

SD7000 Series Differential pH/ORP Electrode Instructions

Introduction

Congratulations on your purchase of your Sensorex SD7000 Series pH or ORP true differential electrode. Please follow instructions and tips to get the maximum life out of your electrode.

Electrode Care and Use Tips

1. The SD7000 Series pH and ORP electrodes are shipped with a cap containing a solution of pH 4 buffer and potassium chloride.

The cap should remain on the electrode until it is used. If the electrode is used infrequently the cap and its solution should be saved and the electrode stored in it. Store pH and ORP electrodes in pH 4 buffer if soaking solution is discarded.

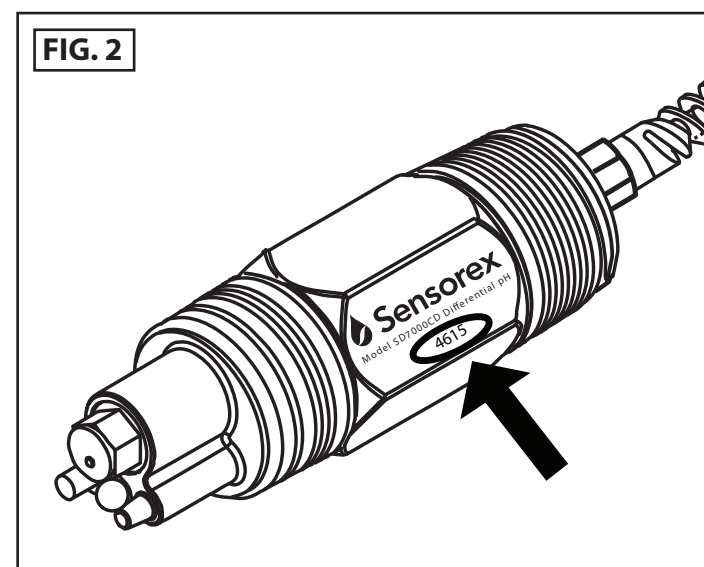
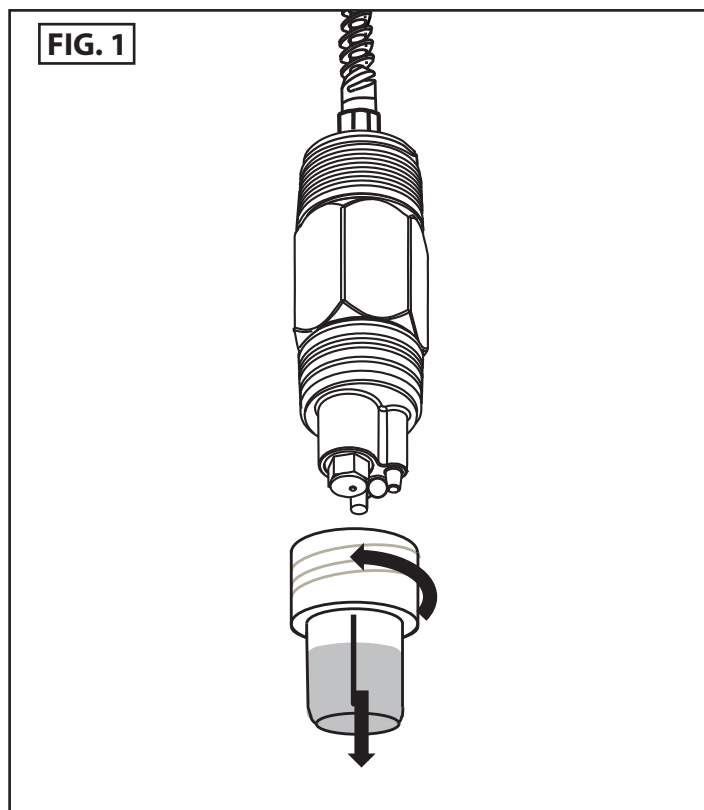
Before using the electrode remove the soaker cap as shown in FIG 1.

2. Sensorex true differential electrodes have a 2 year prorated warranty from the date etched in the electrode body as shown in FIG 2. Electrodes in inventory should be rotated so that the older electrodes are used first. The date code is stamped on each electrode by fiscal week and year (Example: 4613 = week 2 of November 2013).

3. After exposure to a sample, buffer or rinse solution, carryover can be minimized by blotting—never by wiping—the electrode with a clean non-abrasive paper or a clean cloth towel. *Do not use a brush on pH glass.*

4. As a rinse solution, measure and use a portion of the next sample or buffer. This action will minimize carryover contamination.

5. When calibrating pH electrodes, use a buffer close in value to that expected from the sample for one-point calibrations or as the second buffer for two-point calibrations (See below). This action will minimize span errors. ORP electrodes are typically not calibrated. However, a solution to verify electrode performance should be used periodically. 225mV solution, Zobell's solution (Part no. B225), is a good choice for single point verification.



6. Readings stabilize faster in some solutions than in others; allow time for the readings to stabilize. In general, new pH electrodes stable readings display in 10-15 seconds. ORP stability in samples can take much longer.
7. All pH electrodes age with time. Aging is characterized by shortened span and slower speed of response. Aging is best detected by the two-point calibration method. If the pH meter has manual or microprocessor slope (span) controls, the controls can be adjusted to compensate for electrode span errors (but will not affect the speed of response).
8. Salt bridge should be replaced when the electrode readings cannot be corrected by the meter's controls and/or when their speed of response is too slow for the application for which they are being used. The frequency of electrode replacement is a function of the application; electrodes operating in hot liquids at very high or very low pH values will have shorter lives than those operating at neutral pH and ambient temperature.
9. Coatings on an electrode's surface prevent new liquids from contacting an electrode's measuring surface and can mimic the effects of electrode aging. Before concluding that a salt bridge needs replacing, check the pH glass surface for coatings by removing the pH electrode cartridge and looking at the pH glass.
10. Temperature affects electrode readings in two ways. First, the output of an electrode varies with temperature. For pH electrodes this effect can be corrected by automatic temperature compensation (ORP/Redox readings are not corrected for temperature effects). Secondly, the real pH or ORP value, independent of the electrode measuring the value or use of the temperature compensation, is temperature dependent.

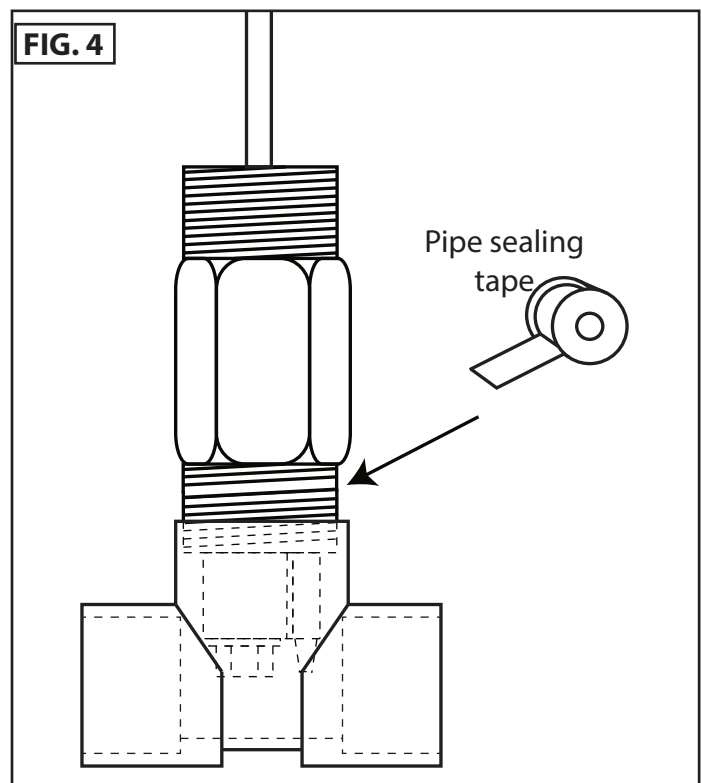
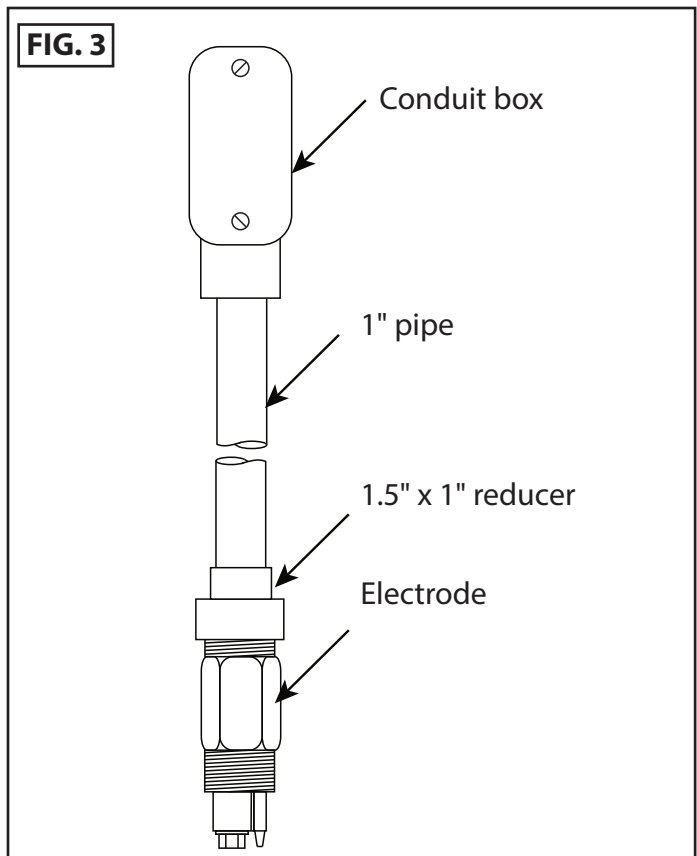
Mechanical Installation

Submersion Installation

Make a submersible conduit assembly using 1.5" F x 1" F reducer and 1" pipe. On top of the pipe, mount a junction box with a 2-sided terminal strip. Thread the electrode onto the reducer. Be sure to use sealing tape or paste. Attach the wires to one side of the terminal strip and an extension cable to the other. Match colors if using the same wires colors. See FIG 3.

In-Line Installation

Use pipe sealing tape or paste on the 1.5" threads near the pH glass and salt bridge. Thread into user-supplied SCH80 1.5" threaded tee. See FIG 4.



Salt Bridge Removal and Replacement

1. Remove the salt bridge using an adjustable wrench or pliers by turning counterclockwise. SEE FIG 5.
2. Pull up on salt bridge to remove. SEE FIG 6.
3. Flush out chamber with fresh standard cell buffer then refill with standard cell buffer (refill solution) to level shown in FIG. 7 (below top thread).
4. Install new salt bridge by turning clockwise on hex of salt bridge (OPPOSITE OF FIG5) DO NOT OVER-TIGHTEN. Make sure o-ring is properly seated. The salt bridge will be slightly below the body surface . See FIG. 6A.

Electrode Cleaning Tips:

Coating of an electrode's measuring surface can lead to erroneous readings including shortened span and slow response times. The type of coating determines the type of cleaning technique.

Soak the sensor in a mild soap solution for 2-3 minutes. Using a soft bristle brush, scrub the entire measuring end of the sensor, taking care not to scratch the glass measuring electrode. Rinse in clean, warm water. If the sensor is usually in a process above 7 pH, it is advisable to soak it 4 - 5 minutes in a weak acid solution (hydrochloric recommended). Place the sensor back in the soap solution for 2 - 3 minutes. Rinse it in clean warm water.

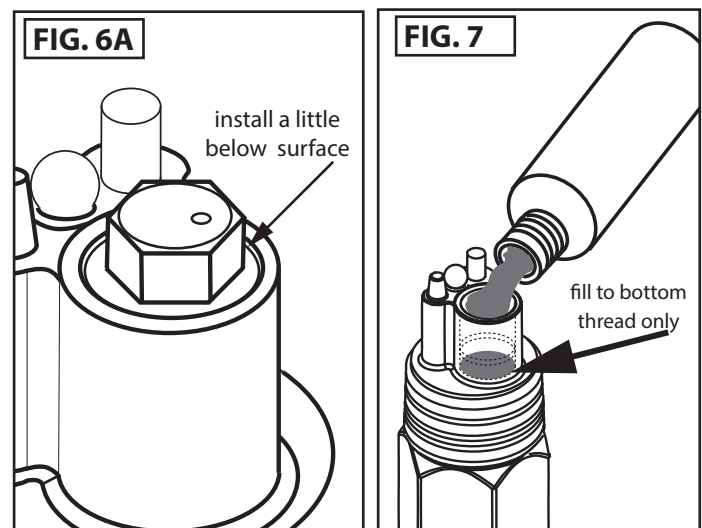
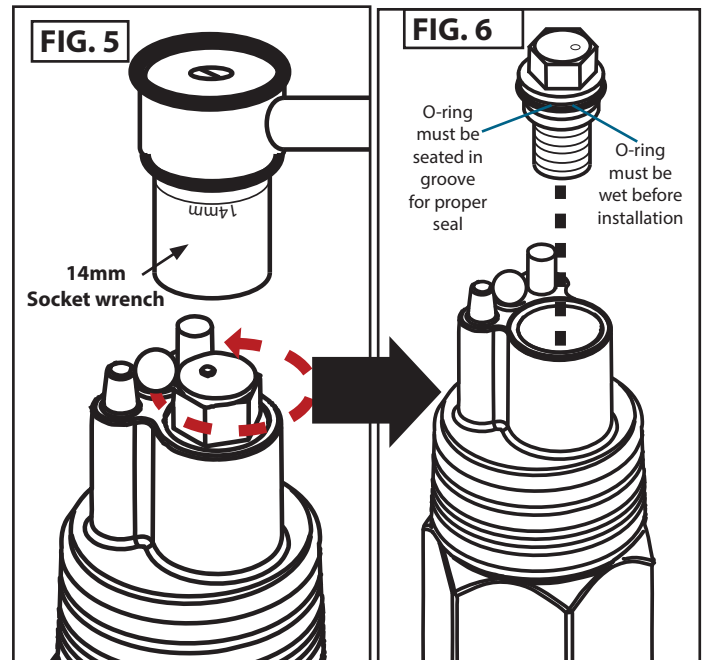
Hard Coatings should be chemically removed. The chemical used to remove the coating should be the least harsh chemical that dissolves the coating in one or two minutes and does not attack the electrode's materials of construction. For example, a calcium carbonate coating might be removed with 5% HCl (muriatic acid). **Do not keep electrode in acid for more than 5 minutes. Rinse with clean water after acid.**

Oily or Organic Coatings are best removed with detergents or an appropriate solvent that does not attack the electrode's materials of construction.

NOTE: When using chemicals or solvents, care should be taken and appropriate eye, face, hand, body and/or respiratory protection should be used.

Protein-based coatings are best removed with an enzyme-based cleaner such as TERG-A-ZYME (www.alconox.com).

Abrading or sanding a pH electrode's surface should never be done.



Electrode Calibration Guidelines:

As a rule, follow the procedures shown in the pH Meter's Instruction Manual. These procedures will vary depending on whether the meter is a simple type with manual adjustments, a micro-processor type or a pH transmitter.

The frequency of calibration is a function of many factors. These factors include:

- 1) The accuracy required by the application.
- 2) The value of the off-specification product versus the cost of calibration.
- 3) The coating or abrasive nature of the application.
- 4) The stability of the pH Electrode and pH Meter as a system.

The frequency of calibration is really determined by experience. At a new installation, calibration might initially be checked every few hours or shift with the calibration changes noted in a log. As a pattern of longer stability is found, the time between calibration checks can be increased to once a day or once a week.

System Calibration Concepts

The pH Electrode and the pH controller should always be calibrated as a system. Electronic calibration of a pH controller with a pH signal simulator checks the controller only and does not correct for imperfections of the pH electrode. Even if perfect when new, the performance of pH electrodes varies with time, usually in an unpredictable way. When changing electrodes or connecting an electrode to a different pH controller, re-calibration must be performed. ORP is usually not calibrated but quinhydrone based solution or other standards can be used to verify ORP sensor performance. See FIG. 9.

Two-Point Calibrations

Two-point calibrations correct for both the pH electrode's offset and span errors. Since both the offset and span vary with time the two-point method is the onr preferred. Choose buffer pH 7 for zero-point and a second buffer close to your normal operating range (usually pH4.01 or pH 10.00). See FIG. 8 A-C.

Grab Sample Calibrations

The Grab Sample Calibration method is used when it is difficult or undesirable to remove an electrode from a system. This method involves obtaining a sample of the liquid being measured and noting the meter's reading at that time. The sample's reading is obtained by use of a calibrated lab or portable meter and that reading is compared to that of the on-line meter. The on-line meter is adjusted by the difference between the readings. It is important to use the difference between the readings because the system's reading may have changed in the intervening time. It is important that the sample being measured by the lab meter be at the process temperature or erroneous results may occur.

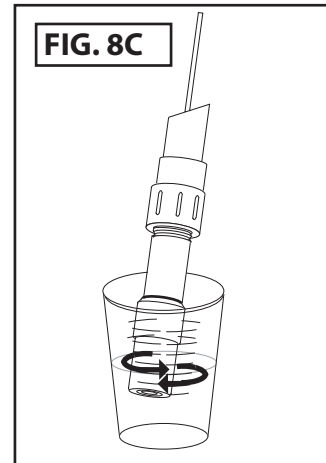
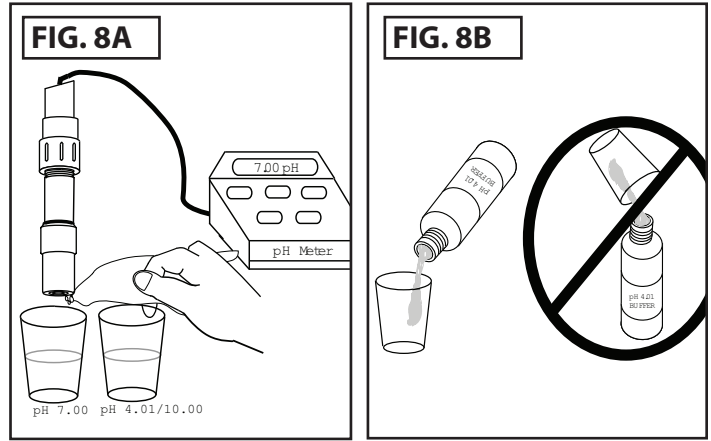


FIG. 9

PLATINUM ORP ELECTRODE IN 7 BUFFER/QUINHYDRONE MIXTURE

Temperature	20C (68F)	25C (77F)	30C (86F)
Readings (mV)	89-107	83-101	76-94
Readings (pH)	5.20-5.50	5.30-5.60	5.42-5.72

PLATINUM ORP ELECTRODE IN 4 BUFFER/QUINHYDRONE MIXTURE

Temperature	20C (68F)	25C (77F)	30C (86F)
Readings (mV)	260-287	254-281	247-274
Readings (pH)	2.15-2.60	2.25-2.70	2.37-2.82

Intermittent Operation

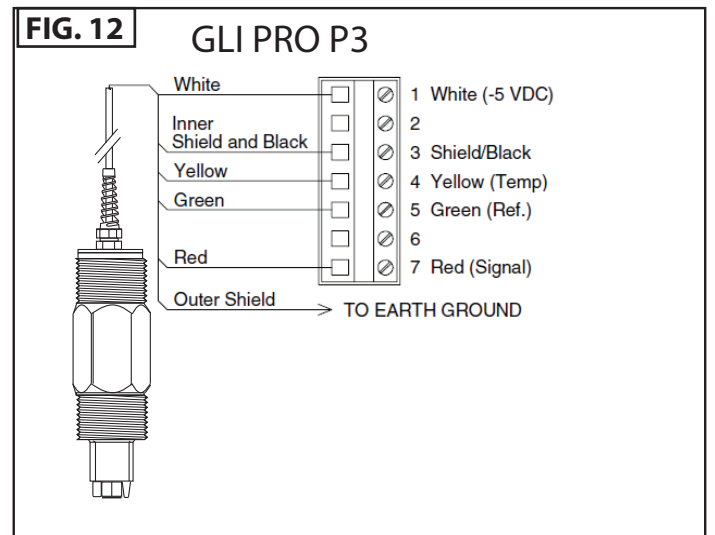
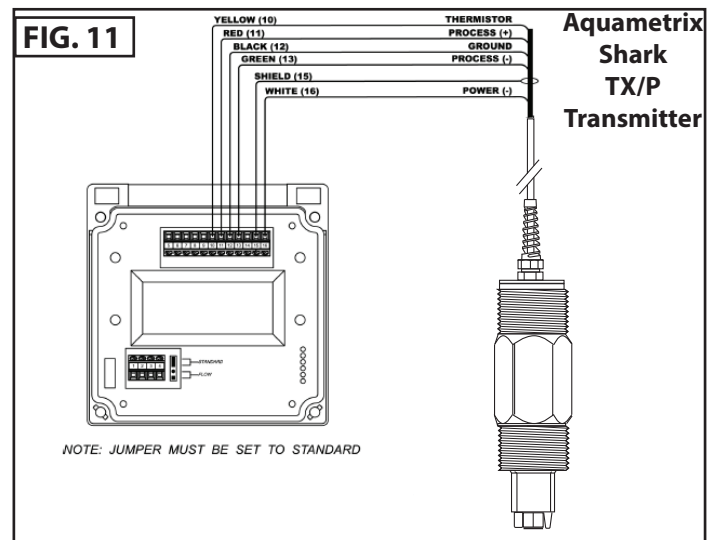
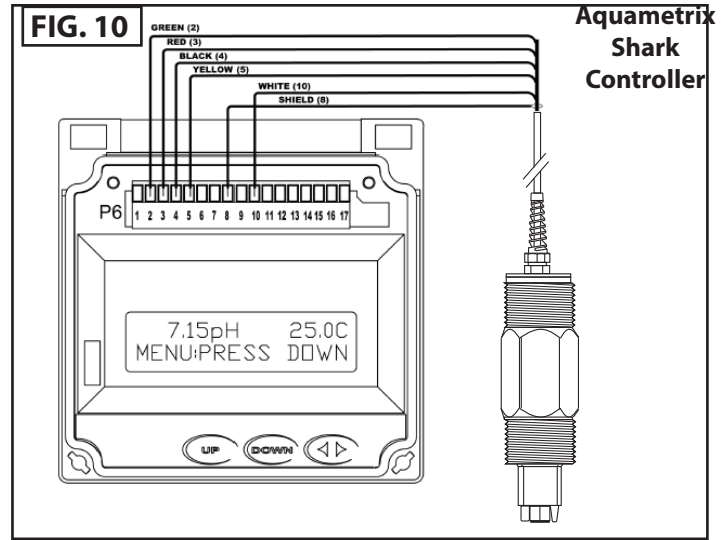
Some facilities are only operated part of the time. When out of operation, electrodes must not be allowed to be exposed to air and become dry. Electrodes should be removed from such systems and stored in their bottles or caps or in a beaker filled, preferably, with pH 4.0 Buffer. In some instances, power to the meter is shut off; this condition can be harmful to electrodes. Electrodes should be disconnected from un-powered meters.

Electrode Wiring

See the figures 10 through 17 to find wiring for your particular pH or ORP controller or transmitter. **Figures 10-17 apply to SD700CD and SD700CD-ORP sensors only.** If you don't see a wiring diagram for your make and model number of controller, please contact Sensorex Technical support at techsupport@sensorex.com or call 714-895-4344.

Figure 18 is wiring for the SD7420CD & SD7420CD-ORP sensors. These sensors are loop powered 4-20mA. 12-30V DC power is required (>24V DC is recommended).

Figure 19 is wiring for SD7500CD & SD7500CD-ORP sensors. **These sensors DO NOT REQUIRE POWER. Do not connect to power. These are self-powered.**



Troubleshooting Your SD7000 Series Electrode

General Troubleshooting

Always check all electrical connections. Make sure all parts are assembled correctly and o-rings are well greased.

Electrode Troubleshooting

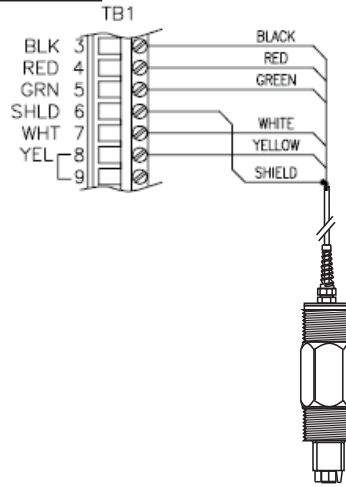
- Put the sensor in a pH 7 buffer solution and wait for the temperature of the sensor and buffer to reach room temperature.
- Disconnect the red, green, yellow and black sensor wires from the module (applies to SD7000CD, SD7000CD-ORP, SD7500CD, SD7500CD-ORP).
- Measure the resistance between the yellow and black wires to verify the operation of the temperature element. The resistance should be between 250 and 350 ohms at approximately 25 °C (SD7000CD only). For SD7500CD the resistance should measure about 1100 ohms at 25 °C. If the temperature element is good, reconnect the yellow and black wires to the module.
- Measure the DC mV with the multimeter (+) lead connected to the red wire and the (-) lead connected to the green wire. The reading should be between -50 and + 50 mV. If the reading is outside of these limits, clean the sensor and change the salt bridge and standard cell solution.
- With the multimeter still connected the same way, rinse the sensor with water and put it in a pH 4 or pH 10 buffer solution. Wait for the temperature of the sensor and buffer to reach room temperature.
- Compare the mV reading in the pH 4 or 10 buffer to the reading in the pH 7 buffer. The reading should differ by approximately 160 mV. If the difference is less than 160 mV, call technical support.
- The SD7420CD & SD7420CD-ORP sensors are loop-powered 4-20mA. In pH7 buffer the SD7420CD output should measure approximately 12mA. For SD7420CD-ORP, use B225 solutions. The reading should be approximately 8.9mA.

pH ELECTRODE TROUBLESHOOTING

Buffer reading	Possible Cause	Corrective Action
6.2-6.8 in all buffers	a) Cracked pH glass b) Stress crack	a) Replace electrode b) Contact Sensorex for Return Authorization
7.00 in all buffers	a) Bad connection b) Internal short circuit	a) Check/fix connection b) Contact Sensorex for Return Authorization
Buffers read close to expected value but speed of response* is slow (>30 seconds)	a) Dirty electrode pH glass and/or reference junction	a) Clean electrode
Short span*** (Less than 70%)	a) Dirty pH glass or reference junction b) Aged electrode	a) Clean pH glass or replace salt bridge b) Replace electrode (too old)
Unstable or drifting reading	Reference dirty or plugged	Clean pH glass or replace salt bridge

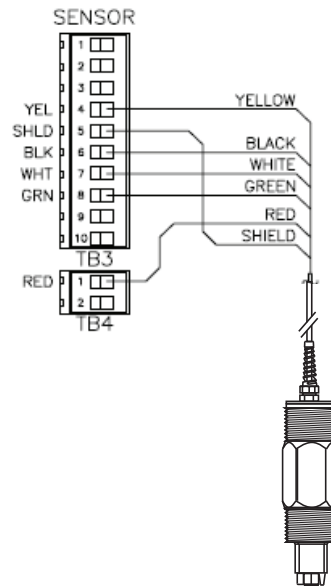
SEE CONTROLLER MANUAL

FIG. 13



GLI P63

FIG. 14



GLI P33

Product Specifications

Electrode Specifications:

SD7000CD, SD7000CD-ORP

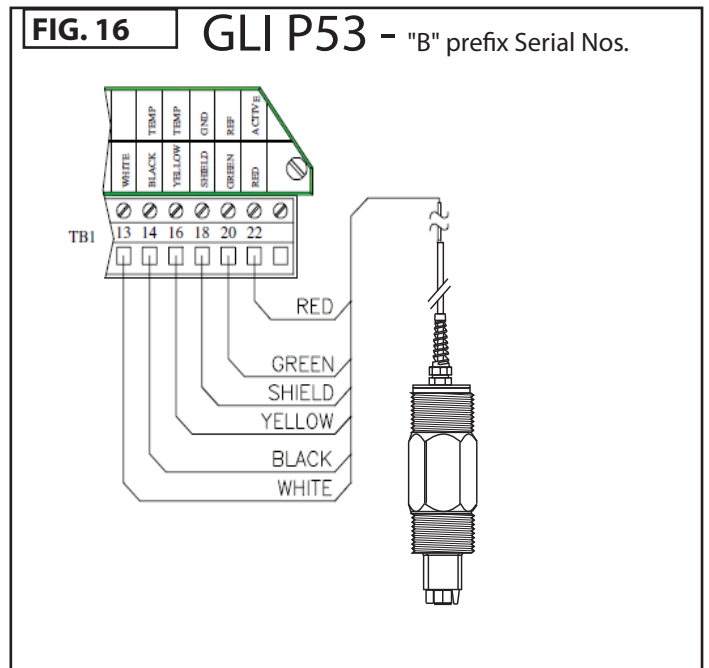
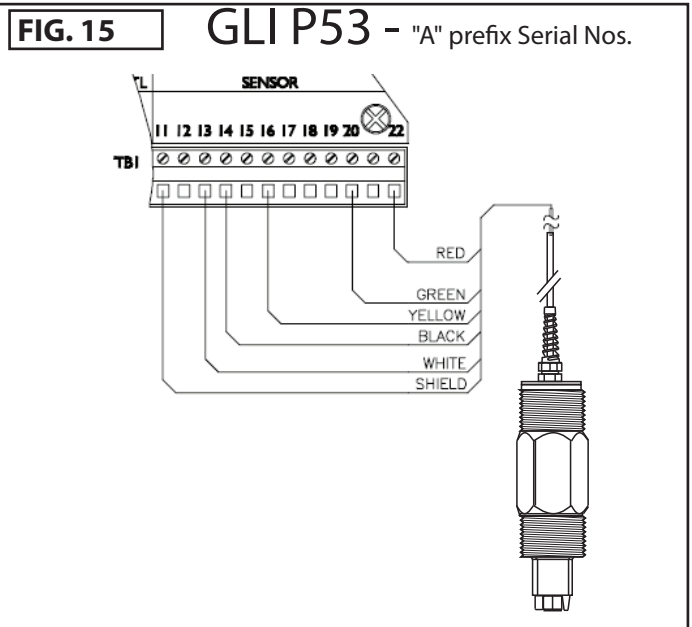
- pH Range: 0-14
- ORP Range: -2000 to + 2000mV
- Temp/Pressure: Min 32° F(0°C)/ Max 203° F/(95° C)
- Speed of Response: 95% in 5 seconds
- Wetted Materials: PPS (Body), PVDF(Salt bridge junction), pH glass (pH), Platinum (ORP), Titanium (ground pin), Viton (o-rings)
- Cable Length: 20ft
- Max flow Rate: 10ft./sec
- Max transmission distance: 3000ft (914m)

SD7500CD, SD7500CD-ORP

- pH Range: 0-14
- ORP Range: -2000 to + 2000mV
- Temp/Pressure: Min 32° F(0°C)/ Max 185° F/(85° C)
- Speed of Response: 95% in 5 seconds
- Wetted Materials: PPS (Body), PVDF(Salt bridge junction), pH glass (pH), Platinum (ORP), Titanium (ground pin), Viton (o-rings)
- Cable Length: 20ft
- Max flow Rate: 10ft./sec
- Max transmission distance: 3000ft (914m)

SD7420CD, SD742CD-ORP

- pH Range: 0-14pH = 4-20mA
- ORP Range: -2000 to + 2000mV = 4-20mA
- Temp/Pressure: Min 32° F(0°C)/ Max 185° F/(85° C)
- Speed of Response: 95% in 5 seconds
- Wetted Materials: PPS (Body), PVDF(Salt bridge junction), pH glass (pH), Platinum (ORP), Titanium (ground pin), Viton (o-rings)
- Cable Length: 20ft
- Max flow Rate: 10ft./sec
- Max transmission distance: 3000ft (914m)
- Power Supply: 12 to 30V DC (>24V DC recommended)



LIMITED WARRANTY

The SD7000, SD7500 and SD7420 sensors are all warranted to be free of defects in materials and workmanship for 2 years from date marked on the product. Any sensor that is deemed to have a workmanship defect within 1 year of the manufacture date stamped on the product (WWYY code) will be replaced free of charge. Products beyond 1 year date code will have a prorated warranty cost for replacement. Contact your supplier for details. There are no offers of warranty, either expressed or implied, as to the useful life of these products. There are no implied warranties of merchantability or fitness for a particular purpose given in connection with the sale of any goods. In no event shall the supplier of the sensor be liable for consequential, incidental or special damages. The buyer's sole and exclusive remedy and the limit of the supplier's liability for any loss whatsoever shall not exceed the purchase price paid by the purchaser for the product to which claim is made.

Ordering Information

Part Number	Description
SD7000CD	Differential pH sensor with replaceable salt bridge, 20ft cable, tinned leads, 1.5" NPT mounting. Replacement salt bridges sold separately.
SD7000CD-ORP	Differential ORP sensor with replaceable salt bridge, 20ft cable, tinned leads, 1.5" NPT mounting. Replacement salt bridges sold separately.
SD7420CD	Differential pH sensor with replaceable salt bridge, 20ft cable, tinned leads, 1.5" NPT mounting, 4-20mA loop-powered. Replacement salt bridges sold separately.
SD7420CD-ORP	Differential ORP sensor with replaceable salt bridge, 20ft cable, tinned leads, 1.5" NPT mounting, 4-20mA loop-powered. Replacement salt bridges sold separately.
SD7500CD	Differential pH sensor with replaceable salt bridge, 20ft cable, tinned leads, 1.5" NPT mounting, self-powered. Replacement salt bridges sold separately.
SD7500CD-ORP	Differential ORP sensor with replaceable salt bridge, 20ft cable, tinned leads, 1.5" NPT mounting, self-powered. Replacement salt bridges sold separately.
SDA-7001	Replacement salt bridge quantity 1 each for pH and ORP differential sensors
SDA-7003	Replacement salt bridge quantity 3 each for pH and ORP differential sensors
SDA-7010	Replacement salt bridge quantity 10 each for pH and ORP differential sensors
SDS-7015	Standard Refill solution for PH and ORP differential sensors, 150mL
SDS-7025	Standard Refill solution for PH and ORP differential sensors, 250mL
SDS-7050	Standard Refill solution for SD7000 Series sensors, 500mL

