

**WALCHEM**

An Iwaki America Company

Disinfection Sensors

# Disinfection Sensors Instruction Manual

Five Boynton Road Hopping Brook Park Holliston, MA 01746 USA

TEL: 508-429-1110 FAX: 508-429-7433 WEB: [www.walchem.com](http://www.walchem.com)

# Notice

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Five Boynton Road, Holliston, MA 01746 USA  
(508) 429-1110  
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# 1.0 Introduction

The Walchem disinfection sensors consist of an amperometric sensor assembly and a flow cell. Assembly of these parts is required, so please read these instructions carefully. The sensor is capable of measuring the disinfectant in clean water or in water contaminated with debris thanks to our unique flow cell design.

The WFCB, WFCBL, and WFCBH free chlorine/bromine sensor membrane is not compatible with water containing surfactants!

## Sensor

The sensor assembly includes the sensor body with 6 meters (20 feet) of cable, a replaceable membrane cap, a 100-ml bottle of electrolyte fill solution, and special abrasive paper. Make sure that all parts are included.

The oxidizer molecules diffuse through the membrane and in the acidic environment of the electrolyte fill solution, a redox reaction occurs at the electrodes in the sensor. The current generated by this reaction is converted to a robust voltage signal that is linear with the concentration of the oxidizer.

## Flow Cell

The flow cell consists of a translucent flow cell body, mounting nut and o-ring, washer set and o-ring. Make sure that all parts are included.

The flow cell is required to prevent bubble formation on the membrane and to provide proper flow velocity across the face of the membrane. The sensor will not read accurately if it is not installed in the flow cell, with a flow rate between 30 and 100 liters per hour, at an operating pressure of 1 atmosphere or less. The  $\frac{1}{4}$ " adapter must NOT be removed from the flow cell.

## 2.0 Installation

### Assembling the Sensor



**CAUTION:** Wear gloves and safety glasses during assembly of the sensor since the electrolyte is a **STRONG ACID**. It is recommended to perform this operation over a sink with running water available. After using, re-cap any remaining electrolyte and store the bottle upside-down until the next use.

### WFCB, WFCBL, and WFCBH Free Chlorine/Bromine Sensors

1. Clean just the **tip** of the working electrode with the special abrasive paper supplied. Avoid touching the electrodes! Place the special abrasive paper on top of a clean paper towel and rub the electrode tip over the abrasive paper, holding the electrode at a slight angle. Repeat several times at different angles. Never touch or clean the brown electrode shaft.
2. Remove the rubber band from the groove in the membrane cap just until the vent hole underneath is exposed, then fill the membrane cap to the top with the electrolyte fill solution. **Never shake the electrolyte bottle, it must stay free of bubbles!**
3. Hold the sensor body vertically with the tip pointing down and **SLOWLY** screw on the membrane cap until it is hand tight. **Be prepared for some electrolyte solution to squeeze out from the vent hole in the cap.**
4. Rinse your hands, the sensor, and all surfaces contaminated with electrolyte solution with running water. Check the sensor for leaks, especially at the membrane and the membrane cap threads. If any leaks are detected, tighten the membrane cap or replace it. Move the rubber band back into the groove. **Never remove the membrane cap with the rubber band covering the vent hole, or the membrane will be damaged!**
5. Push the cable onto the end of the sensor, aligning the pins with the holes. Turn the connector until hand tight to seal the cable connection.

## Other Sensors

1. Remove the black protective tube from the electrode tip, and clean just the **tip** of the working electrode with the special abrasive paper supplied. Avoid touching the electrodes! Place the special abrasive paper on top of a clean paper towel and rub the electrode tip over the abrasive paper, holding the electrode at a slight angle Repeat several times at different angles. Never touch or clean the brown electrode shaft.
2. Open the vial containing the membrane cap. Empty out the water. Make sure that only one grey rubber band is in the groove covering the vent hole in the membrane cap. Fill the membrane cap to the top with the electrolyte fill solution.
3. Hold the sensor body vertically with the tip pointing down and **SLOWLY** screw on the membrane cap until it is hand tight. **Be prepared for some electrolyte solution to squeeze out from the vent hole in the cap.**
4. Push the second grey band into the groove in the cap, making sure that the bands are smooth and flush.
5. Rinse your hands, the sensor, and all surfaces contaminated with electrolyte solution with running water. Check the sensor for leaks, especially at the membrane and the membrane cap threads. If any leaks are detected, tighten the membrane cap or replace it.
6. Push the cable onto the end of the sensor, aligning the pins with the holes. Turn the connector until hand tight to seal the cable connection.

## Flow Cell Placement

Instructions for mounting the sensor into the process can vary greatly with the circumstances that are encountered in your application. Here are some general guidelines to assist you. Refer also to the typical installation drawings.

**The sensor should be mounted such that the measuring surfaces will always stay wet.** If the membrane dries out, it will respond slowly to changing disinfectant values for 24 hours, and if dried out repeatedly, will fail prematurely. **If the sensor is left dry for longer than 24 hours, the membrane cap must be replaced!**

The flow cell should be placed on the discharge side of a circulation pump or downhill from a gravity feed. Flow into the cell must come from the bottom side that has the  $\frac{3}{4}$ " x  $\frac{1}{4}$ " NPT reducing bushing installed. **The reducing bushing provides the flow velocity required for accurate readings and must not be removed!**

A "U" trap should be installed so that if the flow stops, the sensor is still immersed in the water. The outlet of the flow cell must be plumbed to open atmosphere unless the system pressure is at or below 1 atmosphere. If the flow through the line cannot be stopped to allow for cleaning and calibration of the sensor, then it should be placed in a by-pass line with isolation valves to allow for sensor removal. Install the sensor vertically, with the measuring surface pointing down, at least 5 degrees above horizontal. (Refer to Installation drawings)

Flow rate regulation must be done upstream from the sensor, because any flow restriction downstream can increase the pressure above atmospheric and damage the membrane cap!

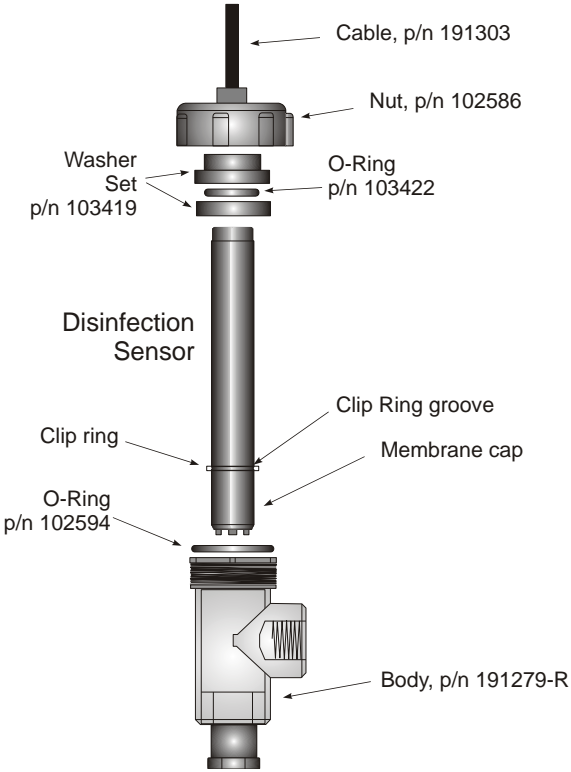
The sensor should be installed in an area where there is good solution movement and where it will respond rapidly to chemical additions. The placement of the sensor relative to the placement of chemical replenishment, along with the quality of the mixing, and the replenishment chemical flow rate are critical to accurate process control.

To avoid biological growth on the membrane, which can block measurement, never leave the sensor in water without oxidant for longer than 24 hours.

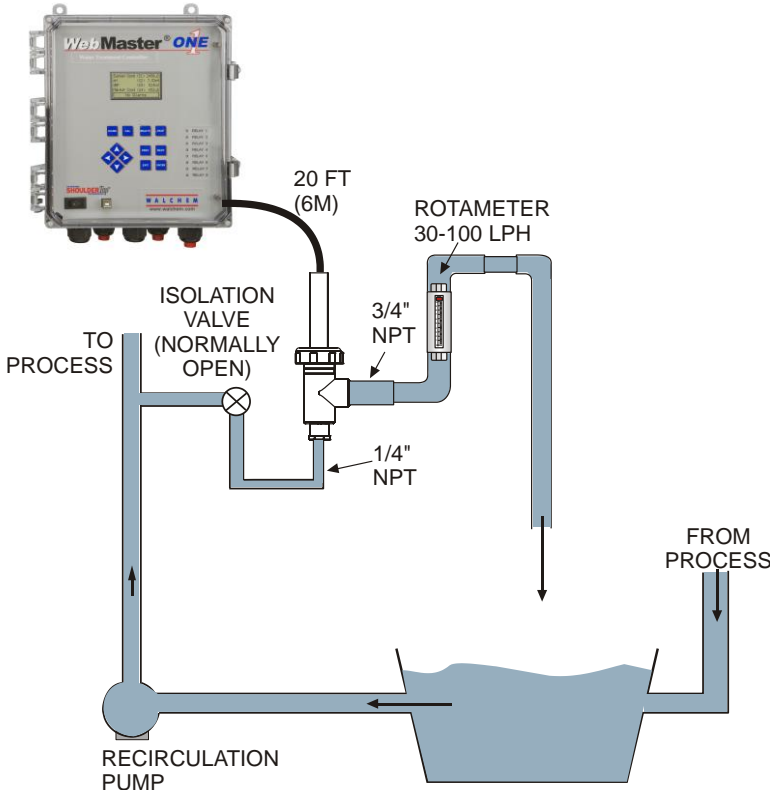
## **Installing Sensor into Flow Cell**

1. Assemble the flow cell as shown below from the top down. The reducer should already be installed in the flow cell body.
2. Slide the 103419-B bottom washer (concave side up) over the cable end of the sensor, followed by the 103422 o-ring, followed by the 103419-T top washer (concave side down), followed by the 102586 nut.
3. Place the 102594 o-ring in the top o-ring groove of the 191279-R flow cell body.
4. Place the sensor body into the flow cell body, and tighten the 102586 nut until it is hand-tight. Before tightening completely, pull the sensor up until the clip ring is up against the bottom washer.

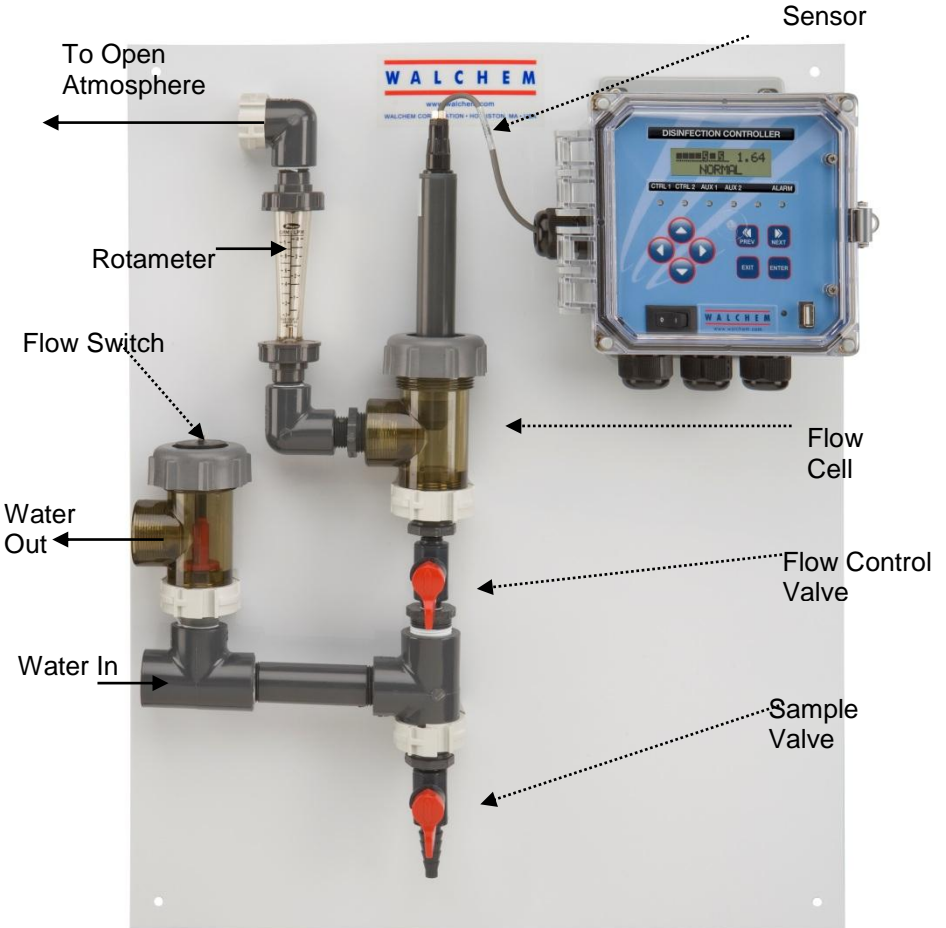
# Sensor Parts Exploded View



# Typical Installation



# Typical Installation Using Walchem Flow Switch Manifold



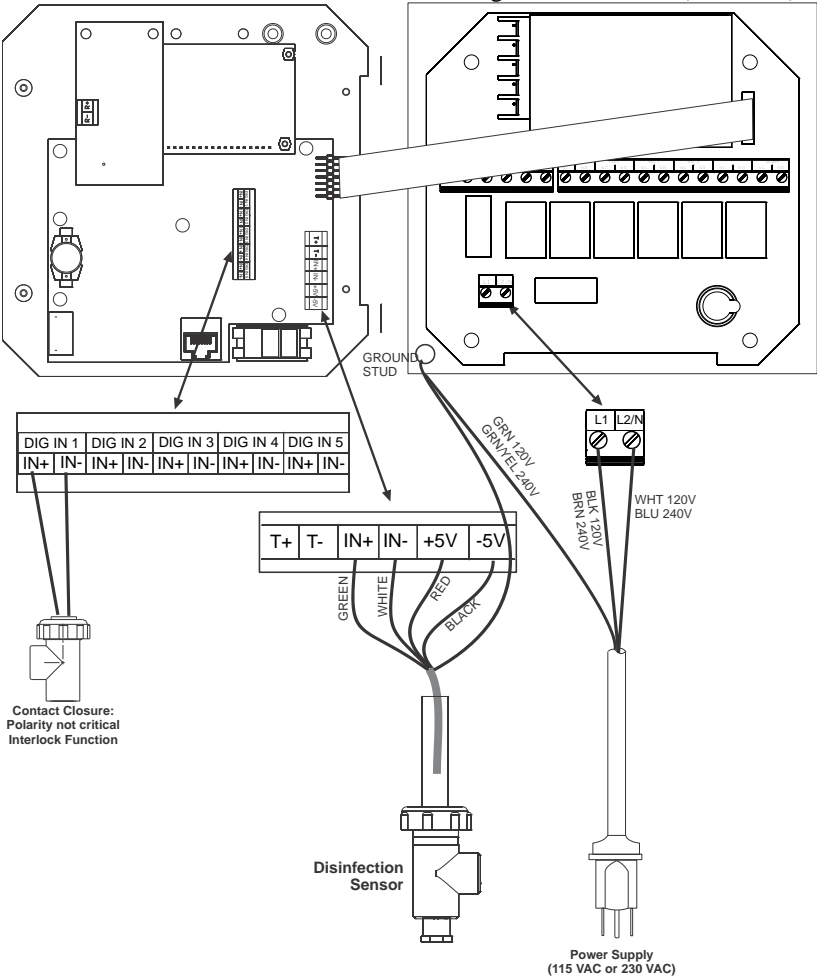


# WDIS410

The sensor is provided with a 2-twisted pair, shielded, 24 AWG, 35 pF/foot capacitance cable. The wiring to the controller is as follows:

<b>Shield Drain:</b>	<b>Earth Ground</b>
<b>GRN:</b>	<b>IN+</b>
<b>WHT:</b>	<b>IN-</b>
<b>RED:</b>	<b>+5 V</b>
<b>BLK:</b>	<b>- 5 V</b>

If the required cable length exceeds the 6 meters (20 feet) that is supplied, wire the housing to a 190851 terminal box, then use a p/n 100084 cable to reach the instrument. The maximum cable length is 305 meters (1000 feet).







## **The disinfectant reading is much higher than the manual analysis**

<b>Possible Causes</b>	<b>Corrective Actions</b>
Insufficient conditioning	Wait for the appropriate amount of time before attempting a calibration.
Faulty membrane	Replace membrane cap.
Faulty sensor	Replace sensor
Faulty analysis equipment or reagents	Consult test equipment instructions
Sample contaminated with interfering molecule (refer to Sensitivity specification in Section 6)	Remove source of contamination

## **Sensor Error**

This error message appears if the signal from the sensor is outside the range of -1400 to 1400 mVDC (WebMaster) or -2000 to 2000 (WDIS).

<b>Possible Causes</b>	<b>Corrective Actions</b>
Faulty wiring	Check wiring
Faulty sensor	Replace sensor
Faulty controller sensor input	Go to the Sensor Input menu and perform a self test. If this passes, then the problem is with the sensor or its wiring. If it fails, then disconnect the sensor from the circuit board and try the self test again. If it still fails, replace the circuit board.

## **Disinfectant Reading is Unstable**

<b>Possible Causes</b>	<b>Corrective Actions</b>
Air bubbles on membrane	Dislodge bubbles. Adjust flow rate higher if necessary.
Air bubbles in electrolyte	Refill membrane cap with electrolyte.
Faulty membrane	Replace membrane cap.
Faulty wiring	Check wiring
Faulty controller sensor input	Go to the Sensor Input menu and perform a self test. If this passes, then the problem is with the sensor or its wiring. If it fails, then disconnect the sensor from the circuit board and try the self test again. If it still fails, replace the circuit board.





4. Unpack the new membrane cap, taking care not to touch the membrane or get it dirty.
5. Fill the membrane cap to the top with the electrolyte fill solution.
6. Hold the sensor body vertically with the tip pointing down and SLOWLY screw on the membrane cap until it is hand tight. **Be prepared for some electrolyte solution to squeeze out from the cap.**
7. Rinse your hands, the sensor, and all surfaces contaminated with electrolyte solution with running water.
8. Check the sensor for leaks, especially at the membrane and the membrane cap threads. If any leaks are detected, tighten the membrane cap or replace it. Move the rubber band(s) back into the groove.

## Sensor Storage

The sensor may be stored for up to one month in the flow cell assuming that the membrane is always kept submerged in water.



For long term storage, up to 3 years, follow this procedure:

**CAUTION:** Wear gloves and safety glasses during assembly of the sensor since the electrolyte is a **STRONG ACID**. It is recommended to perform this operation over a sink with running water available. After using, re-cap any remaining electrolyte until the next use.

1. Hold the sensor vertically with the membrane facing down and carefully unscrew the membrane cap. Always move the gray bands to uncover the vent hole before removing the cap!
2. Rinse the electrolyte fill solution off the cap and electrodes with cold water.
3. Allow the parts to air dry.
4. Loosely screw the membrane cap back on and store the sensor in a clean dry place. The electrode tip must not touch the membrane.
5. The old membrane cap used to protect the sensor during storage must be discarded and replaced when the sensor is put back into service.







### *Hydrogen Peroxide*

<b>Range (Nominal)</b>	<b>Range (WDIS)</b>	<b>Range (WM1, WIND)</b>	<b>Resolution</b>
0-200 mg/l	0-167.5 mg/l	0-100 mg/l	0.1 mg/l
0-2,000 mg/l	0-1,675 mg/l	0-1000 mg/l	1 mg/l
0-20,000 mg/l	0-16,750 mg/l	0-10,000 mg/l	10 mg/l

<b>Sensitivity</b>	Chlorine (none may be present) PAA (none may be present) Ozone (none may be present)
<b>Sample Flow rate</b>	30 to 100 liters/hour (0.13 to 0.44 gal/min)
<b>pH Range</b>	2.0-11.0
<b>Conductivity Range</b>	50 to 10,000 µS/cm
<b>Response time</b>	5-10 min
<b>Conditioning time</b>	180 min

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FIVE BOYNTON ROAD  
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