



# HYDROGUARD HG-DOx Water Quality Analyzer



# User Manual

Version 5.3

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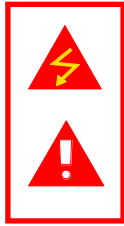
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# 1 General Safety Precautions



This section presents important information intended to ensure safe and effective use of this product.

Read the following carefully before handling the product. These warnings and cautions must be followed carefully to avoid injury to yourself or damage to equipment.

Warning: Only properly trained and licensed electricians should attempt to wire or service the electronic components of the analyzer/controller.

Attention! Seuls des électriciens qualifiés ayant reçu la formation adéquate peuvent entreprendre le branchement, l'entretien ou la réparation des composants électroniques de l'analyseur/du contrôleur.

There is an Electrical Shock Hazard when servicing this system.

Il existe un risque de choc électrique lors de l'entretien de ce système.

Always verify that all electrical power source(s) are off before opening the analyzer/controller unit or attempting to service electronic components or wiring.

Ayez soin de toujours vérifier que la ou les source(s) d'alimentation électrique est ou sont bien déconnectée(s) avant d'ouvrir l'unité ou d'entreprendre toute opération de service technique et tout branchement des composants électroniques.

Caution: Extreme caution should be used when installing, operating, and maintaining the HYDROGUARD® Analyzer. Only properly trained technicians are authorized to install and maintain the analyzer/controller.

Attention! Il y a lieu d'agir avec une extrême prudence lors de l'installation, de la mise en œuvre et de la maintenance l'HYDROGUARD®. Seuls des techniciens dûment formés à cet effet sont autorisés à effectuer l'installation et la maintenance de l'analyseur/du contrôleur.

Only properly trained and licensed operators should attempt to make any changes to chemical dosing levels.

Seuls des opérateurs qualifiés ayant reçu la formation adéquate sont habilités à modifier les dosages des produits chimiques utilisés.

Always follow local health and safety regulations when performing any service on the analyzer/controller unit or when changing chemical dosing settings.

Conformez-vous sans exception aux consignes locales de santé et de sécurité lorsque vous effectuez toute opération technique sur l'analyseur/le contrôleur, ou lorsque vous modifiez les paramètres de dosages chimiques.

The main power supply may be connected to either 110-120 or 220-240VAC 50/60Hz. Switching between voltages is accomplished by changing two (2) jumpers located above the main power connection, to the left of the transformer. For 110-120VAC, a 1amp fuse should be use; for 220-240VAC, a 0.5amp fuse should be used. These changes must be completed prior to wiring.

L'alimentation générale peut être branchée sur 110-120 ou sur 220-240VAC 50/60Hz. Pour basculer d'une tension à l'autre, il suffit de changer les deux (2) cavaliers situés au-dessus de la principale connexion électrique, à gauche du transformateur. Une tension à 110-120VAC requiert un fusible de 1 Amp. ; une tension à 220-240VAC requiert un fusible de 0,5 Amp. Ces modifications doivent être accomplies avant le branchement électrique.

Caution: Before connecting to a power source, confirm that both jumpers are located on the correct voltage and that the appropriate fuse is in place.

Précautions! Avant de relier l'appareil à une quelconque alimentation électrique, vérifiez que les deux cavaliers sont situés sur les valeurs correctes de tension et que c'est le bon fusible qui est en place.

Each relay connection is limited to 4 amps, to prevent overheating. The relays may show a higher rating but do not connect equipment exceeding 4 amps.

All electrical connections should comply with National Electrical Code (NEC) and all local regulations.

Caution: Do not use chemicals that reduce the surface tension. When using hydrochloric acid, observe all safety regulations.

Electrodes:

Warning: Do not swallow the electrolyte. Avoid electrolyte contact with skin or eyes. In case of accidental contact, wash with a lot of cold water! In case of eye inflammation, contact a doctor immediately. Wear safety glasses and gloves when working with the electrolyte solution.

Caution: Do not touch or damage the electrodes. The electrolyte is sensitive to oxidation: Always keep the electrolyte bottle closed after use. Do not transfer the electrolyte to other containers. The electrolyte should not be stored for more than one year and should be clear (not yellow) in appearance (for use by date, see label). Avoid forming air bubbles when pouring the electrolyte into the measuring chamber.

Caution: HYDROGUARD's control board unit should not be opened except for initial installation and troubleshooting, and should only be opened by a trained and approved technician.

Chaque connexion relais est limitée à 4 Amp. afin d'éviter toute surchauffe. Même si les relais affichent éventuellement une valeur supérieure, ils ne se connecteront pas à un élément dépassant 4 Amp.

Tous les branchements électriques doivent être conformes au Code Electrique National (NEC – *National Electrical Code*) ainsi qu'à toutes les consignes locales.

Attention! N'utilisez pas de produits chimiques susceptibles de réduire la tension superficielle. Lors de l'utilisation d'acide chlorhydrique, appliquez scrupuleusement toutes les consignes pertinentes.

Les électrodes:

Attention! N'avalez pas de substance électrolyte. Evitez tout contact de l'électrolyte avec la peau ou les yeux. En cas de contact accidentel avec cette substance, rincez abondamment à l'eau froide! En cas d'inflammation oculaire, consultez immédiatement un médecin. Portez des lunettes et des gants de protection lors de la manipulation de la solution électrolyte.

Attention! Ne touchez pas ni n'abîmez les électrodes. L'électrolyte est sensible à l'oxydation. Maintenez la bouteille contenant l'électrolyte toujours fermée après utilisation. Ne transvasez pas l'électrolyte dans d'autres récipients. L'électrolyte ne doit pas être conservé plus d'un an et doit garder une apparence claire (pas jaunâtre) (pour la période d'utilisation, voir l'étiquette). Evitez la formation de bulles d'air en versant la solution électrolyte dans le compartiment de dosage.

Attention! Le tableau de commandes de l'HYDROGUARD ne doit en aucun cas être ouvert si ce n'est lors de l'installation initiale et en cas de dépannage – auquel cas son ouverture ne doit être effectuée que par un technicien ayant reçu la formation adéquate et dûment habilité.

## 2 Preface

### 2.1 Measurements and Features

The HYDROGUARD HG-DOx can be configured to measure any combination of the following water quality parameters.

Dissolved oxygen (Dox)  
Dissolved oxygen (Dox) + pH  
Dissolved oxygen (Dox) + ORP  
Dissolved oxygen (Dox) + pH + ORP

Several communication options are also available:

- Internal 4 to 20 mA Outputs (up to 6 channels programmable)
- HydroSoft - Direct Connection Software
- WaterGuard OL – Wireless Communication Package

### 2.2 System Components

The unit includes HG 602 main platform. Electrode and cable  
All the additional partS in the drawing are optional and could be purchase separately



## 3 Installation

### 3.1 Working Environment

**Pollution Degree:** 2

**Installation Category:** 2

**Altitude:** 2,000 m

**Humidity:** 1 to 90% non-condensing

**Electrical Supply:** 100-115Vac, 1.0A or 200-230Vac, 0.5A, 50/60Hz

**Temperature:** 5°C to 45°C

### 3.2 Electrical Requirements and Installation

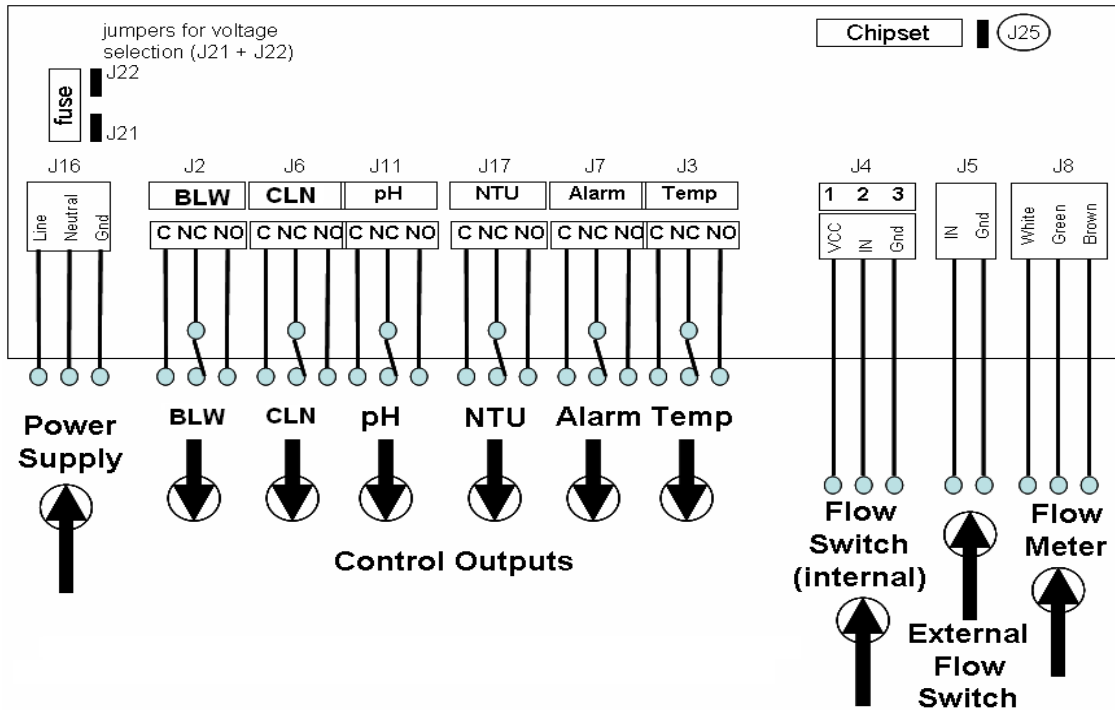
HYDROGUARD requires a 90-120 or 190-240 VAC, 50/60 Hz electrical power source. The main HYDROGUARD power supply should be connected to a non-dependent power supply, so that the unit remains powered constantly. Any relays used to directly activate equipment should be powered by a dependent power supply (interlocked power supply).

#### 3.2.1 Connecting the Main Electrical Power

The Main Power Supply may be connected to either 90-120 or 190-240VAC 50/60Hz. Switching between voltages is accomplished by changing two (2) jumpers located above the main power connection, to the left of the transformer. For 90-120VAC, a 1amp fuse should be use; for 190-240VAC, a 0.5amp fuse should be used. These changes must be completed prior to wiring.

**Caution:** Before making a connection to a power source, confirm that both the J21 and J22 jumpers are located on the correct voltage and that the appropriate fuse is in place (1.0A for 110V and 0.5A for 220V).

- 1) Verify that the power switch or circuit breaker to the non-dependent power source is off.
- 2) Connect the line (live) wire to the I/O board connector marked Line.
- 3) Connect the neutral wire to the I/O board connector marked Neutral.
- 4) Connect the earth wire to the I/O Module connector marked Ground.
- 5) Continue with the other electrical connections.
- 6) Turn on electrical power only after all electrical connections have been completed.



### 3.2.2 Input Switches

Flow input switch terminal blocks on the I/O module allow for three optional input switches to be connected to the system to ensure that there is flow in the system and/or to the analyzer.

Two flow switches and one flow meter may be connected:

- Flow Switch (internal): Flow switch connected to flow cell.
  - If no flow switch is installed, a jumper must be installed for the analyzer to operate properly.
- External Flow Switch ("external off"): Connection for external 2-wire flow switch. If an external switch is not connected, a jumper must be installed for the analyzer to operate properly.
- Flow Meter: Connection for 2 or 3 wire flow meter where:
  - White = VCC
  - Green = IN
  - Brown = Ground

**Note:** Electrical connections in this section are ONLY recommendations. All electrical connections should comply with National Electrical Code (NEC) and all local regulations.

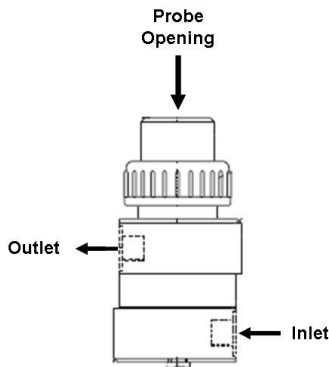


### 3.3 Relays

Relay 1 (J2) will activate a blower or other air system based on the DO set-point.

Relay 2 (J6) will active the automatic cleaning cycle.

### 3.4 Installing Probes



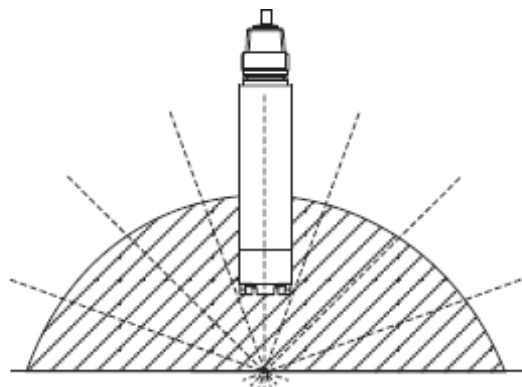
#### 3.4.1 Dissolved Oxygen Probe

The Dissolved Oxygen (DO) probe is supplied from the factory with the following components:

- DO Probe with 7m (21 ft) of cable
- Flow Assembly (optional)
- Replacement Membranes
- Abrasive Paper

#### Installation Using Flow Cell (optional)

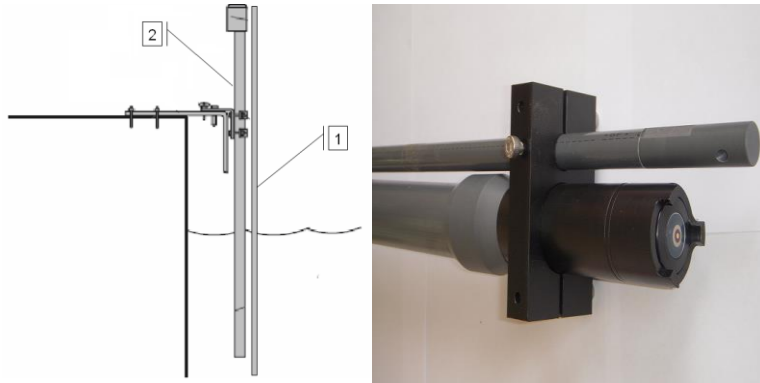
1. Mount the DO flow assembly such that the probe opening is facing between horizontal and vertical up; never facing down. (see diagram)
2. Thread the Probe into the opening of the flow cell.
3. Connect the Inlet and Outlet Flow to the Flow Assembly
  - a) Connect the Inlet to the Bottom  $\frac{3}{4}$ " fitting
  - b) Connect the Outlet to the Top  $\frac{3}{4}$ " fitting
  - c) Max Pressure = 10 bar (150 psi)
  - d) Min Flow Rate = 30 L/hr (0.13 GPM)



#### Installation without Flow Cell (immersion in water)

1. Mount the piping and auto cleaning assembly as describe in separated manual ("immersion assembly manual")
2. Secure the immersion assembly with mounting bracket (2 in figure A) station

3. Submerge the probe into the sample ambient and secure the probe or probe cable to keep the probe in the desired location with the probe facing down. Make sure the cleaning assembly as describe below photo
4. Immersion in water should be 40-100 cm below surface to ensure correct reading

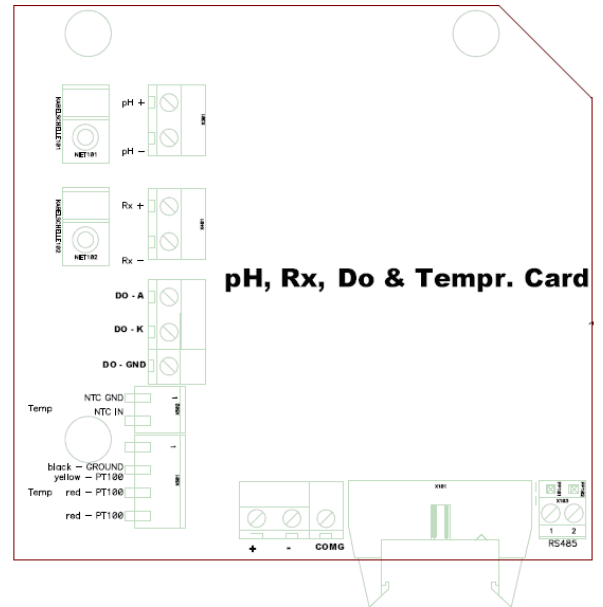


**Figure A**

- Connect the auto cleaning assembly to clean water supply (1 in figure A)
- Use an electric valve to activate the auto-cleaning. Command for cleaning is used by relay 2 (J6 on the I/O board)
- Set in the cleaning interval in the main menu

## Probe Wiring

- 7) Route the DO cable through an open gland in the bottom of the electronics enclosure.
- 8) The cable may be extended up to 100m (330 ft) with appropriate cables and connectors (contact your Blue I Technologies representative for more details)
- 9) Connect the Probe Cable to the DO electronics card:
  - Green Wire = CL-A
  - White (thin) Wire = CL-K
  - Gray (thick) Wire = CL GND
  - Brown Wire = NTC GND
  - Red Wire = NTC IN



## pH

The pH sensor is emerged with the same immersion assembly

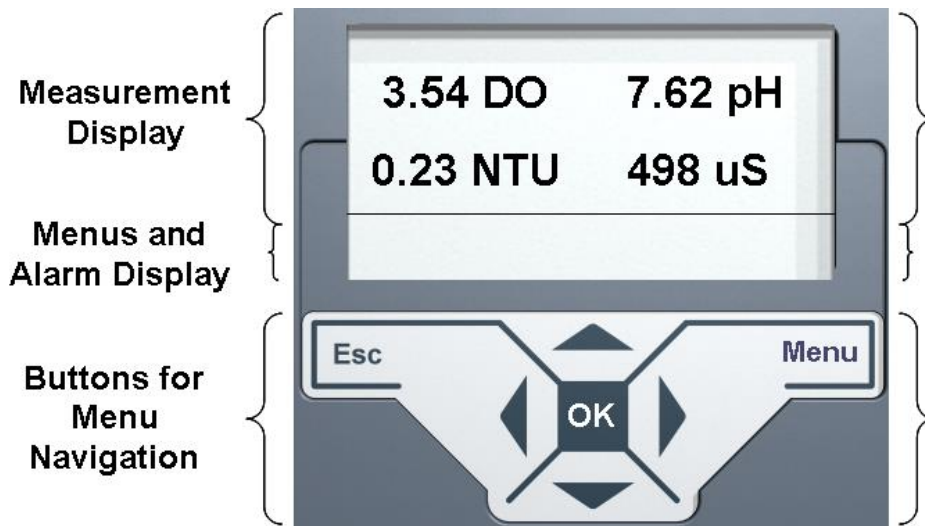
### Probe wiring

1. Route the pH cable through an open gland in the bottom of the electronics enclosure.
2. Connect the Probe Cable to the pH electronics card at pH(+) and pH(-) which is the shield

## 4 First Time Operation and Calibration

### 4.1 Menus and Settings

HYDROGUARD has two menu levels: Operator and Technician. The Operator menu includes settings that may be controlled by on-site operators. The Technician menu includes settings and calibrations that should be restricted to specially trained HYDROGUARD maintenance technicians. Each menu has a separate password. The technician level password may be used whenever a password is required, however the operator password will only be accepted in the operator menu.



**Note:** The default Operator Password is: 123 and the default Technician Password is: 456.

**Caution:** DO NOT Forget your password! There is no way to reset the technician password without a complete reprogramming of the HYDROGUARD System.

Each of the parameters in the operator menu is configured in the same way. The following procedure describes how to configure a typical setting:

- 1) Locate the desired parameter in the menu:
  - a) Press Menu until the desired parameter name appears in the LCD display.
- 2) Press OK. Enter Password 100 appears in the LCD display.
- 3) Enter the Operator password (or technician password; both are accepted)
- 4) Press the up arrow or down arrow until the password number is reached.

Holding Menu while pressing up or down will advance the first digit. Holding up or down for an extended period of time will proceed through the numbers more quickly.

- 5) Press OK to accept the password. The parameter name and current setting appear in the LCD display.
- 6) Press OK, again. The LCD display shows the parameter and the current setting.
- 7) Enter the new parameter setting:
  - b) Press the up arrow or down arrow until the desired value is reached.
  - c) The second row of the menu display, below the value that is being changed, shows the current value.
- 8) Press OK to save the new setting or Esc to abort without saving the new setting.

To change the settings of additional parameters, press Menu until the desired parameter appears in the LCD display and repeat steps 6-8 above to set the new parameter. The table on the right outlines an example of menu settings.

Menu	Value
Low DO Alarm	0.50
High DO Alarm	15.00
Low pH	6.5
High pH	8.5
Low Temp	20
High Temp	30

### To enter the Technician Menu

- 1) Press Menu to enter the operator menu then press UP + DOWN together until the display changes to menu # 51.
- 2) Navigate the menus exactly the same as the operator menus, but the technician password is the only password accepted.

## 4.2 Configuring Internal 4-20mA Outputs

The menu for internal 4-20mA settings is found in the technician menu.

Setting the 4-20mA outputs:

- 1) Enter the technician menu and scroll until "4-20 Settings" appears in the LCD
- 2) Enter the technician password and press OK.
- 3) Select the Output Channel (1 to 2 Built-In or 1 to 4 on NTU/4-20 card)
- 4) Select the output Parameter (DO, pH, etc.)
- 5) Select the Value for 4mA Output
- 6) Select the Value for 20mA Output
- 7) Test the output (with multi-meter set on mA) using the test output settings will help adjusting the external unit (PLC)
- 8) Repeat the above steps for the remaining outputs. The table on the right outlines some example settings. Note that a single variable may be the output of more than one channel.
- 9) Set the 4-20mA alarm output
  - a) 2mA, 4mA, 20mA, or hold last value

Channel	Variable	Min Value	Max Value
1	DO	0	10.0
2	DO	0	5.5
3	pH	4	10.0
4	Temp	0	50.0

The 4-20 alarm output is the output value that will be sent in case of a problem with the HYDROGUARD that does not have flow or cannot perform a test (e.g. stuck piston or unclean cell). In case of low or high level (i.e. low chlorine), no 4-20mA alarm will be activated.

## 5 Calibration

### 5.1 DO Calibration

The oxygen calibration has 2 options: air calibration and reference calibration. The air calibration is a direct calibration of the DO sensor and the reference calibration is a comparative calibration method.

#### 5.1.1 Air Calibration

1. Remove the sensor from the flow cell or water sample
2. Clean the sensor body with a damp cloth and dry the membrane with a soft dry cloth
3. If the membrane was under pressure (greater than atmospheric pressure), you must equilibrate the pressure before calibrating:
  - a. Remove the membrane cap
  - b. Refill the electrolyte solution and replace the membrane cap
  - c. Wait for the probe to re-polarize (< 60 minutes)
4. Wait approximately 40 minutes for the probe to adjust to the ambient air temperature and the measured value to stabilize. (make sure to keep the probe away from direct sunlight)
5. Determine the Calibrate to Value using the following Formula:

*Calibrate \_to \_Value* =  $S \times K \times L \times M$  , where:

S = Saturation Value (see Table)

K = Altitude Factor (see Table)

L = Relative Air Pressure at Calibration in hPA  
(use 1013 hPa if unknown)

M = 1.02 in air or 1.00 in air-saturated water

Temp		S factor	Temp		S factor
°C	°F	(mg/l)	°C	°F	(mg/l)
0	32	14.64	21	70	8.90
1	34	14.23	22	72	8.73
2	36	13.83	23	73	8.57
3	37	13.45	24	75	8.41
4	39	13.09	25	77	8.25
5	41	12.75	26	79	8.11
6	43	12.42	27	81	7.96
7	45	12.11	28	82	7.82
8	46	11.81	29	84	7.69
9	48	11.53	30	86	7.55
10	50	11.25	31	88	7.42
11	52	10.99	32	90	7.30
12	54	10.75	33	91	7.18
13	55	10.51	34	93	7.06
14	57	10.28	35	95	6.94
15	59	10.06	36	97	6.83
16	61	9.85	37	99	6.72
17	63	9.64	38	100	6.61
18	64	9.45	39	102	6.51
19	66	9.26	40	104	6.41
20	68	9.08	---	---	---

Altitude		K-factor
m	ft	--
0	0	1.000
50	164	0.994
100	328	0.988
150	492	0.982
200	656	0.977
250	820	0.971
300	984	0.966
350	1148	0.960
400	1312	0.954
450	1476	0.949
500	1640	0.943
550	1804	0.938
600	1969	0.932
650	2133	0.927
700	2297	0.922
750	2461	0.916
800	2625	0.911
850	2789	0.905
900	2953	0.900
950	3117	0.895
1000	3281	0.890

6. Press Menu until “Oxygen in Air Calibrated to” appears in the LCD display.

The top line will display “Oxygen in Air Calibrated to” and a number. The number displayed is the last value someone entered for the calibration. The bottom line will display “Sensor was” and a number. This number is the sensor reading without any calibration at the time of the last calibration. If there is a large discrepancy between these two numbers, the sensor was calibrated improperly or the probe may require maintenance. The value displayed normally on the main screen and the value the analyzer uses to determine dosing rates is the calibrated value.

7. Press OK.
8. Enter the password. Press the up arrow or down arrow until the password is reached.
9. Press OK.
10. Press OK again.

The display will now show “Cal. Oxygen in Air to” on the top line and “Sensor Reading” on the bottom line. The “Sensor Reading” is the current reading of the sensor with no calibration. The “Cal. Oxygen in Air to” value is the new value which you want to set.

11. Press the up arrow or down arrow until the value is the same as the value given by the digital photometer.
12. Press OK to save the new calibration or Esc to abort without saving.
13. Press Esc to return to the main display.

### 5.1.2 Reference Calibration

- 1) Test the water sample using an external digital Dissolved Oxygen tester.
- 2) Press Menu until "Oxy. Reference Calibrate to" appears in the LCD display.
- 3) Press OK.
- 4) Enter the password. Press the up arrow or down arrow until the password is reached.
- 5) Press OK.
- 6) Press OK again.
- 7) Press the up arrow or down arrow until the value is the same as the value given by the external tester
- 8) Press OK to save the new calibration or Esc to abort without saving.
- 9) Press Esc to return to the main display.



## 5.2 Calibrating other Sensors and Meters

Calibration of other sensors and meters can be done using reliable external testing device or standard solutions. When using an external testing device, make sure to take the sample water from the same supply to that probe or sensor.

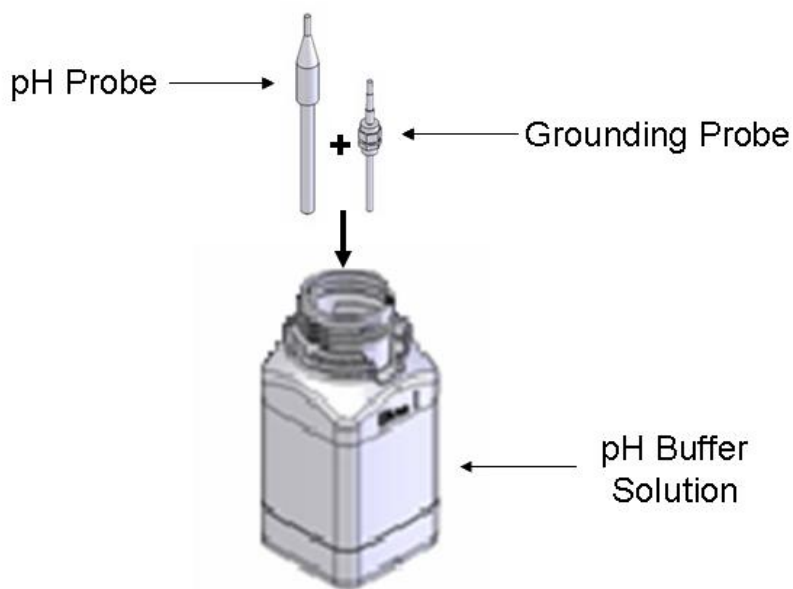
### Using External Testing Devices

Follow Test Method for Reference Calibration

### Using Standard Solutions

**Note:** for pH (or ORP) calibration, the temperature probe must also be placed in the standard for the reading to stabilize.

1. Remove the probe or sensor, clean with a dry cloth and place in the standard solution
2. Place the probe or sensor in the standard solution and wait for the reading to stabilize.
3. Press Menu until “\_\_\_ Calibrated to” appears in the LCD display.
4. Press OK.
5. Enter the password. Press the up arrow or down arrow until the password is reached.
6. Press OK.
7. Press OK again.
8. Press the up arrow or down arrow until the value is the same as the standard solution.
9. Press OK to save the new calibration or Esc to abort without saving.
10. Press Esc to return to the main display.



## **6 Maintenance**

### **6.1 DO Probe Maintenance**

Probe maintenance will be required periodically and will depend primarily on water conditions. Before performing any maintenance, turn OFF the power and water to the probe.

#### **6.1.1 Cleaning the sensor**

Always clean the sensor before calibration and whenever there is slow response time to changes or errors in measurement.

Depending on the soiling of the probe, proceed as follows:

Salt Deposits

Soak in 1-5% HCL solution for several minutes

Rinse with plenty of water

Dirt on Sensor Body

Clean with water and brush or cloth

Dirt on Membrane

Clean with water and soft sponge

#### **6.1.2 Regenerating the Sensor**

##### **Cleaning the Gold Cathode**

The Gold Cathode needs to be cleaned when visibly soiled or if there is a coating of silver.

Unscrew the membrane cap from the membrane body

Carefully clean the gold cathode in 2 steps using the supplied abrasive paper.

Use the Green paper first then use the yellow paper until the soil or silver coating is removed

Clean the electrode with tap or distilled water

Fill the membrane cap with new electrolyte solution and re-attach to the membrane body

#### **6.1.3 Replacing Electrolyte**

Electrolyte is consumed during normal operation and requires replacement periodically.

Remove the membrane cap

1. Replace the electrolyte, and if damaged the membrane cap

2. Fill the complete contents of an electrolyte ampoule into the membrane cap
3. Remove air bubbles by tapping the side of the membrane cap
4. Hold the sensor body at an angle and carefully screw the membrane cap down to the stop.
5. Place the membrane cap on the body and screw the cap to the stop.

**CAUTION:** The electrolyte solution is strongly alkaline and proper care and personal protective equipment should be used when handling the electrolyte.

## 7 Troubleshooting

The table below outlines very basic troubleshooting. Refer to the latest documents and technical notes, available for download at [www.blueitechnologies.com](http://www.blueitechnologies.com). For more information or to contact your Blue I Technologies' representative.

**Before** troubleshooting a problem:

1. Perform a System Reset (last menu of operator menu)
2. Check that all flat cable connections between electronic cards are secure
3. Check that all chipsets on electronic cards are secure and no pins are bent

Problem / Symptoms	Potential Cause	Solution / Suggestion
<b>Display not functioning or is displaying odd numbers</b>	Connection between boards is loose	Check all connections between boards
	Improper wiring or bad connection	Check wiring -- compare to wiring diagram
	Chipset is loose or pin bent	Check that no pins on the chipset are bent and it is in completely and correctly
<b>Analyzer won't power up</b>	Fuse is blown	Check and Replace fuse above main Power Supply
	I/O board has been damaged due to improper electrical installation	Check for burn marks on I/O board. Recheck for proper wiring -- confirm all neutrals and grounds in contact are from the same power supply
<b>DO Measurement is Low</b>	Sensor Calibrated too Low	Recalibrate Sensor
	Flow too Low	Increase Flow
	Coating on Membrane	Clean or Replace Membrane
	Electrolyte Exhausted	Replace Electrolyte
<b>DO Measurement is High</b>	Sensor Calibrated too High	Recalibrate Sensor
	Damaged Membrane	Replace Membrane
	Gold Cathode Dirty	Clean Cathode
	Anode Coating Dissolved	Anode Silver instead of Brown? Replace probe
<b>Unstable pH or ORP Readings</b>	Poor Grounding	Check: PT100, I/O board ground and Cl and pH wire grounding

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