

# OPERATION MANUAL

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



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Model:  7722  
 77232

## INTRODUCTION

Thank you for purchasing this wall mount CO<sub>2</sub> monitor. It could measure the 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 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

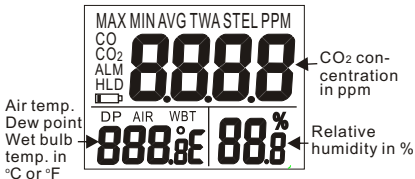
Optional accessory:

- ✓ 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 temp. (7722,77232)
AIR	Air temp.
WBT	Wet bulb temp. (7722,77232)
%	Unit of relative humidity
°E (C/F)	Celsius/Fahrenheit
AVG/CO/ ALM/HLD/ 🔋	Vain icons in these models

## KEYPAD

-  Enter setup mode.  
Save and finish settings.
-  Enter CO<sub>2</sub> calibration with  .  
Enter RH calibration with  .  
Exit setup page/mode.
-  Reset the meter and clear MAX/MIN.  
Terminate during calibration.
-  Select AIR, DP, WBT temp. display.  
(7722/77232 only)  
or  
 Select mode or increase value in  
calibration and setup.
-  Activate MAX, MIN, STEL, TWA  
function. Select mode or decrease  
value in calibration and setup.

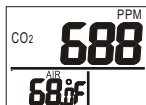
## OPERATION

### POWER ON/OFF

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



Fig. 1



Model 7721/77231




Model 7722/77232

## 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 face in case that exhalation affects CO<sub>2</sub> levels.

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

Press  to switch temp. display. The lower left LCD will cycle through air temp., Dew point temp. (Fig.3), and wet bulb temp.(Fig.4).

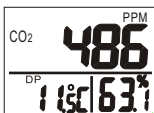


Fig.3

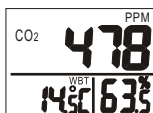




Fig.4

## MAX,MIN, STEL,TWA

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

In MIN and MAX modes, it shows the minimum and maximum reading of CO<sub>2</sub> on the upper LCD. The reading of AIR or DP or WB temp. and humidity (7722/77232) shows on the lower LCD. (Fig.5)



Fig.5

In **STEL** and **TWA** modes, the upper LCD shows the weighted average of CO<sub>2</sub> reading for the past 15 minutes (STEL) and 8 hours (TWA). The lower LCD shows the current AIR, DP/WB temp. and humidity (7722/77232). (Fig.6)

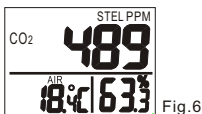


Fig.6

### **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 the TWA value.
- 2.It takes at least 5 minutes to calculate the STEL and TWA value. The LCD shows "----" (Fig.7) during the first 5 minutes from power on.

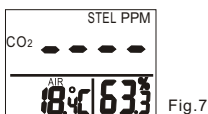


Fig.7


## **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:

1. Upper limit: the alarm threshold requires air conditioning
  2. Lower limit: to stop the alarm.
- (See page 7 **P1.0** to set the 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 stop when CO<sub>2</sub> reading falls below the lower limit.

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

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


## SETUP

Hold  key under normal mode for more than 1 sec to enter setup mode. To exit setup, press  key 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  key again to enter **P1.1** to set the CO<sub>2</sub> upper limit. The current setting value will be blinking on the LCD(Fig.9).

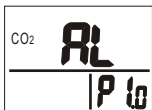





Fig. 8






Fig. 9

Press  or  key to increase the value or  key to decrease. Each press tunes 100ppm 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  key to enter **P1.2** (Fig. 10) to set the lower limit. After both settings are done, press  key to save or  key without saving and return to **P1.0**.

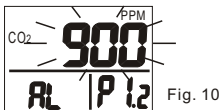


Fig. 10

### P3.0 TEMPERATURE SCALE







Press  key in **P1.0** to access **P3.0** to set up the temperature scale (Fig. 11). Press  key to enter **P3.1**, current setting of °C or °F would be blinking on the lower LCD (Fig. 12). Press  or  key to switch °C or °F. Then press  key 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 on when turning on the meter. Users can disable it by following the procedure. Press  in **P3.0** or  in **P1.0** to access **P4.0** to select the ABC function. (Fig. 13).



Fig. 13






Press  key enter **P4.1** with blinking "en" icon (Fig.14) on the lower LCD. To disable the ABC function, press  or  and "dis" blinks for choice (Fig.15). After the preferred selection is done, press  key 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 the 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 closed 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 around 400ppm during a period of time. It's not suitable to implement ABC in the closed area with higher CO<sub>2</sub> level. The ABC default is on. To disable the function, please refer to **P4.0**. (See p.8)

## 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 the places crowded with people or closed area 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  and  keys simultaneously to enter CO<sub>2</sub> calibration mode (Fig.16). 400ppm and "CAL" are blinking on the LCD while performing calibration.

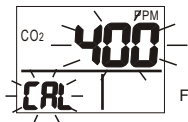




Fig. 16

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

To abort the calibration, press  key for more than 1 sec.



## **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 stop calibration, hold  key for more than 1 sec at any time.

### **CAUTION:**

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

### **33% calibration**

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

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



Fig. 17



Fig. 18

### **75% calibration**





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



Fig.19

" CAL" icon and calibrating value (75.2% if at 25°C) are blinking on the LCD with current temp. 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  key to exit when 33% calibration is completed. To calibrate 75% only, press  or  key within 5 minutes while initializing 33% calibration. And it skips 33% and enters 75% calibration mode.

## **TROUBLE SHOOTING**

### **? 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 link to PC 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		0~5000ppm	
	2001~9999(out of scale)		5001~9999(out of scale)	
Resolution	1 ppm		1 ppm	
Accuracy	±50ppm±5%rdg(0~2000)		±30ppm±5%rdg(0~5000)	
	Not specified for out of scale		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%)	N/A	±3%(10~90%)
		±5%(others)		±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 one year 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**

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

**600ppm:** minimal air quality complaints

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

**1000ppm:** indicates inadequate ventilation; complaints such as headaches, fatigue and eye/throat irritation will be more widespread. 1000ppm 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.



## **Accuracy, the Zenith of Measuring / Testing Instruments !**

Hygrometer/Psychrometer

Thermometer

Anemometer

Sound Level Meter

Air Flow meter

Infrared Thermometer

K type Thermometer

pH Meter

Conductivity Meter

T.D.S. Meter

D.O. Meter

Lux / Light Meter

Data logger

Temp./RH transmitter

Wireless Transmitter .....

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