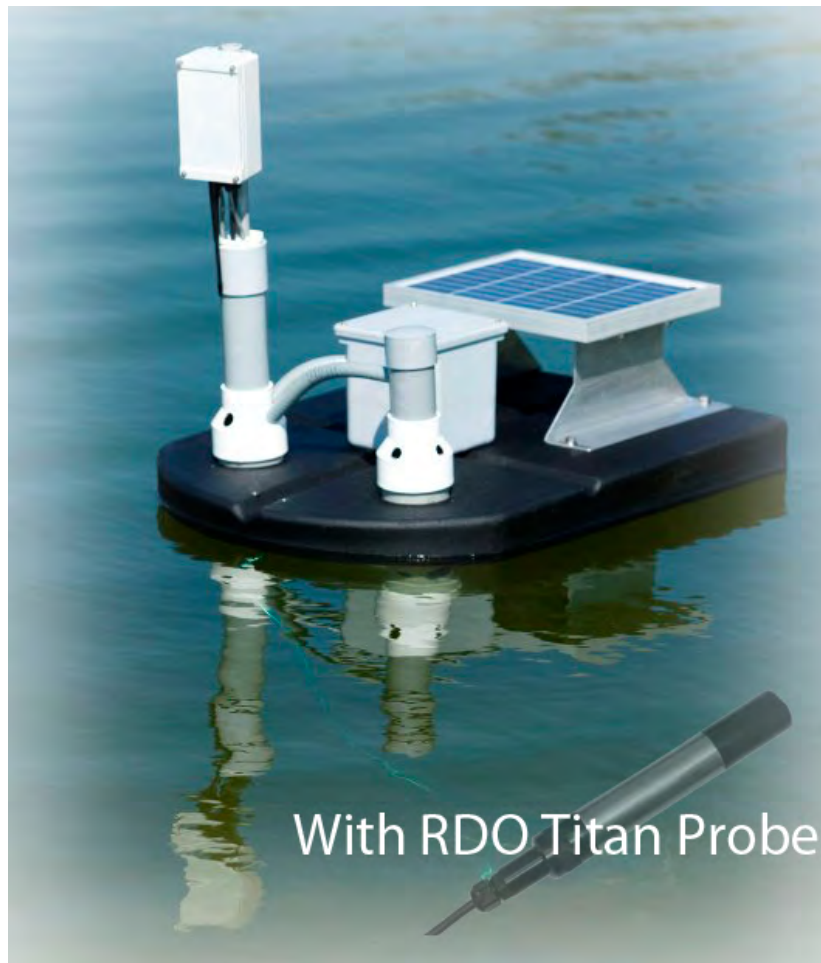


Aquaculture Buoy with RDO[®] Titan Probe

0097000



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Safety Information

Please read this manual before unpacking or installing any part of this system.

Hazard Symbols that may Appear in the Manual



Danger—Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.



Note—Indicates a situation that is not related to potential injury.

Precautionary Labels that many Appear on the Product



Important—When noted on the instrument, this symbol references the user to the manual.



Electrical Shock—When noted on the instrument, this symbol indicates a risk of electrical shock.



Protective Earth Ground—When noted on the instrument, this symbol indicates the location of protective earth ground.

Specifications

Buoy Specifications

Operating temperature	0° to 50° C (32° to 122° F)
Storage temperature	-5° to 60° C (23° to 140° F)
Dimensions (W x H x D)	61 x 91.4 x 81.3 cm (24 x 36 x 32 in.) (W x H x D)
Weight	18 kg (40 lbs)
Buoy materials	Polyethylene float with PVC mountings and fittings
Radio type	Frequency hopping; 100 mW
Transmitter	900 MHz spread spectrum; 9600 baud; 11.3 km (7 mi) maximum range, line-of-sight (Achievable range is dependent on site characteristics.)
Solar panel	10 W
Battery	12 V, 12 Ah, sealed lead acid
Brush motor	12 VDC
Brush enclosure	PVC
Warranty	1 year from date of shipment

RDO Titan Probe and Sensor Specifications

Optical RDO Titan Dissolved Oxygen Probe	
Sensor Type	Optical (luminescent) dissolved oxygen sensor using RDO Classic Sensor Cap
RDO Titan Probe	Range: 0 to 50 mg/L concentration
	Accuracy: ±0.1 mg/L, 0 to 8 mg/L ±0.2 mg/L, 8 to 20 mg/L ±10% of reading, 20 to 50 mg/L
	Resolution: 0.01 mg/L Display resolution: 0.10 mg/L
	Response time: T90 < 45 sec; T95 < 60 sec @ 25°C
	Storage conditions: -5° to 60° C (23° to 140° F)
	Usage life: 1 year typical from the first instrument reading (15 months of total usage)
RDO Classic Sensor Cap	Shelf life: 36 months from date of manufacture
	Storage conditions: 1° to 60° C (33° to 140° F), in factory container
	Range: 0° to 50° C (32° to 122° F)
Temperature sensor	Accuracy: ±0.1° C typical
	Resolution: 0.01° C

Transmitter/local display	Optional, sold separately
IP rating	IP-67 with cap off, IP-68 with cap installed
Compliance	Heavy industrial, IEC 61000-6-2:2005
Salinity range	0 to 42 PSU, fixed
Maximum power consumption	50 mA at 12 VDC
Warranty	Probe: 3 years from date of shipment

Overview

The In-Situ Aquaculture System provides large or small fish farming operations with a reliable and easy-to-maintain water quality monitoring system. The system consists of the following components.

- Solar-powered wireless buoys capable of transmitting oxygen, and temperature data to the host computer
- A host computer that processes the data transmitted by the buoy
- Wireless controllers that receive control messages from the computer and turns on/off aerators and pumps as needed

Additionally, the system can monitor hundreds of ponds spread out over large areas by using wireless repeaters and high-gain antennas.

Unpacking

Remove the buoy from the shipping box. The transceiver mast is detached from the buoy. After removing the buoy from the box, install the mast as shown in Figure 3.1 . The battery is shipped outside the battery box.

Buoy Components

The primary components of the foam-filled, polyethylene buoy include the following components.

- A wireless radio transceiver that transmits dissolved oxygen and temperature data to the host computer
- The RDO Titan Probe
- A 12 VDC battery that powers the transceiver
- A 10 W solar panel with charge controller to recharge the battery
- A cleaning brush and chlorine cleaning dispenser to minimize biofouling
- Desiccant pack (Part number 0087630)

Additionally, you may wish to purchase a buoy anchor from In-Situ Inc. (Part number 0097060).

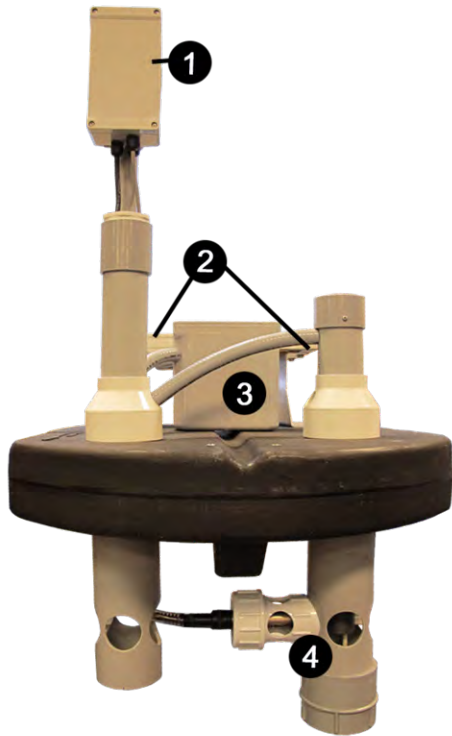


Figure 3.1 Main components of the buoy

1	Radio transceiver
2	Solar panel (behind the battery box)
3	Battery box
4	DO sensor, cleaning brush, and cleaning dispenser

Deployment Considerations

- Ensure that the DO sensor and bush are submerged in the pond sufficiently away from the pond's edge, and above the bottom of the pond.
- Carry the buoy by the float. Do not carry the buoy by the conduit or PVC pipes because it will cause damage.
- Anchor the buoy. The tether should be just long enough to reach the bottom of the pond, but not so long that it might wrap around the buoy, aerator, or any other object in the pond.

RDO Titan Probe

The RDO Titan Probe ships pre-installed on the buoy. The RDO Titan Probe has an optical dissolved oxygen (DO) and temperature sensor, which deliver accurate data across a wide measurement range. The probe features a titanium body, removable cable, and internally stored calibration. The RDO Titan system consists of the following components.



Figure 4.1 RDO Titan Probe with cable attached

- Titanium probe and temperature sensor
- RDO Classic Sensor Cap
- Removable nose cone
- Cable with stripped-and-tinned wires on one end and a dome connector on the probe end.

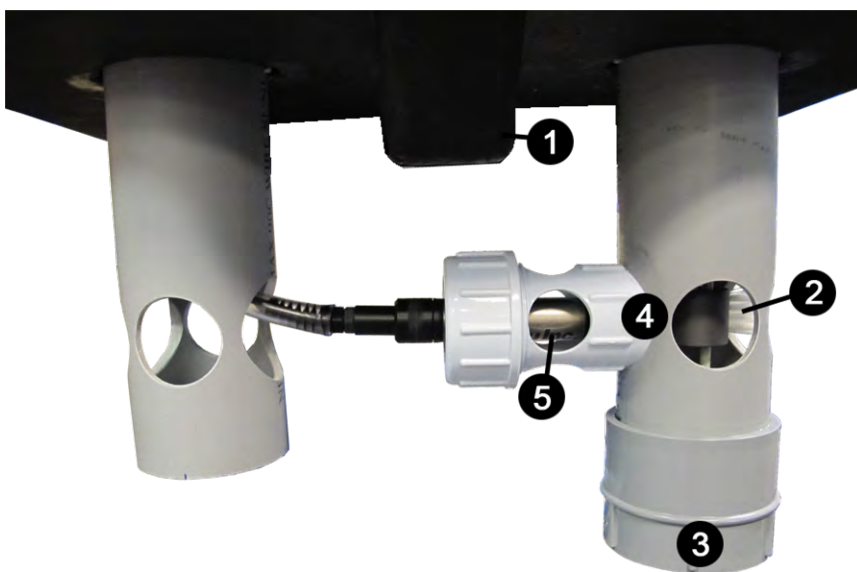


Figure 4.2 Underside of buoy

1	Anchor attachment
2	Cleaning brush
3	Chlorine tablet container
4	DO Sensor cap (inside PVC tube)
5	RDO Titan Probe

Replace the RDO Classic Sensor Cap

The RDO Classic Sensor Cap has a 1-year typical life, and a 15-month total life, after the instrument takes its first reading. The cap shelf life is 36 months from date of manufacture. The buoy is shipped with the RDO Titan and RDO Classic Sensor Cap already installed.



The following procedure should be used only when you need to replace the RDO Classic Sensor Cap. It is not necessary for the first installation.

1. Remove the lid from the battery box.
2. Remove the red lead from the battery.

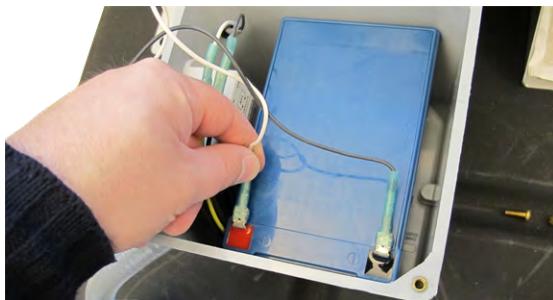


Figure 4.3 Buoy battery power connections

3. Loosen the white PVC compression fitting that holds the probe in place.
4. Slide the probe out of the PVC tube.



Figure 4.4 RDO Titan Probe with grommets installed

5. Clean and dry the probe.
6. Remove the nose cone from the probe.



Figure 4.5 RDO Titan Probe with nose cone removed

7. Pull the old cap from the probe without twisting.



Figure 4.6 RDO Titan Probe with RDO Classic Sensor Cap removed

8. Inspect the sensor lens. If necessary, clean the lens with a lint-free lens cloth. Avoid touching or cleaning the lens with anything other than the lens wipe supplied in the RDO Replacement Sensor Kit.

-
9. Remove the existing O-rings from the probe. Ensure there is no moisture in the O-ring grooves.
 10. Use your finger to apply a very thin layer of lubricant around the O-ring grooves.
 11. Place the O-rings on the probe. Apply another thin layer of lubricant to the O-rings and grooves.
 12. Inspect the lens to ensure it is still clean.
 13. Remove the RDO Classic Sensor cap from the storage sleeve.
 14. Align the flat side of the cap with the electrical contacts on the sensor and press firmly without twisting, until it seals over the probe body.



The cap must be firmly installed on the probe before it is submerged in water.



Figure 4.7 RDO Titan Probe and RDO Classic Sensor Cap with electrical contacts aligned



Do not allow moisture or atmospheric humidity inside the cap. Keep the cap in its sealed package until you are ready to install it. Install promptly. Ensure that O-ring grooves are dry and the O-rings are not rolled or pinched inside the cap.

15. Reattach the nose cone.
16. If desired, calibrate the probe using the RDO Comm Box kit and instructions.
17. Slide the probe back into the PVC tube near the cleaning brush.

Adjust the Wiper Brush

Old Brush Removal

1. Remove the lid from the battery box.
2. Remove the red lead from the battery.
3. Pull up on the brush motor housing tube (the short tube on the top of the buoy with the round end cap). The brush assembly is attached to the housing. Pull the entire assembly out of the tube.



You do not need to remove any screws to remove the brush assembly from the tube.



4. Put on gloves to handle the fiberglass drive shaft.
5. If replacing only the brush bristles, slide the existing bristles off the brush holder. If replacing the entire brush, loosen the set screw holding the existing brush in place using a 5/64 in. or 3/32 in. Allen hex wrench, depending on the brush model.
6. Slide the existing brush off of the fiberglass shaft.

New Brush Installation

1. Clean the fiberglass shaft thoroughly.
2. Clean the RDO PRO or RDO Titan sensor cap using clean water and a soft bristled brush (such as a toothbrush).

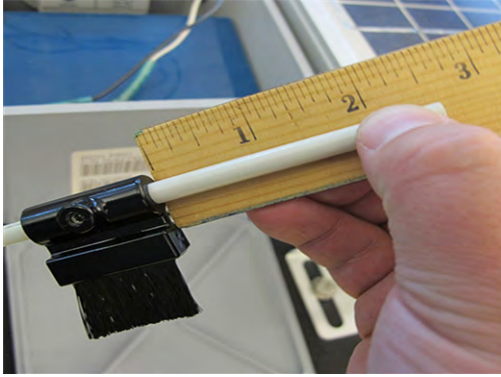


You can slide the probe forward (away from the cable end) through the drive shaft down tube for easier access by loosening the compression fitting. Be sure to slide the probe back into place when it is clean.



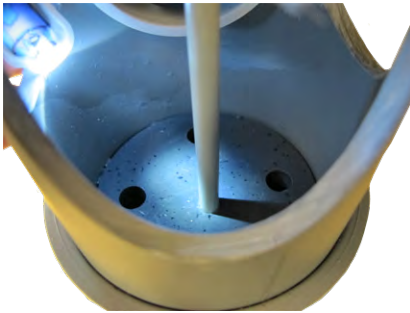
The sensor face on the cap should be black. Replace the RDO Sensor Cap when white film or white, pink, or clear spots are present.

3. If replacing only the brush bristles, slide the new bristles fully in to the brush holder slot. If replacing the entire brush, loosen the set screw on the new brush using a 5/64 in. Allen hex wrench.
4. Slide the new brush onto the fiberglass shaft until the bottom of the brush is approximately 6.4 cm (2.5 in.) from the bottom of the fiberglass shaft. Tighten the set screw of the brush so that the brush is held in place.



Do not over-tighten the screw, as the brush needs to be adjusted once the brush assembly has been reinstalled.

- Slide the entire assembly back into the down tube. Ensure the bottom of the drive shaft is inserted into the center hole of the bottom plate of the down tube assembly. Press the motor housing firmly back into the slot on the top of the buoy.



- Loosen the brush set screw and align the center of the brush with the center of the RDO PRO or RDO Titan cap.
- Adjust the RDO Probe or RDO Titan so that the brush makes contact with the sensor surface. The probe should be 3.2 cm (1.25 in.) from the fiberglass shaft.



Do not place the sensor too close to the brush. This may cause wear on the sensor surface.

- Reattach the red lead to the battery terminal. The brush rotates when power is reconnected. Observe the rotation. The brush should wipe squarely across the face of the sensor. Adjust if needed.
- Replace the battery box lid.



Replace the brush bristles (PN 0036440) every time you replace your RDO cap.

Installing the Cleaning Tablet

1. Remove the cap from the bottom of the brush motor housing tube.
2. Place a new chlorine or bromine tablet in the cap.
3. Replace the cap.



Figure 5.1 Brush motor housing tube for cleaning tablet installation

Buoy Transceiver

Overview

The transceiver consists of the following items.

- A microprocessor that is programmed to take sensor readings at given intervals
- A radio module that transmits the sensor readings to the host computer
- A desiccant pack

In between the readings, the radio module operates in sleep mode, enabling the buoy to operate with lower power consumption.



Figure 6.1 Transceiver interior

1	Probe power connection—red wire
2	Probe RS485 - connection—green wire
3	Probe RS485 + connection—blue wire
4	Probe return ground—black wire
5	Probe shield ground—silver wire
6	Motor power +
7	Motor power -
8	Power 9-18 volts DC+
9	Power 9-18 volts DC-
10	Transceiver addressing dip switches
11	Radio module with integrated antenna

Addressing

Each transceiver radio is programmed with a different address that identifies the buoy when communicating with the host computer.

A switch module on the transceiver board sets the buoy address. The switch has the following characteristics.

- It is a binary switch
- The address is the sum of the values of the binary switches that are in the "on" or "up" position. Figure 6.2
- If you change the buoy address after powering the system on, it is necessary to disconnect and reconnect power for the address change to take effect.

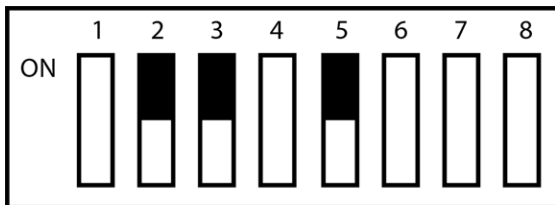
Dip Switch Addressing Explanation and Examples

The dip switch panel is located in between the microprocessor and the wiring connections. Figure 6.1

Dip switches 1 through 7 have a binary value. These values are shown in the table below.

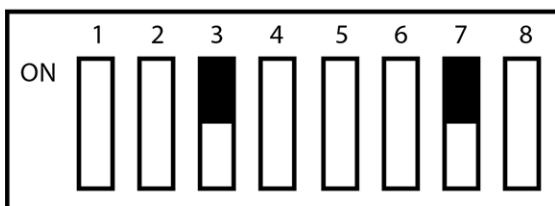
Switch	Value if in the ON position
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

To determine the address, add all of the values of the switches that are in the ON position.



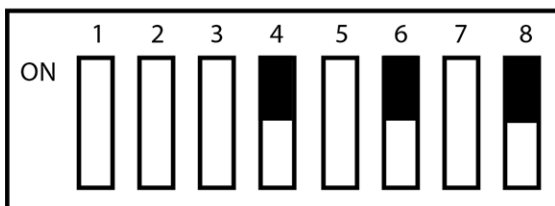
Switch 2 value = 2
 Switch 3 value = 4
 Switch 5 value = 16

$2 + 4 + 16 = 22$
 22 is the address



Switch 3 value = 4
 Switch 7 value = 64

$4 + 64 = 68$
 68 is the address



Switch 4 value = 8
 Switch 6 value = 32
 Switch 8 value = 128

$8 + 32 + 128 = 168$
 168 is the address



Switch 2 value = 2
 Switch 3 value = 4
 Switch 4 value = 8
 Switch 5 value = 16

$2 + 4 + 8 + 16 = 30$
 30 is the address

Figure 6.2 Dip switch addressing diagram

Connecting Power to the Transceiver and Buoy

1. Use a screwdriver to remove the cover from the battery box.

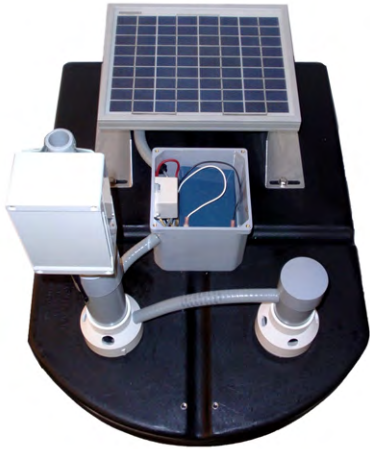


Figure 7.1 Top of buoy with battery box cover removed

2. Connect the black lead to the black terminal.
3. Connect the white lead to the red terminal. If the system is functioning properly, you will hear the brush motor power on for a few seconds.

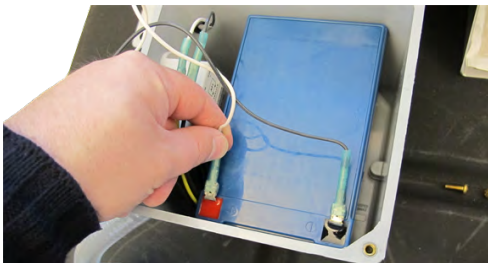


Figure 7.2 Buoy battery power + and - connections

4. Replace the battery box cover.

Programming Module Purchased Separately

A programming module (0085410) is necessary for programming the radios with the network settings.

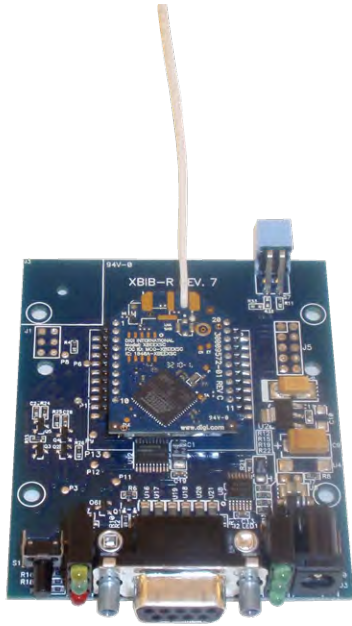


Figure 7.3 Programming module with radio installed

Radio Description

The buoy system uses a 900 MHz spread-spectrum radio manufactured by Digi International Inc. The radio network configuration is site-specific and usually involves setting the following parameters.

Radio Settings Definitions

MK – Address Mask

The Address Mask is used with the Destination Address. The setting is 7FFF for the buoy, controller, or repeater OUT. The setting is 8000 for the host modem radio or repeater IN.

DT – Destination Address

The Destination Address is used with the Address Mask to establish Parent/Child relationships and to determine which radios communicate with each other. Buoys—8001, 8002, 800x; Controllers—8101, 8102, 810x; Repeater IN—7FFF; Repeater OUT—8001, 8002, 800x; Host modem radio—7FFF.

ID – Modem VID

The Modem VID must be unique for each installation. This prevents radios from communicating with radios at another location. However, radios with different VIDs may still interfere with each other if they use the same hopping channel (HP).

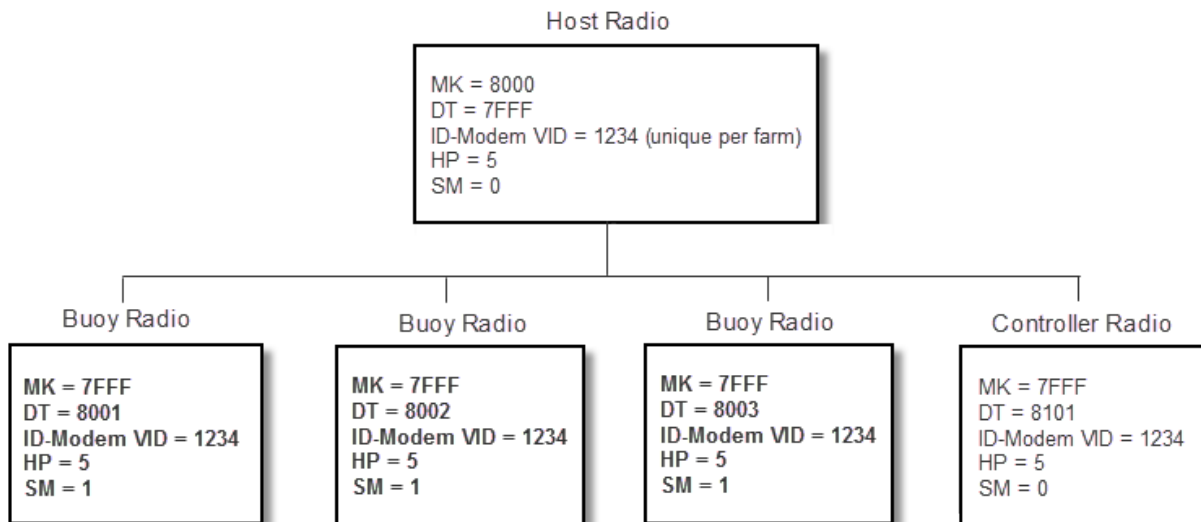
HP – Hopping Channel (0-6)

The Hopping Channel defines a subset of the radio frequency range. Radios set with the same hopping channel will communicate with each other. Radios set to different hopping channels will not interfere with each other.

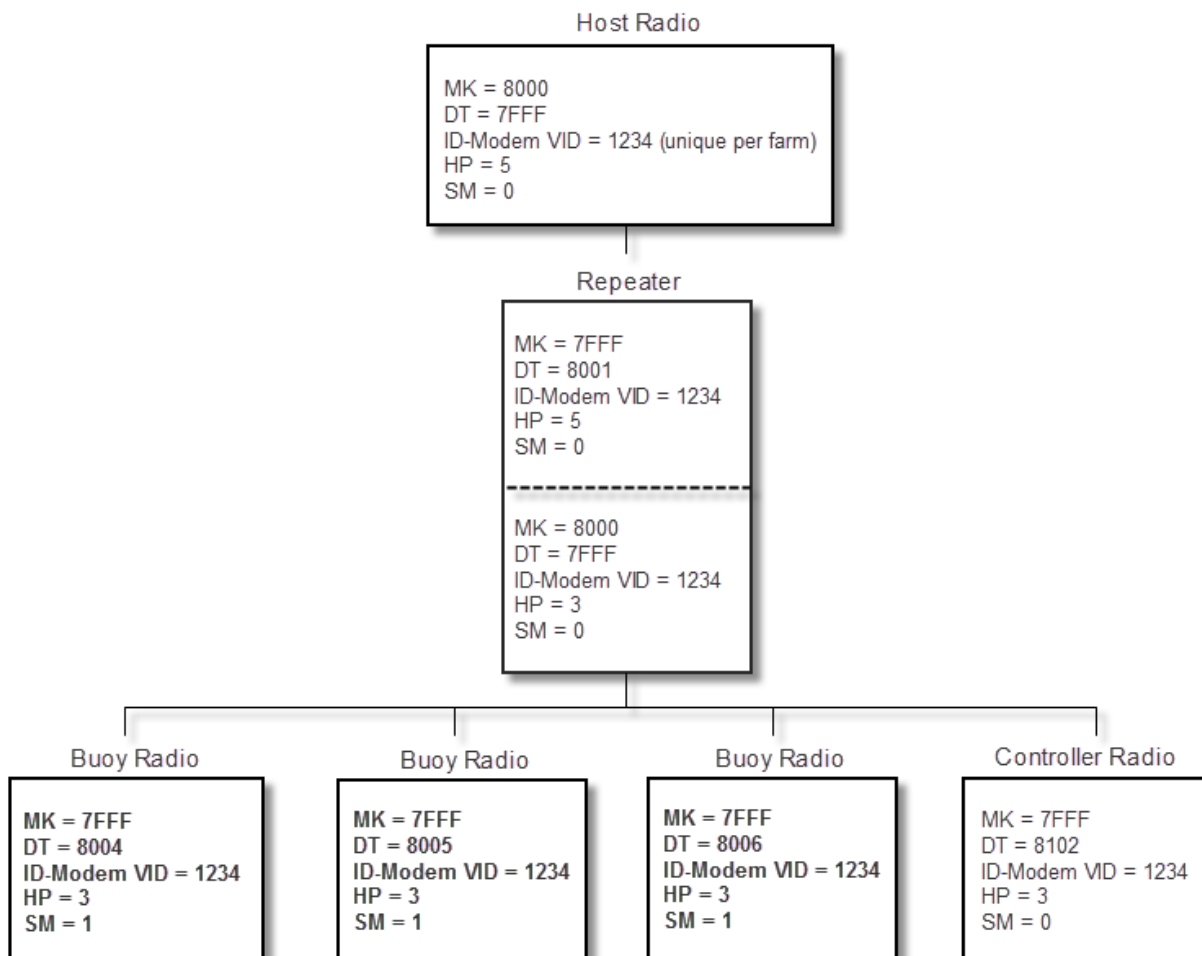
SM – Sleep Mode

Sleep Mode is used to put the radio in low power mode when not in use. Sleep mode is set to a value of 1 (Pin Sleep) only on buoy radios. The SM setting must be set to 0 on host modem and controller radios.

Standard Radio Network Diagram



Radio Network Diagram Including a Repeater



Programming the Radio Network Settings

1. Align the radio pins with the sockets on the programming module and press the replacement radio into place.
2. Attach signal and power cables to the programming module.
3. Connect the cables to a computer with Digi-MaxStream software installed.



You can download the software from www.digi.com/support.

4. Go to Start>Programs>Digi>X-CTU and open the software.
5. Select the appropriate COM port for the computer you are using.
6. Select the **Modem Configuration** tab and scroll to the **Networking** section.

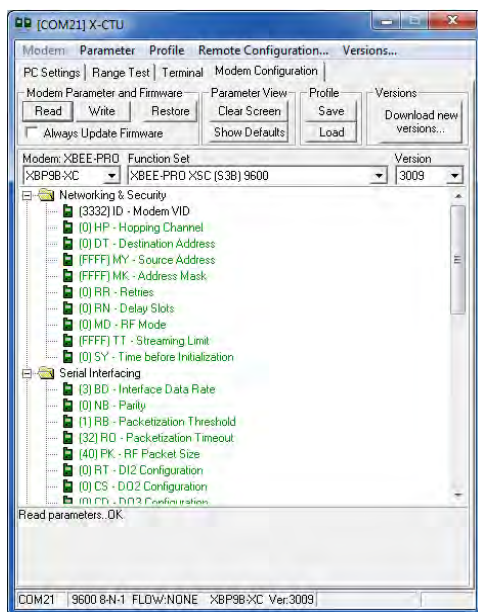


Figure 9.1 Digi X-CTU software, Modem Configuration tab

7. Click the following labels one at a time and enter the proper network settings: HP, DT, MK, and SM. See page 22.
8. Click the **Write** button to write the settings to the new radio.
9. Click the **Terminal** tab to change the **Modem VID**.
10. All radios in a network must be set with the same **VID**.
11. Type +++ to put the radio into programming mode for 20 seconds.



Figure 9.2 Digi X-CTU software, Terminal tab

12. Type atid followed by the 4-digit ID number (e.g. atid3456) and click **Enter**.
13. Type atwr and click **Enter**.
14. Disconnect the programming module from power and the computer.
15. Remove the radio from the programming module.
16. Align the radio pins with the sockets on the buoy board and press the radio into place.
17. Ensure that a fresh desiccant pack is installed. See page 26.
18. Replace the housing and attach the cables.

Install Desiccant Pack

A desiccant pack is included in the kit. Place a desiccant pack inside the transceiver housing, while taking care not to disturb the wiring connections.



Replace the desiccant pack before the indicator beads change from blue to pink.



Figure 10.1 Desiccant pack installed in a transceiver box.

Host Computer Overview

The host computer can be any Microsoft® Windows®-based computer operating with a Windows 98 or later operating system. Additional requirements include the following items.

At least one serial communications port, or the serial to USB adapter available from In-Situ

A radio modem connected to the serial port in order to communicate with the transceivers and wireless controllers.

The data retrieval software runs on the host computer at all times. This software receives all transmissions and makes the appropriate control decisions. The software also archives the data, makes logs of all actions, sends alerts for critical situations, displays pond and farm status, and provides for review of historical data.

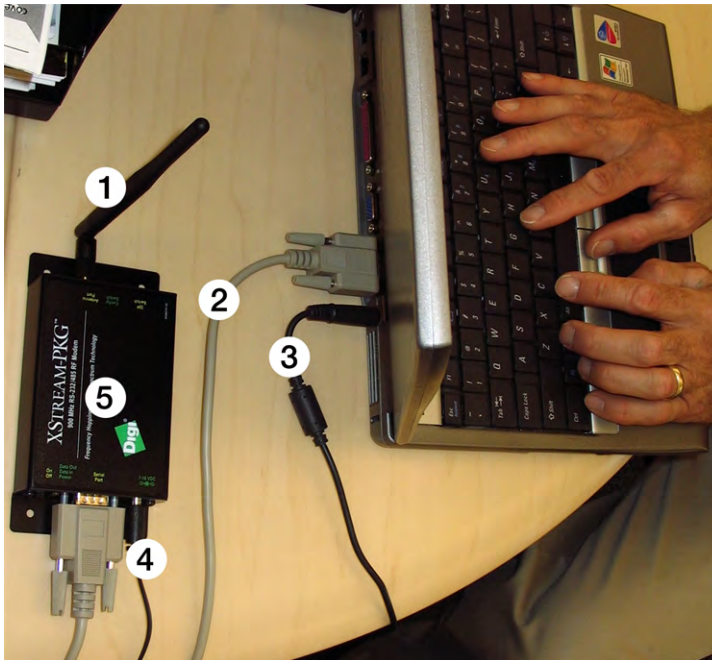
Host Computer Setup

1. Install the Aquasoft software from the provided flash drive.



Set the computer so that it does not enter sleep mode and so it does not make automatic Windows updates.

2. Attach the antenna, power cord, and serial port to the host radio.
3. Connect the radio to power.
4. Connect the serial cable from the radio to the host computer.

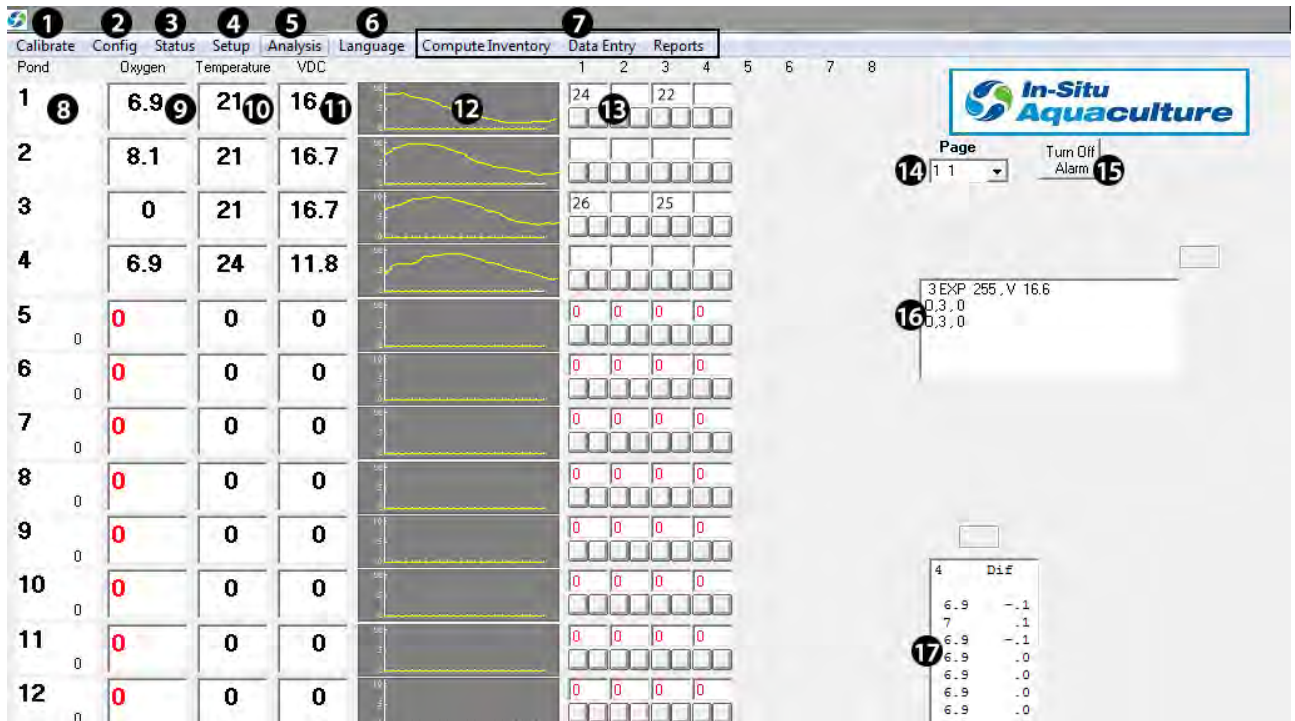


1	Antenna
2	Serial cable from host computer to host radio
3	Host computer power cable
4	Host radio power cable
5	Host radio modem

Aquaculture Software

Pond Status Screen

The Pond Status screen offers a quick view of farm data from the last 24 hours.



1	Calibrate menu (Do not use) If you need to remove an erroneous adjustment factor, send a value of 25.5.
2	Config menu—Set aerators, send test email, database, program settings window
3	Status—Farm status window
4	Setup—Farm status window, allows you to configure Farm Status screen
5	Analysis—Access the Communication Test window and the Monitor Analysis window
6	Language—Select English or Spanish
7	Feeding system menus
8	Pond—User-entered pond name A small number in the lower-right corner of the box appears when there are 30 or fewer days left on the sensor cap.

9	<p>Dissolved oxygen value—Running average of the last 3 readings. This average is compared to the on/off limits. Zero is ignored unless there are 3 zeros in a row.</p> <p>A red zero indicates that the buoy is not communicating with the host . The buoy power supply, microprocessor, and radio should be checked.</p> <p>A black zero indicates an oxygen sensor problem. The sensor is not sending a signal to the microprocessor and needs to be serviced.</p>
10	Temperature—Value displayed in degrees C or F
11	VDC—The buoy battery voltage that the probe is receiving, not the actual voltage from the battery. A value of less than 10 displays red.
12	Graph of the dissolved oxygen readings for the last 24 hours.
13	<p>Aerators—The value is displayed in amps. They are displayed in sets of two even if the second of the last two isn't used. When the squares are gray, the system is in automatic mode.</p> <p>Double-click on the Amp reading to switch the aerator into manual mode. Buttons change from gray to red and green. Green turns the aerator on, and red turns the aerator off. In manual mode, the aerator will not automatically turn on. Double-click the value again to return to automatic mode.</p> <p>A red zero indicates that the controller is not communicating with the host.</p>
14	Page—Shows the number of the page that is displayed. The page that is displayed cycles approximately every 45 seconds. Use the drop down arrow to view a specific page.
15	Turn Off Alarm—Acknowledges the current alarms.
16	<p>Scrolling Data—Shows incoming data.</p> <p>A= Aerator</p> <p>O=Oxygen</p>
17	Scrolling DO readings—Click on a DO reading and this box shows the last 15 readings.

Farm Status Screen

The **Farm Status** screen can quickly reveal problems with ponds and monitoring equipment. This real-time screen is updated every minute and displays a pond icon for each pond of the farm. Click the **Status** menu to access **Farm Status**.



Pond Color—Oxygen Concentration Spectrum

The color of each pond icon represents the oxygen level of the pond. The color varies from bright yellow, indicating a high oxygen concentration, to deep brownish red, indicating low oxygen concentration.

Pond Interior Green Squares—Aerator Status

A green box appears on the pond icon when an aerator is on.

Pond Color—Aerator Alert

An aqua pond icon indicates an aerator alert that is activated when an aerator is supposed to be on but is not reporting enough amps to the host computer.

Pond Color—Oxygen Alert

A white pond icon indicates that the oxygen level is below the minimum level that was set by the user in the database.

Aerator Report

From the **Farm Status** screen, click on a pond icon, and select **Aerator Report** from the menu that appears. The aerator report can be printed and compared to logs maintained by the pond crew. You can also produce a report of the total aerator run time for a specific time period.

AERATOR OPERATION - POND 2				
UNIT	MINUTES	START	STOP	DATE
Total Runtime 0				

1	81.7	8:45	10:06	05/21/13
1	21.5	10:35	10:57	05/21/13
1	33.6	12:52	13:25	05/21/13
Total Runtime 136.8				

2	533.0	15:07	24:00	05/20/13
2	91.2	8:35	10:06	05/21/13
2	21.5	10:35	10:57	05/21/13
2	33.6	12:52	13:25	05/21/13
Total Runtime 679.3834				

3	81.7	8:45	10:06	05/21/13
3	21.5	10:35	10:57	05/21/13
3	33.6	12:52	13:25	05/21/13
Total Runtime 136.8				

4	81.7	8:45	10:06	05/21/13
4	21.5	10:35	10:57	05/21/13
4	33.6	12:52	13:25	05/21/13

Set Aerators

The **Set Aerators** screen allows you to set ON and OFF limits for each aerator in each pond. This screen also allows you to set minimum amperage, which is used to verify whether or not an aerator came on or is beginning to fail. If you have purchased the feed system software, this screen allows you to enter the feed rate and conversion factor.

Screen Text	Description
Pond	Drop-down list of all ponds
Active checkbox	When selected this indicates that the pond is in use and designated for system control.
Buoy	Buoy number dip switch address.
Min DO	Use the up and down arrows to set the minimum dissolved oxygen level that can be reached before an alert is sent.
Conversion	Pounds of fish per pounds of feed
Feed Rate	Pounds of feed per day per pounds of fish
Controller	Controller number dip switch address associated with the pond, buoys, and aerators
Device	Relay number (usually an aerator)
On	Dissolved oxygen level at which an aerator turns ON.
Off	Dissolved oxygen level at which an aerator turns OFF.
Min Amps	Set the minimum amperage below which the system will send an alert that there is a problem with the aerator.

Screen Text	Description
All Alerts Active checkbox	When selected this turns ON all system alerts for all sensors not for just the selected pond.
SAVE	Click this button to save changes to the database.
Exit	Click this button to exit without saving changes to the database.

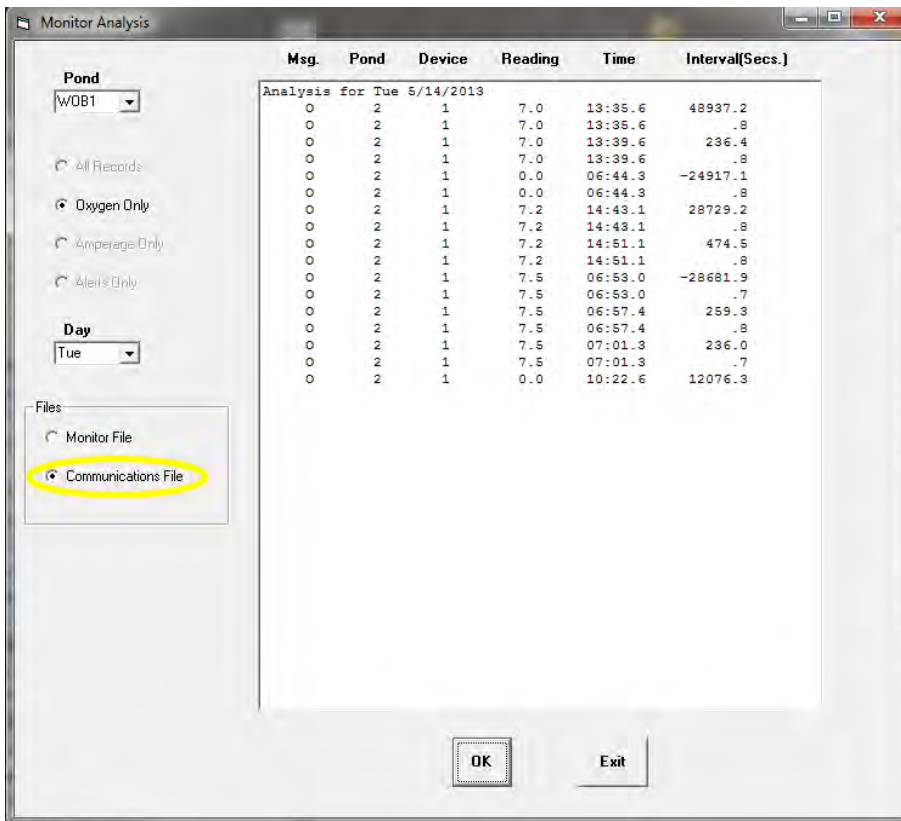
Monitor Analysis

The **Analysis** menu provides access to the **Communication File** and the **Monitor File** that can be used for troubleshooting and system analysis. The system stores data for the current day and the previous 6 days.

Communications File

The Communications File shows communication between the buoy radio and the host radio.

1. Select a pond from the drop-down list.
2. **Oxygen Only** is the only available filter.
3. Select a day of the week from the drop-down list.
4. Select **Communications File**.
5. Click **OK**.

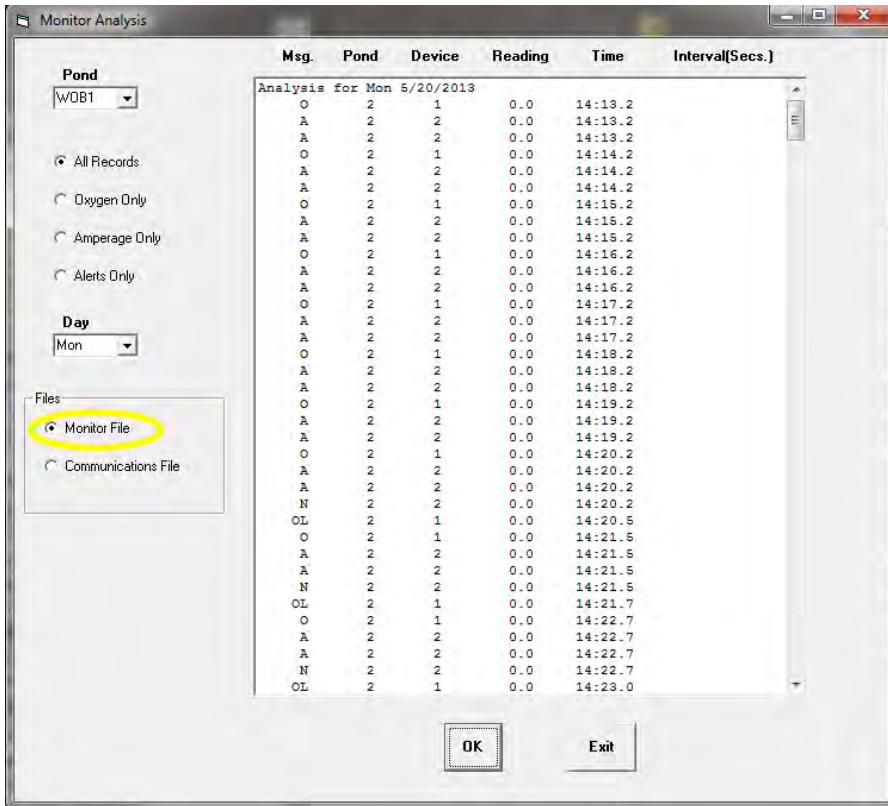


Monitor File

The Monitor File displays a snap shot view of dissolved oxygen and amperage readings. This file also displays aerator ON and OFF commands and alerts.

1. Select a pond from the drop-down list.
2. Select any desired filters.

3. Select a day of the week from the drop-down list.
4. Select **Monitor File**.
5. Click **OK**.



- A—Controller amperage reading
- O—Buoy dissolved oxygen reading
- N—On command
- F—Off command
- AL—Aerator alert
- OL—Oxygen alert

Database

The database enables setup and changes to farm configuration. Do not make changes to the database unless you are very familiar with the system and how it works. The database allows an administrator or installation engineer to do the following actions.

- Add sensors
- Renumber sensors
- Set limits by device
- Adjust ON limits
- Adjust OFF limits
- Set minimum dissolved oxygen limits
- Set minimum amperage limits
- Renumber groups



After changes are made to the database, you must close and then restart Aquasoft in order for the changes to take effect.

1. To access the database, click the **Config** menu and select **Database**
2. Enter your password.

The screenshot shows the 'Sensor Setup' window with a menu bar containing: Add Sensors, Renumber Sensors, Set Limits by Device, Adjust On Limits, Adjust Off Limits, Set Min DO, Set Min Amps, and Renumber Groups. Below the menu is a table with the following columns: SensorDescr, SensorNum, ModNum, MinDO, Salinity, Inactive, PondGroup, ControllerNum, ControllerDevice1, ControllerDevice2, OnLimit1, OnLimit2, OffLimit1, OffLimit2, MinAmps1, and MinAmps2. The table contains 8 rows of data for Oxygen sensors.

SensorDescr	SensorNum	ModNum	MinDO	Salinity	Inactive	PondGroup	ControllerNum	ControllerDevice1	ControllerDevice2	OnLimit1	OnLimit2	OffLimit1	OffLimit2	MinAmps1	MinAmps2
OxygenWB02	1	6	2.1	0	0	1	1	1	3	10.4	5.4	11.0	5.6	7	7
OxygenW061	2	2	2.1	0	0	1	1	2	4	7.4	-1.0	8.0	99.0	7	7
Oxygen1	3	1	2.1	0	0	1	2	1	0	5.0	-1.0	10.0	99.0	7	7
Oxygen2	4	7	0	0	0	1	3	1	2	-1.0	-1.0	99.0	99.0	0	0
Oxygen3	5	8	0	0	0	1	3	3	4	-1.0	-1.0	99.0	99.0	0	0
Oxygen4	6	9	0	0	0	1	3	5	6	-1.0	-1.0	99.0	99.0	0	0
Oxygen5	7	10	0	0	0	1	3	7	8	-1.0	-1.0	99.0	99.0	0	0
Oxygen6	8	11	0	0	0	1	4	1	2	-1.0	-1.0	99.0	99.0	0	0

Software Settings Screen

The **Software Settings** screen allows you to make changes to communication and control settings. From the **Config** menu select **Program Software Settings**.

Screen Text	Description
Use Default Settings	Click this button to restore the system default settings.
Startup Period (Hours)	Idle period prior to sending alerts or controlling so data can start coming in.
Maximum Interval Between Communications (Minutes)	This is the amount of time between loss of communication with the buoy and assumption of zero reading. Then screen shows red zero and sends alert. (Buoy radios send data approximately every 4 minutes.)
Maximum Interval Between Control Communications (Minutes)	This is the amount of time between loss of communication with the controller and an assumption of a problem with the system.
Minimum Time Between Alerts	Sets how often the system will send a message regarding an alert.

Screen Text	Description
Early Off Start Time	Allows the aerator to start according to a different DO limit during the day versus night. Enables aerators to shut off earlier during the day when oxygen values will likely recover on their own. The time format is in military time.
Early Off End Time	Time that the Early Off feature stops. The time format is in military time.
Early Off Differential	Value that defines what is a large enough shift in oxygen values to override the "Early Off" feature.
No Off at Night	Drop-down list: Disable—Turns "No Off at Night" OFF Enable—Turns "No Off at Night" ON On Screen—Adds option to the Quick View screen and allows you to select each day. This feature, when enabled, keeps aerators on all night once they have come on, unless there has been a very large shift in the oxygen value.
No Off Start Time	Time that the "No Off at Night" feature starts.
No Off End Time	Time that the "No Off at Night" feature stops. (Usually set at sunrise when oxygen levels will continue to recover on their own.)
No Off Differential	Value that defines what is a large enough shift in oxygen values to override the "No Off at Night" feature.
Automatic Control	Drop-down list: Auto—Host computer uses settings and turns aerators on and off. Manual—Host computer is not in Auto mode, but allows you to turn on and off the aerators manually from the host computer. None—Host computer is not in Auto mode and you cannot turn on and off the aerators from the host computer.
Language	Select English or Spanish
Confirm Feed	Feed software only—Use radio to transmit data to host computer. Use this feature only on the host.
Feed Truck Mode	Feed software only—Provides extra options for feeding

Screen Text	Description
Audible Alerts	Select checkbox to hear a beep sound on the host computer when an alert limit has been reached.
Temperature	Drop-down list to select Fahrenheit or Celsius
Communications Port 1	Communications port number for the host radio modem
Communications Port 2	Communications port number for the host radio modem if a second host is used on a larger farm.
Auto Detect Radio	Click the button. If two host radios are found, you will be asked which radio should be designated to Port 1 and then it adds the radios to the boxes.
Email/Text Addresses	Enter email addresses or cell phone text/email address that will receive alerts. Maximum 4. For questions about cell phone text messages contact your phone service provider.
Exit	Click the button to exit without saving changes.
Save	Click the button to save changes to the database.

Cleaning, Maintenance, and Storage

Storage Recommendations

If you remove the buoy from service seasonally, remove the battery from the buoy and store it separately.

If the sensor cap will expire before you redeploy the unit, discard the cap and place a red dust cap over the end of the sensor. If you do not have a dust cap, keep the sensor cap in place. The sensor lens on the probe must always have adequate protection.

When you redeploy the buoy after a period of storage, use a new RDO Classic Sensor Cap.

Replace the desiccant regularly.

Maintaining the Rotating Wiper Brush

A rotating brush removes contaminants and biofouling from the sensor. Periodically check the brush for cleanliness and contact with the sensor cap. For optimum performance, the brush should lightly sweep the sensor cap. See page 13.

Maintaining the Cleaner Shaft

The cleaner shaft is connected to the motor shaft with a flexible coupler made of rubber hose that is secured with stainless steel hose clamps.

When replacing the cleaner shaft, ensure that the shaft extends through the bottom of the buoy, but above the chlorine tablet. Adjust the shaft length by varying the depth of the shaft in the flexible coupling. Also ensure that the coupler clamps do not hit the motor mounting screws.

Maintaining the Chlorine/Bromine Tablet Chamber

The cleaner assembly includes a chamber in the bottom of the brush motor down tube that holds a 3 inch chlorine or bromine tablet. These tablets will slowly dissolve to reduce algae and other organic growth on the probe and sensor. The tablets dissolve at varying rates depending on environmental conditions. Replace the tablets as necessary. Tablets are available anywhere swimming pool supplies are sold.

Cleaning the RDO Classic Sensor Cap

If extensive fouling of the sensor occurs, remove the buoy from the pond and perform the following procedure.

1. Do not remove the cap and nose cone from the probe.
2. Rinse the sensor with clean water from a spray bottle.
3. Gently wipe the sensor with a soft-bristled brush or soft cloth if biofouling is present. Use Alconox to remove grease.



Do not use organic solvents because they will damage the sensor cap.

4. If extensive fouling or mineral buildup is present, soak the cap end in vinegar for 15 minutes, then soak it in deionized (DI) water for 15 minutes.
5. After cleaning the sensor, perform a 1- or 2-point user calibration or calibration check.

Cleaning the Probe Body

With the sensor cap installed on the probe, gently scrub the probe body with a soft-bristled brush or nylon dish scrubber. Use Alconox to remove grease or other matter. Soak in vinegar and DI water to remove mineral deposits or extensive fouling as previously described.

Replacing the Sensor Cap

See page 11.

Service

Obtaining Repair Service

If you suspect your system is malfunctioning and repair is needed, you can help assure efficient servicing by following these guidelines:

1. Call or email In-Situ Technical Support. Have the product model and serial number available.
2. Be prepared to describe the problem, including how the product was used and the conditions noted at the time of the malfunction.
3. If Technical Support determines that service is needed, they will ask your company to fill out the RMA form and pre-approve a specified monetary amount for repair charges. When the form and pre-approval is received, Technical Support will assign an RMA (Return Material Authorization) number.
4. Clean the product as described in the manual.
5. If the product contains a removable battery, remove and retain it unless you are returning the system for a refund or Technical Support states otherwise.
6. Carefully pack your product in its original shipping box, if possible.
7. Mark the RMA number clearly on the outside of the box.
8. Send the package, shipping prepaid, to:

In-Situ
ATTN: Repairs
221 East Lincoln Avenue
Fort Collins, CO 80524

The warranty does not cover damage during transit. In-Situ recommends insurance for all shipments. Warranty repairs will be shipped back prepaid.

Outside the U.S.

Contact your international In-Situ distributor for repair and service information.

Guidelines for Cleaning Returned Equipment

Please help us protect the health and safety of our employees by cleaning and decontaminating equipment that has been subjected to potential biological or health hazards, and labeling such equipment. Unfortunately, we cannot service your equipment without such notification. Please complete and sign the form on page 46 (or a similar statement certifying that the equipment has been cleaned and decontaminated) and send it to us with each instrument.

-
- We recommend the glassware cleaning product, Alconox, available from In-Situ and from laboratory supply companies.
 - Clean all cables and remove all foreign matter.
 - Clean the cable connectors with a clean, dry cloth. Do not submerge the connectors.
 - Clean the instrument including the nosecone, cable head, and protective caps.



If an instrument is returned to our Service Center for repair or recalibration without a statement that it has been cleaned and decontaminated, or if it is the opinion of our Service Representatives that the equipment presents a potential health or biological hazard, we reserve the right to withhold service until proper certification is obtained.

Decontamination and Cleaning Form

Decontamination & Cleaning Statement

Company Name _____ Phone _____

Address _____

City _____ State _____ Zip _____

Instrument Type _____ Serial Number _____

Contaminant(s) (if known) _____

Decontamination procedure(s) used _____

Cleaning verified by _____ Title _____

Date _____



Troubleshooting

Inspect the Buoy

If you suspect that something has malfunctioned in the buoy, pull the buoy from the pond and inspect the following items.

- Probe and brush—Make sure that there is no biofouling, feed, or mud interfering with the operation of these parts.
- Brush motor—Make sure that the brush did not become tangled in algae or other material and burn out the motor.
- Chlorine tablet—Replace as needed.
- Brush shaft—Make sure that the shaft is not damaged.

Check the Power

The system will not work if the solar-powered battery charge falls below 7 volts. Check the voltage to the following items to make sure that they are operational.

- Solar panel
- Voltage regulator
- Battery

Also, check all wiring connections to make sure they are secure.

Checking the Communication

A black zero indicates an oxygen sensor problem. The sensor is not sending a signal to the microprocessor and the probe needs to be serviced.

A red zero oxygen reading on the computer screen indicates a lack of communication between the buoy and the host computer. Check the power as described in the previous section.

Ensure that the radio module is firmly in place on the board and that the antenna is properly connected. Test the radio by swapping it out with a radio from another buoy that is working properly.

If the power is connected, inspect the transceiver for power.

1. Remove the housing cover.
2. Check the power input terminal in the lower-right corner. You should measure 11 to 14 volts DC at this connector.
3. If voltage is low, charge or replace the battery. Check the solar panel and charge controller for damage.