

Software Manual

MultiVision

Gas Detector



biosystems

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WARNING

MULTIVISION PERSONAL PORTABLE GAS DETECTORS HAVE BEEN DESIGNED FOR THE DETECTION AND MEASUREMENT OF POTENTIALLY HAZARDOUS ATMOSPHERIC CONDITIONS

IN ORDER TO ASSURE THAT THE USER IS PROPERLY WARNED OF POTENTIALLY DANGEROUS ATMOSPHERIC CONDITIONS, IT IS ESSENTIAL THAT THE INSTRUCTIONS IN THE MULTIVISION REFERENCE MANUAL BE READ, FULLY UNDERSTOOD, AND FOLLOWED.

THIS MANUAL COVERS THE USE OF THE MULTIVISION SOFTWARE PACKAGE AND IS NOT INTENDED TO REPLACE THE MULTIVISION REFERENCE MANUAL. IT SHOULD BE USED IN CONJUNCTION WITH THE MULTIVISION REFERENCE MANUAL AT ALL TIMES.

**MultiVision
Software Manual
Biosystems Part Number 13-242
Version 1.10
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by
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Signal Words

The following signal words, as defined by ANSI Z535.4-1998, are used in the MultiVision Reference Manual.

⚠DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION indicates a potentially hazardous situation, which if not avoided, may result in moderate or minor injury.

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Warnings and Cautions

1. **⚠WARNING** The MultiVision personal, portable gas detector has been designed for the detection of dangerous atmospheric conditions. An alarm condition indicates the presence of a potentially life-threatening hazard and should be taken very seriously.
2. **⚠WARNING** In the event of an alarm condition it is important to follow established procedures. The safest course of action is to immediately leave the affected area, and to return only after further testing determines that the area is once again safe for entry. Failure to immediately leave the area may result in serious injury or death.
3. **⚠WARNING** Use only Duracell MN1500 or Ultra MX1500, Eveready Energizer E91-LR6, Eveready EN91, Radio Shack 23-874* size AA 1.5V Alkaline batteries, Eveready CH15* or Radio Shack 23-149* size AA NiMH batteries, or Eveready L91*† AA 1.5V Lithium batteries. Substitution of batteries may impair intrinsic safety.

*Not for use with ATEX certified instruments. (ATEX is a European safety directive).

†Not CSA approved (CSA is the Canadian Standards Association (similar to UL in the United States)).

4. **⚠WARNING** The accuracy of the MultiVision should be checked periodically with known concentration calibration gas. Failure to check accuracy can lead to inaccurate and potentially dangerous readings.
5. **⚠WARNING** The accuracy of the MultiVision should be checked immediately following any known exposure to contaminants by testing with known concentration test gas before further use. Failure to check accuracy can lead to inaccurate and potentially dangerous readings.
6. **⚠WARNING** A sensor that cannot be calibrated or is found to be out of tolerance should be replaced immediately. An instrument that fails calibration may not be used until testing with known concentration test gas determines that accuracy has been restored, and the instrument is once again fit for use.
7. **⚠WARNING** Do not reset the calibration gas concentration unless you are using a calibration gas concentration that differs from the one that is normally supplied by Biosystems for use in calibrating the MultiVision.
Customers are strongly urged to use only Biosystems calibration materials when calibrating the MultiVision. Use of non-standard calibration gas and/or calibration kit components can lead to dangerously inaccurate readings and may void the standard Biosystems warranty.
8. **⚠WARNING** Use of non-standard calibration gas and/or calibration kit components when calibrating the MultiVision can lead to inaccurate and potentially dangerous readings and may void the standard Biosystems warranty.
Biosystems offers calibration kits and long-lasting cylinders of test gas specifically developed for easy MultiVision calibration. Customers are strongly urged to use only Biosystems calibration materials when calibrating the MultiVision.
9. **⚠WARNING** Substitution of components may impair intrinsic safety.
10. **⚠WARNING** For safety reasons this equipment must be operated and serviced by qualified personnel only. Read and understand this reference manual before operating or servicing the MultiVision.
11. **⚠WARNING** A rapid up-scale reading followed by a declining or erratic reading may indicate a hazardous combustible gas concentration that exceeds the MultiVision's zero to 100 percent LEL detection range.

1. Description

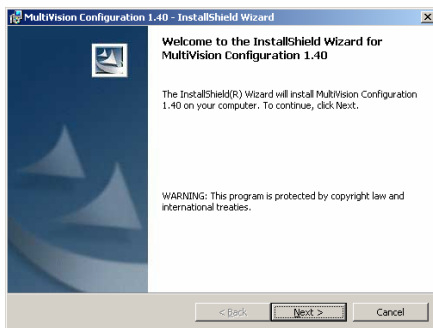
The MultiVision is a four-sensor gas detector that can be configured to meet a wide variety of requirements. This manual provides operating instructions for the MultiVision Software Package. The software package allows the user to program the following items and settings in the MultiVision:

- Date and Time
- Alarm Settings
- Calibration Gas Settings
- Data Sampling Interval
- Alarm Latch Setting
- TWA Setting
- Calibration Due Lockout Setting
- Internal Clock Update Setting
- Security Beep Interval
- Calibration Reminder Interval

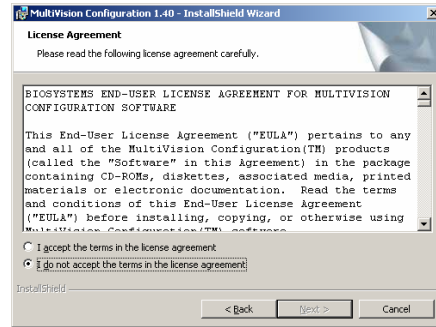
The MultiVision may also be programmed manually through the MODE button. See section 6 of this manual for details.

2. Installing the MultiVision PC Software

1. Place the CD-ROM into your computer's CD tray and close the tray. If the software fails to set itself up immediately, use Windows Explorer to run "setup.exe" on the CD-ROM drive. The following screen will be shown once the software loads.



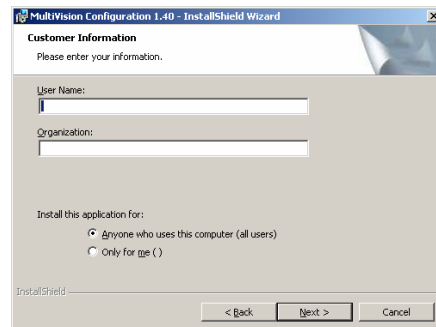
2. Click the "Next" button to proceed with the software installation. The end user license agreement will be shown.



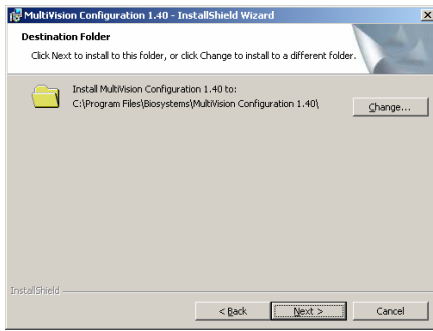
3. If you accept the terms of the agreement, click "I accept...". If you do not accept the terms of the agreement, click "Back" or "Cancel" to end the installation.



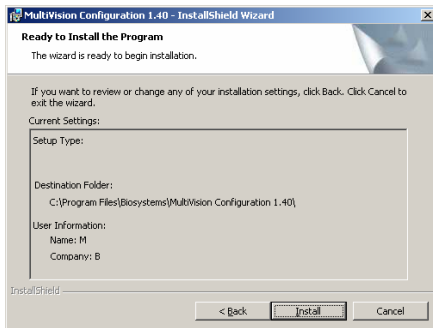
4. Click "Next" to proceed. The Customer Information screen will then be shown. Enter the User Name and Organization and click "Next"



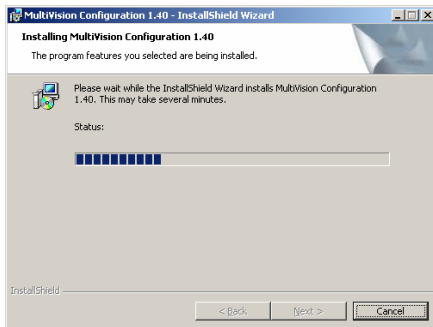
The Destination Folder screen will be shown.



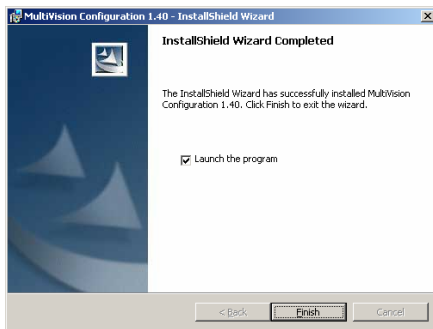
5. To accept the default destination folder, click “Next” or click “Change” and use Explorer to specify a different location for the files. Then click “Next”.



6. Click “Install” to proceed. The status of the installation will be shown.



Once the program has been successfully installed, the following screen will be shown.



7. Click “Finish” to complete the

installation. The program will be automatically launched unless the “Launch the program” option is deselected.

Once the PC restarts, the MultiVision logo will be shown on the PC’s desktop screen. Click on the logo to access the program.



The program can also be accessed by clicking on the start button and selecting Programs/Biosystems/MultiVision.

3. Connecting the MultiVision to the PC

To connect the MultiVision to the PC:

1. Plug the end of the connection cable with the 9-pin connector into your PC’s communications port #1. If you are unable to locate your PC’s communications port, see your PC’s owner’s manual.
2. Turn the MultiVision off.
3. Remove the four screws from the top of the MultiVision.

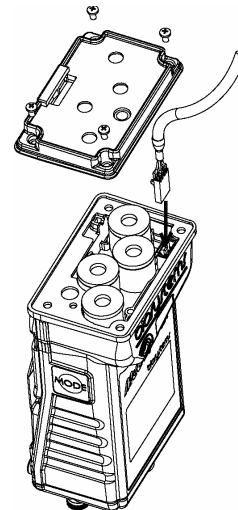


Figure 3 Connection diagram

4. Remove the sensor cover plate. The internal connection port is located near the front right corner of the instrument when viewing it from the display side.

Note: Functional batteries must be installed in the MultiVision to change any available settings.

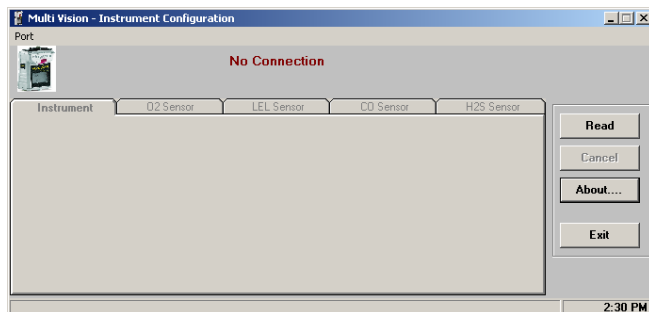
5. Plug the connector into the connection port on the sensor interface board.

4. Initializing the connection

Once the MultiVision is connected to the PC, click on the MultiVision icon to run the PC software. The software may also be accessed through the Programs/Biosystems/MultiVision file from the start menu.



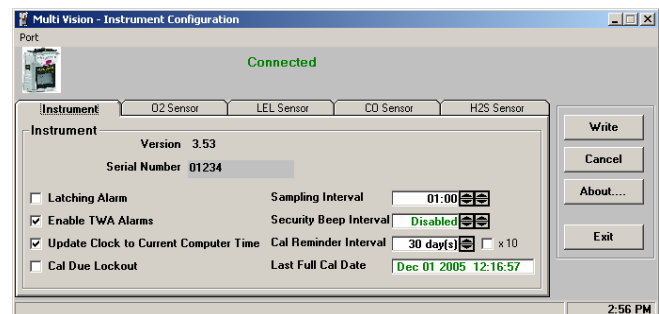
Once the software has been activated, the following screen will be shown on the PC.



The screen will indicate that there is “No Connection” as shown above. Press the Read button to initialize the connection.



Once the connection has been successfully initialized, the Instrument tab will be shown:



Note that the “Read” button changes into the “Write” button once the connection is established. The “Write” button must be pressed to upload any changes to the instrument settings.

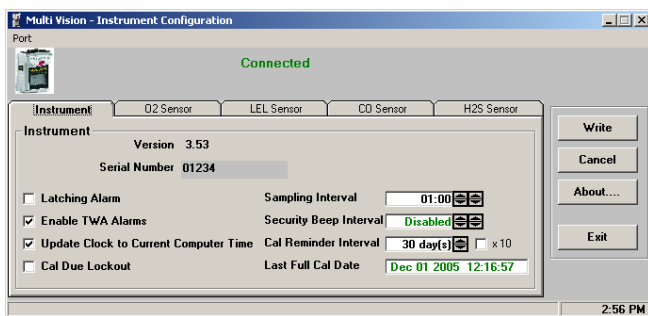
5. Modifying information

The configuration controls are divided into five tabbed pages. The first tabbed page covers the optional setup choices for the instrument. The remaining four tabbed pages contain sensor controls for each of the four sensors. Following any changes to the instrument or sensor settings, the changes must be uploaded to the instrument by pressing the “Write” button.



5.1 Instrument tab

The Instrument tab contains basic instrument information and controls for the user-configurable options for the MultiVision.



The software version, serial number and last full calibration date fields are not modifiable. The remaining seven fields can be modified to meet the needs of the user.

5.1.1 Latching Alarm

When the latching alarm is enabled following an alarm condition, the audible and visible alarms will continue to sound even after the atmospheric hazard has cleared. To turn the latching alarm off after the hazard has cleared, press the MODE button. To enable the alarm latch, click on the box next to Latching Alarm so that a check appears in the box.



If the latching alarm is disabled and the alarm condition is no longer present, the instrument will automatically return to normal operation and the visible and audible alarms will cease without further

input from the user. To disable the alarm latch, the checkbox next to Latching Alarm should be left open.



5.1.2 Enable TWA Alarms

To enable TWA Alarms, click on the box next to Enable TWA Alarms so that a check appears in the box.



To disable the TWA alarms, leave the checkbox open.



Note: OSHA requires that TWA values be monitored for certain substances.

Time Weighted Average or TWA values are calculated by taking the sum of exposure to a particular toxic gas in the current operating session in terms of parts-per-million-hours and dividing by an eight-hour period.

Note: It is not possible to calculate a toxic gas TWA reading until the instrument has been operating for 15 minutes. For the first 15 minutes after start-up, the TWA screen will not show any readings.

5.1.3 Update clock to current computer time

To automatically update the clock in the MultiVision to match the clock in the PC whenever the connection is initialized, check the box to the right of “Update Clock to Current Computer Time”.



To allow the clock in the MultiVision to function independently of the PC's clock, leave the box open.



5.1.4 Cal Due Lockout

The MultiVision automatically displays the “Cal due now” prompt upon instrument turn on when calibration is due. With the

Cal Due Lockout enabled, an instrument that is due for calibration will automatically shut itself off if the calibration is not performed immediately following the “Cal due now” prompt.



If the Cal Due Lockout is disabled, an instrument that is due for calibration can still be used. Simply press the MODE button once to continue without calibrating the instrument once the “Cal due now” prompt is shown.



5.1.5 Sampling interval

There is a finite amount of memory storage available in the datalogger, so the data stream has to be broken into discrete intervals to be recorded. The sampling interval controls the frequency of breaks in the data stream. Lengthening the interval results in a longer amount of time before the datalogger memory is full, but also results in a corresponding loss of data precision since the data intervals are larger. Once the datalogger memory is full, the oldest data will be automatically rewritten with new data as it is acquired. The standard interval is 1 minute. With the data stream broken into 1 minute intervals, the MultiVision will store 40 hours of data before the oldest data is overwritten. A 2 minute interval will yield 80 hours of data before the oldest data is overwritten.

The up and down arrows located next to the interval setting are used to change the setting. The left arrows control the minute interval, which can be set from 0 to 60 minutes. The right arrows controls the number of seconds, which can be set between 0 and 59. The maximum datalogging interval is 60 minutes.



Setting the interval to 0:00 will effectively disable the datalogger.



5.1.6 Security beep interval

The security beep is an audible alarm that “beeps” on a regular basis while the instrument is in normal operation. The beep serves as a reminder that the instrument is turned on. The security beep interval may be set anywhere between 1 second and one hour by using the arrows located to the right of the interval setting figure. The left arrows control the minute interval, which can be set from 0 to 60 minutes. The right arrows controls the number of seconds, which can be set between 0 and 59. The maximum security beep interval is 60 minutes.



Setting the interval to 0:00 will effectively disable the security beep.



5.1.7 Calibration reminder interval

The calibration reminder interval should be set to the number of days between scheduled calibrations. If the instrument has not been calibrated for a period that exceeds the interval, the instrument will show “Cal Due Now” upon turn on.



Use the up and down arrows to the right of the interval setting to adjust the number of days between calibration reminders. To move the interval in 10 day increments, check the “ x 10” box to the right of the interval. The calibration reminder interval may be set anywhere between 0 and 180 days. To Disable the

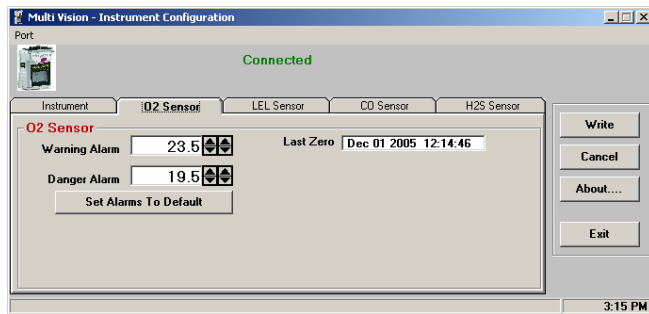
calibration reminder, set the interval to 0 days.



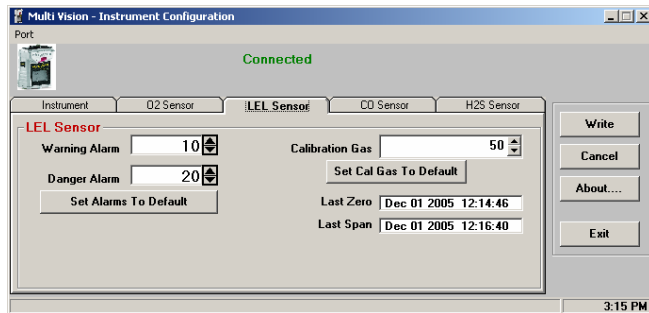
Note: Biosystems recommends regular verification of accuracy with calibration gas. See Appendix B for details.

5.2 Sensor tabs

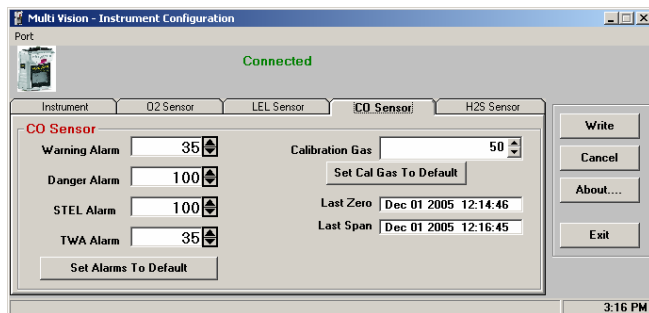
There are four tabbed pages relating to the four available sensor ports in the instrument. To access the sensor information, simply click on the appropriate tab.



O₂ Sensor Tab



LEL Sensor Tab

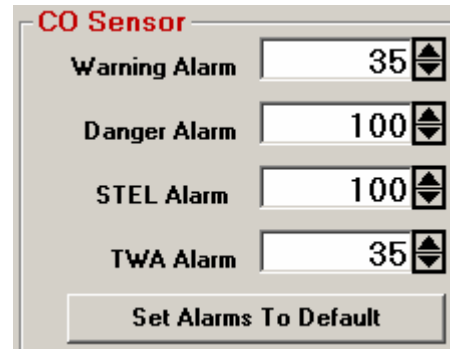


Toxic Sensor Tab (CO)

5.2.1 Alarm settings

All sensor channels include warning and

danger alarms that are configurable by the user. Toxic sensors also include user-configurable STEL and TWA alarms. Alarms may be set to any figure within the established range of the sensor.



The warning alarm is typically set lower than the danger alarm for LEL and toxic gas sensors. For oxygen sensors, the warning alarm is normally used to detect oxygen enrichment and the danger alarm is used to detect oxygen deficiency.

Short Term Exposure Limit (STEL) and Time Weighted Average (TWA) values and alarms apply to toxic gas sensors only. The STEL value is the average gas concentration for the most recently completed 15 minutes of operation. The TWA value is calculated by taking the sum of exposure to a particular toxic gas in the current operating session in terms of parts-per-million-hours and dividing by an eight-hour period.

For more information on the toxic gas sensor alarm settings, see the MultiVision reference manual.

To change alarm settings, use the arrows next to the alarm figure to raise or lower the setting. To restore default alarms, simply click on the “Set Alarms to Default” button.

Caution: Do not set the TWA alarm to 0 PPM. The MultiVision includes a downscale alarm that is automatically set at –50% of the TWA value. If the

TWA value is set to 0 PPM, then the downscale alarm will be activated at a reading of 0 PPM.

5.2.2 Calibration gas settings

Calibration gas information is contained in the panel at the upper right section of the window for the LEL and toxic sensors. The oxygen sensor is calibrated with fresh air (20.9% oxygen), so there is no setting for the oxygen calibration gas.

To change the calibration gas setting, use the arrows next to the figure to raise or lower the setting. To restore default alarms, simply click on the “Set Alarms to Default” button.



⚠WARNING Calibration values shown in the calibration value table must match those appearing on the calibration gas cylinder that will be used to calibrate the MultiVision. Non-matching calibration gas and calibration gas value settings may lead to inaccurate and potentially dangerous readings.

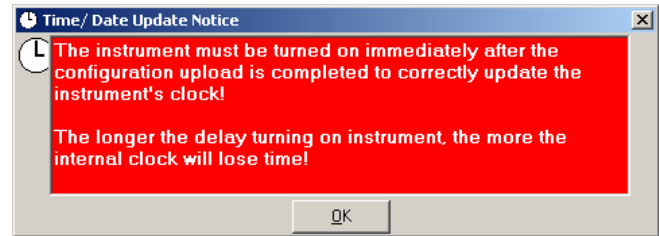
5.3 Uploading changes

Once changes have been made to the settings, press the “Write” button to upload the new settings from the PC to the MultiVision.



Once the “Write” button is pressed, the

following screen will be shown:



Once the update is completed, the serial cable must be disconnected from the MultiVision and the instrument must be immediately turned on. Failure to immediately turn the instrument on will result in a time loss on the MultiVision's internal clock.

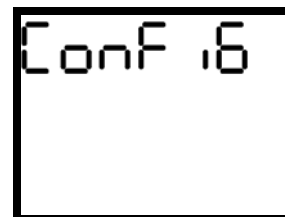
Be sure to reinstall the sensor cover before returning the MultiVision to use.

6. Direct modification

In the event that a setting needs to be changed in the field and a software-equipped PC is not available, the MultiVision can be programmed directly with the MODE button.

6.1 Entering Advanced Mode

To enter the “Advanced Mode” hold the MODE button down for 30 seconds until the “Config” screen is shown.



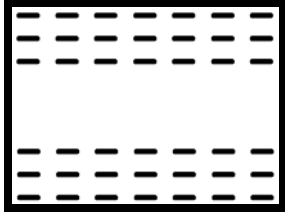
If the MultiVision contains an enabled datalogger and an IrDA port, the “PC Connect” screen will be shown after 10-20 seconds.



If the ‘PC Connect’ screen is shown,

continue to hold the MODE button until 'Config' is shown.

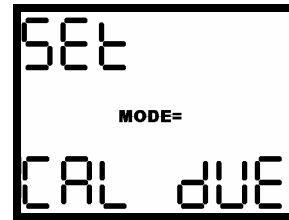
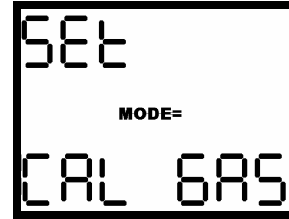
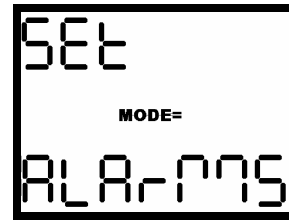
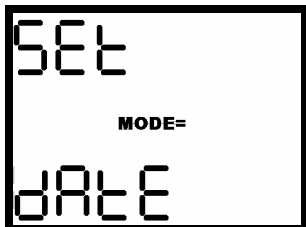
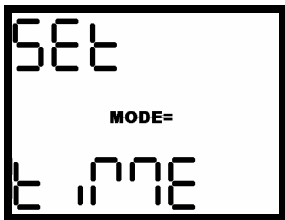
Once "Config" is shown, release the button. Once the screen showing six bars is shown, triple click the MODE button within three seconds to enter the Configuration Menu.



Once the MODE button has been clicked three times in rapid succession, the "Set Options" screen will be shown.



In five seconds the screen will automatically move on to the "Set Time" screen, followed by the "Set Date", "Set Alarms", "Set Cal Gas" and the "Set Cal Due" screens.



The MODE button is used to perform three functions in the Main Menu.

1. Click the MODE button once to advance to the next main menu screen.
2. Click the MODE button three times in rapid succession to enter the submenu for the current menu item.
3. Hold the MODE button for three full seconds to exit the programming menu.

Once a submenu is entered, the MODE button is used to perform the following functions:

1. Click the MODE button once to advance to the next item in the submenu you've entered.
2. Hold the MODE button to change the selection.
3. Click the MODE button three times in rapid succession to return to the Main Menu.

6.2 Set options

The set options submenu houses the controls for the following items:

- TWA (on or off)
- Security beep (on or off)
- Alarm Latch (on or off)
- Cal Due Use (on or off)

Once the Set options submenu is entered, the MultiVision will automatically scroll through the options at 5-second intervals. To change a setting for on to off (or vice-versa) hold the MODE button down for 1-2 seconds.

Once the settings have been modified as needed, click the MODE button three times in rapid succession to return to the Main Menu.

The TWA, Security Beep and Alarm Latch settings are described above in section 5.1.

The Cal Due Use setting determines whether the instrument can be used when it is due for calibration. Selecting “Cal Due Use On” will allow the MultiVision to be used when it is due for calibration. Selecting “Cal Due Use Off” will cause the MultiVision to be shut down if the calibration is due and not performed immediately upon instrument turn on.

Note: For more detailed descriptions of the “Set Options” submenu items, see section 5.1 above.

6.3 Set time

The set time submenu is divided into the hours screen and the minutes screen. The hours screen is given in 24-hour format.



Click the MODE button once to change the selection from hours to minutes (or vice versa).



Hold the MODE button down to advance the hours or minutes figure.

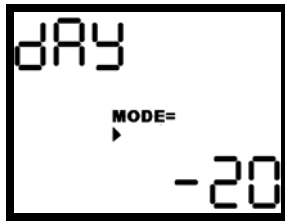
Once the time has been correctly set, click the MODE button three times in rapid succession to return to the Main Menu.

6.4 Set date

The set date submenu is divided into year, month and day screens.

Click the MODE button once to move between the year, month and day screens.





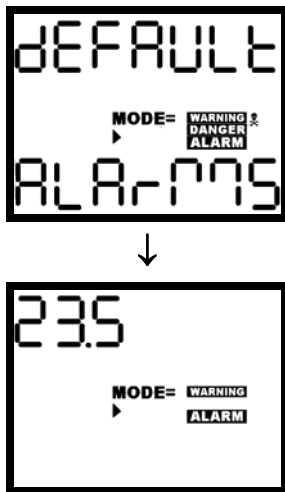
Hold the MODE button down to advance the year, month or day.

Once the day, month or year has been correctly set, click the MODE button once to move on to the next setting.

Click the MODE button three times in rapid succession to return to the Main Menu.

6.5 Set alarms

Once the “Set Alarms” submenu has been reached, the MultiVision will scroll through the various alarm levels and the set default alarms option.



Click the MODE button once to advance through the screens.

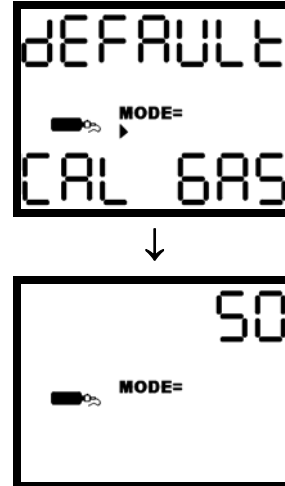
Hold the MODE button down to advance the counter for a specific alarm.

To set default alarms click the MODE button three times in rapid succession with “Default Alarms” displayed.

Once the alarm values have been set correctly, click the MODE button three times in rapid succession to return to the Main Menu.

6.6 Set cal gas

Once the set cal gas submenu has been reached, the MultiVision will scroll through the various calibration gas values screens and the set default cal gas option.



Click the MODE button once to advance through the screens.

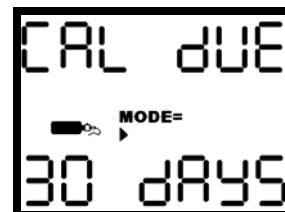
Hold the MODE button down to advance the counter for a specific calibration gas.

To set default alarms click the MODE button three times in rapid succession with “Default Cal Gas” displayed.

Once the calibration gas values have been set correctly, click the MODE button three times in rapid succession to return to the main menu.

6.7 Set cal due

Once the set cal due submenu is reached, the following screen will be shown.



Hold the MODE button down to advance the counter. The maximum length of time between calibrations is 180 days.

To disable the calibration due warning,

set the interval to 0 days (OFF).

Once the calibration due interval has been set correctly, click the MODE button three times in rapid succession to return to the Main Menu.

Note: Biosystems recommends regular verification of accuracy with calibration gas. See Appendix B for details.

6.8 Setup accept

Once the settings in any of the submenus have been changed as needed, return to the Main Menu by clicking the MODE button three times in rapid succession. Once in the Main Menu hold the MODE button down for three seconds to exit. The MultiVision will provide a countdown to accept changes to the settings.



Click MODE to accept the changes and the instrument will show “setup stored” and proceed to turn itself off.



Allow the countdown to run out if you do not wish to save the changes.

Appendix A Toxic gas measurement – Warning, Danger and TWA alarms

Many toxic substances are commonly encountered in industry. The presence of toxic substances may be due to materials being stored or used, the work being performed, or may be generated by natural processes. Exposure to toxic substances can produce disease, bodily injury, or death in unprotected workers.

It is important to determine the amounts of any toxic materials potentially present in the workplace. The amounts of toxic materials potentially present will affect the procedures and personal protective equipment that must be used. The safest course of action is to eliminate or permanently control hazards through engineering, workplace controls, ventilation, or other safety procedures. Unprotected workers may not be exposed to levels of toxic contaminants that exceed Permissible Exposure Limit (PEL) concentrations. Ongoing monitoring is necessary to insure that exposure levels have not changed in a way that requires the use of different or more rigorous procedures or equipment.

Airborne toxic substances are typically classified on the basis of their ability to produce physiological effects on exposed workers. Toxic substances tend to produce symptoms in two time frames.

Higher levels of exposure tend to produce immediate (acute) effects, while lower levels of long-term (chronic) exposure may not produce physiological symptoms for years.

Hydrogen sulfide (H₂S) is a good example of an acutely toxic substance which is immediately lethal at relatively low concentrations. Exposure to a 1,000 ppm (parts per million) concentration of H₂S in air produces rapid paralysis of the respiratory system, cardiac arrest, and death within minutes.

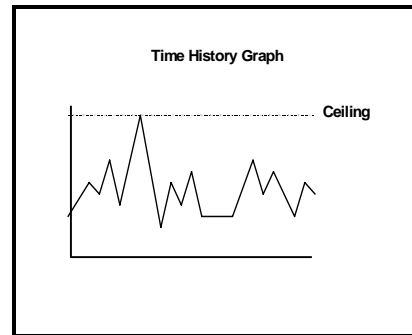
Carbon monoxide (CO) is a good example of a chronically toxic gas. Carbon monoxide bonds to the hemoglobin molecules in red blood cells. Red blood cells contaminated with CO are unable to transport oxygen. Although very high concentrations of carbon monoxide may be acutely toxic, and lead to immediate respiratory arrest or death, it is the long term physiological effects due to chronic exposure at lower levels that take the greatest toll of affected workers. This is the situation with regards to smokers, parking garage attendants, or others chronically exposed to carbon monoxide in the workplace. Exposure levels are too low to produce immediate symptoms, but small repeated doses reduce the oxygen carrying capacity of the blood over time to dangerously low levels. This partial impairment of the blood supply may lead over time to serious physiological consequences.

Because prudent monitoring programs must take both time frames into account, there are two independent exposure measurements and alarm types built into the MultiVision design.

1. Warning and Danger Alarms

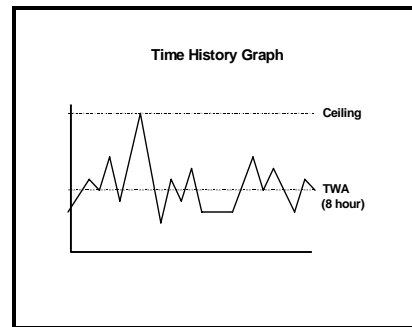
OSHA has assigned some, but not all, toxic substances with a ceiling level which represents the highest concentration of a toxic substance to which an unprotected worker should ever be exposed, even for a very short time. The default Warning and Danger alarm levels in the MultiVision are less than or equal to the OSHA-assigned ceiling levels for both CO and H₂S. **Never enter an environment even momentarily when concentrations of toxic substances exceed the level of**

either the Warning or the Danger Alarm.



2. Time Weighted Average (TWA):

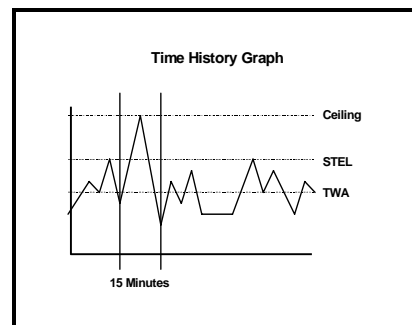
The maximum average concentration to which an unprotected worker may be exposed over an eight hour working day is called the Time Weighted Average or TWA value. TWA values are calculated by taking the sum of exposure to a particular toxic gas in the current operating session in terms of parts-per-million-hours and dividing by an eight-hour period.



3. Short Term Exposure Limits (STEL):

Toxic substances may have short term exposure limits which are higher than the eight hour TWA. The STEL is the maximum average concentration to which an unprotected worker may be exposed in any fifteen minute interval during the day. During this time, neither the eight hour TWA or the ceiling concentration may be exceeded.

Any fifteen minute periods in which the average STEL concentration exceeds the permissible eight hour TWA must be separated from each other by at least one hour. A maximum of four of these periods are allowed per eight hour shift.



Appendix B

Calibration

Frequency

Recommendations

One of the most common questions that we are asked at Biosystems is: "How often should I calibrate my gas detector?"

Sensor Reliability and Accuracy

Today's sensors are designed to provide years of reliable service. In fact, many sensors are designed so that with normal use they will only lose 5% of their sensitivity per year or 10% over a two-year period. Given this, it should be possible to use a sensor for up to two full years without any significant loss of sensitivity.

A lot of sensors indeed do last that long with only minimal loss of sensitivity. However, there are a number of reasons why a sensor may unexpectedly lose additional sensitivity or even fail to respond to gas. Such reasons include desiccation, poisoning, physical restriction of airflow, overexposure, leakage, and mechanical damage due to dropping or immersion.

Verification of Accuracy

With so many reasons why a sensor can lose sensitivity and given the fact that dependable sensors can be key to survival in a hazardous environment, frequent verification of sensor performance is paramount.

There is only one sure way to verify that a sensor can respond to the gas for which it is designed. That is to expose it to a known concentration of target gas and compare the reading with the concentration of the gas. This is referred to as a "bump" test. This test is very simple and takes only a few seconds to accomplish. **The safest course of action is to do a "bump" test prior to each day's use.** It is not necessary to make a calibration adjustment unless readings are off by more than 10% of the expected value.

Lengthening the Intervals between Verification of Accuracy

We are often asked whether there are any circumstances in which the period between accuracy checks may be lengthened.

Biosystems is not the only manufacturer to be asked this question! One of the professional organizations to which Biosystems belongs is the Industrial Safety Equipment Association (ISEA). The "Instrument Products" group of this organization has been very active in developing a protocol to clarify the minimum conditions under which the interval between accuracy checks may be lengthened.

A number of leading gas detection equipment manufacturers have participated in the development of the ISEA guidelines concerning calibration frequency. Biosystems procedures closely follow these guidelines.

If your operating procedures do not permit daily checking of the sensors, Biosystems recommends the following procedure to establish a safe and prudent accuracy check schedule for your Biosystems instruments:

1. During a period of initial use of at least 10 days in the intended atmosphere, check the sensor response daily to be sure there is nothing in the atmosphere, which is poisoning the sensor(s). The period of initial use must be of sufficient duration to ensure that the sensors are exposed to all conditions that might have an adverse effect on the sensors.
2. If these tests demonstrate that it is not necessary to make adjustments, the time between checks may be lengthened. The interval between accuracy checks should not exceed 30 days.
3. When the interval has been extended the toxic and combustible gas sensors should be replaced upon warranty expiration. This will minimize the risk of failure during the interval between sensor checks.
4. The history of the instrument response between verifications should be kept. Any conditions, incidents, experiences, or exposure to contaminants that might have an adverse effect on the calibration state

of the sensors should trigger immediate re-verification of accuracy before further use.

5. Any changes in the environment in which the instrument is being used, or changes in the work being performed, should trigger a resumption of daily checking.
6. If there is any doubt at any time as to the accuracy of the sensors, verify the accuracy of the sensors by exposing them to known concentration test gas before further use.

Gas detectors used for the detection of oxygen deficiencies, flammable gases and vapors, or toxic contaminants must be maintained and operated properly to do the job they were designed to do. Always follow the guidelines provided by the manufacturer for any gas detection equipment you use!

If there is any doubt regarding your gas detector's accuracy, do an accuracy check! All it takes is a few moments to verify whether or not your instruments are safe to use.

One Button Auto Calibration

While it is only necessary to do a "bump" test to ensure that the sensors are working properly, all current Biosystems gas detectors offer a one-button auto calibration feature. This feature allows you to calibrate a Biosystems gas detector in about the same time that it takes to complete a "bump" test. The use of automatic bump test and calibration stations can further simplify the tasks, while automatically maintaining records

**Don't take a chance
with your life.
Verify accuracy frequently!**

Please read also Biosystems' application note: AN20010808 "Use of 'equivalent' calibration gas mixtures". This application note provides procedures to ensure safe calibration of LEL sensors that are subject to silicone poisoning.

Biosystems Standard Warranty Gas Detection Products

General

Biosystems LLC (hereafter Biosystems) warrants gas detectors, sensors and accessories manufactured and sold by Biosystems, to be free from defects in materials and workmanship for the periods listed in the tables below.

Damages to any Biosystems products that result from abuse, alteration, power fluctuations including surges and lightning strikes, incorrect voltage settings, incorrect batteries, or repair procedures not made in accordance with the Instrument's Reference Manual are not covered by the Biosystems standard warranty.

The obligation of Biosystems under this warranty is limited to the repair or replacement of components deemed by the Biosystems Instrument Service Department to have been defective under the scope of this standard warranty. To receive consideration for warranty repair or replacement procedures, products must be returned with transportation and shipping charges prepaid to Biosystems at its manufacturing location in Middletown, Connecticut, or to a Biosystems Authorized Warranty Service Center. It is necessary to obtain a return authorization number from Biosystems prior to shipment.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. BIOSYSTEMS WILL NOT BE LIABLE FOR LOSS OR DAMAGE OF ANY KIND CONNECTED TO THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCTS TO FUNCTION OR OPERATE PROPERLY.

Instrument & Accessory Warranty Periods

Product(s)	Warranty Period
PhD ⁵ , PhD Lite, PhD Plus, PhD Ultra, Cannonball3, MultiVision, Toxi, Toxi/Oxy Plus, Toxi/Oxy Ultra, ToxiVision, Ex Chek	As long as the instrument is in service
ToxiPro [®] , MultiPro	2 years from date of purchase
ToxiLtd [®]	2 years after activation or 2 years after the "Must Be Activated By" date, whichever comes first
Mighty-Tox	90 days after activation or 90 days after the "Must Be Activated By" date, whichever comes first
Mighty-Tox 2 Prorated credit is given towards repair or purchase of a new unit of the same type.	0 – 6 months of use 100% credit 6 – 12 months of use 75% credit 12 – 18 months of use 50% credit 18 – 24 months of use 25% credit
IQ Systems, Series 3000, Airpanel, Travelpanel, ZoneGuard, Gas✓Chek1 and Gas✓Chek4	One year from the date of purchase
Battery packs and chargers, sampling pumps and other components, which by their design are consumed or depleted during normal operation, or which may require periodic replacement	One year from the date of purchase

Sensor Warranty Periods

Instrument(s)	Sensor Type(s)	Warranty Period
PhD Plus, PhD Ultra, PhD ⁵ , PhD Lite, Cannonball3, MultiVision, MultiPro, ToxiVision, ToxiPro [®] , Ex Chek	O ₂ , LEL**, CO, CO+, H ₂ S & Duo-Tox	2 Years
	All Other Sensors	1 Year
Toxi, Toxi/Oxy Plus, Toxi/Oxy Ultra	CO, CO+, H ₂ S	2 Years
	All Other Sensors	1 Year
All Others	All Sensors	1 Year

** Damage to combustible gas sensors by acute or chronic exposure to known sensor poisons such as volatile lead (aviation gasoline additive), hydride gases such as phosphine, and volatile silicone gases emitted from silicone caulks/sealants, silicone rubber molded products, laboratory glassware greases, spray lubricants, heat transfer fluids, waxes & polishing compounds (neat or spray aerosols), mold release agents for plastics injection molding operations, waterproofing formulations, vinyl & leather preservatives, and hand lotions which may contain ingredients listed as cyclomethicone, dimethicone and polymethicone (at the discretion of Biosystems Instrument Service department) void Biosystems' Standard Warranty as it applies to the replacement of combustible gas sensors.