

INSTRUCTION MANUAL FOR RIKEN PORTABLE CO/O₂ COMBINATION MODEL CX-

Safety precautions

Read this manual before operating the CX- .

- Follow all the instructions in this manual.
- We do not assume indemnification for any accident or damage caused by the operation of this gas monitor, and our warranty is limited to the replacement of parts or our complete goods.
- If the CX- finds defective, contact authorized distributors, dealers, and representative appointed by Riken Keiki Co., Ltd.



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INTRODUCTION

Using an advanced microprocessor controlled detection system, the CX- Portable CO/O2 Combination Gas Monitor detects the presence of Carbon monoxide (CO) and Oxygen contents to prevent the accident caused by gas toxicity and oxygen deficiency.

This manual is just a guide book to operate the CX- . Your kind reading of this manual is requested not only for first user but for already experienced staff.

Identification of each caution mark

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury or serious damage to the product.

This signal word is to be limited to the most extreme situation.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury on the human body or object.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or some damage on the human body or objects. It may also be used to alert against unsafe practices.

* NOTE

This means “ADVICE” at operation.

Cautions for the safety

**DANGER**

This is not an explosion proof monitor. Do not use this monitor in hazardous area.

**WARNING**

- Perform gas calibration in proper interval.
- Do not use unspecified batteries.
- Check battery capacity before operation.
- Worn the CX- to be exposed to ambient air. If not, correct detection cannot be performed.
- Do not disassemble the sensor since there is an electrolyte inside.
When touch the electrolyte, wash the wet part enough with water.
- Do not remodel or alter circuit, structures etc.
- Follow all the instructions in this manual, any deviation will compromise the quality and performance of this monitor.

**CAUTION**

- Do not push sensor and buzzer window with pointed article.
It may cause defective or damage and correct detection cannot be performed.
- Do not pour water into the CX- . It causes to defective.
- Do not give high impact or shock, since this is precision instrument.

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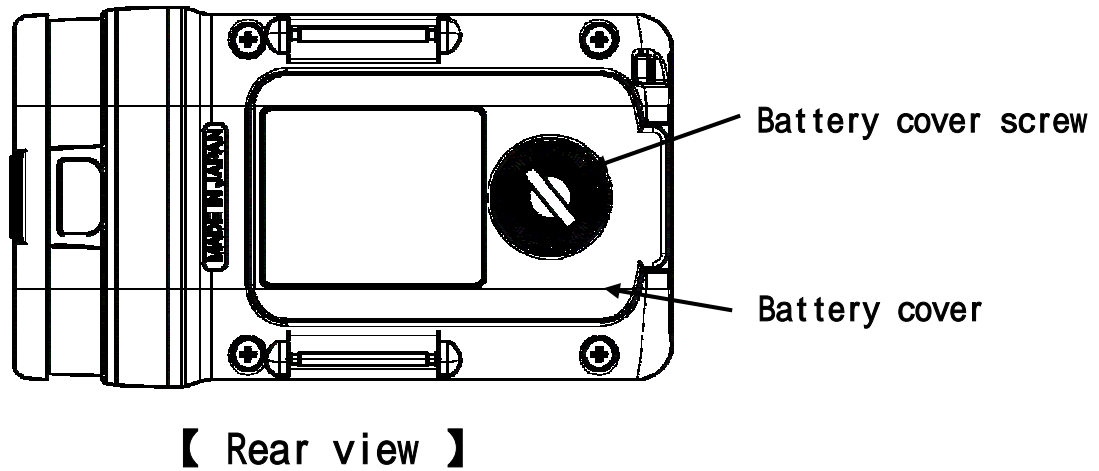
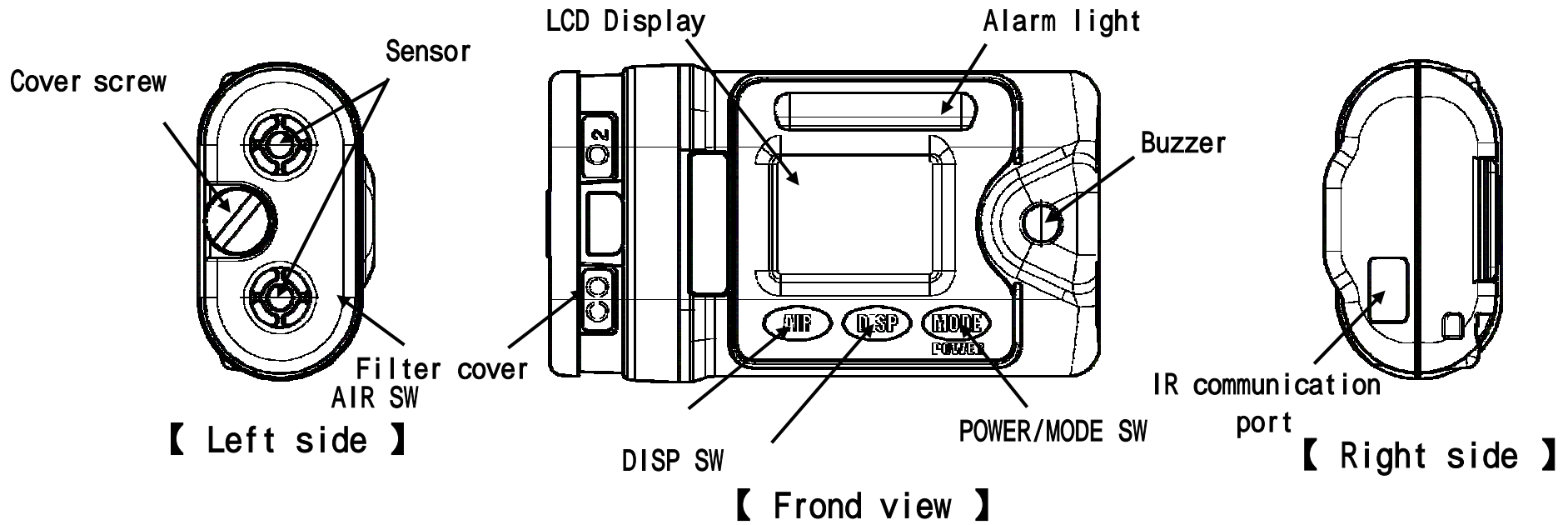
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1. Name of each part



2. Preparation before operation

2-1 Mounting batteries

Loosen the battery cover screw on the rear of instrument by coin etc.

Raise the hook and remove the battery cover.

Mount the new battery (alkaline "AA" size).

Put in the battery cover and screw up the screws.

⚠ WARNING

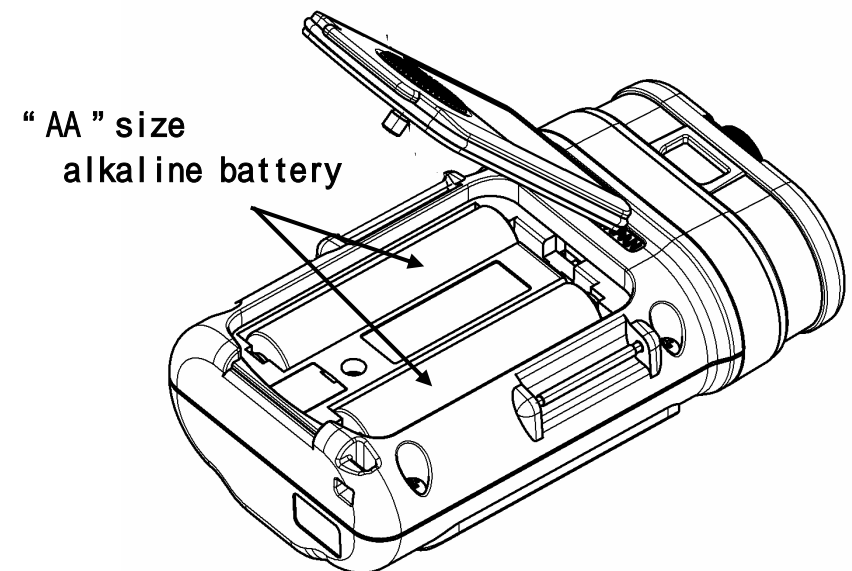
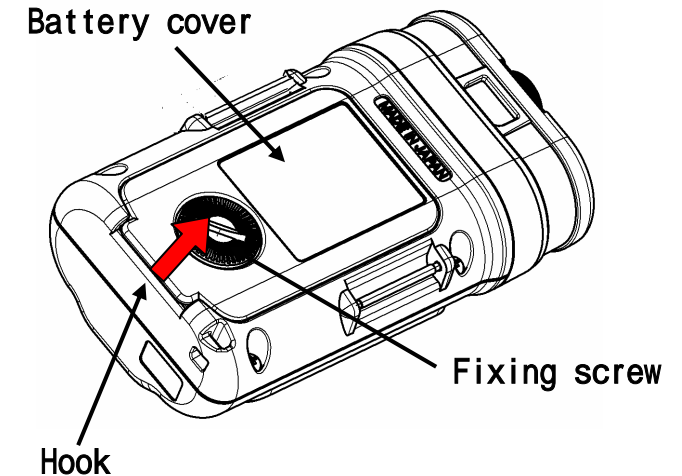
Do not remove the battery with power on condition. This will be a cause for trouble. The battery replacement shall be made with power off condition.

⚠ CAUTION


- Take care not to make mistake for battery polarity (+ and -).
- Put in the battery cover from the sensor side and plug in by checking that the packing cannot come out.
- Be sure to screw up to mounting screws.

***NOTE**

For battery replacement, be sure to make it with power off condition.



2-2 Power ON/OFF


When continue to press  for about 5 sec, the power will be on.

* NOTE

- When make power, press & hold switch until the buzzer sounds "Pi".

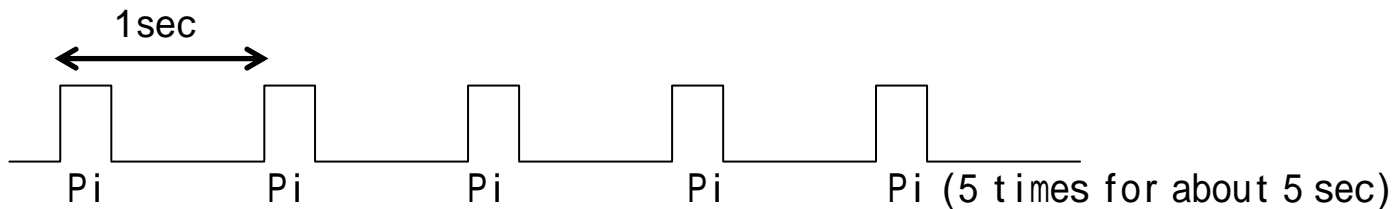
DANGER

- After make power on, be sure to make air cal (see 3-2)

If in any mode, press and hold  for over 6 sec, then, the power can be off.

* NOTE

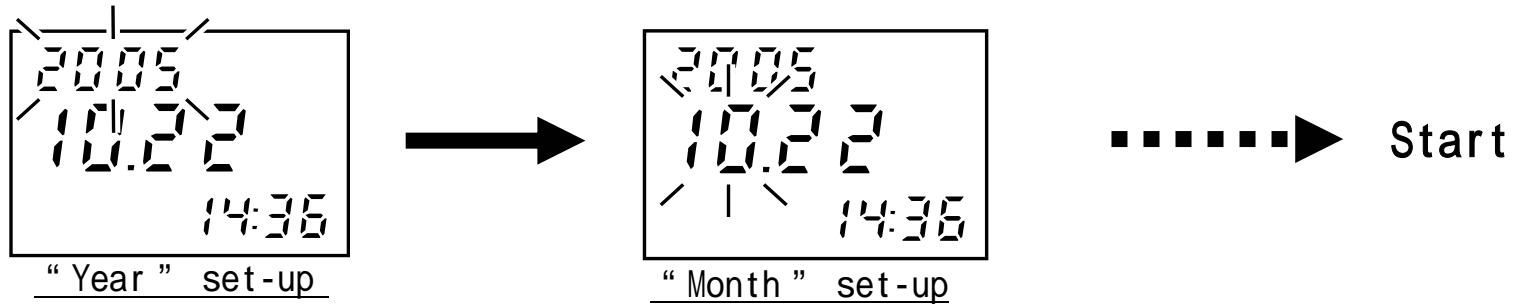
Press & hold until the display can be off.



2-3 Setting up the year & date

This instrument is provided with clock function. When the clock time is deviated from the current time, set up the time.

By pressing **DISP** SW, press **MODE** and turn on the power. This works on clock set mode. Set up year, month, day, hour, and minute in turn of blinking.



Switch operation at the date set mode.

Press **AIR** SW once and one digit gets down.

When press **DISP** once, one digit will be up.

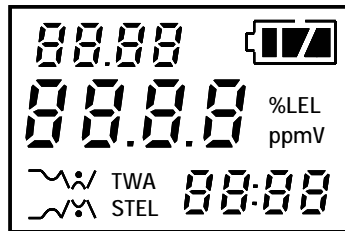
When press **MODE** once, the following item shall blink.

When enter the number of minute by **MODE** SW, the unit starts measurement mode.

3. Operation

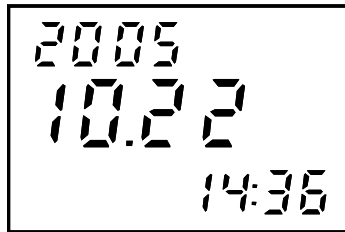
3-1 Measurement mode

Power ON



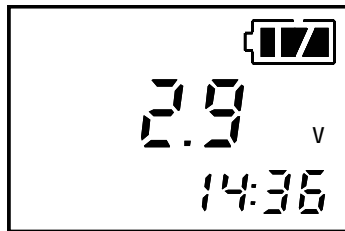
Pi-, bru
 All LCDs on all
 Alarm light on
 (About 4 sec)
 Back light on

Date display



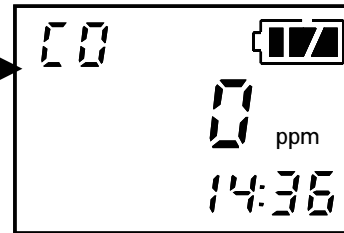
Alarm light off
 Date displayed
 (About 5 sec)

Battery voltage display



Battery voltage
 display
 (About 10 sec)

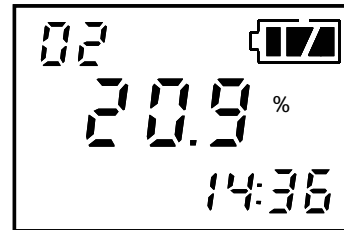
CO display



Pi
 CO concentration is displayed
 Backlight off
 (About 20 sec later)

When no switch operation is provided,
 CO and O2 operation shall be changed
 over automatically
 (Display time: CO/about 30 sec,
 O2/about 20 sec)

O2 display



O2 density is displayed

*** NOTE**

Oxygen concentration may vary by fluctuations of atmospheric pressure and temp/humidity change. The performance of O2 display function shall conform to JIS T8201

3-2 AIR cal operation

When the power gets on, it shall be to measurement mode. In the display, the current CO and O2 concentrations shall be displayed.

Oxygen is displayed at 20.9% normally. Before operation, be sure to make Air cal at fresh air.

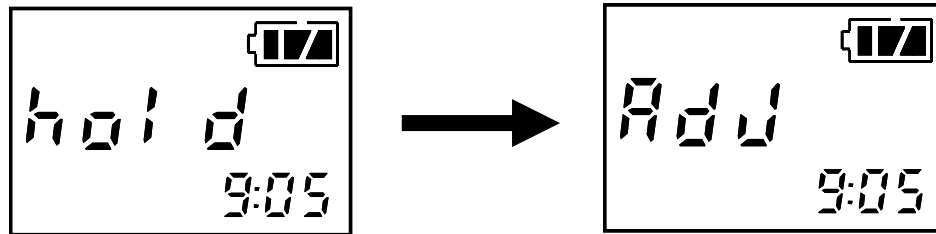
Press and hold **AIR** for about 3 sec in the measurement mode.

Buzzer shall sound “Pi” “Pi” “Pi”

After checking “Adj” in display, release the switch.

After 2 sec later, it shall automatically calibrate.

Check that CO and O2 readings are 0ppm and 20.9% respectively.



*NOTE

- AIR cal is performed for 2 gases simultaneously in spite of display.
- AIR cal can be performed even in gas alarming.
- AIR cal is not performed for the gas which shows sensor failure at the time of power ON.

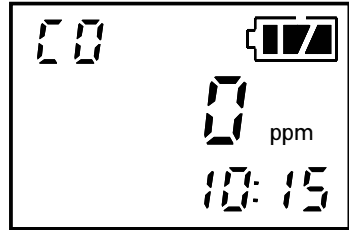
⚠ DANGER

- Perform AIR cal in a fresh air environment with similar operating conditions (pressure, temperature and humidity). If AIR cal would be performed at the detection place, you cannot detect gases correctly and it is in danger of accident.

3-3 Changing the display in measurement mode

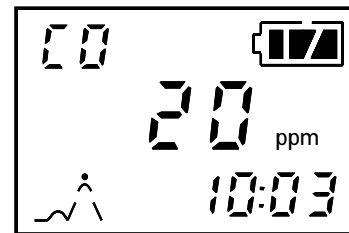
(1) Carbon monoxide (CO)

Display of CO concentration



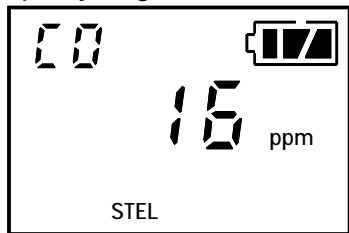
MODE
POWER

Displaying the peak
(upper limit)



MODE
POWER

Displaying STEL



MODE
POWER

DISP

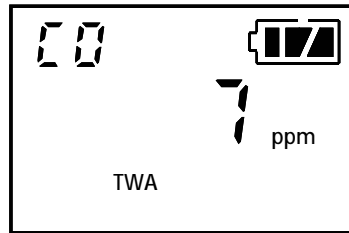
To display of O2
concentration
(Fixed about 10
sec)

DISP

To display of O2
peak
(lower limit)

- Display of CO concentration
Displays current CO gas concentration.
- Display of peak (upper limit) reading.
It displays the highest reading since the last time the CX- was turned on.
- Display of STEL
Displays current STEL reading
(Calculated once per approx 60 sec)


Displaying TWA



To display of CO
concentration

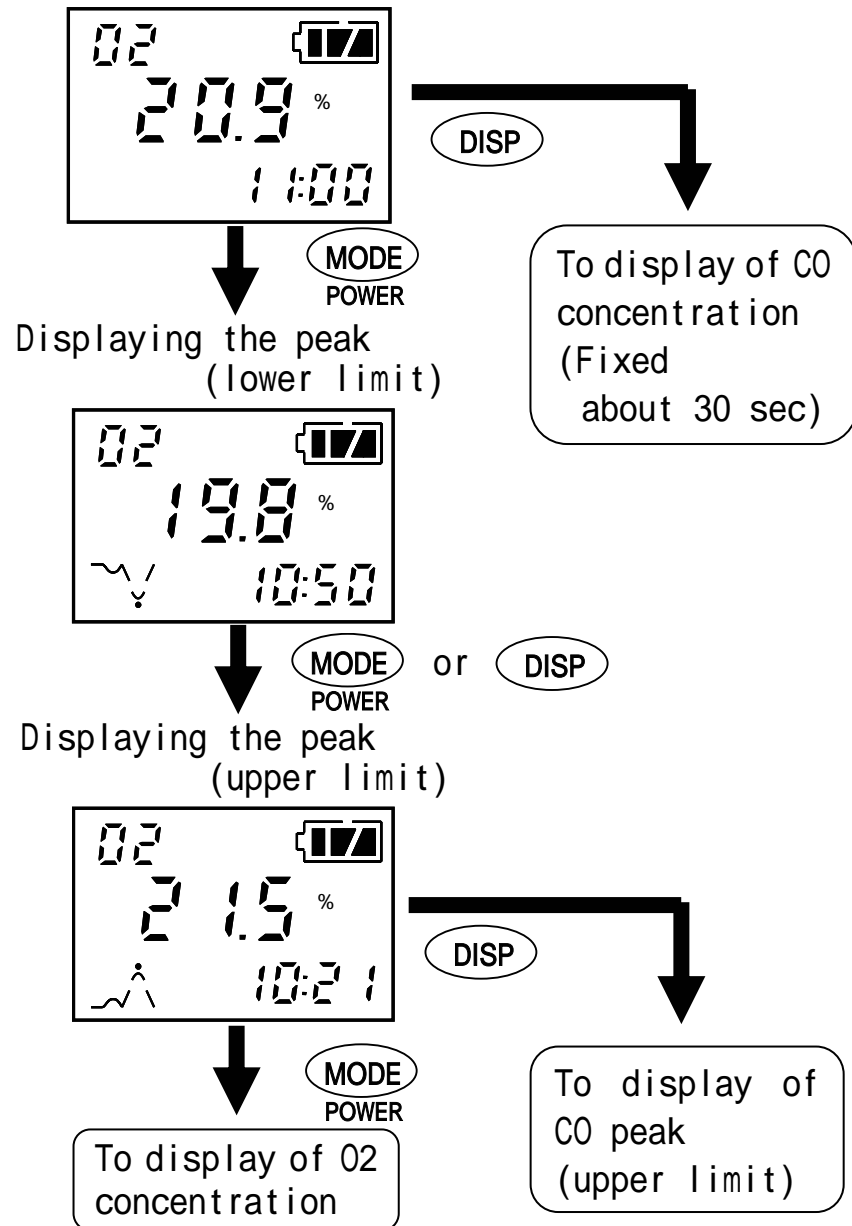
- Display of TWA
Current TWA reading is displayed
(Calculated once per approx 60 sec)

* NOTE

- If you do not press a button for about 20 seconds while displaying the peak, STEL or TWA readings, the unit will return to measurement mode automatically.
- The backlight will turn off automatically for 20 seconds (except alarming).
- The backlight will turn on in any condition by pressing the key.
- Press and hold the  button for about 6 seconds, and you can turn off the unit in any of the above condition.

 **WARNING**

- Avoid to use or store in the place of high temperature, high humidity or high pressure.
- Do not use the unit continuously over one hour if high concentration (above 200ppm) carbon monoxide exists in the atmosphere.

(2) Oxygen (O₂)Display of O₂ concentration

- Display of O₂ concentration
Displays current O₂ concentration.
- Display of peak (lower limit) reading
It displays the lowest reading and the time of lowest reading since the last time the CX- was turned on.
- Display of peak (upper limit) reading
It displays the highest reading and the time of highest reading since the last time the CX- was turned on.

*** NOTE**

- If you do not press button for about 20 seconds while displaying the peak reading, the unit will return to the display of O₂ concentration automatically.
- The backlight will turn off automatically for 20 seconds (except alarming).
- The backlight will turn on in any condition by pressing the key.
- Press and hold the **MODE POWER** button for about 6 seconds, and you can turn off the unit in any of the above condition.

3-4 Recording and display the measurement data

This unit provides the data logging function to record measurement data as following categories. Each record can be read out by using the optional “Data Logger Management Program”

- Interval trend
- Gas alarm trend
- Gas alarm event
- Trouble alarm event
- Calibration record

*** NOTE**

For details of data logging, refer to the instruction manual for “Data Logger Management Program”

3-5 Wearing the unit

The unit is supplied with a standard arm band. You can use the arm band to wear the unit on your upper arm.

Adjust the length of arm band with adjuster to fit the arm.

Tear off the Velcro section and loosen the whole of band, then wear on the arm.

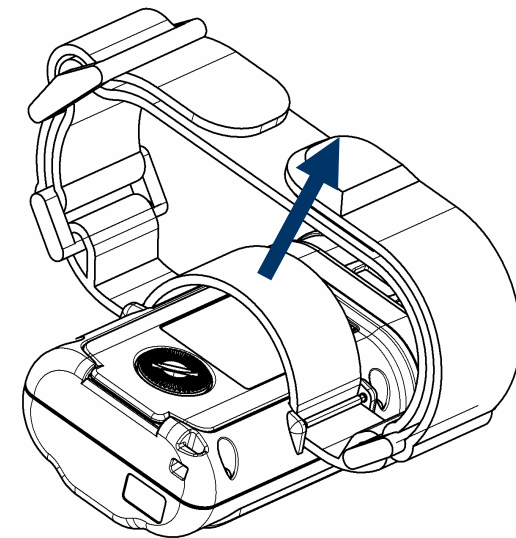
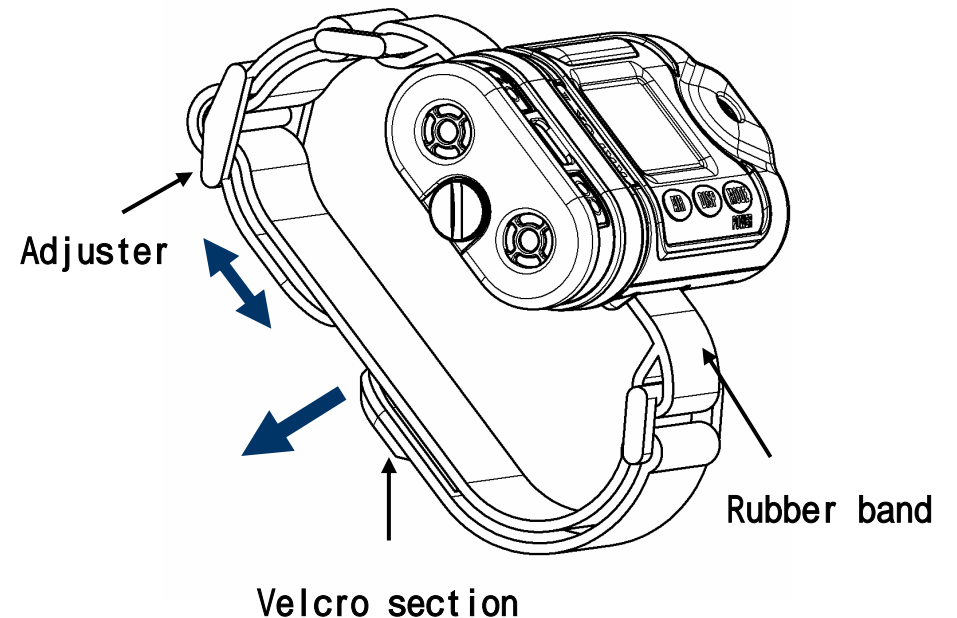
Make sure you position the arm band so you can use the Velcro section properly once the arm band is installed.

* NOTE

- A part of arm band is a rubber. After adjustment, you can detach the unit smoothly by use of Velcro section.
- Battery replacement shall be done by loosening the band at the rear of the unit. (See section 2-1)

⚠ WARNING

Be sure to wear the unit so as to expose it to atmosphere. If not, correct measurement cannot be performed.



4. Alarm

4-1 Each type of gas alarm and its pattern

When gas concentration exceeds preset alarm level, gas reading flashes, backlight and alarm light turn on, buzzer sounds on and the unit vibrates.

Gas alarm type : 1st alarm (L alarm, 1st), 2nd alarm (LL alarm, 2nd), OVER alarm, TWA alarm, STEL alarm

Alarm pattern : Pattern A, Pattern B






Action of alarm : Buzzer, light, vibration, display (blinking, backlight ON)

Alarm type	Target gas		Alarm pattern
	Oxygen	Carbon monoxide	
1st alarm	19.5 % (Low alarm)	50ppm	Pattern A
2nd alarm	23.5 % (High alarm)	150 pap	Pattern B
OVER range alarm	40.0 %	1000ppm	Pattern B *1
TWA alarm		50 ppm	Pattern A *1
STEL alarm		200 ppm	Pattern A *1

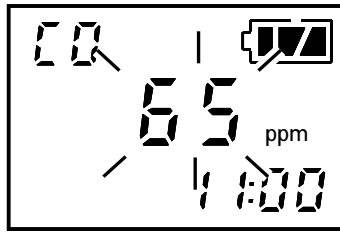
*1 : Actions of audible, alarm light and vibration alarm are the same for both 1st and 2nd alarms.

Only display screen changes. (See next page)

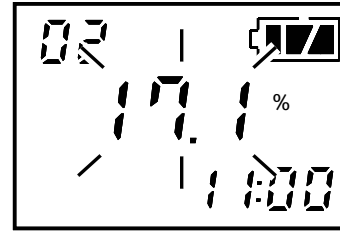
Actions of alarm light, buzzer sounds and vibration

Alarm pattern	Pattern A (Cycle : Slow)	Pattern B (Cycle : Fast)
	Buzzer sound	
Alarm light		
Vibration		

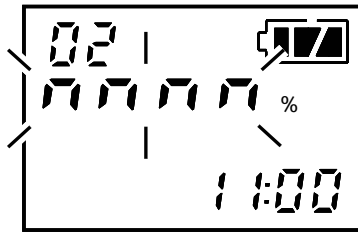
< Example of display screen when gas alarm has been activated >



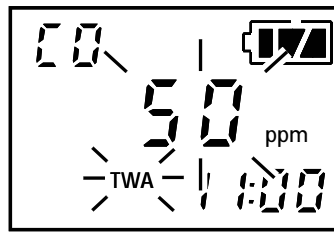
CO 1st alarm
(Gas reading flashes)



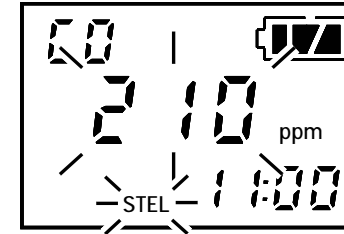
O2 2nd alarm
(Gas reading flashes)



O2 Over range alarm
(Gas reading replaced
by blinking brackets)




CO TWA alarm
(TWA blinks)




CO STEL alarm
(STEL blinks)

*** NOTE**

- The unit automatically switches to the alarm screen if an alarm has been activated.
- Even though the gas concentration may have returned to normal or may have fallen below the alarm point, alarm indications will continue until you have pressed the  switch once.

⚠ WARNING

- The unit displays only for the gas that indicates an alarm afterwards, if plural gas alarms are activated. If plural gas alarms would be activated, confirm the alarm indication by pressing the  button.

4-2 Responding to gas alarm

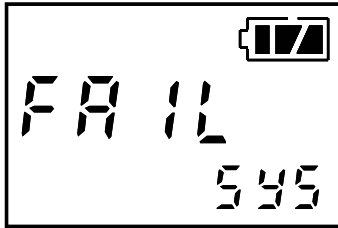
Gas alarm is set at safety level. However the juttred out gas will exceed the safety level and reaches to dangerous level within a short time. If the alarm would be activated, leave from that area immediately and ventilate there. Also stop the leaking source immediately, if the gas leak is identified.

 **DANGER**

If Oxygen and/or Carbon monoxide alarm is activated, ventilate it with fresh air or escape to the fresh atmosphere immediately. It is danger since the oxygen deficiency air or toxic gas may be blown out.

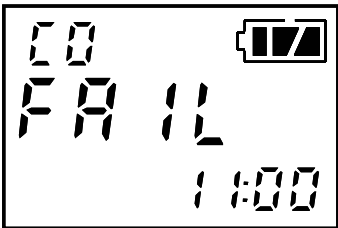
4-3 Other alarms

System failure



PiPi- PiPi-
Alarm light
Back light turns on.

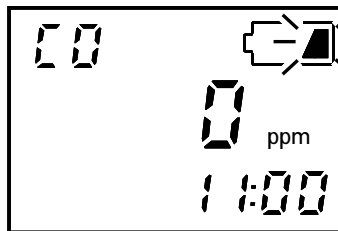
Sensor failure (In case of CO)



PiPi- PiPi-
Alarm light
Back light turns on

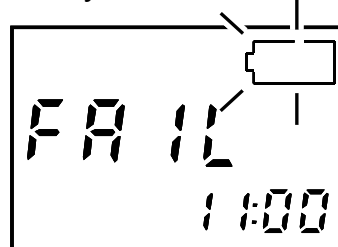
4-4 Low battery voltage

Low battery warning




Battery icon flashes

Battery failure alarm






PiPi- PiPi-
Alarm light
Battery icon flashes
Gas reading replaced
by FAIL.

* NOTE

- Sensor failure may be activated at the time of AIR cal. To reset an alarm, press the  button. In this case, AIR cal is not performed.
- If the sensor failure would be activated except for system failure, low battery alarm or at the time of AIR cal. Only power off operation can be performed. When sensor failure or system failure has been occurred, turn off the power and contact our authorized agent.

* NOTE

The standard of the bar in battery icon is as follows:

-  : Enough remaining
-  : Battery capacity has been decreased.
-  : Change the battery as soon as possible.

WARNING

The unit is not operational as a gas monitoring. Change the battery as soon as possible when a low battery warning occurs.

5. Maintenance and check

Perform following checks to maintain the reliability and correct functions.

WARNING

If you could find abnormality to this unit, contact our authorized agent.

5-1 Daily check

Check that unit housing, display part, switches, filter and lights are not dirty or damaged.
Also check battery voltage, actions of buzzer, lights and vibration when putting power on.

5-2 AIR calibration

Perform air calibration when putting on the power. Also perform AIR calibration in fresh atmosphere if CO and O₂ concentrations are not 0 ppm and 20.9% respectively.

5-3 Replacing batteries

Replace the battery if battery voltage decreases during operation (Sec 2-1).

5-4 Gas calibration

It is required to perform gas calibration more than one time per year.
To calibrate the unit, you will need the calibration kit. Ask to our authorized agent for calibration kit.

*NOTE

Guarantee period of the sensor is one year from the date of shipment from RIKEN KEIKI CO., LTD.

5-5 Replacing the sensor

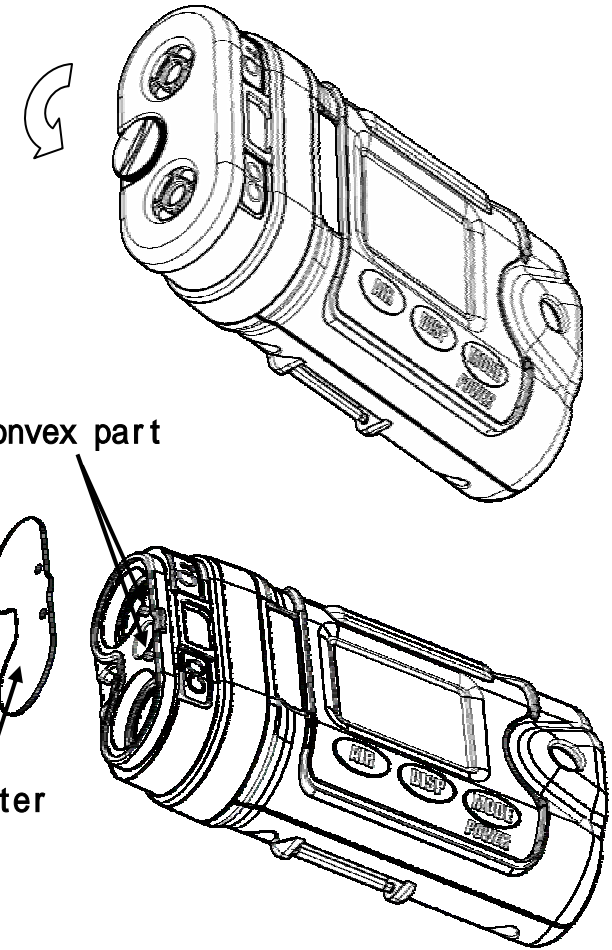
Replace the sensor if you could not perform AIR cal or if the reading would fluctuate. Ask to our authorized agent to change the sensor. Guarantee period of sensors is one year from the date of shipment from RIKEN KEIKI CO., LTD.

5-6 Replacing the filter

The filter is a consumable parts. Replace it periodically if it is dirty or clogged.

Unscrew the single screw that holds the cover and remove the filter cover.

Replace the filter with new one. In this case, install a new filter and make sure two holes in filter are properly seated on the convex part of the housing. Reinstall the filter cover and fix it with the single screws.



⚠ CAUTION

- Install the filter correctly. If not, drip-proof function is not performed.
- Replace the filter, once per six months. Replace it each time if it is dirty even though they are within six months.

5-7 Consumable parts list

No.	Parts	Checking interval	Replacement interval	Quantity (pce/unit)
1	Filter	Before use and after use	At the time of checking as occasion demands	1 pce

Replacement of consumable parts shall be done as occasion demand at the time of checking.

6. Troubleshooting

Symptoms	Probable causes	Recommended action
The power is not turned on (The LCD is blank)	The battery may need to be replaced.	See «2-1 Mounting batteries»
	The battery polarity may be different.	
	Time to press and hold the MODE/POWER button may be too short.	Press the MODE/POWER button for about 1 sec (until it turns on).
	Battery cover may not be closed tightly.	Close the battery cover completely.
“ FAIL SYS ” is indicated on the LCD	A microprocessor failure has occurred.	Contact our authorized agent for repair.
“ O2 FAIL ” or “ CO FAIL ” is indicated on the LCD	Sensor may need replacement	Contact our authorized agent to replace the sensor.
“ O2 FAIL ” or “ CO FAIL ” displays during air calibration	Fresh air may not be supplied to the around of unit.	Supply fresh air.
	Sensitivity of the sensor may decrease.	Contact our authorized agent to replace the sensor
“ FAIL(battery icon) ” is displayed on the LCD	Battery voltage has dropped.	Turn off the unit and replace the battery in a non hazardous environment.
Alarm is not reset even though the gas concentration returns to normal or may have fallen below the alarm point	MODE (alarm reset) switch may not be pressed.	The alarm of this unit is a latched mode. Press the MODE switch to reset the alarm after an alarm has occurred.

7. Specifications

7-1 Specifications

Model	CX-	
Measurable gas	Oxygen (O ₂)	Carbon monoxide (CO)
Detection principle	Galvanic cell	Electrochemical cell
Measuring range (Resolution)	0 ~ 40.0vol% (0.1vol%)	0 ~ 1000ppm (1ppm)
Gas alarm	Low alarm : 19.5% vol% High alarm : 23.5% vol% OVER range : 40.0% vol%	1st alarm : 50ppm 2nd alarm : 150ppm TWA : 50ppm STEL : 200ppm OVER range : 1000ppm
Trouble alarm	Sensor disconnection, wire disconnection, low battery, circuit failure, calibration range error.	
Alarm indication	Gas alarms : Alarm light flashes, pulsing tone, gas reading flashes, vibration Trouble alarm: Alarm light flashes, pulsing tone, gas reading replaced by FAIL	
Type of alarm	Latching mode(reset an alarm by pressing MODE button after the gas reading returns normal)	
Detection method	Diffusion sampling	
Display	Digital LCD with 7 segments + symbols	
Output signal	IrDA transmission (for data logging)	
Power source	AAA size alkaline batteries (2 pcs)	

Continuous operation (battery life)	Up to 2000 hours at 20 without any alarms.
Explosion proof	Exia BT4X (Pending)
Operation temp. & humidity	-20 ~ 50 , below 95%RH (Non-condensing)
Function	Manual backlight LCD (automatic at an alarm), TWA and STEL alarms, PEAK hold function, clock display, IrDA data transmission to PC, data logging function.
Dimensions & weight	Approx 90(W) × 50(H) × 25(D)mm, Approx 120g

7-2 Standard accessories

- AAA size alkaline batteries 2 pcs (built-in the unit)
- Alligator clip

7-3 Optional accessories

- Pack of 10 dust filters
- Arm band
- Belt clip
- Data logging software for management program.

8. Definition of terms

TLV-TWA :Threshold Limit Value Time Weighted Average

The time weighted average concentration for a normal 8-hour workday or a 40-hour workweek to which nearly all workers may be repeatedly exposed day after day without adverse effect.

TLV-STEL :Threshold Limit Value Short Terms Exposure Limit

The time weighted average concentration for 15 minutes that cannot be exceeded. Also this is a limited concentration of toxic substances to workers without adverse effect if the exposure concentration by every day is within TLV-TWA.

ppm

This is the unit of gas concentration showing a volume at a part per million.

vol%

Gas concentration as represented by the unit of one-hundred of the volume.

Calibration

By using calibration gas, it seeks relations between display reading and standard gas concentration.

PEAK

This is a peak reading since the last time the unit was turned on.

Alarm point

Preset level to actuate an alarm when gas concentration reaches that point.

Maintenance and check

Work and inspection to maintain the performance of this unit.

Data logger

The function to memorize gas concentrations at each fixed interval and at gas alarm.

9. Warranty

RIKEN KEIKI CO., LTD. warrants the Model CX- Portable CO/O2 Combination by us to be free from defects in materials, workmanship, and performance for a period of one(1) year from the date of shipment from Riken Keiki Co., Ltd. This includes the instrument and the original sensor. Any parts found defective within their warranty period will be repaired or replaced, at our option, free of charge. This warranty does not apply to those items, which by their nature, are subject to deterioration or consumption in normal service, and which must be cleaned, repaired, or replaced on a routine basis. Examples of such items are as follows:

- Filter elements, disks, or sheets
- Batteries

Warranty is voided by abuse including mechanical damage, alteration, rough handling, or repair procedures not in accordance with the instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement cost, local repair costs, transportation cost, or contingent expenses incurred without our prior approval.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF Riken Keiki Co., Ltd.

INCLUDING BUT NOT LIMITED TO THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL Riken Keiki Co., Ltd. BE LIABLE FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL LOSS OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCTS TO FUNCTION OR OPERATE PROPERLY.

This warranty covers instruments and parts sold to users only by authorized distributors, dealers and representatives as appointed by Riken Keiki Co., Ltd.

We do not assume the indemnification for any accident or damage caused by the operation of this gas monitor and our warranty is limited to the replacement of parts or our complete goods.