Manual for Hand Held Carbon Dioxide and Temperature Monitor CDH

Jan.08

Accessories

CO_2View™ Real-Time Graphing Software & Calibration

This Software allows the CDH to log directly to a Windows compatible PC and graph concentrations in real time.

Includes graphing software and RS232 connection cable.

All data is stored in a txt.file, which is easily opened by other programs.

CO_2View™ also provides and interface that allows the user to perform a zero and span calibration on the sensor.

Hobo® Datalogger Kit CO_2-Temp &RH

This kit includes a tiny data-logger that can record CO_2 concentrations from the CDH and also measures temperature and relative humidity.

The data-logger can be easily attached to the CDH using the provide Velcro™ strip.

The data-logger can store over 7900 data points and can sample at a user adjustable time interval.

Also provided with Boxcar software provides basic launch, data readout. graphing and export capabilities.

Introduction

The CDH is an easy-to-use hand-held CO_2/Temperature monitor.

The unit provides stable, highly accurate readings due to our patented dual beam NDIR technology.

Equipped with a 0-4 V output, the unit is perfect for long-term monitoring/recording.

The unit features a large, easy-to-read display with a push-button interface which al-lows for easy calibration, quick adjustments for altitude correction, and simple toggling between °C and °F temperature readings.

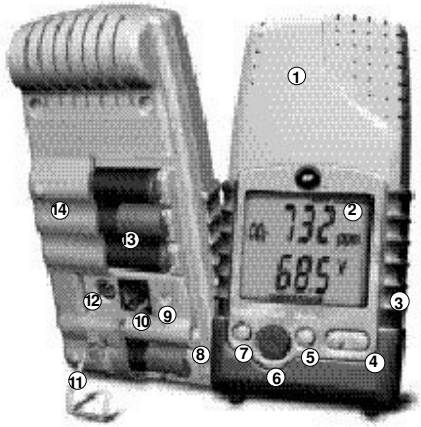
A new feature of the sensor now includes the ability to calculate and display the cfm/person ventilation rate in a space based on the inside/outside CO_2 concentration.

Features

1. **Lightweight** — Made of ABS Plastic. This durable, lightweight plastic adds protection while weighing less than one pound.
2. **Display** — The large display allows for CO_2 and Temperature readings at a glance.

   The display also allows for adjustments to mode settings using the push button interface.
3. **Soft Touch** — Attractive, gives comfort and extra durability.
4. **Up/Down Button** — Used to increase or decrease values while the edit mode.
5. **Mode Button** — Toggles between menu options.
6. **Power** — Turns the power on and off.
7. **Enter** — When toggling between menu options, the Enter button will select desired menu option for editing (e.g. Altitude settings).

   After changes have been made, the Enter key will also confirm settings and return to the main menu.
8. **Calibration Port** — Used for gas connection during calibration or for providing a flow through sample to the sensor.
9. **Calibration Activation Switch** — Located in the battery compartment, this switch is used for activating the calibration process for CO_2 or Temp.
10. **Voltage Output** — The sensor is equipped with an output for datalogging. (see accessories).
11. **Built-in Kickstand** — For continuous monitoring. The built-in kickstand simply swings out from the base to support the monitor in an upright position.
12. **Power Connection** — For connecting the supplied 6V power adapter.
13. **Battery Compartment** — 4 AA Batteries are required for portable operation.
14. **Battery Cover**



Display

Listed below are the modes of operation visible on the display.

Warm-Up
When the power button is pressed, the monitor enters a one minute warm-up indicated by the word WARM-UP in the upper left corner.

On Line
Indicates when a PC is communicating to the sensor via the RJ45 port in the rear of the monitor.

Normal Operating Mode
After warm-up the sensor will stabilize and display current conditions.

Adjustment modes

Pressing the mode button can access adjustment modes. The following information is displayed for each mode. Once the mode is displayed, press enter to adjust the setting. Press enter again to leave the adjustment mode.

Flashing ELEVATION - This feature allows the user to correct the monitor for elevation changes. "ELEVATION" will flash in the lower right corner of the display. Press the enter button and the current elevation above sea level will be displayed. To change adjust from ft. to meters press the mode button. Use the up/dwn buttons to adjust elevation in 500 ft. (100 meter) increments. When finished with adjustment press enter and the adjustment will be saved.

Flashing CALIBRATION - When the word "CALIBRATION" flashes in the middle of the screen the user can enter the CO_2 calibration mode using the procedure described below.

Flashing "TEMPERATURE" - When the word "TEMPERATURE" is flashing at the bottom of the screen the user can enter the Temperature calbration mode using the procedure described below.

Flashing CO_2 and ppm
When "CO_2" and "ppm" are flashing on the screen the user can enter mode to adjust the outdoor reference concentration for the cfm/person calculation.
See the procedure below for more information.

Calibration in Progress Mode
Displays when calibration is in progress.

Outdoor Concentration Mode
To properly calculate the ventilation rate in the space the CO_2 sensor must know what the outside CO_2 concentrations are. This mode allows the CO_2 sensor to store in it´s memory the outside concentration.
It is activated by holding the "enter button" for 5 seconds when the monitor is exposed to stabilized outside conditions.
When this feature is activated, CO_2, PPM and the lower display should flash.
The instructions below also describe how the outside concentration can be manually set.

Low Battery - Displays when the power source is low.

Start-Up

Battery Operation - For portable use, the monitor operates on 4 AA batteries.
Expected battery life is as follows:

Normal (Non-Alkaline)....	**Up to 50 hours**
Rechargeable.....	**Up to 60 Hours**
Industrial Alkaline	**Up to 70 Hours**

Battery Installation - Remove the battery cover by pressing the pressure clip (located on the bottom) and pull upward. Follow the battery diagram imprinted on plastic forproper installation.
Replace battery cover when battery installation is complete.

Low Battery - A warning signal.
(Low battery), will flash when there is less than 30 minutes of battery life.
At this point the batteries should be replaced or the AC adapter should be used as a substitute.

If operation continues, the unit will become inoperable and only the **Low Battery** will be blink on the LCD display.

AC Power - The sensor is shipped with a 6 Vdc 500 mA AC/DC adapter.

To use the AC adapter, connect the plug into the back of the unit and plug the transformer into any standard wall outlet.

NOTE

Use the supplied adapter.
Using the wrong adapter may cause damage to the unit.
If power is lost during operation, battery operation will not function as a back up.

Operation

Power-Up

1. Press the Power Button.
2. A 2 second delay will occur before the display becomes visible.
3. 10 seconds will elapse before current CO_2 readings are displayed.
4. **"Warm-up"** will display for approximately one minute. During this one minute warm-up, adjustments can not be made to the sensor.

Elevation Correction - The sensor is shipped with the elevation setting set at "zero" or sea level. The sensor, like any other gas measuring device is directly affected by altitude changes. If you are at an altitude greater than 500 feet, an adjustment should be made to assure maximum sensor accuracy. The altitude correction is very small for changes of 500-1000 ft. (e.g. 10-15 ppm/500 ft. increment). Once the elevation correction is set it will be stored in the monitor memory and will be retained if the unit is turned off or batteries removed.

To change the default setting using Elevation Correction follow the steps below.

1. While in Normal Mode press the "Mode" button once. The Elevation LCD will begin blinking.
2. Press Enter.
3. Press mode to toggle the elevation reading between feet (ft) and meters (m)
4. Use the Up/Down button to adjust the alti-tude. The altitude can be adjusted in increments of 500 (feet) or 100 (meters). Once the correct altitude is set, press Enter to lock the setting and return to normal mode.

Temperature or Cfm/person - The lower digital display will cycle through the display of the following units when up/down buttons are pressed: Temp°F, Temp°C, cfm/person(fm), turn lower display off.

Stand-alone Monitoring - Once the batteries have been installed and the Elevation correction has been made (as described in the steps above), the sensor will begin to

accurately display current room conditions.

Kickstand - The sensor is equipped with a kickstand which can be used for desktop monitoring.

Using an External Datalogger - Voltage outputs for both CO_2 and temperature are available via an RJ-45 jack on the rear of the unit.

Calibration (CO2)

IMPORTANT

This CDH has been factory calibrated and should only need calibration once every 12 months. For the most accurate field calibration possible we recommend calibrating this sensor with the AP calibration Kit (part number CD CAT) available from AP.

In the CDH Monitor, any sensor drift usually occurs at it zero refernce point. The manual calibration process allows the user to perform a one point calibration based on ambient levels or by flowing a gas of a known concentration through the sensor. This process will adjust the zero offset of the sensor and will provide an accurate calibration. If for reason a two point calibration is required the calibration kit or CO_2View™ software should be used. To manually calibrate the Model CDH CO_2 sensor see instructions below.

1. The calibration procedure will last approximately 15 minutes. Before performing the calibration procedure, remove the battery cover (see “Battery Installation”) to provide access to the CO_2 calibration activation switch.
   Connect the supplied AC adapter to the back of the sensor.
   Ensure the sensor has new batteries or is powered by the plug in transformer.
2. Power up the sensor and wait for the Warm-up to end.
3. Next verify the Elevation correction has been set. Refer to the steps in Elevation Correction for procedure.
4. If you are calibrating to ambient conditions make sure the sensor is displaying a stable reading. It is also very importent to avoid breathing in the area of the monitor. If you are flowing gas to the calibration port of the sensor, allow the gas to flow for at least 10 minutes before initia ting calibration.
5. Press the **Mode** button twice. The Calibration mode will begin blinking.
6. Press **Ente**r.
7. Use the Up/Down Rocker button to adjust the lower reading on the display to the current ambient conditions. Pressing the button once will change the readings in increments of 10 ppm.
   To increase the speed, press and hold the button.

NOTE

For best accuracy, a reference or known concentration of CO_2 should be used when adjusting the reading.

8. Next, on the backside of the unit locate the push button switch (under the battery cover, in the small round hole to the right of the connector jack), use a small pointed object to depress and hold the switch for 5 seconds.
   The **Calibration** light will begin to blink.
9. Press Enter.
10. **Calibration In Progress** will begin to blink.

At this point the unit will program itself based on the CO_2 value that was input in Step 6.

The calibration process will take approximately 5 minutes.

When Calibration is complete, the display will return to the steady **Calibration** mode.
Press **Enter** to return to the normal operation mode.

Temperature Adjustment

Use this procedure to adjust the temperature output when, for example, you wish to have the temperature output match a reference sensor.
The accuracy of a field adjustment is dependent upon the stability of the environment is which the procedure is performed, and upon the accuracy of the reference sensor.

1. Before performing the temperature adjustment, connect the supplied AC adapter to the back of the sensor. If you do not have the AC adapter, new batteries should be used.
2. Power up the sensor and, using the kickstand, place it on a flat surface in a stable environment relatively free of drafts or temperature changes. Wait 30 minutes for the unit to fully equilibrate with the environment. Do not hold the unit in your hand during this period.
3. Press the **Mode** button a number of times. until the blinking word “TEMPERATURE” appears.
4. Press **Ente**r. Both the word “TEM-PERATURE” and the numeric temperature display will begin blinking in unison.
5. Use the Up/Down Rocker button to adjust the temperature reading to match the reference.
6. Press **Ente**r. The temperature offset is immediately adjusted, the blinking stops, and the unit is now in normal operating mode.

Ventilation Rate Indicator (cft)

Overwiew - To display the ventilation rate scroll through the up/down button until the lower display provides a reading showing ftm, which stands for cfm (cubic feet per minute). This value represents how much outside air is being introduced on a cfm per person basis in the space. Current codes and standards generally require 15 to 20 cfm/person to be delivered to most spaces to ensure acceptable indoor air quality. Lower cfm/person values will indicate lower levels of ventilation and potentially poor air quality. Higher levels will indicate excessive ventilation and potential excessive energy usage. Accurate interpretation of the ventilation rate indicator requires a measurement be take 2 to 3 hours after occupancy has stabilized in a space or at a peak in daily CO2 concentrations. In other conditions the indicator may tend to over estimate ventilations rates. The calculation of ventilation rates also assumes an office type of activity level (sitting some walking and other low level activity). If activity levels are higher the sensor will also underestimate the ventilation rate.

The CDH will calculate the outside air ventilation rate to a space based on the inside/outside CO2 differential readings. The sensor is factory set to assume an outside level of 400 ppm, which should be close to the outside concentration in most areas. The outside level of CO2 can also be changed by measuring outside levels or by manually adjusting the monitor.

Adjustment - To measure readings, take the unit outside and wait for levels to stabilize on the CO_2 display (should take approximately 5 minutes). Once levels have stabilized, hold the ”enter” button on the sensor for 5 seconds.

This will store the outside reading in the monitor memory and use this value to calculate the ventilation rate based on the differential of the measured outside value and into measured inside concentration. The monitor will remember this outside value until a new value is entered.

Manual Input Of Outside Concentration - The outside reading can also be manually set using the on-board keypad and display (default is 400 ppm). The monitor assumes that the activity level (and related CO_2 production) in the space is similar to that of a office environment (1.2 MET). To manually adjust the assumed outside concentration for the internal cfm/person calculation or to check the current CO_2 level programmed into the monitor, use the following procedure.

1. Once the CDH has warmed up, press the mode button a number of times until "CO_2" and "ppm" indicators are flashing.
2. Press the enter button and the current assumption for outside levels will be didplayed.
3. Using the up/down scroll button adjust the outside level to the desired level.
4 Press enter to store the value in the monitor.

Specifications

Method
Dual Beam Absorption Infrared™

Sample Method
Diffusion or flow through (50 - 100 ml/min)

Warranty
18 months parts and labor

Performance

CO_2 Channel Measurement Range
0-4,000 ppm voltage output
0-10,000 ppm display

Resolution
± 1 ppm

Accuracy
±50 ppm or ±5% of reading, whichever is greater

Repeatability
±20 ppm

Temperature Dependence
±0.1% of reading per °C or ±2 ppm per °C, whichever is greater, referenced to 25°C

Pressure Dependence
0.13% of reading per mm Hg
(Corrected via user input for elevation)

Annual Drift
± 20 ppm typical

Response Time
<60 seconds for 90% of step change

Warm-Up Time
<60 seconds at 22°C

Operating Conditions
32...122°F (0...50°C)
0-95% RH, non-condensing

Storage Temperatures
-40...140°F (-40...60°C)

Calibration Interval
12 months, offset adjustment using single gas at 0-1000 ppm CO_2. Full factory calibration available

Temperature Channel

Temperature Range
Voltage output 32...104°F (0 to 40°C)
Display 32...122°F (0 to 50°C)

Display Resolution
0.1°F (0.1°C)

Display Options
°F, °C, or Off. Set with panel button.

Accuracy
±2°F (±1°C)

Response Time
20-30 minutes (case must equilibrate with environment)

Calibration Interval
12 months, offset adjustment using temperature standard at 50...86°F (10...30°C). Full factory calibration available

Output - Analog

CO2
0-4 Vdc, 1mV/ppm (4,000 ppm max)

Temperature
0-4 Vdc linear, 32-104°F (0-40°C)

Output Impedance
100 Ohms

Wiring Connection
Via RJ-45 to (accessory cable 2070 or 2071)

Output - Digital

Wiring Connection
Via RJ-45 to DB9 serial port cable

Display
LCD with independent CO_2/ temperature readings (panel buttons set elevation, °F/°C, calibration functions)

Power Supply

Battery Type
Four AA batteries, not included

Battery Operation
70 hours (alkaline)

External
6 Vdc from external AC/DC adapter, included

Power Requirements
100 mA Peak, 20 mA average from 6 V

Certification
FCC Class 15 Part B

Accessories

CD CA	Datalogging cable (analogo utput)
CD CR	Datalogging cable Recordaire ®
CD CAT	Calibration kit
CD DSW	CO_2View Datalogging Software
CD LOG	Datalogging Kit with Temp/RH
CD DL	Recordaire ® datalogger, 4-channel
CD GSW	VG Graphing software