

**Instruction Manual**

PN 51-MCL/rev.C

November 2004

# Model MCL

## Monochloramine Measuring System



## **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.



## **WARNINGS**

### **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.

### **Emerson Process Management**

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# QUICK START GUIDE

## FOR MODEL MCL ANALYZER

1. Refer to Section 2.0 for installation instructions, and Section 3.0 for wiring instructions.
2. Once connections are secured and verified, apply power to the analyzer.
3. When the analyzer is powered up for the first time, **Quick Start** screens appear. Using **Quick Start** is easy.
  - a. A blinking field shows the position of the cursor.
  - b. Use the ◀ or ▶ key to move the cursor left or right. Use the ▲ or ▼ key to move the cursor up or down or to increase or decrease the value of a digit. Use the ▲ or ▼ key to move the decimal point.
  - c. Press ENTER to store a setting. Press EXIT to leave without storing changes. Pressing EXIT also returns the display to the previous screen.

```
English      Fran ais
Espa ol     >>
```

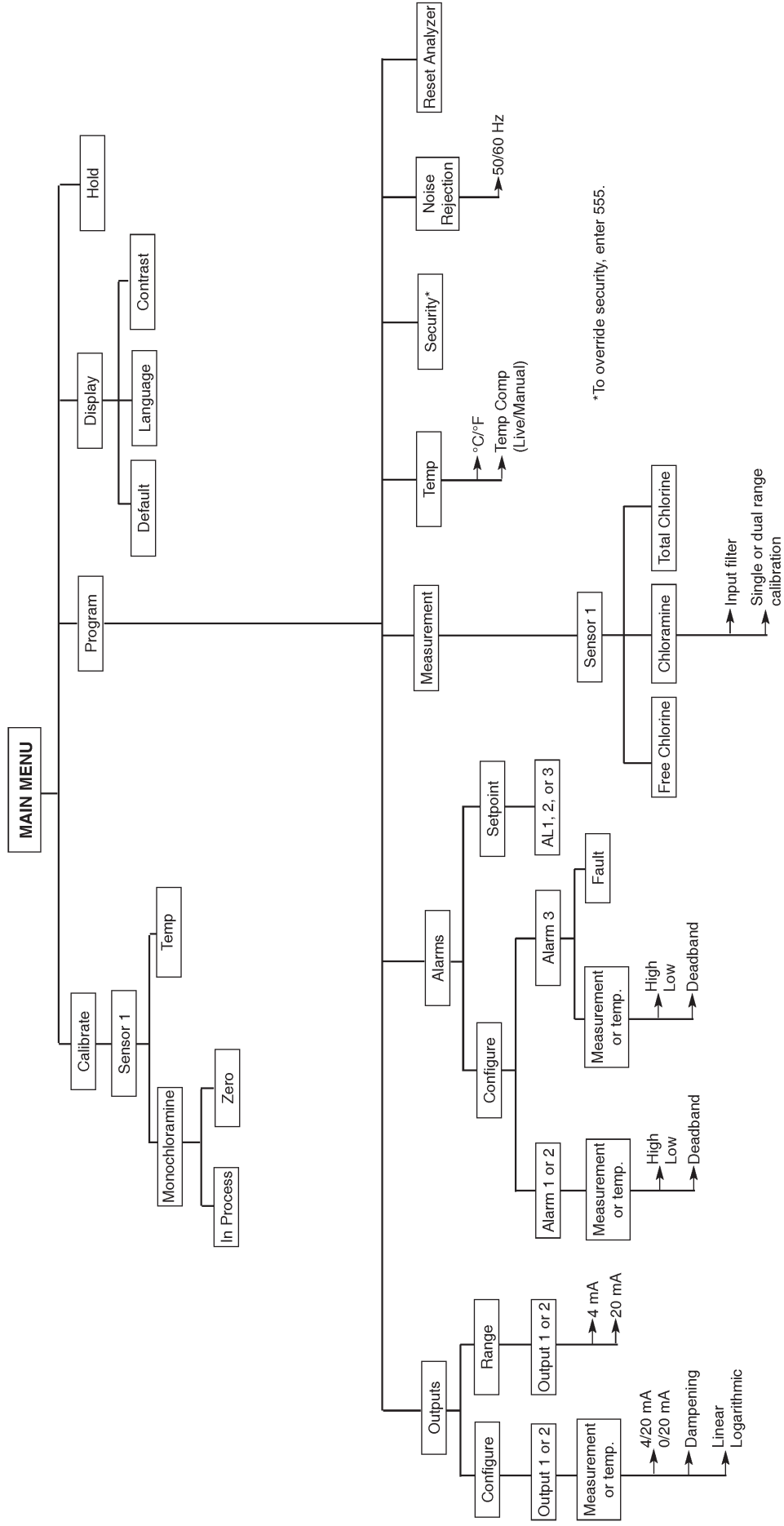
```
S1 Chlorine Type
free        total  >>
```

```
Temperature in?
C          F
```

4. Choose the desired language. Choose >> to show more choices.
5. Move the cursor to >> and press ENTER. Choose **monochloramine**.
6. Choose temperature units.
7. The main display appears. The outputs and alarms are assigned to default values.
8. To change outputs, alarms, and temperature-related settings, go to the main menu and choose **Program**. Follow the prompts. For a guide to the Program menu, see the menu tree on the following page.
9. To return the analyzer to the default settings, choose **Reset Analyzer** in the Program menu.

# QUICK REFERENCE GUIDE

## MENU TREE FOR MONOCHLORAMINE MEASUREMENTS



# MODEL MCL SYSTEM FOR THE DETERMINATION OF MONOCHLORAMINE

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## About This Document

This manual contains instructions for installation and operation of the Model MCL Monochloramine Measuring System.

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

<u>Rev. Level</u>	<u>Date</u>	<u>Notes</u>
A	7/03	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	12/03	Added note on page 35.
C	11/04	Updated drawings on pages 6, 30, and 34.

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# SECTION 1.0.

## DESCRIPTION AND SPECIFICATIONS

### 1.1 FEATURES

### 1.2 SPECIFICATIONS

### 1.3 ORDERING INFORMATION AND ACCESSORIES

- COMPLETE SYSTEM INCLUDES sensor, connecting cable, analyzer, and flow controller.
- VARIOPOL QUICK-DISCONNECT FITTINGS make replacing sensor easy.
- FEATURE-PACKED ANALYZER: dual outputs, three fully-programmable alarm relays, two-line display.

### 1.1 FEATURES

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

The Model MCL uses a membrane-covered amperometric sensor. A polarizing voltage applied to a gold mesh cathode behind the membrane reduces 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 Model MCL includes the easy-to-use Model 1055 analyzer. The analyzer features two fully programmable 4-20 mA outputs and three fully programmable relays. The back-lit, two line display allows the user to read monochloramine concentration at a glance.

Valves, rotameters, and pressure regulators to control sample flow are things of the past with the Model 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)  
 A check valve in the inlet prevents the sensor flow cells from going dry if sample flow is lost. The 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°)

Minimum Flow: 3 gal/hr (11 L/hr)

Maximum flow: 80 gal/hr (303 L/hr); high flow causes the overflow tube to back up.

**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:

Overflow sampler: acrylic, nylon, CPVC, Buna N, 316 stainless steel

Monochloramine sensor: Noryl<sup>1</sup>, Viton<sup>2</sup>, silicone, and Zitex<sup>3</sup> 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)]*

## SPECIFICATIONS — SENSOR

**Range:** 0 to 6 ppm as Cl<sub>2</sub>. For higher ranges, consult the factory.

**pH range:** Response 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.)

**Electrolyte volume:** 25 mL (approx.)

**Electrolyte life:** 3 months (approx.)

<sup>1</sup> Noryl is a registered trademark of General Electric.  
<sup>2</sup> Viton is a registered trademark of E.I. duPont de Nemours & Co.  
<sup>3</sup> Zitex is a registered trademark of Performance Plastic Corp.

## SPECIFICATIONS — ANALYZER

**Case:** ABS, NEMA 4X

**Display:** Two-line, 16-character, back-lit. Character height: 4.8 mm.

**Languages:** English, German, Italian, Spanish, French, Portuguese

**Ambient temperature and humidity:** 0 to 50°C (32 to 122°F); RH 5 to 95% (con-condensing)

The analyzer can be operated between -20 and 60°C (-4 to 140°F) with some degradation in display performance.

**Power:** 115/230Vac ± 15%, 50/60 Hz ± 6%, 8.0 W. Installation category II.

Equipment protected throughout by double insulation.

### Ordinary Location:



12RN

POLLUTION DEGREE 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

**RFI/EMI:** EN-61326



**LVD:** EN-61010-1

**Outputs:** Two 4-20 mA or 0-20 mA isolated outputs. Continuously adjustable. Linear or logarithmic. Maximum load 600 ohms. Output dampening with time constant of 5 sec is user-selectable.

**Alarms:** Three alarm relays for process measurement(s) or temperature. Alarm 3 can be configured as a fault alarm, instead of a process alarm. Each relay can be configured independently. Alarm logic (high or low activation) and deadband are user-programmable.

**Relays:** Form C, single pole double throw, epoxy sealed



	Resistive	Inductive
28 Vdc	5.0 A	3.0 A
115 Vac	5.0 A	3.0 A
230 Vac	5.0 A	1.5 A

### 1.3 ORDERING INFORMATION

**Model 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	Monochloramine Measuring System
MCL	EXAMPLE

### COMPONENT PARTS

ANALYZER MODEL	DESCRIPTION
1055-01-11-24-68	1055 analyzer, single input (monochloramine), wall mount, 115/230 Vac
1055-01-11-24-32-68	1055 analyzer, dual input (monochloramine and pH), wall mount, 115/230 Vac

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)

## SECTION 2.0. INSTALLATION

### 2.1 UNPACKING AND INSPECTION 2.2 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 MODEL MCL

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

1. Model 1055-01-13-24 analyzer with sensor cable attached.
2. Constant head overflow sampler 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.
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 122°F (0 to 50°C)
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 Model MCL is intended for wall mounting only. Refer to Figure 2-1 for details. The sensor screws into the flow cell adapter 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 inlet fitting screws into a 1/4-inch FNPT check valve. The check valve prevents the sensor 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.

**Remove the foam packing insert between the outer tube and the inner overflow tube.** Adjust the sample flow until the water level is even with the central overflow tube and excess water is flowing down the tube.

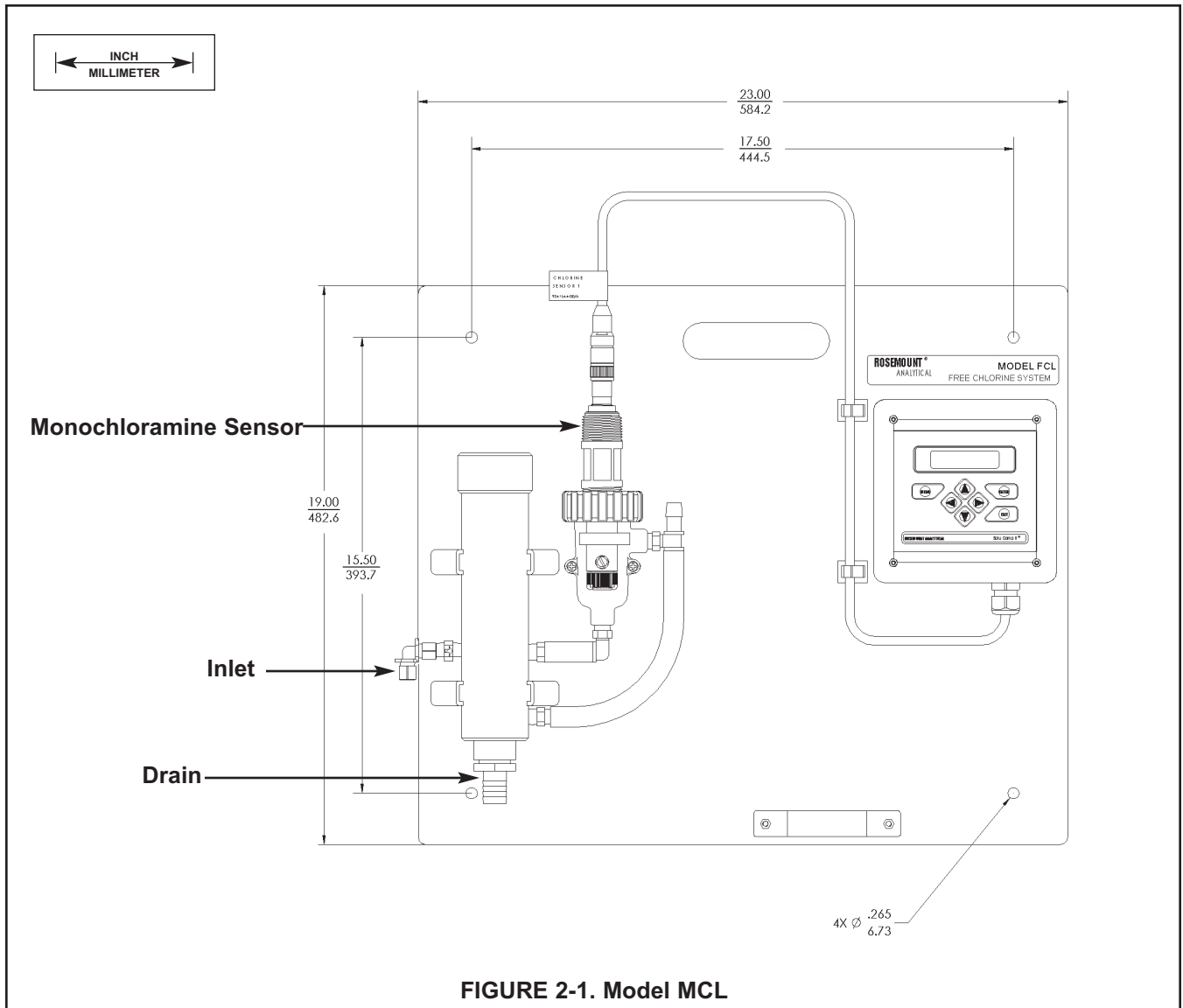
### 2.2.4 Electrical Connections

Refer to Section 3.1 for details.

### 2.2.5 Installing the Sensor

The Model MCL is provided with the sensor cable 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 a plastic fitting, which is held in the flow cell by a union nut. Do not remove the protective cap on the sensor until ready to put the sensor in service.



# SECTION 3.0. WIRING

## 3.1 POWER, ALARM, AND OUTPUT WIRING 3.2 SENSOR WIRING

### 3.1 POWER, ALARM, AND OUTPUT WIRING

See Figure 3-1 for identification of power, alarm, and output terminals. Note that the sensors are already wired to the analyzer.

AC power wiring should be 14 gauge or greater. Run the power wiring through the conduit opening nearest the power terminal (TB1). 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.

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

For best EMI/RFI protection use shielded output signal cable enclosed in an earth-grounded metal conduit. Connect the shield to earth ground at TB1-4.

Keep output wiring at least one foot from high voltage conductors.

To reduce stress on the wiring connections, do not remove the hinged front panel from the base while installing wiring. Be sure the leads are sufficiently long to avoid stress on the conductors.

**WARNING:**  
**RISK OF ELECTRICAL SHOCK**

AC connections and grounding must be in compliance with UL 508 or local electrical code. DO NOT apply power to the analyzer until all electrical connections are verified and secure.

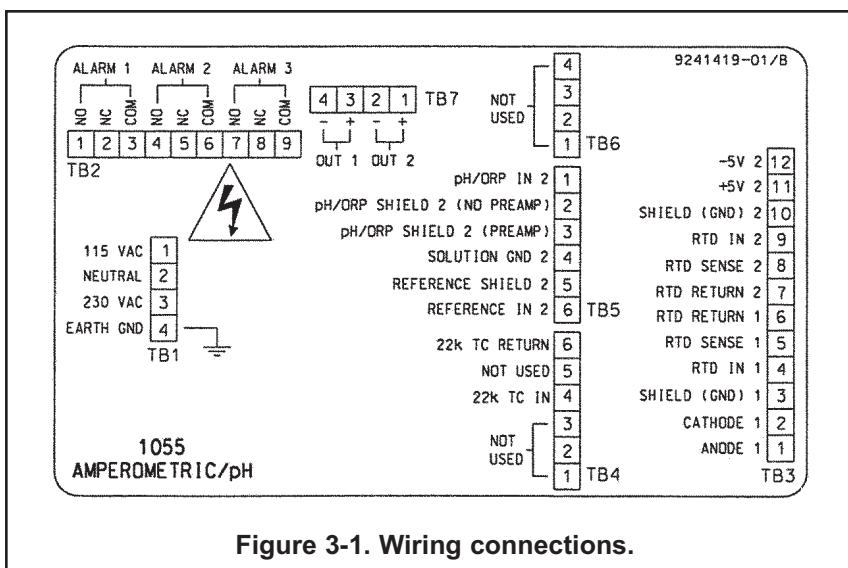
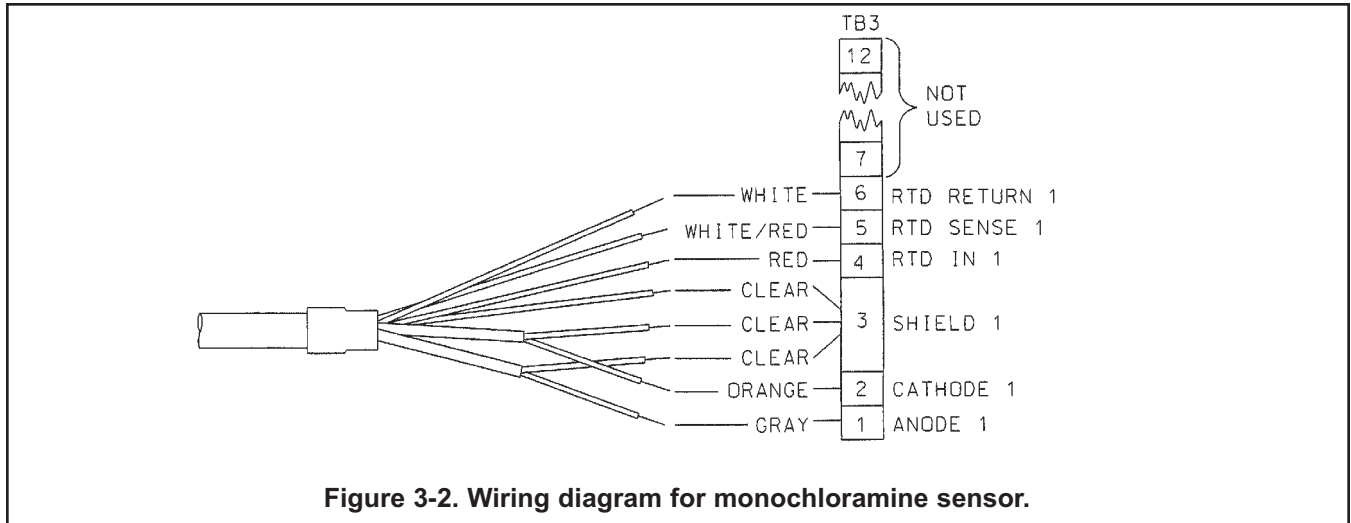


Figure 3-1. Wiring connections.

### 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 cable, refer to the wiring diagram below.





## SECTION 4.0 DISPLAY AND OPERATION

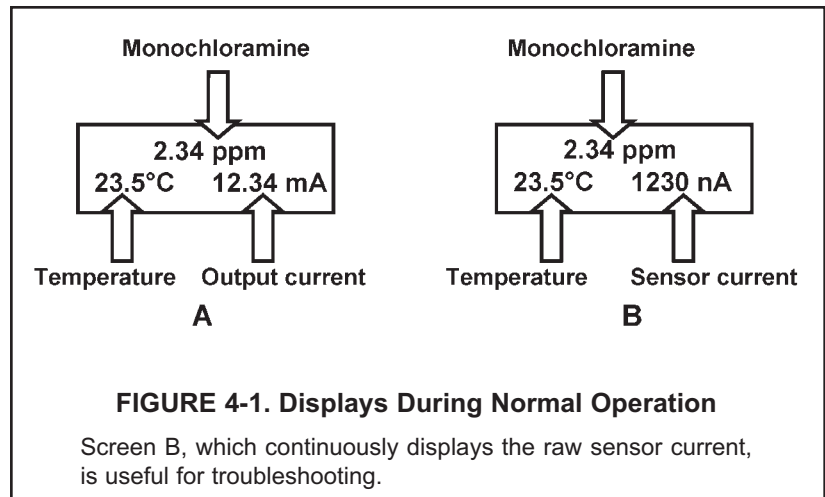
- 4.1 DISPLAY
- 4.2 KEYPAD
- 4.3 PROGRAMMING AND CALIBRATING THE ANALYZER - TUTORIAL
- 4.4 SECURITY
- 4.5 USING HOLD

### 4.1. DISPLAY

The Model MCL analyzer has a two-line display. The display can be customized to meet user requirements (see Section 5.11). Figure 4-1 shows the two displays available.

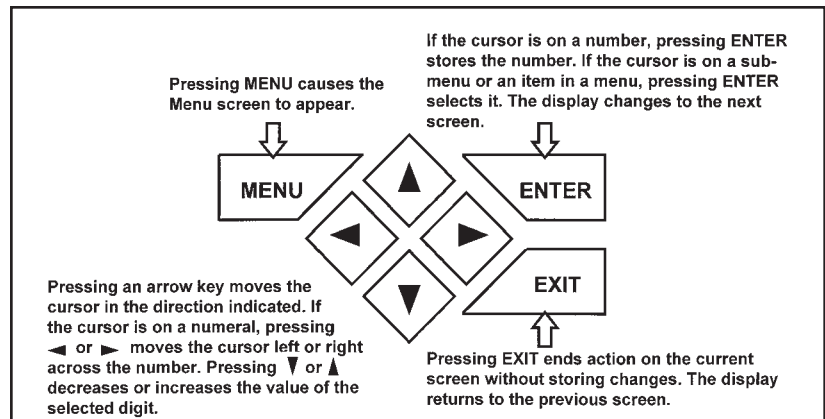
The MCL analyzer has information screens that supplement the data in the main display. Press ▲ or ▼ to view the information screens. **The last information screen is the software version.**

During calibration and programming, key presses cause different displays to appear. The displays are self-explanatory and guide the user step-by-step through the procedure.



### 4.2 KEYPAD

Figure 4-2 shows the keypad.



Four arrow keys move the cursor around the screen. A blinking word or numeral show the position of the cursor. The arrow keys are also used to change the value of a numeral. Pressing ENTER stores numbers and settings and moves the display to the next screen. Pressing EXIT returns to the previous screen without storing changes. Pressing MENU always causes the main menu screen to appear. Pressing MENU followed by EXIT causes the main display to appear.

### 4.3 PROGRAMMING AND CALIBRATING THE ANALYZER - TUTORIAL

Setting up and calibrating the MCL is easy. The following tutorial describes how to move around in the programming menus. For practice, the tutorial also describes how to assign monochloramine values to the 4 and 20 mA outputs for sensor 1 (monochloramine sensor).

```

Calibrate          Hold
Program           Display
  
```

```

Calibrate          Hold
Program           Display
  
```

```

Outputs           Alarms
Measurement       >>
  
```

```

Output Range
Output Configure
  
```

```

Output Range?
Output1           Output2
  
```

```

Out1 S1 Range?
4mA              00.00PPM
  
```

```

Out1 S1 Range?
20mA            20.00PPM
  
```

```

Output Range?
Output1         Output2
  
```

1. If the MENU screen (shown at the left) is not already showing, press MENU. **Calibrate** is blinking, which means the cursor is on **Calibrate**.
2. To assign values to current outputs, the **Program** sub-menu must be open. Press  $\blacktriangledown$ . The cursor moves to **Program** (**Program** blinking). Press ENTER. Pressing ENTER opens the **Program** sub-menu.
3. The **Program** sub-menu permits the user to set outputs, alarms, automatic or manual temperature compensation, and a security code. When the sub-menu opens, **Outputs** is blinking, which means the cursor is on Outputs. Press  $\blacktriangledown$  or  $\blacktriangleright$  (or any arrow key) to move the cursor around the display. Move the cursor to  $\blacktriangleright\blacktriangleright$  and press ENTER to cause a second screen with more program items to appear. There are three screens in the **Program** menu. Pressing  $\blacktriangleright\blacktriangleright$  and ENTER in the third screen causes the display to return to the first screen (**Outputs**, **Alarms**, **Measurement**).
4. For practice, assign values to the 4 and 20 mA outputs for sensor 1. Move the cursor to **Outputs** and press ENTER.
5. The screen shown at left appears. The cursor is on **Output Range** (blinking). Output range is used to assign values to the low and high current outputs. Press ENTER.
6. The screen shown at left appears. The MCL has two outputs, output 1 and output 2. Move the cursor to the desired output and press ENTER. For purposes of the example, choose **Output 1**.
7. The screen shown at left appears. **Out1 S1** in the top line means output 1 (**Out1**) is assigned to sensor 1 (**S1**). (The analyzer keeps track of the sensor because the analyzer is also available in a dual-sensor version.) Use the **Out1 S1 Range?** screen to assign a monochloramine concentration to the **4 mA** output.
  - a. Use the arrow keys to change the concentration to the desired value. Press  $\blacktriangleleft$  or  $\blacktriangleright$  to move the cursor from digit to digit. Press  $\blacktriangleup$  or  $\blacktriangledown$  to increase or decrease the value of the digit. Holding  $\blacktriangleup$  or  $\blacktriangledown$  down causes the numeral to continuously scroll up or down.
  - b. To move the decimal point, press  $\blacktriangleleft$  or  $\blacktriangleright$  until the cursor is on the decimal point. Press  $\blacktriangleup$  to move the decimal point to the right. Press  $\blacktriangledown$  to move the decimal point to the left.
  - c. Press ENTER to store the setting.
8. The screen shown at left appears. Use this screen to assign a full scale monochloramine concentration to the **20 mA** output. Use the arrow keys to change the monochloramine to the desired value. Press ENTER to store the setting.
9. The screen shown at left appears. To assign values to the low and high currents for output 2, select **Output 2** and follow the prompts.
10. To return to the main menu, press MENU. To return to the main display press MENU then EXIT, or press EXIT repeatedly until the main display appears. To return to the previous display press EXIT.

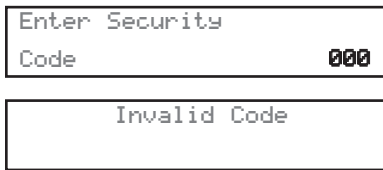
#### NOTE

To store values or settings, press ENTER before pressing EXIT.

## 4.4 SECURITY

### 4.4.1 How the Security Code Works

Use the security code to prevent accidental or unwanted changes to program settings, displays, and calibration.



1. If a security code has been programmed, pressing MENU causes the security screen to appear.
2. Enter the three-digit security code.
3. If the entry is correct, the main menu screen appears. If the entry is incorrect, the **Invalid Code** screen appears. The **Enter Security Code** screen reappears after 2 seconds.

### 4.4.2 Bypassing the Security Code

Enter 555. The main menu will open.

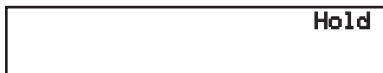
### 4.4.3 Setting a Security Code

See Section 5.6.

## 4.5 USING HOLD

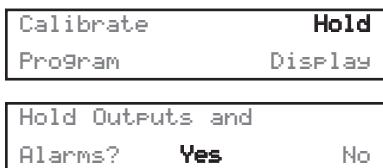
### 4.5.1 Purpose

The analyzer output is always proportional to monochloramine concentration. To prevent unwanted alarms and improper operation of control systems or dosing pumps, place the analyzer in hold before removing the sensor for calibration and maintenance. Be sure to remove the analyzer from hold once calibration is complete. During hold, both outputs remain at the last value. **Once in hold, the analyzer remains there indefinitely.** While in hold, the screen shown to the left appears periodically.



### 4.5.2 Using the Hold Function

**To choose a menu item, move the cursor to the item and press ENTER.**  
**To store a number or setting, press ENTER.**



1. Press MENU. The main menu screen appears. Choose **Hold**.
2. The **Hold Outputs and Alarms?** screen appears. Choose **Yes** to place the analyzer in hold. Choose **No** to take the analyzer out of hold.
3. The main display screen will appear.

## SECTION 5.0

# PROGRAMMING THE ANALYZER

- 5.1 GENERAL**
- 5.2 CHANGING STARTUP SETTINGS**
- 5.3 CONFIGURING AND RANGING THE OUTPUTS**
- 5.4 CONFIGURING ALARMS AND ASSIGNING SETPOINTS**
- 5.5 SELECTING THE TYPE OF MONOCHLORAMINE MEASUREMENT**
- 5.6 CHOOSING TEMPERATURE UNITS AND MANUAL OR AUTOMATIC TEMPERATURE COMPENSATION**
- 5.7 SETTING A SECURITY CODE**
- 5.8 NOISE REJECTION**
- 5.9 RESETTING FACTORY CALIBRATION AND FACTORY DEFAULT SETTINGS**
- 5.10 SELECTING A DEFAULT SCREEN, LANGUAGE, AND SCREEN CONTRAST**

### 5.1 GENERAL

This section describes how to do the following:

1. configure and assign values to the current outputs
2. configure and assign setpoints to the alarm relays
3. choose the type of monochloramine measurement being made
4. choose temperature units and manual or automatic temperature mode
5. set a security code
6. tell the analyzer the frequency of the ac power (needed for optimum noise rejection)
7. reset the analyzer to factory calibration and default settings
8. select a default display screen

Default settings are shown in Table 5-1 on the following page. To change a default setting, refer to the section listed in the table. To reset default settings, see Section 5.9.

### 5.2 CHANGING STARTUP SETTINGS

When the Model MCL analyzer is powered up for the first time, Quick Start screens appear, which enable the user to quickly configure the analyzer for measuring monochloramine. Because the analyzer can be used to measure other chlorine compounds, it must be specifically configured to measure monochloramine. If incorrect settings were entered at startup, enter the correct settings now. Refer to Section 5.5.

**TABLE 5-1. DEFAULT SETTINGS****1. OTHER OUTPUT SETTINGS**

Output	Assignment	Range	Current	Dampening	Mode	Section
1	monochloramine	0 - 10 ppm	4 - 20 mA	off	linear	5.3 and 5.9
2	temperature	0 - 100°C	4 - 20 mA	off	linear	5.3 and 5.9

**2. ALARM CONFIGURATION AND SETPOINTS**

	Alarm			If AL3 is a sensor alarm	Section
	1	2	3		
Assigned to	monochloramine	monochloramine	Fault	Temperature	5.4
High or low	High	Low	NA	Low	5.4
Deadband	0.00	0.00	NA	0.00	5.4
Setpoint	10 ppm	0 ppm	NA	0.00°C	5.4

**3. MISCELLANEOUS SETTINGS**

Setting	Default	Section
Temperature units	°C	5.6
Automatic temperature correction	On	5.6
Sensor input filter	5 sec	5.5
Language	English	5.10
Hold	Off	4.5
Security code	000	5.7
AC power frequency	60 Hz	5.8

**5.3 CONFIGURING AND RANGING THE OUTPUTS.****5.3.1 Purpose**

The Model MCL analyzer has two current outputs. This section describes how to configure and range the outputs. **CONFIGURE THE OUTPUTS FIRST.**

1. Configuring an output means
  - a. Selecting either a 4-20 mA or 0-20 mA output,
  - b. Assigning either the monochloramine reading (measurement) or temperature to output 1 or output 2,
  - c. Turning on or turning off output current dampening,
  - d. Choosing a linear or logarithmic output.
2. Ranging the outputs means assigning values to the low (0 or 4 mA) and high (20 mA) outputs.

**5.3.2 Definitions**

1. **CURRENT OUTPUTS.** The analyzer provides either a continuous 4-20 mA or 0-20 mA output current directly proportional to monochloramine concentration.
2. **ASSIGNING OUTPUTS.** Figure 5-1 shows the ways in which the outputs can be assigned.
3. **DAMPEN.** Output dampening smooths out noisy readings. It also increases the response time of the output. With output dampening the time to reach 63% of final reading following a step change is 5 sec. Output dampening does not affect the response time of the display.
4. **MODE.** The current output can be made directly proportional to the displayed value (linear mode) or directly proportional to the common logarithm of the displayed value (log mode).

## 5.3.3. Procedure: Configure Outputs.

To choose a menu item, move the cursor to the item and press ENTER.  
To store a number or setting, press ENTER.

Calibrate	Hold
<b>Program</b>	Display

<b>Outputs</b>	Alarms
Measurement	>>

Output Range
<b>Output Configure</b>

Output Config?
<b>Output1</b> Output2

OutM is for?
<b>Measurement</b> Temp

1. Press MENU. The main menu screen appears. Choose **Program**.
2. Choose **Outputs**.
3. Choose **Output Configure**.
4. Choose **Output1** or **Output2**.
5. Choose **Measurement** or **Temp**. **Measurement** means monochloramine.
6. Make the appropriate settings:
  - a. Choose **4-20 mA** or **0-20 mA**.
  - b. Choose **Yes** or **No** for output dampening.
  - c. Choose **Linear** or **Log** output.
7. The display returns to the **Output Config?** screen. Select the other output or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

## 5.3.4. Procedure: Assigning Values to the Low and High Current Outputs (Output Ranging)

To choose a menu item, move the cursor to the item and press ENTER.  
To store a number or setting, press ENTER.

Calibrate	Hold
<b>Program</b>	Display

<b>Outputs</b>	Alarms
Measurement	>>

<b>Output Range</b>
Output Configure

1. Press MENU. The main menu screen appears. Choose **Program**.
2. Choose **Outputs**.
3. Choose **Output Range**. Choose **Output1** or **Output2**.
4. Make the appropriate settings.
  - a. Assign a value to the low current (**0 mA** or **4 mA**) output.
  - b. Assign a value to the high current (**20 mA**) output.
5. The display returns to the **Output Range** screen. Select the other output or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

## 5.4 CONFIGURING ALARMS AND ASSIGNING SETPOINTS

### 5.4.1 Purpose

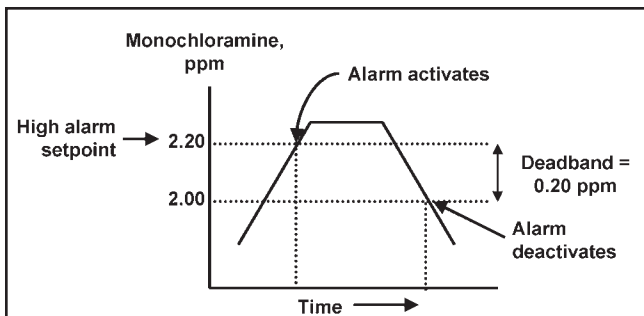
This section describes how to do the following:

1. assign alarm 3 relay to the sensor or leave as a fault alarm,
2. set the alarm logic to high or low,
3. assign values to the alarm setpoints,
4. set the alarm deadbands.

**ALARM RELAYS MUST BE CONFIGURED BEFORE ASSIGNING SETPOINTS.**

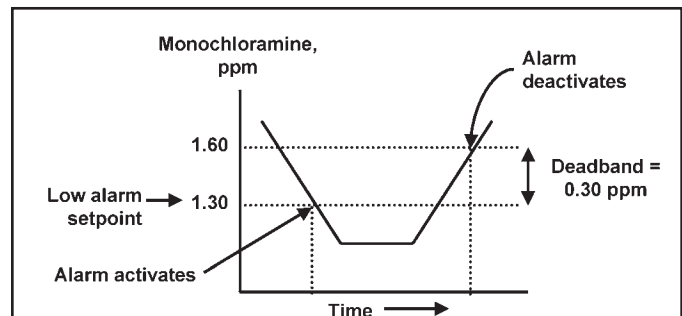
### 5.4.2 Definitions

1. **ASSIGNING ALARMS.** There are three alarms (**AL1**, **AL2**, and **AL3**). Alarms 1 and 2 are always assigned to the sensor. Alarm 3 can be assigned to the sensor or used as a fault alarm. The fault alarm activates when a fault exists in a sensor or the analyzer.
2. **FAULT ALARM.** A fault condition exists when the Model MCL analyzer detects a problem with a sensor or with the analyzer that is likely to cause seriously erroneous readings. If Alarm 3 was programmed as a fault alarm, the alarm 3 relay will activate. The word **Fault** will appear alternately in the display with the reading.
3. **ALARM LOGIC, SETPOINTS, AND DEADBANDS.** See Figures 5-1 and 5-2.



**FIGURE 5-1. High Alarm Logic**

The alarm activates when the monochloramine concentration exceeds the high setpoint. The alarm remains activated until the reading drops below the value determined by the deadband.



**FIGURE 5-2. Low Alarm Logic**

The alarm activates when the monochloramine concentration drops below the low setpoint. The alarm remains activated until the reading increases above the value determined by the deadband.

Alarm relays are single pole-double throw (SPDT). When an alarm is activated, the coil is energized. When an alarm activates, **AL1**, **AL2**, or **AL3** (as appropriate) appears periodically in the display.

## 5.4.3 Procedure: Configuring Alarms

To choose a menu item, move the cursor to the item and press ENTER.  
To store a number or setting, press ENTER.

Calibrate	Hold
<b>Program</b>	Display

Outputs	<b>Alarms</b>
Measurement	>>

Alarm Setpoints
<b>Alarm Configure</b>

Alarm Config?		
<b>AL1</b>	AL2	AL3

AL1 S1 is for?	
<b>Measurement</b>	Temp

AL3 is for?	
<b>Fault</b>	Sensor1

1. Press MENU. The main menu screen appears. Choose **Program**.
2. Choose **Alarms**.
3. Choose **Alarm Configure**.
4. Choose Alarm 1 (**AL1**), Alarm 2 (**AL2**), or Alarm 3 (**AL3**).
5. For **AL1** or **AL2**
  - a. Choose **Measurement** or **Temp**.
  - b. Choose **High** or **Low**.
  - c. Set the alarm **Deadband**.
6. The display returns to the **Alarm Configure?** screen. Select another alarm or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.
7. For **AL3**
  - a. Choose **Sensor1** (monochloramine) or **Fault**.
  - b. For sensor 1, choose **Measurement** or **Temp**.
  - c. Choose **High** or **Low**. Set the deadband.
  - d. Choosing **Fault** means **AL3** will activate when a sensor or analyzer fault exists. There is no user setting to make.
8. The display returns to the **Alarm Configure?** screen. Select another alarm or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.



## 5.4.4 Procedure: Programming Alarm Setpoints

To choose a menu item, move the cursor to the item and press ENTER.  
To store a number or setting, press ENTER.

Calibrate	Hold
<b>Program</b>	Display

1. Press MENU. The main menu screen appears. Choose **Program**.

Outputs	<b>Alarms</b>
Measurement	>>

2. Choose **Alarms**.

<b>Alarm Setpoints</b>
Alarm Configure

3. Choose **Alarm Setpoints**.

Select Alarm?
<b>AL1</b> AL2            AL3

4. Choose Alarm 1 (**AL1**), Alarm 2 (**AL2**), or Alarm 3 (**AL3**).

AL1 S1 Setpoint?
High <b>20.00PPM</b>

5. The display shows the alarm selected (**AL1**) and the configuration. The alarm is for Sensor 1 (**S1**), and the logic is high. Use the arrow keys to change the alarm setpoint.

6. The display returns to the **Select Alarm?** screen. Select another alarm or press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

## 5.5 SELECTING THE TYPE OF CHLORINE MEASUREMENT

### 5.5.1 Purpose

This section describes how to do the following:

1. Program the analyzer to measure monochloramine. This step is necessary because the Model MCL analyzer can be used with other sensors to measure other chlorine oxidants.
2. Determine the level of electronic filtering of the sensor current

### 5.5.2 Definitions

1. **FREE CHLORINE.** Free chlorine is the result of adding sodium hypochlorite (bleach), calcium hypochlorite (bleaching powder), or chlorine gas to fresh water. Free chlorine is the sum of hypochlorous acid (HOCl) and hypochlorite ion (OCl<sup>-</sup>).
2. **TOTAL CHLORINE.** Total chlorine is the sum of free and combined chlorine. Combined chlorine generally refers to chlorine oxidants in which chlorine is combined with ammonia or organic amines.
3. **MONOCHLORAMINE.** Monochloramine (NH<sub>2</sub>Cl) is the product of a chemical reaction between ammonia and chlorine. It is commonly used to disinfect drinking water.
4. **INPUT FILTER.** Before converting the sensor current to a monochloramine reading, the analyzer applies an input filter. The filter reduces noisy readings, but increases the response time. The level of filtering is selected by choosing the amount of time required for the display to reach 63% of a step change.

### 5.5.4 Procedure.

To choose a menu item, move the cursor to the item and press ENTER.

To store a number or setting, press ENTER.

Calibrate	Hold
<b>Program</b>	Display

1. Press MENU. The main menu screen appears. Choose **Program**.

Outputs	Alarms
<b>Measurement</b>	>>

2. Choose **Measurement**.

S1 Chlorine Type	
<b>free</b>	total >>

3. For **Sensor 1** (chlorine), choose **monochloramine**.

Input filter?
63% in 005sec

4. Choose the amount of filtering desired.

5. The display returns to the screen shown in step 3. Press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

## 5.6 CHOOSING TEMPERATURE UNITS AND MANUAL OR AUTOMATIC TEMPERATURE COMPENSATION

### 5.6.1 Purpose

This section describes how to do the following:

1. Choose temperature display units (°C or °F).
2. Choose automatic or manual temperature compensation for membrane permeability.
3. Enter a temperature for manual temperature compensation.

### 5.6.3 Definitions

#### 1. AUTOMATIC TEMPERATURE COMPENSATION.

The monochloramine sensor is a membrane-covered amperometric sensor. The permeability of the membrane is a function of temperature. As temperature increases, membrane permeability increases. Thus, an increase in temperature will cause the sensor current and the analyzer reading to increase even though the monochloramine level remained constant. A correction equation in the analyzer software automatically corrects for changes in membrane permeability caused by temperature. In automatic temperature compensation, the analyzer uses the temperature measured by the sensor for the correction.

#### 2. MANUAL TEMPERATURE COMPENSATION.

In manual temperature compensation, the analyzer uses the temperature entered by the user for membrane permeability correction. It does not use the actual process temperature. Do NOT use manual temperature compensation unless the measurement and calibration temperatures differ by no more than about 2°C. Manual temperature compensation is useful if the sensor temperature element has failed and a replacement sensor is not available.

### 5.6.3 Procedure.

To choose a menu item, move the cursor to the item and press ENTER.

To store a number or setting, press ENTER.

Calibrate	Hold
<b>Program</b>	Display

1. Press MENU. The main menu screen appears. Choose **Program**.

Outputs	Alarms
Measurement	>>

2. Choose >>.

<b>Temp</b>	Security
	>>

3. Choose **Temp**.

Config Temp?	
°C/F	Live/Manual

4. Choose °C/F to change temperature units. Choose **Live/Manual** to turn on (Live) or turn off (Manual) automatic temperature compensation.
  - a. If °C/F is chosen, select °C or °F in the next screen.
  - b. If **Live/Manual** is chosen, select **Live** or **Manual** for sensor 1 (monochloramine) in the next screen.
  - c. If **Manual** is chosen, enter the temperature in the next screen. The temperature entered in this step will be used in all subsequent temperature corrections, no matter what the process temperature is.

5. To return to the main display, press MENU then EXIT.

## 5.7 SETTING A SECURITY CODE

### 5.7.1 Purpose.

This section describes how to set a security code. The security code prevents program and calibration settings from accidentally being changed. Refer to Section 4.4 for additional information.

### 5.7.2 Procedure.

To choose a menu item, move the cursor to the item and press ENTER.  
To store a number or setting, press ENTER.

Calibrate	Hold
<b>Program</b>	Display

Outputs	Alarms
Measurement	>>

Temp	<b>Security</b>
	>>

1. Press MENU. The main menu screen appears. Choose **Program**.
2. Choose >>, then **Security**.
3. Enter a three digit security code. The security code takes effect two minutes after the last key stroke.
4. The display returns to the security menu screen. Press EXIT to return to the previous screen. To return to the main display, press MENU followed by EXIT.

## 5.8 NOISE REJECTION

### 5.8.1 Purpose.

For maximum noise rejection, the frequency of the ac power must be entered in the analyzer.

### 5.8.2. Procedure.

To choose a menu item, move the cursor to the item and press ENTER.  
To store a number or setting, press ENTER.

Calibrate	Hold
<b>Program</b>	Display

1. Press MENU. The main menu screen appears. Choose **Program**.

<b>Outputs</b>	Alarms
Measurement	>>

2. Choose >>.

<b>Temp</b>	Security
	>>

3. Choose >>.

<b>Noise Rejection</b>	
ResetAnalyzer	>>

4. Choose **Noise Rejection**.

5. Enter the mains frequency, 50 Hz or 60 Hz.

6. The display returns to the **Noise Rejection** screen. To return to the main menu, press EXIT. To return to the main display, press MENU followed by EXIT.

## 5.9 RESETTING FACTORY CALIBRATION AND FACTORY DEFAULT SETTINGS

### 5.9.1 Purpose.

This section describes how to re-install factory calibration and default values. The process also clears all fault messages and returns the display to the first quick start screen.

### 5.9.2. Procedure.

**To choose a menu item, move the cursor to the item and press ENTER.  
To store a number or setting, press ENTER.**

Calibrate	Hold
<b>Program</b>	Display

1. Press MENU. The main menu screen appears. Choose **Program**.

<b>Outputs</b>	Alarms
Measurement	>>

2. Choose >>.

<b>Temp</b>	Security
	>>

3. Choose >>.

Noise Rejection	
ResetAnalyzer	>>

4. Choose **ResetAnalyzer**.

Load factory settings?	<b>Yes</b>	No
------------------------	------------	----

5. Choose **Yes** or No. If **Yes** is selected, previous settings are cleared and the **Quick Start Menu** appears.

## 5.10 SELECTING A DEFAULT SCREEN, LANGUAGE, AND SCREEN CONTRAST

### 5.10.1 Purpose

This section describes how to do the following:

1. set a default display screen
2. select a language
3. change the screen contrast

**To choose a menu item, move the cursor to the item and press ENTER.**  
**To store a number or setting, press ENTER.**

### 5.10.2 Procedure: Selecting a Display Screen

Calibrate	Hold
Program	<b>Display</b>

1. Press MENU. The main menu screen appears. Choose **Display**.

<b>Default Display</b>	
Language	Contrst

2. Choose **Default Display**.

3. Press ▲ or ▼ until the desired display appears.

4. The display returns to the screen in step 2. To return to the main menu, press MENU. To return to the main display, press MENU followed by EXIT.

### 5.10.3 Procedure: Choosing a Language

Calibrate	Hold
Program	<b>Display</b>

1. Press MENU. The main menu screen appears. Choose **Display**.

Default Display	
<b>Language</b>	Contrast

2. Choose **Language**.

3. Choose English, Français, Español, Deutsch, Italiano, or Portugues.

<b>English</b>	Fran çais
Espa òl	>>

4. The display returns to the screen in step 2. To return to the main menu, press MENU. To return to the main display, press MENU followed by EXIT.

### 5.10.4 Procedure: Changing Screen Contrast

Calibrate	Hold
Program	<b>Display</b>

1. Press MENU. The main menu screen appears. Choose **Display**.

Default Display	
Units	<b>Contrst</b>

2. Choose **Contrst**.

Screen Contrast:	
<b>50</b>	

3. Press ▲ or ▼ to increase or decrease the screen contrast. As contrast increases, the number increases.

4. The display returns to the screen shown in step 2. To return to the main menu, press MENU. To return to the main display, press MENU followed by EXIT.

## SECTION 6.0 CALIBRATION

- 6.1 INTRODUCTION
- 6.2 CALIBRATING TEMPERATURE
- 6.3 CALIBRATING MONOCHLORAMINE

### 6.1 INTRODUCTION

The Calibrate Menu allows the user to calibrate the monochloramine sensor. Both the ppm reading and the temperature can be calibrated.

Monochloramine sensors require periodic full-scale calibration. The purpose of the full-scale standard is to establish the slope of the calibration curve. Because stable monochloramine standards do not exist, **the sensor must be calibrated against a test run a grab sample of the process liquid**. Several manufacturers offer portable test kits for this purpose.

New monochloramine sensors must be zeroed before being placed in service. Sensors should also be zeroed every time the electrolyte solution is replaced. Zeroing involves placing the sensor in a monochloramine-free sample until the sensor current drops to its lowest stable value.

### 6.2 CALIBRATING TEMPERATURE

#### 6.2.1 Purpose

Temperature is important in the measurement of monochloramine.

The monochloramine sensor is a membrane-covered amperometric sensor. As the sensor operates, monochloramine diffuses through the membrane and is consumed at an electrode immediately behind the membrane. The reaction produces a current that depends on the rate at which the monochloramine diffuses through the membrane. The diffusion rate, in turn, depends on the concentration of the monochloramine and how easily it passes through the membrane (the membrane permeability). Membrane permeability is a function of temperature. If the temperature changes, the sensor current will change, even though the concentration remained constant. To account for changes in sensor current caused by temperature alone, the analyzer automatically applies a membrane permeability correction. The membrane permeability changes about 5%/°C at 25°C, so an uncorrected 1°C change in temperature produces about a 5% error in the reading.

Without calibration the accuracy of the temperature measurement is about  $\pm 0.4^\circ\text{C}$ . Calibrate the sensor/analyzer unit if

1.  $\pm 0.4^\circ\text{C}$  accuracy is not acceptable
2. the temperature measurement is suspected of being in error. Calibrate temperature by making the analyzer reading match the temperature measured with a **standard thermometer**.



## 6.2.2 Procedure

1. Remove the sensor from the process. Place it in an insulated container of water along with a **calibrated thermometer**. Submerge at least the bottom two inches of the sensor. Stir continuously.
2. Allow the sensor to reach thermal equilibrium. For the monochloramine sensor, the time constant for a change in temperature is 5 min., so it may take as long as 30 min. for temperature equilibration.
3. If the sensor cannot be removed from the process, measure the temperature of a flowing sample taken from a point as close to the sensor as possible. Let the sample continuously overflow an insulated container holding a **calibrated thermometer**.
4. Change the analyzer display to match the **calibrated thermometer** using the procedure below.

Calibrate	Hold
Program	Display

CalSensor1?	
Measurement	Temp

Live	25.0°C
CalS1	+25.0°C

a. Press MENU. The main menu screen appears. Choose **Calibrate**.

b. Choose **Temp**.

c. If the analyzer was programmed in Section 5.6 to use the actual process temperature, the screen at left will appear. To calibrate the temperature, change the number in the second line to match the temperature measured with the **standard thermometer**. Press ENTER. Go to step e.

If the calibration temperature is more than 2 or 3°C different from the live reading, see Section 8.4 and 8.6.

If the analyzer was programmed to use a temperature entered by the user, go to step e.

ManualTemp?	
S1: +25.0°C	

CalSensor1?	
Measurement	Temp

d. The screen at left will appear. Change the temperature to the desired value, then press ENTER. The analyzer will use the temperature entered in this step in all measurements and calculations, no matter what the true temperature is.

e. To return to the main display, press MENU followed by EXIT.

## 6.3 CALIBRATION — MONOCHLORAMINE

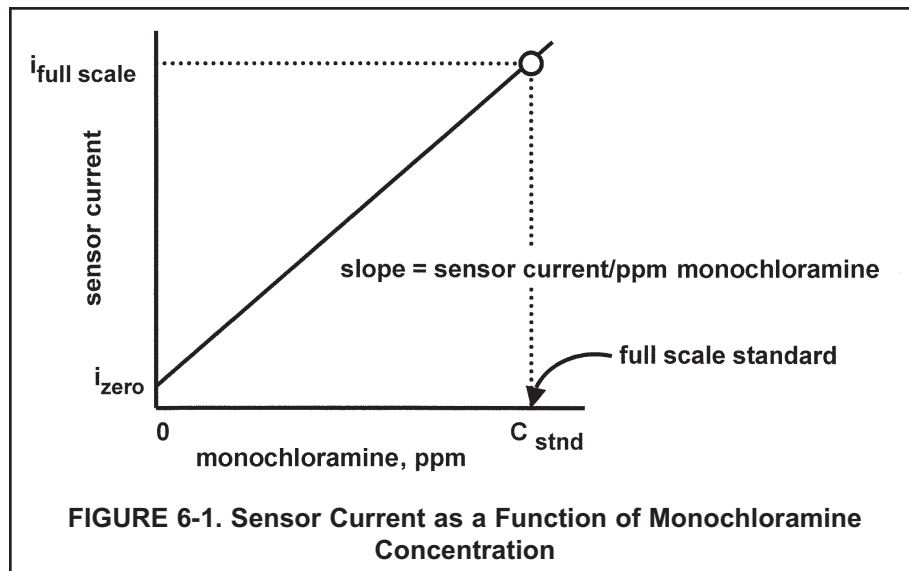
### 6.3.1 Purpose

As Figure 6-1 shows, a monochloramine sensor generates a current directly proportional to the concentration of monochloramine in the sample. Calibrating the sensor requires exposing it to a solution containing no monochloramine (zero standard) and to a solution containing a known amount of monochloramine (full-scale standard).

The zero standard is necessary because monochloramine sensors, even when no monochloramine is present, generate a small current called the residual current. The analyzer compensates for the residual current by subtracting it from the measured current before converting the result to a monochloramine value. New sensors require zeroing before being placed in service, and sensors should be zeroed whenever the electrolyte solution is replaced. Deionized water makes a good zero standard:

The purpose of the full-scale standard is to establish the slope of the calibration curve. Because stable monochloramine standards do not exist, **the sensor must be calibrated against a test run on a grab sample of the process liquid.** Several manufacturers offer portable test kits for this purpose. Observe the following precautions when taking and testing the grab sample.

- Take the grab sample from a point as close to the sensor as possible. Be sure that taking the sample does not alter the flow of the sample to the sensor. It is best to install the sample tap just downstream from the sensor.
- Monochloramine solutions are unstable. Run the test immediately after taking the sample. Try to calibrate the sensor when the monochloramine concentration is at the upper end of the normal operating range.



**6.3.2 Procedure — Zeroing the sensor.**

- Place the sensor in the zero standard (deionized water). Be sure no air bubbles are trapped against the membrane. The sensor current will drop rapidly at first and then gradually reach a stable zero value. To monitor the sensor current, go to the main display and press ▼ until the sensor input current is showing. Typical zero current for a monochloramine sensor is in the range -10 to +15 nA.

A new sensor or a sensor in which the electrolyte solution has been replaced may require several hours (occasionally as long as overnight) to reach a minimum zero current. **DO NOT START THE ZERO ROUTINE UNTIL THE SENSOR HAS BEEN IN ZERO SOLUTION FOR AT LEAST TWO HOURS.**

<b>Calibrate</b>	Hold
Program	Display

- Press MENU. The main menu screen appears. Choose **Calibrate**.

CalSensor1?	
<b>Measurement</b>	Temp

- Choose **Measurement**.

Cal S1?	
InProcess	<b>Zero</b>

- Choose **Zero**.

S1 Live	1.000PPM
Zeroing	<b>Wait</b>

- The screen at left appears. The top line is the current monochloramine reading based on the previous calibration or, for a first time calibration, the default sensitivity.

S1 Live	0.000PPM
Sensor Zero Done	

- Once the reading is stable, the screen at left appears. Sensor zero is complete and the analyzer has stored the zero current. The screen remains until the operator presses MENU then EXIT to return to the main display.

**NOTE**

Pressing ENTER during the zero step will cause the analyzer to use the present sensor current as the zero current. If the sensor is zeroed before the current has reached a minimum stable value, subsequent readings will be in error.

After zeroing, leave the sensor in the zero solution and verify that the sensor current is between -10 and +15 nA. To display the sensor current, go to the main display and press ▼ until the input current is showing.

Sensor Zero Fail	
Current Too High	

- This screen appears if the zero current is extremely high. See Section 8.3 for troubleshooting. To repeat the zero step, press EXIT and choose **Zero**.

Possible ZeroErr	
Proceed? Yes	<b>No</b>

- This screen appears if the zero current is moderately high. To continue, choose **Yes**. To repeat the zero step, choose **No**.

**6.3.3 Procedure — Calibrating the sensor**

1. Place the sensor in the flow cell. Adjust the sample flow until water overflows the center tube in the constant head flow controller.
2. Adjust the monochloramine concentration until it is near the upper end of the operating range. Wait until the analyzer reading is stable before starting the calibration.

<b>Calibrate</b>	Hold
Program	Display

CalSensor1?	
<b>Measurement</b>	TEMP

Cal S1?	
<b>InProcess</b>	Zero

Live	10.000PPM
Cal S1	10.000PPM

3. Press MENU. The main menu screen appears. Choose **Calibrate**.
4. Choose **Measurement**.
5. Choose **InProcess**.
6. The screen shown at left appears. The top line is the current monochloramine reading based on the previous calibration.

Sample the process liquid. Make a note of the reading before taking the sample. Immediately determine monochloramine. Note the analyzer reading again. If the present reading (X) differs from the reading when the sample was taken (Y), calculate the value to enter (C) from the following formula:

$$C = (X/Y) (A)$$

where A is the concentration of monochloramine in the grab sample.

Change the reading in the second line to match the results of the grab sample test.

7. During calibration, the analyzer stores the measured current and calculates the sensitivity. Sensitivity is sensor current in nA divided by the concentration of ozone. The sensitivity of a 499ACL-03 (monochloramine) sensor is 250-450 nA/ppm at 25°C.

Possible Cal Err	
Proceed? Yes	<b>No</b>

8. This screen appears if the sensitivity is much higher or lower than expected. See Section 8.3. for troubleshooting. To repeat the calibration step, press EXIT and choose **InProcess**.

Calibration	
Error	

9. This screen appears if the sensitivity is moderately higher or lower than expected. To continue, choose **Yes**. To repeat the calibration, choose **No**. For troubleshooting assistance, see Section 8.3.

## SECTION 7.0 MAINTENANCE

### 7.1 ANALYZER

### 7.2 SENSOR

### 7.3 CONSTANT HEAD SAMPLER

#### 7.1 ANALYZER

The Model MCL analyzer 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 solvent, like alcohol, that might cause a buildup of static charge.

Only a few components of the analyzer are replaceable. See Table 7-1 and Figure 7-1.

Circuit boards are not replaceable.

If the analyzer must be replaced, order Model 1055-01-11-24-68.

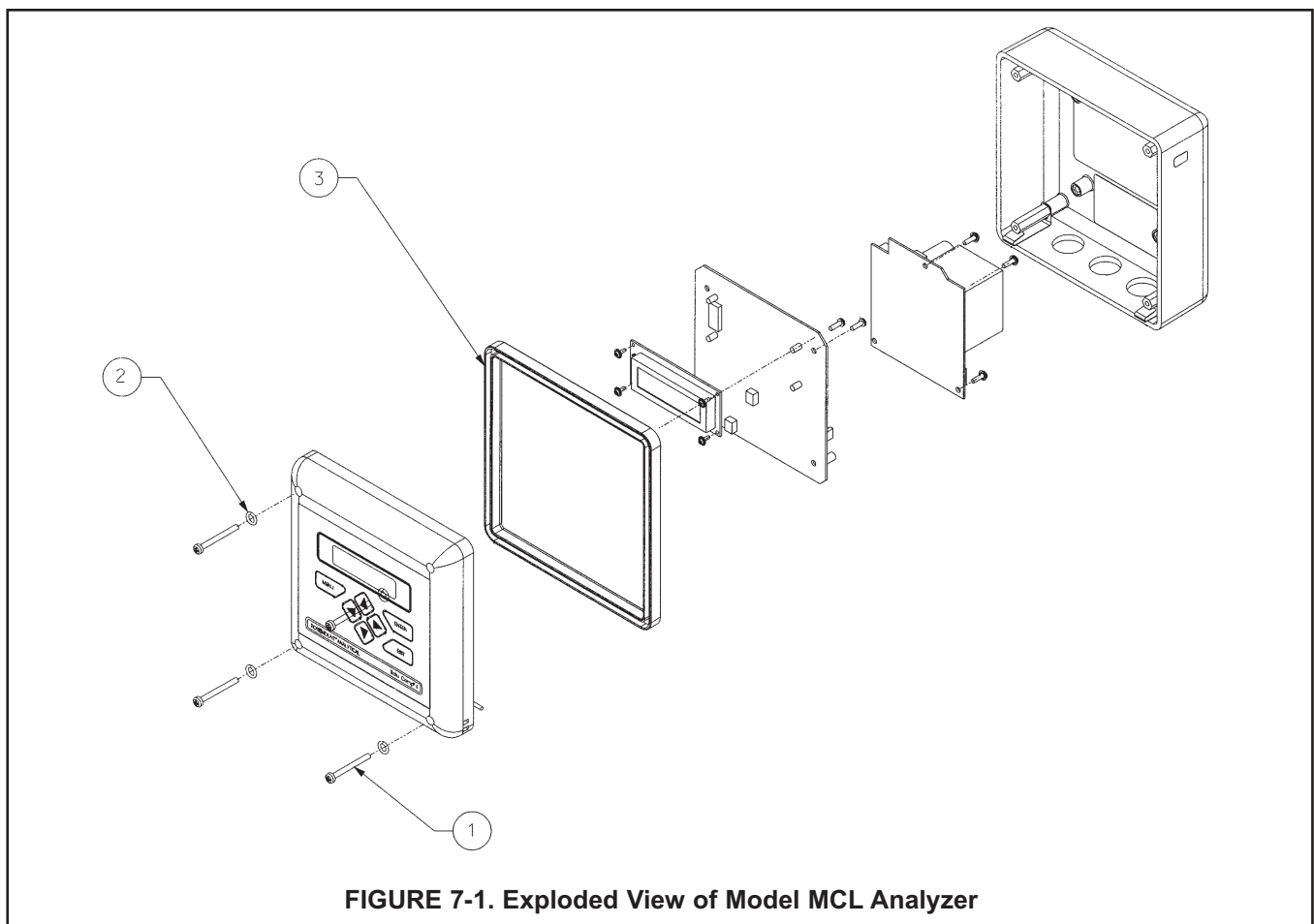
#### Replacing the analyzer.

1. Turn off power to the MCL.
2. Loosen the four screws holding the front panel to the enclosure case and let the panel swing down.
3. Disconnect the power, alarm, output, and sensor wires.
4. The front panel is held to the rear enclosure by a -shaped metal pin inserted into clips on each side of the rear enclosure. To remove the front panel, close the panel until the pin moves slightly past the open end of one of the clips. Using a small screwdriver, press down on the top of the clip. At the same time lift the pin over the end of the clip. Once one end of the pin is free, the other end easily slides out of the other clip.
5. Using the procedure in step 4, remove the front panel from the replacement analyzer.
6. To install the replacement panel, place one end of the pin in one of the clips. Push the other end of the pin over the other clip. The pin will snap into place.
7. Replace the power, alarm, output, and sensor wires. See Section 3.0 for wiring connections. Be sure to leave adequate slack to avoid stress on the conductors when the panel is opened.

**TABLE 7-1. Replacement Parts for MCL Analyzer (1055-01-11-24-68)**

Location in Figure 7-1	PN	Description	Shipping Weight
1	note	Screw, 6-32 x 1.38 in.	
2	note	O-ring 2-007	
3	33655-00	Gasket for pipe/surface mount version	2 lb/1.0 kg
not shown	23833-00	Surface mount kit; consists of four self-tapping screws #6 x 1.75 in. and four O-rings	1 lb/0.5 kg

Note: Information about the size of screws and O-rings is for information only. Screws and washers cannot be purchased from Rosemount Analytical.  
Shipping weights are rounded up to the nearest whole lb or 0.5 kg.



## 7.2 MONOCHLORAMINE SENSOR

**CAUTION:**

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

### 7.2.1 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.

### 7.2.2 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 swirling the sensor in a beaker of clean water.

**NOTE**

**Do not use a stream of water from a wash bottle or a tissue to clean the sensor. Do not touch the membrane. Doing so may damage the cathode, making the sensor unusable.**

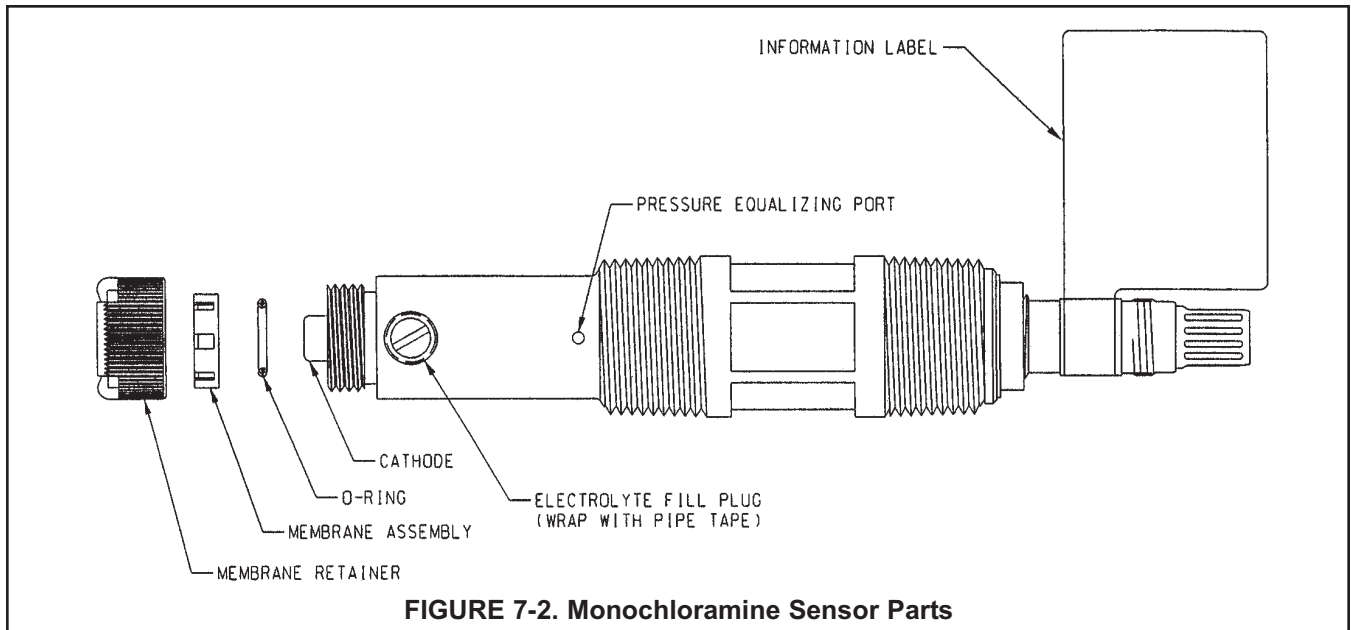
### 7.2.3 Replacing the electrolyte solution and membrane.

1. Unscrew the membrane retainer and remove the membrane assembly and O-ring. See Figure 7-2.

**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.



**TABLE 7-2. 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	Monochloramine Sensor Fill Solution, 4 oz (120 mL)



## 7.3 CONSTANT HEAD FLOW CONTROLLER

### 7.3.1 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. Severe loss of flow may ultimately have an impact on the monochloramine sensor performance. The flow controller is designed to provide about 2 gal/hr flow. Lowering the flow to 1 gal/hr causes less than a 5% drop in sensor output.

Low flow may cause bubbles to get trapped against the membrane. Trapped bubbles will lower the sensitivity.

### 7.3.2 Cleaning the flow controller

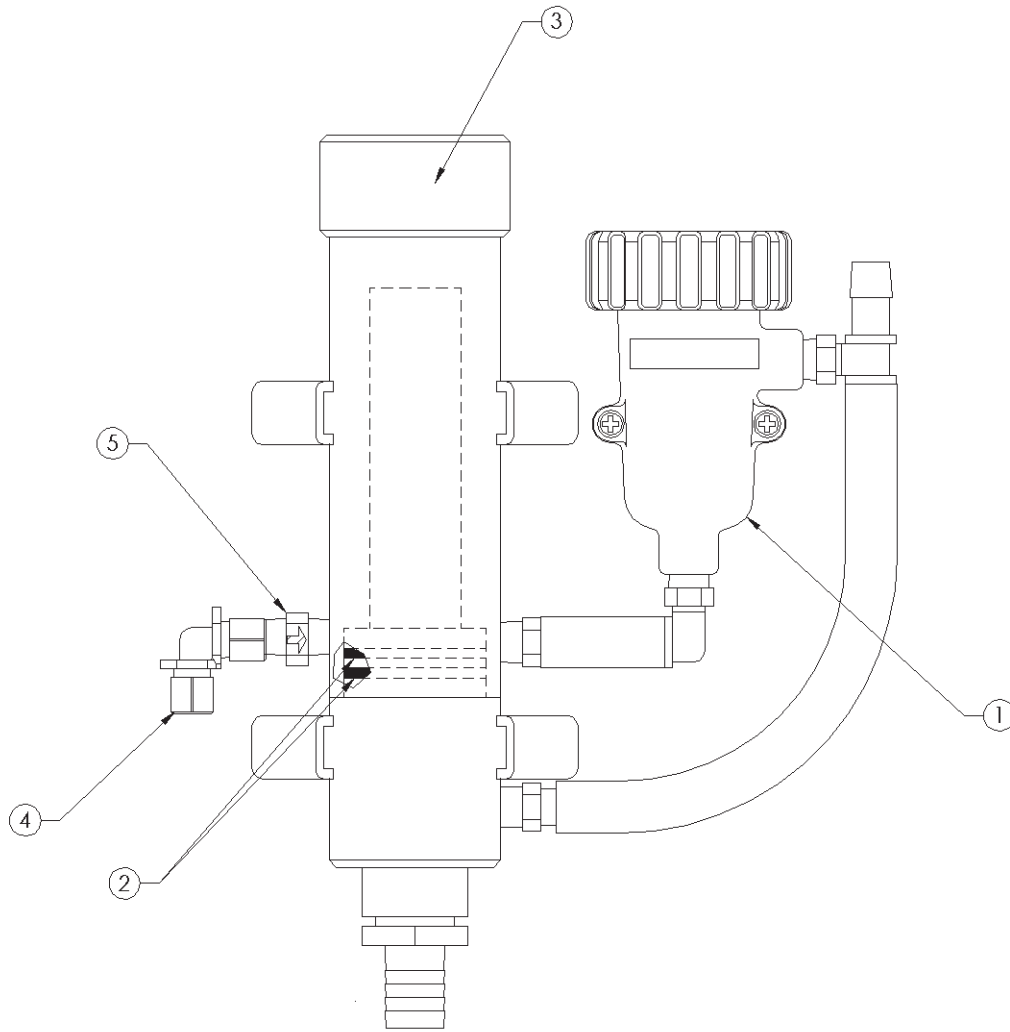
The low flow controller can be taken apart completely for cleaning. Use a strong flow of water to flush out the tubing. A pipe cleaner or a small bottlebrush can remove more adherent deposits. To prevent leaks in the reassembled flow controller, apply a thin layer of silicone grease (or equivalent) to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

### 7.3.3 Other Maintenance

Table 7-3 and Figure 7-3 show the replacement parts for the flow controller assembly used in Model MCL.

**TABLE 7-3. Replacement parts for constant head flow controller assembly (Model MCL)**

Location in Figure 7-3	PN	Description	Shipping Weight
1	24091-01	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



**FIGURE 7-3. Replacement Parts for the Flow Controller Assembly used in Model MCL.**

## SECTION 8.0 TROUBLESHOOTING

### 8.1 OVERVIEW

### 8.2 TROUBLESHOOTING USING FAULT CODES

### 8.3 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING

### 8.4 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING — GENERAL

### 8.5 SIMULATING INPUTS

### 8.6 SIMULATING TEMPERATURE

### 8.1 OVERVIEW

The analyzer used with the Model MCL continuously monitors itself and the sensor(s) for faults. When the analyzer detects a fault, the word *fault* appears in the display alternately with the measurement. If alarm 3 was configured as a fault alarm, the alarm relay will energize. The outputs do not change during a fault condition. They continue to reflect the measured monochloramine and temperature. **Press ▲ to display the fault codes.**

#### NOTE

A large number of information screens are available to aid troubleshooting. The most useful of these are raw sensor current and sensitivity and zero current at last calibration. To view the information screens, go to the main display and press the ▼ key.

### 8.2 TROUBLESHOOTING USING FAULT CODES

Fault Code	Explanation	See Section
S1 Out of Range	Sensor current exceeds 210 $\mu$ A	8.2.1
TC1 Open	RTD is open	8.2.2
TC1 Shorted	RTD is shorted	8.2.2
S1 Sense Line Open	RTD sense line is open	8.2.3
EEPROM Failure	EEPROM failure	8.2.4

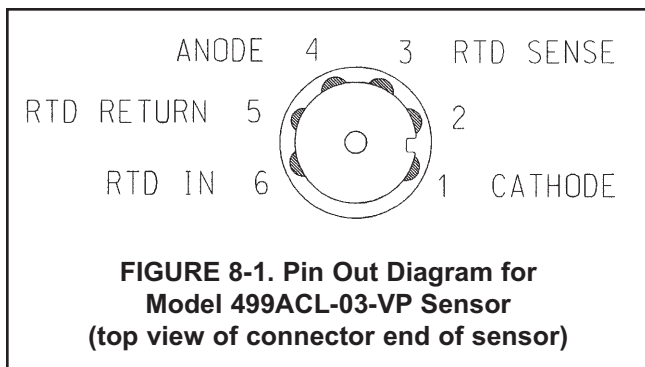
#### 8.2.1 Monochloramine Sensor Current Exceeds 210 $\mu$ A

Excessive sensor current implies that the monochloramine sensor is miswired or the sensor has failed.

**8.2.2 RTD is Open or Shorted.**

There is an open or short in the sensor RTD or wiring.

- A. If the sensor cable has just been replaced, check the wiring connections. See Section 3.2.
- B. Disconnect the sensor from the lead wire. Connect an ohmmeter across the RTD IN and RTD RETURN pins on the Variopol plug at the top of the sensor. Refer to Figure 8-1. The resistance should be about 110  $\Omega$ . If there is an open or short circuit, the sensor has failed and should be replaced. If the resistance is acceptable, attach the sensor to the Variopol cable and disconnect the RTD IN and RTD RETURN leads at the analyzer. Refer to Figure 3-2. Connect an ohmmeter across the leads and measure the resistance. If the circuit is open or shorted, the failure is in the cable, and the cable must be replaced.
- C. If there is no open or short, check the analyzer. See Section 8.8.

**8.2.3 RTD Sense Line is Open.**

The analyzer measures temperature using a three-wire RTD. See Figure 8-4. The in and return leads connect the RTD to the measuring circuit in the analyzer. A third wire, called the sense line, is connected to the return line. The sense line allows the analyzer to correct for the resistance of the in and return leads and to correct for changes in lead wire resistance caused by changes in the ambient temperature.

- A. Verify that all wiring connections are secure.
- B. The system can be operated with the sense line open. The measurement will be less accurate because the analyzer can no longer correct for lead wire resistance and for changes in lead wire resistance with ambient temperature. However, if the sensor is to be used at approximately constant temperature, the lead wire resistance error can be eliminated by calibrating the sensor at the measurement temperature. Errors caused by changes in lead wire resistance with changes in ambient temperature cannot be eliminated. To make the error message disappear, connect the RTD sense and return terminals with a jumper.

**8.2.4 EEPROM Failure.**

Call the factory at (800) 854-8257.

**8.3 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING**

<b>Problem</b>	<b>See Section</b>
Zero current was accepted, but the current is outside the range -10 to 50 nA	8.3.1
Error or warning message appears while zeroing the sensor (zero current is too high)	8.3.1
Zero current is unstable	8.3.2
Sensor can be calibrated, but the current is less than about 350 nA/ppm at 25°C	8.3.3
Process readings are erratic	8.3.4
Readings drift	8.3.5
Sensor does not respond to changes in monochloramine level	8.3.6
Readings are too low	8.3.7

**8.3.1 Zero current is too high**

- A. Is the sensor properly wired to the analyzer? See Section 3.2.
- B. Is the zero solution monochloramine-free? Take a sample of the solution and test it for monochloramine level. The concentration should be less than 0.02 ppm.
- C. Has adequate time been allowed for the sensor to reach a minimum stable residual current? It may take several hours, sometimes as long as overnight, for a new sensor to stabilize.
- D. Check the membrane for damage and replace it if necessary. Be careful not to touch the membrane or cathode. Touching the cathode mesh may damage it.

**8.3.2 Zero current is unstable**

- A. Is the sensor properly wired to the analyzer? See Section 3.2. Verify that all wiring connections are tight.
- B. Readings are often erratic when a new or rebuilt sensor is first placed in service. Readings usually stabilize after about an hour.
- C. Is the space between the membrane and cathode mesh filled with electrolyte solution? Often the flow of electrolyte can be started by simply holding the sensor with the membrane end pointing down and sharply shaking the sensor a few times as though shaking down a clinical thermometer.  
Verify that the sensor is filled with electrolyte solution. Refer to Section 7.2 for details.

### 8.3.3 Sensor can be calibrated, but the current is too low

- A. Is the temperature low? The sensor current decreases about 5% for every °C drop in temperature.
- B. Sensor current depends on the rate of sample flow past the sensor tip. If the flow is too low, monochloramine readings will be low. Be sure the liquid level in the constant head flow controller 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 7.3.
- C. Is a bubble trapped against the membrane? If a sample flow becomes too low (because dirt or slime has built up on in the flow controller), bubbles will have a tendency to collect on the membrane. The bubble reduces the active area of the membrane, and readings drop. The design flow (2 gph) is adequate to push away bubbles. See Section 7.3 for cleaning procedure.
- D. Low current can be caused by lack of electrolyte flow to the cathode and membrane. See step D in Section 8.5.2.
- E. When was the sensor fill solution last replaced? The monochloramine sensor loses sensitivity, that is, it generates less current per ppm of monochloramine, as it operates. Gradual loss of sensitivity can usually be compensated for by calibrating the sensor weekly. After about three months of operation, the sensitivity may start to drop rapidly. At this point, the electrolyte solution and membrane should be replaced. Refer to the sensor instruction manual.
- F. Is the membrane fouled or coated? A dirty membrane inhibits diffusion of monochloramine through the membrane, reducing the sensor current and increasing the response time. Clean the membrane by swirling it vigorously in a beaker of water. **DO NOT** use a membrane or tissue to wipe the membrane.
- G. If cleaning the membrane does not improve the sensor response, replace the membrane and electrolyte solution. See the sensor instruction sheet for details.

### 8.3.4 Process readings are erratic

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

### 8.3.5 Readings drift

- A. Is the sample temperature changing? Membrane permeability is a function of temperature. The time constant for the sensor is about five minutes. Therefore, the reading may drift for a while after a sudden temperature change.
- B. Is the membrane clean? For the sensor to work properly, monochloramine must diffuse freely through the membrane. A coating on the membrane will interfere with the passage of monochloramine, resulting in slow response. Clean the membrane by swirling it vigorously in a beaker of water. **DO NOT** use a membrane or tissue to wipe the membrane.
- C. 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 flow controller 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 7.3.
- D. Is a bubble trapped against the membrane? If a sample flow becomes too low (because dirt or slime has built up on in the flow controller), bubbles will have a tendency to collect on the membrane. The bubble reduces the active area of the membrane, and readings drop. The design flow (2 gph) is adequate to push away bubbles. See Section 7.3 for cleaning procedure.
- E. Is the sensor new or has it been recently serviced? New or rebuilt sensors may require several hours to stabilize.
- F. 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 the sensor instruction manual for details.

**8.3.6 Sensor does not respond to changes in monochloramine level.**

- A. Is the grab sample test accurate? Is the grab sample representative of the sample flowing to the sensor?
- B. When was the sensor fill solution last replaced? The monochloramine sensor loses sensitivity, that is, it generates less current per ppm of monochloramine, as it operates. After about three months of operation, the sensitivity may start to drop rapidly. If the fill solution is extremely old, the sensor may be completely non-responsive to monochloramine. Replace the fill solution and membrane. See the sensor instruction manual for details.
- C. Is the membrane clean? Clean the membrane with a stream of water and replace it if necessary.
- D. Is a bubble trapped against the membrane? If a sample flow becomes too low (because dirt or slime has built up on in the flow controller), bubbles will have a tendency to collect on the membrane. The bubble reduces the active area of the membrane, and readings drop. The design flow (2 gph) is adequate to push away bubbles. See Section 7.3 for cleaning procedure.
- E. Replace the sensor.

**8.3.7 Readings are too low.**

- A. Was the sample tested as soon as it was taken? Monochloramine solutions are moderately unstable. Test the sample immediately after collecting it. Avoid exposing the sample to sunlight.
- B. When was the sensor fill solution last replaced? The monochloramine sensor loses sensitivity, that is, it generates less current per ppm of monochloramine, as it operates. Generally, calibrating the sensor every week compensates for the gradual loss in sensitivity. After about three months of operation, the sensitivity may start to drop rapidly. At this point, the electrolyte solution and membrane should be replaced. Refer to the sensor instruction manual.

- C. Low readings can be caused by zeroing the sensor before the residual current has reached a stable minimum value. Residual current is the current the sensor generates even when no monochloramine is in the sample. Because the residual current is subtracted from subsequent measured currents, zeroing before the current is a minimum can lead to low results.

Example: The true residual current for a monochloramine sensor is 20 nA, and the sensitivity is 400 nA/ppm. Assume the measured current is 600 nA. The true concentration is  $(600-20)/400$  or 1.45 ppm. If the sensor was zeroed prematurely when the current was 40 nA, the measured concentration will be  $(600-40)/400$  or 1.40 ppm. The error is 3.5%. Suppose the measured current is 800 nA. The true concentration is 1.95 ppm, and the measured concentration is 1.90 ppm. The error is now 2.6%. The absolute difference between the reading remains the same, 0.05 ppm.

- D. Sensor response depends on flow. If the flow is too low, readings will be low and flow sensitive. Be sure the liquid level in the constant head flow controller 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 7.3.
- E. Is a bubble trapped against the membrane? If a sample flow becomes too low (because dirt or slime has built up on in the flow controller), bubbles will have a tendency to collect on the membrane. The bubble reduces the active area of the membrane, and readings drop. The design flow (2 gph) is adequate to push away bubbles. See Section 7.3 for cleaning procedure.

### 8.4 TROUBLESHOOTING WHEN NO ERROR MESSAGE IS SHOWING — GENERAL

Problem	See Section
New temperature during calibration more than 2-3°C different from the live reading	8.4.1
Current output is too low	8.4.2
Alarm relays do not operate when setpoint is exceeded	8.4.3
Display is unreadable — too faint or all pixels dark	8.4.4
Bubbles trapped against membrane	8.4.5

#### 8.4.1 Difference Between Solu Comp II and Standard Thermometer is Greater than 3°C.

- A. Is the reference thermometer, RTD, or thermistor accurate? General purpose thermometers, particularly ones that have been mistreated, can have surprisingly large errors.
- B. Review Section 6.2.2.

#### 8.4.2 Current Output Too Low.

Load resistance is too high. Maximum load is 600 Ω.

#### 8.4.3 Alarm Relays Do Not Work

Verify the relays are properly wired.

#### 8.4.4 Display is Unreadable.

While holding down the MENU key, press ▲ or ▼ until the display has the correct contrast.

#### 8.4.5 Bubbles Trapped Against Membrane.

If the flow against the sensor is too low, bubbles can get trapped against the membrane. Normally, low flow is caused by dirt or slime building up in the flow system tubing. See Section 7.3 for cleaning procedure.

### 8.5 SIMULATING INPUTS

To check the performance of the analyzer, use a decade box and 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.

- A. Disconnect the anode and cathode leads from terminals 1 and 2 on TB3 and connect a decade box and battery as shown in Figure 8-2. It is not necessary to disconnect the RTD leads.
- B. Set the decade box to the resistance shown below.

Polarizing Voltage	Resistance	Expected Current
400 mV	3 MΩ	400 nA

- C. Note the sensor current. It should be close to the value in the table. The actual value depends on the voltage of the battery. To view the sensor current, go to the main display and press ▼ until the sensor current is displayed.
- D. Change the decade box resistance and verify that the correct current is shown. Calculate current from the equation:

$$\text{current } (\mu\text{A}) = \frac{V_{\text{battery}} - V_{\text{polarizing}} \text{ (mV)}}{\text{resistance (k}\Omega\text{)}}$$

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

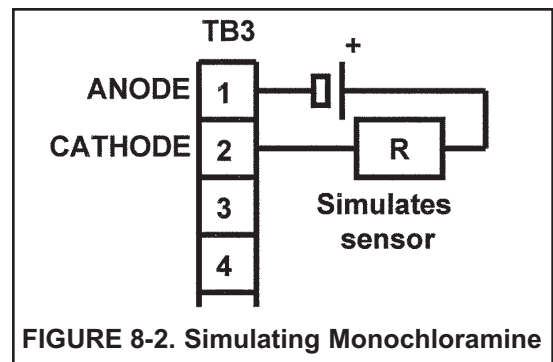


FIGURE 8-2. Simulating Monochloramine



## 8.6 SIMULATING TEMPERATURE

### 8.6.1 General.

The MCL analyzer accepts a Pt100 RTD. The Pt100 RTD is in a three-wire configuration. See Figure 8-3.

### 8.6.2 Simulating temperature

To simulate the temperature input, wire a decade box to the analyzer or junction box as shown in Figure 8-4.

To check the accuracy of the temperature measurement, set the resistor simulating the RTD to the values indicated 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 MCL is measuring temperature correctly if the difference between measured temperatures equals the difference between the values in the table to within  $\pm 0.1^{\circ}\text{C}$ .

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

## 8.9 MEASURING REFERENCE VOLTAGE

Some processes contain substances that poison or shift the potential of the reference electrode. Sulfide is a good example. Prolonged exposure to sulfide converts the reference electrode from a silver/silver chloride electrode to a silver/silver sulfide electrode. The change in reference voltage is several hundred millivolts. A good way to check for poisoning is to compare the voltage of the reference electrode with a silver/silver chloride electrode known to be good. The reference electrode from a new sensor is best. See Figure 8-7. If the reference electrode is good, the voltage difference should be no more than about 20 mV. A poisoned reference electrode usually requires replacement.

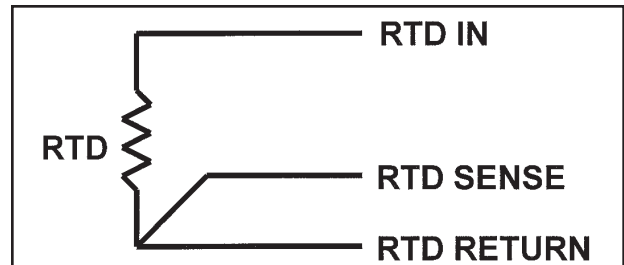


FIGURE 8-3. Three-Wire RTD Configuration.

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 with temperature.

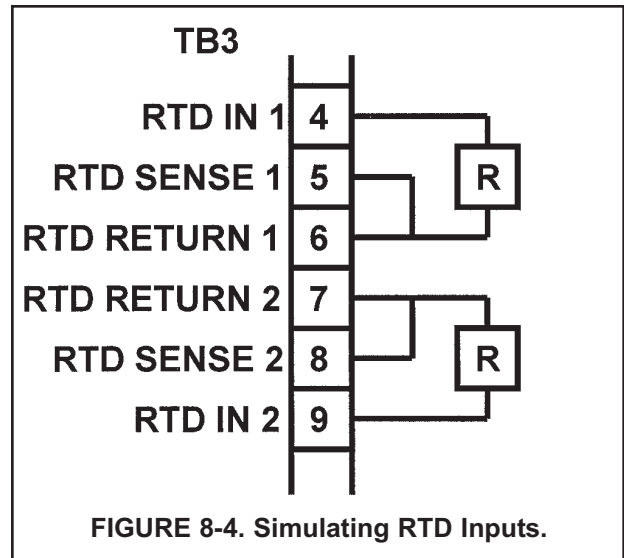


FIGURE 8-4. Simulating RTD Inputs.

Temp. ( $^{\circ}\text{C}$ )	Pt 100 ( $\Omega$ )
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

## SECTION 9.0 RETURN OF MATERIAL

- 9.1 GENERAL**
- 9.2 WARRANTY REPAIR**
- 9.3 NON-WARRANTY REPAIR**

### 9.1 GENERAL.

To expedite the repair and return of instruments, proper communication between the customer and the factory is important. Before returning a product for repair, call 1-949-757-8500 for a Return Materials Authorization (RMA) number.

### 9.2 WARRANTY REPAIR.

The following is the procedure for returning instruments still under warranty:

1. Call Rosemount Analytical for authorization.
2. To verify warranty, supply the factory sales order number or the original purchase order number. In the case of individual parts or sub-assemblies, the serial number on the unit must be supplied.
3. Carefully package the materials and enclose your "Letter of Transmittal" (see Warranty). If possible, pack the materials in the same manner as they were received.
4. Send the package prepaid to:

Emerson Process Management  
Liquid Division  
2400 Barranca Parkway  
Irvine, CA 92606

Attn: Factory Repair

RMA No. \_\_\_\_\_

Mark the package: Returned for Repair

Model No. \_\_\_\_\_

### 9.3 NON-WARRANTY REPAIR.

The following is the procedure for returning for repair instruments that are no longer under warranty:

1. Call Rosemount Analytical for authorization.
2. Supply the purchase order number, and make sure to provide the name and telephone number of the individual to be contacted should additional information be needed.
3. Do Steps 3 and 4 of Section 9.2.

#### NOTE

Consult the factory for additional information regarding service or repair.

## WARRANTY

Seller warrants that the firmware will execute the programming instructions provided by Seller, and that the Goods manufactured or Services provided by Seller will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller, whichever period expires first. **Consumables, such as glass electrodes, membranes, liquid junctions, electrolyte, o-rings, catalytic beads, etc., and Services are warranted for a period of 90 days from the date of shipment or provision.**

Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products.

If Buyer discovers any warranty defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall, at its option, promptly correct any errors that are found by Seller in the firmware or Services, or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Seller to be defective, or refund the purchase price of the defective portion of the Goods/Services.

All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources, unsuitable environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by an authorized Seller representative. All costs of dismantling, reinstallation and freight and the time and expenses of Seller's personnel for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Seller.

Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller. Except as otherwise expressly provided in the Agreement, THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES.

## RETURN OF MATERIAL

Material returned for repair, whether in or out of warranty, should be shipped prepaid to:

**Emerson Process Management  
Liquid Division  
2400 Barranca Parkway  
Irvine, CA 92606**

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.

If the material is returned for out-of-warranty repairs, a purchase order for repairs should be enclosed.



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**Liquid Division**

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Irvine, CA 92606 USA  
Tel: (949) 757-8500  
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