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ORBISPHERE Model 3650 Portable Analyzer

User Manual

05/2015, Edition 7

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Section 1 General Information

1.1 Disclaimer

The information in this manual has been carefully checked and is believed to be accurate. However, Hach Lange assumes no responsibility for any inaccuracies that may be contained in this manual. In no event will Hach Lange be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. In the interest of continued product development, Hach Lange reserves the right to make improvements in this manual and the products it describes at any time, without notice or obligation.

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1.2 Contact information

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1.3 Safety information

For safe operation, please read the entire manual before unpacking, setting up, or operating this instrument.

Pay particular attention to all warning and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To ensure the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that which is specified in this manual.

1.3.1 Use of hazard information

WARNING
A warning is used to indicate a condition which, if not met, could cause serious personal injury and/or death. Do not move beyond a warning until all conditions have been met.

CAUTION
A caution is used to indicate a condition which, if not met, could cause minor or moderate personal injury and/or damage to the equipment. Do not move beyond a caution until all conditions have been met.

Note: *A note is used to indicate important information or instructions that should be considered before operating the equipment.*

1.3.2 Service and repairs

None of the instrument's components can be serviced by the user. Only personnel from Hach Lange or its approved representative(s) is (are) authorized to attempt repairs to the system and only components formally approved by the manufacturer should be used. Any attempt at repairing the instrument in contravention of these principles could cause damage to the instrument and corporal injury to the person carrying out the repair. It renders the warranty null and void and could compromise the correct working of the instrument and the electrical integrity or the CE compliance of the instrument.

If you have any problems with installation, starting, or using the instrument please contact the company that sold it to you. If this is not possible, or if the results of this approach are not satisfactory, please contact the manufacturer's Customer Service.

1.3.3 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.

	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.
	This symbol, when noted on the product, indicates that the marked item can be hot and should not be touched without care.
	This symbol, when noted on the product, indicates the presence of devices sensitive to electrostatic discharge and indicates that care must be taken to prevent damage to them.
	This symbol, when noted on the product, identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.
	This symbol, if noted on the product, indicates the need for protective eye wear.
	This symbol, when noted on the product, identifies the location of the connection for protective earth (ground).
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems. In conformity with European local and national regulations, European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.
	Products marked with this symbol indicates that the product contains toxic or hazardous substances or elements. The number inside the symbol indicates the environmental protection use period in years.

1.4 Product recycling information



ENGLISH

Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

Note: *For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.*

DEUTSCH

Elektrogeräte, die mit diesem Symbol gekennzeichnet sind, dürfen in Europa nach dem 12. August 2005 nicht mehr über die öffentliche Abfallentsorgung entsorgt werden. In Übereinstimmung mit lokalen und nationalen europäischen Bestimmungen (EU-Richtlinie 2002/96/EC), müssen Benutzer von Elektrogeräten in Europa ab diesem Zeitpunkt alte bzw. zu verschrottende Geräte zur Entsorgung kostenfrei an den Hersteller zurückgeben.

Hinweis: *Bitte wenden Sie sich an den Hersteller bzw. an den Händler, von dem Sie das Gerät bezogen haben, um Informationen zur Rückgabe des Altgeräts zur ordnungsgemäßen Entsorgung zu erhalten.*

FRANCAIS

A partir du 12 août 2005, il est interdit de mettre au rebut le matériel électrique marqué de ce symbole par les voies habituelles de déchetterie publique. Conformément à la réglementation européenne (directive UE 2002/96/EC), les utilisateurs de matériel électrique en Europe doivent désormais retourner le matériel usé ou périmé au fabricant pour élimination, sans frais pour l'utilisateur.

Remarque: *Veuillez vous adresser au fabricant ou au fournisseur du matériel pour les instructions de retour du matériel usé ou périmé aux fins d'élimination conforme.*

ITALIANO

Le apparecchiature elettriche con apposto questo simbolo non possono essere smaltite nelle discariche pubbliche europee successivamente al 12 agosto 2005. In conformità alle normative europee locali e nazionali (Direttiva UE 2002/96/EC), gli utilizzatori europei di apparecchiature elettriche devono restituire al produttore le apparecchiature vecchie o a fine vita per lo smaltimento senza alcun costo a carico dell'utilizzatore.

Nota: *Per conoscere le modalità di restituzione delle apparecchiature a fine vita da riciclare, contattare il produttore o il fornitore dell'apparecchiatura per un corretto smaltimento.*

DANSK

Elektriske apparater, der er mærket med dette symbol, må ikke bortskaffes i europæiske offentlige affaldssystemer efter den 12. august 2005. I henhold til europæiske lokale og nationale regler (EU-direktiv 2002/96/EF) skal europæiske brugere af elektriske apparater nu returnere gamle eller udtjente apparater til producenten med henblik på bortskaffelse uden omkostninger for brugeren.

Bemærk: *I forbindelse med returnering til genbrug skal du kontakte producenten eller leverandøren af apparatet for at få instruktioner om, hvordan udtjente apparater bortskaffes korrekt.*

SVENSKA

Elektronikutrustning som är märkt med denna symbol kanske inte kan lämnas in på europeiska offentliga sopstationer efter 2005-08-12. Enligt europeiska lokala och nationella föreskrifter (EU-direktiv 2002/96/EC) måste användare av elektronikutrustning i Europa nu återlämna gammal eller utrangerad utrustning till tillverkaren för kassering utan kostnad för användaren.

Obs! *Om du ska återlämna utrustning för återvinning ska du kontakta tillverkaren av utrustningen eller återförsäljaren för att få anvisningar om hur du återlämnar kasserad utrustning för att den ska bortskaffas på rätt sätt.*

ESPANOL

A partir del 12 de agosto de 2005, los equipos eléctricos que lleven este símbolo no deberán ser desechados en los puntos limpios europeos. De conformidad con las normativas europeas locales y nacionales (Directiva de la UE 2002/96/EC), a partir de esa fecha, los usuarios europeos de equipos eléctricos deberán devolver los equipos usados u obsoletos al fabricante de los mismos para su reciclado, sin coste alguno para el usuario.

Nota: *Sírvase ponerse en contacto con el fabricante o proveedor de los equipos para solicitar instrucciones sobre cómo devolver los equipos obsoletos para su correcto reciclado.*

NEDERLANDS

Elektrische apparatuur die is voorzien van dit symbool mag na 12 augustus 2005 niet meer worden afgevoerd naar Europese openbare afvalsystemen. Conform Europese lokale en nationale wetgegeving (EU-richtlijn 2002/96/EC) dienen gebruikers van elektrische apparaten voortaan hun oude of afgedankte apparatuur kosteloos voor recycling of vernietiging naar de producent terug te brengen.

Nota: *Als u apparatuur voor recycling terugbrengt, moet u contact opnemen met de producent of leverancier voor instructies voor het terugbrengen van de afgedankte apparatuur voor een juiste verwerking.*

POLSKI

Sprzęt elektryczny oznaczony takim symbolem nie może być likwidowany w europejskich systemach utylizacji po dniu 12 sierpnia 2005. Zgodnie z europejskimi, lokalnymi i państwowymi przepisami prawa (Dyrektywa Unii Europejskiej 2002/96/EC), użytkownicy sprzętu elektrycznego w Europie muszą obecie przekazywać Producentowi stary sprzęt lub sprzęt po okresie użytkowania do bezpłatnej utylizacji.

Uwaga: *Aby przekazać sprzęt do recyklingu, należy zwrócić się do producenta lub dostawcy sprzętu w celu uzyskania instrukcji dotyczących procedur przekazywania do utylizacji sprzętu po okresie użytkownia.*

PORTUGUES

Qualquer equipamento eléctrico que ostente este símbolo não poderá ser eliminado através dos sistemas públicos europeus de tratamento de resíduos sólidos a partir de 12 de Agosto de 2005. De acordo com as normas locais e europeias (Directiva Europeia 2002/96/EC), os utilizadores europeus de equipamentos eléctricos deverão agora devolver os seus equipamentos velhos ou em fim de vida ao produtor para o respectivo tratamento sem quaisquer custos para o utilizador.

Nota: *No que toca à devolução para reciclagem, por favor, contacte o produtor ou fornecedor do equipamento para instruções de devolução de equipamento em fim de vida para a sua correcta eliminação.*

1.5 Product disposal

Note: *The following only applies to European customers.*

Hach Lange is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) that came into force on August 13 2005 aims to reduce the waste arising from electrical and electronic equipment; and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment.



In conformity with European local and national regulations (EU Directive 2002/96/EC stated above), electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12 August 2005.

Hach Lange will offer to take back (**free of charge to the customer**) any old, unserviceable or redundant analyzers and systems which carry the above symbol, and which were originally supplied by Hach Lange. Hach Lange will then be responsible for the disposal of this equipment.

In addition, Hach Lange will offer to take back (**at cost to the customer**) any old, unserviceable or redundant analyzers and systems which do not carry the above symbol, but which were originally supplied by Hach Lange. Hach Lange will then be responsible for the disposal of this equipment.

Should you wish to arrange for the disposal of any piece of equipment originally supplied by Hach Lange, please contact your supplier or our After Sales Service department in Geneva for instructions on how to return this equipment for proper disposal.

1.6 Restriction of hazardous substances (RoHS)

The European Union RoHS Directive and subsequent regulations introduced in member states and other countries limits the use of six hazardous substances used in the manufacturing of electrical and electronic equipment.

Currently, monitoring and control instruments do not fall within the scope of the RoHS Directive, however Hach Lange has taken the decision to adopt the recommendations in the Directive as the target for all future product design and component purchasing.

Note: *The following only applies to exports of this product into the People's Republic of China.*



含有有毒或者危险物质及成分的产品。

环保使用期限标记（年）

	有毒或者危险物质和成分					
部件名称	铅	汞	镉	六价铬	多溴联苯	多溴联苯醚
1184 Board	X					
1112 Analog board	X					
1185 Board	X					
Spacer	X					
External connector	X					

O: 表示所有此类部件的材料中所含有毒或危险物质低于限制要求

X: 表示至少有一种此类部件材料中所含有毒或危险物质高于限制要求

Section 2 Specifications

2.1 General technical data

Power Supply	Batteries: two C-type cells, NiCd or alkaline, each 26 x 50mm, 2.4 - 3volts total
Power Autonomy	40 hours continuous use
Signal Drift	<0.5% of reading between service
Serial Output (RS232)	Baud rate: 9600; Stop Bits: 1; Start Bits: 0; Parity: None;
Temperature Compensation Range	-5 to 60°C
Instrument Operating Limits	-5 to 100°C
Dimensions (HxWxD)	150mm x 115mm x 220mm
Weight	2.4kg
Enclosure Protection	IP 65/NEMA 4
EMC Requirements	EN 61326:1997 + A1:1998 + A2:2001 + A3:2003
ISO Certification	ISO9001/EN29001

2.2 Instrument display options

Instrument Model	Display Units	Maximum Display Resolution
3650/111	ppm/ppb (liquid) ppm (liquid) only	1 ppb 0.001 ppm
3650/112	%/ppm (gaseous)	1 ppm
3650/113	ppm (liquid) % (gaseous)	0.001 ppm 0.001%

2.3 Theory of operation

The sensor circuitry performs four functions:

- Applying a constant voltage to the anode
- Measuring the current flowing through the sensor
- Compensating this current for sample temperature variations
- Converting these resulting signals into a scaled current or voltage

The anode is held positive with respect to the cathode. Current flowing through the sensor due to oxygen reduction at the cathode is converted to a voltage by an amplifier, the proportionality between voltage and current being determined by the feedback resistance of this amplifier.

The output voltage is essentially a function of oxygen activity (partial pressure), temperature and membrane permeability. Corrections for variations in membrane permeability are made when the sensor is calibrated. The temperature compensation circuit accounts for temperature variations. Hence the output voltage varies only with oxygen concentration.

Section 3 Installation

This section provides necessary information to install and connect the instrument. Should you have any questions, do not hesitate to contact your Hach Lange representative regarding the installation procedure.

The ORBISPHERE 3650 instrument is a self-contained portable analyzer, configured to make oxygen concentration measurements in gaseous or liquid samples, with Electrochemical (EC) Sensors.

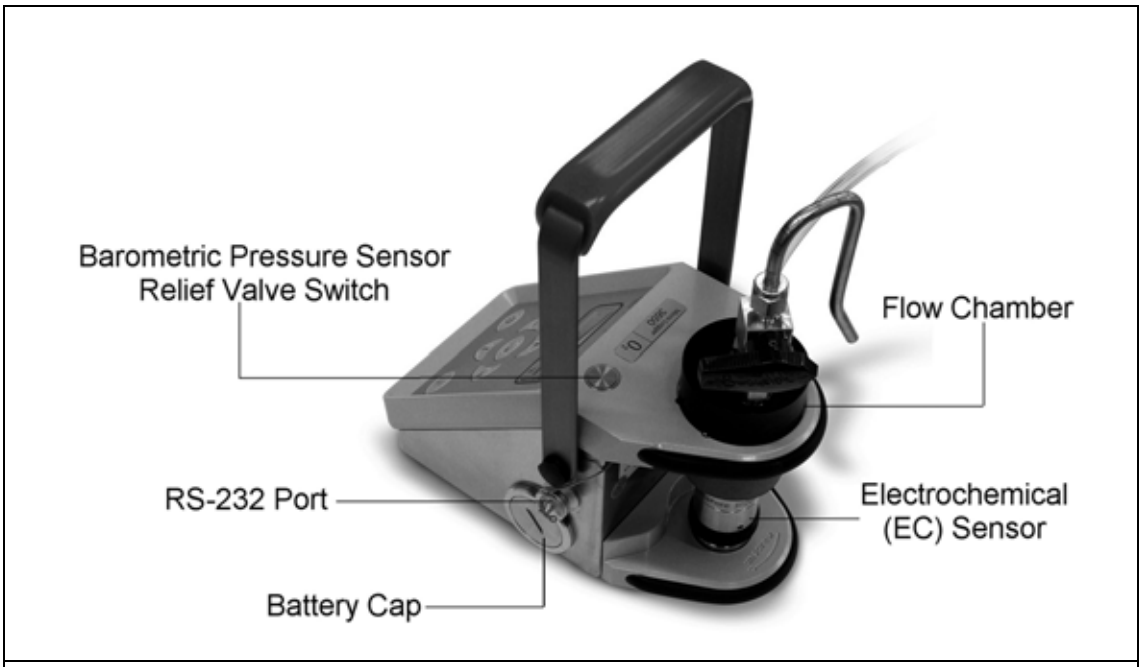


Figure 1 ORBISPHERE 3650 Portable O_2 Analyzer

Refer to Instrument configurations on page 41 for a complete list of the 3650 instrument configurations available.

Up to 500 measurement values can be stored in memory and downloaded to a personal computer for further analysis.

Locate the instrument convenient to the sample being analyzed and to the PC if one is being used. A 6-pin LEMO connector for RS-232 serial output to a PC, or an optional external power source is located on the right side (as illustrated in Figure 1).

3.1 Sensor installation

The sensor has a threaded collar and calibration cap, and a screw-on protection cap to prevent disturbances to the membrane. A plastic screw-on base at its rear provides a stand for servicing, and protects the sensor's screw-on 10-pin LEMO connection.

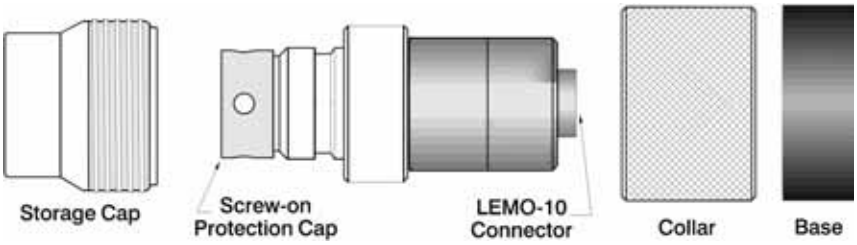


Figure 2 Electrochemical Sensor Components - Exploded View

The electrochemical (EC) sensor connects to the instrument base through a 10-pin LEMO connector. A locking nut holds the sensor in place. Generally, the sensor is shipped already installed in the instrument. If this is not the case, for full installation instructions, please refer to the **EC Sensors Maintenance & Installation Manual** that was provided with your instrument.

Should a sensor service be required, then again please refer to the **EC Sensors Maintenance & Installation Manual** for instructions on sensor servicing.

3.2 Flow chamber installation

The model 32007F flow chamber (illustrated in Figure 3 below) draws the liquid or gaseous sample past the EC sensor. It attaches to the sensor with a threaded collar and is then sealed to the sensor with two O-rings.



Figure 3 Flow Chamber 32007F

The flow chamber centrally located inlet and eccentrically located outlet use either ¼-inch or 6-mm diameter transparent plastic tubing. Connect by compression fittings to the sample source and to the drain, respectively.

3.3 Sample tube adapter (optional)

A model 32051 sample tube adapter can be attached to the flow chamber's inlet tubing. This adapter, in turn, attaches to 6 mm or ¼ inch stainless steel or flexible tubing using rubber gasket model 32813 (or, for 8 mm tubing, rubber gasket model 32814).

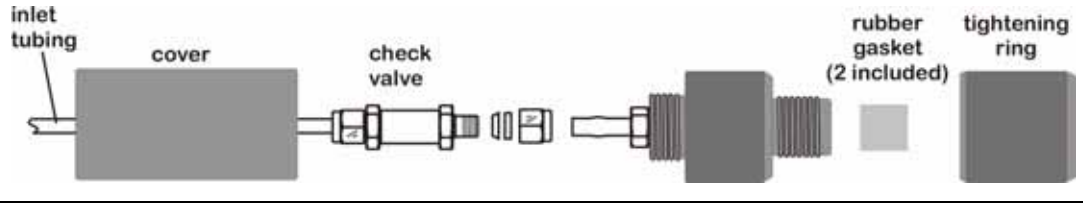


Figure 4 32051 Sample Tube Adapter with Check Valve from Flow Chamber

The tightening ring provides a compression fitting to the sample tube.

3.4 WinLog97 PC program installation

Install the WinLog97 program onto the PC by inserting the accompanying CD into your PC and running the SetUp program. Simply follow the on-screen instructions.

When finished, a new Windows Program Group labeled **Orbisphere** is created containing the software and help files.

3.5 Connections

3.5.1 External power (optional)

The instrument is usually powered by the batteries supplied. You can, however, power it from an external +5VDC source (as supplied by an electronics supply store). Connect the 2-wire output from this source, using a model 28083 male 6-pin LEMO plug, to the RS-232 connector on the right side of the instrument.

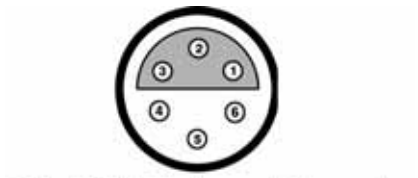


LEMO-6 Pin	Description
Pin 1	Not used
Pin 2	Not used
Pin 3	Not used
Pin 4	Not used
Pin 5	External +5VDC voltage input
Pin 6	Ground

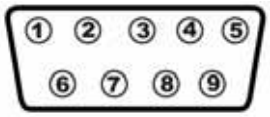
Figure 5 External Power Connection

3.5.2 Instrument - PC Connection

An RS-232 cable is supplied with the instrument, with a 6-pin LEMO plug on one end and a 9-pin D-Type plug on the other.



6-Pin LEMO Instrument Connector



9-Pin Male PC Connector

Pin	RS232 Signal
Pin 1	Transmitted data (TXD)
Pin 2	Received data (RXD)
Pin 3	Not Used
Pin 4	Not Used
Pin 5	Not Used
Pin 6	Ground

Pin	Use
Pin 1	Not Used
Pin 2	RS-232 Transmitted Data (TXD)
Pin 3	RS-232 Received Data (RXD)
Pin 4	Not Used
Pin 5	Ground
Pin 6	Not Used
Pin 7	Not Used
Pin 8	Not Used
Pin 9	Not Used

Figure 6 Instrument to PC Connections

Note: *If you use an adapter for the connection to the PC, make sure it is designed for this purpose and, thus, has all nine pins accessible. Some 25-to-9 pin adapters are supplied for specific use, such as a mouse, and these may have only certain pins available.*

It is not necessary to keep the PC connected to the instrument during measurement. This connection is required for downloading stored measurements, real-time monitoring, reviewing and changing configuration parameters and testing the instrument from the PC (see Troubleshooting on page 37 for details).

3.6 Installation completion check list

3.6.1 Batteries

The instrument is designed to work on battery power. If battery power should drop, a **LO BAT** warning appears in the instrument LCD's top-left corner, and they should be replaced.

3.6.2 Instrument clock setting

If you use the instrument to store measurements for downloading to a PC, you should verify the date and time settings of the instrument's internal clock, as described in Clock settings on page 38.

3.6.3 Electrochemical sensor

Shipping conditions can have adverse effects on the sensor, thus you should perform a sensor service as described in the accompanying **EC Sensors - Maintenance & Installation Manual** before trying to make measurements.

However, if you intend to make trial measurements with the sensor as shipped, first examine the sensor head. To do this, remove the plastic base at the bottom of the sensor, then unscrew the calibration cap by loosening its collar (see Figure 2 on page 12).

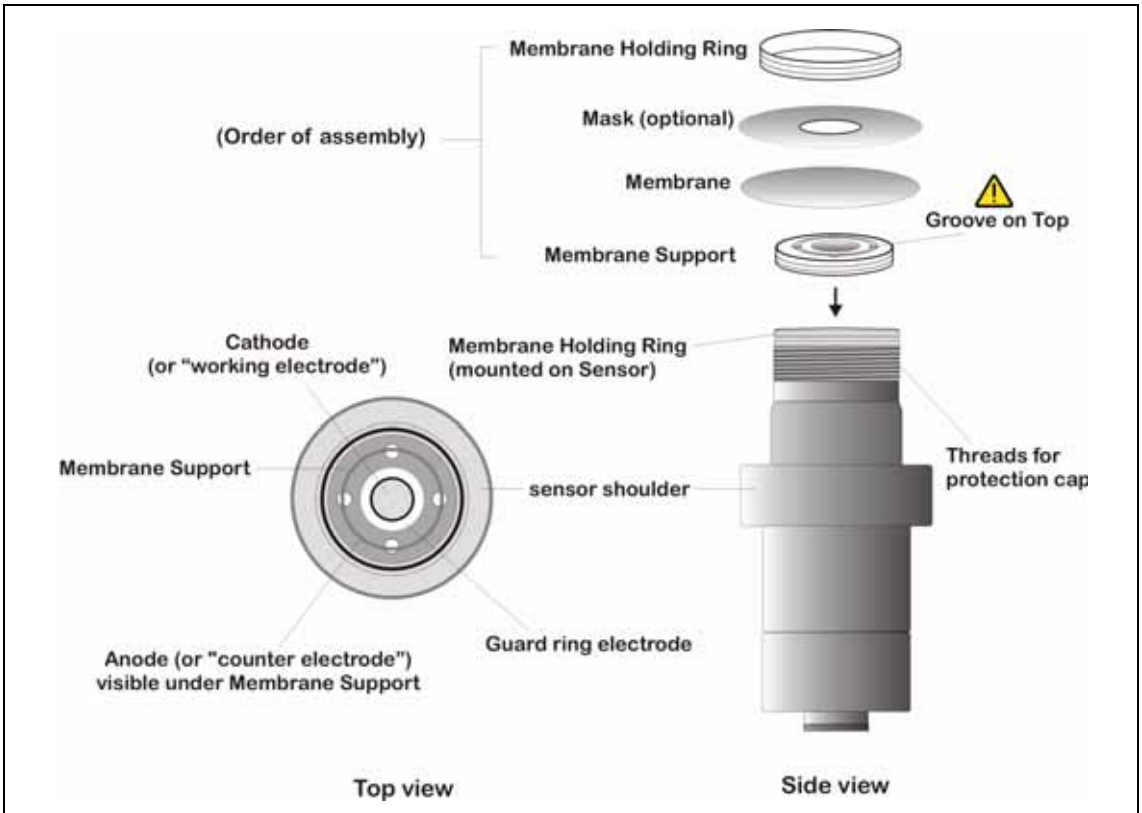


Figure 7 Sensor Components and Membrane Assembly Order

Your sensor head is fitted with a screw-on protection cap. For a view of the sensor head, you must remove the cap, using the spanner key supplied in your recharge kit. Do this carefully, making sure not to wrinkle the membrane that covers the sensor head, held in place by a membrane holding ring.

You should be able now to view the gold cathode in the center, surrounded by a guard ring electrode, and separated by a fine groove. The counter electrode is underneath the membrane support.

You will get a better look at all these components during your first sensor service. Before making a measurement, check the sensor head to see that:

- The membrane mounting ring is firmly in place,
- The membrane surface is smooth and wrinkle-free,
- The electrolyte beneath the membrane is free of bubbles, and
- The electrodes appear clear, clean and bright.

3.6.4 Flow chamber

The model 32007F flow chamber's inlet and outlet should be free of any obstructions. Regulate the sample flow using the adjustment knob on top of the flow chamber. When switching from liquid to gaseous samples, ensure that the sensor membrane is dry. Ensure that the gas from the exit tube of the flow chamber (in gaseous mode) is released at atmospheric pressure and that it is constant.

3.7 Storage when not used

At the end of the workday, run clean water through the flow chamber to prevent passageways from clogging. You may wish to repeat preconditioning (see Preconditioning sensors on page 19) prior to the next use.

If you do not expect not to use your sensor for more than a few months, you should clean the sensor as instructed in the **EC Sensors - Maintenance & Installation Manual** and then store it dry, without electrolyte, and with the calibration cap in place for protection.

Section 4 Operating Information

4.1 Operating controls

The front panel of the instrument has a three-digit liquid crystal display (LCD). The LCD includes a right-side marker to distinguish between gas concentration and temperature display. This marker also indicates the measurement display units (ppm, ppb, %, etc.) depending on the instrument model. To the LCD's right is a label showing the measurement units configured at the factory for your application.



In addition to the controls indicated on the front panel, there is also a pressure relief valve switch on top of the instrument (as indicated in Figure 1 on page 11) to enable atmospheric pressure equilibrium for sensor calibration, or for measurements in gaseous samples in % units.

The panel keyboard has the following push-button controls:

	Power switch. This turns instrument power on or off. The instrument starts in measurement mode
	Places the instrument in measurement mode
	Calibrates the analyzer against a reference sample. This button can be locked out from the WinLog97 PC program
	Stores a measurement value into memory
	Backlights the LCD for approximately three minutes

 	Toggles between gas concentration and temperature measurement displays in measurement mode, increases or decreases the storage number during storage or memory view, or sets a calibration value during calibration

To start the analyzer, press the keyboard **POWER** switch (located bottom left of the keyboard). When you turn power on, the instrument displays its model number briefly, and then starts in measurement mode.

You can access other instrument functions by pushing one of these keys while turning power on:

	Sensor calibration - see Sensor calibration on page 34
	Start automatic data acquisition - see Automatic data acquisition on page 20
	Start memory storage view - see Viewing stored measurements on page 22
	Display program identification information

Once you have completed the installation and start-up procedures defined in Installation on page 11, the instrument can be operated independently, making measurements as a portable analyzer. You may store these measurement values for later analysis via the WinLog97 program (on your personal computer) or the memory view mode (on the instrument). The WinLog97 program operation is described in detail throughout the manual, where relevant.

4.2 Taking measurements

Once the system is calibrated, you should be able to begin taking measurements. Connect the top-mounted inlet to accept your sample, typically this is accomplished by connection to a sampling valve. The sample flow can be regulated by adjusting the knurled stainless steel knob on top of the flow chamber.

Minimum flow rates, measurement limits and response times for the various available membranes are given in the accompanying **EC Sensors - Maintenance & Installation Manual**.

The LCD includes a right-side marker to distinguish between gas concentration measurements and temperature. This marker also indicates the measurement display units (ppm, ppb or % depending on the instrument model).

To switch between gas measurement and temperature measurement, press the **Up/Down Arrow** buttons.

To backlight the LCD for approximately three minutes, press the **Backlight** button.

Note: *For measurements of gaseous samples in % units, you must open the barometric pressure sensor relief valve switch on the top of the instrument from time to time, to allow the pressure inside the instrument to equilibrate to the barometric pressure.*

4.2.1 Preconditioning sensors

You can expect a more rapid and accurate first result if you precondition the sensor before you take readings.

To precondition, connect the flow chamber to a convenient sampling source at or below expected O_2 levels. If measurements take place in carbonated samples, precondition with carbonated water. Open the sampling valve on the flow chamber, just enough for a trickle. Then, switch on the instrument and watch the LCD. You will see the values drop.

If you are measuring in the 0.1 **ppm** range, then only a short time is required for the display to fall to this level, whereas **ppb** level measurements may require the sensor to remain exposed to the sample for half an hour or more. You will establish your own requirement with experience.

Once the LCD displays the expected level of O_2, close off the sample. The sensor is now preconditioned and ready to use.

You may want to precondition prior to each series of measurements, depending on frequency of use.

4.3 Storing measurements in the instrument

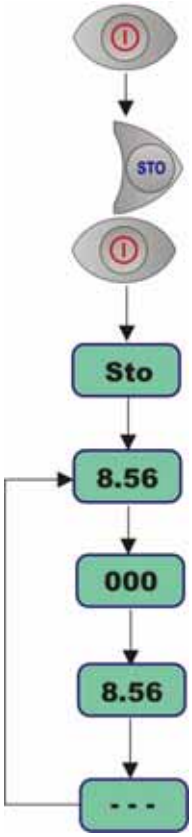
The instrument will store up to 500 gas measurement values, labeled by numbers 0 through 499, along with the current date and time of each measurement. You have the choice of acquiring this information manually or automatically, as described below.

Before storing measurements, you should verify the date and time settings of the instrument's internal clock, as described in Clock settings on page 38.

4.3.1 Automatic data acquisition

Note: *When the instrument is used to automatically store measurement data, all buttons except the* ***POWER*** *key are disabled. If enough time elapses to store all 500 values, the instrument will return to normal measurement mode and the buttons re-enabled.*

Before starting automatic measurement storage, first select the sampling rate desired using the Sampling Rate menu of the WinLog97 program (see Automatic data acquisition - Setting sampling intervals on page 29).



1. Switch the instrument **OFF** (by pressing the **POWER** key)
2. Then hold down the **STO** button while switching the instrument back **ON**. The LCD displays the message **`Sto`** for about one second
3. Normal gas concentration measurements are displayed for about two minutes
4. After two minutes the instrument displays the sample number (starting at **`000`**), then the gas concentration measurement value followed by **`[---]`** to indicate the measurement is being stored.
5. This storage sequence repeats automatically, at the rate specified by the WinLog97 program Sampling Rate menu. Values are stored sequentially in sample numbers **`000`** through **`499`**.

Note: *If you have not cleared previously stored values, the storage sequence automatically overwrites the older values, as they are stored.*

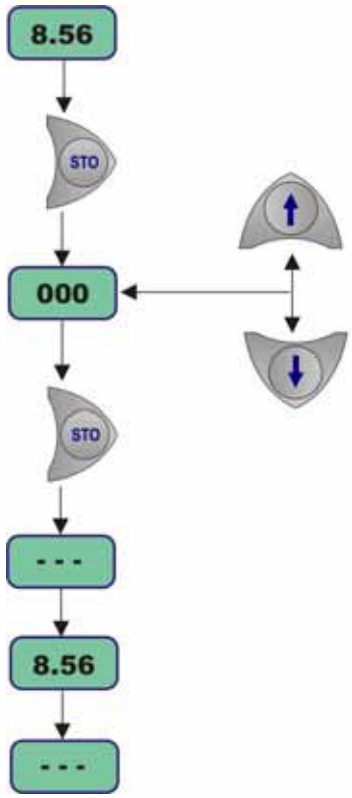
To end automatic storage, switch the instrument **OFF** (by pressing the **POWER** key) while it is in normal measurement mode and not while it is in the process of automatically storing data.

Switching **ON** again without holding down the **STO** button returns the instrument to measurement mode.

Note: *If you accidentally interrupt the automatic data storage by switching off the instrument while it is in the process of storing a value, and you then attempt to download the stored values by the WinLog97 program, you will get a Windows* ***Checksum Error*** *message, and you will not be able to view the measurement data. If this happens, then go back to the instrument and manually log one more value (as described in Manual data acquisition on page 21). You can then download your original set of values to your PC.*

4.3.2 Manual data acquisition

Note: *You cannot store measurement data manually if the instrument has already been set up to store the data automatically.*

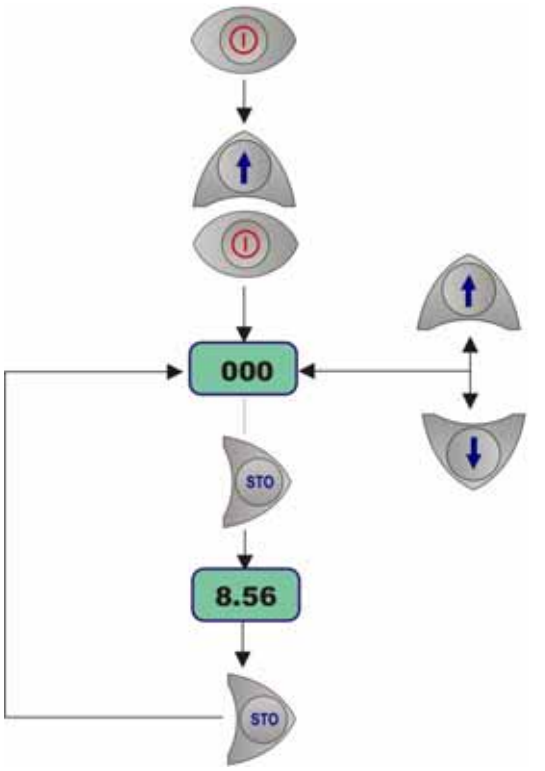


1. For the first measurement you wish to store, press the **STO** button once to display a sample number. The default sample number is **`000`** (for first time access), or the last used memory position where data was stored, incremented by a value of 1.
2. You can increase or decrease this number by pressing the **Up/Down Arrow** buttons within three seconds.
3. Should you decide at this point, not to store this particular measurement, just wait five seconds and the display returns to measurement mode. You may also exit this routine by pressing the **MEAS** button.
4. Press **STO** a second time, within five seconds of the first. The instrument then displays a brief clearing **`[---]`** message, followed by the gas concentration measurement value for about three seconds (e.g. **`8.56`** in the flow diagram)
5. The **`[---]`** message is displayed as this measurement value is stored
6. Repeat the above steps to store additional measurements.

If you stored the first value as sample **`001`**, the instrument automatically increases the next storage location, and labels it sample **`002`**. You can increase or decrease this number by pressing the **Up/Down Arrow** buttons.

Note: *If you label a sample number the same as a previously stored measurement value, the new measurement value overwrites the previously stored value.*

4.3.3 Viewing stored measurements



1. Switch the instrument **OFF** (by pressing the **POWER** key)
2. Hold down the **Up Arrow** button while switching the instrument back **ON**. The LCD displays a sample location number.
3. Scroll through the numbered sample locations of all the stored values using the **Up Arrow** and **Down Arrow** buttons.
4. To view the actual gas concentration measurement value at a particular sample number, press the **STO** button. The LCD now displays the stored value for that sample number.
5. Press **STO** a second time to return to the next numbered location display, to continue scrolling or view another stored value.

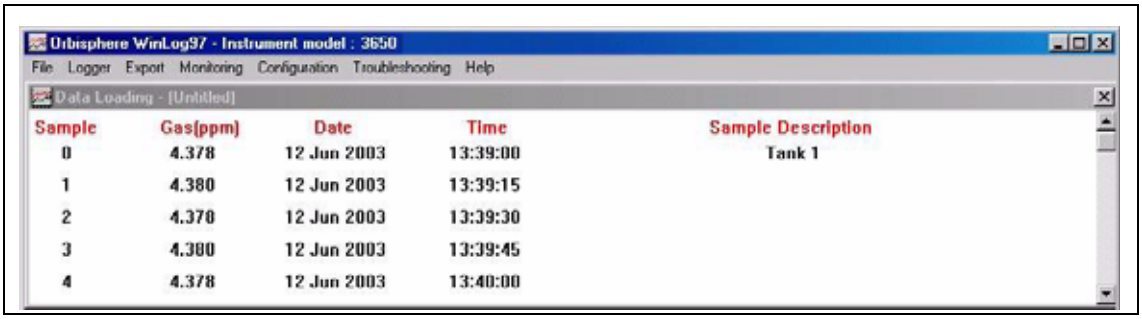
To return to the measurement mode, switch the instrument **OFF** and then back **ON** again without holding down any additional buttons.

4.4 Storing and accessing measurements from the PC

If you have made measurements and stored them in the instrument, you should be ready to bring them into the WinLog97 program for viewing, copying, saving and printing. See also Options Setup on page 27 for additional information on the WinLog97 program.

4.4.1 Downloading stored values

To download the stored results from the instrument to the PC, choose the **DownLoad** data command from the **Logger** menu. Below is a typical list.



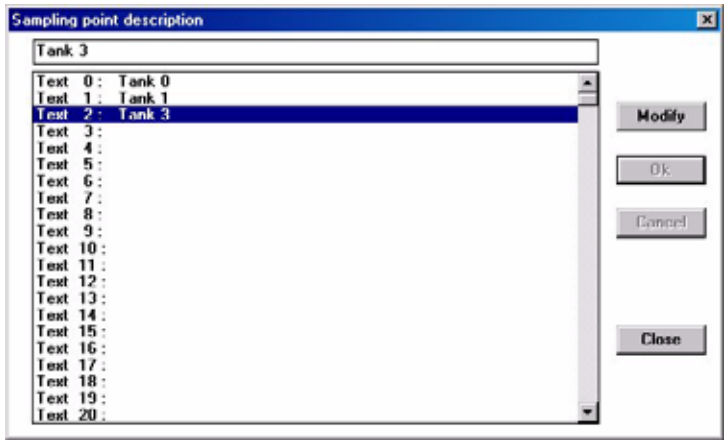
The **DownLoad** window presents a display of the stored measurements from the instrument. The window displays five columns of data:

- Sample (sequence number of the sample)
- Gas (concentration of the measured gas)
- Date (date of the measurement)
- Time (time of the measurement)
- Sample Description

The descriptions can be modified for your applications using the procedures described below.

4.4.2 Altering the sampling point descriptions

For help in identifying the locations of various sampling points that are stored by the instrument, you may choose the **Sampling Point Description** command from the **Logger** menu to bring up the dialog box.



The measurement values to be placed in positions 0 through 499 (identified as Text 0, Text 1... etc.) can be described however you wish. Double-click on a particular position (or click **Modify**), then type a description in the box as shown (e.g. **Tank 3**). Choose **OK** when finished entering a description.

When you Close this box, your modifications will be saved, and will appear in the **Sample Description** column for the ***next*** downloaded list. These descriptions can be modified again later as your requirements change.

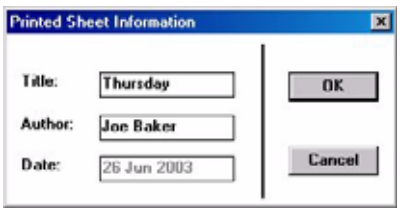
4.4.3 Copying values

To copy the results to the Windows Clipboard, so that the data can be pasted into a spreadsheet, word processor or other Windows program that accepts tabular text information, choose the **Clipboard** command from the **Export** menu.

4.4.4 Saving values

To save this list of measurements as a text (**.txt**) file, capable of being recalled by the WinLog97 program or imported as a file into other Windows programs, choose the **Save As** command from the **File** menu. A dialog box appears, with a space to fill in with an eight-letter name. (The program automatically attaches a **.txt** suffix to these files.) If you have saved previous files, a grayed-out list of these names appears as well. Typical to Windows programs, **Directories** and **Drives** boxes can be used to locate other places to save (e.g. on a floppy disk). You may also type the drive and directory yourself when saving the file.

4.4.5 Printing values

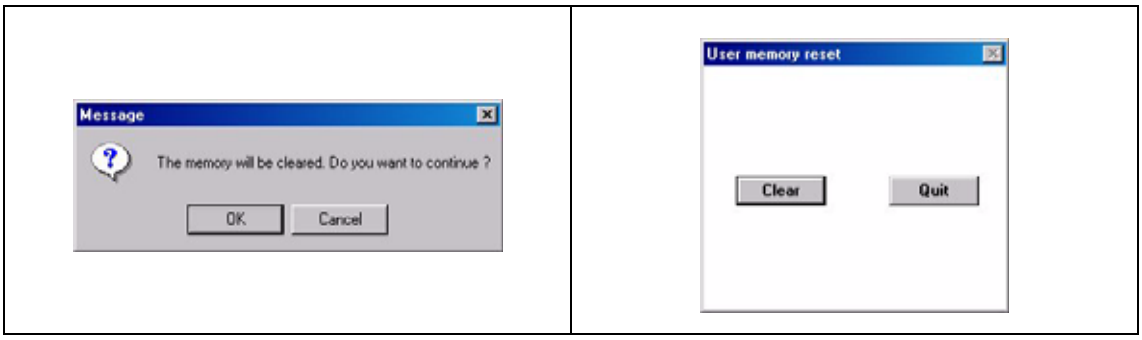


To place this list of measurements into a tabular format and send it to the Windows printer, choose the **Print** command from the **File** menu. The program asks you to enter **Title** and **Author** information. Note that the **Date** is fixed by your operating system.

The resulting printed list will include this information on each page.

4.4.6 Clearing stored values

To clear all the values stored in the instrument via the WinLog97 program, choose the **Clear Data** command from the **Logger** menu. Since this action will clear the storage memory of the instrument, a warning appears first.



Choose **OK** to bring up the next dialog box to confirm the clear action.

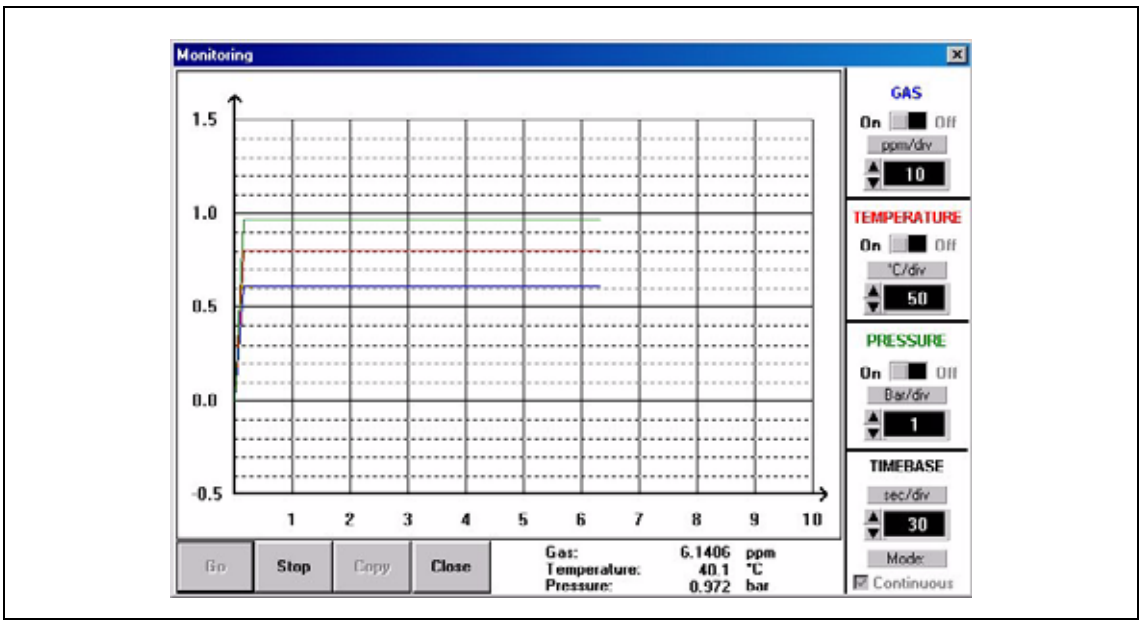
Choose **Clear** to start the memory clear operation. A message, **Reset should be completed** appears in this box when the task is finished.

Note: *You can accomplish the same thing passively, by simply allowing the analyzer to overwrite a set of stored values with new ones.*

4.5 Monitoring measurements in real-time

You may wish to analyze a particular sampling point via the WinLog97 program's **Monitoring** menu. To use this Monitoring chart, the instrument must be connected to your PC.

Choose **Monitoring** from the WinLog97 menu to bring up a chart display.



The Monitoring chart shows the gas concentration (in blue), temperature (in red), and pressure (in green) as the sample is being measured by the 3650 instrument. The chart is updated directly from instrument measurements, at a rate determined by the time scale set in the **TIMEBASE** box at the lower right corner of the chart.

Click the **TIMEBASE** up/down pointers to change the time scale of the divisions of the chart. Each division mark along the baseline (1, 2, ...10) can be made to represent from 30 seconds to 2½ hours, providing from 5 minutes to 25 hours of continuously displayed samples.

The chart updating rate is determined by the time scale selected.

Timebase	Updating Rate*	Maximum Samples (10 divisions)
30 Seconds/Division	5 Seconds/Sample	60
1 Minute/Division	5 Seconds/Sample	120
10 Minutes/Division	5 Seconds/Sample	1,200
30 Minutes/Division	9 Seconds/Sample	2,000
1 Hour/Division	18 Seconds/Sample	2,000
2.5 Hours/Division	45 Seconds/Sample	2,000
*This chart's updating rate is independent from the acquisition rate (see Automatic data acquisition - Setting sampling intervals on page 29).		

Click on the **Continuous** box, in the lower right corner, to enable or disable continuous charting. When this box is checked, the chart scrolls continuously after reaching the **10** division, and the oldest samples are lost off the left of the chart. When **Continuous** is not checked, the chart stops displaying new results after reaching the **10** division, and all subsequent measurements are lost.

Click the up/down pointers for each measurement variable (**GAS**, **TEMPERATURE** and **PRESSURE**) at the right of the chart to change the scaling of that value on the chart. The display of each measurement variable may be turned on or off by choosing the appropriate **On** or **Off** switch at the right of the chart.

If your measurements do not chart properly, try using a higher or lower value scale or time base than the one displayed. Adjust these scale factors ***before*** starting the monitoring operation.

A running display of latest sample **Gas**, **Temperature** and **Pressure** is also shown in the bottom-right corner of the chart.

Use the buttons at the bottom of the chart to control real-time monitoring. Choose **Go** to clear the chart and start real-time monitoring display, **Stop** to stop real-time monitoring and **Copy** to copy the data from the chart as text information to the Windows Clipboard. This information can be pasted from the clipboard into any Windows application, such as a spreadsheet or word processor.

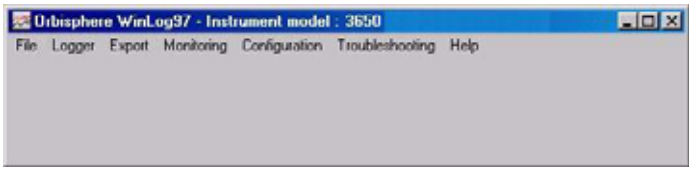
Finally, choose **Close** to close the Monitoring window.

Section 5 Options Setup

The WinLog97 program is an integral part of the analyzer. Running under Microsoft Windows®, it permits you to list and analyze up to 500 stored measurement values. The program also includes a special monitoring feature, which lets your computer act as a chart recorder, and enables a hardware test to ensure that the system is in good working order.

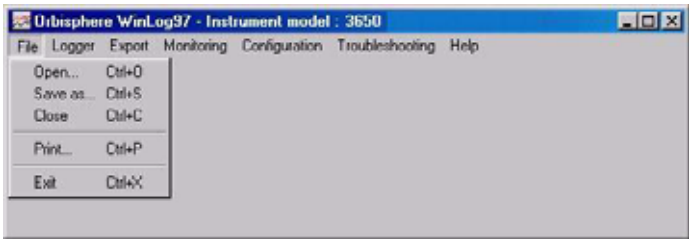
5.1 Main menu basics

When you start the program, it displays the **Main Menu**, which automatically maximizes on opening and appears as follows:



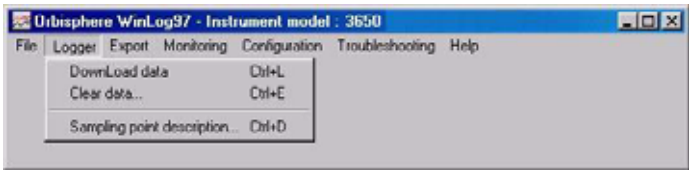
Throughout the WinLog97 program menus, you will see shortcut keys (such as Ctrl+P, to print a list of stored values). As you become familiar with the program, you may choose these keystroke commands for faster operation.

File, shown below, serves typical Windows file management needs.

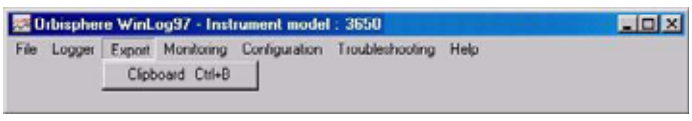


WinLog97 data files can be opened, saved under a different name, closed, or printed. You can also exit the program.

The **Logger** menu appears as follows. Here you can download measurement values from the instrument, make modifications to the sample list that can be used to identify sampling point locations, or clear the instrument's stored values.

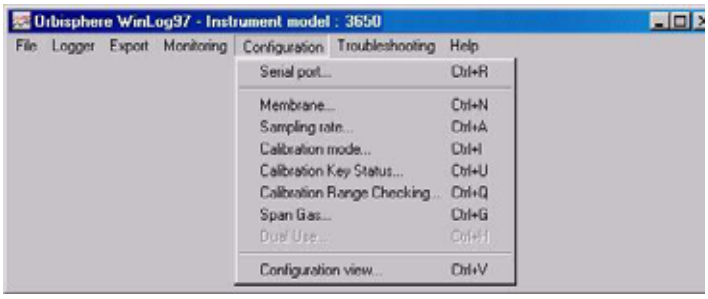


Export places your information into the Windows Clipboard, so that it can be pasted directly into other Windows programs. This is especially useful when working with spreadsheet programs, but the information can be pasted into word processing programs as well.

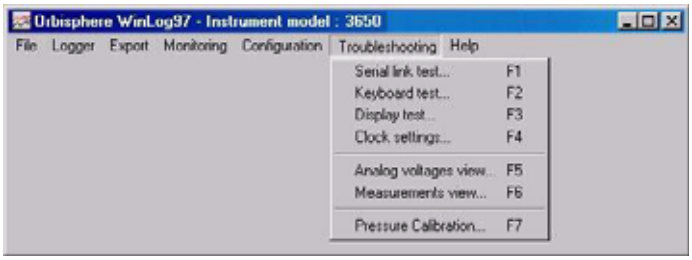


The **Monitoring** menu creates a running chart of real-time measurements (see Monitoring measurements in real-time on page 24). These can also be saved to the Windows Clipboard.

The **Configuration** menu lets you see how your system has been configured for your application. You may change the PC's COM port, the sensor membrane, automatic data acquisition rate, or the sensor calibration mode. You may also lock out the instrument's **CAL** button, or for calibration using a span gas, you may enter the span gas percentage.



The **Troubleshooting** menu includes a series of tests, permits the setting of the clock, and enables a barometric pressure calibration routine.

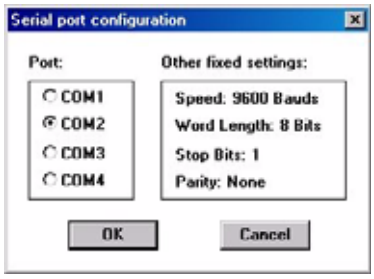


Finally, the **Help** menu gives access to the Help file and allows the identification of the WinLog97 program (version number and copyright date).

5.2 Instrument - PC connection

For the hardware connection of the instrument to a PC, see WinLog97 PC program installation on page 13.

The **Configuration**, **Serial port** menu lets you choose one of four serial communication ports, as follows:

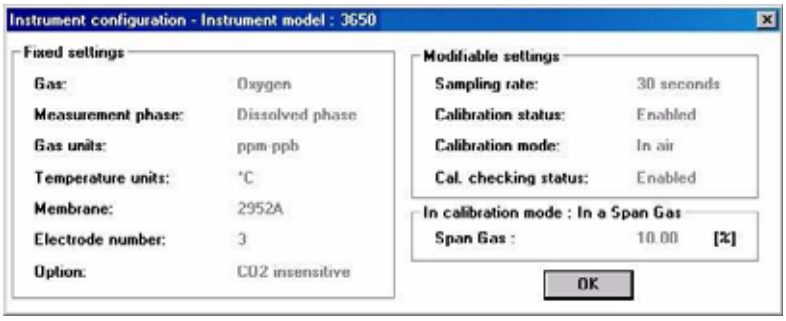


Usually, **COM1** is used to connect to a mouse, so try **COM2** first. You may find that a separate SetUp program supplied with your PC is necessary to activate this port.

Click on **OK** to activate the selected port. If the port you have selected here is adequate, the WinLog97 program will return to the main menu. Otherwise, you will see an **RS232 ERRORS** message advising you to select another port.

5.3 Reviewing instrument configuration

To review if the analyzer is set up as expected, choose the **Configuration**, **Configuration view** command.



You may change a number of these settings using the WinLog97 program. The modifiable settings, and information relating to these settings are listed in the next section, Configuring the instrument.

However, should you see any unexpected items listed on your screen which you are unable to correct, please contact your Hach Lange representative.

5.4 Configuring the instrument

The 3650 analyzer can be readily configured for your application using the following commands in the **Configuration** menu. The instrument must be connected to your PC in order to change its configuration.

5.4.1 Automatic data acquisition - Setting sampling intervals

The instrument can perform as a standalone data acquisition device, automatically recording gas measurements with the date and time, and storing up to 500 of these values. Choosing the WinLog97 program's **Configuration**, **Sampling Rate** menu lets you select time intervals (acquisition rate) for this storage capability.



Use the slide bar to view and select a sampling rate, from 15 seconds to 1 hour. The selected rate is shown in the **Acquisition rate** window. Click **OK** to save this rate.

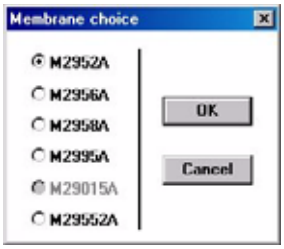
Once your choice is made, the instrument can be used independently of the WinLog97 program for data acquisition, as described in Automatic data acquisition on page 20.

Note: *The Acquisition rate set via this menu is independent from the monitoring chart updating rate described in Monitoring measurements in real-time on page 24. The sampling rate menu applies only to automatic data acquisition, while the chart updating rate is used only for displaying real-time results via the monitoring chart.*

5.4.2 Membrane selection

You may find it necessary to use a different type of membrane for different applications. Naturally, with any membrane change, you will need to re-calibrate (see Sensor calibration on page 34). You should also consider the changes in required flow rates and response times, which are specified in the accompanying **EC Sensors - Maintenance & Installation Manual**.

To re-configure the analyzer, choose **Configuration**, **Membrane** to bring up the box which reveals the membrane models available.

	Choose **OK** when the desired membrane is selected.

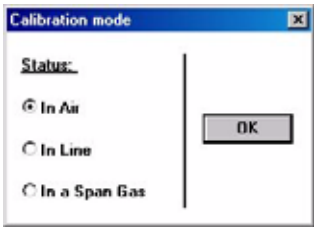
Note: *Only those membranes applicable for your instrument model can be selected. All other membranes are grayed out.*

5.4.3 Selecting type of calibration

5.4.3.1 Select from the PC

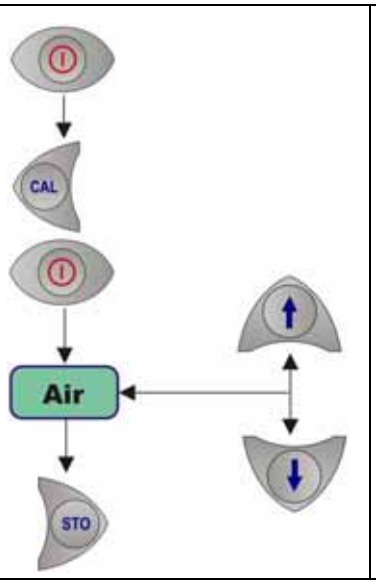
You can use the **Configuration**, **Calibration mode** command to select how the sensor is to be calibrated.

Note: *Only the calibration modes applicable to your sensor can be selected. Others will be grayed out.*

	Choose **In Air** to allow calibration of the sensor in air. Choose **In Line** to calibrate the sensor directly in the sampling line, in a sample of known gas content. In instrument models that measure gaseous samples, you may select **In a Span Gas** to calibrate. Choose **OK** when the desired mode is selected.

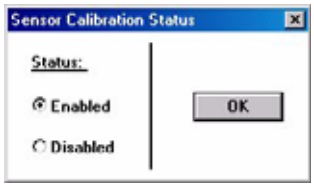
Note: *Calibration mode can also be selected from the instrument keyboard (see below).*

5.4.3.2 Select from the instrument

	1. Switch the instrument power **OFF** 2. Switch the instrument on by holding down the **CAL** button and then pressing the **POWER** button while still pressing the **CAL** button 3. The instrument display will show either **SPA** for span gas calibration, **LI** for in line calibration, or **Air** for in air calibration 4. Use the **Up/Down Arrow** buttons to change the mode to your choice 5. Press the **STO** button to set the selected mode. The instrument displays **Sto** for a few seconds, then returns to measurement mode

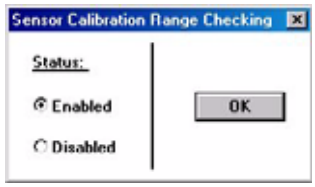
5.4.4 Locking out the instrument's CAL button

You can use the **Configuration**, **Calibration Key Status** menu to prevent an accidental sensor re-calibration from the instrument keyboard.

	Choose **Disabled** to lock out the keyboard **CAL** button. To unlock this capability, choose **Enabled**. Choose **OK** when the desired mode is selected.

5.4.5 Sensor calibration range checking

When calibration is performed for **In Air** and **In a Span Gas** calibration modes, the sensor measurement current is compared to an ideal current for the selected membrane to determine whether or not to complete the calibration. You can use the **Configuration**, **Calibration Range Checking** menu to enable or disable sensor calibration range checking in the instrument.

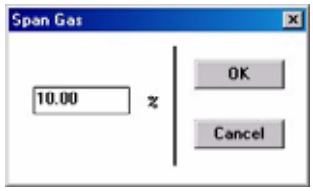
	Choose **Disabled** to calibrate without checking the value of the measurement current, within a range of 0% to 999% of the ideal current.

When set to **Enabled**, at calibration the measurement current should be between 25% and 175% of the ideal current; if the value is outside of these limits, the calibration fails and **`Err`** is displayed on the instrument LCD. Choose **OK** when the desired mode is selected.

Note: *It is recommended to leave range checking enabled. In special measurement situations it may be necessary to disable range checking. However, contact a Hach Lange representative for further details before disabling this feature.*

5.4.6 Entering a span gas value

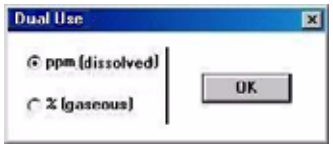
When calibrating the sensor in a span gas, use the **Configuration**, **Span Gas** menu to enter the concentration of the gas to be measured in the span gas.

	Enter the percentage of measurement gas in the span gas (e.g. 10.00%), then choose **OK**.

5.4.7 Dual use (model 3650/113 only)

5.4.7.1 Change from the PC

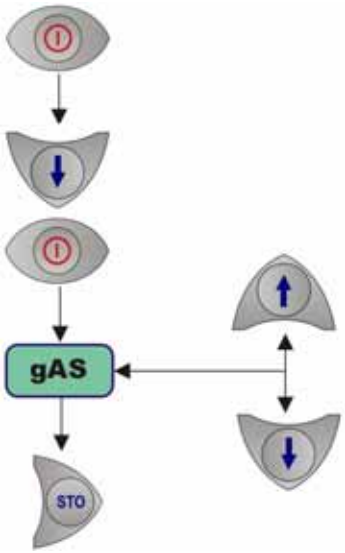
Use the **Configuration**, **Dual Use** menu to change the measurement phase (either dissolved or gaseous) for the model 3650/113 dual-use analyzer.

	Choose **ppm (dissolved)** to set the instrument for dissolved measurement in liquids, or **% (gaseous)** to set the instrument to gas phase measurement.

Note: *You can also choose the measurement phase from the instrument keyboard (see below).*

5.4.7.2 Change from the instrument

With this dual phase instrument, you can also select the measurement phase (dissolved or gaseous) using the instrument panel buttons as follows.



1. Switch the instrument power **OFF**
2. Switch the instrument on by holding down the **Down Arrow** button and then pressing the **POWER** button while still pressing the **Down Arrow** button
3. The instrument will first display **USE** followed by either **dIS** for dissolved phase measurement in liquids or **gAS** for gaseous phase measurement
4. Use the **Up/Down Arrow** buttons to change the mode to your choice
5. Press the **STO** button to set the selected mode. The instrument displays **Sto** for a few seconds, then returns to measurement mode

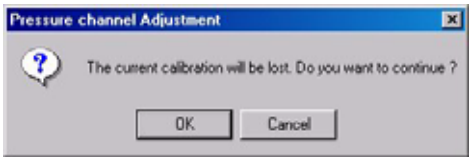
Section 6 Calibrations

6.1 Pressure calibration

Since the instrument is sealed against moisture, you must open the barometric pressure sensor relief valve switch on top of the instrument (see Figure 1 on page 11 for actual location) to permit the instrument to achieve atmospheric pressure equilibrium, and take an accurate barometric pressure reading.

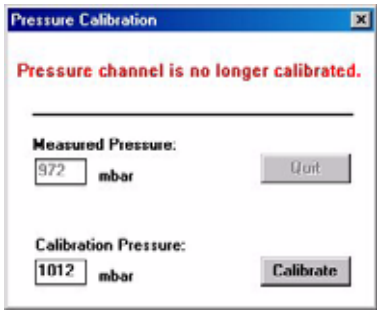
This must be done with every calibration. To open the relief valve, depress and hold down the pressure sensor relief valve switch for five seconds, then release.

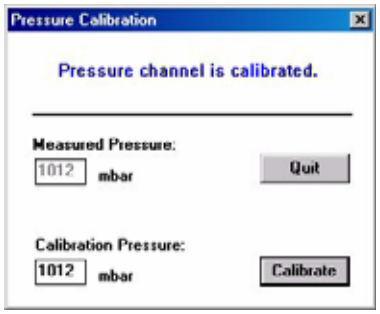
If you have access to an accurate barometer, you may wish to calibrate the instrument's internal barometric pressure sensor. This is done using the PC WinLog97 program. Choose **Troubleshooting**, **Pressure Calibration** and an informational message will appear to warn you that the instrument's current pressure calibration will be lost.



Choose **OK** to continue. The calibration procedure then displays a **Pressure Calibration** dialog box. The **Measured Pressure** value shows the current instrument pressure reading.

Note: *Since the instrument is sealed against moisture, you must open the barometric pressure sensor relief valve switch (location depicted in Figure 1 on page 11) to permit the instrument to achieve atmospheric pressure equilibrium, and take an accurate barometric pressure reading.*





Enter the current atmospheric pressure, in mbars, in the **Calibration Pressure** entry box. Choose **Calibrate** to direct the instrument to read and display the **Measured Pressure** using this calibration value.

Choose **Quit** when you are satisfied with the pressure calibration to return to normal operation.

6.2 Sensor calibration

When delivered, the sensor is pre-calibrated. However, it should be re-calibrated on site, when being used for the first time, and always after a membrane change. If you have just replaced the membrane, allow at least half an hour for the membrane to settle before attempting to calibrate.

If you want to verify the accuracy of the calibration, place the analyzer back in measurement mode and compare your displayed gas concentration against the value in the appropriate tables found in the accompanying Calibration Tables booklet.

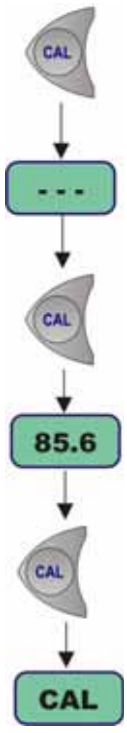
Your calibration is stored internally and is valid for the life of the sensor's membrane, thus it is not necessary to repeat the calibration procedure until after the next membrane change.

The sensor can be calibrated either by using a span gas, directly in line in a liquid sample, or in air. The mode of calibration may be selected using the WinLog97 program or directly from the instrument (see Selecting type of calibration on page 30 for more details).

6.2.1 Calibration in a span gas

The span gas calibration procedure may be used if you have a supply of gas with a known concentration of O_2 (in % units). To perform this type of calibration, the instrument must be set for calibration **In a Span Gas**. The WinLog97 program also must be used in this procedure.

Switch on the instrument, if necessary, and wait a minute or so for the displayed measurement to settle. Then expose the sensor to a span gas sample with a known oxygen concentration. Enter the percentage of oxygen in the span gas using the WinLog97 program (see Entering a span gas value on page 31).



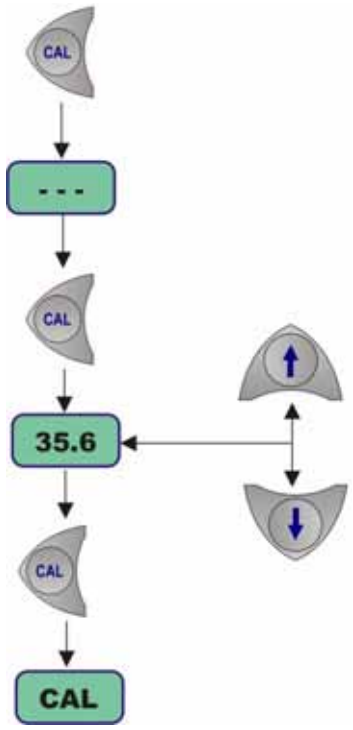
1. Press the **CAL** button. Remember, this button may have been locked out to prevent an accidental reset (see Locking out the instrument's CAL button on page 31 for details).
2. A brief clearing **[- - -]** message appears.
3. Press **CAL** again within a 3 second period.
4. The percentage of the measured current to the ideal one is displayed.
5. When the reading is stable, press **CAL** again.

   If the new calibration current is within 25% to 175% of the ideal current, the instrument displays **CAL** and returns to the measurement mode. Calibration is now complete, the sensor is calibrated, and you can proceed with your measurements.

   If the new calibration current is not within this range, the instrument displays **Err** and returns to measurement mode. The system will not calibrate, and it is likely that a sensor service will be required.

6.2.2 Calibration in line

The in line calibration procedure can be used to calibrate the sensor directly in line, against a liquid sample with a known dissolved oxygen concentration. To perform this type of calibration, the instrument must be set for calibration **In line**. Switch on the instrument, if necessary, and wait a minute or so for the displayed measurement to settle. Expose the sensor to a liquid sample with a known gas concentration.



1. Press the **CAL** button. Remember, this button may have been locked out to prevent an accidental reset (see Locking out the instrument's CAL button on page 31 for details).
2. A brief clearing **[- - -]** message appears.
3. Press **CAL** again within a 3 second period.
4. A measurement will flash on the LCD, showing the oxygen concentration of the calibration sample.
5. Assuming you know the gas content to be a certain value, you can adjust the displayed value with the **Up/Down Arrow** keys.
6. When the reading is adjusted to the known concentration, press **CAL** again.
7. The instrument displays **CAL** and returns to the measurement mode.

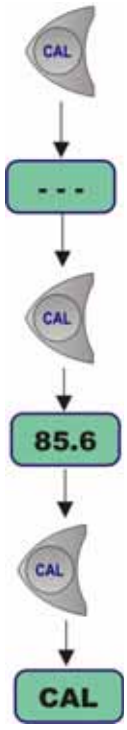
6.2.3 Calibration in air

The sensor can be accurately calibrated in air. To perform this type of calibration, the instrument must be set for calibration **In air**.

In order to calibrate the sensor in air, you will need to extract it from its mounting or flow chamber, and wipe dry the sensor protection grille (if applicable).

Calibration is best achieved using the storage cap that protected the sensor during shipment. Put several drops of tap water in the cap, shake out the excess, and then attach it to the sensor by means of its collar. It is best to leave the cap slightly loose, to avoid compressing the air inside. The cap and sensor should be about the same temperature.

Switch on the instrument, if necessary, and wait a minute or so for the displayed measurement to settle.



1. Press the **CAL** button. Remember, this button may have been locked out to prevent an accidental reset (see Locking out the instrument's CAL button on page 31 for details).
2. A brief clearing **[- - -]** message appears.
3. Press **CAL** again within a 3 second period.
4. The percentage of the measured current to the ideal one is displayed.
5. When the reading is stable, press **CAL** again.

   If the new calibration current is within 25% to 175% of the ideal current, the instrument displays **CAL** and returns to the measurement mode. Calibration is now complete, the sensor is calibrated, and you can proceed with your measurements.

   If the new calibration current is not within this range, the instrument displays **Err** and returns to measurement mode. The system will not calibrate, and it is likely that a sensor service will be required.

6.3 Calibration range checking

When calibrating the sensor in air or in a span gas, as detailed in Sensor calibration on page 34, the new calibration current should be between 25% to 175% of the ideal current (which is stored in the instrument's non-volatile memory for each membrane). If not, the instrument displays **Err** on its LCD and the system will not calibrate. When the system will not calibrate, it is likely that a sensor service will be required.

Note: *This calibration range checking can be enabled or disabled using the WinLog97 program (see Sensor calibration range checking on page 31). It is recommended to leave this checking feature enabled. In special measurement situations it may be necessary to disable range checking. This will allow calibration between 0% to 999% of the ideal current. Contact a Hach Lange representative before disabling this range checking feature.*

Section 7 Maintenance and Troubleshooting

7.1 Maintenance

7.1.1 Instrument batteries

The ORBISPHERE 3650 instrument operates on battery power (two standard C-type cells). If battery power should drop, a **LO BAT** warning message appears in the instrument LCD's top-left corner.

To install the batteries, unscrew the battery cap (on the right side of the instrument) with a coin or flat screwdriver, place the cells lengthwise into the battery compartment (positive end first), and then replace the cap. Refer to the diagram on the back of the instrument.

Rechargeable nickel-cadmium batteries may be used - expect about 40 hours of autonomy. Alkaline batteries provide the longest continuous use though mercury-free batteries are available that present less of a disposal problem.

Make sure that a fully charged (or fresh) set is installed before switching on the instrument.

7.1.2 Sensor

For information on sensor maintenance and servicing, please refer to the accompanying **EC Sensors - Maintenance & Installation manual**.

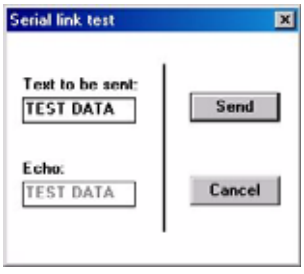
7.2 Troubleshooting

If your analyzer is behaving strangely (failing to calibrate, giving inappropriate measurement values, etc.) and you have attempted to rectify the problem by servicing the sensor, but to no avail, you may wish to use the **Troubleshooting** menu of the PC WinLog97 program to make sure that the instrument is configured correctly for your application, and is in good working order.

The instrument must be connected to your PC and placed in measurement mode to perform these tests.

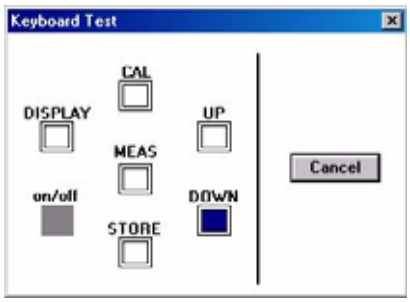
7.2.1 Serial test

Normally, the analyzer will inform you of a disconnected RS-232 (serial) link when appropriate. However, you can confirm a good connection using the **Troubleshooting**, **Serial Link Test** by echoing a test message via the instrument.

	Enter text characters in the **Text to be sent** box, then click **Send**. If the serial link is operating correctly, the exact same text will be displayed back from the instrument in the **Echo** box. Choose **Cancel** to exit from this test box.

7.2.2 Keyboard test

The **Troubleshooting**, **Keyboard Test** will reveal whether all the analyzer buttons are functioning correctly.

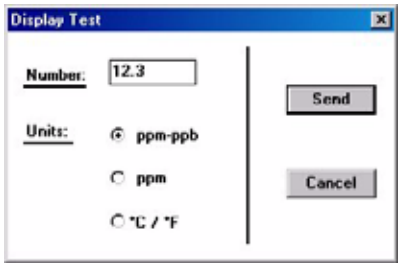


Press any one of the instrument's buttons (***except*** the **on/off** button) for a full second or more.

The appropriate square on-screen should darken (as illustrated for the **Down Arrow** button). Choose **Cancel** to exit from this test box.

7.2.3 Display test

Choosing **Troubleshooting**, **Display Test** lets you perform a one-way communication between computer and instrument.

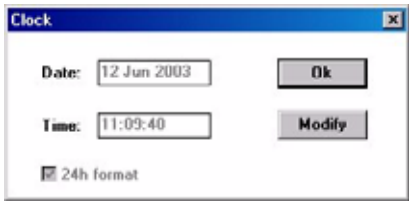


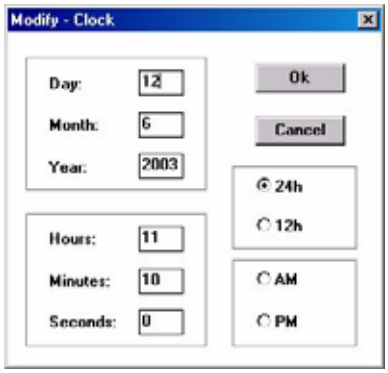
Type a number in the **Number** box (you may also select one of three units positions for the LCD's rightmost indicator bar as well). Then choose **Send**.

The number and indicator bar placement should appear on your instrument LCD.

7.2.4 Clock settings

Choose the **Clock settings** command to set the date and time in the instrument.



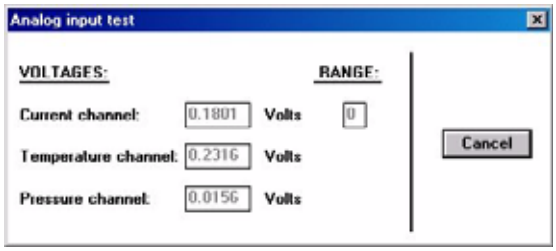


The first screen displays the current date and time as set in the instrument. If this is correct, choose **Ok**, else if either date or time must be changed, choose **Modify** to bring up the next screen.

Enter the current date and time and choose **Ok** to store the entry into the instrument. All measurements will be noted with the appropriate date and time when they are downloaded to the WinLog97 program.

7.2.5 Analog voltages view

The **Troubleshooting**, **Analog Voltage View** gives a real-time look at voltages used by the system to transmit information about sensor current, temperature and pressure. This is useful when trying to identify an instrument problem with a Hach Lange service representative either on-site or over the phone.



When performing this test, if the system is over-range, you may receive a message that states, for example, **The current input is saturated**.

Similar messages will also appear, to warn when temperature and pressure limits are exceeded.

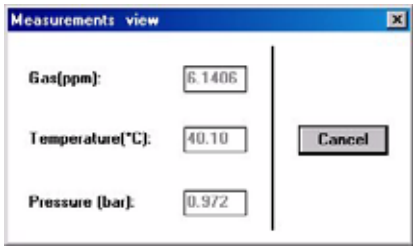
The voltage limits for normal operation are:

- Current channel: -1.5 V to +1.5 V
- Temperature channel: +10 mV to +4 V
- Pressure channel: -100 mV to +100 mV

The **Range** window on the right side of the Current channel voltage indicates one of the four instrument ranges: 0 (less sensitive) to 3 (most sensitive).

7.2.6 Measurements view

The **Troubleshooting**, **Measurements View** confirms, on your PC monitor, what your instrument should be displaying on the LCD for gas concentration and sample temperature.



Choose **Cancel** to exit from this display.

Section 8 Part Lists

8.1 Instrument configurations

Part N°	Description
3650/111	Substance measured: Oxygen, Configuration: Portable battery powered, RS232 (serial) output, Measurement units: ppm/ppb/ppm.
3650/112	Substance measured: Oxygen, Configuration: Portable battery powered, RS232 (serial) output, Measurement units: %/ppm/%
3650/113	Substance measured: Oxygen, Configuration: Portable battery powered, RS232 (serial) output, Measurement units: ppm, DO_2/%, gas phase.

8.2 Accessories

A model 32051 sample tube adapter is an optional accessory, for attaching the flow chamber's inlet tube to the sampling point. For information on this and how to install it, please refer to Sample tube adapter (optional) on page 13.

Additionally, you can also power the instrument from an external +5VDC power source. This can be connected to the instrument with the use of a model 28083 male 6-pin LEMO plug. Refer to External power (optional) on page 13 for connection details.

Part N°	Description
32051	Adapter for attaching 32007F flow cell inlet tubing to customer's sample tube. Includes one 6mm (32813) and one 8mm (32814) rubber sealing gasket.
28083	Connector LEMO 6, male.

8.3 Spare parts

What follows is a listing of materials you may require to maintain your instrument. Be sure to mention the model number and item description when ordering.

Part N°	Description
32507.MM	1 to 3 meters of 10 wire sensor cable for use with 31XXX sensors and 3650Ex and 3650 instruments. Supplied with 2 connectors. MM = total length of cable.
32512.MM	Sensor cable for 3650 longer than standard 4 meters. Add price per meter of length more than 4 meters.
32537	3 meter RS232 cable for use with 365x and 36XX portable electrochemical instruments (except Exproof). Supplied with LEMO 6 connector instrument end and 9D connector computer end.
32689	Windows software (WINLOG97) for 3650Ex, 3650, 3655. Program in English, French, German, or Spanish.
32751	Battery recharger with pack of two rechargeable NiCd batteries (Europe only).
32813	Rubber sealing gaskets for flow cell tubing adapters 32051 & 32051A. 6mm/1/4" inside diameter. 5 pcs.
32814	Rubber sealing gaskets for flow cell tubing adapters 32051 & 32051A. 8 mm inside diameter. 5 pcs.
32818.01	1 meter exit tube in Tygothane [tm], for flow chambers 32007F and 32013A
32819	Check valve in stainless steel, on inlet tube of flow chambers 32007B (obsolete) and 32007F

For information on sensor spare parts and recharge kits, please refer to the accompanying **EC Sensors - Maintenance & Installation Manual**.

Section 9 Glossary

9.1 Common units

Unit	Meaning
%	percentage, by weight
% vbar	percentage per volume, barometric pressure referenced
% vext	percentage per volume, sample pressure compensated
cc/kg	cubic centimeters per kilogram
g/kg	grams per kilogram
mg/L	milligrams per liter
ml/L	milliliters per liter
ppb	parts per billion, by weight
ppm	parts per million, by weight
V/V	volume per volume (ratio)

9.2 Terms and definitions

Terms	Meaning
Absolute pressure	Absolute pressure is relative pressure, plus atmospheric pressure
Concentration	The relative content of a component in a gaseous or liquid media.
Conductivity	The reciprocal of electrical resistivity.
Headspace	The empty volume above a liquid or solid in a closed container.
Relative pressure	Relative pressure is absolute pressure, less atmospheric pressure (this is the customary gauge reading).
Resistivity	The opposition offered by a body or substance to the passage through it of a steady electric current.

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