Advanced Calibration Designs, Inc.

VersaCal

Gas Generator

Release III

INSTRUCTION MANUAL

www.goacd.com

Advanced Calibration Designs, Inc.

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Revision - 060922

Instruction Manual

VersaCal
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TABLE OF CONTENTS

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WARNING:

This instrument generates calibration gas for toxic gas detectors. The instruction manual should be read and understood prior to operation of the instrument. Failure to operate the instrument correctly can lead to improper calibrations.

I. GENERAL DESCRIPTION

The VersaCal is a battery-powered, portable gas generator designed to calibrate toxic gas sensors. A built-in mass flow sensor provides accurate flow measurement. An internal photo-ionization detector (PID) is used to accurately measure gas concentrations and make adjustments as needed. The VersaCal uses the following components to produce the calibration gas/air mixture:

Internal Micro Pump

A small, rotary vane, micro air pump draws in ambient air to blend with the generated gas. The manufacturer of this pump has rated it at 1000 hours of operation.

Quick Check Vial (QCV)

The Quick Check Vial contains a chemical solution of different concentration and chemical composition depending upon the gas type and range being generated. The QCV consists of an inner ampoule containing the chemical. This ampoule is contained inside a squeezable plastic vial. The vial has a permeable membrane on one end. When the inner ampoule is broken the chemical is released and begins to permeate through the membrane in the vial, providing an instrument adjustable source of calibration gas. This will last for up to eight or more consecutive hours, and should then be disposed of.

Alkaline "C" Batteries

A set of four fully charged, **heavy duty alkaline** "C" batteries provides approximately 10 hours of operation at .5 LPM. **Note: Rechargeable or light duty batteries can be used, but they give significantly less operating time.**

Microprocessor-Based Circuitry

The VersaCal has microprocessor based circuitry that performs several different operations and offers the user many different features. The microprocessor tracks battery usage, monitors the air flow rate and controls the pump to give the selected ppm. In addition to English, every VersaCal is capable of providing menu displays in French, German and Spanish. See section IV. Menu Options for instructions on how to change the menu language.

Digital Display

The VersaCal has a liquid crystal display (LCD) located on the front of the instrument. This display is protected by a thin, clear plastic cover that is part of the front label and may be replaced if it becomes scratched or unclear.

POWER and SELECT

The POWER and SELECT switches are momentary push button type switches activated through the front membrane panel. They are physical switches mounted directly on the circuit board.

Delivery Hose

The instrument comes standard with a three (3) foot long, ¼ inch diameter norprene hose for delivering the gas to the sensor or calibration adapter. The hose has a male quick connect adapter for easy attachment to the instrument.

VIII. SPECIFICATIONS

Ammonia (NH_3).....10 - 150 ppm

Useful Vial Life.....up to 8+ hours
Warm-up time.....Approximately 5 minutes
L x W x H.....8.5 x 4.3 x 3.0" (21.6 x 10.8 x 7.6 cm)
Weight.....2.5 lbs. (1134 g)
Operating Temperature.....0° C to 50° C
Relative Humidity (intermittent use).....0 -100%
Accuracy.....±10%
Battery Power.....4 alkaline "C"
Battery Life.....Approximately 10 hours (@ .5 LPM)

VII. Accessory Items / Parts List

The following items are available as accessories for the VersaCal:

P/N	Description
113-0402-00	Male Hose Barb Quick Connector, 1/8" OD hose
150-4121-00	Charcoal Filter Element, one each
150-4131-00	Charcoal Filter Element, package of 12
362-0600-00	AC Adaptor, 115 VAC, US style plug 7.5VDC, 300 mA
525-0001-12	QCV, Ammonia, Qty 12
700-0600-03	Pump, Low Flow Rotary Vane, 6 VDC
715-0403-0X	3 Foot Hose w/connector, low flow, 1/4" OD
715-0405-0X	5 Foot Hose w/connector, low flow, 1/4" OD
730-0615-00	Hard-body, Water Resistant, Padded Carrying Case
910-0610-00	Instruction Manual

Nylon Carrying Case

The VersaCal comes with a convenient, durable, nylon carrying case. It is adjustable to be worn as a hip pack, or the belt strap can be reattached to be worn around the neck or over the shoulder. The top of the carrying case is clear plastic, allowing the unit to be operated while within the case, and there is a convenient pocket for storage of additional QCV's or the delivery hose.

Mass Flow Sensor

The VersaCal has a built-in mass flow sensor that measures the flow rate of the instrument. The mass flow sensor is calibrated at our factory and is traceable to the National Institute of Standards and Technology (N.I.S.T.). This traceability is good for 12 months. The mass flow sensor is re-certified when the VersaCal is sent in for re-certification (recommended every 12 months).

Internal Charcoal And Humidity Filters

Two internal filters are used to scrub contaminated air and provide a clean air source for the calibration gas generated. The charcoal filters should be replaced on a yearly basis and are removed by pulling out the grey plungers. Spare filter elements can be purchased through ACD. Note: The grey filter plungers must be firmly installed into the instrument for correct operation.

Photo-Ionization Detector (PID)

The VersaCal uses a photo-ionization detector (PID) to monitor the calibration gas output of the Quick Check Vial. This information is used to control the flow-rate as needed to give an accurate calibration gas concentration. The PID used in the VersaCal is a long life design rated to last for thousands of hours. No field maintenance is required on the PID. It is maintained when the VersaCal is returned to the factory for service and/or re-certification to NIST standard.

AC Adapter

The VersaCal may also be operated from an AC adapter. The AC adapter converts the AC voltage supplied from the main power lines to 6 VDC which is used in lieu of the batteries. The adapter plugs into the instrument from the back of the case directly into the power board and is independent of polarity.

Optional items available for the VersaCal include:

Hard Body Instrument Case

A water resistant, padded instrument case is available for storage and shipping of the VersaCal. The case is made out of rugged, high impact resistant plastic and will help protect the instrument in harsh environments. The foam insert may be customized to hold additional items like spare batteries and QCV's.

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 Quick Check Vials.

Ammonia - One year shelf life unused.

VI. 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, but are not limited to:

a. Quick Check Vials
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 Advanced Calibration Designs, Inc. at its manufacturing facilities, with transportation charges prepaid, and which Advanced 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

II. Quick Check Vials (QCV)

The Quick Check Vials (QCV) are designed for use with the VersaCal as well as other ACD products. The QCV consists of an inner ampoule contained in a plastic housing. The plastic housing is sealed at one end, and contains a permeable membrane at the other end. The inner ampoule contains a known concentration of the chemical to be generated.

Note: Before use it is necessary to firmly squeeze the plastic housing to break the inner ampoule and release the calibration chemical.

The internal PID in the VersaCal monitors actual QCV ouput and varies flow rate to provide selected calibration gas concentrations. The valve on the QCV holder is used to vary the output from the QCV.

QCV Installation and Removal

There are no tools required by the end user for service of the instrument. The Quick Check Vials are shipped seperate of the unit and should be installed only prior to use and promptly removed when done. To install the QCV, remove the QCV holder from the front of the instrument labeled ‘Vial Chamber’. Make sure that no QCV has been left in the unit while it was shut down.

Before inserting into the instrument, firmly squeeze the QCV so that the inner ampoule is broken. Install the QCV onto the end of the QCV holder. Place the QCV and the QCV holder in the vial chamber, pushing it in firmly until the o-ring makes a complete seal.

"Battery is Low!" *accompanied by an audible beep.*

If battery power drops below 5% capacity, the screen will flash "Battery is Low!" Replace the batteries or switch to AC power. If the battery power remains below the 5% threshold for more than 30 seconds, the VersaCal will automatically begin its purge cycle and then turn itself off.

V. Troubleshooting

No Power To Instrument

The most common cause of this is that the batteries are dead. Try replacing the batteries with new alkaline batteries or try powering the unit from the AC power adapater. If the AC adapter is being used make sure that the plugs are firmly inserted into both the instrument and the 115 VAC outlet. Also insure that the 115 VAC outlet has power to it.

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

The microprocessor and built-in precision mass flow sensor continuously monitor the air flow. If, however, a flow problem develops (e.g. air blockage or kinked tubing) which cannot be corrected within ten seconds, the unit will display either "Flow too low" or "Flow too high." If the problem cannot be cleared after an additional minute, the instrument will enter the purge mode and then power down.

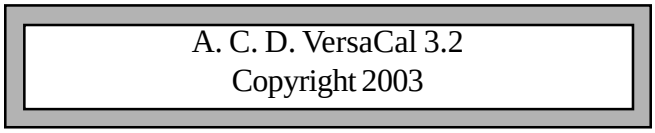
"PPM Too Low!" / "PPM Too High!" *accompanied by an audible beep.*

If the amount of gas coming from the QCV becomes too low or too high for the VersaCal to control through adjusting the flow rate, an audible alarm will sound and the screen will flash "PPM Too Low!" or "PPM Too High!" To change the concentration press the SELECT button to access the ppm selection screen. Alternately the needle valve on the QCV holder can be adjusted to allow more or less gas out of the QCV in an attempt to maintain the desired ppm concentration. See **Section III. Normal Operation** for more detailed information.

III. Normal Operation

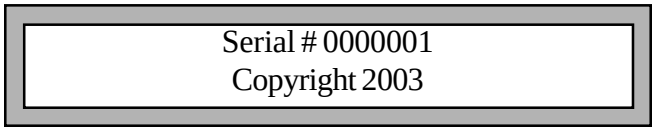
To start the generator, **press and hold** the POWER switch, located in the middle left front of the instrument, until the display reads A. C. D., approximately **three (3) seconds**. Release the switch immediately thereafter.

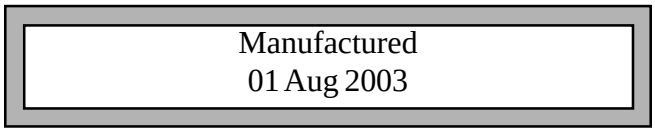
The instrument will sequence through several screens as follows:

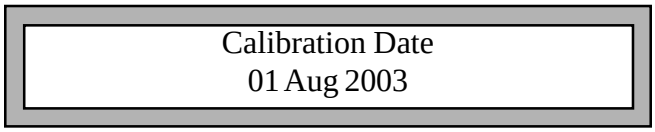


Please Note: If you would like to change the language of the menus, see section III. Menu Options: Foreign Language Option, for instructions.

The instrument will display the Serial Number, followed by the manufactured date, and the calibration date.

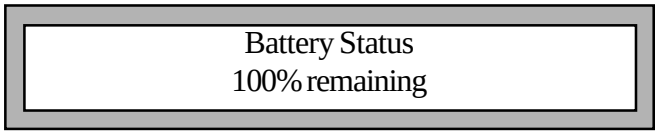






The Calibration Date refers to when the instrument itself was last calibrated at the Factory. This will either be the date of manufacture, or the last date the instrument has been returned for re-certification to NIST standards.

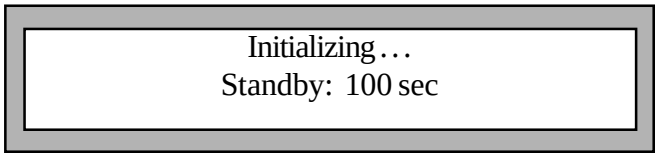
The following status screen indicates the battery status.



You will then see the screen asking you to install the QCV in the VersaCal.

Select desired QCV. Before inserting into the instrument, firmly squeeze the QCV so that the inner ampoule is broken. Install the QCV onto the end of the QCV holder. Place the QCV and the QCV holder in the vial chamber, pushing it in firmly until the o-ring makes a complete seal.

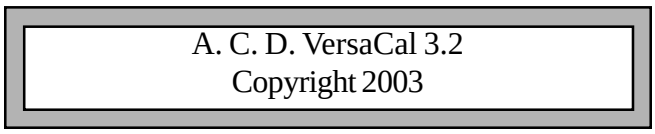
When 100 seconds are remaining, the screen will note that the PID is being initialized.



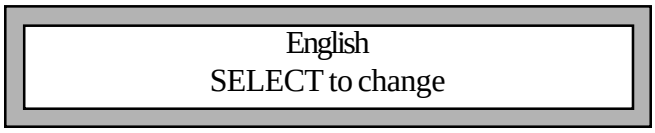
IV. Menu Options

Foreign Language Option

The menu options can be adjusted to read in German, French, or Spanish. To change the language, start the unit as you normally would. When the ACD screen appears,

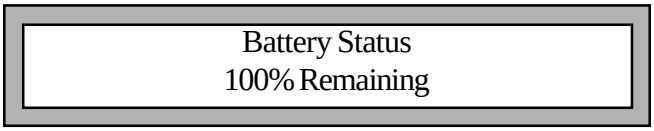


press the SELECT button. This will bring up the following screen:



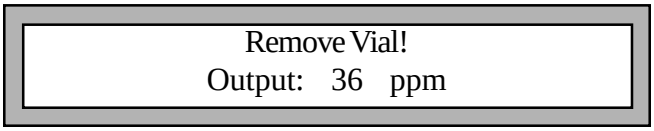
Press the SELECT button to choose the preferred language. When the language is displayed, press the POWER button to continue with the start up sequence.

If the concentration is not changed (the select button is not pressed for three seconds) the instrument will then display the battery status screen.



Turning Off The VersaCal

To turn off the VersaCal press and hold the POWER button for three seconds. The VersaCal will then begin a purge cycle and display the following screen.



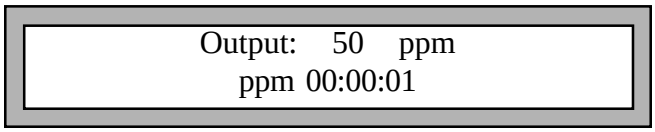
The 'Remove Vial!' message will alternate with the message 'Purging...'.

The VersaCal will be checking for an absence of calibration gas due to the removal of the QCV vial. If the VersaCal sees this the instrument will shut down. If higher concentrations of gas were being generated it may take a few minutes for the VersaCal to purge the concentration low enough for the unit to turn off.

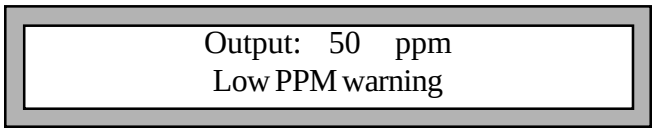
If the vial is not removed the VersaCal will continue to run in purge mode. This purge will not end until the gas concentration is sufficiently low enough, or until the alkaline batteries are depleted.

Leaving a vial inside the VersaCal while the instrument is shut off will result in saturation of inner components and require extensive purging upon turn on. For this reason the VersaCal will continue to purge while any gas concentration is present during the shut down period.

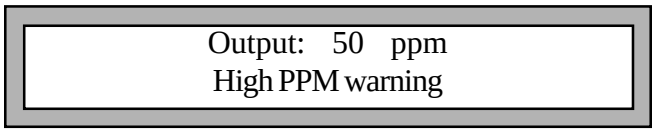
When the VersaCal has finished the initialization process it will try to match the previously set ppm concentration when the instrument was last used. If the QCV inserted is capable of giving this range the instrument will then display the ppm concentration being generated as well as a running count of the time the VersaCal has been generating gas.



If the VersaCal cannot produce the previously set ppm range, the display will show one of the following screens.



Or

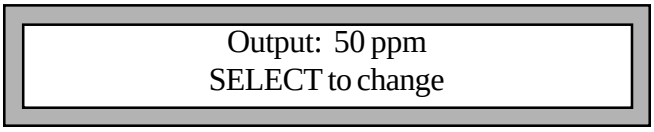


Both the low and high ppm warnings are accompanied by an audible beep every five seconds.

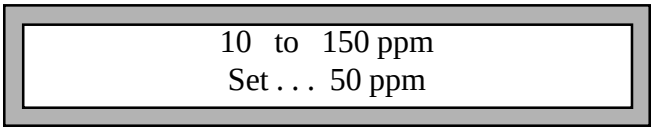
A 'Low ppm' warning indicates that the output of the QCV is too low, and the VersaCal cannot adjust the pump to produce the desired value. A 'High ppm' warning indicates the QCV output is too high to obtain the desired value. The amount of gas that the QCV is generating can be adjusted using the needle valve on the QCV holder. Opening the needle valve (turning counter-clockwise) will allow more gas from the QCV while closing the needle valve (turning clockwise) will reduce the gas from the QCV.

Pressing the SELECT button while the instrument is in normal gas generation mode will bring up a set of two screens.

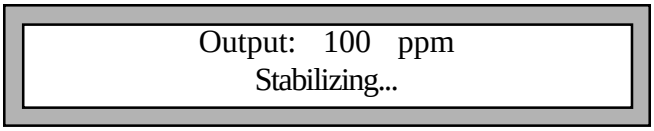
The display first shows:



Pressing the SELECT button will allow the user to change the ppm output.



The gas concentration can now be changed by pressing the up arrow POWER button to increase the concentration, or by pressing the down arrow SELECT button to decrease the concentration. Once you have selected the desired ppm, wait three seconds and the instrument will attempt to change to this concentration.



If the VersaCal cannot set to this new value a low or high ppm warning will occur. The needle valve on the QCV holder allows more or less gas to escape from the vial as needed.

For example, generating lower concentrations will typically require the needle valve to be somewhat closed. As the vial is depleted the valve can be opened to allow more gas from the QCV, thus allowing the VersaCal to continue producing the selected ppm value.

Another use of the needle valve is to compensate for external conditions such as temperature. Higher temperatures produce more gas from the QCV. The reverse is also true. Thus if an instrument is moved from one temperature condition to another, it may be necessary to adjust the needle valve so that the VersaCal can continue to produce the selected ppm value.

If a ppm range is selected and the VersaCal gives the display “PPM too low” this means that the amount of gas coming from the QCV is insufficient to obtain the desired ppm output. The needle valve should be opened slowly (turned counterclockwise) until the instrument no longer displays “PPM too low”. For a display of “PPM too high” the amount of gas coming from the QCV is too much, and the needle valve should be slowly closed (turned clockwise) until this reading is no longer displayed. The VersaCal should then be able to generate the desired ppm value.

The needle valve can also be used to roughly set the flow-rate. ACD recommends setting the flow-rate to approximately 0.5 LPM to allow the greatest amount of control for the VersaCal instrument.

Note: If the concentration still cannot be set it may be necessary to replace the QCV or to return the instrument to a more moderate temperature.

Once gas production begins at a new concentration the timer will reset to zero (00:00:00) and then begin counting upwards again.