orbisphere

Operating Guide

Series 366x O_2 or O_3 Analyzer

Applicable models—

This Operating Guide is applicable to the following series 3660 and series 366xEX analyzers.

Series	Configuration
3660	Standard single-box instrument, with display and controls
3660EX	Intrinsically safe single-box instrument, with display and controls, for safe area
3661EX	Intrinsically safe two-box system, with display and keypad box for hazardous area and interface box for safe area
3662EX	Intrinsically safe single-box instrument, with display and controls, for hazardous area

Instrument controls—

Display and keypad controls are the same in all series 366x instruments with one exception — in the 3661EX, the power switch is in the interface box, not in the display and keypad box.

Power switch — Press the power switch to the "on" position. The system automatically starts in "measurement" mode. Upon switching on the instrument, the displayed gas concentration value will typically start from a maximum and rapidly decrease to the actual concentration levels.

Display — The instrument has a three-digit Liquid Crystal Display (LCD), with a label showing measurement units configured at the factory and a right-side marker to distinguish between gas concentration and temperature displays. This marker also indicates which concentration units are displayed, for instruments configured for multiple gas concentration units (such as ppb/ppm).

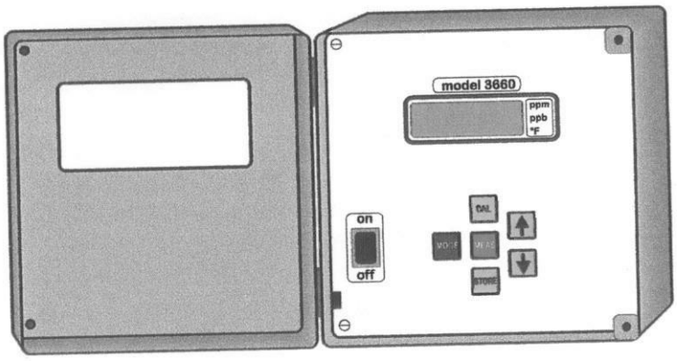
Function keys — The instrument front panel provides the following control buttons:

"MODE" changes the operating mode of the instrument.

"CAL" calibrates the instrument against a reference sample and selects the calibration method.

"MEAS" places the instrument in measurement mode.

"STORE" stores a measurement value into memory.



"↑" and "↓" toggle between gas and temperature measurement displays in measurement mode, or increase/decrease the storage label number in "storage" or "memory view" mode.

366x.OG.E9901

Calibration

To calibrate the O_2 or O_3 sensor—

The sensor can be calibrated either in air, directly in-line in a liquid sample, or using a span gas. (**Note:** Span gas calibration cannot be used for the ozone sensor.)

First choose which method you wish to use, using the WIN3660 PC program Calibration Mode command, page 6, or using the instrument front panel buttons, as follows.

1. Push "MODE" and "CAL" at the same time. The instrument displays either "**Air**" for in air, "**Li**" for in-line, or "**SPA**" for span gas calibration.
2. Press either "↑" or "↓" to change the mode to your choice.
3. Press "STORE" to set the selected mode. The instrument displays "**Sto**" for a few seconds, then returns to measurement mode.

Sensor calibration in air—

To calibrate in air, extract the sensor from its mounting. The screw-on protection cap should be in place on the sensor head. If the (optional) mesh inside the protection cap is wet, dry it before proceeding.

1. Put several drops of tap water in the storage cap, shake out the excess, then attach the cap to the sensor by its collar. Leave the cap slightly loose, to avoid compressing the air in the cap.
2. Switch on the instrument.
3. Press the "CAL" button. A brief clearing ("- - -") message appears.
4. Press "CAL" again within a 3 second period.
5. The percentage of the measured current to the ideal current is displayed.

   If the calibration current is not within 60% to 140% of the ideal current, the instrument alternately displays "**Er0**" and the percentage. A sensor service should be performed.
6. When the reading is stable, press "CAL" again.

   If the calibration current is within 25% to 175% of the ideal current, the instrument displays "**CAL**" and then returns to the measurement mode. The sensor is calibrated.

   If the calibration current is not within this range, the instrument displays "**Er1**" and returns to measurement mode. The sensor will not calibrate.
7. Place the sensor back into the flow chamber or sensor socket, using its collar to secure it.

After the new calibration is stored (step 6), the instrument holds the analog and alarm outputs, and alternately displays "**hld**" and a measurement value. When the sensor is returned to the sample, press "MEAS" to resume normal measurements and outputs.

Avoiding false alarms with the "Hold" feature—

To perform "In air" calibration as a part of in-line oxygen measurements, *without setting off any alarms*, you must engage the "hold" feature *before* withdrawing the sensor from the sample.

To do this, press "CAL" twice (steps 3 and 4 above), *while the sensor is still in the sample.* (Note: You may see a very low (or very high) percentage of measured current, initially.)

Now remove the sensor and place the storage cap on, as above. Once the percentage is stable, press "CAL" a third time to calibrate the sensor (step 6 above), and continue from step 6 above.

To make O_2 or O_3 measurements—

When the instrument is powered on, the displayed gas concentration value will typically start from a maximum and rapidly decrease to the actual concentration levels. It is normal for the right-most digits to vary in reaction to slight variations in gas content.

To switch between displaying gas concentration and temperature, press "↑" or "↓".

To store measurements—

The instrument will store gas concentration measurements, manually or automatically, labeled as sample numbers 0 – 499, with the date and time of the measurement.

Do not switch off the instrument while it is storing data, or data values will be lost.

Manual data acquisition

Press "STORE" to bring up a sample number display. The default number is "**000**" — you can increase or lower this number by pressing "↑" or "↓" within five seconds.

Press "STORE" a second time, within five seconds; the following storage sequence is displayed:

1. A brief clearing ("- - -") message,
2. A measurement display, for about three seconds,
3. A ("- - -") message as these values are stored in sample memory.

Repeat the above steps to store further measurements. If you stored the first value as sample "**001**", the next value to be stored will be automatically advanced and labeled as sample "**002**".

Automatic data acquisition

Automatic storage can be set for "Timer" mode where the timing between samples is at pre-specified intervals, or "Event" mode where samples are stored at the occurrence of specific events. Use the WIN3660 program to select the mode and to set the sampling interval (page 6).

To start automatic data acquisition mode, hold down "MODE" while pressing "STORE". You will see the letters "**Sto**" on the LCD for about two seconds. Then you will see the storage steps similar to those described above (Manual data acquisition).

If you have not cleared previously stored values, this data acquisition automatically overwrites the old values as they are stored.

To end automatic data acquisition mode, hold down "MODE" while pressing "STORE". You will see the letters "**End**" on the LCD for about two seconds.

To recall memory storage—

To view the stored values, hold down "MODE" while pressing "↑". You will see the letters "**rcl**" on the LCD for about two seconds.

You can now scroll through the locations of all the stored values using "↑" or "↓". To see the gas concentration measurement at a particular storage location, press "STORE". Press "STORE" a second time to return to the next numbered location, to view another stored value.

To return to the measurement mode, hold down "MODE" while pressing "↑". You will see the letters "**End**" on the LCD for about two seconds.

WIN3660 Program Operation

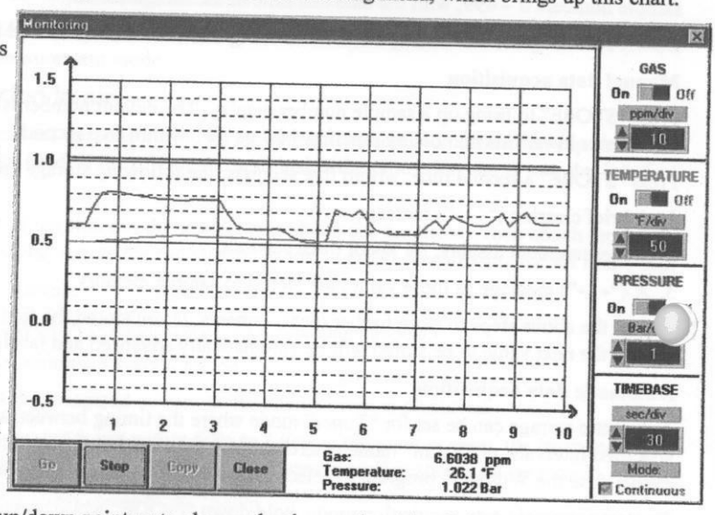
WIN3660 Program Overview—

The WIN3660 program, running on a PC under Microsoft Windows®, provides: on-line monitoring of 3660, 3660EX, 3661EX, or 3662EX instrument measurements; downloading stored measurement values from the instrument; reviewing and setting instrument configuration parameters; and troubleshooting to assure that the system is in good working order.

To monitor measurements in real-time—

You may wish to view the instrument measurements in real-time via the WIN3660 program. To view, choose the Monitoring command from the Monitoring menu, which brings up this chart.

The Monitoring chart shows the gas concentration (in blue), temperature (in red), and pressure (in green) as the sample is measured by the 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 represent from 30 seconds to 2½ hours, providing from 5 minutes to 25 hours of continuously displayed samples.

Click on the CONTINUOUS box, in the lower right corner, to enable or disable continuous charting. When this 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 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. The display of each variable may be turned on or off by choosing the appropriate On or Off switch.

Choose Go (at the bottom of the chart) to clear the chart and start the real-time monitoring display; choose Stop to stop real-time monitoring; choose Copy to copy the data displayed on the chart to the Windows Clipboard, as text information.

Windows is a registered trademark of Microsoft Corporation.

Note: For the model 3662EX instrument, PC connections can be made ***only in the safe area***.

To download, copy, save, print, and clear stored measurements—

If you have made measurements and stored them in the instrument sample memory (page 3), you can download them to the WIN3660 program to display and save the data.

Download

To download the stored results from the instrument to the PC, choose the DownLoad Data command from the Logger menu. The following is a typical display of the data.

Orbisphere WIN3660

File Logger Export Monitoring Configuration Troubleshooting Help

Data loading - SAMPLE.TXT

Sample	Gas (ppm)	Date	Time	Line status
0	5.651	01 Feb 1997	19:58:45	Power on
1	9.954	01 Feb 1997	19:59:00	High alarm
2	9.663	01 Feb 1997	19:59:15	Thermal cut-off
3	0.026	01 Feb 1997	19:59:30	Low alarm
4	5.668	01 Feb 1997	19:59:45	Normal measurement

The DownLoad window presents a display of measurements downloaded from the instrument. The window displays five columns: Sample (sequence number of the sample), Gas (concentration of the measured gas), Date (date of the measurement), Time (time of the measurement), and Line Status (the event type for each sample stored in Event mode, see page 6).

Copy

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

Save

To save this data as a text (".txt") file, capable of being recalled by the WIN3660 program or imported as a text 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 this file name.)

Print

To print the displayed measurements, use the Print command from the File menu. The program asks you to enter optional "Title" and "Author". ("Date" is fixed by your operating system.) The printout will include this information on each page.

Printed Sheet Information

Title: Final Test

Author: Your Name

Date: 05 Mar 1997

OK

Cancel

Clear data

To clear all measurement values stored in the instrument, choose the Clear data command from the Logger menu. Since this action will clear the sample memory storage of the instrument, a warning message appears first.

Message

The memory will be cleared. Do you want to continue ?

OK Cancel

To review and set analyzer configuration—

The instrument must be connected to your PC (see note, page 4) in order to review or change the analyzer configuration. Use the Serial port command from the WIN3660 Configuration menu to select the PC communication port connected to the instrument.

To review the current analyzer configuration, use the following Configuration menu commands.

Configuration View — Displays the current instrument and sensor configuration.

Last Calibration View — Displays the date and time of the last calibration and the sensor current at that calibration. (These values are updated only after a successful calibration.)

To change the analyzer configuration for your application, use the following Configuration menu commands. Each command calls up a dialog box with choices appropriate to that command.

Gas Phase — Establishes type of sample measurement (dissolved or gaseous). Ozone sensor measurements may only be made in dissolved phase.

Oxygen Sensor Insensitivity — Eliminates the oxygen sensor's sensitivity to CO_2 or H_2S in the sample. (Not available for the ozone sensor.)

Units — Specifies measurement units for gas concentration and temperature. The selected units are used for the instrument LCD and all WIN3660 displays, printouts, and data copied or saved. Ozone sensor gas concentration measurements units are limited to ppm/ppb or ppm.

Membrane — Reviews (or changes) the membrane model selected for the sensor.

Calibration Mode — Selects whether the sensor is to be calibrated in air, directly in-line, or in a span gas. Span gas calibration cannot be selected for the ozone sensor.

Calibration Range Checking — Enables or disables calibration range checking for "In Air" and "In a Span Gas" calibration modes.

Span Gas — Records the span gas concentration, for calibrating the O_2 sensor in a span gas.

Thermal cut-off — Enables or disables the thermal cut-off feature and sets the temperature limit above which the analyzer will be switched off. This protects the sensor if the sample temperature is above the sensor's temperature compensated range.

Automatic Storage Mode — Selects type of automatic data storage mode (see page 3). "Timer" measurements are stored at intervals defined by the Sampling Rate command (below); "Events" measurements are stored when an event occurs, for each of the following: Power On, Sensor Out, Thermal Cut-off, Alarm High, Alarm Low.

Sampling Rate — Selects the time interval (Acquisition rate) for the automatic storage capability. This rate is used when automatic storage mode is set to "Timer" (above).

Calibration Key Status — Enables or disables the instrument front panel CAL button, to prevent accidental sensor recalibration.

Alarms — Establishes High and Low gas concentration limits for your application. When the measured gas concentration exceeds the High limit or falls below the Low limit, an alarm is signaled from the instrument alarm output connections. (Not available in series 3662EX.)

Analog Output — Establishes the Low and High gas concentration range of the analog output. Use these limits to rescale the instrument analog output for use with peripheral equipment.

WIN3660 program troubleshooting—

Use the Troubleshooting menu commands to ensure that the 3660, 3660EX, 3661EX, or 3662EX instrument is configured correctly, and is in good working order. The instrument must be connected to your PC (see note, page 4), and in measurement mode for these tests.

Serial Link Test — Verifies whether the instrument to PC serial connection is operating.

Keyboard Test — Verifies whether all the instrument buttons are functioning correctly.

Display Test — Verifies the LCD display on the instrument.

Alarms Test — Tests the high and low alarm limit relays (not available for 3662EX).

Analog Output Test — Tests the analog output of the instrument.

Analog Voltages View — Provides a real-time view of voltages used by the sensors.

Measurements View — Shows how your instrument should be displaying gas concentration and sample temperature and pressure.

Sensor Current View — Monitors the sensor's current.

You also may reset the instrument date and time via the **Clock** command, or recalibrate the instrument's internal pressure sensor via the **Pressure Calibration** command.

Troubleshooting tips—

Some common operational problems are outlined in the table below. Warning messages and their explanation follow on the next page. If you can't find a solution here, your authorized Orbisphere service technician can help — a partial listing of phone contacts is listed on the next page.

Problem	Probable cause	Possible solution
Sensor won't calibrate, even though you've serviced it thoroughly	H_2S insensitivity option unnecessarily enabled	Unless you need "H_2S insensitive", disable from WIN3660 menu
No analog output signal	Instrument requires power for analog output	Connect to appropriate mains power
Shorter-than-expected sensor operation (in relatively high DO_2)	High O_2 concentrations require more work from electrochemical sensor	Shut off analyzer when not needed
Unexpected/incorrect DO_2 readings	Sample air leak	Set flow rate to 100 ml/min; wait until stable; slowly increase to 200 ml/min; if a significant DO_2 decrease is shown, a sample air leak is likely
Instrument and WIN3660 PC program do not work together (i.e., no data transfer)	Improper PC-to-instrument connection	Verify that all 9 pins are available if using a 25-to-9 pin converter at PC Check for COM port/IRQ conflicts
Alarm relays won't operate properly	Normally open/Normally closed state reversed	Separate NO or NC relays are available from instrument Confirm wiring to terminal block

Alarms, warnings, and help

Abnormal conditions—

The following table shows the warning messages which may appear on the instrument's LCD in place of the gas concentration, and their explanation.

Message	Explanation
out	The sensor is disconnected — reconnect.
hld	The analog and alarm outputs are held after a calibration (see page 2). Press the "MEAS" button to resume normal output.
Er0 Er1	Calibration range checking error indications (see page 2). Perform a sensor service.

The following table shows the range of normal and abnormal analog outputs, and explanation of probable cause for abnormal output.

Analog output	Explanation
0 mA, or 4 mA	Thermal cutoff or below analog output low level
0/4mA < signal < 20 mA	Normal operating condition
20 mA	Sensor disconnected, overrange, or above analog output high level

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