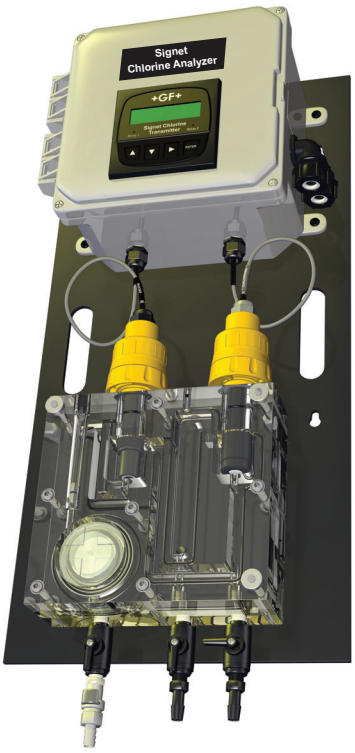
English

Signet 4630 Free Chlorine Analyzer System
Signet 4632 Chlorine Dioxide Analyzer System

3-4630.090 Rev 13 08/19

Operating Instructions

The Signet 4630 and 4632 Systems are EPA 334.0 Compliant.



Description

The Signet Chlorine Analyzer Systems are integrated, all-in-one Chlorine Panel Systems designed to measure Free Chlorine or Chlorine Dioxide in drinking water and clean, fresh water treatment applications.
This manual includes the 4630 Free Chlorine and 4632 Chlorine Dioxide Analyzer Systems.

Features:

- EPA 334.0 Compliant: The 4630 Free Chlorine and 4632 Chlorine Dioxide Systems can be used for reporting chlorine residuals in accordance with EPA Method 334.0.
- Complete Chlorine Analyzer System allows quick setup and easy installation. Connect to a water source and plug it in.
- Unique integrated clear flow cell combines sensors, flow regulator, filter and variable area flow indicator in one compact unit.
- Built-in variable area flow indicator facilitates flow rate confirmation at a glance.
- Integrated flow regulator with removable filter accepts inlet pressures of 1 to 8 bar (15 to 120 psi) while maintaining constant flow and minimal pressure to the sensors.
- Water flows vertically into sensor tip, eliminating bubble entrapment. Raised exit in flow cell sensor chamber ensures sensors stay submerged even when system and flow is turned off.
- Flow cell accommodates two sensors; one chlorine and an optional pH sensor.
- Automatic pH and temperature compensation or manual pH value input capability for accurate free chlorine readings.
- Easy viewing of the transmitter via the bright backlit LCD display.
- Moisture-proof NEMA 4X wiring enclosure.

Additional information can be found in the individual product manuals, refer to www.gfsignet.com.
Click on Product Manuals under the Signet Quick Links section.

- English
- Deutsch
- Français
- Español
- Italiano

Safety

CAUTION!

1. Follow instructions carefully to avoid personal injury.
2. Do not exceed the maximum pressure or temperature specifications.
3. Mounting the Chlorine System in an outdoor box, in areas with elevated temperatures, may cause damage to the system if the enclosure's internal temperature exceeds the temperature specification of the Chlorine Analyzer.
4. Do not alter product construction.
5. For use with clean fresh water only.
6. Disconnect AC power before opening wiring enclosure.
7. This panel system uses AC voltages. Wiring should be done by qualified personnel only.

Warranty Information

Refer to your local Georg Fischer Sales office for the most current warranty statement.

All warranty and non-warranty repairs being returned must include a fully completed Service Form and goods must be returned to your local GF Sales office or distributor. Product returned without a Service Form may not be warranty replaced or repaired.

Signet products with limited shelf-life (e.g. pH, ORP, chlorine electrodes, calibration solutions; e.g. pH buffers, turbidity standards or other solutions) are warranted out of box but not warranted against any damage, due to process or application failures (e.g. high temperature, chemical poisoning, dry-out) or mishandling (e.g. broken glass, damaged membrane, freezing and/or extreme temperatures).

Product Registration

Thank you for purchasing the Signet line of Georg Fischer measurement products.
If you would like to register your product(s), you can now register online in one of the following ways:

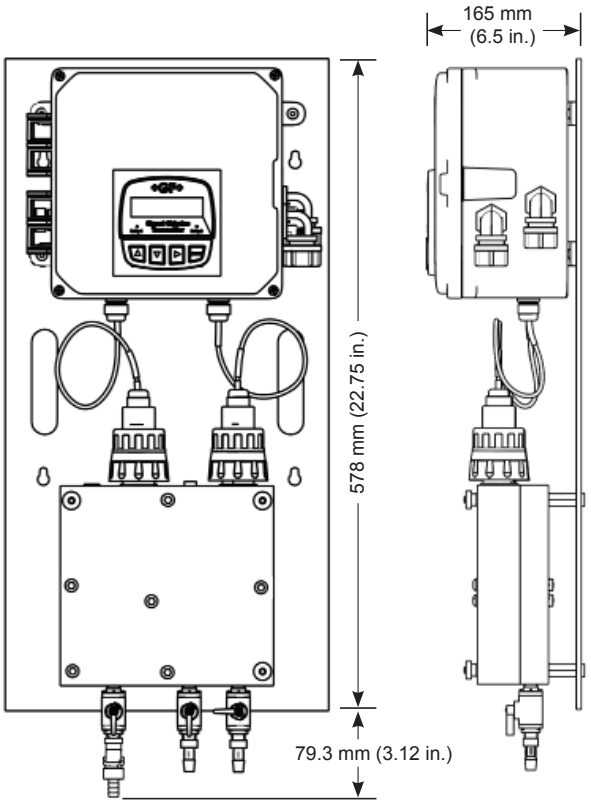
- Visit our website **www.gfsignet.com** and click on **Product Registration Form**
- If this is a pdf manual (digital copy), **click here**
- Scan the QR Code on the left

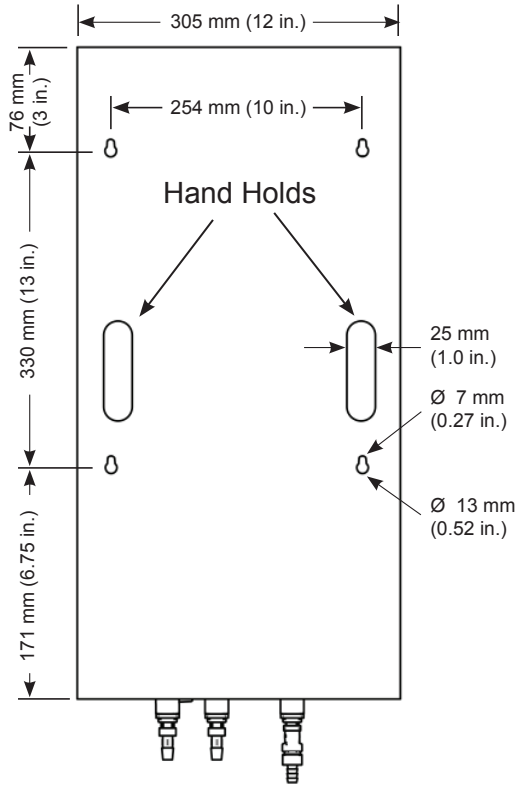
Safety Information

	**Warning / Caution / Danger** Indicates a potential hazard. Failure to follow all warnings may lead to equipment damage, injury, or death
	**Electrostatic Discharge (ESD) / Electrocution Danger** Alerts user to risk of potential damage to product by ESD, and/or risk of potential of injury or death via electrocution.
	**Personal Protective Equipment (PPE)** Always utilize the most appropriate PPE during installation and service of Signet products.
	**Pressurized System Warning** Sensor may be under pressure, take caution to vent system prior to installation or removal. Failure to do so may result in equipment damage and/or serious injury.
	**Hand Tighten Only** Overtightening may permanently damage product threads and lead to failure of the retaining nut.
	**Do Not Use Tools** Use of tool(s) may damage product beyond repair and potentially void product warranty.
	**Note / Technical Notes** Highlights additional information or detailed procedure.
	**Do Not Freeze** Products are temperature sensitive and may contain freezable liquids. Freezing damage to pH, ORP, and Chlorine electrodes voids product warranty.

Table of Contents

Dimensions





Safety Data Sheets (SDS) are available online at www.gfsignet.com.

System Specifications

General

Compatible Signet Sensors
3-2630-1 Free Chlorine Sensor 0.02 to 2 ppm
3-2630-2 Free Chlorine Sensor 0.02 to 5 ppm
3-2630-3 Free Chlorine Sensor 0.05 to 20 ppm
3-2632-1 Chlorine Dioxide Electrode 0.02 to 2 ppm
3-2724-00 Flat pH Electrode
Free Chlorine.....5.5 to 8.5 pH
Chlorine Dioxide .....4.0 to 11 pH

Materials

Panel.....Black acrylic
Flow Cell .....Acrylic
Wiring Enclosure .....Polycarbonate
Wetted Materials
Flow cell, spacer rings .....Acrylic
Flow regulator housing.....Polycarbonate
Strainer, e-clip, regulator spring, float .....Stainless steel
Valves, vent.....Polypropylene
Flow Cell O-rings, diaphragm .....EPR (EPDM), FKM
Chlorine electrode .....PVC, PTFE, FKM, Nylon, Silicone
pH electrode.....PPS, Glass, UHMW, PE, FKM
Sealing tape (valves, plug, vent) .....PTFE
Plug.....Polyethylene

Performance

System Inlet
Pressure Rating.....1 to 8 bar (15 to 120 psi)
Pressure Regulator.....< 0.69 bar (10 psi) variation over all ranges of flow and pressure
Flow tolerance .....±15% or rated specification above
Flow rate limits .....8 to 12 gph (US) (30.24 to 45.36 LPH)

Electrical

AC Input (standard) .....100 to 240 VAC nominal 50 to 60 Hz, 0.17 A at 100 VAC
DC Input (optional) .....12 to 24 VDC ±10% regulated, 10 W, 250 mA max

Environmental Requirements
Storage Temperature .....0 °C to 65 °C (32 °F to 149 °F)
Operating Temperature .....0 °C to 45 °C (32 °F to 113 °F)
Relative Humidity.....0 to 95%
Maximum Altitude .....2000 m (6562 ft)
Shipping Weight .....10 kg (22 lbs)
Enclosure .....NEMA 4X (with output wire glands sealed)

Standards and Approvals
CE, UL, CUL, WEEE
RoHS Compliant
Manufactured under ISO 9001 for Quality, ISO 14001 for Environmental Management and OHSAS 18001 for occupational health and safety.
China RoHS (Go to www.gfsignet.com for details)

Declaration of Conformity according to FCC Part 15

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and,
(2) This device must accept any interference received, including interference that may cause undesired operation.

System Inventory

1. Chlorine panel assembly
   a. Built-in pressure regulator 15 to 120 psi.
   b. 3/8 inch hose barb connectors.
2. 1 each 2630 series Free Chlorine sensor or 2632 Chlorine Dioxide sensor; each with protective cap
   a. 1 spare membrane cap
   b. 2 bottles of electrolyte solution
   c. 1 syringe needle (taped to bottle)
   d. 1 syringe
3. 1 each Flat pH sensor 3-2724-00 (159 001 545) (3-4630-11, -21, -31 and 3-4632-11 models only)
4. Manual package
   a. English panel assembly manual
   b. CD with multi-language manuals
   c. Wall mounting hardware
   d. Drill template
5. 1 each North American Type B power cord
6. Customer supplied
   a. 3/8" hose input and drain
   b. Hose clamps

Quick Start

Follow the steps below to set up a new Chlorine Analyzer System. Refer to the individual component manuals for detailed information.

Step 1. Mount the panel on a vertical flat surface using appropriate hardware.

Do not turn on power at this time.

Step 2. Open the wiring enclosure and wire input power.
(see page 8: Wiring Input, page 9: Wiring Output, and page 10: Electrical Box Wiring Schematic)

Step 3. Wire any 4 to 20 mA and relay output.

Step 4. Remove sensor access plugs from the flow cell. (Figure 1)
If the optional pH sensor is NOT used, do not remove the left-side plug from the flow cell.

Step 5. Remove the protective cap from the chlorine electrode.
(Keep the electrode cap in a safe place for future use. It is recommended to use the cap to protect the sensor during the removal of the electrode for cleaning or maintenance of the flow cell)

Step 6. **Complete Sensor Preparation** (see page 11) and install the chlorine sensor into the electronics.
(see page 12: Sensor Installation) Install the chlorine electrode into the flow cell.
The chlorine sensor is installed in the right-side access port, optional pH sensor is installed in the left-side access port.

NOTE: All new chlorine and pH sensors require calibration during the start up of a system and throughout the life of the sensor. A new chlorine sensor requires a conditioning period of up to 4 hours with power on and chlorinated water flowing past the sensor prior to calibration. See page 24: Chlorine Sensor Calibration, for chlorine calibration and set up procedure.

NOTE: If a Free Chlorine sensor without optional pH sensor is used, pH value must be "hard-coded" into the system (See page 23: Manual pH compensation).
If optional pH sensor is installed, see page 22 to complete pH Sensor Calibration.

Step 7. Repeat step 5 and 6 if the optional pH sensor is being used.

Step 8. Install the influent water source to the "Inlet Port" nipple assembly of the flow cell. Install 3/8-inch tubing and secure with a hose clamp.
(Not included. See page 13: Tubing Connections)

Step 9. Install 3/8-inch tubing and secure with a hose clamp on the "Drain" port and direct the tube to a proper drain. (Not included)

Step 10. Verify the inlet and drain ball valves are in the open position and the sample port is in the off position. (See page 13: Tubing Connections)

Step 11. Turn on the influent water source and check the system for leaks.

Step 12. Apply power to the system and allow system to initialize. Calibrate per instructions.
(See page 24: Chlorine Sensor Calibration and page 22: pH Sensor Calibration)

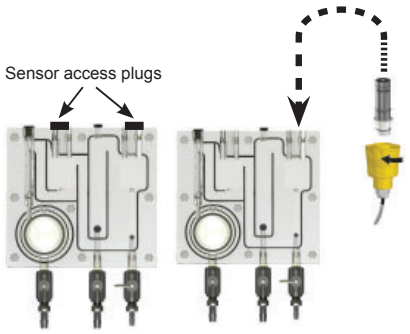
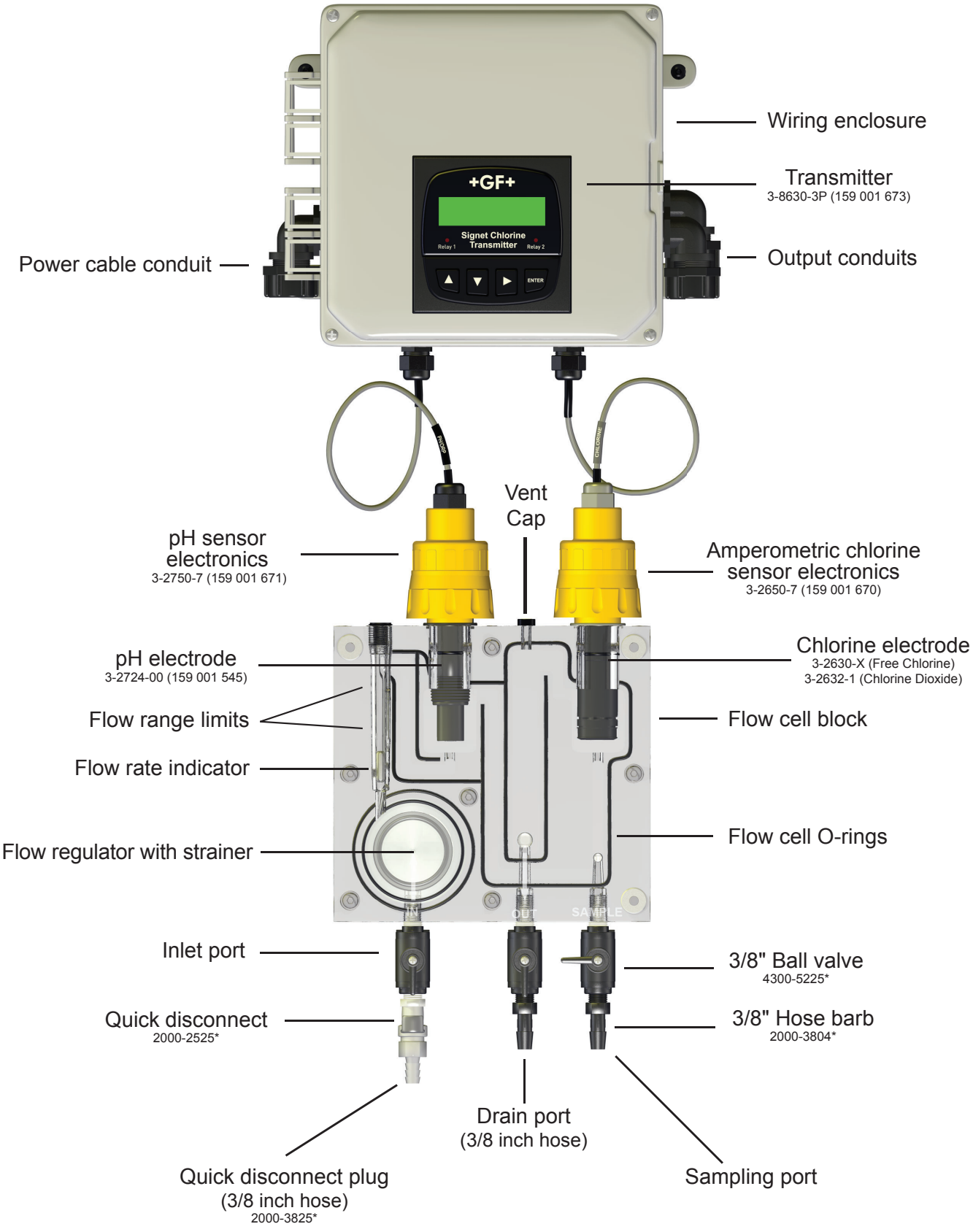


Figure 1

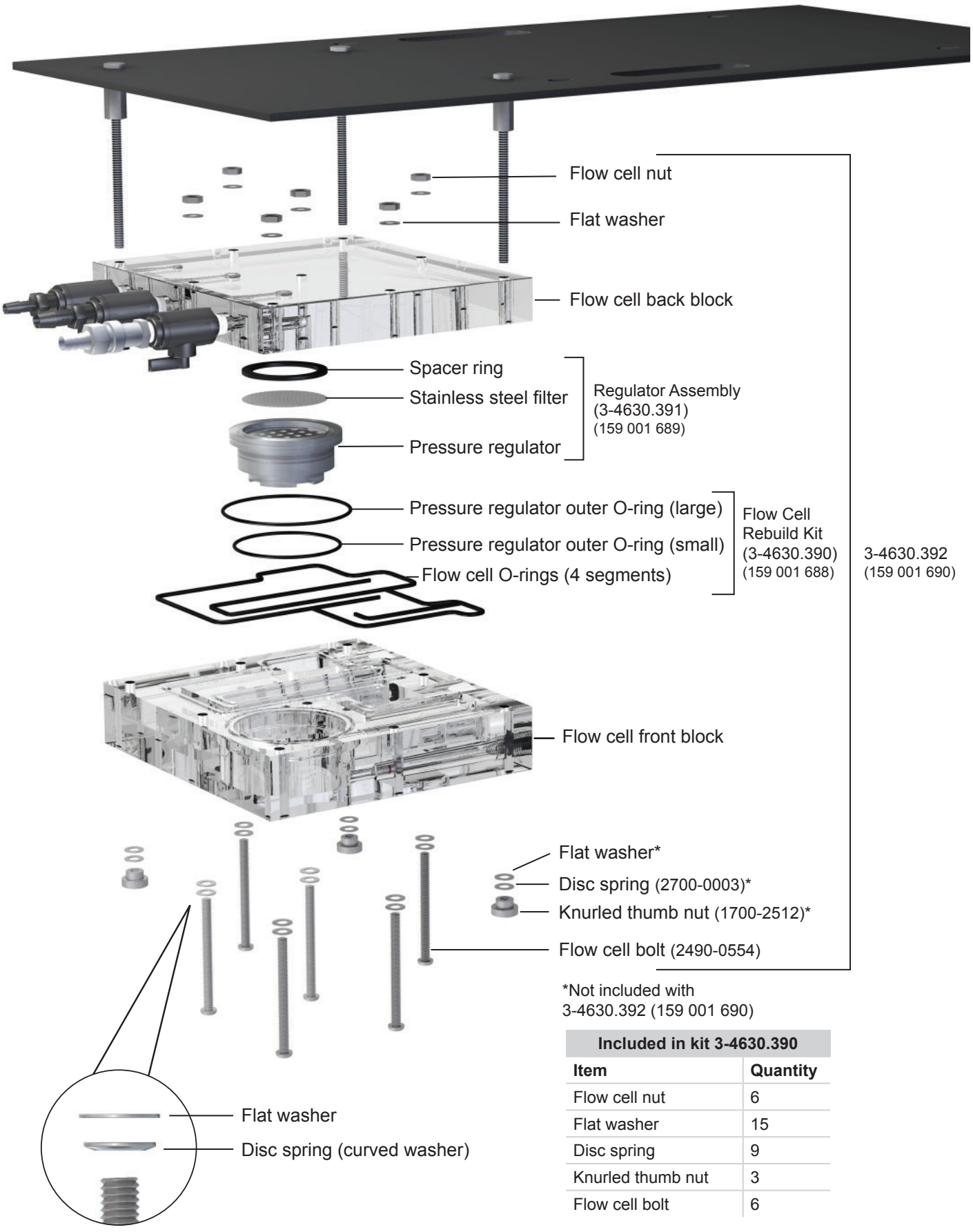
NOTE: As factory default, the 4630-X Chlorine Panel Assembly is set to measure Free Chlorine. If a 2632 Chlorine Dioxide sensor is to be used to convert to a Chlorine Dioxide Panel Assembly, refer to the 8630-3 OPTIONS Menu on page 20.

Panel Assembly



* Contact factory for quote

Component Identification: Flow Cell



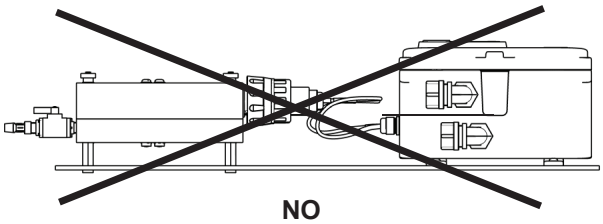
*Not included with
3-4630.392 (159 001 690)

Included in kit 3-4630.390	
Item	**Quantity**
Flow cell nut	6
Flat washer	15
Disc spring	9
Knurled thumb nut	3
Flow cell bolt	6

Mounting

Do not mount in direct sunlight.

- Bright light can promote algae growth. Indoor mounting is recommended.
- If the system is mounted outdoors, an outdoor enclosure for the whole system must be used to protect the electronics and flow cell from light, rodents, insects and dirt.
- Mount the panel according to local electrical, building, and/or plumbing codes and seismic requirements.
- Use four 6 mm (¼ in.) diameter screws or bolts of sufficient length to mount the panel to a sturdy vertical surface. A mounting template is provided.
- Allow clearance on the sides and bottom for service to the unit.
- Keep panel system electronics and enclosure away from dripping water.
- The panel must be mounted vertically in an upright position.



NO

Wiring Input

Power Supply Terminal Identification		
Terminal	Name	Description
V. ADJ	Voltage adjustment	Adjusts within ±10%; turning clockwise increases output voltage
DC ON	Operation indicator	Green LED is lit when output voltage is on
+V, –V	DC output terminals	+V: Positive output terminal –V: Negative output terminal
L, N	Input terminals	Accepts a wide range of voltages and frequencies (100 to 240 VAC DC input)

100 to 240 VAC input
Standard AC configuration

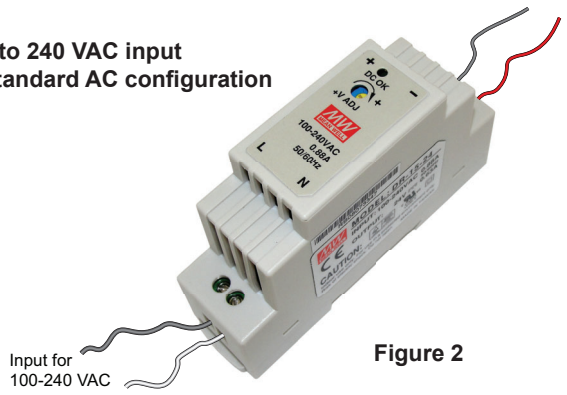


Figure 2

Figure 3

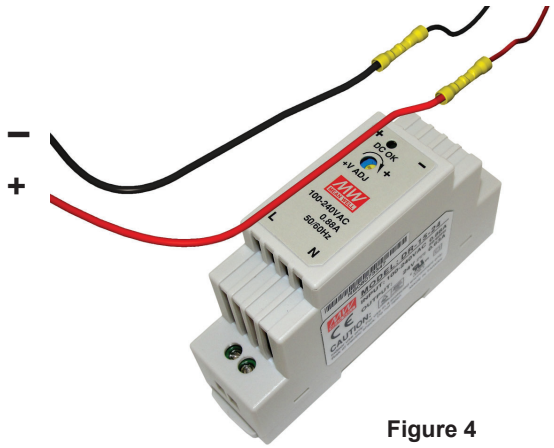


Figure 4

WARNING

This panel system is wired for AC voltages that can injure or kill. Wiring should be performed by qualified personnel only.
Disconnect AC power before opening wiring enclosure.

Follow all local and government recommendations and methods for installation of electrical connections to and between the system and other devices.

System Input Power

- The panel system is pre-wired with an auto switching power supply that is rated for 100 to 240 VAC 50/60 Hz input.
- Wire with NEC Class I, 300 volt, 105 C wire.
- A switch or circuit breaker rated at 15 amps AC shall be included in the building installation.
- Install the circuit breaker in close proximity to the equipment and within easy reach of the operator.
- Mark the circuit breaker as the disconnecting device for the equipment.
- Grounding: The protective ground terminal must be bonded to protective earth in the host equipment.

Part # 7300-0024 (159 001 693) shown.
Actual power supply may differ from Figure 2.

100 to 240 VAC Input Wiring

- Open the electrical box by loosening the four corner screws of the front cover.
- Insert input power wiring into the pre-drilled access hole on the left side of the electrical box using appropriate conduit adapters to maintain the Type 4X rating. (Supplied conduit connectors may have to be removed.)
- Install the input power wires into the proper terminals on the power supply (Figure 2). Use only 12 to 26 AWG copper wiring.
- Recommended torque for the terminals is 7 lb-in.

NOTE: When using alternate power supply 7300-7524 (159 000 687):
- Use 10-24 AWG copper wiring, 105 ˚C, torque 4.4 lb-in.

12 to 24 VDC Input Wiring Conversion

- If the power source supplied to the system will be 12 to 24 VDC instead of 100 to 240 VAC, disconnect the red and black output wires from the power supply (Figure 3) and connect your UL approved limited-energy DC power supply (Figure 4), using an insulated nylon parallel splice connector such as T&B part number 2C-12 or equivalent.
- Insert input power wiring into the pre-drilled access hole on the left side of the electrical box using the appropriate conduit adapters to maintain the Type 4X rating. (Customer may have to remove the supplied conduit connectors.)
- A switch or circuit breaker rated at 5 amps DC shall be included in the building installation.
- Install the circuit breaker in close proximity to the equipment and within easy reach of the operator.
- Mark the circuit breaker as the disconnecting device for the equipment.

Wiring Output

Follow all local and government recommendations and methods for installation of electrical connections to and between the system and other devices.

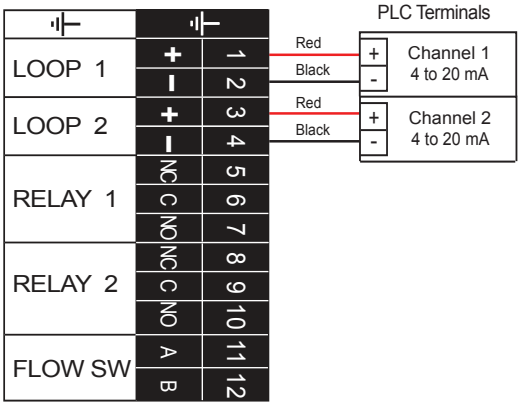
Output Connections

- Use the wiring enclosure terminal block for output wire connections. Do not wire directly to the transmitter.
- Recommended torque for the terminals is 7 lb-in.
- Do not run 4 to 20 mA loop cables in the same conduit as the power or other high voltage wiring.
- Remove one installed jumper wire (from both of its terminals) on the terminal block in the enclosure for each loop device connected. Replace the jumper if you later remove your loop device. If only one loop device is connected, remove just one jumper wire from its two terminals.
- The panel system uses an active loop output wired to the enclosure terminal block.
- **If connecting to a PLC, use the PLC's passive input.**
- **The transmitter must have a jumper wire or loop device always connected to Loop 1.**

Wiring Label Legend	
Ground	Earth Ground. Attach 4 to 20 mA loop cable shield wire here to help eliminate possible noise.
Loop 1	4 to 20 mA Loop #1
Loop 2	4 to 20 mA Loop #2
Relay 1	Relay Output #1
NC	Relay Normally Closed (contact) when de-energized
C	Common
NO	Relay Normally Open (no contact) when de-energized
Relay 2	Relay Output #2 (terminals same as Relay #1)

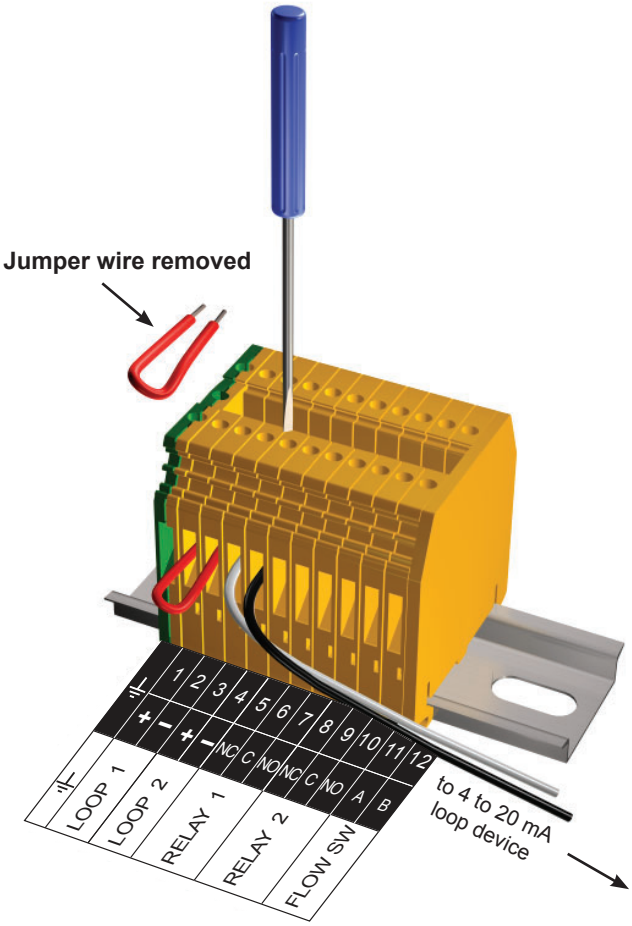
WARNING

This panel system is wired for AC voltages that can injure or kill.
Wiring should be performed by qualified personnel only.
Disconnect AC power before opening wiring enclosure.

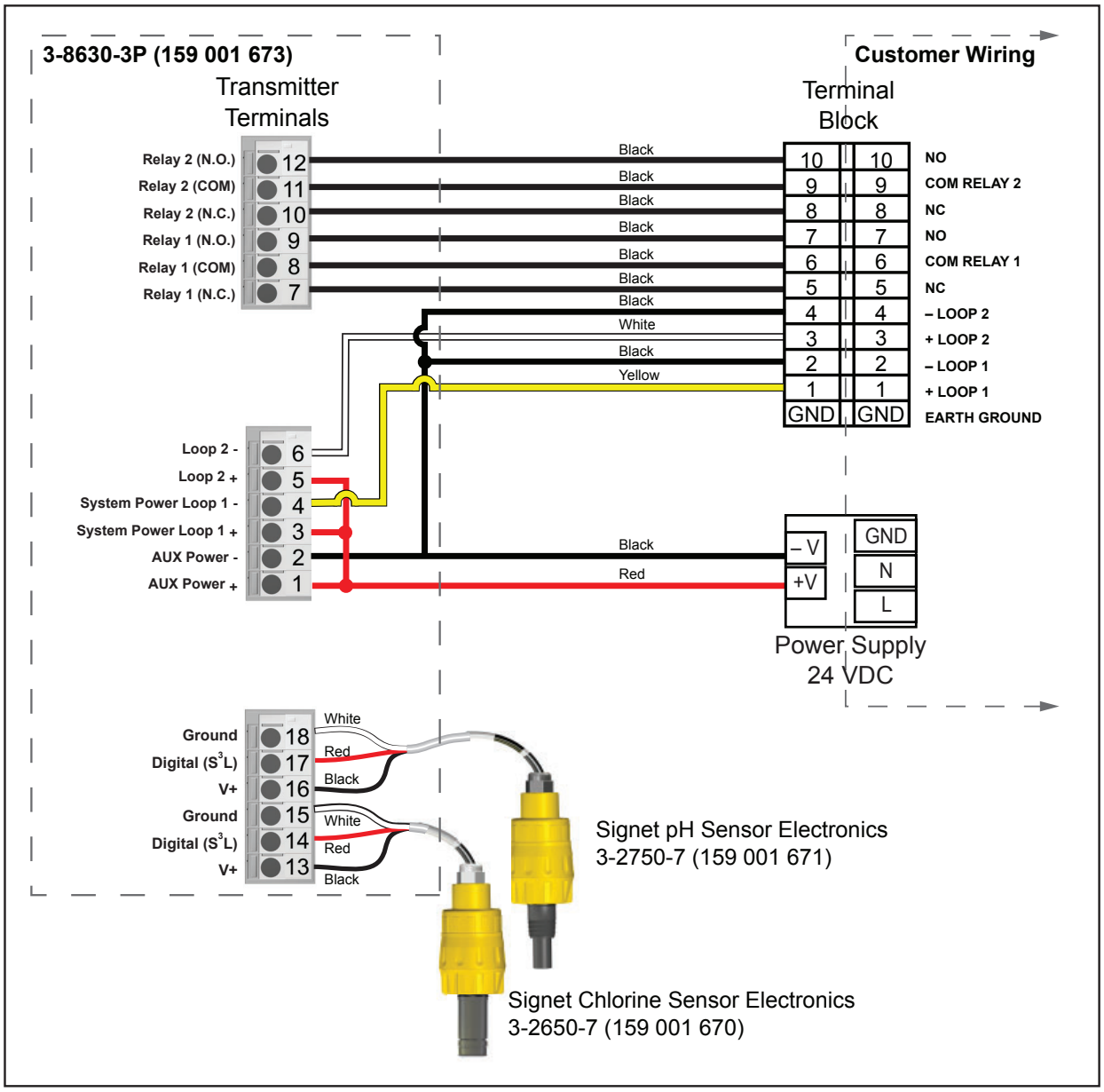


PLC dual channel connection

Wiring a 4 to 20 mA loop device



Electrical Box Wiring Schematic



Chlorine Sensor Preparation

2630 Free Chlorine Electrode
2632 Chlorine Dioxide Electrode

- Chlorine sensors are shipped without internal electrolyte solution.
- Prior to installation and supplying power, Chlorine sensors must be filled with the appropriate internal electrolyte solution.
- Verify the correct electrolyte solution is utilized with the corresponding sensor.
- Free Chlorine and Chlorine Dioxide sensor require different electrolyte solutions.

Avoid skin or eye contact with electrolyte solution.
Wear rubber gloves and goggles.
* Material Safety Data Sheets (MSDS) are available online at www.gfsignet.com.

Initial Fill Procedure:
When adding electrolyte, be prepared for an accidental spill.
Working near a sink is recommended.

1. Remove the protective bottle from the end of the electrode.
2. Remove the membrane cap from the front of the sensor.
   Note: When new sensors are shipped, the membrane cap is not tightened to the sensor.
3. Fill supplied syringe with electrolyte solution.
   Additional caution should be taken when handling Chlorine Dioxide electrolyte solution.
4. Place the electrode on a level surface.
5. Insert syringe needle fully into one of the eight electrode holes while injecting with electrolyte solution. Slowly injecting the electrolyte solution into the sensor to avoid introducing air bubbles. The electrode holds approximately 14 milliliters of solution. Slowly fill until solution begins to flow out of holes. Do not allow the solution to run down the electrode and wet the electrical contacts in the DryLoc connector.
6. Slowly screw on the membrane cap finger tight. Do not use tools. To avoid damage and contamination, do not touch the white membrane surface on the membrane cap.

CAUTION:
DO NOT touch the gold-plated tip or the membrane of the sensor.

Chlorine Sensor Calibration

A new chlorine electrode or one that has had the membrane cap changed must be calibrated. See page 24, 8630 Transmitter information on calibration of the chlorine sensor. A diethyl-p-phenylenediamine (DPD) colorimeter test kit (not included) is required for sensor calibration. A sample is taken and analyzed with the DPD test kit, then this value is entered into the Signet 8630 transmitter.

- Calibrate after a membrane cap change (requires 2 hour stabilization time).
- Calibrate after the internal electrolyte is replaced (requires 2 hour stabilization time).
- Check calibration one day after sensor is placed in service.
- Check calibration weekly to monthly depending on process requirements.

Chlorine Sensor Maintenance

The sensor membrane and internal electrolyte solution must be replaced over the life of the electrode. To maintain accurate chlorine measurements, GF Signet recommends that the internal electrolyte be replaced every 3 to 6 months, or when Chlorine readings drift low and/or cannot maintain a calibration longer than 5 days. Actual interval between maintenance of the sensor will be dependent on the actual applications, chlorine level and contaminates in the water. See Appendix page 36; Maintenance and Storage.

Keep spare membrane caps available. Membrane caps carry no warranty.

To maintain accurate chlorine measurements, GF Signet recommends the internal electrolyte be replaced and the gold-plated sensor electrode be properly polished every 3 to 6 months. See Appendix, page 37.

NOTE: Inspect and change the membrane cap if damaged. See page 36, Maintenance, for cleaning procedure.

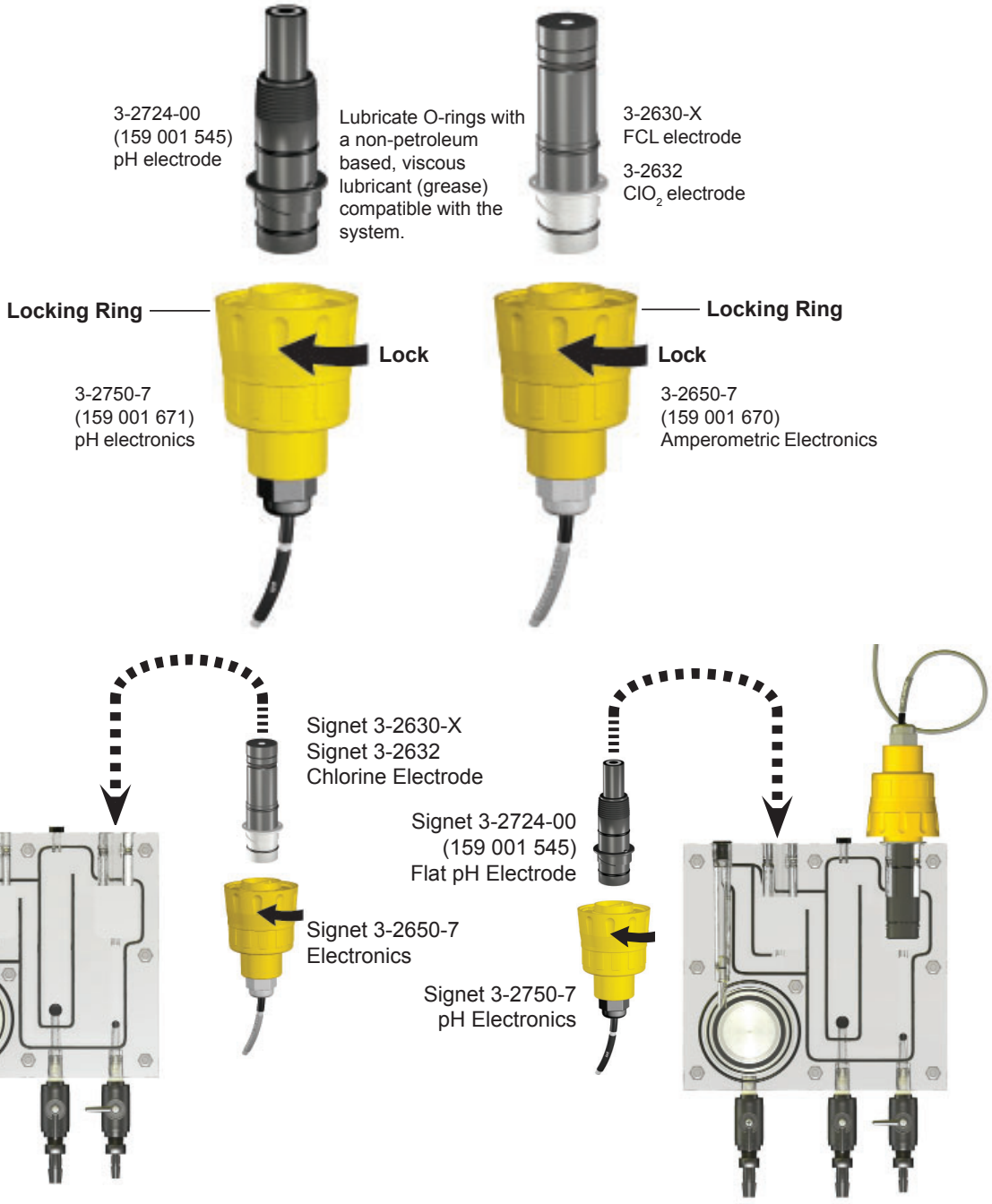
Sensor Installation

- Remove sensor access plugs from the flow cell (pg. 4, Figure 1).
  Note: Chlorine Sensor Preparation must be completed prior to installation, see page 11.
- Holding the 3-2750-7 (159 001 671) or 3-2650-7 (159 001 670) electronics inverted, open the DryLoc® connector by turning the upper locking ring ¼-turn counter-clockwise.
- Insert the electrode facing up. Turn the locking ring ¼-turn clockwise to lock the electronics in place.
- The mechanism will "click" when it is locked.
- Install the complete assembly into the flow cell and ensure the key on the electrode aligns with the key slot on the flow cell.

Avoid skin or eye contact with electrolyte solution. Wear rubber gloves and goggles. Safety Data Sheets (SDS) are available online at www.gfsignet.com.

Do Not Use Lubricant or Sealing Tape on Threads.
Do Not Overtighten. Do Not Use Tools.
Do Not Drop or Strike the Membrane.

DryLoc® Connection to Sensor Electronics

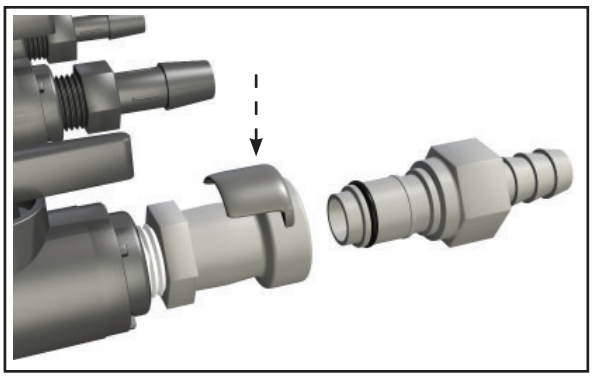


Tubing Connections

Use suitable 9.5 mm (3/8 in) ID tubing that is rated for your inlet pressure. Use hose clamps.

Inlet Quick Release Connection

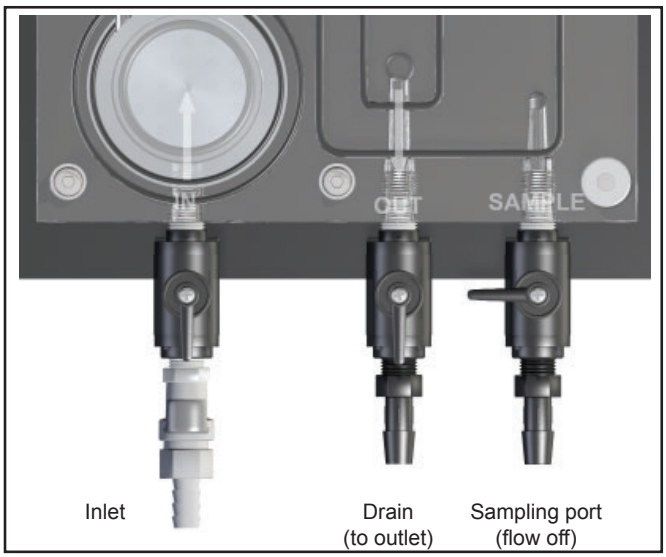
Press down gray plunger to release. Water flow is automatically shut off when disconnected.



Valve position for start up and normal use.

Note: Turn off inlet valve first when stopping water flow.

- The drain tube must be positioned lower than the influent water source to allow proper flow through the flow cell. The flow cell must drain by gravity, not system pressure.
- When testing, allow the sample to flow for a few seconds before collection.

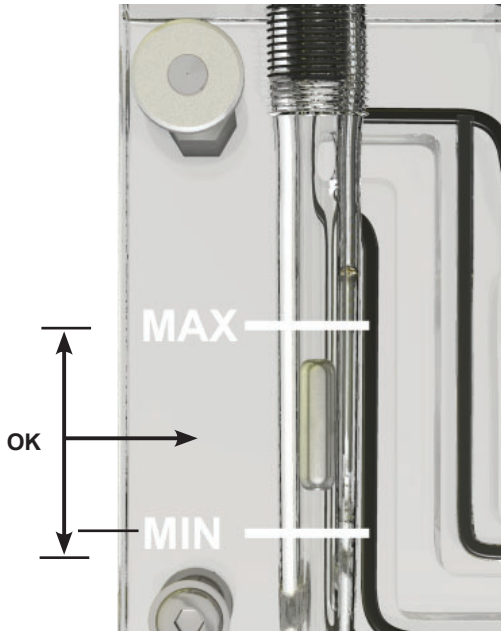


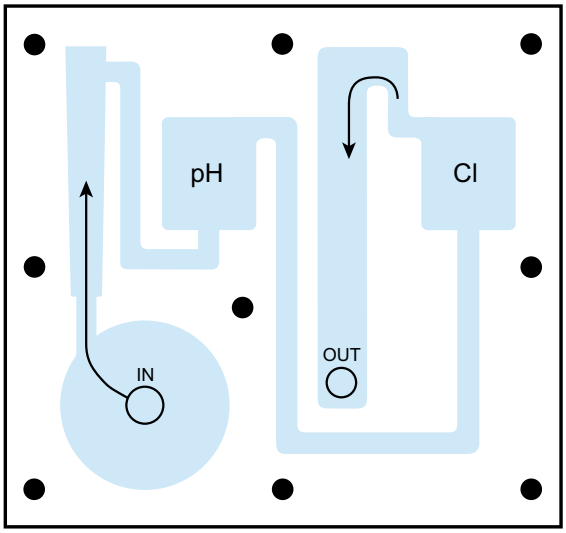
Water Flow

Flow Rate

The flow rate is in the proper range when the float is between the Min. and Max. markers on the flow cell. The flow range limits are 30.24 to 45.36 L/h (8 to 12 gal/h).

For Low Flow applications (flow less than 1 bar/15 psi), the Flow Regulator can be removed and the flow adjusted using the Flow Cell ball valve. (**NOTE:** The inlet hose barb will also need to be changed. Contact factory for details.)





8630 Chlorine Transmitter

The Signet 8630 ProcessPro® Chlorine Transmitter displays and transmits free chlorine or chlorine dioxide, along with pH information when connected to Signet Amperometric Chlorine Sensors and a Signet pH Sensor.

Features of the 8630 include:

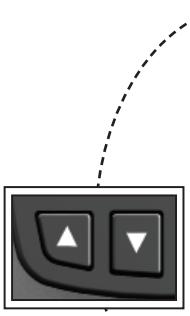
- Displays Free Chlorine measurements from 0.02 to 20 ppm (parts per million) or Chlorine Dioxide measurements from 0.02 to 2 ppm.
- Specifies all compatible chlorine sensors.
- Automatic pH and temperature compensation or manual pH input to calculate accurate free chlorine measurements.
- Simple setup and easy customization with the 4-button keypad.
- Dual 4 to 20 mA outputs with two built-in SPDT mechanical relays.
- Easy viewing via the bright backlit LCD display.

CAUTION!

- Remove power to unit before wiring input or output connections.
- Follow instructions carefully to avoid personal injury or damage to the transmitter.

8630 View Mode

- The View Menu is displayed during normal operation.
- To select a VIEW display, press the ▲ or ▼ arrow keys. The selections will scroll in a continuous loop. There are four pages to view.
- Changing the VIEW display does not interrupt system operations.
- No key code is necessary to change display selection.
- The VIEW MODE will not allow access to the CALIBRATION or OPTION menus, preventing accidental changes to the application settings by an unauthrized person.
- All menus time-out after 10 minutes and return to the previous operating display.
- When editing the CALIBRATE or OPTIONS menus, the transmitter will return to the default display after 10 minutes and then the VIEW menu in another 10 minutes if no activity occurs.



```
FCl:  2.67 ppm
7.10 pH  25.3 °C
```

View chlorine, pH and Temperature values from the sensor.
FCl = free chlorine, ClO2 = chlorine dioxide.

The example View menus below return to the default display after 10 minutes.

```
Cl Raw:  103.8 nA
 pH Raw:  -5.9 mV
```

Chlorine nanoamps (nA), and pH raw millivolt (mV) signals from the electrodes. For reference only.

```
Loop 1   10.68 mA
Loop 2    8.56 mA
```

Displays the actual current output in milliamps (mA) of the electrode assigned to Loop 1 and Loop 2. (Scaled as a 4 to 20 mA signal)

```
    Last CAL:
    05-01-17
```

View of the last system calibration date: Manually entered by the operator.

8630 Editing Procedure

The 8630-3 (159 001 662) has two menus the user can edit: CALIBRATE and OPTIONS

- The CALIBRATE menu allows you to calibrate and initialize sensors, define current loops and set relay functions.
- The OPTIONS menu allows you to set sensor type, adjust and test current loops, test relays and more.

Step 1. **Press and hold the ENTER key:**
- **2 seconds** to select the **CALIBRATE** menu.
- **5 seconds** to select the **OPTIONS** menu.

Step 2. **Enter the Key Code.**
The Key Code is ▲-▲-▲-▼ keys in sequence.
- After entering the Key Code, the display will show the first item in the selected menu.

Step 3. **Scroll the menu in a loop with the ▼ or ▲ arrow keys.**

Step 4. **Press the ► key to select the menu item to be edited.**
- The first display element will begin flashing.

Step 5. **Press the ▲ or ▼ keys to edit the flashing element.**
- The ► key advances the flashing element.

Step 6. **Press the ENTER key to save the new setting and return to Step 3.**

Made an Error?

Press the ▲ and ▼ keys simultaneously while any element is flashing. This will recall the last saved value of the item being edited and will return you to Step 3.

Finished Editing?

Press the ▲ and ▼ keys simultaneously after saving the last setting to return to View menu.

8630 Editing Procedure

Example: Calibration

ENTER **Access the CALIBRATE Menu:**
Press and hold the ENTER key for 2 seconds to access the CALIBRATE menu.

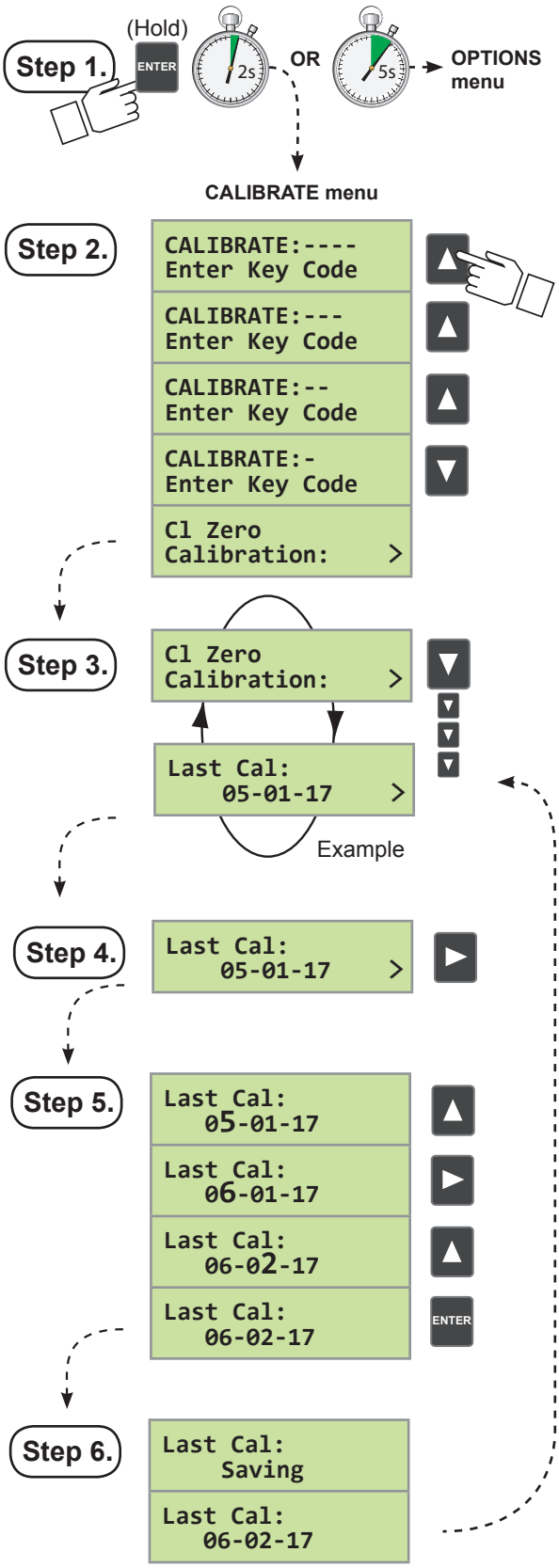
▲ **Enter the Key Code:**
The CALIBRATE and OPTIONS menus require a password (KEY CODE). Pressing the ▲, ▲, ▲, ▼ keys in sequence unlocks the display and the first menu item will appear. If no key is pressed for 5 minutes while the display is showing "Enter Key Code", it will return to the VIEW menu.

▼ **Scroll the Menu:**
Press the ▼ or ▲ keys to scroll through the Menu. While in this mode, pressing the ▲ and ▼ keys simultaneously will return the display to the VIEW menu. If no key is pressed for 10 minutes, the display will return to the VIEW menu.

► **Select the item to be edited:**
In this example, "Last Cal" (last calibration date) is chosen to edit. Pressing the ► key selects the menu item and enters the screen into edit mode.

▼ **Edit the flashing element:**
This is the edit mode.
The ▲ or ▼ keys change the flashing element.
The ► key advances the flashing element in a continuous loop. In this example, the "Last Cal" date was changed from 05-01-17 to 06-02-17.
All output functions remain active during editing.
Only the flashing element can be edited.

ENTER **Press ENTER to save the new value.**
When you have set your desired value, pressing the ENTER key stores the value on the screen, making it immediately available to output functions and exits you back to Step 3.



8630 Calibrate Menu

The menus below are displayed here in the order seen when scrolling down through the Calibrate Menu.

NOTE:
For greater accuracy it is recommended that the initial calibration of the system should be in the following order:
1. Temperature
2. pH electrode (if optional pH sensor is installed. If manual pH sensor is selected enter the pH value into the option menu prior to calibrating the chlorine sensor)
3. Chlorine sensor.

- Although the Calibrate Menu can be navigated upwards or downwards, it is best to navigate downwards when editing Current Loop and Relay settings as previous entries can influence subsequent menus.
- Chlorine and pH calibration screens will be shown only when a valid sensor is detected.

▲ ▼ Press the ▲ or ▼ Arrow key to scroll through the menus.

► Press the ► key to enter Edit mode.

ENTER Press the Enter key to save your settings.

Calibrate Menus Factory settings shown	**Description**
`Chlorine Units: ppm >`	This is the first screen. Choose units of measurement: ppm or mg/l.
`Cl Zero Calibration: >`	When > is pressed, the "live" readings are shown. The nA value is displayed, but cannot be edited and is used for diagnostic and calibration purposes. When in Edit Mode, pressing Enter stores the displayed value as your zero reference.
`Cl In Process Calibration: >`	Enter process chlorine value determined from a DPD test kit here.
`Reset Cl to Factory Cal: >`	This menu resets Cl readings, Zero Calibration and temperature back to Factory Calibration. **WARNING!** User entered Cl calibration settings will be lost.
`Cl Temperature Calibration: >`	Enter process temperature from a reference thermometer: °C or °F. Units are set up in the Options Menu.

NOTE: *The next two pH calibration screens will be shown only when a valid pH sensor is detected.*

`pH Standard Calibration: >`	Set pH standard value. This applies a linear offset to the pH measurement.
`pH Slope Calibration: >`	Applies a slope to the pH measurement. The slope and standard value must be at least 2 pH units apart.
`Reset pH to Factory Cal: >`	Reset pH standard, slope or back to Factory Calibration. **WARNING!** User entered pH calibration settings will be lost.

Current Output Functions

`Loop 1 Source: Chlorine >`	Choose chlorine or pH for this 4 to 20 mA current loop.
`Loop 1 Rng: ppm 0.00 → 5.00 >`	Select the minimum and maximum values for the current loop output. Units are derived from Loop 1 Source. If the Source 1 is changed, be sure to re-edit this page.
`Loop 2 Source: pH >`	Choose pH or chlorine for this 4 to 20 mA current loop.
`Loop 2 Rng: pH 00.0 →14.00 >`	Select the minimum and maximum values for the current loop output. Units are derived from Loop 2 Source. If Source 2 is changed, be sure to re-edit this page.

Relay Functions

Verify all relay settings if the Relay Source is changed

Relay 1 Mode: Off >	Choose mode of operation: Off, Low, High, Window, or Pulse. If Off, all subsequent Relay 1 functions are inactive and not visible.

If Low or High Mode was chosen:

Relay 1 Source: Chlorine >	Choose chlorine or pH for Relay 1.
Relay 1 Setpnt: 0.00 ppm >	In Low or Hi Mode, Relay 1 will be activated when the process reaches this value. Units of measure reflect Relay 1 Source.
Relay 1 Hys: 0.20 ppm >	Relay 1 will be deactivated at Relay 1 Setpoint ± this hysteresis setting depending on High or Low Setpoint selection.
Relay 1 Delay: 0.0 secs >	Set the time delay for Relay 1 to activate after reaching the Setpoint. Range: 0 to 6400 seconds.

If Window Mode was chosen:

Relay 1 Source: Chlorine >	Choose chlorine or pH for Relay 1.
Relay1 Rng: ppm 0.00 → 5.00 >	Enter the range where Relay 1 will activate above and below this setpoint.
Relay 1 Hys: 0.20 ppm >	Relay 1 will be deactivated at Range setpoints ± this hysteresis setting.
Relay 1 Delay: 0.0 secs >	Set time delay for Relay 1 to activate after reaching the setpoints set in Relay 1 Range.

If Pulse Mode was chosen:

Relay 1 Source: Chlorine >	Choose chlorine or pH for Relay 1.
Relay1 Rng: ppm 0.00 → 5.00 >	Enter the range where Relay 1 will activate above and below this setpoint.
Relay1 PlsRate: 120 pulses/min >	Set the maximum pulse rate. Range: 1 to 400 pulses/min.
Relay 2 Mode: Off >	Choose Relay 2 mode of operation: Off, Low, High, Window, or Pulse. To disable this relay choose Off.

If Low or High Mode was chosen:

Relay 2 Source: pH >	Choose pH or chlorine for Relay 2. This menu screen and all subsequent Relay 2 screens below do not appear if Relay 2 Mode is set to Off.
Relay 2 Setpnt: 0.00 pH >	In Low or High Mode, Relay 2 will be activated when the process reaches this value. Units of measure reflect Relay 2 Source.
Relay 2 Hys: 0.20 pH >	Relay 2 will be deactivated at Relay 2 Setpoint ± this hysteresis setting depending on High or Low Setpoint selection.
Relay 2 Delay: 0.0 secs >	Set the time delay for Relay 2 to activate after reaching the Setpoint. Range: 0 to 6400 seconds.

8630 Calibrate Menu

If Window Mode was chosen:

Relay 2 Source: pH >	Choose pH or chlorine for Relay 2.
Relay 2 Rng: ppm 0.00 → 5.00 >	Enter the range where Relay 2 will activate above and below this setpoint.
Relay 2 Hys: 0.20 ppm >	This relay will be deactivated at Relay 2 Range setpoints ± this hysteresis.
Relay 2 Delay: 0.0 secs >	Set the time delay for Relay 2 to activate after reaching the setpoints set in the Relay 2 Range.

If Pulse Mode was chosen:

Relay 2 Source: pH >	Choose pH or chlorine for Relay 2.
Relay2 Rng: pH 0.00 → 14.0 >	Enter the range where Relay 2 will activate above and below this setpoint.
Relay2 PlsRate: 120 pulses/min >	Set the maximum pulse rate. Range: 1–400 pulses/min.
Find New Sensor(s): >	Required only when a new sensor is changed while the power is on. Choose Yes or No.
Last Cal 10-18-09 >	Edit the calibration date.

End of Calibrate Menu

8630 Options Menu

The menus below are displayed here in the order seen when scrolling down through the Options Menu.

→ **OPTIONS menu**

▲ ▼ Press the ▲ or ▼ Arrow key to scroll through the menus.

► Press the ► key to enter Edit mode.

ENTER Press the Enter key to save your settings.

Options Display (Factory settings shown)	**Description**
Contrast: 3 >	Adjust the LCD contrast for best viewing. A setting of 1 is lower contrast, 5 is higher.
Cl Sensor Type: Free Cl >	Select the chlorine sensor: Free Cl or ClO2.
pH Input Sensor >	Choose Manual or Sensor. If Sensor is chosen, the pH value from the connected pH sensor will be used. Choose Manual to enter a pH value manually when no sensor is connected or if measuring chlorine dioxide.
If Manual pH input was chosen:	
Manual pH Value 7.000 pH	Enter your pH value here if a pH sensor is not connected.
Temp Display: °C >	Choose units of °C or °F.
Averaging: Off >	OFF gives the fastest response to input changes. LOW = 4.5 seconds, HIGH = 9 seconds of averaged response. Increase averaging to steady the display.
Decimal: ***.** >	Select the decimal point for the display. Maximum of 2 decimal places.
Loop 1 Adjust: 4.00 mA >	Adjust the minimum current output for Loop 1. The display value represents the precise current output. Range: 3.80 mA to 5.00 mA.
Loop 1 Adjust: 20.00 mA >	Adjust maximum current output for Loop 1. Range: 19.00 mA to 21.00 mA.
Loop2 Adjust: 4.00 mA >	Adjust the minimum current output for Loop 2. Range: 3.80 mA to 5.00 mA.
Loop2 Adjust: 20.00 mA >	Adjust maximum current output for Loop 2. Range: 19.00 mA to 21.00 mA.
Test Loop 1: >	Press UP or DOWN keys to manually output any current value from 3.6 mA to 21.00 mA to test Loop 1 output.
Test Loop 2: >	Press UP or DOWN keys to manually output any current value from 3.6 mA to 21.00 mA to test Loop 2 output.

8630 Options Menu

`Test Relay 1: >`	Press UP or DOWN keys to manually toggle Relay 1 Off and On. The left LED on the front of the transmitter confirms operation.
`Test Relay 2: >`	Press UP or DOWN keys to manually toggle Relay 2 Off and On. The right LED on the front of the transmitter confirms operation.
`Read Sens Data: No >`	If "YES" is selected the following (**Read Only**) screens will be shown. If "NO" then this menu ends the Options Menu.

If Yes was chosen:

`Cl Sensor S/N: xxxxxxxxx`	View the sensor serial number.
`Cl Type & Range: 2630 xxx.x ppm`	Identify the chlorine sensor type connected and its ppm range.
`Zero Cal: ppm&nA xxx.xx xxxx.x`	View user entered Zero Calibration data in ppm and nA.
`In Proc: ppm&nA xxx.xx xxxx.x`	View user In-Process Calibration value when it was entered in the Calibrate Menu.
`Temp at Cal: xxxx.x °C`	Temperature recorded during user In-Process Calibration.
`pH at Cal: xxx.xx pH`	pH value recorded during user In-Process Calibration.
`Temp Offset: xxxx.x °C`	Temperature offset calculated from user entered temperature calibration from Calibrate Menu.
`Elapsed Time: xxxxx. hrs`	Total hours of operation.
`Low & High: °C -xxxx.x +xxxx.x`	Lowest and highest temperatures the Cl sensor has been subjected to during operation.

End of Options Menu

Calibration

In order to properly calibrate a GF Chlorine system it is important to follow the process below:
1 - Calibrate Temperature
2 - Calibrate the pH electrode (if a pH electrode is not being used, refer to page 23 , Set manual pH Compensation)
3 - Calibrate Chlorine sensor

pH Sensor Calibration

If a pH sensor is part of the system, use the Calibration Kit 3-2700.395 (159 001 605) prior to initially installing the sensor and during its normal lifetime. If a pH sensor is not available but pH determination is necessary, measure process pH with a separate test and enter the value in the Options Menu.

NOTE: Temperature must be calibrated before calibrating the pH sensor. See Chlorine Sensor section.

Refer to your pH sensor manual.

The pH sensor needs to be calibrated against two different pH buffer references to calibrate the offset (standard) and slope. Electrode offset is any deviation from 0 mV in a pH 7 buffer at 25 °C. Slope is the ratio of mV to pH units.

- Always keep any output devices offline when calibrating.

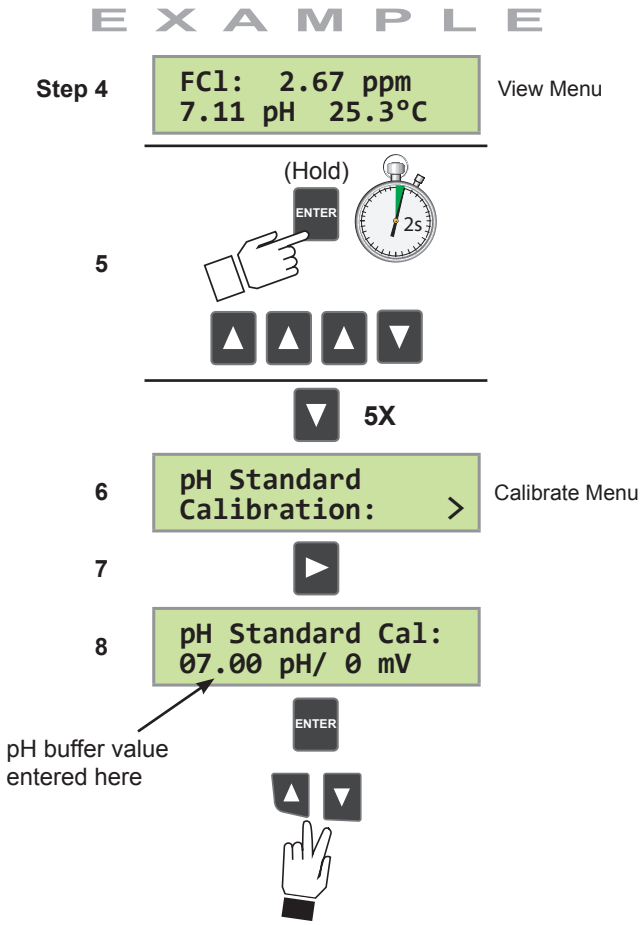
Set pH Offset (Standard)
The transmitter must be powered on and the pH sensor must be connected.

1. Turn off the water flow through the system, then remove the pH sensor from its flow cell.
2. Using pH buffer 7.0, place enough pH buffers into clean calibration cups, supplied with the pH calibration kit 3-2700.395 (159 001 605), to cover the tip of the electrode.
3. Pour distilled water in another clean cup for rinsing the electrode between buffers.
4. Rinse probe, place the pH sensor in the pH 7.0 buffer and allow the mV reading to stabilize.

Example: Set pH Standard to 7.00

EXAMPLE

5. Go to the Calibrate Menu.
6. Scroll down ▼ 5 menus to the **pH Standard** menu.
7. Press ► to enter Edit Mode.
8. Enter the pH value of the buffer that the electrode is placed in; **7.00** in this case.
9. Press the Enter button to save the setting.
10. Exit to the View Menu. ▲▼



NOTE: The pH sensor will not calibrate when the mV value exceeds 50 mV from the original new electrode specification. Electrode: pH 4.01 = + 177 mV

pH Sensor Calibration

Set pH Slope

1. Remove the pH sensor from the first buffer solution and rinse it in distilled water.
2. Place the pH sensor in a different buffer solution (example: pH 4.01). The pH standard and slope must be at least 2 pH units apart.
3. Note the pH and mV readings on the View Menu and allow it to stabilize.

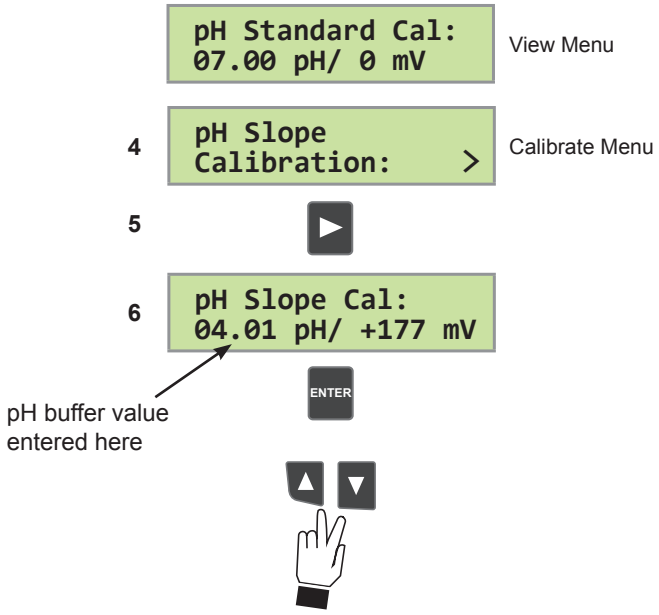
Example: Set pH slope to 4.01

EXAMPLE

4. Scroll down ▼ 1 menu to the **pH Slope** menu.
5. Press ► to enter Edit Mode.
6. Enter the pH value of the buffer that the electrode is placed in; **4.01** in this case.
7. Press the Enter button to save the settings.
8. Exit to the View Menu. ▲▼

9. Replace the pH sensor back into its flow cell.
10. Turn on the water flow.
    The pH sensor calibration is complete.

EXAMPLE



Set Manual pH Compensation

If the pH of the application is stable, then the pH of the application can be entered manually and will be used to calculate the free chlorine measurements.

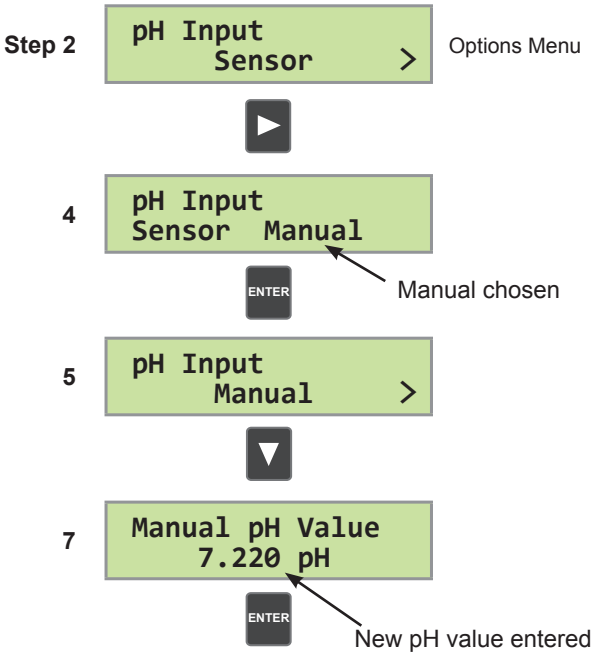
NOTE: Chlorine Dioxide does not require pH compensation.

Example: Change the pH input from Sensor to Manual and enter a pH value of 7.22

EXAMPLE

1. Go to the Options Menu.
2. Scroll down ▼ 2 menus to the **pH Input** menu.
3. Press ► to enter Edit Mode.
4. Choose **Manual** and press Enter.
5. Scroll down ▼ 1 menu to the **Manual pH Value** menu.
6. Press ► to enter Edit Mode.
7. Enter your new process pH value: **7.22**.
8. Press the Enter button to save the setting.
9. Exit to the View Menu. ▲▼

EXAMPLE



Chlorine Sensor Calibration

Chlorine sensors need to be calibrated for accuracy. Calibration must be done with every new sensor and any time a membrane cap is replaced. After the 4 hour conditioning period, Temperature Calibration and In-Process Calibration needs to be performed. Any 4 to 20 mA or relay output devices should be offline.

Chlorine Sensor Temperature Calibration
The temperature element inside the chlorine sensor needs to be calibrated. Use a reference thermometer to verify the actual temperature of the sample. This value is then entered in Step 4 to calibrate the system. After completing Temperature Calibration, proceed to In-Process Calibration, page 25.

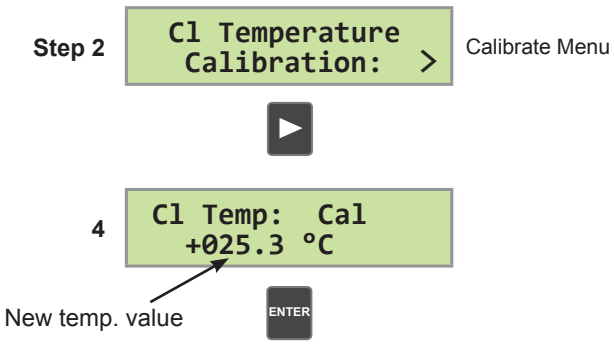
Tip: Remove the pH electrode from the flow cell and insert the reference thermometer. If no pH sensor is being used, remove the cell plug to insert the thermometer. Replace the plug after calibration.

Example: Set the calibrated temperature to 25.3 ºC

EXAMPLE

1. Go to the Calibrate Menu.
2. Scroll down ▼ 3 menus to the **Cl Temperature** menu.
3. Press ► to enter Edit Mode.
4. Enter the temperature reading. **Example: 25.3**.
5. Press the Enter button to save the setting.
6. Exit to the View Menu. ▲▼

EXAMPLE



Zero Point Calibration
Zero Point Calibration is only used at the factory to program the sensors zero calibration point. This value does not shift throughout the life of the electrode and does not need to be performed in the field. After completing Temperature Calibration, proceed to In-Process Calibration, page 25.

For Reference Only:
The chlorine sensor needs to be calibrated against two chlorine references: zero chlorine and the process chlorine. Typically the zero point calibration is very stable. Calibration must be done with every new sensor and any time a membrane cap is replaced.

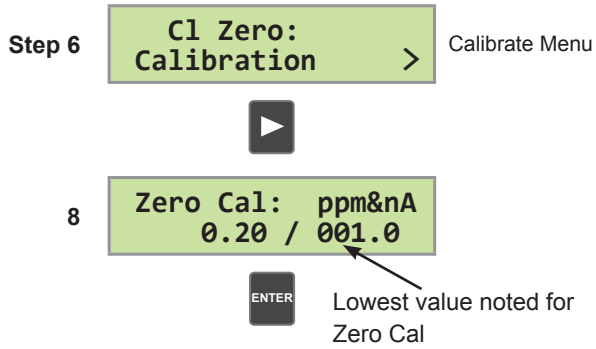
1. Keep offline any 4 to 20 mA devices or relay actuated output devices that connect to the transmitter.
2. Turn off the water flow and remove the powered chlorine sensor with the electronics still attached.
3. Place the sensor tip in distilled water.
4. Wait until the reading stabilizes, then save the calibration. Stirring the sensor in water is not necessary, but allows the signal to stabilize faster.

Example: Set the Zero Point Calibration at 1.0 nA

EXAMPLE

5. Go to the Calibrate Menu.
6. Scroll down ▼ one menu to the **Cl Zero** menu.
7. Press ► to enter Edit Mode. The live sensor readings in ppm and nA will be flashing. These readings cannot be modified, but can only be saved as displayed.
8. Press the Enter button at the lowest reading to save the setting or press ▲▼ to escape without changes.
9. Exit to the View Menu. ▲▼
10. After Zero Point Calibration is complete, replace the sensor back into the flow cell and turn the water flow back on.
11. Wait until the chlorine readings stabilize once again, then perform a chlorine In-Process Calibration.

EXAMPLE



The signal level during a Zero Point Calibration must be at least 1 nA lower than the In-Process Calibration point.

Chlorine Sensor Calibration

In-Process Calibration
A diethyl-p-phenylenediamine (DPD) colorimeter test kit (not included) is required for sensor calibration. A sample is taken and analyzed with the DPD test kit, then this value is entered into the Signet 8630 transmitter.

1. Take a water sample from the Sampling Port (after purging it) from a stabilized and running system.
2. Use this sample to measure the chlorine content with a colorimetric DPD test kit (not included). Refer to the DPD kit instructions on how to perform this test.

NOTE: For greater accuracy, it is recommended that the DPD test be repeated three times and the results averaged.

3. Record the test results.

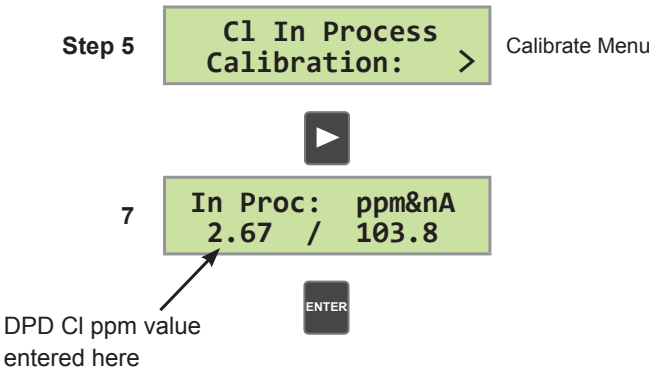
Example: Set the Chlorine In-Process to 2.67 ppm

EXAMPLE

4. Go to the Calibrate Menu.
5. Scroll down ▼ 2 menus to the **Cl In-Process** menu.
6. Press ► to enter Edit Mode.
7. Enter the chlorine reading determined from the DPD test into the edit screen: **2.67 ppm**. The Cl ppm is editable and must be at least 0.2 ppm.
8. Press the Enter button to save the setting.
9. Exit to the View Menu. ▲▼

Calibration is complete for the chlorine sensor.

EXAMPLE



The signal level during an In-Process Calibration must be at least 1 nA higher than the previous Zero Calibration point.

Output Settings - Loops and Relays

Configure the current loop and relay functions if applicable.
NOTE: The current and relay outputs can be tested in the Options Menu.

Current Loop Settings
Current outputs are passive outputs that can be spanned in the forward and reverse direction. Example: 0 to 5 or 5 to 0.

Example: Set a current loop source as chlorine and the operational range to 0 to 5 ppm

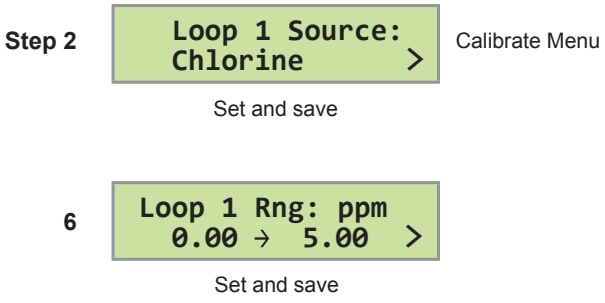
EXAMPLE

1. Go to the Calibrate Menu.
2. Scroll down ▼ to the **Loop 1 Source** menu.
3. Press ► to enter Edit Mode.
4. Choose either the chlorine or pH sensor as the source that will control this loop: **Chlorine**.
5. Press the Enter button to save the setting.

6. Scroll down ▼ 1 menu to the **Loop 1 Rng** menu.
7. Press ► to enter Edit Mode.
8. Select the minimum and maximum process values for the current loop output: **0 to 5 ppm**.
9. Press the Enter button to save the setting.
10. Exit to the View Menu. ▲▼

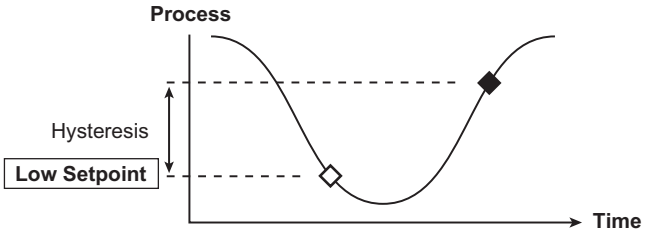
NOTE:
When integrated into the 463X Chlorine Panel Assembly, the loop outputs are wired into Active outputs via the terminal strip found inside the 463X enclosure.

EXAMPLE



Mechanical Relay Functions

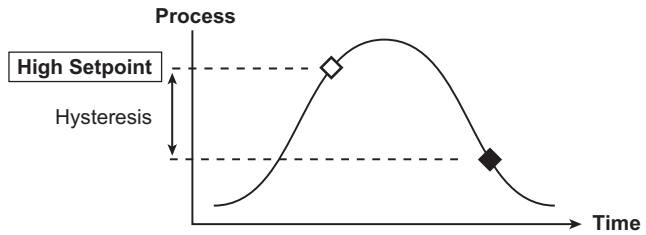
The 8630 relays are selectable and configurable and can be used as switches that respond when the process value moves above or below a user defined setpoint. They can be used for Low Alarm, High Alarm or Proportional Pulse triggering related to the process value. Relay functions, hysteresis and time delay settings are set up in the CALIBRATE menu and can be tested in the OPTIONS menu.



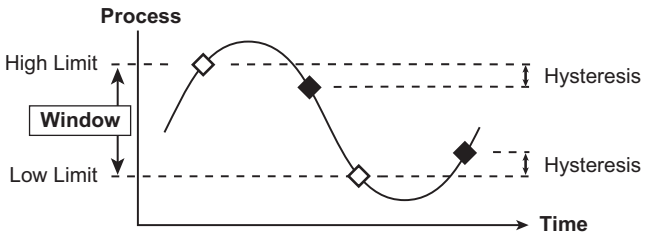
◇ Relay energized
Relay de-energized ◆

◇ **Low Setpoint:**
Relay is energized when the measured value is less than the setpoint.

◇ **High Setpoint:**
Relay is activated when the measured value is higher than the setpoint.



◆ **Window:**
Relay is off within the window of two setpoints minus the hysteresis. Relay is activated when the value is higher or lower than the high and low setpoint.

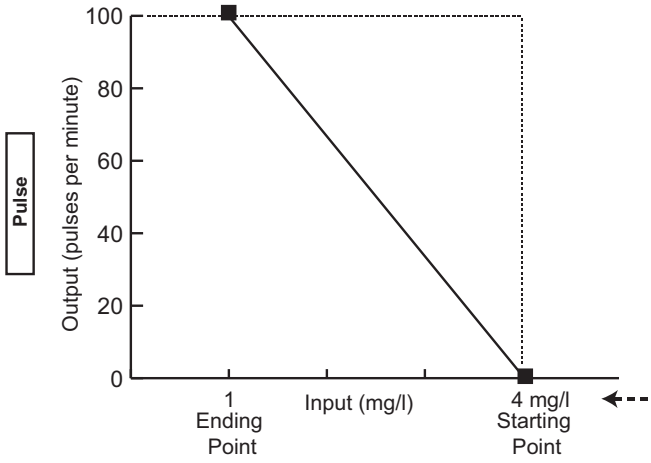


⎍⎍ **Pulse-frequency Operation:**
The transmitter can output a pulse at the rate defined by the settings in the CALIBRATE menu and the sensor input. The maximum pulse square wave output from the relays is 400 pulses per minute. Example usage would be to control solenoid operated dosing pumps.

Example: As the process value drops below the setpoint (4 mg/l) the output will start pulsing in relation to the process value, the maximum pulse endpoint and the programmed pulses/minute. The pulse rate will increase as the process value decreases and approaches the programmed endpoint. This functionality can be used to precisely control the process.

- The output will be 0 pulses/minute when the input value is greater than 4 mg/l.
- The output will be 35 pulses/minute when the input value is 3 mg/l.
- The output will be 100 pulses/minute when the input value is 1 or less.

The starting point, endpoint and maximum pulse rate are selectable in the CALIBRATE menu.



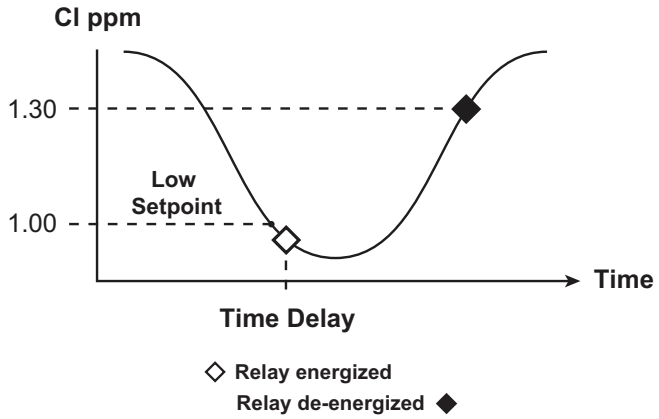
Relay Settings

Example: Set a relay to energize at a low setpoint of 1.0 ppm with a time delay of 15 seconds and de-energize at 1.30 ppm

- **Once a setting is saved it immediately becomes active.**

1. Go to the Calibrate Menu.
2. Scroll down ▼ to the **Relay 1 Mode** menu.
3. Press ► to enter Edit Mode.
4. Scroll down ▼ and choose **Low**.
5. Press Enter.
6. Scroll down ▼ to the **Relay 1 Source** menu. The default is Free Chlorine.
7. Scroll down ▼ to the **Relay 1 Setpnt** menu.
8. Press ► to enter Edit Mode.
9. Set the ppm value to trigger the relay: **1.00 ppm**.
10. Press Enter.
11. Scroll down ▼ to the **Relay 1 Hys** menu.
12. Press ► to enter Edit Mode.
13. Set the hysteresis (dead zone) for this relay. This affects the turn off only: **0.3 ppm**.
14. Press Enter.
15. Scroll down ▼ to the **Relay 1 Delay** menu.
16. Press ► to enter Edit Mode.
17. Set the turn-on delay in seconds for the relay: **15 secs**.
18. Press Enter.
19. Exit to View Mode. ▲▼

- Relay function can be tested in the Options Menu.



E X A M P L E

Step 4	Relay 1 Mode: Low >	Calibrate Menu
	Set and save	
6	Relay 1 Source: Chlorine >	
	Set and save	
9	Relay 1 Setpnt: 1.00 ppm >	
	Set and save	
13	Relay 1 Hys: 0.30 ppm >	
	Set and save	
17	Relay 1 Delay: 15.0 secs >	
	Set and save	

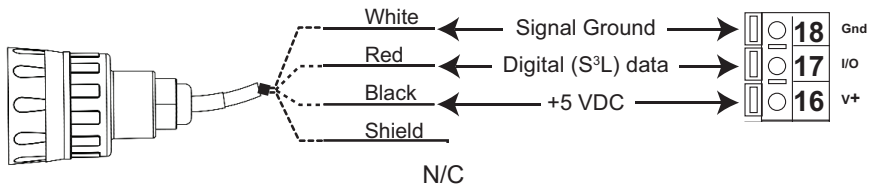
2650-7 Amperometric and 2750-7 pH DryLoc® Electronics

- The Signet 2650-7 Amperometric Electronics provide the polarization voltage and signal conditioning required by the Signet 2630-X and 2632-X Sensors.
- The Signet 2750-7 pH Electronics conditions and amplifies the output from the Signet 2724-00 pH Electrode.
- Both units output a Digital (S^3L) signal to the Signet 8630 Chlorine Transmitter.

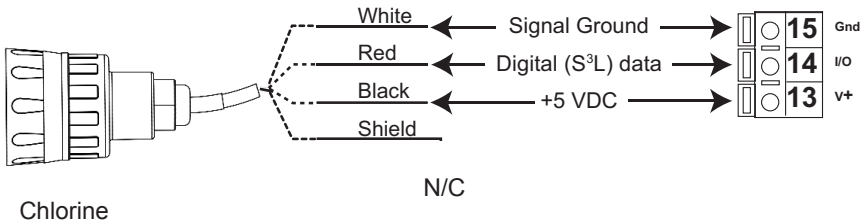
CAUTION!
- Remove power before wiring.
- Follow instructions carefully to avoid personal injury or damage to the electronics.

Wiring to the Signet 8630 Chlorine Transmitter

The electronics are pre-wired from the factory to the transmitter. Refer to the following schematics when replacing the electronics.



pH
Signet 3-2750-7
(159 001 671)



Chlorine
Signet 3-2650-7
(159 001 670)

- Refer to the wiring diagram above to connect the 2650 cable to the terminals on the 8630 Chlorine Transmitter.
- For calibration and configuration please refer to the 8630 Calibrate Menu discussions above.

Chlorine Electrode Overview

These electrodes require the Signet 2650 Amperometric Electronics module to communicate with the Signet 8630-3P Chlorine Transmitter.

Electrode Range: The electrodes must match the type and range of chlorine concentration to be measured.

Flow Rate: The electrodes must have a stable and constant flow of water past its membrane for accurate measurement.

When the sensor is installed in the Flow Cell Block 3-4630.392 (159 001 690), the flow rate range is controlled by the internal flow regulator and the flow rate is reduced to 30.24 to 45.36 LPH (8 to 12 US gph).

Sensor Conditioning: A new chlorine electrode requires conditioning of up to 4 hours with the electrode powered on and chlorinated water flowing across the membrane to generate a stable reading. Subsequent start-ups can require an electrode conditioning of up to 2 hours.

The electrodes should not be used in water containing surfactants, oils, organic chlorine or stabilizers such as cyanuric acid.

The maximum allowable operating pressure must be less than 1 bar (15 psi). Higher pressures will damage the electrodes.

CAUTION!

1. Follow instructions carefully to avoid personal injury or damage to electrode.
2. Prior to installation or removal:
   a. Disconnect flow through system.
   b. Drain below sensor level.
3. Confirm chemical compatibility before use.
4. Do not alter product construction.

2630 Amperometric Chlorine Electrodes

The Signet 2630 Amperometric Chlorine Electrodes are designed to measure free chlorine in ranges of 0.02 to 2 ppm, 0.02 to 5 ppm or 0.05 to 20 ppm.

Mfr. Part No.	Code	Chlorine Range	Chlorine Type
3-2630-1	159 001 746	0.02 to 2 ppm (mg/L)	Free chlorine
3-2630-2	159 001 662	0.02 to 5 ppm (mg/L)	Free chlorine
3-2630-3	159 001 747	0.05 to 20 ppm (mg/L)	Free chlorine

Lubricate O-rings with a non-petroleum based, viscous lubricant (grease) compatible with the system.

2632 Amperometric Chlorine Dioxide Electrodes

The Signet 2632 Amperometric Chlorine Dioxide Electrode is designed to measure chlorine dioxide (ClO_2) in a range of 0.02 to 2 ppm.

The Signet 2632 Amperometric Chlorine Dioxide Electrode has an integrated temperature element for automatic temperature compensation.

Mfr. Part No.	Code	Chlorine Range	Chlorine Type
3-2632-1	159 001 767	0.02 to 2 ppm (mg/L)	Chlorine Dioxide

Lubricate O-rings with a non-petroleum based, viscous lubricant (grease) compatible with the system.

2632 Amperometric Chlorine Dioxide Electrodes

pH Compensation for Free Chlorine
Amperometric free chlorine sensors measure only hypochlorous acid. As noted in the text above and in Figure 1, the ratio of hypochlorous acid and hypochlorite is pH dependent. In many applications the process pH is relatively stable and no correction is needed. However, where the pH of the water changes significantly, accurate free chlorine measurement requires pH compensation. With the addition of a pH sensor, the Signet 8630 transmitter will automatically compensate the free chlorine reading for changes in pH.

Automatic pH Compensation and Free Chlorine
In many applications, the process pH does not significantly fluctuate and only a free chlorine sensor and instrument is necessary for accurate chlorine measurement. It is when the pH varies that free chlorine concentration can not accurately be determined without the use of automatic pH compensation.

The addition of the Signet 3-2724-00 (159 001 545) pH electrode along with its 3-2750-7 (159 001 671) preamplifier to the system makes pH compensation extremely easy and automatic even with wide fluctuations or high pH.

See Figure 2 for pH variation recommendations.

Example:
If the pH nominal value is 7.5 and the pH variation is ± 0.2 then automatic pH compensation is recommended.
If the pH nominal value is 7.0 and the pH variation is ± 0.2 then automatic pH compensation is not required.

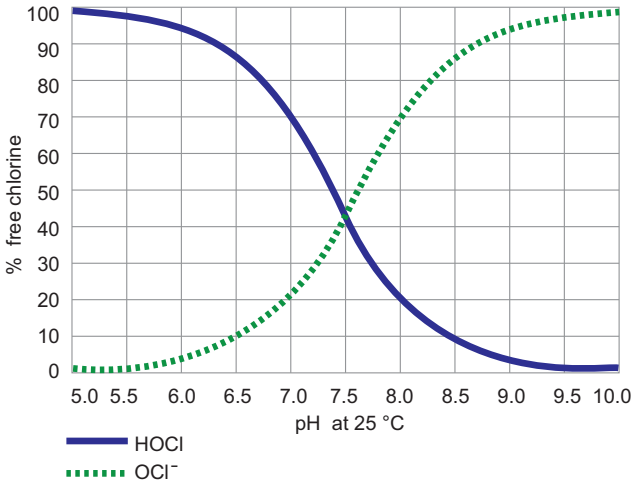


Figure 1

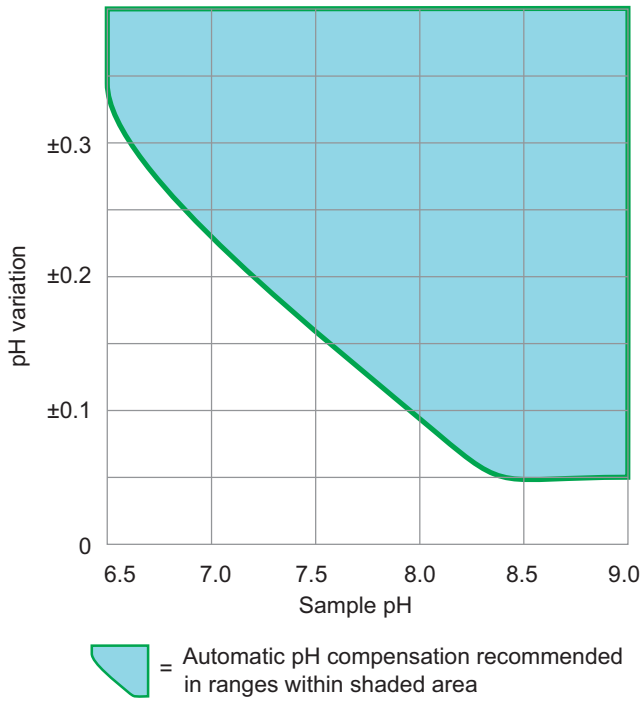


Figure 2

Calibration

A new chlorine electrode or one that has had the membrane cap changed must be calibrated. See page 24, 8630 Transmitter information on calibration of the chlorine sensor. A diethyl-p-phenylenediamine (DPD) colorimeter test kit (not included) is required for sensor calibration. A sample is taken and analyzed with the DPD test kit, then this value is entered into the Signet 8630 transmitter.

- Calibrate after a membrane cap change (requires 4 hour stabilization time).
- Calibrate after the internal electrolyte is replaced (requires 2 hour stabilization time).
- Check calibration one day after sensor is placed in service.
- Check calibration weekly to monthly depending on process requirements.

Maintenance

The sensor membrane and internal electrolyte solution must be replaced over the life of the electrode. To maintain accurate chlorine measurements, GF Signet recommends that the internal electrolyte be replaced every 3 to 6 months, or when Chlorine readings drift low and/or cannot maintain a calibration longer than 5 days. Actual interval between maintenance of the sensor will be dependent on the actual applications, chlorine level and contaminates in the water. See Appendix page 36; Maintenance and Storage.

Keep spare membrane caps available.
Membrane caps carry no warranty.

NOTE: Inspect and change the membrane cap if damaged. See page 36, Maintenance, for cleaning procedure.

2724 DryLoc pH Electrode

CAUTION!

1. Use appropriate eye, face, hand, body and/or respiratory protection when using chemicals or solvents.
2. Prior to installation or removal:
   a. Depressurize and vent system.
   b. Drain below sensor level.
3. Confirm chemical compatibility before use.
4. Do not alter product construction.

WARNING: 3-2724-00 (159 001 545) is the only recommended electrode to be used in the Chlorine Analyzer System.

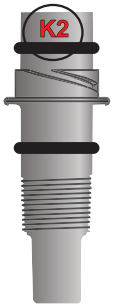
Lubricate O-rings with a non-petroleum based, viscous lubricant (grease) compatible with the system.

Electrode Date Code

The electrode date code indicates the manufacturing date of the electrode. Electrodes should be put into service as soon as possible and should not remain in the box for more than two years. Over time, the storage solution (found in the "boot" covering the electrode tip) will evaporate or leak, allowing the delicate sensing tip and reference junction dry.

To rehydrate a dry electrode, soak it in pH 4 buffer for 24 to 48 hours. Electrodes more than 2 years old may still be functional, but will take longer to rehydrate. Restoration may not be effective for severely dehydrated electrodes.

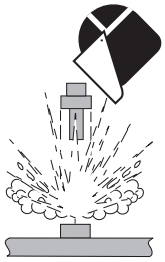
First Digit = Month
N = January
M = February
L = March
K = April
J = May
H = June
G = July
F = August
E = September
D = October
C = November
B = December



Second Digit = Year
2 = 2017
3 = 2018
4 = 2019
5 = 2020
6 = 2021
7 = 2022
7 = 2023
9 = 2024
0 = 2025
1 = 2026

Example: K2 = manufactured in April 2017

Removing the electrode from In-line installations



The use of this product assumes that operators are trained and are familiar with this type of device. They should be knowledgeable of the potential risks associated with pressurized piping systems. Operators MUST follow all necessary safety procedures.

In-line removal Instructions:

1. Depressurize and vent the piping system.
2. Drain the system to below sensor level.
3. Wear safety goggles or face shield during removal.
   Use all appropriate eye, face, hand, body and/or respiratory protection when working with chemicals or solvents.
4. Place a Lockout tag on the pipe when the sensor is removed for maintenance to prevent accidental opening and exposure to potentially hazardous chemicals.

Calibration

pH Calibration Procedure

1. Rinse the sensor off in the rinse water cup. Gently pat dry with a soft, dry cloth or tissue. **Warning: Do not let the rinse water drip into the buffer solution; this will dilute the solution and may change the buffer values.**
2. Place the pH sensor in the first buffer solution (pH 7). Wait until the output from the sensor is stable on the instrument display.
3. Follow the instrument's instructions regarding buffer recognition.
4. Rinse the sensor with water. **Warning: Do not let the rinse water drip into the buffer solution; this will dilute the solution and may change the buffer values.**
5. Dry the sensor gently by patting it with a dry, clean cloth or tissue.
6. Place the sensor in a cup containing the second buffer solution (pH 4 or pH 10). The second solution used will depend on the typical pH value of the application.
   - If the process value is below pH 7, then use a pH 4 buffer solution.
   - pH 10 buffer solution is used when the typical process value is above 7 pH; however, pH 4 buffer is sufficient if pH 10 buffer is not available.
7. Wait until the output from the sensor is stable.
8. Follow the instructions in the instrument manual regarding buffer recognition.
9. Rinse the sensor with water. **Warning: Do not let the rinse water drip into the buffer solution; this will dilute the solution and may change the buffer values.**
10. Dry the sensor gently by patting it with a dry, clean cloth or tissue.
11. If the calibration was successful, put the sensor back on-line. If it was not successful, clean the sensor and recalibrate. If the sensor cannot be calibrated, the electrode may need to be replaced.

Calibration Tips

1. The pH buffer solutions can be used for calibrating more than one sensor within a day. However, the solutions must remain free of debris and must not be diluted by rinse water from previous calibrations.
   Note: Use fresh buffer solutions for best results.
2. Tap or deionized water may be used to rinse the electrodes between each buffer solution.
3. Calibration solutions change value with varying temperature. Allow both the sensor and buffers to equalize with the ambient temperature. Sensors will not calibrate properly if the sensor is not at ambient temperature. Take note of all temperature variations of the sensors and the calibration solutions.
4. Do not pour used buffer solutions back into the bottle; dilute with plenty of water and flush them down the drain.
5. Store electrodes in pH 4 buffer when not in use.
6. Calibrate sensors on a regular basis.
7. If the pH sensor does not calibrate within acceptable limits, clean the electrode and calibrate again. If the sensor continues to calibrate outside of acceptable limits, the electrode is spent and must be discarded.
8. Acceptable pH ranges during calibration are as follows:

pH 7:	High:	7.8 pH =	-50 mV;	Low:	6.2 pH = 50 mV
pH 4:	High:	4.8 pH =	227 mV;	Low:	3.2 pH = 127 mV
pH 10:	High:	10.8 pH =	-227 mV;	Low:	9.2 pH = -127 mV

Electrochemical pH vs. mV Ratio

- The mV output from the electrode is created by the interaction of the electrode and the fluid. The electrode contains a gel that depletes over time, so the instrument must be readjusted periodically to maintain system accuracy. The need for recalibration varies with each application, but the life of the electrode is usually consistent.
- Keep a maintenance log to establish a depletion trend in new systems.
- The mV calibration is a two-point procedure. Signet offers pH buffer solutions prepared specifically for this purpose.
- pH buffer solutions can be used for calibrating more than one sensor within a day provided that the solutions are protected from debris and are not diluted by rinse water from the calibration procedure.
- Use clean water to rinse buffer solutions from the electrode.
- Dispose of all buffer solutions at the end of the day.
- If the pH sensor will not calibrate within acceptable limits, clean the electrode and recalibrate. If the calibration results remain outside of acceptable limits, the sensor is depleted and must be discarded.
- Follow the guidelines of local waste disposal regulations when discarding buffer solutions and spent electrodes.

Theoretical mV Values @ 25 °C

pH	mV
2	+295.8 mV
3	+236.64 mV
4	+177.48 mV
5	+118.32 mV
6	+59.16 mV
7	0 mV
8	-59.16 mV
9	-118.32 mV
10	-177.48 mV
11	-236.64 mV
12	-295.8 mV

Electrode slope is the ratio of mV to pH units.
At 25 °C the theoretical slope is 59.16 mV per pH.

Maintenance - 463X Chlorine Analyzer Flow Cell

Sensor Removal

CAUTION: Over time, a sensor can get tight in the flow cell fitting. When removing the sensor, avoid hitting the sensor electronics on the bottom of the wiring enclosure if the sensor suddenly releases. **Take care not to damage the components.**

While holding the flow cell, grasp the yellow electronics as a whole unit and carefully pull upwards, gently rocking back and forth if necessary. Once the sensor is loose, disengage the electronics, then remove the sensor.

TIP: A tool can be used to carefully pry the sensor electronics up and out if it is difficult to remove.

Under certain conditions, a dirty flow cell and filter can create a chlorine demand which could lower the chlorine concentration in the water flowing past the chlorine sensor. It is recommended to clean the filter and flow cell on a regular basis. The frequency of necessary cleaning will depend on the application in which the system is being used and the level of accuracy required.

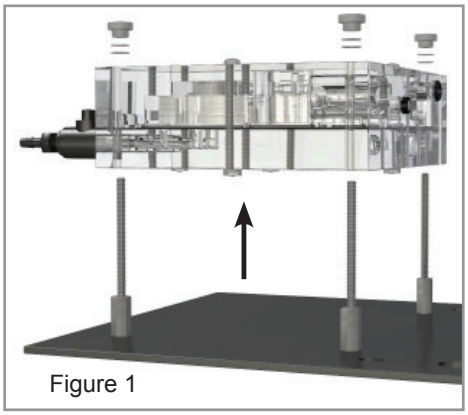


Figure 1

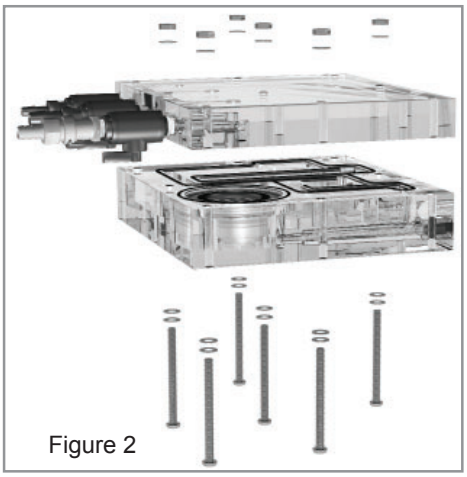


Figure 2

Cleaning

Service the flow cell on a clean, dirt free surface to avoid scratches or damage to the flow cell.

Step 1. Keep the system powered on.
Step 2. Disable the relays and any output loops.
Step 3. Turn off the water flow.
Step 4. Remove the sensors from the flow cell. **NOTE:** It is not necessary to remove the electronics from the sensor.
Step 5. Install the vinyl caps on to the sensor tips or place the tips of the removed sensors in a cup of sample water for temporary storage while cleaning the flow cell.
Keep the sensor tips wet and the sensors energized.
Step 6. Remove the flow cell from the panel by removing the knurled nuts (Figure 1).
Step 7. Remove the remaining hardware from the flow cell. (Figure 2).

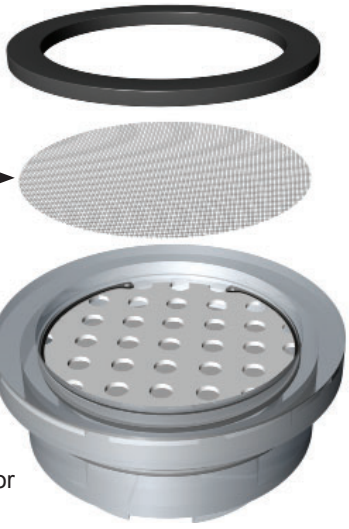
NOTE: *It is recommended that an anti-seizing compound appropriate for the application be used during the reassembling of the flow cell.*

- **Wash the surfaces with plain or soapy water only.**
- **Use gentle, liquid dishwashing soap if necessary.**
- **DO NOT USE commercial glass cleaning fluids.**
- **Use a soft, lint-free cloth.**

Servicing the Flow Regulator and Filter

WARNING: Do not disassemble the flow regulator. There are no user serviceable parts inside.

If your inlet pressure is less than 1 bar (15 psi), remove the flow regulator and quick disconnect inlet connector.

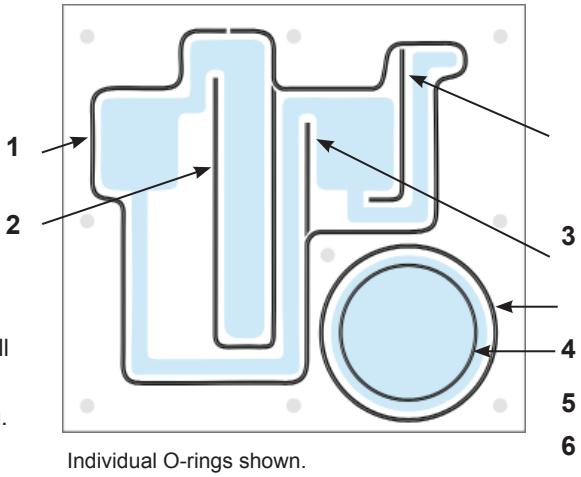


Remove filter screen to clean. If the filter is not desired, it may be removed from the system.

Flow Regulator

O-Ring Installation

CAUTION! The 3-4630.390 (159 001 688) O-ring kit comes complete with two O-rings (5 and 6) and a single cord of material that must be cut and fitted into the O-ring groove of the flow cell (1 and 4).



Individual O-rings shown.
Butt all segment joints together in final assembly.

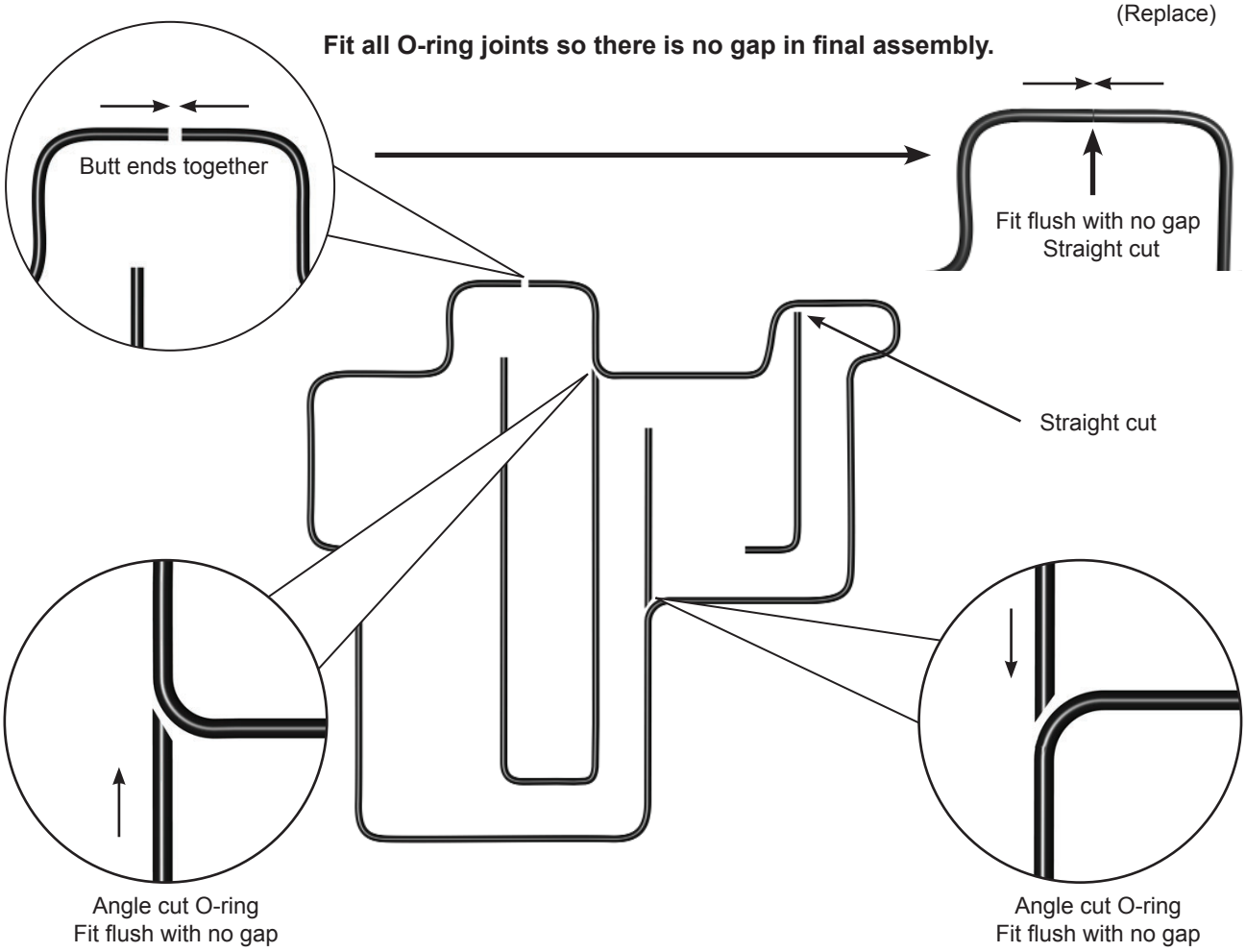
- The sealing of the flow cell is accomplished by four cut O-ring segments and two round O-rings sealing the flow regulator. Refer to the illustration below for special O-ring fitting instructions. Butt all O-ring joints together so there is no gap.
- Remove the O-rings during flow cell disassembly. Both the O-rings and all sealing grooves should be examined for cleanliness.
- Wipe all surfaces carefully with a soft, lint-free cloth to ensure good sealing.
- The cross section of the O-rings should be round and smooth. If they are flattened, their ability to seal is reduced.
- Do not use liquid or paste sealant.

Do not scratch the sealing surfaces of the flow cell block. Scratches to the sealing surfaces can cause irreparable leaks.

New O-ring
cross section

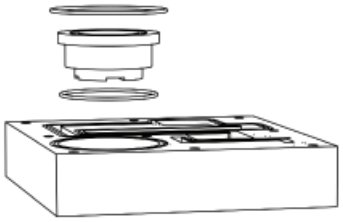
Old flattened O-ring
cross section
(Replace)

Fit all O-ring joints so there is no gap in final assembly.

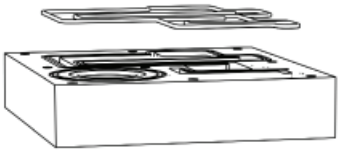


Flow Cell Assembly

WARNING! Do not over tighten flow cell bolts. Maximum torque is 8.1 Nm (72 Lb-In).
Over tightening the bolts can damage the flow cell.
Do not over-tighten the bolts in an attempt to stop a leak.

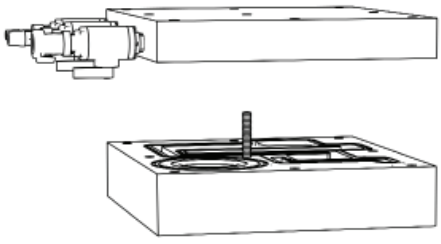


1 Install the assembled pressure regulator and the two round O-rings into the flow cell.

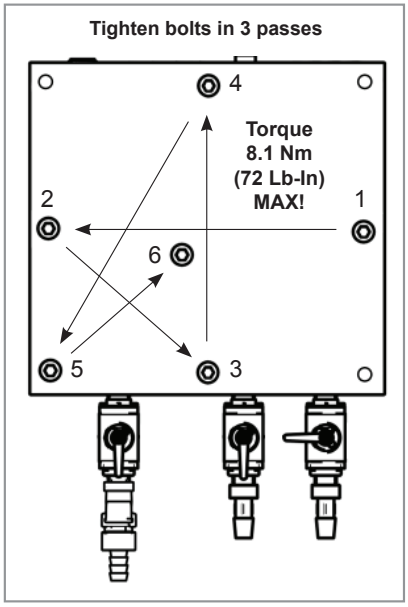


2 Install the four O-ring segments.

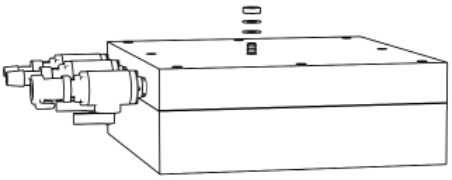
3 Insert the center bolt into the block.



4 Align and place the back block onto the flow cell. Check to be sure that the O-rings are seated correctly.

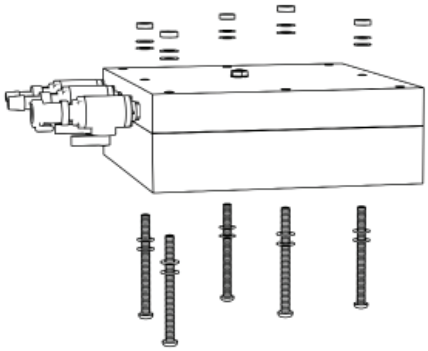


NOTE: *It is recommended that an anti-seizing compound appropriate for the application be used during the reassembling of the flow cell.*

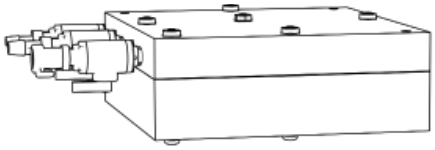


5 Install the nut and washers.

6 Tighten the nut just enough to hold the block together and keep the O-rings in place.



7 Install the remaining bolts, washers and nuts.



8 Tighten the bolts in three passes to specification.

9 Install the flow cell on the panel. Screw on the thumb nuts finger tight. **DO NOT** use tools on the thumb nuts.

Maintenance - 2630 Free Chlorine Electrode
Maintenance - 2632 Chlorine Dioxide Electrode

It is required to calibrate the sensor after servicing the membrane and electrolyte. See Page 24.

Verifying the sensors accuracy using the DPD method should be performed to determine if the sensor requires maintenance.

1. Inspect the membrane for dirt or damage. Replace the membrane if its torn or if the gold-plated cathode is visible.
2. If the membrane is dirty clean the membrane by soaking it in 1 - 5% HCL and gently washed with a stream of DI water. (do not use any mechanical device on the membrane)

Refill Procedure:
When adding electrolyte, be prepared for an accidental spill. Working near a sink is recommended.

1. Remove the membrane cap from the front of the sensor.
2. Turn the sensor upside down and shake the sensor vigorously to remove the internal electrolyte.
3. Fill supplied syringe with electrolyte solution. Additional caution should be taken when handling Chlorine Dioxide electrolyte solution.
4. Place the electrode on a level surface.
5. Insert syringe needle fully into one of the eight electrode holes while injecting with electrolyte solution. Slowly injecting the electrolyte solution into the sensor to avoid introducing air bubbles. The electrode holds approximately 14 milliliters of solution. Slowly fill until solution begins to flow out of holes. Do not allow the solution to run down the electrode and wet the electrical contacts in the DryLoc connector.
6. Slowly screw on the membrane cap finger tight. Do not use tools.
   To avoid damage and contamination, do not touch the white membrane surface on the membrane cap.

Storage

If the sensor or panel assembly is to be removed from service for a period of time the sensor must be properly prepared for storage and may need to be recommissioned.

Storage Periods:

1 week or less:

- Close the drain valve, then close the inlet valve of the flow cell, to maintain water inside the flow cell to keep the membrane wet.
- If draining the flow cell is required, remove the sensor from the cell and the 2650 electronics and store in the shipping bottle with tap water added.

Continue to Page 37 for additional storage periods

Diluted HCl can irritate the eyes and skin, use proper safety equipment.
Do not use surface tension reducing chemicals, detergents or solvents on the membrane.

- If a fresh water rinse does not clean the membrane, it will need to be replaced.
- Keep spare membrane caps available. Membrane caps carry no warranty.

Avoid skin or eye contact with electrolyte solution. Wear rubber gloves and goggles.
* Material Safety Data Sheets (MSDS) are available online at www.gfsignet.com.

CAUTION:
DO NOT touch the gold-plated tip or the membrane of the sensor.

Store electrode between -10 ºC to 60 ºC (-4 ºF to 140 ºF) at a relative humidity that does not exceed 95%.

The primary concerns when storing the electrode is membrane dehydration and freezing in extremely cold environments.

Storage of sensor

- Remove the membrane cap and internal electrolyte solution.
- Rinse the sensor internal chamber with DI water or cold tap water; drain and allow to dry.
- Place the membrane cap back onto the sensor. INSTALL LOOSE, DO NOT COMPLETELY TIGHTEN THE CAP. WHEN STORED DRY, THE MEMBRANE CAP MUST BE STORED RELAXED AND UNSTRESSED.
- Store sensor DRY in the shipping bottle, DO NOT ADD WATER.

Storage Periods Greater than 1 week, but less than 2 months:

Recommissioning Procedure:

1. Fill the sensor with the electrolyte as outlined in Maintenance, Page 36, and install the membrane cap.
2. The sensor will have to be polarized in the flow cell with flowing Chlorinated water before being used.
   Note: This may take 30 to 120 minutes before calibration can be performed.
3. If the sensor does not recover after recommission, follow steps 1-10 outlined under **Storage periods greater than 2 months.**
4. If the sensor still fails to work properly, continue with steps 11-17.

CAUTION!
Bleach and Chlorine Dioxide solutions are very corrosive and may release dangerous gases if it comes in contact with acids.

- Wear proper protective clothing (gloves and eye protection)
- Avoid contact with skin and eyes
- Observe all warnings on safety data sheets
- Avoid spilling bleach and possible contact with acids

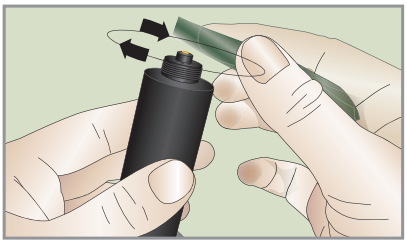
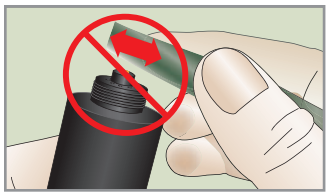


Figure 1



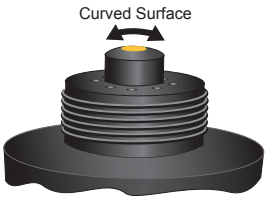
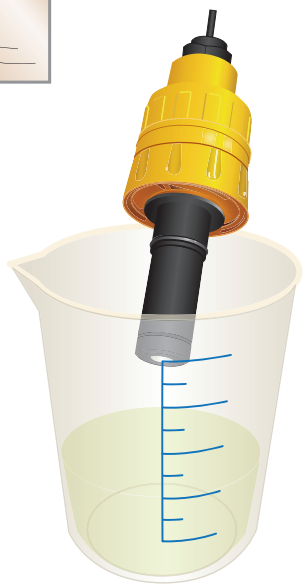


Figure 2



Storage periods greater than 2 months:

- If the sensor has been in storage for a long period of time, or used in a chlorine free environment, the sensor may develop a low slope (output), which may cause the sensor to have a slow response time.
- In this case, the sensor must be reconditioned.

Required to recondition a sensor:

- DI Water
- Beaker (any size available)
- Polishing Sheets (Included in sensor maintenance kit)
- Free Chlorine: Chlorine Bleach (13% concentration)
- Chlorine Dioxide: Aqueous Chlorine Dioxide solution

Reconditioning Procedure:

1. Remove the sensor from the 2750-7 electronics.
2. Remove the membrane cap.
3. Place the sensor on a firm flat surface with the gold-plated cathode pointing upward.
4. Apply a small amount of water to the Blue (Coarse) polishing paper (dull side).
5. Polish the gold-plated electrode by moving the paper in a circular pattern for 10 seconds. DO NOT go back and forth in a single direction. **See Figure 1.**
6. Rinse the sensor tip with DI water.
7. Apply a small amount of DI water to the White (Fine) polishing paper (dull side) and polish the gold-plated electrode by moving the paper in a circular pattern 40-60 seconds. DO NOT go back and forth in a single direction. **See Figure 1.**
8. Rinse the sensor tip with DI water.
9. Top off the sensor with electrolyte and inspect membrane for dirt or damage. Replace if necessary.
10. Insert the sensor into the 2650 electronics and apply power.
11. Fill beaker with a 12 mm (½ inch) of the appropriate solution.
12. Position or suspend the sensor 0.2 mm to 12 mm (¼ in. to ½ in.) above the appropriate solution. **See Figure 2.** DO NOT SUBMERGE THE SENSOR.
13. Apply power to the system.
14. Monitor the nA of the sensor (press the down arrow once on the 8630 transmitter). The nA reading should start to rise. Response time and nA reading will depend upon the temperature of the appropriate solution.
15. Once the sensor's nA reading reaches approximately 300-360 nA allow the sensor to remain in the beaker, suspended over the appropriate solution, for an additional 20 minutes.
    - If sensor does not recover quickly, cover the beaker to avoid air contamination.
    - Contact the factory for assistance (www.gfsignet.com).
16. After 20 minutes, remove the sensor and install it into the flow cell and restore flow to the system.
17. Calibrate the sensor after the system has become stable.

Maintenance - 2724 DryLoc® pH Electrode

Electrode Care and Application

pH electrodes are similar to batteries; they age with time and usage. The following information will help maximize electrode life.

General Tips:
- To ensure uninterrupted operation of critical pH systems, replacement electrodes should be available.
- Store boxed electrodes flat or upright (electrode tip down) to maximize hydration of the glass surface.
- Keep the glass surface wet at all times.
- Soak the sensor tip in pH 4.0 buffer during system maintenance intervals.
- If the sensor dehydrates, soak the sensor tip in pH 4 buffer for 24 to 48 hours, then visually inspect the electrode for surface cracks, swelling, or discoloration.
- It may not be possible to restore severely dehydrated electrodes to normal operation.
- High temperatures, strong acids or caustics will increase electrochemical reactions and speed electrode aging.
- Coatings (e.g. grease) on the glass or junction surfaces cause extended response time and inaccurate measurement.
- Never store the electrode tip in deionized (DI) water. Use pH 4 buffer solution to keep the glass wet when out of the process.
- Never store the electrode at temperatures below 0 °C (32 °F) or allow it to dehydrate.
- Never scrape or sand the glass electrode surface.
- Treat glass electrode surfaces with care to prevent accidental breakage.

Cleaning

Problem	Suggested Solution
Hard Coatings	Use a dilute acid solution (HCl solution of 5% or less). If the electrode has been used in applications with a pH value higher than 7 pH, soak the electrode for 2 to 5 minutes.
	Use a dilute alkaline solution (NaOH solution at 5% or less) if the electrode has been used in applications with pH values less than 7 pH, soak the electrode for 2 to 5 minutes.
	Alternating immersion in acidic and alkaline solutions may be necessary for thorough cleaning.
Soft Coatings	Spray or vigorously stir the electrode with a mild detergent, such as dishwashing liquid. Chlorine bleach can also be used.
Oily or Organic Coatings	Spray or vigorously stir the electrode with a mild detergent or an appropriate solvent that will not attack the materials of construction (isopropyl alcohol or similar).
After Cleaning	Always rinse the electrode with water after cleaning.
	Soak the electrode in a pH 4 buffer (with KCl if available) for at least 10 minutes after cleaning.

Troubleshooting - 463X Chlorine Analyzer

The troubleshooting table below outlines possible causes and remedies related to the flow cell panel system. Refer to the respective transmitter and sensor manuals for specific component troubleshooting.

Problem	Possible Cause	Remedies
No water flow	Inlet pressure below 1 bar (15 psi)	Check source pressure. Remove regulator if pressure is < 1 bar/15 psi
	Damaged flow regulator	Replace flow regulator
	Clogged filter	Clean filter or remove pressure regulator if inlet pressure is below 1 bar (15 psi)
Low water flow	Clogged filter	Clean filter
	Insufficient inlet pressure	Increase inlet pressure to specification or remove flow regulator
	Damaged flow regulator	Inspect or replace
Excessive flow	Excessive pressure over 8 bar (120 psi)	Ensure inlet pressure does not exceed 8 bar (120 psi)
	Damaged flow regulator	Replace flow regulator
Flow cell leaks	Incorrect assembly	Inspect, clean, and reassemble
	Loose bolts	Tighten bolts (8.1 Nm, 72 Lb-In Max)
	Defective or missing O-rings	Replace O-rings
	Damaged sealing surfaces	Replace flow cell
Leaks around sensor	Damaged sensor O-ring	Inspect or replace O-ring
	Damaged flow cell	Inspect flow cell
Water leaks out of top vent hole	Drain valve closed or plugged	Inspect
	Hose connections are backwards	Connect water source correctly
	Outlet drain not below flow cell	Route drain line below flow cell and vented to atmosphere
Algae growth in flow cell	Low chlorine concentration in water	Locate flow cell away from light
	Exposure to light	
Excessive small bubbles in flow cell accumulating on sensors	Water source contains bubbles	Check water source
	Water source is saturated with dissolved gasses	
Transmitter does not turn on	No power or external circuit breaker is switched off	Inspect power and wiring connections
	Loose or incorrect wire connections	Check connections
	Open loop wiring or missing jumper wire on terminal 1 (Loop 1) on the wiring enclosure terminal block	Replace jumper wire to terminal 1 or connect a loop device if the jumper wire to terminal 1 is removed
Chlorine reading too high	Breached membrane	Replace membrane and fill solution
Chlorine reading too low	Electrode needs to be repolished	Polish gold-plated electrode
	Not enough electrolyte	Check electrolyte level
	Low flow rate	Check source pressure
	Filter clogged	Clean the filter
	Sensor conditioning not long enough	Allow the sensor to condition for 4 hours (See 2630 or 2632 sensor manual for details)
Sensor output drifts	Electrode needs to be repolished	Polish gold-plated electrode
	Not enough electrolyte	Check electrolyte level
	Variable flow rate	Check flow rate
	Clogged filter	Clean the filter
	Contaminated fill solution	Change electrolyte fill solution

Chlorine Electrode Troubleshooting (see 2630-2 or 2632-1 electrode manual: 3-2630.090)

Transmitter Troubleshooting (see 8630-3 transmitter manual: 3-8630.090-3)

pH Electrode Troubleshooting (see 2724 electrode manual: 3-2724.090)

Troubleshooting - 8630 Chlorine Transmitter

Several factors can cause irregular or incorrect readings. The first thing to check is to verify that the transmitter and sensors have been installed correctly. The list below outlines possible causes and remedies.

Problem	Possible Cause	Remedies
Transmitter does not turn on.	Incorrect wiring. No or low voltage supplied to transmitter. Blown fuse. Bad wire connections or splices.	Check wiring, power supply and wiring connections.
Display screen is too dark or too dim.	Contrast set incorrectly or ambient temperature is too high.	Adjust contrast in Options Menu.
LCD backlight, relays and sensors do not work.	No power supplied to terminals 1 and 2.	Transmitter requires power to terminals 1, 2, 3 and 4.
Incorrect temperature reading.	Faulty chlorine sensor. Bad sensor connection.	Check connections or replace sensor.
Display or Current output is erratic.	Electrical noise interfering with the measurement. Sensor malfunction.	Ensure system is properly grounded. See Sensor Troubleshooting.
Output is not zero when electrode is placed in non-chlorinated water.	Electrode not properly conditioned. Noise interfering with the measurement. Calibration incorrect.	Condition new sensor for 4 hours. Cap replacement or electrolyte refill: 2 hours. Properly ground system. Replace sensor.
4 to 20 mA output is incorrect.	4 to 20 mA is not scaled same as Loop device. Loop device is not scaled same as sensor.	Re-span loop device to match sensor.

Chlorine Sensor Troubleshooting (see 2630 sensor manual)		
Incorrect readings	Sensor conditioning time too short.	Run for 4 hours before calibrating.
	Membrane cap damaged or contaminated.	Clean or replace cap.
	Interference from water contaminants.	See Specifications data.
	Low flow rate.	Check flow.
	Air bubbles on membrane.	Install flow cell vertically with upwards flow.
	pH outside working range (See Specifications data).	Check pH.
	Low or no electrolyte in sensor.	Fill sensor with electrolyte.
	Membrane cap loose.	Inspect/tighten (do not use tools).
	Only combined chlorine present when measuring free chlorine.	Validate with DPD test.
	Sensor not making good contact with electronics.	Inspect and reconnect.
	Defective sensor.	Replace.
	No pH compensation being used.	Manually enter pH value in Options or calibrate pH sensor.
	Cl sensor not calibrated.	Calibrate Cl sensor.

8630 Transmitter Error Messages

The 8630 error warnings are self-explanatory. An error message can appear under the following circumstances:

- User input value is out of range
- Poor electrical connection
- Sensor is not connected or detected
- Temperature error
- Incorrect sensor type chosen in the Options Menu
- Two calibration points are too close together when calibrating pH or chlorine.

Error Messages	Problem	Possible Cause	Remedies
Sens Data Error	Cl sensor data memory error.	Cl sensor is not connected. Damaged sensor.	Check Cl sensor wiring and connection. Perform "Find New Sensor" or recycle power afterward.
CHK Cl PREAMP	Cl preamp is not detected.	Cl preamp is not connected. Wrong wiring. Damaged preamp.	Check preamp and transmitter wiring. Perform "Find New Sensor" or recycle power afterward.
CHK pH PREAMP	pH preamp is not detected.	pH preamp is not connected. Wrong wiring. Damaged preamp.	Check preamp and transmitter wiring. Perform "Find New Sensor" or recycle power afterward.
CHK Cl SENSOR	Cl sensor is not detected.	Cl sensor not connected. Damaged sensor.	Check sensor connection.
CHK pH SENSOR	pH sensor is not detected.	pH sensor is not connected. Damaged sensor.	Check sensor connection.
Out Of Range CHECK SENSOR	pH calibration error.	pH values are out of range.	Enter proper values during calibration.
Standard Too Close To Slope!	pH standard calibration point is too close to slope point.	Wrong data is entered. pH buffer solution used has value too close to standard point.	Re-enter correct data. Use proper buffer solution at least 2 pH units apart from slope buffer solution.
Slope Too Close To Standard!	pH slope calibration point is too close to standard point.	Wrong data is entered. pH buffer solution used has value too close to standard point.	Re-enter correct data. Use proper buffer solution at least 2 pH units apart from standard buffer solution.
Signal Too Close To Other Cal Pt	The signal level of Cl for In-process calibration is too close to the Zero Cal Point.	The Cl solution used for In-process calibration is too close to Zero Cal. These two points must be 1 nA apart.	Use proper solution at least 1 nA apart.
Cl Value Must Be > = 0.2 ppm	The Cl value entered during In-process calibration is too small.	Wrong data is entered. The value entered must be at least 0.2 ppm (mg/l).	Re-enter correct value.
Signal Too High Must Be =< 10 nA	The signal level during Zero calibration is too high. Signal must be equal or less than 10 nA.	The sensor is not stabilized. The solution used has too much chlorine.	Wait for sensor stabilization. Check solution to ensure that the chlorine level is close to zero ppm (mg/l).
pH Too High Must be =< 9	pH value is too high.	During In-Process calibration the pH value is too high and must be less than or equal to 9.	Check pH.
pH Too Low Must be >= 4	pH value is too low.	During In-process calibration the pH value is too low and must be greater than or equal to 4.	Check pH.

Transmitter Error Messages - continued

FCl= - - - - - - CHK pH SENSOR	pH sensor is not detected.	pH sensor is not connected. Wrong wiring. Damaged pH sensor.	Check pH sensor connections or change pH input to Manual in Options Menu.
FCl= - - - - - - CHK pH PREAMP	pH preamp is not detected.	pH preamp is not connected. Wrong wiring. Damaged preamp.	Check pH preamp wiring. Perform a "Find New Sensor" or recycle power afterward.
FCl= WRONG SENSOR	Wrong sensor is detected.	Different type of sensor is connected. Wrong sensor type is selected under Option Menu.	Use correct sensor type. Perform a "Find New Sensor" or recycle power afterward. Select correct sensor type under Option Menu.

NOTE: Whenever a new type of Cl Sensor is connected to the preamp, a power recycling is required. Another option is to perform a "Find New Sensor" under the Option Menu.

Troubleshooting - 2630 Free Chlorine Electrode
Troubleshooting - 2632 Chlorine Dioxide Electrode

Transmitter error messages related to calibration are detailed in the Signet 8630 Chlorine Transmitter operation manual.

Problem	Possible Causes	Remedies
Sensor cannot be calibrated. Output is lower than DPD test.	Sensor conditioning time too short	Condition for 4 hours minimum prior to initial calibration
	Chlorine content too low	DPD value must be greater than 0.2 ppm to calibrate
	Low flow rate	Check to make sure flow rate is sufficient
	Air bubbles on electrode membrane	Inspect visually. Tap to remove bubbles. Mount at an angle
	Low or no electrolyte in electrode	Fill electrode with electrolyte
	Organic chlorination agents present in water	See Specifications data
	Surfactants in water	Remove surfactants and replace cap
	Membrane cap coated	Clean or replace membrane cap
	Membrane cap loose	Tighten or replace membrane cap
	pH outside working range.	See Specifications data
Sensor output very low	Electrode needs to be repolished	Polish gold-plated electrode
	Not enough electrolyte	Check electrolyte level
	Sensor conditioning time too short	Condition for 4 hours minimum prior to initial calibration
	Chlorine content too low	Add chlorine to validate
	Only bound chlorine present. No free chlorine	Check for chloramine with appropriate DPD test
	Electrode not making good contact with electronics	Inspect and reconnect
Unstable output from sensor	Electrode needs to be repolished	Polish gold-plated electrode
	Not enough electrolyte	Check electrolyte level
	Air bubbles on electrode membrane	Inspect visually. Tap to remove bubbles. Mount at an angle
	Membrane damaged	Replace membrane. Condition sensor for at least 2 hours and recalibrate.
	Electrode not making good contact with electronics	Inspect and reconnect
	Non-sensor problem	Check 3-2650 Electronics connection to electrode (see 3-2650 manual for instructions). Make sure connections are dry. Check instrument hookup

Troubleshooting - 2750-7 pH Electronics

Problem	Possible Cause	Remedies
After completing calibration procedure, the output values are inaccurate.	Insufficient time allowed for electrode stabilization during calibration.	Recalibrate, verify that test solutions are at room temperature and wait at least 30 seconds after placing electrode in solution.
Transmitter Troubleshooting (see 8630-3 transmitter manual: 3-8630.090-3)		
pH Electrode Troubleshooting (see 2724 electrode manual: 3-2724.090)		

Specifications

8630 Chlorine Transmitter

General

Compatibility:

- Sensors: 3-2630-1 Free Chlorine Sensor 0.02 to 2 ppm
  3-2630-2 Free Chlorine Sensor 0.05 to 5 ppm
  3-2630-3 Free Chlorine Sensor 0.01 to 20 ppm
  3-2632-1 ClO_2 Electrode, 0.02-2 ppm
  3-2724-00 Flat pH Electrode, See FCL and CL02 system pH specification
- Electronics: 3-2650-7 Amperometric Electronics
  3-2750-7 pH Sensor Electronics

Materials:

- Case: PBT
- Panel gasket: Neoprene
- Window: Polyurethane-coated polycarbonate
- Keypad: Silicone rubber
- Display: Backlit alphanumeric 2 x 16 dot matrix
  Update rate: 1 second
  Contrast: User selected, 5 levels
- Keypad: Silicone rubber

Performance

System Operational Ranges/Limits:

- 3-2630-1: Free Cl: 0.02 to 2 ppm, pH: 5 to 8.5
- 3-2630-2: Free Cl: 0.05 to 5 ppm, pH: 5 to 8.5
- 3-2630-3: Free Cl: 0.1 to 20 ppm, pH: 5 to 8.5
- 3-2632-1: ClO_2: 0.2 to 2 ppm, pH: 4 to 11
- 3-2724-00: pH: 0 to 14 (8.5 when used with the 4630)

Cl Temp. Range: 0 °C to 45 °C (32 °F to 113 °F)

Max. Cable Length:

- Digital (S^3L): 30 m (100 ft) maximum
- 4 to 20 mA: 305 m (1000 ft) maximum

Electrical

Input Power: 12 to 24 VDC ±10% regulated, 250 mA max current

Sensor Power: 5 VDC ±1% @ 25 ºC, regulated (provided by 8630)

Input Specifications

- One Digital (S^3L) input from Free Chlorine or Chlorine Dioxide sensor
- One Digital (S^3L) input from pH sensor

Output Specifications:

- Current Loop (2 loops provided)
- 4 to 20 mA, isolated, adjustable span, reversible with minimum and maximum endpoint adjustment.
- Ability to use chlorine or temperature as input
- Update Rate: 300 ms
- Max Loop impedance: 50 Ω max. @ 12 V
  325 Ω max. @ 18 V
  600 Ω max. @ 24 V

Relay Outputs:

- 2 mechanical SPDT contacts with adjustable hysteresis and programmable High, Low, Off, Pulse or Window range.
- May be disabled if not used
- Max. voltage rating: 5 A @ 30 VDC
  5 A @ 250 VAC, resistive load
- Time delay: Programmable from 0 to 6400 s

Environmental Requirements

- Operating Temperature: -25 °C to 120 °C (-13 °F to 248 °F) (transmitter only)
- Storage Temperature: -15 °C to 80 °C (5 °F to 176 °F)
- Relative Humidity: 0 to 95%, non-condensing
- Maximum Altitude: 2000 m (6562 ft)
- Enclosure: NEMA 4X

Standards and Approvals

- CE, UL, CUL, WEEE
- RoHS Compliant
- Manufactured under ISO 9001 for Quality, ISO 14001 for Environmental Management and OHSAS 18001 for occupational health and safety.

China RoHS (Go to www.gfsignet.com for details)

Declaration of Conformity according to FCC Part 15
This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and,
(2) This device must accept any interference received, including interference that may cause undesired operation.

Specifications

2650 DryLoc Amperometric Electronics

General

Compatibility:

- Sensors: All Signet Amperometric DryLoc Sensors
- Instruments: Signet 3-8630-3P Chlorine Transmitter

Mounting: DryLoc connection
Materials: PBT
Cable: 4.6 m (15 ft) 3 conductor shielded, 22 AWG

- Max. Length: 30 m (100 ft)

Performance

- Accuracy: < 5 nA or 1% of reading, whichever is greater @ 25 °C over full input range
- Temperature: ± 1.0 °C (PT1000) over full operation range (when calibrated at ambient temperature)
- Update Rate: 500 ms
- Range: ± 450 nA
- Resolution: 0.1 nA

Electrical

Input Specifications:

- Sensor: Raw signal
- Temperature: PT1000 RTD

Output Specifications:

- Digital (S^3L): Serial ASCII, TTL level 9600 bps

Power Supply Input:

- Digital (S^3L): 5 to 6.5 V ± 10%, 3 mA max

Environmental

- Storage Temp.: -20 °C to 50 °C (-4 °F to 120 °F)
- Operating Temp.: 0 °C to 85 °C (32 °F to 185 °F) (electronics only)
- Relative Humidity: 0 to 95%, non-condensing (no electrode connected)
- Enclosure: NEMA 4X/IP65 with electrode installed
- Shipping Weight: 0.64 kg (1.41 lb)

Standards and Approvals

- CE, WEEE
- RoHS Compliant
- Manufactured under ISO 9001 for Quality, ISO 14001 for Environmental Management and OHSAS 18001 for occupational health and safety.

China RoHS (Go to www.gfsignet.com for details)

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(2) This device must accept any interference received, including interference that may cause undesired operation.

2750-7 pH Electronics

General

Compatibility:

- Electrode: Signet 2724-00 Flat pH electrode
- Instrument: Signet 8630-3P Chlorine Transmitter

Mounting: DryLoc connection
Materials: PBT
Cable: 4.6 m (15 ft) 3 conductor shielded, 22 AWG

Performance

- Accuracy: ± 0.03 pH @ 25 °C
- Resolution: 0.02 pH
- Response Time (includes electrode response): < 6 s for 95% of change
- Range: 0.00 to 14.00 pH (8.2 when used with the 4630)
- Resolution: 0.02 pH

Electrical

Input Specifications:

- Input Impedance: $>10^{11}$ Ω
- Temperature Drift: ± 0.002 pH per ºC
- Input Resolution: 0.02 pH, 0.3 ºC

Output Specifications:

- Digital (S^3L): Serial ASCII, TTL level 9600 bps

Environmental

- Storage Temp.: -20 °C to 50 °C (-4 °F to 120 °F)
- Operating Temp. (Electronics Only): 0 °C to 85 °C (32 °F to 185 °F)
- Relative Humidity: 0 to 95%, non-condensing
- Enclosure: NEMA 4X/IP65 with electrode installed
- Shipping Weight: 0.64 kg (1.41 lb)

Standards and Approvals

- CE, WEEE
- RoHS Compliant
- Manufactured under ISO 9001 for Quality, ISO 14001 for Environmental Management and OHSAS 18001 for occupational health and safety.

China RoHS (Go to www.gfsignet.com for details)

Declaration of Conformity according to FCC Part 15
This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and,
(2) This device must accept any interference received, including interference that may cause undesired operation.

Specifications

2630-X Amperometric Free Chlorine Electrode
2632 Amperometric Chlorine Dioxide Electrode

General

Compatibility
- Flow Cells: Signet 3-4630.392
- Electronics: Signet 2650 Amperometric Electronics

Mounting: Signet DryLoc connection

Materials
- Housing: CPVC
- Membrane
  - Free Chlorine: PTFE
  - Chlorine Dioxide: PTFE
- O-ring: FKM
- Electrode: Gold-plated (working), Silver halide (counter-reference)

Wetted Materials: PVC, PTFE, FKM, Nylon, Silicone

Performance

Electrode
- Repeatability: ± 0.08 ppm (mg/L) or 3% of selected range whichever is less

Slope
- Free Chlorine: 15 to 85 nA/ppm (mg/L) @ 25 ºC
- Chlorine Dioxide: 40 to 200 nA/ppm (mg/L) @ 17 ºC
- Response time, T90: < 2 minutes

Sensor Conditioning
- 4 hours max. before calibration (new/first time start)
- 2 hours max. (subsequent start-ups)

System (including electronics and instrument)
- Accuracy: < ±3% of electrode signal after calibration
- Resolution: ≤ 0.5% of electrode range

Temp. Element: PT1000, Class B with measurement range of -50 ºC to 150 ºC (-58 ºF to 302 ºF) (measurement only, not operating specification)

Operational Ranges and Limits
- Free Chlorine: 3-2630-1: 0.02 to 2 ppm (mg/L)
  3-2630-2: 0.05 to 5 ppm (mg/L)
  3-2630-3: 0.1 to 20 ppm (mg/L)
- Free Chlorine pH: 5.5 to 8.5 pH
- Chlorine Dioxide: 3-2632-1: 0.02 to 2 ppm (mg/L)
- Chlorine Dioxide pH: 4.0 to 11.0 pH

Temperature: 0 °C to 45 °C (32 °F to 113 °F)

Maximum Pressure
- Membrane: 0.48 bar @ 25 °C (7 psi @ 77 °F)

Flow Velocity Across Membrane Surfac:
- Minimum: 15 cm/s (0.49 ft/s)
- Maximum: 30 cm/s (0.98 ft/s)

Cross Sensitivity
- Free Chlorine: ClO_2, ozone, bromine
- Chlorine Dioxide: FCl, ozone

Chemical Compatibility: < 50% ethanol/water < 50% glycerol/water

Environmental

Temperature
- Operating: 0 ºC to 45 ºC (32 ºF to 113 ºF)
- Storage (dry): -10 ºC to 60 ºC (-4 ºF to 140 ºF)

Relative Humidity: 0 to 95% indoor/outdoor non-condensing to rated ambient

Shipping Weight: 0.14 kg (0.30 lb)

Standards and Approvals

CE, WEEE
RoHS Compliant
Manufactured under ISO 9001 for Quality,
China RoHS (Go to www.gfsignet.com for details)
Declaration of Conformity according to FCC Part 15
This device complies with Part 15 of the FCC rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and,
(2) This device must accept any interference received, including interference that may cause undesired operation.

Specifications

2724 DryLoc pH Electrode

General

Compatibility: ..... Signet 2750 pH/ORP Sensor electronics

Process Connection ..... ¾ in. NPT or ISO 7/1 R¾ threads or Signet flow fittings

Wetted Materials ..... PPS, glass, UHMW PE, FKM

Performance

Efficiency ..... >97% @ 25 °C (77 °F)
Efficiency indicates the "wellness" of a new electrode. Efficiency is measured by comparing the actual slope (mV/pH) at 25 °C to the theoretical output of 59.16 mV/pH. An efficiency of 97% to 100% is equivalent to a slope of 57.39 to 59.16 mV/pH.

Range ..... Free Chlorine 5.5 to 8.5 pH
Chlorine dioxide 4.0 to 11 pH

Environmental

Pressure

Operating ..... -10 ºC to 65 °C (14 °F to 149°F), 0 to 6.9 bar (0 to 100 psi)
65 °C to 85 °C (149 °F to 185°F), Linearity derated 6.9 to 4.0 bar (100 to 58 psi)

Temperature

Storage ..... 0 °C to 50 °C (32 °F to 120 °F).
CAUTION: The electrode glass will be shattered if shipped or stored at temperatures below 0 °C (32 °F).
The performance life of the electrode will be shortened if stored at temperatures above 50 °C (120 °F).

Operating ..... -10 ºC to 85 ºC (14 ºF to 185 ºF)

Rel. Humidity ..... 0 to 95% indoor/outdoor non-condensing to rated ambient

Shipping Weight ..... 0.25 kg (0.55 lb)

Standards and Approvals

WEEE
RoHS Compliant
Manufactured under ISO 9001 for Quality, ISO 14001 for Environmental Management and OHSAS 18001 for occupational health and safety.
China RoHS (Go to www.gfsignet.com for details)

Ordering Information

463X Chlorine Analyzer

Mfr. Part No.	Code	Description
3-4630-10	159 001 748	Chlorine panel, transmitter, free chlorine sensor (0.02 to 2 ppm), w/ sensor electronics, no pH sensor
3-4630-11	159 001 749	Chlorine panel, transmitter, free chlorine sensor (0.02 to 2 ppm) w/ sensor electronics, pH sensor w/ electronics
3-4630-20	159 001 691	Chlorine panel, transmitter, free chlorine sensor (0.05 to 5 ppm) w/ sensor electronics, no pH sensor
3-4630-21	159 001 692	Chlorine panel, transmitter, free chlorine sensor (0.05 to 5 ppm) w/ sensor electronics, pH sensor w/ electronics
3-4630-30	159 001 750	Chlorine panel, transmitter, free chlorine sensor (0.01 to 20 ppm), w/ sensor electronics, no pH sensor
3-4630-31	159 001 751	Chlorine panel, transmitter, free chlorine sensor (0.01 to 20 ppm) w/ sensor electronics, pH sensor w/ electronics
3-4632-10	159 001 768	Chlorine panel, transmitter, chlorine dioxide sensor (0.02 to 2 ppm), with sensor electronics, no pH sensor
3-4632-11	159 001 769	Chlorine panel, transmitter, chlorine dioxide sensor (0.02 to 2 ppm), with sensor electronics, pH sensor w/ electronics
3-8630-3P	159 001 673	Panel mount chlorine and pH transmitter
3-2630-1	159 001 746	Free Chlorine electrode, 0.02 to 2 ppm (mg/L)
3-2630-2	159 001 662	Free Chlorine electrode, 0.05 to 5 ppm (mg/L)
3-2630-3	159 001 747	Free Chlorine electrode, 0.01 to 20 ppm (mg/L)
3-2632-1	159 001 767	Chlorine Dioxide electrode, 0.02 to 2 ppm (mg/L)
3-2724-00	159 001 545	Electrode, pH, flat, PT1000, ¾ in. NPT
3-2750-7	159 001 671	pH - Inline Electronics, Digital (S^3L), 4.6 m (15 ft) cable
3-2650-7	159 001 670	Chlorine - Inline Amperometric Electronics, Digital (S^3L), 4.6 m (15 ft) cable

Accessories and Replacement Parts

3-4630.390	159 001 688	Rebuild kit, O-rings, boots, screws, 1 filter screen
3-4630.391	159 001 689	Pressure regulator with 1 spare filter screen
3-4630.392	159 001 690	Acrylic flow cell complete with all components and connections
3-4630.393	159 310 162	Flow Switch Kit, PP
7300-0024	159 001 693	24 VDC Power Supply
3-2630.391	159 001 674	Free Chlorine electrolyte, 30 mL (2)
3-2632.391	159 310 160	Chlorine Dioxide electrolyte, 30 mL (2)
3-2630.394	159 310 164	Free Chlorine and Chlorine Dioxide Replacement PTFE membrane (1)
3-2630.398	159 310 166	Free Chlorine Sensor maintenance kit - (2) electrolyte, (2) PTFE membranes, (2) Silicone Bands, and Polishing Paper
3-2632.398	159 310 165	Chlorine Dioxide maintenance kit - (2) electrolyte, (2) PTFE membranes, (2) Silicone Bands, and Polishing Paper
1220-0021	159 801 182	O-ring FKM
3-0700.390	198 864 403	pH Buffer Kit (1 each 4, 7, 10 pH buffer in powder form, makes 50 mL of each)
3822-7004	159 001 581	pH 4.01 buffer solution, 1 pint (473 mL) bottle
3822-7007	159 001 582	pH 7.00 buffer solution, 1 pint (473 mL) bottle
3822-7010	159 001 583	pH 10.00 buffer solution, 1 pint (473 mL) bottle
3-2700.395	159 001 605	Calibration kit: included 3 polypropylene cups, box used as cup stand, 1 pint pH 4.01, 1 pint pH 7.00
3-2759	159 000 762	pH/ORP System Tester (adapter cable sold separately)
3-2759.391	159 000 764	2759 DryLoc Adapter Cable (for use with 2750 and 2760)

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For Worldwide Sales and Service, visit our website: www.gfsignet.com • Or call (in the U.S.): (800) 854-4090
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