Instruction Manual
PN 51-MCL-56/rev A
March 2012

MCL with 56 Analyzer

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ESSENTIAL INSTRUCTIONS

READ THIS PAGE BEFORE PROCEEDING!

Your purchase from Rosemount Analytical, Inc. has resulted in one of the finest instruments available for your particular application. These instruments have been designed, and tested to meet many national and international standards. Experience indicates that its performance is directly related to the quality of the installation and knowledge of the user in operating and maintaining the instrument. To ensure their continued operation to the design specifications, personnel should read this manual thoroughly before proceeding with installation, commissioning, operation, and maintenance of this instrument. If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

- Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.
- Ensure that you have received the correct model and options from your purchase order. Verify that this manual covers your model and options. If not, call 1-800-854-8257 or 949-757-8500 to request correct manual.
- For clarification of instructions, contact your Rosemount representative.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Use only qualified personnel to install, operate, update, program and maintain the product.
- Educate your personnel in the proper installation, operation, and maintenance of the product.
- Install equipment as specified in the Installation section of this manual. Follow appropriate local and national codes. Only connect the product to electrical and pressure sources specified in this manual.
- Use only factory documented components for repair. Tampering or unauthorized substitution of parts and procedures can affect the performance and cause unsafe operation of your process.
- All equipment doors must be closed and protective covers must be in place unless qualified personnel are performing maintenance.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

⚠WARNING

RISK OF ELECTRICAL SHOCK

⧈ Equipment protected throughout by double insulation.

- Installation of cable connections and servicing of this product require access to shock hazard voltage levels.
- Main power and relay contacts wired to separate power source must be disconnected before servicing.
- Do not operate or energize instrument with case open!
- Signal wiring connected in this box must be rated at least 240 V.
- Non-metallic cable strain reliefs do not provide grounding between conduit connections! Use grounding type bushings and jumper wires.
- Unused cable conduit entries must be securely sealed by non-flammable closures to provide enclosure integrity in compliance with personal safety and environmental protection requirements. Unused conduit openings must be sealed with NEMA 4X or IP65 conduit plugs to maintain the ingress protection rating (NEMA 4X).
- Electrical installation must be in accordance with the National Electrical Code (ANSI/NFPA-70) and/or any other applicable national or local codes.
- Operate only with front and rear panels fastened and in place over terminal area.
- Safety and performance require that this instrument be connected and properly grounded through a three-wire power source.
- Proper relay use and configuration is the responsibility of the user.

⚠CAUTION

This product generates, uses, and can radiate radio frequency energy and thus can cause radio communication interference. Improper installation, or operation, may increase such interference. As temporarily permitted by regulation, this unit has not been tested for compliance within the limits of Class A computing devices, pursuant to Subpart J of Part 15, of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense, will be required to take whatever measures may be required to correct the interference.

⚠WARNING

This product is not intended for use in the light industrial, residential or commercial environments per the instrument's certification to EN50081-2.

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QUICK START GUIDE
FOR MCL-240 ANALYZER

1. Refer to Section 2.0 for installation instructions and Section 3.0 for wiring instructions.
2. Once connections are secure and verified, apply power to the analyzer.
3. When the analyzer is powered up for the first time Quick Start screens appear.
4. The first quick start screen has two control boxes, one for language and the other for temperature units.
    a. The cursor, shown by dark blue backlighting, will be on the language control box. To change the language, press the ENTER/MENU key. A list of available languages, shown two at a time, will appear. Using the up and down keys, scroll (see section 4.2) to display the choices. Press ENTER/MENU to select the desired language. Press the down key to move to the cursor to the temperature control box. To change units, press ENTER/MENU and scroll to either °F or °C. Press ENTER/MENU to store the selection.
    b. To move to the next screen, use the navigation keys to move the cursor to NEXT and press ENTER/MENU.
5. The next screen lists navigation rules. Press ENTER/MENU for the next screen.
6. Choose monochloramine.
7. Choose the desired units.
8. The display will change to show some basic keypad operation guidelines. Press ENTER/MENU to show the main display.

About This Document

This manual contains instructions for installation and operation of the Model MCL-56

The following list provides notes concerning all revisions of this document.

Rev. Level	Date	Notes
A	9/11	This is the initial release of the product manual. The manual has been reformatted to reflect the Emerson documentation style and updated to reflect any changes in the product offering.
B	03/12	Update addresses - mail and web

MCL-56

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SECTION 1.0.
DESCRIPTION AND SPECIFICATIONS

- NO REAGENTS NEEDED
- COMPLETE SYSTEM INCLUDES sensor, connecting cable, analyzer, and flow controller.
- VARIOPOL QUICK-DISCONNECT FITTINGS make replacing sensor easy.
- FEATURE-PACKED ANALYZER: four outputs, four fully-programmable relays, data logger, and large full color display including graphics.

1.1 FEATURES

The MCL monochloramine system is intended for the determination of monochloramine in fresh water.

The MCL uses a membrane-covered amperometric sensor. A polarizing voltage applied to a gold mesh cathode behind the membrane destroys the monochloramine diffusing through the membrane and keeps the concentration of monochloramine in the sensor equal to zero. The current generated by the cathode reaction is proportional to the rate of diffusion of monochloramine through the membrane. Because the concentration of monochloramine in the sensor is zero, the diffusion rate and the current are proportional to the concentration of monochloramine in the sample.

Diffusion rate also depends on membrane permeability, which is a function of temperature. An RTD in the sensor continuously measures the temperature of the sample and the analyzer automatically corrects the raw sensor current for temperature changes.

Maintenance is fast and easy. Replacing a membrane requires no special tools or fixtures. A screw cap holds the pre-tensioned membrane in place. Replacing the electrolyte solution takes only minutes.

The MCL includes the easy-to-use Model 56 analyzer. The analyzer features four fully programmable 4-20 mA outputs and four fully programmable relays. The large, full color display allows the user to read sample pH and chlorine concentration at a glance. A data logger, graphical display, and HART digital communications are standard.

Valves, rotameters, and pressure regulators to control sample flow are things of the past with the MCL. A constant head overflow sampler ensures the correct sample flow to each sensor. To eliminate wiring hassles, quick-disconnect Variopol cable is standard.

Stable monochloramine standards do not exist. The monochloramine sensor must be calibrated using the results of a laboratory test run on a grab sample.

1.2 SPECIFICATIONS — GENERAL

Sample requirements:

Pressure: 3 to 65 psig (122 to 549 kPa abs). Inlet check valve opens at 3 psig (122 kPa abs). If the check valve is removed, minimum pressure is 1 psig (108 kpa abs).

Temperature: 32 to 122°F (0 to 50°)

Flow: 3-80 gal/hr (11-303 L/hr)

Sample Conductivity: >10 µS/cm at 25°C

Process connection: ¼-in OD tubing compression fitting (can be removed and replaced with barbed fitting for soft tubing).

Drain connection: ¾-in barbed fitting. Sample must drain to open atmosphere.

Wetted parts: acrylic, nylon, polycarbonate, polyester, Kynar(1), silicone, Noryl(2), Viton(3), silicone, and Zitex(4), PTFE, (gold mesh cathode - not normally wetted)

Response time to step change in monochloramine concentration: <60 sec to 95% of final reading for inlet sample flow of 17 gph (64 L/hr).

Weight/shipping weight: 10 lb/13 lb (4.5 kg/6.0 kg)

[rounded to the nearest 1 lb. (0.5 kg)]

1.3 SPECIFICATIONS — SENSOR

Range: 0 to 6 ppm as Cl_2. For higher ranges, consult the factory.

pH range: Signal is practically independent of pH between pH 7.0 and 10.0. Sensor current at pH 10.0 is within 5% of sensor current at pH 7.0.

Accuracy: Accuracy depends on the accuracy of the chemical test used to calibrate the sensor.

Linearity: 2% (typ.)

Interferences: free chlorine and other oxidizing agents

Electrolyte volume: 25 mL (approx.)

Electrolyte life: 2 months (approx.)

1.4 SPECIFICATIONS — ANALYZER

Case: Polycarbonate

Display: Full color LCD, 3.75 x 2.20 in. (95 x 56 mm); display can be customized by the user.

Languages: English, French, German, Italian, Spanish, Portuguese, Chinese, Russian, and Polish.

Ambient Temperature and Humidity: 14 to 140°F (-10 to 60°C); RH 5 to 95% (non-condensing). Between 23 and 131°F (-5 to 55°C) there is no visible degradation in display response or performance.

Storage temperature: -4 to 140°F (-20 to 60°C)

Power: 85 to 265 VAC, 47.5 to 65.0 Hz, 20 W

RFI/EMI: EN-61326

LVD: EN-6101-01

CE

Outputs: Four 4-20 or 0-20 mA isolated current outputs; assignable to measurement or temperature; fully scalable; maximum load 550 Ω. HART digital signal is superimposed on output 1.

Alarms and Timers: Four relays, fully configurable as a setpoint alarm, interval timer, TPC, bleed and feed timer, delay timer, date and time timer, and fault alarm.

Relays: Form C, SPDT, epoxy sealed.

Relay Contact ratings:

5 A at 28 VDC or 300 VAC (resistive)
1/8 HP at 120/240 VAC

Control features: PID control (analog output) and time proportional control or TPC (relays) are standard.

Data logger: Data automatically stored every 30 seconds for 30 days; older data removed to make room for new data. The following data are automatically stored:
Chlorine: date and time, ppm, temperature, raw sensor current
pH: date and time, pH, temperature, mV, glass impedance, and reference impedance (if available)

Event logger: Stores up to 300 events with data and time stamp: faults, warnings, calibration data, calibration results (pass or fail), power on/off cycles, and hold on/off. Alarm relay activation and deactivation can also be stored. Older events are automatically removed to make room for new events.

Data and event downloading: through USB port on front panel.

Graphical display: Dual graphical display shows measurement data on the y-axis and time on the x-axis. Y-axis is fully assignable and scalable. X-axis can be set to one hour, one day, seven days, or 30 days.

Digital communications: HART digital communications is standard.

1 *Kynar is a registered trademark of Elf Atochem North America.*
2 *Noryl is a registered trademark of General Electric.*
3 *Viton is a registered trademark of E.I. duPont de Nemours & Co.*
4 *Teflon is a registered trademark of E.I. duPont de Nemours & Co.*

1.5 ORDERING INFORMATION

MCL Monochloramine Measuring System. The MCL is a complete system for the determination of monochloramine in water. It consists of the sensor, analyzer, Variopol cable, and constant head overflow cup to control sample flow. All components are mounted on a backplate, and the cable is pre-wired to the analyzer. Three replacement membranes and a 4-oz. bottle of electrolyte solution are shipped with the sensor.

MODEL	DESCRIPTION
MCL-240	Monochloramine Measuring System

MCL-240 EXAMPLE

COMPONENT PARTS

ANALYZER MODEL	DESCRIPTION
56-03-24-38-HT	56 analyzer, single input (monochloramine), 85-265 VAC, 47.5/65.0 Hz

SENSOR MODEL	DESCRIPTION
499ACL-03-54-VP	Monochloramine sensor with Variopol connector

SENSOR CABLE	DESCRIPTION
23747-04	Interconnecting cable, Variopol for 499ACL sensor, 4 ft

ACCESSORIES

PART #	DESCRIPTION
9240048-00	Tag, stainless steel (specify marking)

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SECTION 2.0. INSTALLATION

2.1 UNPACKING AND INSPECTION

Inspect the shipping container. If it is damaged, contact the shipper immediately for instructions. Save the box. If there is no apparent damage, unpack the container. Be sure all items shown on the packing list are present. If items are missing, notify Rosemount Analytical immediately.

2.1.1 MCL-240

Model MCL-240 consists of the following items mounted on a back plate.

1. Model 56-03-24-38-HT analyzer with sensor cable attached.
2. Constant head flow controller with flow cell for monochloramine sensor.

The monochloramine sensor (Model 499ACL-03-54-VP), three membrane assemblies, and a bottle of electrolyte solution are in a separate package.

2.2 INSTALLATION

2.2.1 General Information

1. Although the system is suitable for outdoor use, do not install it in direct sunlight or in areas of extreme temperature.

> **⚠CAUTION**
>
> The MCL monochloramine analyzer is NOT suitable for use in hazardous areas.

2. To keep the analyzer enclosure watertight, install plugs (provided) in the unused cable openings.
3. Install the system in an area where vibrations and electromagnetic and radio frequency interference are minimized or absent.
4. Be sure there is easy access to the analyzer and sensors.

2.2.2 Sample Requirements

Be sure the sample meets the following requirements:

1. Temperature: 32 to 122ºF (0 to 50ºC)
2. Pressure: 3 to 65 psig (122 to 549 kPa abs)
3. Minimum flow: 3 gal/hr (11 L/hr)

2.2.3 Mounting, Inlet, and Drain Connections

The MCL is intended for wall mounting only. Refer to Figure 2-1 for details. The sensor screws into the flow cell adapters as shown in the figure.

A 1/4-inch OD tubing compression fitting is provided for the sample inlet. If desired, the compression fitting can be removed and replaced with a barbed fitting. The fitting screws into a 1/4-inch FNPT check valve. The check valve prevents the flow cells from going dry if sample flow is lost.

The sample drains through a 3/4-inch barbed fitting. Attach a piece of soft tubing to the fitting and allow the waste to drain open atmosphere. Do not restrict the drain line.

Adjust the sample flow until the water level is even with the central overflow tube and excess water is flowing down the tube.

2.2.4 Electrical Connections

Refer to Section 3.1 for details.

2.2.5 Installing the Sensor(s)

The MCL is provided with sensor cables pre-wired to the analyzer. The terminal end of the sensor is keyed to ensure proper mating with the cable receptacle. Once the key has slid into the mating slot, tighten the connection by turning the knurled ring clockwise.

The sensor screws into the plastic fitting, which is held in the flow cell by the union nut. Do not remove the protective cap on the sensor until ready to put the sensor in service.

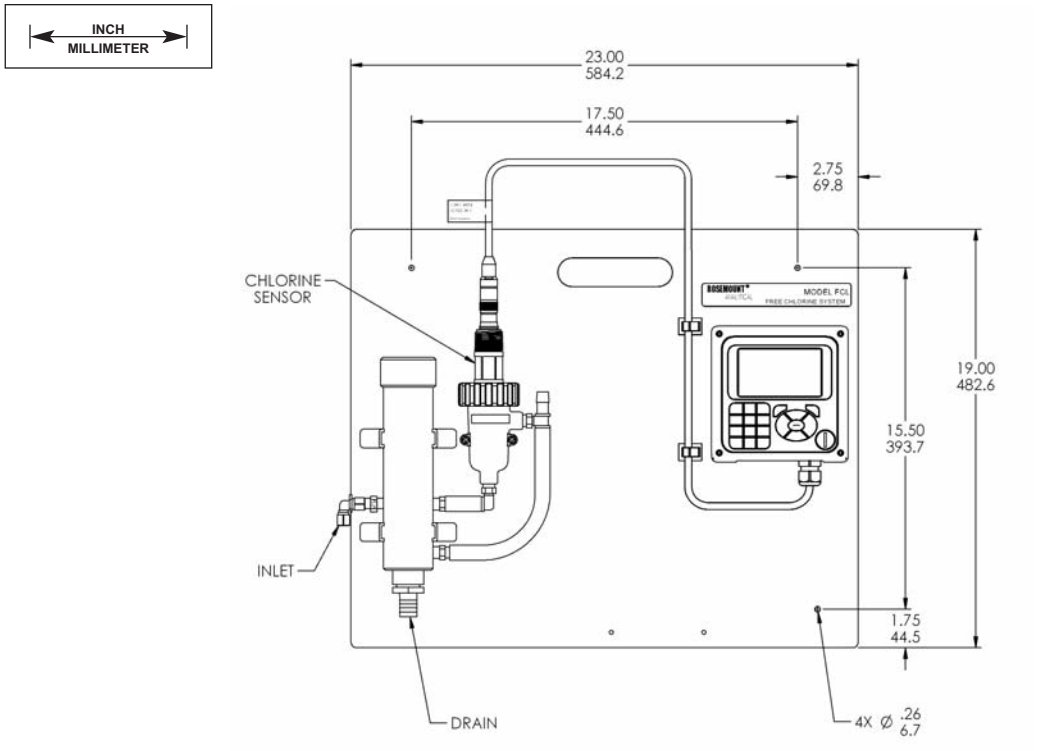

FIGURE 2-1. MCL

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SECTION 3.0.
WIRING

3.1 POWER, ALARM, AND OUTPUT WIRING

⚠WARNING

RISK OF ELECTRICAL SHOCK

Electrical installation must be in accordance with the National Electrical Code (ANSI/NFPA-70) and/or any other applicable national or local codes.

3.1.1 Power

Wire AC mains power to the power supply board, which is mounted on the left hand side of the enclosure beneath the gray plastic cover. To remove the cover, grab it by the upper edges and pull straight out. The power connector is at the bottom of the board. See Figure 3-2. Bring the power cable through the conduit opening just below the connector. Unplug the connector from the board and wire the power cable to it. Lead connections are marked on the connector. (L is live or hot; N is neutral; the ground connection has the standard symbol.)

Replace the cover. The two tabs on the back edge of the cover fit into slots at the rear of the enclosure, and the three small slots in the front of the cover snap into the three tabs next to the relay terminal strip. See Figure 3-2. Once the tabs are lined up, push the cover to snap it in place.

AC power wiring should be 14 gauge or greater. Run the power wiring through the conduit opening nearest the power terminal. Provide a switch or breaker to disconnect the analyzer from the main power supply. Install the switch or breaker near the analyzer and label it as the disconnecting device for the analyzer.

3.1.2 Analog output wiring

Four analog current outputs are located on the main circuit board, which is attached to the inside of the enclosure door. Figure 3-1 shows the location of the terminals, the outputs they are assigned to, and the polarity.

For best EMI/RFI protection, use shielded output signal cable enclosed in earth-grounded metal conduit.

Keep output signal wiring separate from power wiring. Do not run signal and power or relay wiring in the same conduit or close together in a cable tray.

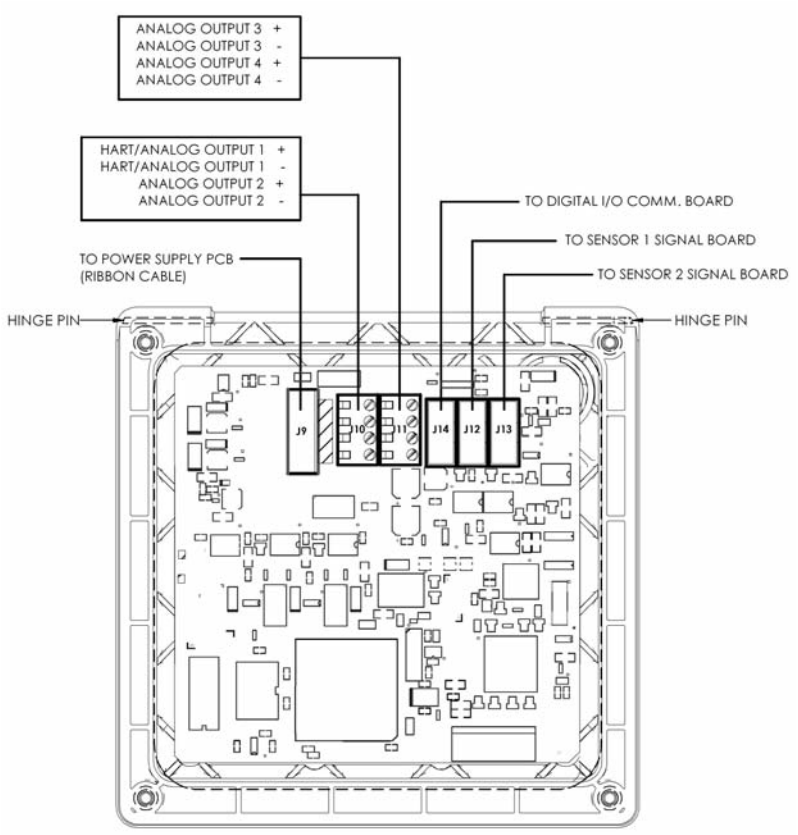

FIGURE 3-1. Analog output connections.
The analog outputs are on the main board near the hinged end of the enclosure door.

TITLE	WIRING DIAGRAM MAIN BOARD, 1056	
B SIZE	DWG NO 40005603	REV A

3.1.3 Alarm wiring.

⚠WARNING

Exposure to some chemicals may degrade the sealing properties used in the following devices: Zettler Relays (K1-K4) PN AZ8-1CH12DSEA

The alarm relay terminal strip is located on the power supply board, which is mounted on the left hand side of the enclosure beneath the gray plastic cover. To remove the cover, grab it by the upper edges and pull straight out. The relay terminal strip is at the top of the board. See Figure 3-2. Bring the relay wires through the rear conduit opening on the left hand side of the enclosure and make connections to the terminal strip.

Replace the cover. The two tabs on the back edge of the cover fit into slots at the rear of the enclosure, and the three small slots in the front of the cover snap into the three tabs next to the relay terminal strip. See Figure 3-2. Once the tabs are lined up, push the cover to snap it in place.

Keep alarm relay wiring separate from signal wiring. Do not run signal and power or relay wiring in the same conduit or close together in a cable tray.

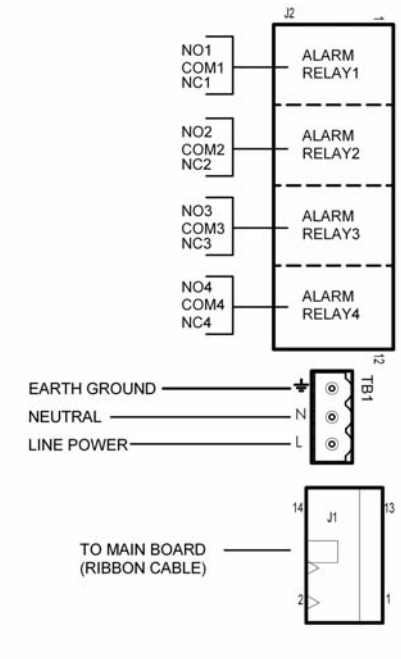

FIGURE 3-2. Alarm relay connections.

POWER AND RELAY WIRING, 56
85-265 VAC POWER SUPPLY
SIZE B | DWG NO 40005607 | REV A

3.2 SENSOR WIRING

The Model MCL is provided with the sensor cable pre-wired to the analyzer. If it is necessary to replace the sensor cable, refer to the instructions below.

1. Shut off power to the analyzer.
2. Loosen the four screws holding the front panel in place and let it drop down.
3. Locate the appropriate signal board.

Slot 1 (left)	Slot 2 (center)
communication	input 1 (chlorine)

4. Loosen the gland fitting and carefully push the sensor cable up through the fitting as you pull the board forward to gain access to the wires and terminal screws. Disconnect the wires and remove the cable.
5. Insert the new cable through the gland and pull the cable through the cable slot.
6. Wire the sensor to the signal board. Refer to the wiring diagram in Figure 3-3.
7. Once the cable has been connected to the board, slide the board fully into the enclosure while taking up the excess cable through the cable gland. Tighten the gland nut to secure the cable and ensure a sealed enclosure.

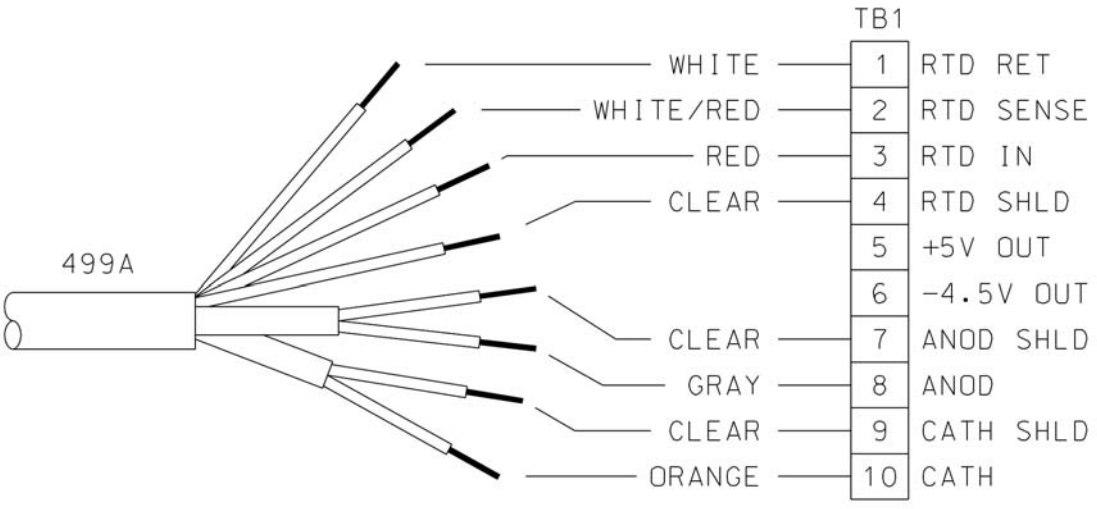

Figure 3-3. Wiring Diagram for Monochloramine Sensor

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SECTION 4.0
DISPLAY AND OPERATION

4.1. MAIN DISPLAY

The analyzer has a four line display. See Figure 4-1. The display can be customized to meet user requirements. See Section 4.5. Fault or warning messages, if appropriate, appear at the bottom of the screen. See Section 11.1.

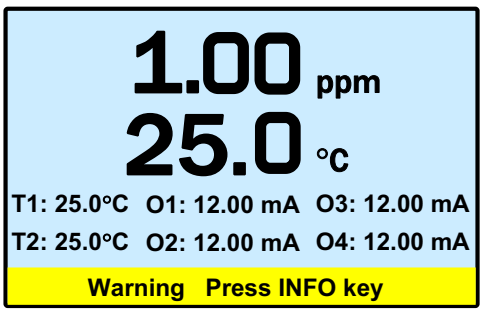


FIGURE 4-1. Main Display

The following abbreviations are used in the lower two lines of the display. The number following the abbreviation refers to the sensor, alarm relay, or output.

O	output
T	temperature (live)
Tm	temperature (manual)
M	measurement
AL	alarm relay

I	sensor current (chlorine)
mV	mV input (pH)
Slp	slope (pH)
R.Z	reference impedance (pH)
Gl.Z	glass impedance (pH)

4.2. KEYPAD

Local communication with the analyzer is through the membrane keypad. See Figure 4-2.

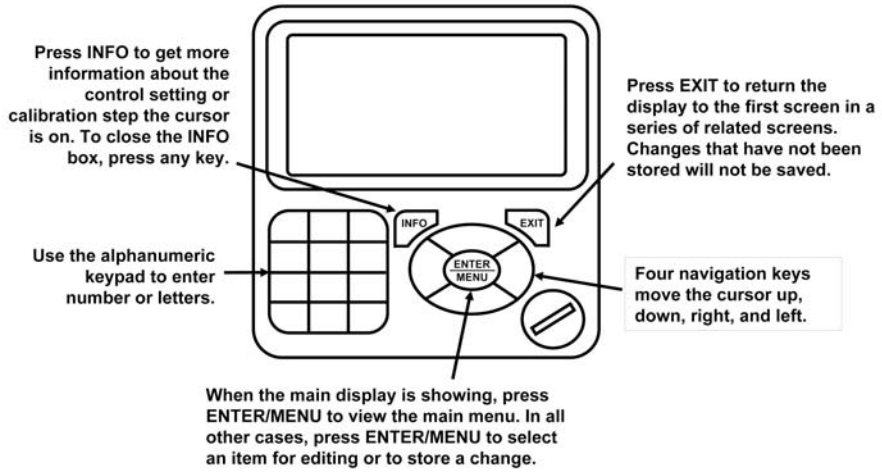
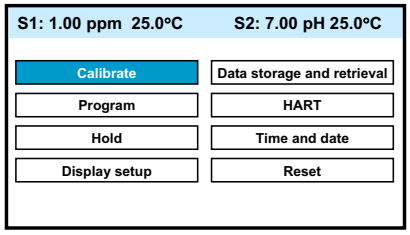


FIGURE 4-2. Analyzer keypad.

4.3 OPERATION

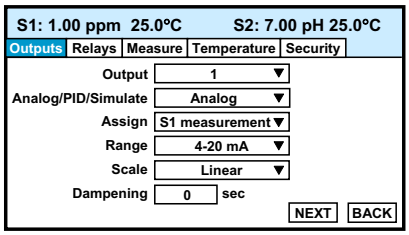
The operation of the Model 56 can best be understood from the following example.



1. With the main display showing (Figure 4-1), press the ENTER/MENU key. The main menu, shown at left, will appear. **Pressing the ENTER/MENU key will bring up the main menu only if the main display is showing.**

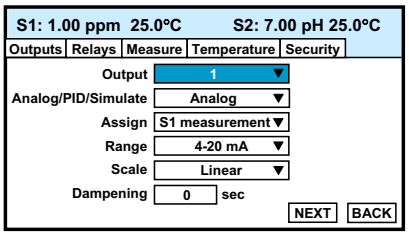
   Note that the current reading and temperature for sensor 1 (S1) and sensor (S2), if applicable, always appear at the top of the screen.

   The cursor (dark blue backlit field) is on the Calibrate button. Press the down key to move the cursor to the Program button.

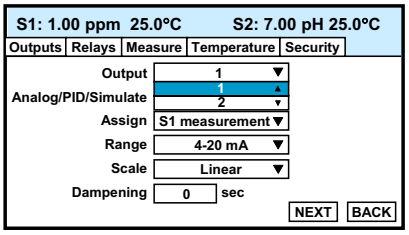


2. Press the ENTER/MENU key. The cursor is on the outputs tab and the first screen in the outputs sub-menu is showing.

   To select a different program submenu use the right key to move the cursor to the desired tab and press ENTER/MENU.

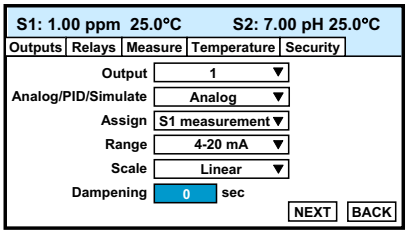


3. To enter the outputs submenu, press the down key. The cursor moves to the first control box, Output. The Model 56 has four analog outputs, and this control lets the user select which output to configure.

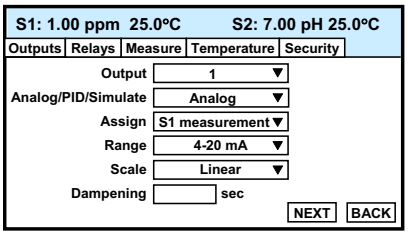


4. The default is output 1. To select a different output, press the ENTER/MENU key. A list of the available outputs, shown **two at a time**, appears. To view the list, press or press and hold the up or down key. To select and store the highlighted selection, press ENTER/MENU.

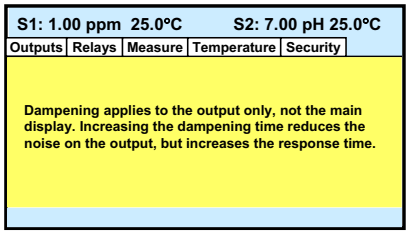
5. To move from one control box to another, press the up or down key.



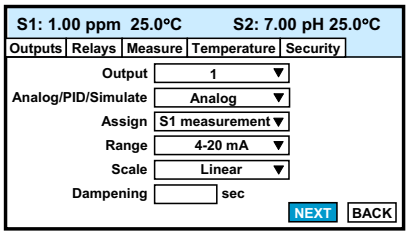
6. Some controls require the user to select an item from a list. Others, like the dampening control, require the user to enter a number. Move the cursor to Dampening at the bottom of the screen.



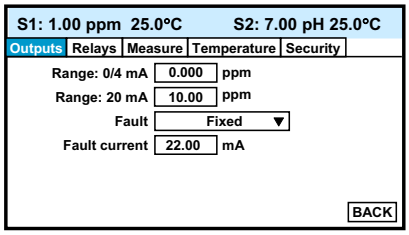
7. The default dampening value is 0 seconds. To change the value, press ENTER/MENU. The dark blue back-lighting will disappear indicating that a number can be entered. Use the numeric keypad to enter the desired number. If you make an error, press the left key to erase the digit last entered. To store the number, press ENTER/MENU.



8. Every control box has an information or help screen associated with it. To view the information screen for the control box the cursor is on, press the INFO key. The information screen for the Dampening control is shown at left. To close the information screen, press any key.



9. A NEXT and BACK button are at the bottom of the screen. The NEXT button means that additional control boxes are available on at least one more screen. To view the next screen, use the navigation keys (either down or right) to move the cursor to NEXT and press ENTER/MENU.



10. The next screen in the Outputs sub-menu appears. The cursor is on the outputs tab. To enter the screen, press the down navigation key.

11. To return to the previous screen, move the cursor to BACK and press ENTER/MENU.

12. To return to the main menu, press EXIT.

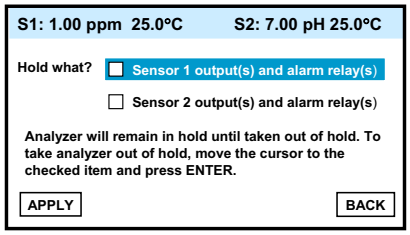
4.4 HOLD

4.4.1 Purpose

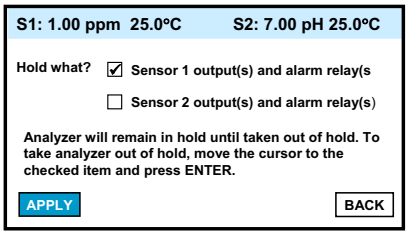
To prevent unwanted alarms and improper operation of control systems or dosing pumps, place the alarm relays and outputs assigned to the sensor in hold before removing the sensor for maintenance. During hold, outputs assigned to the sensor remain at the last value, and alarms assigned to the sensor remain in their present state.

4.4.2 Using the Hold Function.

The hold function uses certain programming features not discussed in Section 4.3.

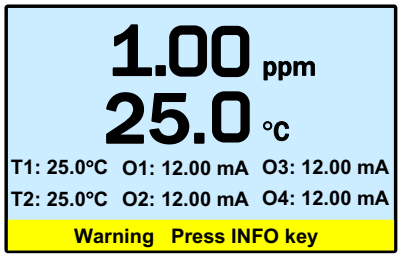


1. With the main display showing, press ENTER/MENU. The main menu will appear. Choose Hold. The screen shown at left appears. The cursor is on the first check box. To hold outputs and relays associated with sensor 1, press ENTER/MENU. A check will appear in the check box. To put sensor 2 (if present) on hold also, move the cursor to the sensor 2 line and press ENTER/MENU to check the sensor 2 hold box.



2. To activate Hold, move the cursor to the APPLY button at the bottom left of the screen and press ENTER/MENU. The selected sensor outputs and alarm relays will remain on hold until taken out of hold. However, if power is lost then restored, hold will automatically be turned off.

3. The screen describes how to take the analyzer out of hold. **Be sure to press APPLY once the box has been unchecked.**

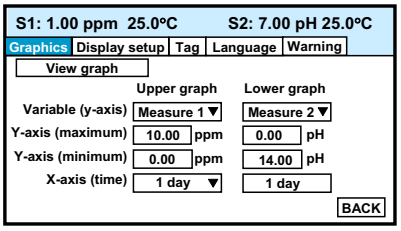


4. A message stating which sensors are in hold will appear in the fault/warning banner at the bottom of the main display.

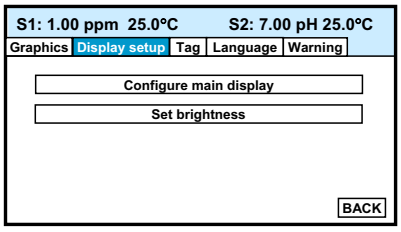
4.5 MAIN DISPLAY

4.5.1 Configuring the main display

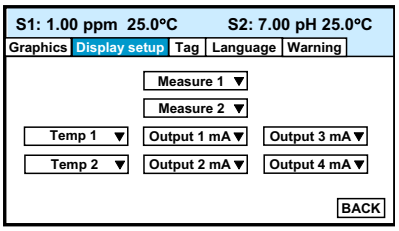
The main display can be configured to meet specific user requirements.



1. With the main display showing, press ENTER/MENU. The main menu will appear. Choose Display Setup. The screen shown at left appears.



2. Move the cursor the Display setup tab and press ENTER/MENU. The screen shown at left appears.



3. Choose Configure main display. The screen at left appears. The position of each control box corresponds to the position of the variable in the main display. Move the cursor to the control box and press ENTER/MENU. Use the up and down keys to scroll through the list of variables and press ENTER/MENU to select the desired variable for display.

4.5.2 Setting brightness

Move the cursor to the Set brightness button in the screen shown in step 2 in Section 4.5.1 and press ENTER/MENU. Then, move the cursor to the Display brightness control and select the desired brightness. The information screen gives recommendations about setting the brightness level especially in areas where the ambient temperature exceeds 121°F (50°C).

4.6 SECURITY

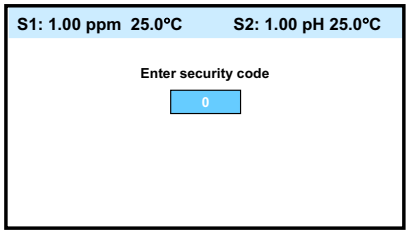
4.6.1 How the Security Code Works

Security codes prevent accidental or unwanted changes to program settings or calibrations. There are three levels of security.

a. A user can view the main display and diagnostic screens only.

b. A user has access to the calibration and hold menus only.

c. A user has access to all menus.



1. If a security code has been programmed, pressing a sub-menu button (See section 4.3) will cause the security screen shown at left to appear.

2. Enter the three digit security code.

3. If the entry is correct, the requested sub-menu will appear and the user has access to all the sub-menus the code entitles him to.

4. If the entry is wrong, the invalid code screen appears.

4.6.1 Assigning Security Codes

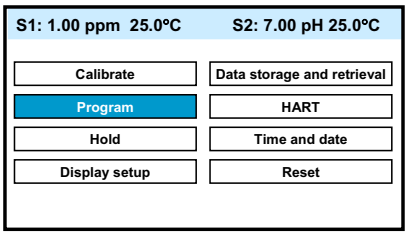
See Section 5.7.

4.6.2 Bypassing Security Codes

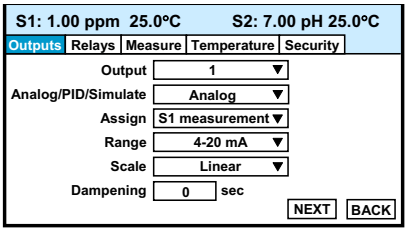
Call the factory.

SECTION 5.0
PROGRAMMING THE ANALYZER

5.1 ENTERING THE PROGRAM MENUS



1. With the main display showing, press ENTER/MENU to display the main menu. Move the cursor to Program and press ENTER/MENU.



2. Move the cursor to the tab showing the desired sub menu and press ENTER/MENU.

5.2 OUTPUTS

5.2.1 Menu Tree

Figure 5-1 is the Outputs menu tree.

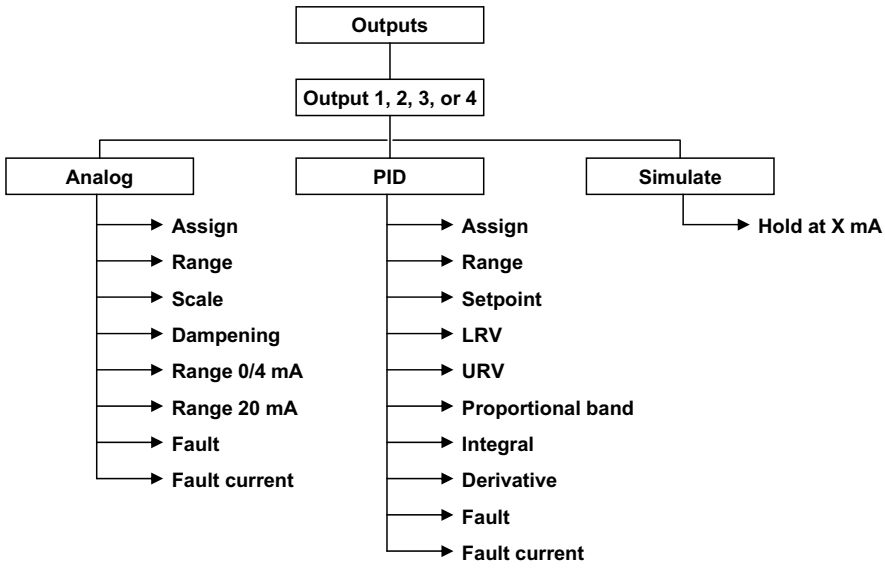


FIGURE 5-1. Menu tree for the Outputs sub menu.

5.2.2. Settings

Move the cursor to the appropriate control box and make the desired setting. For more information about the control box the cursor is on press INFO. To close the information screen, press any key.

5.3 RELAYS

5.3.1 Menu Tree

Figure 5-2 is the Relays menu tree.

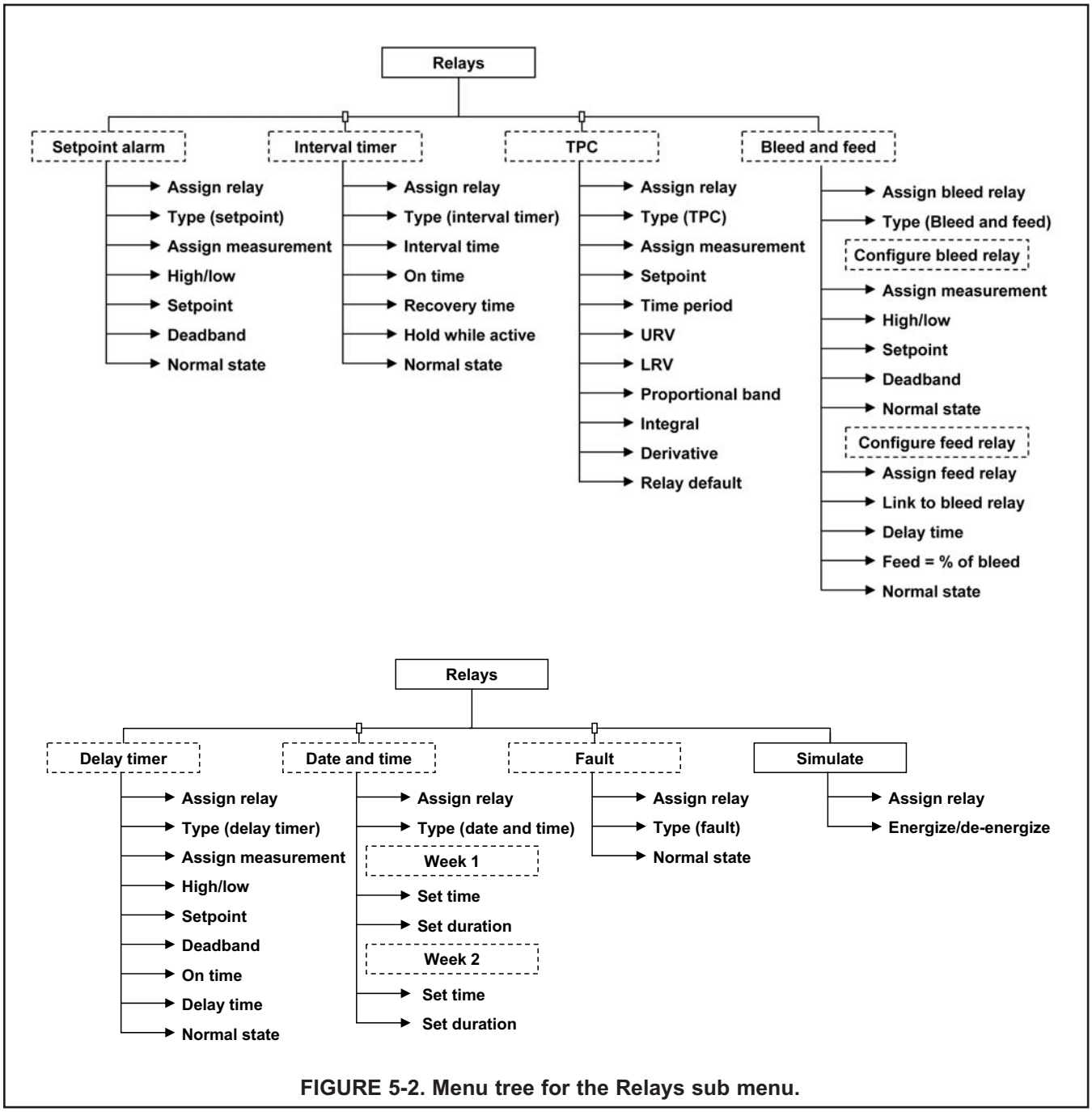
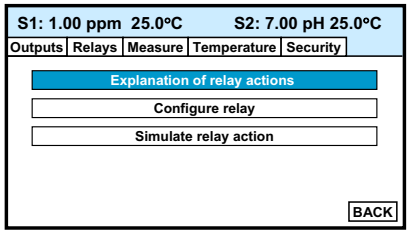
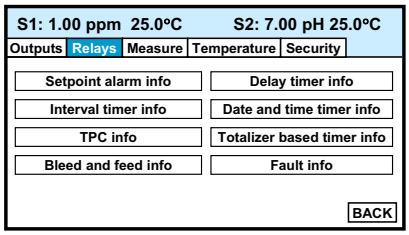


FIGURE 5-2. Menu tree for the Relays sub menu.

5.3.2. Settings



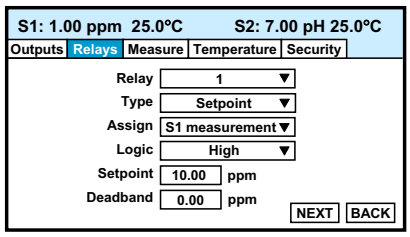
1. A large number of relay actions are available in the Model 56. For more information about a relay action, move the cursor the Explanation of relay actions button and press ENTER/MENU.



2. The screen at left appears. Select the desired relay action and press INFO to display the information screen. To close the information screen, press any key.

   The totalizer-based relay timer is not available in the MCL. It is available only if one of the measurements is flow.

   To configure a relay, press EXIT to return to the screen in step 1.



3. Move the cursor to the Configure relay button and press ENTER/MENU. A screen similar to the one at left will appear.

4. Move the cursor to the appropriate control box and make the desired setting. For more information about the control the cursor is on press INFO. To close the information screen, press any key.

5.4 MEASUREMENT

5.4.1 Menu Tree

Figure 5-3 is the Measurements menu tree. Sensor 2 settings appear only if a second sensor is present.

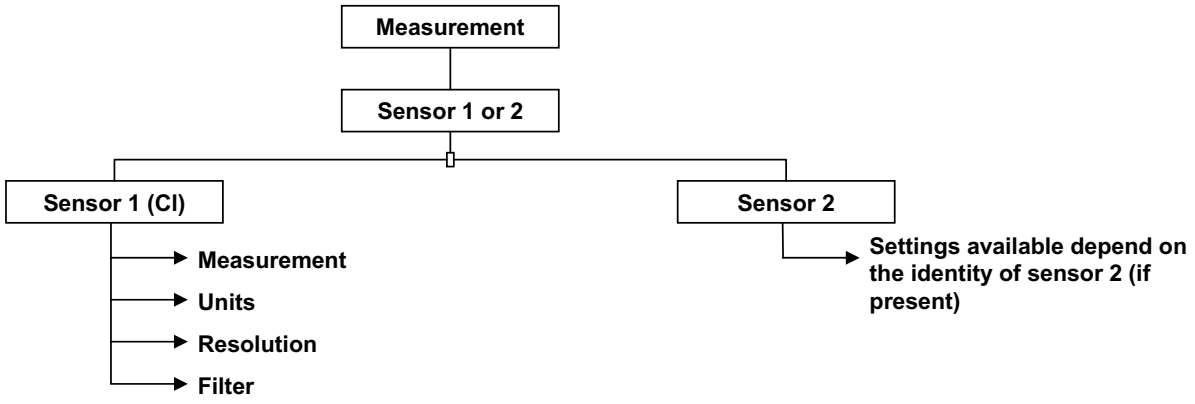


FIGURE 5-3. Menu tree for the Measurements sub menu.

5.4.2. Settings

Move the cursor to the appropriate control box and make the desired setting. For more information about the control the cursor is on press INFO. To close the information screen, press any key.

5.5 TEMPERATURE

5.5.1 Menu Tree

Figure 5-4 is the Temperature menu tree. Sensor 2 settings appear only if a second sensor is present.

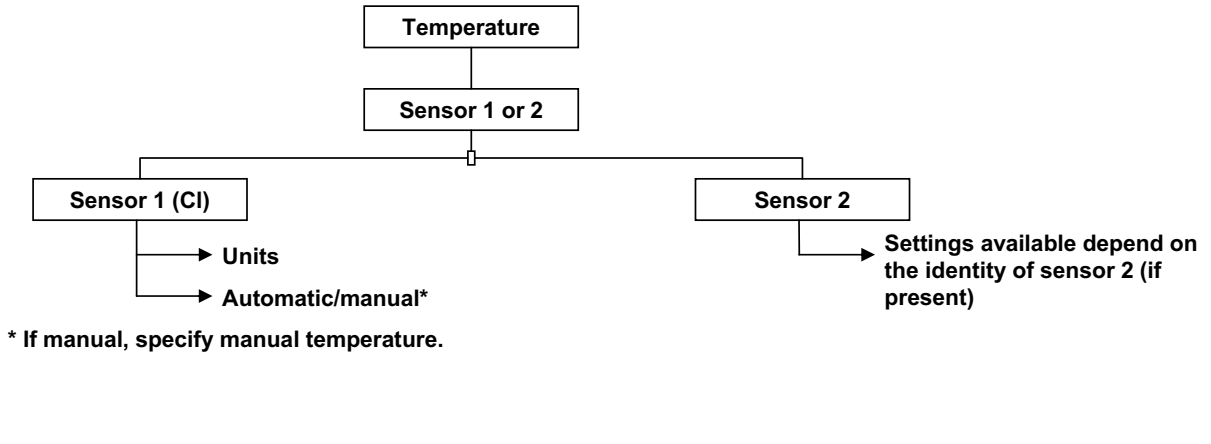


FIGURE 5-4. Menu tree for the Temperature sub menu.

5.5.2. Settings

Move the cursor to the appropriate control box and make the desired setting. For more information about the control the cursor is on press INFO. To close the information screen, press any key.

5.6 SECURITY

5.6.1 Menu Tree

Figure 5-5 is the security setup menu tree.

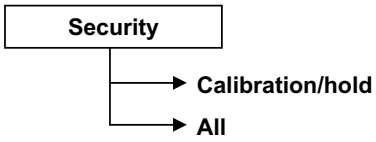


FIGURE 5-5. Menu tree for the security setup sub menu.

5.6.2. Settings

Move the cursor to the appropriate control box and make the desired setting. For more information about the control the cursor is on press INFO. To close the information screen, press any key.

5.7 RESTORING DEFAULT SETTINGS

See section 6.7.

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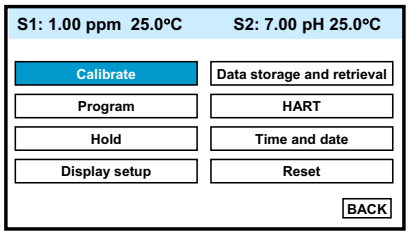
SECTION 6.0
CALIBRATION

6.1 INTRODUCTION

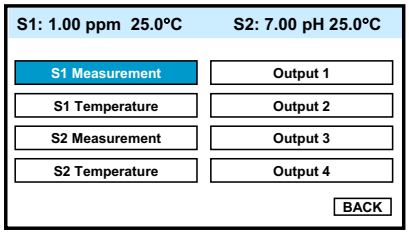
The calibrate menu allows the user to do the following:

1. Calibrate the RTD (temperature sensing element) in the monochloramine sensor.
2. Calibrate the monochloramine sensor.
3. Calibrate the analog outputs.

6.2 ENTERING THE CALIBRATION MENUS



1. With the main display showing, press ENTER/MENU to display the main menu. The cursor will be on Calibrate. Press ENTER/MENU.

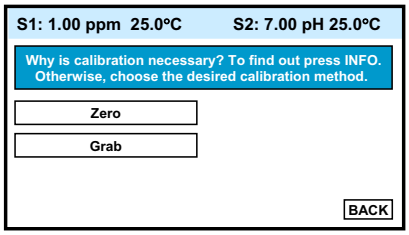


2. Choose the sensor (measurement or temperature) or output to be calibrated. Sensor 1 (S1) is the free chlorine sensor. Sensor 2 buttons appear only if a second sensor is present.

6.3 CALIBRATING TEMPERATURE

To calibrate the temperature device in the sensor, choose S1 temperature and follow the prompts. If you want more information about a calibration step, press the INFO key. Once the calibration is complete, the screen will show the results of the calibration. The screen will also show some acceptance criteria to help you determine whether to accept the calibration. Press the INFO key for an information screen to aid with troubleshooting if the calibration results are not acceptable.

6.4 CALIBRATING THE MONOCHLORAMINE SENSOR



1. Choosing sensor 1 (monochloramine) in section 6.2 causes the screen shown at left to appear. There are two steps to calibrating a monochloramine sensor, measuring the zero current (zero) and determining the slope of the calibration curve (grab). Because stable monochloramine standards in the ppm range do not exist, the sensor must be calibrated against the results of a laboratory test run on a grab sample.

2. To zero the sensor, select Zero and follow the prompts. For more information about preparing the zero solution and measuring the zero current, press the INFO key when prompted.

   If the zero step is successful, the analyzer will display the zero complete screen and the measured zero current. The screen will also show the typical zero current for the sensor and the recommended acceptance criterion. You will be asked to accept the zero current. Press the INFO key for an information screen to aid with troubleshooting if the results are not acceptable.

   If the zero current is badly in error, the analyzer will display the zero failed screen. Press the INFO key for troubleshooting.

3. To calibrate the sensor response in chlorinated water, select Grab and follow the prompts. Be sure the sensor is installed in the flow cell in the MCL and the sample is overflowing the inside tube in the overflow sampler.

   If the calibration is successful, the analyzer will display the calibration complete screen and the sensitivity (nA/ppm). The screen will also show the typical sensitivity range for the sensor and the recommended acceptance criterion. You will be asked to accept the calibration. Press the INFO key for an information screen to aid with troubleshooting if the calibration is not acceptable.

   If the sensitivity is badly in error, the analyzer will display the calibration failed screen. Press the INFO key for troubleshooting.

6.5 CALIBRATING THE ANALOG OUTPUTS

Choose the appropriate output in section 6.2 and follow the prompts to trim the selected output. If the calibration is successful the trim complete screen will appear. If the entered value is more than 1.0 mA different from the simulated output current, the analyzer will display the possible error screen, and you will be asked to accept the calibration. Press the INFO key for an information screen to aid with troubleshooting if the calibration is not acceptable.

6.6 RESET

6.6.1 Purpose

There are three resets.

1. Reset all user settings, including calibration and program settings, to the factory default values. The analyzer will return to Quick Start. **The event logger and data logger (See section 8.0) will be unaffected.**
2. Reset sensor calibration to the default value. The analyzer will clear all user-entered calibration data for the selected sensor. It will leave all other user-entered data unaffected.
3. Reset the analog output calibration for the selected output to the default value. The analyzer will leave all other user-entered settings unchanged.

6.6.2 Procedure

1. With the main display showing, press ENTER/MENU to display the main menu. Move the cursor to Reset and press ENTER/MENU.
2. Check the desired boxes and press APPLY.

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SECTION 7.0
DIGITAL COMMUNICATIONS

The Model 56 analyzer supplied with the MCL has HART communications as a standard feature. For more information refer to the Model 56 HART Addendum Manual.

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SECTION 8.0
DATA AND EVENT LOGGING AND RETRIEVAL

8.1. OVERVIEW

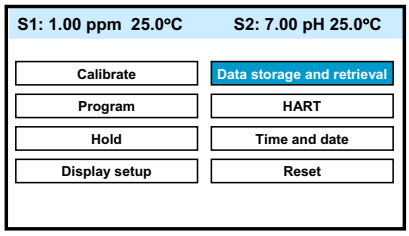
Data and event logging is a standard feature in the Model 56 analyzer. However, the feature must be enabled.

When data/event logging is enabled, the Model 56 analyzer will automatically store the following **events** with date and time stamp: faults, warnings, calibration data, calibration results (pass or fail), power on/off cycles, hold on/off, and new sensor board detected. At the user's discretion the analyzer will also store alarm activation and deactivation as events. The event logger holds 300 events. When the capacity of the logger is reached, the oldest events are removed to make room for new events.

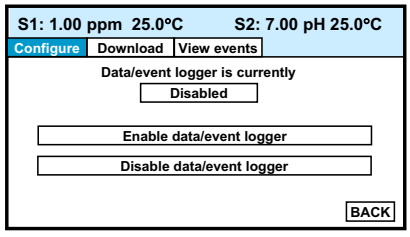
When data/event logging is enabled, the analyzer will automatically store the following measurement **data** for monochloramine: date and time, ppm chlorine, temperature, and sensor current.

The analyzer can store up to 30 days of data. When the capacity of the logger is reached, the oldest data are removed to make room for new data. Data storage frequency is once every 30 seconds.

8.2. CONFIGURATION



1. With the main display showing, press MENU/ENTER. Choose Data storage and retrieval



2. The screen shown at left appears. The data logger is currently disabled (default). To enable the data logger, move the cursor to the Enable data/event logger button and press ENTER/MENU.

3. Make the appropriate date and time settings and choose which alarm relay activations and deactivations to record as events.

NOTE

Setting the date or time to an earlier value than the one currently showing will cause data to be lost from the data/event logger. Download data before resetting time or date. See section 8.3.

8.3. DOWNLOADING DATA AND EVENTS

To download data or events, move the cursor to the download tab and press ENTER/MENU. Unscrew the USB port cover in the lower right hand corner of the front panel and insert a USB flash drive in the port. Press the appropriate button to download data or events. Downloading may take as long as 20 minutes. During download, the display and keypad are frozen, but all other analyzer functions continue.

Downloaded data and events are stored in a spreadsheet. There is a separate spreadsheet for every day of data. The filename for downloaded data is **dl mmddyy** *or* **dl ddmmyy**, depending on the date and time format selected by the user. The filename for downloaded events is **el mmddyy or el ddmmyy**.

8.4. VIEWING EVENTS

The event log can be viewed on the Model 56 display. Move the cursor the View events tab and press ENTER/MENU. Move the cursor to the View Events button and press ENTER/MENU.

To scroll through the list of events move the cursor to the DOWN or UP key at the bottom of the screen and press and hold ENTER/MENU.

8.5. DATE AND TIME

The date and time can also be reset from the main menu by pressing the Time and Date button.

NOTE

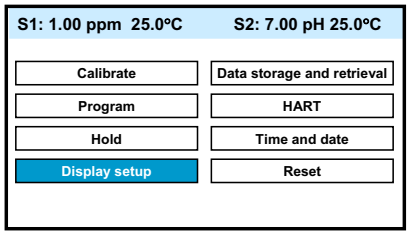
Setting the date or time to an earlier value than the one showing will cause data to be lost from the data/event logger. Download data before resetting time or date. See section 8.3.

SECTION 9.0
GRAPHICAL DISPLAY

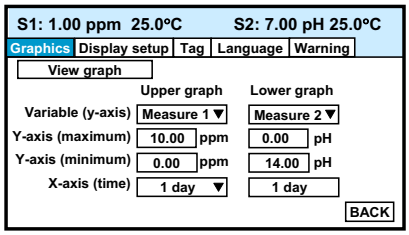
9.1. OVERVIEW

The Model 56 has a dual graphical display. Each graph can be configured to meet user requirements, although the time axis on both graphs must be the same. The time scale can be one hour, one day, seven days, or 30 days.

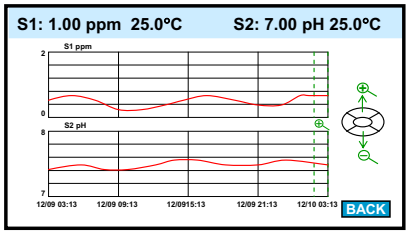
9.2. CONFIGURATION



1. With the main display showing, press MENU/ENTER. Choose Display setup.



2. The screen shown at left appears. Configure the displayed variable, the maximum and minimum values for the y-axis, and the time scale. To view the graphs, move the cursor to the View graph button and press ENTER/MENU.



3. The time axis can be expanded or shrunk. To expand the time scale, use the left or right navigation keys to move the pair of dotted green lines to the area of interest. Press the up navigation key to expand the graph. To shrink the time axis, press the down navigation key.

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SECTION 10.0
MAINTENANCE

10.1 ANALYZER

The analyzer used with the MCL needs little routine maintenance.

Clean the analyzer case and front panel by wiping with a clean soft cloth dampened with water ONLY. Do not use solvents, like alcohol, that might cause a buildup of static charge.

The chlorine sensor circuit board is replaceable.

PN	
24203-01	chlorine sensor board

To replace a board

⚠WARNING

RISK OF ELECTRICAL SHOCK

Disconnect main power and relay contacts wired to separate power source before servicing

1. Turn off power to the analyzer.
2. Loosen the four screws holding the front panel in place and let the front panel drop down.
3. Loosen the gland fitting and carefully push the sensor cable up through the fitting as you pull out the circuit board.
4. Once you have access to the terminal strip, disconnect the sensor.
5. Unplug the sensor board from the main board. See Figure 3-2.
6. Slide the replacement board partially into the board slot. Plug the sensor board into the main board and reattach the sensor wires.
7. Carefully pull the sensor cable through the gland fitting as you push the sensor board back into the enclosure. Tighten the cable gland.
8. Close the front panel.
9. Turn on power.

10.2 MONOCHLORAMINE SENSOR

10.2.1 General.

When used in clean water, the monochloramine sensor requires little maintenance. Generally, the sensor needs maintenance when the response becomes sluggish or noisy or when readings drift following calibration. For a sensor used in potable water, expect to clean the membrane every month and replace the membrane and electrolyte solution every three months. In water containing suspended solids, like manganese and iron oxides, actual cleaning and maintenance frequency can be determined only by experience.

10.2.2 Cleaning the membrane.

Keep the membrane clean and free from dirt and algae. Periodically inspect the membrane. If it appears fouled and sensor response is less than expected, clean the membrane by using a stream of water from a wash bottle.

NOTE

Do not use a tissue to clean the sensor. Do not touch the membrane. Doing so may damage the cathode, making the sensor unusable.

10.2.3 Replacing the electrolyte solution and membrane.

⚠ CAUTION

Fill solution may cause irritation. May be harmful if swallowed. Read and follow manual.

1. Unscrew the membrane retainer and remove the membrane assembly and O-ring. See Figure 7-1.

   NOTE

   Do not touch the cathode. Doing so may damage the cathode, making the sensor unusable.

2. Hold the sensor over a container with the cathode pointing down.
3. Remove the fill plug and allow the electrolyte solution to drain out.
4. Wrap the plug with several turns of pipe tape and set aside.
5. Prepare a new membrane. Hold the membrane assembly with the cup formed by the membrane and membrane holder pointing up. Fill the cup with electrolyte solution.
6. Hold the sensor at about a 45-degree angle with the cathode end pointing up. Add electrolyte solution through the fill hole until the liquid overflows. Tap the sensor near the threads to release trapped air bubbles. Add more electrolyte solution if necessary.
7. Place the fill plug in the electrolyte port and begin screwing it in. After several threads have engaged, rotate the sensor so that the cathode is pointing up and continue tightening the fill plug. Do not overtighten.
8. Place a new O-ring in the groove around the cathode post. Cover the holes at the base of the cathode stem with several drops of electrolyte solution.
9. Cover the cathode with electrolyte solution, then place the membrane assembly over the cathode. Screw the membrane retainer in place.
10. Hold the sensor with the cathode end pointing down. Give the sensor several sharp shakes to dislodge air bubbles trapped behind the cathode.
11. The sensor may require several hours operating at the polarizing voltage to equilibrate after the electrolyte solution has been replaced.

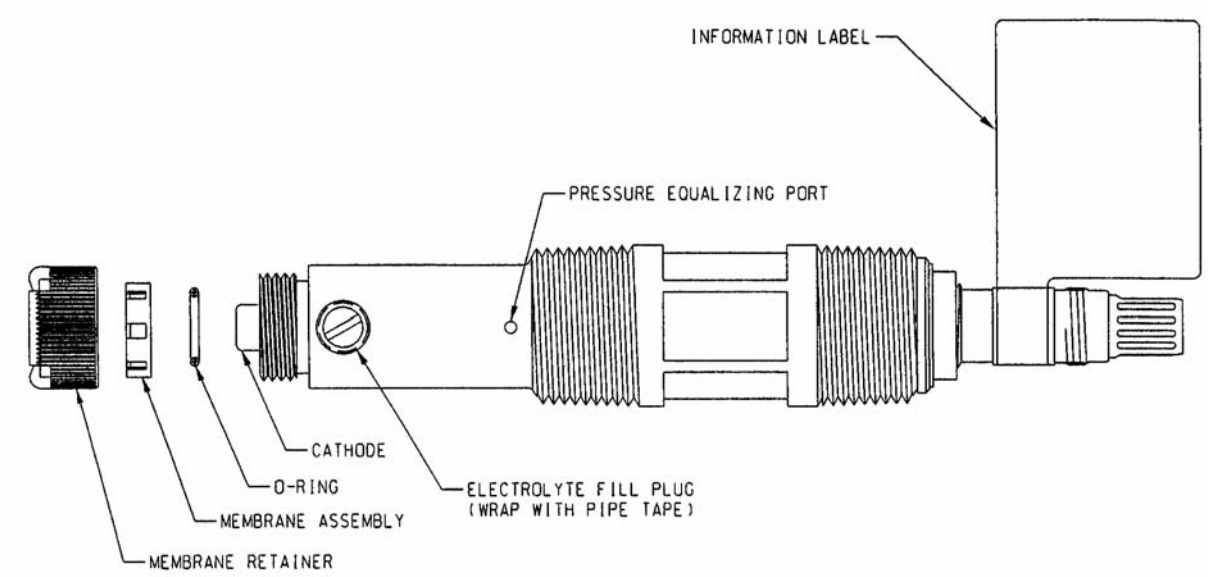


FIGURE 10-1. Chlorine Sensor Parts

TABLE 10-1. Spare Parts

23750-00	Electrolyte Fill Plug with Wooden Osmotic Pressure Relief Port
9550094	O-Ring, Viton 2-014
33521-00	Membrane Retainer
23501-09	Monochloramine Membrane Assembly: includes one membrane assembly and one O-ring
23502-09	Monochloramine Membrane Kit: includes 3 membrane assemblies and 3 O-rings
9210372	#4 Monochloramine Sensor Fill Solution, 4 oz (120 mL)

10.3 CONSTANT HEAD FLOW CONTROLLER

10.3.1 General

After a period of time, deposits may accumulate in the constant head overflow chamber and in the tubing leading to the flow cell. Deposits increase the resistance to flow and cause the flow to gradually decrease. Loss of flow may ultimately have an impact on the chlorine sensor performance. The flow controller is designed to provide about 2 gal/hr (120 mL/mm) flow. Loss of flow to about 1 gal/hr (60 mL/mm) causes about a 5% decrease in chlorine sensor output. Loss of flow has almost no effect on pH sensor performance other than to increase the overall response time.

10.3.2 Cleaning the flow controller

The low flow controller can be taken apart completely for cleaning. Use a strong flow of water to flush out the tubing. A pipe cleaner or a small bottlebrush can remove more adherent deposits. To prevent leaks, apply a thin layer of silicone grease (or equivalent) to the two O-rings at the base of overflow chamber and to the O-ring sealing the central overflow tube to the base.

10.3.3 Other Maintenance

Table 10-2 and Figure 10-2 show the replacement parts for the flow controller assembly used in Model MCL.

TABLE 10-2. Replacement parts for constant head flow controller assembly (Model MCL)

Location in Figure 10-2	PN	Description	Shipping Weight
1	24039-00	Flow cell for chlorine sensor with bubble shedding nozzle	1 lb/0.5 kg
2	24040-00	O-ring kit, two 2-222 and one 2-024 silicone O-rings, with lubricant	1 lb/0.5 kg
3	33812-00	Dust cap for constant head flow controller	1 lb/0.5 kg
4	9322032	Elbow, ¼ in FNPT x ¼ in OD tubing	1 lb/0.5 kg
5	9350029	Check valve, ¼ in FNPT	1 lb/0.5 kg
6	33823-00	Outside tube for constant head device	1 lb/0.5 kg

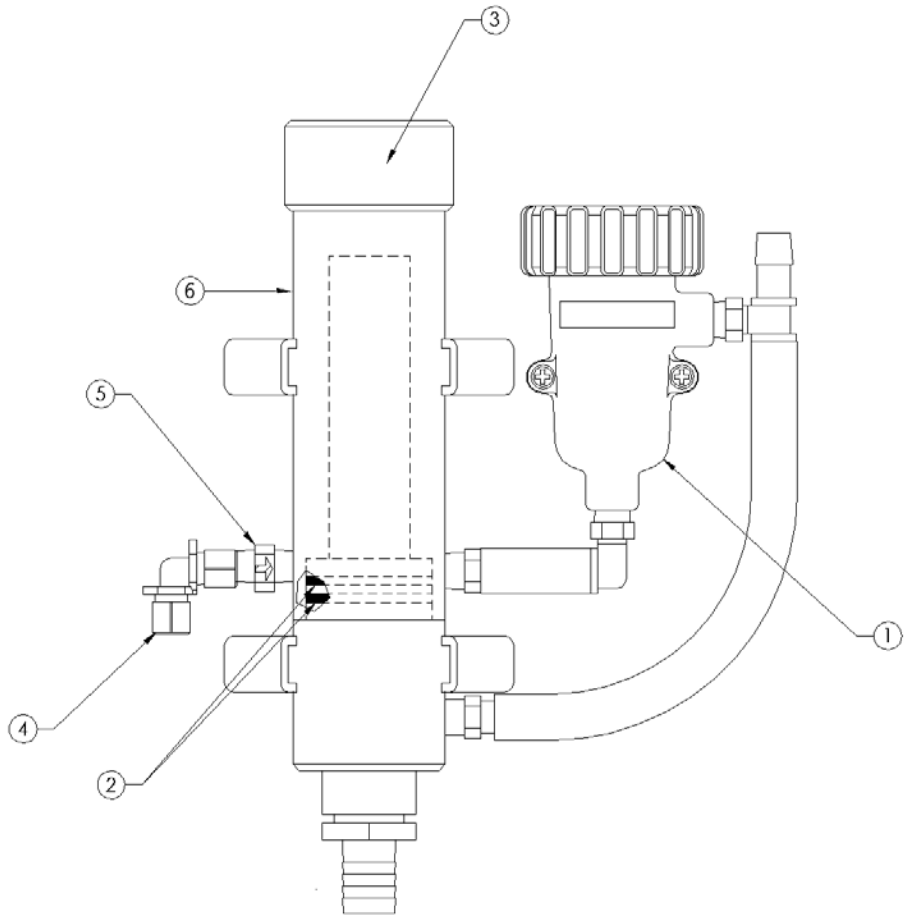


FIGURE 10-2. Replacement Parts for the Flow Controller Assembly used in Model MCL.

SECTION 11.0
TROUBLESHOOTING

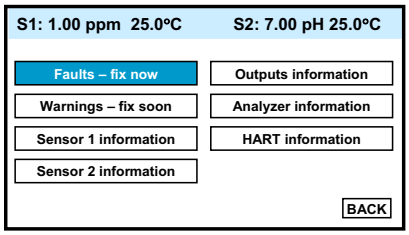
11.1 OVERVIEW

The analyzer continuously monitors itself and the sensor(s) for problems. When the analyzer identifies a problem, the word **warning** or **fault** appears intermittently at the bottom of the display. To read the fault or warning message and troubleshooting information, press INFO. See section 11.2.

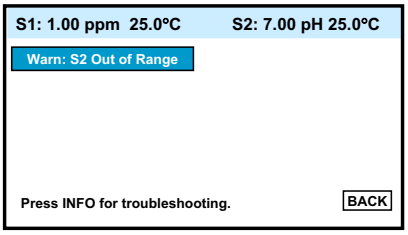
A **warning** means the instrument or sensor is usable, but steps should be taken as soon as possible to correct the condition causing the warning. Warning messages can be turned off. To turn off warning messages, go to the main menu and choose Display setup. Scroll to the Warning tab and turn off warning messages.

A **fault** means the measurement is seriously in error and is not to be trusted. A fault condition might also mean that the analyzer has failed. Fault conditions should be corrected immediately. When a fault occurs, the analog output goes to 22.00 mA or to the value programmed in Section 5.2. Fault messages cannot be turned off.

11.2 READING AND TROUBLESHOOTING FAULT AND WARNING MESSAGES



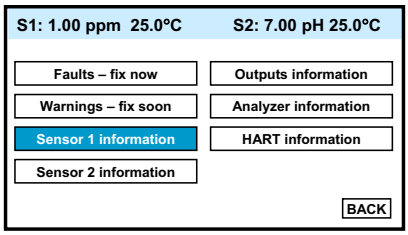
1. With the main display showing, press the INFO key. The screen at left appears. Move the cursor to the appropriate button and press ENTER/MENU.



2. A screen like the one at left will appear showing all the warning or fault messages. For troubleshooting information press the INFO key

11.3 SENSOR DIAGNOSTICS

Sensor diagnostic readings are often useful in troubleshooting measurement problems.



1. With the main display showing, press the INFO key. Move the cursor to the Sensor 1 or Sensor 2 information button and press ENTER/MENU.

2. A list of sensor diagnostics will appear. For more information about a specific diagnostic measurement, move the cursor to the diagnostic of interest and press the INFO key.

11.4 TROUBLESHOOTING CALIBRATION PROBLEMS

If a calibration attempt results in an error or a likely error, the analyzer will display the appropriate warning screen. For troubleshooting suggestions, press the INFO key.

11.5 OTHER TROUBLESHOOTING

Although calibration troubleshooting information is available in the analyzer by pressing the INFO key, troubleshooting information for process measurement problems is not.

Problem	See Section
Process readings are erratic	11.5.1
Readings drift	11.5.2
Sensor does not respond to changes in monochloramine concentration	11.5.3
Current output is too low	11.5.4
Alarm relays do not operate properly	11.5.5

11.5.1 Process readings are erratic

1. Readings are often erratic when a new sensor or a rebuilt sensor is first placed in service. The current usually stabilizes after a few hours.
2. Verify that wiring is correct. Pay particular attention to shield and ground connections.
3. Is the membrane in good condition and is the sensor filled with electrolyte solution? Replace the fill solution and electrolyte. Refer to Section 10.0 for details.

11.5.2 Readings drift

1. Is the sample temperature changing? The analyzer automatically corrects for changes in sensor current caused by temperature changes. The time constant for the temperature measurement is about five minutes. Therefore, the reading may drift for a while after a sudden temperature change.
2. Is the membrane clean? For the sensor to work properly, chlorine must diffuse freely through the membrane. A coating on the membrane will interfere with the passage of chlorine, resulting in slow response. Clean the membrane by rinsing it with a stream of water from a wash bottle. **DO NOT** use a tissue to wipe the membrane.
3. Is the sample flow within the recommended range? Gradual loss of sample flow will cause a downward drift. Be sure the liquid level in the constant head sampler is level with the central overflow tube and that excess sample is flowing down the tube. If necessary, disassemble and clean the overflow sampler. See Section 10.4.
4. Is the sensor new or has it been recently serviced? New or rebuilt sensors may require several hours to stabilize.
5. Is a bubble trapped against the membrane? For the sensor to work properly, the chlorine must continuously diffuse through the membrane. Bubbles block the chlorine in the sample from reaching the membrane, so readings drift downward as bubbles form and grow. The nozzle at the bottom of the flow cell pushes bubbles to the edges of the membrane where they do no harm. In cold samples the nozzle may not be as effective.
   a. If bubbles are visible, confirm that they are blocking the membrane by removing the sensor from the flow cell and replacing it. Removing the sensor breaks the bubbles, so when the sensor is replaced, readings return to normal.
   b. Confirm that the nozzle is properly positioned in the flow cell. Line up your eye with the bottom of the membrane retainer. No gap should be visible between the end of the nozzle and membrane retainer.
6. Gradual downward drift is caused by depletion of the fill solution. Normally, calibrating the sensor every week adequately compensates for the drift. After the sensor has been in service for several months, it will probably be necessary to replace the fill solution and membrane. Refer to section 10.2

11.5.3 Sensor does not respond to changes in monochloramine concentration.

1. Is the grab sample test accurate? Is the grab sample representative of the sample flowing to the sensor?
2. Is sample flowing past the sensor? Be sure the liquid level in the constant head sampler is level with the central overflow tube and that excess sample is flowing down the tube. If necessary, disassemble and clean the over flow sampler. See Section 10.4.
3. Is the membrane clean? Clean the membrane and replace it if necessary. Check that the holes at the base of the cathode stem are open. Unscrew the membrane retainer and remove the membrane assembly. Locate the small holes at the base of the cathode stem. Use a straightened paper clip to clear the holes. Replace the electrolyte solution.
4. Replace the sensor.

11.5.4 Current Output Is Too Low.

Load resistance is too high. Maximum is 550Ω.

11.5.5 Alarm Relays Do Not Operate Properly

1. Verify the relays are properly wired.
2. Verify the relays are properly configured.

11.6 SIMULATING INPUTS — CHLORINE

To check the performance of the analyzer, use a decade box and 1.5V battery to simulate the current from the sensor. The battery, which opposes the polarizing voltage, is necessary to ensure that the sensor current has the correct sign.

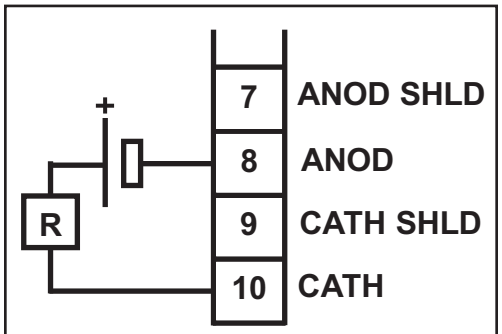


FIGURE 11-1. Simulating Chlorine

1. Disconnect the anode and cathode leads from terminals 8 and 10 on TB1 and connect a decade box and 1.5V battery as shown in Figure 11-1. It is not necessary to disconnect the RTD leads.
2. Set the decade box to 2.4MΩ.
3. Note the sensor current. It should be about 500 nA. The actual value depends on the voltage of the battery. To view the sensor current, go to the main display and press INFO. Choose sensor 1 information. The input current is the second line in the display. Change the decade box resistance and verify that the correct current is shown. Calculate current from the equation:

$$\text{current (nA)} = \frac{V_{battery} - 400 \text{ (voltages in mV)}}{\text{resistance (M}\Omega\text{)}}$$

The voltage of a fresh 1.5 volt battery is about 1.6 volt (1600 mV).

11.7 SIMULATING INPUTS — TEMPERATURE

11.7.1 General.

The analyzer accepts a Pt100 RTD (for pH and chlorine sensors). The Pt100 RTD is in a three-wire configuration. See Figure 9-5.

11.7.2 Simulating temperature

To simulate the temperature input, wire a decade box to the analyzer as shown in Figure 11-4.

To check the accuracy of the temperature measurement, set the resistor simulating the RTD to the values in the table and note the temperature readings. The measured temperature might not agree with the value in the table. During sensor calibration an offset might have been applied to make the measured temperature agree with a standard thermometer. The offset is also applied to the simulated resistance. The analyzer is measuring temperature correctly if the difference between measured temperatures equals the difference between the values in the table to within ±0.1°C.

For example, start with a simulated resistance of 103.9 Ω, which corresponds to 10.0°C. Assume the offset from the sensor calibration was -0.3 Ω. Because of the offset, the analyzer calculates temperature using 103.6 Ω. The result is 9.2°C. Now change the resistance to 107.8 Ω, which corresponds to 20.0°C. The analyzer uses 107.5 Ω to calculate the temperature, so the display reads 19.2°C. Because the difference between the displayed temperatures (10.0°C) is the same as the difference between the simulated temperatures, the analyzer is working correctly.

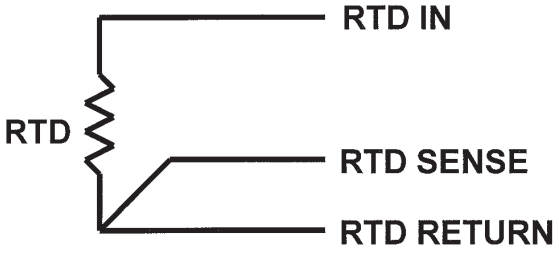


FIGURE 11-2. Three-Wire RTD Configuration.

Although only two wires are required to connect the RTD to the analyzer, using a third (and sometimes fourth) wire allows the analyzer to correct for the resistance of the lead wires and for changes in the lead wire resistance caused by changes in ambient temperature.

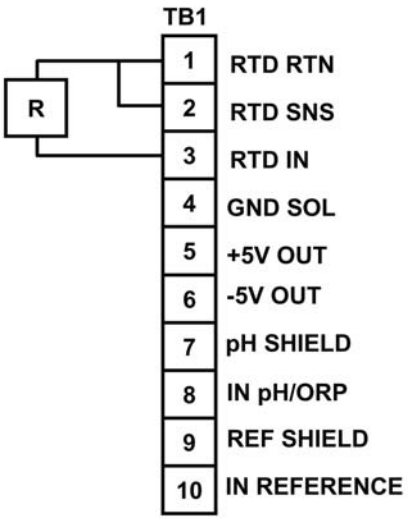


FIGURE 11-3. Simulating RTD Inputs.

Temp. (°C)	Pt 100 (Ω)
0	100.0
10	103.9
20	107.8
25	109.7
30	111.7
40	115.5
50	119.4
60	123.2
70	127.1
80	130.9
85	132.8
90	134.7
100	138.5

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The shipping container should be marked:

Return for Repair
Model _____

The returned material should be accompanied by a letter of transmittal which should include the following information (make a copy of the "Return of Materials Request" found on the last page of the Manual and provide the following thereon):

1. Location type of service, and length of time of service of the device.
2. Description of the faulty operation of the device and the circumstances of the failure.
3. Name and telephone number of the person to contact if there are questions about the returned material.
4. Statement as to whether warranty or non-warranty service is requested.
5. Complete shipping instructions for return of the material.

Adherence to these procedures will expedite handling of the returned material and will prevent unnecessary additional charges for inspection and testing to determine the problem with the device.

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