



# *Chemical Injection Technologies*

## Installation/Service Bulletin

### **SUPERIOR Series CL-16/26/56 Automatic Switchover Gas Chlorinator - Installation & Operation**

#### **IMPORTANT!! READ THESE PRECAUTIONS BEFORE PROCEEDING!!!**

**They are very important for your personal safety, and for proper chlorinator operation.**

1. Read these precautions and all related instructions thoroughly and follow them carefully. If you do not understand any of the information, call your local SUPERIOR supplier or Chemical Injection Technologies, Inc. Do not attempt to install or operate any gas chlorination/sulfonation equipment unless you are properly trained.
2. Read the "CHLORINATOR CYLINDER CHANGING PROCEDURE" card supplied with your chlorinator, and be certain you fully understand the information presented on the card. If you do not have the card, contact your local SUPERIOR supplier or Chemical Injection Technologies, Inc. and we will supply one.
3. Make certain all required safety equipment is in place and operational.
4. When performing any maintenance or changing cylinders, Chemical Injection Technologies, Inc. strongly recommends that a gas mask (a pressure-demand type air pack is strongly recommended) should be available in the immediate area of the chlorination equipment and all operating personnel should be properly trained in its use.
5. Chlorine gas or the fumes from chlorine solutions can be lethal in large enough doses. Therefore, you should always have a co-worker observe from a safe location when you are working on any type of chlorination equipment.
6. Avoid breathing the gas or fumes of chlorine solutions and avoid contact with your skin. Work only in a well-ventilated area. Chlorine will bleach clothing.
7. Before working on the chlorination system, make certain that the cylinder valve is shut off. If it seems to be shut off already, open it one quarter turn and immediately close it to make certain that the valve is not frozen in the open position. If the valve stem does not turn easily, you may use the heel of your hand to tap the cylinder wrench. Never use a hammer or other tool to force the valve stem. If you cannot turn the cylinder valve in either direction, always assume it is open. **BE POSITIVE THIS VALVE IS CLOSED BEFORE LOOSENING THE CHLORINATOR MOUNTING YOKE OR VALVE CAP.** If you are not sure, call your chlorine supplier.
8. Do not use wrenches larger than the standard cylinder wrench and do not hit the wrench with a heavy object to open or close the valve.
9. Do not re-use lead gaskets. **THIS IS VERY IMPORTANT!** Do not re-use a lead gasket because used gaskets will not properly seal the chlorinator/cylinder connection and will cause leaks.
10. Use only lead gaskets. Other types may contract with temperature variations resulting in the escape of gas.
11. Check for chlorine gas leaks every time the chlorinator is connected or remounted onto the cylinder. Using a plastic squeeze bottle of strong ammonia, approximately  $\frac{1}{3}$  full, squeeze fumes under the lead gasket connection and around the cylinder valve bonnet and valve stem. A piece of rag or paper towel wetted with ammonia may also be held under the connection. *Do not pour ammonia onto the valve or connection.* A chlorine or Sulfur Dioxide leak will create "smoke-like" fumes similar to cigarette smoke. Correct the leak before proceeding.
12. Open the cylinder valve  $\frac{1}{4}$  to  $\frac{1}{2}$  **turn only**, and leave the wrench on the cylinder valve when it is open.
13. The rate valve is not a shut-off valve. To shut-off chlorine, use the chlorine cylinder valve.
14. Always use safety chains or clamps to secure the chlorine cylinders so they may not be accidentally tipped over. Protective hoods and valve caps must be in place whenever cylinders are not in use.

NOTE: These instructions are also applicable to SUPERIOR Gas Sulfonators. Just substitute "sulfonator" wherever the word "chlorinator" appears and substitute "sulfur dioxide" wherever "chlorine" appears. Parts for the two types of units, except for the front and back bodies, the diaphragm front and back plates, and the remote meter panel bodies are interchangeable.

<sup>†</sup>To prevent reliquification or condensing of Sulfur Dioxide (SO<sub>2</sub>) gas in locations where the temperature may fall below 50°F (10°C), sulfonator installations should be inside a heated enclosure. DO NOT apply heat directly to chlorine or sulfur dioxide cylinders as this will cause a rapid increase in the gas pressure which could rupture the cylinder.

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## 1.0 INSTALLATION

(See Drawing No. 1)

**IMPORTANT:** Before proceeding, read "**Precautions**"

### 1.1 Handling of Chlorine Cylinders

Chlorine gas is potentially dangerous. The following rules must always be adhered to:

- 1.1.1 Never move a cylinder unless the valve protection cap is screwed on tightly.
- 1.1.2 Locate the cylinders where they will not be bumped or damaged.
- 1.1.3 A safety chain should be placed around the cylinders and secured to a wall or support.
- 1.1.4 When the vacuum regulator is mounted directly on the chlorine cylinder valve, the cylinder and chlorinator need not be in a heated room. For outdoor installation, when temperatures exceed 100° F., the cylinder should be shaded from direct sunlight.
- 1.1.5 Do not open the cylinder valve more than ¼ to ½ turn.

Note: The term "Chlorinator", as used in this publication, refers to the Vacuum Regulator, the Remote Meter Tube/Rate Valve Panel, and the Ejector Assembly, as a complete system.

### 1.2 Mounting Vacuum Regulators

(See Photo No. 1.1)

Follow these steps to mount vacuum regulators onto two separate chlorine cylinder valves.

- 1.2.1 Unscrew the valve protection cap from the chlorine cylinder.
- 1.2.2 Check to make sure the cylinder valve is closed. Carefully unscrew the cap nut which covers the chlorine cylinder valve outlet.
- 1.2.3 Remove any dirt that may be in the valve outlet or on the outlet gasket surface.
- 1.2.4 Remove all shipping material from the vacuum regulator. (DO NOT remove the porous, white high efficiency filter which is inserted in the vacuum regulator inlet).
- 1.2.5 Unscrew the yoke screw until the sliding valve plate can be pushed all the way back.

1.2.6 Place 1/16" thick lead gasket over the chlorine inlet of the vacuum regulator. *Never* use other types of gaskets or gasket materials. **Never re-use the lead gasket.** Replace the lead gasket each time the chlorine cylinder is changed.

1.2.7 Mount vacuum regulator on cylinder valve by placing the yoke over the valve, engage the vacuum regulator inlet properly with the valve outlet, and tighten the yoke screw, compressing the lead gasket. Excessive tightening will squeeze the lead gasket out of the joint and should be avoided. Do not open the chlorine cylinder valve until all components are installed. See section 2.0 "Start-Up".

### 1.3 Installation of Remote Meter Module

1.3.1 Install remoter meter panel right side up in a location that is convenient for the operator and/or affords greatest security. Connect vacuum tubing from the vacuum regulator to the remote meter panel and from the remote meter panel to the ejector as shown in Drawing No. 1.

### 1.4 Installation of Ejector

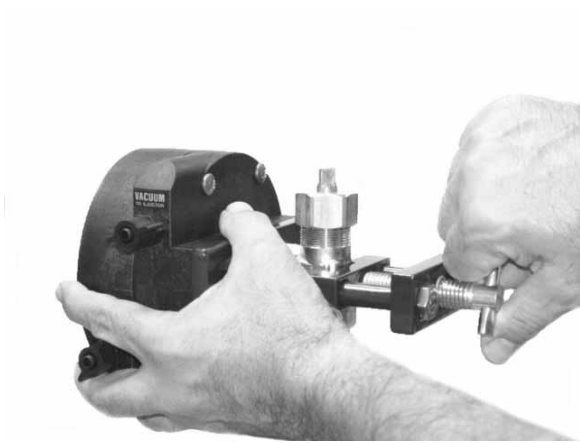
(See Photo Nos. 1.2, 1.3, 1.4)

1.4.1 The check valves in the ejector are designed in such a manner that the ejector may be installed in any position.

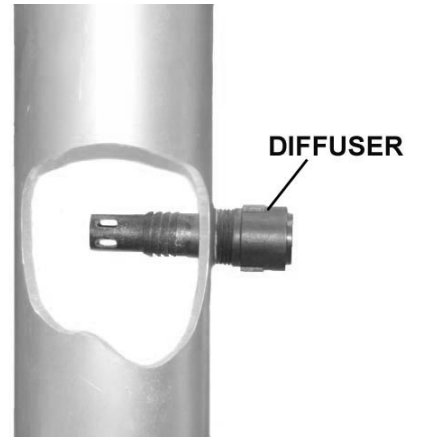
1.4.2 The point of injection should be carefully chosen so that the water pressure at this point is as low as possible. Vacuum is created in the ejector by the nozzle which is actually a precision designed venturi. Water pressure to the nozzle must be high enough to overcome the back pressure and create a strong jet in the nozzle.

1.4.3 The standard ejector is designed to withstand static back pressures in excess of 250 psig (17.5 kg/cm<sup>2</sup>). However, due to possibilities of water line "torque" in high pressure on-off systems, as well as special booster pump considerations, it is recommended that a factory representative, or Chemical Injection Technologies, Inc. be consulted regarding installation details in systems over 100 psig (7 kg/cm<sup>2</sup>).

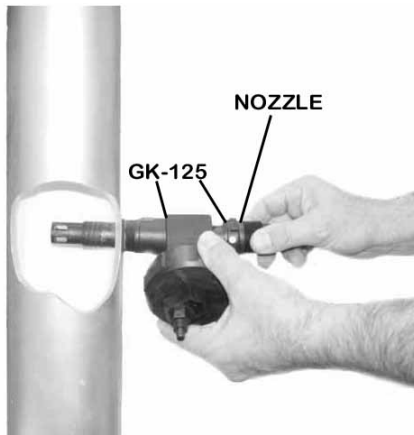
1.4.4 Generally, the amount of water (GPM) required to operate the ejector depends upon the chlorine flow rate (lbs./24 hrs. or gr./hr.). The higher the chlorine flow rate, the greater the water flow needed.



1.1



1.2



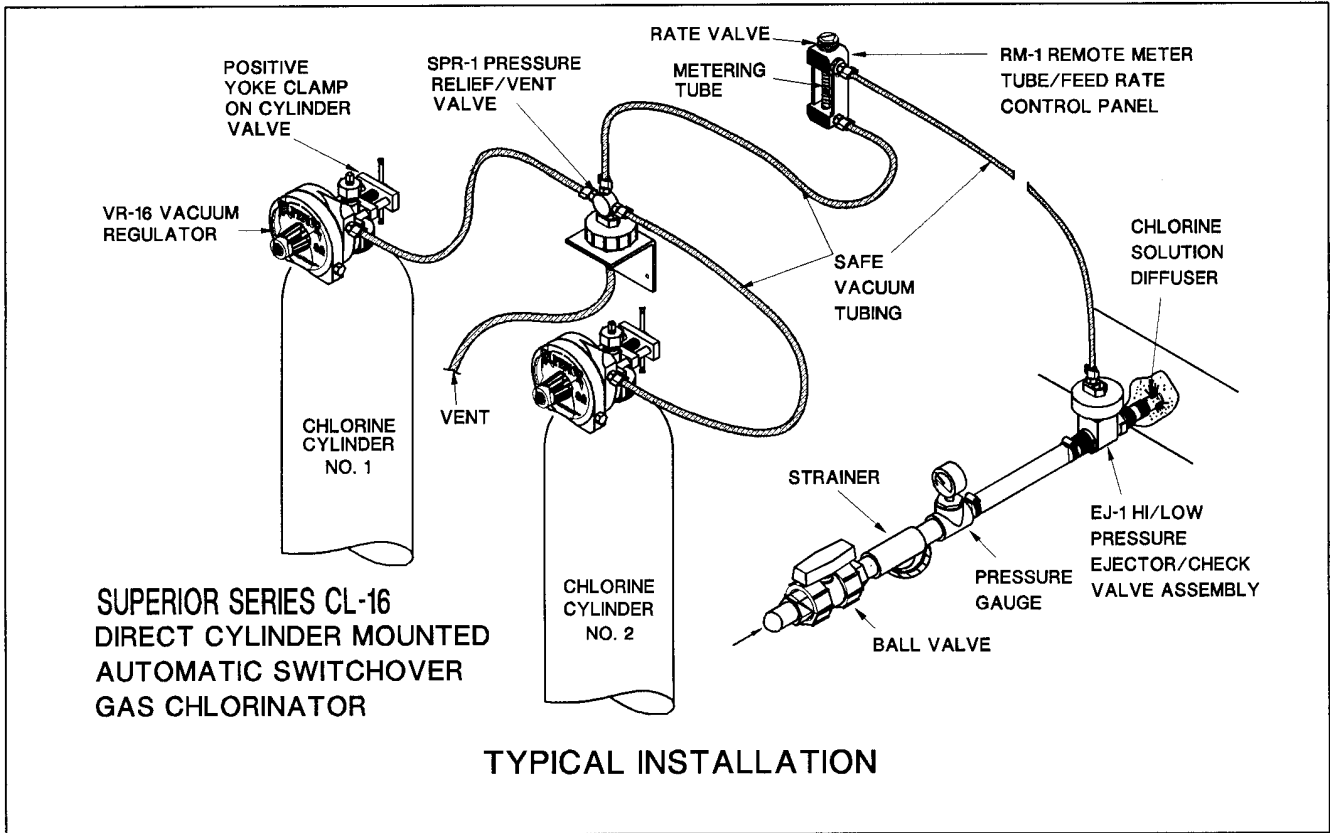
1.3



1.4

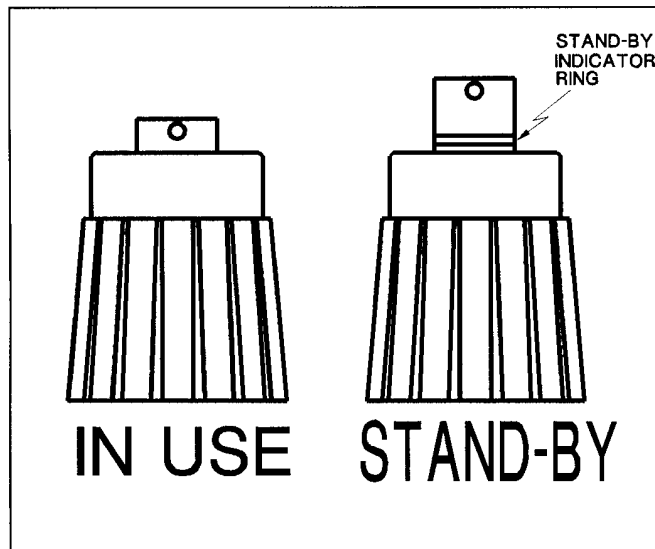


1.5



## DRAWING NO. 1

Typical installation drawings are provided strictly as a guide to help you understand the basic connections and relative placement of the modular assemblies. Each installation has its own unique requirements.



## DRAWING NO. 2

1.4.5 Ejector water supply pressure must be greater than the pressure into which solution is ejected. The amount of pressure differential may vary with the particular application. Generally, the greater the pressure into which the chlorine will be injected, the greater the required differential pressure. However, the minimum pressure differential and water flow for your installation should be determined prior to installation and start-up.

1.4.6 Follow these steps for installing close-coupled diffuser and ejector.

- a. Unscrew the diffuser from the assembly. *DO NOT* install the diffuser when the ejector is assembled or damage may occur.
- b. Put Teflon tape on the 1" pipe threads and screw the diffuser into the pipe. These are high-strength plastic parts, but like all plastic pipe fittings, care should be exercised in tightening. Tighten carefully with properly adjusted wrench. Make sure that the holes in the spray type diffuser are in the main stream. The end of an open type diffuser should not allow strong chlorine solution to come into contact with metal pipe or fittings, as this will cause serious corrosion. (Photo No. 1.2).
- c. Place a gasket (GK-125) into the recess on each side of the check valve body. Insert the nozzle through the check valve body (Photo No. 1.3). Hold the check valve body against the diffuser at ¼ turn **COUNTER CLOCKWISE** from its final position (up, down, side- ways).
- d. Screw the nozzle into the diffuser, by **HAND ONLY**, until contact is made against both gaskets. Turn the check valve body and the nozzle, at the same time, ¼ turn clockwise to the final, tight position (Photo No. 1.4). Attach water supply hose and tighten clamps. (Photo No. 1.5).

1.4.7 Other types of diffuser and ejector installations may be desired for certain applications:

- a. The ejector (nozzle and check valve assembly) may be located near the vacuum regulator. A wall mounting bracket can be provided for the assembly, and the outlet can be supplied with various sizes of adaptors for solution hose or pipe.
- b. If the ejector is to be remotely installed with solution piping or hose running to the point of application, be certain to cut off the tip of the diffuser before installing into the pipe or hose. Failure to do this will result in excessive back- pressure being created in the diffuser, causing chlorine feed rate to drop off or stop.
- c. The entire diffuser-ejector assembly may be submersed in an open channel or tank.
- d. Diffuser tubes with corporation cocks can be supplied for either close coupled or remote ejectors.
- e. Special diffusers can be supplied for use with PVC Ball valves.

## 1.5 Piping of Ejector

- 1.5.1 For most installations, the ejector water supply line should be brought to within 3-5 feet of the nozzle with rigid copper or iron pipe, or schedule 80 PVC pipe.
- 1.5.2 A shut-off valve followed by a Y-type strainer and the ejector is desirable as a service tool, and *is highly recommended*.
- 1.5.3 A pressure gauge installed between the Y-type strainer and the ejector is desirable as a service tool, and is recommended *very strongly*.

1.5.4 Connect hose between the hose adaptor and the ejector nozzle. Clamp the hose securely at both ends with single or double hose clamps. (Photo No. 1.5).

1.5.5 When rigid piping is used all the way up to the ejector inlet instead of hose, cut off the hose adaptor "barbs" on the nozzle where the 1" NPT threads start. Be certain to install pipe unions to allow maintenance.

## 1.6 Installation of Pressure Relief / Vent Valve

- 1.6.1 Mount the pressure relief (vent) valve on the wall using the mounting bracket provided. Install with the "cross" fitting on top.
- 1.6.2 It is preferable to locate the pressure relief valve so it is approximately equidistant from the two vacuum regulators. However, this is not an absolute requirement.
- 1.6.3 Connect ¾" tubing to the bottom (vent) fitting and run the tubing outside the building to a safe location. Should the system become pressurized, the vent will expel excess chlorine gas into the atmosphere. An insect screen is provided for the outside of the vent line, and **MUST** be installed to prevent insects from entering the tubing and plugging the vent.

## 1.7 Connecting Vacuum Regulators to Pressure Relief Valve, Remote Meter, and to ejector

- 1.7.1 Appropriate size plastic tubing is normally used for the vacuum line between the vacuum regulators and pressure relief/vent valve; pressure relief valve and remote meter; and the remote meter and ejector. Use enough length for each line to allow for movement of the vacuum regulators from one cylinder to another.
- 1.7.2 Remove connector nut from connector and slip onto tube. Push tube onto connector and tighten connector nut *HAND TIGHT*.
- 1.7.3 The connector on chlorinator vacuum regulator is for connecting the vacuum tubing to one of the side connectors on top of the pressure relief valve. The top connector on the pressure relief valve is connected to the lower connector on the remote meter panel. The upper connector on the remote meter is for connecting the vacuum tubing to the ejector.

## 1.8 Additional Installation Suggestions

- 1.8.1 Many operators find it convenient to install a "hook" on the wall behind the chlorine cylinder, slightly above the vacuum regulator. When changing cylinders, the vacuum regulator can easily be hung on this "hook" while moving new cylinders into place.
- 1.8.2 A beam-type scale should be used to weigh chlorine cylinders while in use to determine the amount of chlorine remaining.

# 2.0 START-UP

## 2.1 Check Ejector

2.1.1 The ejector, with its water supply and solution lines, must be properly installed and operating before checking the chlorinator: **IMPORTANT**: do not connect ejector to the chlorine vacuum tubing before applying water pressure to the ejector assembly. Dirt or debris can become lodged in the check valve during installation. Cycle the ejector on and off several times to insure tight closing. Failure to follow this procedure can cause water to enter the chlorinator, requiring disassembly.

2.1.2 Unless the ejector is creating a vacuum, the chlorinator

will not work. Follow these steps:

- a. Make sure the plastic vacuum tube is disconnected from the ejector.
- b. With the booster pump running, or pressurized water supply connected, open the ejector water supply valve. The ejector should be in operation and creating a vacuum.
- c. Put your finger on the vacuum connector opening of ejector and feel the vacuum. This is a strong vacuum and there should be no doubt that a vacuum exists. If there is no vacuum, refer to Section 1.4 and be certain the supply pressure is sufficient and that the nozzle or piping is not plugged. Correct the condition and obtain proper vacuum before proceeding.
- d. Be sure that no water is coming out of the vacuum tube fitting when the ejector is shut off. If water is observed leaking past the check valve, see Service Section 5.1 and correct before proceeding.
- e. Re-connect the vacuum tube to check chlorinator. Leave the ejector running.

## 2.2 Check Vacuum Regulators. Leave Chlorine Cylinder Valves Closed.

(Have strong household ammonia and a piece of cloth available to check for chlorine leaks. Avoid breathing the fumes).

- 2.2.1 Make sure that the knobs on both vacuum regulators are in the "ON" position by turning them counter-clockwise until they "bottom out". DO NOT FORCE KNOBS.
- 2.2.2 With the cylinder valves closed, turn on water supply to the ejector.
- 2.2.3 Turn the **rate valve** in the remote flowmeter/rate valve panel counter-clockwise a few turns.
- 2.2.4 With the ejector operating, and the chlorine cylinders still closed, the ball in the metering tube will remain at the bottom. If the ball does not remain at the bottom, or bounces up and down, there is either a leak at the lead gasket where the vacuum regulator connects on the cylinder or a loose connection in the system. Check and correct.
- 2.2.5 Close the ejector water supply valve or turn off the booster pump to stop operation of the ejector.
- 2.2.6 Disconnect the plastic vacuum tube from one of the vacuum regulators and pull off the tube to allow air to enter system. Reconnect tubing.
- 2.2.7 Reset one of the vacuum regulators to STAND-BY by turning the "Reset" knob clockwise until the knob "ratchets" freely and does not unscrew any more. Then turn the knob counter-clockwise until it bottoms out. **DO NOT FORCE THE KNOB.** The lock nut on the end of the center pin should project completely past the end of the knob when the vacuum regulator is in "STAND-BY" mode. (See Drawing No. 2).

**IMPORTANT:** Before proceeding, read "Precautions".

- 2.2.5 Open chlorine cylinder valve 1/4 turn and *close immediately*.
- 2.2.6 Wet small piece of cloth in household ammonia (avoid breathing fumes) and hold below the lead gasket inlet connection and below the cylinder valve bonnet.

If chlorine is leaking, a smoke will appear similar to cigarette smoke. Tighten bonnet or replace gasket and eliminate leaks. (**NOTE:** Do not pour ammonia solution on the vacuum regulator or cylinder valve).

- 2.2.7 Open chlorine cylinder valve 1/4 turn, leave open, and recheck for chlorine leaks.
- 2.2.8 Repeat procedure for the second vacuum regulator. If no leaks are observed around the pressurized connections, check the vent outlet with ammonia fumes. If chlorine is detected at the vent, the inlet valve on one of the vacuum regulators is unable to close completely due to dirt or impurities from the chlorine, and must be cleaned before proceeding.
- 2.2.9 When you are certain that there are no chlorine leaks, turn on water supply valve to ejector and adjust rate valve to desired chlorine flow rate. Flow rate in lbs./24 hrs., or gr./hr. is read on the meter scale at the center of the ball for all flow rates except 200 to 500 PPD which are read at the top of the ball.

**NOTE: NEVER use the rate valve to shut off the chlorine supply. This valve is for adjusting flow rate while the system is in operation. To shut off chlorine flow close the cylinder valve.**

2.2.10 Make certain that both chlorine cylinder valves are open 1/4 turn, that one vacuum regulator is reset to "STAND-BY", and the reset knobs are turned fully counter-clockwise so that it is bottomed out against the face of the regulator.

## 3.0 SHUT-DOWN

**IMPORTANT:** Before proceeding, read "Precautions".

- 3.1 Shut off water supply valve and/or booster pump.
- 3.2 Shut off the chlorine cylinder valve - not the rate valve.
- 3.3 When changing cylinders, follow the procedure on the cylinder changing chart supplied with your SUPERIOR Gas Chlorinator. Make certain that the cylinder valve is closed before removing the vacuum regulator.

## 4.0 RESETTING TO "STAND-BY" AFTER A CYLINDER HAS EMPTIED

- 4.1 Be certain the chlorine cylinder valve is turned off. If the valve will not turn clockwise, try to open the valve by turning counter-clockwise. If it will not turn in either direction, assume the valve is stuck in the open position and call your chlorine supplier.
- 4.2 Before removing the vacuum regulator from an empty cylinder, reset the regulator to "STAND-BY" by turning the Reset knob clockwise to engage the latching mechanism (See 2.2.5).
- 4.3 Turn the reset knob counter-clockwise until it bottoms against the regulator face. **DO NOT FORCE KNOB.**
- 4.4 Follow the procedure for changing cylinders on the "CHLORINATOR CYLINDER CHANGING PROCEDURE" supplied with the chlorinator.

**Chemical Injection Technologies, Inc.**  
835 Edwards Road, Ft. Pierce, FL, 34982, USA  
(772) 461-0666 Fax: (772) 460-1847  
Email: [Superior@chlorinators.com](mailto:Superior@chlorinators.com)  
[www.chlorinators.com](http://www.chlorinators.com)