Reference Manual
00809-0100-3414, Rev AA
May 2019

Rosemount™ MCL-220

Monochloramine System with Rosemount 1056 Transmitter

ROSEMOUNT™

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Essential instructions

Read this page before proceeding!

Your instrument purchase from Emerson is one of the finest 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 quailty of the installation and knowledge of the user in operating and maintaining the instrument. To ensure continued operation to the design specifications, 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 1-800-999-9307 to request the corrrect 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, program, and maintain 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.

Note

Risk of electrical shock

Installing cable connections and servicing this product may require access to shock and high voltage levels.

Equipment protected throughout by double insulation.
Disconnect main power wired to separate power source before servicing.
Do not operate or energize instrument with case open.
Signal wiring within 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 exposure 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 (IP65).
Electrical installation must be in accordance with the National Electrical Code (ANSI/NFPA-70) and/or any other 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.
This product is not intended for use in the light industrial, residential, or commercial environments per the instrument's certification to EN50081-2.

Note

Radio interference

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 operator, at his own expense, will be required to take whatever measures may be required to correct the interference.

⚠ WARNING

Physical access

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and needs to be protected against.

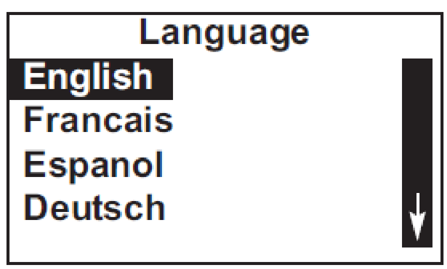
Physical security is an important part of any security program and fundamental to protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

Contents

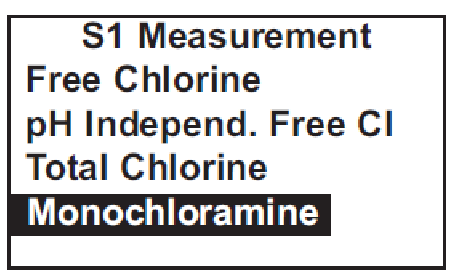
1 Quick Start

Procedure

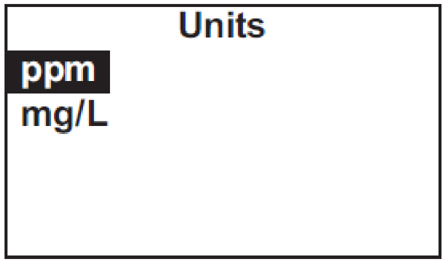
1. Once connections are secured and verified, apply power to the transmitter.
   When the transmitter is powered up for the first time, **Quick Start** screens appear. Using Quick Start is easy.
   a. A backlit field shows the position of the cursor.
   b. To move the cursor left or right, use the keys to the left or right of the **ENTER** key. To scroll up or down or to increase or decrease the value of a digit, use the keys above and below the **ENTER** key. Use the left and right keys 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 initial **Quick Start** screen.
   d. A vertical black bar with a downward pointing arrow on the right side of the screen means there are more items to display. Continue scrolling down to display all the items. When you reach the bottom of the list, the arrow points up.
2. Choose the desired language. Scroll down to display more choices.



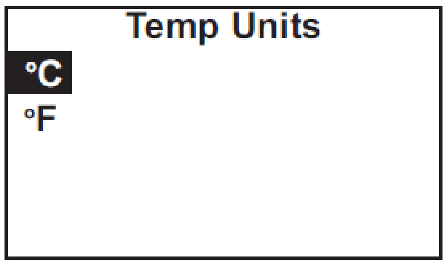
3. Choose Monochloramine for sensor 1 (S1).



4. Choose the desired units for chlorine.



5. Choose the desired temperature units.



The main display appears. The outputs and alarms (if an alarm board is present) are assigned to default values.

6. To change outputs, alarms, and other settings, go to the **Main Menu** and choose Program. Follow the prompts.

Calibrate
- **Sensor 1 (Monochloramine)**
  - Chlorine
    - Zero
    - In process
  - Temperature
- **Output 1**
- **Output 2**

Hold
- **Sensor 1**

Display
- **Main format configuration**
- **Language selection**
- **Warning (enable or disable)**
- **Screen contrast**

Program
- **Outputs**
  - Range (assign values to 4 and 20 mA)
  - Configure
    - Output 1 or 2
      - Assign sensor and measurement
      - Range
      - Scale
      - Dampening
      - Fault mode (fixed or live)
      - Fault value (output current)
  - Simulate
- **Alarms**
  - Configure/Setpoint
    - Alarm 1, 2, 3, or 4
      - Setpoint
      - Assign sensor and measurement
      - High or low logic
      - Deadband
      - Interval time
      - On time
      - Recovery time
  - Simulate
  - Synchronize timers
- **Measurement**
  - Monochloramine (sensor 1)
    - Measurement selection
    - Units
    - Filter
    - Resolution
- **Temperature**
  - Units
  - Temperature compensation (auto or manual)
  - Set manual temperature (if selected)
- **Security**
  - Calibrate/Hold only
  - All
- **Reset Analyzer**

2 Description and specifications

2.1 Specifications

Rosemount™ 1056 Transmitter

For Rosemount 1056 Transmitter specifications, see the Rosemount 1056 Transmitter Reference Manual on Emerson.com/Rosemount: *Manual: Rosemount 1056 Dual-Input Transmitter*.

Table 2-1: General Specifications

Characteristic	Specification
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 °C) • 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 77 °F (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, polycarbonate, polyester, and silicone Monochloramine sensor: Noryl®, Viton®, silicone, and Zitex®. PFTE 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 (rounded to the nearest 1 lb. or 0.5 kg)	10 lb./13 lb. (4.5 kg/6.0 kg)

Table 2-2: Sensor Specifications

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

Table 2-2: Sensor Specifications *(continued)*

Characteristic	Specification
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	2 months (approx.)

2.2 Ordering information

The Rosemount MCL-220 is a complete system for the determination of monochloramine in water. It consists of a monochloramine sensor, Rosemount 1056 transmitter, 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 transmitter. Three replacement membranes and a 4-oz bottle of electrolyte solution are shipped with the sensor.

Table 2-3: Component Parts

Transmitter model	Description
1056-03-24-38-AN	Rosemount 1056 transmitter, single input (monochloramine), alarm relays, analog output, 115/230 Vac
Sensor model	**Description**
499ACL-03-54-VP	Monochloramine sensor with Variopol connector
Sensor cable	**Description**
23747-04	Interconnecting cable, Variopol for Rosemount 499ACL sensor, 4 ft

Table 2-4: Accessories

Part number	Description
9240048-00	Tag, stainless steel (specify marking)

3 Install

3.1 Unpack and inspect

Procedure

1. Inspect the shipping container(s). If there is damage, contact the shipper immediately for instructions.
2. If there is no apparent damage, unpack the container(s).
3. Ensure that all items shown on the packing list are present.

   If items are missing, notify Emerson immediately.

3.2 Rosemount MCL-220

The Rosemount MCL-220 consists of the following items mounted on a back plate.

1. The Rosemount 1056-03-24-38-AN with sensor cable attached.
2. Constant head overflow sampler with flow cell for monochloramine sensor.
3. The monochloramine sensor (Rosemount 499ACL-03-54-VP), three membrane assemblies, and a bottle of electrolyte solution are in a separate package.

3.3 General installation information

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

   ⚠ CAUTION

   Hazardous areas

   The system is not suitable for use in hazardous areas.

2. To keep the transmitter enclosure watertight, install plugs (provided) in the unused conduit openings.
3. Install the system in an area where vibrations and electromagnetic and radio frequency interference are minimized or absent.
4. Keep the transmittter and sensor wiring at least one foot from high voltage conductors. Be sure there is easy access to the transmitter and sample conditioning system.
5. Be sure there is easy access to the transmitter and sensor(s).

3.4 Sample requirements

Be sure the sample meets the following requirements:

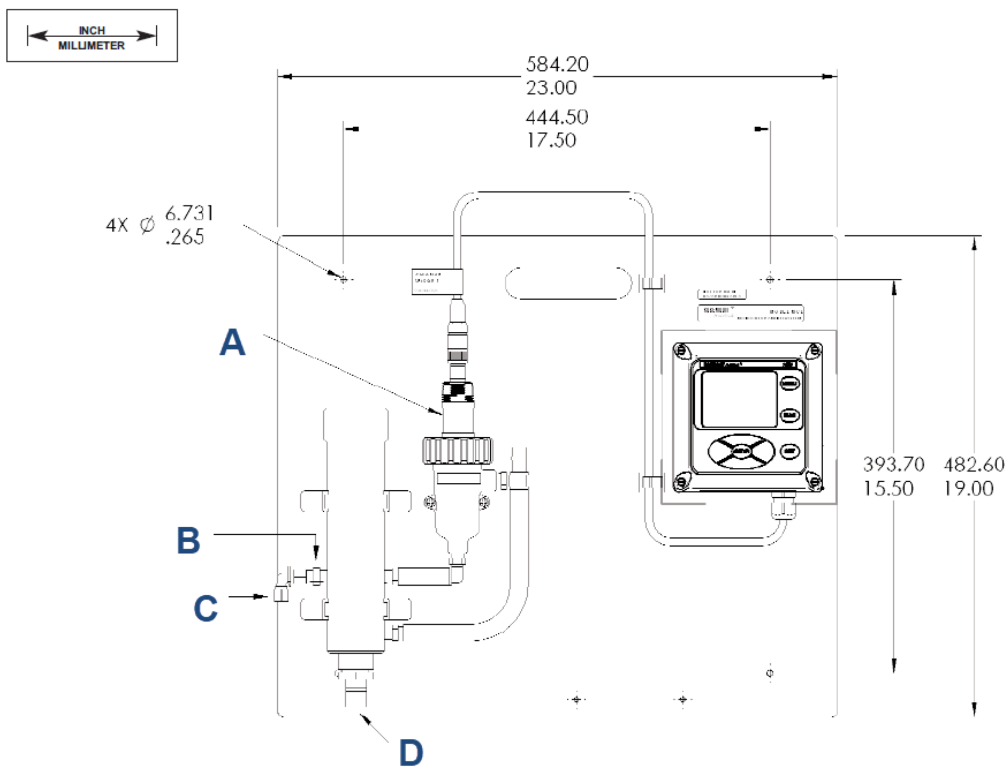
1. Temperature: 32 to 122 °F (0 to 50 °C)
2. Pressure: 3 to 65 psig (122 to 549 kPa abs)
3.

3.5 Mounting, inlet, and drain connections

The Rosemount™ MCL-220 is intended for wall mounting only.

Refer to Figure 3-1 for details. The sensor screws into the flow cell adapter.

Figure 3-1: Rosemount MCL-220 Monochloramine System



A. *Chlorine sensor*
B. *Check valve*
C. *Inlet*
D. *Drain*

If desired, you can remove the compression fitting and replace it with a barb fitting. The inlet fitting screws into a ¼-in. FNPT check valve. The check valve prevents the sensor flow cell from going dry if sample flow is lost.

1. Attach a piece of soft tubing to the fitting and allow the waste to drain to open atmosphere.

   Important
   Do not restrict the drain line.

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

3.6 Install the sensor

Emerson provides the Rosemount™ MCL with the sensor cable pre-wired to the transmitter. The terminal end of the sensor is keyed to ensure proper mating with the cable receptacle.

Procedure

1. Once the key has slid into the mating slot, tighten the connection by turning the knurled ring clockwise.
2. Screw the sensor 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.

4 Wire

4.1 Wire power

Wire AC mains power supply to the power supply board, which is mounted vertically on the left hand side of the transmitter enclosure.

⚠ WARNING

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.

The power connector is at the top of the board.

Procedure

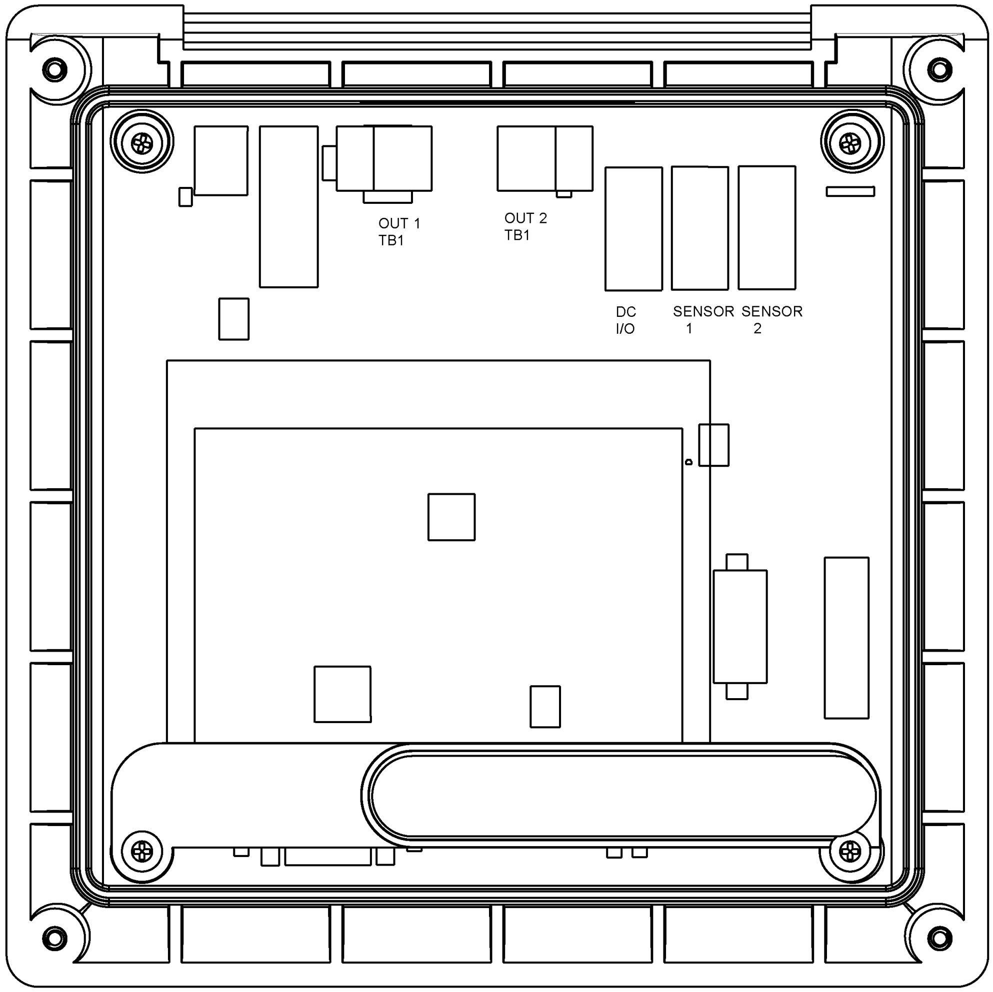
1. Unplug the connector from the board and wire the power cable to it.
   Lead connections are marked on the connector. (`L` is live or hot; `N` is neutral; the ground connection has the standard symbol.)
2. Provide a switch or breaker to disconnect the transmitter from the main power supply.
3. Install the switch or breaker near the transmitter and label it as the disconnecting device for the transmitter.

4.2 Wire analog outputs

Two analog output currents are located on the main circuit board, which is attached to the inside of the enclosure door.

Figure 4-1 shows the locations of the terminals. The connectors can be detached for wiring. TB-1 is output 1. TB-2 is output 2. Polarity is marked on the circuit board.

Figure 4-1: Analog output connections



The analog outputs are on the main board near the hinged end of the enclosure door.

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

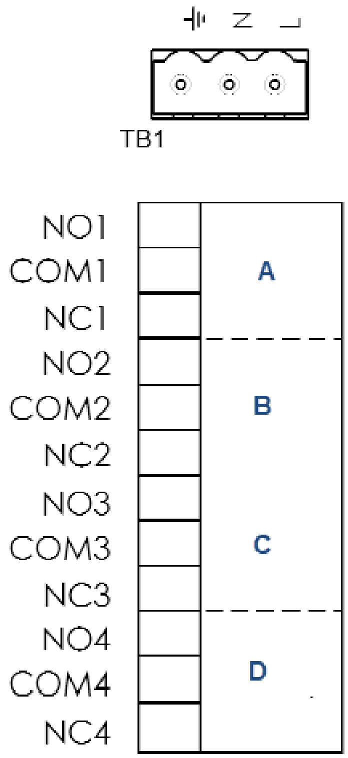
Keep output signal wiring separate from power wiring. Do not run signal and power or relay wiring in the same conduit or close together in a cable tray.

4.3 Alarm wiring

The alarm relay terminal strip is located just below the power connector on the power supply board.

See Figure 4-2.

Figure 4-2: Alarm relay connections



A. *Alarm relay 1*
B. *Alarm relay 2*
C. *Alarm relay 3*
D. *Alarm relay 4*

1. 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.
2. Bring the relay wires through the rear conduit opening on the left hand side of the enclosure and make connections to the terminals strip.
3. 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 4-2. 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.

4.4 Wire sensor

The Rosemount™ MCL is provided with sensor cables pre-wired to the transmitter. If it is necessary to replace the sensor cable, refer to the instructions below.

Procedure

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

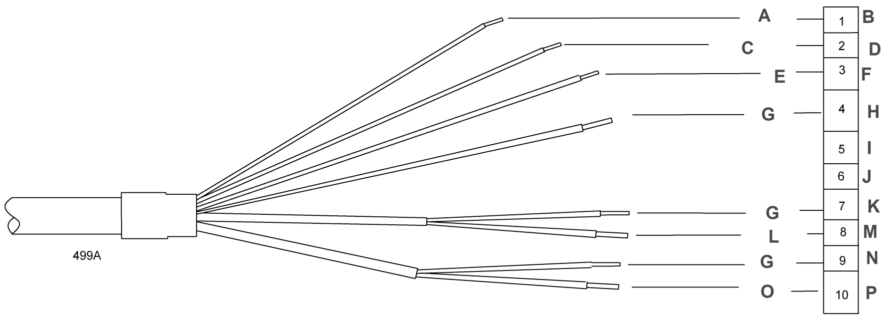
Slot 1 (left)	Slot 2 (center)
communication	input 1 (chlorine)

Slot 1 (left)	Slot 2 (center)	Slot 3 (right)
communication	input 1 (chlorine)	input 2 (optional)

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.
5. Disconnect the wires and remove the cable.
6. Insert the new cable through the gland and pull the cable through the cable slot.
7. Wire the sensor to the signal board.

   See Figure 4-3.

Figure 4-3: Rosemount 499ACL-03-54-60 Sensor Wiring to Rosemount 1056 Transmitter



A. White
B. Resistance temperature device return
C. White/red
D. Resistance temperature device sense
E. Red
F. Resistance temperature device in
G. Clear
H. Resistance temperature device shield
I. +5 V out
J. -4.5 V out
K. Anode shield
L. Orange
M. Anode
N. Cathode shield
O. Gray
P. Cathode

Connect green wire to metal conduit ground plate in bottom of enclosure.

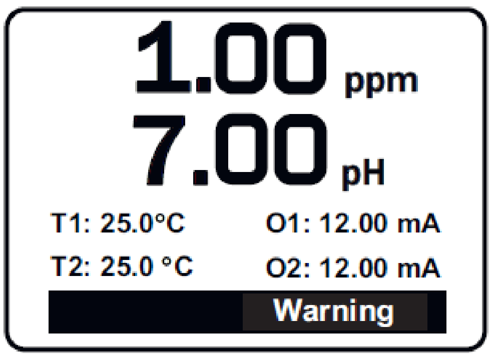
8. Once the cable has been connected to the board, slide the board fully into the enclosure while taking up the excess cable through the cable gland.
9. Tighten the gland nut to secure the cable and ensure a sealed enclosure.

5 Display and operation

5.1 Display

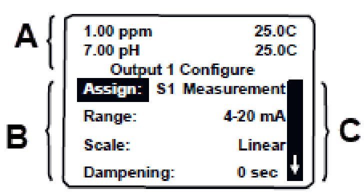
See Figure 5-1. You can customize the display to meet your requirements. Refer to Configure the main display.

Figure 5-1: Main Display



When the transmitter is being programmed or calibrated, the display changes to a screen similar to the one shown in Figure 5-2. The live readings appear in small font at the top of the screen. The rest of the display shows programming and calibration information. Programming items appear in lists. The screen can only show four items at a time, and the arrow bar at the right of the screen indicates whether there are additional items in the list. See Figure 5-3 for an explanation of the arrow bar.

Figure 5-2: Programming Screen Showing Item List



A. *Live measurement*
B. *Item list*
C. *Arrow bar*

The position of the cursor is shown in reverse video. See Keypad and Program the transmitter for more information.

Figure 5-3: Arrow Bar

A. *You are at the top of the list. There are more items for viewing. Scroll down.*
B. *You are at the bottom of the list. There are more items for viewing. Scroll up.*
C. *You are in the middle of the list. There are more items for viewing. Scroll up or down.*

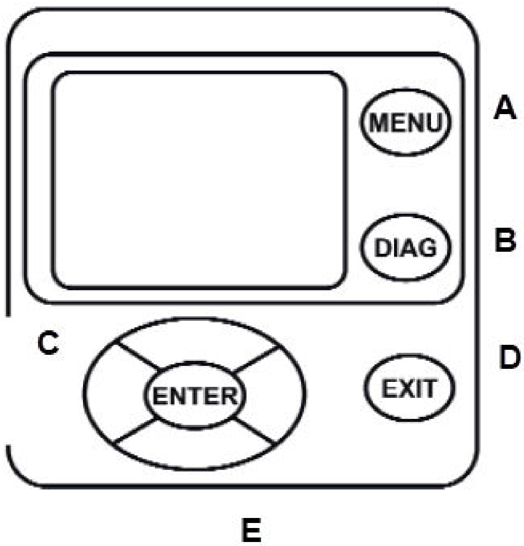
The arrow bar shows whether additional items in a list are available.

5.2 Keypad

Local communication with the transmitter is through the membrane keypad.

Figure 5-4 and Figure 5-5 explain the operation of the keys.

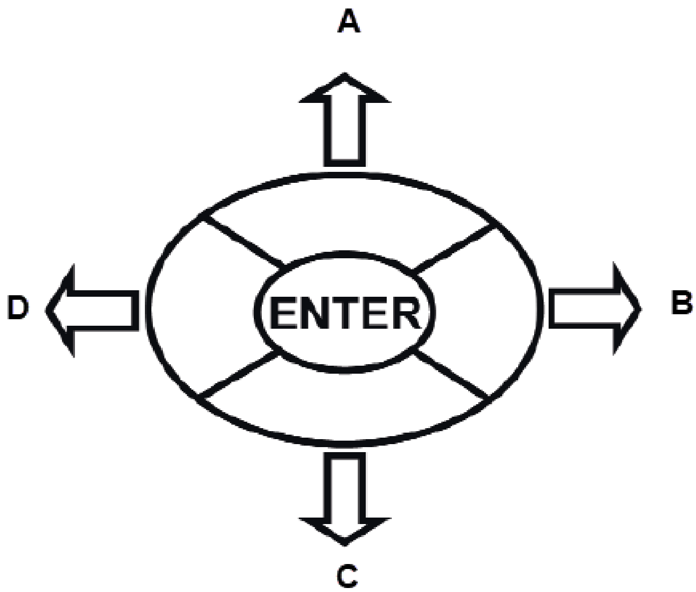
Figure 5-4: Transmitter Keypad



A. *Press **MENU**. The **Main Menu** screen appears.*
B. *Press **DIAG**. The main diagnostic screen appears.*
C. *Navigation keys move the cursor in the direction indicated in Figure 5-5.*
D. *Press **EXIT** to leave a screen without storing changes. The display returns to the previous screen.*
E. *Press **ENTER** to store a change or select an item. The display changes to the next screen.*

Four navigation keys move the cursor around the screen. The position of the cursor is shown in reverse video. The navigation keys are used to increase or decrease the value of a numeral. Press **ENTER** to select an item and store numbers and settings. Press **EXIT** to return to the previous screen without storing changes. Pressing **MENU** always causes the main menu to appear.

Figure 5-5: Navigation Keys



A. *Moves cursor up or increases the value of the selected digit.*
B. *Moves cursor to the right.*
C. *Moves cursor down or decreases the value of the selected digit.*
D. *Moves cursor to the left.*

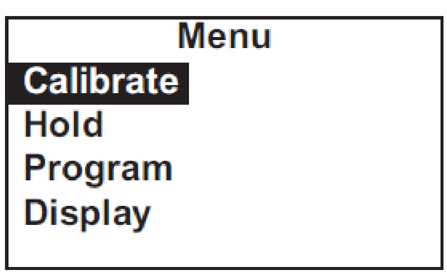
The operation of the navigation keys is shown. To move a decimal point, highlight it and then press **Up** or **Down**.

5.3 Program the transmitter

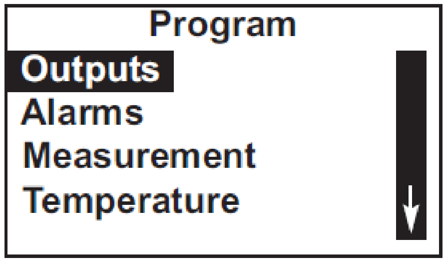
Setting up and calibrating the transmitter is easy. The following tutorial describes how to move around in the programming menus. For practice, the tutorial also describes how to assign ppm monochloramine values to the 4 and 20 mA analog outputs.

Procedure

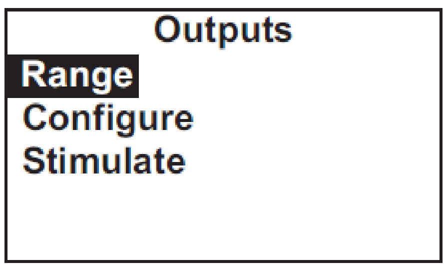
1. Press **MENU**.
   The main **Menu** screen appears. There are four items in the main menu. Calibrate is in reverse video, meaning that the cursor is on Calibrate.



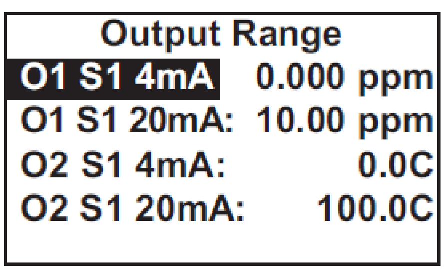
2. To assign values to the analog outputs, you must open the **Program** sub-menu. Use **Down** to move the cursor to Program. Press **ENTER**.
   The **Program** menu appears. There are six items in the **Program** menu. Alarms appears only if the transmitter contains the optional alarm relay board. The screen displays four items at a time. The downward pointing arrow on the right of the screen shows there are more items available in the menu.



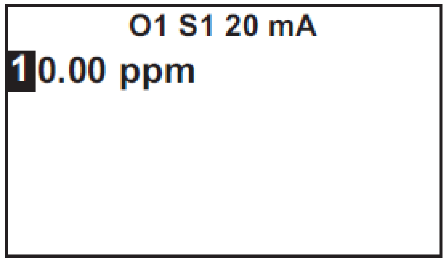
3. To view the other items, use **Down** to scroll to the last item shown and continue scrolling down. When you have reached the bottom, the arrow will point up. Move the cursor back to Outputs and press **ENTER**.
   The **Outputs** screen appears. The cursor is on Range. Output range is used to assign values to the low and high current outputs.



4. Press **ENTER**.
   The **Output Range** screen appears. The screen shows the present values assigned to output 1 (O1) and output 2 (O2). The screen also shows which sensors the outputs are assigned to. S1 is sensor 1.. The assignments shown are the defaults for the Rosemount MCL-220. Outputs are freely assignable under the **Configure** menu.



5. For practice, change the 20 mA settings for output 1 to `8.5 ppm`.
   a) Move the cursor to the O1 S1 20 mA: 10.00 line and press **ENTER**.
      The screen below appears.

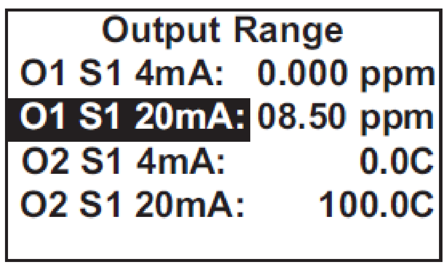


b) Use the navigation keys to change `10.00` to `8.5` ppm. Use **Left** and **Right** to move from digit to digit. Use **Up** and **Down** to increase or decrease the numeral.

c) To move the decimal point, press **Left** or **Right** until the decimal point is highlighted. Press **Up** to move the decimal point to the right. Press **Down** to move to the left.

d) Press **ENTER** to store the setting.

The display returns to the summary screen. Note that the 20 mA setting for output 1 has changed to `8.50 ppm`.



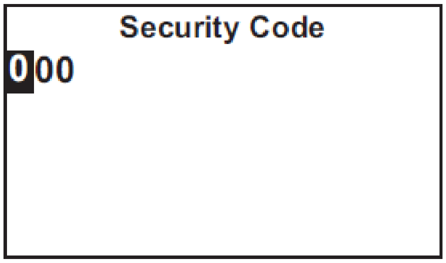
6. To return to the main menu, press **MENU**. To return to the main display, press **MENU** and then **EXIT**.

5.4 Security

5.4.1 How the security code works

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

1. A user can view the default display and diagnostic screens only.
2. A user has access to the calibration and hold menus only.
3. A user has access to all menus.



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. The user has access to the sub-menus the code entitles him to.
4. If the entry is wrong, the **Invalid code** screen appears.

5.4.2 Assign security codes

See Configuring security settings.

5.4.3 Bypassing security codes

Call the factory.

5.5 Using hold

5.5.1 Putting sensor in hold

To prevent unwanted alarms and improper operation of control systems or dosing pumps, place the alarms and outputs assigned to the sensor in hold before removing it for maintenance.

Hold is also useful if calibration will cause an out of limits condition. During hold, outputs assigned to the sensor remain at the last value, and alarms assigned to the sensor remain in their present state.

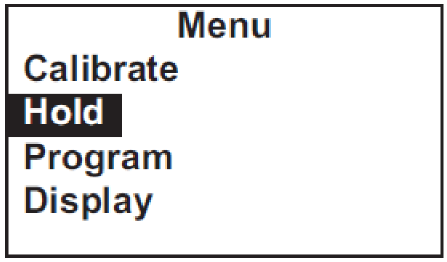
Once in hold, the sensor remains in hold until hold is turned off. However, if power is loss than restored, hold is automatically turned off.

5.5.2 Using the hold function

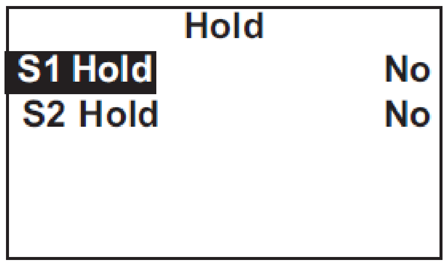
To put the transmitter in hold, complete the following steps.

Procedure

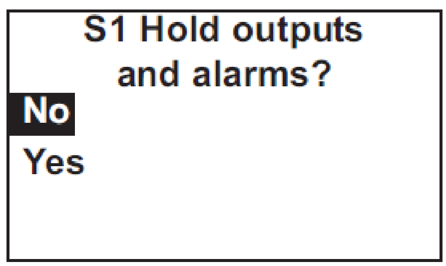
1. Press **MENU**.
   The main **Menu** screen appears.



2. Choose Hold.
   The screen shows the current hold status for each sensor.



3. Select the sensor to be put in hold. Press **ENTER**.



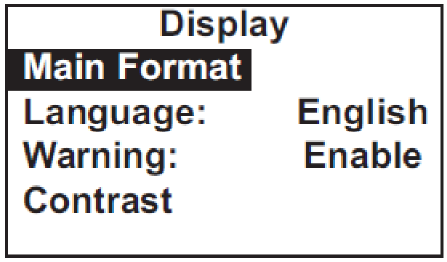
4. To put the sensor in hold, choose Yes. To take the sensor out of hold, choose No.

5.6 Configure the main display

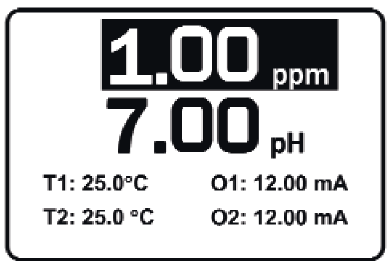
You can configure the main display to meet your requirements.

Procedure

1. Press **MENU**.
   The main **Menu** screen appears.
2. Move the cursor to Display and press **ENTER**.
   The screen shows the present configuration. There are four items: Main Format, Language, Warning, and Contrast.



3. To make a change, move the cursor to the desired line and press **ENTER**.
   A screen appears in which the present setting can be edited.
4. Press **ENTER** to store the setting.
5. Main Format lets you configure the second line in the main display as well as the four smaller items at the bottom of the display. Move the cursor to the desired place in the screen and press **ENTER**.



6. Scroll through the list of items and select the parameter you wish to be displayed.
7. Once you are done making changes, press **EXIT** twice to return to the Display menu.
8. Press **MENU** and then **EXIT** to return to the main display.
   The following abbreviations are used in the quadrant display.

O	output
T	temperature (live)
Tm	temperature (manual)
M	measurement

9. Choose Language to change the language used in the display.
10. Choose Warning to disable or enable warning messages.
11. Choose Contrast to change the display contrast.
12. To change the contrast, choose either lighter or darker and press **ENTER**.
    Every time you press **ENTER**, the display becomes lighter or darker.

6 Programming the transmitter

6.1 Programming overview

This section describes how to make the following program settings using the local keypad.

1. Configure and assign values to the analog current outputs.
2. Configure and assign values to the alarm relays.
3. Choose the type of chlorine measurement being made. This step is necessary because the transmitter used with the Rosemount™ MCL can measure forms of chlorine other than monochloramine.
4. Choose temperature units and manual temperature correction for chlorine and pH (if a pH sensor is installed).
5. Set two levels of security codes.
6. Reset the transmitter to factory default settings.

6.2 Default settings

The transmitter leaves the factory with the default settings shown in Table 6-1. You can change the settings to any value shown in the column labeled **Choices**.

Table 6-1: Default Settings

Item	Choices	Default
Sensor assignment		
1. Sensor 1	Monochloramine	Monochloramine
Outputs		
1. Assignments		
a. Output 1	Monochloramine	Monochloramine
b. Output 2	Temperature	Temperature
2. Range	0-20 or 4-20 mA	4-20 mA
3. 0 or 4 mA setting		
a. Chlorine	-9999 to +9999	0
b. Temperature	-999.9 to +999.9	0
4. 20 mA setting		
a. Chlorine	-9999 to +9999	10
b. Temperature	-999.9 to +999.9	0
5. Fault current (fixed)	0.00 to 22.0 mA	12.00 mA
6. Dampening	0 to 999 sec	0 sec

Table 6-1: Default Settings *(continued)*

Item	Choices	Default
7. Simulate	0.00 to 22.00 mA	12.00 mA
Alarms		
1. Logic	high or low	AL1 low, AL2, 3, 4, high
2. Assignments		
a. AL1 and AL2	Monochloramine, temperature, fault, interval timer,	Monochloramine (sensor 1)
b. AL3 and AL4	Monochloramine, temperature, fault, interval timer,	Temperature (sensor 1)
3. Deadband	0 to 9999	0
4. Interval timer settings		
a. Interval time	0.0 to 999.9 hr	24.0 hr
b. On time	0 to 999 sec	10 sec
c. Recovery time	0 to 999 sec	60 sec
Measurement		
1. Monochloramine (sensor 1)		
a. Units	ppm or mg/L	ppm
b. Resolution	0.01 or 0.001	0.001
c. Input filter	0 to 999 sec	5 sec
Temperature related settings		
1. Units	°C or °F	°C
2. Temperature compensation	Automatic or manual	Automatic
Security code		
1. Calibrate/Hold	000 to 999	000
2. Program/Display	000 to 999	000
Calibration - analog outputs		
1. 4 mA	0.000 to 22.000 mA	4.000 mA
2. 20 mA	0.000 to 22.000 mA	20.000 mA

6.3 Configuring, ranging, and simulating outputs

6.3.1 Purpose of configuration

This section describes how to configure, range, and simulate the two analog current outputs.

Important
Configure the outputs first.

---

1. Configuring an output means
   a. Assigning a sensor and measurement (monochloramine or temperature) to an output.
   b. Selecting a 4-20 mA or 0-20 mA output.
   c. Choosing a linear or logarithmic output.
   d. the amount of dampening on the analog .
   e. Turning output current dampening on or off.
   f. Selecting the value the output current goes to if the transmitter detects a fault.
2. Ranging the output means assigning values to the low (0 or 4 mA) and high (20 mA) outputs.
3. Simulating an output means making the transmitter generate an output equal to the value you enter.

6.3.2 Definitions

Analog current output	The transmitter provides either a continuous 4-20 mA or 0-20 mA output signal proportional to monochloramine or temperature..
Assigning an output	The outputs are freely assignable. Outputs can be assigned to either monochloramine or temperature. .
Linear output	Linear output means the current is directly proportional to the value of the variable assigned to the output (monochloramine or temperature).
Logarithmic output	Logarithmic output means the current is directly proportional to the common logarithm of the variable assigned to the output (monochloramine or temperature).
Dampening	Output dampening smoothes out noisy readings. It also increases response time. The time selected for output dampening is the time to reach 63% of the final reading following a step change. Output dampening does not affect the response time of the display.
Fault	The transmitter continuously monitors itself and the sensor for faults. If the transmitter detects a fault, a fault message appears in the main display. At the same time, the output current goes to the value

programmed in this section. There are two output fault modes: fixed and live. Fixed means the selected output goes to the previously programmed value (between 0.00 and 22.00 mA) when a fault occurs. Live means the selected output is unaffected when the fault occurs.

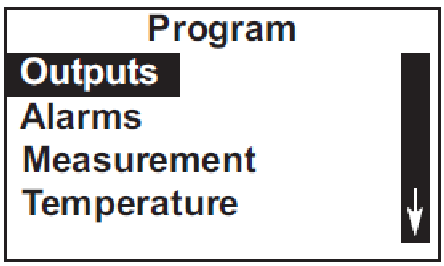
Ranging an output The outputs are fully rangeable, including negative numbers. If the output is logarithmic, assigned values must be positive.

6.3.3 Configure outputs

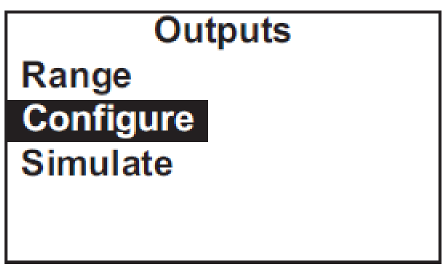
Complete the following steps to configure the analog current outputs.

Procedure

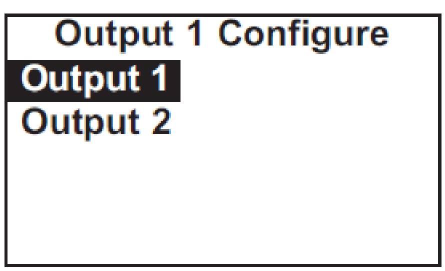
1. Press **MENU**.
   The main **Menu** screen appears.
2. Move the cursor to Program and press **ENTER**.
   The cursor is on Outputs.



3. Press **ENTER**.

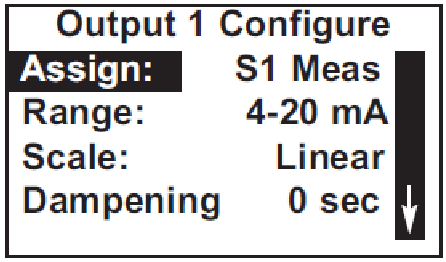


4. Choose Configure.



5. Choose Output 1 or Output 2.

The screen shows the present configuration. There are six items: Assign (S1 is sensor 1), Range, Scale, Dampening, Fault Mode, and Fault Value. To display the fifth and sixth items, scroll to the bottom of the screen and continue scrolling.



6. To make a change, move the cursor to the desired line and press **ENTER**.
   A screen appears in which the present setting can be edited.
7. Press **ENTER** to store the setting.

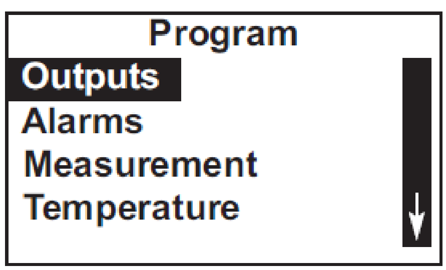
   For an explanation of terms, see Purpose of configuration and Definitions.
8. To return to the main display, press **MENU** and then **EXIT**.

6.3.4 Range outputs

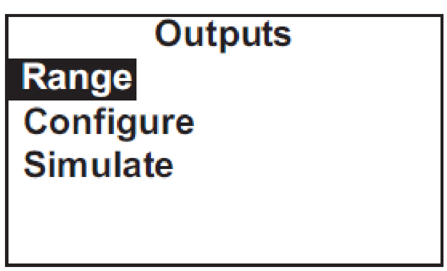
Complete the following steps to range the outputs by assigning values to the low and high outputs.

Procedure

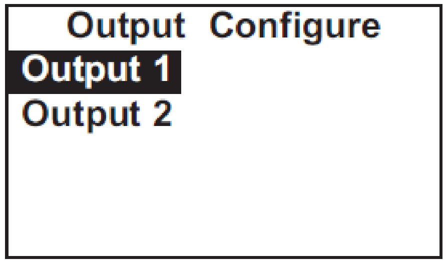
1. Press **MENU**.
   The main **Menu** screen appears.
2. Move the cursor to Program and press **ENTER**.
   The cursor is on Outputs.



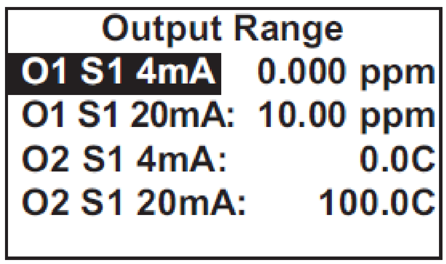
3. Press **ENTER**.



4. Choose Range.



5. Choose Output 1 or Output 2.
   The screen shows the present settings for the outputs. O1 is output 1, O2 is output 2, and S1 is sensor 1..



6. To make a change, move the cursor to the desired line and press **ENTER**.
   A screen appears in which the present setting can be edited.
7. Press **ENTER** to store the setting.

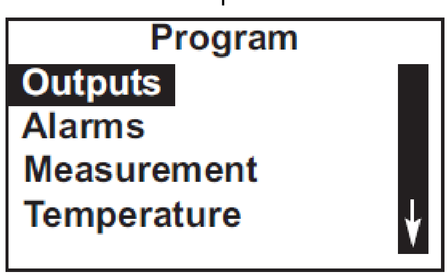
   For an explanation of terms, see Purpose of configuration and Definitions.
8. To return to the main display, press **MENU** and then **EXIT**.

6.3.5 Simulate outputs

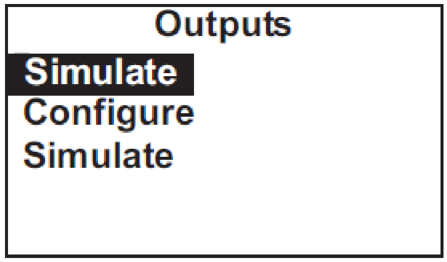
Complete the following steps to simulate an output by making the transmitter generate an output current equal to the value you enter.

Procedure

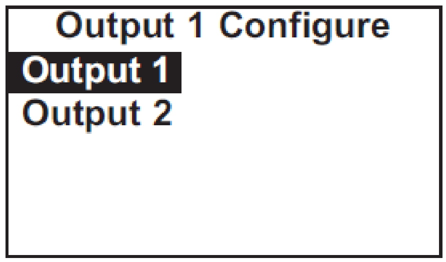
1. Press **MENU**.
   The main **Menu** screen appears.
2. Move the cursor to Program and press **ENTER**.
   The cursor is on Outputs.



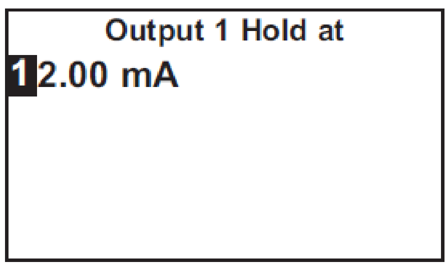
3. Press **ENTER**.



4. Choose Simulate.



5. Choose Output 1 or Output 2.



6. Enter the desired simulated output current.
7. To end the simulated current, press **MENU** or **EXIT**.

6.4 Configuring alarms and assigning setpoints

6.4.1 Purpose

This section describes how to configure and assign setpoints to the alarm relays, simulate alarm action, and synchronize interval timers.

Important
Configure the alarms first.

---

1. Configuring an alarm means
    a. Assigning a sensor and measurement (monochloramine or temperature) to an alarm. An alarm relay can also be used as a timer.
    b. Selecting high or low logic.
    c. Choosing the deadband.

d. Setting the interval timer parameters.

2. Simulating an alarm means making the transmitter energize or de-energize an alarm relay.

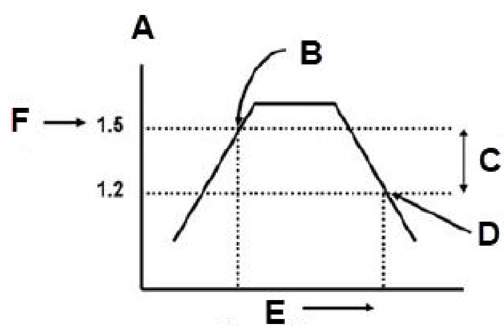
6.4.2 Definitions

Assigning alarms There are four alarm relays. The relays are freely assignable to either monochloramine or temperature.. Alarm relays can also be assigned to operate as interval timers or as fault alarms. A fault alarm activates when the transmitter detects a fault in either itself of the sensor.

Fault alarm A fault condition exists when the transmitter detects a problem with the sensor or with the transmitter itself that is likely to cause seriously erroneous readings. If an alarm was programmed as a fault alarm, the alarm activates. At the same time, a fault message appears in the main display.

Alarm logic, setpoints, and deadbands See Figure 6-1 and Figure 6-2.

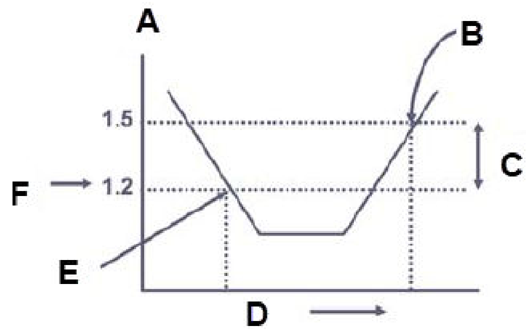
Figure 6-1: High Alarm Logic



A. *Chlorine, ppm*
B. *Alarm activates*
C. *Deadband = 0.3 ppm*
D. *Alarm deactivates*
E. *Time*
F. *High alarm setpoint*

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

Figure 6-2: Low Alarm Logic

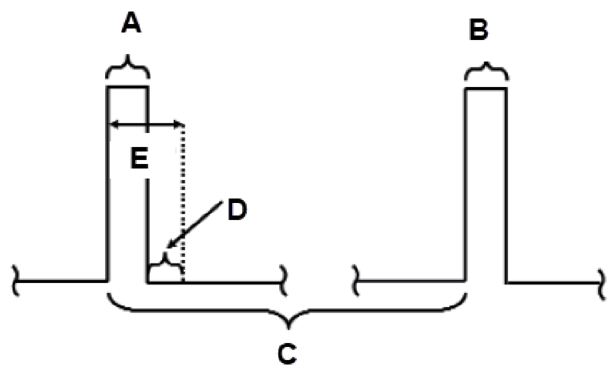


A. Chlorine, ppm
B. Alarm deactivates
C. Deadband = 0.3 ppm
D. Time
E. Alarm activates
F. Low alarm setpoint

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

Interval timer Any alarm relay can be used as an interval timer. Figure 6-3 shows how the timer operates. While the interval timer is operating, the main display, analog outputs, and assigned alarms for the sensor can be put on hold. During hold, the main display remains at the last value.

Figure 6-3: Operation of the Interval Timer



A. *On time duration (0 - 999 sec)*
B. *On (relay activated)*
C. *Timer interval (0 - 999.9 hr)*
D. *Recovery (0 - 999 sec)*
E. *Hold*

The numbers in parentheses are the allowed values for each timer parameter.

Synchronize timer If two or more relays are being used as interval timers, choosing synchronize timers will cause each timer to start one minute later than the preceding timer.

6.4.3 Configure alarms and assign setpoints

The Rosemount™ MCL has an optional alarm relay board. This section describes how to configure and assign setpoints to the alarm relays, simulate alarm action, and synchronize interval timers.

Important
Configure the alarms first.

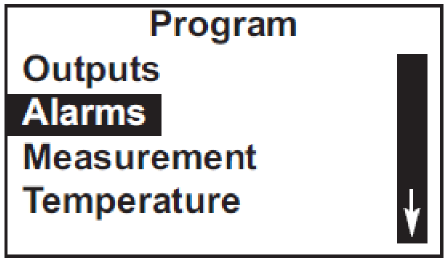
1. Configuring an alarm means
   a. Assigning a sensor and measurement to an alarm. An alarm relay can also be used as a timer.
   b. Selecting high or low logic.
   c. Choosing the deadband.
   d. Setting the interval timer parameters.
2. Simulating an alarm means making the transmitter energize or de-energize an alarm relay.

Procedure

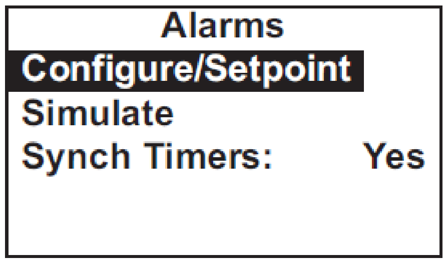
1. Press **MENU**.

The main **Menu** screen appears.

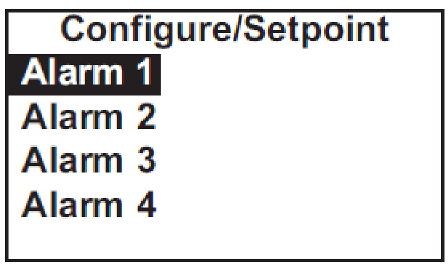
2. Move the cursor to Program and press **ENTER**.



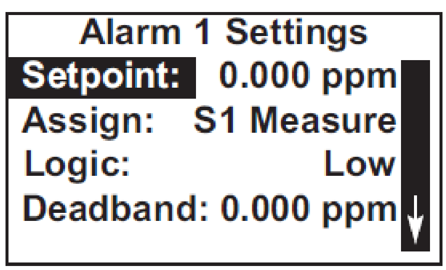
3. Choose Alarms.



4. Choose Configure/Setpoint.



5. Choose Alarm 1, Alarm 2, Alarm 3, or Alarm 4.



The screens summarizes the present configuration and setpoints. There are eight items:

- Setpoint
- Assign (S1 is sensor 1)
- Logic
- Deadband
- Interval time

- On time
- Recover time
- Hold while active

The last four items describe the operation of the timer. Only four items are shown at a time. To view the remaining items, scroll to the bottom of the screen and continue scrolling.

6. To make a change, move the cursor to the desired line and press **ENTER**.
   A screen appears in which the present setting can be edited.
7. Press **ENTER** to store the setting.

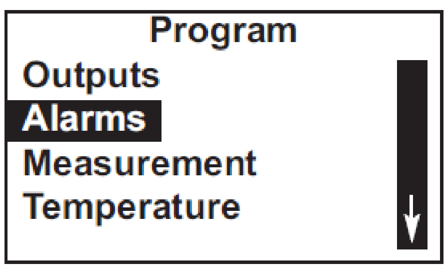
   For an explanation of terms, see Purpose and Definitions.
8. To return to the main display, press **MENU** and then **EXIT**.

6.4.4 Simulate alarms

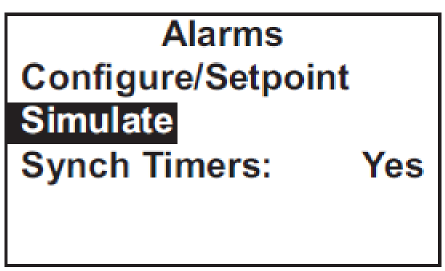
Complete the following steps to make the transmitter energize or de-energize an alarm relay.

Procedure

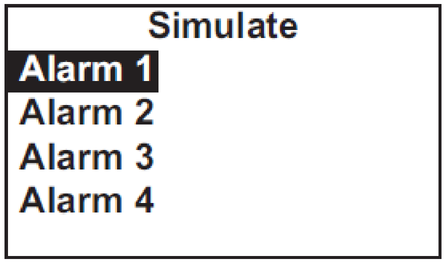
1. Press **MENU**.
   The main **Menu** screen appears.
2. Move the cursor to Program and press **ENTER**.



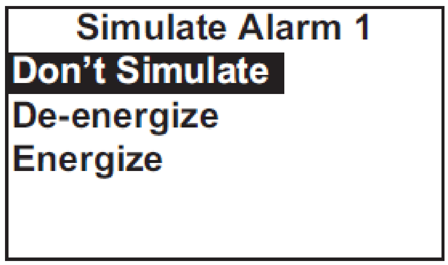
3. Choose Alarms.



4. Choose Simulate.



5. Choose Alarm 1, Alarm 2, Alarm 3, or Alarm 4.



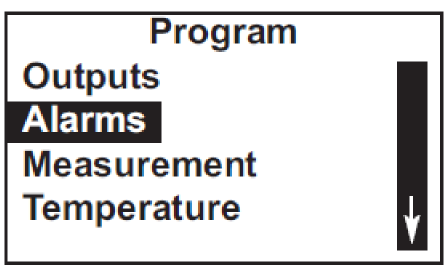
6. Choose Don't simulate, De-energize, or Energize.
7. Press **MENU** or **EXIT** to end simulation.

6.4.5 Synchronize timers

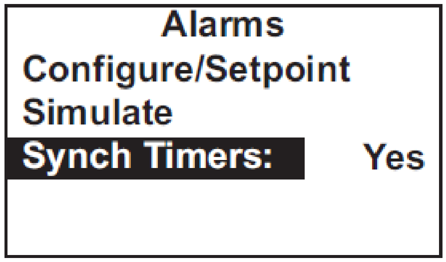
Synch Timers is available only if two or more alarm relays have been configured as interval timers.

Procedure

1. Press **MENU**.
   The main **Menu** screen appears.
2. Move the cursor to Program and press **ENTER**.



3. Choose Alarms.



The summary display shows the current Synch Timers setting (Yes or No).

4. To make a change, choose Synch Timers and press **ENTER**.
   A screen appears in which the present setting can be edited.
5. Press **ENTER** to store the setting.

   For an explanation of terms, see Purpose and Definitions.
6. To return to the main display, press **MENU** and then **EXIT**.

6.5 Configuring the measurement

6.5.1 Purpose of configuring measurement

This section explains how to do the following:

1. Program the transmitter to measure monochloramine using the Rosemount™ 499ACL-03 sensor. This step is necessary, because the transmitter can be used with other sensors to measure other chlorine oxidants.
2. Set the level of electronic filtering of the sensor current.

6.5.2 Definitions - chlorine

Chlorine oxidants Although the Rosemount™ MCL is used to measure monochloramine only, the transmitter used in the Rosemount MCL can be used to measure other chlorine oxidants, for example, free and total chlorine.

Filter The transmitter applies a software filter to the raw sensor current. The filter reduces noise but increases the response time. Only the filter time can be changed. The filter threshold cannot be changed.

Resolution If the chlorine concentration is less than 1.00 ppm (mg/L), the display resolution can be set to `0.XX` or `0.XXX`.

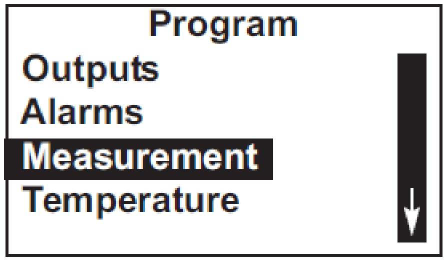
6.5.3 Configure measurement

Complete the following steps to configure the transmitter to measure monochloramine.

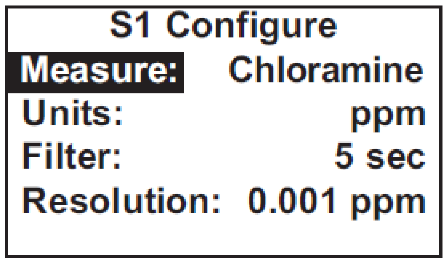
Procedure

1. Press MENU.
   The main **Menu** screen appears.

2. Move the cursor to Program and press **ENTER**.



3. Choose Measurement.
   The screen summarizes the present configuration for sensor 1 (monochloramine). There are four items: Measure, Units, Filter, and Resolution.



4. To make a change, move the cursor to the desired line and press **ENTER**.
   A screen appears in which the present setting can be edited.
5. To store the setting, press **ENTER**.
   a) For Measurement, choose Chloramine..
   b) Leave Filter at the default value unless readings are noisy.
6. To return to the main display, press **MENU** and then **EXIT**.

6.6 Configuring temperature related settings

6.6.1 Purpose

This section describes how to do the following:

1. Choose temperature units.
2. Choose automatic or manual temperature correction for membrane permeability.
3. Enter a temperature for manual temperature compensation.

6.6.2 Definitions

Automatic temperature correction
The monochloramine sensor is a membrane-covered amperometric sensor. It produces a current directly proportional to the rate of diffusion of monochloramine through the membrane. The diffusion rate, in turn, depends on the concentration of monochloramine in the

sample and membrane permeability. Membrane permeability is a function of temperature. As temperature increases, permeability increases. Thus, an increase in temperature will cause the sensor current and the transmitter reading to increase even though the concentration of monochloramine remained constant. In automatic temperature correction, the transmitter uses the temperature measured by the sensor to continuously correct for changes in membrane permeability.

Manual temperature correction

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

6.6.3 Configure temperature related settings

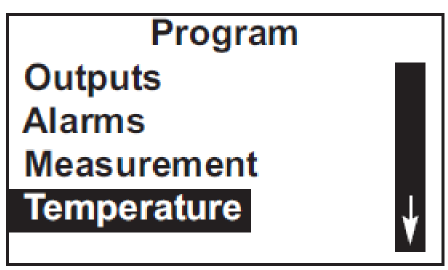
Complete the following steps to set the temperature units and to select automatic or manual temperature correction.

This section describes how to do the following:

1. Choose temperature units.
2. Choose automatic or manual temperature correction for membrane permeability.
3. Enter a temperature for manual temperature compensation.

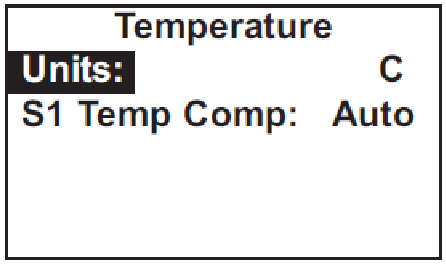
Procedure

1. Press **MENU**.
   The main **Menu** screen appears.
2. Move the cursor to Program and press **ENTER**.



3. Choose Temperature.
   The screen summarizes the present sensor configuration.

   There are between two and three items. Units and S1 Temp Comp always appear. If you selected manual temperature compensation, the manual temperature value entered for the sensor (S1 Manual) also appears.



4. To make a change, move the cursor to the desired line and press **ENTER**.
   A screen appears in which the present setting can be edited.
5. To store a setting, press **ENTER**.
   For an explanation of terms, see Purpose and Definitions.
6. To return to the main display, press **MENU** and then **EXIT**.

6.7 Configuring security settings

6.7.1 Purpose

This section describes how to set security codes. There are three levels of security.

1. A user can view the default display and diagnostic screens only.
2. A user has access to the calibration and hold menus only.
3. A user has access to all menus.

The security code is a three digit number. The table shows what happens when different security codes (`XXX` and `YYY`) are assigned to Calibration/Hold and All. `000` means no security.

Calibration/Hold	All	What happens
000	XXX	User enters `XXX` and has access to all menus.
XXX	YYY	User enters `XXX` and has access to **Calibration** and **Hold** menus only. User enters `YYY` and has access to all menus.
XXX	000	User needs no security code to have access to all menus.
000	000	User needs no security code to have access to all menus.

6.7.2 Configure security settings

This section describes how to set security codes. There are three levels of security.

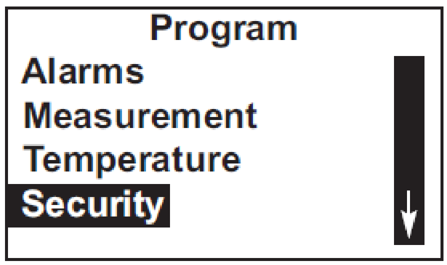
1. A user can view the default display and diagnostic screens only.

2. A user has access to the **Calibration** and **Hold** menus only.
3. A user has access to all menus.

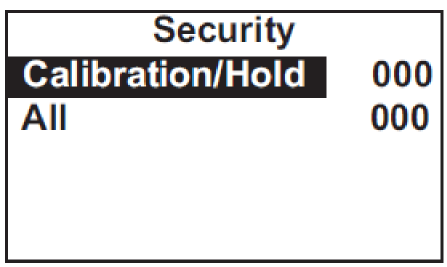
The security code is a three digit number. The table shows what happens when different security codes (`XXX` and `YYY`) are assigned to Calibration/Hold and All. `000` means no security.

Procedure

1. Press **MENU**.
   The main **Menu** screen appears.
2. Move the cursor to Program and press **ENTER**.



3. Scroll to the bottom of the screen and continue scrolling until Security is highlighted. Press **ENTER**.
   The screen shows the existing security codes.



4. To make a change, move the cursor to the desired line and press **ENTER**.
   A screen appears in which the present setting can be edited.
5. Press **ENTER** to store a change.
   The security code takes effect two minutes after pressing **ENTER**.
6. To return to the main display, press **MENU** and then **EXIT**.

6.8 Resetting the transmitter

6.8.1 Purpose

This section describes how to clear user-entered values and restore default settings. There are three resets:

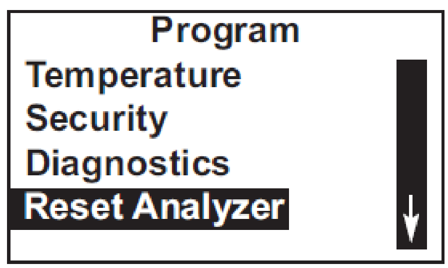
1. Resetting to factory default clears ALL user-entered settings, including sensor and analog output calibration, and returns ALL settings and calibration values to the factory defaults.
2. Resetting a sensor calibration to the default value clears user-entered calibration data for the selected sensor but leaves all other user-entered data unaffected.
3. Resetting the analog output calibration clears only the user-entered analog output calibration. It leaves all other user-entered settings unchanged.

6.8.2 Reset the transmitter

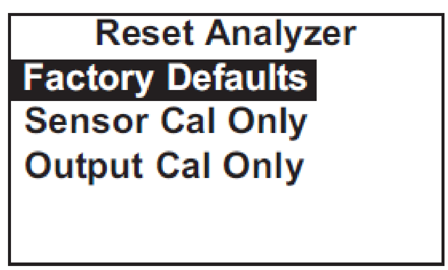
Complete the following steps to reset the transmitter.

Procedure

1. Press **MENU**.
   The main **Menu** screen appears.
2. Move to Program and press **ENTER**.



3. Scroll to the bottom of the screen and continue scrolling until Reset Analyzer is highlighted. Press **ENTER**.



4. Choose whether to reset all user-entered values (Factory Defaults), sensor calibration (Sensor Cal Only), or output calibration (Output Cal Only).
   If you choose Sensor Cal Only or Output Cal Only, a second screen appears in which you can select which sensor or output calibration to reset.

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

7 Calibrate

7.1 Introduction

The **Calibrate** menu allows you to do the following:

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

7.2 Calibrating temperature

7.2.1 Purpose

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 monochloramine and how easily it passes through the membrane (the membrane permeability). Because membrane permeability is a function of temperature, the sensor current changes if the temperature changes. To account for changes in sensor current caused by temperature alone, the transmitter automatically applies a membrane permeability correction. The membrane permeability changes about 3%/° C at 25 °C (77 °F), so a 1 °C error in temperature produces about a 3% error in the reading.

Without calibration, the accuracy of the temperature measurement is about ±0.4 °C. Calibrate the sensor/transmitter unit if:

1. ±0.4 °C accuracy is not acceptable.
2. The temperature measurement is suspected of being in error. Calibrate temperature by making the transmitter reading match the temperature measured with a standard thermometer.

7.2.2 Calibrate temperature

Temperature is important in the measurement of chlorine and pH for different reasons.

The monochloramine sensor is a membrane-covered amperometric sensor. As the sensor operates, free chlorine 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 free chlorine and how easily it passes through the membrane (the membrane permeability). Because membrane permeability is a function of temperature, the sensor current changes if the temperature changes. To account for changes in sensor current caused by temperature alone, the transmitter automatically applies a membrane permeability correction. The membrane permeability changes about

3% per °C at 77 °F (25 °C), so a 1 °C error in temperature produces about a 3% error in the reading.

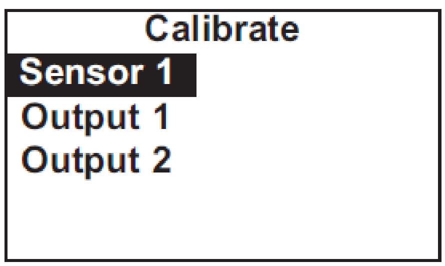
Without calibration, the accuracy of the temperature measurement is about ±0.4 °C. Calibrate the sensor/transmitter unit if:

1. ±0.4 °C accuracy is not acceptable.
2. The temperature measurement is suspected of being in error. Calibrate temperature by making the transmitter reading match the temperature measured with a standard thermometer.

Procedure

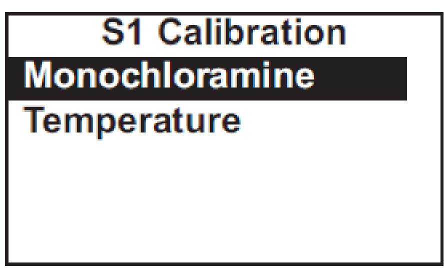
1. Remove the sensor from the flow cell. Place it in an insulated container of water along with a calibrated thermometer. Submerge at least the bottom two inches of the sensor.
2. Allow the sensor to reach thermal equilibrium.

   The time constant for the sensor is about five minutes, so it may take as long as thirty minutes for equilibration.
3. Press **MENU**.
   The main **Menu** screen appears. The cursor is on Calibrate.
4. Press **ENTER**.

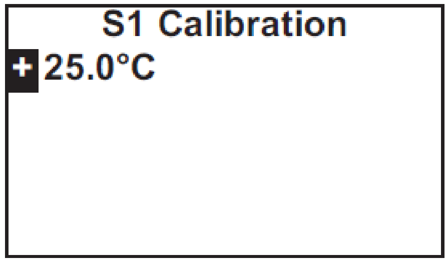


5. Choose the sensor you wish to calibrate.

   Sensor 1 is the monochloramine sensor.



6. Choose Temperature.



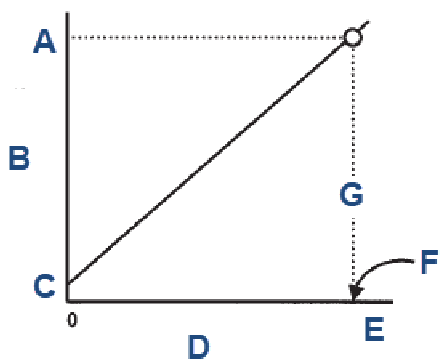
7. Change the display to match the temperature read from the calibrated thermometer. Press **ENTER**.
   If the present temperature is more than 5 °C different from the value entered, an error message appears.
8. To force the transmitter to accept the calibration, choose Yes. To repeat the calibration, choose No.

   For troubleshooting assistance, see Troubleshooting when no error message is showing.
9. To return to the main display, press **MENU** and then **EXIT**.

7.3 Calibrating monochloramine

As Figure 7-1 shows, a monochloramine sensor generates a current directly proportional to the concentration of monochloramine in the sample. To calibrate the sensor, expose it to a solution containing no monochloramine (zero standard) and to a solution containing a known amount of monochloramine (full-scale standard).

Figure 7-1: Sensor Current as a Function of Monochloramine Concentration



A. $i_{full\ scale}$
B. Sensor current
C. i_{zero}
D. Monochloramine, ppm
E. $C_{standard}$
F. Full scale standard
G. Slope = sensor current/ppm monochloramine

The zero standard is necessary, because monochloramine sensors, even when no monochloramine is in the sample, generate a small current called the residual current or zero current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to a monochloramine value. Zero new sensors before placing them in service, and zero sensors whenever you replace the fill solution. Deionized water makes a good zero standard.

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

- Take the grab sample from a point as close to the system as possible. Be sure that taking the sample does not alter the flow of the sample to the unit. It is best to install the sample tap just downstream from the tap for the system.
- Monochloramine solutions are moderately 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.

During calibration, the transmitter must know the pH of the solution. If the transmitter is using automatic pH correction, the pH sensor (properly calibrated) must be in the process liquid before starting the calibration. If the transmitter is using manual pH correction, be sure to enter the pH value before starting the calibration.

7.3.1 Zero the sensor

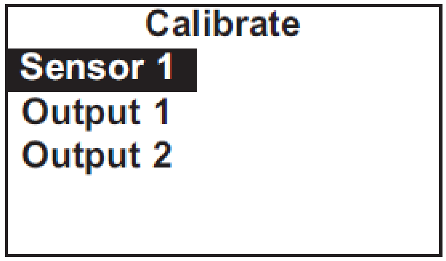
Procedure

1. Remove the sensor from the flow cell and place it in the zero standard (a beaker of deionized water). Be sure no air bubbles are trapped against the membrane.
   The current drops rapidly at first and then gradually reaches a stable zero value.
2. To monitor the sensor current, press **DIAG**.
3. Choose Sensor 1.

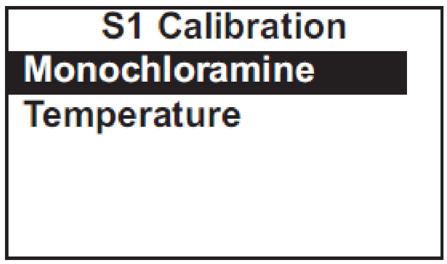
   The input current is the first line in the display. Note the units: nA is nanoamps; µA is microamps. Typical zero current for the new sensor is between -10 and 15 nA. A new sensor or a sensor in which the electrolyte solution has been replaced may require several hours (occasionally as long as overnight) to reach a minimum zero current.

   Important
   Do not start the zero routine until the sensor has been in the zero solution for at least two hours.

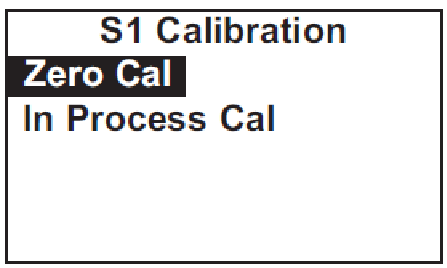
4. Press **MENU**.
   The main **Menu** screen appears. The cursor is on Calibrate.
5. Press **ENTER**.



6. Choose the sensor you wish to calibrate.

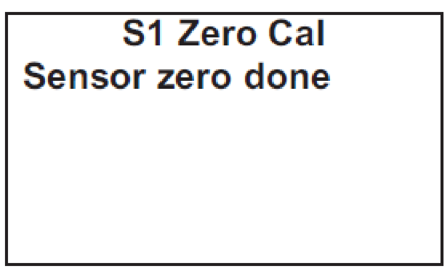


7. Choose Monochloramine.

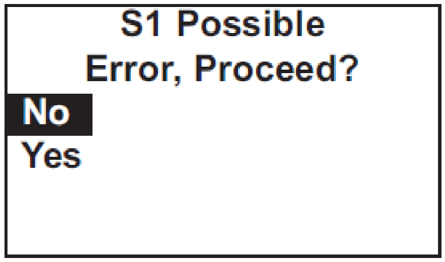


8. Choose Zero Cal.
   The transmitter automatically starts the zero calibration.

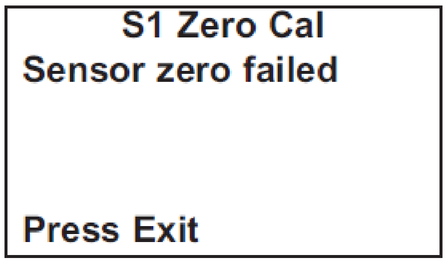
   If the zero calibration was successful, the following screen appears.



If the zero current is moderately larger than expected, an error message appears.



9. To force the transmitter to accept the zero current, choose Yes. To repeat the calibration, choose No.
   If the zero current is much larger than expected, the **Sensor zero failed** screen appears.

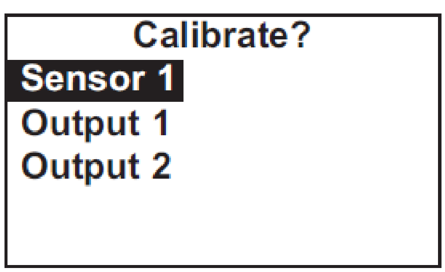


   The transmitter will not update the zero current.
10. To return to the main display, press **MENU** and then **EXIT**.

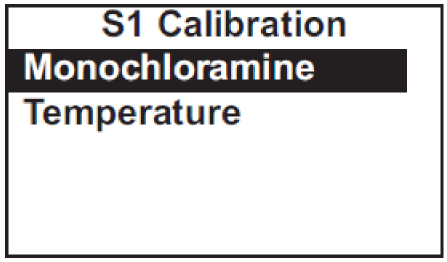
7.3.2 Calibrate the sensor

Procedure

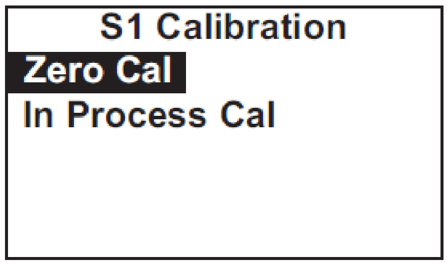
1. Place the monochloramine sensor in the flow cell. Adjust the sample flow until water overflows the inside tube in the constant head flow controller.
2. Adjust the monochloramine concentration until it is near the upper end of the operating range. Wait until the transmitter reading is stable before starting calibration.
3. Press **MENU**.
   The main **Menu** screen appears. The cursor is on Calibrate.
4. Press **ENTER**.



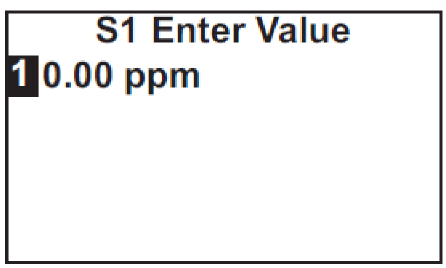
5. Select Sensor 1.



6. Select Monochloramine.

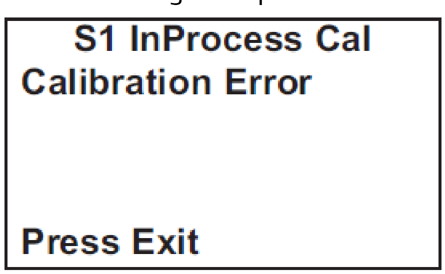


7. Select In Process Cal.
8. Follow the screen prompts. Once the reading is stable, press **ENTER**. Take the sample and press **ENTER**.
   At this point, the transmitter stores the present sensor current and temperature and uses those values in calibration.
9. Determine the monochloramine concentration in the sample and enter the value in the screen below.



See Calibrating monochloramine for sampling and testing precautions.

If the calibration was successful, the live reading changes to the value entered above, and the display returns to the screen in Step 6. If the sensitivity is too far outside the range of expected values the following screen appears.



The transmitter doesn't update the calibration. For troubleshooting assistance, see Troubleshooting when no error message is showing.

10. To return to the main display, press **MENU** and then **EXIT**.

7.4 Calibration - analog outputs

7.4.1 Trimming analog outputs

Although Emerson calibrates the analog outputs at the factory, you can trim them in the field to match the reading from a standard milliameter. You can trim both the low (0 or 4 mA) and high (20 mA) outputs

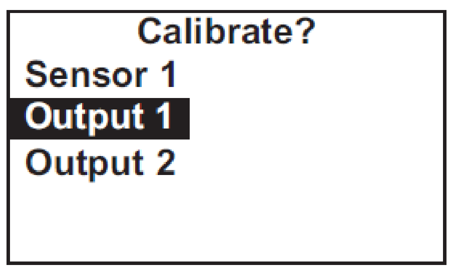
7.4.2 Calibrate analog outputs

Procedure

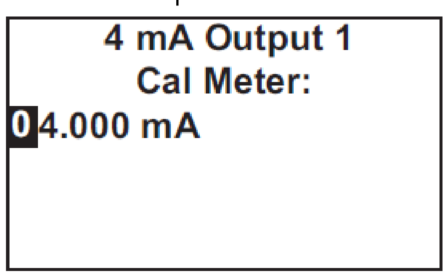
1. Connect a calibrated milliameter across the output you wish to calibrate. If a load is already connected to the output, disconnect the load.

   Do not put the milliameter in parallel with the load.

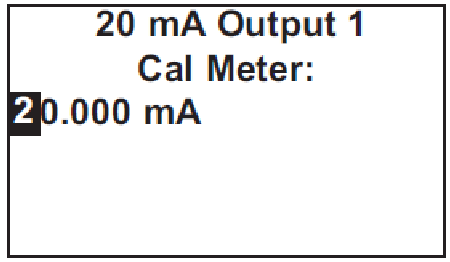
2. Press **MENU**.
   The main **Menu** screen appears. The cursor is on Calibrate.
3. Press **ENTER**.



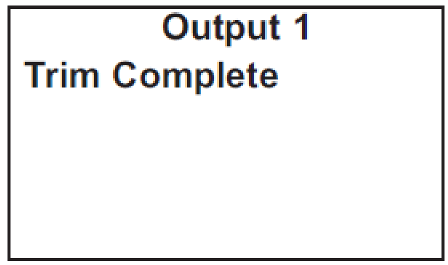
4. Choose the output you wish to calibrate.
   The transmitter simulates the low output current.



5. Change the value in the display to match the reading from the milliameter.
   The transmitter simulates the 20 mA output current.



6. Change the value in the display to match the reading from the milliameter.
   If the calibration was successful, the screen below appears.



   If the user entered value is more than ±1 mA different from the nominal value, a possible error screen appears.

7. To force the transmitter to accept the calibration, choose Yes.
8. To return to the main display, press **MENU** and then **EXIT**.

8 Maintenance

8.1 Replace sensor circuit board

The transmitter used with the Rosemount™ MCL requires little maintenance.

Clean the transmitter 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 sensor circuit board is replaceable.

⚠ WARNING

Electrical shock

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

To replace the board:

Procedure

1. Turn off power to the transmitter.
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 4-2.
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.
8. Tighten the cable glands.
9. Close the front panel.
10. Turn on power.

8.2 Monochloramine sensor

8.2.1 General

When used in clean water, the sensor requires little maintenance. Generally, the sensor needs maintenance when the response becomes sluggish or noisy or when readings drift following calibration.

Maintenance frequency is best determined by experience. For a sensor used in potable water, expect to clean the membrane every month and replace the membrane and electrolyte solution every two or three months.

8.2.2 Cleaning the membrane

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

⚠ CAUTION

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

8.2.3 Replacing the electrolyte solution and membrane

⚠ WARNING

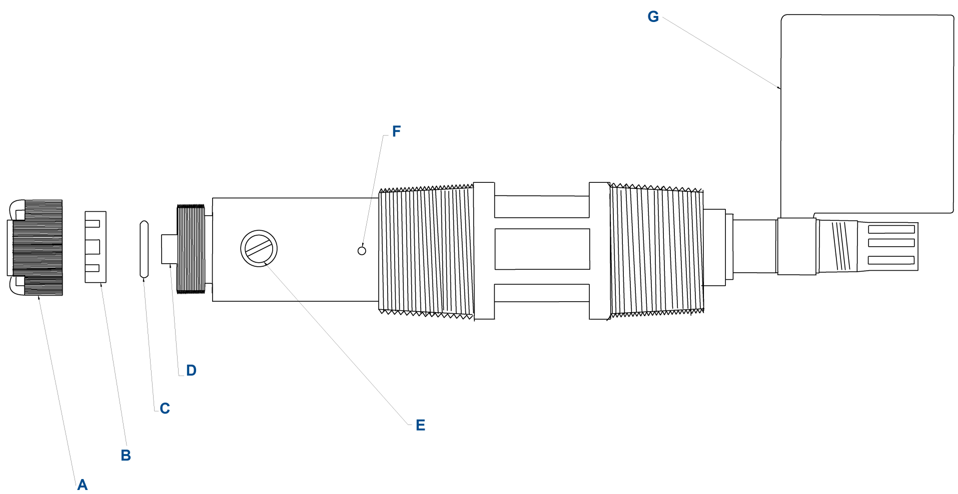
HARMFUL SUBSTANCE
Fill solution may cause irritation. May be harmful if swallowed. Read and follow manual.

Procedure

1. Unscrew the membrane retainer.
2. Remove the membrane assembly and O-ring.

   See Figure 8-1.

Figure 8-1: Monochloramine Sensor Parts



A. Membrane retainer
B. Membrane assembly
C. O-ring
D. Cathode
E. Electrolyte fill plug (wrap with pipe tape)
F. Pressure equalizing port
G. Information label

3. Hold the sensor over a container with the cathode pointing down.
4. Remove the fill plug.
5. Allow the electrolyte solution to drain out.
6. Wrap the plug with several turns of pipe tape and set aside.
7. Prepare a new membrane.
    a) Hold the membrane assembly with the cup formed by the membrane and membrane holder pointing up.
    b) Fill the cup with electrolyte solution.
8. Hold the sensor at about a 45° angle with the cathode end pointing up.
9. Add electrolyte solution through the fill hole until the liquid overflows.
10. Tap the sensor near the threads to release trapped air bubbles.
11. Add more electrolyte solution if necessary.
12. Place the fill plug in the electrolyte port and begin screwing it in.
13. After several threads have engaged, rotate the sensor so that the cathode is pointing up and continue tightening the fill plug.
    Do not overtighten.
14. Place a new O-ring in the groove around the cathode post.
15. Cover the cathode with electrolyte solution; then place the membrane assembly over the cathode.

16. Screw the membrane retainer in place.
17. Hold the sensor with the cathode end pointing down.
18. Give the sensor several sharp shakes to dislodge air bubbles trapped behind the cathode.

    The sensor may require several hours operating at the polarizing voltage to equilibrate after the electolyte solution has been replaced.

Table 8-1: Spare Parts

Part number	Description
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 three membrane assemblies and three O-rings
9210732	Monochloramine sensor fill solution, 4 oz (120 mL)

8.3 Constant head flow controller

8.3.1 General head flow controller information

After a period of time, deposits may accumulate in the constant head overflow chamber and in the tubing leading to the flow cell(s). Deposits increase the resistance to flow and cause the flow to gradually decrease. Loss of flow may ultimately have an impact on the sensor performance.

The flow controller is designed to provide about 1.2 gal/hr (75 mL/min) flow. Loss of flow to about 0.5 gal/hr (30 mL/min) causes about a 5% decrease in sensor output.

8.3.2 Cleaning the flow controller

The flow controller can be taken apart completely for cleaning.

Procedure

1. Use a strong flow of water to flush out the tubing.

   Use a pipe cleaner or small bottlebrush to remove more adherent deposits.

2. To prevent leaks, apply a thin layer of silicone grease (or equivalent) to the two O-rings as the base of the overflow chamber and to the O-ring sealing the central overflow tube to the base.

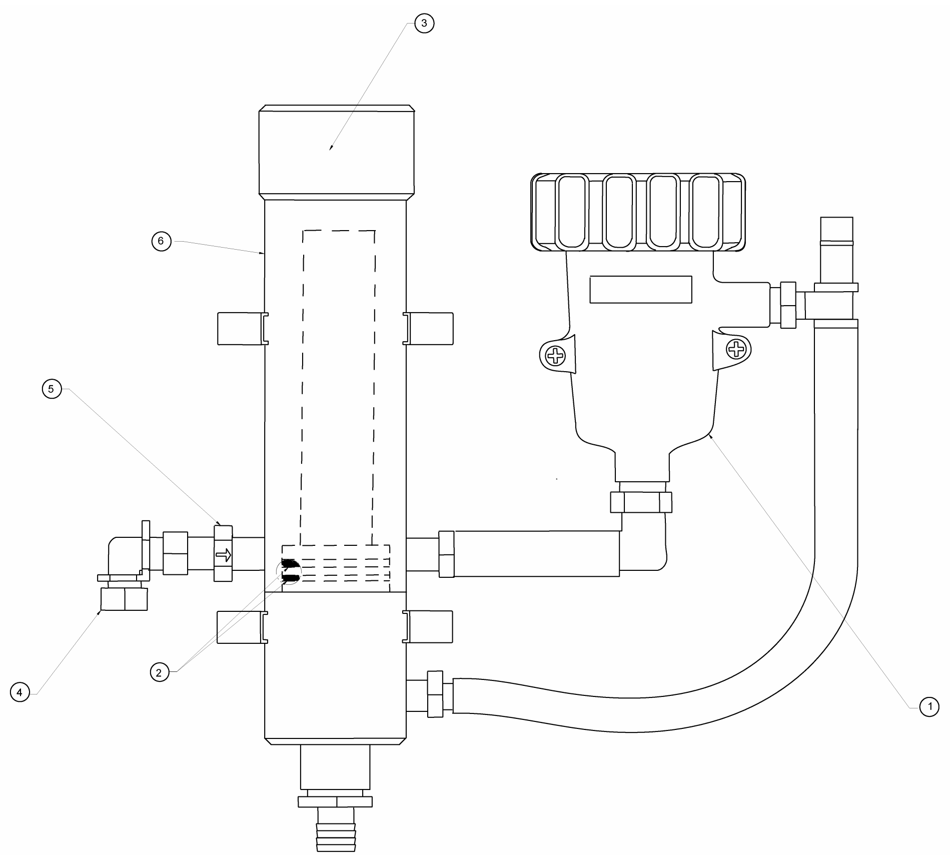
8.3.3 Other maintenance

Table 8-2 and Figure 8-2 show the replacement parts for the flow controller assembly used in the Rosemount MCL.

Table 8-2: Replacement Parts for Constant Head Flow Controller Assembly (Model MCL)

Location in Figure 8-2	PN	Description
1	24039-00	Flow cell for chlorine sensor with bubble shedding nozzle
2	24040-00	O-ring kit, two 2-222 and one 2-024 silicone O-rings with lubricant
3	33812-00	Dust cap for constant head flow controller
4	9322032	Elbow, 1/4 in. FNPT x 1/4 in. OD tubing
5	9350029	Check valve, 1/4 in. FNPT
6	33823-00	Outside tube for constant head device

Figure 8-2: Rosemount MCLFlow Controller Assembly Replacement Parts



9 Troubleshoot

9.1 Overview

When the transmitter identifies a problem, the word `warning` or `fault` appears intermittently in the lower line of the main display. When the `fault` or `warning` message appears, press **DIAG** for more information.

See Use the diagnostic feature.

Warning The instrument or sensor is usable, but you should take steps as soon as possible to correct the condition causing the warning.

Fault The measurement is seriously in error and is not to be trusted. A fault condition might also mean that the transmitter has failed. Correct fault conditions immediately. When a fault occurs, the analog output goes to 22.00 mA or to the value programmed in Configure outputs.

The transmitter also displays warning messages if a calibration is seriously in error. For more information, see Use the diagnostic feature.

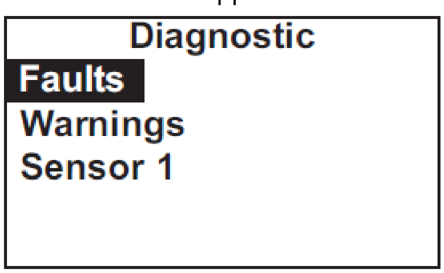
9.2 Use the diagnostic feature

Complete the following steps to troubleshoot your transmitter with the diagnostic feature.

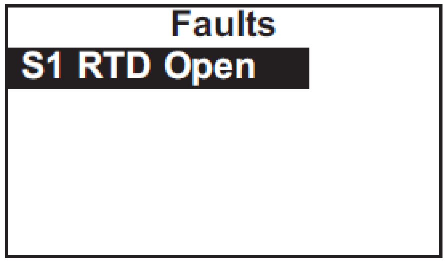
Procedure

1. To read diagnostic messages, press **DIAG**.

   The screen below appears.



2. To display fault messages, select Faults. To display warning messages, select Warnings. To read measurement information about the sensor, including raw sensor signal and calibration data, choose Sensor 1 and press **ENTER**.
   If you choose Faults or Warnings, a screen like the one below appears. S1 means sensor 1.



3. For additional troubleshooting information, select the desired message and press **ENTER**.

   For more information, see Troubleshooting when a Fault message is showing.

4. To return to the main display, press **MENU** and then **EXIT**.

9.3 Troubleshooting when a Fault message is showing

Fault message	Explanation	Section
Main Board CPU Error	Main board software is corrupted.	Main Board CPU, Main Board Factory Data, and Main Board User Data errors
Main Board Factory Data	Main board factory eeprom data is corrupted.	Main Board CPU, Main Board Factory Data, and Main Board User Data errors
Main Board User Data	Main board user eeprom data is corrupted.	Main Board CPU, Main Board Factory Data, and Main Board User Data errors
Sensor Hardware Error	Missing or bad hardware component.	Hardware error
Sensor Board Unknown	Transmitter does not recognize sensor board.	Sensor Board Unknown, Sensor Board HW (Hardware) or SW (Software) Mismatch, or Sensor Board Not Communicating
Sensor HW-SW Mismatch	Sensor board hardware and software do not match.	Sensor Board Unknown, Sensor Board HW (Hardware) or SW (Software) Mismatch, or Sensor Board Not Communicating
Sensor Incompatible	Sensor board software is not supported by main board software.	Sensor Board Unknown, Sensor Board HW (Hardware) or SW (Software) Mismatch, or Sensor Board Not Communicating
Sensor Not Communicating	Sensor board is not communicating with main board.	Sensor Board Unknown, Sensor Board HW (Hardware) or SW (Software) Mismatch, or Sensor Board Not Communicating
Sensor CPU Error	Sensor board software is corrupted.	Sensor CPU Error
Sensor RTD Open	Temperature measuring circuit is open.	Sensor RTD Open

Fault message	Explanation	Section
S1 Not Detected	No sensor board is connected to sensor 1 terminal.	Sensor 1 Not Detected
Sensor Factory Data	Sensor board factory eeprom data is corrupted.	Sensor Factory Data, Sensor Board User Data, and Sensor Eeprom Write errors
Sensor EEPROM Write Error	Bad CPU on the sensor board.	Sensor Factory Data, Sensor Board User Data, and Sensor Eeprom Write errors
Sensor User Data	Sensor board user eeprom data is corrupted.	Sensor Factory Data, Sensor Board User Data, and Sensor Eeprom Write errors
Sensor ADC Error	Bad component on the sensor board.	Sensor ADC error
Sensor RTD Out of Range	RTD is improperly wired or has failed.	Sensor RTD Out of Range

9.3.1 Main Board CPU, Main Board Factory Data, and Main Board User Data errors

These error messages mean the main board is corrupted or the eeprom data on the main board is corrupted.

Procedure

1. Cycle the power off and then on.
2. If cycling the power does not help, call the factory.

   The main board must be replaced. To do this, you must return the transmitter to the factory.
3. If cycling the power does not help and the fault message was `Main Board User Data`, reset the transmitter to factory default, re-enter user settings, and repeat calibration.

9.3.2 Hardware error

Hardware error means that there is a missing or bad hardware component on the sensor board.

The board must be replaced.

9.3.3 Sensor Board Unknown, Sensor Board HW (Hardware) or SW (Software) Mismatch, or Sensor Board Not Communicating

These error messages mean the main board either does not recognize the sensor board or the sensor board and main board are no longer communicating.

Procedure

1. Verify that the ribbon cable connecting the main board (on the inside of the front panel) and the sensor board are properly seated.
2. Inspect the connecting cable for obvious tears or breaks.
3. If the ribbon cable is properly seated and appears undamaged, replace the sensor board.

9.3.4 Sensor Incompatible

This error message means that the sensor board software is not supported by the main board software. Either the sensor board or the main board software is too old.

Replace the main board with one compatible with the sensor board. Call the factory for assistance. You will be asked for the main and sensor board revision numbers. To read the main board revision, press **DIAG** and scroll down until `Inst SW Ver` is showing. To view the sensor board software revision, press **DIAG**, choose the appropriate sensor, and scroll down until `Board SW Ver` is showing. The main board can be replaced only at the factory.

9.3.5 Sensor CPU Error

This message means the sensor board software is corrupted.

Procedure

1. Cycle the power off and then on.
2. If cycling the power does not help, call the factory.

   The sensor board must be replaced.

9.3.6 Sensor RTD Open

The a Pt 100 RTD (resistance temperature device) for measuring temperature. `Sensor RTD Open` means the temperature measuring circuit is open.

Procedure

1. Confirm that the sensor RTD wires are properly connected.
2. Confirm that the Variopol connector is properly seated.
3. Disconnect the sensor from the cable and use an ohmmeter to check the resistance across the RTD.

4. If the resistance is okay, connect the Variopol cable to the sensor and disconnect the three RTD wires at the transmitter. Measure the resistance across the red and white RTD leads.

   See Figure 9-3. If the resistance is very high, the problem is with the VP cable, and it must be replaced.

9.3.7 Sensor 1 Not Detected

The ribbon cable from sensor 1 (chlorine) board must be plugged into the sensor 1 plug.

See Figure 4-2 for the location of the sensor board connectors.

Procedure

1. Confirm that the ribbon cable connecting sensor 1 (chlorine) board to the main board is plugged into the Sensor 1 connector on the main board.
2. Confirm that the ribbon cable is seated at both ends.

9.3.8 Sensor Factory Data, Sensor Board User Data, and Sensor Eeprom Write errors

These messages mean factory eeprom data or user eeprom data on the sensor board is corrupted or the CPU on the sensor board is bad.

Procedure

1. Cycle power off and then on.
2. Replace the sensor board.

9.3.9 Sensor ADC error

There is a bad component on the sensor board. The sensor board must be replaced.

9.3.10 Sensor RTD Out of Range

The sensor contains a Pt 100 RTD (resistance temperature device) for measuring temperature. If the measured resistance is outside the expected range, the transmitter displays the out of range error message.

Procedure

1. Check wiring connections.
2. Disconnect the sensor from the cable and use an ohmeter to check the resistance across the RTD.

   The resistance should be about 110 Ω. If there is an open or short circuit, the sensor has failed and should be replaced.

3. If the resistance is acceptable, attach the sensor to the Variopol cable and disconnect the red and white RTD IN and RTD RTN leads at the transmitter.
4. Connect an ohmeter across the leads and measure the resistance.

If the circuit is open or shorted, the cable must be replaced.

5. If there is no open or short, check the transmitter.
   See Simulate temperature.

9.4 Troubleshooting when a Warning message is showing

Warning message	Explanation	Section
Sensor Need Factory Cal	The sensor was not calibrated at the factory.	Sensor Need Factory Cal
Sensor Negative Reading	The monochloramine reading is less than -0.5 ppm.	Sensor Negative Reading
Sensor RTD Sense Open	RTD sensor line is broken or not connected.	Sensor RTD Sense Open
Sensor Temperature High	Temperature is greater than 155 °C (311 °F).	Sensor Temperature High or Low
Sensor Temperature Low	Temperature is less than -20 °C (-4 °F).	Sensor Temperature High or Low

9.4.1 Sensor Need Factory Cal

The sensor board was improperly calibrated at the factory. Call the factory for assistance.

9.4.2 Sensor Negative Reading

The transmitter converts the raw sensor current to ppm monochloramine by subtracting the zero current from the raw current and multiplying the result by a conversion factor. If the zero current is larger than the raw current, the result will be negative.

Procedure

1. Check the zero current.
   It should be less than about 15 nA.
2. If it is greater than 15 nA, repeat the zero step.
   If the zero current is in the correct range, the negative reading might be the result of the raw current or the senstivity being too low. A properly operating sensor should generate between 250 and 450 nA for every 1 ppm of monochloramine.
3. Recalibrate the sensor. If necessary, clean or replace the membrane and check the fill solution.
4. Replace the sensor.

9.4.3 Sensor RTD Sense Open

The transmitter measures temperature using a three-wire resistance temperature device (RTD). See Figure 9-3. The transmitter uses the in and return leads to measure the resistance of the RTD. The third lead, called the snese line, is connected to the return lead at the sensor. The sense line allows the transmitter to correct for the resistance of the in and return leads and to compensate for changes in wire resistance caused by changes in ambient temperature.

Recommended actions

1. Check wiring.
2. Disconnect the sense and return wires and check the resistance between them.
3. Use a wire jumper to connect the sense and return terminals to the sensor terminal strip.
   The transmitter will no longer correct the temperature for lead resistance or compensate for changes in ambient temperature. The error could be several °C or more.
4. Replace the sensor.

9.4.4 Sensor Temperature High or Low

The sensor RTD is most likely miswired.

Procedure

1. Check wiring connections.
2. Check resistance between RTD in and return leads.
   The resistance should be close to the values given in Simulate temperature.
3. Replace the sensor.

9.5 Troubleshooting when no error message is showing

Problem	See Section
Zero current was accepted, but the current is outside the range -10 to 15 nA.	Zero current is too high.
Error or warning message appears while zeroing the sensor (zero current is too high).	Zero current is too high.
Zero current is unstable.	Zero current is unstable.
Sensor can be calibrated, but the current is less than about 250 nA/ppm at 77 °F (25 °C).	Sensor can be calibrated, but the current is too low.
Process readings are erratic..	Process readings are erratic.
Readings drift.	Readings drift
Sensor does not respond to changes in monochloramine level.	Sensor does not respond to changes in monochloramine level.

9.5.1 Zero current is too high.

1. Is the sensor properly wired to the transmitter? See Wire sensor.
2. Is the zero solution monochloramine free? Take a sample of the solution and test it for monochloramine level. The concentration should be less than about 0.02 ppm.
3. 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.
4. 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.

9.5.2 Zero current is unstable.

1. is the sensor properly wired to the transmitter? See Figure 4-2. Verify that all wiring connections are tight.
2. Readings are often erratic when a new or rebuilt sensor is first placed in service. Readings usually stabilize after about an hour.
3. 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.
4. Verify that the sensor is filled with electrolyte solution. Refer to Monochloramine sensor for details.

9.5.3 Sensor can be calibrated, but the current is too low.

1. Is the temperature low? The sensor current decreases about 5% for every °C drop in temperature.
2. 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 Constant head flow controller.
3. Is a bubble trapped against the membrane? If a sample flow becomes too low (because dirt or slime has built up in the flow controller), bubbles 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 Constant head flow controller for the cleaning procedure
4. Low current can be caused by lack of electrolyte flow to the cathode and membrane. See step 3 in Zero current is unstable..
5. 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 two or three months of operation, the sensitivity

may start to drop rapidly. At this point, the electrolyte solution and membrane should be replaced. Refer to Monochloramine sensor.

6. 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 or by washing with a stream of water from a washer bottle.

⚠ CAUTION

EQUIPMENT DAMAGE
Do not use a tissue to wipe the membrane.

7. If cleaning the membrane does not remove the sensor response, replace the membrane and electrolyte solution. See the sensor instruction sheet for details.

9.5.4 Process readings are erratic.

1. Readings are often erratic when a new sensor or 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 Monochloramine sensor.

9.5.5 Readings drift.

Recommended actions

1. Check to see if the sample temperature is changing.

   Membrane permeability is a function of temperature. The transmitter automatically corrects for changes in sensor current caused by temperature changes. The time constant for response to a temperature change is about five minutes. Therefore, the reading may drift for a while after a sudden temperature change.
2. Make sure the membrane is 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 a slow response. Clean the membrane by rinsing with a stream of water from a wash bottle or by swirling it vigorously in a beaker of water.

⚠ CAUTION

Equipment damage

Do not use a tissue to wipe the membrane.

3. Make sure the sample flow is within the recommended range. Gradual loss of flow will cause 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 Constant head flow controller.

4. Check to see if a bubble is trapped against the membrane.

   For the sensor to work properly, monochloramine must continuously diffuse through the membrane. Bubbles block monochloramine 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 you see bubbles, 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.

5. If the sensor is new or has been recently serviced, wait several hours for it to stabilize.

6. Replace the fill solution and membrane.

   Gradual downward drift is caused by a depletion of the fill solution. Noramally, calibrating the sensor every week adequately compensates for the drift. After the sensor has been in service for several months, you may need to replace the fill solution and membrane. Refer to Replacing the electrolyte solution and membrane.

9.5.6 Sensor does not respond to changes in monochloramine level.

1. Is the grab sample test accurate? Is the grab sample representative of the sample flowing to the sensor?

2. 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 two or 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.

3. Is the membrane clean? Clean the membrane with a stream of water and replace it if necessary.

4. Replace the sensor.

9.5.7 Readings are too low.

1. 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.
2. 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 two or three months of operation, the sensitivity may start to drop rapidly. At this point, the electrolyte solution and membrane should be replaced. Refer to Monochloramine sensor.
3. 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 readings remains the same, 0.05 ppm.
4. 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, dissassemble and clean the overflow sampler. See Constant head flow controller.
5. Is a bubble trapped against the membrane? If a sample flow becomes too low (because dirt or slime has built up on the flow controller), bubbles 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 Constant head flow controller for cleaning procedures.

9.6 Troubleshooting when no error message is showing - general

Problem	See Section
	Difference between transmitter and standard thermometer is greater than 3 °C.
Current output is too low.	Current output too low
Alarm relays do not operate when setpoint is exceeded.	Alarm relays don't work.

9.6.1 Difference between transmitter and standard thermometer is greater than 3 °C.

1. Is the reference thermometer, RTD, or thermistor accurate? General purpose thermometers, particularly ones that have been mistreated, can have surprisingly large errors.
2. Review Calibrate temperature.

9.6.2 Current output too low

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

9.6.3 Alarm relays don't work.

1. Verify the relays are properly wired.
2. Verify the deadband is correctly configured.

9.6.4 Bubbles trapped against membrane.

See Readings drift., step 4.

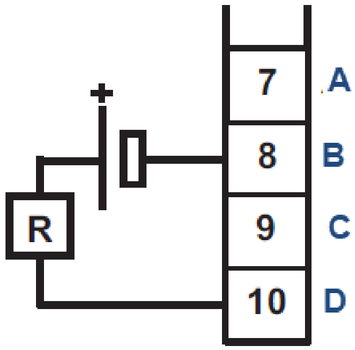
9.7 Simulate inputs

To check the performance of the transmitter, use a decade box and 1.5 V 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.

Procedure

1. Disconnect the anode and cathode leads from terminals 8 and 10 on TB1 and connect a decade box and 1.5 V battery as shown in Figure 9-1.

Figure 9-1: Simulating Chlorine



A. Anode shield
B. Anode
C. Cathode shield
D. Cathode

It is not necessary to disconnect the RTD leads.

2. Set the decade box to 2.4 MΩ.
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 **DIAG**. Choose sensor 1 information. The input current is the second line in the display.
4. Change the decade box resistance and verify that the correct current is shown. Calculate current from the equation:

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

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

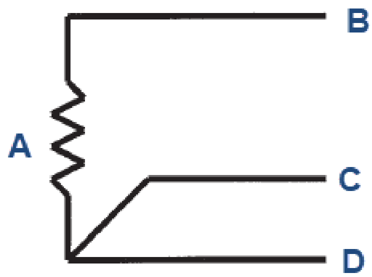
9.8 Simulating temperature

9.8.1 General information about simulating temperature

The transmitter accepts a Pt100 resistance temperature device. The Pt100 resistance temperature device is a three-wire configuration.

See Figure 9-2.

Figure 9-2: Three-Wire RTD Configuration



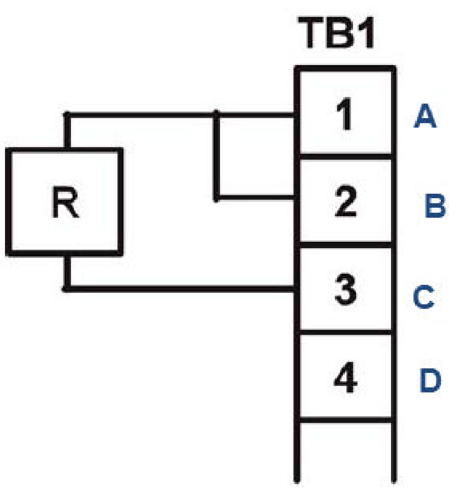
A. *Resistance temperature device*
B. *Resistance temperature device in*
C. *Resistance temperature device sense*
D. *Resistance temperature device return*

Although only two wires are required to connect the resistance temperature device to the transmitter, using a third (and sometimes fourth) wire allows the transmitter to correct for the resistance of the lead wires and for changes in the lead wire resistance with temperature.

9.8.2 Simulate temperature

To simulate the temperature input, wire a decade box to the transmitter or junction box as shown in Figure 9-3.

Figure 9-3: Simulating Resistance Temperature Device Inputs



A. *Resistance temperature device return*
B. *Resistance temperature device sense*
C. *Resistance temperature device in*
D. *Resistance temperature device shield*

To check the accuracy of the temperature measurement, set the resistor simulating the resistance temperature device 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 transmitter 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 transmitter 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 transmitter 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 transmitter is working correctly.

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

A EU Declaration of Conformity

EMERSON

CE

EU Declaration of Conformity

No: RAD 1122 Rev. C

We,

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317-9685
USA

declare under our sole responsibility that the product,

Rosemount™ Dual Input Intelligent Analyzer model 1056-AA-BB-CC-DD-EE

manufactured by,

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317-9685
USA

to which this declaration relates, is in conformity with the provisions of the European Union Directives, including the latest amendments, as shown in the attached schedule.

Assumption of conformity is based on the application of the harmonized standards and, when applicable or required, a European Union notified body certification, as shown in the attached schedule.

(signature)	Vice President of Global Quality (function)
Chris LaPoint (name)	10-Jan-19; Shakopee, MN USA (date of issue & place)

Page 1 of 2

EMERSON.

EU Declaration of Conformity

No: RAD 1122 Rev. C

The product,

Rosemount™ Dual Input Intelligent Analyzer model 1056-AA-BB-CC-DD-EE

Where

AA is Power:
01 115/230VAC, no relays
02 24VDC, 4 alarm relays
03 85-265VAC, 4 alarm relays

BB is Measurement 1:
20 Contacting Conductivity
21 Toroidal Conductivity
22 pH/ORP/ISP
23 Flow/Current
24 Chlorine
25 Dissolved Oxygen
26 Ozone
27 Turbidity

CC is Measurement 2:
30 Contacting Conductivity
31 Toroidal Conductivity
32 pH/ORP/ISP
33 Flow/Current
34 Chlorine
35 Dissolved Oxygen
36 Ozone
37 Turbidity
38 None

DD is Communication Output:
AN 4-20 mA analog signaling
HT 4-20 mA plus HART comm.
DP Profibus protocol

EE is UL option:
Blank if no selection
UL UL, Ordinary Location

to which this declaration relates, is in conformity with relevant Union harmonization legislation:

EMC Directive (2014/30/EU)
Harmonized Standards:
EN 61326-1:2013

Low Voltage Directive (2014/35/EU)
Harmonized Standard:
EN 61010-1:2010

RoHS Directive (2011/65/EU)
Harmonized Standard:
EN 50581:2012

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B China RoHS Table

含有China RoHS管控物质超过最大浓度限值的部件型号列表 1056
List of 1056 Parts with China RoHS Concentration above MCVs

部件名称 Part Name	有害物质 / Hazardous Substances					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr +6)	多溴联苯 Polybrominated biphenyls (PBB)	多溴联苯醚 Polybrominated diphenyl ethers (PBDE)
电子组件 Electronics Assembly	X	O	O	O	O	O
传感器组件 Sensor Assembly	X	O	O	O	O	O

本表格系依据SJ/T11364的规定而制作.
This table is proposed in accordance with the provision of SJ/T11364.

O: 意为该部件的所有均质材料中该有害物质的含量均低于GB/T 26572所规定的限量要求.
O: Indicate that said hazardous substance in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

X: 意为在该部件所使用的所有均质材料里，至少有一类均质材料中该有害物质的含量高于GB/T 26572所规定的限量要求.
X: Indicate that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.

部件名称 Part Name	组装备件说明 Spare Parts Descriptions for Assemblies
电子组件 Electronics Assembly	电子线路板组件 Electronic Board Assemblies 液晶显示屏或本地操作界面显示屏 LCD or LOI Display
传感器组件 Sensor Assembly	传感器模块 Sensor Module

00809-0100-3414
Rev. AA
2019

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