

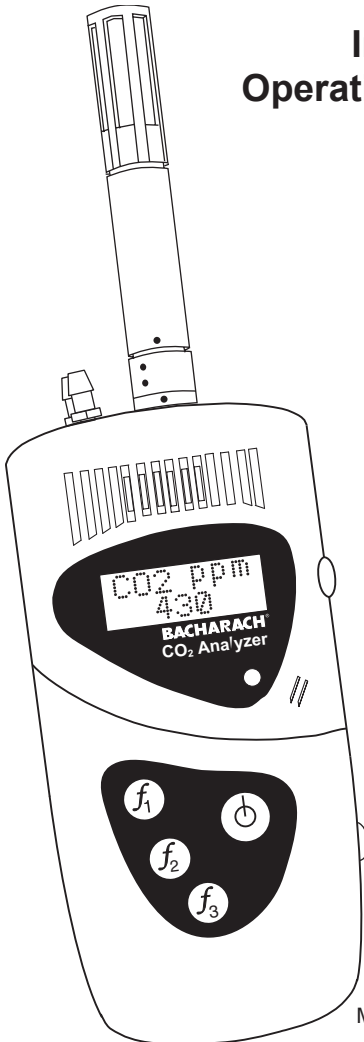


# CO<sub>2</sub> Analyzer

## 2825/2830/2835

### Instruction 19-9320 Operation & Maintenance

Rev. 2 – April 2004



Model 2835 Shown

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## **Notes**

# 1.0 INTRODUCTION

## 1.1 General

Bacharach's line of CO<sub>2</sub> analyzers are easy to use, but it is essential that this instruction manual be read, understood, and followed by all operators and maintenance personnel prior to using or servicing the analyzer.

CO<sub>2</sub> analyzer models 2825, 2830 and 2835 are all compact and light-weight instruments that principally measure and display CO<sub>2</sub> concentrations, with each of the various models offering the ability to also measure barometric pressure, O<sub>2</sub>, temperature, and relative humidity.

- 2825 – CO<sub>2</sub> (0–60%), Pressure, and O<sub>2</sub>
- 2830 – CO<sub>2</sub> (0–60%), Pressure, O<sub>2</sub>, and Temperature
- 2835 – CO<sub>2</sub> (0–10,000 ppm), Pressure, Temperature, and Relative Humidity

Each reading is displayed separately on a backlit LCD, with an operator being able to quickly scroll through all the readings by pressing the  $f_3$  button. A peak-gas-reading mode enables an operator to view the highest gas reading that was taken since the analyzer was switched ON.

Each analyzer can store all measured readings in memory, which can later be downloaded to a personal computer via its integral IrDA communications link and the optional BACH-COM software.

## 1.2 Features

- Normal and peak reading modes
- Up to 10 hours of operation on one charge
- Convenient zero function for all gas sensors
- Internal pump for remote gas sampling
- Long-life sensors (CO<sub>2</sub> - 10 years; O<sub>2</sub> - 2 years)
- Infrared CO<sub>2</sub> sensor and electrochemical O<sub>2</sub> sensor
- Battery capacity display
- Manual (snapshot) and continuous data logging of readings with time and date stamp
- Memory capacity for storing 200 sets of data
- IrDA link for downloading stored data to a personal computer
- Charge-and-run capability for long-term monitoring
- Weight: 12 oz
- Dimensions: 5.5"H x 2.5"W x 1.5"D

## 1.3 Applications

- Incubators
- Mushroom Farms
- Fruit/Vegetable Storage
- Greenhouses
- Food Packing
- Brewing
- Carbonated Drink Dispensing
- Blended Beer Gases

## 1.4 Instruction Manual

Unless otherwise noted, all sections in this instruction manual describe the operation and maintenance of all three CO<sub>2</sub> analyzer models (2825 / 2830 / 2835).

If a section is relevant to only one or more analyzer models, then the section heading will contain the name(s) of those models. For example, section heading *2.3 Probe Installation (2830/2835)* indicates that the information under this heading pertains only to analyzer models 2830 and 2835.

## 1.5 Measuring Ranges



Measurement	Range / Resolution
CO <sub>2</sub> – High Range (2825 / 2830).....	0 to 60% / 1%
CO <sub>2</sub> – Low Range (2835).....	0 to 10,000 ppm / 10 ppm
O <sub>2</sub> (2825 / 2830).....	0 to 30% / 1 %
Barometric Pressure (2825 / 2830 / 2835).....	21 to 36" Hg / 0.01" Hg
Temperature (2830 / 2835) .....	0 to 104°F / 0.1°F
Relative Humidity (2835) .....	0 to 99.9% / 1%

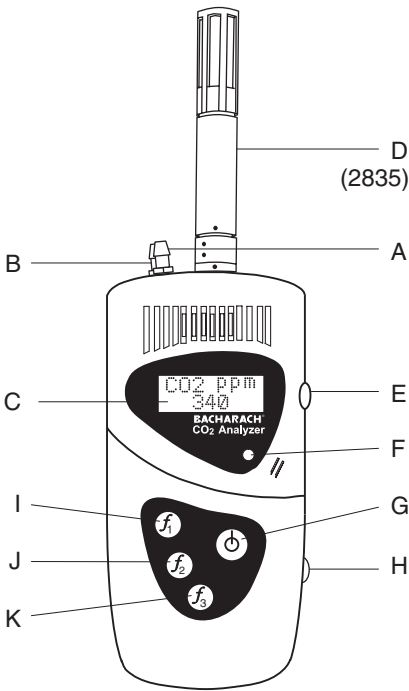
## 2.0 OPERATION

### 2.1 Important Note

Always ensure that the analyzer's gas inlet connector (Figure 1, Item A) and gas exhaust (Figure 1, Item B) are unobstructed and open to the atmosphere. Be careful not to breath directly on the analyzer while taking a measurement; otherwise, inaccurate readings will result.

### 2.2 Switching Analyzer ON/OFF

Switch ON the analyzer by pressing the  button. Switch the analyzer OFF by pressing the  button down for at least 3 seconds, or until the display goes blank. When first switched on, there is an approximate 60 second warm-up period before the CO<sub>2</sub> level is displayed, and 3 minutes before the O<sub>2</sub> level is displayed. Note that normal fresh air background readings are 340 ppm CO<sub>2</sub> and 21% O<sub>2</sub>.




- A - Gas inlet fitting
- B - Gas outlet fitting
- C - LCD display
- D - Temperature and humidity sensor probe (Model 2835)
- E - IrDA link
- F - Pump ON light
- G - Press once to switch analyzer ON; press once to start and stop pump; hold 3 seconds to switch analyzer OFF ()
- H - Battery charging socket
- I - Press once to store data; hold to start and stop data-logging ( $f_1$ )
- J - Press once for battery level; hold to start Air Calibration ( $f_2$ )
- K - Press once to scroll through measurement channels; hold for peak gas reading ( $f_3$ )

Figure 1. Components of the CO<sub>2</sub> Analyzer

## 2.3 Probe Installation (2830 / 2835)

### 2.3.1 Temperature Probe Installation (2830)

The 2030 Analyzer's temperature sensor is mounted in a hand-held probe assembly that plugs into a separate socket on top of the analyzer (Figure 2).

Before installing the probe, turn the analyzer OFF. Align the slot on the probe connector with the tab on the analyzer's mating socket; then push the probe connector onto its socket until it bottoms.

Remove the probe connector by pulling it straight up.

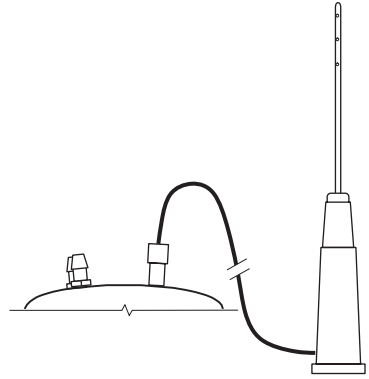


Figure 2. Temperature Probe Installation

### 2.3.2 Temperature & Humidity Probe Installation (2835)

The 2835 Analyzer's temperature and humidity sensors are mounted in a rigid probe assembly that attaches to a separate connector on top of the analyzer (Figure 3).

Before installing the probe, turn the analyzer OFF. Turn the probe's locking collar on the analyzer so that all dots line up. Align the dot on the probe with the dots on the locking collar; then push the probe into its socket until it bottoms. Now lock the probe into place by turning the locking collar to its locked position.

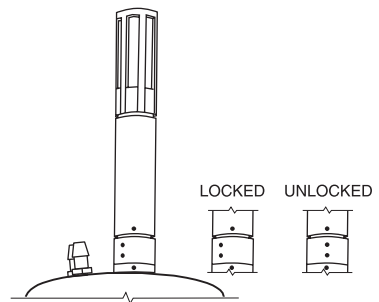



Figure 3. Temperature & Humidity Probe Installation

To remove the probe, first turn the locking collar to its unlocked position; then pull the probe straight up.



## 2.4 Pump Operation

With the analyzer already switched ON, momentarily pressing the  button will start and stop the internal pump. The optional Extended Probe Assembly with in-line filter (P/N 19-3310) can be connected to the gas inlet fitting (Figure 1, Item A) on the top of the analyzer for drawing gas samples from hard-to-reach areas. If desired, a section of 1/8" I.D. tubing can be connected to the gas outlet fitting (Figure 1, Item B) to exhaust the gas being sampled to an outside area.

Note that the combined sampling hose and probe length should not exceed 6 feet (1.8 m). Also note that the internal pump is intended for use only at normal atmospheric pressure, and is not designed to draw in gas samples against a vacuum or an obstruction such as a kink in the sampling hose. If an obstruction or negative-pressure gradient is present, then gas *will not* be drawn into the analyzer. Please consult the factory for applications where longer sampling lengths are required, or where it is necessary to draw against a vacuum.

## 2.5 Pump Contamination

Over time the pump can become contaminated, leading to a slower response time and lower readings. To check for pump contamination, turn the pump ON and hold your index finger over the inlet fitting. The pump should normally stall. If the pump, however, continues to run, then the pump is contaminated and the analyzer needs to be returned to a Bacharach Service Center for repair (refer to Section 4.2).

## 2.6 Selecting the Measurement to be Displayed

Depending upon the analyzer model, several different gases and environmental measurements can be taken as described in Section 1.1 *General*.

**Important!** *For the 2830/2835 analyzer to display accurate temperature readings, the temperature probe must be installed per Section 2.3. Note that if the temperature probe is removed, the analyzer will continue to provide accurate readings for all other measurements.*

Each measurement is displayed separately on the analyzer's LCD (Figure 1, Item C). The measurement displayed is selected by pressing the  $f_3$  button.

Each time the  $f_3$  button is pressed, the display scrolls through the following measurements:

CO <sub>2</sub> ppm 340
----------------------------

Carbon Dioxide  
(2825 / 2830 / 2835)

Baro"Hg 28.79
------------------

Barometric Pressure  
(2825 / 2830 / 2835)

O <sub>2</sub> % 21
------------------------

Oxygen (2825 / 2830) 'Please Wait' will be displayed if the O<sub>2</sub> cell is still warming up (approx. 3 min.)

Temp F 72.4
----------------

Temperature  
(2830 / 2835)

RH % 45
------------

Relative Humidity  
(2835)

## 2.7 Current / Peak Gas Reading Mode

The analyzer can display either the current readings of all measurements, or peak gas readings. While displaying a *gas* reading, pressing and holding the  $f_3$  button for 3 seconds switches the analyzer to its peak reading mode. Note that a peak reading is the highest reading taken since the analyzer was switched ON.

CO2 ppm  
340

peakCO2  
1,530

When using the 2825 / 2830 in its peak-reading mode, pressing the  $f_3$  button toggles the display between 'peak CO<sub>2</sub>' and 'peak O<sub>2</sub>'.

To return the analyzer to its current-reading mode, again press and hold the  $f_3$  button for 3 seconds.


To reset the peak gas readings back to the current readings, switch the analyzer OFF and then back ON.

## 2.8 Storing Readings

There are two reading-storage modes available:

- Snapshot
- Continuous Data Logging

Pressing the  $f_1$  button once stores (takes a snapshot of) the reading shown on the display.

ppm CO2   
430

Clock icon is displayed once for a snapshot, and flashes during continuous logging.

Pressing and holding down the  $f_1$  button for at least 3 seconds starts the continuous data logging of the readings at a preset interval (factory set at 30 seconds).

The analyzer can store from 100 to 200 readings based on the analyzer's configuration. Logging will stop once the analyzer's storage capacity has been reached.

The stored data can be downloaded to a personal computer using the analyzer's IrDA link and the optional BACH-COM software. This software can also be used to alter the data-logging interval; produce tables and plots of time-based CO<sub>2</sub> readings; and clear all logged data from memory.

## 2.9 Battery Low Display

When the battery nears depletion, the display will alternate between its normal display and the following “BattLow” display.

A rectangular display box containing the text "BattLow" on the top line and "340" on the bottom line.

In addition, the beeper will emit three rapid notes every 30 seconds. At this time the analyzer should be given a full charge per Section 3.6 as soon as possible.

## 2.10 Battery Charge Display

An indication of the battery’s charge is obtained by pressing the  $f_2$  button once. A bar graph in the lower part of this screen shows an approximation of the battery’s remaining charge. As the charge reduces, the bar graph decreases in size. Typical operating time from a full charge is approximately 10 hours.

A rectangular display box containing the text "Battery" on the top line and "Level" on the bottom line. To the right of the text is a bar graph consisting of four vertical bars of decreasing height from left to right.



= represents full charge



= represents low charge

## 2.11 Fault Condition Warning

The analyzer is capable of alerting the operator of an internal fault condition (i.e., a sensor failure or blockage in the infrared path). If a fault occurs, the analyzer’s beeper will sound continuously, and the following message is displayed until the analyzer is turned off.

A rectangular display box containing the text "FAULT" in the center.

If the fault warning is displayed at any time, then the analyzer must be returned to a Bacharach Service Center for repair (refer to Section 4.2).

## 2.12 Powering Analyzer from Charger

The analyzer can be continuously powered by its charger by connecting the charger to the analyzer in the following sequence:

1. Switch ON the analyzer *without* the charger attached.

**Note:** *Connecting the charger to an analyzer that is switched OFF causes the unit to enter its charging mode, which in turn prevents the analyzer from being switched ON.*

2. Plug the charger into the appropriate AC wall socket (or 12 VDC when using the optional vehicle charger). Then plug the charger's output connector into the analyzer's charging socket (Figure 1, Item H).

The analyzer will now continuously run, until the charger is removed and the unit switched OFF—the analyzer will not turn OFF with the charger attached.

## 2.13 High Humidity Gas Sampling (2825 / 2830)

When using the 2825 / 2830 to draw gas samples from areas with high levels of humidity (e.g., incubators with water jackets), install both a particulate filter (P/N 54-0548) and desiccant filter (P/N 07-1645) on the analyzer by first connecting the particulate filter to the analyzer's inlet gas fitting, and then connecting the desiccant filter to the particulate filter using a 2–3 inch piece of rubber tubing (cut from the tubing supplied with the analyzer). Use the remaining piece of tubing to connect to the incubator. See Figure 4.

Replace the desiccant filter when its silica gel turns a pinkish color. Note that the filter's silica gel can be rejuvenated by either running pure N<sub>2</sub> through the filter at a low flow rate, or by baking the filter in a 250°F (120°C) oven until its blue color returns.

When storing the desiccant filter, install rubber caps (P/N 19-0001) on both ends of the filter. The caps will seal the filter when not in use and extend its life.

## 2.14 Testing Incubators (2825 / 2830)

When testing incubators with the Model 2825 / 2830, it is important to keep moisture from entering the analyzer. Moisture can contaminate the IR cell and affect the readings.

When a desiccant filter (P/N 07-1645) is installed, it will remove excess water vapor (humidity), refer to Section 2.13. However, when testing water-jacketed incubators the potential exists to draw condensation—water droplets that form inside the incubator’s internal sample line—through the desiccant filter and into the analyzer.

To prevent water from entering the analyzer, install a water trap (P/N 19-3265) in-line between the incubator and desiccant filter as shown in Figure 4.

**Important!** Remove the water trap’s internal particulate filter element before testing.

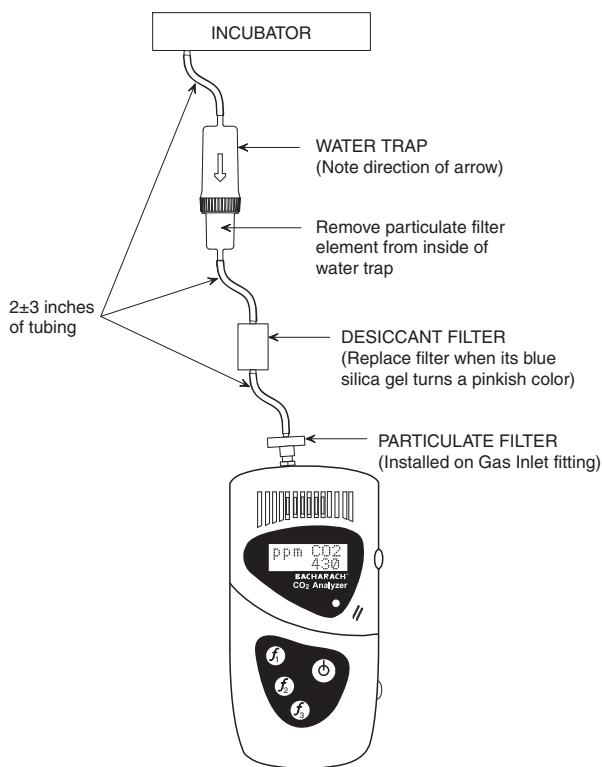


Figure 4. Installation Order of the Particulate Filter, Desiccant Filter & Water Trap Accessories

## 3.0 MAINTENANCE

### 3.1 Cleaning

Keep the analyzer clean by wiping it with a soft cloth dampened with a mild detergent solution.

### 3.2 Sunlight

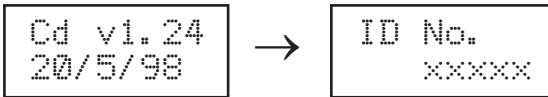
The unit should not be left out in direct sunlight, or in other areas where excessive heat exists, for long periods since component damage due to overheating may result.

### 3.3 Servicing

There are no user-serviceable parts inside the analyzer. Unauthorized disassembly of the unit will invalidate the warranty.

### 3.4 Software Version / Serial Number

With the analyzer switched OFF, and while holding down the  $f_1$  button, switch ON the analyzer to display its software version and issue date. Releasing the  $f_1$  button displays the analyzer's ID number for 5 seconds.



### 3.5 Factory Settings

**Important!** *The analyzer should only be returned to its factory settings when advised by a Bacharach Service Representative.*

With the analyzer switched OFF, and while holding down the  $f_2$  button, switch ON the analyzer. The display will show

```

FACTORY
SETTINGS
  
```

Keep the  $f_2$  button depressed until the display shows

```

RESET OK
  
```

Release the  $f_2$  button and perform an air calibration as described in Section 3.7

**WARNING!** *Failure to perform an air calibration after resetting the analyzer to its factory settings may cause incorrect gas readings to be displayed.*

## 3.6 Battery Charging

When the 'BattLow' message is displayed (refer to Section 2.9), the analyzer must be recharged using the supplied battery charger.

**Important!** *The battery has a long shelf life, but it is recommended that the battery be **recharged once a month** if left unused. Batteries that have not been charged for several months should be given at least two charge/discharge cycles before using the analyzer.*

As with all rechargeable batteries, there are guidelines that should be observed: The battery should normally be charged at room temperature. Charging at temperatures below 54°F (12°C) should be avoided since this may cause a false indication of when the battery is charged, and could also damage the battery.

Before beginning the charging process, first ensure that the analyzer is switched OFF. Next, plug the supplied charger into the appropriate AC wall socket (an optional 12 VDC vehicle charger is also available). Then plug the charger's output connector into the analyzer's charging socket (Figure 1, Item H).

The word 'CHARGING' appears while the battery is being charged. Charging time is approximately 2 hours.

**Note:** *If the battery is deeply discharged, the display will remain blank for a few minutes before the battery begins charging.*

Once the battery is fully recharged, the analyzer will emit a beeping tone for 30 seconds and display the word 'CHARGED'. At this time unplug the charger and remove its output connector from the analyzer.



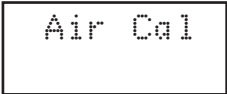


## 3.7 Air Calibration

An air calibration consists of zeroing the gas sensor(s) in fresh outside air, which sets the CO<sub>2</sub> sensor to read 340 ppm or 0.03% (2825 / 2830 / 2835) and the O<sub>2</sub> sensor to read 21% (2825 / 2830).

**Important!** *It is essential to ensure that the analyzer is in fresh air before attempting an air calibration. If this condition is not ensured, incorrect gas readings will occur. Also be careful that your breath does not affect this procedure by keeping your exhaled breath away from the analyzer's gas inlet.*

1. Switch ON the analyzer, and then allow it to warm up while sampling fresh outside air for at least 5 minutes.
2. After the analyzer has warmed up, turn ON the pump for 30 seconds to purge the sensor area; then turn the pump OFF before proceeding to Step 3.
3. Press and hold down the  $f_2$  button until the 'Air Cal' screen is displayed. Note that battery status is first displayed for 2 seconds.



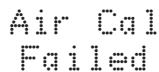
Air Cal

4. Keep the  $f_2$  button depressed until the display shows:



Air Cal  
OK

If the procedure was unsuccessful, or if the  $f_2$  button released prematurely, then the message



Air Cal  
Failed

will be displayed. If this happens, retry the Air Calibration procedure, ensuring that the analyzer is only exposed to fresh air. If the procedure is still unsuccessful, then the analyzer must be returned to a Bacharach Service Center for evaluation (refer to Section 4.2).

5. This completes the Air Calibration procedure.

## 4.0 PARTS & SERVICE

### 4.1 Replacement Parts and Accessories

#### Complete Kits

<b>2825</b> – Includes analyzer capable of measuring CO <sub>2</sub> (0–60%), O <sub>2</sub> , and barometric pressure. Kit also includes a particulate filter, desiccant filter, water trap and battery charger .....	19-8053
<b>2830</b> – Includes analyzer capable of measuring CO <sub>2</sub> (0–60%), O <sub>2</sub> , barometric pressure, and temperature. Kit also includes a particulate filter, desiccant filter, water filter, temperature probe, and battery charger.....	19-8054
<b>2835</b> – Includes analyzer capable of measuring CO <sub>2</sub> (0–10,000 ppm), barometric pressure, temperature, and relative humidity. Kit also includes a temperature and humidity probe, and battery charger .....	19-8055

#### Replacement Parts

110/240 VAC, U.S.A. & European Plug Charger .....	19-3312
Desiccant Filter (2825 / 2830) .....	07-1645
Desiccant Filter Rubber Cap (package of 6) .....	19-0001
Temperature Probe (2830).....	19-3339
Temperature & Humidity Probe (2835).....	19-3338
Particulate Filter (2825 / 2830) .....	54-0548
Water Trap (2825 / 2830).....	19-3265

#### Accessories

12 VDC Vehicle Charger.....	19-3302
Carrying Case, Large (13 1/2"L x 10 13/16"W x 4"H).....	19-3311
Carrying Case, Small (10 5/8"L x 8 1/2"W x 3 3/16"H) .....	19-3337
Extended Probe Assembly w/ In-Line Filter, 3 foot .....	19-3310
IrDA Interface Kit & BACH-COM <i>Plus</i> Software.....	19-3254
Table Top Stand.....	19-3307

## 4.2 Bacharach Service Centers

### United States

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#### California

7281 Garden Grove Blvd.,  
Suite H  
Garden Grove, CA 92841  
Phone: 714-895-0050  
Fax: 714-895-7950  
Email: calservice@bacharach-inc.com

#### New Jersey

7300 Industrial Park  
Rte. 130, Bldg. 22  
Pennsauken, NJ 08110  
Phone: 856-665-6176  
Fax: 856-665-6661  
Email: njservice@bacharach-inc.com

#### Pennsylvania

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