BACHARACH
The Measurable Difference

Comfort Chek® 400
Air Quality Monitor

Instruction 1509-9000
Operation Manual

Rev. 4 - June 2013

Product Leadership • Training • Service • Reliability

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PURCHASE DATE: _____

PURCHASED FROM: _____

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1. OVERVIEW

1.1. Welcome

Thank you for purchasing the Comfort Chek® 400 indoor environmental quality monitor. The Comfort Chek® 400 is an easy-to-use, portable device for monitoring indoor air quality. It utilizes an infrared CO_2 sensor plus temperature and relative humidity (RH) sensors.

The Comfort Chek® 400 is a rugged, hand-held, battery-powered IAQ instrument for measuring and displaying carbon dioxide (CO_2), Temperature and RH indoors. It operates from internal alkaline batteries or wall adapter.

The Comfort Chek® 400 is equipped with integral CO_2, temperature and RH sensors to aid in verifying readings providing an indication of air quality.

NOTE: Calibration and repair are available at our manufacturing facility and through some of our authorized and trained distributors.

If after reading the manual you have any questions, please contact our customer service department for technical support.

Figure 1-1. Comfort Chek® 400

Figure 1-2. Comfort Chek® 400 Kit

1.2. Comfort Chek® 400 Shipping Checklist

This checklist ensures that you have received everything required to run your Comfort Chek™ 400. If you do not receive any of the items listed below, contact the factory immediately.

- Comfort Chek® 400 instrument
- 4 x "AA" alkaline batteries
- AC wall adapter (with North American plug)
- Operation manual
- Black plastic carrying/storage case

1.3. Key Features

Features of the Comfort Chek® 400 include the following.

- Displays CO_2, temperature and RH simultaneously
- Stable NDIR sensor for CO_2 detection
- Statistics for STEL and TWA
- Backlit LCD display for dark areas
- Audible alarm for CO_2 readings
- Battery (operates up to 10 hours) or continuously with wall adapter power supply
- Easy user calibration for CO_2

1.4. General CO_2 Guidelines

General CO_2 indoor air quality guidelines are summarized in the chart below. Aside from the OSHA level of 5000 ppm for unsafe CO_2 levels, the other guidelines of normal (300-400 ppm) and poorly ventilated (1000-1100 ppm) are generally accepted standards for indoor air quality. Your guidelines may vary based on local practices and personal preferences. Refer to Section 7 for additional information.

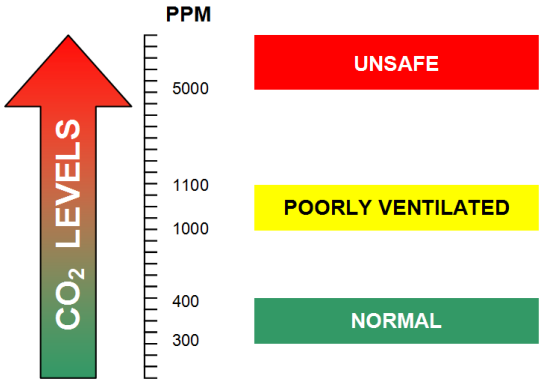


Figure 1-3. General CO_2 Guidelines

2. SPECIFICATIONS

Categories/Subcategories		Descriptions
Enclosure	**Dimensions**	H x W x D 6.63" x 2.75" x 1.25" (17 cm x 7 cm x 3 cm)
	Weight	7.1 ounces (200 grams) including batteries
Power	**Battery**	Four alkaline batteries (4 x "AA")
	External	9 VDC from external AC adapter which is included in kit (North American wall configuration only). The end of the wall adapter that plugs into the instrument is 1.3 mm diameter, center positive. **CAUTION:** DO NOT use rechargeable batteries in the Comfort Chek® 400 and DO NOT try to use the wall adapter to charge them.
User Interface	**Display**	Three parameters, backlit, numerical LCD display
	Audio	Alarms will sound at 1000 PPM, the ASHRAE limit. The alarm level can be modified and the alarm sound can be turned off through the instrument menu.
	Warm-up	30 seconds
Environ-mental	**Temperature**	Operating: 0° to 50° C (32° to 122° F) Storage: -20° to 700° C (-4° to 158° F)
	Relative Humidity	Operating: 0 to 95% RH non-condensing
Standards	**Certifications**	CE
Sensors	**Method**	Diffusion
	Range	0 - 5000 ppm
	Resolution	1 ppm
	Accuracy	±30 ppm ±5% of reading (0 - 5000 ppm)
	Pressure	Dependence: +1.6% reading per kPa deviation from normal pressure, 100 kPa
	Temperature	Range: -10.0° C to 60.0° C (14° F to 140° F) Resolution: 0.1° C (0.1° F) Accuracy: ±0.6° C (±0.9° F)
	Humidity	Range: 0.0% to 99.9% Resolution: 0.1% Accuracy: ±3% (10% to 90% range), ±5% (other ranges)

Figure 2-1. Comfort Chek® 400 Dimensions

3. COMPONENTS

3.1. Power Supply

The instrument is powered by either 4 “AA” alkaline batteries or a supplied DC wall adapter (9V/1A output). Install batteries into the battery compartment on the rear of the instrument and make sure they are in correct polarity and making good contact. When the wall adapter is used it will cut off the power supply from the batteries. The wall adapter cannot be used as a battery charger.

When battery voltage gets low, “Lob” will appear on the LCD and the audible alarm sounds. The CO_2 infrared sensor cannot operate under low voltage, so the instrument beeps to indicate failed CO_2 measurement. The user can press any button to stop the beeps and at that time the sensor readings will not be displayed. To continue, replace the alkaline batteries with fresh ones or connect the wall adapter.

NOTE: If the AC adapter is plugged in while the instrument is powered on, the Comfort CHEK™ 400 will lose power.

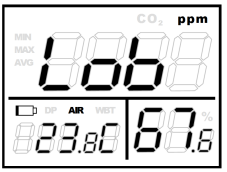


Figure 3-1. Sample Low Battery Screen

3.2. LCD Display

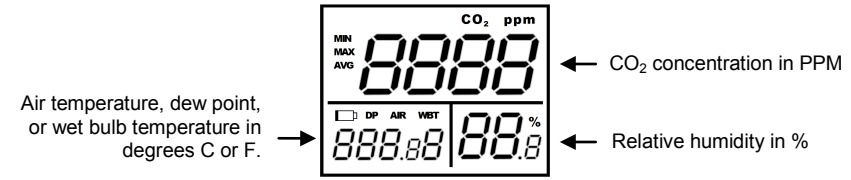


Figure 3-2. LCD Components

LCD Symbol	Description
TWA	Time Weighted Average (8 hours)
STEL	Short-Term Exposure Limit (15 minute weighted average)
HOLD	Readings are frozen and remain unchanged
MIN/MAX	MINimum/MAXimum readings
	Low battery indicator
DP	Dew Point temperature
AIR	AIR temperature
WBT	Wet Bulb Temperature
%	Unit of measurement of relative humidity
°T (C/F)	Celsius/Fahrenheit temperature unit of measure

3.3. Keypad

Keypad Button	Description
SET	Switches instrument on and off Enters set up mode Sets as non-sleep mode along with “HOLD”
CAL **Esc**	Exits set up page/mode Enters CO_2 calibration along with “MODE” Enters RH calibration along with “DP/WBT”
HOLD	Freezes the current readings Cancels data hold function
MODE	Activates or cancels the backlight Selects unit or increases value in set up
DP/WBT	Selects AIR, DP, WBT temps display Selects unit or decreases value in set up
M N X **/AV**	Activates MIN, MAX, STEL, TWA functions Saves and finishes settings

4. OPERATION

4.1. Power On/Off

Press the SET button to switch instrument on. At power up, it emits a short beep and performs a 30-second countdown while the instrument warms up. It then enters normal operating mode displaying real time CO_2, temperature, and RH readings. To switch the instrument off, press the SET button.

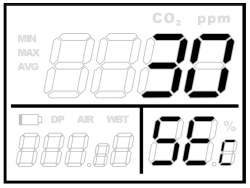


Figure 4-1. Warm-up Countdown

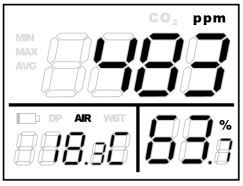


Figure 4-2. Normal Operating Mode

NOTE: For the purpose of saving battery life, the unit will switch itself off after 20 minutes of operation. For continuous operation, switch the unit on using both SET and HOLD buttons together.

4.2. Taking Measurements

The instrument starts taking measurements upon power up and updates information on the LCD every second. When the environment to be monitored changes (example: from high temperature to low temperature), it takes 30 seconds to update the CO_2 reading and 30 minutes to update the RH reading.

NOTE: Do not hold the instrument close to your face because your exhalation will affect the CO_2, temperature and RH readings.

Press DP/WBT (down arrow) button to switch between the three different temperature units of measure. The lower left portion of the LCD will cycle from air temperature to dew point temperature to wet bulb temperature.

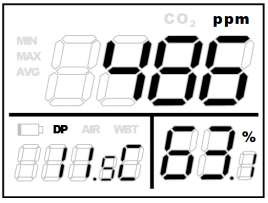


Figure 4-3. Dew Point Temperature

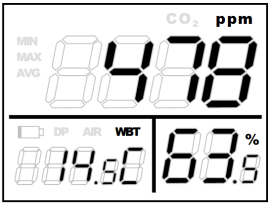


Figure 4-4. Wet Bulb Temperature

4.3. Back Light

Hold down MODE for more than 1 second to activate or cancel the back light function.

4.4. Data Hold

Press the HOLD button to freeze the current readings. The HOLD icon is indicated at the top left corner of the LCD. All current readings remain unchanged, except TWA and STEL. Press the HOLD button again to cancel this function.

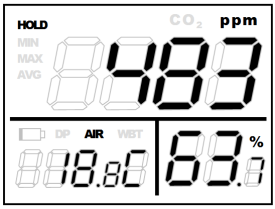


Figure 4-5. HOLD Mode

4.5. MIN, MAX, TWA, and STEL

While in normal operating mode, press MNX/AV to see the minimum, maximum, and time weighted average readings. Each press of this button displays another readings in sequence and finally returns to the normal operating mode.

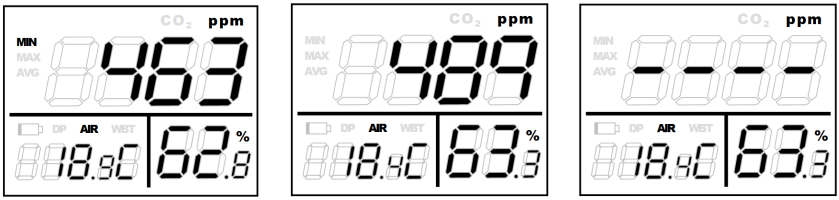
In the MIN/MAX modes, the instrument indicates the minimum and maximum readings for CO_2 on the upper half of the LCD, air/DP/WB temperatures in the lower left corner of the LCD and RH in the lower right corner of the LCD (Figure a).

In STEL and TWA modes, the main part of the LCD indicates the time weighted average for readings for CO_2 for the past 15 minutes (STEL) and past 8 hours (TWA). The lower portions of the LCD are the current AIR, DP/WB temperatures readings and current RH readings (Figure b).

NOTE: If the instrument is switched on for less than 15 minutes, the STEL value will be the time weighted average of the readings taken since switch on. The same calculations apply to the TWA readings indicated prior to 8 hours of operation.

NOTE: It takes at least 5 minutes of recorded readings to calculate the STEL and TWA. The display indicates "- - - -" (Figure c) during the first 5 minutes of operation from power on.

NOTE: While all the other readings are held unchanged, the STEL and TWA are updated every 5 minutes.



(a) **(b)** **(c)**

Figure 4-6. Statistics Screens

4.6. Audible Alarm

The instrument has an audible alarm to provide warnings to the user when CO_2 concentrations exceed the limit (see P1.0 in setup for setting alarm threshold). It emits beeps (about 80 dB) when measured CO_2 concentration exceeds the preset value and stops when any key (except SET) is pressed or readings fall below the preset alarm value. It beeps again when the value once again exceeds the preset limit. Restart the instrument if the beeping cannot be stopped.

4.7. Auto Power Off

The instruments automatically switches off after 20 minutes of inactivity to save on battery life. To override this function, power on the instrument by holding down the SET and HOLD buttons for 2 seconds until “n” appears on the LCD.

NOTE: Auto sleep function is disabled during calibration mode.

4.8. Setup Mode

Hold down the “SET” button for more than 1 second while in normal operation mode to enter the set up mode. To exit set up mode, press the CAL Esc button in P1.0 or P3.0 and it returns to normal operating mode.

4.9. P1.0 CO_2 Alarm Level

When entering the set up mode, P1.0 and AL are indicated on the LCD. Press MNX/AV button to go into P1.1 for setting the CO_2 alarm threshold. The current set value will be blinking on the LCD. Press the MODE (up arrow) button or DP/WBT (down arrow) button to change the set point in intervals of 100 ppm. Press the MNX/AV button to save changes, or the CAL Esc button to exit without saving.

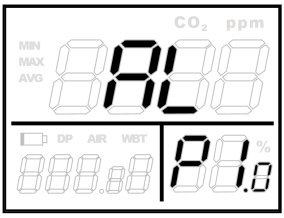


Figure 4-7. Entering Setup Mode

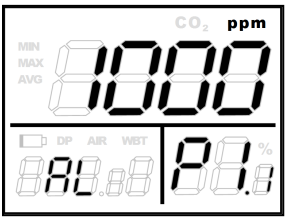


Figure 4-8. Current Set Value (Blinking)

4.10. P3.0 Temperature Units

Press the MODE (up arrow) button or DP/WBT (down arrow) button in P1.0 to access P3.0 for setting up the temperature scale. Press the MNX/AV button and it enters P3.1 mode with blinking °C or °F current settings on the lower left area of the LCD. To switch between °C and °F, press the MODE (arrow up) button and DP/WBT (arrow down) button. Then press the MNX/AV button to save the setting or CAL Esc button to exit without saving and return to P3.0.

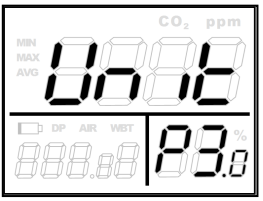


Figure 4-9. P3.1 Temperature Scale

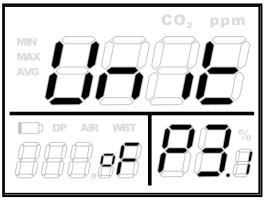


Figure 4-10. Temperature Units

4.11. CO_2 Calibration

The instrument defaults to be calibrated manually in ambient air where CO_2 concentration outdoors is around 400 ppm.

NOTE: Though not required, it is recommended that you calibrate the instrument prior to each use. It is also recommended that the instrument be calibrated annually by a trained technician or the factory using calibration gas.

NOTE: Do not calibrate the instrument in air with unknown CO_2 concentration otherwise it will be calibrated as 400 ppm by default and the CO_2 readings displayed will be inaccurate.

It is suggested to calibrate the instrument in fresh outdoor air that is well ventilated and it is better in sunny weather. Do not calibrate the instrument in places crowed with people or close to areas where CO_2 concentrations may be high such as ventilation outputs, near exhaust, idling cars, garages, transportation depots, traffic, etc.

Set the instrument in the calibration site, switch it on and hold down the CAL Esc and MODE (arrow up) buttons simultaneously to enter the CO_2 calibration mode. CAL and 400 ppm are blinking on the LCD while performing calibration.

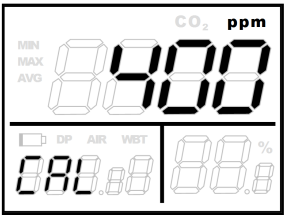


Figure 4-11. CO_2 Calibration Mode

NOTE: Ensure either the wall adapter or fresh batteries are used for the calibration procedure because the infrared CO_2 sensor draws a fairly high current. Low battery voltage may result in an interruption or failed calibration.

Wait about 10 minutes until the blinking stops and the calibration is completed automatically. The instrument returns to normal operation mode. To abort the calibration, switch the instrument off at any time.

4.12. RH Calibration Overview

The meter defaults to be calibrated at 33% RH and 75% salt solution. The ambient condition is recommended to be at 25° C with stable humidity (it's better to be close to the calibration value). To abort the calibration, switch the instrument off at any time.

CAUTION: Do not calibrate the humidity without the default calibration salt solution as it will cause permanent damage to the RH sensor.

4.13. 33% Calibration

Plug the sensor probe into a 33% salt solution bottle. Hold down the CAL Esc button and DP/WBT button while in normal operating mode to enter the 33% calibrating mode. CAL and calibration value (32.7% if at 25° C) are blinking on the LCD with current temperature displayed on the lower left side.

The instrument is now calibrating and will finish in approximately 60 minutes when CAL and humidity stop blinking.

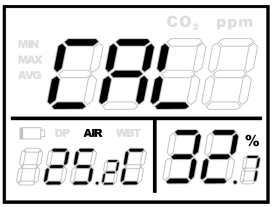


Figure 4-12. 33% Cal Mode

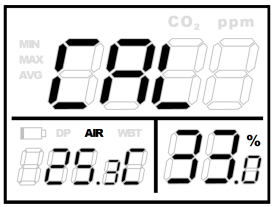


Figure 4-13. Cal Mode Finished

4.14. 75% Calibration

After 33% calibration, plug the sensor probe into a 75% salt solution bottle, then press MNX/AV to enter 75% calibration.

CAL and calibrating value (75.2% if at 25° C) are blinking on the LCD with current temperature indicated at the lower left corner. The instrument is now calibrating and will finish in approximately 60 minutes when CAL and humidity stop blinking and the instrument returns to normal operating mode.

NOTE: To calibrate 33% only, press CAL Esc and exit when 33% calibration is complete. To calibrate 75% only, press MODE (arrow up) or DP/WBT (arrow down) within 5 minutes of initializing 33% calibration.

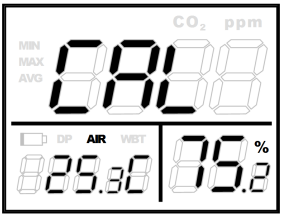


Figure 4-14. 75% Cal Mode

5. TROUBLESHOOTING

5.1. Cannot Power On

Press the SET button for more than 1 second and try again. In using batteries, ensure that the batteries are making good contact and that they are installed with the correct polarity. Otherwise, ensure that the wall adapter is connected and plugged in.

5.2. Fixed (Unchanging) Readings

Verify that the data hold function is not activated. In data hold mode, the HOLD icon is displayed at top left corner of LCD.

5.3. Slow Response

Ensure that the air flow vents on the rear of the instrument are not blocked.

5.4. Error Codes and Descriptions

Error Code	Description
E01	CO_2 sensor damage
E02	The value is under range
E03	The value is over range
E04	The original data error result in this error (DP, WB)
E07	Battery voltage too low to measure CO_2. Replace batteries or use wall adapter.
E11	Retry humidity calibration
E17	Retry CO_2 calibration
E31	Temperature sensor damaged
E34	Humidity sensor damaged

5.5. Service Centers

United States
Bacharach, Inc.
621 Hunt Valley Circle
New Kensington, PA 15068
USA
Phone: 724-334-5051
Fax: 724-334-5723
Email: help@MyBacharach.com

Canada
Bacharach of Canada, Inc.
20 Amber St. Unit# 7
Markham, Ontario L3R SP4
Canada
Phone: 905-470-8985
Fax: 905-470-8963
Email: bachcan@idirect.com

6. CO_2 LEVELS AND GUIDELINES

The following are excerpts from ANSI/ASHRAE addendum standard 62.1 – 2004. Refer to section 1.4 for general CO_2 guidelines.

6.1. Enforceable and/or Regulatory Levels

- OSHA: 5000 ppm (The Occupational Safety and Health Administration)
- MAK: 5000 ppm or 10,000 ppm (1 hour) (German Institution)

6.2. Non-Enforced Guidelines and Reference Levels

- Canadian: 3500 ppm (long term)
- NIOSH: 5000 ppm or 30,000 ppm (15 minutes) (The US National Institutes of Health)
- ACGIH: 5000 ppm or 30,000 ppm (15 minutes) (The American Conference of Governmental Industrial Hygienists)

7. NOTES

- TWA (Time Weighted Average) value represents the average carbon dioxide level exposure during 8 hours (working day).
- STEL (Short Term Exposure Limit) value shows the last 15 minutes' CO_2.
- ASHRAE: Standard 62-1989, Sec.6.1.3: Comfort (odor) criteria are likely to be satisfied if the ventilation rate is set so that 1000 ppm of CO_2 is not exceeded.

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