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.

MultiCheck 2000

Gas Monitor

Operator's Manual

QUEST TECHNOLOGIES

Thank you for choosing Quest Technologies to meet your personal gas monitoring needs. The MultiCheck 2000 is a compact, personal multi-gas monitor that simultaneously measures up to four gases from a selection of nine toxic gases, oxygen and combustible gases. 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 MultiCheck 2000. 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.

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P/N 054-481

QUEST TECHNOLOGIES

The worldwide trusted name in
industrial hygiene instruments
for over 25 years

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OPERATIONAL FLOW DIAGRAMS

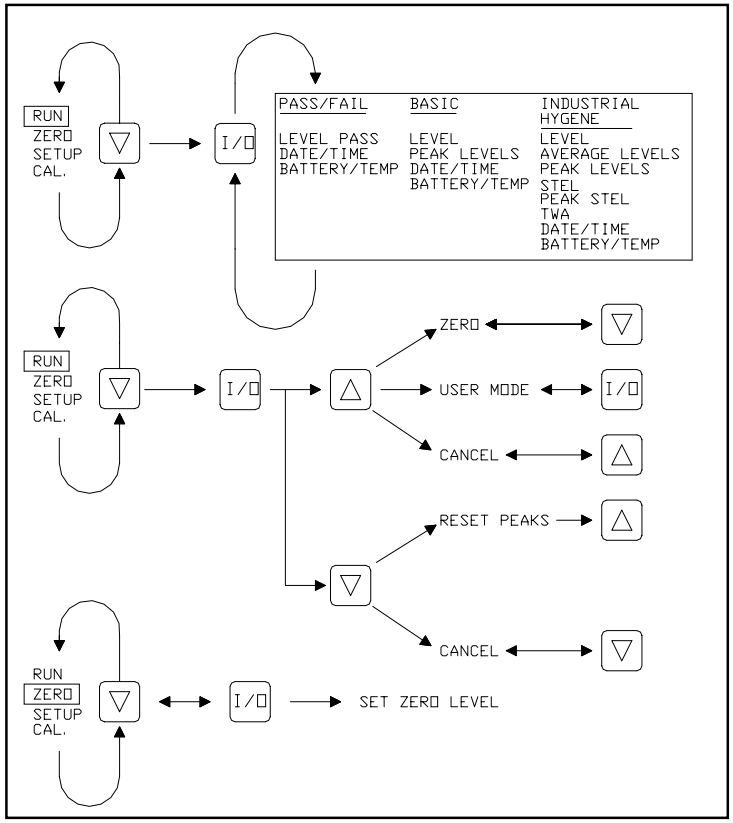


***Figure 1**. Run and Zero Menus*

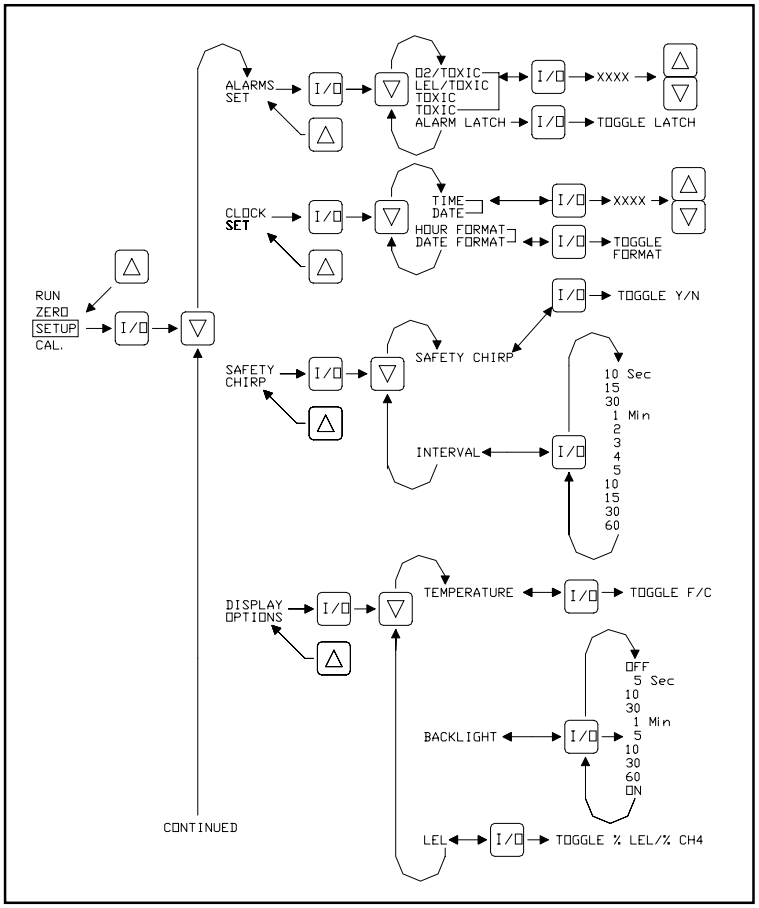


***Figure 2a.** Setup Menu*

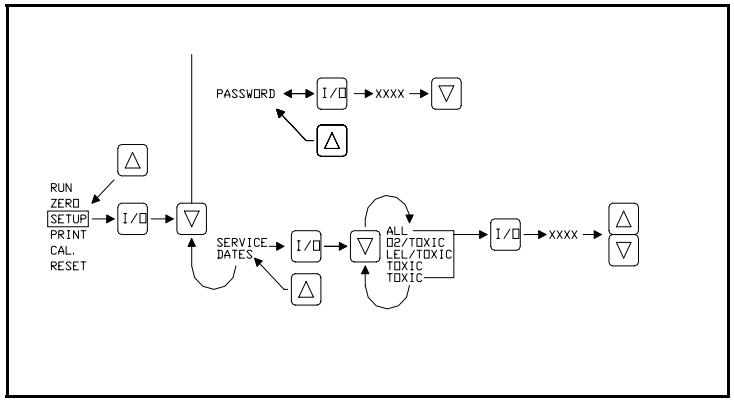


***Figure 2b**. Setup Menu*

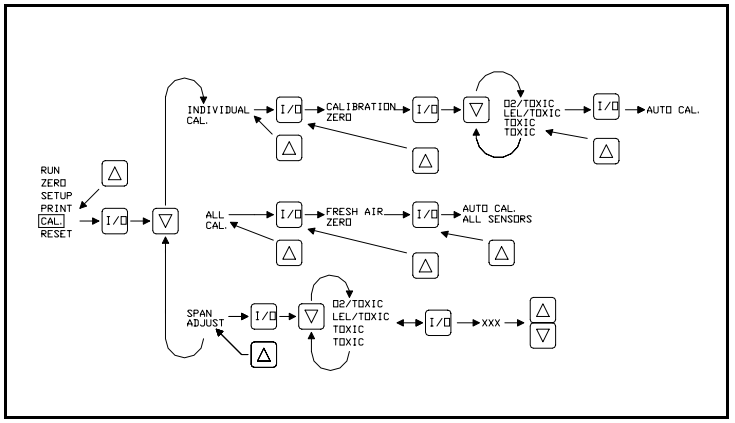


***Figure 3.** Calibration Menu*

1. INTRODUCTION

The MultiCheck 2000 is a compact, personally worn, multi-gas monitor that can simultaneously measure four gases from a selection of toxic gases, oxygen, and combustible gas. (See Section 7 GAS SPECIFIC DATA on page 31 for a complete listing of the gases.) Sturdy, lightweight, and easy to operate, this unit is ideal for industrial use.

Warning: The MultiCheck 2000 is intended to measure gases that are potentially dangerous to human health. To help ensure worker safety through the 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.

Caution: Underwriters Laboratories, Inc. has assessed only the combustible gas portion of this instrument for performance.

Note: When used with alkaline batteries in Canada tested per CSA (Canadian Standards Association) Standard C22 No. 152, Combustible Gas Detection Instruments to be used in Canada only with the following "C" size alkaline batteries:

Eveready:	E93	Duracell:	MN1400
Rayovac:	814	Radio Shack:	23-551

Note: When used with alkaline batteries in Europe to only be used with:

Rayovac:	No.814LR14	Varta:	No. 4041 LR14.C
Duracell:	MN1400 LR14		

2. GENERAL OVERVIEW

2.1 Unit Overview

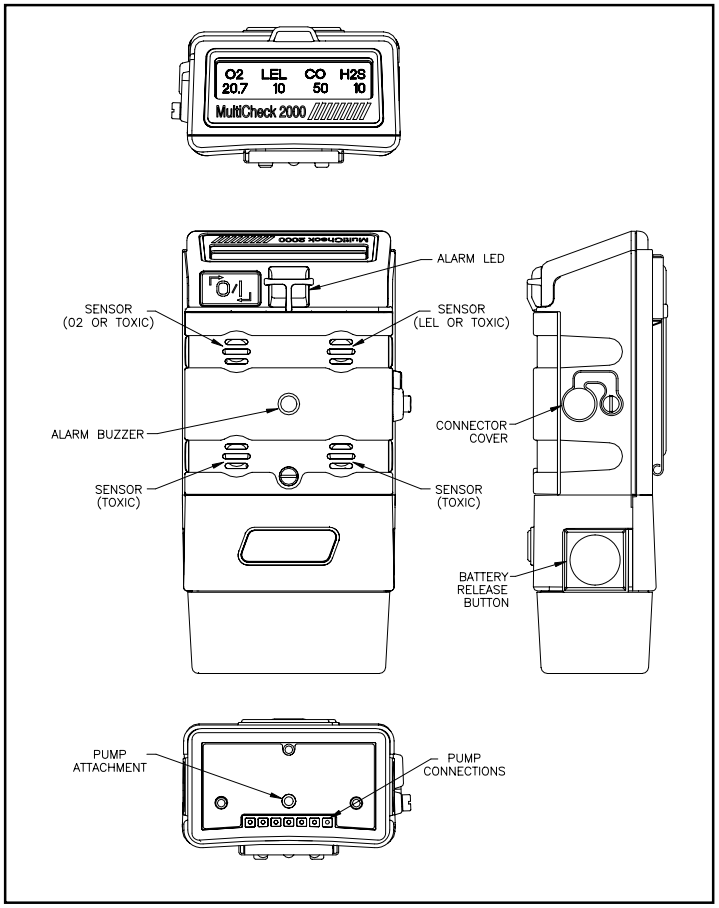


Figure 4. *Unit Overview*

2.2 The Keys

In order to make the operation of the MultiCheck 2000 as simple as possible, you only need to use three keys to perform all of the necessary operations.

This key is found on top of your unit above the display screen. You will use it to turn the unit on, to turn the unit off, and to select your desired menu choices when they are highlighted.

I/O

▼ ▲ These keys are located above the belt clip. You will need to use the arrow keys to change the unit's modes, and during the ZERO, SETUP, and CAL. operations. You generally use the ▲ arrow to return to the previous screen and to adjust numeric values. You generally use the ▼ arrow to scroll through and highlight menu items, and to select and adjust numeric values.

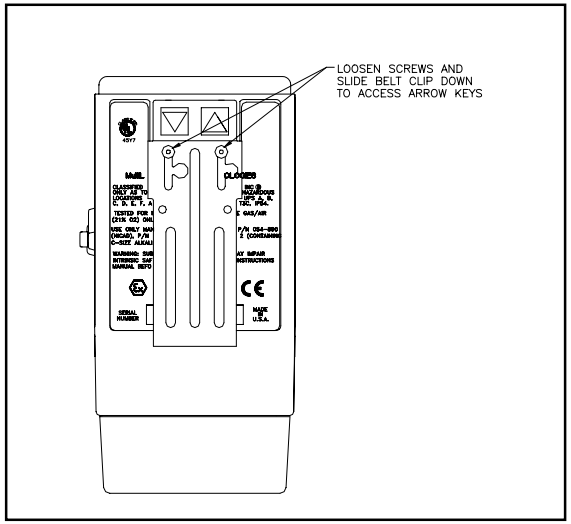


Figure 5. *Accessing the Arrow Keys*

2.3 Backlight

The unit features a backlight that illuminates the screen for a user selectable interval each time a key is pressed. Refer to Section 3.4.3 Setup under Display Options on page 17 to change the backlight illumination interval. The backlight also illuminates for that same interval any time the unit goes into alarm.

2.4 Alarm and Level Definition

All of the following levels and alarm levels are based on the measurement of one sample per second. Refer to Section 3.4.3 Setup under Alarms Set on page 15 to change any of the alarm activation levels.

2.4.1 Oxygen Alarms and Levels

Both oxygen deficient atmospheres and oxygen rich atmospheres present gravely hazardous work conditions.

• Low:The Low alarm level for oxygen is any level less than 19.5%. Oxygen deficiency is the leading cause of worker fatality during confined space entry, therefore the importance of monitoring the oxygen level cannot be overstated.

• High: The High alarm level for oxygen is any level greater than 23.5%. Oxygen rich atmospheres can lower the combustible range of some gases and can cause them to burn violently.

• Average: This is the average (AVG) level of oxygen recorded during a session of use.

2.4.2 Combustible Gas Alarms and Levels

Combustible gas levels can be measured as a percent of the LEL or as a percent by volume of CH4 (methane). Refer to Section 3.4.3 Setup under Display Options on page 18 to change the way that combustible gas levels are measured. Along with the current levels, the PEAK and AVERAGE levels are recorded.

• LEL: LEL stands for Lower Explosive Limit. An atmosphere that contains less than the LEL, the value of which varies among the combustibles is referred to as a lean atmosphere. An atmosphere that exceeds the UEL, or Upper Explosive Limit, the value of which also varies among the combustibles, is referred to as a rich atmosphere. The range between the LEL and the UEL is the combustible (explosive) range.

The default alarm level is set to 10% of the LEL. When this level is reached or exceeded, the unit goes into alarm. If the measured level exceeds 98% of the LEL, the alarm automatically latches on and the unit will remain in alarm until the unit is taken out of the RUN mode. When this occurs, a high probability exists that the gas concentration is above the LEL, in the combustible range, and

overloading the LEL sensor.

• CH4: This is a mode where the unit is set up to measure a specific combustible gas, methane (CH4) in a percent by volume concentration rather than a percent LEL concentration. This is just a different way of reporting the concentration of one specific gas (CH4). When CH4 is at 5.0% by volume, it is also at 100% of it's LEL point.

The default alarm level is set to 0.5% by volume CH4. When this level is reached or exceeded, the unit goes into alarm. If the measured level exceeds 4.9% of CH4, the alarm automatically latches on and the unit will remain in alarm until the unit is taken out of the RUN mode. When this occurs, a high probability exists that the gas concentration is above 5.0% by volume, in the combustible range, and overloading the combustible gas sensor.

ALTHOUGH A RICH ATMOSPHERE MAY NOT PRESENT IMMINENT DANGER OF IGNITING AT THE TIME OF CURRENT MEASUREMENT, ANY DILUTION OF THIS RICH ATMOSPHERE COULD BRING THE CONCENTRATION DOWN INTO THE COMBUSTIBLE RANGE.

• Peak: The highest level of the combustible gas recorded during a single session is the peak level.

• Average: This is the average (AVG) level of combustible gases recorded during a session of use.

2.4.3 Toxic Gas Alarms and Levels

These gases are measured and reported in ppm (parts per million). While each gas has its own particular values for the alarm levels, the method of measurement is the same for all toxic gases.

• TWA: The TWA (Time Weighted Average) is the average toxic gas exposure level over an eight hour period. Your unit calculates TWA by summing the measured values and then dividing this sum by the number of samples measured over an eight hour period (at one sample per second the total would be 28,800). Your unit then compares the TWA to the TWA alarm level.

• TWA Alarm Level: This level is the maximum average concentration of a toxic gas to which an unprotected worker may be exposed over an eight hour period. When a TWA alarm level is reached or exceeded, the unit goes into alarm and the LED light turns on. The display shows the gas causing the alarm and it's TWA level. The TWA alarm can be silenced up to two times for a period of one minute

each before the alarm will turn on and stay on until the RUN mode is exited

STEL: The STEL (Short Term Exposure Limit) is the average toxic gas exposure level over any fifteen minute interval during a work period. Your unit calculates STEL by summing the measured values and then dividing this sum by the number of samples measured over a fifteen minute period (at one sample per second the total would be 900). After the fifteen minute exposure the sum of measured values is updated each minute, using samples from the most recent fifteen minutes.

• STEL Alarm Level: This level is the maximum average concentration of a toxic gas to which an unprotected worker may be exposed over STEL time interval during a work period. When the STEL is reached or exceeded, the unit goes into alarm and the LED light turns on. The display shows the gas causing the alarm and it's STEL level. The STEL alarm can be silenced up to two times for a period of one minute each before the alarm will turn on and stay on until the STEL hazard goes away.

• Peak STEL Level: The peak STEL appears on the printout and on the display.

• HIGH: This level is the highest concentration of a toxic gas to which an unprotected worker should ever be exposed. When this gas level is reached or exceeded, the unit goes into alarm and the gas and its level are displayed on the screen.

• PEAK: This is the highest level of the toxic gas reached during a single session.

• AVERAGE: This is the average level (AVG) of the toxic gas present during a single session.

• LEVEL: This is the current level of the toxic gas.

3. OPERATION

3.1 Turning the Unit ON

Press the I/O key once to turn on the unit. The unit will then go through an internal self test and startup routine. During this startup routine the backlight will illuminate, the LED alarm light will turn on and the audible alarm will sound. Your unit will determine which sensors are installed, show you the last time they were calibrated, what their current alarm levels are, and if any of the sensors are past due their user programmable service dates. Additionally it will let you know the current battery pack voltage, and the current internal unit temperature in either Centigrade or Fahrenheit. This temperature is not necessarily the temperature in the ambient environment around the unit, but the temperature inside the unit near the sensors. This is used to provide temperature compensation for the sensors as the ambient environment changes.

There are a fair number of different screens that the unit can cycle through during power up initialization. For example, if you have all 4 sensors installed there are fifteen different screens that it can go through before getting to the main menu. As a shortcut if you do not wish to see all this information, once you get past the screens showing calibration dates, a single press of the I/O key will bypass the rest of the power up display screens and go directly to the main menu.

After the initialization screens, the main menu automatically appears. The first highlighted item is ZERO if the pump is not attached. At this time you can zero the unit's sensors by simply pressing the I/O key. If the pump is attached RUN is the first highlighted item.

Run	Setup
Zero	Cal.

We recommend that you zero the unit at this time ***provided that you are in a non-hazardous clean-air environment.*** To reduce the chances of the unit being zeroed in a contaminated environment, only small automatic adjustments are allowed in this main menu ZERO function. If the adjustments necessary to zero the sensors are more than the unit will allow, a message will appear indicating which sensor or sensors cannot be zeroed followed by a "Zero Failure" message. In this case, the instrument must be zeroed under the Cal. main menu function. If no main menu selections are made, the unit automatically will go into the RUN mode after 30 seconds if the pump is not attached. If the pump is attached the unit does not automatically go into the RUN mode and will stay in the main menu until placed in the RUN mode by the user.

If you turn the unit ON and there are no sensors in place, the unit will give a message "No Sensors Detected" on power up and will not go into any of the modes that depend on sensors being there (e.g. RUN, ZERO, or CAL).

3.2 Turning the Unit OFF

To turn the unit OFF, the unit must be in the main menu. If in the run mode, exit to the main menu by exiting the RUN mode per page 13, Section 3.4.1. Then press and hold down the I/O key. The screen will display a three second countdown and will beep once per second. When the screen goes blank and the alarm is on steady, you may release the key. The unit is now OFF.

3.3 User Modes

The MultiCheck 2000 has three modes: BASIC, PASS/FAIL, and INDUSTRIAL HYGIENE. They each provide a varying amount of information accessible through the display.

You may change your unit's mode at any time while it is in the RUN mode. To do so, simply press the ▲ arrow key located above the belt clip. The screen provides you with three options. Pressing the I/O key changes the unit to the next user mode. Repeat this process until the unit is set for the desired user mode.

▼=Zero	I/O=User
▲=Cancel	Mode

3.3.1 Basic Mode

In this mode, the screen displays which sensors are installed in your unit. Under each sensor indicator, its current level is displayed in either percentage or ppm (parts per million). When a gas level reaches or exceeds an alarm level, the alarm light will flash, the buzzer will sound, and the display will revert to displaying the reason for the alarm (High, Low, STEL, TWA). The gas that caused the alarm will alternately display the value of the gas and "*AL*".

By pressing the I/O key during this mode, you may scroll through four additional screens. The first two screens display the peak values of the gases being measured. The third screen displays the time and date. The fourth screen displays ambient temperature and the unit's battery voltage.

3.3.2 Pass/Fail Mode

In this mode, the screen displays which gas sensors are installed in your unit. The word PASS is displayed if none of the alarm levels have been exceeded. When a gas level reaches or exceeds an alarm level, the alarm light will flash, the buzzer will sound, and the display will revert to displaying the reason for the alarm (High, Low, STEL, TWA). It also shows a numerical display of the gases in either percentage or ppm (whichever is appropriate) and the gas that caused the alarm will alternately display the value of the gas and "*AL*".

By pressing the I/O key during this mode, you may scroll through two additional screens. The first screen displays the time and date. The second screen displays ambient temperature and the unit's battery voltage.

3.3.3 Industrial Hygiene Mode

In this mode the unit displays information the same way it does in the basic mode with some additions. There are additional screens that display average level, TWA, peak values, STEL, and peak STEL for all installed sensors.

3.4 Main Menu

When you turn on the unit, the main menu appears on the screen after the MultiCheck 2000 completes its power-up sequence. You may return to this menu anytime when in RUN by holding down the I/O key for three seconds. The unit displays a message "Run Stop In x Seconds" with a countdown. After these three seconds, the unit will display a message "Closing Run...". You can release the I/O key and when the session finishes closing, the unit will be in the Main Menu. The item that appears with a blinking cursor on the first character will be referred to as the highlighted item (it is underlined in this manual).

To move through the main menu use the ▼ arrow key located behind the belt clip. When the menu choice you want is highlighted, press the I/O key to select that choice. ZERO is always the first highlighted menu item if the pump is not attached. If the pump is attached RUN is the first highlighted item. IF YOU ARE IN A CLEAN AIR ENVIRONMENT, you may zero the unit at this time by pressing the I/O key. After zeroing, or if a main menu selection is not made, the unit will automatically enter the RUN mode in about 30 seconds if the pump is not attached. If the pump is attached the unit does not automatically go into the RUN mode and will stay in the main menu until placed in the RUN mode by the user.

Run	Setup
Zero	Cal.

3.4.1 Run

Before running, you should zero, calibrate, or at least functional (bump) test your MultiCheck 2000 in a non-hazardous area (an area away from your potentially hazardous work space, free from heavy traffic, excessive cigarette smoke and industrial fumes) before entering the work environment. Do not compromise safety by failing to take these steps prior to use. Enter the RUN mode by selecting RUN from the main menu.

Alternatively, the MultiCheck 2000 will automatically go into the RUN mode in about 30 seconds after zeroing the unit or if a main menu selection is not made within 30 seconds after the unit is turned on if the pump is not attached. If the pump is attached the unit does not automatically go into the RUN mode and must be placed in the RUN mode by the user.

During the RUN mode the LCD screen displays which gas sensors you have installed. During the BASIC and INDUSTRIAL HYGIENE modes, it displays their respective current gas levels in either percentage or ppm.

O2	LEL	H2S	CO
20.9	0	0	0

(Refer to the section 3.3 User Modes on page 12 for information on what is displayed for the different modes: PASS/FAIL, BASIC, and INDUSTRIAL HYGIENE.)

Pressing the I/O key once during the RUN mode will turn on the backlight for the user selected interval. Pressing it again will begin to step through the various screens according to the current USER MODE.

Pressing the ▲ arrow key during the RUN mode allows you to zero the unit or change the user mode. Press the ▼arrow key to zero the unit. Press the I/O key to change the user mode. Press the ▲ arrow key to cancel and make no changes. This zero function works the same as the one in the main menu and only allows small automatic adjustments to be made in case the zero is being attempted in a contaminated environment.

▼=Zero	I/O=User
▲=Cancel	Mode

Pressing the ▼ arrow key during the RUN mode brings up a menu that allows you to reset the peak gas levels currently held in the unit's display memory. This resets the displayed values back to 0 or 20.9% in the case of oxygen. Press the I/O key to reset the peaks and the ▼ arrow to cancel and make no changes.

I/O = Peak Reset
▼= Cancel

Exit the RUN mode by holding down the I/O key for three seconds. The unit displays a message "Run Stop In x Seconds" with a countdown. After these three seconds, the unit will display a message "Closing Run...". You can release the I/O key and when the session finishes closing, the unit will be in the Main Menu.

3.4.2 Zero

Perform this operation in a non-hazardous area prior to every use to adjust for the sensors' sensitivity changes, which occur over time and after use.

Fresh, uncontaminated air is necessary for the proper outcome of this procedure. (Zero the unit away from heavy traffic, excessive cigarette smoke, and industrial fumes.) If such an atmosphere is difficult to reach, zero air cylinders are available.

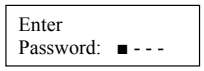
Once you have turned on the unit, ZERO is automatically highlighted if the pump is not attached when the screen displays the main menu. At this time you can zero the unit's sensors by simply pressing the I/O key. We recommend that you zero the unit at this time PROVIDED THAT YOU ARE IN A NONHAZARDOUS CLEAN-AIR ENVIRONMENT. To reduce the chances of the unit being zeroed in a contaminated environment only small automatic adjustments are allowed in this main menu ZERO function. If the adjustments necessary to zero the sensors are more than the unit will allow, a message will appear indicating which sensor or sensors followed by a "Zero Failure" message.

In this case, the instrument must be zeroed under the CAL. main menu function. If a "Zero Failure" message appears for any sensor, the ZERO procedure is aborted and any key pressed will return to the main menu. Unless any menu selections are made following completion of the ZERO function, the unit automatically goes into the RUN mode after 30 seconds if the pump is not attached. Once in the RUN mode, the unit can be zeroed by pressing the ▲ arrow key to pull up the RUN ZERO menu and the ▼ arrow to zero the unit. Remember, however, that the same small adjustment range is also present in RUN ZERO. When zeroing, the screen will display "Zeroing Unit" and then "Unit Zeroed". This indicates that each sensor has been zeroed to the background atmosphere. When the oxygen sensor has been zeroed in a clean air environment, it has also been effectively calibrated since fresh air contains 20.9 % oxygen.

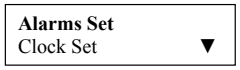
3.4.3 Setup

After turning the unit on, move through the main menu using the ▼ arrow key until SETUP is highlighted. Press I/O, and the screen will ask you to enter a four digit numeric password. For first time users or for users who have forgotten their password, a default password was created. This four digit default password is 9157.

The blinking cursor appears in place of the first digit. Press the ▼ arrow key to scroll through the numbers from 9 down to 0. Once you have reached the number you want, press I/O, and the blinking cursor will appear in place of the next digit. Repeat this process until the entire 4 digit password appears on the screen. Then, when you press the I/O key, you will have successfully accessed the SETUP menu.



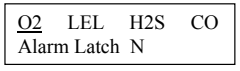
The following items, will be found in the SETUP menu: Alarms Set, Clock Set, Safety Chirp, Display Options, Password, and Service Dates. Press the ▼ arrow key to cycle through them. Press the I/O key to select the highlighted item.



As you are moving through most of the setup sub-menus, pressing the up arrow key will return you to the previous menu.

• **Alarms Set:**

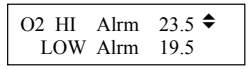
There are alarm activation levels for each of the sensors. While you may alter any of the alarm activation levels, we recommend that you use the default values which have been programmed into the unit. These values are listed under Section 7. GAS SPECIFIC DATA on page 31.



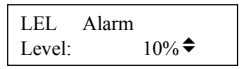
Within the Setup menu, access ALARMS SET by pressing the I/O key when ALARMS SET is highlighted.

To change the alarm activation levels, first highlight a sensor using the ▼ arrow key and then select it by pressing the I/O key.

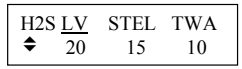
For the OXYGEN sensor, both HI and LOW alarm activation levels can be set.



For the combustible gas sensor (either LEL or CH4), the HIGH LEVEL alarm activation level can be set.

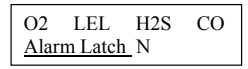


For the TOXIC sensors, LV (level), STEL, and TWA alarm activation levels can be set. Use the ▼ arrow key to highlight the parameter you want to change and then press the I/O key.



Use the arrow keys to change the alarm activation level and then press the I/O key to accept it. To return to the previous menu, press the ▲ arrow key.

When Alarm Latch is highlighted, pressing the I/O key will change between Y (yes) and N (no). This allows you to select whether the alarm will turn off as soon as the hazard goes away (N) or whether the alarm will latch (Y) until you acknowledge it by pressing the I/O key. Once your selection is made, press the ▲ arrow key to return to the SETUP menu or the ▼ arrow key to change any of the sensor's alarm activation levels.



• **Clock Set:**

In this menu, you can set the current date and time into the real-time clock. Access CLOCK SET by moving through the SETUP menu until CLOCK SET is highlighted. Press the I/O key to gain access to the CLOCK SET menu. Options include: changing the time format to either 12-hour or 24-hour, changing the time, changing the date format to either month-day or day-month, and changing the date. Use the ▼ arrow key to highlight the item you want to change.

. Highlight TIME and then press the I/O key to change it. Use the ▲ or ▼ arrow key to change each digit to the correct value. Press the I/O key to accept that digit and move on to the next one. Although displayed, the seconds may not be set. After the minutes are set, AM or PM is highlighted if the unit is in the 12-Hour mode. Press the ▲ or ▼ arrow key to change it and the I/O key to accept it.

Once the AM / PM is set, or the minutes set if in the 24-Hour mode, TIME is highlighted and the new value is placed into memory. Press the ▲ arrow key to

return to the SETUP menu or press the ▼ arrow key to select another item to change.

DATE is changed in the same manner as TIME. In both cases, while changing the digits you may not abort the procedure without entering each digit.

12-Hour	Mo.-Day
Time	11 : 49 : 00AM

The 12-HOUR / 24-HOUR and MO.-DAY / DAY-MO. options are changed by using the ▼ arrow key to highlight them and then the I/O key to change them. Press the ▲ arrow key to return to the SETUP menu.

• **Safety Chirp:**
The SAFETY CHIRP feature, when enabled, provides an audio beep at the selected interval in the RUN mode to inform the user that their unit is turned on and is currently running.

Use the ▼ arrow key to move through the setup menu until you reach SAFETY CHIRP. Press the I/O key to access the safety chirp menu. In this menu you have the options of enabling or disabling the safety chirp and selecting a time interval.

To select whether or not the safety chirp feature is turned on, press the I/O key while SAFETY CHIRP is highlighted. The letter on the right will change between Y (YES) and N (NO).

To change the INTERVAL, press the ▼ arrow key to highlight INTERVAL.

Safety Chirp	Y
Interval	30 SEC

Then press the I/O key. Interval selections are: 10, 15, and 30 seconds, 1, 2, 3, 4, 5, 10, 15, 30, and 60 minutes. To change the INTERVAL, press the I/O key while INTERVAL is highlighted. Each press of the I/O key will increment through the list of chirp intervals. To return to the main setup menu, press the ▲ arrow key.

• **Display Options:**
This menu allows you to select either Centigrade or Fahrenheit for the temperature display. It allows you to select whether or not you wish to use the backlight option and how long you want the backlight on for a key press. It also allows you to select whether to display the combustible sensor (if present) as % LEL or % CH4 (methane) by volume.

Select DISPLAY OPTIONS from the SETUP menu. Use the ▼ arrow key to select TEMPERATURE, BK_LIGHT, or LEL. With TEMPERATURE highlighted, pressing I/O will change between F (Fahrenheit) and C (Centigrade). With

Temperature	F
Bk_Light	ON

BK_LIGHT highlighted, pressing I/O will cycle through the selections: OFF, 5, 10, and 30 seconds, 1, 5, 10, 30, and 60 minutes, and ON (always on).

The backlight option will illuminate the screen for the user selected interval each time a key is pressed during the RUN mode and the MAIN menu, when turning the unit on and off, and when the unit goes into alarm. The backlight is useful in low-light areas but will not be noticed in bright areas.

The last option in the DISPLAY OPTIONS menu is LEL. This allows you to select the way that the gas reading from the LEL (Combustible) sensor will be displayed. With LEL highlighted, pressing I/O will change between % of LEL or % of CH4 by volume. As % of LEL it will display as a percentage of the Lower Explosive Limit from 0 to 100%. As % of CH4 it will display as a percentage of the volume of CH4 (methane) that is present in the environment from 0.0 to 5.0%. Note: 5.0% by volume of CH4 is also 100% LEL for CH4. Press the ▲ arrow key to return to the setup menu.

Bk_Light	ON
LEL = %	of CH4

• **Password:**
This menu item allows you to set or change your unit's password. The password is necessary to enter the setup mode and change any of the unit's setup parameters.

Use the ▼ arrow key to move through the setup menu until PASSWORD is highlighted, then press I/O. Enter the new password using the ▼ arrow key to change the digits and the I/O key to set them. After the last digit is entered, you will be asked to reenter the same password as a check. If they match, the display will show PASSWORD ACCEPTED and then return to the setup menu. If the reentered password does not match the initial one, you will be asked to begin again. Pressing the ▲ arrow key at any time will return to the main setup menu.

Enter New
Password: # - - -

• **Service Dates:**
This item in the main setup menu allows you to set up service due dates for the installed sensors. Whenever a unit is turned on after this date has passed, a "Service Req." message appears along with which sensors need service. Pressing the I/O key acknowledges this and permits normal operations. This message will continue to appear each time the unit is turned on until a new service due date is assigned. They can be set up individually for each sensor or set the same (select ALL) for all the sensors installed. And since this information is stored in each sensor's internal memory, this information will travel with the sensor if it is removed and installed in another unit.

Use the ▼ arrow key to move through the setup menu until SERVICE DATES is highlighted, then press the I/O key. Highlight ALL, then press the I/O key to set the same service date for all sensors. Or, highlight an individual sensor, then press the I/O key to set an individual sensor service date.

Select ALL
O2 LEL CO H2S

DATE is then highlighted for you to review the SERVICE DATE. Press the I/O key to then change the date. SERVICE DATE is changed in the same manner as DATE in CLOCK SET. While changing the digits you may not abort the procedure without entering each digit with the I/O key. After setting a date, press the ▲ arrow to return to the previous menu.

Set O2 : Mo.-Day
Date : 03-14-1997

3.4.4 Calibration

This should be done for each installed sensor prior to entering your work area. An uncalibrated unit can be as dangerous as no unit at all. Failure to calibrate can result in inaccurate sensor readings.

From the main menu, press the I/O key while CAL. is highlighted. The following items, will be found in the CAL. menu: INDIVIDUAL CAL, ALL CAL, SPAN ADJUST and MANUAL CAL. Press the ▼arrow key to cycle through them. Press the I/O key to select the highlighted item.

Individual Cal
All Cal ▼

• **Individual Cal:** The unit first waits to do a CALIBRATION ZERO. This is automatically done before any calibration to adjust for drift in the sensor's sensitivity that occurs over time and after use.

Calibration Zero
Ready? ■

Note: Fresh uncontaminated air is necessary for the proper outcome of this procedure. (Zero the unit away from heavy traffic, excessive cigarette smoke, and industrial fumes.) If such an atmosphere is difficult to reach, zero air cylinders are available.

Press the I/O key when you are sure that you are in a clean air environment. The unit goes through and automatically zeros all the installed sensors.

The installed sensor list now appears in the top line of the display. The second line gives you the date of the last calibration for the highlighted sensor. Use the ▼ arrow key to

O2 LEL SO2 H2S
CAL: 01-JAN-97

scroll through the sensors. Press I/O to access the highlighted gas calibration menu. At this point the unit takes over and runs the calibration. On the display, the unit asks you to apply the concentration of calibration gas that was specified in Span Adjust (page. 22). The second line displays the message "Waiting....." along with the current concentration.

Apply SO2 @ 25.0
Waiting 0

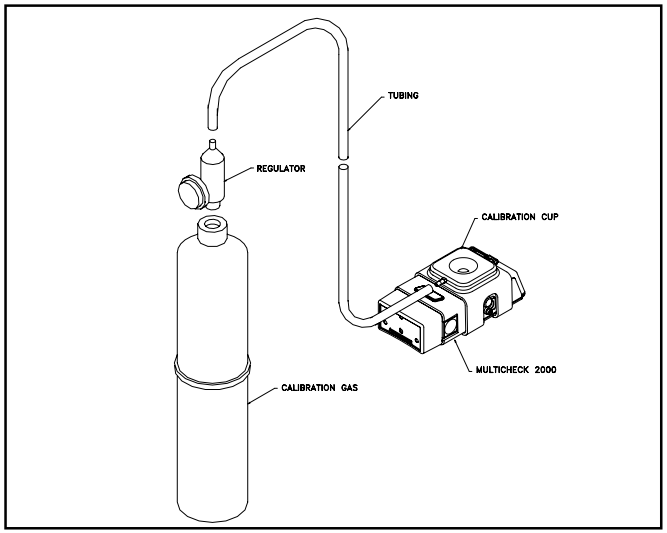


Figure 6. *Calibration*

Place the calibration cup over the unit's sensors on the MultiCheck 2000. Screw the regulator onto the calibration gas cylinder. Refer to the Minimum Flow Rate Table on page 21 to be sure you are using the proper regulator and flow rate for your particular sensors.

Connect tubing between the regulator on the gas cylinder and the calibration cup on the MultiCheck 2000.

Open the regulator as far as it will turn and gas should begin flowing over the sensors. Once the level of gas begins to rise, the second line of the display will change to "Detected" and the number next to it will begin to rise. Once the rise in the gas level starts to slow down and reach a stable level, the unit displays the message "Stabilizing". When the unit determines that the gas level has stabilized

and no longer rising, the unit will do a calibration. It will display a message "Calibrating" and if successful "Calibrated". If calibration is not successful, the unit will indicate "Cal Failure". Check your calibration setup and calibration gas and then attempt another calibration. If the unit still cannot calibrate, either replace the sensor or have the unit serviced.

During the calibration procedure it also shows you the level of gas that the sensor is detecting. At anytime during the calibration procedure, calibration can be terminated by depressing any key. At the conclusion of a successful calibration for a gas, depress the I/O key or the ▲ arrow key to return to the sensor list screen.

Repeat the procedure, as necessary, for any other gases being measured.
To return to the main CAL. menu, press the ▲ arrow key.

• **Minimum Flow Rate Table & Gas Flow Time 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	300 - 400	54-971/54-972
Hydrogen Sulfide	300 - 400	54-971/54-972
Sulphur Dioxide	400	54-971/54-972
Nitric Oxide	300 - 400	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
Ethylene Oxide	1000	54-972

• **All Cal:**
This operates the same as INDIVIDUAL CAL except that it steps automatically through all of the installed sensors to calibrate all of them. The unit first waits to do a CALIBRATION ZERO. This is automatically done before any calibration to adjust for drift in each sensors' sensitivity which occurs over time and after use.

```
Calibration   Zero
Ready?  ■
```

NOTE: Fresh uncontaminated air is necessary for the proper outcome of this procedure. (Zero the unit away from heavy traffic, excessive cigarette smoke, and industrial fumes.) If such an atmosphere is difficult to reach, zero air cylinders are available.

Press the I/O key when you are sure that you are in a clean air environment. The unit goes through and automatically zeros all the installed sensors. It now instructs you to apply the gas to the unit. Apply the calibration gas for sensor #1 in the unit and press the I/O key. It is very important at this point that if sensor #1 is an O2 sensor (typical) and the calibration level used is something other than 20.9% that you apply the calibration gas before pressing the I/O key. Not adhering to this procedure in this case will result in an incorrect calibration for O2.

```
Apply  Gas . . .
Enter to Cal.
```

At this point the unit takes over and runs the calibration. It asks that you apply gas for the first sensor it finds. On the display, the unit asks you to apply the concentration of calibration gas that was specified in SPAN ADJUST, showing the expected value and displaying the message "Waiting". From here on, it operates just like INDIVIDUAL CAL and steps through each gas in turn asking you to apply each gases' cal. level until it is done or you abort the process.

• **Span Adjust:**
This menu allows you to set the concentration of the calibration gas used to calibrate each of the sensors. The unit then uses the concentrations entered here during either of the calibration options. When Span Adjust is selected from the main CAL. menu, the installed sensor list appears in the top line of the display. The first sensor installed is highlighted and it's calibration concentration appears. Using the ▼ arrow key to move across the top line will step through and show the calibration concentration for all installed sensors.

```
 O2   LEL   SO2   H2S
20.9
```

To change a calibration concentration use the ▼ arrow key to select a sensor and press the I/O key. Use the arrow keys to change the calibration concentration and the I/O key to accept it.

```
O2                Span : 20.9
Use ⬍              to change
```

4. QuestSensor INFORMATION

The MultiCheck 2000 has the capacity for up to four QuestSensors. Each one of these sensors is an intelligent sensor and contains information pertinent to it's operation. Information relating to alarm setpoints, calibration, and sensor service dates are some of the items stored in the sensor. You may install less than four sensors, and your unit will still perform all of the necessary functions for the gases you need to monitor.

The unit can simultaneously handle the following QuestSensor combinations:

1. Up to four toxic sensors.
2. Up to three toxic sensors, with either a combustible sensor, or an oxygen sensor.
3. Up to two toxic sensors, a combustible sensor, and an oxygen sensor.

The oxygen sensor and the combustible sensor each have their own particular sockets into which only they will fit. All of the toxic gas sensors are interchangeable in any of the four sockets, with the exception of the chlorine sensor which must be placed in sensor socket #4 for proper calibration. The unit will display a warning message during power-up if the chlorine sensor is in a different socket.

Note: If using less than four sensors in the MultiCheck 2000 a dummy sensor (54-899) must be placed in any empty sensor position to maintain the unit to environment sealing capability.

4.1 Changing or Installing the QuestSensors

Note: Turn the unit off before performing this operation. Install the sensors in a non-hazardous area. When you change the sensors, remember to calibrate them after a warmup period of several hours, which allows them to stabilize.

Using a screwdriver, loosen the 1/4 turn fastener which secures the unit's sensor cover.

The oxygen sensor only fits in the position labeled Sensor 1. Line up the pins with the socket and press it in.

The combustible sensor only fits in the position labeled Sensor 2. Line up the pins with the socket and press it in.

Note: A few toxic QuestSensors, when ordered separately, will come with a "Shorting Spring" connecting two of the pins. It's purpose is to minimize the warmup period of the sensor. The "Shorting Spring" must be removed before pressing the sensor into the socket.

The toxic gas sensors will fit in any of the four sockets. Select the gas sensors which you desire, match their pins with the sockets, and gently but firmly press them in one at time.

Note: The chlorine sensor must be placed in sensor socket #4 for proper calibration.

Once the sensors are in place, replace the cover and tighten the quarter turn fastener to secure the cover.

4.2 Storing the Sensors

To have your sensors ready for use at all times and avoid lengthy warmup periods, it is recommended that the sensors remain biased under power. This is accomplished by leaving the sensors in the unit with strong batteries or by storing them in a Sensor Hotbox (Quest #54-849). Refer to Section 12 for information on the Hotbox.

5. Battery INFORMATION

5.1 Replacing or Installing the Batteries

Turn the unit off before performing this operation. Please dispose of old batteries in an appropriate manner.

Three different removable battery packs are available for your MultiCheck 2000. Sealed packs containing rechargeable NiCAD (Nickel Cadmium) or NiMH (Nickel Metal Hydride) batteries are available as well as a pack which will hold two disposable "C-size" alkaline batteries. These battery packs, which are labeled as to which type they are, are interchangeable and the packs can be removed from the unit and replaced while in a hazardous environment.

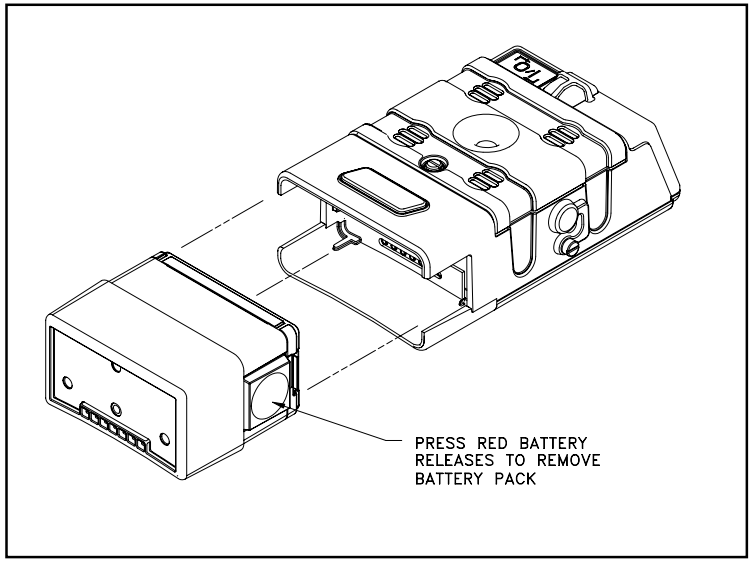


Figure 7. *Battery Replacement*

Caution: Only fully assembled alkaline packs may be removed or replaced in a hazardous environment. Alkaline packs may not be opened for battery replacement in a hazardous environment. In addition, any attempt to use rechargeable batteries in the alkaline battery pack will void any intrinsic safety approvals, and substantially reduce unit run-time.

Caution: Any time the battery pack is removed and then replaced, your unit is designed to turn itself on. This is to insure that, in the case of an accidental power interruption, the unit comes back on to safeguard worker protection. Therefore, any time that the battery pack is removed and then replaced, it is necessary to manually turn off the unit unless you are going to immediately use the instrument.

The unit should be turned off before changing a battery pack. The pack is held in firmly by two spring clips located on either side of the battery. To remove the pack, depress the two spring clips and pull the pack away from the main housing. To replace the battery pack, position the pack such that contacts on the pack are in line with the pins in the housing and gently push the main housing and pack together until both spring clips lock in place. The pack is keyed so it only goes in one way.

5.2 Low Battery Warnings

When the battery voltage is reduced to approximately 2.2 volts, the alarm will sound and the display will indicate "**LOW BATTERY** ALARM". At this point the battery alarm can be silenced up to two times for a period of one minute each before the alarm will turn on and stay on until the unit is shut off. When low battery is indicated, you need to shut the unit off and replace or recharge the battery pack.

If operation of the unit is continued until the battery voltage gets down to 2.1 volts, the alarm will sound and the display will indicate "DEAD BATTERY SHUTDOWN". At this point the alarm cannot be silenced and it will stop monitoring the environment. When this occurs you need to turn the unit off and replace the battery pack. If this is not done, after approximately thirty seconds the unit will turn itself off. This extra protection feature is included to provide an orderly shutdown of the program that controls the unit and ensure that essential values are saved in the unit's memory.

5.3 Recharging NiCAD and NiMH Battery Packs

We provide a charging station for the reconditioning of these battery packs. The battery packs may be charged with the Quest MultiCharger II either as part of the unit or may be removed from the unit for separate recharging.

Caution: The MultiCharger II is not approved for operation in a hazardous environment, so any attempt to charge a unit and/or a rechargeable battery in a hazardous environment is specifically cautioned against. In fact, if the unit is operated while connected to the charger in a hazardous location, all intrinsic safety approvals are voided.

The MultiCharger II is designed to fully recharge a battery pack in less than 2 hours. When the pack is fully charged, the charger switches to a trickle charge to maintain the charge on the pack and to avoid damage to the pack by overcharging. In addition, there is a discharge button that can be used with the NiCAD battery pack to fully discharge the pack before charging to counteract the affect of "battery memory" that

is a problem inherent to NiCAD batteries. As a guide, using this feature would discharge a fully charged NiCAD pack in about six hours. With NiCAD packs it is recommended that you do a discharge before charge cycle about every 10th charge cycle. This helps to lengthen the life of a NiCAD pack especially if the pack is only partially discharged on a regular basis. There is no requirement to do the conditioning discharge/charge cycle on the NiMH battery pack, as this type of battery does not suffer from memory effects.

Note: Rechargeable MultiCheck 2000 battery packs may only be charged with the Quest MultiCharger II battery charger. Use of other charger's could result in damage to either the unit or the battery pack. Likewise, attempting to charge other battery packs with a Quest MultiCharger II could result in damage to the charger.

5.4 Servicing Alkaline Battery Packs

The alkaline pack is designed to hold two "C Size" alkaline batteries. Three captive Phillips head screws hold in the cover on the pack. Loosening the screws, depressing the two red battery pack clips and gently removing the cover opens the pack. Make sure to observe the polarity markings in the battery pack to insure that the batteries are inserted correctly.

Caution: Only fully assembled alkaline packs may be removed or replaced in a hazardous environment. Alkaline packs may not be opened for battery replacement in a hazardous environment. In addition, any attempt to use rechargeable batteries in the alkaline battery pack will void any intrinsic safety approvals and substantially reduce unit run-time.

5.5 Unit Storage With and Without Batteries

Storage of the unit with or without batteries only becomes an issue when there are toxic sensors in the unit. For short-term storage, it is recommended that you leave the batteries in your unit. This keeps the toxic sensors in a ready-to-run mode without any warm up period. In a turned off unit, a fully charged rechargeable battery pack will last approximately 80 days while an alkaline pack will last approximately 140 days.

For long-term storage, to keep the toxic sensors in a ready-to-run mode, keep a battery pack on the unit. Periodically replace the batteries if using the alkaline pack or recharge them if using rechargeable packs. An alternative method to keep the toxic sensors in a ready-to-run mode is to keep them in a Quest Sensor Hotbox. By using the Sensor Hotbox, you no longer need to leave the battery pack in your unit. Refer to Section 12 for information on the Hotbox.

Note: It is recommended to keep a battery pack attached whenever possible to maximize the life of the internal lithium backup battery. The back-up battery is not user replaceable.

6. FACTORS AFFECTING RESPONSE

6.1 Toxic Gas Cross Sensitivity Table

It is very important for you to know that the presence of other gases can affect the sensor readings of the toxic gases 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.

Sensor	Interfering Gas										
	CO	H_2S	CO_2	SO_2	NO	NO_2	CL_2	H_2	HCN	C_2H_4	NH_3
CO	100	<10	0	<5	<10	~-15	<-5	<40	<15	<50	0
H_2S	<0.5	100	0	~20	<2	~20	-20	<0.5	0	0	0
SO_2	<1	<1	n/d	100	0	~-100	-60	<0.5	<45	2	0
NO	0	~10	n/d	0	100	<25	0	0	0	0	0
NO_2	0	0	n/d	<-0.5	0	100	90	0	<1	0	0
CL_2	0	~-3	n/d	<-1	0	120	100	0	0	0	0
HCN	<0.5	n/d	n/d	160	-10	-190	-50	0	100	0.5	0
NH_3	0	130	n/d	70	20	0	-50	n/d	30	0	100
COu*	100	~315	n/d	~50	~30	~-55	~-30	<40	40	90	0
ETO	36	205	n/d	36	76	9	n/d	1	n/d	80	0

* - Unfiltered Carbon Monoxide Sensor

6.2 Combustible Gas

The performance of the combustible gas sensor requires sufficient oxygen levels (at least 10%) to function properly. When monitoring combustible gases, always simultaneously monitor for oxygen, particularly in any application where a lean oxygen atmosphere could be present, as in a confined space.

6.2.1 Rich Atmospheres

In a rich atmosphere, the combustible gas concentration is greater than the Upper Explosive Limit. Several dangers exist in an atmosphere rich in combustible gas. The introduction of fresh air, or simply the introduction of some method of air circulation, could dilute the concentration enough to bring it down into the combustible range. In addition, as the volume of combustible gas rises, its natural cooling effect, which varies from one gas to the next, reduces the temperature of the sensor filament and a lower reading is usually the result.

6.2.2 Oxygen Dependence
The presence of oxygen in the sampled atmosphere is necessary for the proper measurement of the combustibles. If sufficient oxygen is not present, the measurement of combustible gases could be thrown off so drastically that hazardous levels could be present and they would not be detected.

6.2.3 Pocketing
Lean mixtures may collect or be trapped in an area of the confined space such as corners, support beams or equipment and become flammable, therefore it is critical to test all areas and levels of a confined space for the presence of combustible gases.

6.2.4 Combustible (%LEL) Relative Sensitivity Table
The following table shows the sensitivity of the LEL sensor to a number of other combustible gases. The values listed are relative to a calibration for 100% LEL for Methane.

Combustible Gas (LEL)	Relative Sensitivity	Combustible Gas (LEL)	Relative Sensitivity
Methane	100	Acetone	45
Propane	53	Methyl Ethyl Ketone	38
n – Butane	49	Toluene	40
n – Pentane	45	Ethyl Acetate	39
n – Hexane	43	Hydrogen	81
n – Heptane	37	Ammonia	126
n – Octane	35	Cyclohexane	40
Methanol	69	Carbon Monoxide	80
Ethanol	59	iso – Propyl Alcohol	39

6.3 Oxygen

The oxygen sensor can underestimate the amount of oxygen present if water vapor in the area has a higher temperature than the ambient temperature. To adjust for this situation, use the QTP-2000 Sample-Draw Pump to cool the air being drawn to the sensor, allowing the water vapor to condense and permitting sampling at a relatively constant temperature and humidity.

7. GAS SPECIFIC DATA

Note: Underwriters Laboratories, Inc. has assessed only the combustible gas portion of this instrument for performance.

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	0.5 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 ppm	0.5 ppm	±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
Ethylene Oxide ETO	0-20 ppm	0.1 ppm	±5%	<2%	5 ppm	5 ppm	1 ppm

Gas	Range	Reso-lution	Accur-acy	Drift **	Alarm High***	Alarm LOW***	
Oxygen O_2	0-21% ****	0.1%	±5%	<1%	23.5%	19.5%	

Gas	Range	Reso-lution	Accur-acy	Drift **	Alarm High***		
Combustibles (LEL)	0-100%	1%	±5%	±5%	10%		
Methane CH_4 (VOL)	0-5%	0.1%	±5%	±5%	0.5%		

* 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
For the LEL sensor, refers to long term zero drift based on Methane
*** Factory default settings. Recommended for normal use.

8. SPECIFICATIONS

Size:	6.9” x 3.4” x 2.0” (17.5 cm x 8.6 cm x 5.1 cm)
Weight:	22 ounces (0.6 kg)
Power:	Nickel Cadmium Battery Pack - Rechargeable Nickel Metal Hydride Battery Pack - Rechargeable Alkaline Battery Pack - 2 “C” Cells (User Replaceable)
Battery Life:	10 hours/charge with the NiCad or NiMH battery pack. 16 hours with alkaline battery pack.
Sensors:	Combustible gases/methane (catalytic diffusion type), oxygen & toxic gas sensors (City Technology Electrochemical Cells)
Sensor Configurations:	Oxygen and combustible, and up to two toxic gases, or Oxygen or combustible, and up to three toxic gases, or up to four toxic sensors
Measurement:	Continuous (one sample/second)
Display:	Two line alphanumeric backlighted LCD
Alarms:	Pulsating audio tone and flashing visual
Alarm Thresholds:	High level, Low level (O2 only), STEL, TWA, Low battery
Operating Indicator:	Safety chirp (user may select interval)
Temperature Range:	-10 to 40°C (14 to 104°F) operating -15 to 60°C (5 to 140°F) storage
Humidity Range:	0 to 99% relative humidity, non-continuous, non-condensing 15 to 90% relative humidity, 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: 2 year Combustible gas sensor: unlimited

9. ACCESSORIES

9.1 Replacement QuestSensors

54-872	Combustible Gas (LEL)
54-873	Oxygen (O2)
54-875	Carbon Monoxide (CO) (Filtered)
54-874	Hydrogen Sulphide (H2S)
54-878	Sulphur Dioxide (SO2)
54-881	Chlorine (Cl2)
54-879	Ammonia (NH3)
54-877	Nitric Oxide (NO)
54-880	Nitrogen Dioxide (NO2)
54-886	Hydrogen Cyanide (HCN)
54-876	Carbon Monoxide (CO) (Unfiltered)
54-722	Ethylene Oxide (ETO)
54-899	Dummy Sensor (required to cover socket when no sensor is present to maintain unit to environment sealing capability)

9.2 Accessories:

54-486	Protective Leather Case with Shoulder and Chest Strap
54-487	Protective Leather Case for Unit with Automatic Sample Pump
54-720	QTP-2000 Sample-Draw Pump includes 10 ft. of Hose with a Sample Gas Probe and Butyrate Wand
54-710	Sample Gas Probe for Pump with Butyrate Wand
11-609	Butyrate Wand for Sample Gas Probe
11-608	Stainless Steel Wand for Sample Gas Probe
54-301	Replacement Hydrophobic Filter for Pump Probe Assembly - Package of 5
54-948	Hand Aspirator and 10 ft. of Hose
54-898-A	Single Unit Charger with 120V Transformer
54-898-B	Single Unit Charger with 220V Transformer
54-898-C	Single Unit Charger with 12VDC Automobile Adapter
54-725-A	Dual Unit Charger with 120-220V Power supply (includes 110V North American line cord)
54-725-B	Dual Unit Charger with 120-220V Power supply (includes 220V Continental European line cord)
54-725-C	Dual Unit Charger with 12VDC Automobile Adapter
54-726-A	Five Unit Charger with 120-220V Power supply (includes 110V North American line cord)
54-726-B	Five Unit Charger with 120-220V Power supply (includes 220V Continental European line cord)
54-727	Charger Upgrade Kit: adds additional charger to existing charger. Allows up to a total of five, (requires 120-220V Power Supply)
54-849-A	Sensor Hot Box (9V alkaline)

54-849-B	Sensor Hot Box (110V)
54-849-C	Sensor Hot Box (220V)
54-890	NiCad (Nickel Cadmium) Battery Pack
54-891	NiMH (Nickel Metal Hydride) Battery Pack
54-892	Alkaline Battery Pack
54-714	Earphone
54-715	Serial/Computer Interface Cable (RS-232 to PC) for QuestSuite™
56-875	Parallel Printer Cable
54-753	Optical Serial/Computer Interface Cable (RS-232 to PC) for QuestSuite™
54-703	Calibration Adapter (Also used for Sample Draw w/Hand Aspirator)
54-963	Storage Case
54-965	Water Resistant Carrying Case

9.3 Calibration Kit

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

9.4 Regulators

54-971	0.5 lpm Regulator with 2' (.050" I.D.) tubing
54-972	1.0 lpm Regulator for Chlorine with 2' (.050" I.D.) tubing
54-973	1.0 lpm "Corrosive Gas" Regulator for Ammonia with 2' (.050 I.D.) tubing
54-326	On Demand Regulator for use with a Sample Draw Pump

9.5 103 Liter Steel Cylinder Calibration Gases

54-137	2.5% Methane in Air
54-138	0.3% Hexane in Air
54-139	1.1% Propane in Air
54-140	2.0% Hydrogen in Air
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
54-145	50 PPM Carbon Monoxide/2.5% Methane/17% Oxygen in Nitrogen

9.6 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
54-252	25 PPM Hydrogen Sulfide/100 PPM Carbon Monoxide/25% Methane/18% Oxygen in Nitrogen

10. MultiCharger II

Caution: ***The MultiCharger II may only be used when the MultiCheck 2000 contains rechargeable Nickel Cadmium or Nickel Metal Hydride battery packs. If an alkaline battery pack is accidently placed into the charger, it will not attempt to charge. No damage will be done to the charger. The MultiCharger II is not approved for operation in a hazardous environment, so any attempt to charge a unit and/or a rechargeable battery pack in a hazardous environment is specifically cautioned against. In fact, if the unit is operated while connected to the charger in a hazardous location, all intrinsic safety approvals are voided.***

We provide this charger for the reconditioning of the NiCAD and NiMH battery packs. The battery packs may be charged either as part of the unit or may be removed from the unit for separate recharging.

The MultiCharger II is designed to fully recharge a battery pack in less than 2 hours. When the pack is fully charged, the charger switches to a trickle charge to maintain the charge on the pack and to avoid damage to the pack by overcharging. In addition, there is a discharge button that can be used with the NiCAD battery pack to fully discharge the pack before charging to counteract the affect of "battery memory" that is a problem inherent to NiCAD batteries. As a guide, using this feature would discharge a fully charged NiCAD pack in about six hours. With NiCAD packs it is recommended that you do a discharge before charge cycle about every 10th charge cycle. This helps to lengthen the life of a NiCAD pack especially if the pack is only partially discharged on a regular basis. There is no requirement to do the conditioning discharge/charge cycle on the NiMH battery pack, as this type of battery does not suffer from memory effects.

Note: Rechargeable MultiCheck 2000 battery packs may only be charged with the Quest MultiCharger II battery charger. Use of other charger's could result in damage to either the unit or the battery pack. Likewise, attempting to charge other battery packs with a Quest MultiCharger II could result in damage to the charger.

11. QTP-2000 SAMPLE-DRAW PUMP

The QTP-2000 Sample-Draw Pump may be used to test air prior to entering a confined space. Attach the pump to the MultiCheck 2000 using the attachment screw located on the end of the pump. The pump starts automatically any time that the unit is in the RUN MODE or the CALIBRATE MODE. The pump will not run in any other mode to conserve unit battery power. Attach the Tygon tubing and sample gas probe as shown.

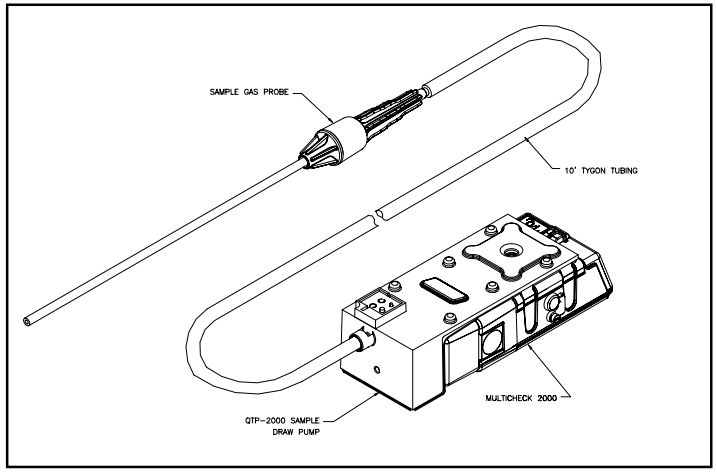


Figure 8. *Sample-Draw Pump*

The Sample Gas Probe contains a replaceable hydrophobic filter to prevent accidentally drawing water into the unit, and to prevent dust and solid objects from getting into the unit. The pump gets its power from the unit and draws approximately 2.5 liters per minute. The unit also controls it, in that if it becomes plugged or begins to draw in water, the unit will cause the pump to shut down and give an audible and visual indication that the pump is plugged.

12. SENSOR HOTBOX

The Sensor Hotbox can maintain up to 4 toxic QuestSensors under power. This can greatly reduce required sensor stabilization time when changing toxic sensors on your MultiCheck 2000. When sensors are transferred from the Sensor Hotbox to the MultiCheck 2000, you must zero and calibrate your unit.

12.1 Operation

- Power: The unit can be powered using a standard 9 volt alkaline battery. The 9 volt battery is accessed by sliding the panel on back of the Sensor Hotbox in the direction of the molded arrow. The life span for a 9 volt alkaline battery is typically over 30 days.

- Sensor Insertion: Before inserting a sensor in a vacant socket, the bias switch beneath the socket must be set to either UNBIASED or BIASED, as required by the sensor. The chart on the Sensor Hotbox label shows the setting required for each sensor type.

Warning: Failure to set the bias switch correctly before inserting a sensor into a socket will result in severe sensor baseline shift. The sensor will not be permanently damaged but will require extended settling time prior to use at the proper bias setting.

A sensor is inserted by aligning the sensor pins with the sockets on the Sensor Hotbox. Then press gently until the sensor is seated.

- TEST LED: Press the pushbutton switch to check the condition of the Sensor Hotbox's internal power supplies. If all supplies are correct, the TEST LED will light. If the TEST LED does not light, replace the battery. If the TEST LED still does not light, the unit may be damaged; check to see if the fuse has blown.

Note: The TEST LED does not check the sensors. In a clean air atmosphere, a working sensor produces no signal. Therefore, only the general condition of the Sensor Hotbox can be checked.

- Fuse Replacement: The Sensor Hotbox is protected from short circuits and reverse voltages at the power jack by a 0.125 Amp fuse. To replace the fuse, remove the four screws from the back of the unit and separate the case halves. The fuse is held in an in-line fuse holder located to the left of the battery compartment. To remove the fuse, open the in-line fuse holder by pressing the two halves together and twisting one quarter turn counterclockwise.

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12.2 Specifications

Power Supplies:	The Sensor Hotbox may be operated with an internal 9 volt alkaline battery.
Current Draw:	Approximately 600 micro amps from a 9 volt alkaline battery.
Battery Life:	A 9 volt alkaline battery will last at least 30 days before LOW BATTERY alert occurs.
Low Battery	Two stage. While Low Battery LED is flashing, battery may be changed without sensor stability loss. (LED will flash up to 2 days before going to "full on"). If LED is "full on", battery is drained to the point where sensor stability cannot be guaranteed. (LED will remain "full on" for at least 1 day before going completely out.) Sensors should be allowed to resettle after battery replacement.
Fuse:	0.125 Amp 250V SLO 3AG

12.3 Sensor Hotbox Accessories

015-695	120 Volt AC to 12 Volt DC Adapter
015-708	220 Volt AC to 12 Volt DC Adapter
054-806	12 VDC Automobile Jack Adapter

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.

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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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