# Lumidor MicroMAX PID

## Operation and Maintenance Manual

**MultiGas Portable Detector for VOC's and other Gases.**

Honeywell

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MAN-MAXPID
REV: 1.0

## Cautions and Warnings

### WARNING

**Do not proceed before reading**

**To ensure proper functioning and use of this product, do not use this instrument until you read and completely understand this operating manual. It contains operating and maintenance procedures to ensure proper instrument function. For your safety, you are required to calibrate this instrument periodically. Please refer to the calibration section of this manual.**

**Substitution of components may impair intrinsic safety. Use only MPRO-BPR NiMH rechargeable battery pack, or MPRO-BPA alkaline battery holder with four each of the following alkaline cells only: Duracell Procell-2400, Duracell MN-2400, and Energizer E-92 or EN-92. Observe proper polarity when installing alkaline batteries.**

### CAUTION

**Do not change or charge batteries in a hazardous location.**

**The LEL (Lower Explosive Level) range of this monitor is factory calibrated to methane. If monitoring a different combustible gas, calibrate the combustible gas range of the monitor to the appropriate gas.**

**This instrument has not been tested in atmospheres exceeding 21% oxygen.**

**Calibration is required when sensors are changed or added to the instrument.**

### WARNING

**Use only the approved accessories indicated in this manual.**

Duracell is a registered trademark of the Procter & Gamble Company
Energizer is a registered trademark of the Eveready Battery Company

## Lifetime Warranty

This instrument is warranted, to the original end-user purchaser, against defects in materials and workmanship for the life of the product, excluding the battery and pump, which carry a two year limited warranty sensors are covered by individual warranty terms per sensor. During this period Honeywell Analytics will repair or replace defective parts on an exchange basis, F.O.B. the factory at Lincolnshire, Illinois. The end-user purchaser will pay freight charges to and from Honeywell Analytics. The decision to repair or replace parts shall be determined by Honeywell Analytics.

**Sensor Warranties**

The oxygen sensor is guaranteed to operate satisfactorily for two years from the date of sale (i.e. the date of shipment) and will be replaced at no charge within that period only if it will not provide a correct reading after calibration by authorized service personnel. Physical or chemical damage, resulting from exposure to improper elements, is not covered.

The combustible sensor is guaranteed to operate satisfactorily for two years from date of sale (i.e. from date of shipment). If It will not provide a correct reading after calibration by authorized service personnel, it will be replaced at no charge within that period. This guarantee is void if it has been contaminated by some unusual substance, including but not limited to, water and/or other liquids, oily compounds, corrosives, silicones, lead vapors, extremely high concentrations of combustible gases, and various particulates which may inhibit gas flow to the sensor element.

The toxic sensors are guaranteed to operate satisfactorily for two years (18 months for CL2 and HCN sensors, 12 months for the NH3 sensor) from the date of sale (i.e. the date of shipment). They will be replaced at no charge within that period only if they will not provide a correct reading after calibration by authorized service personnel, and only if the sensor membranes exhibit no physical or chemical damage resulting from exposure to improper substances.

The Photo Ionization Detector (PID) sensor is guaranteed to operate satisfactorily for one year from the date of sale (i.e. the date of shipment). The PID sensor will be replaced or refurbished at no charge within that period only if it will not provide a correct reading after calibration by authorized service personnel, and only if the sensor exhibits no physical or chemical

damage resulting from improper use. This guarantee does not apply to the Ultra Violet lamp that is a consumable item.

The Infrared (IR) sensor is guaranteed to operate satisfactorily for two years from the date of sale (i.e. the date of shipment). The IR sensor will be replaced or refurbished at no charge within that period only if it will not provide a correct reading after calibration by authorized service personnel, and only if the sensor exhibits no physical or chemical damage resulting from improper use.

**Conditions and Exclusions**

To maintain this warranty, purchaser must perform maintenance and calibration as prescribed in the instrument operation manual, including prompt replacement or repair of defective parts and such other necessary calibration, maintenance and repair as may be required, according to the use of the instrument, in the reasonable judgment of Honeywell Analytics. Normal wear and tear, and parts damaged by abuse, misuse, negligence or accidents are specifically excluded from the warranty.

Purchaser acknowledges that, notwithstanding any contrary term or provision in the purchaser's purchase order or otherwise, the only warranty extended by Honeywell Analytics is the express warranty contained herein. Purchaser further acknowledges that there are no other warranties expressed or implied, including without limitation, the warranty of merchantability or fitness for a particular purpose; that there are no warranties which extend beyond the description of the face hereof; that no oral warranties, representations, or guarantees of any kind have been made by Honeywell Analytics, its distributors or the agents of either of them, that in any way alter the terms of this warranty; that Honeywell Analytics and its distributors shall in no event be liable for any consequential or incidental damages, including but not limited to injury to the person or property of the purchaser or others, and from other losses or expenses incurred by the purchaser arising from the use, operation, storage or maintenance of the product covered by the warranty; that Honeywell Analytics' liability under this warranty is restricted to repair or replacement of defective parts at Honeywell Analytics sole option; and that Honeywell Analytics neither assumes nor authorizes any other person to assume for it any other warranty. The warranty shall be void if serial numbers affixed to the products are removed, obliterated or defaced.

Honeywell Analytics, Sunrise, Florida

## Table of Contents

# 1. Preparation for Use

## 1.1 Unpacking

Check for these items:

- Packaging (retain for possible future use)
- Instrument
- Calibration certificate
- Standard accessories:

  – NiMH rechargeable battery pack
  – AC battery charger
  – Alkaline battery holder
  – Dust filter
  – 10-foot sampling hose with filter and water trap
  – Rubber boot with belt clip and neck strap
  – Instruction manual

## 1.2 Charging

**CAUTION**

**Do not change or charge batteries in a hazardous location. Do not try to turn on or otherwise operate this instrument until it is fully charged.**

**Use only the MPRO-1 A.C.charger, the MPRO-2 220 volt AC charger, or the MPRO-6 vehicular charger. Use of any other charger may cause permanent instrument damage and will void any warranties. The charge period is dependent on the condition of the batteries, but should not exceed about 4 hours for a completely depleted battery pack. Partially depleted packs will be charged in a much shorter period of time.**

Before operating the MicroMAX PID unit, the NiMH batteries must be fully charged. To charge the batteries using the charger supplied, connect the charger plug to the instrument port (See Figure 1) and instrument display should read “CHARGING BATTERY”. When charging is completed, “CHARGE COMPLETE” is displayed. The instrument is now fully charged and ready for use.

If charging is attempted without the rechargeable battery, or with alkaline batteries, "CHECK BATTERY" is displayed.

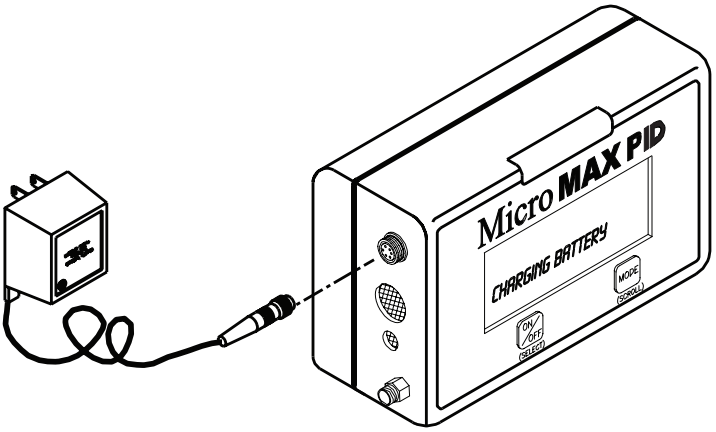



**Figure 1 - Charging the MicroMAX PID**

## 2. General Description

The MicroMAX PID is a versatile gas monitoring platform that can host a variety of optical sensor types including catalytic bead, photo ionization detector, electrochemical and infrared gas sensors.

The MicroMAX PID is ideal for the detection of the broadest range of gases including many hydrocarbons, volatile organic compounds (VOC's), oxygen deficiency and other toxic gases.

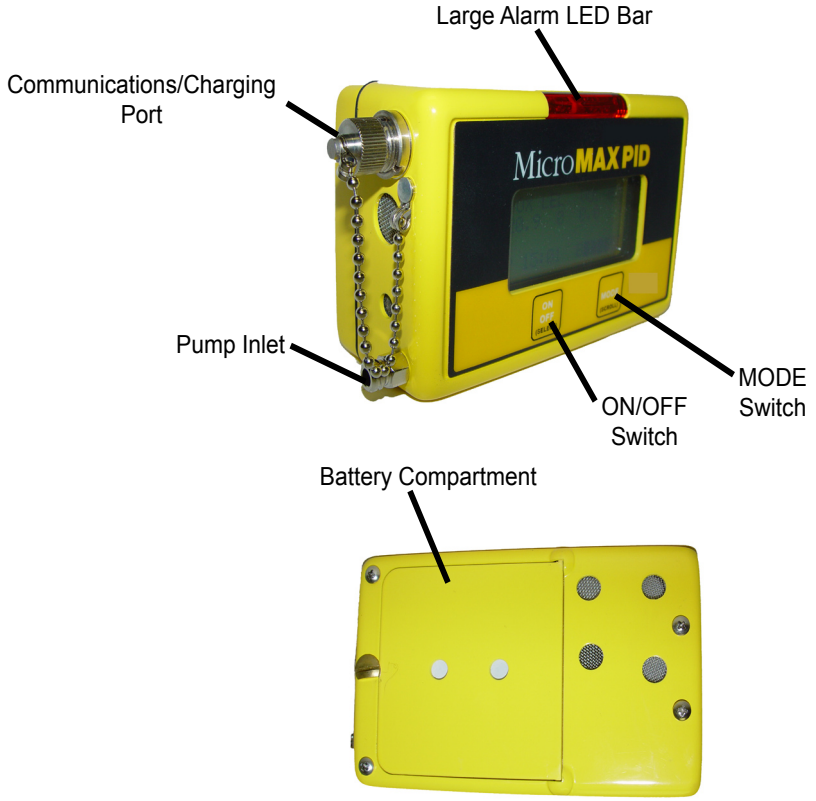



**Figure 2 - MicroMAX PID**

## 3. Features

1) Liquid Crystal Display:

   High contrast 4 lines by 16 character alphanumeric display that indicates gas concentration of up to four gases simultaneously.

2) Display Backlighting

   Automatic fiber-optic backlight provides display readability in dim or dark environments.

3) Automatic Toxic Sensor Recognition in 4th Sensor Channel

   Microprocessor automatically recognizes toxic sensors when plugged in. Monitor displays corresponding gas, sets gain, corrects alarm levels and initializes temperature compensation.

4) User Selectable Power Source

   User has an option of powering instrument either with the supplied NiMH rechargeable battery pack or with four "AAA" alkaline cells (use only the cells that are approved for use), mounted in the supplied battery holder.

5) User Friendly Interface

   User friendly interface is intuitive for ease of use and simplicity of operation.

6) Extensive Programming Options

   There are many programming options to custom-configure the instrument.

7) Programmable Gas Alarms

   High and low alarm levels, TWA mode for VOC's and toxics, latching or non-latching, are all user programmable.

8) Fully Automatic Calibration

Fast, easy, accurate calibration that requires no user adjustments or tools.

9) Confidence Beep

User selectable confidence beep provides a visible flash and audible beep about every 20 seconds to confirm instrument operation.

10) Voice and Display Messaging

User may select English, Spanish, French or German for voice and display messaging.

11) Battery Gauge B■■■■■■

This consists of B (for battery) and a maximum of 6 bars, as illustrated. Six bars represent full charge, while fewer bars indicate various stages of charge. When all bars are depleted, the instrument will run for more than an hour, after which time a low battery alarm is indicated by two beeps every 15 seconds. Low battery alarm will continue for at least half an hour, after which instrument will beep continuously and shut down. If alkaline batteries power the instrument, battery condition is indicated on the display, not by bars, but by battery voltage. A fresh alkaline pack will read about 5.8 volts, and low battery warning commence anywhere from 4.0 to 4.2 volts, model dependent, while shut-off occurs between 3.68 and 3.95 volts, model dependent.

12) Real Time Clock

User adjustable real time clock provides continuous time display. If daylight savings time is selected, the time will be automatically updated.

13) User Selectable Calibration Gas Concentration

This feature allows the user to select the desired calibration gas concentration, within specified limits, for all sensors except oxygen and VOC.

14) User Selectable LEL Conversion Factors

This feature allows instrument to accurately indicate the LEL level for a wide range of hydrocarbons after calibrating with the methane gas.

15) Multiple Gas Alarm Indicators

Audible and visual alarms alert user of unsafe gas levels.

16) Low Flow Alarm

In pump mode, a steady audible alarm is accompanied by a visual alarm and the display indicates "LOW FLOW". If alarm persists, instrument will indicate "PUMP FAIL" and switch to diffusion mode of operation.

17) RFI Resistant Design

High resistance to RFI (radio frequency interference) minimizes false alarms.

18) Charge Status Recognition

The instrument automatically shuts off if charger is connected while monitor is on. This prevents the charger from being used as a power source, which is not intrinsically safe. After charger is connected, display indicates "CHARGING BATTERY".

19) Calibration Record

The date the instrument is last calibrated and the date that the instrument is due for the next calibration can be displayed on the start-up under "LAST CALIBRATED" and "CALIBRATION DUE".

20) Peak, STEL and TWA

The MODE button enables display of peak reading (highest VOC, toxic or combustible and lowest oxygen levels), STEL (15-minute accumulated short-term exposure level), and TWA (8-hour time weighted average) since instrument was last turned on. The STEL and TWA will be indicated only if

"ALARM TYPE" is set to "TWA ON" Toxic Electrochemical cells only.

21) Low Battery Warning

Low battery warning is indicated by dual beep every 15 seconds, approximately 30 minutes prior to shutdown. With alkaline batteries, low battery warning occurs between 4.0 and 4.2 volts.

22) Data Logging

The MicroMAX PID is supplied with data logging capabilities and all necessary hardware, cable and software. There are 2400 data points for storage of up to 200 hours of gas and alarm data. In addition, the last 24 calibration records as well as the latest instrument configuration are stored in the instrument's log memory. All of the above data can be retrieved using the MaxPID Log software, which is a data logging software that provides data transfer between a computer and the MaxPID instrument, storage and management of downloaded instrument data, graphing and reporting utility.Approvals

Intrinsic Safety:

MPID (MicroMAX PID)

UL Classified 'Class I, Divisions 1 & 2, Groups A, B, C & D, Class II, Groups E, F & G'

EN 50270:1999

EN 55011:1998

| |
|---|
| MICROMAX PID |
| VER 1.0 |
| ON |

| |
|---|
| |
| |
| READY |
| |

| |
|---|
| |
| TESTING |
| PLEASE WAIT |

| OX | LEL | VOC | TOX |
|---|---|---|---|
| 20.9 | 0 | 0.0 | 0 |
| | | | |
| P 11:52 | | B■■■■■■ | |

| |
|---|
| |
| |
| ZEROING |
| PLEASE WAIT |

| |
|---|
| |
| ISOBUTYLENE |
| FACTOR = 1.00 |
| PID RESPONSE |

| OX | LEL | VOC | TOX |
|---|---|---|---|
| | | | |
| 19.5 | 10 | 50.0 | 10 |
| LOW ALARM | | | |

| OX | LEL | VOC | TOX |
|---|---|---|---|
| | | | |
| 23.5 | 20 | 99.9 | 35 |
| HIGH ALARM | | | |

| |
|---|
| |
| |
| |
| VOICE ON |

**Figure 3 - Default Turn-on Sequence**

## 4.1 Power-on

After charging the instrument, or installing fresh alkaline batteries, turn instrument on in clean air, by depressing the **ON/OFF** button until a confirming beep is heard. Release the **ON/OFF** button and instrument will display the firmware version number and "ON" before cycling through its turn-on sequence (See **Figure 3 Default Turn-on Sequence**). Then the instrument goes through "TESTING" and "ZEROING" cycles, displays a response factor, low alarm levels and high alarm levels, indicates "VOICE ON" and "READY" and goes into normal operating mode. In normal operating mode, gas types and levels occupy the top two lines, the third line is blank and available for messaging, while on the fourth line is the letter "P" or "D", for pump or diffusion mode of operation respectively, the current time in 24-hour format and the battery gauge. If alkaline batteries power instrument, battery condition is indicated by display of battery voltage. With alkaline batteries, voltage should be about 5.8 volts with fresh batteries, with low battery warning occurring at between 4.0 and 4.2 volts, depending on sensor configuration.

## 4.2 Standard Mode Sequence

| OX | LEL | VOC | TOX |
|---|---|---|---|
| | | | |
| 20.1 | 0 | 16.0 | 9 |
| PEAK READING | | | |

| OX | LEL | VOC | TOX |
|---|---|---|---|
| | | | |
| USER SETUP | | | |
| | | | NO |

| OX | LEL | VOC | TOX |
|---|---|---|---|
| 20.9 | 0 | 0.0 | 0 |
| | | | |
| P 08:49 | | B■■■■■■ | |

Each standard mode option is available by depressing the **MODE** button sequentially.

**PEAK READING**. The highest VOC, toxic and combustible gas levels and the lowest oxygen levels. Depressing the **ON/OFF** button while in this mode clears peak values.

**USER SETUP.** User setup mode allows pump, voice and confidence beep to be turned on or off as desired. It is also here that calibration is usually done, and memory cleared (See **Section 4.7 Clearing Memory**). To enter the user setup mode, keep depressing the **MODE** button until line 3 of display indicates "USER SETUP". Press the **ON/OFF** button to enter user setup mode, to bypass each setting depress the **MODE** button. To change any setting, depress the **ON/OFF** button. For example, to change pump, voice, or confidence beep from "ON" to "OFF" or vice versa, depress the **ON/OFF** button when the appropriate menu item is displayed. To enter calibration mode, depress the **ON/OFF** button when "CALIBRATE?" is displayed (See **Section 5 Calibration**).

## 4.3 Testing Sensors and Alarms

It is recommended that proper alarm function be verified prior to use by applying the appropriate calibration or alarm check gas. The alarm check gas is available from Honeywell Analytics (part number TEST-1A) containing a gas concentration of 16%VOL O2, 2.5%VOL CH4, 100ppm CO and 50ppm H2S in balance N2. It can be used to check alarm response for any sensor combination of O2, LEL, CO and H2S. To check the alarm response of other sensor types, please refer to **Appendix K Calibration Gases** and use the appropriate calibration gas indicated. For each sensor configuration, use calibration gas with instrument in normal operating mode. After testing, remember to clear the peak values, or if "ALARM TYPE" is set to "TWA ON", clear memory. Test low flow alarm by placing finger over inlet when in pump mode. If instrument does not go into low flow alarm when inlet is blocked, instrument should be operated in diffusion mode after entering the "USER SETUP" mode and changing the pump status configuration to "PUMP OFF". Instrument should be serviced as soon as possible to fix the problem.

Instructions for using the appropriate alarm check gas:

- Turn monitor on in fresh air and allow it to go into normal operating mode.
- Break shipping tab off canister.
- Attach blue balloon on to black disk on alarm check gas hose. (See **Figure 5**)
- Insert red end of hose into hole in canister nozzle.
- Pinch hose (or place finger over the end of the hose) and pulse trigger so that gas fills the balloon to its natural shape. Do not over-inflate balloon.

- Insert other end of hose into air intake.
- All channels should be in alarm for a few seconds while gas passes over sensors. Check display to confirm proper operation of visual alarms for each gas. Confirm proper operation of audible alarms.
- Remove hose from monitor and allow alarm check gas to be purged from monitor with fresh air.
- Clear Peaks or, if "ALARM TYPE" is set to "TWA ON", clear memory (Please see **Section 4.7 Clearing Memory**).

**CAUTION**

**Gas/Bump test should be performed in a well-ventilated area.**

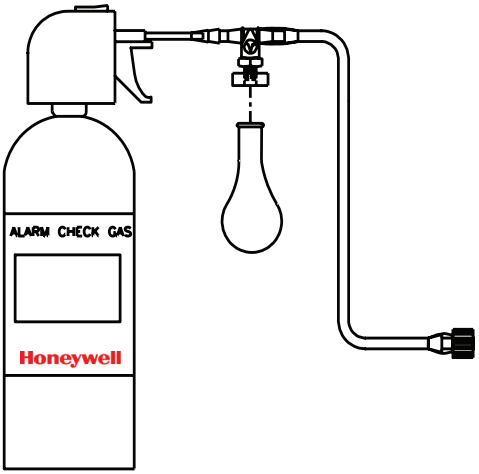



**Figure 5 - Alarm Check Gas (P/N: TEST-1A)**

## 4.4 Continuous Monitoring

For units with a VOC sensor, if the instrument is used on a daily basis, the user should allow the it to stabilize for 10-20 minutes before monitoring.

Honeywell Analytics recommends that the supplied dust filter (part number 16PFC) be attached at all times in pump mode if the instrument is being used in a dusty environment. Keeping dust out increases instrument life and lowers maintenance costs.

## 4.5 Remote Sampling (Pretesting)

Remote areas and confined spaces may be sampled in pump mode prior to entry by connecting the supplied 10-foot sampling hose to the inlet fitting. Longer tubing runs must use Teflon® lined Tygon® tubing (P/N: 16-27T). Continuous monitoring with the sampling hose attached reduces the number of hours of run time available.

The following procedure is recommended:

- Turn instrument on and allow to enter normal operating mode.
- Be sure you are in pump mode. ("P" indicated in line 4 of display).
- Test alarm function with gas as indicated in **Section 4.3 Testing Sensors and Alarms**.
- Test low flow alarm as indicated in **Section 4.3 Testing Sensors and Alarms**.
- Connect sampling hose to instrument. Place hose in area to be sampled.
- Wait two minutes for full response.
- Take readings.
- Retrieve hose and disconnect from instrument.

Hose lengths up to 100 feet may be used for pretesting. Add one second per foot to the two-minute wait for full response.

## 4.6 Alarms

In the event of a gas alarm, evacuate the area immediately. Investigate the cause of the alarm only when you are safely out of the potentially hazardous area. Accessing the "Peak" mode will display the gas and level that generated the alarm.

- A "warning" low gas alarm indicates a gas concentration above the low alarm set point for combustible, toxic or PID channel (or a gas concentration below the low alarm set point for O2 channel) and is indicated by 3 beeps from the horn, flashing LED, flashing gas range of the sensor in alarm, and display of the word "WARNING." Voice will also say "WARNING" except for O2, in which case it will say "DANGER."

- A "danger" high gas alarm is indicative of a gas concentration above the high alarm set point and is indicated by 3 beeps from the horn, flashing LED, flashing gas range of the sensor in alarm, and display of the word "DANGER." Voice will also say "DANGER".

- Low flow or pump fail alarm is indicated by a continuous audible alarm, flashing LED, and the words "LOW FLOW" or "PUMP FAIL" displayed.

- Low battery alarm is indicated by 2 short beeps from the horn every 15 to 20 seconds, together with the words "LOW BATTERY' on the display. It first occurs approximately 30 minutes prior to battery depleted alarm and shutdown.

- Battery depleted alarm is indicated by 5 audible beeps, display of "BATTERY DEPLETED" and shutdown.

**CAUTION**

**VOC sensors are factory preset for a low level alarm of 50 ppm and a high level alarm of 99.9 ppm.**

## 4.7 Clearing Memory

Memory for the peak, STEL and TWA readings is automatically cleared after each calibration. To clear memory manually:

- Depress the MODE button repeatedly until "USER SETUP" is displayed.
- Depress the ON/OFF button to enter the user setup mode.
- Depress the MODE button 4 times until "CLEAR MEMORY" is displayed.
- Depress the ON/OFF button once to simultaneously clear memory and return to normal operating mode.

## 4.8 Turn-off

To turn the MicroMAX PID off, depress and hold the **ON/OFF** button, and instrument will beep 4 times. After the fourth beep, release the button, and instrument will indicate "POWER OFF" and automatically turn itself off.

If **ON/OFF** button is released during countdown, instrument will resume normal operation.

# 5. Calibration

## 5.1 Calibration Frequency

It is important to verify accuracy on a regular basis to guard against any unexpected loss of sensitivity due to mechanical damage, immersion, aging, or exposure of the sensors to poison (such as high concentration of combustible gas, tetra-ethyl-lead, sulfides or silicone containing lubricants) present in the atmosphere being monitored.

The safest possible course of action is to expose the sensors to a known concentration test gas before each day's use. This "bump" test takes only a few seconds to accomplish. It is not necessary to make a calibration adjustment unless readings are off by more than 15% of the applied gas concentration. If this procedure is followed, the calibration interval can be up to 90 days.

If your calibration procedures do not permit daily checking of the sensors, Honeywell Analytics recommends the following procedure to establish a safe and prudent check schedule. Initially, over a period of a few days, check the response daily to be sure there is nothing in your atmosphere that is poisoning the sensors. If the instrument displays correct concentration levels after 2 weeks on this schedule, the calibration interval may be extended to two weeks. If the instrument does not require calibration, after 2 months on this schedule, the calibration interval may be extended to 30 days. Frequency of calibration beyond 30 days utilizing this method is not recommended.

**WARNING**

**This does not preclude testing with gas on a regular basis.**

Always observe your employer's calibration and testing schedules.

## 5.2 Calibration Procedure (When All Calibration Gases are in a Single Canister)

### CAUTION

**Calibration should be carried out only in a clean air environment, known to be free of contaminants. Be sure the calibration gas is within the expiration date indicated.**

- From normal monitoring mode, use **MODE** button to scroll through mode functions to "USER SETUP".
- Depress **ON/OFF** button to enter "USER SETUP".
- Use **MODE** button to scroll to "CALIBRATE?"
- Depress **ON/OFF** button to enter the calibration mode.
- Instrument will be "ZEROING" mode and count down to 0.
- Apply calibration gas when "APPLY GAS" is displayed. (See **Figure 6**).
- Instrument will display "CALIBRATING" and count down to 0.
- If calibration is successful, "CAL COMPLETE" is displayed. If the calibration fails for any reason, "CAL FAILURE" is displayed and instrument returns to normal mode. **Observe that all sensors calibrated are displayed below "CAL COMPLETE". Any sensor not displayed is not calibrated.**
- Remove gas and turn off gas flow.
- Instrument will go into a "PURGING" countdown to 0.
- After purging, instrument automatically clears memory.
- This calibration process is now complete.


**Figure 6 - Calibrating the MicroMAX PID**

## 5.3 Calibration Procedure (When Not All Calibration Gases are in a Single Canister)

### CAUTION

**Calibration should be carried out only in a clean air environment, known to be free of contaminants. Be sure the calibration gas is within the expiration date indicated.**

### CAUTION

**Please refer to Appendices G and H for important additional information.**

- Use **MODE** button to scroll through mode functions to "USER SETUP".
- Depress **ON/OFF** button to enter "USER SETUP".
- Use **MODE** button to scroll to "CALIBRATE?".
- Depress **ON/OFF** button to enter the calibration mode.
- Instrument will be in "ZEROING" mode and count down to 0.
- Apply the first calibration gas, or gases, when "APPLY GAS" is displayed. (See **Figure 6**)
- Instrument will display "CALIBRATING" and count down to 0.
- When "CAL COMPLETE" is displayed, **observe which sensors are calibrated and displayed below "CAL COMPLETE"**. Remove gas and turn off gas flow.
- Depress the ON/OFF switch and instrument will display "APPLY GAS".
- Apply the second calibration gas.
- Instrument will display "CALIBRATING" and count down to 0.
- When instrument displays "CAL COMPLETE", **observe whether all sensors are calibrated and displayed below "CAL COMPLETE"**. Remove gas and turn off gas flow.

- If all sensors were displayed below "CAL COMPLETE", instrument is fully calibrated and will display "PURGING", count down to 0 and clear memory. The calibration process is complete.

- If a third calibration gas needs to be applied, after instrument displays "CAL COMPLETE", depress the **ON/OFF** button and follow the instructions on the display.

- When "CAL COMPLETE" is displayed, remove gas and turn off gas flow.

- Instrument will purge itself while counting down to 0, and clear memory.

- The calibration process is now complete.

## 5.4 Zeroing

**CAUTION**

**Zeroing should be carried out only in a clean air environment, known to be free of contaminants.**

There are three ways to zero the instrument:

- Zeroing is done, automatically, each time the instrument is calibrated.

- Zeroing is done, automatically, each time the instrument is turned on if the "AUTO ZERO" feature is selected in the supervisory mode. Please refer to **Section 6.7 Auto-zeroing**.

- Zeroing may be done manually without doing a full calibration by entering the calibration mode (please refer to **Section 5.2 Calibration Procedure (when all calibration gases are in a single canister)**) and, anytime while the instrument is zeroing and counting down from 30 seconds to 0, depress and hold down the MODE button for at least 3 seconds. Instrument will not immediately exit, but will complete the zeroing cycle, count down to 0, and then exit the calibration mode.

# 6. Programming

## 6.1 Programming Options

Powerful programming options allow user to customize the MicroMAX PID. Some options are available in the user set-up mode (See **Appendix D Mode Sequence, User Set-up Mode**) but the majority of these options are available only in supervisory mode. ALL PROGRAMMING OPTIONS CAN ALSO BE ACCOMPLISHED THROUGH THE MAXPID LOG SOFTWARE, USING THE UPLOAD FUNCTION. THIS IS BY FAR THE MOST CONVENIENT AND EFFICIENT METHOD AND IS STRONGLY RECOMMENDED. If a computer is not available, programming may be accomplished manually in supervisory mode, using the **MODE** and **ON/OFF** buttons. To enter the supervisory mode, depress and hold the **MODE** button for 5 seconds, during the "TESTING" phase of the start-up sequence. The general structure of the supervisory mode is to depress the **MODE** button to bypass an option, or use the **ON/OFF** button to enter the option's menu and make a change. Where a menu has two options only for example, "ON" or "OFF", depressing the **ON/OFF** switch once simultaneously accomplishes three functions: entering the menu, changing the option and exiting the menu.

The following are all programmable:

- VOC gas type
- Response factor for PID cross calibration.
- LEL gas type

  (**CAUTION: This option is operative ONLY with the catalytic % LEL sensor.**)
- Date format, date/time, daylight savings time
- Datalog frequency
- Auto-zero during start-up sequence
- Last calibration date displayed or not during start-up sequence
- Latching or non-latching alarms
- Calibration gas level
- High alarm set points
- Low alarm set points/Low alarm disable (except $O_2$)
- Calibration due date displayed or not during start-up sequence, calibration due frequency
- Language choice
- TWA alarm on or off
- Factory default settings
- Calibration

## 6.2 Selecting VOC Gas Type

The PID sensor is designed to be sensitive to a very broad range of Volatile Organic Compounds (VOCs). The standard calibration is set for 100% sensitivity to isoButylene ($C_4H_{10}$).

**WARNING**

**PID sensors are not suitable for the detection of combustible levels of Methane ($CH_4$) or Hydrogen ($H_2$). Please ensure adequate safety protection with alternative sensor configurations when operating the instrument in zones that may contain combustible levels of Methane and/or Hydrogen.**

For users that need to monitor other VOC gasses, there are two options:

1. For the highest possible accuracy, it is always best to calibrate the PID sensor with 100 ppm of the desired target gas (i.e. the gas being monitored) e.g. Benzene. This is all done by following the procedure outlined in **Section 5.2 (When all gases are in a single canister)** and the leaving the selected VOC gas at Isobutylene and the response factor at 1.00.

2. If the target gas (e.g. Benzene) is not available, good results may be obtained by entering a response factor in the instrument that is based on previously determined correlation experiments with the actual gas and based on a current isoButylene calibration of the PID sensor. This action enables the instrument to indicate the correct ppm VOC reading when monitoring the target gas (e.g. Benzene). See **Appendix J** for a complete list of detectable gases and the appropriate reference factor. A preset library of commonly available gases is already programmed into the MicroMAX PID instrument. This library can be accessed by using the MAXPID-LOG software and alternative VOC compounds uploaded to the library of gases carried by each individual instrument. Alternatively, if the Response Factor value is known for a new target gas, then this value can be entered into the MicroMAX PID unit via the keypad.

3. Enter Response Factor value via the keypad.

To program the instrument for the desired VOC gas type or response factor, enter the supervisory mode (Section 6.1 Programming Options) and the following menu appears:

| EDIT PID SETTING | |
|---|---|
| ISOBUTYLENE | |
| FACTOR = 1.00 | |
| YES | NO |

Depress the ON/OFF button to enter the menu option or depress the MODE button to bypass this. If "YES" is selected, the following menu appears with two options:

| SELECT PID | |
|---|---|
| CORRECTION TYPE | |
| | |
| GAS | FACTOR |

The two options are:

1. Press the ON/OFF button to enter the option for selecting a VOC from a preset gas list. The following screen appears:

| IS PID GAS | |
|---|---|
| ISOBUTYLENE | |
| FACTOR = 1.00 | |
| YES | NO |

Use the MODE button to scroll through the gas list. The response factor changes automatically, depending on the chosen gas. Use the ON/OFF button to save the selected gas and exit this menu sequence.

2. Press the MODE button to enter the option for using a user-defined VOC response factor. The following screen appears:

| | |
|---|---|
| | |
| FACTOR = 1.00 | |
| SET | CHANGE |

Use the MODE button to scroll thru the value for the first digit and depress the ON/OFF button to save it and move on to setting the next digit. Repeat the same procedure to set the two decimal values.

## 6.3 Selecting LEL Gas Type

**WARNING**

**Infrared sensors used for flammable gas detection will not respond to combustible levels of Hydrogen ($H_2$) gas. Please ensure adequate safety protection with alternative sensor configurations when operating the instrument in zones that may contain combustible levels of Hydrogen.**

**WARNING**

**This option is ONLY operative with the catalytic %LEL sensor. It does not work with the IR %LEL, IR %VOL or heavy hydrocarbon LEL sensors.**

The LEL sensor is designed to provide its highest sensitivity to Methane, See **Appendix A Specifications - Section (N) Cross Sensitivity Data**). For users detecting methane or natural gas, the standard calibration methods, using methane, with the "SEL LEL GAS TYPE" set to Methane, is acceptable. This is the standard default setting.

For users that need to monitor for a gas on the list, other than methane or natural gas, there are two options:

1. For the highest possible accuracy, it is always better to calibrate the instrument with the desired target gas (that is, the gas being monitored) e.g.. Pentane. This is done by following the calibration procedure in **Section 5.2 Calibration Procedure (when all calibration gases are in a single canister)** and leaving the "SEL LEL GAS TYPE" setting at Methane.

2. If the target gas (use Pentane as an example) is not available, acceptable results may be obtained by entering the "SEL LEL GAS TYPE" function in the supervisory mode, selecting "Pentane", and using the procedure in **Section 5.2 Calibration Procedure (when all calibration gases are in a single canister)** to do a standard calibration with

methane gas. This action enables the instrument to indicate the correct LEL reading when monitoring Pentane. See **Appendix A - Specifications** for data on the relative span of detectable gases. The 5 gases listed in the "SEL LEL GAS TYPE" function, with their relative spans, are:

| | | | |
|---|---|---|---|
| Methane | 100 | Hexane | 46 |
| Propane | 63 | Xylene | 31 |
| Pentane | 50 | | |

From these five gases, select the one with a relative span value closest to the relative span of your target gas. For example, if your target gas is benzene (relative span 44 per **Appendix A Specifications - Section (N) Cross Sensitivity Data**) select hexane whose relative span of 46 is closest to that of benzene and calibrate with the supplied methane gas. To program the instrument for the desired LEL gas type, enter the supervisory mode (**Section 6.1 Programming Options**) and depress the **ON/OFF** button to enter the "SEL LEL GAS TYPE" menu. Use the MODE button to select the gas type and the ON/OFF button to exit this menu sequence.

## 6.4 Setting Date Format

This function enables user to choose the correct date format. The default date format is MM/DD/YYYY (MONTH/DAY/YEAR), as is customary in the USA. To determine to which date format the instrument is set, enter the supervisory mode (**Section 6.1 Programming Options**) and use the **MODE** button to scroll down to "DATE FORMAT". If set for USA, display will indicate:

DATE FORMAT
MM/DD

If this format is acceptable, and there is no need to set the date and time, depress the **MODE** button to bypass the function. If, however, DD/MM/YYYY (DAY/MONTH/YEAR) format is desired, depress the **ON/OFF** button twice, (once to enter the menu, and again to change the date format) to:

DD/MM
15/06/2000-13:50
(These numbers represent current date & time)

If there is no reason to change the date or time, depress the **ON/OFF** button a further twelve times to exit.

## 6.5 Setting Date/Time

To set date and time enter the supervisory mode (**Section 6.1 Programming Options**) and use the **MODE** button to scroll to "DATE FORMAT". Depress the **ON/OF**F button to enter the menu. Depress the **MODE** button. The first digit on the left will start to flash. Depress the **ON/OFF** switch to accept the flashing number and move one number to the right, or use the **MODE** button to change the flashing number to the desired value. If the date format is MM/DD, the first two digits on the left represent the current month and the first digit must be either a 0 or a 1. Let us set the date to September 2, 2002. We need 09 to represent the month of September. If 0 is flashing, depress the **ON/OFF** switch. This accepts the 0 on the left and we may now use the **MODE** switch to set the next number to 9. Depress the **ON/OFF** button to accept the 9 and the month is correctly set to 09. The next digit on the right is now flashing and the **MODE** button is used to select 0. Depress the **ON/OFF** button to accept the 0, the **MODE** button to select 2, and the **ON/OFF** button to accept 2. To set the year, use the **MODE** button to select 2, the **ON/OFF** button to accept the 2. Use the **MODE** button to select the 0 and depress the **ON/OFF** button to accept. Use the **MODE** button to select 0 again and depress the **ON/OFF** button to accept. Use the **MODE** button to select the 2 and the **ON/OFF** button to accept. This completes the date settings. To continue and set the correct time to 14:45 (2:45PM), use the **MODE** button to select 1 and the **ON/OFF** button to accept the 1. Use the **MODE** button to select 4 and depress the **ON/OFF** button to accept the 4. Use **MODE** switch to select 4 and depress the **ON/OFF** switch to accept the 4. Use **MODE** to select 5 and **ON/OFF** to accept and exit this menu.

The date and time are now correctly set. The "DAYLIGHT SAVING" time menu now appears.

DAYLIGHT SAVING

OFF

Default is "OFF". Depress the **MODE** button to accept this setting and exit, or depress the **ON/OFF** button to turn on daylight savings and exit.

## 6.6 Selecting Data Log Frequency

The data log frequency is the time interval between logged readings and may be set at 1, 2, 3, 4 or 5 minutes. The time internal does not affect the total number of data points. The total number of data points is fixed at 2400 so if a 1-minute interval is chosen, 40 hours of data may be logged. If a 5-minute interval is chosen, 200 hours of data may be logged. The default setting is 1-minute so no action need be taken if this interval is acceptable.

To change the data log frequency, access the supervisory mode (See **Section 6.1 Programming Options**) and use the **MODE** button to scroll down to "DATA LOG-FREQ". Depress the **ON/OFF** button to enter the menu sequence, then use the **MODE** button to select 1,2,3,4 or 5-minute interval. Depress the **ON/OFF** button to accept the selection and exit.

## 6.7 Auto-zeroing

The factory default setting is automatic zeroing during start-up, each time the instrument is turned on. If this is not acceptable, the auto-zero function during start-up may be turned off by entering the supervisory mode (**Section 6.1 Programming Options**) and using the **MODE** button to scroll down to:

AUTO ZERO
ON

Use the **ON/OFF** button to enter the menu, change the setting to "OFF", and exit the menu. Since zeroing is always done during the calibration process, proper instrument operation will be maintained if calibration is always carried out in a clean air environment.

## 6.8 Displaying Last Calibration Date

The instrument may be programmed so that the last calibration date is displayed during the start-up routine. The factory default setting has this function turned off. If it is desired to have the last calibration date displayed each time the instrument is turned on, it is necessary to enter the supervisory mode (See **Section 6.1 Programming Options**) and use the **MODE** button to scroll down to:

LAST CALIBRATED
OFF

Depress the **ON/OFF** button to enter the menu, turn the function on and exit.

## 6.9 Selecting Latching/non-latching Gas Alarms

The factory default setting is non-latching alarms (latching alarms "OFF"). This means that the instrument will cease alarming when gas levels fall below the alarm set points. If latching alarm (latching alarms "ON") is chosen, the instrument will continue to alarm when gas levels fall below alarm set points and may be turned off only when the user depresses the **ON/OFF** button. To turn on the latching, enter the supervisory mode (**Section 6.1 Programming Options**) and use the **MODE** button to scroll down to "LATCHING ALARMS":

LATCHING ALARMS
OFF

Depress the **ON/OFF** button once to make the change and exit the menu.

## 6.10 Setting Calibration Gas Level

The defaults, as well as the full range of programmable calibration gas levels, are set out in **Appendix A Specifications - Section (K) User Programmable Calibration Gas Levels**. If it is desired to change the default levels, enter the supervisory mode (See Section 6.1 Programming Options) and use the MODE button to scroll down to the "CAL GAS LEVEL" menu, which (depending on model) looks like:

| | LEL | VOC | H2S |
|---|---|---|---|
| | 50 | 100 | 25 |
| CAL | GAS | LEVEL | |

If there is a good reason to change these factory default values, depress the **ON/OFF** button to select the LEL.

| | LEL | | |
|---|---|---|---|
| | 50 | 100 | 25 |
| CAL | GAS | LEVEL | |

If the displayed calibration gas level (50% LEL in this example) is acceptable, depress the **ON/OFF** button to accept and move to the next gas. Otherwise, if a change is desired, use the **MODE** button to increase or decrease the level by 5% LEL increments within the range from 5% LEL to 60% LEL. Depress the **ON/OFF** button to move to the next gas.

```
                    VOC
          50        100       25
CAL       GAS       LEVEL
```

The calibration gas level for the PID sensor is factory preset and cannot be changed by user. In this case, depress the ON/OFF button to skip to the next gas. If this channel contains a CO2 sensor, either depress the **ON/OFF** button to accept calibration gas level displayed, or use the **MODE** button to increase or decrease the calibration gas level, by 0.5% vol increments, to the desired value in the range from 1.0% vol to 3.0% vol.

```
                              H2S
          50        100       25
CAL       GAS       LEVEL
```

Depress the **ON/OFF** button to select H2S (or other gas sensor in Tox 2 position). Depress the **ON/OFF** button to accept the level displayed or use the **MODE** button to increase or decrease the desired value, by 5ppm increments, in the range from 5ppm to 25ppm. To exit the menu, depress the **ON/ OFF** button.

## 6.11 Setting High Alarm

The defaults, as well as the full range of programmable high alarm set points, are set out in **Appendix A Specifications - Section (I) User Programmable High and Low Alarm Set Points**. To change the default levels, use the MODE button to scroll down to:

```
   OX        LEL       VOC       H2S
HIGH ALARM SET
  23.5       20        99.9       20
```

Depress the ON/OFF button to select the gas (i.e. oxygen) for which the alarm is being set.

```
   OX
  23.5       20        99.9       20
HIGH ALARM SET
```

If the alarm level displayed (23.5 in this example) is acceptable, depress the ON/OFF button to accept and select the next gas. If a change in value is desired, use the MODE button to change the high alarm setting to the

desired value. Depress the ON/OFF button to select the next gas. Follow this same procedure for the other gases and depress the ON/OFF button to exit this menu.

## 6.12 Setting Low Alarm

The defaults, as well as the full range of programmable low alarm set points, are set out in **Appendix A Specifications - Section (I) User Programmable High and Low Alarm Set Points**. To change the default levels, use the **MODE** button to scroll down to:

| OX | LEL | VOC | H2S |
|---|---|---|---|
| LOW ALARM SET | | | |
| 19.5 | 10 | 50.0 | 10 |

Depress the **ON/OFF** button, select the gas for which the alarm is being set. The procedure for low alarm is identical to that for setting high alarm in **Section 6.11 Setting High Alarm**,to which reference may be made. A zero value disables corresponding low alarm, with the exception of $O_2$.

## 6.13 Displaying Calibration Due Date

The instrument is capable of displaying the calibration due date in start-up sequence. The default setting is "OFF". If it is desired that instrument displays "CALIBRATION DUE" during the start-up sequence, enter the supervisory mode (See **Section 6.1 Programming Options**) and use the **MODE** button to scroll down to:

| CAL | DUE | AUTO |
|---|---|---|
| OFF | | |

To turn on this function, depress the **ON/OFF** button, and instrument will display:

| CAL | DUE | FREQ |
|---|---|---|
| | | 30 |

The "30" is the factory default calibration frequency of 30 days. If this frequency is acceptable, depress the **MODE** button to accept and exit the menu. To change the calibration frequency, depress the **ON/OFF** button and use the **MODE** button to increment the left digit to the desired value in the range 0 to 9, depress the **ON/OFF** button to select the second digit, and use the **MODE** button to set the desired number in the range 0 to 9. The

maximum calibration frequency allowed is 90 days. Depress the **ON/OFF** button to exit the menu. It is now required to calibrate the instrument to make these changes effective. This is very important for the instrument to initialize the process. Use the **MODE** button to scroll down to "CALIBRATE?" and calibrate the instrument. (See **Section 5 Calibration**).

## 6.14 Choosing a Language

The default language is English. If a change to another language is desired, enter supervisory mode (See **Section 6.1 Programming Options**) and use the **MODE** button to scroll down to:

LANGUAGE SET
ENGLISH

To enter the menu, depress the **ON/OFF** button and use the **MODE** button to select English, Spanish, French or German. Depress **ON/OFF** to accept the selection and exit the menu.

## 6.15 Selecting Immediate Alarm Mode/ TWA Alarm Mode

There are two types of alarm modes to choose from: immediate alarm mode and TWA alarm mode.

- In the immediate alarm mode, two types of alarms are available: immediate low and immediate high alarms. The default values for these alarms are pre-set (See **Appendix A Specifications - Section (I) User Programmable High and Low Alarm Set Points**) at the factory but are user programmable.

- In the TWA alarm mode, three types of alarms are available: TWA, STEL, and instantaneous alarms. TWA is a time-weighted average over an 8-hour period. STEL is the short-term exposure limit over a 15-minute period. The instantaneous alarm represents an exposure level that generates an alarm instantly. The values for these alarms are pre-set (See A**ppendix A Specifications - Section (J) Time Weighted Averages** (Only if "TWA ON" is selected) (Toxic sensors only)) at the factory and cannot be changed.

  The default is set to immediate alarm mode ("ALARM TYPE TWA OFF"). If a change to the TWA alarm mode is desired, enter supervisory mode (See **Section 6.1 Programming Options**) and use the **MODE** button to scroll down to:

ALARM TYPE
TWA OFF

Depress **ON/OFF** to make the change and exit the menu

## 6.16 Restoring Factory Defaults

This supervisory option restores the instrument to all factory default settings.

DEFAULT?

A user who modified one or more settings in supervisory mode may depress the **MODE** button to bypass this function for the changes to take effect, or depress the **ON/OFF** button to abandon his changes and revert to the factory default settings.

## 6.17 Calibration in Supervisory Mode

This option allows calibration in the supervisory mode. To bypass, depress the **MODE** button. To calibrate depress the **ON/OFF** button and follow the calibration procedure in **Section 5.2 Calibration Procedure (when all calibration gases are in a single canister)** or **Section 5.3 Calibration Procedure (when all calibration gases are not in a single canister).**

# 7. Data Logging

**WARNING**

**Do not connect the MicroMAX PID to a PC in a potentially hazardous environment.**

## 7.1 System Requirements

- PC running Microsoft Windows 2000, or Windows XP
- 30 mb available disk space
- CD-ROM drive for software installation
- RS-232 serial port
- VGA monitor (with the screen resolution set to 800x600 or higher)

## 7.2 General Information

The MAXPID Log software program for Windows is on a single CD and provides the tool necessary to transfer, save, retrieve, view, and print the data recorded in the MicroMAX PID instrument. It is a full function program that does not require an additional database program. It contains a README.doc file and help content with all information needed for installing, navigating, and using the program.

This program is compatible for use with any MicroMAX PID instruments.

## 7.3 Program Installation

- Place the program CD into the CD-ROM drive.
- If the installation program runs automatically, skip to the next step. Otherwise, go to Start, Run, then type X:\SETUP, where X represents the drive letter of your CD-ROM drive. In most cases, this will be D:\SETUP or E:\SETUP.
- Follow on-screen instructions to complete installation.

**CAUTION**

**Make sure that your computer's system clock and time zone are correct by double-clicking on the current time located on the Windows taskbar. Confirm/correct the date, time, and time zone and click OK.**

## 7.4 Uninstall Procedure

For Windows XP users, go to Start⇨Control Panel. For other Windows users, go to Start⇨Settings⇨Control Panel.

- When the Control Panel opens, double-click the Add/Remove Programs icon.
- In the Add/Remove Programs dialog, select MAXPID Log.
- For Windows XP and Windows 2000 users, click Remove. For other Windows users, click on Add/Remove.
- Follow on-screen instructions to uninstall the program.

## 7.5 Starting The Program

Go to Start⇨Programs⇨Lumidor MaxPID⇨MAXPIDLog. This brings up the program.

- Connect one end of the supplied download cable to an available COM port on your computer.
- Click on the Communication menu.
- Click on Select Port/Time Zone. The Select Port and Time Zone dialog box appears.
- In this dialog box, select the appropriate COM port and time zone. The COM ports that exist and are available appear as possible selections. Make sure your port selection agrees with the COM port on your computer that the download cable is connected to. Click OK to return to the Main Screen (See **Figure 7**).

## 7.6 Downloading Information from the MicroMAX PID

The Download function allows you to transfer data from the instrument to the computer.

- Follow procedures indicated in **Section 7.5 Starting the Program**.
- Turn on the instrument and allow it to go into normal operating mode.
- Click on the Communication menu, then on Download, or simply click on the Download button on the toolbar of the Main Screen. The Download Data/Instrument Parameters dialog box appears.
- In this dialog box, select Data (for downloading instrument parameters, logged gas readings, and calibration data) or Instrument Parameters (for downloading instrument parameters), and click on OK. The following will appear on the screen: "Is the cable connected and the instrument ready?"

**WARNING**

**Choosing the download instrument parameters option dumps all logged data in the instrument and the data is not saved in the program.**

- Connect the instrument interface end of the download cable to the port of the instrument.
- Click on Yes. The instrument will start to count up. This count also takes place on the computer screen.
- After all data has been transferred, the instrument beeps and returns to normal operating mode. When the computer screen displays "Transfer complete", click OK.
- For downloading instrument parameters, click the Upload/ Modify Instrument Parameters button on the tool bar and the parameters will be displayed in a dialog box. For downloading data, type your last name, first name, and location, when prompted to do so. Then, click OK.

**WARNING**

**All fields, including last name, first name, and location, must be entered in order to save the downloaded data. The maximum length to be entered for last name, first name, and location is 14, 14, and 20 alphanumeric characters, respectively.**

**Downloading at the same date and time for a particular instrument is not allowed. For example, if you download data from an instrument having serial number 1234 at 3:30 p.m. on December 8, 2002, and you try to download again with the same instrument at the same date and time as above, it will not save any data for this new download.**

- Wait a moment for the computer to store the information. Now, data from the most recent download is displayed on the Main Screen and the file relating to this download can be accessed from the Open dialog box.

## 7.7 Software Screens

### 7.7.1 Main Screen

Information on the Main Screen includes the following (See **Figure 7**):

- User information (employee's name, instrument's serial number and user ID)
- Download information (date, time, and location that data is downloaded)
- Gas data (gas types, measurement units, peaks, TWA, and number of alarms)

**Note:**

In user-programmable immediate alarm mode, the number of alarms equals to the total number of immediate high and immediate low alarms for $O_2$, a combustible, VOC or toxic gas. In TWA alarm mode, it represents the total number of instantaneous alarms for a toxic or VOC gas, or the total number of immediate high and immediate low alarms for $O_2$ or a combustible gas.

- Alarm levels (immediate low, immediate high, TWA, STEL and instantaneous alarm levels)

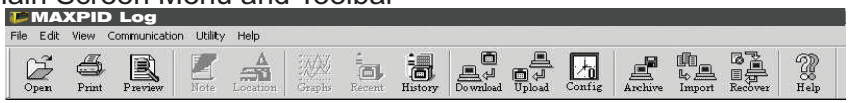
- Note relating to a download
- Histogram (logged gas readings)

**Note:**

The histogram is separated into groups. Each time the instrument is turned on, or when a new day begins during data logging, a new group is created and a new date and time are displayed for that group.

- When a gas alarm occurs, it indicates so in front of the gas reading in the histogram. The letters T, S, I, L, and H are used for alarm indication. In the immediate alarm mode, L and H represent immediate low and immediate high alarm, respectively. In the TWA alarm mode, T, S, and I represent TWA alarm, STEL alarm, and instantaneous alarm, respectively, for VOC and toxic gases only, while L and H represent immediate low and immediate high alarm, respectively, for $O_2$ or combustible gases. On some occasions, TWA, STEL, or instantaneous alarms can occur simultaneously. As a result, any combination of those three types of alarm would be displayed before the gas reading.

Main Screen Menu and Toolbar




Main Screen Data

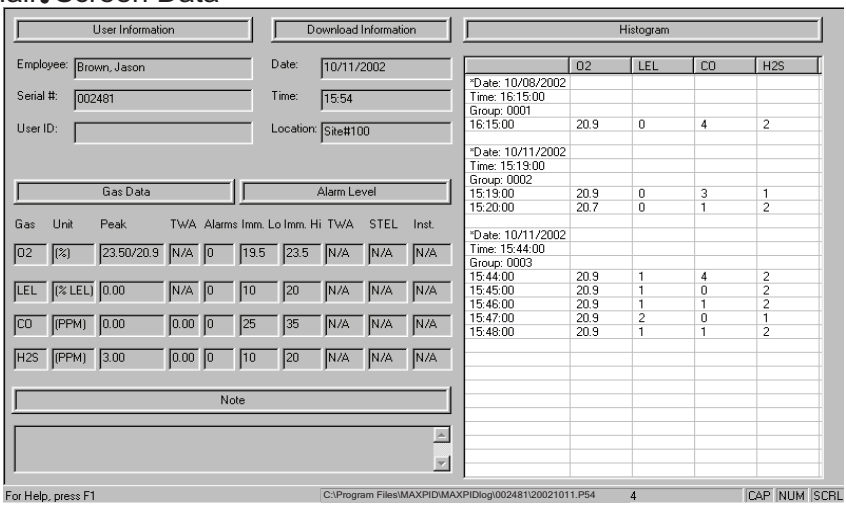



**Figure 7 - Main Screen**

- To view all the available data files, click on the File menu and then on Open, or simply click on the Open button on the toolbar. A list appears with all stored files.
- For your convenience, information in this list can be sorted in ascending order by Employee, Serial #, Date, Time, or Location. To sort by any one of the above, simply click on the corresponding heading.
- To select a file, click on the desired employee name.
    - To open the file, click Open to display all the data for that specific download, or simply double-click on the desired file.
    - To delete the file, click on Delete and the following appears: "Are you sure that you want to delete the selected data file?" Click on Yes to delete.
- To print all information from the Main Screen, click on the File menu and click on Print (or simply click on the Print button on the toolbar of the Main Screen). You can choose to print all or to print only specified pages.
- To print preview all information from the Main Screen, click on the File menu and click on Print Preview (or simply click on the Print Preview button on the toolbar of the Main Screen). On the print preview screen you can view the next page, view the previous page, view one or two pages at a time, zoom in on the document, zoom out from the document, and close the print preview screen to return to the Main Screen.

## 7.7.2 Graph Screen

Information on the Graph Screen includes the following (See Figure 8):

- User information (employee's name, instrument's serial number and user ID)
- Download information (date, time, and location that data is downloaded)
- Graph limits (date, start time, and end time for which the graphs are plotted)
- Graphs in different groups

**Note:**

The group number for the graphs corresponds with the one for the histogram. A curve cannot be plotted for a group with fewer than two data points.

## Graph Screen Menu and Toolbar


## Graph Screen Data

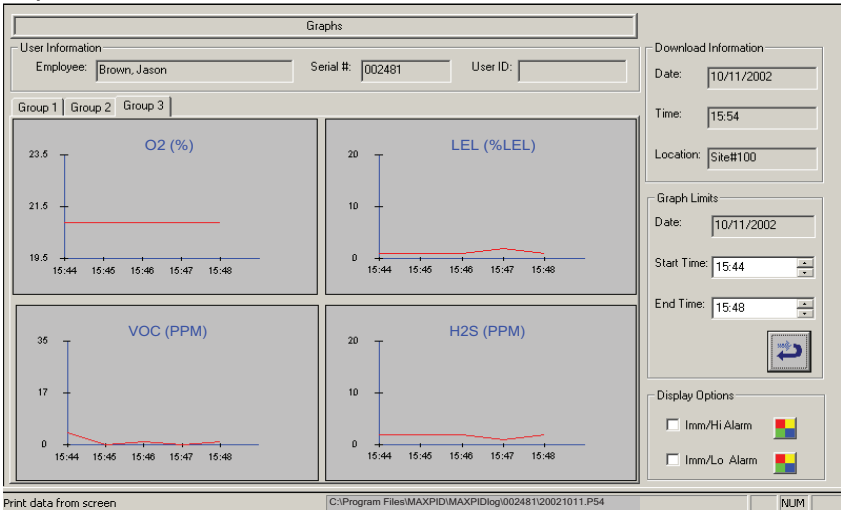



**Figure 8 - Graph Screen**

- To display the graphs, click on the View menu and then on Graphs (or simply click on the View Graphs button on the toolbar of the Main Screen). A group of 4 curves will be displayed (See Figure 8).

- To view the graphs of another group, click on the tab of the corresponding group number.

- To view an enlarged single graph, simply double-click on the desired graph.

  - To print an enlarged single graph, click on the Print Graph button.

  - To return to the Graph Screen, click on the Close button.

- To focus on a particular time span of the graphs, enter the desired start time and end time and click on the Refresh Graphs button on the Graph Screen.

- To display the immediate high alarm level and the immediate low alarm level on the graphs, check the Imm/Hi Alarm and Imm/Lo Alarm boxes, respectively.

- To print the graphs, click on the Graphs menu and then on Print (or simply click on the Print button on the toolbar of the Graph Screen).

- To return to the Main Screen, click on the Graphs menu and then click on Close (or simply click on the Close button on the toolbar of the Graph Screen).

## 7.7.3 Current Calibration Records

Each calibration record contains the following (See Figure 9):

- Date and time that calibration took place

- Pre-calibration readings (for up to 4 gases)

- Post-calibration readings (for up to 4 gases)

- An asterisk symbol (*) to indicate a note is attached

**Note:**

For calibration readings, "Fail" indicates a calibration failure, and "N/A" indicates that a gas sensor is missing.

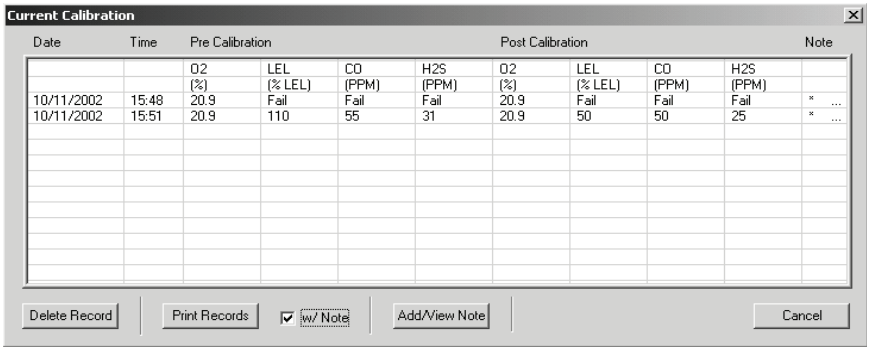



**Figure 9 - Current Calibration dialog box**

- To display the current calibration records, click on the View menu and then on Current Calibration (or simply click on the View Current Calibration button on the toolbar of the Main Screen). A list of all calibration records is displayed for the instrument in that download (See **Figure 9**).

- To delete a calibration record, select the record and click on the Delete Record button.

**WARNING**

**Keep in mind that current calibration records are subsets of the calibration history, so any records deleted from either the Current Calibration dialog or the Calibration History dialog are permanently removed.**

- To add a note to a calibration record, select the record and click on the Add/View Note button. It brings up the Calibration Note dialog box. In this dialog box, type the note and then click on Save. An asterisk (*) is displayed at the end of the record, indicating that a note is attached.

**Note:**

An ellipsis mark (…) at the end of a record indicates that a note can be associated with that record.

- To print the current calibration records for that download while on the Current Calibration dialog box, check on the "w/ Note" check box to indicate all the attached notes are to be printed along with the records (or uncheck it to print without the notes) and click on Print Records.

## 7.7.4 Calibration History

Each calibration record contains the following (See **Figure 10**):

- Date and time for which calibration takes place
- Pre-calibration readings (for up to 4 gases)
- Post-calibration readings (for up to 4 gases)
- An asterisk symbol (*) to indicate a note is attached

## Note:

For calibration readings, "Fail" indicates a calibration failure, and "N/A" indicates that a gas sensor is missing.

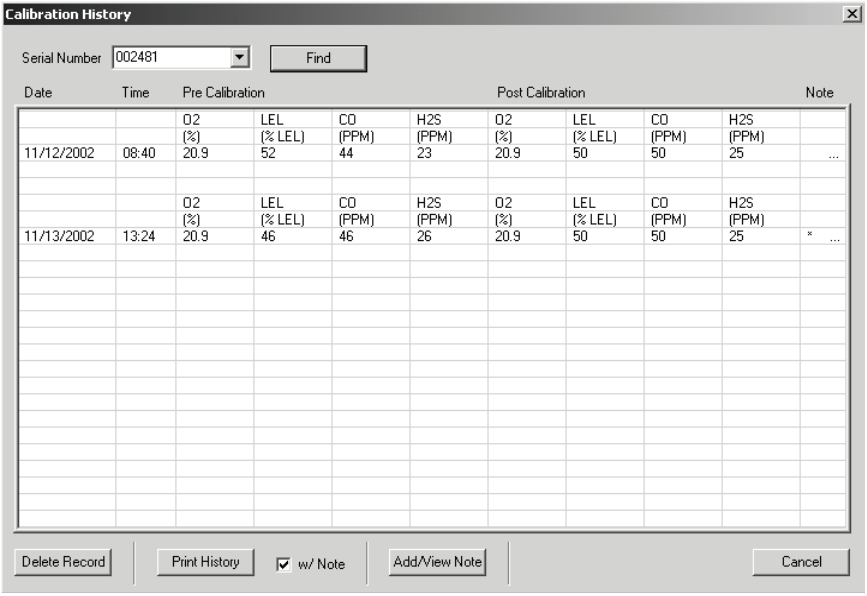



**Figure 10 - Calibration History dialog box**

- To display the calibration history, click on the View menu and then on Calibration History (or simply click on the Calibration History button on the toolbar of the Main Screen). A calibration history is displayed for the selected instrument (See **Figure 10**).

- To select an instrument, select the serial number from the Serial Number drop-down box, or enter the serial number manually in the box and click Find. For example, for an instrument with serial number 1234, append two 0's in the front to make it a 6-digit number, i.e. 001234, and click Find.

- To delete a calibration record, select the record and click on the Delete Record button.

## WARNING

**Current calibration records are subsets of the calibration history, so any records deleted from either the Current Calibration dialog or the Calibration History dialog are permanently removed.**

- To add a note to a calibration record, select the record and click on the Add/View Note button. It brings up the Calibration Note dialog box. In this dialog box, type the note and then click on Save. An asterisk (*) is displayed at the end of the record, indicating that a note is attached.

**Note:**

An ellipsis mark (…) at the end of a record indicates that a note can be associated with that record.

- To print the calibration history while on the Calibration History dialog box, check on the "w/Note" check box to indicate all the attached notes are to be printed along with the history (or uncheck it to print without the notes) and click on Print History.

## 7.7.5 Instrument Parameters

To display the instrument parameters, click on the Communication menu and then on Upload/Modify Instrument Parameters (or simply click on the Upload/Modify Instrument Parameters button on the toolbar of the Main Screen). The Upload/Modify Instrument Parameters dialog box appears (See Figure 11). Parameters in this dialog box can be modified for uploading purposes.

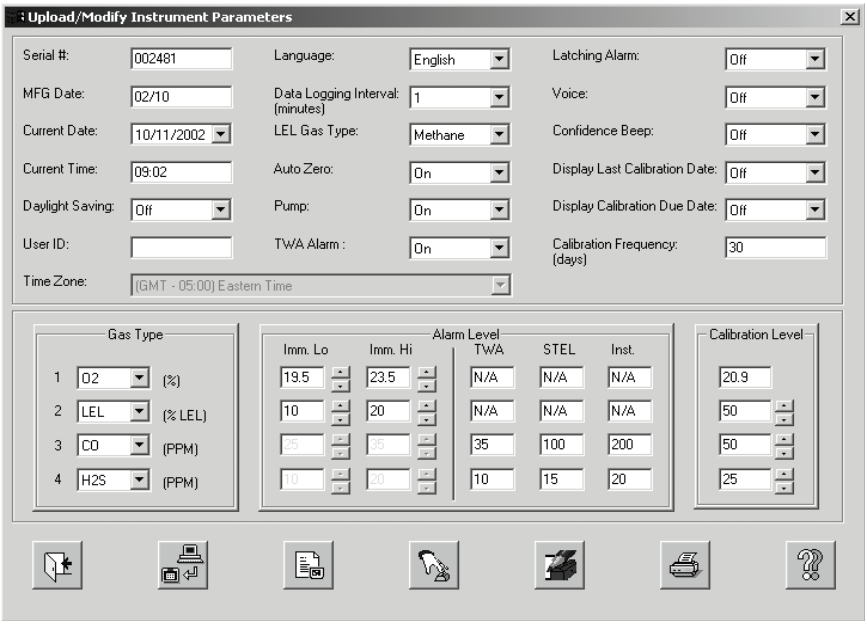



**Figure 11 - Upload/Modify Instrument Parameters dialog box**

The upper section consists of 19 instrument parameters, each of which must have accurate information.

- Serial Number: The serial number is the S/N marked on your MicroMAX PID instrument. Prior to downloading, MAXPID is displayed. After downloading, your instrument's serial number is indicated in this field. Zeroes are placed in front of the serial number to make it a 6-digit number. It is set at the factory and cannot be modified by the user.

- MFG Date: The MFG Date is the manufacture date of your MicroMAX PID instrument. Prior to downloading, 99/12 is displayed. After downloading, your instrument's manufacture date is indicated in this field. It is set at the factory and cannot be modified by the user.

- Current Date: The current date is in MM/DD/YYYY format. This field allows user to transfer the current date to the instrument. To change the current date, click on the down arrow to display a calendar and then click on the correct date.

- Current Time: The current time is in a 24-hour format. The following are a few examples of the time conversion from a 12-hour format to a 24-hour format.

| 12-Hour Format | 24-Hour Format |
|---|---|
| 2:00 p.m. | 14:00 |
| 10:15 a.m. | 10:15 |
| 12 noon | 12:00 |
| 12 midnight | 00:00 |

- Daylight Saving: This feature allows the instrument to be adjusted to daylight saving time. The default setting is OFF. To turn on this feature, select ON for Daylight Saving.

- User ID: The user ID is a user identification number. It is not required to enter the user ID. To create or change it, enter a value up to 12 characters.

- Time Zone: This feature allows the user to view the selected time zone, depending on their location. The default setting is (GMT – 07:00) Mountain Time. To select another time zone, click on

the Config button from the Main Screen's toolbar and select the appropriate time zone.

- Language: There are four kinds of languages available in the MicroMAX PID instrument: English, Spanish, French and German. Both visual and audible messages can be set for the chosen language. The default setting is English. To select another language, click the down arrow and select from the list.

- Data Logging Interval: The interval between data points displayed in the histogram. There are 5 different data logging intervals to choose from 1, 2, 3, 4, and 5 minutes. The default setting is 1 minute. To change the interval, click the down arrow and select from the Data Logging Interval list.

- LEL Gas Type: There are 5 LEL catalytic bead gas types available: methane, propane, pentane, hexane, and xylene. To change the LEL gas type, select the appropriate type from the list.

- Auto-zero: If this feature is enabled on the MicroMAX PID, the instrument will automatically zero itself during the start-up routine. (Regardless, zeroing takes place each time a calibration is completely done). The default setting is ON. To turn off this feature, select OFF for Auto-zero.

- Pump: Pump is required for pre-testing and calibration. However, users may at times prefer to operate the instrument in diffusion mode, for example, when longer run time is desired. The default setting is ON, which represents the pump mode. To go into diffusion mode, select OFF for Pump.

- TWA Alarm: User can choose between two alarm settings: TWA alarm mode and immediate alarm mode. To turn on the TWA alarm mode, set the TWA Alarm option to ON. To turn on the immediate alarm mode, set the TWA Alarm option to OFF. The factory alarm setting is immediate alarm, with values chosen to provide earlier warning than the STEL and TWA settings. The immediate high and immediate low alarms are user-programmable. STEL is the short-term exposure limit over a 15-minute period. TWA is the time weighted average over an 8-hour period. Instantaneous alarm is an exposure level that generates an alarm instantly.

- Latching Alarm: If the instrument goes into gas alarm and latching alarm is set to OFF, the alarm will cease when gas levels fall below the alarm level. If latching alarm is set to ON, the alarm will continue even if gas levels fall below the alarm level. In this case, the latching alarm will stop only when the ON/OFF button is depressed momentarily. The default setting is OFF. To turn on this feature, select ON for Latching Alarm.

- Voice: This feature enables voice messaging while operating the instrument. The default setting is ON. To turn off this feature, select OFF for Voice.

- Confidence Beep: The confidence beep is a visual flash, accompanied by an audible beep every 20 seconds to reassure user that the instrument is working. The default setting is OFF. To turn on this feature, select ON for Confidence Beep.

- Display Last Calibration Date: This feature allows the date for the last calibration to be displayed in the start-up routine each time the instrument is turned on. The default setting is OFF. To turn on this feature, select ON for Display Last Calibration Date.

- Display Calibration Due Date: This feature allows the calibration due date to be displayed in the start-up routine each time the instrument is turned on. The default setting is OFF. To turn on this feature, select ON for Display Calibration Due Date.

- Calibration Frequency: Calibration frequency represents the number of days between calibrations. If Display Calibration Due Date is selected, Calibration Frequency must be specified. The default period is 30 days. To change this option, choose between 1 and 90 days for Calibration Frequency. After this period is chosen, the instrument must be calibrated to initialize the process.

The lower section of the dialog box contains the following information:

- Gas type
- Imm. Lo (Immediate low alarm levels)
- Imm. Hi (Immediate high alarm levels)
- TWA (TWA alarm levels)
- STEL (STEL alarm levels)
- Inst. (Instantaneous alarm levels)
- Calibration Level

**Note:**

Once the gas is chosen, the program automatically provides the correct default TWA alarm levels that conform to United States OSHA recommendations. It also chooses the default values for all other alarm levels and calibration levels. The immediate low alarm levels, immediate high alarm levels, and calibration levels may be changed.

To print the instrument parameters while on this dialog box, simply click on the Print button at the bottom.

To store the instrument parameters to a default user setting, click on the Store User Default Instrument Parameters button. A "Save As" dialog box appears, the user enters a file name to save the user setting.

To restore the instrument parameters from a user setting, click on the Restore User Default Instrument Parameters button. An "Open File" dialog box appears, select the appropriate file, the user setting is then restored.

To restore the instrument parameters to the factory default, click on the Restore Factory Default Instrument Parameters button. The following dialog box appears: "Are you sure that you want to restore the factory default setting?" Click on Yes. When it displays "The factory default instrument parameters are loaded," click on OK.

## 7.8 Editing Location

The Edit Location function allows you to modify the location for a specific download.

- After a data file is opened, click on the Edit menu, then on Edit Location, or simply click on the Edit Location button on the toolbar of the Main Screen. This brings up the Edit Location dialog box.

- In this dialog box, enter a new location of 20 characters or less for the opened file, and click OK.

## 7.9 Editing Note

The Edit Note function allows you to modify the note for a specific download.

- After a data file is opened, click on the Edit menu, then on Create/Edit Note, or simply click on the Create/Edit Note button on the

toolbar of the Main Screen. This brings up the Edit Note dialog box.

- In this dialog box, enter a note for the opened file (up to 2000 characters), and click Save.

## 7.10 Uploading Information to the MicroMAX PID

The Upload function allows you to transfer information from the computer to the instrument. It provides the capability to set date and time in the instrument, as well as modify operating parameters such as the variables in the user setup or supervisory modes or alternative gases other than factory default for VOC detection.

- Follow procedures indicated in **Section 7.5 Starting the Program**.

- Click on the Communication menu and then on Upload/Modify Instrument Parameters.The Upload/Modify Instrument Parameters dialog box (See **Figure 11**) appears.

- In this dialog box, modify the instrument parameters as desired (See **Section 7.7.5 Instrument Parameters**).

**CAUTION**

**Make sure that you have the correct type and number of gases.**

- After verifying that all information is correct, click on the Upload Instrument Parameters button. The following will appear on the screen: "Have you verified that all instrument parameters are correct? Is the cable connected and the instrument ready?"

- Connect the 6-pin connector cable to the instrument, and click on Yes.

- After uploading is complete, the instrument shuts itself off and the computer screen displays "Upload Complete." Click OK and disconnect cable from the instrument.

- To return to the Main Screen, click on the Close button located at the bottom of the window.

## 7.11 Importing Files

The Import File function enables MaxPID Log data files to be imported from another source, such as a drive, a directory on your computer, or a network directory.

- Click on the Utility menu, then on Import File (or simply click on the Import File button on the toolbar of the Main Screen). A dialog box appears.
- In this dialog, browse to the directory that contains the data file(s) to be imported. Usually, this is a folder named as the instrument's serial number, such as 001143.
- Select the directory and click OK. The files can now be accessed in the Open dialog.

## 7.12 Archiving Data

The Archive Data function enables data files to be stored as an archived file with a .csv extension.

- Click on the Utility menu, then on Archive Data, or simply click on the Archive Data button on the toolbar of the Main Screen. This brings up the Archive Data dialog box (See **Figure 13**), which lists all the files available.
- In this dialog box, select the file you wish to archive and click on Archive. The Save As dialog box appears.
- In the File Name box, type the desired filename.
- In the Save In box, select a directory to save the file in. If this is not selected, the file will be saved in "C:\Program Files\MAXPID\ MAXPID Log."
- Click on Save. The file is now saved as a .csv file (comma delimited file).
- The file can be opened in most major spreadsheet programs (such as Microsoft Excel).

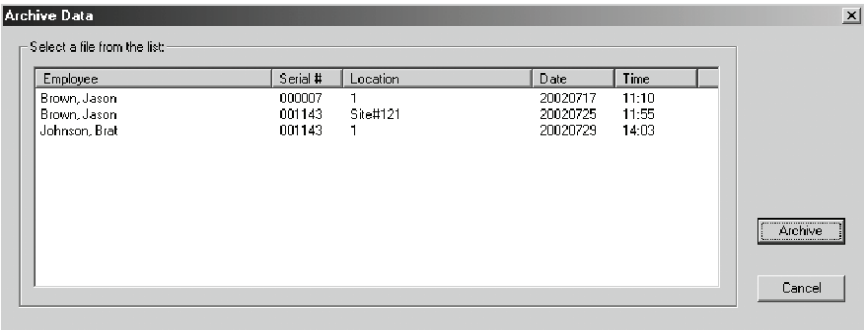



**Figure 12 - Archive Data dialog box**

## 7.13 Recovering Data

The Recover Data function enables the transfer of missing data from a temporary file to the Open dialog for easy access if a file cannot be accessed after a successful download.

- Click on the Utility menu, then on Recover Data, or simply click on the Recover Data button on the toolbar of the Main Screen. The Recover Data dialog box appears.

- In this dialog box, enter the last name, first name, and location, and then click on OK. The file should now appear in the Open dialog where it may be accessed in the normal way.

## 7.14 Getting Help

### 7.14.1 Using MAXPID Log Help

The help function is available from the Main Screen, the Graph Screen, and the Upload/Modify Instrument Parameters dialog box.

### 7.14.2 Honeywell Analytics on the Web

User can access the Honeywell Analytics website from the program. From the Main Screen, click on Help, click on Honeywell Analytics on the Web and then select the area you are interested in.

### 7.14.3 Customer Support

From the Main Screen, click on Help and then on Customer Support. The customer support information is displayed. Click OK to close it.

## 7.14.4 MAXPID Log Version and Copyright

From the Main Screen, click on the Help menu and then on About MAXPID Log. The software version and copyright information is displayed. Click OK to close it.

# 8. Maintenance

## 8.1 Battery Installation

**CAUTION**

**Use only MPRO NiMH rechargeable battery pack or MPRO alkaline battery holder with 4 each of the following alkaline cells only: Duracell Pro-cell-2400, Duracell MN- 2400 and Eveready E-92 or EN-92. Observe proper polarity when installing alkaline batteries.**

**Do not change batteries in a hazardous location.**

Open battery compartment by turning the screw (See **Figure 13**) a half turn counterclockwise to release.

## 8.2 Alkaline Battery Pack Installation

- Refer to Section 8.1 Battery Installation.
- Remove existing battery pack.
- Insert 4 approved alkaline cells into the supplied alkaline battery holder. Observe the polarity indicated in the holder when inserting each cell.
- Insert alkaline battery holder, with 4 approved AAA cells, into the battery compartment. Observe battery pack contacts orientation (See **Figure 14**). This means that the connector end faces the rear of the instrument where it makes electrical contact. Once the end with the connector is pushed in, the rear of the battery pack may be pushed down.
- Push down cover and secure with a half turn clockwise on screw.

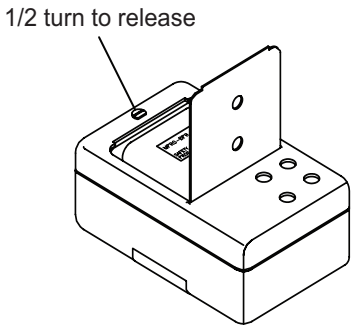



**Figure 13 - Battery Compartment**

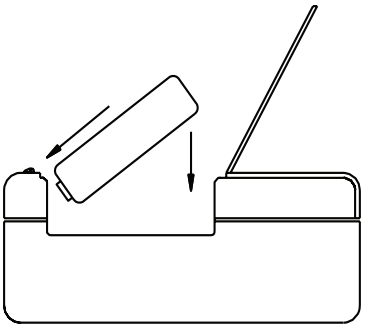


**Figure 14 - Battery Orientation**

## 8.3 NiMH Battery Pack Installation

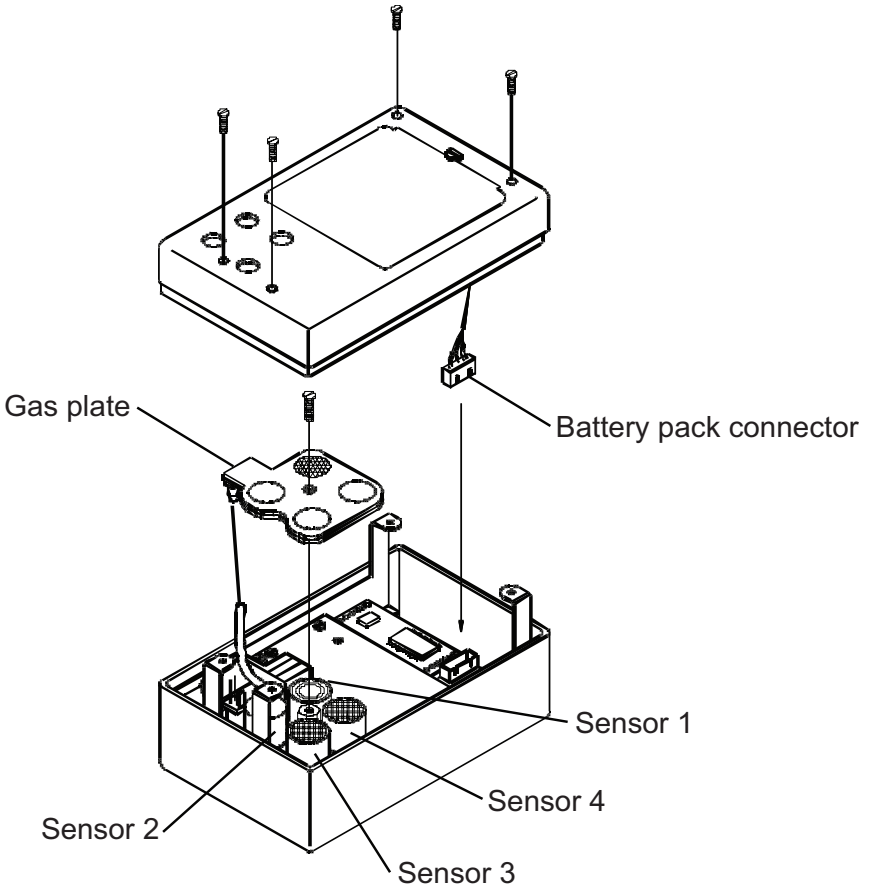
- Refer to Section 8.1 Battery Installation.
- Remove existing battery pack.
- Insert the MPRO NiMH rechargeable battery pack into the battery compartment as shown (See **Figure 14**). The connector end faces the rear of the instrument where it makes electrical contact. Once the end with the connector is pushed in, the rear of the battery pack may now be pushed down.
- Push down cover and secure with a half turn clockwise on screw.
- Charge instrument prior to use.

## 8.4 NiMH Battery Pack – General Information

- The supplied NiMH battery pack represents the latest in battery technology, and as an added benefit, does not have the environmental problems associated with Nickel Cadmium technology.
- It should be left on charge when not in use. There is a small current drain on the pack.
- Periodically, the NiMH battery pack should be allowed to completely run down to prevent the battery pack from developing a "memory" and possibly limiting battery performance.

## 8.5 Sensor Replacement

- Turn off the instrument and remove the 4 screws (See **Figure 15**) securing the top half of the case.
- Disconnect battery pack connector by lifting it straight up.
- Remove the single screw securing the gas plate (See **Figure 15**).
- Remove sensor by lifting it straight up.
- Toxic sensors include a small wafer-thin printed circuit board as part of the sensor assembly. Make sure that this board is removed with the sensor.
- If installing a new toxic sensor, it is necessary to remove any shorting clip or spring attached to the sensor pins.
- Align pins of new sensor with sockets and push down to secure sensor.
- Reconnect gas plate and secure with screw.
- Reconnect battery connector.
- Install case cover and secure with 4 case screws.
- Allow sensors to stabilize for 15 minutes prior to turn-on.
- Calibrate the instrument.




| Sensor Number | Gas |
|---|---|
| Sensor 1 | $O_2$ |
| Sensor 2 | LEL |
| Sensor 3 | VOC or $CO_2$ |
| Sensor 4 | Toxic |

**Figure 15 - Sensor Replaement**

Need section on 8 hour burn-in before use



## 8.6 Removing and adding a Sensor

**CAUTION**

**If you are adding or removing a sensor, be aware of the following:**

- **Adding a sensor. This involves increasing the number of sensors in the instrument. For example, to add a fourth sensor to a three-gas unit, remove the plug, which is located on the gas plate above the new sensor, so that gas is allowed to reach the new sensor.**

- **Removing a sensor. This involves reducing the number of sensors in the instrument. In this event, it is necessary to insert a plug (Part number XIF936) in the gas plate to prevent gas leakage where the vacated sensor no longer resides.**

## 8.7 Cleaning

Clean exterior of instrument with a clean damp cloth. Do not use solvents, soap, polishes etc., on the display.

As the VOC sensor is operating, its response to VOCs may gradually decline over time.

The reason for this decline is the reduction of the lamp's output. Though the lamp has extremely long life expectancy, the lamp's radation can be partially blocked by a film of contaminants deposited on the lamp's window. This may occur when the sensor works in a dirty, humid environment. High sample flow rate typically increases the rate of contamination in this case. Diffusion mode of sample delivery is preferable in that respect.

Cleaning the lamp's window, if performed carefully according to recommended procedure, restores the sensitivity.

### 8.7.1 VOC Sensor Cleaning Frequency

If the sensor is used in a relatively clean environment (for example, for monitoring impurities in specialty gases), then it can run for months without any maintenance, keeping its characteristics unchanged.

On the opposite, if sensor works in dirty, humid environment, it may lose its sensititvity in the course of a workday. Certain "sticky" chemicals will contaminate the lamp quickly (for example, volatile silicones).

On the application side, cleaning frequency depends on the user's goals, for example: what sensitivity (or Minimum Detectable, MD) is required for user's particular application. The sensors come from the factory having the original sensitivity of 0.36 to 0.96 mV/ppm (Isobutylene at normal barometric pressure).

This range of sensitivity provides for the MD of better than 0.1 ppm. For this MDQ, the sensor needs sensitivity no less than 0.2 mV/ppm. Therefore, if the MDQ of 0.1 ppm is required, the lamp cleaning should be done if the sensitivity drops below 0.2 mV/ppm.

The sensor in this case should be calibrated frequently and lamp must be cleaned as soon as calibration reports sensitivity <0.2 ppm.

When the MD is not important, the sensor is still usable even though the sensitivity is 0.1 mV/ppm or lower. MD is going to be reversely proportional to the sensitivity. For example, if calibration reports the sensitivity of 0.05 ppm, then the sensor's MD is about 0.4 ppm Isobutylene.

See **Appendix K - VOC Sensor Lamp Cleaning** for detailed instruction on VOC sensor lamp cleaning.

## 8.8 Pump Inlet Filter Replacement

- If the inlet filter is clogged, the flow rate of the pump is decreased, and in severe cases, the instrument will go into low flow alarm, or the pump can be heard to be struggling under the increased load caused by the restriction.

- To replace the filter, use tweezers to pull out the tubing and filter. Install a new filter (Part number XIP604) and secure with 0.05" of tubing (Part number GFV194). The new filter is held in place by the tubing (Part number GFV194).

## 8.9 Sampling Hose Maintenance

- Check water trap (Part number GFV196), the spherical disc located near the middle of the sampling hose, periodically to make sure it is clean and unobstructed. Replace if necessary.

- Check the porous dust cap (Part number 20HFC), located at the

very end of the sampling hose, periodically to make sure it is clean and unobstructed. Replace if necessary.

## 8.10 Storage

If the instrument will be out of service for more than 2 months:

- Charge NiMH battery pack.
- Remove NiMH or alkaline pack from instrument.
- Remove O2 sensor if more than two years old.
- Store the instrument in a dust and contaminant-free area.
- Store the instrument at ambient temperature.

## 8.11 Sensor And Battery Disposal

The U.S. Environmental Protection Agency (EPA) governs the disposal of waste products in the United States. EPA Regulations are listed in the code of Federal Regulations, CFR40, entitled “Protection of Environment.” Individual states and local communities may also establish regulations covering disposal of waste products. These may be more stringent than Federal Regulations and may cover disposal of household waste, which is not included in Federal Regulations. Thus, state and local agencies should be contacted for their disposal requirements.

See Honeywell Analytics website (www.honeywellanalytics) for information on WEEE and RoHS compliance.

Need section on IR fail messages and modes.
PID sensor fail - what is the protocol?

# 9. Troubleshooting

## 9.1 Sensor Not Recognized ("XXX" Displayed)

When "XXX" is shown in sensor position on the display, it indicates a missing or defective sensor. If it is a LEL sensor, the sensor may need to be zeroed using the procedure in Section 9.2 "LEL FAIL" Message.

## 9.2 "LEL Fail" Message

When this message comes up after start-up, you can reset the zero base of the LEL sensor as follows:

Turn on the instrument.

1. When the instrument displays "TESTING" and "PLEASE WAIT" and starts to count down from 30, depress and hold the MODE button for about 5 seconds, until display reads "EDIT PID SETTING".

2. Open the instrument by removing the 4 screws from the rear cover of the case. Do not unplug the wires from the rear cover to the sensor board. Observe the potentiometer (trimpot) for the LEL zero. It is located beside the pump and is the only potentiometer (trimpot) in the instrument.

3. Set digital voltmeter to the DC voltage range, black lead to test point 12 (analog ground) and the red lead to test point 10. These test points are on the same sensor board as the pump, trimpot and sensors.

4. Adjust the potentiometer (trimpot) for a reading of 0.500 volts (+/- 0.005 volts).

5. Reinstall cover.

6. Exit supervisory mode.

## 9.3 Low Flow Alarm When Sampling Hose Attached

Low flow alarm is activated when a sampling hose is connected.

1. Clean the stone filter at end of sampling hose.
2. Make sure that the sampling hose, or water-trap is not "kinked" or blocked with debris.
3. Remove sampling hose, clean or replace inlet filter.

## 9.4 "Calibration Fail" Message

Check for proper gas concentration and expiration date.

## 9.5 Instrument Will Not Turn On

Charge instrument or install fresh alkaline batteries.

## 9.6 Instrument Is In Diffusion Mode But Pump Comes on When Calibrating

This is normal instrument behavior. The pump will automatically turn off when calibration is complete.

All appendicies need to be reviewed and updated for PID

## Appendix A - Specifications

(A) Mechanical

Dimensions 4.75”L x 3”H x 1.8”D

(120.65mm x 76.2mm x 45.72mm)

Weight < 17.6 ounces (498.96 grams)

**(B) Operating Temperature Range**

-4 degrees F to + 122 degrees F

(-20 degrees C to + 50 degrees C)

**(C) Operating Relative Humidity Range**

Continuous 0-90% (Noncondensing)

Intermittent 0-95% (Noncondensing)

**(D) Power Sources**

Rechargeable NiMH battery pack or 4 AAA alkaline batteries

**(E) Battery Life**

Rechargeable NiMH pack 12 hours minimum

4 AAA alkaline batteries 9 hours

**(F) Alarm Outputs**

Audible >90db at 1 foot

Visual Large LED bar; Flashing display characters

### (G) Gas Ranges and Resolution

| Sensor | Instrument Range | Resolution |
|---|---|---|
| Combustible (catalytic LEL) | 0-100% LEL (or 0-5% $CH_4$) | 1% LEL (or 0.1% $CH_4$) |
| Combustible (LEL by IR) | 0-100% LEL | 1% LEL |
| Combustible (% by vol IR)* | 0-100% $CH_4$ | 0.1 % (0-9.9%), 1% (10-100%) |
| Heavy Hydrocarbon (LEL) | 0-100% LEL | 1% LEL |
| Oxygen ($O_2$) | 0-40% | 0.1% |
| Carbon Dioxide ($CO_2$) | 0-5% | 0.1% |
| Carbon Monoxide (CO) | 0-999 ppm | 1 ppm |
| Hydrogen Sulfide ($H_2S$) | 0-500 ppm | 1 ppm |
| Sulfur Dioxide ($SO_2$) | 0-20 ppm | 0.1 ppm |
| Phosphine ($PH_3$) | 0-20 ppm | 0.1 ppm |
| Ammonia ($NH_3$) | 0-500 ppm | 1 ppm |
| Chlorine ($Cl_2$) | 0-20 ppm | 0.1 ppm |
| Combo-Tox ($CO/H_2S$) | 0-500 ppm | 1 ppm |
| Nitrogen Dioxide ($NO_2$) | 0-50 ppm | 0.1 ppm |
| Hydrogen Cyanide (HCN) | 0-50 ppm | 1 ppm |
| Volatile Organic Compounds (VOCs) | 0-999 ppm | 0.1 ppm (0-99.9 ppm)<br>1 ppm (100-999 ppm) |
| *Hydrogen cannot be monitored by the % by vol IR sensor. | | |

**WARNING**

**If instrument is used in oxygen environments below 10%, the displayed LEL reading will be lower than actual value. In this event, use of dilution tube, part number MAX-DT, is recommended.**

### (H) Repeatability

+/- 2%

## (I) User Programmable High and Low Alarm Set Points

| Sensor | Increment | Low Range (Default) | High Range (Default) |
|---|---|---|---|
| Oxygen ($O_2$) | 0.5% | 18.0-20.5% (19.5%) | 21.5-25% (23.5%) |
| Combustible (%LEL) | 5% LEL | 5-20% LEL (10% LEL) | 15-50% LEL (20% LEL) |
| Combustible (% LEL by IR) | 5% LEL | 5-20% LEL (10% LEL) | 15-50% LEL (20% LEL) |
| Heavy Hydrocarbons (LEL) | 5% LEL | 5-20% LEL (10% LEL) | 15-50% LEL (20% LEL) |
| Combustible (% by vol IR) | 0.1% | 0-3.0% | 0.5-3.0% |
| Carbon Dioxide ($CO_2$) | 0.1% | Default is 0.5% | Default is 1.0% |
| Carbon Monoxide (CO) | 5 ppm | 10-50 ppm (25 ppm) | 35-400 ppm (35 ppm) |
| Hydrogen Sulfide ($H_2S$) | 1 ppm | 5-15 ppm (10 ppm) | 10-25 ppm (20 ppm) |
| Sulfur Dioxide ($SO_2$) | 0.5 ppm | 0.5-2.0 ppm (1.0 ppm) | 1.0-5.0 ppm (2.0 ppm) |
| Phosphine ($PH_3$) | 0.1 ppm | 0.2-0.5 ppm (0.2 ppm) | 0.3-1.0 ppm (0.3 ppm) |
| Ammonia ($NH_3$) | 5 ppm | 5-20 ppm (15 ppm) | 20-50 ppm (25 ppm) |
| Chlorine ($Cl_2$) | 0.1 ppm | 0.3-1.0 ppm (0.3 ppm) | 0.5-2.0 ppm (0.5 ppm) |
| Combo-Tox ($CO/H_2S$) | 5 ppm | 20-50 ppm (25 ppm) | 0.3-1.0 ppm (0.5 ppm) |
| Nitrogen Dioxide ($NO_2$) | 0.5 ppm | 0.5-3.0 ppm (3.0 ppm) | 25-100 ppm (35 ppm) |
| Hydrogen Cyanide (HCN) | 1 ppm | 3-5 ppm (5 ppm) | 2.0-5.0 ppm (5.0 ppm) |
| Volatile Organic Compounds (VOCs) | 0.1 ppm | 0-50.0 ppm (50.0 ppm) | 50-99.9 ppm (99.9 ppm) |

### (J) Time Weighted Averages (only if TWA On is Selected) (VOC and Toxic sensors only)

| Sensor | Instantaneous | STEL | TWA |
|---|---|---|---|
| Carbon Dioxide ($CO_2$) | 200 ppm | 100 ppm | 35 ppm |
| Carbon Monoxide (CO) | | | 25.ppm |
| Hydrogen Sulfide ($H_2S$) | 20 ppm | 15 ppm | 10 ppm |
| Sulfur Dioxide ($SO_2$) | 10 ppm | 5 ppm | 2 ppm |
| Phosphine ($PH_3$) | 5 ppm | 1 ppm | 0.3 ppm |
| Ammonia ($NH_3$) | 50 ppm | 35 ppm | 25 ppm |
| Chlorine ($Cl_2$) | 5 ppm | 1 ppm | 0.5 ppm |
| Combo-Tox ($CO/H_2S$) | 200 ppm | 100 ppm | 35 ppm |
| Nitrogen Dioxide ($NO_2$) | 5 ppm | 5 ppm | 3 ppm |
| Hydrogen Cyanide (HCN) | 10 ppm | 5 ppm | 5 ppm |
| Volatile Organic Compounds (VOCs) | | 25 ppm | 10 ppm |

### (K) User Programmable Calibration Gas Levels

| Sensor | Increment | Range | Defaults |
|---|---|---|---|
| Combustible (% LEL) | 5% LEL | 5-60% LEL | 50% LEL |
| Combustible (% LEL by IR) | 5% LEL | 5-60% LEL | 50% LEL |
| Heavy Hydrocarbon (% LEL) | 5% LEL | 5-60% LEL | 50% LEL |
| Combustible (% by vol IR) | 0.5% | 1-3% | 2.5% $CH_4$ |
| Carbon Dioxide ($CO_2$) | 0.5% | 1-3% | 2.5% |
| Carbon Monoxide (CO) | 5 ppm | 50-300 ppm | 50 ppm |
| Hydrogen Sulfide ($H_2S$) | 5 ppm | 5-25 ppm | 25 ppm |
| Sulfur Dioxide ($SO_2$) | 5 ppm | 5-20 ppm | 10 ppm |
| Phosphine ($PH_3$) | 0.1 ppm | 1-5 ppm | 5 ppm |
| Ammonia ($NH_3$) | 5 ppm | 10-50 ppm | 25 ppm |
| Chlorine ($Cl_2$) | 1 ppm | 1-10 ppm | 10 ppm |
| Combo-Tox ($CO/H_2S$) | 5 ppm | 50-300 ppm | 50 ppm CO |
| Nitrogen Dioxide ($NO_2$) | 1 ppm | 2-10 ppm | 10 ppm |
| Hydrogen Cyanide (HCN) | 1 ppm | 5-20 ppm | 10 ppm |
| Volatile Organic Compounds (VOCs) | * | 100 ppm | 100 ppm |

* Not applicable. Calibration level cannot be changed by user.

### (L) Voice Messaging

User selectable languages:

- English
- French
- Spanish
- German

### (M) Response Time Data

| Gas | Response Time ($T_{90}$) Seconds |
|---|---|
| Oxygen ($O_2$) | 10 |
| Combustible (LEL) | 20 |
| Combustible (LEL by IR) | |
| Carbon Dioxide ($CO_2$) | |
| Carbon Monoxide (CO) | 8 |
| Hydrogen Sulfide ($H_2S$) | 15 |
| Sulfur Dioxide ($SO_2$) | 5 |
| Phosphine ($PH_3$) | 23 |
| Hydrogen Cyanide (HCN) | 21 |

**Note:**

Consult factory for response time data for other gases.

### (N) Cross Sensitivity Data

| **Carbon Monoxide (CO)** | | |
|---|---|---|
| **Gas** | **Concentration (ppm)** | **Typical Response (ppm)** |
| Hydrogen ($H_2$) | 1000 | 140 |
| Methane ($CH_4$) | 10,000 | <1 |
| Ethylene | 50 | 154 |
| Carbon Monoxide (CO) | 100 | 100 |
| Carbon Dioxde ($CO_2$) | 25,000 | <2 |
| Sulfur Dioxide ($SO_2$) | 25 | 38 |
| Nitric Oxide (NO) | 100 | 44 |
| Hydrogen Sulfide ($H_2S$) | 25 | 0 |

| **Hydrogen Sulfide ($H_2S$)** | | |
|---|---|---|
| **Gas** | **Concentration (ppm)** | **Typical Response (ppm)** |
| Hydrogen ($H_2$) | 500 | 15 |
| Methane ($CH_4$) | 10,000 | <1 |
| Ethylene | 500 | 15 |
| Carbon Monoxide (CO) | 100 | 7 |
| Carbon Dioxde ($CO_2$) | 10,000 | <3 |
| Hydrogen Sulfide ($H_2S$) | 25 | 25 |

| **Sulfur Dioxide ($SO_2$)** | | |
|---|---|---|
| **Gas** | **Concentration (ppm)** | **Typical Response (ppm)** |
| Carbon Monoxide (CO) | 300 ppm | <3 ppm |
| Hydrogen Sulfide ($H_2S$) | 15 ppm | 5 ppm |
| Nitric Oxide (NO) | 35 ppm | 0 ppm |
| Nitrogen Dioxide ($NO_2$) | 5 ppm | -5 ppm |
| Chlorine ($Cl_2$) | 1 ppm | no data |
| Hydrogen ($H_2$) | 100 ppm | no data |
| Hydrogen Cyanide (HCN) | 10 ppm | no data |
| Hydrogen Chloride ($HCl_2$) | 5 ppm | no data |
| Ethylene | 100 ppm | no data |

| **Phosphine ($PH_3$)** | | |
|---|---|---|
| **Gas** | **Concentration (ppm)** | **Typical Response (ppm)** |
| Arsine ($AsH_3$) | 150 ppb | 120 ppb |
| Silane ($SiH_4$) | 1000 ppb | 900 ppb |
| Diborane ($B_2H_6$) | 300 ppb | 100 ppb |
| Germane ($GeH_4$) | 600 ppb | 510 ppb |
| Sulfur Dioxide ($SO_2$) | 5 ppm | 1 ppm |
| Hydrogen ($H_2$) | 100 ppm | <0.1 ppm |
| Ethylene | 100 ppm | 1.8 ppm |

| **Ammonia ($NH_3$)** | | |
|---|---|---|
| **Gas** | **Concentration (ppm)** | **Typical Response (ppm)** |
| Hydrogen Sulfide ($H_2S$) | 10 | 0 (Note 1) |
| Sulfur Dioxide ($SO_2$) | 2 | 0 |
| Hydrochloric Acid (HCl) | 5 | 0 |
| Phosphine ($PH_3$) | 300 | 0 |
| Carbon Monoxide (CO) | 1000 | 0 |
| Carbon Dioxide ($CO_2$) | 5000 | 0 |
| Nitrogen ($N_2$) | 1,000,000 | 0 |
| Chlorine ($Cl_2$) | 1 | 0 |
| Hydrogen ($H_2$) | 10,000 | 0 |
| Hydrocarbons | 10,000 | 0 |
| Hydrogen Cyanide (HCN) | 10 | 0 |
| Hydrogen Selenide ($H_2Se$) | 0.1 | 0 |
| Diborane ($B_2H_6$) | 0.1 | 0 |
| Arsine ($AsH_3$) | 1 | 0 |
| Germane ($GeH_4$) | 1 | 0 |
| Hydrogen Fluoride (HF) | 4 | 0 |
| Alcohols | 1000 | 0 |
| Note 1: Short term in minute range | | |

| **Hydrogen Cyanide (HCN)** | | |
|---|---|---|
| **Gas** | **Concentration (ppm)** | **Typical Response (ppm)** |
| Hydrogen Sulfide ($H_2S$) | 10 | 40 |
| Sulfur Dioxide ($SO_2$) | 2 | 0 (Note) |
| Hydrochloric Acid (HCl) | 5 | 0 (Note) |
| Phosphine ($PH_3$) | 0.3 | 0 |
| Carbon Monoxide (CO) | 1000 | 0 |
| Carbon Dioxide ($CO_2$) | 5000 | 0 |
| Nitrogen ($N_2$) | 1,000,000 | 0 |
| Chlorine ($Cl_2$) | 5 | -1 |
| Hydrogen ($H_2$) | 1000 | 0 |
| Nitrogen Dioxide ($NO_2$) | 10 | -12 |
| Hydrocarbons | 10,000 | 0 |
| Nitrogen Monoxide (NO) | 100 | 0 |
| Arsine ($AsH_3$) | 0.1 | 0 |
| Hydrogen Fluoride (HF) | 3 | 0 |
| Alcohols | 1000 | 0 |
| Ozone | 0.1 | 0.2 |
| Note: Short term exposure minutes | | |

| **Chlorine ($Cl_2$)** | | |
|---|---|---|
| **Gas** | **Concentration (ppm)** | **Typical Response (ppm)** |
| Hydrogen Sulfide ($H_2S$) | 10 | -0.3 (Note 1) |
| Sulfur Dioxide ($SO_2$) | 5 | 0 |
| Carbon Monoxide (CO) | 300 | 0 |
| Carbon Dioxide ($CO_2$) | 10,000 | 0 |
| Nitrogen ($N_2$) | 1,000,000 | 0 |
| Nitrogen Dioxide ($NO_2$) | 10 | 1.2 |
| Bromine ($Br_2$) | 1 | 1 |
| Fluorine (F2) | 1 | 0.44 |
| Chlorine Dioxide ($ClO_2$) | 0.25 | 0.05 |
| Hydrogen Chloride (HCl) | 20 | 0 |
| Hydrocarbons | 10,000 | 0 |
| Hydrogen ($H_2$) | 1000 | 0 |
| Hydrogen Cyanide (HCN) | 10 | 0 |
| Ethanol ($C_2H_6O$) | 66,000 | 0 |
| Ammonia ($NH_3$) | 65 | 0 |
| Note 1: Continuous exposure will damage cell | | |

| **Nitrogen Dioxide ($NO_2$)** | | |
|---|---|---|
| **Gas** | **Concentration (ppm)** | **Typical Response (ppm)** |
| Hydrogen Sulfide ($H_2S$) | 10 | no data |
| Sulfur Dioxide ($SO_2$) | 50 | 0 |
| Hydrochloric Acid (HCl) | 5 | 0 |
| Phosphine ($PH_3$) | 0.1 | 0 |
| Carbon Monoxide (CO) | 1000 | 0 |
| Carbon Dioxide ($CO_2$) | 5000 | 0 |
| Nitrogen ($N_2$) | 1,000,000 | 0 |
| Chlorine ($Cl_2$) | 1 | 0 |
| Hydrogen ($H_2$) | 1000 | 0 |
| Hydrocarbons | 10,000 | 0 |
| Ammonia ($NH_3$) | 30 | 0 |
| Ozone ($O_3$) | 1 | 0.7 |
| Diborane ($B_2H_6$) | 0.1 | 0 |
| Arsine ($AsH_3$) | 0.1 | 0 |
| Germane ($GeH_4$) | 1 | 0 |
| Fluorine ($F_2$) | 3 | 0 |
| Alcohols | 1000 | 0 |
| Nitrogen Monoxide (NO) | 100 | 0 |

| **Combo-Tox ($CO/H_2S$)** | | |
|---|---|---|
| **Gas** | **Concentration (ppm)** | **Typical Response (ppm)** |
| Hydrogen Sulfide ($H_2S$) | 15 | 38 |
| Sulfur Dioxide ($SO_2$) | 5 | 2.5 |
| Nitric Oxide (NO) | 35 | 10 |
| Nitrogen Dioxide ($NO_2$) | 5 | -3 |
| Chlorine ($Cl_2$) | 1 | <-1 |
| Hydrogen ($H_2$) | 100 | <40 |

## LEL Cross Sensitivity Data

### CAUTION

**The following is ONLY applicable to the catalytic %LEL sensor. It is NOT applicable to IR %LEL, IR %VOL and heavy hydrocarbon %LEL sensors.**

| Gas/Vapor | Relative Span |
|---|---|
| Acetone | 50 |
| Allyl Alcohol | 50 |
| Benzene | 44 |
| Butane | 51 |
| Butan-2-one (MEK) | 48 |
| Butyl Acetate | 36 |
| Cyclohexane | 44 |
| Di n-Butyl Ether | 43 |
| Ethane | 82 |
| Ethanol | 64 |
| Ethene | 81 |
| Ethyll Acetate | 46 |
| Ethyl Benzene | 30 |
| Ethylene Oxide | 64 |
| Hexane | 46 |
| Heptane | 44 |
| Hydrogen | 107 |
| Methane | 100 |
| Methanol | 84 |
| Methylamine | 80 |
| Methylethylketone | 48 |
| Methyl, t-Butylether | 44 |
| n-Propanol | 50 |
| Octane | 38 |
| Pentane | 50 |
| Propane | 63 |
| Propan-2-ol (IPA) | 49 |

| Gas/Vapor | Relative Span |
|---|---|
| Propylene | 64 |
| Propylene Oxide | 46 |
| Styrene | 32 |
| Tetrahydrofuran | 64 |
| Toluene | 44 |
| t-Butylalcohol | 74 |
| Xylene | 31 |

**Note:**

This section below should be disregarded if you have chosen "LEL GAS TYPE" in the supervisory mode.

The cross sensitivity data above contains the relative span for a number of combustible gases. This information enables the following cross sensitivity calculations:

1. Instrument reading in LEL when exposed to a specific combustible gas included in the table:

$$\text{Instrument reading in LEL} = \frac{\text{LEL concentration of gas applied X relative span of gas applied}}{\text{relative span of calibration gas}}$$

Example 1: What will an instrument, calibrated to methane, read when exposed to 10% toluene?

$$\text{Calculation} = \frac{10 \text{ X } 44}{100} = \textbf{4.4\% LEL Toluene}$$

2. The actual gas concentration applied to an instrument when an LEL reading is observed:

$$\text{Gas Concentration applied (LEL)} = \frac{\text{Instrument reading (LEL) X relative span of calibration gas}}{\text{relative span of gas applied}}$$

Example 2: An instrument, calibrated to methane, reads 22% LEL when exposed to propane. What level of propane is being applied?

$$\text{Calculation} = \frac{22 \text{ X } 100}{63} = \textbf{34.9\% LEL Propane}$$

**VOC Cross Sensitivity Data**

To determine a response factor for a target chemical, perform the following simple procedure:

1. Calibrate the MicroMAX PID monitor using isobutylene as the span gas.

2. On the monitor, set the sample gas name to isobutylene.

3. Apply a known concentration of the target chemical to the monitor and note the concentration reported in the display.

The response factor for the target chemical relative to isobutylene is:

$$\text{Response Factor of Target Gas} = \frac{\text{Actual known concentration}}{\text{Concentration reported by instrument}}$$

Example Calculation

A monitor is calibrated on isobutylene, and the sample gas is defined as isobutylene. When sampling 110 ppm of benzene in air, the instrument reports a concentration of 200 ppm. In this example, the response factor for benzene relative to isobutylene would be:

$$\text{Response Factor of benzene} = \frac{\text{110 ppm known concentration benzene}}{\text{200 ppm reported by instrument}} = 0.55$$

When surveying, if benzene is selected as the sample gas in the Sample Gas page, the instrument would use this response factor to calculate the concentration.

If a chemical has a response factor between zero and one, the monitor has a higher detector response for this chemical than isobutylene. If the response factor is greater than one, the monitor has a lower detector response for this chemical than isobutylene.

**(0) General**

**Sample Flow Rate:**

The pump in the MicroMAX PID samples at 450 cc/minute. Use of the supplied sampling accessories requires the user to be aware that delay time will occur based on the length of tubing. Refer to **Section 4.5 Remote Sampling (Pretesting)** for details. If the sample flow is restricted or below pre-determined limits, the MicroMAX PID will indicate a flow failure alarm and for safety reasons will automatically switch to diffusion mode. In diffusion mode, the sampling pump does not operate but the instrument is fully operational and will sense the atmosphere surrounding the instrument.

Refer to **Section 8.8 Pump Inlet Filter Replacement** for maintenance.

DO NOT USE non-standard sampling tube or fittings.

**Storage:**

| | |
|---|---|
| Temperature Range: | +10 degrees C to + 30 degrees C<br>(50 degrees F to + 86 degrees F) |
| Humidity Range: | 0-95% (Noncondensing) |
| Expected Life: | Instrument - 10 Years<br>Sensors - 2 Years<br>Batteries - NiMH 2 Years<br>PID Lamp - 5000 Hours |

**Oxygen Enriched Atmospheres:**

This instrument is safe for use in normal oxygen (20.9%v/v) atmosphere. In enriched oxygen atmospheres (above 21%) extreme caution should be exercised as electrical safety certification is not applicable nor has it been tested as being safe to use in such atmospheres.

**Oxygen Deficient Atmospheres:**

The LEL readings cannot be relied upon in atmospheres deficient of oxygen. For example, most catalytic sensors cannot be relied upon when oxygen is lower than 10% v/v.

Use extreme caution when the oxygen readings are below 10% v/v and do not enter any confined space when oxygen alarm is operating and/or reading shows less than 19.5% v/v.

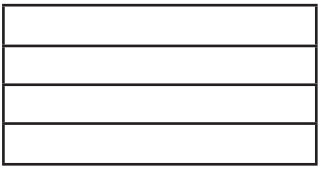
# Appendix B - Alarm Modes

| | Display | | | | LED | Speaker |
|---|---|---|---|---|---|---|
| Low Gas Alarm<br>Voice: DANGER for $O_2$ only | OX | LEL | CO | H2S |  |  <br>3 Beeps<br>"WARNING" or "DANGER" for $O_2$ |
| | 20.9 | 0 | 0 | 0 | | |
| | WARNING | | | | | |
| | P 08:49 | | | B■■■■■■ | Flash | |
| High Gas Alarm | OX | LEL | CO | H2S |  |  <br>3 Beeps<br>"DANGER" |
| | 20.9 | 0 | 0 | 0 | | |
| | DANGER | | | | | |
| | P 08:49 | | | B■■■■■■ | Flash | |
| Low Flow Alarm | OX | LEL | CO | H2S |  |  <br>CONTINUOUS HORN |
| | 20.9 | 0 | 0 | 0 | | |
| | LOW FLOW | | | | | |
| | P 08:49 | | | B■■■■■■ | Flash | |
| Pump Fail Alarm | OX | LEL | CO | H2S |  |  <br>LONG CONTINUOUS Beep |
| | 20.9 | 0 | 0 | 0 | | |
| | PUMP FAIL | | | | | |
| | P 08:49 | | | B■■■■■■ | Flash | |
| Low Battery Warning | OX | LEL | CO | H2S | |  <br>2 SHORT Beeps<br>15 to 20 SEC |
| | 20.9 | 0 | 0 | 0 | | |
| | LOW BATTERY | | | | | |
| | P 08:49 | | | B■■■■■■ | | |
| Battery Depleted | OX | LEL | CO | H2S | |  <br>5 Beeps<br>TURN OFF |
| | 20.9 | 0 | 0 | 0 | | |
| | BATT. DEPLETED | | | | | |
| | P 08:49 | | | B■■■■■■ | | |

## Appendix C - Charging Screens

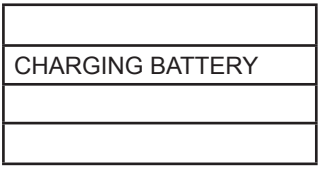
"BLANK"

1. When unit is turned off.
2. When an attempt is made to turn on but battery is very low.



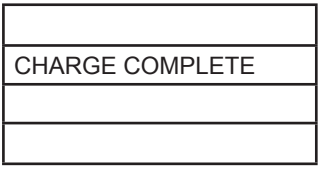
"CHARGING"

1. When charger is connected and charging.



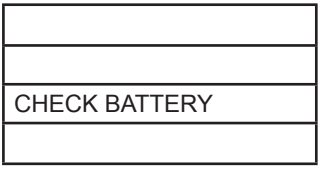

"CHARGE COMPLETE"

1. Remains on screen until charger is removed.




"CHECK BATTERY"

1. When unit is placed on charge with alkaline battery.
2. When unit is placed on charge with a defective battery, or if battery is defective.
3. When unit is placed on charge without battery.



## Appendix D - Calibration Kits

| Model Number | Description |
|---|---|
| MPRO-KIT #1 | Kit containing 58-liter calibration gas cylinder (GFV207-CH4, CO, H2S, balance air), regulator with gauge, tubing, and high impact waterproof carrying case (MCC215A). |
| MPRO-KIT #1-MINI | Kit containing 34-liter calibration gas cylinder (GFV243-CH4, CO, H2S, balance air), regulator, tubing, and water resistant carrying case (MCC210A). |
| MPRO-KIT #2 | Kit containing 103-liter calibration gas cylinder (GFV123-CH4, CO, balance air), regulator with gauge, tubing, and high impact waterproof carrying case (MCC215A). |
| MPRO-KIT #5 | Alarm test kit containing “bump check” gas cylinder (TEST-1A), and water resistant carrying case (MCC210A). |
| MPRO-KIT #7 | Kit containing 23-liter minimix calibration gas in steel cylinder (GFV1090-CH4, CO, balance air), regulator, tubing, and water resistant carrying case (MCC210A). |
| MPRO-KIT #10-MINI | Kit containing 34-liter calibration gas cylinder (GFV279-CH4, CO, SO2, balance air), regulator, tubing, and water resistant carrying case (MCC210A). |
| TEST-1A | Alarm check gas - single canister. |
| TEST-1A-6 | Alarm check gas - six pack. |
| TEST-1A-12 | Alarm check gas - twelve pack. |

## Appendix E - Optional Accessories

| Model Number | Description |
|---|---|
| MPRO-15 | Adapter for single battery charging |
| MPRO-2 | 230V 50Hz AC Battery Charger |
| MPRO-6 | Vehicle Charger |
| MAX-18 | Collapsible 30” fiberglass search probe |
| MAX-19 | Collapsible 30” aluminum search probe |
| 16-21 | 4” Filter w/Water Trap and Dust Filter |
| 16HEX-10 | 10’ Hose Extension w/Fittings |
| 16HEX-20 | 20’ Hose Extension w/Fittings |
| MAX-DT | Dilution Tube |
| MC215A | Waterproof briefcase style case (Holds monitor and calibration kit) |
| GSR-02 | 3’ Carbon Fiber Sample Probe |
| GSR-03-RVS | 3’ Stainless Steel Sample Probe |
| GMK-01 | 3’ Sample Line and Hydrophobic Filter for GSR-Series Sample Probes |

## Appendix F - Replacement Parts

| Model Number | Description |
|---|---|
| MPRO-BPR | NiMH Rechargeable Battery Pack |
| MPRO-1 | 120V AC 4 Hour Charger for MPRO-BPR |
| MPRO-BPA | Alkaline Battery Holder |
| MPID-LAMP01 | Replacement PID 10.6eV Lamp |
| MCF-930 | Rubber Boot |
| 16-27T | 10' Sampling Hose w/Water and Dust Filters withTygon tubing (use with VOC, $SO_2$, Cl, $PH_3$, $NH_3$ and $NO_2$) |
| 16-PFC | 2.5 " Dust Filter |
| GFV107 | PVC Tubing (per foot) |
| GFV256 | Tygon Tubing (per foot) |
| GFV196 | Replacement Water Filter |
| 20HFC | Replacement Dust Filter |
| MPID-DATALOG | Data Logging Software and Cable |
| MPID-LOG | Data Logging Software (CDROM) |
| MPRO-COMM | Data Logging Communications Cable |
| MPRO-02 | $O_2$ Sensor with ID Board |
| MPRO-CL | Chlorine Sensor with ID Board |
| MPRO-CLO | Chlorine Dioxide Sensor with ID Board |
| MPRO-NO2 | Nitrogen Dioxide Sensor with ID Board |
| MPRO-ES-P | Heavy Hydrocarbon Sensor |
| MPRO-ES-S | LEL Sensor |
| MAX-CS-S | Carbon Monoxide Sensor with ID Board |
| MAX-HS-S | Hydrogen Sulfide Sensor with ID Board |
| MAX-SS | Sulfur Dioxide Sensor with ID Board |
| MAX-NH | Ammonia Sensor with ID Board |
| MAX-PS | Phosphine Sensor with ID Board |
| MAX-HCN-K | Hydrogen Cyanide Sensor with ID Board |

| Model Number | Description |
|---|---|
| MAX-TOX | $CO/H_2S$ Combo-Tox Sensor w/ID Board |
| MPID-VOC1 | VOC PID Sensor (10.6eV) |
| MPID-IR1 | % LEL IR Sensor |
| MPID-IR2 | % by Volume IR Sensor |
| MPID-IRCO2 | Carbon Dioxide IR Sensor |
| MPRO-SB | Sensor Board Assembly |
| MPRO-DB | Digital Board Assembly |
| MPRO-VB | Voice Board Assembly |
| MPRO-GSP | Pump Assembly |
| MPRO-MC | Main Case Assembly |
| HSR476 | Case Screw (4 req'd) |
| XIF936 | Gas-Plate Hole Plug |
| MAX-IF | Inlet Fitting w/O-ring, Screen and Plastic Fitting |
| HOR123 | Inlet O-ring |
| XIP604 | Inlet Filter Screen |
| GFV194 | Inlet Plastic Fitting |

## Appendix G - Calibrating with Multiple Canisters

Whether the calibration procedure falls under **Section 5.2 Calibration Procedure (when all calibration gases are in a single canister)** or under **Section 5.3 Calibration Procedure (when not all calibration gases are in a single canister)** is dependent on the instrument's sensor complement. Again, if the sensor complement is $O_2$, LEL, and CO then all three calibration gases are available in one canister (GFV123). GFV123 would also be used where the sensor complement is $O_2$ and LEL. However if the sensor combination is $O_2$ and PID, it can be calibrated usiing one gas cylinder.

Where not all the calibration gases are available in a single canister, the position is as follows:

1. Five-gas models with combo-tox sensor:

   First, apply GFV123 (O2, LEL and CO). Then apply the gas appropriate to the other toxic sensor in the unit. Do not calibrate the combo-tox sensor with H2S gas.

   Four-gas models with O2, LEL and CO sensors First, apply GFV123 (O2, LEL and CO), followed by the gas appropriate to the other toxic sensor.

2. Models with O2 and/or LEL sensors:

   Apply GFV123 (O2, LEL and CO), followed by the gas(es) appropriate to the other toxic sensor(s).

3. Models with PID sensor:

4. Models with IR $CO_2$ sensor:

## Appendix H - Calibration Gases

| Part Number | Gas Compliment | Volume (liters) |
|---|---|---|
| GFV207 | 50% LEL $CH_4$, 50 ppm CO, 25 ppm $H_2S$, Bal Air | 58 |
| GFV243 | 50% LEL $CH_4$, 50 ppm CO, 25 ppm $H_2S$, Bal Air | 34 |
| GFV279 | 50% LEL $CH_4$, 50 ppm CO, 10 ppm $SO_2$, Bal Air | 34 |
| GFV123 | 50% LEL $CH_4$, 50 ppm CO, Bal Air | 103 |
| GFV177 | 10 ppm $SO_2$, Bal $N_2$ | 58 |
| GFV261 | 10 ppm $SO_2$, Bal $N_2$ | 34 |
| GFV272 | 5 ppm $PH_3$, Bal $N_2$ | 58 |
| GFV213 | 25 ppm $NH_3$, Bal $N_2$ | 58 |
| GFV250 | 25 ppm $NH_3$, Bal $N_2$ | 34 |
| GFV252 | 10 ppm $Cl_2$, Bal $N_2$ | 58 |
| GFV249 | 10 ppm $Cl_2$, Bal $N_2$ | 34 |
| GFV234 | 10 ppm HCN, Bal $N_2$ | 58 |
| GFV263 | 10 ppm HCN, Bal $N_2$ | 34 |
| GFV217 | 10 ppm $NO_2$, Bal $N_2$ | 58 |
| GFV264 | 10 ppm $NO_2$, Bal $N_2$ | 34 |
| GFV232 | 50% LEL Pentane, Bal Air | 103 |
| GFV239 | 50% LEL Propane, Bal Air | 58 |
| GAS124 | 50% LEL Hexane, Bal Air | 103 |
| GAS123 | 50% $CH_4$ (50% by Volume) | 58 |
| GFV306 | 100 ppm isoButylene for VOC Calibration | 103 |
| 2992-0030 | 1.5% v/v $CO_2$, Bal Air | 103 |
| 2302D0754 | 2% v/v $CO_2$, Bal Air | 103 |
| N600-1001-38 | 2.5% v/v $CO_2$, Bal Air | 103 |

## Appendix J - PID Detectable Gases

| Chemical Name | eV | Response Factor |
|---|---|---|
| 1,1-Dibromoethane | 10.19 | |
| 1,1-Dimethoxyethane | 9.65 | |
| 1,1-Dimethylhydrazine | 7.28 | |
| 1,2,3-Trimethylbenzene | N/A | 0.49 |
| 1,2,4-Trimethylbenzene | N/A | 0.43 |
| 1,2-Dibromoethane | N/A | 11.7 |
| 1,2-Dibromoethene | 9.45 | |
| 1,2-Dichlorobenzene | N/A | 0.5 |
| 1,3,5-Trimethylbenzene | N/A | 0.34 |
| 1,3-Butadiene (butadiene) | 9.07 | 0.69 |
| 1,3-Dibromopropane | 10.07 | |
| 1,4-Dioxane | N/A | 1.4 |
| 1-Bromo-2-methylpropane | 10.09 | |
| 1-Bromo-4-fluorobenzene | 8.99 | |
| 1-Bromobutane | 10.13 | |
| 1-Bromopentane | 10.1 | |
| 1-Bromopropane | 10.18 | |
| 1-Bromopropene | 9.3 | |
| 1-Butanethiol | 9.14 | |
| 1-Butanol | N/A | 3.4 |
| 1-Butene | 9.58 | |
| 1-Butyne | 10.18 | |
| 1-Chloro-3-fluorobenzene | 9.21 | |
| 1-Hexene | 9.46 | |
| 1-Iodo-2-methylpropane | 9.18 | |
| 1-Iodobutane | 9.21 | |
| 1-Iodopentane | 9.19 | |

| Chemical Name | eV | Response Factor |
|---|---|---|
| 1-Iodopropane | 9.26 | |
| 1-Methoxy-2-Propanol | N/A | 1.4 |
| 1-Methyl Napthalene | 7.96 | |
| 1-Pentene | 9.5 | |
| 1-Propanethiol | 9.2 | |
| 1-Propanol | N/A | 5.7 |
| 2,2,4-Trimethyl Pentane | 9.86 | |
| 2,2-Dimethyl Butane | 10.06 | |
| 2,2-Dimethyl Propane | 10.35 | |
| 2,3-Butadione | 9.23 | |
| 2,3-Dichloropropene | 9.82 | |
| 2,3-Dimethyl Butane | 10.02 | |
| 2,3-Lutidine | 8.85 | |
| 2,4-Lutidine | 8.85 | |
| 2,4-Pentanedione | 8.87 | |
| 2,4-Xylidine | 7.65 | |
| 2,6-Lutidine | 8.85 | |
| 2-Amino Pyridine | 8 | |
| 2-Bromo-2-methylpropane | 9.89 | |
| 2-Bromobutane | 9.98 | |
| 2-Bromopropane | 10.08 | |
| 2-Bromothiophene | 8.63 | |
| 2-Butanone (MEK) | 9.54 | |
| 2-Butoxyethanol | N/A | 1.3 |
| 2-Chlorothiophene | 8.68 | |
| 2-Furaldehyde | 9.21 | |
| 2-Heptanone | 9.33 | |
| 2-Hexanone | 9.35 | |
| 2-Iodobutane | 9.09 | |
| 2-Iodopropane | 9.17 | |

| Chemical Name | eV | Response Factor |
|---|---|---|
| 2-Methoxyethanol | N/A | 2.5 |
| 2-Methyl Furan | 8.39 | |
| 2-Methyl Napthalene | 7.96 | |
| 2-Methyl Propene | 9.23 | |
| 2-Methyl-1-butene | 9.12 | |
| 2-Methylpentane | 10.12 | |
| 2-Pentanone | 9.38 | |
| 2-Pentanone | N/A | 0.78 |
| 2-Picoline | 9.02 | |
| 2-Picoline | N/A | 0.57 |
| 3,3-Dimethyl Butanone | 9.17 | |
| 3-Bromopropene | 9.7 | |
| 3-Butene Nitrile | 10.39 | |
| 3-Chloropropene | 10.04 | |
| 3-Methyl-1-butene | 9.51 | |
| 3-Methyl-2-butene | 8.67 | |
| 3-Methylpentane | 10.08 | |
| 3-Picoline | 9.02 | |
| 3-Picoline | N/A | 0.9 |
| 4-Hydroxy-4-Methyl-2-Pentanone | N/A | 0.55 |
| 4-Methylcyclohexene | 8.91 | |
| 4-Picoline | 9.04 | |
| Acetaldehyde | 10.21 | 10.8 |
| Acetamide | 9.77 | |
| Acetic Anhydride | 10 | |
| Acetone | 9.69 | 1.2 |
| Acetophenone | 9.27 | 0.59 |
| Acetyl Bromide | 10.55 | |
| a-Chloroacetophenone | 9.44 | |
| Acrolein | 10.1 | 3.9 |

| Chemical Name | eV | Response Factor |
|---|---|---|
| Acrylamide | 9.5 | |
| Allyl Alcohol | 9.67 | 2.5 |
| Allyl Chloride | 9.9 | |
| a-Methyl Styrene | 8.35 | |
| Ammonia | 10.2 | 9.4 |
| Amylacetate | N/A | 3.5 |
| Aniline | 7.7 | |
| Anisidine | 7.44 | |
| Anisole | 8.22 | |
| Arsine | 9.89 | 2.6 |
| Benzaldehyde | 9.53 | |
| Benzene | 9.25 | 0.53 |
| Benzenethiol | 8.33 | |
| Benzonitrile | 9.71 | |
| Benzotrifluoride | 9.68 | |
| Biphenyl | 8.27 | |
| Bromine | 10.54 | |
| Bromobenzene | 8.98 | |
| Bromoform | 10.48 | 2.3 |
| Bromomethane | N/A | 1.8 |
| Butadiene | N/A | 0.69 |
| Butyl Mercaptan | 9.15 | |
| Camphor | 8.76 | |
| Carbon Disulfide | 10.07 | 1.2 |
| Chlorine Dioxide | 10.36 | |
| Chlorobenzene | 9.07 | 0.4 |
| Chrysene | 7.59 | |
| cis-2-Butene | 9.13 | |
| cis-Dichloroethene | 9.65 | |
| Cresol | 8.14 | |

| Chemical Name | eV | Response Factor |
|---|---|---|
| Crotonaldehyde | 9.73 | |
| Cumene (Isopropyl Benzene) | 8.75 | 0.54 |
| Cyclohexane | 9.8 | 1.5 |
| Cyclohexanol | 9.75 | |
| Cyclohexanone | 9.14 | 0.82 |
| Cyclohexene | 8.95 | |
| Cyclo-octatetraene | 7.99 | |
| Cyclopentadiene | 8.56 | |
| Cyclopentane | 10.53 | |
| Cyclopentanone | 9.26 | |
| Cyclopentene | 9.01 | |
| Cyclopropane | 10.06 | |
| Decaborane | 9.88 | |
| Decane | N/A | 1.6 |
| Diazomethane | 9 | |
| Dibromochloromethane | 10.59 | |
| Dibromomethane | 10.49 | |
| Dibutylamine | 7.69 | |
| Diesel Fuel #1 | N/A | 0.9 |
| Diesel Fuel #2 | N/A | 0.75 |
| Diethoxymethane | 9.7 | |
| Diethyl Amine | 8.01 | 1 |
| Diethyl Ether | 9.53 | |
| Diethyl Ketone | 9.32 | |
| Diethyl Sulfide | 8.43 | |
| Diethyl Sulfite | 9.68 | |
| Dihydropyran | 8.34 | |
| Diiodomethane | 9.34 | |
| Diisopropylamine | 7.73 | |
| Dimethoxymethane (Methylal) | 10 | 11.3 |

| Chemical Name | eV | Response Factor |
|---|---|---|
| Dimethyl Amine | 8.24 | |
| Dimethyl Disulfide | N/A | 0.3 |
| Dimethyl Ether | 10 | |
| Dimethyl Sulfide | 8.69 | |
| Dimethylaniline | 7.13 | |
| Dimethylformamide | 9.18 | |
| Dimethylphthalate | 9.64 | |
| Dioxane | 9.19 | |
| Diphenyl | 7.95 | |
| Dipropyl Amine | 7.84 | |
| Dipropyl Sulfide | 8.3 | |
| Durene | 8.03 | |
| Epichlorhydrin | N/A | 7.6 |
| Epichlorohydrin | 10.2 | |
| Ethanethiol (Ethyl Mercaptan) | 9.29 | |
| Ethanol | N/A | 10 |
| Ethanolamine | 8.96 | |
| Ethene | 10.52 | |
| Ethyl Acetate | 10.11 | 4.2 |
| Ethyl Acrylate | N/A | 2.3 |
| Ethyl Alcohol | 10.48 | |
| Ethyl Amine | 8.86 | |
| Ethyl Benzene | 8.76 | 0.51 |
| Ethyl Bromide | 10.29 | |
| Ethyl Disulfide | 8.27 | |
| Ethyl Ether | 9.51 | 1.2 |
| Ethyl Iodide | 9.33 | |
| Ethyl Isothiocyanate | 9.14 | |
| Ethyl Mercaptan | 9.29 | 0.6 |
| Ethyl Methyl Sulfide | 8.55 | |

| Chemical Name | eV | Response Factor |
|---|---|---|
| Ethyl Propionate | 10 | |
| Ethyl Thiocyanate | 9.89 | |
| Ethylene | N/A | 10.1 |
| Ethylene Chlorohydrin | 10.52 | |
| Ethylene Diamine | 8.6 | |
| Ethylene Dibromide | 10.37 | |
| Ethylene Glycol | N/A | 15.7 |
| Ethylene Oxide | 10.57 | 19.5 |
| Ethylenelmine | 9.2 | |
| Ethynylbenzene | 8.82 | |
| Fluorobenzene | 9.2 | |
| Formamide | 10.25 | |
| Furan | 8.89 | |
| Furfural | 9.21 | |
| Gasoline | N/A | 1.1 |
| Heptane | 10.08 | 2.5 |
| Hexane | 10.18 | |
| Hydrazine | 8.1 | 2.6 |
| Hydrogen Iodide | 10.38 | |
| Hydrogen Selenide | 9.88 | |
| Hydrogen Sulfide | 10.46 | 3.2 |
| Hydrogen Telluride | 9.14 | |
| Hydroquinone | 7.95 | |
| Iodine | 9.28 | |
| Iodobenzene | 8.73 | |
| Isoamyl Acetate | N/A | 1.8 |
| Isobutane (Isobutylene) | 9.4 | 1 |
| Isobutanol | N/A | 4.7 |
| Isobutyl Acetate | 9.97 | 2.6 |
| Isobutyl Alcohol | 10.12 | |

| Chemical Name | eV | Response Factor |
|---|---|---|
| Isobutyl Amine | 8.7 | |
| Isobutyl Formate | 10.46 | |
| Isobutyraldehyde | 9.74 | |
| Isobutyric Acid | 10.02 | |
| Isooctane | N/A | 1.3 |
| Isopentane | 10.32 | 8 |
| Isophorone | 9.07 | 0.74 |
| Isoprene | 8.85 | 0.6 |
| Isopropanol | N/A | 5.6 |
| Isopropyl Acetate | 9.99 | 2.6 |
| Isopropyl Alcohol | 10.16 | |
| Isopropyl Amine | 8.72 | 0.9 |
| Isopropyl Benzene | 8.69 | |
| Isopropyl Ether | 9.2 | 0.8 |
| Isovaleraldehyde | 9.71 | |
| Jet A Fuel | N/A | 0.4 |
| JP-5 Fuel | N/A | 0.48 |
| JP-8 Fuel | N/A | 0.48 |
| Ketene | 9.61 | |
| m-Bromotoluene | 8.81 | |
| m-Chlorotoluene | 8.83 | |
| m-Dichlorobenzene | 9.12 | |
| Mesityl Oxide | 9.08 | 0.47 |
| Mesitylene | 8.4 | |
| Methanethiol (Methyl Mercaptan) | 9.44 | |
| Methyl Acetate | 10.27 | 7 |
| Methyl Acetoacetate | N/A | 1.1 |
| Methyl Acetylene | 10.37 | |
| Methyl Acrylate | 9.9 | 3.4 |
| Methyl Amine | 8.97 | 1.2 |

| Chemical Name | eV | Response Factor |
|---|---|---|
| Methyl Benzoate | N/A | 0.93 |
| Methyl Bromide | 10.54 | |
| Methyl Butyl Ketone | 9.34 | |
| Methyl Butyrate | 10.07 | |
| Methyl Cellosolve | 9.6 | |
| Methyl Disulfide | 8.46 | |
| Methyl Ethyl Ketone | 9.53 | 0.9 |
| Methyl Iodide | 9.54 | |
| Methyl Isobutyl Ketone | 9.3 | 1.1 |
| Methyl Isobutyrate | 9.98 | |
| Methyl Isopropyl Ketone | 9.32 | |
| Methyl Isothiocyanate | 9.25 | |
| Methyl Mercaptan | 9.44 | 0.6 |
| Methyl Methacrylate | 9.7 | 1.5 |
| Methyl Propionate | 10.15 | |
| Methyl Propyl Ketone | 9.39 | |
| Methyl Tert-Butyl Ethyl | N/A | 0.86 |
| Methyl Thiocyanate | 10.07 | |
| Methylal (Dimethoxymethane) | 10 | |
| Methylbenzil Alcohol | N/A | 0.8 |
| Methylcyclohexane | 9.85 | |
| Methyl-n-amyl Ketone | 9.3 | |
| m-Fluorotoluene | 8.92 | |
| m-Iodotoluene | 8.61 | |
| Monomethyl Aniline | 7.32 | |
| Monomethyl Hydrazine | 7.67 | |
| Morpholine | 8.2 | |
| m-Xylene | 8.56 | 0.53 |
| N,N-Diethyl Acetamide | 8.6 | 0.73 |
| N,N-Diethyl Formamide | 8.89 | 0.8 |

| Chemical Name | eV | Response Factor |
|---|---|---|
| N,N-Dimethyl Acetamide | 8.81 | |
| N,N-Dimethyl Formamide | 9.12 | |
| Naphthalene | 8.12 | 0.37 |
| n-Butyl Acetate | 10.01 | 2.4 |
| n-Butyl Alcohol | 10.04 | |
| n-Butyl Amine | 8.71 | |
| n-Butyl Benzene | 8.69 | |
| n-Butyl Formate | 10.5 | |
| n-Butyraldehyde | 9.86 | |
| n-Butyric Acid | 10.16 | |
| n-Hexane | N/A | 4.5 |
| Nickel Carbonyl | 8.27 | |
| Nitric Oxide, (NO) | 9.25 | 7.2 |
| Nitrobenzene | 9.92 | |
| Nitrotoluene | 9.45 | |
| n-Methyl Acetamide | 8.9 | |
| n-Nonane | N/A | 1.6 |
| n-Pentane | N/A | 9.7 |
| n-Propyl Acetate | N/A | 3.1 |
| o-Bromotoluene | 8.79 | |
| o-Chlorotoluene | 8.83 | |
| Octane | 9.82 | 2.2 |
| o-Dichlorobenzene | 9.06 | |
| o-Fluorophenol | 8.66 | |
| o-Fluorotoluene | 8.92 | |
| o-Iodotoluene | 8.62 | |
| o-Terphenyls | 7.78 | |
| o-Toluidine | 7.44 | |
| o-Vinyl Toluene | 8.2 | |
| o-Xylene | 8.56 | |

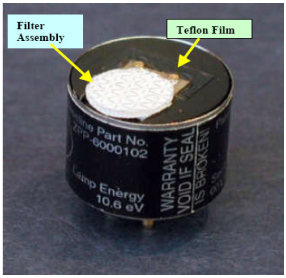
| Chemical Name | eV | Response Factor |
|---|---|---|
| o-Xylene | N/A | 0.54 |
| p-Bromotoluene | 8.67 | |
| p-Chlorotoluene | 8.7 | |
| p-Dichlorobenzene | 8.95 | |
| p-Dioxane | 9.13 | |
| Pentaborane | 10.4 | |
| Pentane | 10.35 | |
| Perchloroethylene | 9.32 | |
| p-Fluorotoluene | 8.79 | |
| Pheneloic | 8.18 | |
| Phenol | 8.5 | 1 |
| Phenyl Ether (Diphenyl Oxide) | 8.82 | |
| Phenyl Hydrazine | 7.64 | |
| Phenyl Isocyanate | 8.77 | |
| Phenyl Isothiocyanate | 8.52 | |
| Phenylene Diamine | 6.89 | |
| Phosphine | 9.87 | 2.8 |
| Phosphorus Trichloride | 9.91 | |
| Phthalic Anhydride | 10 | |
| Pinene, Alpha | N/A | 0.4 |
| Pinene, Beta | N/A | 0.4 |
| p-Iodotoluene | 8.5 | |
| p-Nitrochloro Benzene | 9.96 | |
| Propargyl Alcohol | 10.51 | |
| Propiolactone | 9.7 | |
| Propionaldehyde | 9.98 | |
| Propionaldehyde (Propanol) | N/A | 14.8 |
| Propionic Acid | 10.24 | |
| Propyl Acetate | 10.04 | |
| Propyl Alcohol | 10.2 | |
| Propyl Amine | 8.78 | |

| Chemical Name | eV | Response Factor |
|---|---|---|
| Propyl Benzene | 8.72 | |
| Propyl Ether | 9.27 | |
| Propyl Formate | 10.54 | |
| Propylene | 9.73 | 1.3 |
| Propylene Imine | 9 | |
| Propylene Oxide | 10.22 | 6.5 |
| Propyne | 10.36 | |
| p-tert-Butyltoluene | 8.28 | |
| p-Xylene | 8.45 | 0.5 |
| Pyridine | 9.32 | 0.79 |
| Pyrrole | 8.2 | |
| Quinoline | N/A | 0.72 |
| Quinone | 10.04 | |
| s-Butyl Amine | 8.7 | |
| s-Butyl Benzene | 8.68 | |
| sec-Butyl Acetate | 9.91 | |
| Stibine | 9.51 | |
| Styrene | 8.47 | |
| Styrene | N/A | 0.4 |
| Sulfur Monochloride | 9.66 | |
| Sulfuryl Fluoride | 13 | |
| t-Butyl Amine | 8.64 | |
| t-Butyl Benzene | 8.68 | |
| Tert-Butyl Alcohol | N/A | 3.4 |
| Tert-Butyl Mercaptan | N/A | 0.55 |
| Tert-Butylamine | N/A | 0.71 |
| Tetrachloroethene | 9.32 | |
| Tetrachloroethylene | N/A | 0.56 |
| Tetrahydrofuran | 9.54 | 1.6 |
| Tetrahydropyran | 9.25 | |
| Thiolacetic Acid | 10 | |

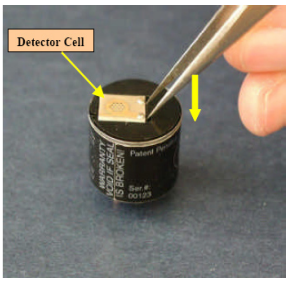
| Chemical Name | eV | Response Factor |
|---|---|---|
| Thiophene | 8.86 | 0.47 |
| Toluene | 8.82 | 0.53 |
| Trans-1,2-Dichloroethene | N/A | 0.45 |
| trans-2-Butene | 9.13 | |
| trans-Dichloroethene | 9.66 | |
| Tribromoethene | 9.27 | |
| Tribromomethane | 10.51 | |
| Trichloroethene | 9.45 | |
| Trichloroethylene | 9.47 | 0.5 |
| Triethylamine | 7.5 | 0.83 |
| Trimethyl Amine | 7.82 | |
| Tripropyl Amine | 7.23 | |
| Turpentine - Crude Sulfite | N/A | 1 |
| Turpentine - Pure Gum | N/A | 0.45 |
| Valeraldehyde | 9.82 | |
| Valeric Acid | 10.12 | |
| Vinyl Acetate | 9.19 | 1.3 |
| Vinyl Bromide | 9.8 | 0.4 |
| Vinyl Chloride | 10 | 1.8 |
| Vinyl Methyl Ether | 8.93 | |
| Vinylcyclohexane (VCH) | N/A | 0.54 |
| Vinyldene Chloride (1,1-DCE) | N/A | 0.8 |

## Appendix K - VOC Sensor Lamp Cleaning

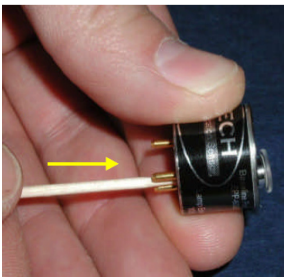
1. Remove the sensor's Lid by pushing its edge upwards with your fingernail or a tip of the screwdriver.
2. Remove the Filter Assembly (two layers).



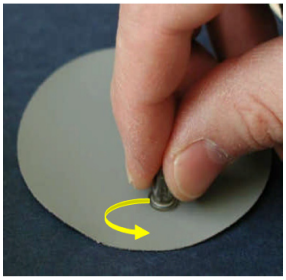

3. Remove the strip of Teflon tape that is attached to the Detector's Cell.
4. Using a pair of fine-tipped tweezers, carefully remove the Detector Cell by prying under the Cell's edge where connector pins are located. See section **K.1** for Detector Cell cleaning.



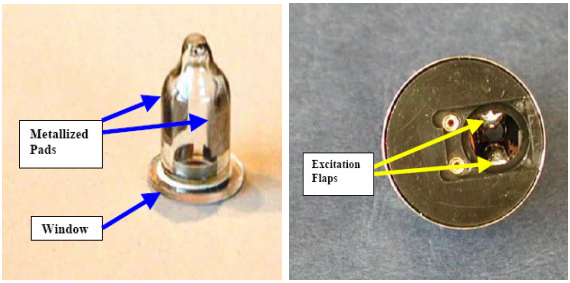

5. Remove the lamp by pushing its tail through the hole in the bottom of the sensor by using a toothpick.



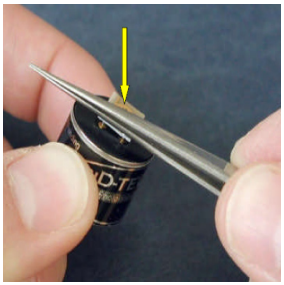
6. Grab the lamp by the cylindrical glass body and clean the window by rubbing it against the Polishing Pad. Use circular motion and try to keep the window surface flat relatively to the pad. Five seconds of rubbing will be enough in most cases. Another indication of cleaning completeness is that you have used about 1/6th of the pad's surface during the procedure.



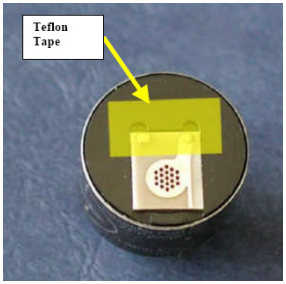
7. Install the Lamp into sensor. Make sure that the lamp's Metallized Pads are aligned against excitation flaps inside the lamp's cavity.




8. Using tweezers, install the Detector Cell by pushing it down in pins area with some flat metal object (e.g. the flat side of tweezers). Make sure that the Cell sits flush in its place.



9. Attach a ½" piece of Teflon tape to the top of Detector Cell in the way it was attached originally.




10. Place the sensor's Filter Assembly over detector's cell in the area where the holes are located. Make sure that filters are installed in correct order: clothlike filter on the bottom, filter with the backing – on the top.

11. Install the Lid by pushing it down on the sensor's housing uniformly until it snaps in place. Make sure that the hole in the lid is aligned against the Filter assembly.

**Note:**

Avoid touching lamp's window as well as metallized portion of the Detector cell with your bare fingers. It is acceptable to hold the lamp by its glass body or by the edges of the window. Fingerprints left on those parts may affect adversely the sensor's operation.

## K.1 Detector Cell Cleaning Procedure

1. Remove sensor in a clean location
2. Remove lid and filters
3. Remove Detector Cell with the help of fine tweezeers (as described in the Lamp Cleaning Procedure)
4. Handle detector cell carefully with pair of fine tweezers
5. Place Detector Cell in beaker with GC grade methanol inside an ultrasonic cleaner (10 Cells per 100 ml methanol)
6. Clean for 30 minutes
7. Dry in the oven at 110 deg C for at least 4 hours.
8. Reinstall detector cell, filters and the lid
9. Test sensor for span and zero signal

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