SafeLog 100
Single Gas
Datalogging Monitor

Operator's Manual

Note: Due to the new ATEX Directive in Europe, all references in this document to "Ex" or "EEx" for intrinsic safety approvals should be disregarded effective 7/1/03 within the member countries of the European Union (EU). At this time, this product is not approved in accordance with the new ATEX Directive and is not sold for use in hazardous atmospheres or explosive zones by customers within the EU. Outside of the EU, all references to intrinsic safety continue without change.

QUEST TECHNOLOGIES

Thank you for choosing Quest Technologies to meet your personal gas monitoring needs. The SafeLog 100 is an extremely rugged, lightweight single gas datalogging personal monitor. It is our goal to make your decision to buy Quest products the right one, and to provide support for any questions or concerns that might arise.

The purpose of this manual is to provide the user with the necessary information to operate the SafeLog 100. The entire manual should be read to fully understand the many features this instrument offers.

This manual is not all inclusive and cannot cover all unique situations. In addition, no warranties are contained in this manual except as described under the warranty policy section.

P/N 054-479

QUEST TECHNOLOGIES

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1. INTRODUCTION

The Quest SafeLog 100 single gas detector is a compact, personally worn unit, which measures either oxygen or one of eight possible toxic gases. The measured levels of these gases are shown in a backlit, four-digit LCD display.

When one of the unit's alarm thresholds has been exceeded, the unit produces a two-tone alarm and the LED flashes.

This 8.8 oz. unit is powered by a single 9 volt alkaline battery (life expectancy 100 hrs.). The unit measures its gas sensor's output continuously at one sample per second. It records over 60 hours of 1 minute historical data including the high level for each minute, STEL, TWA, and temperature. All recorded data can be sent to a printer or computer for record keeping or further data analysis.

Like many of Quest's data logging instruments, the SafeLog 100 works with the QuestSuite™ software package.

Warning: The SafeLog 100 is intended to measure gases that are potentially dangerous to human health. To help ensure worker safety through proper use of your unit, it is important that you not only read but also understand the contents of this manual. Please familiarize yourself with the unit before using it in a potentially hazardous situation.

2. GENERAL DESCRIPTION

2.1 SafeLog 100:

The SafeLog 100 is an extremely rugged, light-weight single gas datalogging, personal monitor. Designed for today's demanding work environments, the unit features a large four digit display with backlighting and pulsating warning horn and visual alarms.

Figure 1. SafeLog 100

2.2 Sensors:

The SafeLog 100 uses sensor modules with onboard memory that contains information about the individual sensor including: sensor identification, alarm setpoints, calibration data, and temperature compensation information. When powered on, the SafeLog 100 automatically recognizes which sensor type is in place and reads the information from the module. Sensor type, identification number, and other information is stored for every datalogging session and appears in the printout.

2.2.1 Temperature Compensation:

Because the sensor's output varies with temperature, the unit measures temperature and automatically compensates for changes. Compensation is based upon sensor data provided by the sensor's manufacturer. Because the compensation is based upon the response of an average sensor, some amount of error will still be present for any individual sensor. It is therefore recommended that, whenever possible, the unit be calibrated close to the temperature it will be used in.

2.3 Display Annunciator:

2.3.1 RUN:

This annunciator appears whenever the unit enters the run mode. While in the run mode, gas measurements are taken, compared to the alarm settings, and logged into memory.

2.3.2 LVL:

This annunciator appears in the display when the level measured by the sensor is shown, when the high and low alarms are set, when the calibration level is shown, and when zeroing.

2.3.3 TWA:

This annunciator, which stands for Time Weighted Average, is present only when using a toxic gas sensor. The unit calculates the TWA by summing the sensor values, and then dividing them by the number of samples measured in eight hours (28,800). It then compares the TWA to its alarm level, which is the maximum average concentration to which an unprotected worker can be exposed over an eight hour period. If this level is exceeded, the alarm activates and the alarm value is shown on the display.

2.3.4 STEL:

This annunciator, which stands for Short Term Exposure Limit, is present only when using a toxic gas sensor. Toxic gases may have STEL's which are higher than the eight hour TWA. This is the maximum average concentration to which an unprotected worker may be exposed in any fifteen minute interval during the day. The monitor calculates the STEL by compiling fifteen one minute averages, updating each minute thereafter. The monitor compares the STEL to the peak STEL value, which is replaced whenever it is exceeded. It then compares the STEL to its alarm level, and if this level is exceeded, the alarm activates and the current value is shown on the display.

2.3.5 HI:

This annunciator appears when the high level alarm of a toxic gas or the upper limit of O2 is displayed. This is the highest concentration of gas to which an unprotected worker should ever be exposed, even momentarily.

2.3.6 LO:

This annunciator appears only on the O2 monitor when the low oxygen alarm limit is displayed. This is the minimum permissible oxygen level to which an unprotected worker should ever be exposed.

2.3.7 ZERO:

This annunciator appears when you put the monitor into the zero sensor mode. YOUR UNIT MUST BE ZEROED IN A CLEAN AIR ENVI RONMENT PRIOR TO CALIBRATION. See Section 3.7 "Zeroing" on page 13 for further information.

2.3.8 BAT:

This annunciator, representing a low battery condition, appears when the battery's voltage drops below 6.5 volts. If the battery remains within the unit until its voltage drops to 6.1, the unit will chirp. At 6.0 volts, the alarm produces a steady tone for 25 seconds, 'dEAd' appears in the display, and then the unit automatically turns itself off. A new 9 volt alkaline battery has a life expectancy of over 100 hours. Approximately 8 hours remain from the time the BAT annunciator first appears in the display. See Section 6 "Changing the Battery" on page 22 for further information.

2.3.9 PEAK:
This annunciator appears during the RUN mode when the peak level and, in the case of the toxic gases, the peak STEL are shown.

2.3.10 CAL:
This annunciator appears during the SETUP mode when changing the calibration level and while calibrating.

2.3.11 AVG:
This annunciator appears during the RUN mode when the average exposure level is shown.

2.4 The Keys:
2.4.1 ON/OFF/ENTER:
This key turns the unit on and off, selects a value to be changed, initiates the printing, calibration and zero functions, and enters the RUN mode.

2.4.2 SETUP:
The setup key enters and exits the SETUP mode. Pushing the key from the display with four dashes enters the SETUP mode. Pushing the key again exits to the display with four dashes.

2.4.3 PRINT / ▲ ARROW:
The print key enters and exits the PRINT mode. Pushing the key from the display with four dashes enters the PRINT mode. Pushing the key again exits to the display with four dashes.

The ▲ arrow key moves through menu items or increases numeric set points.

2.4.4 ZERO / ▼ ARROW:
The zero key enters and exits the ZERO mode. Pushing the key from the display with four dashes enters the ZERO mode. Pushing the key again exits to the display with four dashes.

The ▼ arrow moves through menu items or decreases numeric setpoints.

2.5 THE BACKLIGHT:
Pressing any key turns the backlight on for five seconds. The backlight is also on during all alarming conditions.

3. UNIT OPERATION

3.1 Turning the Unit ON:
Press ON/OFF. The following startup sequence will occur.

1. All of the display segments appear simultaneously on the screen and the backlight turns on.

2. The software revision of the unit's internal program is displayed. The LED and audio alarm activate.

3. If the sensor has been changed or if no sensor is in place, the display will show an error code and the alarm will chirp. Press the enter key to continue.

4. The chemical symbol for the measuring sensor is briefly shown in the display, (i.e. CO)

5. The status of the confidence chirp is displayed. CC 1 indicates that it is active. CC 0 indicates that it is turned off.

6. The display shows the battery's voltage. A reading of 6.5 indicates that your battery has roughly eight hours of life remaining, and at that voltage point the LOBAT annunciator appears on the screen**. QUEST RECOMMENDS THAT YOU CHANGE THE BATTERY AS SOON AS THE VOLTAGE REACHES THIS LEVEL**. A reading of 6.1 will turn the LOBAT alarm on, indicating that you should change the battery immediately in a non-hazardous area.

7. The display shows four dashes. If no keys are pushed for thirty seconds, the unit automatically enters the run mode.

3.2 Turning the Unit OFF:
Press ON/OFF and hold the key down as the unit counts down from three. Once it counts down to zero and the alarm turns on continuously, release the key and the unit turns off. If the key is released prior to counting down to zero, the unit returns to the display with four dashes.

3.3 Setup Mode:

With four dashes in the display, press the setup key to enter the SETUP mode. The display shows four zeros representing the password. Use the arrow keys to change each digit and the enter key to select the digit. If the password is correct, the unit goes to the SETUP mode. If the password is forgotten, the default password is 9157.
The SETUP mode menu includes Zero, Calibration Level, Calibration, Hi Level Alarm, LO Level Alarm (Oxygen), STEL Alarm (Toxic), TWA Alarm (Toxic), Confidence Chirp Status, Time, Date, Temperature, and Password. The ▲ arrow and ▼ arrow keys move through the menu items. Press the setup key to return to the display with the four dashes.

3.3.1 Zero:

The display shows the current level along with the LVL and ZERO annunciator. Press the enter key to zero the unit. If the sensor can not be zeroed, an error message is displayed. See Section 3.7 "ZEROING" on page 13 and Section 5 "ERROR MESSAGES" on page 21 for further information.

3.3.2 Calibration Level:

The display shows the calibration gas level along with the CAL and LVL annunciator. Pressing the enter key allows adjustment of the calibration gas level. The first digit will flash. Use the arrow and enter keys to adjust the level.

3.3.3 Calibration:

The display shows the CAL annunciator and the current sensor reading. When the reading is stable, press the enter key and the display will show CAL indicating that it is adjusting the calibration. When calibration is complete, the display returns to the new sensor reading. If the sensor can not be calibrated, an error message is shown. See Section 3.8 "CALIBRATION" on page 14 and Section 5 "ERROR MESSAGES" on page 21 for further information.

3.3.4 Alarm Levels:

For the high level alarm, the HI and LVL annunciator will be on the display. For the low level alarm (oxygen only) LO and LVL will be on the display. For the STEL alarm (toxics only) HI and STEL will be on the display. For the TWA alarm (toxics only) HI and TWA will be on the display. Pressing the enter key causes the first digit to flash. Use the arrow and enter keys to adjust the level.

3.3.5 Confidence Chirp Status:

The confidence chirp feature gives a single audible chirp every 30 seconds while the unit is running. The confidence chirp status is indicated by CC 1 if turned on and CC 0 if turned off. Pressing the enter key changes the status.

3.3.6 Time:

The current time of day is displayed in 24-hour format. Pressing the enter key causes the first digit to flash. Change the time using the arrow and enter keys. If the new time entered is not a valid time, the original time is put back into the display with the first digit flashing.

3.3.7 Date:

The display will show "dAtE". Pressing the enter key displays a "d" followed by the day of the month with the first digit flashing. Use the arrow and enter keys to change the day. When the day is entered an "0" is displayed followed by the month with the first digit flashing. When the new month has been entered, the year is displayed with the first digit flashing. When the last digit of the year has been entered, the display will return to dAtE. If any portion of the date is invalid, the original date is put back into the display and it must be re-entered.

3.3.8 Temperature:

The current temperature reading is displayed followed by F for Fahrenheit or C for Celsius. Pressing the enter key changes between Fahrenheit and Celsius.

3.3.9 Password:

The display shows "PASS". Pressing the enter key shows "0000" with the first digit flashing. Use the arrow keys to change the digit and the enter key to accept it. When the last digit is entered, the display will return to "PASS".

3.4 Zero Mode:

While four dashes are shown in the display, pressing the zero key enters the ZERO mode (this operates the same as zeroing through the SETUP mode). The LVL and ZERO annunciator appear along with the current gas level. Pressing the enter key zeroes the unit. Pressing the zero key exits the Zero mode menu. See Section 3.7 "ZEROING" on page 13 for further information.

3.5 Print Mode (Reset):

3.5.1 Print:

From the display with four dashes, pressing the PRINT key enters the PRINT mode. The display will show "PrLL" or "SEr" based upon which cable, parallel or serial, is plugged into the unit. With "SEr" in the display, the unit will accept commands from a personal computer or QuestSuite™ for Windows software. Serial communications are at a fixed rate of 9600 baud. Pressing the enter key initiates printing.

3.5.2 Reset:

To reset the unit while in the PRINT mode, press the ▼ arrow key. The display shows "rSt" which allows resetting of the logged memory. Press and hold the enter key for a three second countdown to reset the logging memory. This will clear all recorded sessions but will not affect any user setup options. After a complete reset, the unit automatically returns to the display with four dashes.

3.6 Run Mode:

While four dashes are shown in the display, the unit automatically enters the RUN mode after thirty seconds or after pressing the enter key. The display will show the current gas level along with the RUN and LVL annunciators.

In the RUN mode, pressing the arrow keys will display the following items: Level, STEL (Toxic), TWA (Toxic), Peak Level, LO Level (oxygen), Peak STEL (Toxic), Average Level, Time, Temperature, and the chemical symbol corresponding to the installed sensor. Press the enter key to turn on the backlight without changing the item in the display.

Close the run mode by pressing and holding the on/off key while a three second close (CLS) countdown is shown in the display. This closes the session. The next time the unit enters the run mode, it begins a new session.

3.7 Zeroing:

THE SENSOR'S SENSITIVITY CHANGES OVER TIME AND AFTER USE, SO TO ADJUST FOR THIS, PERFORM THIS EXERCISE PRIOR TO EVERY USE.

Note: Fresh, uncontaminated air is necessary for this procedure. (Perform away from heavy traffic, excessive cigarette smoke, etc.) If such an atmosphere is difficult to reach, zero air cylinders are available.

Zeroing the sensor adjusts for small baseline drifts which occur over time in electrochemical sensors.

Zero the unit by pressing the zero key from the display with four dashes or as one of the options available through the setup mode. The LVL and ZERO annunciators appear along with the current gas level. The gas level displayed should be stable before continuing. Press the enter key to zero the unit. If successfully zeroed, the display will show the current gas level as zero (except in the case of oxygen where the display will *show 20.9). An unsuccessful zero results in an error message appearing in the display.

If the level reading is high prior to attempting to initiate a zero, an error occurs. Typical causes include: the presence of gas, the sensor has recently been put in the unit and has not had enough time to settle, or the sensor is old and can no longer be adjusted. Make certain that the environment is free from toxic gases and the sensor has been under power long enough to have settled. If the unit still can not successfully perform a zero, replace the sensor.

3.8 Calibration:

Note: You must zero your unit prior to calibration. Perform this operation in a non-hazardous area. (See Section 3.7 "Zeroing" on page 13).

First check the calibration level. While in the SETUP mode, use the arrow keys to move through the menu until the CAL and LVL annunciator appears. Check the calibration level shown on the display against the level printed on the calibration gas cylinder. If they differ, change the calibration level in the unit to match the calibration gas. (See Section 3.3.2 "Calibration Level" on page 11).

Snap the unit's calibration cup over the top of the unit so that the cup chamber is over the sensor. See Figure 2. Calibration on page 15.

Check the Minimum Flow Rate Table (Section 3.8.1 on page 16) for the specific gas to be sure the regulator is adequate. Tightly screw the regulator onto the calibration gas cylinder and check the hose's connection to the regulator to be sure it is secure. Firmly place the end of the hose onto the nozzle of the unit's calibration cup.

Turn the knob on the regulator counter-clockwise as far as it will turn to release the gas.

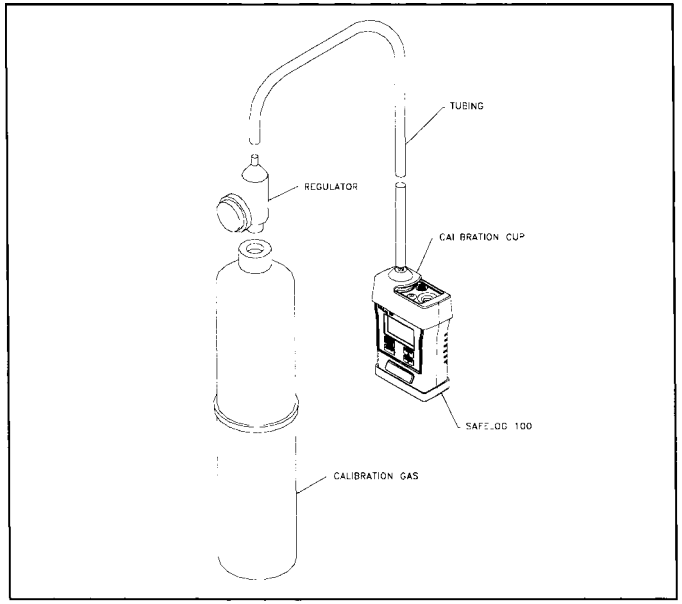

Figure 2. *Calibration*

Press the ▼ arrow key on the unit so that the CAL annunciator appears in the display along with the current gas level. Wait for the level on the unit's display to stabilize. Press the enter key; "CAL" appears in the display as the unit calibrates itself.

When the sensor is old and can no longer calibrate, an error message is given in the display. (See Section 5 "ERROR MESSAGES" on page 21 for more information.)

3.8.1 Minimum Flow Rate Table:
This chart shows the minimum flow rate necessary for calibration. Be sure that the proper regulator is used.

Gas	Minimum Flow Rate (ml/min)	Regulator Stock Number
Carbon Monoxide	150	54-971 /54-972
Hydrogen Sulfide	250	54-971/54-972
Sulphur Dioxide	400	54-971/54-972
Nitric Oxide	250	54-971/54-972
Nitrogen Dioxide	400	54-971/54-972
Chlorine	1000	54-972
Hydrogen Cyanide	400	54-971/54-972
Ammonia	250	54-973

3.9 Alarms:

All alarm levels may be set or changed through the setup mode. The unit uses HI, STEL, and TWA alarms for toxic sensors and HI and LO alarms for oxygen sensors.

During the run mode, HI and LO alarm conditions are checked each second and STEL and TWA alarm conditions are checked every minute. If any alarm setting is exceeded, the buzzer and LED turn on, the value causing the alarm is displayed, and the alarm condition and time of occurrence are recorded in memory. Pressing the on/off key will turn off the alarm. If the alarm condition still exists, it will be turned back on when the alarming value is next calculated (1 minute for STEL and TWA, 1 second for HI and LO levels).

Using ***QuestSuite™*** for Windows software, allows a high level pre-alarm to be set and enabled. If the sensor reading exceeds the pre-alarm level, the unit gives a once per second chirp. Note that this feature may only be set up and enabled with ***QuestSuite™*** software.

3.10 Data Acquisition:

While in the RUN mode, the sensor is sampled every second. All values except for STEL are updated and compared to the alarm settings. STEL is updated and compared to it's alarm setting every minute.

3.11 Logging:

Each time the unit enters the run mode, a new session begins. The TWA, STEL, and AVG levels all begin at zero. Each session's data is recorded separately in memory and is printed with its own header and data summary.

In the RUN mode, the unit records data to memory in one minute intervals. For each one minute interval the record contains the highest value (HI) measured, the lowest value (LO) measured (oxygen), STEL (toxic), TWA (toxic), and temperature. The summary data for each session will contain the sensor type, serial number, last calibration date, alarm history, peak level (PEAK), average level (AVG), minimum level (oxygen), peak STEL (toxic), the session number, and the session start and stop times.

The unit logs data for approximately 60 hours. When the logging memory is full, "FULL" appears in the display and the alarm will chirp. Press the on/off key to acknowledge the memory full condition and stop the alarm's chirp. The unit will continue to operate in a non-datalogging mode and will measure gas, update values, and check for alarm conditions but it stops logging time history data to memory.

4. PRINTING

The SafeLog 100 can send data serially to a computer or in parallel to a printer. Serial data transmission requires the Quest cable #54-715 and parallel data transmission requires the Quest cable #56-875. With the cable plugged into the unit, pressing the print key from the main menu results in either "SEr" or "PrLL" showing in the display corresponding to which cable is plugged in. If a cable is not plugged in, the unit will default to serial and "SEr" will be displayed. Pressing the enter key initiates printing. "Prn" shows up in the display while the unit is printing. Press and hold the enter key during printing to abort.

4.1 Serial:

Use serial cable #54-715 to print data to, or communicate with, a personal computer. Connect the cable between the SafeLog 100 and the PC's serial RS-232 (com) port. ***QuestSuite™*** for Windows software is recommended for use with the SafeLog 100. "SEr" must be in the display for the unit to be able to send and receive information from ***QuestSuite™.*** Other communication programs such as WIN 95's Hyperterminal may be used to capture the unit's printout into a file.

Note: The PC's serial port should be either a 25 pin male or a 9 pin male connector. If the PC only has a 9 pin port available, then a standard 25 to 9 pin converter can be used. Do not use any other adapter cables.

The serial format is:

Baud rate:	9600
Data bits:	8
Stop bits:	1
Parity:	none
Flow control:	Xon/Xoff

4.2 Parallel:

Use parallel cable #56-875 to send data to a parallel printer. Connect the cable between the SafeLog 100 and the printer. Make sure the printer is powered on and its ONLINE light (typically green) is lit.

4.3 Sample Printout:

QUEST TECHNOLOGIES
GAS DETECTION REPORT
Page 1

File Identification ____________________

Employee Name ____________________

Employee ID ____________________

Facility ID ____________________

Department ID ____________________

Job ID ____________________

SafeLOG 100 Ver 2.04
Serial # TR7060001

Sensor: Carbon Monoxide (CO)
Serial # 4CF 141038 067

Session (1)
Start: 22-AUG-97 08:45:13
Stop: 22-AUG-97 09:29:50

Printed: 22-AUG-97 09:37:26

Comments/Notes ____

LAST CALIBRATION:
50 ppm 21-AUG-97 15:20:12

SUMMARY INFORMATION

Temperature:			
High:	26 C	22-AUG-97	09:25:45
Low:	22 C	22-AUG-97	08:45:14
Carbon Monoxide (CO)			
Peak Level:	205 ppm	22-AUG-97	09:22:07
Average Level:	30 ppm		
Peak STEL Level:	89 ppm	22-AUG-97	09:25:13
TWA Level:	2 ppm		

ALARM SETTINGS:
High: 200 ppm STEL: 100 ppm TWA: 35 ppm

ALARM OCCURRENCES: 4

ALARM HISTORY:

22-AUG-97	09:17:27	HIGH
22-AUG-97	09:19:31	HIGH
22-AUG-97	09:21:52	HIGH
22-AUG-97	09:24:28	HIGH

Figure 3a. *Sample Printout*

SESSION (1) HISTOGRAM DATA
Page 2

TIME	PEAK	STEL	TWA	TEMP (C)
08:46	0	0	0	22
08:47	0	0	0	22
08:48	0	0	0	22
08:49	45	1	0	22
08:50	3	1	0	23
08:51	0	1	0	23
08:52	0	1	0	23
08:53	0	1	0	23
08:54	0	1	0	24
08:55	0	1	0	24
08:56	0	1	0	24
08:57	0	1	0	24
08:58	0	1	0	24
08:59	0	1	0	24
09:00	0	1	0	24
09:01	0	1	0	24
09:02	0	1	0	24
09:03	0	1	0	24
09:04	0	0	0	24
09:05	0	0	0	23
09:06	0	0	0	23
09:07	0	0	0	23
09:08	0	0	0	23
09:09	0	0	0	23
09:10	0	0	0	23
09:11	0	0	0	23
09:12	0	0	0	23
09:13	0	0	0	23
09:14	0	0	0	23
09:15	0	0	0	23
09:16	0	0	0	23
09:17	198	10	0	23
09:18	203	23	0	24
09:19	202	31	1	24
09:20	203	43	1	25
09:21	158	51	1	25
09:22	205	62	2	25
09:23	204	72	2	25
09:24	192	83	2	25
09:25	200	89	2	25
09:26	6	89	2	26
09:27	3	89	2	26
09:28	2	89	2	26
09:29	2	89	2	26

Figure 3b. *Sample Printout*

5. ERROR MESSAGES:

ERR1: No sensor installed:
The unit does not recognize a valid sensor and it will chirp at one second intervals as long as the unit remains powered on. Turn the unit off. Check to make sure a Quest sensor module is in place. If there is a sensor in place, try replacing it.

ERR2: Memory error:
The unit's self test detected a problem with the memory. Press the on/off key to continue the unit's startup sequence. Print the unit's data if desired then reset the memory.

ERR3: New sensor installed and/or sensor not calibrated:
This error message acts as a warning message that the sensor has been changed. Press the on/off key to continue the unit's startup sequence. Zero and calibrate the sensor prior to use.

ERR4: Can not zero:
Make sure the environment contains clean air and the measured gas is not present. If the sensor is new, make sure it has been installed under power long enough to stabilize. If the sensor is old, try replacing it.

ERR5: Can not calibrate:
Make sure the calibration gas cylinder is turned on and that it is the correct gas for the sensor being calibrated. Check the concentration of gas in the cylinder and make sure it matches the unit's calibration level setting. If the sensor is new, make sure it has been installed under power long enough to stabilize. If the sensor is old, try replacing it.

FULL: Memory full:
This message may appear during a session run or when putting the unit in the run mode. It indicates that the 60 hours of logging memory is full. When "FULL" appears in the display, press the on/off key to acknowledge the message and stop the alarm's chirp. The unit will continue to operate in a non-datalogging mode. All other measurements, computed values, and alarms will continue to function normally. Reset the memory prior to the next session to avoid this message.

DEAD: Dead battery:
When the battery voltage drops below the usable range, "dEAd" appears in the display, the buzzer activates for approximately 25 seconds, then the unit turns itself off. The 9 volt alkaline battery must be replaced prior to the next use. The on board lithium battery maintains the memory during this process.

6. CHANGING THE BATTERY

Note: While the case is open the unit is not intrinsically safe. Perform this operation in a non-hazardous area.

While the unit is turned off, turn the unit upside down and squeeze the two red slides together and pull out from the unit. Replace the battery with a new 9 volt alkaline battery. A new 9 volt alkaline battery has a life expectancy of over 100 hours. The unit will automatically turn on when the new battery is installed. If the old battery was dead or if the unit has been without power for more than several minutes, then the sensor will require a stabilization period, perhaps as long as 24 hours with some gases. (The unit does not need to be turned on during the stabilization period). After changing the battery, remember to zero and calibrate before entering a hazardous area.

Approximately 8 hours of usage remain from the time the BAT annunciator first appears in the display. As a safety precaution, it is recommended that the battery be replaced as soon the BAT annunciator is first noticed.
If the battery is inadvertently removed while the unit is turned on and in the run mode, the current session is closed and saved in memory. Inserting a new battery and then entering the run mode begins a new session.

The following alkaline batteries are recommended for intrinsically safe use of the SafeLog 100:

Eveready Energizer, No. 522, Alkaline
Eveready Energizer Industrial Alkaline, No. EN22
GP Alkacell, Alkaline, No. 1604A
Kodak Supralife Alkaline
Panasonic Alkaline, Industrial use, No. 6AM6X
Procell (Duracell) Professional Alkaline, No. PC 16094
Radio Shack Energy Plus Alkaline Enercell, No. 23-553
Rayovac Alkaline Maximum, No. A1604
Sanyo Alkaline, No. 6AM69V
Varta Alkaline Extra Longlife, No. 4022, E-Block, 6LR61, 6AM6, MN 1604

7. CHANGING THE SENSOR

Note: While the case is open the unit is not intrinsically safe; perform this exercise in a non-hazardous area. Allow the new sensor to stabilize. Zero and calibrate prior to use.

The entire sensor module is replaced. The old sensor module should be discarded; do not attempt to break the module apart or reuse any parts.

To change the sensor, first remove the battery and its holder. Inside of the battery compartment is a single screw. Turning the screw counter-clock wise pushes up and releases the red top cap of the unit. Lift the sensor module up off of the circuit board and push in the new one. A circular hydrophobic filter sits in the opening on top of the sensor module; make sure the new sensor has a filter in place prior to reinstalling the top cap. Set the top cap back on the unit and turn the screw clockwise until the top cap again seals against the unit's main housing. When the battery is replaced the unit will turn on and read the new sensor information.

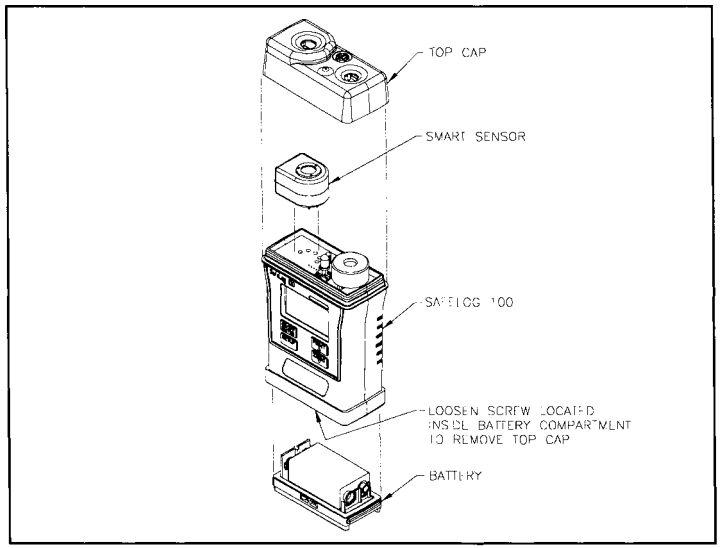

Figure 4. *Changing the Sensor*

8. MAINTENANCE

When the unit is stored or not in use for extended lengths of time, it should be calibrated, functionally tested, and its battery should be checked or changed at least once per month. This will help to ensure that the unit will be working properly when it is needed.

Note: If the unit has been stored without a battery, then it requires a stabilization period, prior to calibration, once the battery has been replaced.

9. FACTORS AFFECTING RESPONSE

9.1 Toxic Gases:

The presence of some gases can affect the sensor reading of the toxic gas for which you are measuring. The chart below shows how each sensor listed in the left column will respond to 100 ppm of the interfering gases listed along the top row.

9.2. Cross Sensitivity Chart:

Sensor	Interfering Gas									
	CO	H_2S	SO_2	NO	NO_2	CL_2	H_2	HCN	C_2H_4	NH_3
CO	100	<10	<5	<10	≈-15	<-5	<40	<15	<50	0
H_2S	<0.5	100	≈20	<2	≈20	-20	<0.5	0	0	0
SO_2	<1	<1	100	0	≈-100	-60	<0.5	<45	2	0
NO	0	≈10	0	100	<25	0	0	0	0	0
NO_2	0	0	<-0.5	0	100	90	0	<1	0	0
CL_2	0	≈-3	<-1	0	120	100	0	0	0	0
HCN	<0.5	n/d	160	-10	-190	-50	0	100	0.5	0
NH_3	0	130	70	20	0	-50	n/d	30	0	100
COu*	100	≈315	≈50	≈30	≈-55	≈-30	<40	40	90	0

* Unfiltered Carbon Monoxide Sensor

10. GAS SPECIFIC DATA

Gas	Range	Reso-lution	Accur-acy*	Drift**	Alarm High***	Alarm STEL***	Alarm TWA***
Carbon Monoxide CO	0-999 ppm	1 ppm	±5%	<2%	200 ppm	100 ppm	35 ppm
Hydrogen Sulfide H_2S	0-500 ppm	1 ppm	±5%	<2%	20 ppm	15 ppm	10 ppm
Chlorine CL_2	0-20 ppm	0.1 ppm	±5%	<2%	1 ppm	1 ppm	0.5 ppm
Hydrogen Cyanide HCN	0-50 ppm	0.1 ppm	±5%	<2%	10 ppm	4.7 ppm	4.7 ppm
Ammonia NH_3	0-50 ppm	1 ppm	±5%	<10%	50 ppm	35 ppm	25 ppm
Sulphur Dioxide SO_2	0-50 ppm	0.1 ppm	±5%	<2%	10 ppm	5 ppm	2 ppm
Nitric Oxide NO	0- 100 pm	0.1ppm	±5%	<2%	50 ppm	25 ppm	25 ppm
Nitrogen Dioxide NO_2	0-50 ppm	0.1 ppm	±5%	<2%	8 ppm	5 ppm	2 ppm

Gas	Range	Reso-lution	Accur-acy*	Drift**	Alarm High***	Alarm LOW***
Oxygen O_2	0-30%	0.1%	±5%	<1%	23.5%	19.5%

* Sensor accuracy, listed by City Technology, as a percentage of the reading.
** Long term output drift listed as percentage of signal loss per month. For Ammonia, an exposure of <25ppm/month is assumed.
*** Factory default settings. Recommended for normal use.

11. SPECIFICATIONS

Size:	4.5" x 3.0" x 1.5" (11.4 cm x 7.6 cm x 3.8 cm)
Weight:	8.8 oz. (250 grams)
Power:	9 volt alkaline battery
Battery Life:	100 Hours.
Sensors:	City Technology Electrochemical Cells (4 series)
Measurement:	Continuous (1 sample/second)
Display:	4 digit backlit LCD
Alarms:	Pulsating audio tone and flashing LED Remote alarm jack
Alarm Thresholds:	High level High level pre-alarm (through QuestSuite™ only) Low level (O2 only) STEL TWA Low battery
Memory:	60 hours at 1 minute intervals
Output:	Jack for data output. Serial and Parallel
Operating Indicator:	Periodic confidence chirp and visual flash every 30 seconds (if enabled)
Temperature Range:	-10 to 45°C (14 to 113°F) operating -15 to 60°C (5 to 140°F) storage
Humidity Range:	0 to 95% R.H., non-continuous, non-condensing 15 to 90% R.H., continuous, non-condensing
Warranty:	Sensors 1 year, electronics 1 year
Cell Life Expectancy:	Ammonia sensor: 1 year in air (or 2ppm years) Other Toxic sensors: 2 years Oxygen sensor: 1 year
Intrinsic Safety:	UL, cUL, CENELEC (DEMKO), Class I,II,III, Division 1, Groups A, B, C, D, E, F, G ANSI/ISA-S12.1 Definition and Information Pertaining to Electrical Instruments in Hazardous (Classified) Location ANSI/ISA-S12.15, Part I, Performance Requirements for Hydrogen Sulfide Detection Instruments
RFI Protection:	ANSI Standard C95.1-1982, Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields 300kHz to 100GHz. Instrument readout will not change by more than 5% of its full-scale reading when placed no less than one foot from a five watt radio transmitting on a frequency of 30, 150 or 450 MHz.

12. ACCESSORIES

12.1 Replacement Sensor Modules:

54-873	Oxygen (O_2)
54-875	Carbon Monoxide (CO)
54-876	Carbon Monoxide unfiltered (COu)
54-874	Hydrogen Sulphide (H_2S)
54-881	Chlorine ($C1_2$)
54-879	Ammonia (NH_3)
54-878	Sulphur Dioxide (SO_2)
54-877	Nitric Oxide (NO)
54-880	Nitrogen Dioxide (NO_2)
54-886	Hydrogen Cyanide (HCN)

12.2 Accessories

54-488	Protective Leather Carrying Case - with Shoulder Strap
54-948	Sample-Draw Adapter with Hand Aspirator and 10 Feet of Hose
54-105	Replacement Hose (per foot)—3/16" I.D. TYGON (Clear)
54-702	Calibration Cup
54-964	Storage Case
54-714	Earphone
54-715	Serial Interface Cable
54-875	Parallel Printer Cable
54-849	Sensor Hotbox

12.3 Calibration Kit

54-974 Two Cylinder Calibration Kit: Includes two cylinder calibration case, regulator (specify which regulator), and tubing

12.4 Regulators:

54-971 0.5 1pm Regulator with 2' (.050 I.D.) tubing 54-972 1.0 1pm Regulator for Chlorine with 2' (.050 I.D.) tubing 54-973 1.0 1pm "Corrosive Gas" Regulator for Ammonia with 2' (.050 I.D.) tubing

12.5 103 Liter Steel Cylinder Calibration Gases:

54-141	100% Nitrogen
54-142	50 PPM Carbon Monoxide in Air
54-143	200 PPM Carbon Monoxide in Air
54-144	50 PPM Carbon Monoxide in Nitrogen

12.6 58 Liter Aluminum Cylinder Calibration Gases:

54-146	25 PPM Hydrogen Sulphide in Air
54-147	10 PPM Chlorine in Nitrogen
54-148	10 PPM Sulphur Dioxide in Air
54-149	25 PPM Nitric Oxide in Nitrogen
54-150	5 PPM Nitrogen Dioxide in Nitrogen
54-152	10 PPM Hydrogen Cyanide in Nitrogen
54-264	10 PPM Ammonia in Air
54-265	25 PPM Ammonia in Air

QUEST SERVICE POLICY

Service Policy

The Quest product you have purchased is one of the finest gas detection instruments available. It is backed by our full one year warranty which seeks complete customer satisfaction. This is your assurance that you can expect prompt courteous service for your equipment from the entire Quest service organization.

Should your Quest equipment need to be returned for repair or recalibration, please contact the Service Department at (800)245-0779 (USA) or Fax (262)567-4047 for a Return Authorization Number. The RA number is valid for 30 days, and must be shown on the shipping label and purchase order/cover letter. If you are unable to return instruments in that time call for a new RA number. Send it prepaid and properly packed in the original shipping carton directly to Quest Technologies, 1060 Corporate Center Drive, Oconomowoc, WI 53066 U.S.A.

Repair or replacement work done under warranty will be performed free of charge, and the instrument will be returned to you prepaid. Your copy or a photocopy of the Quest Registration Card will serve as proof of warranty should the factory require this information.

If for any reason you should find it necessary to contact the factory regarding service or shipping damage, please direct your calls or letters to the attention of the Service Manager, Quest Technologies, (262) 567-9157 or (800) 245-0779. Office hours are from 7 AM to 6 PM (Central Standard Time) Monday through Friday.

For service or recalibration outside the U.S.A., please contact your local Quest Dealer or fax Quest U.S.A. at 1-262-567-4047.

QUEST WARRANTY POLICY

Warranty Policy

Quest Technologies warrants our instruments to be free from defects in materials and workmanship for one year under normal conditions of use and service. For U.S.A. customers we will replace or repair (our option) defective instruments at no charge, excluding batteries, abuse, misuse, alterations, physical damage, or instruments previously repaired by other than Quest Technologies. Microphones, sensors, and printers may have shorter warranty periods. This warranty states our total obligation in place of any other warranties expressed or implied. Our warranty does not include any liability or obligation directly resulting from any defective instrument or product or any associated damages, injuries, or property loss, including loss of use or measurement data.

For warranty outside the U.S.A., a minimum one year warranty applies to the same limitation and exceptions as above with service provided or arranged through the authorized Quest distributor or our Quest European Service Laboratory. Foreign purchasers should contact the local Quest distributor for details.

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