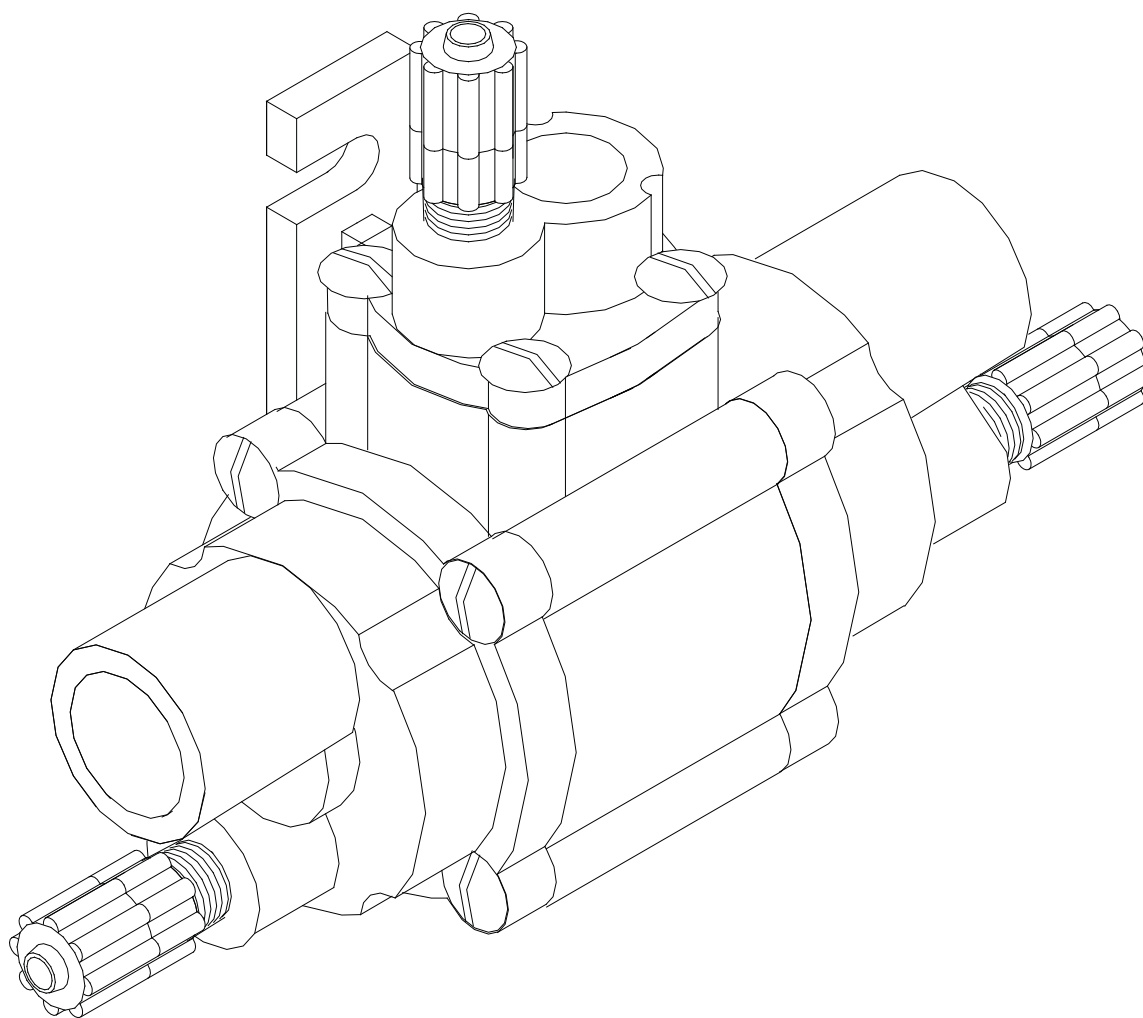

Instruction Manual — Automatic
Switchover Module, Vacuum Type,
500 PPD Max (10 kg/h)

SEVERN
TRENT
SERVICES



These instructions describe the installation, operation and maintenance of the subject equipment. Failure to strictly follow these instructions can lead to an equipment rupture that may cause significant property damage, severe personal injury and even death. If you do not understand these instructions, please call Severn Trent Water Purification (STWP), Inc. for clarification before commencing any work at +1 215 997 4000 and ask for a Field Service Manager. Severn Trent Water Purification, Inc. reserves the rights to make engineering refinements that may not be described herein. It is the responsibility of the installer to contact STWP Inc. for information that cannot be answered specifically by these instructions.

Any customer request to alter or reduce the design safeguards incorporated into STWP Inc. equipment is conditioned on the customer absolving STWP Inc. from any consequences of such a decision.

STWP Inc. has developed the recommended installation, operating and maintenance procedures with careful attention to safety. In addition to instruction/operating manuals, all instructions given on labels or attached tags should be followed. Regardless of these efforts, it is not possible to eliminate all hazards from the equipment or foresee every possible hazard that may occur. It is the responsibility of the installer to ensure that the recommended installation instructions are followed. It is the responsibility of the user to ensure that the recommended operating and maintenance instructions are followed. Severn Trent Water Purification, Inc. cannot be responsible for deviations from the recommended instructions that may result in a hazardous or unsafe condition.

STWP Inc. cannot be responsible for the overall system design of which our equipment may be an integral part of or any unauthorized modifications to the equipment made by any party other than STWP Inc.

STWP Inc. takes all reasonable precautions in packaging the equipment to prevent shipping damage. Carefully inspect each item and report damages immediately to the shipping agent involved for equipment shipped "F.O.B. Colmar" or to STWP Inc. for equipment shipped "F.O.B Jobsite". Do not install damaged equipment.

**SEVERN TRENT WATER PURIFICATION INC., COLMAR OPERATIONS
COLMAR, PENNSYLVANIA, USA
IS ISO 9001: 2008 CERTIFIED**

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1 INTRODUCTION

1.1 Principle of Operation (See Figure 1)

Each of two vacuum regulators with flow indicators are adapted to independent sources of gas under pressure. An automatic switchover module allows gas to flow under vacuum from the vacuum regulator in service to the flowmeter and rate control panel and the ejectors, until that source is depleted.

The vacuum sealing O-ring in the vacuum regulator then seals and the vacuum level increases, initiating the switching of toggle assembly in the switchover module. The open port on the depleted side of the switchover module closes, with the aid of a spring-loaded toggle assembly, while the closed port on the standby source opens to permit gas to flow.

When the operator replaces the depleted source, the fresh source is placed on automatic standby. The module will not access the fresh supply until the supply in service is exhausted.

1.2 Module Gas Capacity

Chlorine or Sulfur Dioxide Gas

100 PPD (2 kg/h)

200 PPD (4 kg/h)

500 PPD (10 kg/h)

Anhydrous Ammonia Gas

50 PPD (1 kg/h)

100 PPD (2 kg/h)

250 PPD (5 kg/h)

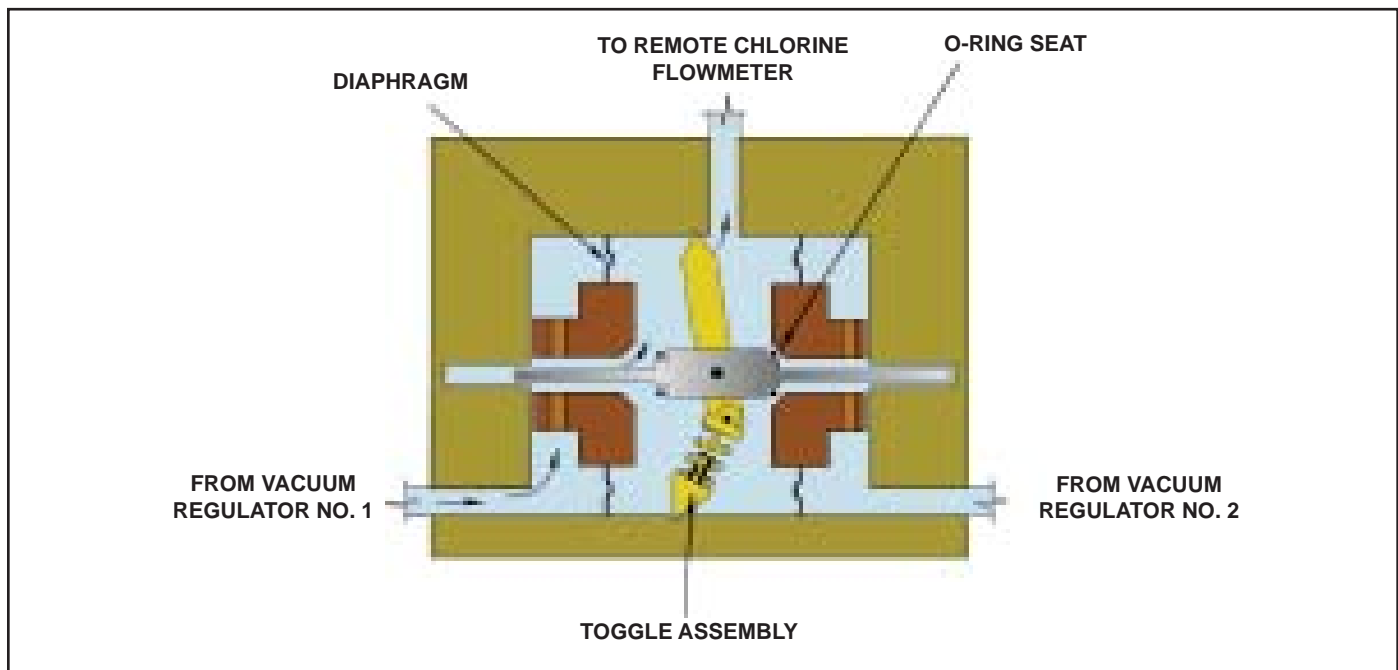


Figure 1 - Flow Diagram

1.3 Component Description

The components of the vacuum type automatic switchover system include:

- 1.3.1 Two (2) gas vacuum regulators each equipped with gas flow indicators and served by an independent source of gas.
- 1.3.2 One (1) vacuum type automatic switchover module having two inlets (one gas inlet from each vacuum regulator) and one vacuum outlet.
- 1.3.3 A vacuum producing device (ejector or chemical induction unit [CHLOR-A-VAC]) via a flowmeter with rate adjustment. The gas from the switchover module can be distributed to multiple ejectors via multiple metering and rate controls.

NOTE: These instructions are applicable to the switchover module only. Other components are described in separate instruction manuals.

2 INSTALLATION

2.1 General

The principle by which the automatic switchover module operates does not permit the use of a variable restriction, such as a rate valve, in the vacuum lines on the inlet sides. The vacuum regulators are therefore furnished with a plugged rate valve and gas flow indicators.

The gas flow rate is set and indicated by one or more panel or cabinet mounted rate valves and flowmeters inter-connected in the vacuum line between the discharge from the switchover module and the ejector(s). See Figures 2 and 3.

NOTE: When using a vacuum manifold system where two or more vacuum regulators are manifolded together on either side of a switchover module, the vacuum regulator's will be provided with rate valves. These rate valves are used to trim the vacuum regulator at full capacity. (Reference 121.3004)

2.2 Mounting (See Figure 4)

2.2.1 Mount the switchover module to a wall, cylinder scale, manifold or other fixed vertical surface.

2.2.2 Connect a length of tubing from each gas inlet of the automatic switchover module to the gas outlet on the two (2) vacuum regulators.

NOTE: When cutting the tubing, be sure to have enough length to allow the vacuum regulator to be moved when changing cylinders.

2.2.3 Connect a length of tubing from the gas outlet of the automatic switchover module to the gas inlet of the gas flow rate control.

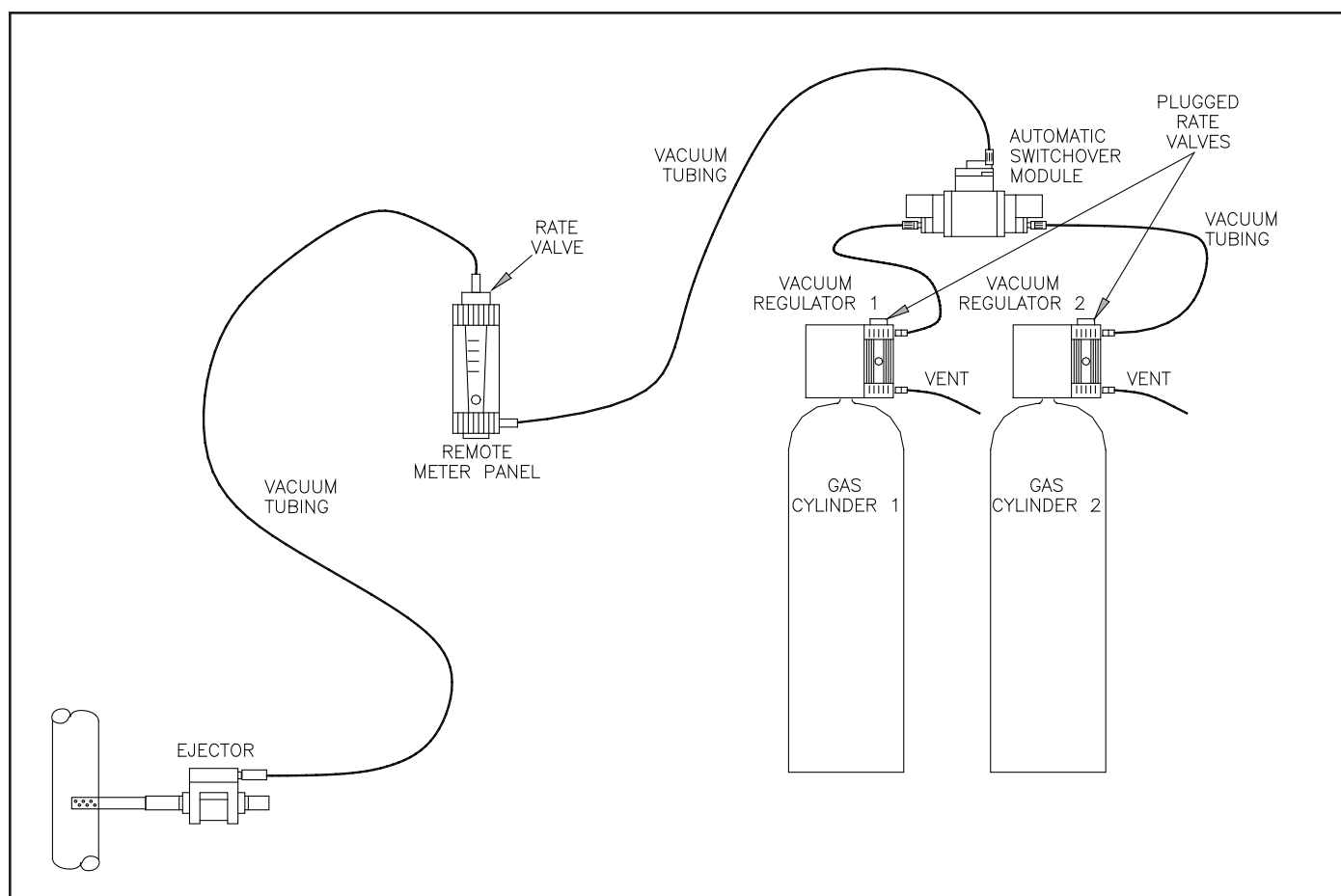


Figure 2 - Cylinder Mounted Automatic Switchover System

- 2.2.4 Connect a length of tubing from the gas outlet of the gas flow rate control to the inlet of the ejector.

General Design Note: Routing vacuum tubing through unventilated conduit is discouraged. A minute portion of gas flowing through tubing under vacuum conditions, will slowly diffuse at a molecular level through its walls and collect in the closed conduit over an extended period of time.

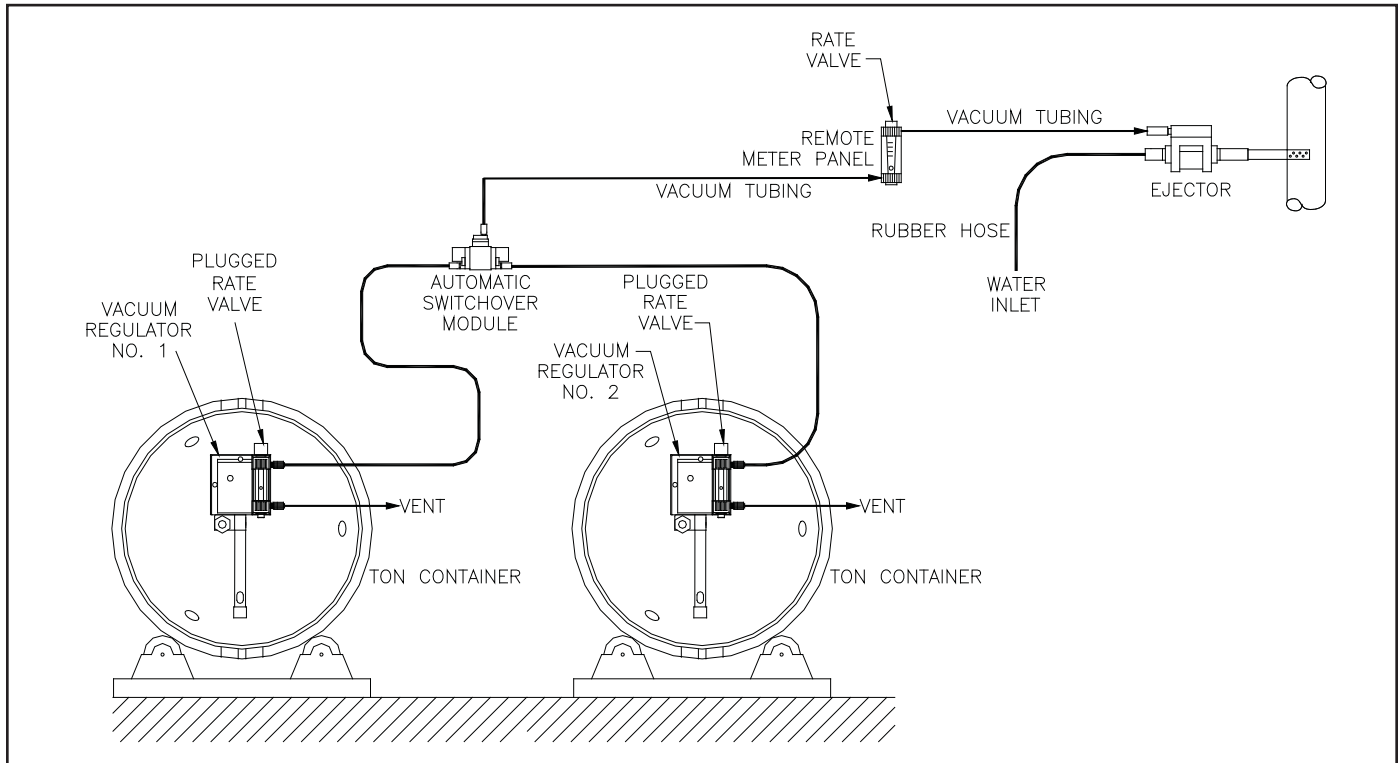


Figure 3 - Ton Container Mounted Automatic Switchover System

- ① TUBING CONNECTORS FOR 100 PPD (2 KG/H) (3/8") OR 200 PPD (4 KG/H)(1/2") CAPACITY
- ② TUBING CONNECTORS FOR 500 PPD (10 KG/H) (5/8") CAPACITY

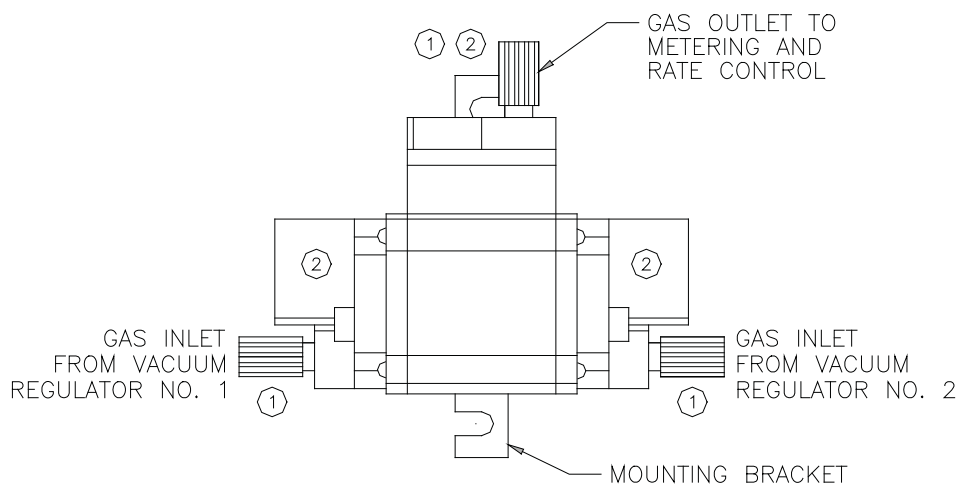


Figure 4 - 100 to 500 PPD (2 to 10 kg/h) Automatic Switchover Module

3 OPERATION

3.1 General

The automatic switchover module does not require any adjustment. For operating instructions on other system components, refer to the appropriate instruction manuals.

3.2 Start-up

- 3.2.1 After installation of all components, turn on the water supply to the ejector, or one ejector in a multiple ejector installation or chemical induction unit (CHLOR-A-VAC), to create an operating vacuum.
- 3.2.2 Test for gas leaks as described in the vacuum regulator instruction manual.
- 3.2.3 Open both gas source valves.
- 3.2.4 Close the gas source valve supplying vacuum regulator #1. This should cause the module to transfer feed to vacuum regulator #2. Vacuum regulator #1 should indicate out-of-gas at the vacuum regulator.
- 3.2.5 Open the gas source valve supplying vacuum regulator #1 and close the gas source valve supplying vacuum regulator #2. This should return gas feed to vacuum regulator #1 and should indicate out -of-gas at vacuum regulator #2.
- 3.2.6 Open both gas source valves, and proceed with normal operation.

3.3 Low Capacity

When the supply pressure is depleted, vacuum will build up and switchover will initiate. The rate at which vacuum builds after a gas supply is exhausted in one source is dependent upon two factors:

- 3.3.1 The volume, length and size of the vacuum lines which extends from the vacuum regulator to the ejector(s).
- 3.3.2 The gas feed rate.

The larger the vacuum line volume and the lower the gas feed rate, the slower the automatic switchover will function. It may be necessary, in systems feeding at a rate of less than 10 PPD (200 g/h) (chlorine or sulfur dioxide) and 5 PPD (100 g/h) (ammonia) to exercise the switchover module weekly to assure switchover operation and prevent sticking on both sides opening. This is accomplished by repeating steps 3.2.4 and 3.2.5.

3.4 Capacity Conversion

If the gas flow requirements change to exceed the design capacity, it is usually possible to achieve the new requirements by substituting resized parts, provided the new requirements are within the maximum capacity of the components. The equipment that may require modification includes:

Vacuum regulators

Switchover module

Gas flowmeter and rate valve

Ejector

Interconnecting vacuum lines

Consult Capital Controls or your local sales representative to determine the extent of the modifications.

4 SERVICE

The modular automatic switchover system is designed to give years of excellent service and will require minimum maintenance if operated with reasonable care. It is recommended that the Gas Dispensing System be inspected and serviced a minimum of once per year.

More frequent service periods may be required due to: 1) the type, quality and quantity of the gas being handled, 2) the complexity of the gas supply system and 3) operation procedures.

More frequent service periods are especially indicated when venting of the VR is occurring during the one year operational period. This is usually indicative of foreign debris holding the inlet valve open or destruction of the inlet valve parts caused by the gas quality not up to industry purity standards.

Preventative maintenance kits for each of the assemblies are available from the factory. Each kit contains all the parts and detailed instructions that are required for complete maintenance. All o-rings and gaskets that have been disturbed during the disassembly must be replaced during reassembly in order to insure safe, trouble free operation. Failure to replace these parts could result in a shortened operation period and bodily injury.

4.1 Cleaning the Module (Refer to Figure 5)

- 4.1.1 Shut down the system and evacuate all gas. Refer to the vacuum regulator instruction manual.
- 4.1.2 Remove the switchover module from the system. The gas dispensing system can be temporarily restored to operation by installing a length of vacuum line in place of the switchover module. Alternately, if the switchover system was installed with a valved bypass around the switchover module, open and close the appropriate valves before removing the module.
- 4.1.3 Remove the four (4) screws or bolts securing the toggle cap to the module.
- 4.1.4 Remove the four (4) screws holding each end body flange to the center body and remove the end body flanges and diaphragm assemblies.
- 4.1.5 Remove the toggle assembly.
- 4.1.6 Remove the spring to the assembly and examine the guide pin. It should be free of dirt and burrs. If not, clean with alcohol and/or polish lightly with crocus cloth. It should then slide freely when straight and free of dirt.
- 4.1.7 Examine the O-ring seats in the diaphragm assemblies. They should be free of residue. If not, clean with alcohol. DO NOT use a sharp instrument to clean.
- 4.1.8 Examine the O-rings. If they are hardened or distorted, replace.
- 4.1.9 Reassemble the module, reversing steps 4.1.2-4.1.6. Be certain the spring pivot knife edge is seated in the slot in the toggle cap before it is tightened.

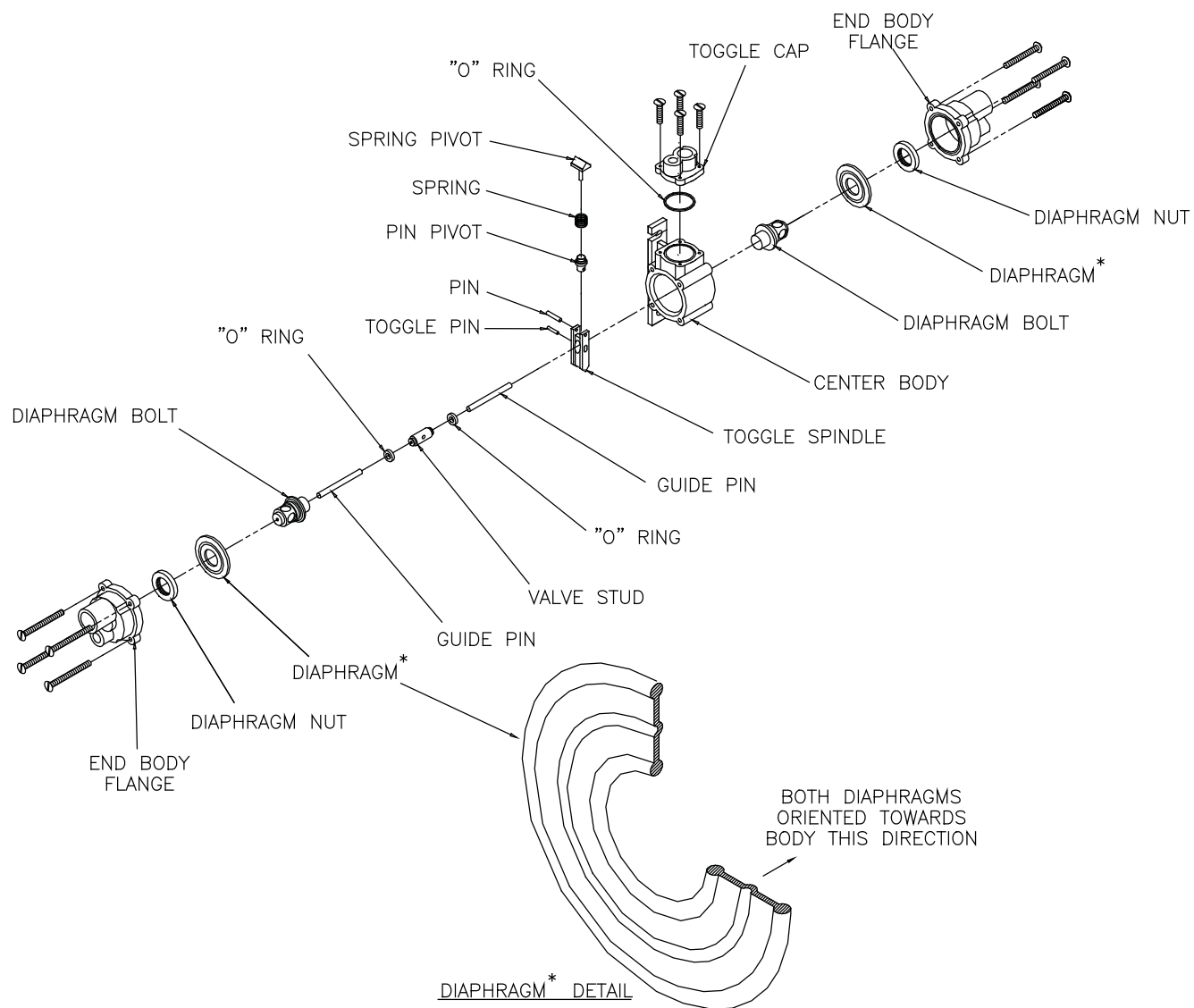


Figure 5 - 100 to 500 PPD (2 to 10 kg/h) Automatic Swichover Module Components

5 TROUBLESHOOTING CHART

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
1. Automatic switchover does not occur.	a. System is not entirely vacuum tight. b. Lack of ejector vacuum. c. Both gas supply valves are not open and second source is full. d. Module dirty.	a. Check system for vacuum tight integrity by following vacuum test procedure in appropriate instruction manual. b. Confirm ejector hydraulic conditions. c. Open both gas supply valves and ensure that the second gas supply is available. d. Clean the module, See Service Section.
2. Gas is being withdrawn from both sources simultaneously.	a. Module dirty.	a. Clean the module. See Service Section.
3. Switchover occurs before the first source is empty.	a. System feed rate exceeds available gas withdrawal rate from gas supply causing a pressure drop in the supply, simulating a depleted supply therefore, causing premature switchover. b. Vacuum regulator inlet filter is dirty and flow of gas cannot be achieved.	a. Increase the air temperature and air circulation around the gas supply to permit withdrawing the gas at the desired rate without causing a pressure drop switching to the gas supply. Do not apply heat directly. b. Clean or replace the inlet filter.

NOTE: Premature switching from a supply not yet depleted because of high withdrawal rates (that causes a pressure drop simulating an empty supply) may not be objectionable. Allow the system to operate from the stand-by source as the first source will regain pressure as its heat is replenished from the atmosphere. When the second container empties or pressure decreases, the system will switch back to the first source.

Design improvements may be made without notice.

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