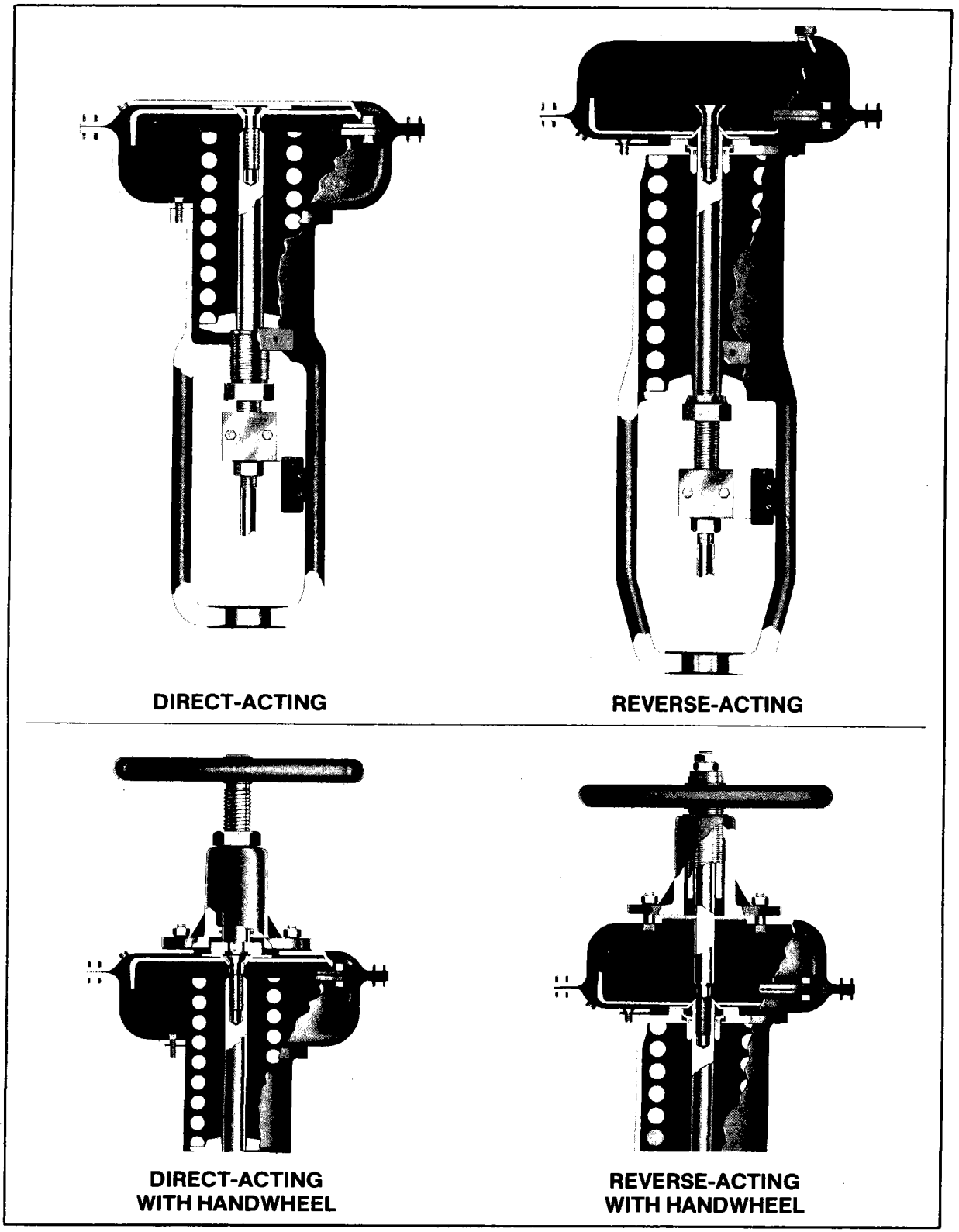


DIMENSIONS			A					B	C (NPT)	D
			SCREWED ① and SOC. WELD	BUTT WELD ②	FLANGED CLASS ③			PRESSURE CLASS		
					125 and 150	250 and 300	400	600	ALL	ALL	ALL
VALVE BODY	INCHES	¾	7⅝	7⅝	7⅜	7⅝	8⅛	8⅛	5 3/16	⅜	2¾
	MM	19	193.6	193.6	187.3	193.6	206.3	206.3	131.7	9.5	69.8
	INCHES	1	7¾	7¾	7¼	7¾	8¼	8¼	5 3/16	⅜	2¾
	MM	25	196.8	196.8	184.4	196.8	209.5	209.5	131.7	9.5	69.8
	INCHES	1½	9¼	9¼	8¾	9¼	9⅞	9⅞	5 7/16	⅜	3
	MM	38	234.9	234.9	222.2	234.9	250.8	250.8	138.1	9.5	76.2
	INCHES	2	10½	10½	10	10½	11¼	11¼	6 5/16	½	3¾
	MM	50	266.7	266.7	254.0	266.7	285.7	285.7	160.3	12.7	95.2
	INCHES	3		12½	11¾	12½	13¼	13¼	8⅜	½	5
	MM	75		317.5	298.4	317.5	336.5	336.5	212.7	12.7	127.0
	INCHES	4		14½	13⅞	14½	15¼	15½	9 9/16	½	6½
	MM	100		368.3	352.4	368.3	387.3	393.7	242.8	12.7	165.1
	INCHES	6		20	17¾	18⅝	19½	20	10 13/16	¾	7¾
	MM	150		508.0	450.8	473.0	495.3	508.0	274.6	19.0	196.8
	INCHES	8		24	21⅜	22⅜	23⅜	24	12 3/16	¾	9
	MM	200		609.6	542.9	568.3	593.7	609.6	309.5	19.0	228.6

DIMENSIONS			E	F	G	H DIRECT ACTING	J REVERSE ACTING	K
VALVE ACTUATOR	CV600-4	INCHES	15¾	16⅛	10	6	6½	10
		MM	400.1	409.6	254.0	152.4	165.1	254.0
	CV600-6	INCHES	18 3/16	19 11/16	11½	6	6½	10
		MM	462.0	499.3	292.1	152.4	165.1	254.0
	CV600-10	INCHES	23⅜	28 5/16	15⅛	10¾	10½	18
		MM	593.7	719.1	384.1	273.0	266.7	457.2
	CV600-16	INCHES	30 1/16	30¾	18	10¾	11½	18
		MM	763.5	781.0	457.2	273.0	292.1	457.2

① Screwed and socket weld ends per ANSI Std. B16.11.
② Butt weld ends per ANSI Std. B16.25.
③ Flanged ends per ANSI Std. B16.5.

FIGURE 2
DIAPHRAGM ACTUATORS



2.1 VALVES WITH POSITIONERS

The CV600 assembly may be designated as reverse or direct action. The action of the CV600 assembly is determined by the individual action of the valve trim, valve actuator and positioner. Changing the action of any one of the individual components will change the action of the assembly. Changing the action of any two of the individual components results in no change of the assembly action.

Refer to Figure 11 for the resulting assembly actions for various component arrangements.

The pneumatic controller signal is directed to the CV600 valve positioner at the port marked *'instrument'*. A change in the pneumatic controller signal results in an output pressure change from the positioner. This change is directed to the diaphragm chamber of the valve actuator causing the valve to be repositioned. As the valve is repositioned a linkage attached from the valve yoke to the positioner causes a feedback force to be exerted on the positioner bellows resulting in a counterbalance of the pneumatic controller signal. The circuit is designed to result in a continued loading change on the valve's diaphragm by the positioner until the valve has actually repositioned itself and has rebalanced the initial pneumatic signal change. This arrangement provides fast, accurate, positive positioning of the valve.

2.2 VALVES WITHOUT POSITIONERS

The action of the CV600 assembly without a positioner is determined by the individual action of the valve trim and valve actuator. Changing any one of the individual components will change the action of the assembly. Refer to Figure 11.

The pneumatic control signal is directed to the diaphragm chamber of the CV600 valve. An increase in the pneumatic controller's signal increases the pressure on the valve diaphragm causing the valve to reposition itself until the range spring is compressed sufficiently to establish equilibrium. Since the counterforce exerted by the range spring varies proportionally to the distance compressed, linear increases in the diaphragm pressure result in a linear repositioning of the valve stem.

SECTION 3
ASSEMBLY

3.1 DIRECT-ACTING

Reference Figure 3.

In a direct-acting actuator, the lower seat of the range spring is supported by the spring adjustor and the upper seat applies its force to the diaphragm plate to force the stem upward. The spring adjustor is screwed up or down over the actuator stem, and the upper part of the actuator stem is fastened to the diaphragm plate. The actuator stem is prevented from turning by the diaphragm plate and stem connector.

The lower diaphragm cover is held to the frame by capscrews, and the two (2) diaphragm covers are held together by capscrews and nuts. Attached to the lower end of the actuator stem is the stem connector, into which the valve stem assembly is screwed and clamped. In the absence of, or upon loss of, air to the diaphragm chamber, the spring exerts its force upward against the diaphragm plate to force the stem upward and the valve into the open position.

An increase in pneumatic loading pressure drives the diaphragm plate and stem assembly downward toward the closed position, when the pressure is sufficient to overcome the counterforce of the spring.

3.2 REVERSE-ACTING

Reference Figure 4.

In a reverse-acting actuator, the upper seat of the range spring is supported by the frame and the lower seat applies its force to the spring adjustor which is screwed onto the lower end of the actuator stem. The upper end of the actuator stem is attached to the diaphragm plate after passing through the frame and lower diaphragm cover. The actuator stem is prevented from turning by the diaphragm plate at the top and the stem connector at the bottom. The lower diaphragm cover is fastened to the frame with capscrews. The two (2) diaphragm covers are held together by capscrews and nuts. Attached to the lower end of the actuator stem is the stem connector, into which the valve stem assembly is screwed and clamped.

In the absence of, or upon loss of, air pressure to the diaphragm chamber, the spring exerts its force downward against the spring adjustor to force the stem downward and the valve into the closed position. An increase in pneumatic loading pressure moves the diaphragm plate in the upward direction, as well as the stem assembly to which it is connected. When the counterforce of the spring is completely overcome the valve is fully open.

SECTION 4
ACTION IDENTIFICATION

4.1 DIRECT-ACTING VALVE

A valve is direct-acting when it closes with valve stem movement toward the valve body and opens with valve stem movement away from the valve body.

4.2 DIRECT-ACTING ACTUATOR

An actuator is direct-acting when an increase in the diaphragm loading pressure causes the valve stem to move toward the valve body.

4.3 REVERSE-ACTING ACTUATOR

An actuator is reverse-acting when an increase in the diaphragm loading pressure causes the valve stem to move away from the valve body.

4.4 DIRECT-ACTING POSITIONER

A positioner is direct-acting when an increase in the pneumatic input signal causes an increase in the positioner output pressure.

4.5 REVERSE-ACTING POSITIONER

A positioner is reverse-acting when an increase in the pneumatic input signal causes a decrease in the positioner output pressure and a decrease in the pneumatic input signal causes an increase in the positioner output pressure.

4.6 DIRECT-ACTING ASSEMBLY

An assembly is direct-acting when an increase in the pneumatic input signal causes valve closing.

4.7 REVERSE-ACTING ASSEMBLY

An assembly is reverse acting when an increase in the pneumatic input signal causes valve opening.

FIGURE 3
DIRECT-ACTING ACTUATOR ASSEMBLY

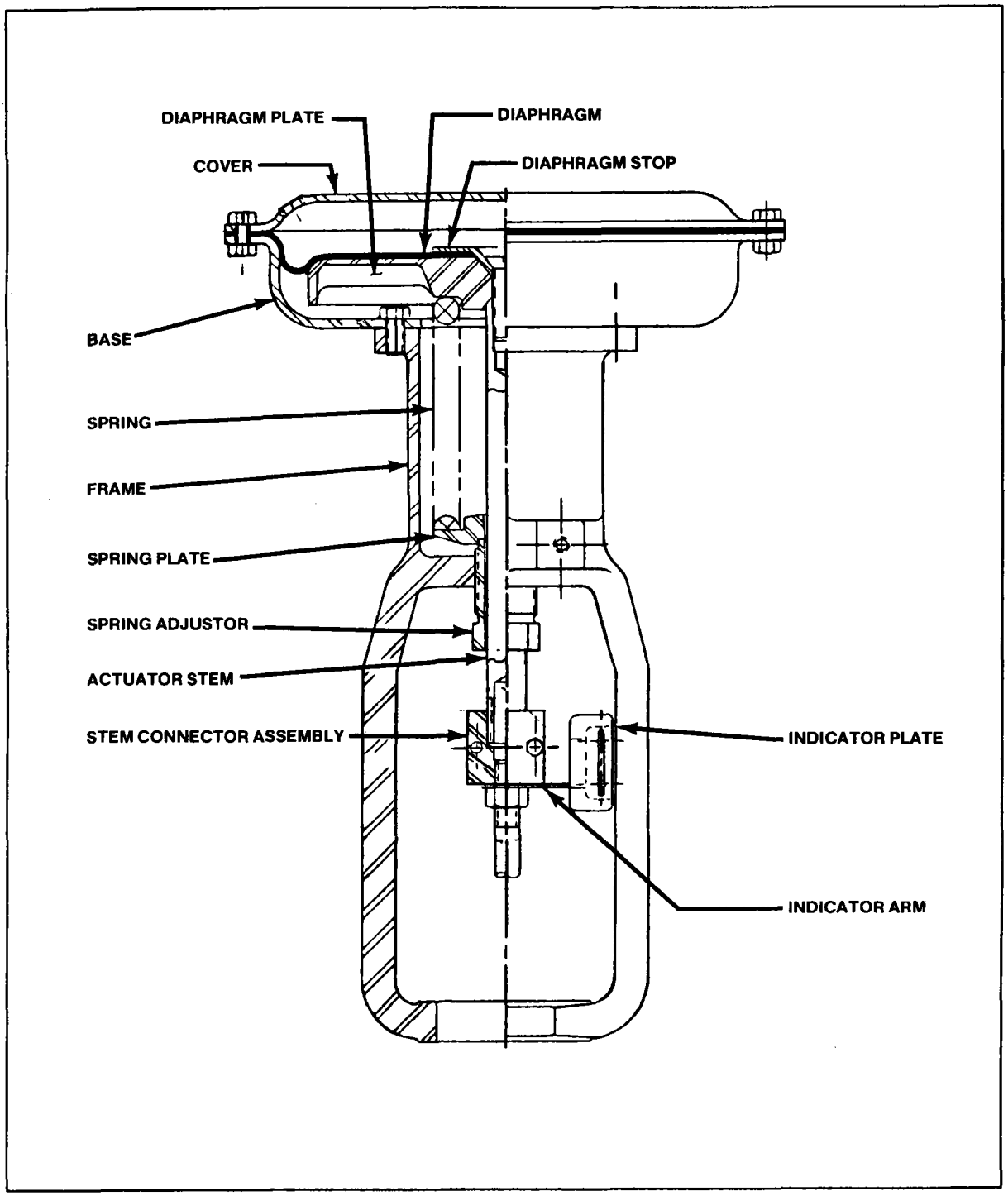
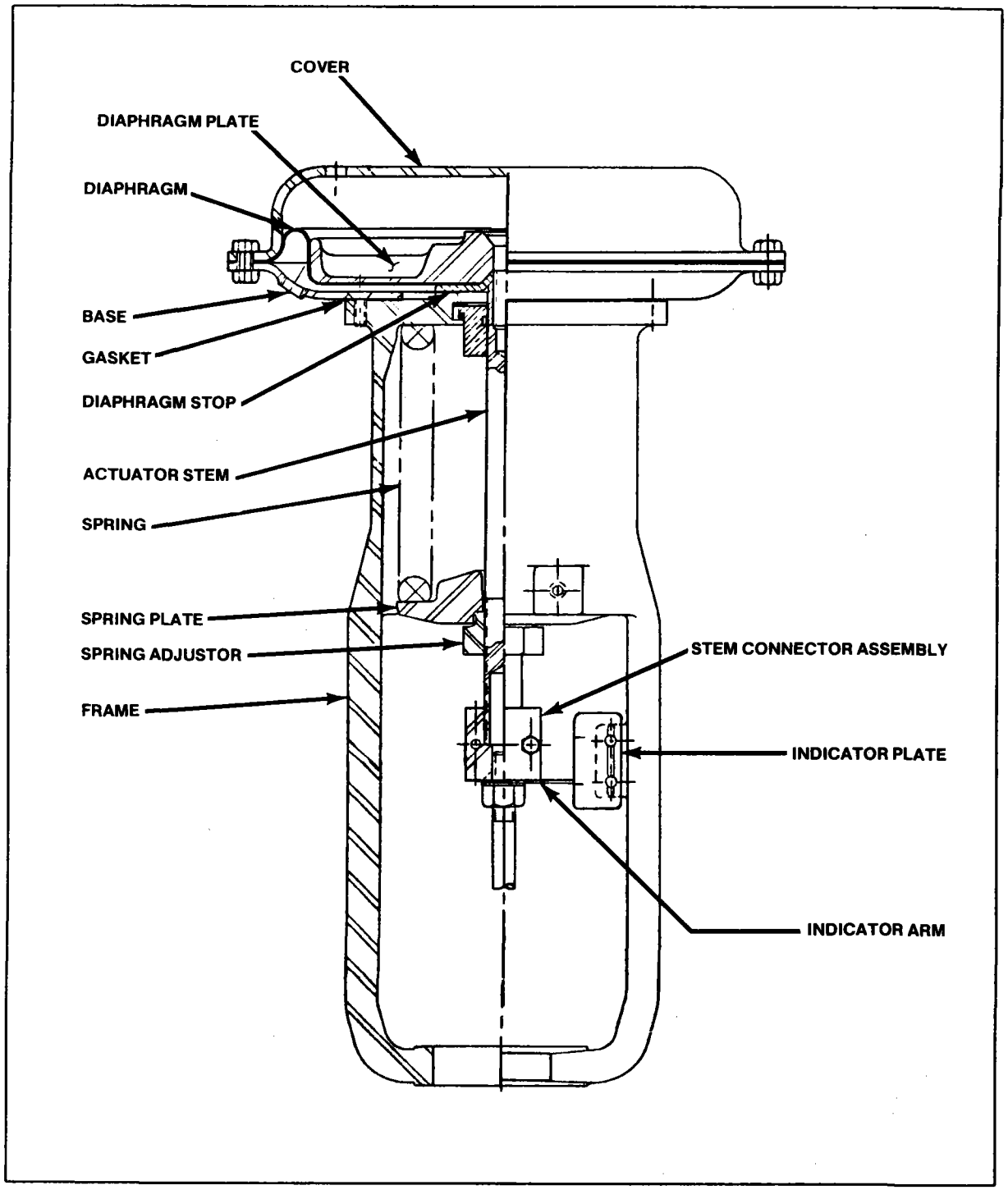


FIGURE 4
REVERSE-ACTING ACTUATOR ASSEMBLY

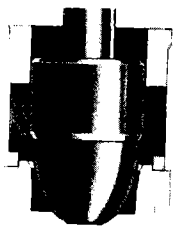


SECTION 5
QUICK CHANGE TRIM DESIGN

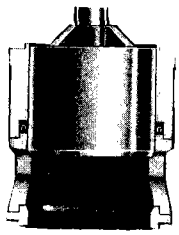
This quick change design provides ease of inspection and maintenance in addition to permitting trim interchangeability. A number of full and reduced trim sizes are easily adapted to meet specific field requirements.

FIGURE 5
TRIM TYPE

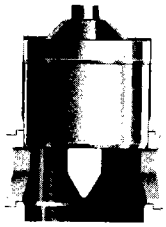
UNBALANCED SINGLE SEAT PLUG THROTTLE



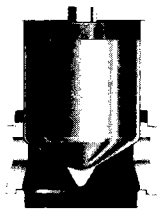
BALANCED SINGLE SEAT PORT THROTTLE



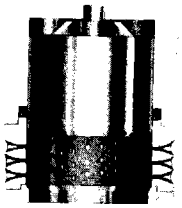
BALANCED DOUBLE SEAT PORT THROTTLE



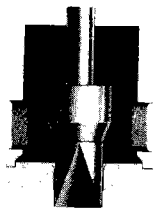
UNBALANCED SINGLE SEAT PORT THROTTLE



CAV-B9® BALANCED SINGLE SEAT



GROOVE TIP UNBALANCED SINGLE SEAT



TYPICAL REDUCED TRIM

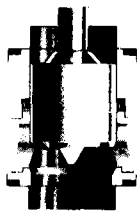
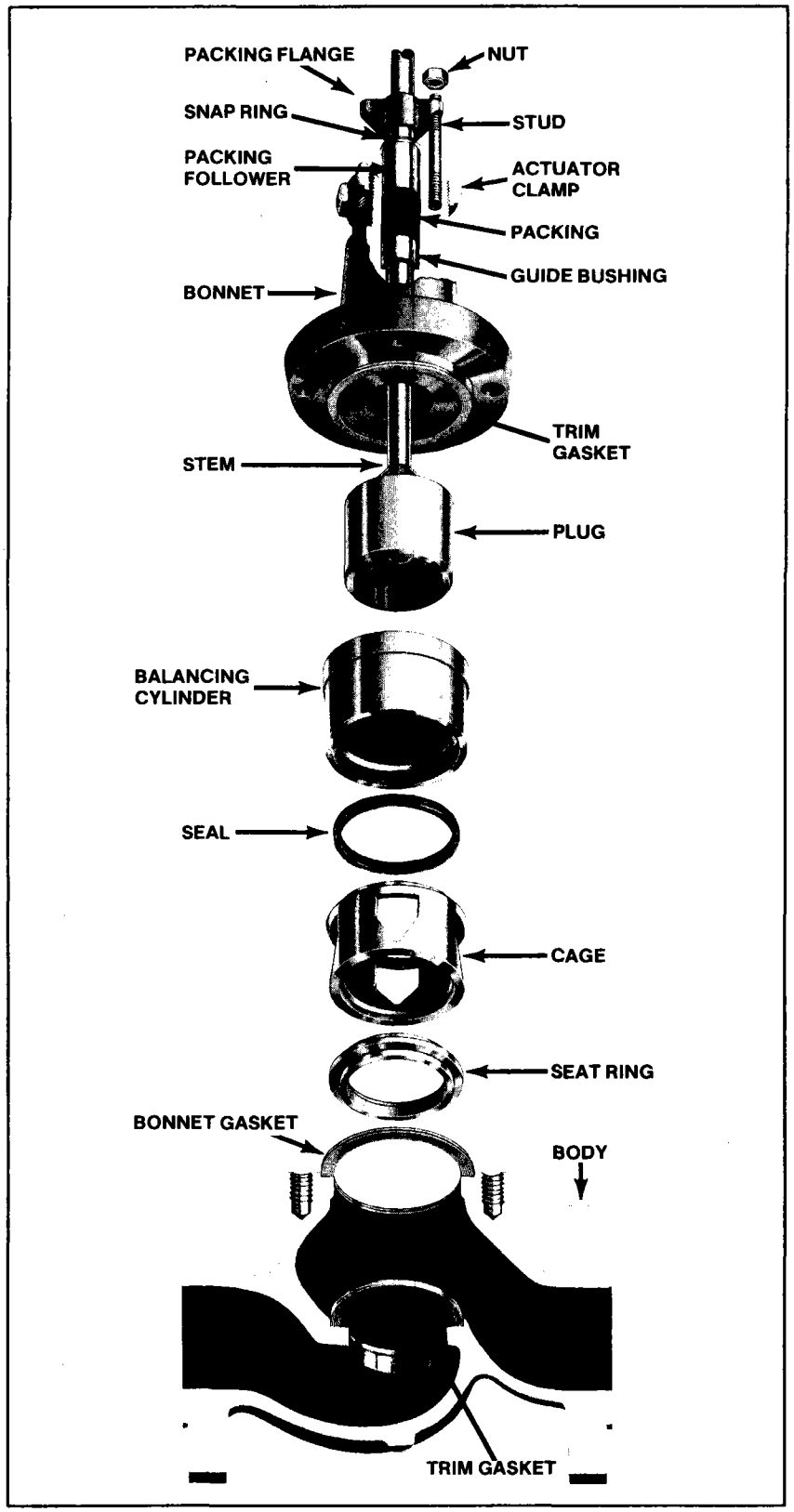


FIGURE 6
EXPLODED VIEW OF TYPICAL QUICK CHANGE TRIM



SECTION 6
VALVE SPRING AND STEM ADJUSTMENT

6.1 VALVE SPRING ADJUSTMENT

The spring was properly adjusted at the factory and only minor adjustments should be necessary unless the actuator has been disassembled. Turn the spring adjustor counterclockwise (looking down) to increase the spring force.

6.2 ASSEMBLY OF STEM CONNECTOR AND STEM ADJUSTMENT

CV600 valves are assembled and adjusted at the factory. After maintenance, stem adjustment should be made before other adjustments, such as valve travel indicator plates, positioner linkages or limit switches (if included). The following applies to all lengths of strokes.

DIRECT-ACTING (NORMALLY OPEN)

With the plug seated, pressurize the air chamber to bring the actuator stem down to a distance equal to the valve stroke. Confirm that *'stroke'* can be exceeded by at least 1/16". (If not, back off from the maximum travel by 1/16".)

Position locking nut and indicator arm on valve stem. Attach stem connector to actuator stem and valve stem; torque securing bolts to 18 to 20 ft. lbs. Tighten stem locking nut.

The travel is thus limited in the open position by the diaphragm stop striking the cover and in the closed position by the plug seating in the cage.

REVERSE-ACTING (NORMALLY CLOSED)

With the plug seated, pressurize the air chamber to lift the actuator stem to its maximum travel. Lower the actuator stem by an amount equal to valve stroke plus 1/16" by reducing the air pressure. After assembly, the actuator stem must rise by at least 1/16".

Attach the locking nut and indicator arm to the valve stem. Attach stem connector to actuator stem and valve stem; torque securing bolts to 18 to 20 ft. lbs. Tighten stem locking nut.

The travel is thus limited in the open position by the valve striking the bonnet or the diaphragm plate striking the cover. The travel is limited in the closed position by the plug seating in the cage.

SECTION 7
MAINTENANCE

7.1 PACKING REPLACEMENT

Under normal operating conditions the main valve stem packing should be replaced once a year. (Obtain the part number from the valve data sheet.)

1. Check replacement packing for proper size and type.
2. Shut off the valve to prevent leakage during the removal of the old packing.
3. Remove the two (2) packing flange nuts from their studs and remove the old packing.
4. Remove the old packing with a packing hook and make sure the stuffing box is clean. Compressed air directed into the box may be used for cleaning.
5. Open the replacement packing in the direction of the bias cut and insert one (1) ring around the stem and tamp into the stuffing box. Each succeeding packing

ring should be oriented so that its split is rotated 90° (clockwise) from the ring immediately below it. The packing follower may be used to tamp the packing rings into place.

6. Replace the packing gland and screw it into the stuffing box.

7.2 DIAPHRAGM

The main valve diaphragm should be inspected once a year and the diaphragm replaced as required. (Obtain the part number from the operator assembly drawing.)

7.3 POSITIONER (OPTIONAL)

Refer to the attached positioner instructions for maintenance procedure.

7.4 FITTINGS

Under normal operation the valve fittings should be inspected once a year and the fittings should be cleaned, reground or replaced as required. Replace u-cup seals when they show excessive wear. More frequent inspection and servicing of the valve fittings may be required for severe operating conditions. Reference Section 9.5 for proper field fit-up of trim.

SECTION 8
FIELD DISASSEMBLY

8.1 DIRECT-ACTING ASSEMBLY

Remove body/bonnet nuts and lift actuator off body. The bonnet, plug and stem assembly being attached to the actuator, will also be removed at this time.

The balancing cylinder or cage spacer (whichever is required), plus the seal, cage, seat ring and trim gasket can now be lifted out of the body for examination. Reference Figures 7 and 8.

Loosen stem nut and screw the plug and stem assembly out of the stem connector and pull it through the bonnet. Or remove the two (2) bolts and nuts from the stem connector and separate the connector. Then pull the stem through the bonnet.

If the actuator and bonnet are to be separated, unscrew the actuator clamp and lift the actuator from the bonnet.

8.2 REVERSE-ACTING ASSEMBLY

The field disassembly procedure for the reverse-acting assembly is the same as for the direct-acting except that the plug must be moved off the seat by either the handwheel or by loading the diaphragm chamber with air. Once this is done, the above procedure can be followed. After the actuator is removed the air may be bled off.

SECTION 9
FIELD REASSEMBLY

9.1 PLUG AND STEM ASSEMBLY (IF REQUIRED)

Coat tapered junction threads and pilot with Crane Anti-Seize Compound S-4395 before assembly.

The plug shall be screwed on the stem before pinning; for 1/2" tapered junction use 25 ft. lbs. torque and for 3/4" tapered junction use 50 ft. lbs. torque.

Use a proper strap wrench or a wrench with soft jaws, being careful not to damage the chrome surface of the stem or the guide surface of the plug.

After the stem is properly torqued, drill the pinhole in the stem, 3/32" diameter for 1/2" stems and 1/8" diameter for 3/4" stems.

Next assemble the spring pin being careful to center the pin in the stem.

9.2 TRIM ASSEMBLY

Reference Figures 7 and 8.

Place the seat ring gasket in the body counterbore and carefully center the seat ring over it; there should be a .050" gap between the bottom of the seat ring guide and the body counterbore surface. Make sure the seat ring seat is facing toward the bonnet flange of the body. (The seat ring seat is an approximately 20° inclined surface.) Place the cage over the pilot diameter on the seat ring, the end of the cage that matches with the seat ring has the smaller outside diameter.

Next, assemble the balancing cylinder, if required. (Reference Figure 7.) If a u-cup seal is called for, press the seal into the counterbore recess on the end with the smaller outside diameter, with the opening of the seal facing that end. Push the seal into the cylinder until it touches the shoulder. Place the balancing cylinder over the pilot diameter on the top of the cage. The top of the balancing cylinder should be .200" below the top surface of the bonnet flange.

Next, place a trim gasket on top of the balancing cylinder if required.

Insert the plug and stem assembly into the trim and push down to the seat ring seat. With light pressure on top of the balancing cylinder stroke the plug to ensure the seat ring, cage and balancing cylinder will line up concentrically with it. Return the plug to the seat ring seat.

For reduced trim assemblies which require cage spacers, (reference Figure 8) the assembly procedure is as above except the cage spacer is placed over the pilot diameter on the cage.

For reduced trim assemblies which require reducer bushings (reference Figure 7), the assembly procedure is as above except that first a reducer bushing and full size trim gasket are placed in the body counterbore, and last, a reducer bushing is placed over the balancing cylinder and a full size trim gasket placed on top of it. The gap between the top of the reducer bushing and the top of the bonnet flange will be .100".

9.3 BONNET ASSEMBLY

Place the guide bushing into the bottom of the stuffing box.

Place the bonnet onto the body, making sure the body gasket is in place, over the stem and body studs. Be careful to line the stem up with the guide bushing inside the bonnet and the body studs with the bonnet flange holes. The bonnet is to be oriented with the packing stud centerline, perpendicular to the flow centerline. The raised face of the bonnet flange should pilot concentrically with the bore of the body. The gap between the bonnet flange and the body flange should be approximately .050" for full and reduced size trim on trim sizes 3/4", 1" and 1 1/2", approximately .100" for full size trim size 2" and larger; and approximately .200" for reduced trim size 2" or larger.

Assemble the body nuts after applying Crane Anti-Seize Thread Compound S-4395 to the threads and nut contact area. Tighten until the gap between the flanges is approximately 1/32".

FIGURE 7

Single Seat Port Throttling Trim

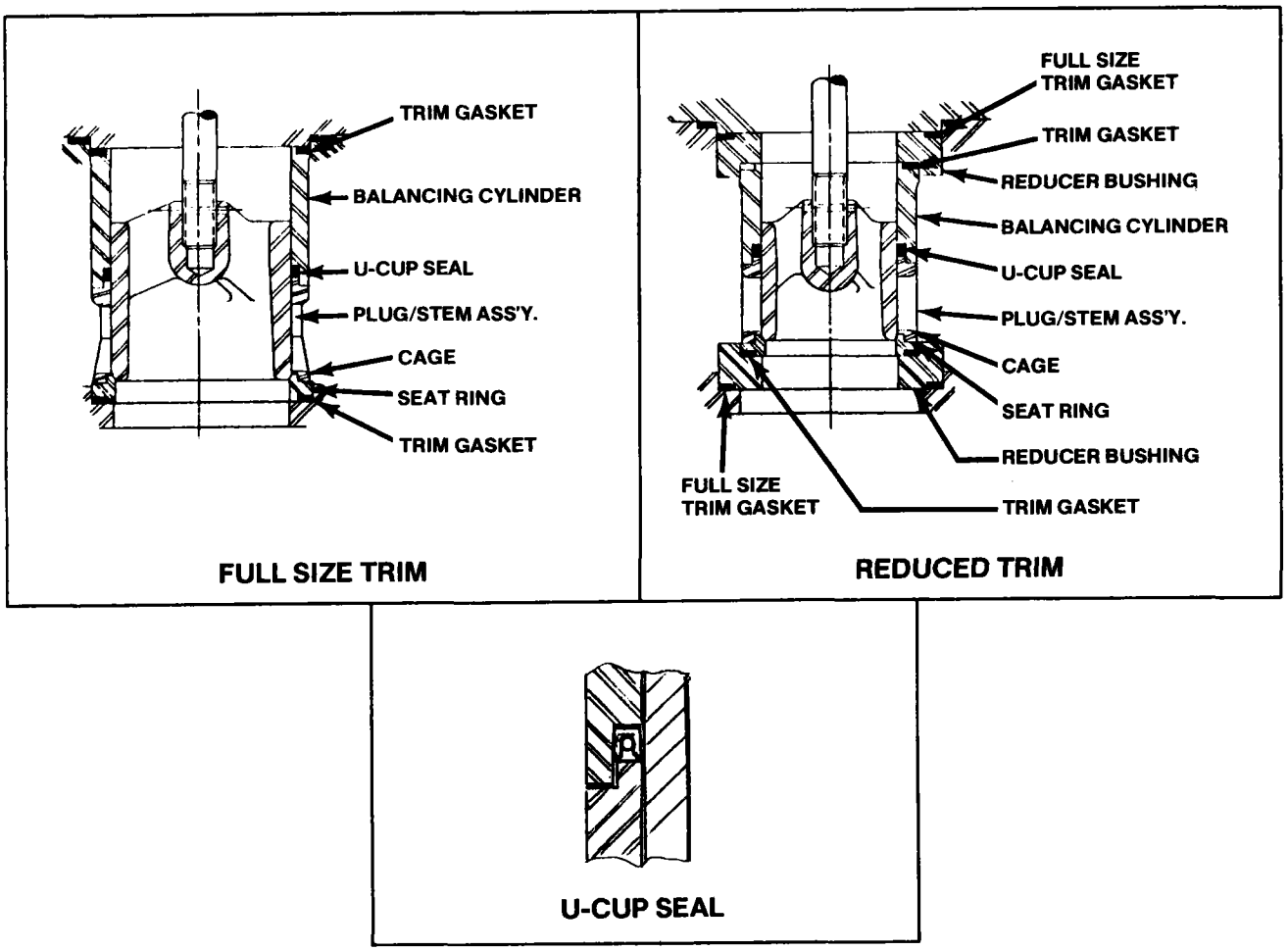
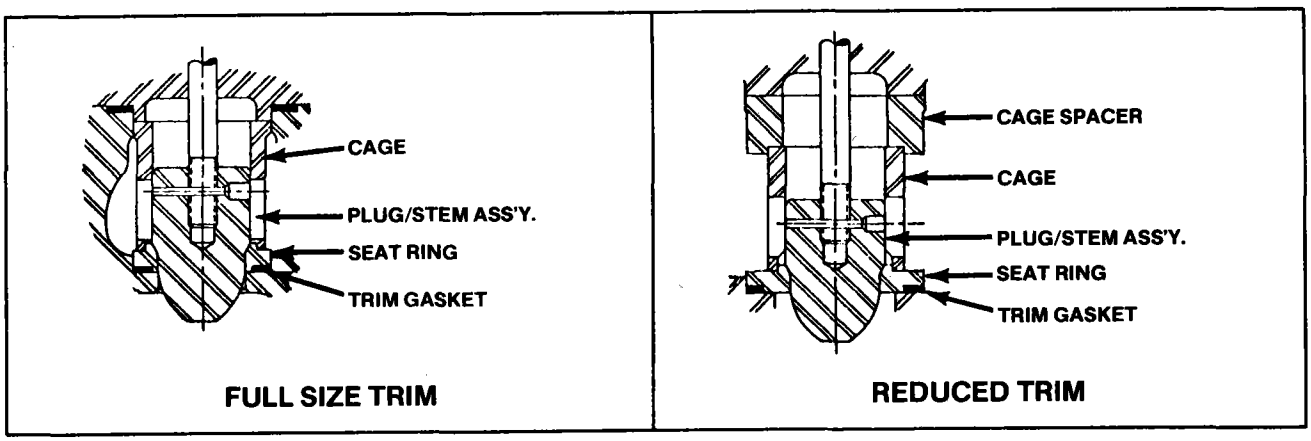


FIGURE 8

Single Seat Plug Throttling Trim



Assemble the stuffing box. On top of the guide bushing, place the required packing sets, each ring individually seated with end cuts staggered. The packing follower may be used to seat the packing. Place the packing flange over the studs and follower and tighten the packing nuts sufficiently to eliminate leakage. Avoid overtightening the packing. Stroke the plug to assure alignment.

Tighten the body nuts to the torques listed in Figure 9 securing the bonnet to the body. Tighten all nuts to the initial torque, then relieve and tighten to final torque, one by one.

9.4 ACTUATOR TO BONNET ASSEMBLY

Place the required actuator onto the bonnet. The actuator clamp (with machined boss facing the bonnet), the stem connector lock-nut, and the indicator arm must be installed before the actuator is completely lowered.

Orient the actuator so that the positioner brackets face the side of the body marked *'Copes-Vulcan'.*

Screw the actuator clamp down and torque using a spanner wrench. For 3/4" to 2" valves use 1350 ft. lbs. minimum torque and for 3" or larger valves use 2100 ft. lbs. minimum torque.

For stem adjustment and stem connection, reference Section 6.

9.5 LAPPING OF TRIM ASSEMBLIES

Reference Figure 10.

Single and double seat trim assemblies are to be lapped as follows:

Evenly apply lapping compound, such as Carborundum Finishing Compound Grade 'CM' (medium grit), to the seat(s).

Rotate the stem (applying little vertical force) clockwise and counterclockwise between 90° and 180° in each direction. If the plug is heavy, relieve excess weight by hanging the plug on a spring scale.

Periodically clean the seats and inspect for uniformity of wear, (even all the way around).

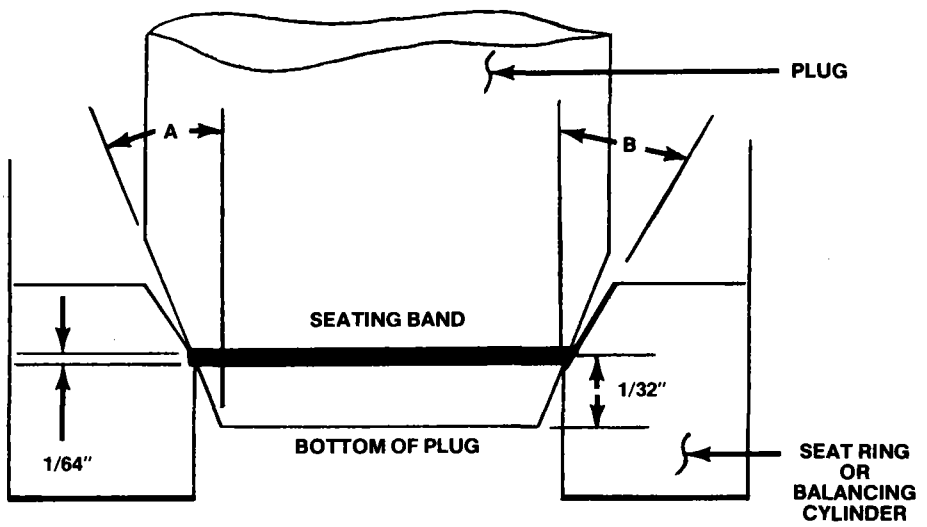
FIGURE 9

Torque Table

STUD THREAD SIZE	INITIAL TORQUE	FINAL TORQUE (20,000 PSI STUD STRESS)
1/2 - 13 UNC	46	23
5/8 - 11 UNC	90	45
3/4 - 10 UNC	155	78
7/8 - 9 UNC	250	125
1 - 8 UNC	375	178
1 1/8 - 8 UN	540	271
1 1/4 - 8 UN	750	378

FIGURE 10

Seat Lapping



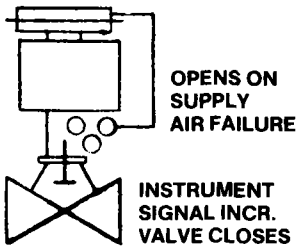
NOTE: SEAT ANGLE 'A' OF PLUG MUST BE STEEPER FROM VERTICAL CENTERLINE THAN SEAT ANGLE 'B' OF SEAT RING SEAT. FOR EXAMPLE, IF THE SEAT ANGLE OF SEAT RING IS 22° + 1/2°, THE PLUG ANGLE MUST BE 20° + 1/2°.

FIGURE 11

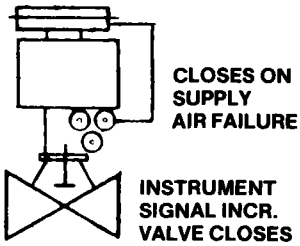
CV600 Arrangements

WITH POSITIONER

ACTUATOR	POSITIONER	ASSEMBLY
DA	DA	DA
RA	RA	DA
DA	RA	RA
RA	DA	RA

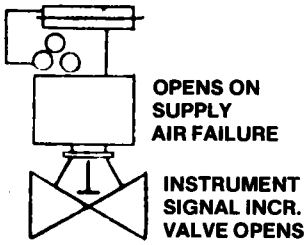


DIRECT ACTUATOR
DIRECT POSITIONER
DIRECT FITTING

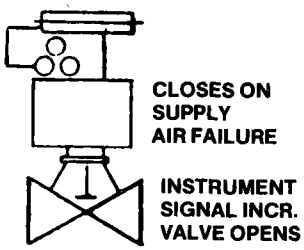


REVERSE ACTUATOR
REVERSE POSITIONER
DIRECT FITTING

DIRECT-ACTING ASSEMBLIES



DIRECT ACTUATOR
REVERSE POSITIONER
DIRECT FITTING

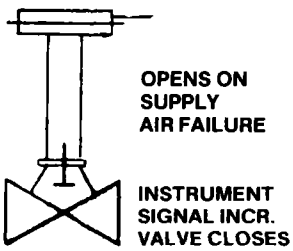


REVERSE ACTUATOR
DIRECT POSITIONER
DIRECT FITTING

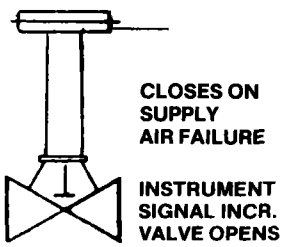
REVERSE-ACTING ASSEMBLIES

WITHOUT POSITIONER

ACTUATOR	ASSEMBLY
DA	DA
RA	RA



DIRECT ACTUATOR
DIRECT FITTING

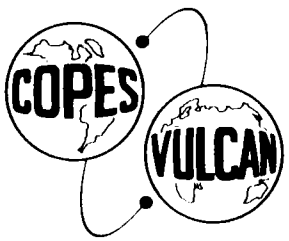


REVERSE ACTUATOR
DIRECT FITTING

MAXIMUM AIR TO DIAPHRAGM - 80 PSIG

MAXIMUM STROKE:

CV600-4 ——— 1 Inch
CV600-6 ——— 1 Inch
CV600-10 ——— 2 Inches
CV600-16 ——— 3 Inches



COPES-VULCAN

Lake City, Pennsylvania 16423

Division of White Consolidated Industries, Inc

PC—10/79

4.1.55-171

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COPES-VULCAN
PROCEDURE NO. Modified for Service Instructions

ISSUED March 29, 1979

REV. NO. 4 DATE 3-3-81

PROCEDURE TITLE ASSEMBLY OF CV600 VALVES AND ACTUATORS

1. PURPOSE

The purpose of this procedure is to establish instructions for the proper assembly of CV600 valves to the CV600 diaphragm actuators.

2. SCOPE

This procedure describes the assembly of valves, body assemblies, bonnet assemblies, studs, plugs, stems, trim assemblies, stem connectors and 40, 60, 100 and 160 square inch CV600 type actuators.

3. DEFINITION

The letter "a" shall be defined as the travel of the valve as indicated on the shop order for each particular valve.

4. PROCEDURE

4.1 Bonnet and Packing Studs

The following assembly method shall be used for all studs which are to be threaded into the body and bonnet. In all cases, the end of the stud with the short length of threads is assembled into the body or bonnet. Markings should be on the outside end.

4.1.1 Degrease the tapped stud holes. Degrease the threads on the studs.

4.1.2 At assembly, apply Locktite Sealant grade AV 87 or Locktite 271 to the stud thread. Do not apply Locktite to the stud thread that will accept the nut.

4.1.2 Screw the studs into body or bonnet soon after Locktite is applied. The nuts on the studs should be tightened to the bonnet or packing gland follower to seat the stud threads before the sealant hardens.

4.2 Plug and Stem Assembly

4.2.1 Plug and stem may be pre-assembled for fit-up or lapping operation.

4.2.2 Coat dog point threads and pilot with Crane Anti-Seize Compound S-4395 before assembly.

The plug shall be screwed on the stem before pinning using the following torques:

1/2" dog point	-	25 ft/lbs
3/4" dog point	-	50 ft/lbs

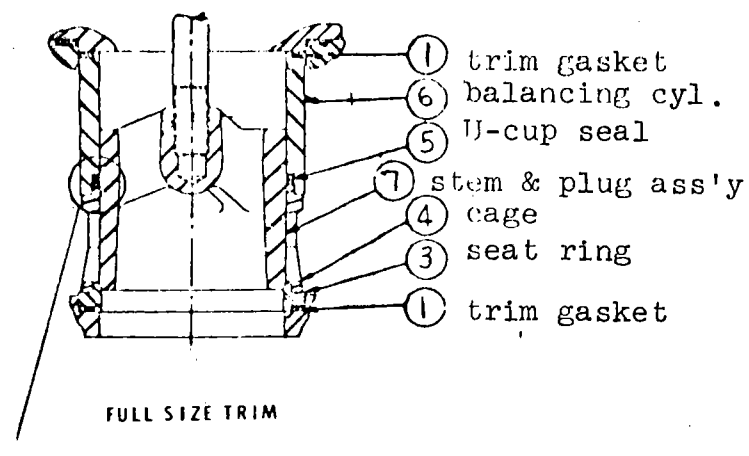
Use a proper strap wrench or wrench with soft jaws, being careful not to damage the chrome surface of the stem or the guide surface of the plug.

4.2.3 After the stem is properly torqued, transfer drill the pinhole in the stem, 3/32" diameter for 1/2" stems and 1/8" diameter for 3/4" diameter stems.

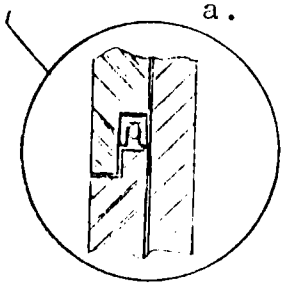
Next, assemble the spring pin, being careful to center the pin in the stem. (P/N 188238 for 1/2" stems; P/N 96228 for 3/4" stems.)

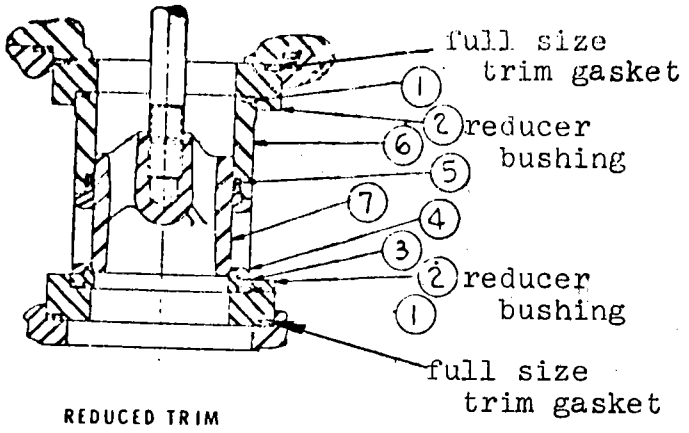
4.3 Trim Assembly

4.3.1 Place the seat ring gasket in the body counterbore and carefully center the seat ring over it; there should be a .050" gap between the bottom of the seat ring guide and the body counterbore surface. Make sure the seat ring seat is facing toward the bonnet flange of the body. (Seat ring seat is an approximately 20° inclined surface.) Place the cage over the pilot diameter on the seat ring; the end of the cage that matches with the seat ring has the smaller outside diameter.



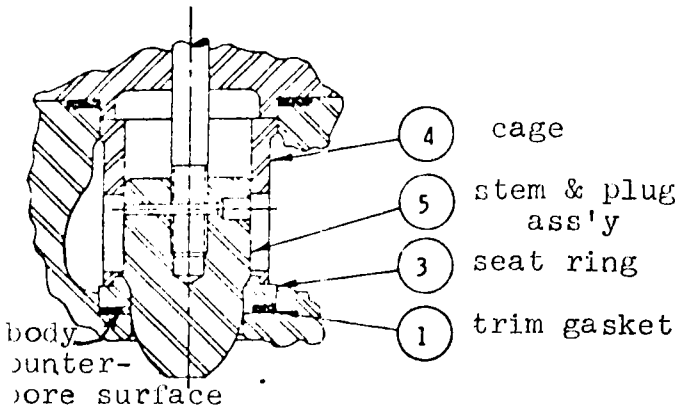
a.



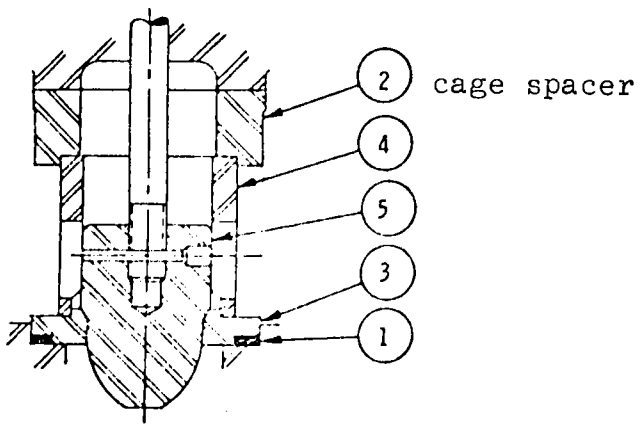


b.

FIGURE 1



a.



b.

FIGURE 2

4.3.2 Next, assemble the balancing cylinder if required. (See Figure 1.) If a U-cup seal is called for, press the seal into the counterbore recess on the end with the smaller outside diameter with the opening of the seal facing that end. Push the seal into the cylinder until it touches the shoulder. Place the balancing cylinder over the pilot diameter on the top of the cage. The top of the balancing cylinder should be .200" below the top surface of the bonnet flange.

4.3.3 Next, place a trim gasket on top of the balancing cylinder if required.

4.3.4 Insert the plug and stem assembly into the trim and push down to the seat ring seat. With light pressure on top of the balancing cylinder stroke the plug to insure the seat ring, cage and balancing cylinder will line up concentrically with it. Return the plug to the seat ring seat.

4.3.5 For reduced trim assemblies which require "cage spacers" (see Figure 2b) the assembly procedure is as above except the cage spacer is placed over the pilot diameter on the cage.

4.3.6 For reduced trim assemblies which require "reducer bushings" (see Figure 1b) the assembly procedure is as above except that first a reducer bushing and full size trim gasket are placed in the body counterbore, and last, a reducer bushing is placed over the balancing cylinder and a full size trim gasket placed on top of it. The gap between the top of the reducer bushing and the top of the bonnet flange will be .100".

4.4 Bonnet Assembly

All bonnet assembly parts are to be manufactured according to the part drawings and all component parts are to be selected according to the assembly drawing.

4.4.1 Assemble packing studs according to Section 4.1.

4.4.2 Assemble pipe plug, if called for, using Teflon tape or suitable thread compound to assure pressure tight assembly and ease of disassembly.

4.4.3 Place snap ring into groove on packing follower.

4.4.4 Place guide bushing into bottom of stuffing box.

4.4.5 Place the bonnet onto the body, making sure the body gasket is in place, over the stem and body studs. Be careful to line the stem up with the guide bushing inside the bonnet and the body studs with the bonnet flange holes. Bonnet is to be oriented with packing stud centerline perpendicular to flow centerline. The raised face of the bonnet flange should pilot concentrically with the bore of the body. The gap between the bonnet flange and the body flange should be .050" for full and reduced size trim on trim sizes 3/4", 1", and 1-1/2"; .100" for full size trim size 2" and larger; and .200" for reduced trim size 2" and larger.

4.4.6 Assemble the body nuts after applying Crane Anti-Seize thread compound S-4395 (CVI P/N 95123) to the threads and nut contact area. Tighten until the gap between the flanges is approximately 1/32".

4.4.7 Assemble the stuffing box. On top of the guide bushing place the required packing sets each ring individually seated with end cuts staggered. The packing follower may be used to seat the packing. Place the packing flange over the studs and follower and tighten the packing nuts sufficiently to eliminate leakage. Avoid overtightening the packing. Additional packing instructions are contained in procedure 1.2.199. Stroke the plug to assure alignment.

4.4.8 Tighten the body nuts to the following torques securing the bonnet to the body:

STUD THREAD SIZE	*TIGHTENING TORQUE (FT/LBS) HYDROSTATIC TEST	TIGHTENING TORQUE (FT/LBS) DESIGN COND. (20,000 PSI STUD STRESS)
1/2 - 13 UNC	46	23
5/8 - 11 UNC	90	45
3/4 - 10 UNC	155	78
7/8 - 9 UNC	250	125
1 - 8 UNC	375	178
1-1/8 - 8 UN	540	271
1-1/4 - 8 UN	750	378

*Per ASME Boiler and Pressure Vessel Code Section VIII, Appendix S, 1968

4.5 Inlet Tag

Place the inlet tag on the centerline of the body/bonnet flange on the end defined by the trim as follows:

Balanced trim: "inlet" is over seat
Unbalanced trim: "inlet" is under seat

4.7 Actuator to Bonnet Assembly

4.7.1 Place the required actuator onto the bonnet. The actuator clamp (with machined boss facing the bonnet), the stem connector lock nut, and the indicator arm must be installed before the actuator is completely lowered.

4.7.2 Orient the actuator so that the positioner brackets face the side of the body marked "Copes-Vulcan."

4.7.3 Screw the actuator clamp down and torque using a spanner wrench as follows:

3/4" - 2" valves	-	1350 ft/lbs minimum
3" & larger valves	-	2100 ft/lbs minimum

4.7.4 Assembly of Stem Connector

4.7.4.1 Direct acting (normally open)

With the plug seated, pressurize the air chamber to bring the actuator stem down by the dimension "a" given in the shop order. Confirm that "a" can be exceeded by at least 1/16 of an inch. (If not, back off from the maximum travel by 1/16 of an inch.)

Attach stem connector and torque securing bolts to 18 - 20 ft/lbs. Locking nut and indicator arm were to have been previously positioned.

The travel is thus limited in the open position by the diaphragm stop striking the coverand in the closed position by the plug seating in the cage.

4.7.4.2 Reverse acting (normally closed)

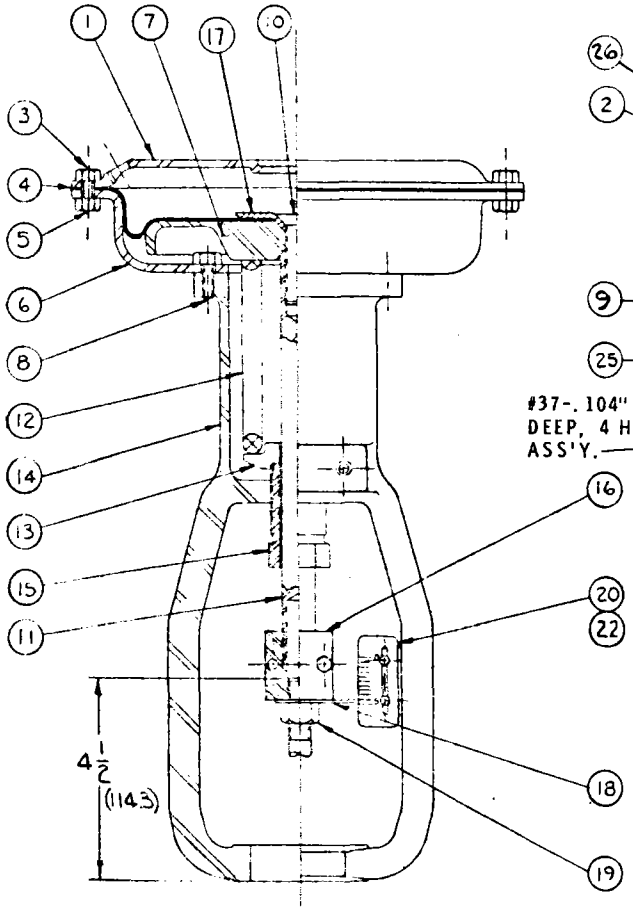
With the plug seated, pressurize the air chamber to lift the actuator stem by its rated travel, plus 1/16 of an inch and less dimension "a". Dimension "a" is as given in the shop order. The actuator stem must rise by at least 1/16 of an inch.

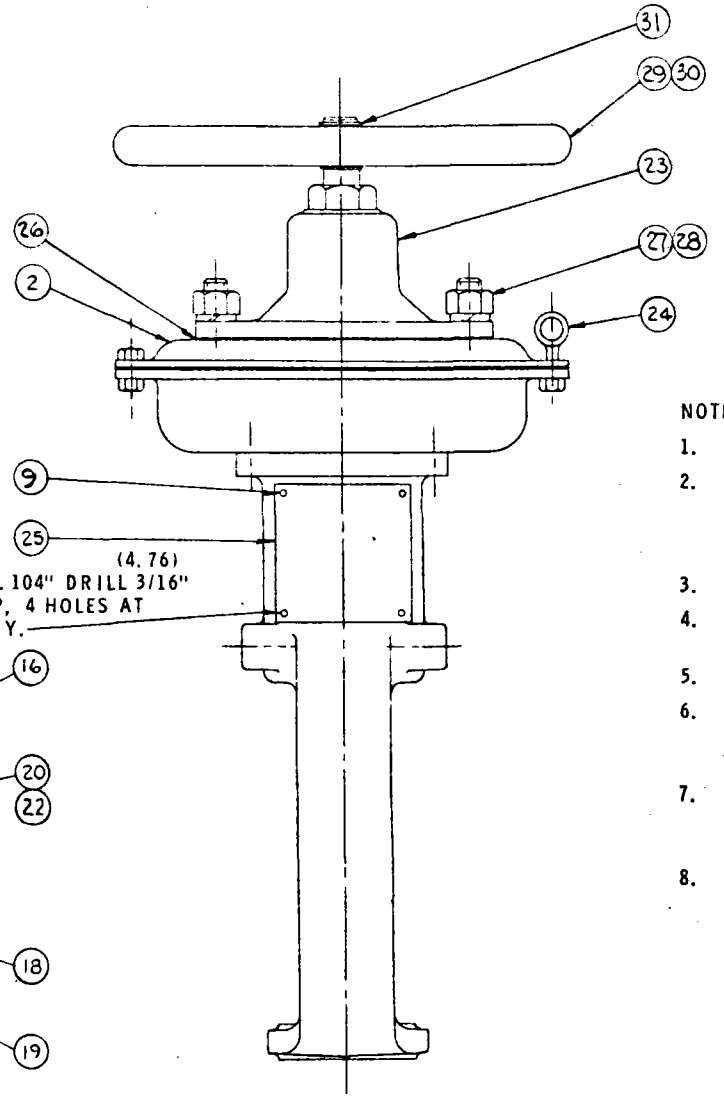
4.7.4.2 - Continued...

Attach stem connector and torque, securing bolts to 18 - 20 ft/lbs. Locking nut and indicator arm were to have been previously positioned.

The travel is thus limited in the open position by the valve plug striking the bonnet or the diaphragm plate striking the cover. The travel is limited in the closed position by plug seating in the cage.

	SHT. 1	SHT. 2	SHT. 3	SHT. 4	SHT. 5
0	O	O	—	—	
1			—	—	
2			O	O	





NOTES:

1. EYE BOLTS TO BE 180° APART.
2. WHEN ASSEMBLING ITEM 14, YOKE, AND ITEM 15, SPRING ADJUSTOR, USE CRANE COMPOUND 425A, CV PART NO. 95123, ON THREADS.
3. TIGHTEN 19, NUT, TO 20 LBS. FT. OF TORQUE.
4. TIGHTEN ITEM 10, SCREW, TO 35 LBS. FT. OF TORQUE.
5. DIMENSIONS IN INCHES & (MILLIMETERS).
6. ALL NUTS, BOLTS, AND WASHERS ARE TO BE BLACK OXIDE FINISHED PRIOR TO ASSEMBLY.
7. YOKE, COVER, BASE, ACTUATOR (HANDWHEEL) HOUSING, AND BRACKETS (IF REQUIRED) ARE TO BE PRE-PAINTED.
8. ASSEMBLE PER CV PROCEDURE #1. 2. 279.

ASSEMBLY
PART NO.

189959-2 MODEL CV-600-4 D. A. WITHOUT HANDWHEEL, 3-15 SPRING
189959-3 MODEL CV-600-4 D. A. WITH HANDWHEEL, 3-15 SPRING
189959-4 MODEL CV-600-4 D. A. WITHOUT HANDWHEEL, 6-30 SPRING
189959-5 MODEL CV-600-4 D. A. WITH HANDWHEEL, 6-30 SPRING

NO.	DATE	REVISIONS	BY	CHK.
1	9-6-79	DELETED ITEM 21 & UPDATED REV. STATUS BLOCK PER E.C. 6276	JHR	
2	9-18-79	ADDED ITEM 17, NOTES 6, 7 & 8, AND SHEETS 4 & 5 PER E.C. 6269.	JHR	

NO.	DATE	REVISIONS	BY	CHK.

REPRO FROM L-187045-1
PART CODE 4

COPES-VULCAN, INC.
One of the Aloyco Companies
LAKE CITY (ERIE CO.) PA. U.S.A.

ACTUATOR ASSEMBLY
MODEL CV-600-4 D. A.
CAST STEEL CONSTRUCTION
(1/2" VALVE STEM)

DFTSMN JHR DATE 6-1-79
CHECKED [illegible] DATE 6-5-79
[illegible] DATE [illegible]
JOB NO.
SCALE

DWG. NO. L-189959 SHT. 1 OF 5 REV. 2

4.1.55-180

7 6 5 4 3 2 1

LIST OF MATERIALS

ITEM NO.	NO. REQ'D.	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
2	1	169658	3	COVER ASSEMBLY			L-169658	
3	10	4548	3	HEX HEAD CAP SCREW	STEEL	COM'L.		5/16-18 x 3/4" LONG
4	1	185987	3	DIAPHRAGM	BUNA'N'	COM'L.	L-185987	1/16" THICK WITH FABRIC
5	12	13803	3	HEX NUT	STEEL	COM'L.		5/16-18
6	1	185977	3	BASE	STEEL		L-185977	SAE-1008-1010
7	1	185991	3	DIAPHRAGM PLATE	ALUM.	ASTM-B26	L-185991	ALLOY SG70A, COND. T6
8	6	4467	3	HEX. HEAD MACH. SCREW	STEEL	COM'L.		3/8-16 x 3/4" LONG
9	4	64341	3	ROUND HEAD DRIVE SCREW	STEEL	COM'L.		#4 x 3/16" LONG
10	1	187034	3	FLAT HEAD MACH. SCREW	STEEL	COM'L.		1/2-20 x 1-3/4" LONG
11	1	186000	3	ACTUATOR STEM	STEEL	ASTM-A108	M-185999	SAE-1112
12	1	185952	3	SPRING	STEEL	ASTM-A689	S-185952	GR.-5160-6150, 6-30 RANGE
13	1	186983	3	SPRING PLATE	DU. IRON	ASTM-A536	M-186983	GR.65-45-12
14	1	185963-R	3	YOKE	C.STEEL	ASTM-A216	E-185963	GR. WCB
15	1	185995	3	SPRING ADJUSTOR	STEEL	ASTM-A108	M-185995	SAE-1112
16	1	186995	3	STEM CONNECTOR ASS'Y.			M-186995	
17	1	186009	3	DIAPHRAGM STOP	STEEL	ASTM-A103	M-186009	10 GA. STL. SHEET
18	1	187036	3	INDICATOR ARM	STEEL		S-187036	
19	1	4536	3	HEX JAM NUT	STEEL	COM'L.		1/2"-20
20	1	187019	3	INDICATOR PLATE	BRASS	ASTM-B36	S-187019	23 GAUGE (.028")
22	2	V-2253	3	SELF-TAPPING SCREW	STEEL	COM'L.		#8-32 X 5/16 LONG
23	1	187023	3	MANUAL ACTUATOR ASS'Y.			L-187022	
24	2	139380	3	EYEBOLT	STEEL	COM'L.		
25	1	174703	3	IDENTIFICATION PLATE	BRASS	ASTM-B36	M-174703	22 GAUGE (.0313")
26	1	78688	3	GASKET	GARLOCK	COM'L.	S-78688	
27	6	2619	3	HEX NUT	STEEL	COM'L.		1/2"-13
28	6	1898	3	LOCKWASHER	STEEL	COM'L.		1/2"
29	1	187040	3	HANDWHEEL	ALUM	COM'L.	L-187039	GR. 43F
30	1	61822	3	KEY	STEEL	COM'L.		3/16" SQ. x 13/16" LONG
31	2	31340	3	RETAINING RING	STEEL	COM'L.		WALDES 5100-68

4.1.55-181

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.

REPRO FROM L-189959-3
PART CODE 4

COPES-VULCAN, INC.
Div. of the Walworth Company
LAKE CITY (Erie Co.), PA. U.S.A.

MODEL CV-600-4 D.A. ACTUATOR
CAST STEEL CONSTRUCTION
WITH MANUAL ACTUATOR

($\frac{1}{2}$" VALVE STEM) 6-30 SPRING

DFTSMN JHR DATE 10-19-77
CHECKED RCL DATE 10-30-77
ARP DATE 11-16-77
JOB NO.
SCALE

DWG. NO. L-189959 SHT. 5 OF 5 REV. 0

REVISION STATUS OF SHEETS						
SHT. 1	SHT. 2	SHT. 3	SHT. 4	SHT. 5	SHT. 6	SHT. 7
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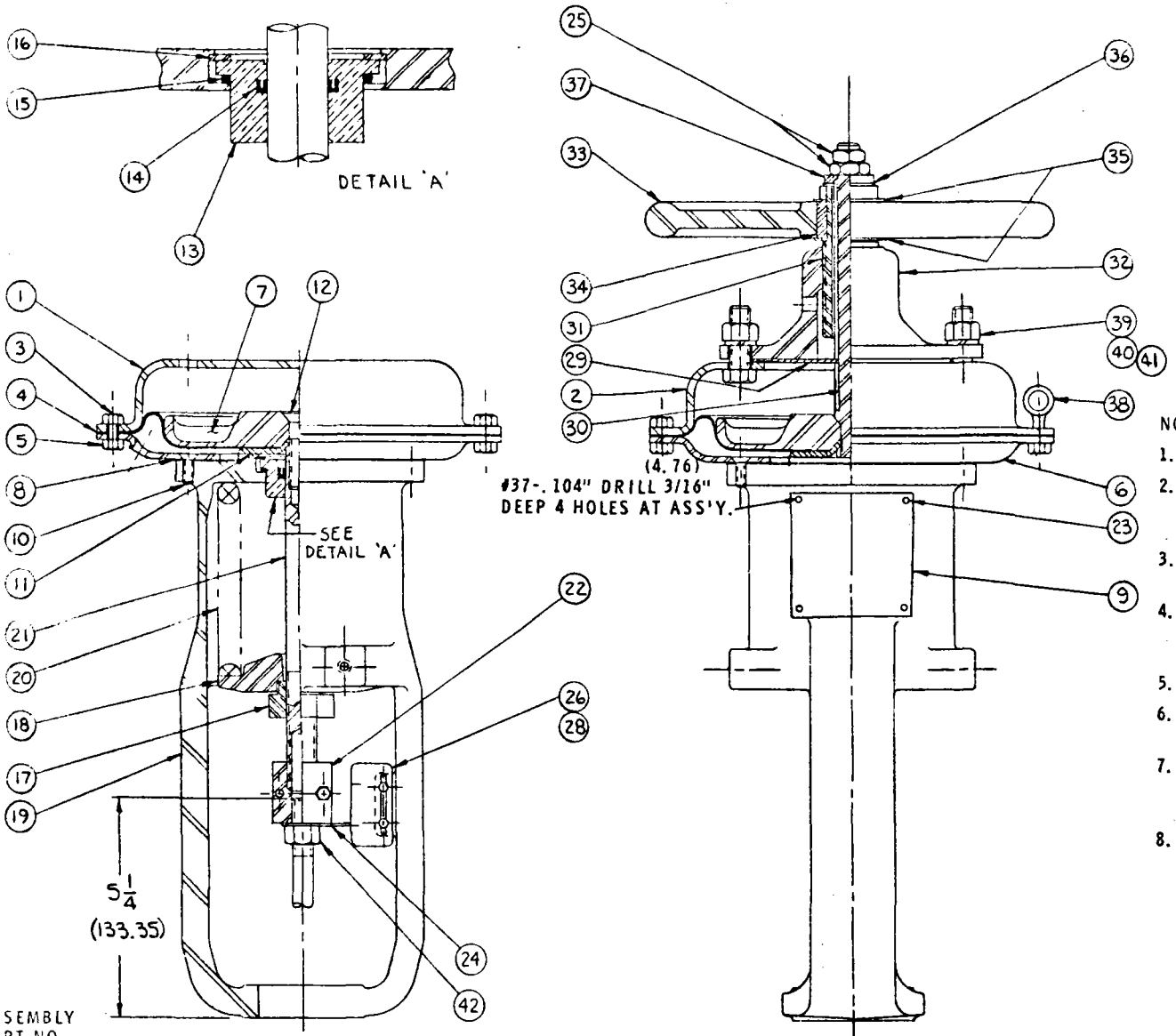
1	1	1	–	–	–	–
2	2	2	0	0	0	0



NOTES:

1. EYE BOLTS TO BE 180° APART.
2. WHEN ASSEMBLING ITEM 19, YOKE, & ITEM 17, SPRING ADJUSTOR, USE CRANE COMPOUND 425A, CV PART NO. 95123, ON THREADS.
3. TIGHTEN ITEM 25, NUT, TO 20 LBS. FT. OF TORQUE.
4. TIGHTEN ITEM 12, SCREW, OR ITEM 30, MANUAL ACTUATOR STEM, TO 35 LBS. FT. OF TORQUE.
5. DIMENSIONS IN INCHES AND (MILLIMETERS).
6. ALL NUTS, BOLTS, AND WASHERS ARE TO BE BLACK OXIDE FINISHED PRIOR TO ASSEMBLY.
7. YOKE, COVER, BASE, ACTUATOR (HANDWHEEL) HOUSING, AND BRACKETS (IF REQUIRED) ARE TO BE PRE-PAINTED.
8. ASSEMBLY PER CV PROCEDURE #1. 2. 279.

ASSEMBLY PART NO.

189960-2 MODEL CV-600-4 R. A. WITHOUT HANDWHEEL, 20-40 SPRING
189960-3 MODEL CV-600-4 R. A. WITH HANDWHEEL, 20-40 SPRING
189960-4 MODEL CV-600-4 R. A. WITHOUT HANDWHEEL, 6-30 SPRING
189960-5 MODEL CV-600-4 R. A. WITH HANDWHEEL, 6-30 SPRING
189960-6 MODEL CV-600-4 R. A. WITHOUT HANDWHEEL, 3-15 SPRING
189960-7 MODEL CV-600-4 R. A. WITH HANDWHEEL, 3-15 SPRING

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.
1	9-6-79	DELETED ITEM 27 & UPDATED REV. STATUS BLOCK PER E.C. 6276	JHR	[illegible]					
2	10-5-79	ADDED NOTES 6,7, & 8 AND SHEETS 4,5,6, & 7 PER E.C. 6269.	JHR	[illegible]					

REPRO FROM L-187046-1
PART CODE 4

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

ACTUATOR ASSEMBLY
MODEL CV-600-4 R. A.
CAST STEEL CONSTRUCTION
(1/2" VALVE STEM)

DFTSMN JHR DATE [illegible]
CHECKED [illegible] DATE 7-5-79
[illegible] DATE [illegible]
JOB NO.
SCALE

DWG. NO. L-189960 SHT. 1 OF 7 REV. 2

4.1.55-182

ITEM NO.	NO. REQ'D	PART NO	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
2	1	185977	3	COVER	STEEL		L-185977	SAE-1008-1010
3	10	4548	3	HEX HEAD CAP SCREW	STEEL	COM'L.		5/16-18 x 3/4" LONG
4	1	185987	3	DIAPHRAGM	BUNA'N'	COM'L.	L-185987	1/16" THICK WITH FABRIC
5	12	13803	3	HEX NUT	STEEL	COM'L.		5/16-18
6	1	185975	3	BASE	STEEL		L-185975	SAE-1008-1010
7	1	185991	3	DIAPHRAGM PLATE	ALUM.	ASTM-B26	L-185991	ALLOY SG70A, COND. T6
8	1	187029	3	GASKET	NITRILE	COM'L.	S-187029	1/16" THICK WITH FABRIC
9	1	174703	3	IDENTIFICATION PLATE	BRASS	ASTM-B36	M-174703	#22 GAUGE (0.313")
10	6	187057	3	FLAT HEAD MACH. SCREW	STEEL	COM'L.		3/8-16 x 3/4' LONG
11	1	186009	3	DIAPHRAGM STOP	STEEL	ASTM-A303	M-186009	10 GA. STL. SHEET
13	1	187017	3	SEAL BUSHING	BRONZE	ASTM-B103	M-187017	
14	1	186993	3	'U' CUP	NITRILE	COM'L.		PARKER #8404-0075
15	1	187059	3	'O' RING	NITRILE	COM'L.		PARKER #2-130
16	1	129624	3	RETAINING RING	STEEL	COM'L.		WALDES #N5000-206
17	1	185997	3	SPRING ADJUSTOR	STEEL	ASTM-A108	M-185997	SAE-1112
18	1	186984	3	SPRING PLATE	DU. IRON	ASTM-A536	M-186984	GR. 65-45-12
19	1	185964-R	3	YOKE	C.STEEL	ASTM-A216	E-185964	GR. WCB
20	1	185953	3	SPRING	STEEL	ASTM-A689	S-185953	GR-5160-6150, 20-40 RANGE
21	1	186005	3	ACTUATOR STEM	STEEL	ASTM-A108	M-186004	GR.-1112
22	1	186995	3	STEM CONNECTOR ASS'Y.			M-186995	
23	4	64341	3	ROUND HEAD DRIVE SCREW	STEEL	COM'L.		#4 x 3/16" LONG
24	1	187036	3	INDICATOR ARM	STEEL		S-187036	
25	2	41347	3	HEX JAM NUT	STEEL	COM'L.		1/2"-13
26	1	187019	3	INDICATOR PLATE	BRASS	ASTM-B36	S-187019	23 GAUGE (.028")
28	2	V-2253	3	SELF-TAPPING SCREW	STEEL	COM'L.		#8-32 X 5/16 LONG
29	1	187083	3	ANTI-ROTATION PLATE	STEEL	ASTM-A569	M-187011	
30	1	187007	3	REVERSE ACTING STEM	STEEL	ASTM-A108	L-187007	SAE-1112
31	1	187009	3	ADJUSTING SCREW	STEEL	AISI-1015	M-187009	
32	1	187000	3	ACTUATOR HOUSING	C. IRON	ASTM-A48	L-186999	CL. 35
33	1	187041	3	HANDWHEEL	ALUM.	COM'L.	L-187039	GR-43 F
34	1	39149	3	KEY	STEEL	COM'L.		1/4" SQ. x 3/4" LONG
35	2	169152	3	RETAINING RING	STEEL	COM'L.		WALDES 5100-137
36	1	187060	3	THRUST BEARING	GARLOCK	COM'L.		#DU09
37	1	187015	3	THRUST WASHER	STEEL	COM'L.	S-187015	
38	2	139380	3	EYE BOLT	STEEL	COM'L.		
39	6	14225	3	LOCKWASHER	STEEL	COM'L.		3/8"
40	6	41390	3	HEX NUT	STEEL	COM'L.		3/8"-16
41	6	34586	3	HEX HEAD CAP SCREW	STEEL	COM'L.		3/8"-16 x 1-1/2" LONG
42	1	4536	3	HEX JAM NUT	STEEL	COM'L.		1/2"-20

NO	DATE	REVISIONS	BY	CHK.
1	9-6-79	ITEM 27 WAS P/N 187033 & ITEM 28 WAS P/N 187035 PER E.C. 6276.	JHR	MA.
2	10-5-79	ADDED 20-40 SPRING TO TITLE, DWG. WAS SHEET 3 OF 3, ITEM 39 WAS P/N	JHR	MA.

NO	DATE	REVISIONS	BY	CHK.
2	cont.	1898, ITEM 40 WAS P/N 2619, & ITEM 19 MAT'L WAS C. IRON PER E.C. 6269.	JHR	MA.

REPRO FROM L-187036-3

PART CODE 4

COPES-VULCAN, INC.
One of the Waxo Consolidated Industries
LAKE CITY (ERIE CO.) PA U.S.A.

MODEL CV-600-4 R.A. ACTUATOR
CAST STEEL CONSTRUCTION
WITH MANUAL ACTUATOR

(1/2" VALVE STEM)
20-40 SPRING

DFTSMN JHR DATE 7-24-79
CHECKED MA. DATE 7-5-79
JHR DATE 12-1-79
JOB NO.
SCALE

DWG. NO. L-189960 SHT. 3 OF 7 REV. 2

4.1.55-183

LIST OF MATERIAL

ITEM NO.	NO. REQ'D	PART NO	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
2	1	185977	3	COVER	STEEL		L-185977	SAE-1008-1010
3	10	4548	3	HEX HEAD CAP SCREW	STEEL	COM'L.		5/16-18 x 3/4" LONG
4	1	185987	3	DIAPHRAGM	BUNA'N'	COM'L	L-185987	1/16" THICK WITH FABRIC
5	12	13803	3	HEX NUT	STEEL	COM'L.		5/16-18
6	1	185975	3	BASE	STEEL		L-185975	SAE-1008-1010
7	1	185991	3	DIAPHRAGM PLATE	ALUM.	ASTM-B26	L-185991	ALLOY SG70A, COND. T6
8	1	187029	3	GASKET	NITRILE	COM'L.	S-187029	1/16" THICK WITH FABRIC
9	1	174703	3	IDENTIFICATION PLATE	BRASS	ASTM-B36	M-174703	#22 GAUGE (0.313")
10	6	187057	3	FLAT HEAD MACH. SCREW	STEEL	COM'L.		3/8-16 x 3/4' LONG
11	1	186009	3	DIAPHRAGM STOP	STEEL	ASTM-A303	M-186009	10 GA. STL. SHEET
13	1	187017	3	SEAL BUSHING	BRONZE	ASTM-B103	M-187017	
14	1	186993	3	'U' CUP	NITRILE	COM'L.		PARKER #8404-0075
15	1	187059	3	'O' RING	NITRILE	COM'L.		PARKER #2-130
16	1	129624	3	RETAINING RING	STEEL	COM'L.		WALDES #N5000-206
17	1	185997	3	SPRING ADJUSTOR	STEEL	ASTM-A108	M-185997	SAE-1112
18	1	186984	3	SPRING PLATE	DU. IRON	ASTM-A536	M-186984	GR. 65-45-12
19	1	185964-R	3	YOKE	C.STEEL	ASTM-A216	E-185964	GR. WCB
20	1	189077	3	SPRING	STEEL	ASTM-A689	S-189077	GR-5160-6150, 6-30 RANGE
21	1	186005	3	ACTUATOR STEM	STEEL	ASTM-A108	M-186004	GR-1112
22	1	186995	3	STEM CONNECTOR ASS'Y.			M-186995	
23	4	64341	3	ROUND HEAD DRIVE SCREW	STEEL	COM'L.		#4 x 3/16" LONG
24	1	187036	3	INDICATOR ARM	STEEL		S-187036	
25	2	41347	3	HEX JAM NUT	STEEL	COM'L.		1/2"-13
26	1	187019	3	INDICATOR PLATE	BRASS	ASTM-B36	S-187019	23 GAUGE (.028")
28	2	V-2253	3	SELF-TAPPING SCREW	STEEL	COM'L.		#8-32 X 5/16 LONG
29	1	187083	3	ANTI-ROTATION PLATE	STEEL	ASTM-A569	M-187011	
30	1	187007	3	REVERSE ACTING STEM	STEEL	ASTM-A108	L-187007	SAE-1112
31	1	187009	3	ADJUSTING SCREW	STEEL	AISI-1015	M-187009	
32	1	187000	3	ACTUATOR HOUSING	C. IRON	ASTM-A48	L-186999	CL. 35
33	1	187041	3	HANDWHEEL	ALUM.	COM'L.	L-187039	GR-43 F
34	1	39149	3	KEY	STEEL	COM'L.		1/4" SQ. x 3/4" LONG
35	2	169152	3	RETAINING RING	STEEL	COM'L.		WALDES 5100-137
36	1	187060	3	THRUST BEARING	GARLOCK	COM'L.		#DU09
37	1	187015	3	THRUST WASHER	STEEL	COM'L.	S-187015	
38	2	139380	3	EYE BOLT	STEEL	COM'L.		
39	6	14225	3	LOCKWASHER	STEEL	COM'L.		3/8"
40	6	41390	3	HEX NUT	STEEL	COM'L.		3/8"-16
41	6	34586	3	HEX HEAD CAP SCREW	STEEL	COM'L.		3/8"-16 x 1-1/2" LONG
42	1	4536	3	HEX JAM NUT	STEEL	COM'L.		1/2"-20

4.1.55-184

NO	DATE	REVISIONS	BY	CHK.	NO	DATE	REVISIONS	BY	CHK.

REPRO FROM L-189960-3
PART CODE 4

COPES-VULCAN, INC.
One of the Wheelabrator Corporation Industries
LAKE CITY (ERIE CO.) PA U.S.A.

MODEL CV-600-4 R.A. ACTUATOR
CAST STEEL CONSTRUCTION
WITH MANUAL ACTUATOR

(1/2" VALVE STEM)
6-30 SPRING

DFTSMN JHR DATE 9-25-79
CHECKED RCS DATE 10-30-79
ARP DATE 11-12-79
JOB NO.
SCALE

DWG. NO. L-189960 SHT. 5 OF 7 REV. 0

7 6 5 4 3 2 1

REVISION STATUS OF SHEETS

sht 2	sht 3	sht 4	sht 5	sht 6	sht 7	sht 8	sht 9	sht 10	sht 11	sht 12	sht 13
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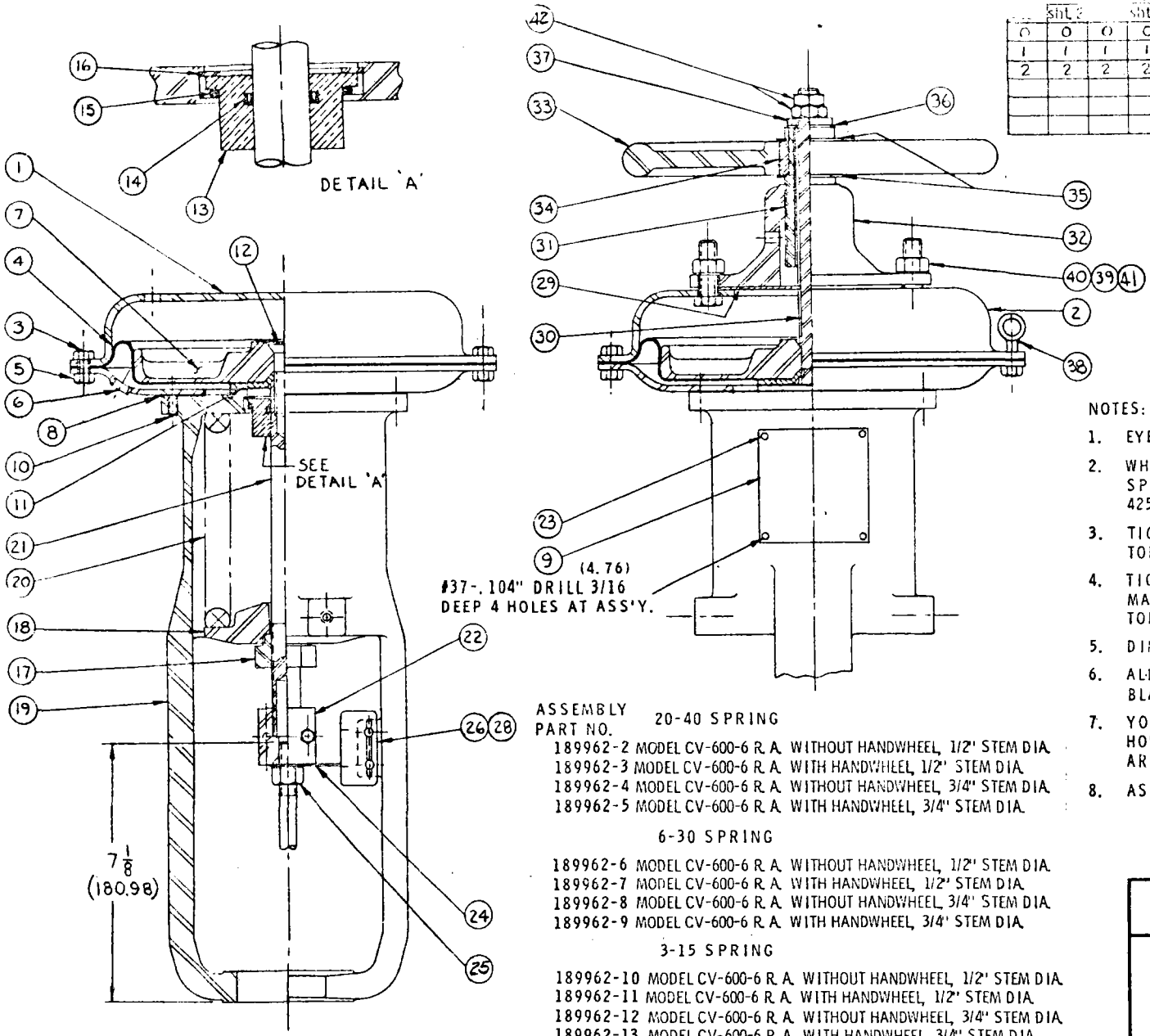


NOTES:

1. EYE BOLTS TO BE 180° APART.
2. WHEN ASSEMBLING ITEM 19, YOKE, & ITEM 17 SPRING ADJUSTOR, USE CRANE COMPOUND 425A, CV PART NO. 95123, ON THREADS.
3. TIGHTEN ITEM 25, NUT, TO 30 LBS. FT. OF TORQUE.
4. TIGHTEN ITEM 12, SCREW, OR ITEM 30, MANUAL ACTUATOR STEM, TO 35 LBS. FT. OF TORQUE.
5. DIMENSIONS IN INCHES AND (MILLIMETERS).
6. ALL NUTS, BOLTS, AND WASHERS ARE TO BE BLACK OXIDE FINISHED PRIOR TO ASSEMBLY.
7. YOKE, COVER, BASE, ACTUATOR (HANDWHEEL) HOUSING, AND BRACKETS (IF REQUIRED) ARE TO BE PRE-PAINTED.
8. ASSEMBLY PER CV PROCEDURE #1. 2. 279.

ASSEMBLY PART NO.

20-40 SPRING

189962-2 MODEL CV-600-6 R.A. WITHOUT HANDWHEEL, 1/2" STEM DIA.
189962-3 MODEL CV-600-6 R.A. WITH HANDWHEEL, 1/2" STEM DIA.
189962-4 MODEL CV-600-6 R.A. WITHOUT HANDWHEEL, 3/4" STEM DIA.
189962-5 MODEL CV-600-6 R.A. WITH HANDWHEEL, 3/4" STEM DIA.

6-30 SPRING

189962-6 MODEL CV-600-6 R.A. WITHOUT HANDWHEEL, 1/2" STEM DIA.
189962-7 MODEL CV-600-6 R.A. WITH HANDWHEEL, 1/2" STEM DIA.
189962-8 MODEL CV-600-6 R.A. WITHOUT HANDWHEEL, 3/4" STEM DIA.
189962-9 MODEL CV-600-6 R.A. WITH HANDWHEEL, 3/4" STEM DIA.

3-15 SPRING

189962-10 MODEL CV-600-6 R.A. WITHOUT HANDWHEEL, 1/2" STEM DIA.
189962-11 MODEL CV-600-6 R.A. WITH HANDWHEEL, 1/2" STEM DIA.
189962-12 MODEL CV-600-6 R.A. WITHOUT HANDWHEEL, 3/4" STEM DIA.
189962-13 MODEL CV-600-6 R.A. WITH HANDWHEEL, 3/4" STEM DIA.

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

ACTUATOR ASSEMBLY
MODEL CV-600-6 R.A.
CAST STEEL CONSTRUCTION
($\frac{1}{2}$" OR $\frac{3}{4}$" VALVE STEM)

DFTSMN JHR DATE 6-26-79
CHECKED [illegible] DATE 7-5-79
[illegible] DATE 7-6-79

DWG. NO. L-189962 SHT. 1 OF 13 REV. 2

NO.	DATE	REVISIONS	BY	CHK.
1	9-6-79	DELETED ITEM 21 & UPDATED REV. STATUS BLOCK PER E.C. 6276.	JHR	[illegible]
2	10-5-79	ADDED NOTES 6,7, & 8 AND SHEETS 6 THRU 13 PER E.C. 6269.	JHR	[illegible]

REPRO: L-187048-1 Pr Copy 4

ITEM NO.	NO. REQ'D	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
2	1	185978	3	COVER	STEEL		L-185978	SAE-1008-1010
3	10	4548	3	HEX HEAD CAP SCREW	STEEL	COM'L.		5/16"-18 x 3/4" LONG
4	1	185988	3	DIAPHRAGM	BUNA'N'	COM'L.	L-185988	1/16" THICK WITH FABRIC
5	12	13803	3	HEX NUT	STEEL	COM'L.		5/16"-18
6	1	185979	3	BASE	STEEL		L-185979	SAE-1008-1010
7	1	185992	3	DIAPHRAGM PLATE	ALUM.	ASTM-B26	L-185992	ALLOY SG70A, COND. T6
8	1	187030	3	GASKET	NITRILE	COM'L.	S-187030	1/16" THICK WITH FABRIC
9	1	174703	3	IDENTIFICATION PLATE	BRASS	ASTM-B36	M-174703	22 GAUGE (.0313")
10	6	187057	3	FLAT HEAD MACH. SCREW	STEEL	COM'L.		3/8"-16 x 3/4" LONG
11	1	186009	3	DIAPHRAGM STOP	STEEL	ASTM-A 303	M-186009	10 GA. STL. SHEET.
13	1	187018	3	SEAL BUSHING	BRONZE	ASTM-B103	M-187018	
14	1	187058	3	'U' CUP	NITRILE	COM'L.		PARKER 1 1/8" I.D x 1 3/8" O.D
15	1	187059	3	'O' RING	NITRILE	COM'L.		PARKER #2-130
16	1	129624	3	RETAINING RING	STEEL	COM'L.		WALDES #N5000-206
17	1	185998	3	SPRING ADJUSTOR	STEEL	ASTM-A108	M-185998	SAE-1112
18	1	186986	3	SPRING PLATE	DU. IRON	ASTM-A536	M-186986	GR. 65-45-12
19	1	187087-R	3	YOKE	C.STEEL	ASTM-A216	E-185966	GR. WCB
20	1	185956	3	SPRING	STEEL	ASTM-A689	S-185956	GR. -5160-6150, 20-40 RANGE
21	1	186006	3	ACTUATOR STEM	STEEL	ASTM-A108	M-186004	GR. 1215
22	1	187053	3	STEM CONNECTOR ASS'Y.			M-187053	
23	4	64341	3	ROUND HEAD DRIVE SCREW	STEEL	COM'L.		#4 x 3/16" LONG
24	1	187036	3	INDICATOR ARM	STEEL		S-187036	
25	1	4536	3	HEX JAM NUT	STEEL	COM'L.		1/2"-20
26	1	187019	3	INDICATOR PLATE	BRASS	ASTM-B36	S-187019	23 GAUGE (.028")
28	2	V-2253	3	SELF-TAPPING SCREW	STEEL	COM'L.		#8-32 X 5/16 LONG
29	1	187084	3	ANTI-ROTATION PLATE	STEEL	ASTM-A569	M-187011	
30	1	187007	3	REVERSE ACTING STEM	STEEL	ASTM-A108	L-187007	GR. 1215
31	1	187009	3	ADJUSTING SCREW	STEEL	AISI-1015	M-187009	
32	1	187001	3	ACTUATOR HOUSING	C. IRON	ASTM-A48	L-186999	CL. 35
33	1	187041	3	HANDWHEEL	ALUM.	COM'L.	L-187039	GR. 43F
34	1	39149	3	KEY	STEEL	COM'L.		1/4" SQ. x 3/4" LONG
35	2	169152	3	RETAINING RING	STEEL	COM'L.		WALDES 5100-137
36	1	187060	3	THRUST BEARING	GARLOCK	COM'L.		#DU09
37	1	187015	3	THRUST WASHER	STEEL	COM'L.	S-187015	
38	2	139380	3	EYE BOLT	STEEL	COM'L.		
39	6	14225	3	LOCKWASHER	STEEL	COM'L.		3/8"
40	6	41390	3	HEX NUT	STEEL	COM'L.		3/8"-16
41	6	34586	3	HEX HEAD CAP SCREW	STEEL	COM'L.		3/8"-16 x 1-1/2" LONG
42	2	41347	3	HEX JAM NUT	STEEL	COM'L.		1/2"-13

NO.	DATE	REVISIONS	BY	CHK.
1	9-6-79	ITEM 21 WAS P/N 187033 & ITEM 28 WAS P/N 187035 PER E.C. 6276.	JHR	RJL
2	10-5-79	ITEM 19 MAT'L WAS C.IRON, DWG. WAS SHEET 3 OF 5, ADDED 20-40 SPRING TO TITLE, & ITEM 2 WAS P/N 185980 PER E.C. 6269.	JHR	RJL

REPRO FROM L-187048-3
PART CODE 4

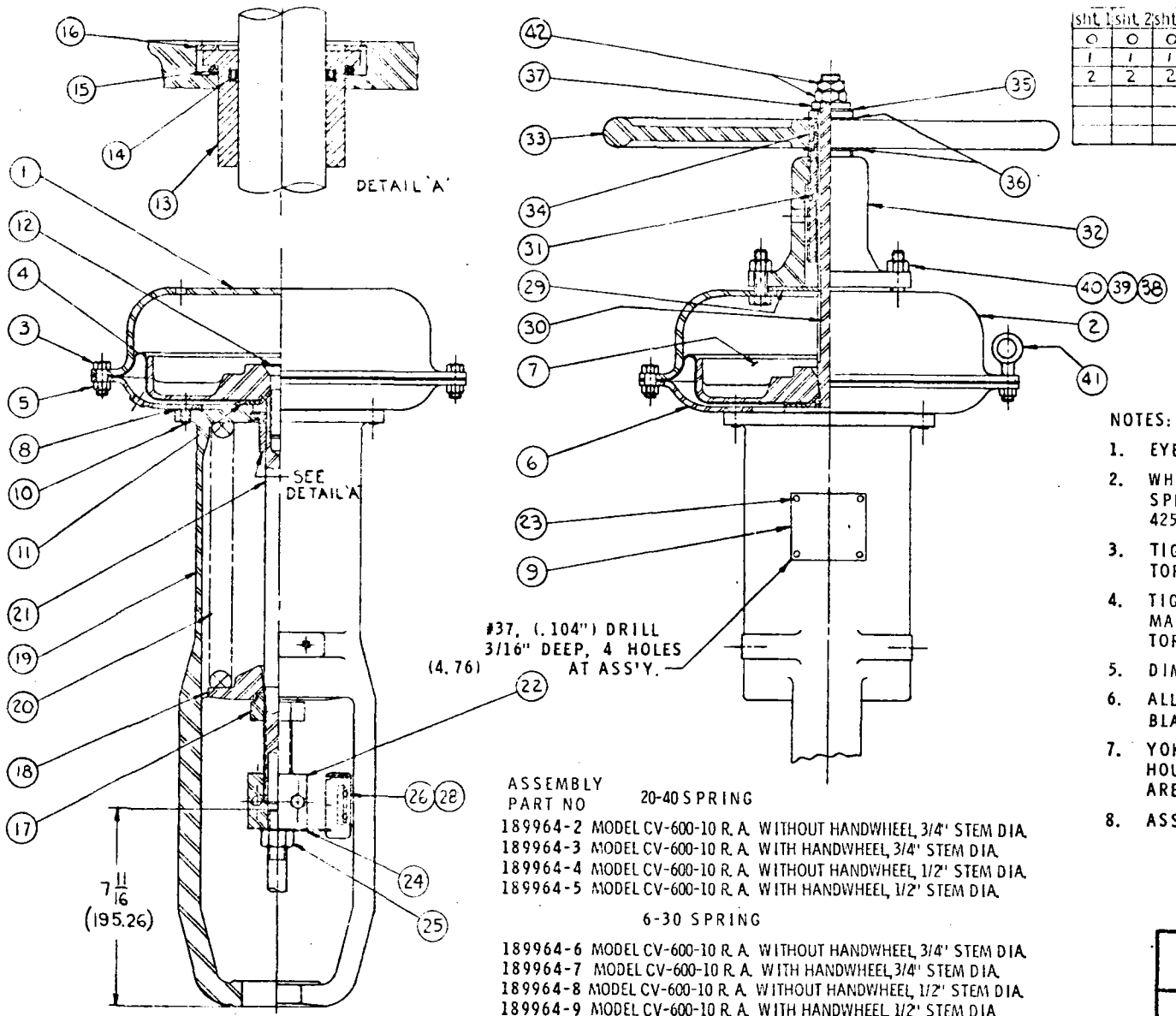
COPES-VULCAN, INC.
One of the Worthington Companies
LAKE CITY (ERIE CO.) PA. U.S.A.

CAST STEEL CONSTRUCTION
MODEL CV-600-6 R.A. ACTUATOR
WITH MANUAL ACTUATOR
(1/2" VALVE STEM)
20-40 SPRING

DFTSMN JHR DATE 6-26-79
CHECKED RJL DATE 7-5-79
JJW DATE 7-5-79
JOB NO.
SCALE

DWG. NO. L-189962 SHT. 3 OF 13 REV. 2

4.1.55-186



REVISIONS OF PARTS												
sht 1	sht 2	sht 3	sht 4	sht 5	sht 6	sht 7	sht 8	sht 9	sht 10	sht 11	sht 12	sht 13
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1	1	1	1	1	—	—	—	—	—	—	—	—
2	2	2	2	2	0	0	0	0	0	0	0	0

NOTES:

1. EYE BOLTS TO BE 180° APART.
2. WHEN ASSEMBLING ITEM 19, YOKE, & ITEM 17, SPRING ADJUSTOR, USE CRANE COMPOUND 425A, CV PART NO. 95123, ON THREADS.
3. TIGHTEN ITEM 25, NUT, TO 30 LBS. FT. OF TORQUE.
4. TIGHTEN ITEM 12, SCREW, OR ITEM 30, MANUAL ACTUATOR STEM, TO 50 LBS. FT. OF TORQUE.
5. DIMENSIONS IN INCHES AND (MILLIMETERS).
6. ALL NUTS, BOLTS, AND WASHERS ARE TO BE BLACK OXIDE FINISHED PRIOR TO ASSEMBLY.
7. YOKE, COVER, BASE, ACTUATOR (HANDWHEEL) HOUSING, AND BRACKETS (IF REQUIRED) ARE TO BE PRE-PAINTED.
8. ASSEMBLY PER CV PROCEDURE #1. 2. 279.

ASSEMBLY PART NO	20-40 SPRING
189964-2	MODEL CV-600-10 R.A. WITHOUT HANDWHEEL, 3/4" STEM DIA.
189964-3	MODEL CV-600-10 R.A. WITH HANDWHEEL, 3/4" STEM DIA.
189964-4	MODEL CV-600-10 R.A. WITHOUT HANDWHEEL, 1/2" STEM DIA.
189964-5	MODEL CV-600-10 R.A. WITH HANDWHEEL, 1/2" STEM DIA.
	6-30 SPRING
189964-6	MODEL CV-600-10 R.A. WITHOUT HANDWHEEL, 3/4" STEM DIA.
189964-7	MODEL CV-600-10 R.A. WITH HANDWHEEL, 3/4" STEM DIA.
189964-8	MODEL CV-600-10 R.A. WITHOUT HANDWHEEL, 1/2" STEM DIA.
189964-9	MODEL CV-600-10 R.A. WITH HANDWHEEL, 1/2" STEM DIA.
	3-15 SPRING
189964-10	MODEL CV-600-10 R.A. WITHOUT HANDWHEEL, 3/4" STEM DIA.
189964-11	MODEL CV-600-10 R.A. WITH HANDWHEEL, 3/4" STEM DIA.
189964-12	MODEL CV-600-10 R.A. WITHOUT HANDWHEEL, 1/2" STEM DIA.
189964-13	MODEL CV-600-10 R.A. WITH HANDWHEEL, 1/2" STEM DIA.

NO.	DATE	REVISIONS	BY	CHK
1	9-5-79	DELETED ITEM 21 & UPDATED REV. STATUS BLOCK PER E.C. 6270	JHP	
2	10-8-79	ADDED NOTES 6,7,&8 AND SHEETS 6 THRU 13 PER E.C. 6269.	JHP	

NO.	DATE	REVISIONS	BY	CHK.

REPRO FROM L-187050-1
PART CODE 4

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

ACTUATOR ASSEMBLY
MODEL CV-600-10 R.A.
CAST STEEL CONSTRUCTION
($\frac{1}{2}$" OR $\frac{3}{4}$" VALVE STEM)

DFTSMN JHR DATE 7-2-79 JOB NO.
CHECKED WEA DATE 7-5-79 SCALE N.T.S.
DATE

DWG. NO. L-189964 SHT. 1 OF 13 REV. 2

4.1.55-187

ITEM NO.	NO. REQ'D	PART NO	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
2	1	185981	3	COVER	STEEL		L-185981	SAE-1008-1010
3	10	4377	3	HEX HEAD CAP SCREW	STEEL	COM'L.		3/8"-16 x 1-1/4" LONG
4	1	185989	3	DIAPHRAGM	BUNA'N'	COM'L.	L-185989	1/16" THICK WITH FABRIC
5	12	41390	3	HEX NUT	STEEL	COM'L.		3/8"-16
6	1	185982	3	BASE	STEEL		L-185982	SAE-1008-1010
7	1	185993	3	DIAPHRAGM PLATE	ALUM.	ASTM-B26	L-185993	ALLOY SG70A, COND. T6
8	1	187031	3	GASKET	NITRILE	COM'L	S-187031	1/16" THICK WITH FABRIC
9	1	78701	3	IDENTIFICATION PLATE	BRASS	ASTM-B36	M-78701	22 GAUGE (.0313")
10	6	187057	3	FLAT HEAD MACH. SCREW	STEEL	COM'L.		3/8-16 x 3/4" LONG
11	1	186010	3	DIAPHRAGM STOP	STEEL	ASTM-A303	M-186010	10 GA. STL. SHEET
13	1	187018	3	SEAL BUSHING	BRONZE	ASTM-B103	M-187018	
14	1	187058	3	'U' CUP	NITRILE	COM'L.		PARKER 1-1/8" I.D. x 1-3/8" O.D.
15	1	187059	3	'O' RING	NITRILE	COM'L.		PARKER #2-130
16	1	129624	3	RETAINING RING	STEEL	COM'L.		WALDES #N5000-206
17	1	185998	3	SPRING ADJUSTOR	STEEL	ASTM-A108	M-185998	SAE-1112
18	1	186988	3	SPRING PLATE	DU. IRON	ASTM-A53	M-186988	GR. 65-45-12
19	1	185971-R	3	YOKE	C.STEEL	ASTM-A216	E-185970	GR. WCB
20	1	189061	3	SPRING	STEEL	ASTM-A689	S-189061	AISI-5160-6150, 6-30 RANGE
21	1	186007	3	ACTUATOR STEM	STEEL	ASTM-A108	M-186004	GR-1215
22	1	186996	3	STEM CONNECTOR ASS'Y.			M-186996	
23	4	64341	3	ROUND HEAD DRIVE SCREW	STEEL	COM'L.		#4 x 3/16" LONG
24	1	187037	3	INDICATOR ARM	STEEL		S-187037	
25	1	188072	3	HEX JAM NUT	STEEL	COM'L.		3/4"-16
26	1	187020	3	INDICATOR PLATE	BRASS	ASTM-B36	S-187020	23 GAUGE (.028")
28	2	V-2253	3	SELF-TAPPING SCREW	STEEL	COM'L.		#8-32 X 5/16 LONG
29	1	187085	3	ANTI-ROTATION PLATE	STEEL	ASTM-A569	M-187012	
30	1	187008	3	REVERSE ACTING STEM	STEEL	ASTM-A108	L-187008	SAE-1112
31	1	187010	3	ADJUSTING SCREW	STEEL	AISI-1015	M-187010	
32	1	187003	3	ACTUATOR HOUSING	C. IRON	ASTM-A48	L-187002	CL. 35
33	1	187044	3	HANDWHEEL	ALUM.	COM'L.	L-187042	GR.-356-T7
34	1	3997	3	KEY	STEEL	COM'L.		1/4" SQ. x 1-1/8" LONG
35	2	32392	3	RETAINING RING	STEEL	COM'L.		WALDES 5100-175
36	1	187061	3	THRUST BEARING	GARLOCK	COM'L.		DU13
37	1	187016	3	THRUST WASHER	STEEL	COM'L.	S-187016	SAE-1112
38	6	5496	3	HEX HEAD CAP SCREW	STEEL	COM'L.		1/2"-13 X 1 3/4" LONG
39	6	1898	3	LOCKWASHER	STEEL	COM'L.		1/2"
40	6	2619	3	HEX NUT	STEEL	COM'L.		1/2"-13
41	2	139381	3	EYE BOLT	STEEL	COM'L.		
42	2	5746	3	HEX. JAM NUT	STEEL	COM'L.		3/4"-10

4.1.55-188

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.

REPRO FROM L-189964-3
PART CODE 4

COPES-VULCAN, INC.
One of the Wheatley Companies
LAKE CITY (ERIE CO.), PA. U.S.A.

MODEL CV-600-10 R.A. ACTUATOR
CAST STEEL CONSTRUCTION
WITH MANUAL ACTUATOR

(3/4" VALVE STEM)

6-30 SPRING

DFTSMN JHR DATE 9-21-76
CHECKED KAS. DATE 10-31-76
ARP DATE 11-12-76
JOB NO.
SCALE

DWG. NO. L-189964 SHT. 7 OF 13 REV. 0

7 6 5 4 3 2 1

ITEM NO.	NO. REQ'D	PART NO	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
2	1	185981	3	COVER	STEEL		L-185981	SAE-1008-1010
3	10	4377	3	HEX HEAD CAP SCREW	STEEL	COM'L.		3/8"-16 x 1-1/4" LONG
4	1	185989	3	DIAPHRAGM	BUNA'N'	COM'L.	L-185989	1/16" THICK WITH FABRIC
5	12	41390	3	HEX NUT	STEEL	COM'L.		3/8"-16
6	1	185982	3	BASE	STEEL		L-185982	SAE-1008-1010
7	1	185993	3	DIAPHRAGM PLATE	ALUM.	ASTM-B26	L-185993	ALLOY SG70A, COND. T6
8	1	187031	3	GASKET	NITRILE	COM'L	S-187031	1/16" THICK WITH FABRIC
9	1	78701	3	IDENTIFICATION PLATE	BRASS	ASTM-B36	M-78701	22 GAUGE (.0313")
10	6	187057	3	FLAT HEAD MACH. SCREW	STEEL	COM'L.		3/8-16 x 3/4" LONG
11	1	186010	3	DIAPHRAGM STOP	STEEL	ASTM-A303	M-186010	10 GA. STL. SHEET
13	1	187018	3	SEAL BUSHING	BRONZE	ASTM-B103	M-187018	
14	1	187058	3	'U' CUP	NITRILE	COM'L.		PARKER 1-1/8" I. D. x 1-3/8" O. D.
15	1	187059	3	'O' RING	NITRILE	COM'L.		PARKER #2-130
16	1	129624	3	RETAINING RING	STEEL	COM'L.		WALDES #N5000-206
17	1	185998	3	SPRING ADJUSTOR	STEEL	ASTM-A108	M-185998	SAE-1112
18	1	186988	3	SPRING PLATE	DU. IRON	ASTM-A53	M-186988	GR. 65-45-12
19	1	185971-R	3	YOKE	C. STEEL	ASTM-A216	E-185970	GR. WCB
20	1	189080	3	SPRING	STEEL	ASTM-A689	S-189080	AISI-5160-6150, 3-15 RANGE
21	1	186007	3	ACTUATOR STEM	STEEL	ASTM-A108	M-186004	GR-1215
22	1	186996	3	STEM CONNECTOR ASS'Y.			M-186996	
23	4	64341	3	ROUND HEAD DRIVE SCREW	STEEL	COM'L.		#4 x 3/16" LONG
24	1	187037	3	INDICATOR ARM	STEEL		S-187037	
25	1	188072	3	HEX JAM NUT	STEEL	COM'L.		3/4"-16
26	1	187020	3	INDICATOR PLATE	BRASS	ASTM-B36	S-187020	23 GAUGE (.028")
28	2	V-2253	3	SELF-TAPPING SCREW	STEEL	COM'L.		#8-32 X 5/16 LONG
29	1	187085	3	ANTI-ROTATION PLATE	STEEL	ASTM-A569	M-187012	
30	1	187008	3	REVERSE ACTING STEM	STEEL	ASTM-A108	L-187008	SAE-1112
31	1	187010	3	ADJUSTING SCREW	STEEL	AISI-1015	M-187010	
32	1	187003	3	ACTUATOR HOUSING	C. IRON	ASTM-A48	L-187002	CL. 35
33	1	187044	3	HANDWHEEL	ALUM.	COM'L.	L-187042	GR. - 356-T7
34	1	3997	3	KEY	STEEL	COM'L.		1/4" SQ. x 1-1/8" LONG
35	2	32392	3	RETAINING RING	STEEL	COM'L.		WALDES 5100-175
36	1	187061	3	THRUST BEARING	GARLOCK	COM'L.		DU13
37	1	187016	3	THRUST WASHER	STEEL	COM'L.	S-187016	SAE-1112
38	6	5496	3	HEX HEAD CAP SCREW	STEEL	COM'L.		1/2"-13 X 1 3/4" LONG
39	6	1898	3	LOCKWASHER	STEEL	COM'L.		1/2"
40	6	2619	3	HEX NUT	STEEL	COM'L.		1/2"-13
41	2	139381	3	EYE BOLT	STEEL	COM'L.		
42	2	5746	3	HEX. JAM NUT	STEEL	COM'L.		3/4"-10

4.1.55-189

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.

REPRO FROM L-189964 -3

PART CODE 4

COPES-VULCAN, INC.
One of the Wilcox Companies
LAKE CITY (ERIE CO.), PA. U.S.A.

MODEL CV-600-10 R. A. ACTUATOR
CAST STEEL CONSTRUCTION
WITH MANUAL ACTUATOR

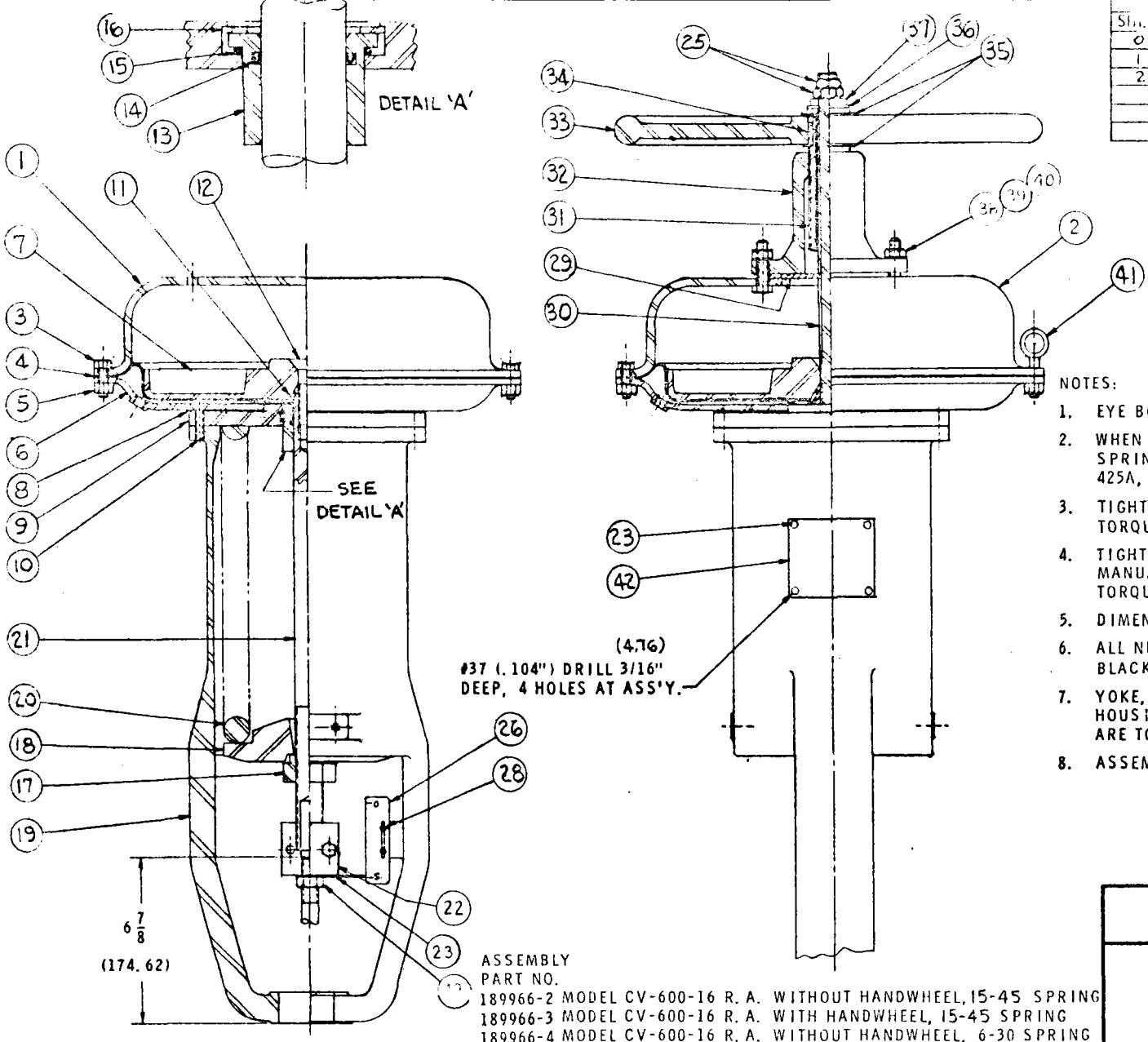
(3/4" VALVE STEM)

3-15 SPRING

DFTSMN JHR DATE 9-27-79
CHECKED [illegible] DATE 10-31-79
[illegible] DATE 11-14-79

JOB NO.
SCALE

DWG. NO. L-189964 SHT. 11 OF 13 REV. 0



	Sht. 1	Sht. 2	Sht. 3	Sht. 4	Sht. 5	Sht. 6	Sht. 7
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1	1	1	—	—	—	—	—
2	2	2	0	0	0	0	0

NOTES:

1. EYE BOLTS TO BE 180° APART.
2. WHEN ASSEMBLING ITEM 19, YOKE, & ITEM 17, SPRING ADJUSTOR, USE CRANE COMPOUND 425A, CV PART NO. 95123, ON THREADS.
3. TIGHTEN ITEM 25, NUT, TO 30 LBS. FT. OF TORQUE.
4. TIGHTEN ITEM 12, SCREW, OR ITEM 30, MANUAL ACTUATOR STEM, TO 50 LBS. FT. OF TORQUE.
5. DIMENSIONS IN INCHES AND (MILLIMETERS).
6. ALL NUTS, BOLTS, AND WASHERS ARE TO BE BLACK OXIDE FINISHED PRIOR TO ASSEMBLY.
7. YOKE, COVER, BASE, ACTUATOR (HANDWHEEL) HOUSING, AND BRACKETS (IF REQUIRED) ARE TO BE PRE-PAINTED.
8. ASSEMBLY PER CV PROCEDURE #1. 2. 279.

ASSEMBLY PART NO.

189966-2 MODEL CV-600-16 R. A. WITHOUT HANDWHEEL, 15-45 SPRING
189966-3 MODEL CV-600-16 R. A. WITH HANDWHEEL, 15-45 SPRING
189966-4 MODEL CV-600-16 R. A. WITHOUT HANDWHEEL, 6-30 SPRING
189966-5 MODEL CV-600-16 R. A. WITH HANDWHEEL, 6-30 SPRING
189966-6 MODEL CV-600-16 R. A. WITHOUT HANDWHEEL, 3-15 SPRING
189966-7 MODEL CV-600-16 R. A. WITH HANDWHEEL, 3-15 SPRING

NO.	DATE	REVISIONS	BY	CHK.
1	9-5-79	DELETED ITEM 27 / UPDATED REV. STATUS BLOCK PER E.C. 6271.	JHR	
2	10-10-79	ADDED ITEM 38, NOTES 6, 7, & 8, AND SHEETS 4, 5, 6, & 7 PER E.C. 6269.	JHR	

NO.	DATE	REVISIONS	BY	CHK.

REPRO FROM L-187052-1
PART CODE 4

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

ACTUATOR ASSEMBLY
MODEL CV-600-16 R. A.
CAST STEEL CONSTRUCTION
(3/4" VALVE STEM)

DFTSMN JHR DATE 6-28-79
CHECKED [illegible] DATE 7-5-79
DATE
JOB NO.
SCALE

DWG. NO. L-189966 SHT. 1 OF 7 REV. 2

4.1.55-190

ITEM NO.	NO. REQ'D	PART NO	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
2	1	185984	3	COVER	STEEL		L-185984	SAE-1008-1010
3	22	4377	3	HEX HEAD CAP SCREW	STEEL	COM'L.		3/8"-16 x 1-1/4" LONG
4	1	185990	3	DIAPHRAGM	BUNA'N'	COM'L.	L-185990	1/16" THICK WITH FABRIC
5	24	41390	3	HEX NUT	STEEL	COM'L.		3/8"-16
6	1	185985	3	BASE	STEEL		L-185985	SAE-1008-1010
7	1	185994	3	DIAPHRAGM PLATE	ALUM.	ASTM-B26	L-185994	ALLOY SG70A, COND. T6
8	1	187032	3	GASKET	NITRILE	COM'L.	S-187032	1/16" THICK WITH FABRIC
9	1	186991	3	YOKE PLATE	STEEL	ASTM-A36	L-186991	
10	6	187081	3	FLAT HEAD MACH. SCREW	STEEL	COM'L.		1/2"-13 x 1-1/2" LONG
11	1	186010	3	DIAPHRAGM STOP	STEEL	ASTM-A303	M-186010	10 GA. STL. SHEET
13	1	187018	3	SEAL BUSHING	BRONZE	ASTM-B103	M-187018	
14	1	187058	3	'U' CUP	NITRILE	COM'L.		PARKER 1-1/8" I. D. x 1-3/8" O. D.
15	1	187059	3	'O' RING	NITRILE	COM'L.		PARKER #2-130
16	1	129624	3	RETAINING RING	STEEL	COM'L.		WALDES #N5000-206
17	1	185998	3	SPRING ADJUSTOR	STEEL	ASTM-A108	M-185998	SAE-1112
18	1	186990	3	SPRING PLATE	DU. IRON	ASTM-A536	M-186990	GR. 65-45-12
19	1	185974-R	3	YOKE	C.STEEL	ASTM-A216	E-185974	GR. WCB
20	1	189062	3	SPRING	STEEL	ASTM-A689	S-189062	AISI-5160-6150, 6-30 RANGE
21	1	186008	3	ACTUATOR STEM	STEEL	ASTM-A108	M-186004	GR 1215
22	1	186996	3	STEM CONNECTOR ASS'Y.			M-186996	
23	4	64341	3	ROUND HEAD DRIVE SCREW	STEEL	COM'L.		#4 x 3/16" LONG
24	1	187037	3	INDICATOR ARM	STEEL			
25	2	5746	3	HEX JAM NUT	STEEL	COM'L.		3/4"-10
26	1	187021	3	INDICATOR PLATE	BRASS	ASTM-B36	S-187021	23 GAUGE (.028")
28	2	V-2253	3	SELF-TAPPING SCREW	STEEL	COM'L.		#8-32 X 5/16 LONG
29	1	187086	3	ANTI-ROTATION PLATE	STEEL	ASTM-A569	M-187012	
30	1	187008	3	REVERSE ACTING STEM	STEEL	ASTM-108	L-187008	SAE-1112
31	1	187010	3	ADJUSTING SCREW	STEEL	AISI-1015	M-187010	
32	1	187004	3	ACTUATOR HOUSING	C. IRON	ASTM-A48	L-187002	CL. 35
33	1	187044	3	HANDWHEEL	ALUM.	COM'L.	L-187042	GR. 356-T7
34	1	3997	3	KEY	STEEL	COM'L.		1/4" SQ. x 1-1/8" LONG
35	2	32392	3	RETAINING RING	STEEL	COM'L.		WALDES 5100-175
36	1	187061	3	THRUST BEARING	GARLOCK	COM'L.		DU13
37	1	187016	3	THRUST WASHER	STEEL	COM'L.	S-187016	
38	6	5496	3	HEX HEAD CAP SCREW	STEEL	COM'L.		1/2"-13 X 1 3/4" LONG
39	6	1898	3	LOCKWASHER	STEEL	COM'L.		1/2"
40	6	2619	3	HEX NUT	STEEL	COM'L.		1/2"-13
41	2	139381	3	EYE BOLT	STEEL	COM'L.		
42	1	78701	3	IDENTIFICATION PLATE	BRASS	ASTM-B36	M-78701	22 GAUGE (.0313")
43	1	188072	3	HEX JAM NUT	STEEL	COM'L.		3/4"-16

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.

REPRO FROM L-189966-3

PART CODE 4

COPES-VULCAN, INC.
One of the Witte Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

MODEL CV-600-16 R.A. ACTUATOR
CAST STEEL CONSTRUCTION
WITH MANUAL ACTUATOR
(3/4" VALVE STEM)
6-30 SPRING

DFTSMN JHR	DATE 9-21-89	JOB NO.	
CHECKED [illegible]	DATE 10-31-89	SCALE	
AKP	DATE 11-13-89		

DWG. NO. L-189966 SHT. 5 OF 7 REV. 0

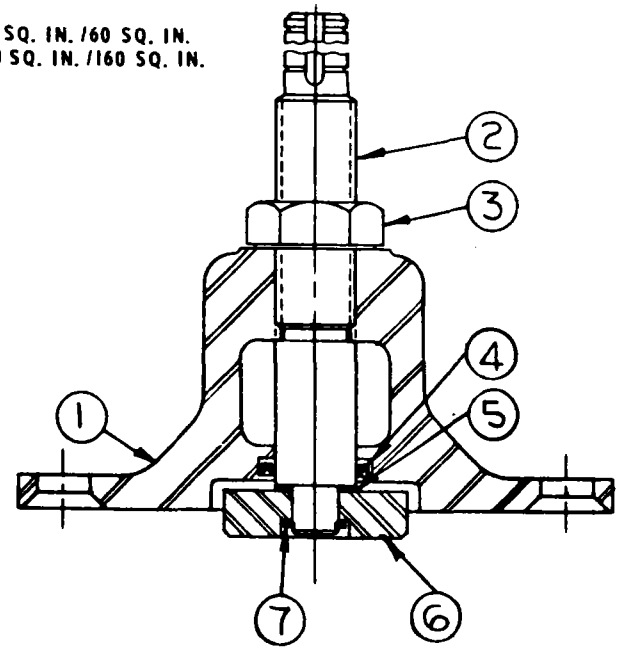
4.1.55-191

LIST OF MATERIAL

ITEM NO.	NO. REQ'D. A	NO. REQ'D. B	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPECS.	DWG. NO.	REMARKS
1	1		186997		HOUSING	C. IRON	ASTM-A-48	L-186997	CL. 35
		1	186998			C. IRON	ASTM-A-48	L-186998	CL. 35
2	1		187005		STEM	C. R. S.	ASTM-A-108	M-187005	
		1	187006			C. R. S.	ASTM-A-108	L-187006	
3	1		41338		HALF NUT	STEEL	COM'L.		
		1	40662			STEEL	COM'L.		
4	1		187027		SEAL	NITRILE	COM'L.		PARKER PT. NO. 8404-0087
		1	187028			NITRILE	COM'L.		PARKER PT. NO. 8505-0137
5	1		187025		BEARING		COM'L.		GARLOCK - DU06
		1	187026				COM'L.		GARLOCK - DU10
6	1		187013		THRUST BASE	C. R. S.	ASTM-A-108	S-187013	
		1	187014			C. R. S.	ASTM-A-108	S-187014	
7	1		5572		RETAINING RING	STEEL	COM'L.		WALDES 5100-50
		1	14492			STEEL	COM'L.		WALDES 5100-75

NOTE:

COLUMN	ASS'Y. PT. NO.	
A	187023	FOR 40 SQ. IN. /60 SQ. IN.
B	187024	FOR 100 SQ. IN. /160 SQ. IN.



REVISIONS

NO.	DESCRIPTION	REV. BY	CK'D BY	DATE	APPD
1	ITEM 1 CL. WAS GR. PER E.C. 6156.	JHR	WB.	3-8-79	

MATERIAL

STOCK NO. AMOUNT REQ'D

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
BREAK CORNERS 1/64 MAX.
FILLETS ARE 1/64 TO 1/32 R
✓ INDICATES 250 FINISH
TOLERANCES ARE:

DIMENSION	UNDER 6	6 - 18	OVER 18
DECIMALS	± .005	± .005	± .010
FRACTIONS	± 1/64	± 1/32	± 1/16

TOLERANCE ON ANGLES ± 2½°

COPES-VULCAN, INC.
One of the Wheo Consolidated Industries
LAKE CITY (ERIE CO.), PA U.S.A.

FOR: 40, 60, 100 & 160 SQUARE INCH
DIRECT ACTING CV-600 ACTUATORS

MANUAL ACTUATOR ASSEMBLY

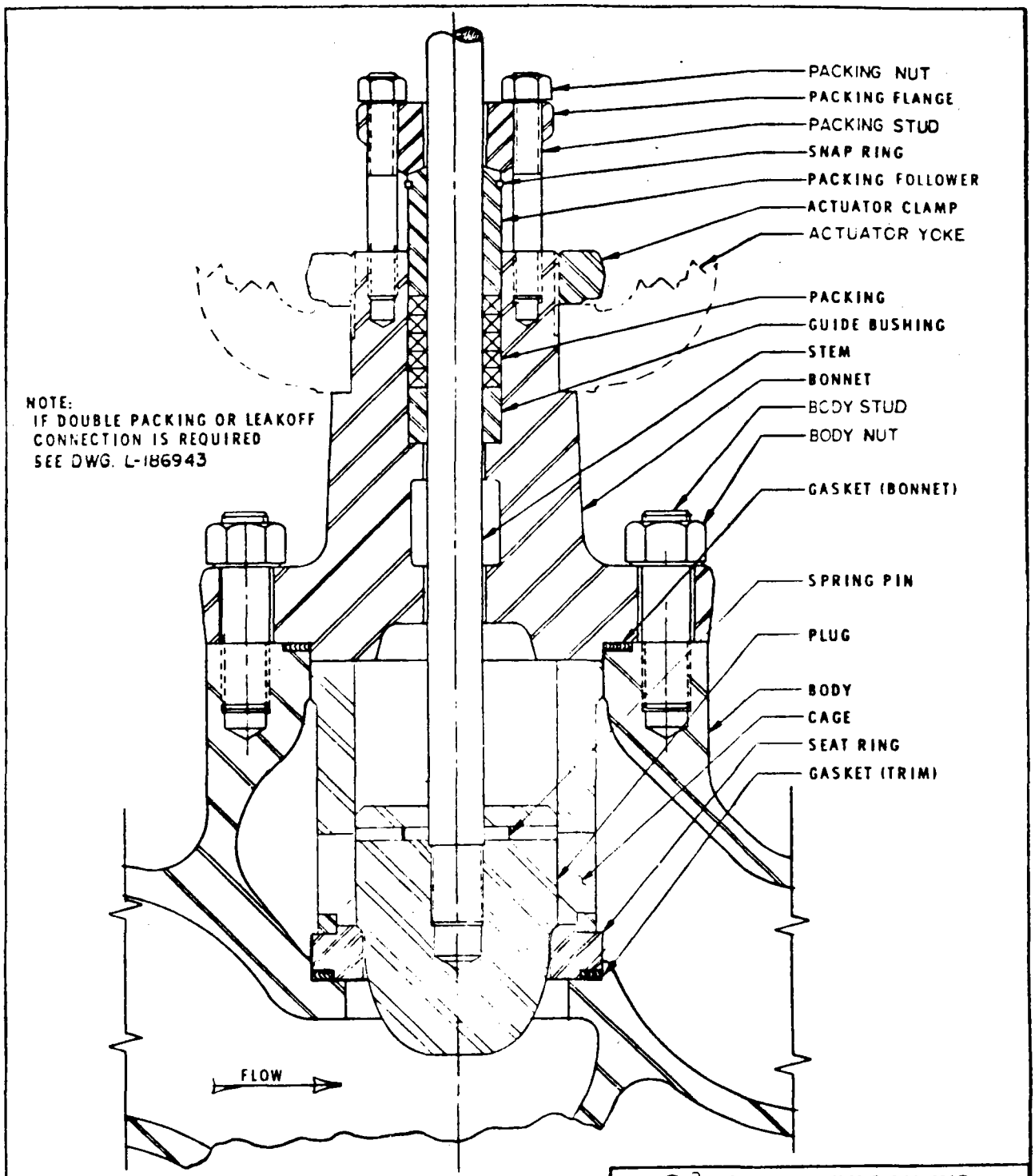
DFTSMN JHR	DATE 12-7-78	DSGN J.S.C.	DATE 12-9-78
CHECKED WB.	DATE 12-7-78	MFG.	DATE
	DATE		DATE

APPD

MASTER ASSY | SUB ASSY
JOB NO.
REPRO FROM
PART CODE 4

SCALE **DWG. NO. L-187022** REV. 1

4.1.55-192



COPES-VULCAN, INC.
One of the Walworth Companies Worldwide
LAKE CITY (ERIE CO.), PA. U.S.A.

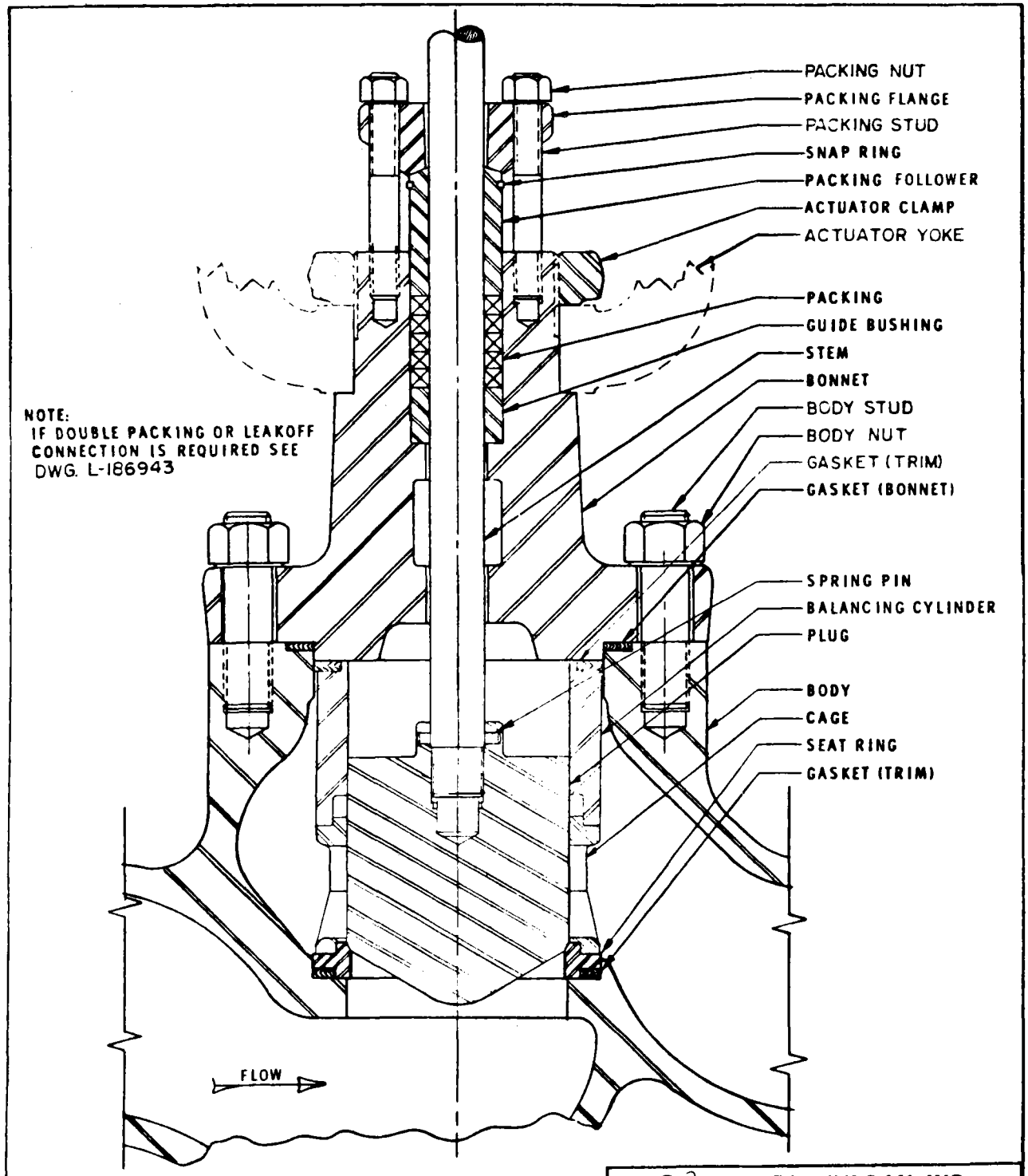
CV-600 SERIES VALVES

SINGLE SEAT PLUG THROTTLE
MODIFIED PARABOLIC - UNBALANCED

DFTSMN	DATE	DSGN.	DATE
CHECKED	DATE	MFG.	DATE
	DATE		DATE

APPD

SCALE | DWG. NO. L-186122 | REV. 0



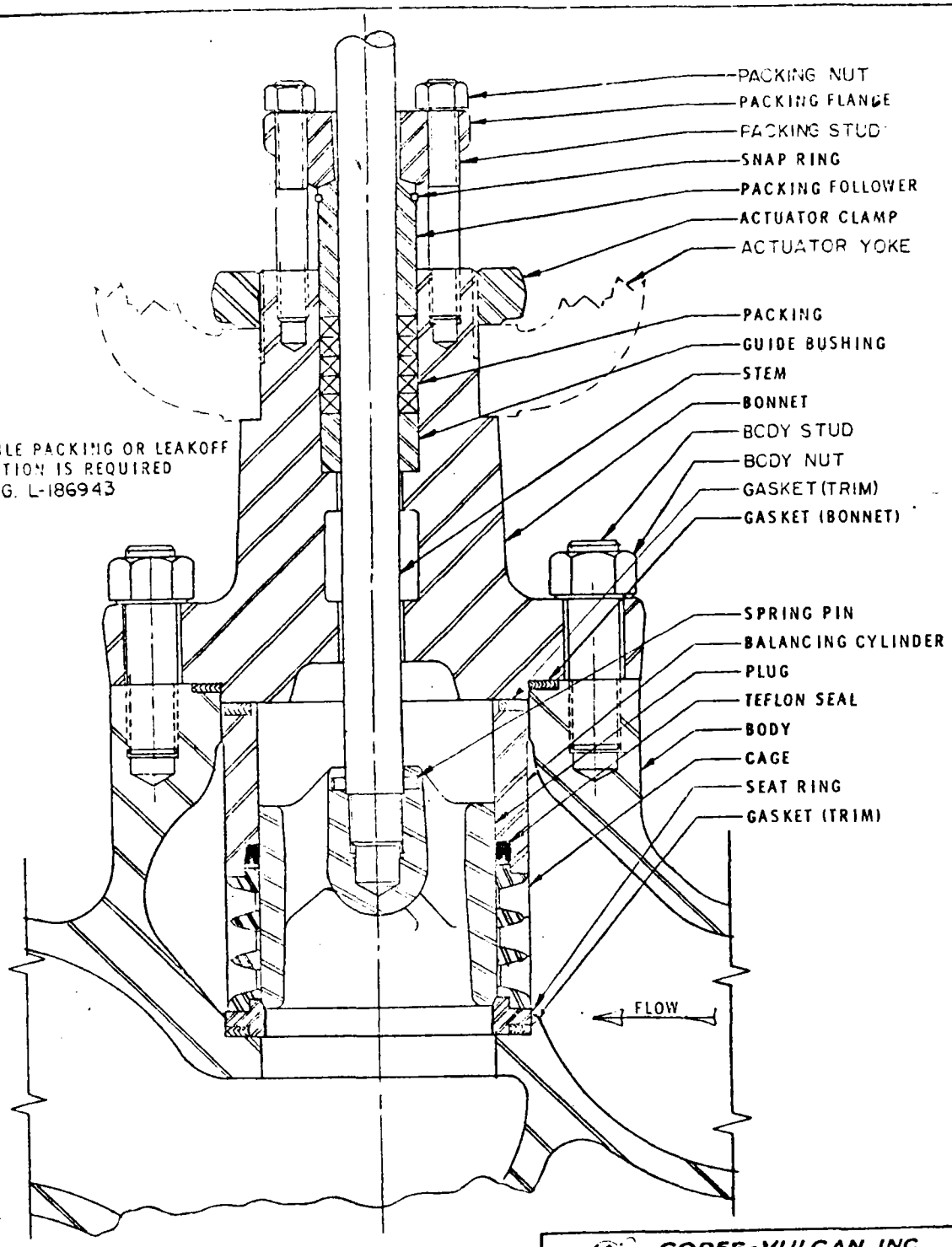
NOTE:
IF DOUBLE PACKING OR LEAKOFF CONNECTION IS REQUIRED SEE DWG. L-186943

COPES-VULCAN, INC.
One of the Wheelabrator Corporation
LAKE CITY (ERIE CO.), PA. U.S.A.

CV-600 SERIES VALVES
SINGLE SEAT PORT THROTTLE - UNBALANCED

DFTSMN	DATE 11-8-78	APPD	DSGN. A.K.P.	DATE 11-30-78
CHECKED	DATE 11-27-78		MFG.	DATE
	DATE			DATE

SCALE | DWG. NO. L-186123 | REV. 0



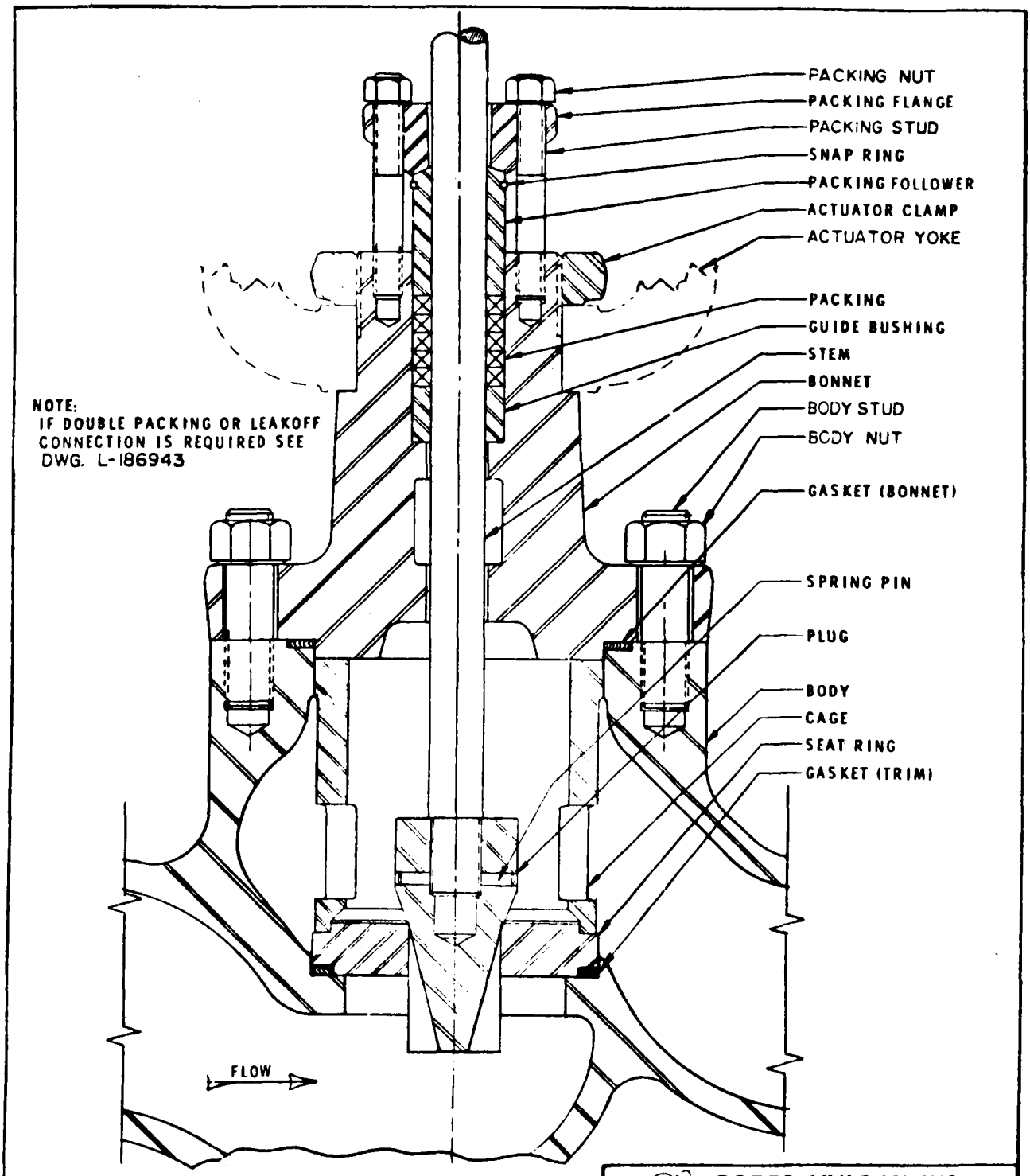
NOTE:
IF DOUBLE PACKING OR LEAKOFF CONNECTION IS REQUIRED SEE DWG. L-186943

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA U.S.A.

CV-600 SERIES VALVES

SINGLE SEAT CAV-B9, BALANCED, WITH TEFLON PLUG SEAL

DFTSM'N [illegible] DATE 1-8-75	APP'D	DSGN [illegible] DATE 1-30-75	
CHECKED [illegible] DATE [illegible]		MFG. _____ DATE _____	
_____ DATE _____		_____ DATE _____	
SCALE NONE	DWG. NO. L-186124		REV. 1



NOTE:
IF DOUBLE PACKING OR LEAKOFF CONNECTION IS REQUIRED SEE DWG. L-186943

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

CV-600 SERIES VALVES
SINGLE SEAT GROOVE TIP, UNBALANCED

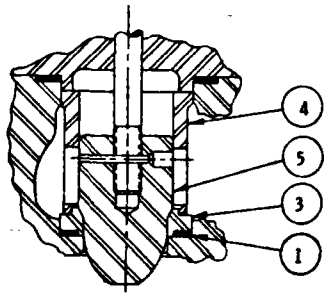
DFTSMN	DATE 11-8-78	APPD	DSGN. A.K.P.	DATE 11-30-78	
CHECKED	DATE		MFG.	DATE	
	DATE			DATE	
SCALE	DWG. NO. L-186125			REV. O	

*FOR FLEXICARB (GRAFOIL) GASKET REPLACE THE STANDARD GASKETS WITH THE FOLLOWING:

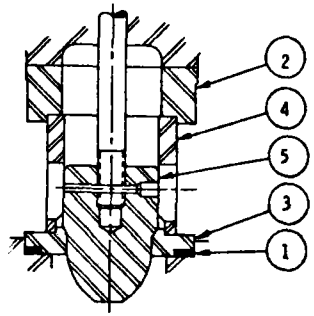
CANADIAN ASB.	FLEXICARB
185385	196047
185384	196046
185383	196045
185382	196044

ITEM NO.	NO. REQ'D.						PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L. SPEC.	DWG. NO.	REMARKS
5						1	185375-G	3	PLUG	CRES.	ASTM-A479	M-185375	TYPE 410
			1		1		184966-G			CRES	ASTM-A479	M-184966	TYPE 410
	1	1		1			182315-G			CRES	ASTM-A479	M-182315	TYPE 410
4			1		1	1	184695-X*	3	CAGE	CRES	ASTM-A296	M-184695	GR. CA6NM
	1	1		1			184694-G			CRES	ASTM-A296	M-184694	GR. CA-15
3						1	185684-G	3	SEAT RING	CRES	ASTM-A479	M-185684	TYPE 410
					1		185683-G			CRES	ASTM-A479	M-185683	TYPE 410
				1			185263-G			CRES	ASTM-A479	M-185263	TYPE 410
			1				185071-G			CRES	ASTM-A479	M-185071	TYPE 410
		1					185682-G			CRES	ASTM-A479	M-185682	TYPE 410
	1						185070-G			CRES	ASTM-A479	M-185070	TYPE 410
2						1	185681-R	3	CAGE SPACER	STEEL	ASTM-A575	S-185681	SAE-1045
					1		185680 R			STEEL	ASTM-A575	S-185680	SAE-1045
				1			185679-R			STEEL	ASTM-A575	S-185679	SAE-1045
		1					185678-R			STEEL	ASTM-A575	S-185678	SAE-1045
1						1	185385	3	TRIM GASKET*	FLEXIT. STYLE R3	304 SST AND CAN. ASB. FIL.		3-7/8"O. D. x 3-1/4" I. D. x .175" THK.
				1	1		185384						2-15/16 O.D. x 2-7/16" I. D. x .175" THK.
		1	1				185383						2-1/4"O. D. x 1-11/16" I. D. x .175" THK.
	1						185382						1-7/8"O. D. x 1-5/16" I. D. x .175" THK.

TRIM SIZE	1"	1"	1 1/2"	1"	1 1/2"	1 1/2"
VALVE SIZE	3/4" & 1"		1 1/2"	2"		3"
ASS'Y. PART NO.	186886	186887	186888	186889	186890	186955



FULL SIZE TRIM



REDUCED TRIM

SEE SHEET-2 FOR (FBM (316) SST. MAT'L

COPES-VULCAN, INC.
One of the White Consolidated Industries
LAKE CITY (ERIE CO.), PA. U.S.A.

TRIM ASSEMBLY
FOR SERIES "C" VALVES
SINGLE SEAT
UNBALANCED TRIM (3/4" THRU 3")
410 SST. MAT'L

NO.	DATE	REVISIONS	BY	CHK.
1	12-18-78	REVISED PART NO'S	JHR	WES
2	2-20-79	ADDED SHEET-2 (CF8M) E.C. 157	VC	WEA
3	6-26-81	ADDED FLEXICARB GASKET P/N SPER ENG. CHG. 6468	DT	Rel.

DFTSMN KRH DATE 12-4-78 JOB NO. ——
CHECKED WES DATE 12-4-78 SCALE NONE
APP'D AKP DATE 12-6-78

REPRO FROM ——
PART CODE 3

DWG. NO. L-186885 SHT. 1 OF 2 REV. 3

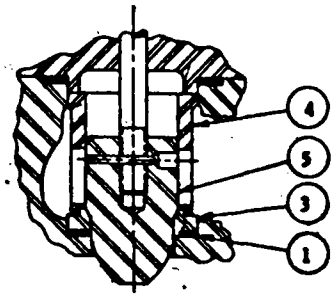
4.1.55-197

FOR FLEXICARB (GRAFOIL) GASKETS REPLACE THE STANDARD GASKETS WITH THE FOLLOWING:

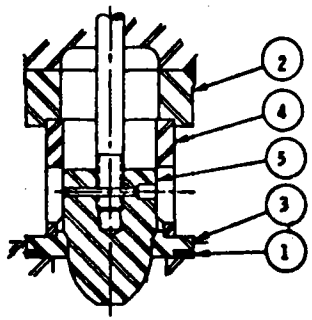
CANADIAN ASB.	FLEXICARB
185385	196047
185384	196046
185383	196045
185382	196044

ITEM NO.	NO. REQ'D.	PART NO.	PART CODE	DESCRIPTION	MAT'L.	MAT'L SPEC.	DWG. NO.	REMARKS
5	1	185375-F	3	PLUG	CRES.	ASTM-A479	M-185375	TYPE 316L
	1	184966-F			CRES	ASTM-A479	M-184966	TYPE 316L
	1 1	182315-F			CRES	ASTM-A479	M-182315	TYPE 316L
4	1	184695-F	3	CAGE	CRES	ASTM-A351	M-184695	GR. CF8M
	1 1	184694-F			CRES	ASTM-A351	M-184694	GR. CF8M
3	1	185684-F	3	SEAT RING	CRES	ASTM-A479	M-185684	TYPE 316L
	1	185683-F			CRES	ASTM-A479	M-185683	TYPE 316L
	1	185263-F			CRES	ASTM-A479	M-185263	TYPE 316L
	1	185071-F			CRES	ASTM-A479	M-185071	TYPE 316L
	1	185682-F			CRES	ASTM-A479	M-185682	TYPE 316L
	1	185070-F			CRES	ASTM-A479	M-185070	TYPE 316L
2	1	185681-F	3	CAGE SPACER	CRES	ASTM-A479	M-185681	TYPE 316L
	1	185680-F			CRES	ASTM-A479	M-185680	TYPE 316L
	1	185679-F			CRES	ASTM-A479	M-185679	TYPE 316L
	1	185678-F			CRES	ASTM-A479	M-185678	TYPE 316L
1	1	185385	3	TRIM GASKETS	FLEXIT, STYLE R3	304 SST AND CAN. ASB. FIL		3-7/8" O. D. x 3-1/4" I. D. x .175" THK.
	1	185384						2-15/16 O.D. x 2-7/16" I. D. x .175" THK.
	1 1	185383						2-1/4" O. D. x 1-11/16" I. D. x .175" THK.
	1	185382						1-7/8" O. D. x 1-5/16" I. D. x .175" THK.

TRIM SIZE	1"	1"	1½"	1"	1½"	1½"
VALVE SIZE	3/4"	1"	1½"	2"		3"
ASSY. PART NO.	184294	184295	184296	184297	185298	184298



FULL SIZE TRIM



REDUCED TRIM

SEE SHEET-1 FOR 410 SST. MAT'L.

COPES-VULCAN, INC.
LAKE CITY ERIE CO., PA. U.S.A.

TRIM ASSEMBLY
FOR SERIES "C" VALVES
SINGLE SEAT
UNBALANCED TRIM (3/4" THRU 3")
CF8M (316) SST. MAT'L

NO.	DATE	REVISIONS	BY	CHK.	NO.	DATE	REVISIONS	BY	CHK.

DFTSMN KRH DATE 12-4-78
CHECKED WEA DATE 12-4-78
APP'D. ARP DATE 12-4-78
JOB NO. ——
SCALE NONE

REPRO FROM ——
PART CODE 3

DWG. NO. L-186885 SHT. 2 OF 2 REV. B

4.1.55-198

COPES-VULCAN, INC.
One of the White Consolidated Industries

RECOMMENDED SPARE PARTS LIST

COPES-VULCAN CV600 CONTROL VALVES

CV JOBS #8010-14896 & 8064-16895

VALVE'S TAG: TV-1004
1-1/2" - 150# CV600-40 (DA) CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	185987
Packing Set	172417
Body/Bonnet Gasket	185377
Trim Gasket	185382
Trim Gasket	185383
Cage	196957
Stem	186973
Guide Bushing	185112-H
Plug	Per Drawing M-192208 Mk'd.
Roll Pin	188238
Seat Ring	Per Drawing M-192136 Mk'd.
Seat Spacer	Per Drawing M-192204 Mk'd.
Handwheel Operator Gasket	78688
Handwheel Operator Seal	187027

VALVE'S TAG: TV-1002
1-1/2" - 300# CV600-40 (DA) CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	185987
Packing Set	172417
Body/Bonnet Gasket	185377
1-1/2" Trim Assembly	186888
Trim Gasket	185383
Cage	184695-XG
Stem	186973
Guide Bushing	185112-H
Plug	184966-G
Roll Pin	188238
Seat Ring	185071-G
Handwheel Operator Gasket	78688
Handwheel Operator Seal	187027

VALVE'S TAG: AOV-1009
1-1/2" - 600# CV600-40 (RA) CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	185987
Packing Set	172417
Body/Bonnet Gasket	185377
1-1/2" Trim Assembly	186888

Continued

RECOMMENDED SPARE PARTS LIST (continued)
CV JOBS #8010-14896 & 8064-16895

DESCRIPTION	PART NUMBER
Trim Gasket	185383
Cage	184695-XG
Stem	186973
Guide Bushing	185112-H
Plug	184966-G
Roll Pin	188238
Seat Ring	185071-G
Gasket	187029
'U' Cup	186993
'O' Ring	187059

VALVE'S TAG: LV74D-2
2" - 150# CV600-40 (RA) CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	185987
Packing Set	172417
Body/Bonnet Gasket	185378
Trim Gasket	185384
Balancing Cylinder	Per Drawing M-185516 Mk'd.
Cage	196942
Stem	186974
Guide Bushing	185112-H
Plug	196956
Roll Pin	188238
Seat Ring	Per Drawing M-185191 Mk'd.
Gasket	187029
'U' Cup	186993
'O' Ring	187059

VALVE'S TAG: LV-74A
1-1/2" - 600# CV600-60 (RA) CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	185988
Packing Set	172417
Body/Bonnet Gasket	185377
Trim Gasket	185382
Trim Gasket	185383
Cage	196957
Stem	186974
Guide Bushing	185112-H
Plug	Per Drawing M-192210 Mk'd.
Roll Pin	188238
Seat Ring	Per Drawing M-192138 Mk'd.
Gasket	187030
'U' Cup	187058
'O' Ring	187059

RECOMMENDED SPARE PARTS LIST (continued)
CV JOBS #8010-14896 & 8064-16895

VALVE'S TAG: LV-74C
2" - 600# CV600-60 (RA) CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	185988
Packing Set	172417
Body/Bonnet Gasket	185378
Trim Gasket	185384
Cage	196957
Stem	186975
Guide Bushing	185112-H
Plug	Per Drawing M-182315 Mk'd.
Roll Pin	188238
Seat Ring	Per Drawing M-185263 Mk'd.
Gasket	187030
'U' Cup	187058
'O' Ring	187059

VALVE'S TAG: LV-74B
4" - 150# CV600-100 (RA) CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	185989
Packing Set	186199
Body/Bonnet Gasket	185380
Trim Gasket	185386
Balancing Cylinder	Per Drawing M-183587 Mk'd.
Cage	Per Drawing L-186866 Mk'd.
Stem	185401
Guide Bushing	184686-H
Plug	196943
Roll Pin	96228
Seat Ring	Per Drawing M-182804 Mk'd.
Teflon Seal	185398
Gasket	187031
'U' Cup	187058
'O' Ring	187059

VALVE'S TAG: LV74D-1
4" - 150# CV600-100 (RA) CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	185989
Packing Set	186199
Body/Bonnet Gasket	185380
Trim Gasket	185384
Trim Gasket	185386
Balancing Cylinder	Per Drawing M-185516 Mk'd.
Cage	196942

Continued

RECOMMENDED SPARE PART LIST (continued)
CV JOBS #8010-14896 & 8064-16895

DESCRIPTION	PART NUMBER
Stem	187740
Guide Bushing	184686-H
Plug	Per Drawing M-186026 Mk'd.
Roll Pin	96228
Seat Ring	Per Drawing M-185514 Mk'd.
Gasket	187031
'U' Cup	187058
'O' Ring	187059

VALVE'S TAG: PV-647C
4" - 300# CV600-160 (RA) CONTROL VALVE

DESCRIPTION	PART NUMBER
Diaphragm	185990
Packing Set	186199
Body/Bonnet Gasket	185380
Trim Gasket	185386
Trim Gasket	185384
Cylinder Assembly	196272
Cage Spacer	196269
Stem	185401
Guide Bushing	184686-H
Plug	196273
Roll Pin	96228
Seat Ring	196270
Gasket	187032
'U' Cup	187058
'O' Ring	187059