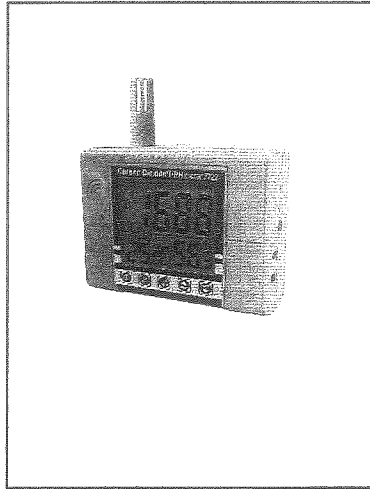


# OPERATION MANUAL

## WALL-MOUNT CO<sub>2</sub> MONITOR



- Model:  7721  
 77231  
 7722  
 77232

## INTRODUCTION

Thank you for purchasing this wall mount CO<sub>2</sub> monitor. It measures CO<sub>2</sub> level, air temp., dew point, wet bulb temp. and humidity(DP, WB, RH are for models 7722/77232) and is an ideal instrument for indoor air quality (IAQ) diagnosis.

Poor indoor air quality is considered unhealthy because it causes tiredness, loss of ability to concentrate, and even illness(ex. Sick Building Syndrome). IAQ monitoring and survey, especially on CO<sub>2</sub> level and air ventilation become widely applied in public areas such as offices, classrooms, factories, hospitals and hotels. It is also suggested in regulations of industrial hygiene in some countries. (See appendix)

With NDIR (non-dispersive infrared) sensor used, this CO<sub>2</sub> monitor is stable in long term monitoring. And the built-in relay for alarm output is especially helpful in ventilation control and HVAC system performance verification.

### Features:

- Triple displays of CO<sub>2</sub> level, temp. and humidity (7722/77232).
- Stable NDIR sensor for CO<sub>2</sub> detection
- Statistics of weighted averages
  - TWA (8 hours weighted average)
  - STEL(15 minutes weighted average)
- Visible and audible CO<sub>2</sub> warning alarm
- Alarm output for ventilation control
- ABC(Automatic Baseline Calibration) and manual CO<sub>2</sub> calibration
- PC connect via RS232 interface

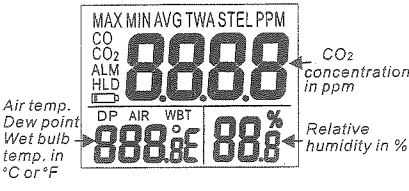
**MATERIAL SUPPLIED**

- This package contains:
- ✓ Meter
  - ✓ Adaptor
  - ✓ Operation manual
  - ✓ Plain white box
- Optional accessory:
- ✓ 33% calibration salt (VZ0033AZ1)
  - ✓ 75% calibration salt (VZ0075AZ1)
  - ✓ RS232 cable and software

**POWER SUPPLY**

The meter is powered by an AC adaptor (12V/1A output).

**LCD DISPLAY**



**Symbols**

- MAX/MIN Maximum/Minimum readings
- TWA Time weighted average (8 hours)
- STEL Short-term exposure limit (15 minutes weighted average)
- DP Dew point temperature(7722,77232)
- AIR Air temperature
- WBT Wet bulb temperature(7722,77232)
- % Unit of relative humidity
- °E (C/F) Celsius/Fahrenheit
- AVG/CO/ALM/HLD/□ Vain icons in these models

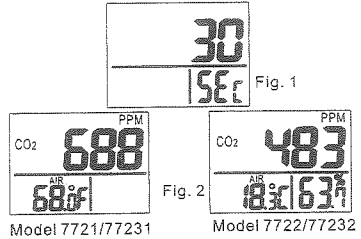
**KEYPAD**

- Enters setup mode. Saves and finishes settings.
- Enters CO<sub>2</sub> calibration with . Enters RH calibration with . Exits setup page/mode.
- Resets the meter and clear MAX/MIN. Terminates during calibration.
- Selects AIR, DP, WBT temps display. (7722/77232 only)
- Selects mode or increases value in calibration and setup.
- Activates MAX, MIN, STEL, TWA function. Selects mode or decreases value in calibration and setup.

**OPERATION**

**POWER ON/OFF**

Plug in the adaptor and the meter turns on automatically with a short beep. It performs 30 seconds countdown(Fig. 1) for meter warm up, then enters normal mode with current CO<sub>2</sub>, temperature, and humidity(7722/77232) readings displayed (Fig.2).




**TAKING MEASUREMENT**

The meter starts taking measurement after power on and updates readings every second. In the condition of operating environment change (ex. from high to low temp.), it takes 30 sec to respond for CO<sub>2</sub> sensor and 30 minutes for RH.

**NOTE:** Do not hold the meter close to faces in case that exhalation affects CO<sub>2</sub> levels.

**AIR(all models),DP,WBT(7722/77232)**

Press  to switch temperatures display. The lower left display will cycle from air temperature, dew point temp. (Fig.3), and wet bulb temp.(Fig.4).

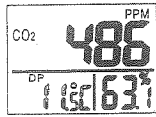


Fig.3

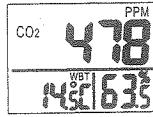




Fig.4

**MAX,MIN, STEL, TWA**

Under normal mode, press  to see the minimum, maximum, and weighted average readings. Each press of , it displays MIN, MAX, STEL, TWA in sequence and returns to normal mode.

In MIN and MAX modes, it shows the minimum and maximum readings of CO<sub>2</sub> on main display and of AIR or DP or WB temperature and humidity(7722/77232) on the lower displays. (Fig.5)

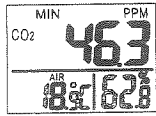


Fig.5

In STEL and TWA modes, the main display shows the weighted average of CO<sub>2</sub> readings for the past 15 minutes (STEL) and 8 hours(TWA). The lower displays are the current AIR, DP/WB temperatures and humidity (7722/77232). (Fig.6)

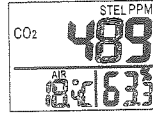


Fig.6

**NOTE:**

- 1.If the meter is turned on for shorter than 15 minutes, the STEL value will be the weighted average of readings taken since power on. Same for TWA values appear before 8 hours.
- 2.It takes at least 5 minutes to calculate STEL and TWA. The display shows "----" (Fig.7) during the first 5 minutes from power on.

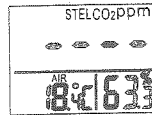



Fig.7

**ALARM & OUTPUT**

**ALARM**

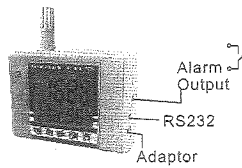
The meter features visible and audible alarm to give warnings when CO<sub>2</sub> concentration exceeds the limit. Users can set up 2 limits: An upper limit for alarm threshold that requires air conditioning and a lower limit to stop the alarm. (See P1.0 in setup for setting alarm limits).


It emits beeps (Abt. 80dB) with blinking LED when CO<sub>2</sub> level goes over the upper limit. Beeps can be stopped by pressing any key or automatically stops when CO<sub>2</sub> reading falls below lower limit.

If the beeper is temporarily shut, it will sound again when readings fall below lower limit and then go over the upper limit again, or users press  for more than 1 second to activate it.

LED alarm keeps blinking when beeps are manually shut. It stops only when readings fall under the lower limit.



#### ALARM OUTPUT



The meter is designed with a relay  to send output for further connection.


When CO<sub>2</sub> readings go over the upper limit and cause alarming. The relay picks up automatically and send output. It can be connected to a ventilation system or activator for conditioning the air quality. The relay will drop out when CO<sub>2</sub> readings fall under the lower limit.

#### SETUP

Hold down  under normal mode for more than 1 sec to enter setup mode. To exit setup, press  in P1.0, P3.0, or P4.0 and it returns to normal mode.

**Note:**  
P2.0 is not applicable in these models but for future model with CO and CO<sub>2</sub> measurements.

#### P1.0 CO<sub>2</sub> ALARM: UPPER & LOWER LIMITS

When entering setup mode, P1.0 and "AL" (Fig.8) are displayed on the LCD. Press  again to go into P1.1 for setting CO<sub>2</sub> upper limit. The current set value will be blinking on LCD (Fig.9).

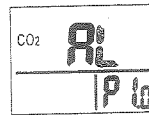


Fig. 8

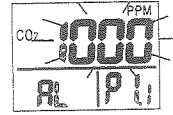



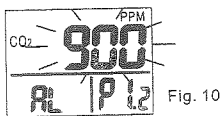


Fig. 9

Press  or  to increase the value or  to decrease. Each press tunes 100 ppm and the alarm range is from 100 to 9900ppm.

**CAUTION:**  
It's suggested to set up the alarm value within specification range that accuracy is ensured. The out of spec readings are only for reference and not suitable to use as alarm limits.

When the preferred value is set, press to go into P1.2 (Fig. 10) for lower limit setting. After both settings are done, press to save or without saving and return to P1.0.



### P3.0 TEMPERATURE SCALE

Press in P1.0 to access P3.0 for setting up temperature scale (Fig. 11). Press and it goes into P3.1 with blinking °C or °F current set (Fig. 12) on the lower left display. To switch °C or °F, press or . Then press to save the setting or without saving and return to P3.0.



Fig. 11

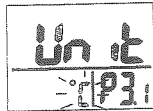


Fig. 12

### P4.0 ABC SELECTION

ABC (Automatic Baseline Calibration) is to implement baseline calibration to eliminate the zero drift of the infrared sensor. The ABC function default is off when turning on the meter. Users can enable it by following the procedure. Press in P3.0 or in P1.0 to access P4.0 for selecting ABC function. (Fig. 13).



Fig. 13

Press and it goes into P4.1 with blinking "dis" default (Fig. 14) on the lower left display. To enable the ABC function, press or and "En" blinks for choice (Fig. 15). After the preferred selection is done, press to save the setting or without saving and return to P4.0.

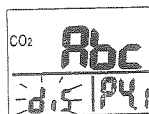


Fig. 14

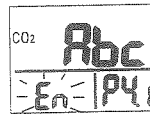


Fig. 15

### CO<sub>2</sub> CALIBRATION

The meter is calibrated at standard 400ppm CO<sub>2</sub> concentration in factory. It's suggested to do either ABC or manual calibration regularly to maintain good accuracy.

#### Note:

When the accuracy becomes a concern after a long time usage or other special conditions, return to dealers for standard calibration.

#### CAUTION:



1. Do not calibrate the meter in the air with unknown CO<sub>2</sub> level. Otherwise, it will be taken as 400 ppm and leads to inaccurate measurements.
2. When operating the meter in the close indoor areas that are not ventilating, such as hospitals or offices with windows shut, be sure to disable the ABC function to prevent incorrect calibration.

### ABC (Automatic Baseline Calibration)

ABC is to calibrate the meter at the minimum CO<sub>2</sub> reading detected during 7 days continuous monitoring (power on). It is supposed that the ventilating area can have fresh air with CO<sub>2</sub> level in around 400ppm during a period of time. It's not suitable to implement ABC in close area with higher CO<sub>2</sub> level. The ABC default is off. To enable the function, please refer to SETUP P4.0.

### Manual Calibration

The manual calibration is suggested to be done in outdoor area with ventilating fresh air where CO<sub>2</sub> level is around 400 ppm. Do not calibrate in places crowded with people or close to where with high CO<sub>2</sub> concentration such as ventilating outlets or fireplaces.

Place the meter in the calibration site. Turn on the meter and hold down  and  simultaneously to enter CO<sub>2</sub> calibration mode (Fig. 16). 400ppm and "CAL" are blinking on the LCD while performing calibration.

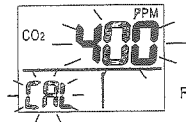




Fig. 16

Wait about 5 minutes until the blinking stops and the calibration is completed automatically and return to normal mode.

To abort the calibration, press  for more than 1 second.



### RH CALIBRATION (7722/77232)

The meter defaults to be calibrated the humidity with 33% and 75% salt solution. The ambient condition is recommended to be at 25°C and stable humidity (better to be close to the calibrating value). To abort calibration, hold down  for more than 1 second at any time.

#### CAUTION:

Do not calibrate the humidity without the default calibration salt. Otherwise, it will cause permanent damage. Contact the dealer for calibration salt or services.

### 33% calibration

Plug the sensor probe into 33% salt bottle. Hold down  and  under normal mode to enter 33% calibration (Fig. 17). "CAL" and calibrating value (32.7% if at 25°C) are blinking on the LCD with current temperature at the left.

Meter is now calibrating, and will finish in about 60 minutes when "CAL" and humidity stop blinking. (Fig. 18)

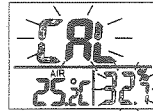


Fig. 17

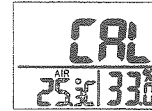



Fig. 18

### 75% calibration

After 33% calibration, plug the sensor probe into 75% salt bottle, then press  to enter 75% calibration (Fig. 19).

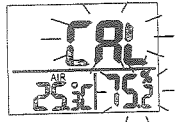


Fig.19

"CAL" and calibrating value (75.2% if at 25°C) are blinking on the LCD with current temperature at the left. Meter is now calibrating. Wait about 60 minutes until blinking stops, then calibration is completed and it returns to normal mode.

**NOTE:**

Users can also calibrate either point. To calibrate 33% only, press to exit when 33% calibration is completed. To calibrate 75% only, press or within 5 minutes while initializing 33% calibration. And it skips 33% and enters 75% calibration mode.

**TROUBLESHOOTING**

? **Can't power on**

Check whether the adaptor is well plugged.

? **Slow response**

Check whether the air flow channels on the rear were blocked.

? **Error messages**

- E01: CO<sub>2</sub> sensor damaged.
- E02: The value is under range.
- E03: The value is over range.
- E04: The original data error results in this error (RH, DP, WB)
- E07: Too low voltage to measure CO<sub>2</sub>.  
Check if the adaptor output is 12V.
- E11: Retry humidity calibration.
- E17: Retry CO<sub>2</sub> calibration.
- E31: Temperature sensor damaged.
- E34: Humidity sensor damaged.

**PC CONNECTION**

The meter can do PC link for on-line logging and data analysis via RS232 interface and software.

The protocol is as follows.

A.9600 bps, 8 data bits, no parity.

B.Format (ASCII)

Model 7721/77231

Cxxxxppm:Txxx.xC(F) LRC CRLF

Description: \$CO<sub>2</sub>:Air LRC CRLF

Model 7722/77232

Cxxxxppm:Txxx.xC(F):Hxx.x%:

dxxx.xC(F):wxxx.xC(F) LRC CRLF

Description: \$CO<sub>2</sub>:Air:RH:DP:WBT LRC CRLF

**SPECIFICATION**

	7721	7722	77231	77232
<b>CO<sub>2</sub></b>				
Range	0~2000ppm 2001~9999(out of scale)		0~5000ppm 5001~9999(out of scale)	
Resolution	1 ppm		1 ppm	
Accuracy	±50ppm±5%rdg(0~2000) Not specified for out of scale		±30ppm±5%rdg(0~5000) Not specified for out of scale	
Pressure Dependence	+1.6% reading per kPa deviation from normal pressure, 100kPa			
<b>Temp.</b>				
Range	-10.0~60.0°C (14~140°F)			
Resolution	0.1°C/0.1°F			
Accuracy	±0.6°C / ±0.9°F			
<b>Humidity</b>				
Range	N/A	0.0~99.9%	N/A	0.0~99.9%
Resolution	N/A	0.1%	N/A	0.1%
Accuracy	N/A	±3%(10~90%) ±5%(others)	N/A	±3%(10~90%) ±5%(others)
Warm up	30 seconds			
Operating	0~50°C, 0~95%RH (avoid condensation)			
Storage	-20~60°C, 0~99%RH (avoid condensation)			
Power	12V adaptor			



## WARRANTY

The meter is warranted to be free from defects in material and workmanship for a period of two years from the date of purchase. This warranty covers normal operation and does not cover misuse, abuse, alteration, neglect, improper maintenance, or damage resulting from leaking batteries. Proof of purchase is required for warranty repairs. Warranty is void if the meter has been opened.

## RETURN AUTHORIZATION

Authorization must be obtained from the supplier before returning items for any reason. When requiring a RA (Return Authorization), please include data regarding the defective reason, the meters are to be returned along with good packing to prevent any damage in delivery and insured against possible damage or loss.

## OTHER RELATED PRODUCTS

Other related CO<sub>2</sub> products:

- a. Model 7752 portable Temp./CO<sub>2</sub> meter, general purpose.
- b. Model 77532 portable Temp./CO<sub>2</sub> meter, high performance.
- c. Model 7755 portable Temp./RH/CO<sub>2</sub> meter, general purpose.
- d. Model 77535 portable Temp./RH/CO<sub>2</sub> meter, high performance.

## Appendix

### CO<sub>2</sub> LEVELS AND GUIDELINES

#### Non-Enforced Reference levels

##### NIOSH recommendations

**250-350 ppm:** normal outdoor ambient concentrations

**600 ppm:** minimal air quality complaints

**600-1000 ppm:** less clearly interpreted

**1000 ppm:** indicates inadequate ventilation; complaints such as headaches, fatigue, and eye/throat irritation will be more widespread. 1000 ppm should be used as an upper limit for indoor levels.

##### EPA Taiwan: 600ppm and 1000ppm

**Type 1** indoor areas such as department stores, theaters, restaurants, libraries, the acceptable CO<sub>2</sub> concentration of 8 hours average is 1000ppm.

**Type 2** indoor areas with special requirements of good air quality such as schools, hospitals, day care centers, the suggested CO<sub>2</sub> level is 600ppm.

#### Regulatory exposure limit

##### ASHRAE Standard 62-1989: 1000ppm

CO<sub>2</sub> concentration in occupied building should not exceed 1000ppm.

##### Building bulletin 101 (BB101): 1500ppm

UK standards for schools say that CO<sub>2</sub> at averaged over the whole day (i.e. 9am to 3.30 pm) should not exceed 1500ppm.

##### OSHA: 5000ppm

Time weighted average over five 8-hour work days should not exceed 5000ppm.

##### Germany, Japan, Australia, UK...: 5000ppm

8 hours weighted average in occupational exposure limit is 5000ppm.