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REGAL MODEL VAC 2000 VACUUM MONITOR

The VAC 2000 is a full featured vacuum monitoring system. The system uses the latest in integrated circuit technology which allows a compact design, accuracy and reliability. The VAC 2000 features independent high and low vacuum detection using separate high, low and latch alarm relays. The VAC 2000 also includes a three digit display of vacuum in inches of Hg., LED status indicators and an analog output. The high and low alarm levels are adjustable as is a variable delay timer. The enclosure has a NEMA 4X rating and can be mounted outside. Applications include loss of chlorination in water and wastewater treatment.

IMPORTANT NOTES

1. The entire contents of this instruction manual should be thoroughly reviewed and understood prior to installing and operating this equipment.
2. Do not discard this instruction book upon completion of the installation. This book contains complete maintenance instructions, and includes spare parts lists. Replacement or additional manuals are available at a nominal cost.
3. Plastic pipe or tubing connector fittings may be broken or damaged if tightened excessively.

WARNINGS

1. This equipment is suitable for use only with the gases specified (DETERMINED BY THE SYSTEM OR SYSTEM COMPONENTS MODEL AND/OR PART NUMBER). **DO NOT USE THIS EQUIPMENT WITH OTHER GASES.** Such use can result in failures having hazardous consequences.
2. This equipment is designed FOR VACUUM SERVICE **ONLY.**
3. To insure proper operation of this equipment, use only parts manufactured by Chlorinators. The use of non- REGAL parts in this equipment WILL void the REGAL warranty and result in a loss of REGAL's insurance coverage.
4. Maintenance on REGAL Systems and System Components should be performed by competent personnel familiar with this type of equipment, such as authorized REGAL dealers or Chlorinators.
5. It is essential that all external wiring be done exactly as shown on the wiring diagrams depicted in this manual. Incorrect wiring or improper grounding of this equipment **WILL** cause improper operation and presents a safety hazard.
6. Field wiring **MUST** conform to national and local electrical codes.
7. **DISCONNECT POWER BEFORE** removing the cover or servicing this equipment.
8. **ALWAYS** make sure that the cover is in place and securely fastened to prevent the entry of moisture, water, or corrosive gases and also to eliminate the potential for electric shock.
9. Any equipment powered by AC line voltage presents a potential shock hazard. Installation and servicing of this equipment should only be attempted by qualified electronics technicians.
10. This non-metallic enclosure **DOES NOT** automatically provide grounding between the conduit connections. Grounding **MUST** be provided as part of the installation.
11. Damage to the circuit boards or internal components incurred by drilling the enclosure for field wiring or connecting power lines to low voltage signal terminals voids the warranty.
12. Changing parameter settings and selections **WILL** affect the operation of this equipment. If unsure, consult Chlorinators **BEFORE** changing parameters or selections.

CHLORINATORS ONE (1) YEAR LIMITED WARRANTY

Chlorinators sets forth the following warranties with respect to its REGAL Vacuum Monitor. This warranty does not apply to the purchase of spare parts or other services performed by Chlorinators. This represents the entire agreement between Chlorinators and Buyer (also referred to as "end-user") and shall apply unless modified in writing and signed by a Chlorinators Officer, and this warranty and its intended terms shall supersede any prior negotiations, correspondence, understandings, or agreements, written or oral. The Buyer agrees to and accepts all terms of this warranty by its contracting for or acceptance of Chlorinator's products, and forms or other documents or statements issued by Buyer or any other person shall not modify or otherwise affect any of the following terms. Buyer should be aware that reseller must rely entirely upon Chlorinators warranties, or assume their own responsibility.

The following states Chlorinators entire warranty and represents Buyer's exclusive remedy with respect to its product. Such warranties are expressly given in lieu of any other warranty, expressed or implied, including but not limited to those of merchantability and fitness for a particular purpose. This expressed warranty or any other warranty implied by law shall not cover defects due to accident, improper use, or non-compliance with Chlorinators operating and maintenance, assembly, installation manual and instructions.

Recommendations and advice as to specifications, capabilities, design, installation, engineering, application, and use of products are provided as an accommodation and are intended only as suggestions. Chlorinators assumes no liability for such recommendations and advice and they are not to be construed as constituting any warranty, expressed or implied.

TERMS OF WARRANTY

Chlorinators warrants its REGAL Vacuum Monitor for a period of one (1) year from date of shipment from Chlorinators. Date of shipment from the factory shall be determined solely on the basis of the monitor's serial code located inside the monitor enclosure. All serial numbers are also registered by Chlorinators as to date of shipment, model number and billing name. If the serial number is missing, defaced, changed, or in any way rendered unreadable, Chlorinators shall, at its option, have the right to declare the warranty void. If the serial number does not match the registered model number as to, but not limited to, such items as maximum chlorine feed rate, the same shall be applicable.

The warranty shall apply against material defects in components and workmanship occurring in the course of manufacture. Buyer's sole remedy for breach of said warranty shall be, at Chlorinators option, either repair or replacement of any unit which is received by Chlorinators at its plant in Stuart, Florida (shipping charges prepaid by buyer), within the time period set forth above and which is found by Chlorinators to be defective by reason of manufacture.

Notwithstanding the foregoing, Chlorinators shall not be liable to Buyer for damages, including personal injury or death to any person or persons, or claims of any kind by a third party or property damage or loss of business or profits. In no event shall Chlorinators be liable to Buyer for consequential or accidental damages of any kind, even if Chlorinators. was aware of the possibility of such damages. There are no remedies except those set forth. Further, that there are no other authorized warranty repair facilities other than those at the Chlorinators factory in Stuart, Florida.

EXCLUSIONS

The following are considered external environmental factors beyond the control of Chlorinators, and which may cause damage and/or need for service which will be specifically excluded from this warranty (i.e., not a material defect in components and workmanship occurring in the course of manufacture).

1. Damage by extraneous causes such as fire, water, lightning, chemical or galvanic attack, etc.
2. Damage to the circuit boards or internal components incurred by drilling the enclosure for field wiring.
3. Damage due to the connection of AC power lines to the analog output terminals.
4. Physical damage due to force, dropping, misuse or other abuse.
5. Use other than that as described in this Instruction Manual.
6. Improper installation for the application.
7. Any alteration of design, or use of non-Chlorinators manufactured parts.

The exclusions listed above are provided for purposes of clarification, and are not intended to, in any way, limit or eliminate other possible exclusions.

NO OTHER WARRANTIES

Unless otherwise explicitly agreed in writing, and signed by a Chlorinators officer, it is understood that this is the only written warranty given by Chlorinators for the systems and components stated.

The dealers or representatives of Chlorinators. may not make verbal representations that add, modify or change the written warranties contained herein or change the extent and nature of Chlorinators liability. In no event shall Chlorinators be liable for direct, consequential, special, incidental or punitive damages of any kind with respect to the product, including but not limited to those which may allegedly arise out of breach of warranty, breach of contract, negligence, strict liability, or any other law, governmental regulation, or court decision, except as provided herein.

CONTENTS

IMPORTANT:
Please mail or fax this registration form
to establish your warranty.

REGAL Registration Card

REGAL REGISTRATION CARD

IMPORTANT: To further establish your warranty and to enable us to contact you should the need arise, please fill out this card and return it promptly. Please do it now. Thank you.

Chlorinators, Stuart, FL is the only authorized Warranty Repair facility for REGAL VACUUM MONITORS.

PLEASE PRINT, THANK YOU

Vacuum Monitor Serial No.(s)* 1._____ 2._____

*Serial No. located inside unit on the bottom right of circuit board.

Purchased From _____

Your Name _____ Title_____

Organization _____

Mailing Address _____

City _____ State _____ Zip _____

Phone (_____) _____ Ext. _____

DRAWINGS

Drawing No. 1
Wiring Diagram

Drawing No. 2
Enclosure Mounting

Drawing No. 3
Typical Installation

Drawing No. 4
Typical Automatic Switchover System Installation

IMPORTANT:
Fill out and mail or fax the form on the reverse side to establish your warranty.

CHLORINATORS
1044 SE Dixie Cutoff Road
Stuart, FL 34994-3436

PLACE STAMP HERE

1.0 BASIC INFORMATION

1.1 SPECIFICATIONS

Input Voltage:	90-265V AC 50-60Hz @ 0.1 Amps
Alarm Relays:	NO/NC Type 240V AC @ 5 Amps resistive 115V AC @ 5 Amps general use 30V DC @ 5 Amps general use
Gas/Fluid Compatibility:	System includes a protection device that uses a chemically inert synthetic oil compatible with chlorine, sulfur dioxide and ammonia gas
Enclosure:	NEMA 4X rated
Vacuum Measurement Range:	0 to 30 inches Hg
Low Alarm Range:	0 to 15 inches Hg
High Alarm Range:	15 to 30 inches Hg
Over Pressure:	85 PSI
Delay Timer:	1 to 100 sec.
Analog Output:	
Voltage:	0 to 3 VDC
Current:	0 to 3 mA DC
Reset Switch:	IP 65 protection
External Connectors:	IP 68 protection
Indicators:	
Vacuum:	3 digit digital LED display
Alarms:	3 LED indicators – high, low and latch
Polarity:	1 LED indicator for pressure
Temperature Range (System):	
Storage:	-30°C to 70°C (4°F to 158°F)
Operating:	-20°C to 50°C (14°F to 122°F)
Vacuum Temperature:	-40°C to 50°C (-6°F to 122°F)
Humidity:	Relative 0 to 90% noncondensing

2.0 INSTALLATION

Installation should only be performed by a licensed electrician. Follow any local, state or other applicable codes that apply when installing this unit.

THIS UNIT SHOULD BE WIRED TO A GROUND FAULT RECEPTACLE.

CAUTION: HIGH VOLTAGE COULD EXIST INSIDE THIS UNIT. DISCONNECT ALL POWER BEFORE INSTALLATION.

2.1 OPENING UNIT

Remove the four plastic screws to open the VAC 2000. The printed circuit board contains static sensitive parts.

THE INSTALLER MUST WEAR A GROUNDING STRAP WHEN HANDLING THE BOARD.

2.2 ENCLOSURE MOUNTING

IMPORTANT: This unit contains two enclosures. The larger one contains the electronics and the smaller one contains the sensor. The two enclosures are permanently connected together by a low voltage wire. The sensor enclosure contains an oil-based protection device that is filled with a special fluid. The protection device has a cap over the 3/8" fitting to prevent the oil from leaking out during shipping and installation.**The sensor enclosure must be mounted in an upright position to prevent the fluid from leaking out.** Once the unit is securely mounted in an upright position, the cap over the 3/8" fitting can be removed.

The recommended mounting method for the VAC 2000 is to use the four mounting holes located where the 4 plastic screws are that hold down the lid. Use the box as a template for mounting. (See Drawing 2).

NOTE: THE VAC 2000 SHOULD NOT BE MOUNTED WHERE SUNLIGHT CAN DIRECTLY ENTER THE TRANSPARENT COVER.

2.3 VACUUM LINE AND RESET BUTTON

Connect the vacuum tubing to the fitting attached to the protection device. The reset button is prewired to the board reset terminals.

2.4 ANALOG OUTPUT

The VAC 2000 has an analog output which will allow the vacuum to be remotely monitored. The connection for this is located in the upper left section of the printed circuit board (See Drawing 1). Two spade lugs are provided for the connection. These are labeled "GND" for ground and "OUT" for the output. The output is capable of sourcing 0 to 3 VDC or 0 to 3 mA. If a 4 to 20 mA loop is required, a signal conditioner can be used to convert the output.These are available from many sources.

2.5 POWER AND ALARM WIRING

CAUTION: BE SURE POWER IS DISCONNECTED BEFORE HANDLING ANY WIRES.

WARNING: Improper wiring to this unit can damage unit and could cause serious bodily injuries.

See Drawing 1 for typical electrical wiring. Connect 115/240V AC to the connector location labeled GND, L1/N, L2.

NOTE: A surge arrestor is recommended on the AC power line to prevent damage from lightning strikes or other power surges.

Be sure the relay specifications are not exceeded. The relay outputs are labeled HIGH ALARM, LOW ALARM and LATCH ALARM. Remember the latch alarm will stay active until the reset button is pushed.

NOTE: NO = Normally open contact
NC = Normally closed contact
COM = Relay common

3.0 SET UP AND CALIBRATION

The VAC 2000 comes preset at the following default levels:
Delay: 50 Sec.
Low Alarm: 5 inches Hg
High Alarm: 25 inches Hg

The following is a procedure for changing these values. See Drawing 1 for the location of the adjustment potentiometers.

CAUTION: HIGH VOLTAGE EXISTS INSIDE THE UNIT.

3.1 DELAY ADJUSTMENTS

The delay time is adjustable from approximately 1 second to 100 seconds. To adjust the delay, insert a small screwdriver into pot R24 and rotate until the desired delay is achieved.

3.2 LOW LEVEL ALARM

The low level alarm is adjustable from approximately 0.0 to 15 inches of Hg. To adjust the low level, insert a screwdriver into pot R19 and rotate it to the desired level. MIN = 0 and MAX = 15 inches of Hg.

NOTE: If you want to disable the low alarm, turn the pot counter clockwise until it stops.

3.3 HIGH LEVEL ALARM

The high level alarm is adjustable from approximately 15 to 30 inches of Hg. To adjust the high level, insert a screwdriver into pot R16 and rotate it to the desired level. MIN = 15 and MAX = 30 inches of Hg

NOTE: If you want to disable the high alarm, turn the pot clockwise until it stops.

3.4 ALTERNATE METHOD FOR ACCURATE HIGH/LOW LEVEL ADJUSTMENT

If a high degree of accuracy is required, then use the procedure in the following example.

EXAMPLE:
Desire a high level alarm at 26.3 inches of Hg.

1. Adjust your vacuum level until the digital readout reaches 26.3.
2. Rotate the high level alarm pot full counterclockwise.
3. Rotate the high level pot clockwise slowly until the high level LED comes on. This represents the correct adjustment for 26.3 inches of Hg.

This method can be used for low level adjustment, except the rotation of the pot is reversed.

3.5 MAINTENANCE AND CALIBRATION

Once the VAC 2000 has been in operation for approximately one week, the unit should be checked for the correct zero reading. This is the reading when no vacuum is present. Ideally, the zero reading would be 00.0. However, due to the ambient temperature or if the vacuum line is attached, some variation is normal. If the zero reading is over 00.7, then an adjustment may be needed. The zero adjustment pot is located in the upper right hand corner of the board (See Fig. 1). Slowly turn this pot to get the zero reading as close to 00.0 as you can without the polarity LED coming on. This will end the zero calibration.

Once a month the system should be functionally tested. This testing should include all relays, LED indicators, delay timer and vacuum level accuracy. To perform this test, adjust your vacuum level up and down to cause the high and low alarms to engage. The delay timer and reset can also be tested in the same manner. At this time, inspect the board for any corrosion or loose wires. If corrosion is present, check all fittings for a snug fit. Corrosion can only be removed by a trained technician. The sensor is made from Stainless Steel and is sealed from any chlorine and the oil protection fluid. The outside of the enclosure can be cleaned with warm water and a damp cloth.

DO NOT ATTEMPT TO CLEAN ANY CORROSION FROM THE BOARD. HIGH VOLTAGE EXISTS ON THE BOARD.

4.0 OPERATION BASICS

4.1 DIGITAL DISPLAY

The three digit display indicates the working vacuum level in inches of Hg. Minimum vacuum equals 00.0 and the maximum vacuum reading, depending on altitude, is approximately 30.0 inches.

4.2 LED INDICATORS

The VAC 2000 has four LED indicators: High, Low, Latch and Polarity. See Drawing 1 for their location.

A) HIGH LED INDICATOR

This LED indicates that the vaacuum level exceeds the pre-set "high alarm" set point.

NOTE: This indicator confirms the existence of a high vacuum condition prior to the activation of the timed delay alarm.

B) LOW LED INDICATOR

This LED indicates that the vaacuum level is below the pre-set "low alarm" set point.

NOTE: This also activates prior to the timed delay alarm.

C) LATCH LED INDICATOR

When either the high or low indicators are active, this starts the delay timer. If the alarm is active longer than the preset delay time, the latch LED indicator will activate. It stays active until the manual reset button (See Figure 2) is pushed. This indicator verifies that either an alarm occurred or is still present. If the latch indicator is on and the high/low indicators are off, an alarm condition has occurred, but has been corrected. If the high/low indicators are lighted, the alarm condition still exists.

NOTE: The alarm relays do not become active until the latch alarm indicator is on.

D) POLARITY LED INDICATOR

When this LED is on, this indicates that the VAC 2000 is measuring pressure. The digital display shows this pressure in inches of Hg pressure.

4.3 ALARM RELAYS

The VAC 2000 has three alarm relay outputs. These do not become active until the time on the delayed timer has run out. This causes the latch alarm indicator to become active. The three alarm relays are general purpose and can be used for exterior alarms, load switching or phone monitoring.

NOTE: Do not exceed relay specifications.

A) HIGH ALARM RELAY

This relay becomes active from a high alarm condition only after the time on the delayed timer has run out. This relay remains active as long as the alarm condition exists. Once the alarm condition is corrected, this relay becomes inactive.

B) LOW ALARM RELAY

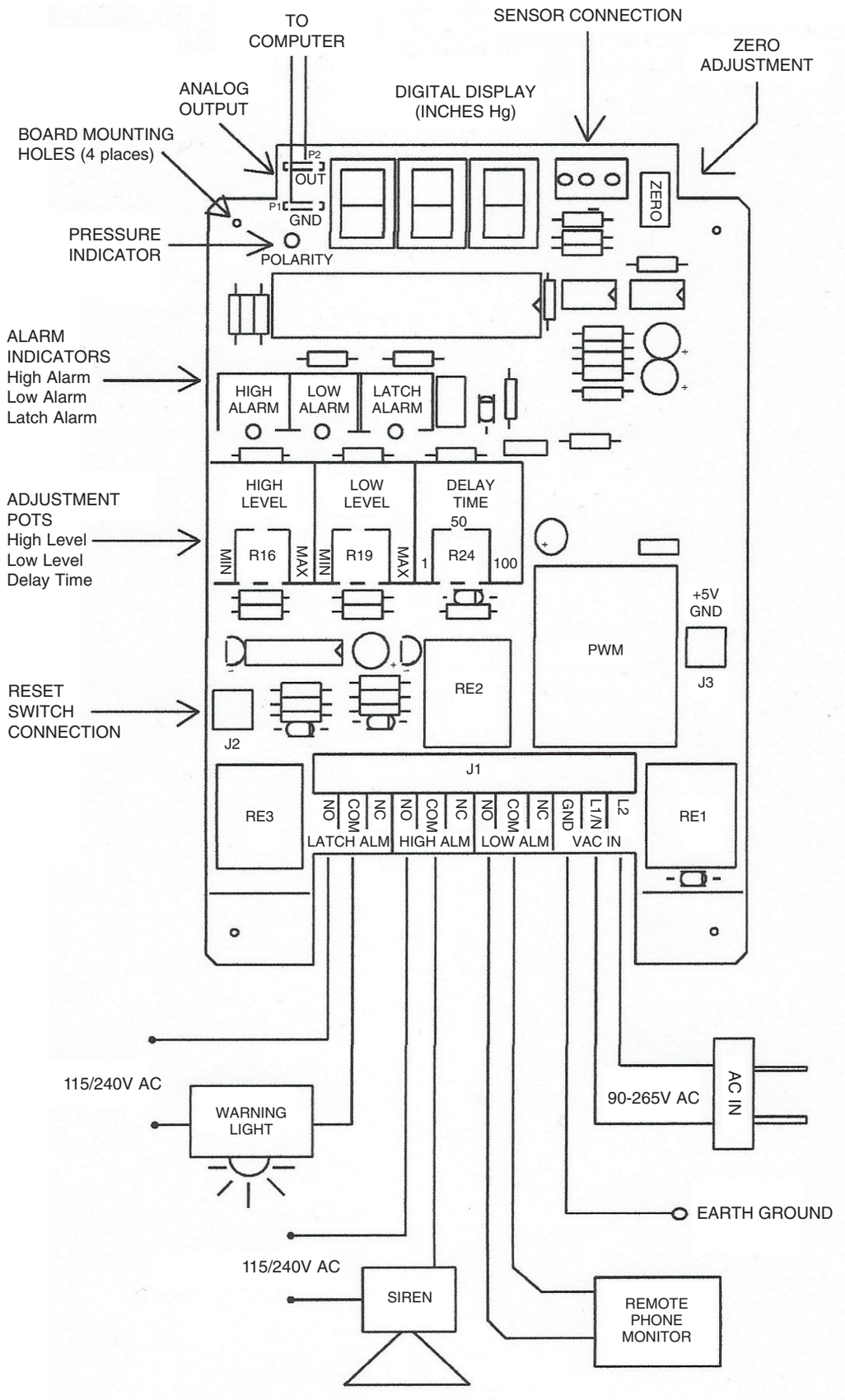
This relay becomes active from a low alarm condition only after the time on the delayed timer has run out. This relay remains active as long as the alarm condition exists. Once the alarm condition is corrected, this relay becomes inactive.

C) LATCH ALARM RELAY

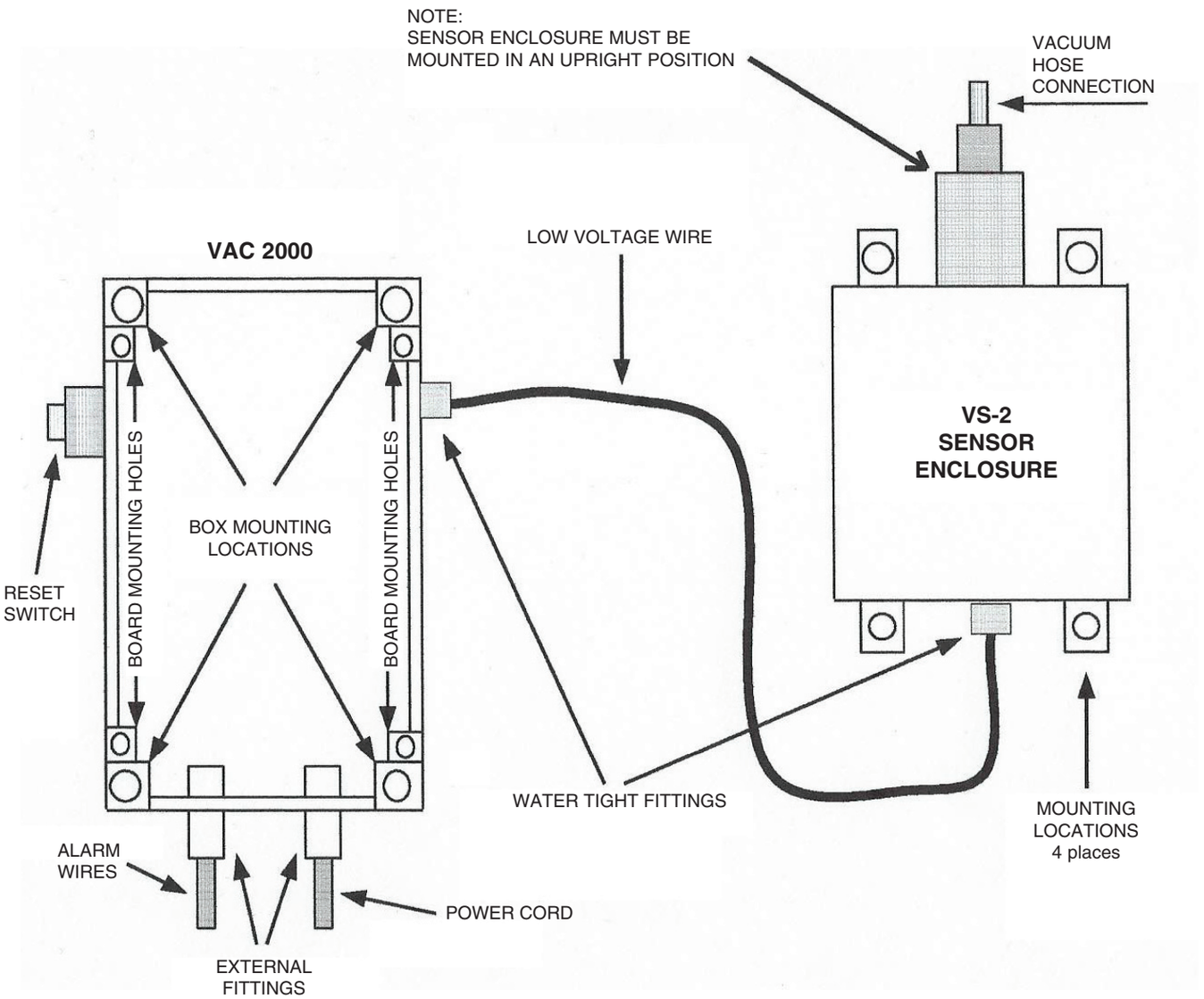
When either the high or low alarm relays become active, the latch alarm relay also becomes active. This is indicated by the latch alarm indicator. This relay stays active until the manual reset button is pushed (See Drawing 2).

NOTE: In some applications, special attention needs to be given to the electrical hookup. If your vacuum source, under normal operation is cycled on and off (as is the case when the vacuum is created only when a well pump is operating), the 115V AC power to the VAC 2000 should be switched on and off with the well pump. This will prevent a low alarm condition when the pump is off.

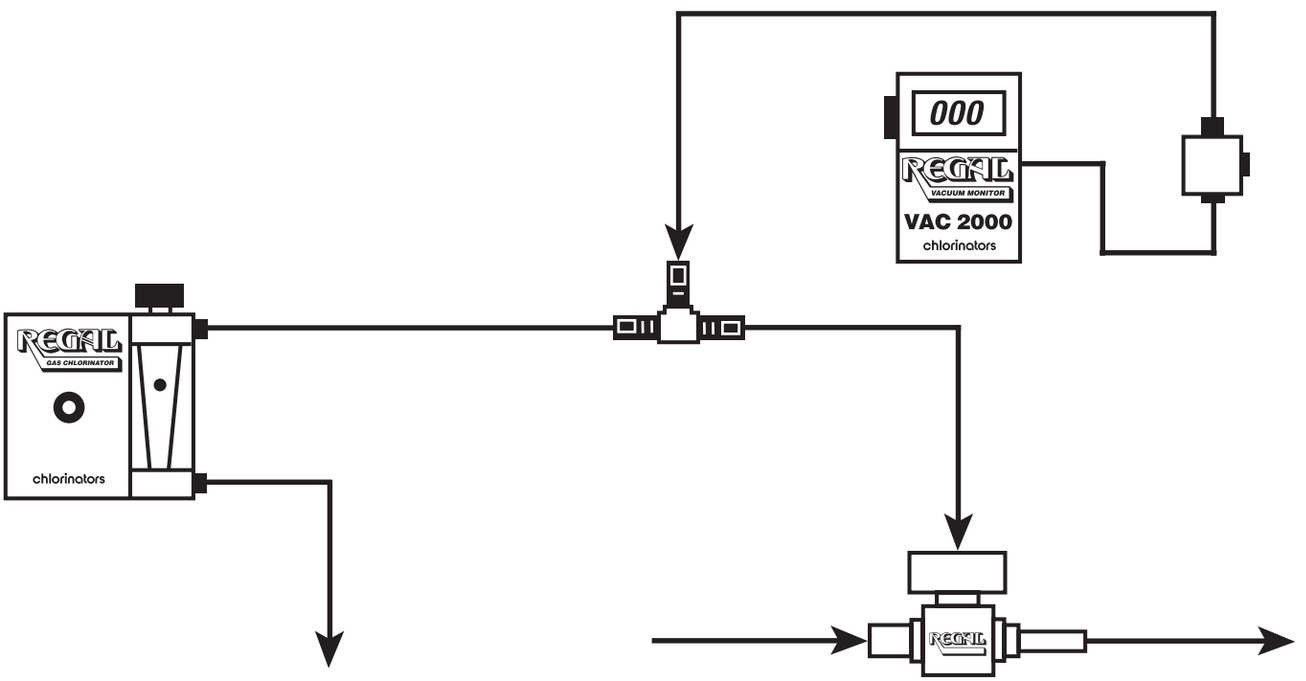
DRAWING NO. 1 - WIRING DIAGRAM



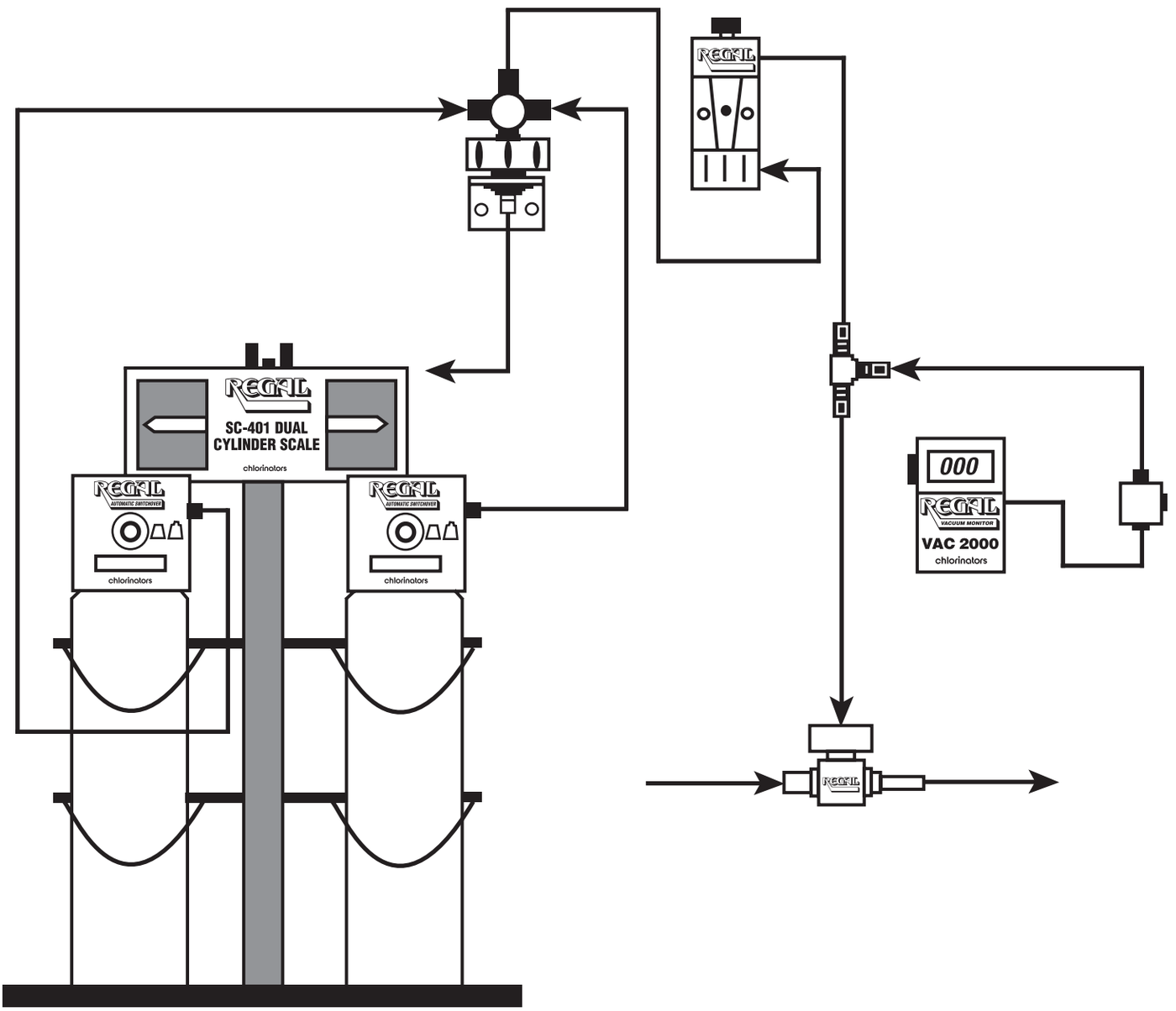
DRAWING NO. 2 - ENCLOSURE MOUNTING



DRAWING NO. 3 - TYPICAL (NON SWITCHOVER) INSTALLATION



DRAWING NO. 4 - TYPICAL AUTOMATIC SWITCHOVER SYSTEM INSTALLATION



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