

MODEL 300

INSTRUCTION MANUAL

THIS INSTRUMENT GENERATES:

- Bromine (Br₂)
- Chlorine (Cl₂)
- Chlorine Dioxide (ClO₂)
- Hydrogen Cyanide (HCN)
- Hydrogen Sulfide (H₂S)
- Hydrogen (H₂)

FACTORY-SET POINT:

_____ PPM Air Flow _____

Advanced Calibration Designs, Inc.

1775 S. Pantano Road, Suite 140 • Tucson, Arizona 85710 • U.S.A.
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Instruction Manual

Model 300 Gas Generator

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Manufactured by:

Advanced Calibration Designs, Inc.
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Phone: 520 290 2855
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SUPPLEMENTAL WARRANTY

The generating cell, which is consumed during normal operation, has a prorated warranty based upon usage. Repair / Replacement costs on the model 300 are as follows:

For units less than one year from date of calibration:

Cell Consumption	Repair / Replacement
0-19%	\$ 0.00
20-29%	\$225.00
30-39%	\$250.00
40-49%	\$275.00
50-59%	\$300.00
60-69%	\$325.00
70-79%	\$350.00
80-89%	\$375.00
90-99%	\$400.00
100%	\$425.00

For units over one year from the date of calibration, normal repair charges apply depending on the type of repair needed.

Prices effective 01/01/98. ACD reserves the right to change pricing without notice. Please contact the factory for current pricing.

WARNING:

This instrument conforms to the protection requirements of the **EC DIRECTIVE 89/336/EEC** on Electromagnetic Compatibility (EMC), in accordance with the provisions of Statutory Instrument 2372.

The following standards have been applied:

EN 50081-1
Emissions Standard (Residential Commercial and Light Industry)

EN 50082-1
Immunity Standard (Residential Commercial and Light Industry)

Two exceptions to this compatibility are:

The unit should not be operated with the charger attached.

The unit display is subject to corruption in areas containing high levels of electrostatic discharge. While this will not effect the overall operation of the unit, the unit must be restarted in an electrostatic free area to clear the display.

STANDARD WARRANTY

We warrant gas calibration equipment manufactured and sold by us to be free from defects in materials, workmanship and performance for a period of one year from date of shipment. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, F.O.B. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired, or replaced on a routine basis.

Such items may include:

- a. Electrochemical type generating cells
- b. Batteries

Warranty is voided by abuse including rough handling, mechanical damage, alteration, or repair procedures not in accordance with the instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement cost, local repair costs, transportation costs or contingent expenses incurred without our prior approval.

Advanced Calibration Designs, Inc.'s obligation under this warranty shall be limited to repairing or replacing, and returning any product which shall be returned to Advance Calibration Designs, Inc. at its manufacturing facilities, with transportation charges prepaid, and which Advance Calibration Designs, Inc.'s Material Review Board examination shall disclose to its satisfaction to have been defective.

This warranty is expressed in lieu of any and all other warranties and representations, expressed or implied, and all other obligations or liabilities on the part of Advanced Calibration Designs, Inc. including, but not limited to, the warranty of fitness for a particular purpose. In no event shall Advanced Calibration Designs, Inc. be liable for direct, incidental or consequential loss or damage of any kind connected with the use of its products or failure of its products to function or operate properly.

The following is a listing of the available electrochemical MiniCal cells and their standard warranty when installed in equipment manufactured and supplied by Advanced Calibration Designs, Inc.

1. Chlorine - One year, 250 tests.
2. Hydrogen Sulfide, hydrogen cyanide - One year, 250 tests.

GENERAL DESCRIPTION

The Model 300 is a battery-powered, portable electrochemical gas generator that may be used either intermittently or continuously. Fast warm-up time allows the instrument to be turned off between remotely located sensors saving battery life and avoiding generation of unwanted gas. The Model 300 uses the following components to produce a precise gas/air mixture:

Internal micro pump

The pump draws in ambient air that is then scrubbed by a charcoal filter, ensuring a fresh air supply.

Charcoal Filter

The charcoal filter element that is used to scrub the ambient air should be replaced periodically, depending upon usage and background air conditions. The element is unplugged from the outside of the instrument.

Electrochemical Generating Cell

The electrochemical generating cell contains an electrolyte solution and either inert or consumable electrodes, depending upon the gas being generated. A precise concentration of gas is produced when a known amount of current is applied continuously to the cell. The gas permeates into an air chamber where it is mixed with the cleaned air stream before exiting the instrument.

Electronic Flow Meter

An electronic flow meter, connected to a microprocessor, continuously monitors and adjusts the air flow, ensuring the flow rate is constant and correct.

Rechargeable Nicad Battery

When fully charged, the battery provides 8-10 hours of operation. The Model 300 may also be operated continuously using the AC Adaptor.

Microprocessor-Based Circuitry and Digital LCD

When powered-up, the LCD identifies the generator with instrument and cell serial numbers. The microprocessor reminds you when the generator was last calibrated; provides remaining cell life and battery life; verifies gas output; and allows the user to change gas concentrations if necessary. At any time, the cell life, battery life and the ppm change mode may be accessed by the user.

AC Adapter

The AC adapter may be used to charge the battery or run the instrument continuously. The standard adapter is for 115 VAC, US style plug. Alternate AC adapters are available for 220 VAC and various plug styles. The AC adapter is an unregulated 12 VDC, 350mA current limited, wall adapter. Please consult the factory before using a non-standard adapter as circuit board damage may be incurred by improper usage.

Power and Select Switches

The Power and Select switches are momentary type switches that are activated through the front membrane panel. The power switch has an arrow indicating down. The Select switch has an arrow indicating up. These arrows determine the direction in which the microprocessor scrolls information in the altitude and ppm adjustment menus (described later in this manual).

During normal operation, you will be asked to either **press and release** or **press and hold** the Power or Select buttons. If you are instructed to hold the buttons, you will usually do so until the LCD screen changes. If you are instructed to press and release a button, the screen will usually not change until you have released the appropriate button. Usually one second is required on the press and release function to activate the program.

Strap

The model 300 comes equipped with a 1 1/2 inch wide nylon shoulder strap. The strap is mounted on the instrument so as to minimize roll over of the instrument. It is important, when using the shoulder strap, to maintain horizontal position on the instrument.

ACCESSORY ITEMS

The following items are available as accessories for the Model 300:

P/N	Description
113-0102-00	Male Hose Barb Quick Connector, low flow 1/4"OD hose
113-0103-00	Male Hose Barb Quick Connector, high flow 3/8" OD hose
150-0121-00	Plug-in Charcoal Filter Element, one each
150-0131-00	Plug-in Charcoal Filter Element, package of 12
362-0300-00	Battery Charger, 115 VAC, US style plug 12VDC, 350 mA
362-0301-00	Battery Charger, 220 VAC, European style plug, 12 VDC
715-0110-0X	3 Foot Hose w/connector, low flow, 1/4" OD (specify gas)
715-0115-0X	5 Foot Hose w/connector, low flow, 1/4" OD (specify gas)
715-0300-00	3 Foot Hose w/connector, high flow, clear, 3/8" OD
730-0350-00	Hard-body, Water Proof, Padded Carrying Case
910-0300-00	Instruction Manual, generic

LCD WARNING DISPLAYS

The following warning displays will appear if abnormal operation is detected by the microprocessor:

"Flow too low" / Flow to high" *accompanied by an intermittent, audible beep.*

Accurate air flow is critical to an accurate gas mixture. The microprocessor and built-in precision flowmeter continuously monitor the air flow. If, however, a flow problem develops (e.g. air blockage, kinked tubing) cannot be corrected within five seconds, the unit will display "Flow too low."

With sample draw sensors, where the sensor pump may be drawing at a higher rate than the Model 300 pump, the generator will attempt to compensate. If the problem (e.g. excessive sample draw) cannot be corrected within five seconds, the unit will display "Flow too high."

"Cell Failure!" *accompanied by a continuous, audible beep.*

The cell failure alarm will engage if the microprocessor detects an abnormally high voltage condition. One possibility is that the electrolyte is not covering the active electrode which normally happens if the instrument has been placed on its side or upside down while in storage or on the shoulder strap. If this message continues after the unit has been upright for at least 10 minutes, contact the factory.

"Cell used up / Return to Factory" *accompanied by an intermittent audible beep.*

The cell warranty has expired and the display will show 0% cell life remaining. Contact the factory for proper cell replacement.

"Battery Low" *accompanied by an intermittent, audible beep.*

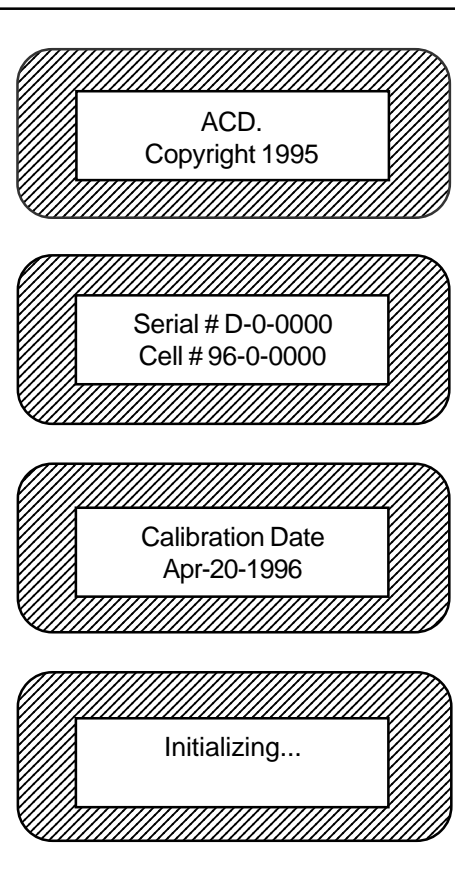
If battery power drops below 15% capacity, the screen will flash "Battery Low." Recharge the battery or switch to AC power.

START-UP

The instrument may be powered either by the internal battery pack or the AC adapter. If the charger is plugged into the instrument, the initial screen will read "Charging." This indicates that the AC adapter is supplying voltage to the unit.

To start the generator, **press and hold** "POWER" until the ACD logo appears on the screen, approximately **three (3) seconds**.

The first screen will show "ACD Copyright 1995."

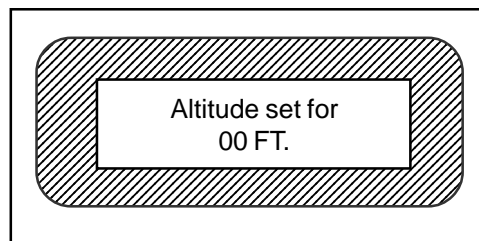


The second screen will identify the instrument by its serial numbers.

The third screen will show the date of last calibration. This date is reset every time a new cell is put into the instrument.

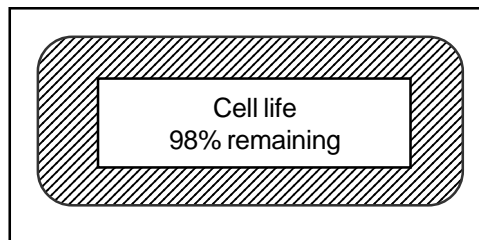
The fourth screen will display "Initializing." During this period the instrument is reading stored values from memory. It takes approximately 15 seconds for all values to be read into the microprocessor.

Immediately following the initializing screen, the instrument will enter the altitude screen. At this point, the you may enter a new altitude by pressing the "SELECT" button when prompted to do so. A sub menu will guide you through the process of changing altitude.



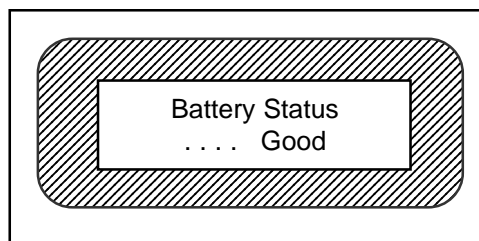
Note: Changes in altitude and temperature can cause changes in air density, thus affecting the output. The Model 300 allows you to specify the altitude setting thereby compensating for changes in air density, and will retain that altitude specification until a change is desired. Your instrument is calibrated at the factory using an altitude setting of 00 feet (sea-level). The Model 300 automatically adjusts for temperature changes in air.

The next screen to appear will report the cell life remaining of the generating cells. All generating cells consume either the electrolyte and/or the electrodes and must be replaced when exhausted. See the prorated warranty schedule for current pricing.



Note: An intermittent audible beep will accompany the message "Cell used up / Return to Factory" when the cell has reached 0% life remaining.

The next screen to appear will be the battery status indicator. The indicator will read "Charged" when fully charged, "Good" when the battery has at least 15% battery life remaining or "Battery Low" when the instrument needs charging.



Note: An intermittent audible beep will accompany the message "Battery Low." You should recharge the battery or switch to AC power.

HOW TO CHANGE GAS CONCENTRATION

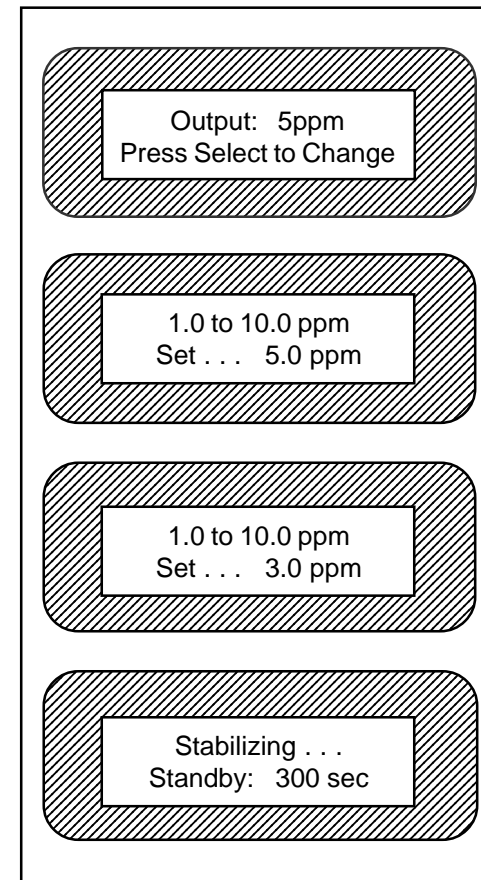
At any time during the fresh air mode or the gas generation mode, you may change the gas concentration. To begin, press and release the "SELECT" button.

The instrument will show the battery status and cell life status. It will then show the current ppm setting and give you the opportunity to change the output by pressing the "SELECT" button once again.

At this point the instrument enters the change ppm mode. It lists the minimum and maximum ppm setting for your instrument as well as the current set point.

To increase the ppm setting, push and/or hold the "SELECT" button. To decrease the ppm setting, push and/or hold the "POWER" button. You may scroll up or down to the desired ppm. Once you have achieved the desired ppm setting, simply wait three seconds and the instrument will return to normal operation.

If the instrument was in the air mode, it will return to the air mode immediately. If you were in the gas mode, the instrument will enter the gas stabilization screen as the instrument equilibrates to the new gas setting.



HOW TO CHANGE ALTITUDE SETTING

At start-up, the instrument will display the current altitude setting. To change the altitude setting, **press and release** "SELECT" when instructed.

When the word "SET . . ." appears, you may use the arrow keys, (POWER/SELECT) to scroll up or down until the display reads the desired altitude. The available range is 0-9,900 Ft. Once the desired altitude set point has been reached, simply wait three seconds and the instrument will resume its normal operation.

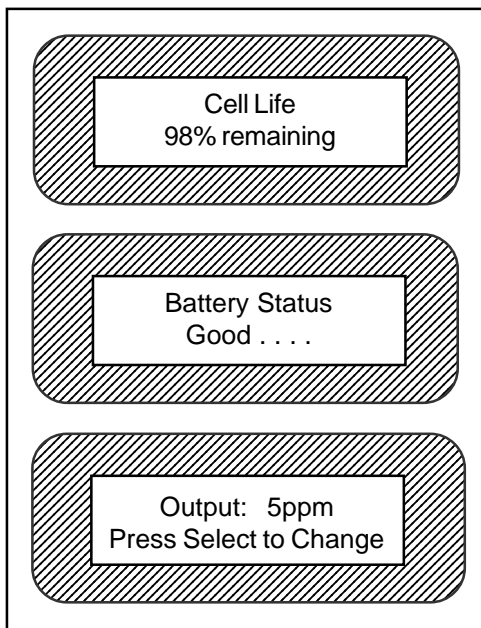
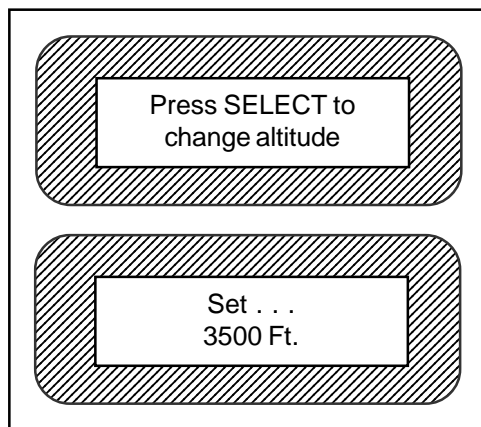
Note: Unlike the ppm adjustment, the altitude adjustment can only be made during start-up.

HOW TO CHECK OPERATING STATUS

At any time during the air or gas mode, you may check the status of the generating cell, battery and ppm setting. Simply **press and release** the "SELECT" button.

The current status of each component will be displayed before returning to normal operation.

Note: This operation is not available during stabilization, purging or shut down mode.



The model 300 has a built-in rechargeable nicad battery pack which will provide 8-10 hours of remote operation for low flow units (0.25 LPM to 0.5 LPM) and 6-8 hours for high flow units (1 LPM to 2 LPM). To charge the battery simply plug in the AC adaptor. The Model 300 LCD should display "Charging" if the instrument is not turned on. It will take approximately eight hours to reach full capacity.

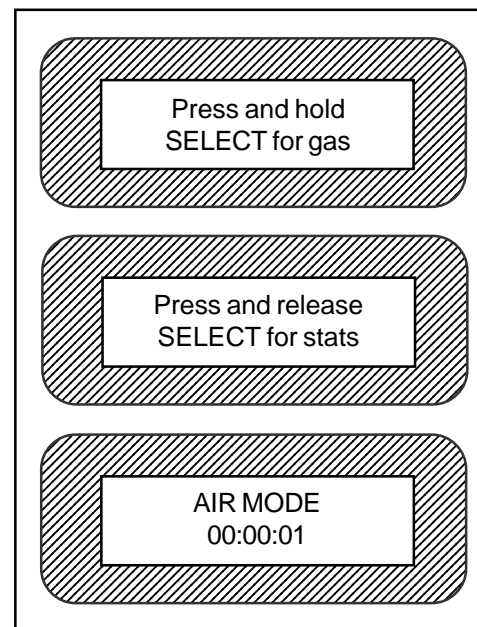
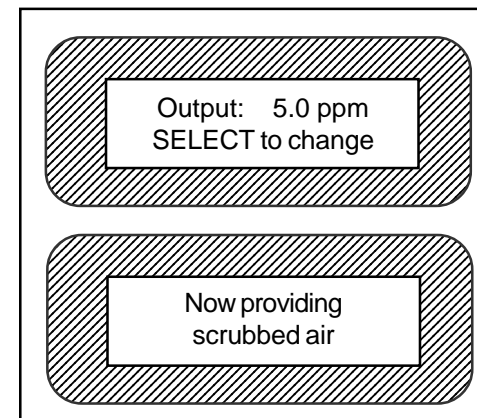
The next screen verifies the last ppm output setting that the instrument was adjusted to. At this point the output may be changed by pressing the "SELECT" button. A sub menu will guide you through the ppm adjustment menu.

After the ppm screen, and adjustment menu if accessed, the instrument will begin providing scrubbed ambient air for the purpose of "zeroing" your sensor.

Note: The air is scrubbed by a replaceable charcoal filter. This filter should be replaced as frequently as the background air conditions mandate and is different for each application.

At any time during the fresh air mode you may start the gas generation process by **pressing and holding** the "SELECT" button.

The cell life status, battery status and ppm change menu may be accessed by **pressing and releasing** the "SELECT" button.



Unless gas has been selected, the instrument remains in the "AIR MODE" for up to 30 minutes, at which time it will automatically shut off.

A digital counter keeps track of how much time has elapsed in the fresh air mode.

HOW TO GENERATE GAS

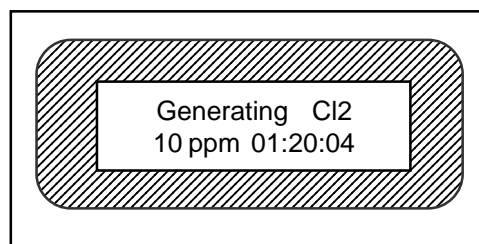
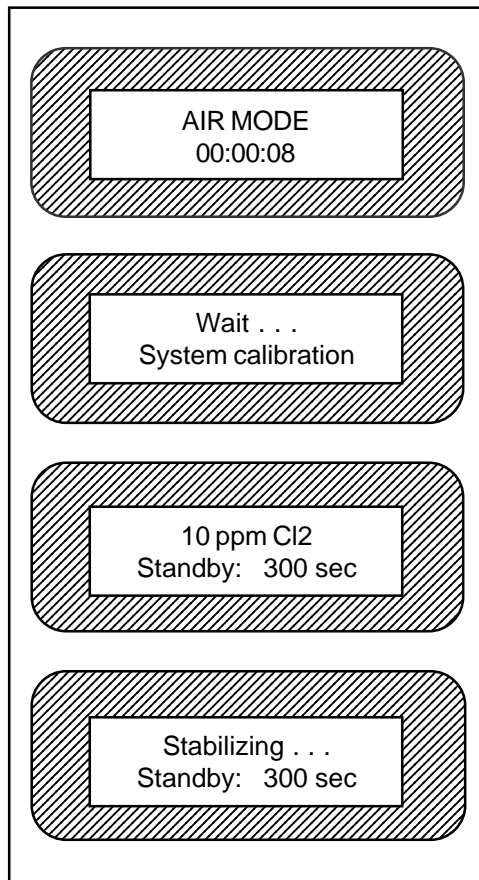
While in the fresh air mode, **press and hold** the "SELECT" button for approximately three (3) seconds, until...

... the screen displays the message "Wait . . . System Calibration." During this wait period the microprocessor is setting the flow to the correct value to insure proper concentrations of gas are provided.

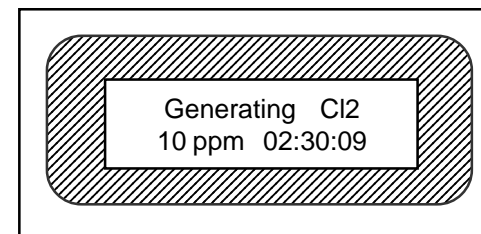
The Instrument will the display the output settings as it begins to generate gas electrochemically.

When the Standby" counter reaches zero, cell equilibrium has been achieved and your ready to calibrate your sensor(s).

Note: Stabilization times for the various gases range from approximately 4 minutes for chlorine to approximately 15 minutes for hydrogen cyanide. This is mainly dependent upon the solubility of the gas in water (the main electrolyte component).



While in the gas mode, a digital counter will display elapsed time. Unlike the air mode, the model 300 will run continuously in the gas mode until either the battery becomes discharged or the cell is consumed (if on AC power).



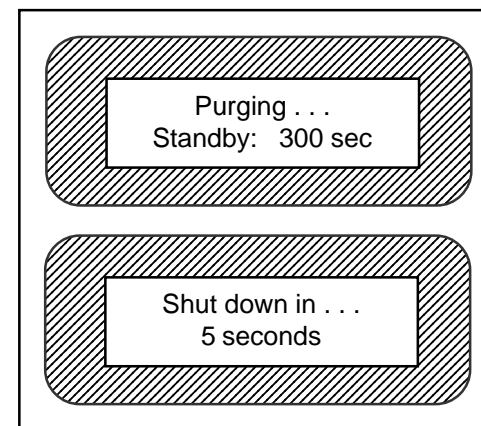
At any time in the gas mode, the battery status, cell life status or ppm change menu may be accessed by **pressing and releasing** the "SELECT" switch.

To return to the fresh air mode, **press and hold** "SELECT" for approximately three (3) seconds. The instrument will purge itself of gas and then switch to the air mode. You may alternate between air mode and gas mode as often as desired.

When you have completed your calibrations, **press and hold** "POWER" for approximately three seconds.

If you power down in the gas mode, the instrument will first purge itself of gas and then power down automatically.

If you are in the air mode, the instrument will power down directly. The instrument should then be plugged into the AC adapter to recharge the battery.



CELL LIFE

The generating cell is consumed during normal operation and the higher the ppm setting and flow rate, the faster the consumption of the cell. All cells except chlorine dioxide are rated for 1000 hours of generation at 1 ppm and 1/2 LPM air flow rate. This would only be 100 hours at 10 ppm and 1/2 LPM and only 20 hours at 25 PPM and 1 LPM. Chlorine dioxide is only rated at 1/10 of the life of the other cells, i.e., 100 hours at 1 ppm and 1/2 LPM.