

# Wallace & Tiernan®

an eVOQUA brand

## **Series 55-400 Remote Vacuum Switchover Unit**

**BOOK NO. WT.055.400.001.UA.IM.0714**

W3T109530

**SERIES 55-400  
REMOTE VACUUM  
SWITCHOVER UNIT**

BOOK NO. WT.055.400.001.UA.IM.0714

# REMOTE SWITCHOVER

EQUIPMENT SERIAL NO. \_\_\_\_\_

DATE OF START-UP \_\_\_\_\_

START-UP BY \_\_\_\_\_

Prompt service available from nationwide authorized service contractors.

## ORDERING INFORMATION

In order for us to fill your order immediately and correctly, please order material by description and part number, as shown in this book. Also, please specify the serial number of the equipment on which the parts will be installed.

## WARRANTY

Seller warrants for a period of one year after shipment that the equipment or material of its manufacture is free from defects in workmanship and materials. Corrosion or other decomposition by chemical action is specifically excluded as a defect covered hereunder, except this exclusion shall not apply to chlorination equipment. Seller does not warrant (a) damage caused by use of the items for purposes other than those for which they were designed, (b) damage caused by unauthorized attachments or modifications, (c) products subject to any abuse, misuse, negligence or accident, (d) products where parts not made, supplied, or approved by Seller are used and in the sole judgment of the Seller such use affects the products' performance, stability or reliability, and (e) products that have been altered or repaired in a manner in which, in the sole judgment of Seller, affects the products' performance, stability or reliability. **SELLER MAKES NO OTHER WARRANTY OF ANY KIND, AND THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS OF THE MATERIAL OR EQUIPMENT FOR ANY PARTICULAR PURPOSE EVEN IF THAT PURPOSE IS KNOWN TO SELLER.** If Buyer discovers a defect in material or workmanship, it must promptly notify Seller in writing; Seller reserves the right to require the return of such defective parts to Seller, transportation charges prepaid, to verify such defect before this warranty is applicable. In no event shall such notification be received by Seller later than 13 months after the date of shipment. No action for breach of warranty shall be brought more than 15 months after the date of shipment of the equipment or material.

**LIMITATION OF BUYER'S REMEDIES.** The **EXCLUSIVE REMEDY** for any breach of warranty is the replacement f.o.b. shipping point of the defective part or parts of the material or equipment. Any equipment or material repaired or replaced under warranty shall carry the balance of the original warranty period, or a minimum of three months. Seller shall not be liable for any liquidated, special, incidental or consequential damages, including without limitation, loss of profits, loss of savings or revenue, loss of use of the material or equipment or any associated material or equipment, the cost of substitute material or equipment, claims of third parties, damage to property, or goodwill, whether based upon breach of warranty, breach of contract, negligence, strict tort, or any other legal theory; provided, however, that such limitation shall not apply to claims for personal injury.

Statements and instructions set forth herein are based upon the best information and practices known to Evoqua Water Technologies, but it should not be assumed that every acceptable safety procedure is contained herein. Of necessity this company cannot guarantee that actions in accordance with such statements and instructions will result in the complete elimination of hazards and it assumes no liability for accidents that may occur.



725 Wooten Road  
Colorado Springs, Co 80915

# REMOTE SWITCHOVER

## INTRODUCTION

This manual provides a description of the Evoqua Water Technologies Series 55-400 Remote Vacuum Switchover Unit, including installation, operation, and maintenance procedures. This equipment is designed to provide unattended switchover of gas supply cylinders in a vacuum gas feeding system.

The remote vacuum switchover unit is designed to be installed in the vacuum gas feed line between the vacuum regulating valve(s) and the gas control units(s) of a new or existing vacuum gas feed disinfection system. The unit includes a metal mounting bracket that is designed for easy wall or panel mounting.

For swimming pool, water park, or similar nonresidential recreational applications, contact your Evoqua Water Technologies representative for information concerning specific systems designed for such use.

More information may be given in this book than applies to a particular installation. The reader should determine and disregard that which does not apply.



**WARNING: HAZARDOUS GAS IS PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, READ THIS INSTRUCTION BOOK BEFORE CONNECTING THIS EQUIPMENT TO A VACUUM SUPPLY OF GAS. OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BE RESTRICTED TO TRAINED, QUALIFIED PERSONNEL WHO ARE COMPLETELY FAMILIAR WITH THESE INSTRUCTIONS. CONSULT FACTORY FOR APPLICATIONS OUTSIDE OF THE OPERATIONAL SPECIFICATIONS INDICATED IN SECTION 1 OF THIS MANUAL.**

**NOTE: When submitting correspondence or ordering material, always specify model and serial number of equipment.**

## TABLE OF CONTENTS

Very Important Safety Precautions.....	SP-1, -2
Regional Offices .....	1.010-1
Technical Data.....	Section 1
Installation .....	Section 2
Operation .....	Section 3
Service .....	Section 4
Illustrations .....	Section 5
Preventive Maintenance Kits and Spare Parts.....	Section 6

# REMOTE SWITCHOVER

## VERY IMPORTANT SAFETY PRECAUTIONS

This page provides very important safety information related to safety in installation, operation, and maintenance of this equipment.

### WARNING

TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, OBSERVE THE FOLLOWING:

THIS EQUIPMENT SHOULD BE INSTALLED, OPERATED AND SERVICED ONLY BY TRAINED, QUALIFIED PERSONNEL WHO ARE THOROUGHLY FAMILIAR WITH THE ENTIRE CONTENTS OF THIS INSTRUCTION BOOK.

THE UNIT IS DESIGNED TO OPERATE UNDER VACUUM ONLY. DO NOT CONNECT TO A SOURCE OF GAS UNDER PRESSURE.

DO NOT USE HYDROCARBONS OR ALCOHOLS AS RESIDUAL SOLVENT MAY REACT WITH GAS. SOLVENTS CAN PRODUCE SERIOUS PHYSIOLOGICAL EFFECTS UNLESS USED IN STRICTEST COMPLIANCE WITH THE SOLVENT MANUFACTURER'S SAFETY RECOMMENDATIONS.

DO NOT TOLERATE ANY LEAKS. LEAKS ALWAYS GET PROGRESSIVELY WORSE AND MUST BE CORRECTED PROMPTLY.

TURN POWER OFF BEFORE SERVICING TO PREVENT ELECTRICAL SHOCK.

DO NOT DISCARD THIS INSTRUCTION BOOK UPON COMPLETION OF INSTALLATION. INFORMATION PROVIDED IS ESSENTIAL TO PROPER SAFE OPERATION AND MAINTENANCE.

ADDITIONAL OR REPLACEMENT COPIES OF THIS INSTRUCTION BOOK ARE AVAILABLE FROM:

Evoqua Water Technologies  
725 Wooten Road  
Colorado Springs, CO 80915  
Phone: (800) 524-6324

### NOTE

Minor part number changes may be incorporated into Evoqua Water Technologies products from time to time that are not immediately reflected in the instruction book. If such a change apparently has been made in your equipment and does not appear to be reflected in your instruction book, contact your local Evoqua Water Technologies sales office for information.

Please include the equipment serial number in all correspondence. It is essential for effective communication and proper equipment identification.

# REMOTE SWITCHOVER

## REGIONAL OFFICES

### INSTALLATION, OPERATION, MAINTENANCE, AND SERVICE INFORMATION

Direct any questions concerning this equipment that are not answered in the instruction book to the Reseller from whom the equipment was purchased. If the equipment was purchased directly from Evoqua Water Technologies, Colorado Springs, CO contact the office indicated below.

#### UNITED STATES

725 Wooten Road  
Colorado Springs, CO 80915  
TEL: (800) 524-6324

#### CANADA

If the equipment was purchased directly from Evoqua Water Technologies, Canada, contact the nearest office indicated below.

##### **ONTARIO**

Evoqua Water Technologies Ltd.  
2045 Drew Road  
Mississauga, Ontario  
L5S 1S4  
(905) 944-2800

##### **QUEBEC**

Evoqua Technologies des Eaux Itee  
505 Levy Street  
St. Laurent, Quebec  
H4R 2N9  
(450) 582-4266

# REMOTE SWITCHOVER





# REMOTE SWITCHOVER

## SECTION 1 - TECHNICAL DATA

### List of Contents

PARA./DWG. NO.

Technical Data .....	1.1
General Data.....	1.2
Illustrations	
Performance - Vacuum Line Length Limits.....	25.052.190.030

# REMOTE SWITCHOVER

## 1.1 Technical Data

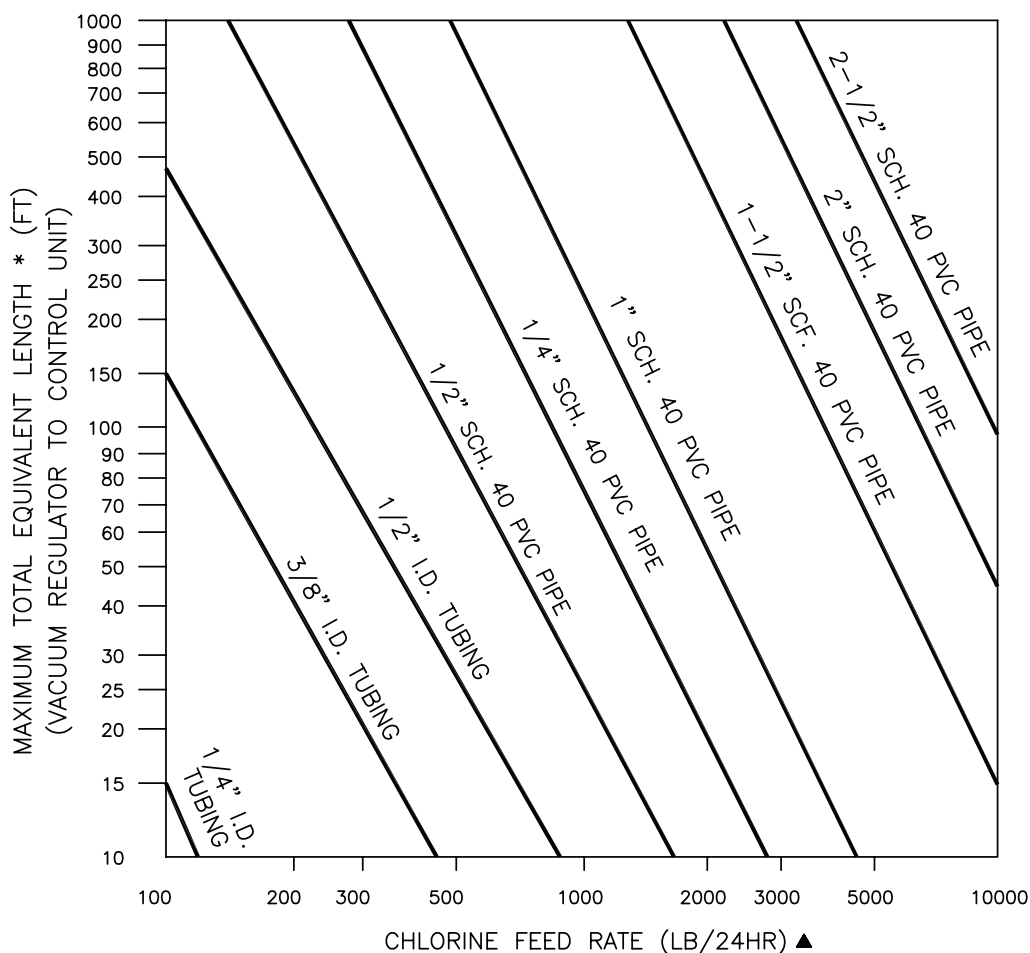
Versions (gas feed only):

- Model RSO-1: for use with chlorine ( $\text{Cl}_2$ ) or sulfur dioxide ( $\text{SO}_2$ ) gas
- Model RSO-2: for use with ammonia gas ( $\text{NH}_3$ ) only

## 1.2 General Data

<b>Operational temperature</b>	10 to 130°F (-12 to 55°C)
<b>Operational pressure</b>	Vacuum only
<b>Operational vacuum</b>	10 - 115" water ( $\text{H}_2\text{O}$ )
<b>Switchover vacuum level</b>	105 - 115" water ( $\text{H}_2\text{O}$ ), nominal
<b>Maximum flow rate</b>	4000 lbs./day chlorine 4000 lbs./day sulfur dioxide 1900 lbs./day ammonia (70°F & 20" $\text{H}_2\text{O}$ vacuum)
<b>Airborne Noise Emission</b>	Does not exceed 70dB (A)
<b>Dimensions</b>	8" (203) W x 6.5" (165) L x 7" (178) H
<b>Weight</b>	4.5lbs (2 kgs)

# REMOTE SWITCHOVER



APPROXIMATE FRICTION LOSS IN PVC PIPE  
FITTING IN EQUIVALENT FEET OF PIPE:

NOMINAL PIPE SIZE, IN.	1/2	3/4	1	1-1/2	2	2-1/2
TEE, SIDE OUTLET	4	5	6	8	12	15
90° ELBOW	1-1/2	2	2-3/4	4	6	8
45° ELBOW	3/4	1	1-3/8	2	2-1/2	3

## NOTE:

\* TOTAL EQUIVALENT LENGTH = PIPE LENGTH PLUS EQUIVALENT LENGTH FOR EACH FITTING. SEE TABLE ABOVE. 1.) WITH AUTOMATIC SWITCHOVER VACUUM REGULATORS, USE THE LENGTH OF THE LONGER OF THE TWO VACUUM LINES, NOT BOTH, TO DETERMINE TOTAL LENGTH. 2.) TO KEEP THE PRESSURE LOSS WITHIN PERMISSIBLE LIMITS, A COMBINATION OF PIPE SIZES MAY BE USED. IF THIS IS DONE, FOR A GIVEN FLOW, THE LOSS THROUGH EACH FOOT OF 1/2" SCH. 40 PVC PIPE IS EQUIVALENT TO THE LOSS THROUGH : A.) 3FT. OF 3/4" SCH. 40 PVC PIPE; B.) 8 FT. OF 1" SCH. 40 PVC PIPE; C.) 45FT. OF 1-1/2" SCH. 40 PVC PIPE; D.) 122 FT. OF 2" SCH. 40 PVC PIPE; E.) 248 FT. OF 2-1/2" SCH. 40 PVC PIPE.

▲ FOR GASES OTHER THAN CHLORINE, USE THE FOLLOWING APPROXIMATE CONVERSIONS:

CHLORINE FEED RATE = SULFUR DIOXIDE FEED RATE (LB/24HR.)

= 2.1 X AMMONIA FEED RATE (LB/24HR.)

= 1.3 X CARBON DIOXIDE FEED RATE (LB/24HR.)

VACUUM LINE LENGTH LIMITS - PERFORMANCE  
Used In Remote Vacuum Gas Feeders

25.052.190.030

ISSUE 3 5-97

# REMOTE SWITCHOVER

## **SECTION 2**

# REMOTE SWITCHOVER

## SECTION 2 - INSTALLATION

### List of Contents

	PARA. /DWG. NO.
Unpacking.....	2.1
Location Requirements .....	2.2
Mounting .....	2.3
Gas Connections .....	2.4
Safety Relief Valve / Vent Line.....	2.5
Remote Indication Switch.....	2.6
Illustrations	
PVC Pipe - Installation .....	50.830.110.011
Typical Installation (Capacities to 500PPD) .....	55.400.110.010
Typical Installation (Capacities to 4000PPD) .....	55.400.110.020



**WARNING: THIS SWITCHOVER UNIT IS DESIGNED TO OPERATE UNDER VACUUM ONLY. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT CONNECT TO A SOURCE OF GAS UNDER PRESSURE.**

## 2.1 Unpacking

Unpack the equipment in a clean, dry area, preferably at the installation site. Check all items against the packing list to ensure that nothing is discarded with the packing materials. Handle unit with care to prevent damage to operating shaft and knob.

Do not remove the cap plugs from threaded connection ports on the switchover device until you are ready to make the pipe connections. Identify and set aside items, such as spare parts, that are not required for installation.



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT DISCARD OR REMOVE THIS INSTRUCTION BOOK WHEN THE INSTALLATION IS COMPLETED. THE OPERATOR WILL NEED IT.**

## 2.2 Location Requirements

The remote switchover device is intended to be mounted indoors on a vertical or horizontal wall or panel surface.

- The general physical requirements of the installation are shown on the Typical Installation drawing.
- Adequate access should be available to permit ease of operation, routine maintenance, and service.
- The switchover device should be mounted at a suitable height such that the indicator icons on the front cover are readily visible.
- Position of the equipment in the gas storage and operation room must correspond to local regulations.

## 2.3 Mounting

Mount the switchover unit on a vertical surface, wall, panel, etc., with the indicator windows at a suitable reading height. See Figure 2-1.

# REMOTE SWITCHOVER

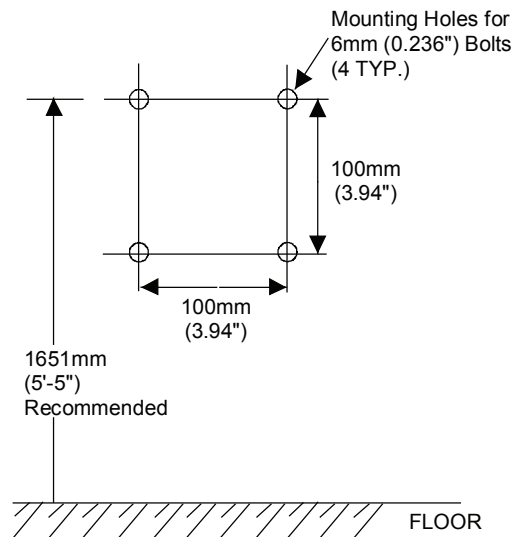


Figure 2.1 - Switchover Mounting Diagram

- Provide mounting holes in the location and sizes shown.
- Mount the unit to the wall using appropriate anchors, bolts, or screws as required by type of wall material.
- Mount the unit such that the outlet connection is facing up. Level the switchover unit using a spirit level before final tightening of mounting bolts.

**NOTE:** If the switchover unit is being bolted to an uneven wall, shims must be added behind the mounting bracket pads to prevent the mounting bracket from twisting when the bolts are tightened.

## 2.4 Gas Connections



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, THE SWITCHOVER UNIT MUST BE CONNECTED TO A VACUUM GAS SUPPLY ONLY. DO NOT OPEN THE CYLINDER OR DRUM VALVE UNTIL THE SYSTEM HAS BEEN FULLY INSTALLED AND THE PRE-START CHECKS HAVE BEEN CARRIED OUT.

To reduce the pressure from the gas tanks, vacuum regulating valves and a safety relief valve are necessary. The switchover device must be connected downstream of the vacuum regulating valves. Refer to the typical installation drawing at the end of this section.

The inlet and outlet ports on the switchover device are designed to accept one-inch NPT threaded pipe or fittings. The diameter of the vacuum line between the regulating valves, switchover device, and the gas control unit depends on the distance between these devices. These distances must not exceed the distance as determined on Dwg. 25.052.190.030.



It is recommended that pipe unions be used on both inlets and the outlet piping to the switchover device to facilitate servicing. If uninterrupted operation of the gas feed system is required, a manual by-pass valve and piping arrangement should be considered to facilitate servicing of the switchover device.

If necessary, any size tubing or pipe can be installed that will not give more than five inches of water differential between the gas control unit and the vacuum regulators at the maximum gas feed rate. Note that the equivalent length of the fittings must be added to the tubing length to obtain the total equivalent length.

The piping must be sized as required to obtain a minimum of six inches of mercury of vacuum at the gas control unit. If PVC pipe is used, refer to Dwg. 50.830.110.001 for important information. If using teflon tape on pipe threads, use caution to ensure no excess tape gets into switchover unit.

When using polyethylene tubing, to prevent the tubing from fast embrittling under the influence of gas, do not install it in narrow, poorly vented pipes or in the ground.

## 2.5 Safety Relief Valve/Vent Line



**CAUTION:** To avoid possible equipment damage, a pressure relief valve is required in the gas feed system. If the vacuum regulator does not provide pressure relief, a pressure relief valve must be installed in the vacuum gas supply line.

A pressure relief valve must be installed in the gas feed system, either at the vacuum regulator or in the vacuum line between the regulating valve and the switchover device. There must not be any isolating valve between the pressure relief valve and the vacuum regulator.

A vent line is required from the pressure relief valve to a point outside the building where an occasional discharge of gas will not be objectionable. The proper installation of this line is important. The gradient of this line must be down toward the outside atmosphere and the line must be continuous without traps. The outside end of this line should be pointed down and be screened to prevent the entrance of water and foreign materials. Where traps are unavoidable or a continuous down gradient is not possible, provisions for condensate removal must be installed at all low points (drip leg). Suitable support for the vent line is required throughout its entire length.



**WARNING:** THE PRESSURE RELIEF VALVE MUST BE VENTED TO OUTSIDE ATMOSPHERE. THE VENT LINE MUST TERMINATE IN AN AREA WHERE GAS FUMES CANNOT CAUSE INJURY TO PERSONNEL OR DAMAGE. DO NOT TERMINATE THE VENT LINE AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS, NOR NEAR WINDOWS OR VENTILATION SYSTEM INTAKES.

# REMOTE SWITCHOVER

## 2.6 Remote Indication Switch (Optional)

Wire the switch as shown in Figure 2.2.

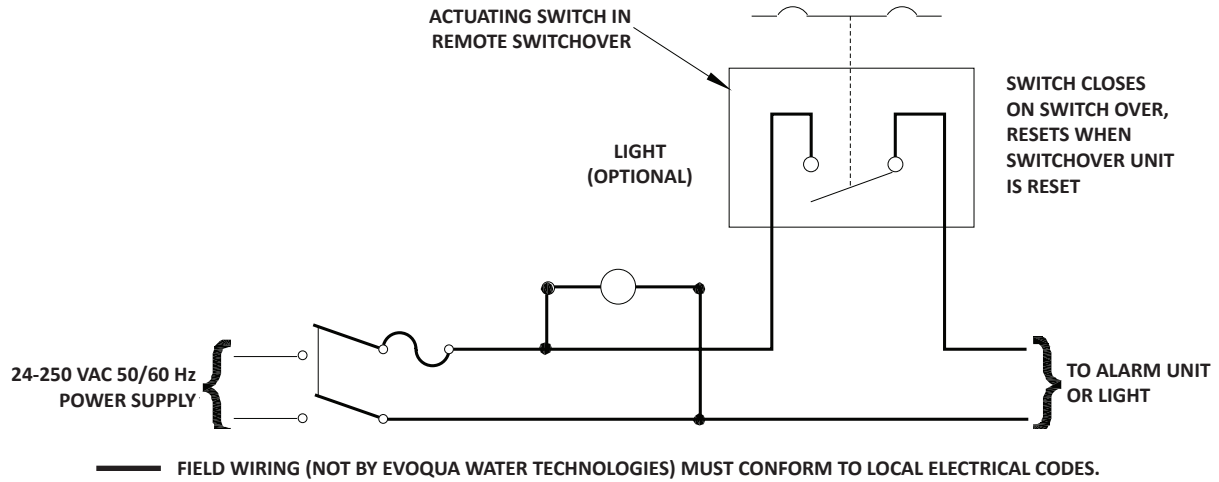


Figure 2.2 - Remote Indication Switch Wiring

# REMOTE SWITCHOVER

## **TEMPERATURE AND PRESSURE:**

PVC PIPE IS NOT RECOMMENDED FOR TEMPERATURES OVER 130°F OR BELOW 0°F, NOR FOR LINES THAT MAY BE EXPOSED TO PHYSICAL ABUSE (SEE MANUFACTURER'S RECOMMENDATIONS). ONE HUNDRED FEET OF PIPE WILL EXPAND OR CONTRACT APPROXIMATELY 0.7 INCHES FOR EVERY 10°F TEMPERATURE CHANGE. MANUFACTURER'S RECOMMENDED MAXIMUM WORKING PRESSURES SHOULD NOT BE EXCEEDED.

## **SUPPORT AND PROTECTION:**

IT IS PREFERABLE TO SUPPORT HORIZONTAL OVERHEAD LINES WITH A CHANNEL OR ANGLE IRON PARALLEL TO THE PIPE. IF STRAP HANGERS ARE USED, SPACE THEM AT 2- TO 4-FOOT INTERVALS, AS RECOMMENDED BY THE PIPE MANUFACTURER. PIPE SHOULD NOT REST DIRECTLY ON RODS OR WIRES. PIPE MAY BE LAID UNDERGROUND WITH NO SPECIAL PRECAUTIONS OTHER THAN THOSE USED FOR IRON PIPE.

## **THREADING:**

SCHEDULE 80 PVC PIPE CAN BE CUT AND THREADED WITH STANDARD PIPE TOOLS, EITHER HAND OR POWER DRIVEN. STANDARD DIES COMMONLY USED FOR METAL PIPE WILL PRODUCE SATISFACTORY THREADS, THOUGH A 5° NEGATIVE RAKE ANGLE IS PREFERRED. KEEP DIES CLEAN AND SHARP AT ALL TIMES. DIES THAT HAVE BEEN USED EXTENSIVELY FOR STEEL PIPE MAY NOT PRODUCE GOOD THREADS UNLESS RESHARPENED. USE NORMAL CUTTING SPEEDS; NO LUBRICANT OR CUTTING OIL IS REQUIRED. A TAPERED PLUG (AVAILABLE FROM THE MANUFACTURER, IF DESIRED) TAPPED FIRMLY INTO THE END OF THE PIPE PREVENTS DISTORTION OF THE PIPE AND DIGGING-IN BY THE DIE, AS WELL AS CORRECTS ANY SLIGHT OUT-OF-ROUND THAT MAY EXIST. TAKE CARE TO CENTER THE DIE ON THE PIPE AND ALIGN THE THREAD TO PREVENT REDUCING THE WALL EXCESSIVELY ON ONE SIDE. SCHEDULE 40 PVC CANNOT BE THREADED.

## **THREADED JOINTS:**

THREADED JOINTS IN PVC PIPE REQUIRE MORE CARE THAN THOSE IN SIMILAR SIZE METAL PIPE. IF A NON-LUBRICATING THREAD COMPOUND IS USED, THE JOINT MAY FEEL TIGHT WHEN ONLY 2 OR 3 THREADS ARE ENGAGED. IF TEFLON TAPE OR SIMILAR LUBRICATING THREAD COMPOUND IS USED, THE JOINT MAY NOT FEEL TIGHT AT ALL, AND OVERTIGHTENING—RESULTING IN CRACKED FITTINGS OR STRIPPED THREADS—CAN EASILY OCCUR. CARE MUST BE TAKEN TO ENGAGE THE JOINED PARTS TO A NORMAL ENGAGEMENT OF 5 TO 7 TURNS AND NO MORE. STRAP WRENCHES ARE PREFERRED FOR ASSEMBLY, AS THE SHARP EDGES ON PIPE WRENCHES MAY SCORE AND WEAKEN THE PIPE.

## **FLANGED JOINTS:**

FOR FLANGED JOINTS, USE A FULL-FACED RUBBER GASKET AND FLAT WASHERS UNDER BOLTS AND NUTS. TIGHTEN OPPOSITE FLANGE BOLTS TO COMPRESS THE GASKET TO A SLIGHT DEGREE, BUT DO NOT DISTORT THE FLANGE.

## **SOLVENT WELD OR CEMENT JOINTS:**

ALWAYS USE CEMENT RECOMMENDED BY THE MANUFACTURER. ADD THINNER IF CEMENT THICKENS FROM EXPOSURE TO THE AIR.

1. CUT PIPE WITH ORDINARY HAND OR POWER SAW. MAKE A SQUARE CUT AND REMOVE BURRS.
2. CLEAN AND DRY OUTSIDE OF PIPE AND INSIDE OF FITTING.
3. APPLY A THIN COAT OF CEMENT TO INSIDE OF FITTING AND OUTSIDE OF PIPE. USE A NATURAL BRISTLE PAINT BRUSH. CEMENT TO BE WITHIN 1/4" BUT NOT CLOSER THAN 1/8" FROM END OF PIPE TO PREVENT INTERNAL BEAD FROM FORMING.
4. WHILE THE CEMENT IS STILL WET, STAB THE PIPE INTO THE FITTING AND GIVE 1/8 TURN.
5. AVOID ROUGH HANDLING FOR ONE HOUR. DEPENDING ON ATMOSPHERIC CONDITIONS, APPROXIMATELY 50% STRENGTH WILL BE ATTAINED IN 2 HOURS AND FULL STRENGTH IN 48 HOURS.

PIPE SIZE	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	3"	4"
JOINTS PER PINT OF CEMENT	50	50	35	35	25	25	16	12

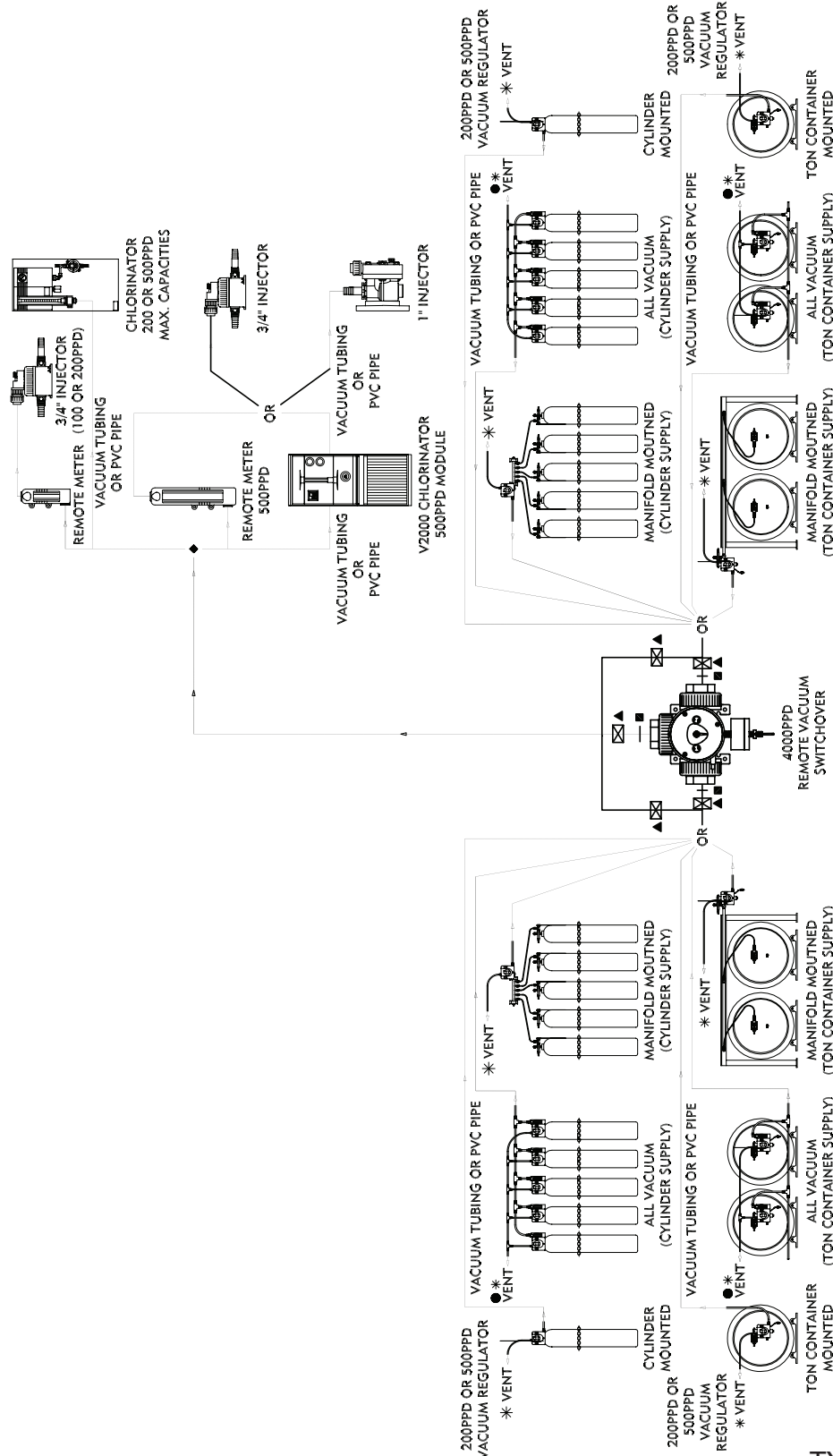
CEMENT AVAILABLE FROM EVOQUA WATER TECHNOLOGIES CORP. IN PINT CANS (U24647). ALSO AVAILABLE COMMERCIALY IN PINT, QUART, AND GALLON CANS.

**PVC PIPE - INSTALLATION**  
**Fabrication and Installation**

**50.830.110.011**

ISSUE 14 6-14

# REMOTE SWITCHOVER



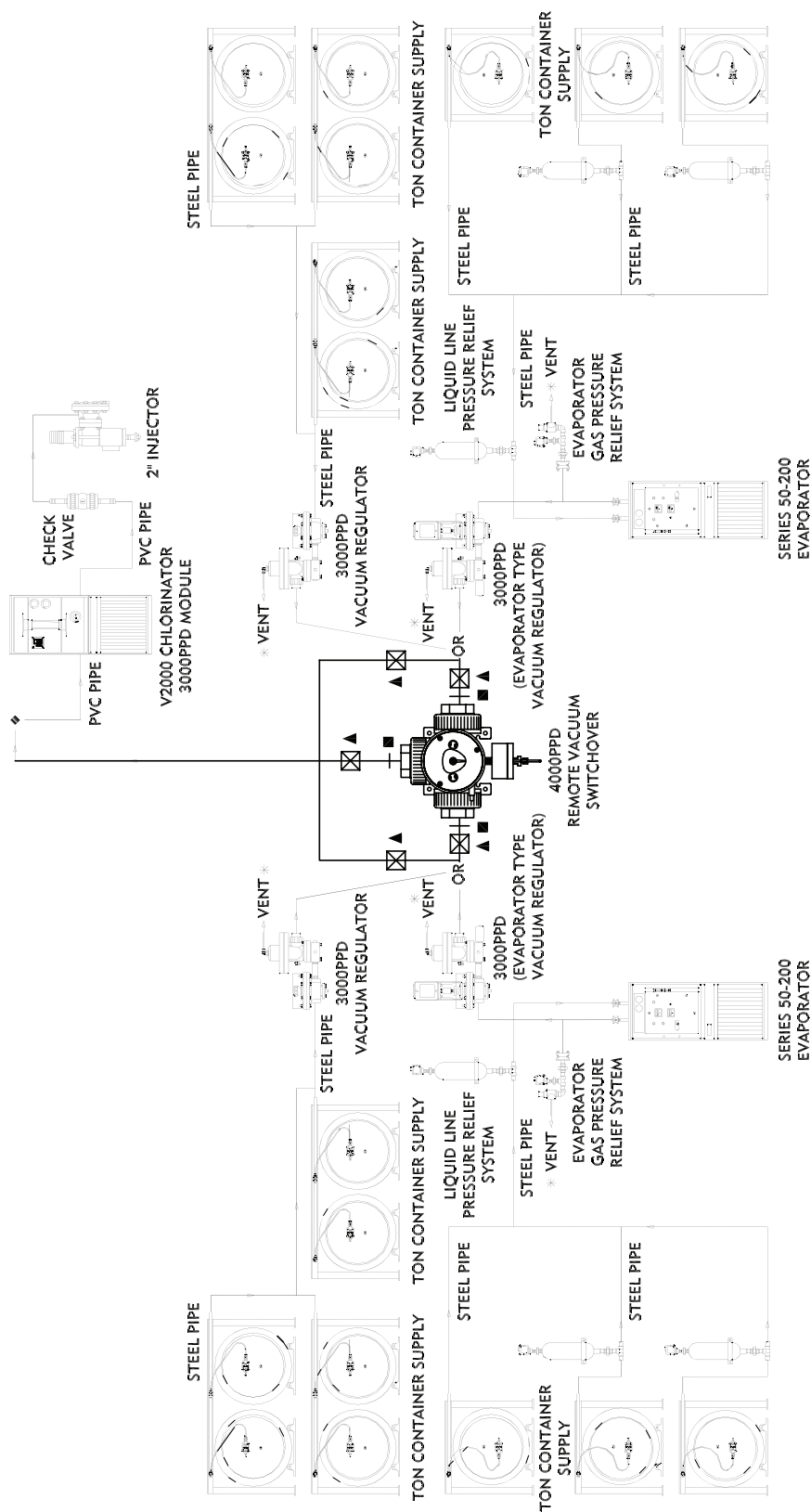
- NOTE:**
- ✓ THE VENT LINE MUST TERMINATE IN AN AREA WHERE GAS FUMES CANNOT CAUSE DAMAGE OR INJURY TO PERSONNEL. DO NOT TERMINATE THE VENT LINE AT A LOCATION ROUTINELY USED BY PERSONNEL SUCH AS WORK AREAS OR PATHWAYS NOR NEAR WINDOWS OR VENTILATION SYSTEM INTAKES.
  - ◆ ANY COMBINATION OF CHLORINE CONTROL UNITS MAY BE USED WITH VACUUM REGULATOR UP TO THE MAXIMUM RATED CAPACITY OF THE REGULATOR.
  - IF MORE THAN TWO REGULATOR VENT LINES ARE CONNECTED TO A COMMON VENT, ENSURE THAT THE COMMON VENT LINE IS PROPERLY SIZED.
  - RECOMMENDED LOCATION OF PIPE UNIONS.
  - ▲ RECOMMENDED LOCATION OF MANUAL BY-PASS TO FACILITATE SERVICING.

500 PPD  
- TYPICAL INSTALLATION

55.400.110.010

ISSUE 1 2-03

# REMOTE SWITCHOVER



- NOTE:**
- \* THE VENT LINE MUST TERMINATE IN AN AREA WHERE GAS FUMES CANNOT CAUSE DAMAGE OR INJURY TO PERSONNEL. DO NOT TERMINATE THE VENT LINE AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS NOR NEAR WINDOWS OR VENTILATION SYSTEM INTAKES.
  - ◆ ANY COMBINATION OF CHLORINE CONTROL UNITS MAY BE USED WITH VACUUM REGULATOR UP TO THE MAXIMUM RATED CAPACITY OF THE REGULATOR.
  - RECOMMENDED LOCATION OF PIPE UNIONS.
  - ▲ RECOMMENDED LOCATION OF MANUAL BY-PASS TO FACILITATE SERVICING.

4000 PPD  
- TYPICAL INSTALLATION

55.400.110.020

ISSUE 1 2-03

# SECTION 3

# REMOTE SWITCHOVER

## SECTION 3 - OPERATION

### List of Contents

PARA./DWG. NO.

Intended Use .....	3.1
Theory of Operation.....	3.2
Initial Operation .....	3.3
Physical Check .....	3.3.1
Vacuum Leak Check.....	3.3.2
Gas Supply Leak Check .....	3.3.3
Operating Procedure .....	3.4
Setting the Switchover Unit.....	3.4.1
Automatic Switchover .....	3.4.2
Resetting After Automatic Switchover .....	3.4.3
Manual Switchover.....	3.4.4
Changing Gas Supply Cylinders.....	3.5
Illustrations	
Device Layout .....	55.400.170.001

## 3.1 Intended Use

The remote switchover device is intended to be used in chlorine, sulfur dioxide, or ammonia gas feed systems that dose gas under vacuum into a flow of water at rates ranging up to 4000 ppd (80 kg/hr). Other use is prohibited without advanced permission from Evoqua Water Technologies.

## 3.2 Theory of Operation

The remote switchover unit is designed to control and indicate the flow of gas under vacuum from two separate banks of gas storage cylinders. It provides a means of initially isolating one bank of cylinders, and then, at the achievement of a certain vacuum level in the gas vacuum feed line, opening this isolated bank of cylinders to allow gas feed from them. The unit is designed to be installed with, or into an existing, gas feed water disinfection systems.

Most gas disinfection systems utilize some form of gas storage cylinders for the on-site storage of the disinfection chemical. These cylinders are usually in the form of 150- or 2000-pound (one-ton) containers. The gas storage systems are commonly arranged in two “banks” of cylinders. Each bank typically consists of from one to six cylinders manifolded together. Each cylinder may have its own vacuum regulator (all vacuum piping) or several cylinders may be manifolded into a single vacuum regulator (cylinder manifold under pressure).

Since these types of disinfection systems usually operate unattended for extended periods of time, there is a requirement for a means to draw from one bank of cylinders until they are empty and then automatically switch to the other bank. While the system is drawing from the second bank, the empty first bank can be replaced with full cylinders—allowing uninterrupted operation of the disinfection system.

The remote switchover device functions by sensing the gas feed vacuum level. In operation of the gas feed system, as the first bank of cylinders near the empty condition, the vacuum level in the gas supply line between the vacuum regulator(s) and the gas feed equipment rises from the nominal value of 20" to 40" H<sub>2</sub>O. When the gas feed vacuum level reaches the set point of the switchover device, the device will trip.

On tripping, the unit opens the gas flow to both the first and second banks of cylinders. It is important to note that upon switchover, the device does not isolate the empty bank of cylinders from the system. This allows the removal of any residual gas in the empty cylinders and prevents the return of partially-empty cylinders. Because of this, the device is classified as a non-isolating switchover device.



## 3.3 Initial Operation



**WARNING: HAZARDOUS GAS IS PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, READ THIS INSTRUCTION BOOK AND THE APPROPRIATE GAS MANUAL BEFORE CONNECTING THIS EQUIPMENT TO A SUPPLY OF GAS. OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BE RESTRICTED TO TRAINED, QUALIFIED PERSONNEL WHO ARE COMPLETELY FAMILIAR WITH THESE INSTRUCTIONS.**

When all of the connections in Section 2 - Installation have been made, the following pre-start checks must be carried out before the system can be taken into operation.

### 3.3.1 Physical Check

- Ensure that the gas supply lines from the cylinder or ton containers are securely connected to the vacuum regulators and that all valves in the system are closed.
- Ensure that the gas supply lines from the vacuum regulators to the switchover device are securely connected. Also, check the gas supply line from the switchover device to the gas metering equipment. All lines and connections must be vacuum tight.
- Ensure that the pressure relief valve vent line is securely connected to the pressure relief valve and that the line is terminated correctly.

### 3.3.2 Vacuum Leak Check

- a. Ensure that the operating knob on the switchover unit is in the center position. Keep the valves on the gas supply tanks closed. Open the valve in the water supply line to the injector and at the point of application.
- b. Injector operating vacuum should be indicated on the vacuum gauge of the gas control unit (if so equipped). If no leaks are present, this gauge should be reading full scale.
- c. Check the flow meter on the gas control unit. Any flow indication indicates a leak in the system.
- d. If a leak is indicated, check all pipe connectors and fittings. If the leak is isolated to the switchover device, check the following:
  - O-rings at the inlet/outlet nipples. (Apply a thin film of halocarbon grease to all O-rings before installation.)
  - NPT threaded connections between piping and inlet/outlet nipples.

# REMOTE SWITCHOVER

- The Teflon shaft seal, refer to Section 4 - Service for correction.
- The Detent mechanism diaphragm, tubing, and connectors.

**NOTE:** Vacuum leaks will result in errors in gas feeding and may impair the performance of the injector.

## 3.3.3 Gas Supply Leak Check



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT TOLERATE ANY GAS LEAKS. LEAKS ALWAYS GET PROGRESSIVELY WORSE AND MUST BE CORRECTED PROMPTLY.

After the vacuum regulator units are in place, check for gas leaks as directed in the separate instruction book provided with the vacuum regulator.

## 3.4 Operating Procedure (See Dwg. 55.400.170.001)

### 3.4.1 Setting the Switchover Unit

- a. The operating knob on the switchover unit should initially be in the centered position. The arrow on the operating knob should be pointing straight down. If this is not the case, depress the manual release button to trip the unit.
- b. To set the left bank of cylinders to feed initially, rotate the operating knob counterclockwise (ccw) approximately 60° until you hear a click. The detent plunger should engage and hold the knob in this position. The icons in the two indicator windows should appear as follows:

The left icon should be:



operating

The right icon should be:



standby

# REMOTE SWITCHOVER

- c. To set the right bank of cylinders to feed initially, rotate the operating knob clockwise (cw) approximately 60° until you hear a click. The detent plunger should engage and hold the knob in this position. The icons in the two indicator windows should appear as follows:

The left icon should be:



standby

The right icon should be:

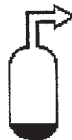


operating

## 3.4.2 Automatic Switchover

- a. Once the unit is set as indicated above, operation of the switchover device is automatic and does not require any additional operator actions. The unit will remain in the set position until the bank of cylinders that is feeding begins to empty. As the cylinders run out of gas, the operating vacuum level in the supply lines will start to increase and the switchover device will trip.
- b. Upon tripping, the operating knob on the device will return to the center position and both banks of cylinders will now be feeding.
- c. If the left bank of cylinders was set to feed initially, the icons in the two indicator windows should appear as follows:

The left icon should be:



empty

The right icon should be:



operating

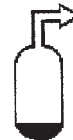
- d. If the right bank of cylinders was set to feed initially, the icons in the two indicator windows should appear as follows:

The left icon should be:



operating

The right icon should be:



empty

## 3.4.3 Resetting After Automatic Switchover

The device may be reset at any time after switchover; however, to minimize the possibility of running out of supply gas, it is recommended that the empty cylinders be replaced as soon as possible after switchover. After the empty cylinders are replaced, reset the switchover device by rotating the operating knob such that the arrow on the knob points to the bank of cylinders that were replaced. Turn the knob until a click is heard, the detent plunger should lock the knob into position.

The device is now reset and will switchover when the other bank of cylinders is empty.

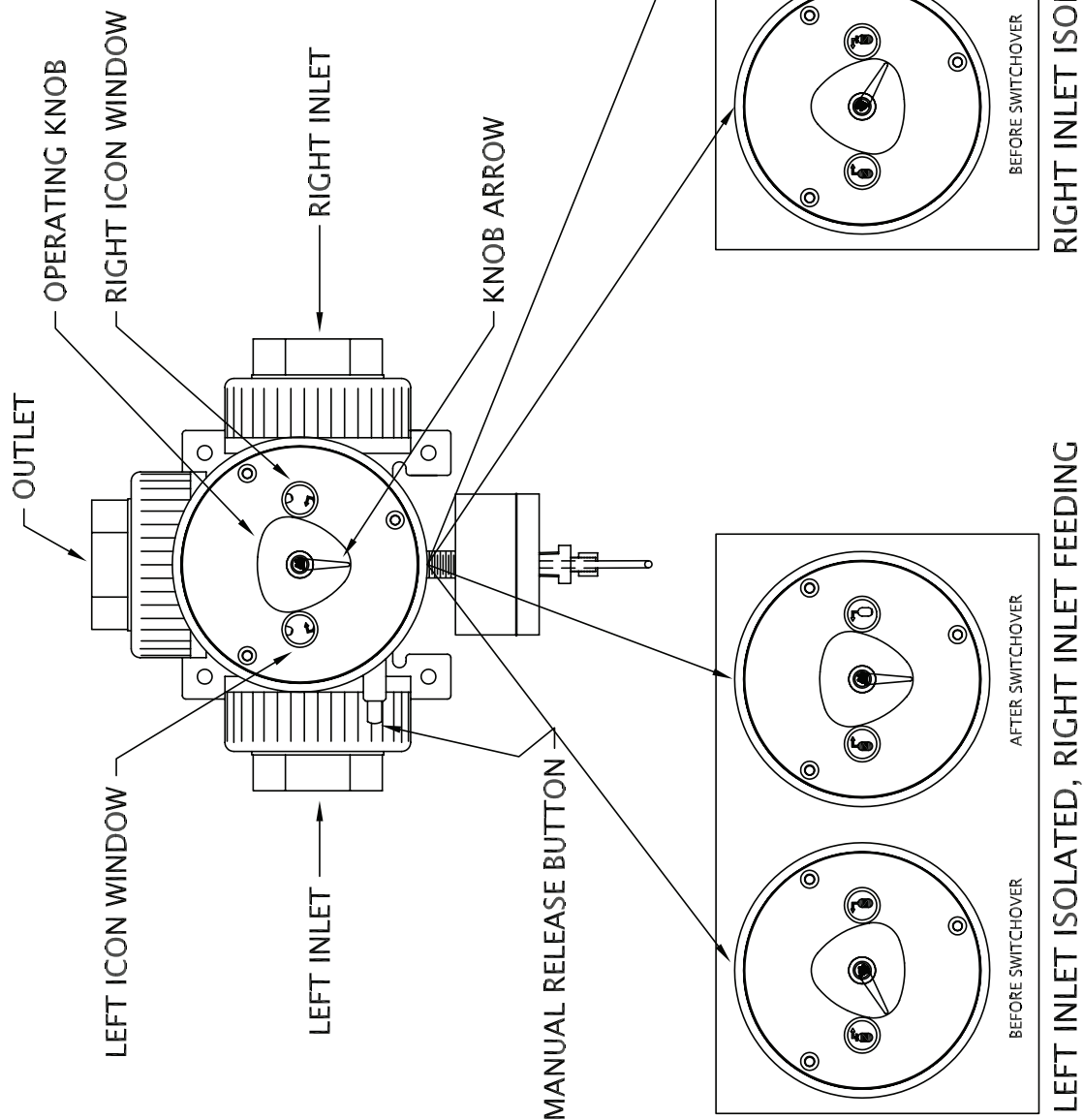
## 3.4.4 Manual Switchover

The device may be manually tripped at any time by depressing the manual release button. Manually tripping the device will result in the icons reading as if an automatic switchover occurred (refer to paragraph 3.4.2, Automatic Switchover).

## 3.5 Changing Gas Supply Cylinders

Refer to the separate instruction book provided with the vacuum regulator for detailed instructions and precautions on how to change the gas supply cylinders.

# REMOTE SWITCHOVER



DEVICE LAYOUT

55.400.170.001

ISSUE 0 6-99

# REMOTE SWITCHOVER

## **SECTION 4**

## SECTION 4 - SERVICE

### List of Contents

	PARA. NO.
General .....	4.1
Checking for Leaks.....	4.1.1
Plastic Parts .....	4.1.2
Inspection.....	4.1.3
Seals/O-Rings.....	4.2
Maintenance.....	4.3
Periodic Performance Checks.....	4.3.1
Switchover Level.....	4.3.1.1
Mechanical.....	4.3.1.2
Periodic Cleaning .....	4.3.2
Cleaning Internal Parts .....	4.3.2.1
Periodic Preventive Maintenance.....	4.3.3
Disassembly and Reassembly Instructions.....	4.3.4
Disassembly Instructions.....	4.3.4.1
Reassembly Instructions .....	4.3.4.2
Troubleshooting.....	4.4





**WARNING:** HAZARDOUS GAS IS PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONNEL INJURY OR DAMAGE TO THE EQUIPMENT, READ THIS INSTRUCTION BOOK AND THE APPROPRIATE GAS MANUAL BEFORE CONNECTING THIS EQUIPMENT TO A SUPPLY OF GAS. OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BE RESTRICTED TO TRAINED, QUALIFIED PERSONNEL WHO ARE COMPLETELY FAMILIAR WITH THESE INSTRUCTIONS.

## 4.1 General



**WARNING:** EXCEPT WHEN DETECTING LEAKS, TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, THE GAS SUPPLY MUST BE SHUT OFF AT THE GAS SUPPLY CONTAINERS AND THE GAS IN THE SYSTEM MUST BE COMPLETELY EXHAUSTED BEFORE BREAKING ANY CONNECTIONS AND SERVICING THE EQUIPMENT. TO DO THIS, TURN OFF THE GAS SUPPLY AT THE CONTAINER VALVE, WAIT UNTIL THE SUPPLY VACUUM GAUGE READS FULL SCALE AND THE ROTAMETER FLOAT RESTS ON THE BOTTOM STOP, AND THEN TURN OFF THE INJECTOR WATER SUPPLY.

Maintenance is simplified if certain general precautions are taken. These are usually easy to accomplish and will contribute to reducing maintenance costs by maintaining normal operating conditions. Before reassembling, apply halo-carbon grease to all O-rings and Teflon tape to all NPT threaded joints.

### 4.1.1 Checking for Leaks



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY, IT IS GOOD PRACTICE TO HAVE AN APPROVED GAS MASK AVAILABLE WHEN MAKING LEAK CHECKS.



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT TOLERATE ANY LEAKS. THEY ALWAYS GET PROGRESSIVELY WORSE AND MUST BE CORRECTED PROMPTLY.

**NOTE:** For leak testing, use Evoqua Water Technologies U409 or commercial 26° Baumé aqua ammonia. Household ammonia is not strong enough.

For checking leakage of chlorine gas at joints, fittings, etc., hold the ammonia-moistened dauber close to the joint or suspected leakage area. If leakage exists, a white cloud will form. When a leak is found, immediately shut off the gas supply. To remove all gas from the equipment, continue injector operation until the supply vacuum gauge reads full scale and the rotameter float rests on the bottom stop or bounces.



**WARNING:** ESCAPED GAS MUST BE VENTED TO OUTSIDE. DO NOT TERMINATE THE VENT AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS, NOR NEAR WINDOWS OR VENTILATION SYSTEM INTAKES.

Eliminate all leaks before proceeding. As a routine practice, check gas connections for leaks daily. Green or reddish deposits on metal parts indicate possible leaks. No gas odor should be around the equipment except when a joint is temporarily opened.



**WARNING: WHEN ANY CONNECTION IS BROKEN EVEN FOR A SHORT TIME, IMMEDIATELY PLUG THE RESULTING OPENINGS WITH A RUBBER STOPPER OR EQUIVALENT TO PREVENT THE ENTRANCE OF MOISTURE. MOISTURE MUST BE EXCLUDED FROM ANY PART OF THE EQUIPMENT THAT IS NORMALLY EXPOSED TO DRY CHLORINE ONLY. WHILE DRY CHLORINE IS NON-CORROSIVE, MOIST CHLORINE IS EXTREMELY CORROSIVE TO COMMON METALS SUCH AS BRASS AND STEEL.**

## 4.1.2 Plastic Parts

Whenever plastic parts are assembled, use Teflon tape on NPT threads. In general, do not use tools to make up plastic pipe connections. Make this type of connection by hand pressure only. Plastic parts should not be exposed to hydrocarbons, alcohol, ether, or petroleum distillates, since these chemicals may attack the plastic. Any plastic part exhibiting cracks or severe pitting should be replaced at once.

## 4.1.3 Inspection

After any disassembled parts are cleaned, and prior to reassembly, perform the following:

- a. Check for physical damage to removed parts (chipped, cracked, damaged threads, etc.). Replace damaged parts.
- b. Discard and replace all removed O-rings, seals, and flat seats.

## 4.2 Seals/O-Rings/Flat Seats

Keep a supply of flat seats, O-rings, and seals on hand so that the equipment can be maintained properly. A regular replacement program for these parts will go far in eliminating operating difficulties. The preventative maintenance kit includes a complete set of seals and seats.



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, NEVER REUSE SEALS. ALWAYS REPLACE WITH A NEW PART OF THE PROPER SIZE AND MATERIAL AS IDENTIFIED ON THE EQUIPMENT PARTS DRAWING.**

## 4.3 Maintenance

Maintenance of the remote auto switchover device consists of three periodically performed operations:

- Periodic performance checks to detect the onset of any deteriorating conditions before their progress leads to serious malfunction.
- Periodic cleaning to remove contaminants and deposits brought to the unit by the gas flow.
- Periodic preventative maintenance to disassemble, inspect, clean, and accomplish recommended parts replacement. Kits of replacement parts required for this periodic service are available and are listed in Section 6.

**NOTE:** If the equipment is used seasonally or after a long-term shutdown, the preventative maintenance should be performed prior to startup.

### 4.3.1 Periodic Performance Checks

To assure that the switchover device is functioning in a normal manner, it is recommended that the following check be made at approximately three-month intervals. The check is easy to perform and requires no tools other than the vacuum gauge on the gas feed line and a cylinder valve wrench.

#### 4.3.1.1 Switchover Vacuum Level Check

Operate the gas feeding equipment in a normal manner. Check to ensure that neither bank of gas cylinders is empty. Check the switchover device to ensure that it is set to isolate one bank of cylinders. Identify which bank of cylinders is currently feeding the system. Slowly close the gas supply cylinder container valve(s) on the bank that is feeding. The vacuum level should begin to increase. When the vacuum level reaches around 110 inches H<sub>2</sub>O, the knob on the front of the switchover device should snap to the center position. The vacuum level in the system should then drop back to normal operating levels.

Reopen the gas supply cylinder container valve(s) closed as a result of the above procedure and repeat the procedure, setting the switchover device to feed initially from the second bank of gas cylinders. The switchover unit should trip at approximately the same vacuum level.

#### 4.3.1.2 Switchover Unit Mechanical Check

Depress the manual release button to center the unit. The knob should rotate smoothly to the center position with no binding or backlash. Any observed abnormalities indicate a need for service.

## 4.3.2 Periodic Cleaning

To ensure that the internal parts of the switchover device remain free of contaminants, it is recommended that the following cleaning procedures be done at the stated intervals.

**NOTE:** The actual frequency of cleaning will depend on the feed rate and amount of gas fed, the care exercised in container changing, and the source and quality of the gas. This maintenance schedule provides recommended cleaning intervals; however, your own operating experience is the best guide to preventative maintenance and may result in significant variations from the recommended schedule.



**WARNING:** TO PREVENT POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, ALL CLEANING SHOULD BE CARRIED OUT IN AN OPEN AREA OR IN A WELL VENTILATED ROOM.

Most of the residue that accumulates can usually be removed with warm water and a detergent. Plastic and elastomer parts should be cleaned with warm water and a detergent only.



**WARNING:** TO PREVENT POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, DO NOT USE WOOD ALCOHOL, ETHER, PETROL, OR PETROLEUM DISTILLATES.

All traces of detergent and moisture must be removed from internal parts that come in contact with the gas before being returned to service. Do not use heat on plastic or elastomer parts.

### 4.3.2.1 Cleaning Internal Parts (See Dwg. 55.400.000.010)

When used in chlorine service, the switchover device will tend to accumulate deposits on the internal parts. Eventually these deposits will become heavy enough to affect the operation of the device. It is therefore recommended that the switchover device be removed from the system and the internal flow passages cleaned every six months. This can be accomplished with only minor disassembly of the unit.

Follow the system shutdown directions detailed in the gas feeder and vacuum regulator instruction manuals before removing the switchover device from the system. Remove the switchover device to a suitable work area for cleaning.

- a. Depress the manual release button to center the unit.
- b. Remove the three union nuts from the inlets and the outlet connectors.

- c. Using a twisting motion, remove the three inlet/outlet nipples from the body of the unit. Inspect the three O-ring seals for any nicks or cuts; replace seals if required.
- d. Remove backup disc and flat seat from both inlet connection ports. Inspect both parts for any signs of deterioration; replace if necessary.
- e. Disconnect connection tube between body and diaphragm housing.
- f. Inspect the interior flow passages in the body for deposit buildup.
- g. Many (but not all) contaminants are soluble in water. Hold the switchover unit under running warm (110-125°F) water so that the water enters the outlet connection bore and exits through the two inlet connection bores. A common pipe cleaner may be used to scrub the interior. A detergent will promote cleaning action. Continue flushing until the contaminate deposits are removed.



**WARNING: DO NOT USE HYDROCARBONS OR ALCOHOLS AS RESIDUAL SOLVENT MAY REACT WITH THE GAS. DO NOT ALLOW ANY WATER TO ENTER THE DIAPHRAGM HOUSING OR THE INDICATOR HOUSING. DO NOT IMMERSE THE UNIT IN WATER DO NOT USE WATER HOTTER THAN 120°F.**

- h. Drain and let dry. Do not use a pipe cleaner or any type of towel or rag as a drying tool because the lint from it will stick to the interior flow passages. Place the unit with all three ends open so air can flow through. Drying can be hastened by adding heat, as from a hand-held hair dryer.



**WARNING: DO NOT USE A COMMERCIAL HEAT GUN OR ANY FORM OF HEAT IN EXCESS OF 120°F AS DAMAGE TO THE INTERNAL PARTS WILL RESULT.**

- i. While the body is drying, clean flat seats and backup discs and inlet/outlet nipples. After cleaning, dry them thoroughly before reassembly.
- j. Reassemble unit by installing flat seats and backup discs into inlet bores. Before installing inlet/outlet nipples, apply a small amount of halocarbon grease to O-rings. Reconnect connection tube.

### 4.3.3 Periodic Preventive Maintenance

Because of aging of elastomeric components and the desirability of checking internal passages for accumulations of deposits not seen in routine cleaning, it is recommended that at one-year intervals the switchover device be completely disassembled. Before starting work, ensure that the recommended spare parts are on hand.

**NOTE: If the equipment is used seasonally or after a long-term shutdown, the preventative maintenance should be performed prior to startup.**

Disassembly and reassembly instructions necessary to install the maintenance kit parts are included in paragraph 4.3.4, as well as with the kit.

Servicing of Evoqua Water Technologies equipment including installation of parts from maintenance kits should be restricted to trained, authorized personnel who are completely familiar with the entire contents of the equipment instruction book. The Evoqua Water Technologies sales office from which you purchased the equipment can provide the preventative maintenance kits or overhaul service.

## **4.3.4 Disassembly and Assembly Instructions**

Before undertaking any disassembly of the switchover device, first ensure that a full set of replacement parts is available. Following the applicable procedures from the above sections, remove the switchover device from the feed system.

### **4.3.4.1 Disassembly Instructions (See Dwg. 55.400.000.010)**

- a. Using a screwdriver, remove the mounting bracket (2) by removing the four 6mm panhead screws (1).
- b. Remove the three union nuts (8) from over the inlet/outlet fittings.
- c. Remove the three inlet/outlet nipples (7) by pulling and twisting. Remove the O-ring (6) from each nipple and discard. Use caution not to nick or damage the O-ring groove. Thoroughly clean the interior bore and O-ring groove of the inlet/outlet nipples.
- d. Remove and discard the flat seats (29) and the backup discs (30) from the two inlet bores in the body assembly (3).
- e. Ensure that the operating knob (22) is in the centered position. Using an allen wrench, loosen the two allen set screws (23) on the knob. Pull straight up on the knob to remove it.
- f. Using a screwdriver, remove the three screws (21) holding the front cover (20) to the indicator housing assembly (14).
- g. Using a small flat-bladed screwdriver, carefully pry between the front cover and the indicator housing assembly to remove the cover. Use extreme caution not to gouge the front cover or indicator housing.
- h. Place the front cover face down on a clean surface. The white indicator disc (18) and seal (19) should be on the stub of the front cover. Gently grasp the indicator disc by the OD and twist and pull to separate the indicator disc and seal from the front cover.

## REMOTE SWITCHOVER

- i. Using finger pressure, press the seal out of the bore of the indicator disc. Discard seal.
- j. Using a screwdriver, remove the three screws (15) holding the indicator housing assembly (14) to the body assembly (3). Loosen the two tube nuts on the tubing fittings (4) at the upper diaphragm housing (38) and the body assembly. Remove the tube (5) and the two tube nuts as an assembly, leaving the tubing fittings in the upper diaphragm housing and body.
- k. Using a screwdriver, remove the two screws (1) from the diaphragm housing support bracket (40) and remove bracket.
- l. Using an allen wrench, loosen the set screw (23) holding the threaded shaft of the lower diaphragm housing (33) in the threaded bore of the indicator housing assembly (14). Remove diaphragm housing assembly [consisting of detent rod (32), springs (24), lower diaphragm housing (33), lower piston (34), O-ring (35), diaphragm (36), upper piston (37), upper housing (38), screws (39), and tubing fitting (4)] by unscrewing in a counter-clockwise direction. Separate diaphragm housing assembly from indicator housing by pulling diaphragm housing assembly straight out until tip of detent rod (32) clears threaded bore of indicator housing.
- m. Holding diaphragm housing assembly, unscrew the detent rod counter-clockwise from the lower piston. Pull the detent rod and the spring straight out of the diaphragm housing. Remove the six screws holding the upper housing to the lower housing. Separate the upper and lower diaphragm housings. Holding the upper piston, unscrew the lower piston counter-clockwise and separate upper and lower pistons. Remove O-ring and diaphragm from upper piston. Discard O-ring and diaphragm.
- n. Holding the body assembly (3) with one hand, pull the indicator housing straight up. Continue to withdraw the indicator housing until the seal (13) is clear of the top of the shaft (10). Remove the detent cam (17) and the torsion spring (16), which should have remained in the bore of the indicator housing. Use caution when removing the torsion spring (16) as it will snap out when the spring tangs clear the indicator housing bore ledge. On chlorine service units, discard torsion spring (16).
- o. Remove and discard the O-ring (12) in the bore of the body housing.
- p. Flip the indicator housing (14) over to expose the seal. Carefully pry the seal out of the indicator housing bore. Use caution not to scratch or nick the indicator housing bore. Discard seal. Using a large flat-bladed screw driver, unscrew the detent rod bearing (31) from the threaded bore of the indicator housing.
- q. If equipped with optional remote indicator switch (42) remove switch from indicator housing by turning counter-clockwise.

# REMOTE SWITCHOVER

- r. Unscrew manual release rod retainer (26) from indicator housing bore. Pull manual release rod (25) and spring (24) from bore.
- s. Holding the body assembly (3) with one hand, firmly grab and pull the exposed end of the shaft (10) straight up. Continue to withdraw the shaft until the bearing (11) is clear of the top of the body assembly. The pinion gear (9) will remain on the shaft. After the shaft and gear are clear of the body, remove gear from shaft by pulling gear straight off shaft.
- t. Working from the left inlet of the body, push the carriage assembly consisting of the carriage (28) and the rack gear (27) through the right inlet port of the body. Remove rack gear from carriage by squeezing tabs of rack gear and pushing up through bore of carriage.

## 4.3.4.2 Reassembly Instructions (See Dwg. 55.400.000.010)

- a. Assemble carriage assembly by placing rack gear (27) into cut-out bore of carriage (28). Using thumb pressure, press straight down on gear rack until it snaps into place in the carriage.
- b. Assemble operating shaft assembly by taking pinion gear (9) and sliding it over the lower square bore of operating shaft (10). Press gear onto shaft until it bottoms on the top land of shaft.
- c. Assemble three inlet/outlet nipple assemblies by coating O-ring (6) with U27546 halocarbon grease and placing into groove in inlet/outlet nipple (7). Repeat for the remaining two nipple assemblies.
- d. Assemble indicator housing assembly by pressing lip seal (13) into bottom bore of indicator housing (14). Use hand pressure only and take care to press seal squarely into bore. Using a 3/8"-wide flat-bladed screwdriver, screw the detent rod bearing (31) into the 12mm threaded bore in the indicator housing until the back edge is just past the 12mm cross bore in the indicator housing (determine by sighting down cross bore). Slide compression spring (24) over manual release pawl (25); insert pawl and spring into cross bore in the indicator housing with the tapered end of the pawl oriented as shown on exploded view drawing. Slide rod retainer (26) over end of rod and screw into the 12mm threaded bore. Tighten until it bottoms in the threaded bore. Take one set screw (23) and thread half-way into 4mm threaded bore in the indicator housing.
- e. Assemble diaphragm piston assembly by placing the center threaded portion of the upper piston (37) through the central hole of the diaphragm (36). Apply a thin coat of halocarbon grease (U27546) to O-ring (35) and place it over the threaded portion of the upper piston. Screw lower diaphragm piston (34) onto threaded portion of the upper piston such that the beveled threads of the lower diaphragm piston bear on the O-ring. Use care not to overtighten the lower diaphragm piston (torque to 5in-lb).



## REMOTE SWITCHOVER

- f. Place the assembled diaphragm piston assembly into the lower diaphragm housing (33) and line up the holes in the diaphragm (36) with the screw holes in the lower diaphragm housing. Place spring (24) on center counterbore hole of the upper piston (37). Place upper diaphragm housing (38) on top of the diaphragm, lining up the holes in the upper diaphragm housing with the holes in diaphragm. Place screws (39) into holes in the upper diaphragm housing and tighten alternately and evenly to 15in-lb of torque.
- g. Slide compression spring (24) over detent shaft (32). Insert threaded end of the detent shaft into the bore of the threaded end of the lower diaphragm housing. The male threaded end of the detent shaft should engage the threaded bore of the upper diaphragm piston (37). Tighten the detent shaft to 5in-lb of torque. Wrap male threads of tubing fitting (4) with teflon tape and screw it into the upper diaphragm housing. Tighten the tubing fitting to 15in-lb of torque.
- h. Insert the carriage assembly [consisting of rack gear (27) and carriage (28)] into the right side inlet of the body assembly (3). Line up the square body of the carriage with the slots in the bore of the body assembly (refer to Figure 4.1). Center the rack gear in the operating shaft hole of the body assembly (refer to the detail in Figure 4.1).

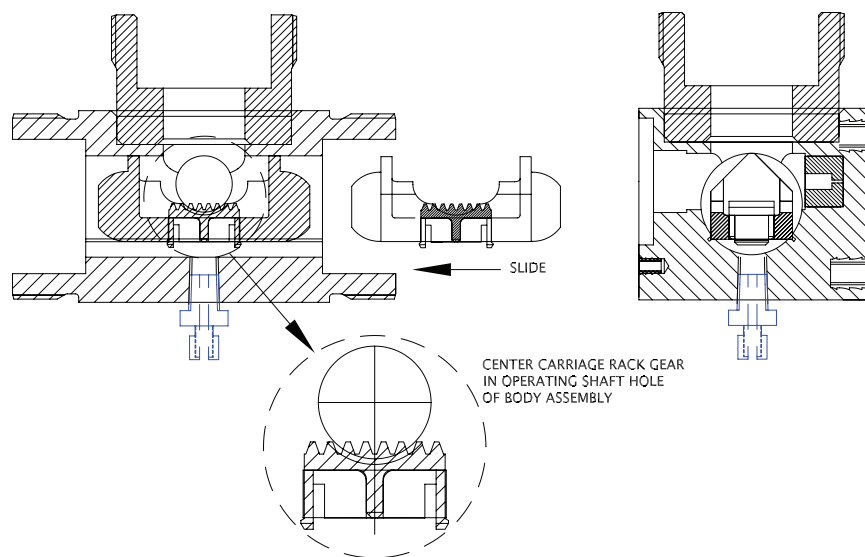


Figure 4.1 - Installing Carriage Assembly

- i. Insert the operating shaft assembly [consisting of the shaft (10) and the pinion gear (9)] into the operating shaft bore of the body assembly (refer to Figure 4.2). Take care to position the shaft assembly (as shown in the detail of Figure 4.2) prior to insertion. The pinion gear should engage the rack gear (27) as shown, with the slot in the shaft (10) vertical, the flats on the shaft facing down and the rack gear centralized. Continue to insert the shaft until it bottoms on the lower teflon bushing in the body assembly.

# REMOTE SWITCHOVER

Check operation by rotating shaft 60° clockwise and counter clockwise from the centered position. The carriage assembly [(27) and (28)] should move in the bore of the body assembly without binding. Return shaft to the center position.

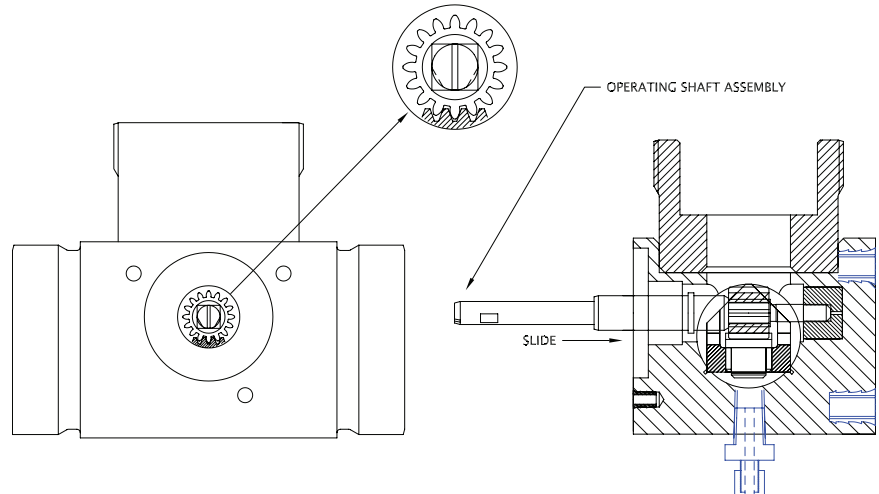


Figure 4.2 - Installing Operating Shaft Assembly

- j. Install upper teflon bearing by sliding bearing (11) over the top of the operating shaft (10) until the bearing sets in the bore of the body assembly. Press the bearing into its bore by using a 4" long piece of ½" diameter schedule 40 plastic pipe (refer to Figure 4.3).

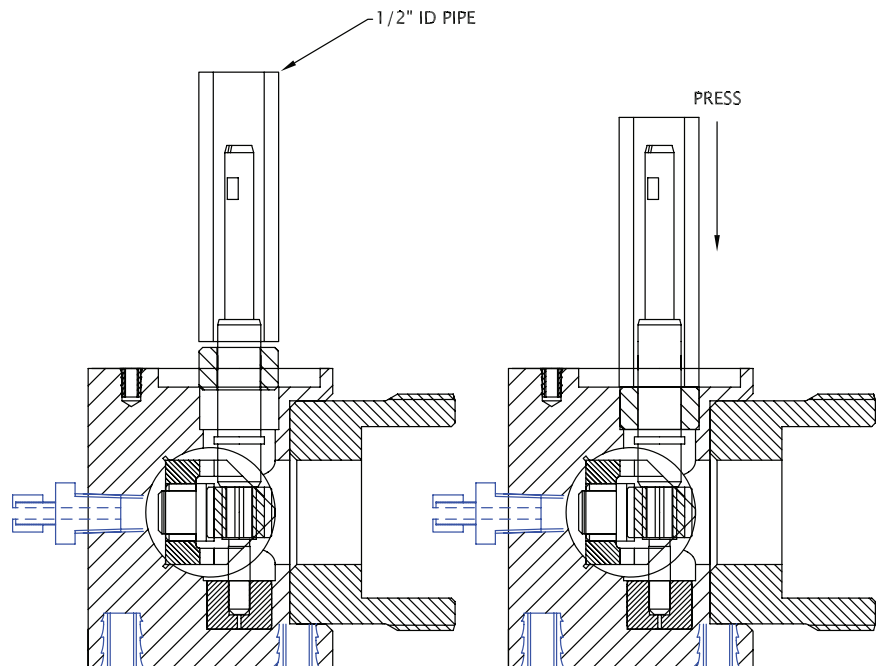


Figure 4.3 - Installing Upper Teflon Bushing

- k. Place a flat seat (29) and a backup disc (30) into the left and right inlet bores of the body assembly—ensure that the flat seat is on the inside for both the left and right sides. Into the two inlet and the one outlet bores of the body assembly, insert one inlet-outlet nipple assembly [(6) and (7)] until it bottoms in the bore. Secure each nipple with a union nut (8)—tighten union nut to 50 in-lbs of torque. Note that the top (outlet) port of the body assembly does not get a flat seat and backup disc.
- l. Install mounting bracket (2) to body assembly (3) using 6mm pan head screws (1). Tighten the screws to 25 in-lb of torque.
- m. Apply a thin coat of U27546 halocarbon grease to O-ring (12) and place O-ring into bore on top of body assembly (over operating shaft).
- n. Take indicator housing assembly assembled in step d, above, and carefully lower it over the operating shaft (10) such that the operating shaft goes through the center of the teflon lip seal (13) bore. Use care to prevent the operating shaft from damaging the lip seal. Align the three holes in the indicator housing (14). With the screw inserts in the top of the body assembly (3). Secure the indicator housing assembly to the body assembly using three 4mm screws (15). Tighten screws to 15 in-lb of torque.



**WARNING: SAFETY GLASSES MUST BE WORN DURING THE FOLLOWING PROCEDURE.**

- o. Install torsion spring (16) by sliding it over the operating shaft (10) such that the right-side tang of the spring is on the bottom. Slide spring down to the bottom of the bore in the indicator housing (14). The right tang of spring should seat on the right side shoulder of the ledge in the bore of the indicator housing. Carefully twist the left tang of the spring until it aligns with the left-side shoulder of the ledge in the bore of the indicator housing. Push down on the left spring tang until it seats on the left shoulder ledge. Spring should remain set in bore of the indicator housing without jumping out.
- p. Install detent cam (17) by placing it over the operating shaft and aligning the square bore on the cam with the square shaft section of the operating shaft. The small button at the top of the cam should be opposite the outlet port of the device, with the two notches in the cam facing the four and eight o'clock positions. Using hand pressure, press detent cam down onto operating shaft, taking care to allow the lower tang of the detent cam to pass in between the two torsion spring tangs. It may be helpful to rotate the cam about 10° counter-clockwise while pressing after the square bore of the cam engages the square section of the shaft. Continue to press the cam onto the shaft until it bottoms on the ledge of the shaft, then release the cam—it should return to the center position by action of the torsion spring. Check operation by rotating the cam 20° clockwise and then counter clockwise—the cam should spring back to the center position in both cases.

## REMOTE SWITCHOVER

- q. Install the diaphragm housing assembly assembled in steps e through g, above, to the indicator housing assembly by taking the threaded rod of the diaphragm housing (33) and screwing it into the 12mm threaded bore on the bottom side of the indicator housing (14). As the diaphragm housing is being screwed into the bore, the detent rod (32) should pass thru the bore of the detent rod bearing (31) and contact the detent cam (17). Note the position of the diaphragm housing when contact is made, then continue to rotate the diaphragm housing an additional two full turns. Tighten set screw (23) to lock diaphragm housing into position.
- r. Connect tube (5) to the tube fittings (4) at the body and the diaphragm housing. Tighten tube fitting nuts after connecting tubes.
- s. Install seal (19) into indicator disc (18) by pressing seal (spring side down) into center bore of indicator disc (graphic icons facing up). Slide indicator disc over operating shaft and place it on top of the detent cam (17). Align slot in the indicator disc with the pin in the detent cam.
- t. Install cover (20) by sliding over operating shaft until it bottoms in the counter-bore of the indicator housing (14). Align the three screw holes in the cover with the screw inserts in the indicator housing. Secure the cover with three 4mm screws (21). Tighten screws to 10 in-lb of torque.
- u. Install operating knob (22) on shaft such that the arrow on knob is pointing toward the diaphragm housing. Install two set screws (23) into the bores on the side of the knob. Tighten set screws hand tight to lock knob to operating shaft.
- v. Install diaphragm housing support bracket (40) and secure with two 6mm screws (1).

# REMOTE SWITCHOVER

## 4.4 Troubleshooting

**NOTE:** Refer to the preceeding pages for complete details on actions/procedures necessary to apply the remedies indicated in Table 4.1.

**Table 4.1 - Troubleshooting**

SYMPTOM	PROBABLE CAUSE	REMEDY
Unit can not be set to isolate the stand-by supply (will not latch).	<ol style="list-style-type: none"> <li>1. Gas supply vacuum level high (<math>&gt;110'' \text{ H}_2\text{O}</math>).</li> <li>2. Mechanical damage to unit.</li> </ol>	<ol style="list-style-type: none"> <li>1. Determine cause for high gas supply vacuum level and correct.</li> <li>2. Disassemble unit, check detent rod, cam and shaft for damage and correct</li> </ol>
Unit will not switchover to the stand-by supply after primary supply is depleted—gas supply vacuum level $<110'' \text{ H}_2\text{O}$ .	<ol style="list-style-type: none"> <li>1. Vacuum leak(s) in piping.</li> <li>2. Vacuum leak(s) in unit.</li> <li>3. Unit not isolating stand-by supply—permitting gas flow from stand-by cylinders.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check all piping for leaks—check vacuum relief valve in system (if equipped) and correct.</li> <li>2. Check the shaft seal, diaphragm and connecting tube for leaks and correct.</li> <li>3. Check for weight loss in stand-by cylinders—if weight loss is present check unit flat seats and carriage plunger for deposits and/or damage</li> </ol>
Unit will not switchover to the stand-by supply after primary supply is depleted—gas supply vacuum level $>110'' \text{ H}_2\text{O}$ .	<ol style="list-style-type: none"> <li>1. Mechanical damage to unit.</li> <li>2. Deposit build-up inside unit</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the detent rod, cam and the diaphragm housing for damage and correct.</li> <li>2. Remove unit from piping—inspect interior bores for deposits, clean if required.</li> </ol>
Unit permitting gas flow from isolated stand-by supply.	Worn or damaged flat seat, or deposit build-up on seat and/or carriage.	Check flat seat and carriage disc on side that is failing to seal—clean/correct as required.

# SECTION 5

# REMOTE SWITCHOVER

## SECTION 5 - ILLUSTRATIONS

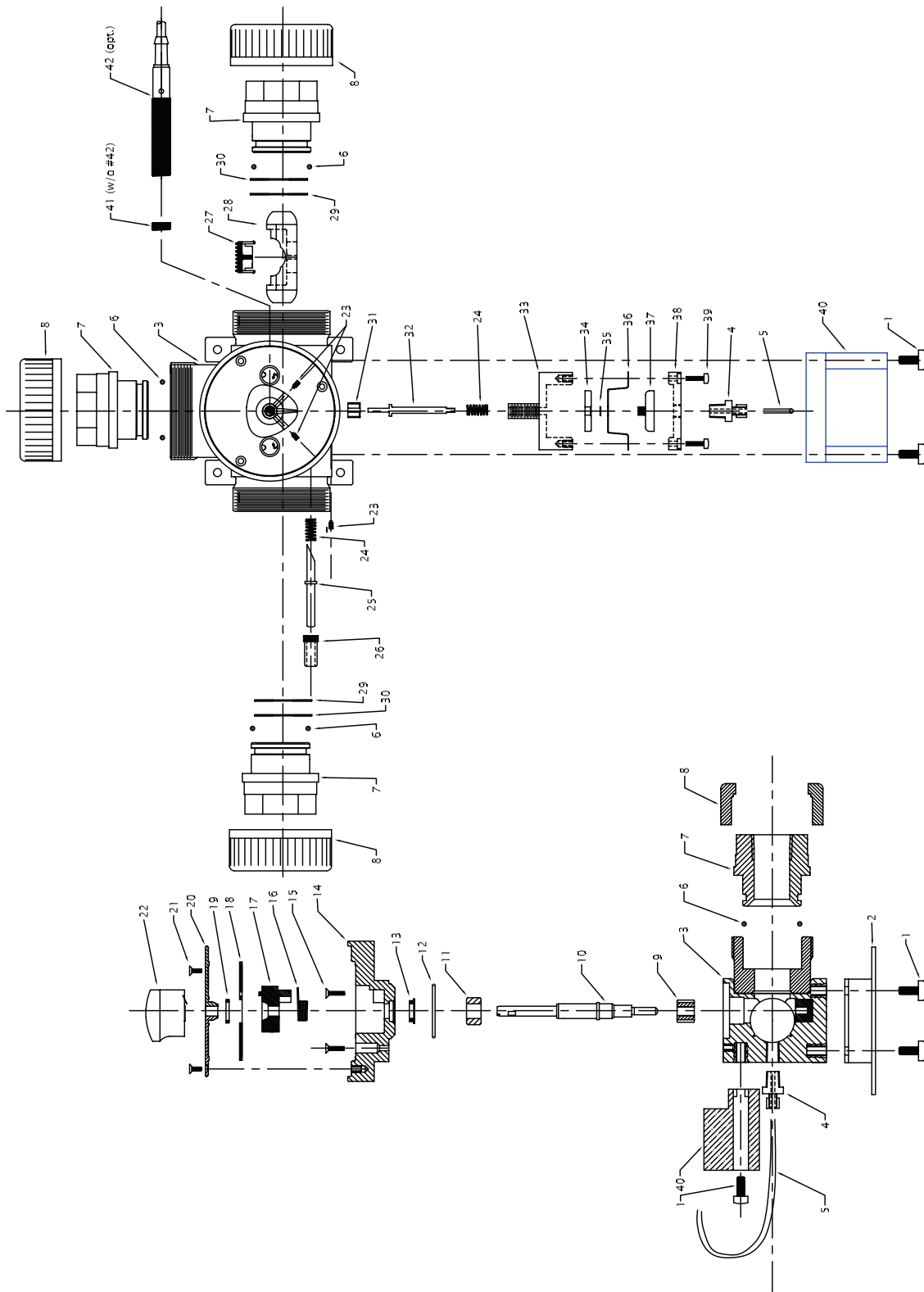
### List of Contents

DRAWING NO.

Parts

Remote Switchover Assembly ..... 55.400.000.010A&B

# REMOTE SWITCHOVER



AAB4514 - CHLORINE & SULFUR DIOXIDE; AAB2975 - AMMONIA  
REMOTE SWITCHOVER ASSEMBLY - PARTS

55.400.000.010A

ISSUE 2 6-03



# REMOTE SWITCHOVER

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAA1344	6	SCREW, 6mm x 1 x 16, PANHD
2	AAA6479	1	MOUNTING BRACKET
3	AAB2939	1	BODY ASSEMBLY
4	P96974	2	TEFLON TUBING FITTING
5	RP9024426	0.8'	TEFLON TUBING
▲ 6	AAA6659	3	O-RING, 40.37 x 3.53
	OR		
	AAA6935	3	O-RING, 40.37 x 3.53
7	AAA6530	3	INLET/OUTLET NIPPLE
8	AAA2514	3	"UNION NUT, 2-1/4" BSPF"
9	AAA6464	1	PINION GEAR
10	AAA6509	1	OPERATING SHAFT
11	AAA6494	1	TEFLON BEARING, 12 x 22
▲ ■ 12	AAA6938	1	O-RING, 39.34 x 2.62
	OR		
	AOO5049	1	O-RING, 39.34 x 2.62
13	AAA6515	1	LIP SEAL, TEFLON, 12 x 2.5
14	AAA6500	1	INDICATOR HOUSING
15	AAB1494	3	SCREW, 4 x .7 x 16, FHD, TITANIUM
16	AAA6599	1	TORSION SPRING, K-MONEL 500
17	AAA6512	1	DETENT CAM
18	AAA6506	1	INDICATOR DISC
19	AAA6959	1	LIP SEAL, TERLON, 15 x 2
20	AAB4691	1	COVER, SILKSCREENED
21	AAB1491	3	SCREW, 4 x .7 x 10, FHD, SST
22	P97070	1	OPERATING KNOB
23	AAA8883	3	SET SCREW, 4 x .7 x 6
24	AAA6956	3	COMPRESSION SPRING
25	AAB2972	1	MANUAL RELEASE PAWL
26	AAB2969	1	MANUAL RELEASE PAWL RETAINER
27	AAA6461	1	RACK GEAR
28	AAA6476	1	CARRIAGE
▲ ■ 29	AAA6527	2	FLAT SEAT
	OR		
	AAA6941	2	FLAT SEAT
30	AAA6641	2	BACKUP DISC
31	AAB1772	1	DETENT ROD BEARING
32	AAB1757	1	DETENT ROD
33	AAB2942	1	LOWER DIAPHRAGM HOUSING ASSEMBLY
34	AAB1763	1	LOWER PISTON
▲ ■ 35	ANM3591	1	O-RING, 8 x 2
	OR		
	AAA1298	1	O-RING, 8 x 2
▲ ■ 36	AAB1748	1	DIAPHRAGM
	OR		
	AAB3140	1	DIAPHRAGM
37	AAB1766	1	UPPER PISTON
38	AAB1760	1	UPPER DIAPHRAGM HOUSING
39	AUK6106	6	SCREW, 4 x .7 x 16, PANHD
40	AAB4205	1	LOWER DIAPHRAGM HOUSING SUPPORT BRK.
41	AAA6524	1	SCR. PLUG (w/o PROX. SEN.)
42	AAB4646	1	PROX. SWITCH (optional)

**NOTES:** ▲ USED IN AAB4514  
■ USED IN AAB2975

**WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.**

AAB4514 - CHLORINE & SULFUR DIOXIDE; AAB2975 - AMMONIA  
**REMOTE SWITCHOVER ASSEMBLY - PARTS LIST**

55.400.000.010B

ISSUE 3 10-04

# REMOTE SWITCHOVER

## **SECTION 6**

# REMOTE SWITCHOVER

## SECTION 6 - PREVENTIVE MAINTENANCE KITS AND SPARE PARTS LIST

<u>DESCRIPTION</u>	<u>PART NO.</u>
Chlorine & Sulfur Dioxide Assembly PM Kit	AAB3527
Ammonia Assembly PM Kit	AAB3530