List of Components

■ Standard

| Item | Model | Qty. | Features |
|------------------------|---------|------|---|
| Main Body | 2212-00 | 1 | _ |
| Probe | 2212-01 | 1 | CO, CO ₂ , Temperature, Humidity Sensor |
| Carrying Case | 2211-02 | 1 | |
| Probe Stand | 2211-03 | 1 | Used to hold and stabilize a probe |
| Gas Calibration Cap | 2211-04 | 1 | Used for gas calibration |
| Tube | _ | 1 | Used to connect the above gas calibration cap to a calibration gas cylinder |
| Operation Manual | — | 1 | _ |
| Manganese AA Batteries | — | 6 | _ |
| Software CD-ROM | 2212-41 | 1 | Data Acquisition Software (for Windows) |
| RS232C Cable | 6000-02 | 1 | Used to connect the instrument and PC |

Options

| Item | Model | Features | |
|--------------------------|----------|---|--|
| ZERO Gas | 2211-05 | Zero Point Calibration for CO and CO ₂ | |
| CO Span Gas | 2211-06 | CO Span Calibration (Approx. 35ppm) | |
| CO ₂ Span Gas | 2211-07 | CO ₂ Span Calibration (Approx. 1000ppm) | |
| Gas Valve | 2211-08 | Valve for the gas cylinders listed above | |
| Spare Probe | 2212-01 | Spare Probe | |
| Analog Output | 2212-09 | Analog Output Terminal | |
| AC Adapter | 6113-02 | Power Supply | |
| Printer (Recommended) | DPU-S245 | For printing out calculation results | |
| Printer Cable | 6000-03 | Printer cable for connecting the instrument with the printer. | |

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1.2 Operation Panel

-MENU KEY

Press once to access the MENU screen to select the desired feature.

* If pressing this key while measuring or configuring the settings, whatever the operation being conducted will be cancelled and you will go back to the MENU screen.



To change measurement mode between temperature and humidity.



1.3 Probe



2. Getting Started

2.1 Installing Batteries







1. Press down the battery cover with your finger as shown left.

2. Slide the cover toward the bottom of the instrument.

3. Lift the cover away from the instrument.

- Types of batteries that can be used
- Manganese (R6), AA batteries
- Alkaline (LR6), AA batteries
- Ni-Cd, AA batteries

4. Insert batteries ensuring the battery polarity is correct. This instrument requires six (6) AA size batteries. Types of batteries that can be used are: Manganese (R6), Alkaline (LR6) or Ni-Cd batteries. The six (6) batteries must be of the same type. Do NOT mix different

types of batteries. Mixing different types of batteries or incorrect battery polarity may cause battery leakage or damage to the instrument.* Batteries CANNOT be recharged by the (optional) AC adapter.

5. Put the cover back on by reversing the above procedure.

2.2 Connecting Probe

CAUTION * <u>Make sure that the power is OFF when connecting</u> <u>or disconnecting the probe.</u>

- 1. Put the probe's connector on the main body's probe socket.
- 2. Push the connector in until you hear a click.

A CAUTION

* DO NOT squeeze the probe into the main body or twist the probe when it is attached, as it may cause a serious damage to the instrument.





2.3 Disconnecting Probe

CAUTION * <u>Make sure that the power is OFF when connecting or</u> <u>disconnecting the probe.</u>

- 1. Pull up the probe's connector (See chart 1-A).
- 2. Pull out the connector from the main body with the connector up (See below chart 2).





2.4 Turning ON/OFF the Power

The power switch for turning ON/OFF the instrument is located at the side of the instrument. When powered up after a probe is connected, the KANOMAX logo, its model name and software version will be displayed for a few seconds before the measurement mode screen shows up.



Battery Level Indicator



Check the "Battery Level Indicator" in the upper right corner to confirm the remaining battery level. When the battery level drops to a level requiring replacement, the indicator starts blinking. Since each battery has different battery life, it is recommended to replace them ahead.

The below shows how the indicator changes as the batteries are running low:



2.5 Precautions for Measurement

2.5.1 CO and CO₂ Measurement Precautions

- ♦ Air diffusion condition (flow condition) affects the response time of CO and CO₂ sensor. In order to obtain an accurate measurement result, perform a measurement in the place which has the flow of air as much as possible.
- Mechanism of CO and CO₂ sensor has a limitation in accuracy when a measurement takes place under drastic thermal change. When the sensor and the measuring object have apparent thermal discrepancy, leave the probe in open air for at least 20 minutes before starting a measurement.
- ◆ After turning the power ON, sensor circuit requires some time to stabilize a detecting circuit. For an accurate measurement result, leave the instrument for about 5 minutes after turning the power ON.
- Keep this sensor away from expiratory air; exhaled air contains more than 10,000ppm of CO₂ and exhaled air of smokers contains several ppm of CO. In order to perform an accurate measurement it is recommended to use the provided prove stand and to place the probe away from you while measuring.

<How to use the Probe Stand>

Lightly push the grip part of the probe into the probe stand's holder as shown in the below figure 1.

* Make sure to place the probe stand on a stable flat surface. Placing the probe on an unstable surface may cause the probe stand to fall and damage the probe.



<Precaution for Storing the Main Unit and Probe>

* Our CO detection sensor inside the probe uses an electrochemical sensor. As this sensor uses electrochemical reaction, it reacts to not only CO but also the similar types of gas. If the sensor is used or stored in an environment containing organic solvents, paint, medical agents, oil or corrosive gas, the CO sensor will show an abnormal reaction causing zero-point drift, sensitivity variations or damage to the sensor.

• Typical Reactive Gas

Hydrogen Sulfide, Sulphur Dioxide, Nitric Oxide, Nitrogen Dioxide, Chlorine, Hydrogen and Ethanol



CAUTION

* <u>DO NOT use or store the instrument in the environment containing organic solvents, paint, medical</u> agents, oil or corrosive gas.

<Atmospheric Pressure Correction>

- ◆ When atmospheric pressure at a measuring site is abnormal (such as at high altitude), follow steps below to set atmospheric pressure (default setting: 1013hPa).
- Since the change of weather does not significantly affect the atmospheric pressure as long as the measuring site is same (excluding the case of typhoon), once you set atmospheric pressure, you do not need to set it every time.



2.5.2 Temperature Measurement Precautions

- The response time for temperature measurement improves as the air flow increases. Wait for the reading to become stable before taking the data.
- ◆ When a measurement is performed in a no-airflow condition, the air temperature reading may become higher than the actual due to the heat generated by the lamp. It is recommended that the measurement is performed in an environment with at least 0.1m/s airflow to obtain accurate readings.

2.5.3 Humidity Measurement Precautions

◆ If a measurement is performed in the place where the humidity is high for a long period of time or temperature changes rapidly, humidity reading may become exceedingly high due to dew condensation. When dew condensation is built up, leave the probe in the atmosphere of less than 40%RH for 24 hours to dry it out.

-- Comparison with Assman Aspiration Psychrometer --

The quality and accuracy of IAQ Monitor's humidity measurement function is ensured by strict calibration with traceability in Japanese National Standards of JEMIC (Japan Electric Meters Inspection Corporation). This instrument provides stable measurement as an electronic hygrometer, so it can be used as Assman Aspiration Psychrometer. Assman Psychrometer sometimes reads higher humidity comparing to the IAQ Monitor since handling methods such as how to wrap the wet bulb by gauze or how to handle the dirt affect Assman Psychrometer. Assman Psychrometer shall be handled with care. For more details on handling Assman Psychrometer, refer to the Japanese Industrial Standard (JIS) Z 8806 Humidity - Measurement Method.

3. Measurement (NORMAL MODE)

This is the mode that you will see when you turn on the instrument. In this mode you cannot store any data.

Any displayed readings are updated every 1 second.

To move to NORMAL Mode from other measurement mode,

press (MENU) key to bring up the MENU screen,

select "1. NORMAL" and press (SET) key.



<u>3.1 Changing the Measurement Mode</u>

| Display | | Procedure | | |
|---------|---|---|--|--|
| 1 | °04/05/12 15:40:23 € CO2 523 PPM CO 1.7 PPM 24.4 ℃ | Press $(MODE)$ key when the NORMAL (Measurement) mode screen shown in the left is displayed. As $(MODE)$ key is pressed, the measurement mode will be switched between 2. $(CO_2, CO, Temperature) \rightarrow 1.$ $(CO_2, CO, Humidity).$ | | |
| 2 | | <co<sub>2, CO and Humidity Measurement Screen></co<sub> | | |
| | <u>'04/05/12 15:40:23</u> | Press () () key when the screen in the left is displayed to change the | | |
| | 1 ^{CO2} 523 DDM | humidity related display mode in the sequence of Humidity, 3.Dew-point | | |
| | | Temperature [DT], 4.Wet-bulb Temperature [WB], 5.Absolute Humidity | | |
| | | [AH] and 6.Humidity Ratio [HR]. | | |
| | C C C C C C C C C C C C C C C C C C C | See P.42 for detailed information on each item. | | |
| 3 | C ^{CO} 1.7 PPM DT 20.1 °C | <due-point measurement="" screen="" temperature=""></due-point> | | |
| 4 | CO 1.7 PPM WB 16.1 PC | <wet-bulb measurement="" screen="" temperature=""></wet-bulb> | | |
| 5 | ^{CO} 1.7 ppm AH 3.51 g/m ³ | <absolute humidity="" measurement="" screen=""></absolute> | | |
| 6 | HR 0.81 9/k9 | <humidity measurement="" ratio="" screen=""></humidity> | | |

3.2 Hold the Reading

Display



When the NORMAL (Measurement) mode screen is displayed, press

Procedure

| 20470 |)5/12 | 15: | 40: | 23 📾 |
|-------|-----------|--------------|-----|---------------------|
| HOLD | CO2 CO | 5 1 24 | 27 | S PPM PPM PPM |

"HOLD" indicator appears on the left side of the display to indicate that the reading shown is kept on hold on the display. Press (TART) key again to recover from the HOLD mode.

Maximum Value Hold How to Hold the Maximum Value

Display

Procedure



When the NORMAL (Measurement) mode screen is displayed, keep pressing (TAR) key.

| 04/05/12 15:40:23 | | While $(HOLD)$ is being pressed, "HOLD" indicator keeps appearing on the left side of the display and the maximum values of each parameter (CO | |
|-------------------|-----------------|--|--|
| C02 | <u>647</u> | CO ₂ Humidity or Temperature) are shown on the screen | |
| HULD | | START | |
| | A PPM | Release (Hold) key to keep the maximum value on hold on the display. | |
| | 24. 1 °C | Press (HOLD) again to recover from the HOLD mode. | |

4. Measuring MAX, AVG and MIN Value (CALUCULATION MODE)

In Calculation Mode measurement data is stored and maximum, mean and minimum values will be calculated.





CALCULATION MODE SETTING SCREEN

1. CALCULATION MODE





°С

| Display | Procedure | | |
|--|--|--|--|
| ² 04/05/12 15:44:13 EX SMP. CO2 583 PPM N 3 CO 1.9 PPM 24.5 °C | While Measuring> Press (TAR) Key to stop measuring. (If "YES" is selected for "4. DATA STORAGE ?", the measured data will be stored.) You can also stop measuring by pressing (MENU) key. However, any measured data will not be stored. | | |
| CALCULATION MAX CO2 598 PPM AVG CO2 555 PPM MIN CO2 523 PPM | Calculation Result Display> After all the measurements are finished, the calculation result will be displayed. Use key to check each parameter in the sequence of CO ₂ -> CO -> Temperature -> Humidity -> Dew-point Temperature (DT) -> Wet-bulb Temperature (WB) -> Absolute Humidity (AH) -> Humidity Ratio (HR). | | |
| CALCULATION DT 22.8 °C WB 23.7 °C AH 35.3 °C | As for Dew-point Temperature, Wet-bulb Temperature, Absolute Humidity, and Humidity Ratio, only average values will be displayed. Press (MENU) key to return to the MENU screen. Calculation data will be stored when "4.DATA STORAGE" is set to "YES". | | |
| Related Functions: | | | |

- If a printer is connected: press MODE key to print out calculation result.
- To redisplay stored data -- P.18
- To print out measured data -- P.20
- What is DT, WB, AH, HR? -- P42

5. Measuring Percent Outdoor Air (%OA MODE)

%OA MODE is a measurement mode to calculate Percent Outdoor Air either with temperature or CO_2 . The calculation is based on below formula:



Average value in each point is used to calculate percent outdoor air.

Temperature or CO_2 concentration data at each point (TRIAL(1) ~ TRIAL(N)) will be also stored in the memory.



| 20A (R1500/1500) | To get S A MDI INC TIMES |
|---|--|
| 1 MODE TMP 2.SAMPLING TIME 00 3.No.TRIAL(N) 050 4.DATA STORAGE ? YES 5.SET TO START | Use \checkmark key to select "2.SAMPLING TIME", and press $\overset{\text{SET}}{\checkmark}$ key. Use \checkmark key to set sampling time (1-999sec), and press $\overset{\text{SET}}{\checkmark}$ key. |
| | |
| %OA (R1500/1500) | <to number="" of="" set="" trials=""></to> |
| 20A (R1500/1500) 1.MODE TMP. 2 SAMPLING TIME 001 S | <to number="" of="" set="" trials=""></to> Use (SET) key to select "3.No.TRIAL", and press (SET) key. |
| %0A (R1500/1500) 1.MODE TMP. 2 SAMPLING TIME 001 S SAMPLING TIME 001 S 3.No.TRIAL(N) 050 4.DHTH STORHGE 7 YES | To set Number of Trials> Use key to select "3.No.TRIAL", and press SET key. Use key to select the number of trials (1-999 times), and press |





- To redisplay stored data P.18
- To print out measured data P.20

6. Data Output

6.1 Stored Data Item

The measurement data that can be stored in the instrument in the each measurement mode and measurement screen is listed in the table below.

| Measurement Mode | Measurement Display | Stored Parameters | |
|-----------------------------------|-------------------------|--|--|
| CALCULATION Mode (CALCULATION) | All measurement display | CO ₂ , CO, Temperature, Humidity (including all items related to humidity) | |
| Percent Outdoor Air | Temperature. | %OA, Temperature of R_A, S_A, and O_A | |
| (%OA mode) | CO ₂ | %OA, CO ₂ concentration of R_A, S_A, and O_A | |

6.2 To Redisplay Stored Data



| | Dis | play | | Procedure |
|-------------------------------|--|--|-------------------------------|---|
| STAR NUM. 001 002 | CALCU T:001 C02PPM 1003 1001 1005 | LATION END:0 COPPM 1.1 1.1 | 50°C3.5 | Measurement data display screen> Measurement data of the specified page will be displayed. Use key to scroll the data. |
| 004 005 006 Data No. | 1003 1006 1009 CO ₂ | 1.0 1.0 1.0 CO | 23.6 23.6 23.6 Temp. | When a measurement is performed in the CALCULATION mode, press MODE key to switch to display between Temperature and Humidity. |

%OA (Temperature)

| STAR NUM. 001 002 | T:001 CR_A 23.4 23.4 | END:0 CS_A 222.8 |)50 CO_A N21 S CO_A S CO_A S CO_A S S CO_A S S CO_A S S CO_A S S CO_A S S CO_A S S CO_A S S CO_A S S CO_A S S CO_A S S CO_A S S S CO_A S S S CO_A S S S S CO_A S S S S S S S S S S S S S S S S S S S |
|----------------------------|-------------------------------|---|--|
| | | 02222 22222 22222 22222 22222 22222 22222 | |
| Data No. | Return Air | Supply Air | Outdoor Air |
| | Temp. | Temp. | Temp. |

| | %O | $A(CO_2)$ | |
|----------|-----------------|------------|-----------------|
| STAR | T:00 | END:0 | 50 |
| NUM. | PPMRA | PPMSA | PPMOA |
| 001 | 1003 | 623 | 425 |
| 002 | 1001 | 626 | 435 |
| 003 | 1005 | 653 | 420 |
| 004 | 1003 | 663 | 429 |
| 005 | 1006 | 639 | 424 |
| 006 | 1009 | 629 | 415 |
| Data No. | Return Air | Supply Air | Outdoor Air |
| | CO ₂ | CO2 | CO ₂ |

CALCULATION

PPM

PPM

PPM

CALCULATION

C02

C02

C02

MAX

AVG

MIN

<To display calculation result>

You can specify the data range for calculation. (When data range does not need to be changed, press (HOLD) key to display the calculation result of the data range shown.)

Press (SET) key to show a cursor on "START" No.

Use (\mathbf{V}) key to select data number where to start calculation

(START), and press (SET) key. The cursor will move to "END" No.

Use $(\mathbf{V})(\mathbf{A})$ key to select data number where to end the calculation (END), and press (SET) key.

Press (TART) key to display the calculation result of the data range selected. * You cannot select more than one range.

<In CALCULATION mode >

Press \bigcirc key to display calculation result in the sequence of CO2 -> CO -> Temperature -> Humidity -> DT, WB, AH -> HR. Only average value is displayed for DT, WB, AH, and HR.

< In %OA mode >

Press \bigcirc key to display the average value of each point in the sequence of %OA -> R_A -> S_A -> O_A.

Press (SET) key to return to the screen for data output page setting screen. Press (MENU) key to return to the MENU screen.

6.3 Printing out Measurement Data

To print out stored measurement data, a printer cable must be connected to the RS232C terminal located at the side of the instrument.

Note1: Although you can see both RS232c mark (**bob**) and USB mark (**bbb**) near the terminal, only RS232c is available for this instrument.

6.3.1 Preparation for Print Out

<Need to prepare>

- Printer (optional)...recommended model: DPU-H245 (Seiko Instruments)

- Printer Cable (optional)

<Baud rate setting>

The baud rate setting of the instrument and printer must be consistent.

List of communication protocol for IAQ Monitor:

| Data Bit Length | 8 bit |
|-----------------|-------------------------|
| Parity | None |
| Stop Bit | 1 |
| Delimiter | CRLF |
| Baud Rate | Based on the set value* |

* As for setting BAUD RATE, refer to "7.2 Changing Measurement Unit and Baud Rate" (Page 30).

* As for setting the printer, refer to the printer's operation manual.

<Connecting the instrument with a printer >

- 1. Connect a printer to the instrument by inserting a connecting cable into RS232 terminal located at the side of the instrument.
- 2. <u>Turn ON the power of the instrument first</u>, and then turn ON the printer.
- 3. Make sure that the instrument is in NORMAL Mode.

6.3.2 Printing from the NORMAL (Measurement) Mode

| Display | | | Procedure | |
|---|---|--|--|--|
| ^{204/05/12 15:40:23} ^{CO2} 523 F ^{CO} 1.7 F 24.4 | PM When PM the re °C | n a NORMAL eadings that yo | L mode screen is displayed, press (HOLD) key to HOLD bu want to print out. | |
| Image: Press Mode Press Mode Press Mode Press Mode Press Mode Image: Press Press Mode Image: Press Pr | | | | |
| Examples of Data Printout | 2004/05/12 13 CO2 523 CO 1.7 Temperature Humidity | 5:40:45 PPM PPM 24.4 °C 52.7 %RH | CO ₂ CO Temperature Humidity | |



<Side of the Instrument>

| 6.3.3 Printing from CALCULATION mode | | | | | | | |
|--------------------------------------|-------------------|-------------------|-------------------|---|--|--|--|
| |] | Display | | Procedure | | | |
| | CALCUL | ATION | | | | | |
| MAX AVG MIN | C02 C02 C02 | 598 557 523 | PPM PPM PPM | After the calculation measurement is completed and the calculation result is shown, press $(MODE)$ key to print out the measurement result. | | | |
| 6.3.4 | Printing f | rom %OA (P | ercent | Outdoor Air) mode | | | |

| Display | | | | | | |
|---------|------|-------|--|--|--|--|
| | %OA | -1223 | | | | |
| TMP. | 63.1 | %0A | | | | |

D! 1

After %OA measurement is completed and the calculation result is shown, press $\overbrace{\text{MODE}}^{\text{MODE}}$ key to print out the measurement result.

Procedure

Examples of Printout

| | <calc< th=""><th>CULATIC</th><th>N mode></th><th></th><th></th><th><%OA mod</th><th>le></th><th></th></calc<> | CULATIC | N mode> | | | <%OA mod | le> | |
|-----------------------|---|--|--|--|--|--|--|-----------------------|
| Measurement Condition | PAGE SET PAGE :00 MODE :CA DATE :20 TIME :17 ATM. :10 DATA :00 |)4 LCULATI)04/06/1 ':24:33 | ON (I) | Stored Page Measurement Mode Measurement Date Measurement Time Atmospheric Pressure Setting No. of Data | PAGE PAGE MODE DATE TIME ATM. DATA | <pre><%OA mod SET : 002 : %OA (TMP.) : 2004/06/19 : 13:35:23 : 1013hPa : 003 MOD TIME: 001</pre> | .e> | Measurement Condition |
| | | | ן היייייייייייייייייייייייייייייייייייי | Calculation Data Range | START | :001 FND:003 | | К |
| Calculation Result | START:001 MAX 61 AVG 59 MIN 56 MAX AVG AVG 25 MIN 64 DT 15 WB 18 | END: 0 2 PPM 8 PPM 1. 2 PPM 0. 9 PPM 0. 9 PPM 0. 7 PPM 5. 6 ° C 5. 5 ° C | C02 C02 C02 C02 C0 C0 C0 C0 C0 | Co CO Return Air CO Supply Air Temperature Outdoor Air % Outdoor Air Humidity Dew-point Temperature Wet-bulb Temperature | MAX AVG MIN MAX AVG MIN MAX AVG MIN %OA | 25.5 ° C 25.4 ° C 25.4 ° C 24.3 ° C 24.2 ° C 24.1 ° C 23.2 ° C 23.0 ° C 22.8 ° C 85.4 %0A | R_A R_A S_A S_A S_A 0_A 0_A 0_A | Calculation Result |
| | AH 7 HR 6 | '.5 g/m 6.4 g/k | 3 g | Absolute Humidity | | | | |

21



Example of Printout

| <calculation mode=""></calculation> | | <%OA Mode> |
|-------------------------------------|--------------------|--|
| PAGE SET | \mathbf{D} | PAGE SET |
| PAGE :011 | Magazit | PAGE :002 |
| MODE : CALCULATION(I) | Condition | MODE : %OA (TMP.) |
| DATE :2004/06/21 | (These items are | DATE :2004/06/19 |
| TIME :16:23:08 | printed out | TIME :13:35:23 |
| ATM. :1013hPa | all the time.) | ATM. :1013hPa |
| DATA :005 | | DATA :010 |
| SAMPLING TIME :001 | | SAMPLING TIME:001 |
| START:001 END:005 | γ | START:001 END:010 |
| MAX 612 PPM CO2 | | MAX 25.5°C R_A |
| AVG 598 PPM CO2 | | AVG 25.4 °C R_A |
| MIN 567 PPM CO2 | | MIN 25.4 °C R_A |
| MAX 1.2 PPM CO | | MAX 24.3 °C S_A |
| AVG 0.9 PPM CO | Calculation Result | AVG 24.2 °C S_A |
| MIN 0.7 PPM CO | (RESULT) | MIN 24.1 °C S_A |
| MAX 25.6 C | | MAX 23.2 °C 0_A |
| AVG 25.6 C | | AVG 23.0 °C 0_A |
| MIN 25.5 C | | MIN 22.8 C 0_A |
| MAX 64.6 %KH | | |
| | | NUM. CR_A CS_A CU_A |
| MIN 04.4 %RT | | |
| DI 15.4 C | | 002 25.5 24.2 23.1 |
| MD 18.1 C | | 003 25.5 24.2 25.1 004 25.4 24.2 23.1 |
| HR $6 \Lambda \sigma/k\sigma$ | | 005 25 4 24 2 23 1 |
| | | 006 254 242 23.0 |
| | Measurement | 007 25 4 24 2 23 0 |
| 002 601 1.0 25 6 | Data Data | 008 25.5 24 2 22.9 |
| 003 598 1.0 25.5 | | 009 25.4 24.1 22.9 |
| 004 577 0.7 25.6 | | 010 25.4 24.1 22.8 |
| 005 567 0.7 25.5 | | |
| | - | |

6.4 Digital Output

6.4.1 Preparation for Digital Output

For digital-outputting stored measurement data, RS232C cable must be

connected to the RS232C terminal located at the side of the instrument.

Note1: Although you can see both RS232c mark () and USB mark (

near the terminal, only RS232c is available for this instrument.

<Need to prepare>

- Computer
- RS-232C cable (provided)

- Communication Software (Measurement Software (CD-ROM) for Windows is provided)

< Baud rate setting >

The baud rate setting of the instrument and computer must be consistent.

List of communication protocol for IAQ Monitor:

| Data Bit Length | 8 bit |
|-----------------|--------------------------------|
| Parity | None |
| Stop Bit | 1 |
| Delimiter | CRLF |
| Baud Rate | Based on the set value* |

* As for setting BAUD RATE, refer to "7.2 Changing Measurement Unit and Baud Rate" (Page 30).

* As for setting the computer, refer to the computer's operation manual.

<Connecting the instrument with a computer>

- 1. Connect a computer to the instrument with the RS232 cable.
- 2. Turn ON the power of the instrument.
- 3. Make sure that the instrument is in NORMAL Mode.

| PC (D-Sub9 pin) | | | IAQ Monitor (MODEL2212) | | | | |
|-----------------|---------|------------|-------------------------|--------|-----------------------|------------------|--|
| Signal | Pin No. | Connection | Pin No. | Signal | Description of Signal | Signal Direction | |
| NC | 1 0 | • | 1 | GND | Signal Ground | | |
| RXD | 2 | • • | 2 | TXD | Transmit Data | Output | |
| TXD | 3 | <u>∳</u> | 3 | RXD | Receive Data | Input | |
| NC | 4 | | 4 | CTS | Clear to Send | Input | |
| GND | 5 | | 5 | RTS | Request to Send | Output | |
| NC | 6 | | 6 | NC | | | |
| RTS | 7 | | | | | | |
| CTS | 8 | | | | | | |
| NC | 9 | | | | | | |

RS232C Cable Wiring Diagram

RS232C

Terminal (Note 1)

<Side of the Instrument>

6.5 Entering Commands from PC to Output Data

| As for connecting your PC to the instrument, | Command | Function |
|--|-------------|--|
| refer to "6.4.1 Preparation for Digital Output" (Page 24). | D * * * * # | To set how many data to read |
| | NJ | Receive Interrupt |
| | SI | To output measurement condition |
| Icon and its meaning | UJ | To output measurement unit |
| u: Space | F₽ | To set to output humidity related data |
| The Line Prock of the Proce [Enter] key | G₽ | To cancel outputting humidity related data |
| E. Elle Bleak of to Fless [Eller] key | Pe | To output stored number of the page |
| *: To enter any number | T * * * * ₽ | To output stored data |
| | M * * * * Z | To output measurement condition |
| * Enter all commands in capitals. | B₽ | To output measurement condition of all the |
| | | pages |

6.5.1 Transmission of Raw Data (data measured every 1 sec)

| Display | Procedure |
|--|---|
| Example: When entering "D0005" in Measurement Mode. AD UUUU0. 9; UUUU576; UUU23. 4; UUU63. 4 UUUU0. 8; UUUU556; UUU23. 4; UUU63. 3 UUUU0. 8; UUUU556; UUU23. 5; UUU63. 2 UUUU0. 9; UUUU540; UUU23. 5; UUU63. 2 UUUU0. 9; UUUU561; UUU23. 4; UUU63. 3 | <to be="" data="" number="" of="" read="" set="" to=""> Enter "D**** ?". (Enter the number of data to be read in 4 digit number.) After the command is received, "AD" will be returned. Then the raw data which is displayed on the instrument's screen every one second will be output. The maximum number of data which can be set is 9999. When to read more than 9999 data, send another command. <u>What will be output?</u> CO; CO2; Temperature; Humidity</to> |
| ANa | <receive interrupt=""> Enter "NI". After the command is received, "AN" will be returned and the reception will be interrupted</receive> |
| Display | Procedure |
| ASE CTH;00;00;1013E | <to condition="" measurement="" output=""> Enter "SI". After the command is received, "AS" will be returned. The display range of measurement items shown on the screen and configured atmospheric pressure will be output. <u>What will be output?</u> CTH: CO measurement range; temperature measurement range; configured atmosphere pressure CO measurement range: 00:0~50PPM / 01:0~500PPM Temperature measurement range: 00:0~60 °C / 01:-20~60 °C</to> |
| Display | Procedure |
| AU ₽ ppm;ppm; [°] C;%RH; [°] C; [°] C;g∕m3;g∕kg;% ₽ | <pre><to measurement="" output="" unit=""> Enter "UI". After the command is received, "AU" will be returned. Configured measurement unit at the time will be output. What will be output? CO Unit; CO₂ Unit; Temperature Unit; Humidity Unit; Dew-point Temperature Unit; Wet-bulb Temperature Unit; Absolute Humidity Unit; Humidity Ratio Unit; Percent Outdoor Air Unit</to></pre> |

6.5.2 Transmission of Stored Data (data stored in memory)

| Display | | | Procedure | |
|--|--|--|---|--|
| | | <to humidity="" related<="" set="" td=""><td>data output></td></to> | data output> | |
| | | Enter "Fe". After the con | nmand is received, "AF" will be returned | |
| | | and humidity related data such as DT, WB, AH, and HR will be | | |
| | | added in the subsequent dat | ta output. | |
| Display | | | Procedure | |
| | | <to humidity="" rela<="" release="" th=""><th>ted data output ></th></to> | ted data output > | |
| AG | | Enter "GI". After the cor | nmand is received, "AG" will be returned | |
| | | and humidity related data | such as DT, WB, AH and HR will not be | |
| | | added in the subsequent da | ta output. | |
| Display | | | Procedure | |
| | | <pre><to n<="" output="" page="" pre="" stored=""></to></pre> | umber > | |
| P0011 | | Enter "Pe". After the con | nmand is received, "AP" will be returned | |
| | | and the stored page number | r will be output. | |
| Display | | | Procedure | |
| ATe | | <10 output stored data > | · · · · · · · · · · · · · · · · · · · | |
| 2004/05/19;13:32:26 | | Enter "I * * * * !". (En | number). After the command is received | |
| 001 | 63 4교 | "AT" will be returned | number.) After the command is received, | |
| | 62 2m | The raw data stored in the s | specified page will be output. | |
| | ⊔03. 3 ₽ | *Any calculation data such | as min, average and max value, will not | |
| 003;0.8;534;23.5; | ⊔63. 2₽ | be output. (As for %OA, | only the average value in a page will be | |
| 004;0.9;540;23.5; | -63. 2₽ | output. | | |
| 005;0.9;561;23.4; | ∟63. 3₽ | *The measurement unit in the output data depends on the current | | |
| |) | measurement unit setting. | | |
| What will be output? | | | | |
| - CALCULATION Mode (Before sending [F] c | | command) | * YY/MM/DD format is configured | |
| -CAI CIII ATION Mode (After sendi | ing [F] co | mmand) | as the date format in the output. | |
| Data No · CO· CO· Temperature: I | Jumidity: | DT: WB: AH: HR instrument will not be reflected in | | |
| - Percent Outdoor Air (%OA) Mode | runnancy, | | the output | |
| Data No.: %OA: R A: S A: O A | | | the output. | |
| Display | | Pr | ocedure | |
| | <to out<="" th=""><th>put measurement condition</th><th></th></to> | put measurement condition | | |
| AMIE | Enter "N | √ * * * ₩ ² ". (Enter the pa | age number of the measurement condition | |
| CTH; 000; 001; 003; AVG; 1013 | to be ou | tput in 4 digit number.) After | er the command is received, "AM" will be | |
| 1 2 3 4 5 | returned | and the measurement condit | ion of the specified page will be output. | |
| What will be output? | 3. Nun | nber of Data | | |
| 1. Measurement Mode | 4. Calc | culation Mode | | |
| 000: CALCULATION Mode | CA | ALCULATION Mode AVG: average/ INS: Instant | | |
| 001: %OA Mode | %C | OA Mode TMP: Temperature/ CO2: CO ₂ | | |
| 2. Sampling Time 5. Con | | onfigured Atmosphere Pressure | | |
| Display | | Procedure | | |
| | <to out<="" th=""><th>put measurement condition</th><th>of all pages></th></to> | put measurement condition | of all pages> | |
| | Enter "I | BI ". After the command is | received, "AB" will be returned and the | |
| | measure | ement condition of all pages will be output. (Output items are the same | | |
| (CTH; 001; 001; 005; TMP; 1013 | as when | to output measurement condition.) | | |
| Display | | Pr | ocedure | |
| FD | <error]<="" th=""><th>Message></th><th></th></error> | Message> | | |
| | If the page | ge number is entered incorrec | ctly, "ED " will be returned. | |

6.6 Analog Output (Optional)

- 1. Data Update Interval 1 second
- 2. Load Impedance...... $5K\Omega$ and above
- 3. Output Voltage.....DC 0-1V

As For the analog output, you can select one output range from the table below.

| | Output Range | Conversion Formula |
|---------------------|--------------|--|
| | Output Range | (Voltage: V) |
| CO (C) | 0 ~ 50 ppm | $C = 50 \times V ppm$ |
| | 0 ~ 100 ppm | C = 100×V ppm |
| | 0 ~ 250 ppm | C = 250×V ppm |
| | 0 ~ 500 ppm | C = 500×V ppm |
| CO ₂ (M) | 0 ~ 500 ppm | M = 500×V ppm |
| | 0 ~ 1000 ppm | M = 1000×V ppm |
| | 0 ~ 2500 ppm | M = 2500×V ppm |
| | 0 ~ 5000 ppm | M = 5000×V ppm |
| Temperature (T) | 0 ~ 50 °C | $\mathbf{T} = 50 \times \mathbf{V}^{0} \mathbf{C}$ |
| | 0 ~ 100 °C | $T = 100 \times V^{\circ}C$ |
| | -20 ~ 30 °C | $T = 50 \times V - 20 \ ^{\circ}C$ |
| | -20 ~ 80 °C | $T = 100 \times V - 20$ °C |
| Temperature (F) | 32 ~ 122 °F | $\mathbf{F} = 90 \times \mathbf{V} + 32 ^{\mathrm{o}}\mathbf{F}$ |
| | 32 ~ 212 °F | $F = 180 \times V + 32$ °F |
| | -4 ~ 86 °F | $\mathbf{F} = 90 \times \mathbf{V} - 4^{\circ} \mathbf{F}$ |
| | -4 ~ 176 °F | $\mathbf{F} = 180 \times \mathbf{V} - 4^{\circ} \mathbf{F}$ |
| Humidity (H) | 0 ~ 50 %RH | $H = 50 \times V \% RH$ |
| | 0~100 %RH | H = 100×V %RH |



It is linear output whose minimum value is 0V and maximum value is 1V. Output data is output every 1 sec constantly.





7. Other Settings

7.1 Changing Date and Time



* The date format set here is used on the instrument's screen and on printout. However, for digital output (RS232C Communication), the Japanese style (YYYY/MM/DD) is always used.



7.3 Deleting Data

7.3.1 To Delete Certain Pages of Data

When data is deleted partially, data is deleted per page. One measurement taken in CALCULATION MODE or







7.4 Contrast Adjustment



There is a contrast adjuster inside the battery cover located at the rear side of the main body.

The contrast of the screen can be adjusted by using a flat-blade precision screwdriver ($0.9 \sim 1.5$ mm).

As described in the picture below, turn it clockwise to darken and vice versa.



Bright Dark

8. Calibrating CO/CO₂ Sensor

When calibrating the IAQ Monitor on site, follow the instruction below.

It is recommended to calibrate the IAQ Monitor's CO/CO2 measurement every 2-3 months to ensure accurate readings.

In addition, it is still recommended to send your IAQ monitor to KANOMAX for annual calibration.

* It is recommended to exchange the CO sensor annually and it is a consumable.

8.1 Preparation for Calibration

Fully warm up the instrument (for about 20 minutes) before performing a calibration.

Normally calibrate ZERO gas first then Span gas.

(It is also acceptable if you calibrate either ZERO gas or Span gas.)

1. Confirm if the valve of the regulator is closed





3. Connect the regulator to the calibration cap by using a tube. Connect them firmly in order to prevent the gas-leaking.



4. Put the calibration cap on the probe. Insert it firmly in order to prevent the gas-leaking.



8.2 Calibration Procedure – ZERO Calibration





Ready to start calibration:

Countdown initial value is displayed here.

When selecting CO only, the countdown initial value is 90 seconds. When selecting CO2 only, it is 120 seconds. When selecting BOTH, it is 120 seconds.





When selecting "CO" or "CO2", the procedure will be the same.



| CALIBRATION | |
|---|---|
| 1.CO/CO2 ZERO 002 2.CO SPAN 3.CO2 SPAN 4.ATMOS. PRESS SET 1013 hPa 5.SAVE INFO | ······Indicates the selected sensor type. |

8.3 Calibration Procedure – SPAN Calibration









When you select "CO2 SPAN, the procedure is the same.

····· Select CO SPAN calibration.

Result of SPAN Calibration:

CO calibration fails when...

- CO concentration does not reach 60% of the configured value of standard concentration in 30 seconds after calibration starts.
- the calibration value's deviation (Max value-Min value) does not fall within 6% or 6ppm (the greater value will be applied) of the configured value of standard concentration for 20 seconds before calibration completes.

9. Specifications

| Product | | IAQ Monitor | |
|----------------------|---------------------------|--|--|
| Model | | 2212 | |
| Me | easuring Object | Clean Air flow | |
| | Measuring Method | Electrochemical | |
| | Measuring Range | 0.1~500ppm | |
| | Resolution | 0.1~99.9ppm: 0.1ppm,100-500ppm: 1ppm | |
| СО | Accuracy | $\pm 3\%$ of the reading or ± 3 ppm; greater value is applied. (@20 C) | |
| | Temperature Dependence | ±0.125 %FS/ C (within -20~40 C: standard is 20 C) | |
| | Air Pressure Dependence | ± 0.02 %FS/hPa (within 700-1200hPa: the standard is 1013hPa) | |
| | Response Time | Approx. 60sec. (90% responsive when calibration cap is used.) | |
| | Measuring Method | Nondispersive Infrared (NDIR) | |
| | Measuring Range | 0~5000ppm | |
| CON | Resolution | | |
| 02 | Accuracy | $\pm 3\%$ of the reading or ± 50 ppm; greater value is applied. (@20 C) | |
| | A in Deservers Dependence | ± 0.34 %FS/ C (within -20~40 C: the standard is 20 C) | |
| | Air Pressure Dependence | ± 0.02 %FS/nPa (Within /00~1200nPa: the standard is 1013nPa) | |
| | Measuring Method | Approx. 45sec. (90% responsive when calibration cap is used.) | |
| | Measuring Method | | |
| _ | Measuring Range | -4~140 F (-20.0~60.0 C) | |
| Temperature | Resolution | 0.1 °C | |
| | Accuracy | ±0.5 °C | |
| | Response Time | Approx. 60sec.and below (air velocity: 1 m/s, 90% responsive) | |
| | Measuring Method | Electric Capacity | |
| | Measuring Range | 2.0~98.0 %RH | |
| Humidity | Resolution | 0.1 %RH | |
| | Accuracy | 2~80%RH: ±2.0%RH, 80~98%RH: ±3.0%RH | |
| | Response Time | Approx. 15sec. (90% responsive) | |
| | | Hold the reading, Hold the MAX reading, Remaining battery level indicator (5 | |
| | | levels), Time display function, Barometric pressure correction, Selection of | |
| Mea | asuring Function | measuring units (Temp/DT/WB: °C or °F, AH:g/m ³ or lb/ft ³ , Humidity Ratio: | |
| | C | g/kg or lb/lb), Max/Min/Average value measurement (measurement interval: | |
| | | 1-999sec., No of Measurement: 1-999 times, Max memory: 1500 data), | |
| | | Digital output: $RS_{232}C$ (Baud rate: 4800, 9600, 19200, 38400 hps) for | |
| | _ | outputting to a printer and/or PC | |
| | Output | Analog Output*: DC0~1V (Output 1CH among CO, CO2, Temperature, or | |
| | | Humidity) | |
| т | Douvon Gumpler | Manganese AA Batteries x 6 (Alkaline can be used as well) | |
| I | Power Supply | AC Adaptor [*] : AC100~240V (50/60Hz) | |
| | Rottory Life | Approx. 10hours | |
| Battery Life | | (When RS-232C is not being used at 20°C and not using Alkaline) | |
| | Main Unit | $5 \sim 40^{\circ} C$ (No condensation) | |
| Operating | Probe | -20~60 °C (No condensation) | |
| Environment | Storage Temperature | -20~60 °C (No condensation) | |
| | Weight | Main unit: Approx. 400g (including batteries) Probe: Approx. 250g | |
| C. | dand Assessed | Carrying case, Operation manual, Manganese AA batteries x 6, A set of | |
| Stan | dard Accessories | calibration cap and tube, Probe stand, Software for Windows, RS232C cable | |
| Onti | onal Accessories | Spare probe, analog output, printer, ZERO gas, SPAN gas for CO, SPAN gas | |
| Optional Accessories | | for CO2, flow control valve, AC adaptor | |

10. Calculation Result: DT, WB, AH and HR

10.1 What is DT?

DT -- Dew Point Temperature

Warmer air contains much water vapor. As the air gets cooled, it reaches saturation at a certain temperature (Relative Humidity: 100%). As the temperature continues to get lowered, water vapor starts condensing into water. The condensed water is called dew. This temperature is called Dew Point Temperature.

There are many formulas to calculate the Dew Point Temperature. In this manual calculation in conformity with JIS standard Z8806 is used.

```
\begin{split} &\ln \left( e_{w} \right) = -6096.9385 \times T^{-1} + 21.2409642 - 2.711193 \times (10^{-2}) \times T \\ &\quad + 1.673952 \times (10^{-5}) \times T^{2} + 2.433502 \times \ln(T) \\ &e = U/100 \times e_{w} \\ &y = \ln \left( e/611.213 \right) \\ &\text{ In case of } y \geqq 0; \\ &td = 13.715 \times y + 8.4262 \times (10^{-1}) \times y^{2} \\ &\quad + 1.9048 \times (10^{-2}) \times y^{3} \\ &\quad + 7.8158 \times (10^{-2}) \times y^{3} \\ &\quad + 7.8158 \times (10^{-3}) \times y^{4} \\ &\text{ In case of } y < 0; \\ &td = 13.7204 \times y + 7.36631 \times (10^{-1}) \times y^{2} \\ &\quad + 3.32136 \times (10^{-2}) \times y^{3} \\ &\quad + 7.78591 \times (10^{-3}) \times y^{4} \end{split}
```

e_w: Saturated Vapor Pressure (Pa) T: Absolute Temperature (K) = $t(^{\circ}C) + 273.15$ T: Dry-bulb Temperature ($^{\circ}C$) E: Water Vapor Pressure (Pa) U: Relative Humidity Td: Dew-point Temperature ($^{\circ}C$)

10.2 What is WB?

WB: Wet-bulb Temperature

Wet-bulb temperature is measured using a wet-bulb thermometer that has its bulb wrapped in cloth that is kept wet with water.

To calculate wet-bulb temperature without using a wet-bulb thermometer, existing dry-bulb temperature and relative temperature are normally used on the aspirated psychrometer humidity table that is JIS standard Z8806 compliant. In this manual, however, we use Newtonian approximation based on the assumption of a temperature measured on a wet-bulb thermometer being lower than a dry-bulb thermometer.

Ln $(e_{tw})=-6096.9385 \times T_w^{-1}+21.2409642-2.711193 \times (10^{-2}) \times T_w$ +1.673952×(10⁻⁵) × $T_w^{-2}+2.433502 \times \ln(T_w)$ A= e_{tw} f'(tw)=4030.183/((235+tw)^2)×A+P/2/755 tw1=tw-(A-P×(t-tw)/2/755-E×U/100)/f'(tw) tw: Wet-bulb temperature (°C) e_{tw} : Saturated Water Vapor Pressure at tw (Pa) T_w : Absolute Temperature (k)=(tw+273.15) P: Barometric Pressure (Pa) E: Saturated Water Vapor Pressure at t (Pa) U: Relative Humidity T: Dry-bulb Temperature (°C)

10.3 What is AH?

AH: Absolute Humidity

Absolute humidity is the quanity of water per 1kg of dry air. To calculate absolute humidity, apply temperature and relative humidity on below formula.

 $ln(e_w)=-6096.9385 \times T^{-1}+21.2409642-2.711193 \times (10^{-2}) \times T +1.673952 \times (10^{-5}) \times T^2+2.433502 \times ln(T)$ $e=U/100 \times eW$ $D(g/m3)=0.794 \times (10^{-2}) \times e/(1+0.00366 \times t)$ $e_w: Saturated Water Vapor Pressure (Pa)$ $T: Absolute Temperature (K) = t (^{\circ}C) + 273.15$ $t: Dry-bulb Temperature (^{\circ}C)$ e: Water Vapor Pressure (Pa) U: Relative Humidity D: Absolute Humidity (g/m3)

10.4 What is HR?

HR: Humidity Mixing Ratio

Humidity Ratio (or Mixing Ratio) is the mass ratio between water vapor and dry air. Temperature and relative humidity are used on below formula.

R=e×e/(p-e) ×1000

- ϵ : Molar Mass Ratio = 0.62198
- e: Water Vapor Pressure (Pa)
- p: Barometric Pressure (Pa)
- r: Humidity Ratio (g/kg)

11. Troubleshooting

11.1 Battery Check

| Symptom | Possible Cause(s) / Solution(s) | Refer To (Page No.) |
|--------------------------------|---|------------------------|
| Display does not appear when | The battery is exhausted. | 1.6 |
| power is turned ON. | \rightarrow Turn OFF the power and replace the batteries. | 4,0 |
| Nothing appears on the display | The contrast of the display is not adjusted properly. | |
| Even after new batteries are | \rightarrow Adjust the contrast with the contrast adjuster. | 33 |
| inserted. | | |
| Battery indicator " | The battery is exhausted. | 16 |
| blinking. | \rightarrow Turn OFF the power and replace the batteries. | 4, 0 |

<u>11.2 Initial Operation Check</u>

| Symptom | Possible Cause(s) / Solution(s) | Refer To (Page No.) |
|---|---|------------------------|
| Display is too dark/light | The contrast of the display is not adjusted properly. \rightarrow Adjust the contrast with the contrast adjuster. | 33 |
| "NO PROBE!" is displayed on the screen. | Probe is not connected. \rightarrow Turn off the power and connect a probe into the instrument. | 5 |
| Incorrect measurement unit | Set appropriate unit of temperature (°C, °F), absolute humidity $(g/m^3, lb/ft^3)$, and humidity ratio $(g/kg, lb/lb)$. | 30 |

<u>11.3 Check While Measuring</u>

| Symptom | Possible Cause(s) / Solution(s) | Refer To (Page No.) |
|---------------------------------|---|------------------------|
| Reading is displayed as "**.*". | Measurement range is exceeded. | |
| | \rightarrow The instrument must be used in the specified measurement | 41 |
| | range. | |
| Reading is displayed as "". | Probe may not be connected property. | 5 |
| Or it is kept showing as "0". | \rightarrow Check the connection. | 5 |
| | Probe wire disconnection or sensor damage. | |
| | \rightarrow Contact your local distributor for repair. | |
| CO and CO2 readings are not | Probe sensor may be too close to expiratory air. | _ |
| correct. | \rightarrow Keep a sensor away from expiratory air as much as possible. | 7 |
| Temperature reading is high. | Correct reading cannot be obtained when there is not airflow. | 8 |
| | \rightarrow Gently move probe | 0 |
| Humidity reading is lower than | Assman Psychrometer is an intricate instrument and there are | |
| Assman Psychrometer. | great differences between each psychrometer. Check the | 8 |
| | measurement method. | |

11.4 Printer Check

| Problem | Possible Cause(s) / Solution(s) | Refer To (Page No.) |
|------------------|--|------------------------|
| Printing Failure | Confirm that the printer cable is connected properly. | 20 |
| | Confirm that the Baud Rate is set properly. \rightarrow Check the instrument and printer settings. | 20 |

| | Printer may not be compatible (DPU-H245 and DPU-201GS are recommended). \rightarrow Check your printer type. | 20 |
|---------------------------------|---|----|
| | Printer may not be connected in the right order. → After connecting the printer, turn on the instrument first, and then turn on the printer. | 20 |
| Unable to printout the display. | Display is not frozen. → Press (HOLD) key to hold the display, and then press (MODE) key to print out. | 20 |
| Unable to cancel printing. | You cannot cancel printing. | 20 |

<u>11.5 Digital Output Check</u>

| Problem | Possible Cause(s) / Solution(s) | Refer To (Page No.) |
|-----------------------|--|------------------------|
| Data Transfer Failure | Confirm that the RS232C cable is connected properly. Make sure that it is not confused with the printer cable. | 24 |
| | Confirm that the Baud Rate is set properly. \rightarrow Check the instrument and printer settings. | 24 |
| | Communication command may not be correct. | 25 |

11.6 Analog Output Check

| Problem | Possible Cause(s) / Solution(s) | Refer To (Page No.) |
|-----------------------------------|--|------------------------|
| Output Failure | Confirm that the polarity of the output terminal is correct. | 27 |
| | The reading may be in HOLD mode. | 27 |
| Output appears in tiered pattern. | Output is set per second. | 27 |
| Incorrect Output Value | Analog output setting may be incorrect. | 27 |
| | Output value range setting may be incorrect. | 27 |
| | Load impedance may be set lower than the specified value. \rightarrow Load impedance must be set to 5K Ω and over. | 27 |

11.7 Calibration Check

| Problem | Possible Cause(s) / Solution(s) | Refer To (Page No.) |
|---|---|------------------------|
| [-ERR] appears during the CO SPAN calibration. | Output level of CO sensor may be exceeded the normal range or the sensor is damaged. Contact your local distributor for repair. * The sensor life is 1-1.5 year. (Although SPAN calibration is not available when output level is low, it is possible to take a measurement using existing calibration value.) | 38 |
| [-ERR] appears during the CO ₂ SPAN calibration. | Output level of CO_2 sensor may be exceeded the normal range or the sensor is damaged. Contact your local distributor for repair. (Although SPAN calibration is not available when output level is low, it is possible to take a measurement using existing calibration value.) | 38 |

12. Warranty and After-sales Service

Kanomax Limited Warranty

The limited warranty set below is given by KANOMAX with respect to the KANOMAX brand IAQ Monitor, its attachment parts including Probe and other accessories (hereafter referred to as "PRODUCT") that you have purchased. PRODUCT you have purchased shall be the only one that the limited warranty stated herein applies to.

Your PRODUCT, when delivered to you in new condition in its original container, is warranted against defects in materials or workmanship as follows: for a period of one (1) year from the date of original purchase, defective parts or a defective PRODUCT returned to your sales representative, as applicable, and proven to be defective upon inspection, will be exchanged for a new or comparable rebuilt parts, or a refurbished PRODUCT as determined by your sales representative. Warranty for such replacements shall not extend the original warranty period of the defective PRODUCT.

This limited warranty covers all defects encountered in normal use of the PRODUCT, and does not apply to the following cases:

- (1) Use of parts or supplies other than the PRODUCT sold by your sales representative, which cause damage to the PRODUCT or cause abnormally frequent service calls or service problems.
- (2) If any PRODUCT has its serial number or date altered or removed.
- (3) Loss of damage to the PRODUCT due to abuse, mishandling, improper packaging by the owner, alteration, accident, electrical current fluctuations, failure to follow operating, maintenance or environmental instructions prescribed in the PRODUCT's instruction manual provided by KANOMAX, or service performed by other than KANOMAX.

NO IMPLIED WARRANTY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, APPLIES TO THE PRODUCT AFTER THE APPLICABLE PERIOD OF THE EXPRESS LIMITED WARRANTY STATED ABOVE, AND NO OTHER EXPRESS WARRANTY OR GUARANTY, EXCEPT AS MENTIONED ABOVE, GIVEN BY ANY PERSON OR ENTITY WITH RESPECT TO THE PRODUCT SHALL BIND KANOMAX. KANOMAX SHALL NOT BE LIABLE FOR LOSS OF STORAGE CHARGES, LOSS OR CORRUPTION OF DATA, OR ANY OTHER SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES CAUSED BY THE USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT, REGARDLESS OF THE LEGAL THEORY ON WHICH THE CLAIM IS BASED, AND EVEN IF KANOMAX HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL RECOVERY OF ANY KIND AGAINST KANOMAX BE GREATER IN AMOUNT THAN THE PURCHASE PRICE OF THE PRODUCT SOLD BY KANOMAX AND CAUSING THE ALLEGED DAMAGE. WITHOUT LIMITING THE FOREGOING, THE OWNER ASSUMES ALL RISK AND LIABILITY FOR LOSS, DAMAGE OF, OR INJURY TO THE OWNER AND THE OWNER'S PROPERTY AND TO OTHERS AND THEIR PROPERTY ARISING OUT OF USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT NOT CAUSED DIRECTLY BY THE NEGLIGENCE OF KANOMAX. THIS LIMITED WARRANTY SHALL NOT EXTEND TO ANYONE OTHER THAN THE ORIGINAL PURCHASER OF THE PRODUCT, OR THE PERSON FOR WHOM IT WAS PURCHASED AS A GIFT, AND STATES THE PURCHASER'S EXCLUSIVE REMEDY.

After Service

Whenever the PRODUCT is malfunctioning, please check with "Troubleshooting" to find possible cause first.

Repair parts are retained for a minimum period of five (5) years after production cessation of the PRODUCT. This storage period of repair parts is considered as the period during which KANOMAX can provide repair service.

For more information, please contact your sales representative. When you make a call, please have the following information of your PRODUCT at hand:

- (1) PRODUCT name;
- (2) Model number;
- (3) Serial number;
- (4) Probe number;
- (5) Description of Symptom, and;
- (6) Date of purchase

13. Contact Information



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