OPERATION MANUAL

WALL-MOUNT CO_2 MONITOR

CE

Model:
- 7721
- 77231
- 7722
- 77232

INTRODUCTION

Thank you for purchasing this wall mount CO_2 monitor. It measures CO_2 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_2 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_2 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_2 level, temp. and humidity (7722/77232).
- Stable NDIR sensor for CO_2 detection
- Statistics of weighted averages
  TWA (8 hours weighted average)
  STEL(15 minutes weighted average)
- Visible and audile CO_2 warning alarm
- Alarm output for ventilation control
- ABC(Automatic Baseline Calibration) and manual CO_2 calibration
- PC connect via RS232 interface

MATERIAL SUPPLIED

This package contains:

- ✓ Meter
- ✓ Adaptor
- ✓ Operation manual
- ✓ Plain white box

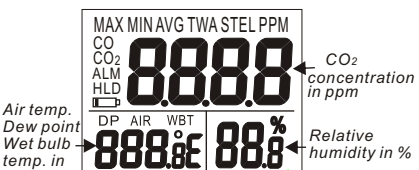
Optional accessory:

- ✓ 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	Maximun/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

SET — Enters setup mode.
Saves and finishes settings.

CAL/ESC — Enters CO_2 calibration with ▲.
Enters RH calibration with ▼.
Exits setup page/mode.

RESET — Resets the meter and clear MAX/MIN.
Terminates during calibration.

▲ °C/°F — Selects AIR, DP, WBT temps display. (7722/77232 only)
or
▲ — Selects mode or increases value in calibration and setup.

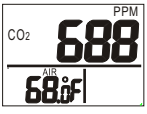
▼ MIN/MAX — Activates MAX, MIN, STEL,TWA function.
Selects mode or decreases value in calibration and setup.

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_2, temperature, and humidity(7722/77232) readings displayed (Fig.2).

Fig. 1



Model 7721/77231

Fig. 2

Model 7722/77232

TAKING MEASUREMENT

The meter starts taking measurement after power on and updates readings every second. In the condition of opera -ting environment change (ex. from high to low temp.), it takes 30 sec to respond for CO_2 sensor and 30 minutes for RH.

NOTE: Do not hold the meter close to faces in case that exhalation affects CO_2 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).

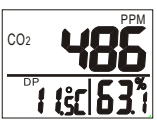


Fig.3

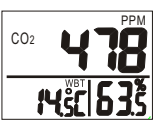


Fig.4

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_2 on main display and of AIR or DP or WB temperature and humidity(7722 /77232) on the lower displays. (Fig.5)

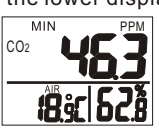


Fig.5

In STEL and TWA modes, the main display shows the weighted average of CO_2 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.

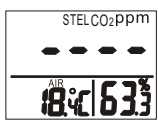


Fig.7

ALARM & OUTPUT

ALARM

The meter features visible and audible alarm to give warnings when CO_2 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_2 level goes over the upper limit. Beeps can be stopped by pressing any key or automatically stops when CO_2 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_2 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_2 readings fall under the lower limit.

SETUP

Hold down MODE under normal mode for more than 1 sec to enter setup mode. To exit setup, press MODE 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_2 measurements.

P1.0 CO_2 ALARM: UPPER&LOWER LIMITS

When entering setup mode, P1.0 and "AL" (Fig.8) are displayed on the LCD. Press MODE again to go into P1.1 for setting CO_2 upper limit. The current set value will be blinking on LCD(Fig.9).

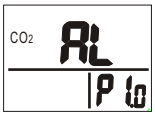


Fig. 8

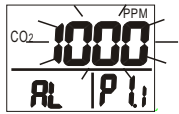


Fig. 9

Press MODE 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 SET to go into P1.2 (Fig. 10) for lower limit setting. After both settings are done, press SET to save or MODE without saving and return to P1.0.

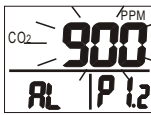


Fig. 10

P3.0 TEMPERATURE SCALE

Press ▲ in P1.0 to access P3.0 for setting up temperature scale(Fig.11). Press SET 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 SET to save the setting or MODE 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).

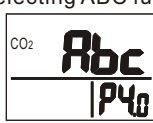


Fig.13

Press MODE 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 MODE to save the setting or ESC without saving and return to P4.0

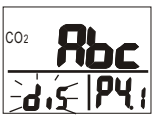


Fig. 14

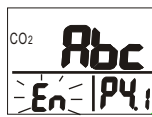


Fig. 15

CO_2 CALIBRATION

The meter is calibrated at standard 400ppm CO_2 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_2 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_2 reading detected during 7 days continuous monitoring (power on). It is supposed that the ventilating area can have fresh air with CO_2 level in around 400ppm during a period of time. It's not suitable to implement ABC in close area with higher CO_2 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_2 level is around 400 ppm. Do not calibrate in places crowded with people or close to where with high CO_2 concentration such as ventilating outlets or fireplaces.

Place the meter in the calibration site. Turn on the meter and hold down MODE and ▲ simultaneously to enter CO_2 calibration mode (Fig.16). 400ppm and "CAL" are blinking on the LCD while performing calibration.

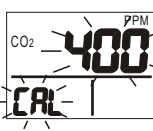


Fig. 16

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

To abort the calibration, press MODE 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 1second 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 25ºC) 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 CAL 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_2 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_2. Check if the adaptor output is 12V.
E11: Retry humidity calibration.
E17: Retry CO_2 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_2:Air LRC CRLF

Model 7722/77232

Cxxxxppm:Txxx.xC(F):Hxx.x%:
dxxx.xC(F):wxxx.xC(F) LRC CRLF
Description: CO_2:Air:RH:DP:WBT LRC CRLF

SPECIFICATION

	7721	7722	77231	77232
CO_2				
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) 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			
Temp.				
Range	-10.0~60.0℃ (14~140℉)			
Resolution	0.1℃/0.1℉			
Accuracy	±0.6℃/ ±0.9℉			
Humidity				
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℃, 0~95%RH (avoid condensation)			
Storage	-20~60℃, 0~99%RH (avoid condensation)			
Power	12V adaptor			

Appendix

CO_2 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_2 concentration of 8 hours avarge is 1000ppm.

Type 2 indoor areas with special requirements of good air quality such as schools, hospitals, day care centers, the suggested CO_2 level is 600ppm.

Regulatory exposure limit

ASHRAE Standard 62-1989: 1000ppm

CO_2 concentration in occupied building should not exceed 1000ppm.

Building bulletin 101 (BB101): 1500ppm

UK standards for schools say that CO_2 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.