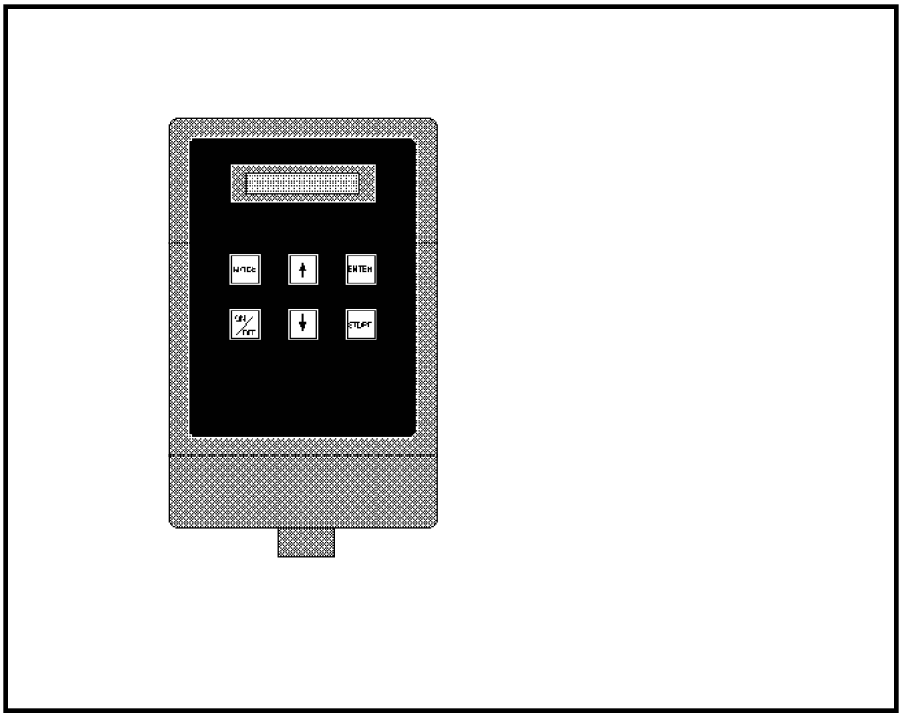
Aqua-Check™ Water Analyzer Operator's Manual



AquaMetrix

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Chapter 1
Introduction

The Aqua-Check Water Analyzer is a compact, rechargeable, battery-operated, field instrument that simultaneously measures the dissolved oxygen level, pH, conductivity, and temperature of water and aqueous solutions.

The operator can elect to display either uncompensated values or values that have been compensated for external effects. In the compensated mode, the conductivity and pH values will be compensated for temperature and the dissolved oxygen reading for temperature, salinity, and atmospheric pressure.

All of these parameters, except atmospheric pressure, are measured with a single compact probe that is equipped with a specific cable length (10', 25', 50', 100', 150', and 200' are the standard lengths). This allows remote measurements to be taken, without the need to draw a sample.

The Water Analyzer also contains a built-in measurement log to manually store readings. This allows up to 199 sets of measurements to be saved in the field for later review.

Power

The battery in the Water Analyzer will provide about 8 hours of continuous operation (6 hours when using the RS-232 or barometer options). A low battery signal will appear when approximately one hour of use is left. The meter has an auto-shutoff safety feature that disconnects the power before the battery voltage drops below a level dangerous to the memory. Recharge time for the battery is 5.5 hours. The Water Analyzer contains a back-up battery and will retain the stored calibration information and the measurement log for at least 30 days without external power.

An AC adapter/charger is provided for charging the Water Analyzer. An optional 12 V automobile cigarette lighter adapter is available. Extreme temperature during recharging is not recommended. It is also recommended that the vehicle not be started while the Water Analyzer is plugged in.

The Water Analyzer uses a sealed lead-acid gelled electrolyte battery. Unlike a NiCad battery, these batteries can be recharged before they have been fully discharged. Incomplete charge and discharge cycles will have little effect on battery life or capacity. The battery is also protected from overcharge by an internal battery maintenance circuit that allows the unit to be left connected to the AC adapter/charger whether the meter is in use or not. The battery requires recharging at least once every 3–4 months during extended periods of nonuse.

Specifications

Sensor	Unit	Resolution	Range	Accuracy	Compensation
pH	pH	0.01	1–13	0.02	Temp (auto)
	mV	1	±500	±2%	None
Temp	°C	.1°	0–50	1	None
	°F	.1°	32–122	1.8	None
Cond	mhos	.1 µmho	0–99.9	±3%	Temp (auto)
		1 µmho	0–999	±3%	(20° or 25°C)
		.01 mmho	0–9.99	±3%	or none
		.1 mmho	0–99.9	±3%	
	Siemens	.1 µS	0–99.9	±3%	Temp (auto)
		1 µS	0–999	±3%	(20° or 25°C)
		.01 mS	0–9.99	±3%	or none
		.1 mS	0–99.9	±3%	
	TDS	.1 ppm	0–49.8	±3%	Temp (auto)
		1 ppm	0–498	±3%	(20° or 25°C)
		.01 ppt	0–4.98	±3%	or none
		.1 ppt	0–49.8	±3%	
Oxygen	ppm	.1 ppm	0–20.0	±2% to 5%	Temp (auto), Salinity, Opt.
	%Sat	0	150.0 %Sat	±2% to 5%	Temp (auto), Salinity, Opt. Press (auto)

Data Storage

- The Water Analyzer stores 199 sets of readings. A log number is assigned when the storage button is pressed and displayed when readings are being reviewed.

Data Review

- Stored readings can be reviewed in Review Log Mode.

Battery

- 6 V rechargeable sealed lead acid.

Discharge Time

- 8 hours (6 hours with RS-232 option)
- Low battery indicator and automatic shutoff to prevent calibration and stored reading memory loss

Recharge Time
- 5.5 hours

Operation Temperature
- Meter: 0°–40°C
- Probe: 0°–50°C

Storage Temperature
- 5°–40°C

Dimensions
- Probe: 12" H x 1.5" D (30 cm x 3.8 cm)
- Meter: 7.5" H x 4.25" W x 1.5" D (19.2 cm x 10.9 cm x 3.8 cm)

Weight
- 5 lbs (2.27 kg)

Options

A kit of calibration standards is available. This kit contains quantities of pH 4, pH 7, and pH 10 buffers; pH boot solution; a set of conductivity standards (73.9 µS/cm, 718 µS/cm, 6.67 µS/cm, and 58.6 µS/cm); a container of deionized water; a package of oxygen sensor membranes; and oxygen filling solution.

Several factory installed hardware options are available:
- longer cable lengths,
- automatic barometric pressure compensation, and
- RS-232 computer interface with autodata logging capabilities.

Additional probes, of any cable length, may be ordered for a previously purchased meter. Additional cable lengths cannot be retrofitted to existing probes.

The automatic barometric pressure compensation option may be added by the factory to a previously purchased unit.

The RS-232 computer interface option allows parameter values, which have been stored, to be downloaded via an RS-232 link to an IBM-compatible or Macintosh computer. This enables the operator to incorporate data values directly into analysis programs. Download software is provided for an MS-DOS®-based computer or use your favorite communications software. Output is 1200 baud, and the output is in ASCII format. The RS-232 option can be added by the factory at any time.

Safety Information

Using the instrument in a manner not specified by the manufacturer may impair the instrument's safety protection. Whenever the safety protection of the Water Analyzer has been compromised, disconnect the instrument from all power sources and secure the instrument against unintended operation.

Operator Precautions

For operator safety, pay attention to ***WARNING*** and ***CAUTION*** statements throughout the manual.

- A ***WARNING*** indicates a condition or possible situation that could result in physical injury to the operator.
- A ***CAUTION*** indicates a condition or possible situation that could damage or destroy the product or the operator's work.

Warnings and precautions in this manual or on the instrument must be followed during operation, service, and repair of the instrument. Failure to follow these warnings and precautions violates the safety design standards and intended use of the instrument. The manufacturer will not be liable for the operator's failure to comply with these warnings and precautions.

Safety Symbols

The following symbols are located on the instrument:


See accompanying instruction for more information.


Indicates a hot surface.


Indicates hazardous voltages.


Indicates earth (ground) terminal.

Chapter 2
Description of Components

Water Analyzer Meter

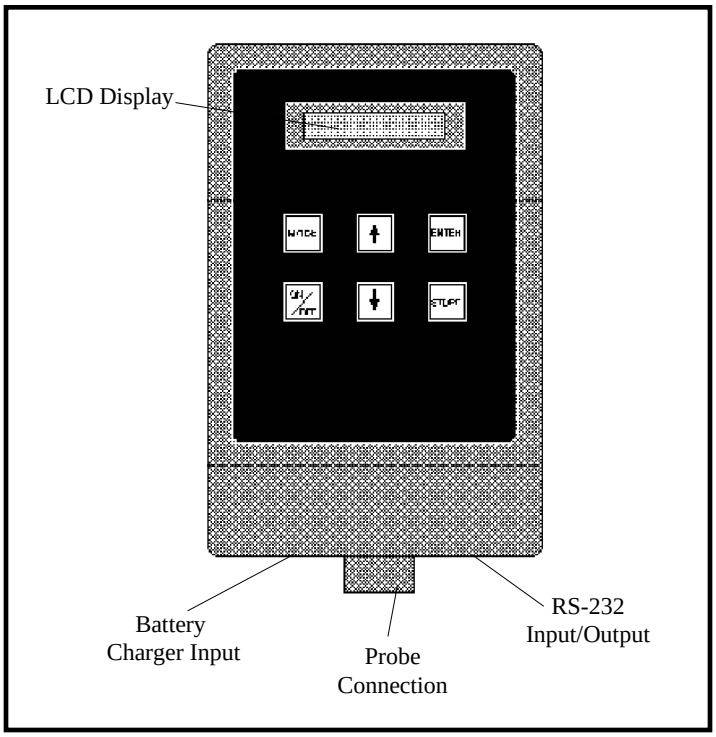


Figure 2.1. Water Analyzer Meter

[UP] and [DOWN] scroll through the menus and set values.

Battery Charger Input connects the meter to the battery charger.

ENTER selects menu items and skips calibration steps.

LCD Display displays operator prompts and measured values.

MODE selects the operating mode.

ON/OFF turns the Water Analyzer on and off.

Probe Connection connects the probe to the meter.

RS-232 Input/Output joins the RS-232 cable to the Water Analyzer Meter.

STORE stores displayed values in the measurement log and calibration information.

Water Analyzer Probe

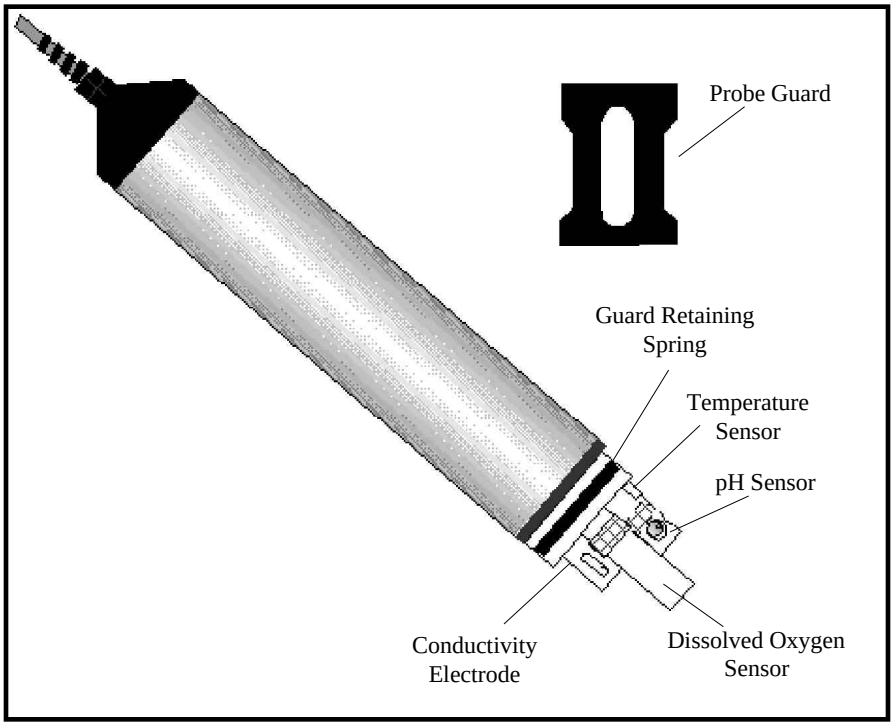


Figure 2.2. Water Analyzer Probe

CAUTION:
Do not touch the oxygen membrane in the oxygen sensor cap—the membrane will not function properly and the oxygen sensor cap will have to be replaced.

Conductivity Electrode consists of 7/16" x 3" graphite embedded in an exoxy/ Delrin casing. It requires very little maintenance and may be replaced in the field.

Dissolved Oxygen Sensor is a gray PVC, 7/16" x 4" polarographic type sensor with a two-sectioned cavity filled with oxygen electrode filling solution. May be replaced in the field.

Oxygen Sensor Cap (not shown) eliminates the need for careful membrane stretching and placement. The membrane is made of a special material through which gases but not liquids may pass. The membrane is integral to the cap, and the cap is easily replaceable.

pH Sensor is an gray PVC, 7/16" x 3.75" electrode. The sensor should be kept wet at all times. A boot is provided for this purpose. The recommended solution for storage is 10% KCl in a pH 4 buffer. The pH sensor may be replaced in the field.

CAUTION:
Do not store the pH electrode dry.

Probe Guard protects the sensors while allowing the test solution to flow past the sensors. The probe guard is a 1.5" O.D. x 2.625" Delrin piece, held in place by the guard retaining spring, which is compressed as the guard slides into place. Remove the probe guard prior to removing any sensor. Make sure that the guard is in place prior to using the probe.

Temperature Sensor is in a stainless steel housing. This sensor requires little maintenance and is not field replaceable.

Chapter 3
Operation

This chapter describes the basics of taking a measurement with the Water Analyzer. Refer to Figures 2.1 and 2.2 in Chapter 2 when necessary.

Removing the pH Boot

Before a measurement can be made, the boot must be removed from the pH sensor. The boot is a small polyethylene capsule that covers the pH sensor.

1. Remove the boot by gently sliding it off of the pH sensor body. Hold the pH sensor body so that it is not pulled out of the probe as the boot is removed. The boot is shipped from the factory filled with a boot solution of 10% KCl in a pH 4 buffer.

2. When storing the probe after taking a measurement, be sure to replace the boot. It should be filled with the boot solution. If none is available, the pH 4 buffer may be used.



CAUTION:
Do not store the pH electrode in distilled water. Do not store the pH electrode dry.

As with any pH sensor, the solution in which the sensor's pH electrode has been stored will affect its calibration. If a solution other than 10% KCl in pH 4 buffer is used as a storage solution, it will become necessary to soak the electrode in the boot solution for at least one day prior to calibrating. This will ensure maximum stability and accuracy.

Preparing the Dissolved Oxygen Sensor



CAUTION:
Do not use any tools to pry the dissolved oxygen sensor out.

1. Remove the probe guard.

2. Firmly pull the dissolved oxygen sensor straight out from the probe body. Do not use any tools to pry the dissolved oxygen sensor out—this may cause damage.

3. Fill the cavity section with oxygen filling solution, and insert the electrode section and tighten. Reconnect the dissolved oxygen sensor to the probe and slide it back into place.



CAUTION:
When the sensor is removed from the probe, do not put the probe in any water.

4. The dissolved oxygen sensor will need to standardize for approximately 20 minutes prior to use. To standardize the sensor, place the probe in distilled water or in a plastic bag with a wet sponge or cloth. The bag should be secured so that a saturated air environment develops.

Probe Connection

It may become necessary to connect or remove the probe cable from the meter.

Connecting the Probe to the Meter

1. Line up the probe cable plug's semicylindrical index with the corresponding notch in the jack of the probe connection on the meter.

2. Gently push the plug into the jack—do not force it in.

3. Rotate the fluted locking ring of the probe cable plug about 1/3 turn to lock the plug and jack connectors together.

Disconnecting the Probe From the Meter

1. Locate the connector that attaches the probe cable to the meter.

2. Rotate the fluted locking ring on the probe cable connector about 1/3 turn.

3. Gripping the cable connector body, gently pull the connector away from the meter. Do not twist the connector or put any unnecessary strain on the probe cable.

Turning on the Water Analyzer

1. Press the [ON/OFF] button. The meter should beep and display the message "WATER ANALYZER Version 7.1.0." After this time, it will begin to display the current sensor readings. Units with factory installed barometers will alternate between displaying the current temperature and the current atmospheric pressure. If you do not want the pressure reading displayed, see "Pressure Compensation" in this chapter.

2. To change the units that the information is displayed in, use the Setup Instrument Mode. To select the Setup Instrument Mode, press the [MODE] key to access the Mode menu. Press the [UP] and [DOWN] key until you reach the "Setup Instrument" prompt. Press the [ENTER] key to activate the Setup Instrument Mode. See "Setup Instrument Mode" in this chapter.

Storing Readings

Pressing the [STORE] key while the Water Analyzer is displaying readings will result in the data being stored in the measurement log. The numbered location assigned to the logged reading will appear on the display, near the temperature readout, for about three seconds. (Location numbers 1–99 are as is. Location numbers 100–109 will be labeled A0–A9, and location numbers 110–119 will be labeled B0–B9, and so on.)

Stored readings will remain stored even when the Water Analyzer is turned off. Data does not need to be reviewed or downloaded in the field.

Setup Instrument Mode

To change the units that the information is displayed in, use the Setup Instrument Mode. This mode allows the operator to select units for the pH, temperature, pressure, conductivity, and oxygen readings. It also allows the operator to select the extrinsic effects that the meter will automatically compensate for. To select the Setup Instrument Mode:

1. Press the [MODE] key to access the Mode menu.

2. Press the [UP] and [DOWN] key until you reach the “Setup Instrument” prompt. Press the [ENTER] key to activate the Setup Instrument Mode.

Temperature Display

The first prompt in the Setup Instrument Mode, “Temp. units:”, is used to select either Fahrenheit or Celsius degrees for the temperature display. Press either the [[UP] and [DOWN] key to toggle between °F and °C.

Press either the [ENTER] or the [STORE] key when the desired choice is displayed. This will save your selection and advance to the pH display.

pH Display

The second prompt in the Setup Instrument Mode, “pH in:”, is used to select either pH or mV for the pH display. Press either the [UP] and [DOWN] key to toggle between pH and mV.

Press either the [ENTER] or the [STORE] key when the desired choice is displayed. This will save your selection and advance to the Oxygen display.

Oxygen Display

The third prompt in the Setup Instrument Mode, “Oxygen in:”, is used to select either ppm or percent of saturation for the oxygen concentration display. Press either the [UP] and [DOWN] key to toggle between ppm and %.

Press either the [ENTER] or the [STORE] key when the desired choice is displayed. This will save your selection and advance to the Oxygen Compensation prompt.

Oxygen Compensation

The fourth prompt in the Setup Instrument Mode, “Comp.Oxygen:”, allows control of whether or not the oxygen readings will be corrected for salinity.

The polarographic sensor used by the Water Analyzer measures the chemical activity of the oxygen in the water rather than its physical concentration. In dilute solutions, the activity and concentration are indistinguishable from each other so no problems arise. As the solution becomes increasingly concentrated with either oxygen or other matter such as salts, the activity will increase above the physical concentration. This is commonly referred to as salting out. At very high concentrations, an error of 10% in the oxygen reading may be observed. Since the Water Analyzer measures the salt concentration as well as the oxygen activity, it can correct for the salt concentration to provide an actual physical oxygen concentration.

1. To enable the automatic correction of the oxygen reading for the salinity, press the [⑦] or [⑨] key to display the answer YES. Press the [STORE] key.

2. To disable the automatic correction, press the [UP] and [DOWN] key to display the answer NO. Press the [STORE] key. When measuring relatively clean, fresh water, this correction will not affect the reading.

After the selection has been saved, the display will advance to the next item, which allows you to select either a manually entered oxygen calibration value or an automatically generated value.

Oxygen Calibration Value

The fifth prompt in the Setup Instrument Mode, “Automatic Ox Cal.” or “Manual Ox Cal.”, selects whether the oxygen calibration is to be done with a manually entered value or with an automatically determined one. The [UP] and [DOWN] keys can be used to toggle between these two choices.

If “Manual Ox Cal.” has been selected during Oxygen Sensor Calibration, you will be asked to specify the oxygen concentration in the water in which the calibration is being performed. This is useful when strict correlation between the values from the Water Analyzer and an older, less sophisticated oxygen meter is required.

If “Automatic Ox Cal.” is selected, you will be asked to specify the atmospheric pressure when calibrating the dissolved oxygen sensor (see “Dissolved Oxygen

Sensor Calibration" in this chapter). The Water Analyzer will calculate the appropriate value for the oxygen concentration based upon the water's temperature and the specified pressure. Once the desired selection is displayed, press either the [ENTER] or the [STORE] key to record the choice and advance to the conductance prompt.

Conductance Display

The sixth prompt in the Setup Instrument Mode, "Conductance:", is used to select the units used for displaying the conductance. The conductance may be displayed in siemens (S) per cm, mhos (W) per cm, or TDS.

Due to the range of conductivity encountered, the values displayed will be in µS/cm; mS/cm; µmho/cm or mmho/cm; or, for TDS readings, ppm or ppt.

1. Press the [UP] and [DOWN] key to cycle through the list of choices.

2. When the desired conductivity units are displayed, press either the [STORE] or the [ENTER] key to save your selection.

3. If TDS is selected, the display will return to the Setup Instrument Mode. If siemens or mhos is selected, the [STORE] or [ENTER] key will advance to the conductivity compensation prompt.

Conductivity Compensation

The seventh prompt of the Setup Instrument mode is "Comp. Cond:". This prompt, which only appears if the conductivity is displayed in siemens or mhos, is used to select the desired temperature and pressure compensation values for the conductivity readings.



CAUTION:
Be careful when calibrating the analyzer when the "Comp. Cond:" is on since a conductivity standard has its specified conductivity at only one temperature.

The conductivity readings may be left uncompensated. In this case, the Water Analyzer will read the actual conductivity of the solution. Be careful when calibrating the Water Analyzer when the "Comp. Cond:" is on since a conductivity standard has its specified conductivity at only one temperature.

Alternatively, the conductivity readings may be corrected for temperature. Either 20°C or 25°C can be selected as the target temperature. When one of these is selected, the displayed conductivity readings will be the conductivity the measured solution would have at the target temperature if all of the conductivity is due to the dissolved KCl. In reality, all of the conductivity will not be due to dissolved KCl, so some slight systematic error will be present. This error is usually small enough to neglect.

When the desired compensation has been entered, press either the [ENTER] or [STORE] key to save the selection. This will advance to the next selection.

Pressure Compensation

The eighth and final prompt of the Setup Instrument Mode is “Pressure in:”. It is used to set the pressure used to compensate for the partial pressure of oxygen in the atmosphere.

Water Analyzers with barometers (factory installed) will first display “Disp. Press.” Responding with YES will inform the meter that the current pressure reading is to be displayed alternating with the temperature readings. A NO response will result in the meter not displaying the current pressure reading.

The pressure will be displayed as torr (mm of Hg) or in (inches of Hg). Press the [UP] and [DOWN] key to select the desired units. Press the [STORE] or [ENTER] key to save the selection. The meter will then return to the display of the current readings.

Calibration

Even though the Water Analyzer is calibrated before it leaves the factory, we recommend calibrating it again prior to use. In addition, periodic recalibration is recommended to ensure the accuracy of the displayed readings.

- Unless very accurate temperature measurements are to be made, the *temperature sensor* should never need recalibration. The Water Analyzer will meet its temperature specification without any operator calibration.

  Should the temperature sensor need to be recalibrated, it should be done prior to any other calibration procedures. The same holds true for units with installed barometers. Once the temperature has been calibrated, the pressure should be calibrated if required, prior to calibrating the pH, dissolved oxygen, or conductivity sensor.

- The condition of the *pH sensor* will primarily depend upon its storage conditions. Storing it in the recommended boot solution of 10% KCl in pH 4 buffer will reduce the frequency of calibration.

- The *dissolved oxygen sensor* also requires periodic calibration. Organic matter can foul the membrane pores, reducing the sensor’s effectiveness. Since the sensor’s response is dependent upon the mass transport characteristics of the membrane, as well as the condition of the surface of the electrode, it needs to be recalibrated whenever the membrane is replaced or conditions warrant recalibration.

- The *conductivity sensor* has less stringent calibration requirements than the pH and dissolved oxygen sensors. Frequently, the factory calibration will suffice for the life of the sensor; this is especially true if you are working with only slightly conductive (less than 5 mS/cm) solutions.



CAUTION:
To reduce the frequency of calibration, store the pH sensor in the recommended boot solution.

Each of the four sensors in the probe (dissolved oxygen, pH, conductivity, and temperature) are calibrated separately. When calibrating, allow the probe to sit in the solution for 5 minutes and then allow up to 10 minutes for the ADC (Analog Digital Conversion) readout to stabilize. Then press the [STORE] key.

Temperature Sensor Calibration

The simplest sensor to calibrate is the temperature sensor. This is also the most stable sensor, so it is unlikely that calibration will ever be required.

1. Immerse the probe into a solution and note the actual temperature of the solution.

2. Turn the Water Analyzer on and allow the displayed readings to stabilize.

3. Press the [MODE] key, and press either the [UP] and [DOWN] key until you reach the "Calibrate Temp" prompt. Press the [ENTER] key to select the Calibrate Temp Mode.

4. The top line of the display will indicate the temperature set point. Press the [UP] and [DOWN] key to change the displayed value to the actual temperature of the solution into which the sensor is immersed. (The solution temperature should be checked with an NIST traceable thermometer.)

5. The bottom line will show the ADC value. A stable readout (the ADC value remains relatively constant for four counts), not the actual value, is important. When the readout is stable, press the [STORE] key to calibrate the temperature sensor and store the calibration information. If you decide not to alter the previously stored calibration information, press the [ENTER] key to skip this step.

The Water Analyzer will resume displaying the measured values for temperature, pH, conductivity, and oxygen.



CAUTION:
The dissolved oxygen sensor requires frequent recalibration for maximum accuracy.

We do not recommend calibrating the temperature sensor in air. The evaporation of any water from the temperature sensor could keep its temperature significantly lower than the surrounding air.

Dissolved Oxygen Sensor Calibration

The dissolved oxygen sensor used in the Water Analyzer requires frequent recalibration for maximum accuracy.

The details of the calibration procedure depend upon whether Automatic or Manual Oxygen Calibration is chosen in the Setup Instrument Mode.

1. Turn on the Water Analyzer and press the [MODE] key to access the Mode menu.

2. Press either the [UP] and [DOWN] key until the "Calibrate Oxygen" prompt is displayed. Press the [ENTER] key to select the Calibrate Oxygen Mode.

Automatic Oxygen Calibration

When Automatic Oxygen Calibration (in units without internal barometers) has been selected, the top line will display a prompt for the atmospheric pressure. This, along with the temperature, is used to determine the solubility of oxygen in water.

1. Use the [UP] and [DOWN] keys to adjust the displayed value to the test site atmospheric pressure.

Note: The barometric pressure as reported by radio and television stations is not the correct atmospheric pressure to use. For standardization, the values reported are corrected to sea level. To convert from the reported value to the actual atmospheric pressure, you must know your altitude above sea level. The local airport should be able to provide this information.

2. Once your altitude is known, the following table may be used to convert from barometric to atmospheric pressure:

Altitude	Correction Factor
–500 m	1.061
sea level	1.000
500 m	0.942
1000 m	0.887
1500 m	0.835
2000 m	0.785

3. Multiply the correction factor corresponding to the altitude by the standardized barometer reading to get the actual atmospheric pressure. Contact the dealer or the factory if additional correction factors are needed.

4. Once the correct pressure has been entered, press either the [ENTER] or [STORE] key to save the value and move to the Air Sat Ox Cal step.



CAUTION: *Do not touch the oxygen membrane—the membrane will not function properly, and the oxygen sensor cap will have to be replaced.*

5. Wrap the probe in a wet cloth, or place it in a plastic bag with a few drops of water and tie the bag shut. Do not touch the oxygen membrane. The object of this operation is to have the oxygen and temperature sensors in a 100% humidity environment.

Manual Oxygen Calibration

When manually calibrating the dissolved oxygen sensor, the top line of the display indicates the oxygen concentration of the standard solution to be used. The [UP] and [DOWN] keys may be used to adjust the displayed value to match that of the standard solution. (The standard solution can be saturated air, approximately 9 ppm.) Place the probe in a standard solution and allow it to stabilize.

Once the ADC value stabilizes (approximately 15 minutes) for either of the above methods (100% humidity or a given standard solution), press the [STORE] key to complete the dissolved oxygen sensor calibration. To skip this step, press the [ENTER] key and the previous calibration information will be used.

After the dissolved oxygen sensor calibration is complete, the Water Analyzer will resume displaying the four measured parameters: temperature, pH, conductivity, and oxygen.

pH Sensor Calibration

For maximum accuracy, the pH sensor is calibrated at three points: acid point, base point, and neutral point.

1. Turn on the Water Analyzer and let the readings stabilize.

2. Completely immerse the pH sensor in a pH 4 buffer.

3. Press the [MODE] key to reach the Mode menu. Press either the [UP] and [DOWN] key until “Calibrate pH” is displayed. Press the [ENTER] key to select the Calibrate pH Mode.

4. The top line of the display will now read “pH low cal 4.00”. The [UP] and [DOWN] keys can be used to adjust this to a different value if desired.

5. The bottom line of the display will show an ADC value. When the displayed ADC value stabilizes, press the [STORE] key to save the calibration information. To skip this step, press the [ENTER] key and the previous information will be used.

After the pH low cal point has been determined, the pH mid cal and the pH high cal points will be prompted for. We recommend that pH 4, pH 7, and pH 10 buffers be used for calibrating the pH sensor.

While the solutions used are buffers and will remain reasonably stable in pH value in spite of slight dilution or contamination, the greatest accuracy will be obtained by using fresh, clean buffers. After a solution has been used to calibrate a pH point, discard it.

Once the pH high point has been determined, the meter will resume displaying the measured values for the temperature, conductivity, pH, and oxygen.

Conductivity Sensor Calibration

The conductivity meter contained within the Water Analyzer has four ranges of sensitivity. The Water Analyzer automatically selects the appropriate range for displaying the conductivity value. Each range must be calibrated separately. We recommend that all four ranges be calibrated at the same time rather than the single range you may be using.

1. Turn on the Water Analyzer and press the [MODE] key to access the Mode menu.

2. Press either the [UP] and [DOWN] key until the “Calibrate Cond” prompt is displayed. Press the [ENTER] key to select the Calibration Cond Mode.

3. The top line of the display will then read “Cnd 1 cal 73.9 uS”. The [UP] and [DOWN] keys can be used to alter the calibrator value to match the standard. Range 1 requires a conductivity standard between 50 and 99 µS/cm for proper calibration. The conductivity sensor and thermistor should be completely immersed.

4. When the displayed ADC value stabilizes, press the [STORE] key to save the calibration information. If you press the [ENTER] key, you will skip the calibration of this conductivity range.

After range 1 has been calibrated or skipped, a prompt will be displayed to calibrate each of the other three ranges in a similar fashion. Each range requires a different standard solution. The conductivity of standard 2 should be between 500 and 990 µS/cm, standard 3 between 5.0 and 9.9 mS/cm, and standard 4 between 50 and 99 mS/cm. (Conductivity standards provided in the Water Analyzer calibration kit are 73.9 µS, 717 µS, 6.66 mS, and 58.6 mS.)

Conductivity standards are not buffers. Dilution or contamination will affect their conductivity value. After a solution has been used to calibrate a conductivity range, discard it.

After the fourth conductivity range has been calibrated, the meter will resume displaying the measured values for temperature, pH, conductivity, and dissolved oxygen.

Review Log

The Review Log Mode allows measurements previously stored in the measurement log to be viewed.

To review the stored readings:

1. Press the [MODE] key to access the Mode menu.

2. Press either the [UP] and [DOWN] key to reach the “Review Log” prompt.

3. Press the [ENTER] key to activate the Review Log Mode.

4. The [UP] and [DOWN] keys can be used to step through the list of numbered log entries. When all of the log entries of interest have been examined, press the [MODE] key to return to the Mode menu.

Clear Log

The Clear Log Mode allows the measurement log to be emptied. This clears the memory for the next set of readings to be stored.

1. To erase the measurement log, press the [MODE] key to access the Mode menu.

2. Press either the [UP] and [DOWN] key to reach the “Clear Log” prompt. Pressing the [ENTER] key activates the Clear Log Mode and allows the measurement log to be erased.

3. The “Clear Log?” prompt will be displayed. Use the [UP] and [DOWN] keys to toggle between the answers YES and NO. To clear the log, toggle to YES and press [ENTER]. To leave the log untouched, toggle to NO and press [ENTER].

After the [ENTER] key is pressed, the Water Analyzer will resume displaying the measured parameters.

RS-232 Option

The Water Analyzer can be optionally equipped with an RS-232 interface and time clock, which links the Water Analyzer with a personal computer. With this link, parameters that have been read and stored can be downloaded to a file in the computer.

Timed Readings—Auto Logging

1. Clear the log (see “Clear Log” in this chapter).

2. Press the [MODE] key. Press either the [UP] and [DOWN] key until the “Timed Readings” prompt is displayed.

3. Press the [ENTER] key. The screen will display “Store 10 minutes”. This means that a set of readings will be taken and stored every 10 minutes. Shorter or longer intervals can be selected by using the arrow keys and pressing [STORE] to initiate the operation of the timed readings.

The first reading will be taken immediately after the [STORE] key has been pressed. Subsequent readings will be taken at the interval selected. As each reading is taken, a location number will appear momentarily in the middle of the display top line.

To defer timed readings or terminate the mode, press the [MODE] key twice or turn the instrument off.

The clock values will be stored but not displayed on the meter. Stored clock values

can be seen only via the RS-232 link.

RS-232 Interface Procedure

The Water Analyzer is a DCE device, with only Tx and Rx implemented. No other protocol lines are present.

Baud Rate:	1200
Number of Bits:	8
Parity:	None
Stop Bits:	1

No modem is needed; the Water Analyzer can be connected directly to COM1 or COM2 of your PC with the cable provided.

Hook-Up

The following are instructions for transferring stored readings from the Water Analyzer to a computer.

1. With both instruments powered off, attach the communications cable to the PC's COM1 port and to the Water Analyzer.

2. Turn on the PC. Insert the diskette into drive A or B.

3. Type <WATER> and press [ENTER]. The Water Analyzer Communications Program will start.

4. Turn on the Water Analyzer.

5. Type in the following letters and press [ENTER] to receive information from the Water Analyzer.

   A .....All data currently displayed on meter
   B .....Barometric pressure (models with internal barometric pressure only)
   C .....Conductivity reading
   I.....Software identification
   O .....Oxygen readings
   P.....pH reading
   S.....Stored data. Use this command to dump stored data into a disk file.
   T .....Temperature reading

6. Type <ALT S>. The program will prompt you to specify the name of your file to save to.

7. Type <S> and press [ENTER]. The stored readings will begin to be displayed on the screen within 10 seconds. If there are no stored readings, there will be a message.

8. When the stored readings have been displayed, type <Alt S> to close your saved file.

9. The Water Analyzer Communications Program may be exited by typing <Alt X>.

Changing the COM port

To change from the COM1 port to the COM2 port:

1. Type <Alt C>. The highlighted line at the bottom of the screen will prompt for the new entry.

2. Type <2> and press [ENTER].

The COM2 port will now be used to transfer the stored readings. This needs to be done only once and can be changed back to COM1 at anytime.

Notes

Chapter 4
Maintenance

This chapter describes the maintenance of the Water Analyzer.

General Sensor Maintenance

The Water Analyzer normally requires only minimal maintenance, aside from periodic calibration. The frequency of required calibration will depend upon the accuracy of the readings desired, the frequency and manner in which the meter is used, and the storage conditions. Figure 4.1 shows the location of each of the sensors in the probe.

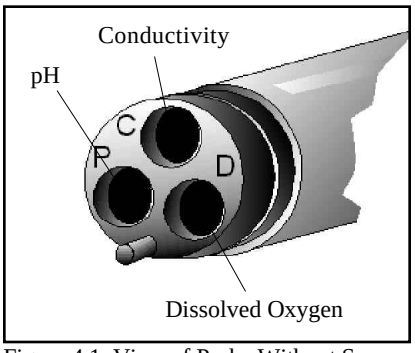


Figure 4.1. View of Probe Without Sensors

Each of the sensors (pH, dissolved oxygen, and conductivity) are field replaceable. To remove a sensor (pH, dissolved oxygen, or conductivity) for service:

1. Remove the probe guard.
2. Firmly pull the sensor straight out from the probe body.

CAUTION: *Do not use any tools to pry the sensor out from the probe body—this may damage the sensor.*

Once removed, the sensor can be cleaned or replaced if needed.

CAUTION: *When a sensor is out of the probe, do not put the probe in any water.*

When a sensor is out of the probe, do not put the probe in any water. Placing a probe in water at this time will destroy the electronics within the probe and invalidate the warranty. When replacing a sensor in the probe, silicone grease (included with your meter) needs to be applied to the connector end of the sensor body. Apply a drop of silicone grease to the edge of the sensor body.

Note: Do not allow any silicone grease to get on the connectors. If any silicone grease gets on the connectors, clean it off with alcohol. The silicone acts as a barrier and will interfere with the sensor/probe communication.

Insert the sensor by pushing and twisting 360° until the retainer ring is in place. This will ensure that the entire outer circumference of the sensor has silicone on it. The silicone increases the O-ring water tightness ability.

Dissolved Oxygen Sensor Maintenance

If the sensitivity of the dissolved oxygen sensor decreases, it may be necessary to clean the sensor or replace the oxygen membrane.

1. Remove the dissolved oxygen (DO) sensor from the probe body (see "General Sensor Maintenance" in this chapter).

2. Unscrew the DO cap from the DO sensor body (see Figure 4.2) and drain the cap of filling solution.

CAUTION: *Do not touch the oxygen membrane in the oxygen sensor cap—the membrane will not function properly and the oxygen sensor cap will have to be replaced.*

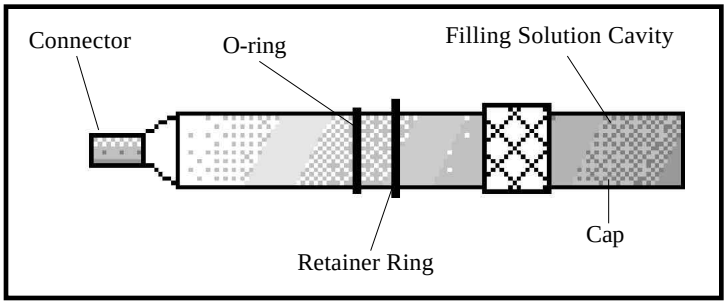


Figure 4.2. Dissolved Oxygen Sensor

CAUTION: *Do not use oxygen filling solution when storing the dissolved oxygen sensor. When not in use, rinse the sensor with DI water and store it dry.*

3. Using a cotton swab soaked in rubbing alcohol, wipe the DO membrane inside and out.

4. After cleaning the membrane thoroughly, rinse the inside and outside body and membrane with deionized water.

5. Refill the DO cap with filling solution and screw the cap back onto the DO sensor body.

6. Recalibrate the DO sensor after re-inserting it into the probe body.

pH Electrode Maintenance

The pH electrode requires more maintenance than any of the other sensors used by the Water Analyzer. The pH electrode is field replaceable.

The pH electrode must not be allowed to dry out. A boot has been provided with the Water Analyzer to keep the electrode moist. It should be filled with pH electrode boot solution (10% KCl in pH 4 buffer) and kept on the electrode when not in use. The boot should be removed prior to use or both the conductivity and pH readings will be in error.

Note: The pH electrode must not be stored dry. If the electrode is allowed to dry, it will be rendered useless and the sensor will have to replaced or returned to the factory for repair.

Storing the pH electrode in deionized water (or any solution lacking sufficient KCl) will cause the electrode to drift and require increasingly frequent calibration.

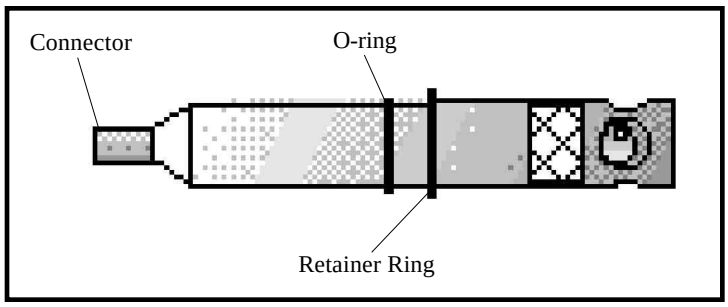


Figure 4.3. pH Electrode With Boot Removed

Conductivity Sensor Maintenance

The conductivity sensor requires only minimal maintenance and is field replaceable. The sensor element is made of graphite and is resistant to most chemicals. The thermistor is housed in stainless steel and is also resistant to most chemicals.

- Rinse the sensors in clean water after each use. These sensors can be stored dry.
- Should any buildup become evident, the sensors should be cleaned. A mild soap detergent, with some agitation, is usually sufficient to effectively remove most deposits. Rinse and recalibrate.

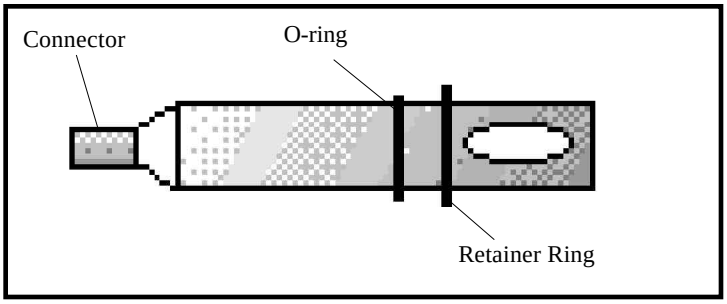


Figure 4.4. Conductivity Sensor

Temperature Sensor Maintenance

Do not attempt to remove the temperature sensor. The temperature sensor is secured internally and can only be removed at the factory. Removal will invalidate the probe warranty. Should the temperature sensor need to be replaced, contact the factory or dealer.

Probe Storage

Short-Term Storage (overnight or over a weekend)

1. Place the boot with the boot solution on the pH sensor.

2. Place the entire probe in a plastic bag with a damp sponge or cloth and secure the bag, so that a humid environment is maintained, or immerse the probe in deionized water (with the pH boot on).

Long-Term Storage

1. Turn the meter off.

2. If the meter is to be charged during storage, disconnect the probe from the meter.

3. Store the pH sensor with the boot containing boot solution.

4. Disconnect and disassemble the dissolved oxygen sensor. Rinse all parts and blot dry.

5. Reconnect the dissolved oxygen sensor to the probe.

Chapter 5
Troubleshooting

The Aqua-Check Water Analyzer is not designed for field repair. Some problems, however, may be remedied without the need for any physical disassembly. The more common of these and their remedies are listed below. If a problem still exists after reviewing the following chart or if a particular problem is not addressed, contact your dealer or the factory for assistance.

PROBLEM	SUGGESTED ACTION
No display	Battery is not charged. Check for operation with the AC adapter. If necessary, recharge the battery by leaving the Water Analyzer plugged in overnight.
Displays <<< or >>>	The symbol <<< is used to indicate under range (too small a value), and >>> indicates over range (too large a value). For conductivity, <<< indicates the solution has a conductivity of less than 10 µS/cm and >>> indicates a conductivity greater than 99.9 mS/cm. If this appears unexpectedly, it may indicate a problem with the probe.
Displayed value is incorrect	Check the calibration of the appropriate sensor. When recalibration is necessary, press the [STORE] key to save the calibration information.
pH will only read 0 or 14	If the pH reading remains at 0 or 14 even after calibration, the probe may be leaking. Remove the sensor and check for water drops. Dry the sensor. Reinsert the sensor (see "General Sensor Maintenance" in Chapter 4).
pH drifts	If the pH reading drifts or you are unable to obtain a constant ADC value, the pH electrode has probably been stored improperly when it was calibrated. Soak the pH sensor in warm (40°C) water saturated with KCl for several hours. Then soak the sensor overnight in 10% KCl in pH 4 buffer. (Be sure to remove the boot from the pH sensor.) Normal storage of the pH electrode is with the boot in place and filled with 10% KCl in pH 4 buffer.
Conductivity readings drift or are in error	Clean the conductivity sensor (see "Conductivity Sensor Maintenance" in Chapter 4). Calibrate the conductivity sensor after cleaning it.

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