OPERATION MANUAL

IAQ CARBON DIOXIDE (CO$_2$) MONITOR / LOGGER

Monitor
98136
98137(Backlight)
98138
98139 (Backlight)

Logger
98536 (KAWALL)
98537(Backlight)
98538
98539(Backlight)

CE

Table of contents

INTRODUCTION

Thank you for purchasing MIC's desktop CO_2 monitor. It is used to measure CO_2 concentration, air temperature and relative humidity with visible and audible alarms. This CO_2 monitor is an ideal instrument for indoor air quality (IAQ) diagnosis and HVAC system performance verification.

Carbon dioxide (CO_2) is a gaseous component of the earth's atmosphere. The concentration of CO_2 in natural ambient air is about 0.04% or 400ppm. With each breath, human convert oxygen (O_2) into carbon dioxide(CO_2). Although carbon dioxide is invisible and odorless, an increased CO_2-content makes is apparent because human will notice increased fatigue and reduced concentration.

FEATURES

1). Super large LCD simultaneously display of CO_2 level, Temp., Relative humidity, Calendar (Y/M/D) and Time (clock).
2). Six (6) smiley icons indicate indoor air quality levels (350/450/700/1000/2500/5000ppm), easy to understand CO_2 concentration.
3). Stable NDIR sensor for CO_2 detection
4). High alarm threshold is selectable.
5). Automatic Baseline Calibration (ABC) function
6). Audible warning for high CO_2 concentration
7). Dew point/ Wet bulb Temperature measurement. (98138.98139.98538.98539 only)
8). Heat Index /WBGT Temperature calculation. (98538.98539 only)
9). Backlight function (98137.98139.98537.98539 only)

MATERIAL SUPPLIED

(1) Meter
(2) Adaptor (9V+10%, >=0.5A)
(3) Operation manual
(4) Box with color sleeve

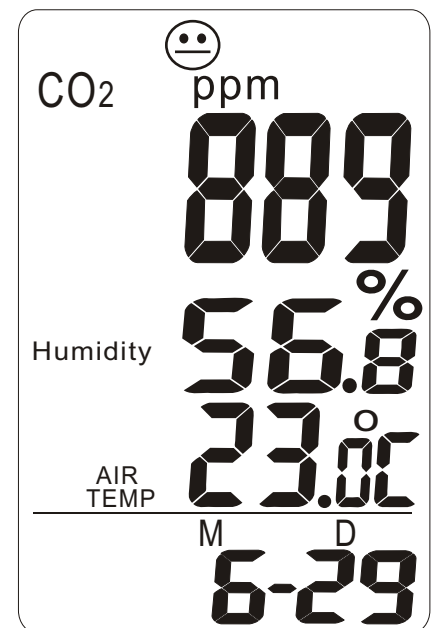# POWER SUPPLY

The meter is powered by an AC adaptor (9V/0.5 A output)

LCD DISPLAY

Symbols:
1) ppm   : CO_2 unit
2) icon ☺ : 350ppm ~ 450ppm
3) icon ☺ : 450ppm ~ 700ppm
4) icon 😐 : 700ppm ~ 1000ppm
5) icon ☹ : 1000ppm ~ 2500ppm
6) icon 😫 : 2500ppm ~ 5000ppm
7) icon 😫 : 5000ppm ↑
8)   Air Temp.: Ambient Temperature
9)   DPT: Dew point temperature
10) WBT: Wet bulb temperature
11) MH : Month / Hour
12) DM: Date / Minute
13) lps% , cfm/p:Vent rate

14) TWA: Time Weighted Average (8 hours)
15) STEL: Short-Term Exposure Limit (15 minutes weighted average)
16) Logging: When it is in the recording mode
17) VOC, NO_2, WBGT, hpa, mbar ,EXT TEMP are not available in these models

2

KEYPAD (CONTROLS)

1) MODE : CO$_2$ mode,TWA,STEL,lps%, cfm/P
   Reset Max.Min, STEL,TWA
   (98138.98139.98538.98539)
2) SEL./R : Edit Date,Time or alarm level
3) TRH.M. : Temp. Humidity mode. DPT,WBT.
   (98138.98139.98538.98539)
   Setting/ Next
4) UNIT : Select Temp. unit and backlight
5) POWER : Enter date and time,alarm setting mode
   Logger mode: Button start or stop.

OPERATION

(a) POWER ON/OFF

Plug with adaptor, meter turns on automatically . LCD shows current CO$_2$, RH & Temperature, Date and Time. Six(6) smiley icons indicate the indoor air quality level and appear on the top of first layer display

Note:

(1) Reset time whenever you turn on the meter.
(2) Please use properly power source, input voltage: 100~240 VAC,50-60Hz
Output voltage: DC 7.5~9.0V
Output current: 0.5A,or the meter will be damaged.

3
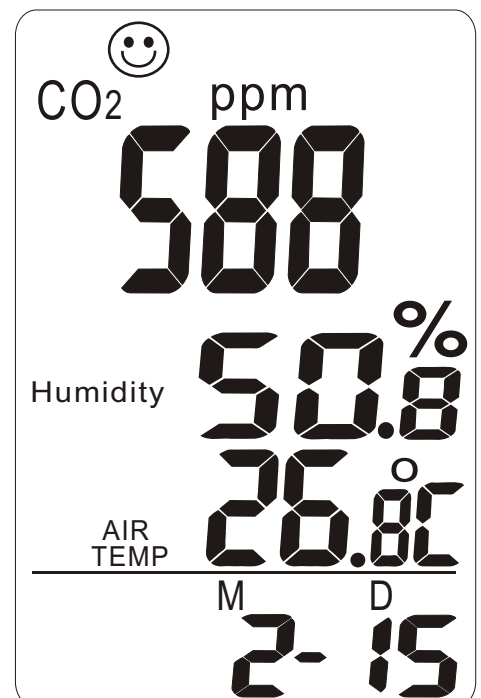
(b) TAKING MEASUREMENT

The meter starts the measurements when powered on and updates reading every 6 sec.
Response time is 10 sec. for CO_2, 2 Sec. for RH.
If the operation environment changes (ex. From high to low temp.), it takes approx. 30 sec. for CO_2 sensor to respond and approx. 30 minutes for RH into stable measurement.

NOTE: Do not hold the meter close to your mouth or any other source of CO_2.

RECORDING MEASUREMENT (Model 9853X series)
While recording, the green LED light is flashing and "Logging" icon is flashing on LCD,too. If you have set up Hi, Lo alarm value, the red LED will be flashing while detecting the value which exceeds the threshold.

(c) CO2 MODE

In the CO_2 Mode, press **MODE** button to switch CO_2 display. The top layer of display will cycle 3 from CO_2, Maximum, Minimum and 98138,98538 features function TWA, STEL, lps% & cfm/p.

| CO_2 ☺ ppm	CO_2 ppm MAX	CO_2 ppm MIN
800 →	**1200** →	**400**
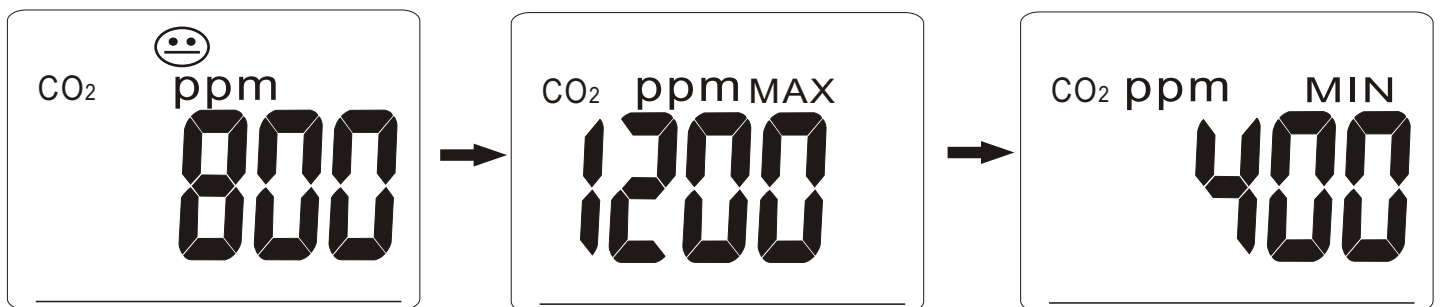
Note 1:

a) MAXIMUM. MINIMUM:

The unit automatically records maximum reading and minimum reading after powered on.

b) RESET MAX/MIN:

Press **MODE** button to get MAX or MIN reading, under MAX or MIN mode, Long press **MODE** button to reset Max.or Min values.If current CO_2 reading is near MAX or MIN, you will not be easy to see the difference.

CO₂ ppm	CO₂ ppm
700	**800**
TWA	STEL

CO₂ ppm	CO₂ ppm
600	**15**
Ips% VENT.R	cfm/p VENT.R
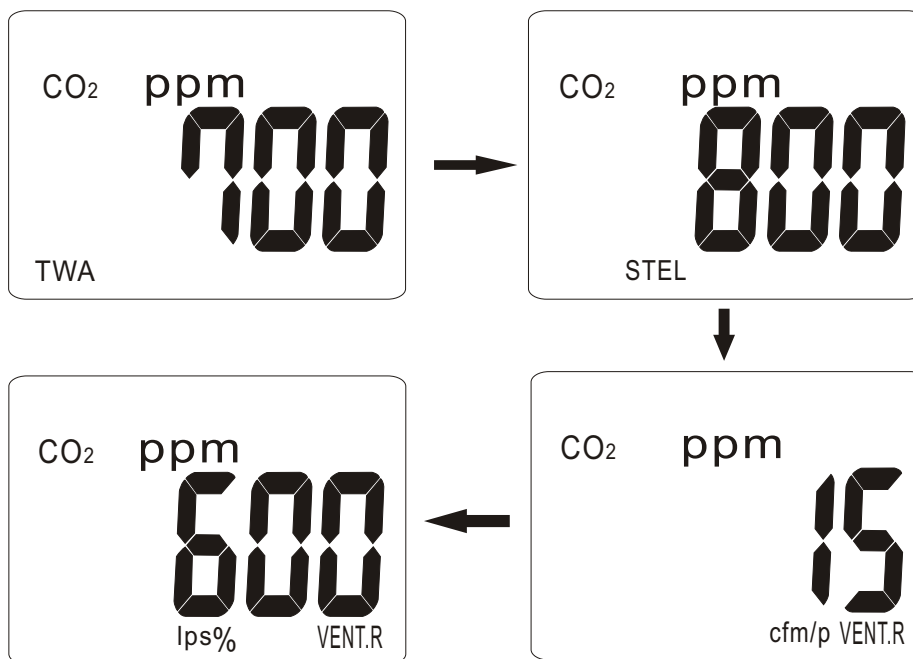
TWA,STEL,Ips%,cfm/p

Note 2 (98138.98139.98538.98539 only):

a) TWA: (Time Weighted Average 8 hours)

The meter keeps updating the reading every minute. If the meter has been powered on for less than 8 hours, the TWA value will be the weighted average of readings since powered on.

b) STEL: (Short-Term Exposure Limit in 15 minutes weighted average)The meter keeps updating readings every minute. If the meter has been powered on for less than 15 minutes, the STEL value shows the weighted average of reading taken since powered on.

c) lps%: Liters Per Second per person.
d) cfm/p: Cubic Feet per Minute per Person

Assuming a conference room with Max. capacity of = 200 persons , If designed ventilation rate= 7 l/s person

The amount of ventilation required= 1,400 l/s (or 5,040 CMH), if number of person is 70, the amount of ventilation only need 490 l/s, we don't need ventilate 1,400 l/s for saving energy.

(d) TRH MODE : Temperature / Relative Humidity mode
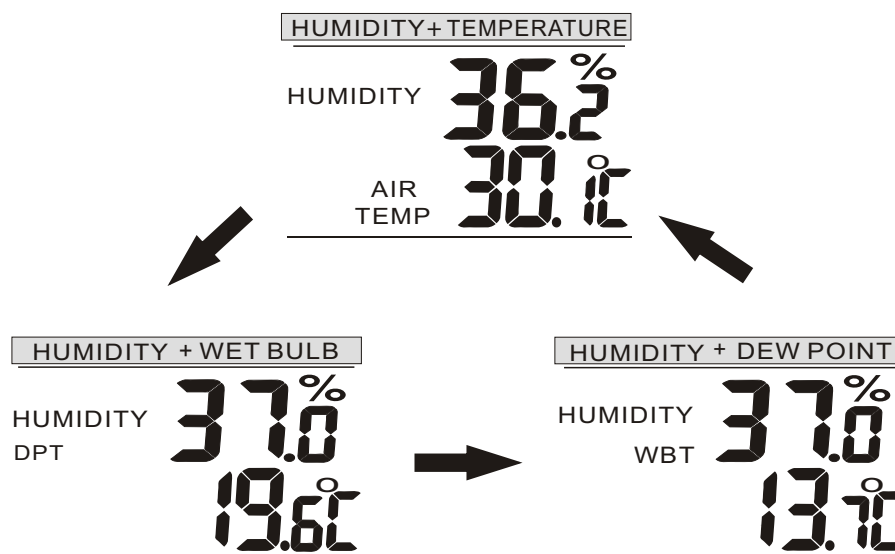In the **TRH** Mode, the meter displays both related humidity and air Temperature simultaneously.

Press **TRH.M** button, the second layer of display will cycle from:
HUMIDITY + AIR TEMP.,
HUMIDITY + WET BULB,(98138.98139.98538.98539 only)
HUMIDITY + DEW POINT(98138.98139.98538.98539 only)

(Ref.2)

HUMIDITY+ TEMPERATURE
HUMIDITY **36.2**%
AIR TEMP **30.1**°C

HUMIDITY + WET BULB
HUMIDITY DPT **37.0**%
19.6°C

HUMIDITY + DEW POINT
HUMIDITY WBT **37.0**%
13.1°C

(e) Temperature unit (°C or °F) selection

Press **UNIT** button to toggle the temperature unit
(°C or°F) .

HUMIDITY	**36.2**%
AIR TEMP	**30.1**°C

HUMIDITY	**36.2**%
AIR TEMP	**86.1**°F
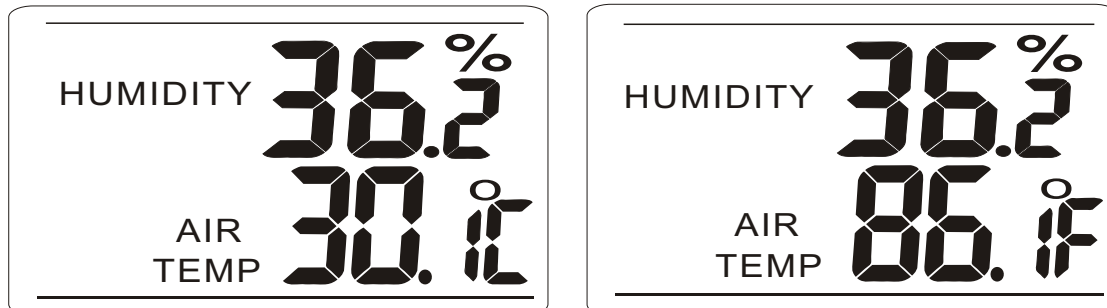
MAINTENANCE

Cleaning and storage:
1). The meter should be cleaned with a damp cloth and mild detergent when necessary.
2). Store the meter in an area with moderate temperature and humidity.

CALIBRATION
ABC (Automatic Baseline Calibration)

The monitor is designed with high accuracy NDIR CO_2 sensor with ABC (Automatic Baseline Calibration) function which establishes a baseline calibration to eliminate the zero drift of the infrared sensor.

The ABC function is always "ON" when the meter is turned on. ABC is designed to calibrate the meter at the minimum CO_2 reading detected during 7.5 days continuous monitoring (power on).

DISABLE ABC FUNCTION

The meter is default with ABC for automatically
It assumes that the area being tested receives fresh air with a CO_2 level of approximately 400ppm at some period of time during the seven days. It is not suitable to use desktop CO_2 in closed areas with consistently high CO_2 levels 24 hours a day.

For example, if the monitor is located in 24 hours area, such as hospital or convenient stores, the ABC function should be turned off for not being calibrated with high CO_2 level.

When adaptor plug in, long press **POWER** button to turn off the meter. Hold **MODE+UNIT** and press **POWER** button. Display shows "AbcOn". Press **SEL/R** to select ABC function ON or OFF. Press **TRH/M** to save setting and meter will restart automatically.
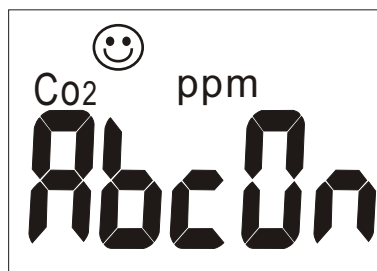

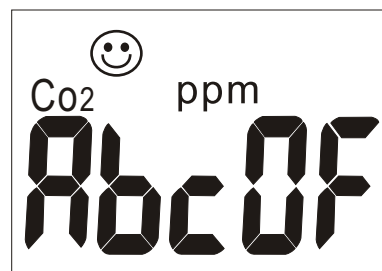Step1:Long press **POWER** turn off meter

Step2:Hold **MODE**+**UNIT**

Step3:Press **POWER** to enter ABC function. Display shows below.

Step4:Press **SEL/R** to select AbcOn or off.

Step5:Press **TRH/M** to save. Meter restarts automatically.

Press SEL./R →

BACKLIGHT FUNCTION
(98137(U).98139.98537.98539)
When monitoring CO_2, Temp. RH in the dark area, press and hold **UNIT** button for 5 seconds to activate backlight Press and hold **UNIT** button again to turn off the function of backlight.

DATALOGGING FUNCTION
(98536.98538.98537.98539)
If you want record the CO_2 concentration, Temp.RH, plug with supplied USB cable as below to do the on-line logging function (Model 98137U or 9853x series)

NOTE: Ensure to set up date and time first
Plug mini USB cable onto logger unit, and the male USB plug onto computer, follow the instruction manual to install datalogger software.
The main screen shows :

Logger screen
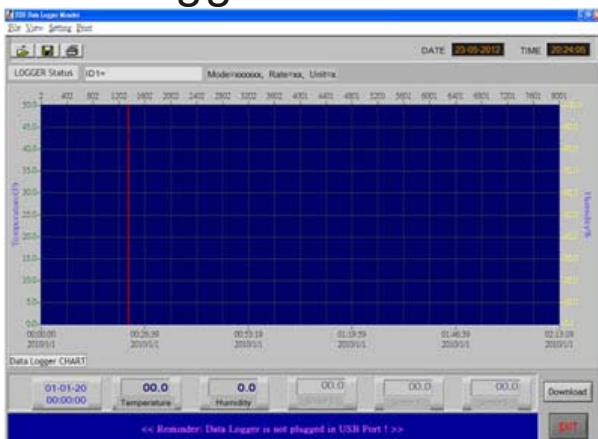
On-line logging screen

(98137U only)

9

SETTING DATE & TIME

a) Real time and date:
   The meter shows Mo./Date and Hr/Min on the 3rd layer of display, and each cycle is 16 seconds.
b) Month/Date and Hour/Min
   Press **POWER** button to enter the real date and time setting. The time default is 24-hours format.

   Though the logger shows only Month/Date, the setting up for YEAR,too.
   Enter setting up mode, edit by **SEL/R** or press **TRH/M** button to the next setting. After Month and date setting, it displays Hour and Minute , the same operation to set up, always press **TRH/M** to save and exit.
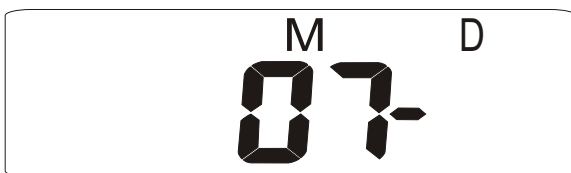
Setting Year

When the number "2012"flash, press **SEL./R** button to increase year(2010-2030).Press **TRH/M** button to save and move to next setting.
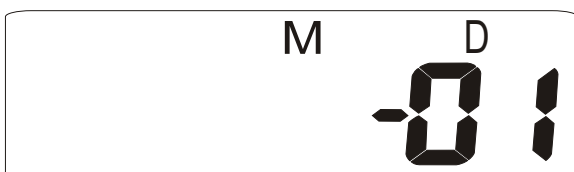
Setting Month

When the number "07" flash on the LCD, press **SEL./R** button to increase Mo. (01-12). Press **TRH/M** button to save and move to next setting.
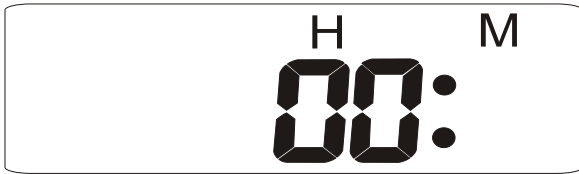
Setting Date

When the number "01" flash on the LCD , press **SEL./R** button to increase Date (01-31). Press **TRH/M** button to save and move to next setting.
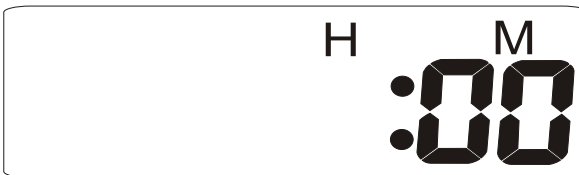
H   M
00:

When the number "00" appear on the LCD, press **SEL./R** button to increase Hr (01-24). Press **TRH/M** button to save and move to next setting.

Setting Minute

H   M
:00

When the number "00" appear on the LCD, press **SEL./R** button to increaser Min. (00-59). Press **TRH/M** button to save and move to next setting.

c) Alarm setting

After the real date and time is set, the meter will show "A-on**"** on the top layer of display, press **SEL./R** button to select Alarm on or off. If alarm is on, press **TRH/M** button to save the setting and move to CO_2 alarm setting.

CO_2 ppm
A-on

Press
SEL./R
→

CO_2 ppm
A-oFF
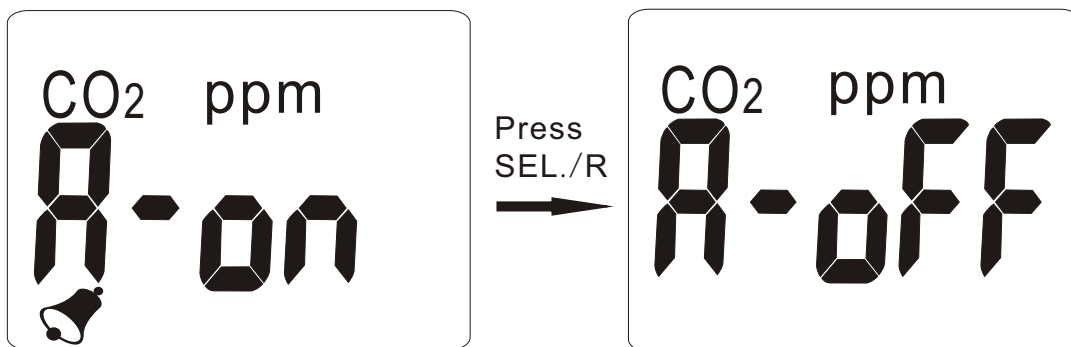
d) CO_2 alarm level setting

The meter shows CO_2 1000 ppm as the default value on the top layer of display. To change Hi alarm value by pressing **SEL./R** button to increase the value. If you pressing the **SEL./R** button, the number starts from Units digit, Tens digit, Hundreds digit and then Thousands digit. Press **TRH/M** button to save and return to CO_2 normal measurement.

Logger setup:

A. Install logger driver for Windows

The PL2303_Prolific_DriverInstaller_v110.exedriver is for Windows operation system,follow the installation steps hereunder:
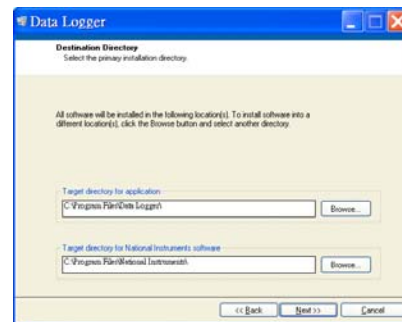
1. Put the CD into CD driver, click PL2303_Prolific_DriverInstaller_v110.exe for installation the driver.

2.The set up status   3.Click "NEXT" to continue

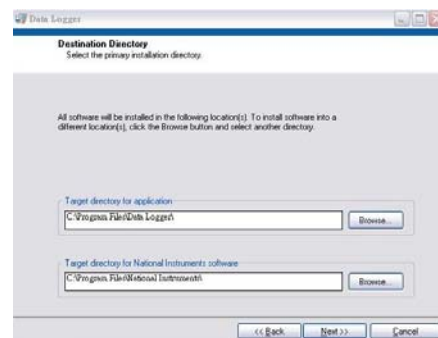4、After complete the installation , press "Finished"。

B. Install the logger software for Windows XP

Please follow the following steps to install the software

1.Put CD into CD driver , click " Setup.exe MSI Installer Bootstrapper National Instruments"to install
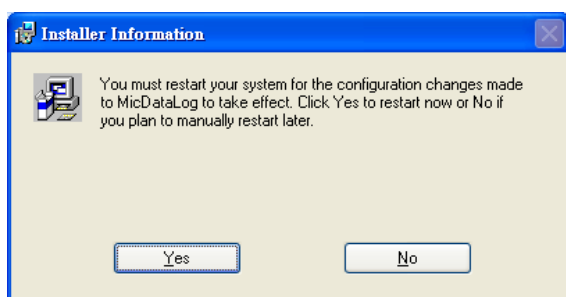

2.Select the destination folder you are go to save by click "Browse"button

3.Once you finish selecting ,press "Next".

4.Select "I accept the License Agreemen:(s)" and press NEXT \ button.

5.Click NEXT button when you see the following.
6.Press FINISH button to complete the installation.
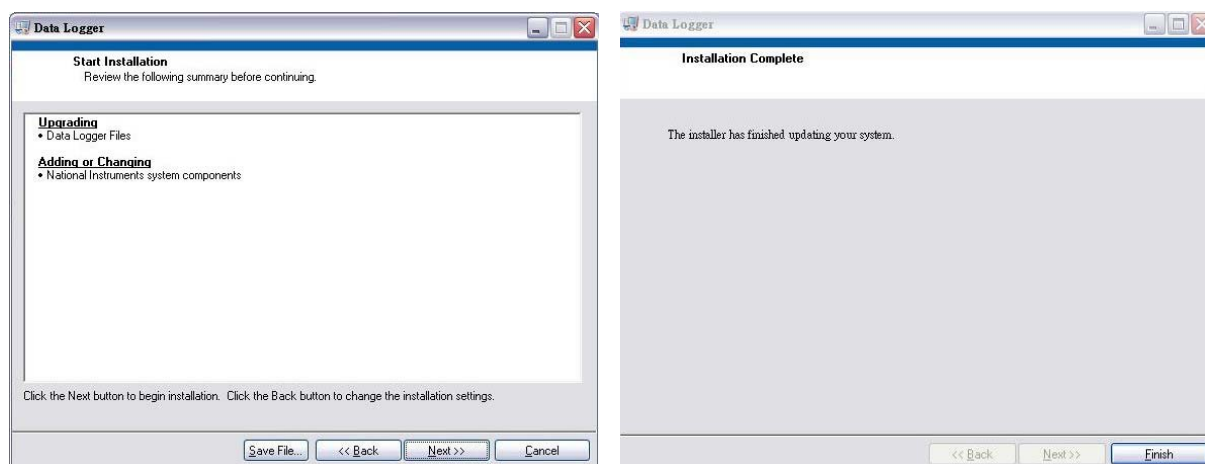
7、Restart the Windows XP system

. **Run the software from Windows XP**
1. Plug the USB datalogger into USB port, since you have already
   Installed the USB driver, computer will automatically detect logger ,
   click "My computer"""Content" in hardware content, click "Device
   manager" to find the listed (COMx) listed under Ports(COM & LPT
   as below with red circle.
If you may Prolific USB-to-Serial Comm. Port , it means the logger is
connected to computer properly.
2. Install logger driver for Windows)
3.Select logger software folder (The 3rd step of logger
   software installation)

3.Clck below

DataLog.exe
USB Link Data Logger Software
Meter Industrial Company
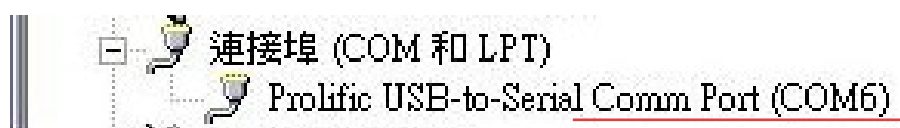
4. The screen of logger software as below:
5. Click "Setting" "Comm port " select the port number as you
   see from step 2, then press OK button.

Reminder:
Software is installed completed,"Get Datalog's
Identifier"shows below, then press SETTING button to enter Log
setting(pic.1)
Note: If logger is not plugged in USB port, the warning message
"Reminder: Data Logger is not plugged in USB port!" shows
below(pic.2)Make sure logger is plugged in and choose the correct
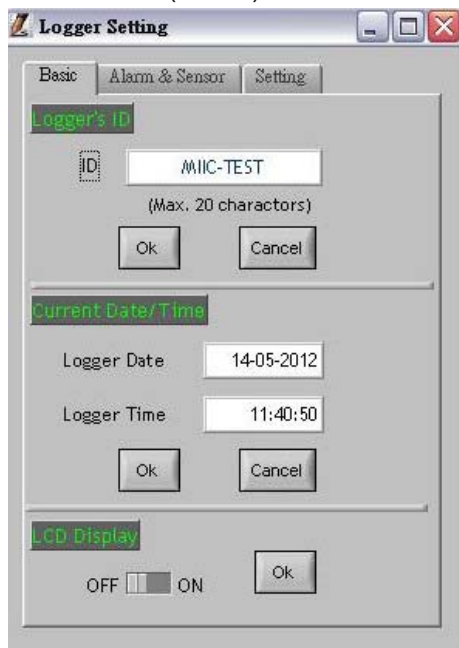COM port.

(Pic.1)

(Pic.2)

LOGGER Status:
Before download data, press **LOGGER status** to show ID, Records,
Sample rate, Unit.
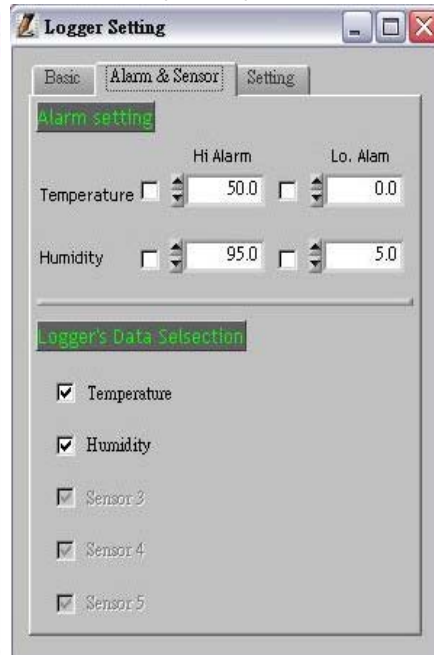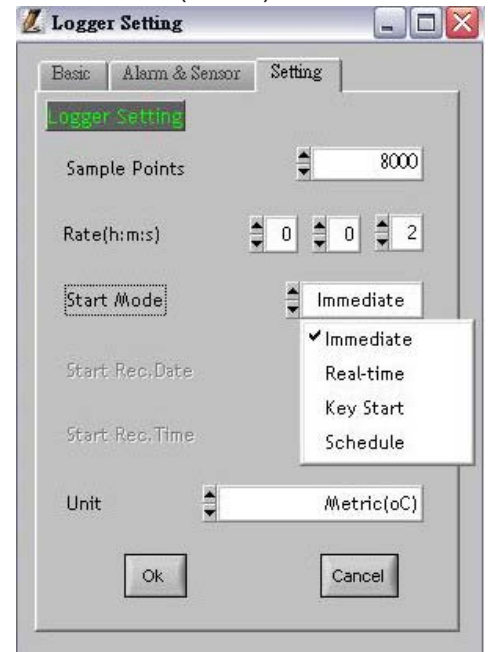NOTE: Once **Download** button is pressed, recording is inactivated.
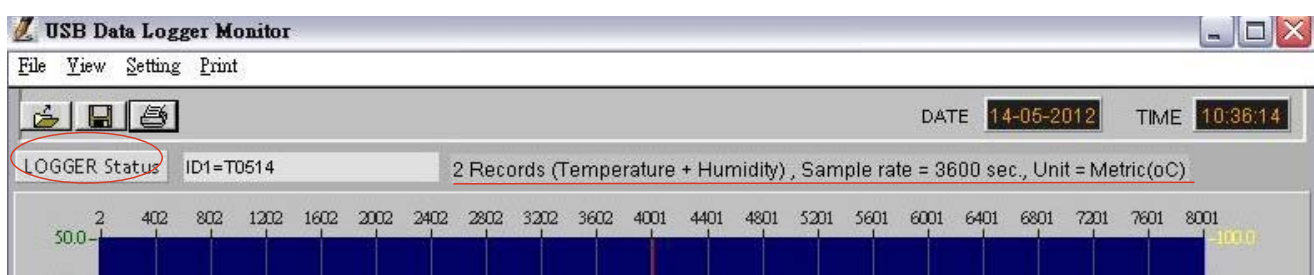
Logger Setting:

BASIC:(Pic.3)

1:ID setting
 Maximum 20 characters , name your logger ,press OK button to confirm.

2:Current Date/Time
Clock setting, the system automatically shows current date and time of your pc. Press OK to confirm.(Note:Schedule date & time refer to current pc date

3:LCD display set (N/A for non-LCD models)
Press ON (Logger LCD still illuminated after complete recording), or OFF(LCD is not illuminated after complete recording. Press OK after selection.

ALARM&SENSOR:(Pic.4)
Select Temp./Humidity alarm, set Hi/Lo Temp. and H/Lo Humidity values. Select the parameter you want to record.

SETTING:(Pic.5)

1: Set sample point (K=1,000 multiple basis within total memory points)
For examples:
16K memory store 8,000 points each of 2 parameters
　　　　　　store 16,000 points of selected parameter
32K memory store 16,000 points each of 2 parameters
　　　　　　or store 32,000 points of selected parameter
Press OK to confirm the sample points and parameters.

2:Select Unit : Select Temperature unit °C/°F,press OK to confirm.

3:Set sample rate, start mode to record
Select "hour(1~6), "minute(0~59)","second(0~59)" time interval.
Select 5 start modes from: "Immediately","Schedule","Real-time" (PC is always connected with the logger unit),"Key start" (Start recording by pressing button) and "Roll-over".

Schedule start mode:
Select the date and time to start recording.
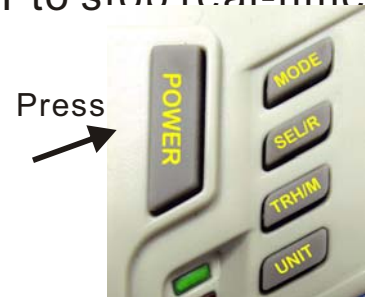**Real-time start mode:**

1. After set start mode at real-time, datalogger starts login records. When logger records, the green LED at left corner shows it is under recording.

2. In real-time mode, it shows "QUIT" button instead of "DOWNLOAD" at the right corner. Press QUIT to stop real-time recording.

Key-start mode:
Select the mode to record once press the POWER button.

Press

Roll-over mode:
Select the mode to record after download the data without reset up each parameter and selection.
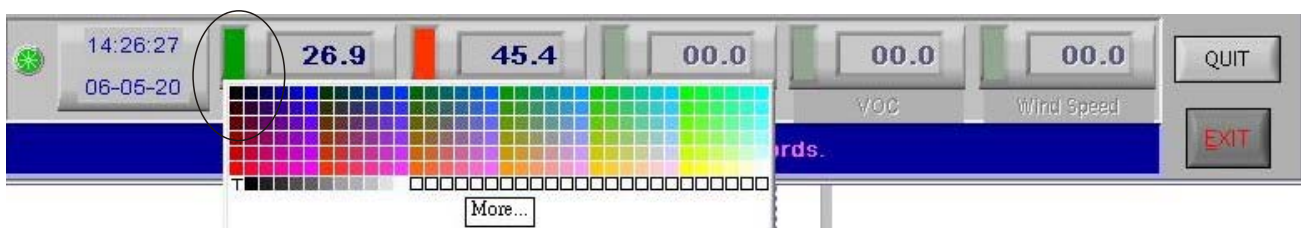Only "Real-time" mode roll-over when data is full.

Zoom in/out

Hold [Ctrl] + Click [Mouse] left key = Screen graph zoom in

Hold [Ctrl] + Click [Mouse] right key = Screen graph zoom out

Line color selecting:

1. Click the color beside the reading(Temp. RH), color box shows below.
2. Move mouse to review and select color.
3. Click to save, the color appear on line and bar.

16

Logger function:

Download data:

Press DOWNLOAD button, data download in few seconds. Graph shows automatically

NOTE: Please do not press DOWNLOAD button if you won't stop record. You can press LOGGER STATUS button to see record points.

Data area/Message area

Next to "DOWNLOAD" button, data area shows the cursor parameter's value. Next to "EXIT" button shows "Reminder and Warning " message.

Retrieve file:

Press RETRIEVE FILE button to select file and show the graph.

Save data:

Press SAVE button to save txt. file. Or Excel , PDF file (Available soon by updating newest logger software version)
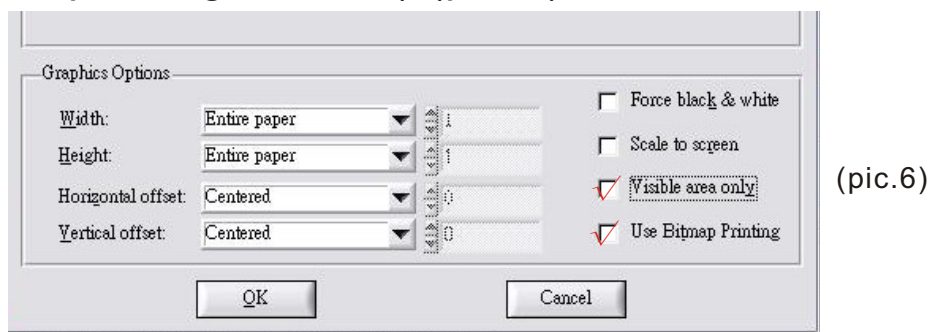
Print graph:

Press PRINT button and print graph. Follow the print setting below to print full screen graph. Press OK to print pdf file.(pic.6)

View Data Table:

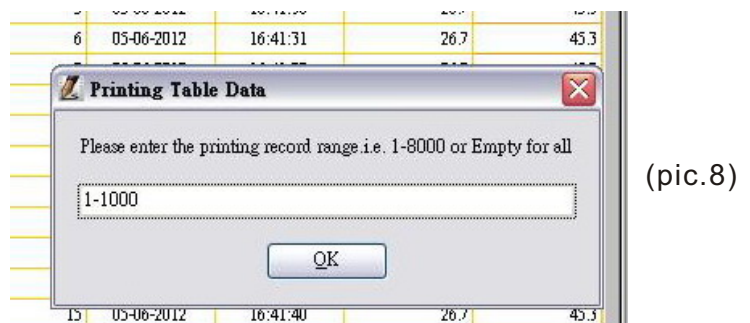Press View button to get data table with details.(pic.7)

Print Table Data:

Press table data, the screen shows the record range, enter the start number to the end number (For example: 1~500 or 200~1000…or leave it blank for printing all data).(pic.8)

(pic.6)

(pic.7)

(pic.8)

SPECIFICATIONS

	98136	98138	98536	98538
	98137	98139	98537	98539
Backlight display	-137 (YES)	-139 (YES)	-537(YES)	-539(YES)
CO2 meas. Range	0~9999 ppm			
CO2 accuracy	±75ppm+5% of rdg (0~2000ppm), others out of specified			
Audible alarm	N/A		YES	
Hi/Lo threshold setting	N/A		YES	
Logger mode	N/A	N/A	YES	YES
Temp.range	-10~50℃	-40~85℃	-10~50℃	-40~85℃
Temp. accuracy	±0.6℃ (-10~50℃), others ±1.2℃			
RH range	10.0% ~ 90.0%RH		0.1% ~ 99.9%RH	
RH accuracy	±5%RH(at25℃ ,10~90RH), others ±7%RH			
TWA.STEL	N/A	YES	N/A	YES
VENT rate: lps%, cfm/P	N/A	N/A	N/A	YES
Dew Point Temp.	N/A	YES	N/A	YES
Wet Bulb Temp.	N/A	YES	N/A	YES
USB Interface	N/A		YES	

TROUBLE SHOOTING

(1) When meter appears break character, please find out if meter ever dropped to the floor. If "yes", please contact with local distributor for technical service.

(2) Error codes:
      E-1 : CO_2 sensor is failed
      E-2 : Humidity sensor is failed
      E-3 : Temp. sensor is failed
      E-4 : Operation Temp. is too high
      E-5 : Operation Temp. is too low
      E-6 : Some hardware are failed

Note: If above error codes appear on the display, please contact with local distributor for technical service.

CE CERTIFICATE

The product complies with EMC directive 2004/108/EC
Technical standard:
Emission
      EN 61326-1:2006 Class B
      EN 55011:2009/A1:2010 Group 1 Class B
Immunity
      EN 61326-1:2006
      EN 61000-4-2:2009
      EN 61000-4-3:2006/A2:2010

WARRANTY

This instrument is warranted for two years from the date of purchase (One year limited warranty applies to cables). A Return Authorization letter must be issued before returning for any reason. This warranty does not apply to defects resulting from action of the user such as misuse, abuse, alteration neglect, improper wiring, improper maintenance or repair, or unauthorized modification, damage resulting from leaking batteries, operation outside of specification.

During the warranty period the manufacturer reserved the right to decide either to repair or replace the product. The meters are to be returned along with good packing to prevent any damage in shipment and insured against possible damage or loss.

The two years' warranty doesn't apply to:
- Accessories and batteries (not covered by warranty).
- Claims is not acceptable for improper use (including adaptation to particular applications not foreseen in the instructions manual) or improper combination with incompatible accessories or equipment, or by previous attempts for repair carried out by none skilled or unauthorized personnel.

CO2 LEVELS AND GUIDELINES

Non-enforced reference levels:

a) 250~350ppm– Background (normal) outdoor air level.

b) 350~1,000ppm – Typical level found in occupied spaces with good air exchange.

c) 1,000~2,000ppm – Level associated with complaints of drowsiness and poor air.

d) 2,000~5,000ppm – Level associated with headaches, sleepiness, and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present.

e) > 5,000 ppm – Exposure may lead to serious oxygen deprivation resulting in permanent brain damage, coma and even death.

Regulatory exposure limits:

ASHRAE Standard 62-1989: 1000ppm. CO2 concentration in occupied building should not exceed 1000ppm.

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

Building bulletin 101 (Bb101): 1500ppm. UK standards for schools say that CO2 at averaged over the whole day(i.e. 9am to 3.30 pm) should not exceed 1500ppm.

Germany, Japan, Australia, UK…: 5000ppm. 8 hours weighted average in occupational exposure limit is 5000ppm.