SD card real time datalogger

CO2/HUMIDITY/TEMP. DATA RECORDER
Model : MCH-383SD

Your purchase of this CO2/HUMIDITY/TEMP. DATA RECORDER marks a step forward for you into the field of precision measurement. Although this DATA RECORDER is a complex and delicate instrument, its durable structure developed. Please read the following instructions carefully and always keep this manual within easy reach.

OPERATION MANUAL

TABLE OF CONTENTS

1. FEATURES

* Monitor with real time data logger, save the measuring data along the time information (year, month, date, minute, second) into the SD memory card and can be down load to the Excel, extra software is no need. user can make the further data or graphic analysis by themselves.
* Show CO_2 (Carbon dioxide), Humidity and Temperature value in the same LCD.
* NDIR method principal for CO_2 (Carbon dioxide) measurement, available for long term operation. high repeatability and high accuracy.
* 0.1 %RH resolution for the humidity reading, 0.1 degree resolution for the Temp. reading.
* Used the precision capacitance type humidity sensor, professional and high accuracy.
* SD card capacity : 1 GB to 16 GB.
* Large LCD display, easy readout.
* Microcomputer circuit, high reliability.
* Low power consumption and long battery life when use battery power.
* Power supply from AC.DC 9V adapter in.
* RS232/USB computer interface.
* Patented

2. SPECIFICATIONS

2-1 General Specifications

Circuit	Custom one-chip of microprocessor LSI circuit.	
Display	LCD size : 60 mm x 50 mm	
Measurement	CO2 (Carbon dioxide) Humidity and Temperature	
Unit	CO2	ppm
	Humidity	%RH
	Temp.	℃, ℉
CO2 Sensor Structure	NDIR	
Response Time for CO2 measurement	*CO2 :* < 2 min. typically. * Reach the 63% reading value * Depend the environment air circulation.	
Temperature Compensation	Automatic temp. compensation for CO2 measurement.	
Datalogger Sampling Time	5/10/30/60/120/300/600 seconds or Auto. * Default sampling time is 60 seconds. * The " Auto " sampling means when the measuring value is changed (> ± 1 %RH or > ± 1 ℃ or ± 50 ppm) will save the data one time only.	
Data error no.	≦ 0.1 % no. of total saved data typically.	
Memory Card	SD memory card. 1 GB to 16 GB.	
Data Output	RS 232/USB PC computer interface. * Connect the optional RS232 cable UPCB-02 will get the RS232 plug. * Connect the optional USB cable USB-01 will get the USB plug.	

Advanced setting	* SD memory card Format * Set clock time (Year/Month/Date, Hour/Minute/Second) * Set sampling time * Set beeper sound ON/OFF * Set SD card Decimal character * Select the Temp. unit to ℃ or ℉ * Set RS232 data output ON/OFF * Set CO2 height (meter) compensation value * Set CO2 height (feet) compensation value
Update Time of Display	Approx. 1 second if measuring data is changed.
Operating Temperature	0 to 50 ℃.
Operating Humidity	Less than 90% R.H.
Power Supply * *Meter & probe*	* DC 9V adapter input. (AC/DC power adapter is included).
Power Supply * *Clock backup battery*	* .Alkaline or heavy duty DC 1.5 V battery (UM4, AAA) x 6 PCs, or equivalent.

Weight	Meter	240 g/0.53 LB.
	CO2 probe	158 g/0.35 LB.
Dimension	Meter	132 x 80 x 32 mm (5.2 x 3.1 x 1.3 inch)
	CO2 probe	132 x 38 x 32 mm (5.2 x 1.5 x 1.3 inch)

Accessories Included	* CO2 probe....................................1 PC
	* AC to DC 9V adapter.....................1 PC
	* Main meter hanging unit (with sticker) ....1 PC
	* CO2 hanging unit (with sticker)... 1 PC
	* Instruction manual.........................1 PC
Optional Accessories	SD Card (2 GB), SD-2GB. USB cable, USB-01. RS232 cable, UPCB-02. Data Acquisition software, SW-U801-WIN.

2-2 Electrical Specifications (23± 5 ℃)

CO2 (Carbon dioxide)

Range	0 to 4,000 ppm	
Resolution	1 ppm	
Accuracy	± 40 ppm	* ≦ 1,000 ppm.
	± 5% of reading	* > 1,000 ppm ≦ 3,000 ppm.
	± 250 ppm typically	* > 3,000 ppm, reference only

Humidity

Range	10 % to 90 % R.H.
Resolution	0.1 % R.H.
Accuracy	≧70% RH : ± (4 % reading + 1% RH).
	< 70% RH : ± 4 %RH.

Temperature

Range	0 ℃ to 50 ℃ ,32 ℉ to 122 ℉.
Resolution	0.1 degree
Accuracy	℃ - ± 0.8 ℃, ℉ - ± 1.5 ℉.

@ Above specification tests under the environment RF Field Strength less than 3 V/M & frequency less than 30 MHz only.

3. FRONT PANEL DESCRIPTION
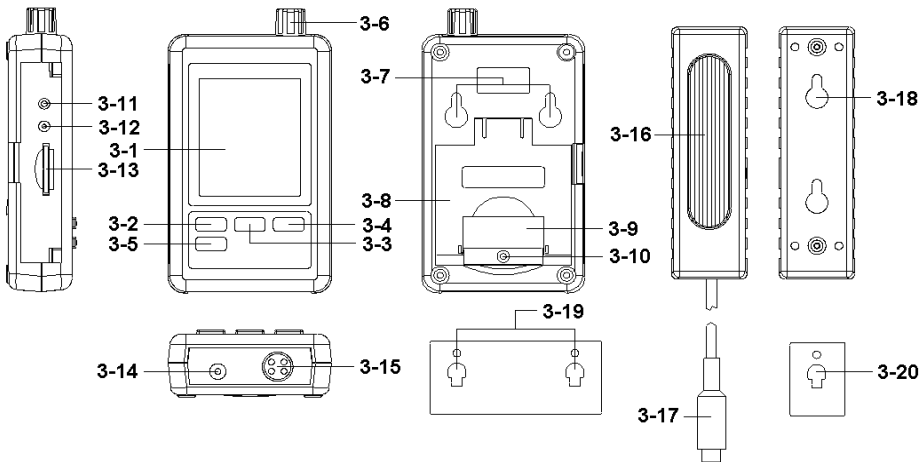
Fig. 1

3-1 Display

3-2 Logger button, Enter button

3-3 ▲ button, Time button

3-4 ▼ button

3-5 SET button

3-6 Humidity/Temp. sensor

3-7 Hanging holes (main meter)

3-8 Stand

3-9 Battery cover/Battery compartment

3-10 Screw of the battery cover

3-11 Reset button

3-12 RS-232 output terminal

3-13 SD card socket

3-14 DC 9V power adapter input socket

3-15 CO2 probe input socket

3-16 CO2 probe/sensor

3-17 Plug of CO2 probe.

3-18 Hanging hole (CO2 probe)

3-19 Main meter hanging unit (with sticker)

3-20 CO2 hanging unit (with sticker)

4. MEASURING PROCEDURE

1) Plug the " Output plug " of " AC/DC 9V adapter " to
   " DC 9V power input socket (3-14, Fig. 1), plug the
   " Input plug " of the " AC/DC 9V adapter " into a properly
   AC outlet (AC 100 V to 240 V) following.
2) The " Display " (3-1, Fig. 1) will show both the
   CO2, Humidity and Temperature value at the same
   time.

   Up Display   -   Humidity value
   Middle Display-   Temperature value
   Low Display   -   CO2 value

3) **Backup batteries consideration :**
   *It recommend to install the batteries DC 1.5 V battery
   (UM4, AAA) x 6 PCs into the " Battery compartment "
   (3-9, Fig. 1) for clock time base backup. If do not
   install those batteries, the internal clock may can not run
   properly after the meter is disconnect from the " AC/DC
   9V adapter " for a certain period.*

   Remark :
   ** How to change the Temp. unit ($^\circ C$, $^\circ F$), refer to chapter 7-6,
      page 15.*

5. DATALOGGER

5-1 Preparation before execute datalogger function

a. Insert the SD card
Prepare a " SD memory card " (1 GB to 16 GB, optional),
insert the SD card into the " SD card socket " (3-13, Fig. 1)
with the correct direction exactly.

 * It recommend use memory card's capacity is $\leqq$ 4 GB.

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b. SD card Format
If SD card just the first time use into the meter, it recommend to make the " SD card Format " at first, please refer chapter 7-1, page 12.

 * *It recommend strongly, do not use memory cards that have been formatted by other meter or by other installation (such as camera...) Reformat the memory card with your meter.*
 * *If the SD memory card exist the trouble during format by the meter, use the Computer to reformat again can fix the problem.*

c. Time setting
If the meter is used at first time, it should to adjust the clock time exactly, please refer chapter 7-2, page 12.
d. Decimal format setting

⚠️

The numerical data structure of SD card is default used the " . " as the decimal, for example "20.6" "1000.53" . But in certain countries   (Europe ...) is used the " , " as the decimal point, for example " 20, 6 " "1000,53". Under such situation, it should change the Decimal character at first, details of setting the Decimal point, refer to Chapter 7-5, page 14.

e. 3 Information of LCD display
* If the Display show :
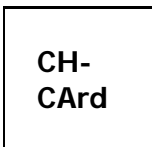
CH-CArd	It means that the SD card exist the problem or the SD card memory is full, it should change SD memory card.

* If the Display show :
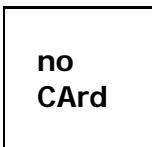
no CArd	It means that the SD card is not plugged into the meter.

5-2 Datalogger

a. Start the datalogger

Press the " Logger button (3-2, Fig. 1) > 2 seconds
continuously, until the Display show the indicator
" DATALOGGER ", release the " Logger Button " (3-2, Fig.
1), then the measuring data along the time information
will be saved into the memory circuit.

Remark :
 *How to set the sampling time, refer to Chapter 7-3,
   page 13.*
 *How to set the beeper sound is enable, refer to
   Chapter 7-4, page 13.*

c.. Finish the Datalogger

During execute the Datalogger function (Display show the
" Datalogger " indicator), press the " Logger button " (3-2,
 Fig. 1) > 2 seconds continuously, until the Display
indicator " DATALOGGER " is disappeared, release the
" Logger Button " will finish the Datalogger function.

Before take away the SD card from the meter, it should execute the procedures of " Finish the Datalogger ", otherwise some existing recent save data may loss.

5-3 Check time information

Press " Time button " (3-3, Fig. 1) > 2 seconds continuously, the LCD display will present the time information of Year/Month/Date, Hour/Minute/Second and the sampling value.

5-4 SD Card Data structure

1) When the first time, the SD card is used into the meter, the SD card will generate a folder :

   ### CHA01

2) If the first time to execute the Datalogger, under the route CHA01\, will generate a new file name CHA01001.XLS.
   After exist the Datalogger, then execute again, the data will save to the CHA01001.XLS until Data column reach to 30,000 columns, then will generate a new file, for example CHA01002.XLS

3) Under the folder CHA01\, if the total files more than 99 files, will generate anew route, such as CHA02\ ....

4) The file's route structure :
   CHA01\
       CHA01001.XLS
       CHA01002.XLS

       ....
       CHA01099.XLS
   CHA02\
       CHA02001.XLS
       CHA02002.XLS

       ....
       CHA02099.XLS
   CHAXX\

       ....
   Remark :
   *XX : Max. value is 10.*

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6. Saving data from the SD card to the computer (EXCEL software)

1) After execute the Data Logger function, take away the SD card out from the " SD card socket " (3-13, Fig. 1).
2) Plug in the SD card into the Computer's SD card slot (if your computer build in this installation) or insert the SD card into the " SD card adapter ". then connect the " SD card adapter " into the computer.
3) Power ON the computer and run the " EXCEL software ". Down load the saving data file (for example the file name : CHA01001.XLS, CHA01002.XLS) from the SD card to the computer. The saving data will present into the EXCEL software screen (for example as following EXCEL data screens) , then user can use those EXCEL data to make the further Data or Graphic analysis usefully.

EXCEL data screen (for example)

	A	B	C	D	E	F	G	H	I
	Position	Date	Time	Ch1_Value	Ch1_Unit	Ch2_Value	Ch2_unit	Ch3_Value	Ch3_unit
1									
2	1	2009/11/11	13:02:14	59.1	%RH	25.6	DEGREE	628	PPM
3	2	2009/11/11	13:02:18	59.1	%RH	25.6	DEGREE	630	PPM
4	3	2009/11/11	13:02:23	59.1	%RH	25.6	DEGREE	640	PPM
5	4	2009/11/11	13:02:28	58.9	%RH	25.6	DEGREE	630	PPM
6	5	2009/11/11	13:02:33	58.7	%RH	25.6	DEGREE	638	PPM
7	6	2009/11/11	13:02:38	58.4	%RH	25.6	DEGREE	641	PPM
8	7	2009/11/11	13:02:43	58.3	%RH	25.6	DEGREE	638	PPM
9	8	2009/11/11	13:02:48	58.6	%RH	25.7	DEGREE	635	PPM
10	9	2009/11/11	13:02:53	58.7	%RH	25.7	DEGREE	635	PPM
11	10	2009/11/11	13:03:58	58.6	%RH	25.6	DEGREE	630	PPM
12	11	2009/11/11	13:03:03	58.4	%RH	25.7	DEGREE	638	PPM
13	12	2009/11/11	13:03:08	58.3	%RH	25.7	DEGREE	641	PPM
14	13	2009/11/11	13:03:13	59.1	%RH	25.7	DEGREE	638	PPM
15	14	2009/11/11	13:03:18	59.1	%RH	25.7	DEGREE	635	PPM

EXCEL graphic screen （for example）
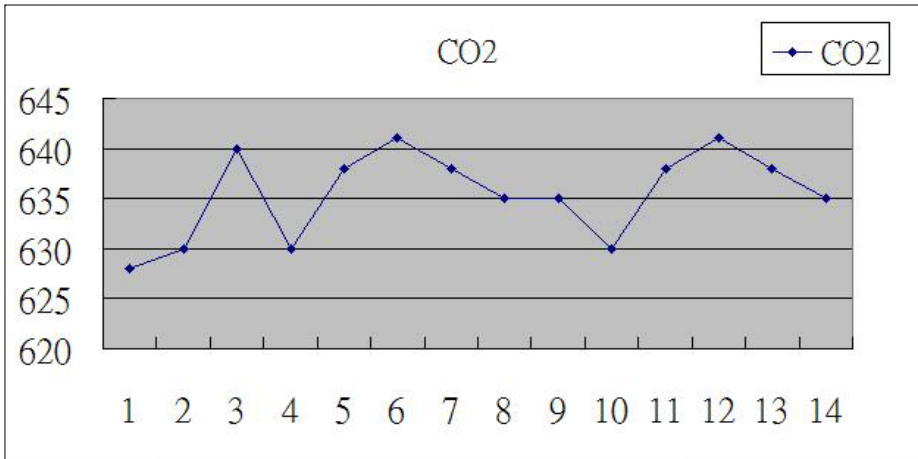
7. ADVANCED SETTING

Under do not execute the Datalogger function, press the
" SET button " (3-5, Fig. 1) > 2 seconds continuously will
enter the " Setting " mode., then release the " SET button ".
Following press the " SET button " (3-5, Fig. 1) once a
while in sequence to select the seven main function, the
display will show :

Sd F..... SD memory card Format
dAtE..... Set clock time (Year/Month/Date, Hour/Minute/
        Second)
SP-t...... Set sampling time
bEEP..... Set beeper sound ON/OFF
dEC....... Set SD card Decimal character
t-CF...... Select the Temp. unit to ℃ or ℉
rS232... Set RS232 data output ON/OFF
HIgh-.... Set CO2 height (meter) compensation value
HIghF... Set CO2 height (feet) compensation value

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Remark :
During execute the " Setting " function, if within 5 seconds , do not press any buttons further, the LCD Display will return to normal screen.

7-1 SD memory card Format

| When the Display show " Sd F " |

1) Use the " ▲ Button " (3-3, Fig. 1) or " ▼ Button " (3-4, Fig. 1) to select the upper value to " yES " or " no ".

   yES - Intend to format the SD memory card
   no - Not execute the SD memory card format

2) If select the upper to " yES ", press the " Enter Button " (3-2, Fig. 1) once again, the Display will show text " yES Enter " to confirm again, if make sure to do the SD memory card format, then press " Enter Button " once will format the SD memory clear all the existing data that already saving into the SD card.

7-2 Set clock time (Year/Month/Date, Hour/Minute/ Second)

| When the Display show " dAtE " |

1) Use the " ▲ Button " (3-3, Fig. 1) or " ▼ Button " (3-4, Fig. 1) to adjust the value (Setting start from Year value). After the desired value is set, press the " Enter button " (3-2, Fig. 1) once will going to next value adjustment (for example, first setting value is Year then next to adjust Month, Date, Hour, Minute, Second value).

Remark :
The adjusted unit will be flashed.

2) After set all the time value (Year, Month, Date, Hour, Minute, Second), press the " SET button " (3-5, Fig. 1) once will save the time value, then the screen will jump to Sampling time " setting screen (Chapter 7-3).

Remark :
After the time value is setting, the internal clock will run precisely even Power off if the battery is under normal condition (No low battery power).

7-3 Set sampling time

When the Display show " SP-t "

1) Use the " ▲ Button " (3-3, Fig. 1) or " ▼ Button " (3-4, Fig. 1) to adjust the sampling value :
5 seconds, 10 seconds, 30 seconds, 60 seconds, 120 seconds, 300 seconds, 600 seconds Auto.

After the desired value is set, press the   " Enter Button " (3-2, Fig. 1) to save the adjusting value with default.

Remark :
The " Auto " sampling time means when the measuring value is changed (> ± 1 %RH or > ± 1 ℃ or ± 50 ppm) will save the data to the memory circuit one time.

7-4 Set beeper sound ON/OFF

When the Display show " bEEP "

1) Use the " ▲ Button " (3-3, Fig. 1) or " ▼ Button " (3-4, Fig. 1) to select the data to " yES " or " no ".

yES - Meter's beep sound will be ON with default when save each data.

no - Meter's beep sound will be OFF with default. when save each data.

2) After select the upper text to " yES " or " no ", press the " Enter Button " (3-2, Fig. 1) will save the setting function with default.

7-5 Decimal point of SD card setting

When the Display show " dEC "

The numerical data structure of SD card is used the " . " as the decimal with default, for example "20.6" "1000.53" . But in certain countries (Europe ...) is used the " , " as the decimal point, for example " 20,6 " "1000,53". Under such situation, it should change the Decimal character at first.

1) Use the " ▲ Button " (3-3, Fig. 1) or " ▼ Button " (3-4, Fig. 1) to select the upper text to " USA " or " Euro ".

USA - Use " . " as the Decimal point with default.
Euro - Use " , " as the Decimal point with default.

2) After select the text to " USA " or " Euro ", press the " Enter Button " (3-2, Fig. 1) will save the setting function with default.

7-6 Select the Temp. unit to ℃ or ℉

When the Display show " t-CF "

1) Use the " ▲ Button " (3-3, Fig. 1) or " ▼ Button "
   (3-4, Fig. 1) to select the upper Display text to " C " or
   " F ".

   C - Temperature unit is ℃
   F - Temperature unit is ℉

2) After Display unit is selected to " C " or " F ", press the
   " Enter Button " (3-2, Fig. 1) will save the setting
   function with default.

7-7 Set RS232 data output ON/OFF

When the Display show " rS232 "

1) Use the " ▲ Button " (3-3, Fig. 1) or " ▼ Button "
   (3-4, Fig. 1) to select the upper Display text to "yES " or
   " no ".

   yES - RS-232 output terminal (3-12, Fig. 1)
   will send the RS232 signal output.
   no - RS-232 output terminal (3-12, Fig. 1)
   will not send the RS232 signal output.

2) After Display text is selected to " yES " or " no ",
   press the " Enter Button " (3-2, Fig. 1) will save the
   setting function with default.

7-8 Set CO2 height (meter) compensation value

When the Display show " High- "

For precision CO2 measurement, it recommend to set the meter's environment altitude (height) value for the compensation.

1) Use the " ▲ Button " (3-3, Fig. 1) or " ▼ Button " (3-4, Fig. 1) to select the desired height compensation value in meter unit.
2) After setting the altitude value, press the " Enter Button " (3-2, Fig. 1) will save the setting value with default.

7-9 Set CO2 height (feet) compensation value

When the Display show " HighF "

For precision CO2 measurement, it recommend to set the meter's environment altitude (height) value for the compensation.

1) Use the " ▲ Button " (3-3, Fig. 1) or " ▼ Button " (3-4, Fig. 1) to select the desired height compensation value in feet unit.
2) After setting the altitude value, press the " Enter Button " (3-2, Fig. 1) will save the setting value with default.

8. POWER SUPPLY from DC ADAPTER

The meter's supply is from the DC 9V Power Adapter (optional). Insert the plug of Power Adapter into " DC 9V Power Adapter Input Socket " (3-14, Fig. 1).

9. CLOCK BACKUP BATTERY REPLACEMENT

1) When do not plug the AC/DC 9V adapter to the meter, if the left corner of LCD display show "⌷✕ ", and text " LoBAt ", it is necessary to replace the battery.
2) Loose the " Screw of the battery cover " (3-10, Fig. 1) and take away the " Battery Cover " (3-9, Fig. 1) from the instrument and remove the battery.
3) Replace with DC 1.5 V battery (UM4/AAA, Alkaline/heavy duty) x 6 PCs, and reinstate the cover.
4) Make sure the battery cover is secured after changing the battery.

Backup batteries consideration :
If the meter do not install those " Clock backup batteries " , the meter still can work, however we recommend strongly to install the batteries DC 1.5 V battery (UM4, AAA) x 6 PCs into the " Battery compartment " (3-9, Fig. 1) for clock time base backup. If do not install those batteries, the internal clock may can not run properly after the meter is disconnect from the " AC/DC 9V adapter " for a certain period.

10. SYSTEM RESET

If the meter happen the troubles such as :

CPU system is hold (for example, the key button can not be operated...).

Then make the system RESET will fix the problem.
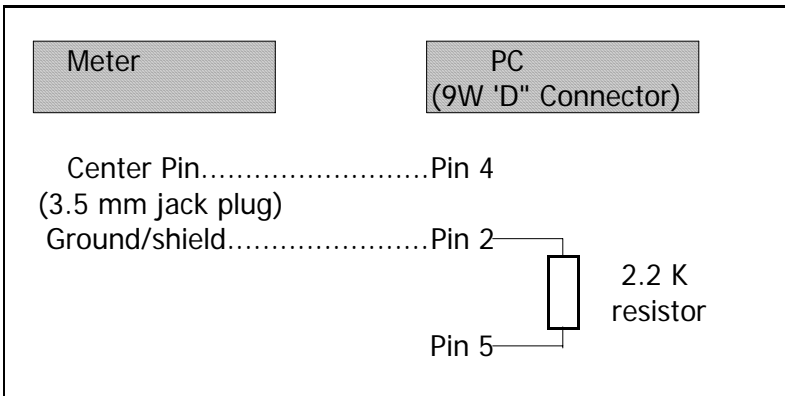The system RESET procedures will be either following
method :

   During the power on, use a pin to press the " Reset
   Button " (3-11, Fig. 1) once a while will reset the
   circuit system.

11. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm
terminal (3-12, Fig. 1) if the RS232 function already select
to " ON ", refer to chapter 7-7, page 15.

The data output is a 16 digit stream which can be
utilized for user's specific application.

A RS232 lead with the following connection will be
required to link the instrument with the PC serial port.

Meter	PC (9W 'D" Connector)

   Center Pin.........................Pin 4
  (3.5 mm jack plug)
   Ground/shield.....................Pin 2

                                    Pin 5

                                    2.2 K
                                    resistor

The 16 digits data stream will be displayed in the
following format :

D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

Each digit indicates the following status :

D0	End Word

D1 & D8	Display reading, D1 = LSD, D8 = MSD
	For example :
	   If the display reading is 1234, then D8 to
	   D1 is : 00001234

D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP
D10	Polarity 0 = Positive 1 = Negative
D11 & D12	Annunciator for Display ℃ = 01 ℉ = 02 % RH = 04 ppm = 19
D13	When send the up display data = 1 When send the middle display data = 2 When send the low display data = 3
D14	4
D15	Start Word

RS232 FORMAT : 9600, N, 8, 1

Baud rate	9600
Parity	No parity
Data bit no.	8 Data bits
Stop bit	1 Stop bit

12. ANNEX

The follow CO2 value are for the requirement for different environment, however it is for reference only.

Building, office, home	≦	1,000 PPM
School	≦	1,500 PPM
Hotel, public area	≦	1,500 PPM
Indoor swimming pool	≦	1,500 PPM
ASHRAE	≦	1,000 PPM
WHO	≦	920 PPM

13. PATENT

The meter (SD card structure) already get patent or patent pending in following countries :

Germany	Nr. 20 2008 016 337.4
JAPAN	3151214
TAIWAN	M 358970 M 359043
CHINA	ZL 2008 2 0189918.5 ZL 2008 2 0189917.0
USA	Patent pending

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