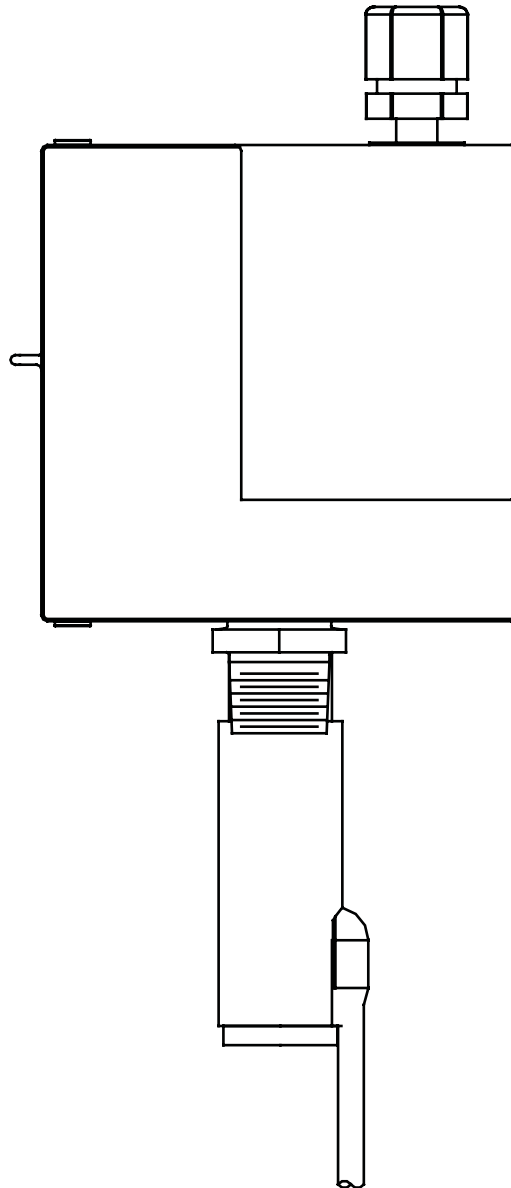

Instruction Bulletin - Series High Capacity
NXT3000 Wall Mounted Vacuum Regulator
1,000 - 3,000 PPD (30-60 Kg/h) Maximum

SEVERN

TRENT

SERVICES

Disinfection Products



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 for clarification before commencing any work at 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 Severn Trent Water Purification, Inc. for information that cannot be answered specifically by these instructions.

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

Severn Trent Water Purification 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 deviations from the recommended instructions that may result in a hazardous or unsafe condition.

Severn Trent Water Purification, 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 Severn Trent Water Purification, Inc.

Severn Trent Water Purification, 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 Severn Trent Water Purification for equipment shipped "F.O.B Jobsite". Do not install damaged equipment.

**SEVERN TRENT SERVICES, COLMAR OPERATIONS
COLMAR, PENNSYLVANIA, USA
IS ISO 9001: 2000 CERTIFIED**

Table of Contents

1	INTRODUCTION	4
1.1	General	4
1.2	Warranty	4
1.3	Standard Equipment	4
1.4	Specifications	5
2	OPERATION	6
2.1	General	6
2.2	Safety Features	6
2.3	Principles of Operation	7
2.4	Capacity	7
2.5	Typical Gas Feed Systems	7
3	INSTALLATION	9
4	OPERATING INSTRUCTIONS	19
4.1	Initial Start-Up	19
4.2	Operation	23
5	SHUTDOWN	28
5.0	Shutdown for Servicing	28
5.1	Shutdown for Extended Period	28
6	SERVICE	29
6.1	General	29
6.2	Cleaning Agents	30
6.3	Lubricating Agents	30
6.4	O-Ring	30
6.5	Diaphragms	30
6.6	Check Valves	30
6.7	Hose Lines	30
6.8	Inlet Valve	30
6.9	Manifold	30
7	TROUBLESHOOTING CHART	31
FIGURES		
1	Basic System Schematics	8
2	Cylinder Mounted Vacuum Regulators	10
3	Ton Container and Wall Mounted Vacuum Regulators	11
4	Mounting Cylinder Mounted Vacuum Regulators	12
5	Mounting Ton Container Mounted Vacuum Regulators	12
6	Mounting Wall Mounted Vacuum Regulators	13
7	Connections - Wall Mounted Vacuum Regulators	14
8	Out-of-Gas Alarm Switch	15
9	SO ₂ Cylinder Adaptor Plate	15
10	Wall Mounted Vacuum Switches	16
11	Vacuum Regulator Exploded View	17
12	Meter Exploded View	18

1 INTRODUCTION

1.1 General

The vacuum regulators are engineered and carefully tested to assure years of satisfactory operation. Correct installation and proper care will ensure continued trouble free operation. Read instructions carefully and save for future reference.

This instruction manual covers the High Capacity *NXT3000* Series vacuum regulator and it's function within a gas feed system. The complete gas feed system consists of a vacuum regulator, a gas flow meter assembly with a manual or automatic rate valve and an ejector. Refer to the following instruction manuals for other system components:

Meter Assemblies 105.6610

Ejectors 122.6051, 122.6060

Also, the following literature is referenced throughout:

Vacuum Line Size Requirements 100.4601 and 121.3003

Chemical feed equipment technical information 010.3650

1.2 Warranty

See Bulletin 005.9001 for Severn Trent Services equipment warranty.

NOTE: The High Capacity *NXT3000* vacuum regulator is designed for use in systems where the feed rate is manually or automatically set and operation is either continuous or start/stop. The Severn Trent Services equipment warranty and service policy is null and void, as it pertains to user protection, if the High Capacity *NXT3000* Series vacuum regulator is misapplied.

1.3 Standard Equipment

The *NXT3000* Series gas feeder system consists of the following major components and accessories:

- 1.3.1 Vacuum regulator, which connects to the gas manifold.
- 1.3.2 Ejector assembly. See Instruction Manuals 122.6051, 122.6060.
- 1.3.3 Metering or multiple feed points, separate meter assemblies. See Instruction Manual 105.6610.
- 1.3.4 Accessories
 - a. (1) - Ammonia leak test bottle
 - b. (1) - Insect screen for vent line
 - c. (4) - Spare lead gaskets
 - d. (1) - Multi purpose wrench

NOTE: This instruction manual covers the vacuum regulator only. Since the vacuum regulator is one part of a gas feed system, references will be made within this bulletin to meter assemblies, ejectors and other ancillary equipment that complete the various systems. Installation of a complete system is covered within.

1.4 Specifications

Capacity:	Chlorine -	1000 to 3000 PPD (20 kg/h to 60 kg/h)
	Sulfur Dioxide -	1000 to 2000 PPD (20 kg/h to 40 kg/h)
	Ammonia -	500 to 1000 PPD (10 kg/h to 20 k/gh)
	Carbon Dioxide* -	750 to 1500 PPD (15 kg/h to 30 k/gh)

*Due to the high gas pressure in the carbon dioxide storage cylinders, a two stage pressure regulator is required between the gas source and the vacuum regulator.

Temperature limits:	35° to 130°F (2° to 54°C)
Maximum inlet pressure:	300 PSIG
Manifold heater power:	25 Watt, 120 or 240 VAC, 50/60 Hz

2 OPERATION

2.1 General

A. Vacuum Regulator

The vacuum regulator serves to reduce the gas supply pressure to a regulated vacuum for safe transport of the gas to the point of application. A leak in any portion of the vacuum transport line simply allows air to be pulled into the system. A substantial vacuum line break will stop gas feed from taking place. The vacuum regulator is a spring opposed diaphragm type that uses vacuum to operate the gas inlet valve. The vacuum regulator can control maximum gas flow rates from 1000 to 2000PPD without any component changes. (Up to 3,000 for chlorine with different components)

For manually controlled systems, the flow rate of gas through the regulator is set and indicated by a meter assembly which contains a manually adjusted needle valve, called a rate valve. One or more meter assemblies may be furnished with each vacuum regulator and they are wall mounted. The operating vacuum that pulls the gas through the system is created by a separately mounted ejector, one normally being required for each meter assembly.

Each vacuum regulator is equipped with a vacuum actuated, manually reset, three position, "status" lever marked RESERVE, OPERATING, and EMPTY. When a system is placed into operation, the lever is manually set to the operating position. When the gas in the cylinder or ton container is exhausted, or has been inadvertently interrupted, the lever automatically moves to the EMPTY position. The RESERVE position is used when a dual regulator type gas dispensing system is furnished, The RESERVE position indicates that the gas cylinder is full and is in stand-by condition. When the operating tank is exhausted, its status lever moves to EMPTY and the reserve tank status lever moves to the OPERATING position. This provides an automatic changeover of gas feed from the exhausted to the full gas supply container.

B. Meter-Rate Valve Assembly

The meter assembly is a variable area type meter and provides visual indication of the gas flow rate set by the rate valve. Since the system operates under sonic conditions a D/P Regulator is not required to maintain constant flow under varying vacuum conditions.

The rate valve is located at the meter outlet (top) to provide manual selection of the desired gas flow rate.

The capacity range of each meter-rate valve assembly is clearly indicated by a calibrated scale, direct reading in pounds per day (PPD) and kilograms per hour (kg/h), etched on the meter assembly tube.

For systems requiring automatic feed control, an automatic valve is provided to be piped between the ejector and the meter assembly. The manual valve on the meter assembly is not supplied for this mode of operation.

C. Ejector

The ejector, operated by the flow of water or process liquid under sufficient pressure and velocity, creates the necessary vacuum to operate the regulator. In some instances, a booster pump is required to provide sufficient water pressure and flow rate.

2.2 Safety Features

The gas inlet valve of the vacuum regulator provides positive shut-off in the absence of operating vacuum. Therefore, the regulator is sealed off from the gas supply if a major leak should develop in the vacuum portion of the gas dispensing system during normal operation or at shutdown when the water supply to the ejector is shut off. This valve is protected by a cartridge type filter located within the gas manifold.

A pressure relief valve, within the vacuum regulator, provides for venting gas, through a vent connection, to a remote and suitable location should gas at greater than atmospheric pressure enter the regulator. This abnormal condition could occur if liquid chemical enters the regulator; or, the gas inlet valve of the regulator does not close tightly due to the accumulation of foreign matter not removed by the filter.

The manifold assembly has a liquid chemical trap, a wrap-around type heater and a cartridge type filter. The trap catches any condensed gas vapors (liquid chemical) which may form in the gas supply line to prevent its entrance into the regulator. The heater vaporizes any liquid chemical and prevents any gas from condensing in the manifold, thereby permitting only gas to enter the regulator. The filter cartridge serves to remove entrained foreign particles from the gas entering the manifold assembly.

2.3 Principle of Operation

When the ejector is operating, gas enters the regulator, being reduced from supply pressure to a constantly regulated vacuum by the throttling action of the regulator, the meter assembly rate valve assembly and into the ejector. Within the ejector, the gas is thoroughly mixed with the water or process liquid to form a chemical solution which is delivered via solution hose or piping to the point of application.

WARNING

All components of the gas dispensing system are constructed of materials capable of withstanding the corrosive action of the particular gas for which the system has been specified. Never attempt to use any component for handling a gas different from that for which it has been purchased. Failure to observe this warning can result in equipment failure and bodily injury.

2.4 Capacity

The vacuum regulators can be provided with maximum capacities of either 2,000 PPD or 3,000 PPD as chlorine. The actual system maximum is determined by the flowmeter-rate valve combination and the commensurate ejector sizing. The capacity of an installed system may be changed by changing the meter assembly and/or ejector capacity components. Refer to the vacuum regulator parts list 100.7609, the meter assembly parts list 105.7226, and ejector parts lists Section 122, for the specific part numbers associated with each ejector.

2.5 Typical Gas Feed Systems

Figure 1 illustrates several basic system arrangements. The meter-rate valve assembly must always be mounted remotely on a wall. The gas flow from the vacuum regulator may be divided to feed more than one application point with the flow to that point being either manually or automatically controlled. The sum of the flows to each application point cannot exceed the capacity of the vacuum regulator.

Automatic switchover may be achieved by adding a second vacuum regulator and connecting the outlets to a tee connected to the meter assemblies and following the procedures outlined further in this manual.

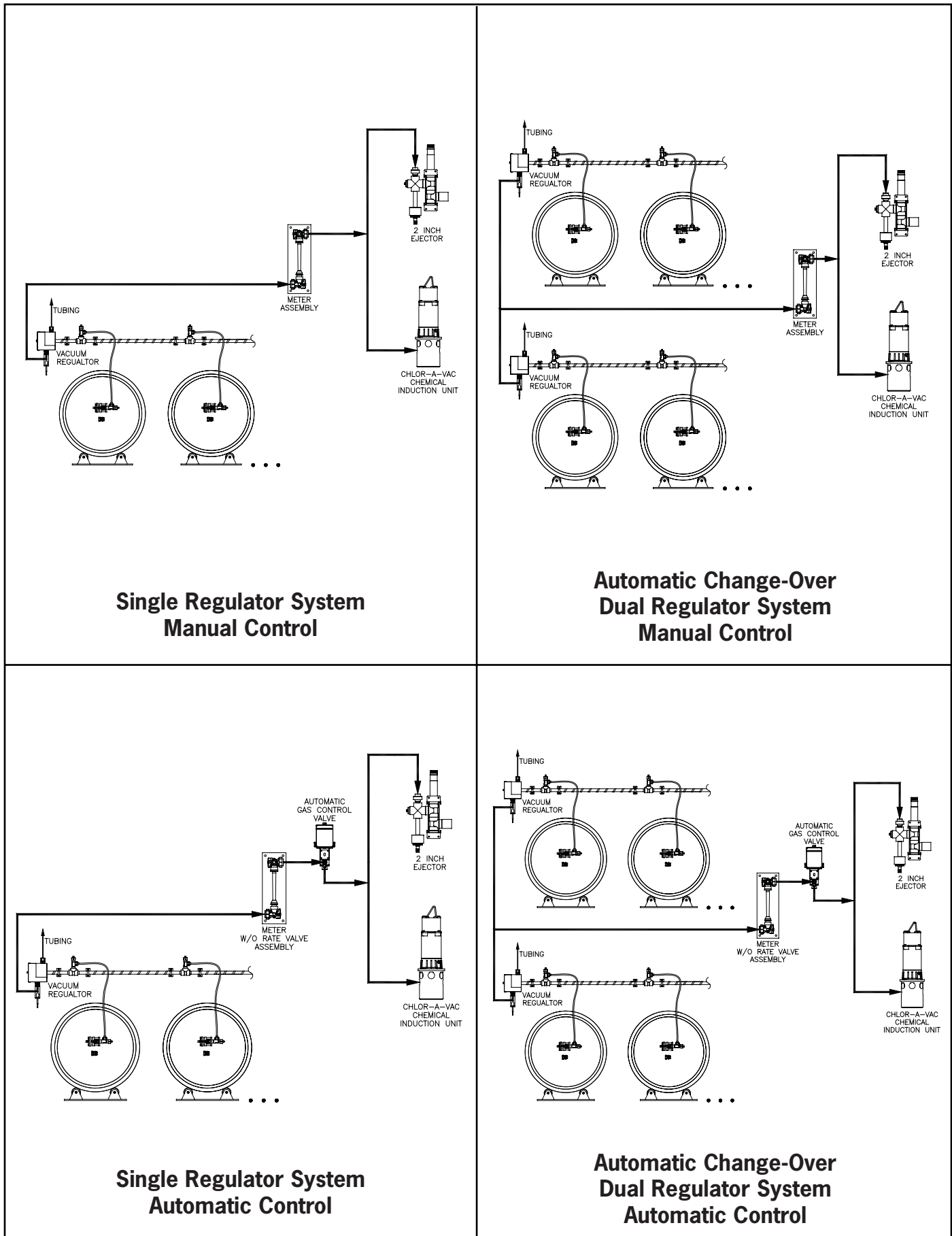


Figure 1 - Basic System Schematics

3 INSTALLATION

Select a location which can be isolated from unauthorized personnel. Outdoor installations for wall mounted regulators are not recommended (especially if the gas supply system consists of two or more containers) since a sudden decrease in ambient temperature will result in the formation of condensed gas vapors (liquid chemical) in the gas supply line. This liquid will be swept into the manifold and if sufficient in volume to exceed the vaporizing capacity of the manifold heater, will flood the manifold and enter the regulator.

CAUTION

The corrosion resistant plastics used in the construction of all regulators and meter-rate valve assemblies, regardless of the particular gas service for which they have been supplied, will soften and distort above 130°F (54°C). Therefore, the ambient temperature, in every instance, must never exceed this maximum allowable limit.

If you must install outdoors, select an area which will provide natural protection for the gas supply against direct sunlight. If this is not possible, erect an open type structure to provide this protection. Observe the upper and lower temperature limits. (Upper limit 130°F (54°C), Lower limit 40°F (5°C))

For indoor installations, select a well ventilated enclosure provided with a source of heat, if necessary, to maintain, a comfortable ambient temperature. Additionally, the enclosure should be of sufficient size to permit easy access for inspection and maintenance of the regulator and gas supply. And finally, to provide for maximum safety of operating personnel, the enclosure should be equipped and fitted as described under the Personnel Safety Section of Instruction Bulletin 010.3550.

The relative locations of the regulator(s); the remote mounted meter-rate valve assemblies, if used; and the ejector(s) must be chosen so that the length(s) of the vacuum line(s) does not exceed the value(s) shown in 100.4601 and 121.3003. Maximum gas flow to the point(s) of application will not be achieved if these limits are exceeded.

The vent line(s), one required for each regulator, must be extended to a suitable area (outside the building for indoor installations) where gas fumes cannot cause damage or endanger personnel. Although there is no restriction (within practical limits) to the distance over which the vent line(s) can be extended, each line, if applicable, must be run individually. Multiple vent lines cannot be manifolded. The end of the vent line(s) must be turned downward to prevent the entrance of water. The fine mesh plastic screen(s) (supplied in the accessory package) must be installed over the outlet(s) to prevent insects from entering the line(s).

When extending vent lines, eliminate low spots to prevent trapping condensed water vapor and arrange to prevent crimping.

All threaded plastic-to-plastic pipe joints must be lubricated to prevent galling of the threads, provide a perfect seal and to permit ease of disassembly. The recommended lubricating agent is Teflon (self lubricating) tape. Apply tape to the male pipe threads, one thread from the end, only to prevent it from entering the piping. Exercise care not to overtighten the joints as this may crack the plastic. Slightly more than hand tight is usually sufficient.

The vacuum regulator shall be wall mounted or mounted on a multi-container manifold only.

Wall Mounting refer to Figure 2 & 3.

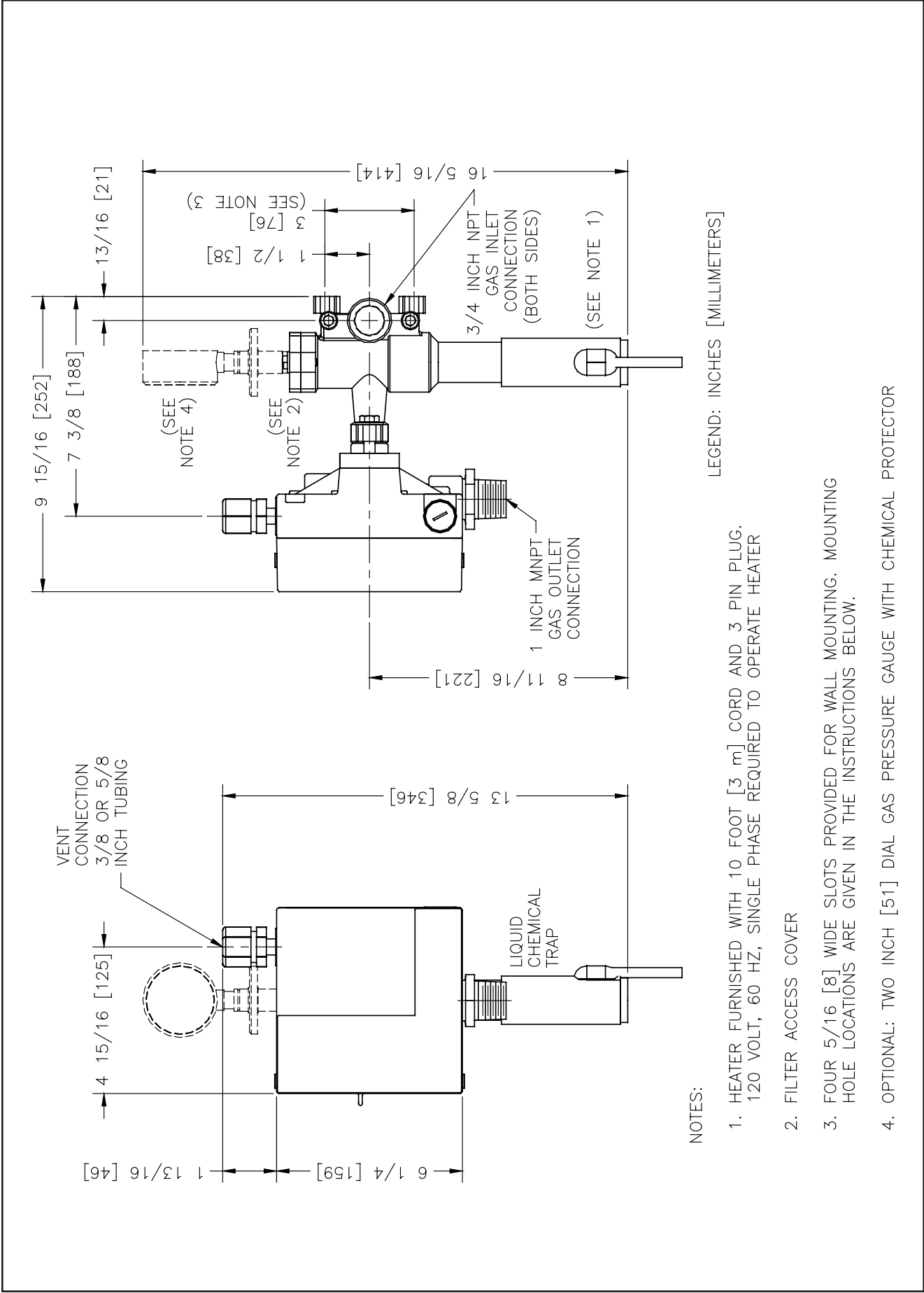
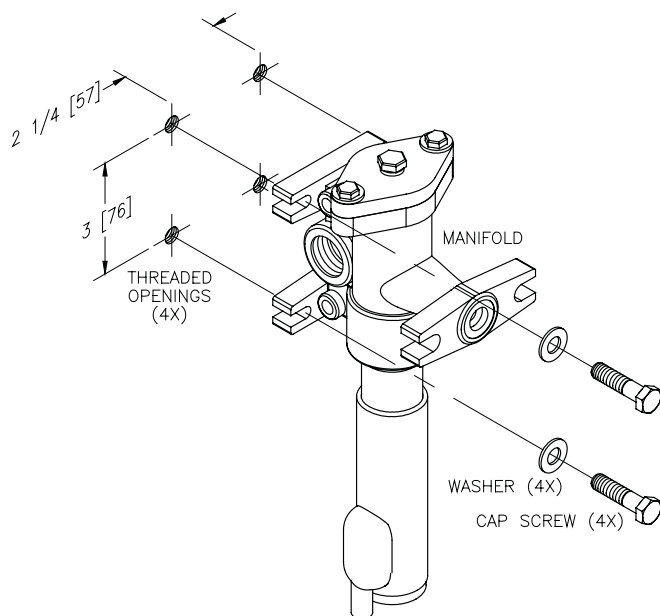


Figure 2 - Wall Mounted Vacuum Regulators



Legend: Inches [millimeters]

GENERAL

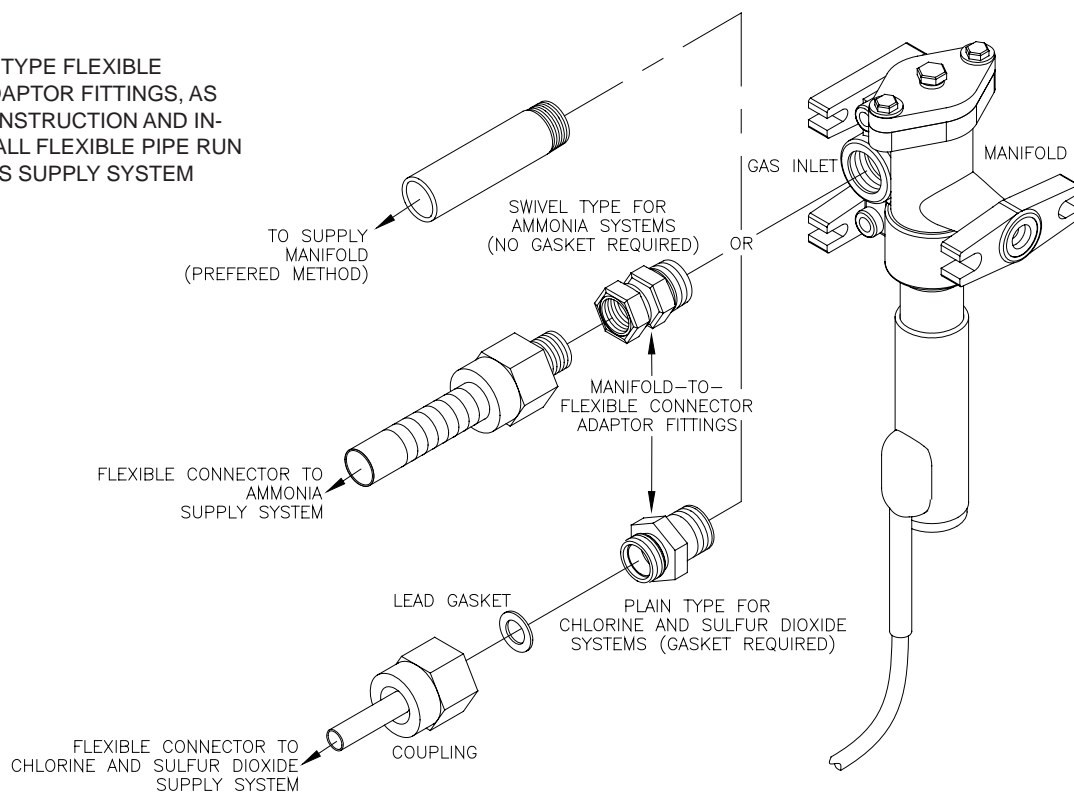
One of the gas inlet connections is fitted with a plug. The plug can be removed and installed in the opposite side if it is not convenient (when mounting on a wall) or possible (when mounting on the gas valve of a ton container) to use the open connection as supplied. If the plug is relocated, reseal the threads using teflon tape.

1. Mount vertically plumb on a wall (or other suitable surface) at a convenient height.
2. Provide four threaded openings to accept 1/4 - 20 hex head cap screws. Slip a washer over each screw and install the screws through the 5/16" wide mounting slots in the manifold.
3. Connect the gas supply to the manifold as illustrated and described in Figure 4.

Figure 3 - Mounting - Wall Mounted Vacuum Regulators

NOTE:

USE ONLY APPROVED TYPE FLEXIBLE CONNECTORS AND ADAPTOR FITTINGS, AS REQUIRED, IN THE CONSTRUCTION AND INTERCONNECTION OF ALL FLEXIBLE PIPE RUN PORTIONS OF THE GAS SUPPLY SYSTEM

**PROCEDURE FOR CONNECTION TO THE GAS SUPPLY SYSTEM**

1. The manifold is provided with an appropriate adaptor fitting for the intended gas service.
2. A second adaptor fitting may be added only in those instances where the gas supply system consists of two supply containers. It is installed (and sealed) in the alternate (normally plugged) gas inlet connection of the manifold. If isolation of the flexible connectors is desired, an isolating valve may be inserted into each of the manifold gas inlet ports in lieu of the manifold-to-flexible connector adaptors.

For three or more container systems the manifold is installed (and sealed) in the outlet connection of a header, which serves to complete the interconnections to the multiple supply containers.

3. Install the gas supply system (and complete the inter-connection between the system and the gas inlet) only after becoming thoroughly familiar with the information provided in Instruction Bulletin 010.3650 concerning gas supply containers, gas supply lines and interconnection practices. The gas supply header must be constructed of Schedule 80 3/4" seamless steel pipe with 3000 lb forged steel fittings.

WARNING**Failure to observe these warnings can result in bodily injury.**

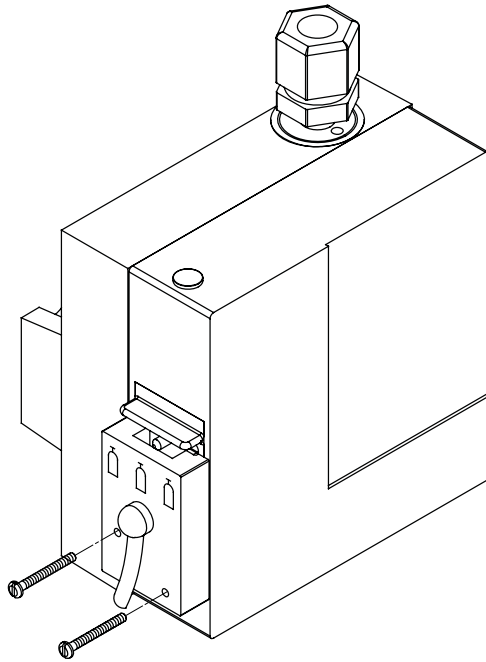
Flexible connectors must be arranged in a smooth spiral to prevent kinking. Kinks cause mechanical damage which will result in immediate or eventual rupture. Connectors so damaged, either during shipment, handling or at time of installation must never be used.

Ton containers must be positioned so that their valves are in a vertical position, one above the other, and chocked or cradled to prevent them from rolling. In this position, the upper valve will discharge gas; the lower valve will discharge liquid chemical. Therefore, be absolutely certain to connect to the upper (gas) valve.

CAUTION

Each flexible connector should be arranged in a smooth curving slope (avoiding traps) and pitched back toward the container(s). This arrangement will permit condensed gas vapors (liquid chemical) that may form in the connector(s), or gas supply header, if present, to flow back into the container(s).

Figure 4 -Connections - Wall Mounted Vacuum Regulators



An optional, field mountable, switch is available for remote indication of a loss of gas supply. The switch may be attached directly to the vacuum regulator body without disassembling the body. Refer to Instruction Bulletin 100.6703 and parts list 100.7603 for further details. The kit P/N is 674B093U02

Figure 5 - Out-of-Gas Alarm Switch

Accessories:

Wall Mounted Vacuum Switches

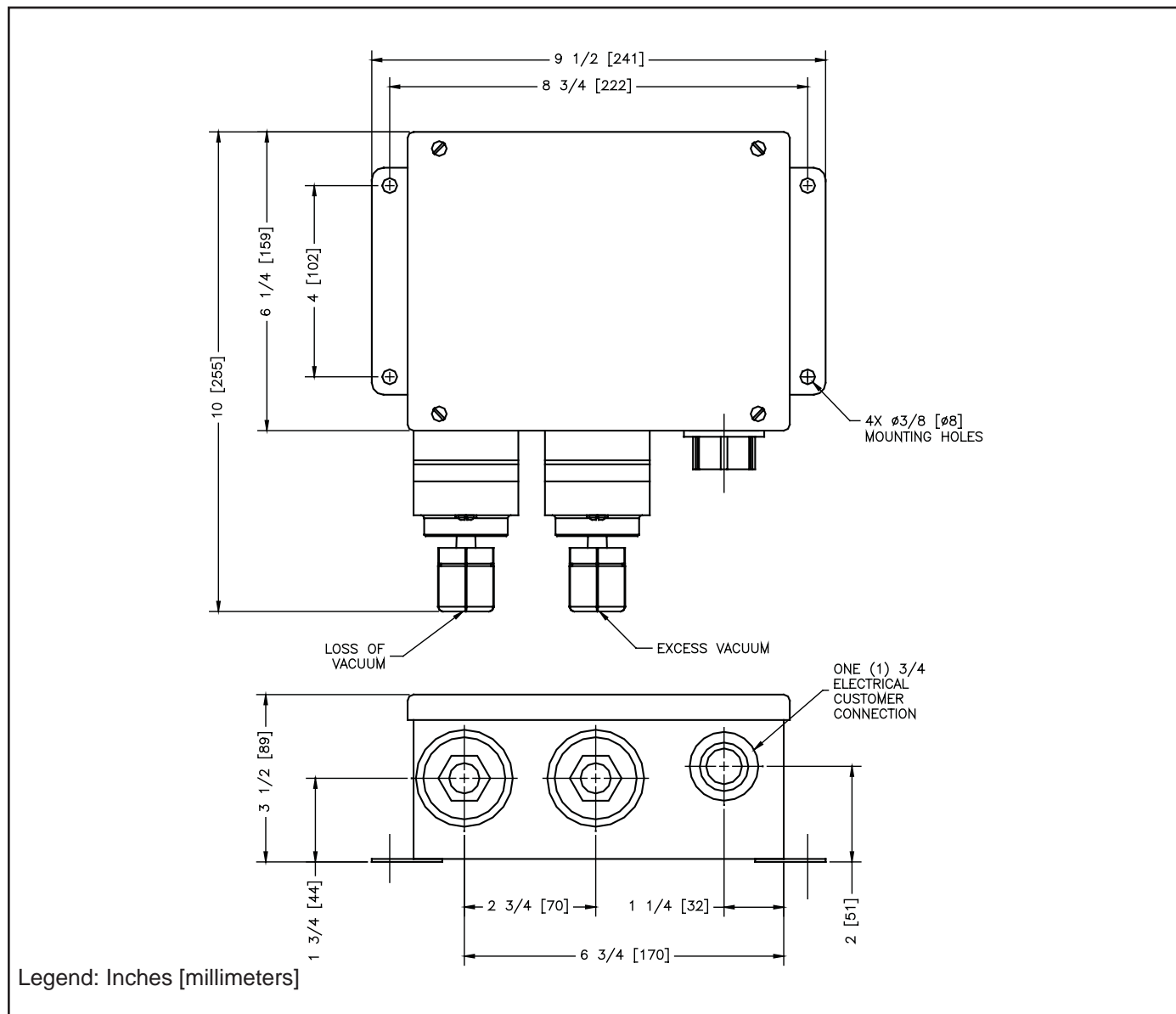
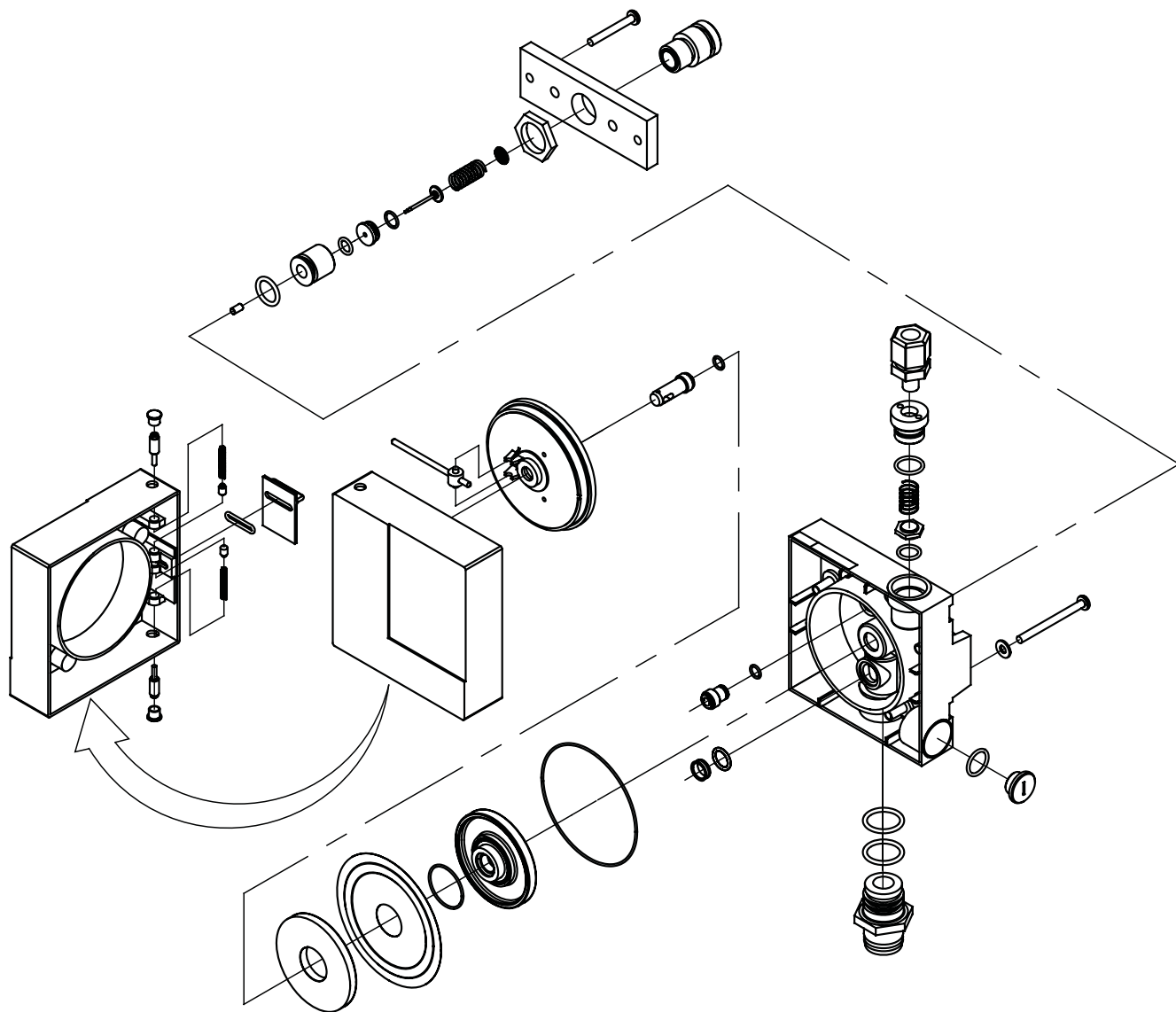


Figure 6 - Wall Mounted Vacuum Switches

Wall mounted Nema 4X vacuum switches are available for remote indication of out of spec vacuum conditions. Low vacuum only (loss of ejector operation, break in vacuum line), P/N 806L051U02. High vacuum only (out of gas, gas source valve closed), P/N 806L051U06. Both high and low vacuum switches, P/N 806L051U03.

Note: Low vacuum is measured at the vacuum line coming from the ejector and high vacuum is measured at the vacuum line between the vacuum regulator and the meter assembly.



See parts list 100.7609 for part number details

Figure 7 - Vacuum Regulator Exploded View

4 OPERATING INSTRUCTIONS

4.1 Initial Start-Up

Prior to start-up after an extended shutdown, inspect all lines and connections, making replacements as necessary. If lines are transparent, inspect for blockage. Disconnect any blocked line and clean by blowing down. If lines cannot be visually inspected, disconnect the lines and blow down to make certain no blockage exists. **DO NOT PRESSURE TEST THE VACUUM LINES AS EQUIPMENT DAMAGE WILL RESULT.**

A. Checking for Operating Vacuum

1. Remove the vent valve spring and flapper located on the top of the vacuum regulator.
If the gas dispensing system is of the dual regulator type, perform this action on the furthest remote mounted regulator since one of the purposes of this procedure is to establish that the length of the vacuum line(s) do not exceed the maximum allowable transport distance.
2. Move the "status" lever located on the side of the regulator to its OPERATING position. Be sure that the valve on the gas container is closed during this procedure.
If the gas dispensing system is of the dual regulator type, perform this action on both regulators since another purpose of this procedure is to establish that the connection(s) to or throughout the gas supply system(s) have been properly made and secured.
3. Open any shut-off valves in the chemical solution line between each ejector and its point of application.
4. Open the shut-off valve in the water supply line to each ejector and start up the booster pump(s), if used.
5. Gradually open the rate valve of each meter-rate valve assembly while observing the upward movement of the meter assembly float. On systems with an automatic valve, manually operate the valve while observing the meter assembly float.
The gas dispensing system is now operating on air being drawn through the vent. Sufficient ejector operating vacuum to provide maximum operating capacity for the complete system is verified when each meter-valve assembly can be operated simultaneously on air at approximately;
a) 50% or higher of max-scale position for chlorine and sulfur dioxide systems; and, b) 25% or higher of max-scale position for ammonia systems.
If the meter assembly float does not rise or if the required air flow rate is not achieved in each assembly the first time, the gas dispensing system is placed in operation, refer to Trouble "A" in the troubleshooting chart to determine the probable cause(s) and corrective action(s) to be taken. If either of these conditions occur on subsequent start-ups (e.g.: following an extended period of servicing shutdown), refer to Trouble "B" in the troubleshooting chart to determine the probable cause(s) and corrective action(s) to be taken.
6. Replace the vent valve spring and flapper, sparingly lubricate the threads (if necessary) to provide a perfect seal. Do not apply any lubricants to the seat seal o-ring or the vent valve seat.
7. With the system dead-ended; a) the float of each meter-rate valve assembly should fall to zero, and b) the "status" lever located on the side of the regulator(s) should move to the EMPTY position (the closed valve shows the same response as an empty gas container).
If either of these conditions do not occur, check that the connection(s) to or throughout the gas supply system, associated with the regulator(s) failing to exhibit the proper response, have been properly made as described and illustrated in Figure 4.
If the occurrence of these conditions cannot be traced to a faulty connection, refer to Trouble "C" or Trouble "D". Trouble "C" in the troubleshooting chart can determine other probable cause(s) and corrective action(s) to be taken if this is placed in operation. Trouble "D" in the troubleshooting chart can determine other probable cause(s) and corrective action(s) to be taken on subsequent start-ups (e.g.: following an extended period or servicing shutdown).
8. When the system exhibits the requirements set forth in steps 5 and 7, shut off the water supply to the ejector(s).

B. Checking for Gas Leaks

1. General

The test solution to be used in each of the following procedures is dependent upon the gas being handled. Use a 26°Baume' (ammonium hydroxide, aqua ammonia) ammonia solution for chlorine and sulfur dioxide systems and a 10% hydrochloric (muriatic) acid solution for ammonia systems.

NOTE: Household ammonia is not strong enough to serve as a test solution.

If the gas dispensing system is of the dual regulator type, be certain to perform the "Checking for Gas Leaks" procedure(s), as applicable, and independently, on each of the associated gas supply systems in question.

WARNING

During the performance of the "Checking for Gas Leaks" procedure(s), as applicable, be certain to use plastic or rubber gloves to protect the hands against direct contact with the test solution. Avoid breathing fumes emitted from the test solution and the smoke formed (as a result of the chemical reaction which occurs between the fumes of the test solution and the gas in question) in the immediate vicinity of a leak as it may irritate the throat.

The gas inlet valve is functional when the "status" lever located on the side of the regulator is in its EMPTY position. The lever automatically assumes this position during the occurrence of a high vacuum condition within the regulator. For example, when the system is dead-ended at the conclusion of the "checking for operation vacuum" procedure; or, when the supply of gas becomes exhausted during the course of normal operation. Therefore, it is not necessary to move the lever to its operating position prior to, or during, the performance of the "Checking for Gas Leaks" procedure(s). In fact, it will be impossible to do so following the "Checking for Gas Leaks" procedure, at which time the lever becomes "vacuum locked" in its EMPTY position and will remain so until gas pressure is applied to the gas inlet connection of the regulator; i.e., either during or at the conclusion of the performance of each of the following procedures.

2. Wall Mounted Vacuum Regulators

- a. Fill the plastic squirt bottle, supplied in the accessory kit, approximately 25-50% full with the appropriate test solution and replace the cap/nozzle.
- b. Before performing any of the test procedures be sure that the manifold heater is plugged in and the heater/manifold is hot to the touch. Additional care should be exercised when ton containers are utilized as the gas source as liquefied gas **will** be present in the gas reduction tube. Initially the container gas valve should be opened and closed quickly to pressurize the system in order to perform a leak test. Direct the nozzle of the squirt bottle at the joint to be tested and squeeze the bottle to expose the joint to the test solution vapors. Do not squirt any *liquid* test solution on the process piping as this will produce corrosion damage to the piping.

CAUTION

Header valves and container isolating valves, which are simply container valves used as auxiliary shut-off valves, should not be opened more than one full turn. One full turn will permit maximum flow through these valves. Opening the cylinder valve less than one full turn may limit the flow and could frost the process piping.

- c. Turn off the water supply to the ejector and close the chlorinator rate valve, with the cylinder isolation valve or header valve closest to the supply container closed, open the remaining valve on the gas supply piping to the vacuum regulator. These valves must be left open to allow for quick evacuation of the piping system, through the ejector, in the event of a leak.

- d. Turn on the water supply to the ejector and open the isolating valve or header valve (NOT THE CONTAINER VALVE) that was left closed in paragraph c) above.
- e. Open the rate valve on the chlorinator and observe the rotameter. There will be an immediate indication of flow, but it should drop quickly to zero as the air in the piping system is withdrawn. If a major leak exists in the gas supply piping system the flow rate indication will not fall to zero. The source of the major leak must be found by listening to the pipe joints and/or by isolating sections of pipe by closing in-line valves. Repair all leaks and retest as above before any gas is introduced into the system.
- f. When you are satisfied that all the leaks have been fixed, close the chlorinator rate valve and close the isolating valve closest to the gas container. Open and close the gas supply valve, on the container, quickly to charge the system.
- g. Check all the pipe joints between the supply and the closed valve. If a leak is indicated, open the rate valve and the closed valve and evacuate the system through the ejector. Close the rate valve and repair the leak. Leaks around the valve stems may usually be eliminated by tightening the packing nut.
- h. Repeat the test until you are satisfied that there are no leaks and move the testing procedure to the next in-line valve downstream from the gas container. If the gas supply consists of multiple gas cylinder/containers connected to a manifold, test each flexible connector and associated valve individually. Do one valve at a time and recheck all the connections previously checked as gas leaks can be insidious, especially on a new system.
- i. Only one valve should be closed at any time between the gas supply and the gas feeder being used for evacuation. The purpose of this sequence is to pressurize small sections of the gas supply system at one time to enable a person to detect leaks quickly and minimize the potential for multiple leaks occurring during the start-up procedure. This procedure should be followed until the entire gas supply system is pressurized from the container to the vacuum regulator.
- j. When you are satisfied that there are no leaks, a final leak test is advised. Turn on the ejector water supply, pressurize the system and adjust the feed rate control valve to approximately 25% to insure that the gas has filled the entire system. Open all valves one full turn. Turn off the water and then the valve on the gas supply container. Note the pressure on the gas pressure gauge, if present. Leave the system pressurized overnight. Check the vent lines for leaks and investigate the cause after evacuating the system. Upon your return to the system, examine the pressure gauge for pressure loss and again recheck each joint as well as the vent lines for leaks. NOTE: A pressure rise or fall can be caused by a change in the ambient temperature. Consult the temperature pressure curves in Instruction Bulletin 010.3650.
- k. When all the leaks have been repaired and the required vacuum levels have been established, close the cylinder/container valves and proceed to place the system in operation.

C. Placing in Operation

1. Plug in the heater(s) and verify that the heater is operating by feeling the top of the manifold drip leg to confirm that it is warm.
- 2a. If the gas dispensing system is of the **single regulator type**, move the "status" lever located on the side of the regulator to its **OPERATING** position.
- 2b. If the gas dispensing system is of the **dual regulator type**, move the "status" lever located on the side of the regulator associated with that portion of the gas supply system that is to be used as the first system in service to its **OPERATING** position. Then move the "status" lever to the second regulator to the **RESERVE** position. This is the stand-by supply.
3. Turn on the water supply to the ejector(s). Open the appropriate container, header and container isolating valves.

CAUTION
Container, header and container isolating valves should not be opened more than one full turn. One full turn will permit maximum flow through the valves. Opening the valves less than one full turn may limit the gas flow and could frost the process piping.

WARNING

Using ton containers as the gas source requires additional care at start-up time, as liquefied gas will be present in the container gas eduction tube. Slowly open the container gas valve and stop when a cavitation noise is heard. This is the liquefied gas vaporizing to its gaseous state due to the pressure drop across the valve. When the noise stops, the container valve should then be opened a total of one full turn. Failing to follow this procedure may allow liquid chlorine to enter the vacuum regulator and meter assembly resulting in possible product damage and bodily injury.

4. Set the gas feed rate to the point(s) of application by adjusting the rate valve of the associated meter assembly until the float indicates the desired value; eg: that feed rate which is necessary to achieve the desired level of chemical residual in the water or process liquid being treated.

The gas flowrate is read by aligning the center of the indicator ball, or the bottom edge of the widest part of a post type float, with the appropriate line on the metering tube.

The time required to achieve the desired level of chemical residual at the sampling point is dependent upon: a) the chemical demand of the overall system, which is greater at time of initial start-up and start-ups following an extended shut-down period; and b) the lag time in the system; i.e., the time required for the chemical solution application to the sampling point. Until these requirements are met, system equilibrium, and hence, chemical residual will not be achieved. The larger the body of water or process liquid being treated, the longer it will take to reach this equilibrium condition.

If the desired level of chemical residual cannot be achieved the first time the Gas Dispensing System is placed in operation, contact the supplier from whom the system was purchased, since this is indicative that the associated components of the system may have been improperly sized.

4.2 Operation

A. General

Initially, and following an extended shutdown period, the gas dispensing system must be started up as described under the initial start-up procedure.

Gas feed rate to the point(s) of application can be changed by simply adjusting the rate valve of the associated meter assembly.

To shut down the system temporarily, shut off the water supply to the ejector(s). It is not necessary to close the cylinder or container valve(s) or any valve(s) in the chemical solution line(s) between the ejector(s) and the point(s) of application. Then, to restart the system, simply turn on the water supply to the ejector(s).

NOTE: Should gas continue to flow after the water to the ejector(s) is shut off, it usually indicates that a suction (vacuum) exists at the point of application. There are a couple of exceptions which may cause gas to continue to flow; such as long vacuum lines and/or low gas feed rates. For these exceptions, the gas flow will stop when the vacuum created by the air capacity of the pipeline decreases over a period of time.

In those instances where the exceptions do not apply, it will be necessary to close the valve in the solution line between the ejector and the point of application during this temporary shutdown. When restarting the system, remember to open the valve before turning on the water supply to the ejector.

WARNING

During a temporary shutdown period should gas be detected leaking from the vent outlet, this is evidence that the gas inlet valve of the regulator associated with the vent outlet in question has not closed tightly. Should this occur, immediately restart the system. Then, shut down the system as described under Part III, following, and remove and clean the gas inlet valve assembly. Failure to observe this warning may result in bodily injury.

CAUTION

The rate valve is not designed to serve as a shut-off valve. Attempting to use it in this fashion may result in valve damage.

Refer to Instruction Bulletin 010.3650 for information pertaining to care of ton containers and maintenance of gas tight seals at all coupling (and flange, if applicable) type connections.

Refer to the troubleshooting chart (troubles "E" through "K") to become familiar with the "troubles" (as well as their probable causes and corrective actions) which may be encountered during the operation of the gas dispensing system.

B. Single Regulator Systems Utilizing Wall Mounted Vacuum Regulators

The heater should be checked daily to make certain it is operating by feeling the **top** of the manifold drip leg to confirm that it is warm.

WARNING

Flexible connectors must be arranged in a smooth spiral to prevent kinking. Kinks cause mechanical damage which will result in immediate or eventual rupture. Connectors so damaged through repeated handling must be renewed immediately. Renewal is also required at the first sign of internal or external corrosive attack and steps should be taken to eliminate the condition(s) which have caused this to occur. Failure to observe this warning may result in bodily injury.

If during the course of normal operation the meter assembly float suddenly begins to bounce up and down rather violently, it usually indicates that either; a) The water supply pressure to the ejector(s) is fluctuating over too wide a range; or b) Liquid chemical is entering the regulator and "flashing off" as it is exposed to the vacuum being created by the ejector. Should this condition occur, first check the water supply pressure to the ejector. If it is determined that this is the cause of the trouble, take all necessary steps to eliminate the adverse pressure condition(s). If not, test the vent outlet for gas flow using a gas mask and test solution that applies to the gas being handled. If gas flow is found, immediately shut down the system as described under Section 5, and check the gas supply system to determine the condition(s) responsible for the formation of liquid chemical. Liquifaction may be caused by pressurized gas lines passing through two or more areas with temperature differentials. Should this be the case, then installation of a pressure reducing valve at the gas source is strongly recommended. Refer to Instruction Bulletin 010.3650 for information concerning this device. If gas flow is not found at the vent outlet, refer to trouble "E" in the troubleshooting chart to determine the other probable causes which may be responsible for the occurrence of float bounce.

When the supply of gas becomes exhausted, as evidenced by observing that the "status" lever of the regulator has moved from its OPERATING position to the EMPTY position, proceed as directed, following, to replenish the exhausted supply.

1. Close the container valve.
2. Continue to operate the ejector(s) until each meter assembly float falls to zero, indicating that gas flow has stopped. Then, proceed to; a) close each container isolating valve, if present, b) close each header valve, if present, and c) shut off the water supply to the ejector(s).

CAUTION

Maintaining ejector operation with the flexible connectors removed from the exhausted cylinder(s) will allow moist atmospheric air to be drawn into the gas feed system. This moisture in the presence of chlorine or sulfur dioxide gas will result in the production of acids which will deteriorate the equipment. The resultant deterioration of the equipment and piping system may result in bodily injury.

3. Disconnect the empty container(s), removing and **discard the lead gasket(s)**.
4. Connect the full container(s) **using a new lead gasket** in each connection and secure by tightening the coupling nut (or yoke screw) using a wrench.
5. Check each renewed connection for leaks as described under the initial start-up procedure. Then, return the system to operation by moving the "status" lever of the regulator to its OPERATING position and turning on the water supply to the ejector(s).

C. Dual Regulator Systems Utilizing Wall Mounted Vacuum Regulators

The heater should be checked daily to make certain it is operating by feeling the top of the manifold to confirm that it is warm.

WARNING

Flexible connectors must be arranged in a smooth spiral to prevent kinking. Kinks cause mechanical damage which will result in immediate or eventual rupture. Connectors so damaged through repeated handling must be renewed immediately. Renewal is also required at the first sign of internal or external corrosive attack and steps should be taken to eliminate the condition(s) which have caused this to occur. Failure to observe this warning may result in bodily injury.

If during the course of normal operation the meter assembly float suddenly begins to bounce up and down rather violently, it usually indicates that either; a) the water supply pressure to the ejector is fluctuating over too wide a range; or b) liquid chemical is entering the "in service" regulator and "flashing off" as it is exposed to the vacuum being created by the ejector.

Should this condition occur, first check the water supply pressure to the ejector. If it is determined that this is the cause of the "trouble", take all necessary steps to eliminate the adverse pressure condition(s). If not, refer to trouble "E" in the troubleshooting chart to determine the other occurrence of float bounce. When the supply of gas associated with the OPERATING regulator for gas flow using a gas mask and test solution that applies to the gas being handled. If gas flow is found, immediately shut down the System as described under Section 5, and check the gas supply system associated with the regulator that was previously in service, now indicating EMPTY, to determine the condition(s) responsible for the formation of liquid chemical. Liquefaction may be caused by pressurized gas lines passing through two or more areas with temperature differentials. Should this be the case then installation of a pressure reducing valve at the gas source is strongly recommended. Refer to Instruction Bulletin 010.3650 for information concerning this device. If gas flow is not found at the vent outlet, refer to Trouble "E" in the Troubleshooting Chart to determine the other probable causes which may be responsible for the occurrence of float bounce.

When the supply of gas associated with the regulator in service is exhausted, its status lever will move from OPERATING to EMPTY. Proceed as directed, to replenish this exhausted supply.

1. Close each container valve associated with the gas supply system of the EMPTY regulator. When the valve is closed, move the "status" lever of this regulator to the RESERVE position.

WARNING

If the “status” lever cannot be moved to its reserve position, this indicates that the supply of gas for the other regulator has been exhausted. If this is the case, close the cylinder or container valve associated with the gas supply system of the other regulator. Then, shut off the water supply to the ejector(s). Replenish both supplies, and then restart the system in the usual manner.

2. Disconnect the empty container(s), removing and **discard the lead gasket(s)**.
3. Connect the full container(s) **using a new lead gasket** in each connection and secure by tightening the coupling nut (or yoke screw) using a wrench.

NOTE: The actions performed in steps 4 and 5, following, are required to prepare the System for checking the renewed connection for leaks as directed in step 6.

4. Shut off the water supply to the ejector(s).
5. Close each container valve associated with the regulator presently in the OPERATING mode. Then move the “status” lever to the regulator associated with the renewed or reserve container(s) to the OPERATING position.
6. Check each renewed connection for leaks as described under the initial start-up procedure. Then move the “status” lever of the regulator associated with the renewed container(s) to its RESERVE position to place this portion of the gas supply system on “standby”.
7. Return the system to operation by moving the “status” lever of the regulator that was previously in service from the EMPTY position to its OPERATING position, if necessary. Then, open the associated container(s) valve one full turn and turn on the water supply to the ejector(s).

5 SHUTDOWN

5.1 Shutdown For Servicing

- 1a. If the gas dispensing system is of the **single regulator type**, close each cylinder and/or container valve associated with its gas supply system.
- 1b. If the gas dispensing system is of the **dual regulator type**, close each cylinder and/or container valve associated with the gas supply system of **both** regulators.
2. Continue to operate the ejector(s) until the meter assembly float(s) falls to zero, indicating that gas flow has stopped, or if applicable, that any liquid chemical that may be in the manifold and gas supply piping has been vaporized.
3. Remove the vacuum regulator from the gas source.
4. Continue to operate the ejector(s) for a few minutes to purge all gas from the system. Then, shut off the water supply to the ejector(s) and close any valves in the chemical solution line between each ejector and its point of application.
5. Before starting up the System after servicing, refer to the initial start-up procedure and perform any or all steps deemed necessary as related to the extent of servicing performed.

5.2 Shutdown for Extended Period

- 1a. If the gas dispensing system is of the **single regulator type**, close each cylinder and/or container valve associated with its gas supply system.
- 1b. If the gas dispensing system is of the **dual regulator type**, close each cylinder and/or container valve associated with the gas supply system of **both** regulators.
2. Continue to operate the ejector(s) until the meter assembly float(s) falls to zero, indicating that gas flow has stopped. Then, in turn, close each container isolating valve, if present, each header valve, if present, and shut off the water supply to the ejector(s).
3. Close any valves in the chemical solution line between each ejector and its point of application.
4. Unplug the heater(s).

Ideally, the gas supply system(s) should remain intact to prevent moisture from coming into contact with and corroding the surfaces normally exposed to the gas. If this is not possible, plug all open connections with a rubber or plastic stopper to protect against corrosion during the extended shutdown period.

If the installation is to be subjected to temperatures below freezing during the extended shutdown period, disconnect and drain all lines and components in the water supply and chemical solution distribution systems which will be exposed to freezing conditions.

6 SERVICING

WARNING

Before disconnecting or disassembling any component, shut down the gas dispensing system as described in Part III under operating instructions. Failure to observe this warning may result in operator bodily injury.

6.1 General

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, 3) the quality and quantity of the water or process liquid being used to operate the ejector(s), and 4) 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 resilient parts (O-ring, 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 may result in bodily injury.

The maintenance kits for CL₂ and SO₂ are as follows:

Vacuum Regulator		614S090U01
Inlet Valve	CL ₂	668B130U01
	SO ₂	668B130U05
Ejector		See IM
Gas Manifold, 2 filters and 6 lead washers		614S095U01
Meter Assembly		See IM
25 Lead gaskets		BM-4901

The nature and extent of servicing is dependent upon: 1) the complexity of the gas supply system 2) the type, quality, and quantity of gas being handled, and 3) the quality and quantity of water or process liquid being used to operate the ejector(s). Therefore, servicing requirements for each gas dispensing system will be learned from experience. For Ammonia Service, refer to the parts list 100.7609 for recommended spare parts to be used for the periodic service.

The manner in which the components can be disassembled for servicing (and reassembled after servicing) becomes apparent by simply referring to their illustrated "exploded views" in the parts list furnished with these instructions or the instructions provided with the maintenance kits.

The optional gas pressure gauge (furnished with wall and ton container mounted regulators, requires no routine maintenance and should never be disassembled. Tampering with the seal results in loss of fill fluid and failure of the gauge.

CAUTION

During disassembly and cleaning of any component, inspect all parts thoroughly and replace any worn or damaged part immediately. When a part needs replacing, it is mandatory that the new part needs to be made of materials that will withstand the corrosive action of the gas being handled. Failure to use proper replacement parts as supplied by Severn Trent Services can result in bodily injury.

Only Severn Trent Services replacement parts, manufactured from materials selected for their proper corrosion-resistance properties, must be used. The use of third party parts voids all warranties. Factory approved parts are available from the supplier. When ordering parts, always note the complete model and serial number of the gas dispensing system as well as the gas service in which it is being used. If desired, the equipment in need of repair may be returned to Severn Trent Services , 3000 Advance Lane, Colmar, PA 18915 for servicing or complete overhaul.

6.2 Cleaning Agents

The preferred cleaning agent is a mild soap solution. More difficult organic residues can be removed with wood alcohol. The parts being cleaned may be wiped with a cloth wetted with the solvent. Do not flood the parts with alcohol. If wood alcohol is used be sure to rinse parts with clean water.

Mineral deposits can be removed with dilute hydrochloric (muriatic) acid. The parts being cleaned should be soaked in the acid, being careful to prevent the acid from coming in contact with the skin or clothing.

After cleaning with any of the above agents, rinse with clean water (to remove all traces of the cleaning agent) and dry thoroughly (to remove all traces of water) before returning to service.

6.3 Lubricating Agents

The recommended lubricating agents are a graphite-petroleum mixture, included in the maintenance kits, or fluorolube. The proper use of lubricants is discussed in the maintenance kit instructions. Their use is only to allow the parts to be assembled with more ease. They are not to be used as a vacuum sealing grease and must be used very sparingly.

6.4 O-Rings

To seal perfectly, o-rings must be properly seated and be soft and pliable. Any o-ring disturbed or moved must be replaced to insure the integrity of the seal. The preventative maintenance kits contain all the required o-rings.

6.5 Diaphragms

Diaphragms should be inspected each time a component with diaphragms is disassembled for servicing. When disassembling the vacuum regulator, be sure to observe the orientation of the convolutions (ridges) on the diaphragms so that they may be reinstalled in the same position. Replace any diaphragm that shows signs of cracks or weak spots. A crack or potential crack line will appear as a milky white line. Upon reassembly, lubricant should be applied to the surfaces of the diaphragm which come in contact with the clamping surfaces of their backing plates or bolts. Lubricant should always be applied **sparingly**. If the diaphragm has convolutions, be certain to properly orient the diaphragm.

6.6 Check Valves

The sealing surfaces of check valves, eg: the ball and o-ring seat in ball types and the plug and seat in diaphragm types, must be clean and smooth to provide a perfect seal. **Use no lubricants on sealing surfaces.**

6.7 Hose/Flexible Connector Lines

Periodically inspect all hose and flexible connector lines for cracks or weak spots which may develop with aging. Faulty lines must be replaced. Hoses and flexible connectors must be protected from strain, freezing, or mechanical damage.

6.8 Inlet Valve

The inlet valve should be examined whenever a regulator is removed. If it is dirty, plugged, or excessively contaminated, it should be cleaned using the appropriate maintenance kit. The cleanliness of the supply gas from cylinders and ton containers will also be a factor contributing to this problem. For the inlet valve maintenance use preventative maintenance kit See 6.1.

6.9 Manifold

The gas manifold heater may be replaced by removing the self clamping heater from the drip leg. Replace filter cartridge and gaskets contained in the preventative maintenance kit See 6.1.

7 TROUBLESHOOTING CHART

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
1. Flowmeter fails to indicate required air flow rate when operating vacuum is being checked the first time that the Gas Dispensing System is placed in operation	<ul style="list-style-type: none"> a. Length of vacuum line(s) exceeds maximum allowable transport distance. b. Vacuum line(s) crimped. c. Leakage at pipe-to-tube vacuum line connection at outlet from flowmeter-rate valve assembly and/or inlet to ejector. d. Ejector throat is not full of water. (Applies only when the ejector is wall mounted in a horizontal position and back pressure is zero or less at the point of application). e. Insufficient ejector vacuum resulting from insufficient water supply pressure for existing back pressure conditions. 	<ul style="list-style-type: none"> a. Refer to bulletin 100.4601 & 121.3003 b. Arrange line(s) to eliminate crimping. c. Tighten/inspect/re-make each connection, as required. d. Refer to Instruction Bulletin 010.3650 e. After first re-checking start-up procedure and above listed probably causes to definitely confirm that this is the cause of trouble, contact the supplier from whom the Gas Dispensing System was purchased.
2. Flowmeter fails to indicate required air flow rate when operating vacuum is being checked following an extended out of service period or servicing shutdown.	<ul style="list-style-type: none"> a. Vacuum line(s) crimped. b. Leakage at pipe-to-tube vacuum line connection at outlet from flowmeter-rate valve assembly and/or inlet ejector. c. Leakage around stem seal-ring of rate valve assembly. d. Leakage around seals (O-ring or gasket type, depending on capacity) of flowmeter outlet adaptor fitting. e. Insufficient ejector vacuum. 	<ul style="list-style-type: none"> a. Arrange line(s) to eliminate crimping. b. Tighten/inspect/re-make each connection, as required. c. Inspect and renew rate valve assembly, if necessary. d. Inspect and reseal or renew seals, as required. e. Refer to Trouble 11.
3. Flowmeter continues to indicate air flow and/or "status" lever of regulator fails to move to its EMPTY position when System is dead-ended when operating vacuum is being checked the first time that the Gas Dispensing System is placed in operation.	<ul style="list-style-type: none"> a. Leakage around seal plug O-ring in auxiliary connection of flowmeter-rate valve assembly. b. Leakage at pipe-to-tube or O-ring seal connection(s), as applicable, in vacuum portion of Gas Dispensing System on upstream side of flowmeter-rate valve(s). c. Regulator diaphragm cracked, ruptured or exhibiting leakage around its sealing surfaces. 	<ul style="list-style-type: none"> a. Tighten seal plug, or, inspect and reset or renew O-ring as required. b. Tighten/inspect/re-make each pipe-to-tube connection; or, inspect and reseal or renew each O-ring seal connection, as required and applicable. c. After first re-checking the above listed probably causes to definitely confirm that this is the cause of the trouble, contact the supplier from whom the Gas Dispensing System was purchased.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
4. Flowmeter continues to indicate air flow and/or "status" lever of regulator fails to move to its EMPTY position when the system is dead-ended when operating vacuum is being checked following an extended out-of -service period or servicing shutdown.	<ul style="list-style-type: none"> a. Leakage around seal plug O-ring in auxiliary connection of flowmeter-rate valve assembly. b. Leakage at pipe-to-tube or O-ring seal connection(s), as applicable, in vacuum portion of Gas Dispensing System on upstream side of flowmeter-rate valve(s). c. Leakage around seals (O-ring or gasket type, depending on capacity) of flowmeter inlet adaptor fitting. d. Regulator diaphragm cracked, ruptured or exhibiting leaked around its sealing surfaces. 	<ul style="list-style-type: none"> a. Tighten seal plug; or inspect and reset or renew O-ring, as required. b. Tighten/inspect/re-make each pipe-to-tube connection; or, inspect and reseal or renew each O-ring seal connection as required and applicable. c. Inspect and reseal or renew seals, as required. d. Disassemble regulator and take all necessary steps to correct this condition.
5. Flowmeter float observed to be bouncing up and down and/ or maximum gas flow rate cannot be achieved during the course of normal operation.	<ul style="list-style-type: none"> a. Gas inlet valve regulator dirty. b. Rate valve dirty. c. Flowmeter dirty. d. Filter in manifold inlet dirty. (Applies only to wall or ton container mounted regulators.) e. Leakage at some point in vacuum portion of Gas Dispensing Sytem. f. Insufficient ejector vacuum. (Applies only to inability to achieve maximum gas flow rate.) 	<ul style="list-style-type: none"> a. Clean gas inlet valve. b. Clean rate valve. c. Clean flowmeter. d. Renew filter. e. Refer to probable causes and corrective actions listed under Trouble 2 and 4. f. Refer to Trouble 11.
6. Maximum gas flow fails to provide desired level of chemical residual at point of application.	<ul style="list-style-type: none"> a. Leakage at some point in vacuum portion of Gas Dispensing System on upstream side of flowmeter. b. Chemical demand of water or process liquid has increased above original designed capacity. 	<ul style="list-style-type: none"> a. Refer to probable causes and corrective actions listed under Trouble 4. b. Contact the supplier from whom the Gas Dispensing System was purchased for possible size increase to a larger capacity.
7. Minimum gas flow provides too high a level of chemical residual at point of application.	<ul style="list-style-type: none"> a. Chemical demand of water or process liquid has decreased below original designed capacity. 	<ul style="list-style-type: none"> a. Contact the supplier from whom the Gas Dispensing System was purchased for possible size decrease to a smaller capacity.
8. Flowmeter fails to indicate gas flow during the course of normal operation but "status" lever of regulator remains in its OPERATING position.	<ul style="list-style-type: none"> a. Vacuum line(s) crimped. b. Rate valve inadvertently closed. c. Tare valve pugged. d. Flowmeter plugged. e. Loss of vacuum condition on downstream side of flowmeter. 	<ul style="list-style-type: none"> a. Arrange line(s) to eliminate crimping. b. Open rate valve. c. Clean rate valve. d. Clean flowmeter. e. Refer to probable causes and corrective actions listed under Trouble 2.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
9. "Status" lever of regulator moves to its EMPTY position during the course of normal operation.	a. Gas supply valve(s) inadvertently closed. b. Gas supply exhausted. c. Gas inlet valve of the regulator stuck in the closed position. d. Filter in manifold inlet plugged.	a. Open all supply valve(s) to a total of one full turn. b. Replenish supply. c. Clean gas inlet valve. d. renew filter.
10. Water noted in flowmeter or discharging from ejector drain outlet, as applicable, at time of shutdown.	a. Ejector back-flow check valve(s) faulty.	a. Inspect, clean and/or repair back-flow check valve(s)
11. Insufficient ejector vacuum.	a. Y-strainer in water supply line is dirty, thereby reducing the available supply pressure. b. Ejector drain valve not sealing. c. Back pressure is greater than the value listed on the tag attached to the ejector, for one of the following reasons: 1. solution valve(s), if present, not fully open. 2. solution line, if present, is partially blocked. 3. back pressure at point of application has increased above its original value. d. Ejector nozzle and/or throat dirty. e. Ejector throat is not full of water. (Applies only when the ejector is wall mounted in a horizontal position and back pressure is zero or less at point of application.) f. Ejector nozzle and throat are worn.	a. Clean Y-strainer; and, if this does not correct the trouble, refer to Troubleshooting Procedure 1 in the Troubleshooting Section of Instruction Bulletin. b. Refer to Troubleshooting Procedure 2 in the Ejector Instruction Bulletin. d. Clean nozzle and/or throat. e. Refer to Instruction Bulletin 010.3650. f. Replace with new nozzle and throat.
12. Gas leaking from vent line.	a. Inlet valve stem length at incorrect length. b. Inlet valve seat has dirt accumulation preventing proper operation. c. Scored valve seat.	a. Adjust stem length to 2.198" as indicated in the parts list. c. Clean gas inlet valve. c. Replace valve seat and plug.



Design improvements may be made without notice.

Represented by:



Severn Trent Services

3000 Advance Lane Colmar, PA 18915
Tel: 215-997-4000 • Fax: 215-997-4062
Web: www.severntrentservices.com
E-mail: marketing@severntrentservices.com