LAKEWOOD INSTRUMENTS
MODEL 2450

MICROPROCESSOR-BASED
REVERSE OSMOSIS MONITOR

INSTALLATION & OPERATION MANUAL

SERIAL #: _____________

Lakewood Instruments
7838 North Faulkner Road, Milwaukee, Wisconsin 53224 USA
Phone (800) 228-0839 • Fax (414) 355-3508
http://www.lakewoodinstruments.com
CAUTION: CHEMICAL FEED

All electromechanical devices are subject to failure from a variety of causes. These include mechanical stress, component degradation, electromagnetic fields, mishandling, improper setup, physical abuse, chemical abuse, improper installation, improper power feeds and exposure.

While every precaution is taken to insure proper functioning, extra precautions should be taken to limit the ability of over-feeding by limiting chemical quantities available, secondary shut-downs, alarms and redundancy or other available methods.

CAUTION: POWER SOURCE AND WIRING

Low voltage wiring and high voltage (110 plus) should not be run in the same conduit. Always run separately. Even shielded low voltage is not a guarantee of isolation.

Every precaution should be taken to insure proper grounding and elimination of shorting or Electromagnetic field (EMF) interference.
Lakewood Instruments

We thank you for your selection and purchase of a Lakewood Instruments product.

With proper care and maintenance, this device should give you many years of trouble-free service. Please take the time to read and understand this Installation and Operation Manual, paying special attention to the sections on OPERATION and MAINTENANCE.

If, in the future, any parts or repairs are required, we strongly recommend that only original replacement parts be used. Our Customer Service Department is happy to assist you with your parts or service requests.

📞 Lakewood Instruments Customer Service and Technical Support Departments can be reached by calling (800) 228-0839 or faxing (414) 355-3508, Monday through Friday, 7:30 a.m. - 5:00 p.m. CST.

✉️ Mail should be sent to:

Lakewood Instruments
7838 North Faulkner Road
Milwaukee, WI 53224 USA
# Model 2450

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OPERATOR/VIEW LEVEL MENUS

MAINTENANCE AND TECHNICAL SERVICE

- Technical Service/Return Material Procedure
- Parts List and Service Guide
- Troubleshooting

DRAWINGS
INTRODUCTION

The Model 2450 is a monitoring instrument for Reverse Osmosis machines and can be used for pH/ORP control. The unit provides for tracking of pH, ORP, and conductivity as well as flow monitoring. The system allows for alarm set points and can do a system shutdown when safety set points are exceeded. Refer to the Table of Contents to find more information about alarm and display features.

The system can also be set up to communicate with a computer by either a direct RS232 connection or remotely by modem. System operating information such as alarms and measurement readings can be saved to a data log and downloaded to a computer.

Security features allow you to select full access to programming features or to restrict to limited or no access.

LONWORKS Technology

The Model 2450 is a LONWORKS® Technology based Monitor. LONWORKS Technology gives you a high level of flexibility. The Model 2450 is user-friendly with a graphical screen and numeric keypad, accesses multiple inputs, and sets up easily. This Monitor can also be quickly upgraded in the field. It’s a combination of reliability, accuracy, security and simplicity.

- **COMMUNICATION** — Setting and reading the Monitor can be done remotely with the -RS2L computer option. This data link can connect directly to a personal computer (PC) or through a modem and phone line to any modem-equipped PC.

- **SECURITY** — A password system can be established which requires a user password to be able to make changes or do anything more than just read the Monitor readout. An operator password can help ensure that only authorized personnel will operate the system.
INTRODUCTION

Benefits, Features, Specifications

**Figure 1: Model 2450**
Reverse Osmosis Monitor

**FEATURES**
- Uses 2-electrode conductivity sensor with ¾ MNPT process connection
- Uses differential pH sensor with ¾ MNPT process connection. pH input can be configured for ORP sensor.
- Two water meter inputs for Permeate and Concentrate flow rates.
- RS232 output for remote monitoring, control and data acquisition (-RS2L).
- Input for CIP lockout.
- Includes Real Time Clock (-RTC).

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>0-14 pH</td>
</tr>
<tr>
<td>Sensor</td>
<td>± 0.05 pH</td>
</tr>
<tr>
<td>2 or 4-electrode Conductivity pH or ORP</td>
<td>0.01 pH</td>
</tr>
<tr>
<td>Temperature comp.</td>
<td>-1000 to +1000 mV</td>
</tr>
<tr>
<td>None, 500 NTC, 4K NTC</td>
<td>± 5 mV</td>
</tr>
<tr>
<td>Temperature switch</td>
<td>1 mV</td>
</tr>
<tr>
<td>Dry contact</td>
<td>Conductivity Range</td>
</tr>
<tr>
<td>Two, open collector type</td>
<td>0-100 or 0-1000 (with proper sensor)</td>
</tr>
<tr>
<td>Relays 3 Amps @ 120 VAC</td>
<td>Conductivity Accuracy</td>
</tr>
<tr>
<td>4-20 mA Two, isolated w/-35L</td>
<td>±1 or ±10 µS (with proper sensor)</td>
</tr>
<tr>
<td>RS232 Requires Windows based PC w/-RTC-RS2L</td>
<td>Conductivity Resolution</td>
</tr>
<tr>
<td></td>
<td>1 or 10 µS (with proper sensor)</td>
</tr>
<tr>
<td></td>
<td>Adjustable</td>
</tr>
<tr>
<td>Keypad Numeric</td>
<td>Setpoints</td>
</tr>
<tr>
<td>Display Illuminated 128x64 pixel LCD</td>
<td>Direct or Reverse (configurable in the field)</td>
</tr>
<tr>
<td>Ambient Temperature 32-158°F (0-70°C)</td>
<td>Enclosure ABS Plastic</td>
</tr>
</tbody>
</table>

**BENEFITS**
The Model 2450 uses LONWORKS® Technology that is the latest in microprocessor capability, giving the user the highest level of application flexibility. A large illuminated graphics screen, multiple inputs and very easy setup with easy field upgrade characterize this new technology. Water meters and sensors are purchased separately.

- System run timer
- 5 Count down timers
  - Lubrication interval
  - Check CIP
  - Check Filters
  - Check Membranes
  - Check Sensor
- Four relays have user-selectable options:
  - pH/ORP setpoint;
  - conductivity setpoint;
  - temperature setpoint
  - permeate flow setpoint;
  - concentrate flow setpoint;
  - percent recovery setpoint;
  - various alarms.
- 4-20 mA output for (-35L, select any four):
  - pH/ORP
  - conductivity
  - temperature
  - concentrate flow
  - permeate flow
  - percent recovery
2450 LONWORKS Technology-based Reverse Osmosis Monitor.

MONITOR OPTIONS (select no more than two, two -35L may be purchased)
-35L Two 4-20 mA outputs (two -35L cards may be used for up to 4 outputs).
-RS2L Communications node with the LRWS program.

SENSOR OPTIONS
1104593 pH High Purity sensor, ¼ inch NPT flow cell
520-4-7I-10-STD pH sensor 0-14 pH, ¼ inch NPT
530-4-7I-10 ORP sensor, ¼ inch NPT
540K0.1-4-10I-10-TC 500 Conductivity Sensor 0-10 µS, ¾ inch NPT
540K.1-4-10I-10-TC 500 Conductivity Sensor 0-100 µS, ¾ inch NPT
543-L-4-8I-10-STD Conductivity Sensor 0-1000 µS, 1 inch NPT
543-M-4-8I-10-STD Conductivity Sensor 500-100,000 µS, 1 inch NPT

AUTOTROL TURBINE WATER METER OPTIONS
1TM-NPT 1 inch turbine water meter with brass pipe thread adapters.
1TM-ESW 1 inch turbine water meter with PVC solvent weld adapters.
2TM-NPT 2 inch turbine water meter with brass pipe thread adapters.
2TM-ESW 2 inch turbine water meter with PVC solvent weld adapters.
49C25 25 ft cable for turbine meters.
49C50 50 ft cable for turbine meters.

SOFTWARE AND EXTERNAL MODEM OPTIONS
LRWS Windows-based registered software for computer to communicate with 2000 Series Controllers.
MD4X High-Baud modem in NEMA-4 enclosure ready to power.
MD High-Baud modem for use with 2000 Series Controllers.
**INTRODUCTION**

**Front Panel Description**

**LCD**
A large, 128x64 pixel graphic display makes it easy to read the menu-driven program.

**Figure 3: Model 2450 Front Panel with Display**

**ENCLOSURE**
A sturdy enclosure protects your Monitor. Make sure it is properly mounted (See: INSTALLATION; Mounting). The weatherproof enclosure provides NEMA protection. The Monitor does not have outlets or a power cord and must be hardwired through ½ inch conduit knockouts.

**16-BUTTON KEYPAD**
- **ENT** = for Menu selection and/or acceptance of selected values.
- **CLR** = to exit a Menu selection and/or skip input options.
- **PRO** = to program a Menu selection.

**LOCK SCREW**
The lock screw keeps your circuit boards secure and provides easy access for wiring and setup. Simply turn the lock screw and pull open the front panel.
INSTALLATION

Checking

Inspect the shipping carton for obvious external damage. Note on the carrier's bill-of-lading the extent of the damage, if any, and notify the carrier. Save the shipping carton until your Model 2450 Monitor is started up.

✅ If shipping damage has occurred, call the Customer Service Department for Lakewood Instruments at (800) 228-0839 and return the Monitor to the factory in the original carton.

Mounting

Model 2450 Monitors are typically panel-mounted, but they can be mounted on a FLAT, NON-VIBRATING wall.

Outline and Dimensions

INSTALLATION NOTES:

- Install on smooth surface to prevent stress on mounting feet.
- Do not install on vibrating wall.
- If enclosure is installed in corrosive environments, consider purging.
- Dimensions indicated as inches (millimeters).
- Material: Body—PVC; Bevel—ABS.
- Use either #6 or #10 mounting screws (4).

Figure 4: Model 2450 Enclosure Dimensions
Plumbing

If you have questions or need assistance, call the Customer Service Department for Lakewood Instruments (800) 228-0839, or fax (414) 355-3508, Monday-Friday, and 7:30 a.m. - 5:00 p.m. CST.

pH/ORP Probe Installation

The pH/ORP sensor should be mounted vertically with the glass bulb facing down. It may be mounted at an angle as long as it is no more than 75° from the vertical position (see DWG #04258 in the back of this manual). Due to the bubble position, however, the preferred mounting angle is no more than 45° from vertical.

**WARNING:** THE SENSOR MUST ALSO BE MOUNTED IN A LOCATION SO THAT IT IS ALWAYS WET. IF IS LOCATED IN A PIPE OR TANK WITH VARIABLE FLUID LEVELS, IT IS IMPORTANT THAT THE SENSOR IS INSTALLED WHERE IT CAN REMAIN WET. FAILURE TO DO SO WILL DAMAGE THE SENSOR.

Conductivity Probe Installation

The Conductivity sensor may be mounted in any position as long as water is always in contact when measuring process water. Avoid connections in “dead leg” sections of pipe. An air pocket around the electrode tips will cause erroneous readings. The sensor electrodes should be in direct contact with the process flow (see DWG #04259 in the back of this manual).

Write your other plumbing installation notes here:
Wiring

The Model 2450 Monitor is equipped with a terminal block inside and three (3) conduit locations at the bottom of the enclosure. It has internal relays suitable for motor loads up to 1/6 horsepower.

If you need more current capacity, contact the Customer Service Department for Lakewood Instruments and order the HR box with 25-Amp rated interposing relays.

Make sure the circuit is not operative while connections are being made. Double-check for proper grounding. DO NOT install sensor wires in the same conduit with 115/230 VAC or power wiring. Doing so is not safe and results in inaccurate control. It is usually a violation of electrical codes as well.

The Model 2450 Monitor can operate on a wide range of AC voltage without need for internal changes. The circuit breaker in the power circuit to the Monitor should be sized to handle the combination of all the loads connected to the Monitor. The Model 2450 by itself will use less than 1 Amp of current. If 230 VAC is used, be sure the motorized valve and other controlled devices are also rated at 230 VAC.

Install conduit and fittings in the knockouts provided in the bottom of the enclosure. Access the power terminals by opening the cover and loosening the lock screw on the left side of the panel. Be sure to connect the green ground wire to the TA lug #1 (also marked "EARTH GROUND") on the grounding plate. The white neutral wire goes to TA#2 or TA#3 (both also marked "NEUTRAL").

Power wiring and signal wiring (low voltage) such as sensor wires MUST NOT occupy the same conduit. Connect low-voltage wiring according to DWG #69506. It is also recommended that you install seal-off compound in the conduit fitting at the Monitor end of the sensor conduit and a small vent hole to the outside to protect the Monitor from damage in the instance of sensor damage and leakage.

WARNING: DO NOT PLUG IN CHEMICAL PUMPS THAT ARE LARGER THAN 1/6 HORSEPOWER. THE CONTROL RELAYS ARE INTENDED FOR ELECTRONIC OR SMALL MOTOR-DRIVEN CHEMICAL PUMPS. LARGER PUMPS REQUIRE THE -HR OPTION WITH 25-AMP-RATED INTERPOSING RELAYS. CONTACT THE CUSTOMER SERVICE DEPARTMENT FOR LAKEWOOD INSTRUMENTS FOR SPECIAL INSTRUCTIONS.

Write your wiring installation notes here:
Check the Operation

After installation is completed, follow these instructions:

- Make sure the Monitor has power and is operating.

You will notice the Monitor will display:

```
SERIES 2000
REVERSE OSMOSIS
MONITOR

PRESS ANY KEY
```

This indicates that power has been applied to the Monitor and no one has touched the keypad. This will also happen anytime there is a power outage and power has been returned to the Monitor.

- Press any key on the keypad and you will see the Display Process Screen on the screen.
- Press CLR on the keypad and you will see the Main Menu on the screen.
- Use the ↑ and ↓ arrow keys to move through the menu.

Reinitialization

It is suggested that you reinitialize the Monitor before programming in your own numbers. This will wipe out any random settings which may be in the Monitor. To do so, follow these instructions:

- After you have practiced moving up and down in the Main Menu, press 6 or highlight SYSTEM SETUP and press ENT.
- Press 2 or highlight INITIALIZATION and press ENT.
- Press 2 or highlight WHOLE MONITOR and press ENT. A warning will appear on the screen, advising you that "this option requires re-calibration and re-programming!" Press 1 to proceed, 2 to cancel.
SETUP AND CALIBRATION

Set Up Conductivity Preamp Settings & Temperature Compensation

Prior to testing your Monitor, set up the internal conductivity preamp for the sensor you are using. If you purchased a sensor with your Monitor, the preamp will already be set up by the factory and you can proceed directly to testing (next page). If you change the sensor used and do not verify the preamp set up for your attached sensor, the conductivity readings may be erroneous. Set up the preamp by following these instructions:

- From the **SYSTEM SETUP** menu, Press 1 or highlight **PROCESS PARAMETERS** and press **ENT**. The **WHICH PROCESS?** menu will be displayed.
- Press 2 or highlight **COND** and press **ENT**. The **CONDUCTIVITY** menu will be displayed.
- Press 2 or highlight **PREAMP SETUP** and press **ENT**. The **COND PREAMP SETUP** menu will be displayed, showing the current voltage gain, sample resistor, and drive frequency values. Use the ▲ and ▼ arrow keys to change each displayed value to the one appropriate for your sensor (see table below). Press **ENT** when each correct value has been entered and displayed.
- You will automatically be returned to the **CONDUCTIVITY** menu. Press 3 or highlight **CELL CONSTANT** and press **ENT**.
- Use the numeric keypad to enter the appropriate cell constant for your sensor (see table below). Press **ENT** when the correct value is displayed.
- After pressing **ENT**, you will be returned to the **CONDUCTIVITY** menu. Press **CLR** to return to the **WHICH PROCESS?** menu.
- Press 3 or highlight **TEMP** and press **ENT**. The **TEMPERATURE** menu will be displayed.
- Press 2 or highlight **TEMP COMPENSATION** and press **ENT**. The **TEMP COMPENSATION** menu will be displayed.
- Press the option number or highlight the correct value for your sensor and press **ENT**. The new stored value will be displayed, along with the message “PRESS ANY KEY”. Press any key to confirm this value.
- Finally, press **CLR** three times to return to the **MAIN MENU**. Your preamp is now set up for your attached conductivity sensor.

### AMPLIFIER SETTINGS IN THE MODEL 2450

<table>
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<tr>
<th>Sensor</th>
<th>Range (µS)</th>
<th>Gain</th>
<th>Sample Resistor</th>
<th>Drive Freq (Hz)</th>
<th>Temp Comp (NTC)</th>
<th>Cell Const</th>
</tr>
</thead>
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<tr>
<td>540K.01 2 Elec</td>
<td>0-10</td>
<td>10</td>
<td>2000</td>
<td>500</td>
<td>500</td>
<td>0.01</td>
</tr>
<tr>
<td>540K.1 2 Elec</td>
<td>0-10</td>
<td>1</td>
<td>2000</td>
<td>30</td>
<td>500</td>
<td>0.1</td>
</tr>
<tr>
<td>540K.1 2 Elec</td>
<td>0-100</td>
<td>10</td>
<td>2000</td>
<td>500</td>
<td>500</td>
<td>0.1</td>
</tr>
<tr>
<td>543L 4 Elec</td>
<td>0-100</td>
<td>10</td>
<td>200</td>
<td>500</td>
<td>4K</td>
<td>0.03</td>
</tr>
<tr>
<td>543L 4 Elec</td>
<td>0-1,000</td>
<td>10</td>
<td>200</td>
<td>500</td>
<td>4K</td>
<td>0.03</td>
</tr>
<tr>
<td>543M 4 Elec</td>
<td>0-1,000</td>
<td>10</td>
<td>200</td>
<td>500</td>
<td>4K</td>
<td>0.38</td>
</tr>
<tr>
<td>543M 4 Elec</td>
<td>0-2,500</td>
<td>10</td>
<td>20</td>
<td>500</td>
<td>4K</td>
<td>0.38</td>
</tr>
</tbody>
</table>
SETUP AND CALIBRATION

Testing

Continue to test the Monitor's accessories by following these instructions:

- Get back to the MAIN MENU.
- Press 1 or highlight OPERATION and press ENT. There may be a dark flashing line separating the two sections; this indicates which alarms are active at the moment. As shown at the bottom of the screen, press ENT to access the relays.
- The four relays line up vertically with boxes that are blank when the relay is not in operation. Select a relay by pressing its number. The box will change (probably it will become shaded), indicating that the relay has reversed its status from OFF to ON. Each time you press the number, the relay reverses its status.
- NOTE that relays retain manual mode even after powering down.
- Finally, press CLR twice to return to the MAIN MENU.

Calibration

Calibration Methodology

1. You must have an accurate reading of the system water to properly calibrate the Monitor.
   - A properly calibrated hand-held temperature, conductivity, pH, or ORP meter may be acceptable for completing calibrations.
   - NOTE: if at any time you believe that the pH, ORP, conductivity, or temperature calibrations have been improperly performed, you may re-initialize the calibrations and restore them to their default values.
2. Calibrate the temperature first:
   - Measure the temperature of the system water.
   - Press PRO on the keypad, select ZERO.
   - Use the number keys to enter the value, then press ENT.
   - Do not choose SPAN when calibrating temperature.
3. To calibrate the pH/ORP:
   - Measure the pH/ORP of the system water with a hand-held meter.
   - Press PRO on the keypad, select ZERO.
   - Use the number keys to enter the value, then press ENT.
   - Do not choose SPAN when calibrating pH/ORP.
4. To calibrate conductivity:
   - Take a system water sample reading with your hand-held meter.
   - Press PRO on the keypad.
   - Use the number keys to enter the value, then press ENT.
   - When the number is accepted, you will see the SPAN COMPLETE screen before the LCD display switches back to the original OPERATION screen.
5. Take a second sample with and confirm that the readings on the Monitor display are correct.
SETUP AND CALIBRATION

Setpoints (pH/ORP, Conductivity, Temperature, Permeate & Concentrate Flow)

1. Typically, pH/ORP is the only process that will be controlled.
2. Follow these instructions to establish the Monitor's setpoint:
   • From the MAIN MENU, press 2 or highlight RELAYS and press ENT.
   • Press the number of the relay governing the operation you wish to control.
   • Press 2 or highlight SETPOINT CONTROL and press ENT.
   • Select process to control (pH/ORP, conductivity, etc.) by pressing its number.
3. Press 1 to enter SETPOINT values for that relay. Simply use the keypad numbers to enter the proper value and press ENT. When finished, you will automatically be moved down to the next setpoint value.
   a) Enter SETPOINT value
   b) Enter DEADBAND value
   "Deadband" refers to a range above and below the setpoint within which the Monitor will not react. Using a deadband range reduces the chances of erroneous or nuisance relay activity due to temporary fluctuations in monitored levels. It should be a small percentage of the setpoint. Half the deadband amount will automatically be put above the setpoint, and the other half below. For example, a pH setpoint of 7.00 pH units in DIRECT mode, with a deadband of .10 pH units, would result in a system that turns the relay ON at 7.05 and OFF at 6.95 pH. The same setpoint in REVERSE mode would turn the relay ON at 6.95 and OFF at 7.05 pH units.
   c) Enter TIMEOUT value
   d) Maximum 17 hours 59 minutes.
4. Press 2 to enter SETPOINT directions
   a) Press 1 to enable DIRECT control (The relay opens below setpoint, e.g., relay controlling acid injection for pH control. That is, when pH rises above the setpoint, the relay closes and allows injection of more acid.)
   b) Press 2 to enable REVERSE control (The relay opens above setpoint, e.g., relay controlling caustic injection for pH control. That is, when pH falls below the setpoint, the relay closes and allows injection of more caustic.)
5. When finished with all setpoint entries, you can press CLR 3 times to select another relay, or, press CLR 4 times to return to the MAIN MENU.
SETUP AND CALIBRATION

Security Levels

The Model 2450 Monitor is menu-driven for easy use. Once you become familiar with the menu options, it will be easy to perform setup and calibration procedures. This section of the manual provides a comprehensive overview of the entire menu as it can be viewed from each security level. In order to lead off with a complete look at the menu, the levels will be shown in the following order: 3) TECHNICIAN, 2) OPERATOR and 1) VIEW ONLY. Once you review the instructions in this section and learn the menu options, you will be able to perform your own setup and calibration using these examples to guide you through the process. The Model 2450 offers three (3) optional security levels: 1) VIEW ONLY, 2) OPERATOR and 3) TECHNICIAN. A password is required to change from one security level to another. Each level has its own factory-preset password (2222 for TECHNICIAN, 1111 for OPERATOR), but your water treatment engineer can also designate personalized passwords from the TECHNICIAN Level Menu.

NOTE: IF YOU USE PERSONALIZED PASSWORDS, MAKE SURE THEY ARE RECORDED IN A SAFE AND SECURE PLACE.

The following pages illustrate the menu screens available in each security level:
The complete MAIN MENU has seven (7) available options that can be accessed in the TECHNICIAN Level. Use the ↑ and ↓ keys to scroll through the options.

The TECHNICIAN Level allows you to review the entire MAIN MENU. As an introduction, here is a graphic overview of the first level of each option in the MAIN MENU to see how it operates. Complete detail of each option is provided on the following pages.

NOTE: Press CLR to return to a previous screen. Repeated use of CLR allows you to return all the way back to the MAIN MENU from anywhere in the program.
The OPERATION menu allows you to do the following:

1) View current status of a) pH/ORP, b) conductivity, c) concentrate flow and d) permeate flow
2) Use PRO to calibrate the Monitor
3) Use ENT to manually control output relays

Current permeate flow in GPM, LPM or cubic meters/hour.

Current concentrate flow in GPM, LPM or cubic meters/hour.

Current conductivity in µS.

Press CLR to return to a previous screen. Repeated use of CLR allows you to return to the MAIN MENU from anywhere in the program.
This screen shows you the current status of the four relays. Simply press the number of the relay if you want to manually change a relay’s status.

<table>
<thead>
<tr>
<th>Relays</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLY1</td>
<td>MANUAL</td>
</tr>
<tr>
<td>RLY2</td>
<td></td>
</tr>
<tr>
<td>RLY3</td>
<td></td>
</tr>
<tr>
<td>RLY4</td>
<td></td>
</tr>
</tbody>
</table>

Press **ENT** to access relays.

**Press CLR to return to the OPERATION menu.**

Press **CLR** to return to a previous screen. Repeated use of **CLR** allows you to return to the MAIN MENU from anywhere in the program.
### TECHNICIAN LEVEL MENUS

**OPERATION**

<table>
<thead>
<tr>
<th>PERM</th>
<th>CONC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>pH</td>
<td>COND</td>
</tr>
<tr>
<td>5.76</td>
<td>90</td>
</tr>
</tbody>
</table>

**RO MACHINE RUN TIME**

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0:00</td>
</tr>
</tbody>
</table>

**TEMP = 25 ºC**

From the main operation screen, press the **↓** or **↑** keys to scroll through these other screens:

<table>
<thead>
<tr>
<th>PERM</th>
<th>CONC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**COND %REC**

<table>
<thead>
<tr>
<th>COND</th>
<th>%REC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0 %</td>
</tr>
</tbody>
</table>

**µS 89**

**PERM 0 GPM**

**pH 5.58**

**FEED 0 GPM**

TOTAL PERM=

<table>
<thead>
<tr>
<th>TOTAL PERM=</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

TOTAL FEED=

<table>
<thead>
<tr>
<th>TOTAL FEED=</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

RLY1 RLY2 RLY3 RLY4

28 AUG ‘96

14:09:07

*Press CLR to return to a previous screen. Repeated use of CLR allows you to return to the MAIN MENU from anywhere in the program.*
Press ENT or 2 to view RELAYS

Pressing 1 will disable the relay chosen.

**SETPOINT OPTIONS**

1 SETPOINT VALUES
2 SETPOINT DIRECTION

**RELAY OPTIONS**

1 DISABLED
2 SETPOINT CONTROL
3 MIN PER DURATION
4 ALARM RELAY
5 CHANGE MY NAME
6 CIP LOCKOUT

**WHICH RELAY?**

1 RLY1
2 RLY2
3 RLY3
4 RLY4

**SETPOINT DIRECTION**

1 DIRECT
2 reverse

Pressing either 1 or 2 will switch the setpoint direction to DIRECT or REVERSE.

**SETPOINT OPTIONS**

1 SETPOINT VALUES
2 SETPOINT DIRECTION

**RELAY OPTIONS**

1 DISABLED
2 SETPOINT CONTROL
3 MIN PER DURATION
4 ALARM RELAY
5 CHANGE MY NAME
6 CIP LOCKOUT

**WHICH ALARMS?**

1 pH: HIGH ALARM
2 pH: LOW ALARM
3 COND: HIGH ALARM
4 TEMP: HIGH ALARM
5 PERM: HIGH ALARM
6 PERM: LOW ALARM
7 FEED: HIGH ALARM
8 FEED: LOW ALARM
9 % REC: HIGH ALARM
10 LUBRICATION INTERN
11 CHECK CIP
12 CHECK FILTERS
13 CHECK MEMBRANES
14 CHECK SENSOR
15 COND: FOULED SENSOR
16 SHORTED TC
17 OPEN TC
18 pH : HI REF IMPED
19 pH: BROKEN GLASS
20 pH: HI REF VOLT
21 pH: LOW REF VOLT
22 CIP SWITCH CLOSED
23 RLY 1: TIME EXC
24 RLY 2: TIME EXC
25 RLY 3 : TIME EXC
26 RLY 4: TIME EXC

Use the ↑ and ↓ keys to scroll through the menu. Press ENT to toggle alarms.

Use the ↑ and ↓ keys to scroll through letters. Press ENT to accept the letter.

**TIMEOUT**

0:00
MAX: 17 HOURS 59 MINS

**OLD NAME**

RLY1

**NEW NAME**

RLY1

**WHICH INPUT DEVICE?**

1 pH
2 COND
3 TEMP
4 PERM
5 CONC
6 FEED
7 % REC

Repeated use of CLR allows you to return to the MAIN MENU from anywhere in the program.
TECHNICIAN LEVEL MENUS

ALARMS

MAIN MENU
-------------
1 OPERATION
2 RELAYS
3 ALARMS
4 FLOW METERS
5 4-20 MA OUTPUTS
6 SYSTEM SETUP
7 CLOCK

Press ENT or 3 to view ALARMS

1—pH/ORP

HIGH ALARM= 10.00 pH
LOW ALARM= 4.00 pH
PRO: “+/-” ENT: ACCEPT

2—COND

HIGH ALARM= 4000 µS
PRO: “+/-” ENT: ACCEPT

3—TEMP

HIGH ALARM= 99 °C
PRO: “+/-” ENT: ACCEPT

WHICH INPUT DEVICE?
-------------
1 pH
2 COND
3 TEMP
4 PERM
5 CONC
6 FEED
7 % REC

4—PERM

HIGH ALARM= 5000 GPM
LOW ALARM= 10 GPM
PRO: “+/-” ENT: ACCEPT

6—FEED

HIGH ALARM= 5000 GPM
LOW ALARM= 10 GPM
PRO: “+/-” ENT: ACCEPT

Concentrate does not have high/low alarms associated with it.

7—% REC

HIGH ALARM= 100%
PRO: “+/-” ENT: ACCEPT

Pressing ENT to accept from any of these secondary menus will return you to the WHICH INPUT DEVICE menu.

Pressing CLR to return to a previous screen. Repeated use of CLR allows you to return to the MAIN MENU from anywhere in the program.
Press ENT or 4 to view FLOW METERS

1—DATA INDUSTRIAL

PERM SLOPE VALUE (K) = 0.0000
OFFSET = 0.0000
PRO: “+/−”
ENT: ACCEPT

PERM SLOPE VALUE (K) = 0.0000
RESET TOTAL COUNT?
1 YES
2 NO

2—SIGNET

PERM K-FACTOR = 00.00
PRO: “+/−”
ENT: ACCEPT

PERM K-FACTOR = 000.000
RESET TOTAL COUNT?
1 YES
2 NO

3—AUTOTROL TURB 1IN.

GALLONS OR LITERS

1 GALLONS
2 LITERS

PERM

AUTOTROL TURB 1IN.
RESET TOTAL COUNT?
1 YES
2 NO

4—AUTOTROL TURB 2IN.

GALLONS OR LITERS

1 GALLONS
2 LITERS

PERM

AUTOTROL TURB 2IN.
RESET TOTAL COUNT?
1 YES
2 NO

5—CHANGE NAME

OLD NAME= PERM
NEW NAME= PERM
<UP><DOWN> ENT: ACCEPT

NOTE: There may be other options available for these water meters. Call an Application Engineer for more details.

Press CLR to return to a previous screen. Repeated use of CLR allows you to return to the MAIN MENU from anywhere in the program.
The Monitor will output what it thinks 4 MA is.

Measure the actual output, key in the value and then press ENT.

The Monitor will output what it thinks 20 MA is.

Measure the actual output, key in the value and then press ENT.

Press CLR to return to a previous screen. Repeated use of CLR allows you to return to the MAIN MENU from anywhere in the program.
OLD NAME= pH
NEW NAME= pH
<UP><DOWN> ENT:ACCEPT

OLD NAME= COND
NEW NAME= COND
<UP><DOWN> ENT:ACCEPT

pH

CHANGE TO ORP

1 YES
2 NO

FORCE THE PROCESS INTO STAND-BY MODE?

1 YES
2 NO

STAND-BY VALUE = 7.00 pH

Press CLR to return to a previous screen. Repeated use of CLR allows you to return to the MAIN MENU from anywhere in the program.

After selecting YES, all references to “pH” will be replaced by “ORP”. This same sequence will change ORP back to pH.
TECHNICIAN LEVEL MENUS

SYSTEM SETUP

MAIN MENU

1  OPERATION
2  RELAYS
3  ALARMS
4  FLOW METERS
5  4-20 MA OUTPUTS
6  SYSTEM SETUP
7  CLOCK

SYSTEM SETUP

1  PROCESS PARAMETERS
2  INITIALIZATION
3  SECURITY
4  SOFTWARE VERSIONS
5  TIMERS
6  DIAGNOSTICS
7  COMMUNICATIONS

INITIALIZATION

1  CALIBRATIONS
2  WHOLE MONITOR

SELECT OPTION #2
Initialize the Monitor.

Initialization resets control functions back to the factory default values.
The three levels of initialization are as follows:
1) Calibrations—simply resets the process calibrations.
2) Process Parameters
3) Whole Monitor—resets all of the control functions.
If you initialize, all previously programmed settings will be lost and you
must go through the proper setup procedures for the areas initialized.

WARNING:
THIS OPTION REQUIRES
RE-CALIBRATION AND
RE-PROGRAMMING!
PROCEED?
1  YES
2  NO

Press CLR to return to a previous screen.
Repeated use of CLR allows you to return to the
MAIN MENU from anywhere in the program.
SELECT OPTION #3  
Change the security password.

A password is assigned for each security level at the factory. For security reasons, you may desire to routinely change the passwords for the OPERATOR and TECHNICIAN Level Menus.

To change a password, select the security level you want to change (i.e., TECHNICIAN), then enter the old password. If the old password is correct, you are asked to assign a new 4-key password.

NOTE: Changing the operator password does not put the Monitor into OPERATOR mode. You will need to return the Monitor back into OPERATOR mode for operator use.

SELECT OPTION #4  
View the software version information.

This option is primarily for use when troubleshooting the Model 2450. The Technical Service Representative for Lakewood Instruments will need to know this information in order to properly diagnose your Monitor.

SELECT OPTION #5  
View raw A/D values.

This option allows you to view the raw A/D values and may be useful when troubleshooting.
SELECT OPTION #6
Communications Port Setup and Password.

Your Monitor must have the RSL option and the LWREMOTE software package installed to allow for remote communications. Please see the LWREMOTE manual for more information on remote communications.

REMOTE PASSWORD
To change a password, enter the old remote password. If the old password is correct, you are asked to assign a new 8-key remote password. Type it again to verify your entry is correct. Keep a confidential log of the password for future reference.

COM PORT SETUP
The COM PORT parameter that you need to configure is BAUD RATE. The other fields are fixed and displayed for reference only. Use the arrow keys to select the desired baud rate, then press ENT.

Press CLR to return to a previous screen. Repeated use of CLR allows you to return to the MAIN MENU from anywhere in the program.
Press **ENT** or **7** to view CLOCK.

Use the ▲ and ▼ keys to set the day of the week. Then press **ENT** to move to the next display. Use the keypad numbers to set the correct calendar date. Press **ENT** to accept the entered value and to move to the next setting.

The clock will start counting time after you move through the entire selection and press **ENT** the last time.

Press **CLR** to return to a previous screen. Repeated use of **CLR** allows you to return to the **MAIN MENU** from anywhere in the program.
In order to change the security level (i.e., from **TECHNICIAN** down to **OPERATOR**, or from **OPERATOR** to **View-Only**), go to the **Main Menu**.

**MAIN MENU**

1. OPERATION  
2. RELAYS  
3. ALARMS  
4. FLOW METERS  
5. 4-20 MA OUTPUTS  
6. SYSTEM SETUP  
7. CLOCK

Press 0 on the keypad. Note that 0 does not appear on the menu screen, only on the keypad.

**SET SECURITY LEVEL**

1. VIEW ONLY  
2. OPERATOR

Select the new security level.

**CHANGE LEVEL TO OPERATOR**

WARNING: YOU SHOULD KNOW THE PASSWORD  
1. YES  
2. NO

Select YES to change the security level.

**OPERATOR**

PRESS ANY KEY

The Monitor menu now functions at the new security level.  To increase the security level, go into the **OPERATION** screen:

<table>
<thead>
<tr>
<th>PERM</th>
<th>CONC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

[ALARMS FLASHING]

<table>
<thead>
<tr>
<th>pH</th>
<th>COND</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.76</td>
<td>90</td>
</tr>
</tbody>
</table>

PRO: CALIB; ENT=RELAYS

Enter the 4-digit security code that goes with the desired security level. The **TECHNICIAN** and **OPERATOR** levels have different security codes. Following the first power-up, the **OPERATOR** code is 1111. Following the first power-up, the **TECHNICIAN** code is 2222. You may change the passwords in the **SYSTEM SETUP** menu.
The OPERATOR Level Menu allows you limited access to the MANUAL RELAYS and CALIBRATION options. In OPERATION, you can view the current conductivity or TDS level, any alarms and various status lines. You can also perform a calibration as shown below:

Current reading of RO process water conductivity level.

This line allows you to view one of six different status lines. To select the status to view, use the ↑ and ↓ keys to move through the list.

To perform a calibration, have your water treatment specialist tell you the value you should enter (based on your water sample reading). Press ENT after you have keyed in the proper number. The calibration procedure is described in the TECHNICIAN Level Menu pages of this book.

Press CLR to return to a previous screen. Repeated use of CLR allows you to return to the MAIN MENU from anywhere in the program.
Technical Support for Lakewood Instruments can be reached by calling (800) 228-0839 or faxing (414) 355-3508, Monday through Friday, and 7:30 a.m. - 5:00 p.m. CST.

NOTE: IF YOU CALL FOR TROUBLESHOOTING HELP, PLEASE MAKE SURE THAT THE MODEL NUMBER, SERIAL NUMBERS AND ANY INFORMATION ABOUT OPTIONS ARE ALL READILY AVAILABLE FOR REFERENCE.

Mail and returns should be sent to:

Lakewood Instruments
7838 North Faulkner Road
Milwaukee, WI 53224 USA

When any merchandise is to be returned to the factory, please call and obtain a Return Goods Authorization (RGA) number and have the following information available:

- Customer’s name, address, telephone and fax numbers (shipping and billing).
- A hard copy purchase order number for cases where repairs or parts are required that are not under warranty.
- A contact person’s name and telephone number to call if the equipment is beyond repair or to discuss any other warranty matter.
- Equipment model and serial numbers.
- Reason for return, e.g., repair, warranty, incorrect part, etc.

We will then fax to your attention an RGA form that must accompany the returned item.

NOTE: THE RGA NUMBER MUST BE CLEARLY WRITTEN ON THE OUTSIDE OF THE PACKAGE(S) BEING RETURNED.

ANY ITEMS SENT BACK TO THE FACTORY WITHOUT AN RGA NUMBER WILL BE REFUSED AND RETURNED TO SENDER
When calling about Lakewood Instruments products, please have the Monitor’s complete model number and serial number available, together with the software version and the software revision so that the Technician can better assist you.

Refer to the Ordering Information in the Introduction to this manual for item part numbers and their descriptions.

Write your Monitor’s complete model number, serial number, software version and software revision here so that you will have them available if you wish to contact a Lakewood Instruments technician.

Model Number:

Serial Number:

Software Version:

Software Revision:
## Troubleshooting

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>WHAT THIS MEANS</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
</table>
| Conductivity Calibration Error message: “SENSOR READING HIGHER THAN EXPECTED.” | The Monitor is being told the conductivity is 50% more than it thinks it is by default. | 1. Is the Monitor being calibrated to TDS when configured for conductivity?  
2. Verify that the sensor tip has no accumulated solids and has not bridged to piping (creating a short).  
3. Clean tip. |
| Conductivity Calibration Error message: “SENSOR READING LOWER THAN EXPECTED.” | The Monitor is being told the conductivity is 50% less than it thinks it is by default. | 1. Is the sensor fouled?  
2. Are all valves open?  
3. Clean or replace sensor. |
| Conductivity drifts or changes after calibration. | Calibration may have been done before the reading stabilized.  
The sample line may contain electrical noise. | 1. When calibrating, wait at least 15 seconds to 1½ minutes for reading to stabilize.  
2. To reduce electrical noise, use grounded metal fittings on the inlet and outlet of the Monitor plumbing. |
| Water meters not accumulating. | Check the manufacturer’s user manual for that particular water meter. | 1. There may be a wiring problem.  
2. The K factor is improperly configured.  
3. If using a turbine meter, verify that turbine is actually spinning. |
| “NODE NOT RESPONDING” error message. | This message occurs when one circuit board in the Monitor cannot communicate with another board. | 1. Check that all boards are mounted correctly and that all connectors are fully mated.  
2. The Monitor may not have the option board that is trying to be accessed.  
3. The board that is trying to be accessed may not be working. |
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>WHAT THIS MEANS</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
</table>
| Display is blank. | Open the front panel. Look at the yellow LED’s on the rear power board. Are they on? | 1. If LED’s are on, check ribbon cable. Is it properly seated?  
2. If LED’s are not on, does the unit have power? |
| pH reading is off by more than 1 pH unit. | Probe calibrated using span, or the pH probe is bad. | 1. Re-initialize calibration.  
2. Recalibrate pH using zero only.  
3. Replace pH sensor. |
| mV reading is off by more than 100 mV. | ORP Probe might be inaccurate. | 1. Re-initialize calibration.  
2. Recalibrate zero, span, or both.  
3. Replace ORP sensor. |
| Relays don’t turn ON/OFF during normal operation. | Relays may be affected by other software variables. | 1. Is the relay manually turned on or off?  
2. Is the CIP input activated?  
3. You must have permeate or concentrate flow for a relay configured as setpoint to function. |
| Chemical pump will not feed chemical. | Pumping may be affected by other software variables. | 1. Is the pump manually turned on or off?  
2. Is the CIP input activated?  
3. You must have permeate or concentrate flow for a relay configured as setpoint to function and trigger pump operation. |
| Chemical pump feed reverse of what you expected. | Relay setpoint not properly configured. | Determine whether you need the relay configured for direct or reverse setpoint feed. |
| **[ALARM FLASHING]** “RLY1:TIME EXCEEDED” “RLY2:TIME EXCEEDED” “RLY3:TIME EXCEEDED” “RLY4:TIME EXCEEDED” | The relay was not able to control the pH/ORP setpoint within the programmed over-feed time. The relay is locked out until the alarm goes away. | 1. Reprogram the over-feed time via “RELAYS/SETPOINT”.  
2. Determine why the chemical feed is failing to control the solution pH/ORP.  
3. To reset the alarm, temporarily stop permeate and concentrate flow. |
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>WHAT THIS MEANS</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“pH :HIGH ALARM”</td>
<td>The pH/ORP has exceeded the user-programmed high alarm value.</td>
<td>See “ALARMS” in Main Menu.</td>
</tr>
<tr>
<td>“ORP :HIGH ALARM”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“pH :LOW ALARM”</td>
<td>The pH/ORP has exceeded the user-programmed low alarm value.</td>
<td>See “ALARMS” in Main Menu.</td>
</tr>
<tr>
<td>“ORP :LOW ALARM”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“COND:HIGH ALARM”</td>
<td>The conductivity has exceeded the user-programmed high alarm value.</td>
<td>See “ALARMS” in Main Menu.</td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“TEMP:HIGH ALARM”</td>
<td>The temperature has exceeded the user-programmed high alarm value.</td>
<td>See “ALARMS” in Main Menu.</td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“PERM:HIGH ALARM”</td>
<td>The permeate flow rate has exceeded the user-programmed high alarm value.</td>
<td>See “ALARMS” in Main Menu.</td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“PERM:LOW ALARM”</td>
<td>The permeate flow rate has exceeded the user-programmed low alarm value.</td>
<td>See “ALARMS” in Main Menu.</td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“FEED:HIGH ALARM”</td>
<td>The feed water flow rate has exceeded the user-programmed high alarm value.</td>
<td>See “ALARMS” in Main Menu.</td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“FEED:LOW ALARM”</td>
<td>The feed water flow rate has exceeded the user-programmed low alarm value.</td>
<td>See “ALARMS” in Main Menu.</td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“%REC:HIGH ALARM”</td>
<td>The percent recovery has exceeded the user-programmed high alarm value.</td>
<td>See “ALARMS” in Main Menu.</td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“LUBRICATION INTERVAL”</td>
<td>The lubrication interval timer has expired.</td>
<td>See “SYSTEM SETUP/TIMERS” to reset the timer.</td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“CHECK CIP”</td>
<td>The Check CIP interval timer has expired.</td>
<td>See “SYSTEM SETUP/TIMERS” to reset the timer.</td>
</tr>
<tr>
<td>{ALARM FLASHING}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“CHECK FILTERS”</td>
<td>The Check Filters interval timer has expired.</td>
<td>See “SYSTEM SETUP/TIMERS” to reset the timer.</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>WHAT THIS MEANS</td>
<td>CORRECTIVE ACTION</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>{ALARM FLASHING} “CHECK MEMBRANES”</td>
<td>The Check Membranes interval timer has expired.</td>
<td>See “SYSTEM SETUP/TIMERS” to reset the timer.</td>
</tr>
<tr>
<td>{ALARM FLASHING} “CHECK SENSOR”</td>
<td>The Check Sensor interval timer has expired.</td>
<td>See “SYSTEM SETUP/TIMERS” to reset the timer.</td>
</tr>
<tr>
<td>{ALARM FLASHING} “COND:FOULED SENSOR”</td>
<td>The conductivity sensor has become fouled.</td>
<td>Check cable, sensor, and wiring.</td>
</tr>
<tr>
<td>{ALARM FLASHING} “SHORTED TC”</td>
<td>The temperature compensation input is shorted.</td>
<td>Check cable, sensor, and wiring.</td>
</tr>
<tr>
<td>{ALARM FLASHING} “OPENED TC”</td>
<td>The temperature compensation input is opened.</td>
<td>Check cable, sensor, and wiring.</td>
</tr>
</tbody>
</table>
| {ALARM FLASHING} “pH :HI REF IMPEDANCE“ or “ORP :HI REF IMPEDANCE“ | 1. A high reference impedance exists in the pH/ORP sensor.  
2. A wire may be broken in the sensor.  
3. KCl solution in the sensor may be leaking (pH only). | 1. Replace pH/ORP Sensor.  
2. Sensor must be grounded. |
| {ALARM FLASHING} “pH :BROKEN GLASS” | The pH sensor glass may be broken.                     | 1. Check glass bulb on the pH sensor.                  
2. Replace sensor if necessary. |
| {ALARM FLASHING} “pH :HIGH REF VOLTAGE“ or “ORP :HIGH REF VOLTAGE“ | High reference voltage exists in the pH/ORP sensor. | Check sensor wiring.                                 |
| {ALARM FLASHING} “CIP SWITCH CLOSED” | 1. The Clean-in-Place switch input condition has become asserted.  
2. Relays are locked out. | None, unless the input is wired incorrectly.           |
NOTES: UNLESS OTHERWISE SPECIFIED:

2. RED & BLACK T.C. WIRES FROM THE 520 SENSOR ARE NOT USED ON THE MODEL 2450.

REV
A  RELEASE
B  ADDED GREEN WIRE
C  REVISED, ADDED VIEW
D  ADDED ORP TEXT
E  ADDED NOTE 2

REV
A  1121  EV  8/25/97
B  1279  BZ  9/12/97  JGB
C  1513  EV  12/13/97  JGB
D  1735  EV  7/8/98  JGB
E  1875  BZ  2/29/98

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NOTES: UNLESS OTHERWISE SPECIFIED:

⚠️ 2450: CANNOT BE USED WITH CONTACTING HEAD METER.
⚠️ 2450: METER 1 IS PERMEATE, METER 2 IS CONCENTRATE.
⚠️ CUSTOMER SUPPLIED, 10K RESISTOR (PULL-UP).
⚠️ ONLY OPEN COLLECTOR OUTPUT WATER METERS MAY BE USED.

CONTACTING HEAD TYPE WATER METER

WATER METER  AUTOTROL TURBINE

BLK (+24VDC)   10 K ⚠️ RESISTOR

RED (SIGNAL)   SHD (GND)

SIGNET
2535/2540 PADDLE WHEEL
NOTES: UNLESS OTHERWISE SPECIFIED;
1. WIRING BY LAKewood.
2. WIRING BY OTHERS.
3. RELAY CONTACTS RATED 3A/250 VAC, 1/6 HP/250 VAC.
DO NOT PLUG RS2L DIRECTLY INTO TELEPHONE LINES

NOTES: UNLESS OTHERWISE SPECIFIED:
- STANDARD FOUR CONDUCTOR TELEPHONE CABLE
- UP TO 50 FEET IN LENGTH MAY BE SUBSTITUTED.

HAYES COMPATIBLE MODEM
25 PIN CONNECTOR SHOWN

DEDICATED TELEPHONE LINE # 2

PERSONAL COMPUTER WITH MODEM

DEDICATED TELEPHONE LINE # 1

PARTS LIST

1 RS2L RS2L COM NODE ASSEMBLED PCB, M-2000
1 66336 CABLE, RJ11, 25 FT.
1 67765 ADAPTER 25 P MALE D TNN TO RJ11 DTE
1 67740 MODEM HAYES COMPATIBLE

INSTALLATION LAYOUT

COMMNODE TO 25P DTE, SER 2000, RS2L
DO NOT PLUG RS2L DIRECTLY INTO TELEPHONE LINES
NOTES: UNLESS OTHERWISE SPECIFIED;

1. LOADS MUST BE LESS THAN 600Ω.

INTERNAL POWER

OPTIONAL EXTERNAL 24 VDC SUPPLY
NOTE: TO ENSURE PROPER FUNCTION, SENSOR TIP MUST BE FULLY IMMERSED WITHIN THE ACTIVE PROCESS STREAM. IF INSTALLED INCORRECTLY, AIR MAY ACCUMULATE AROUND THE SENSOR TIP, OR, LIMITED FLOW AROUND THE SENSOR MAY CAUSE INACCURATE READINGS.