



**INSTRUMENTS**

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**RI-215D CO<sub>2</sub> Gas Detector  
Operator's Manual**

*Part Number: RI-215D*

## In the beginning

Riken model RI-215D is sample drawing type CO<sub>2</sub> monitor. This instrument detect CO<sub>2</sub> gas, and give the output signal 0-10VDC or 4-20mA which is in proportion to 0- full scale of gas concentration.

This is instruction manual of RI-215D. Read this instruction manual before operating the instrument.

This manual use below marks for safety and effective operation.



### DANGER

This mark means the matter makes serious damage on the human body or life directly.



### WARNING

When the operation and treatment are not performed as on the manual, it makes serious damage on the human body or equipment.



### CAUTION

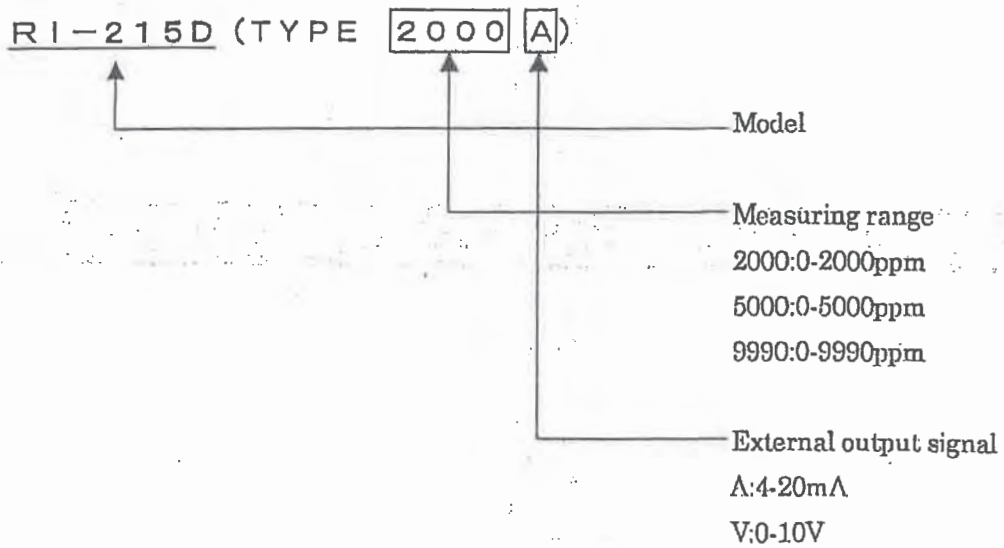
When the operation and treatment are not performed as on the manual, it may makes damage on the human body or equipment.

### \* NOTICE

This mark means the advise on usage.

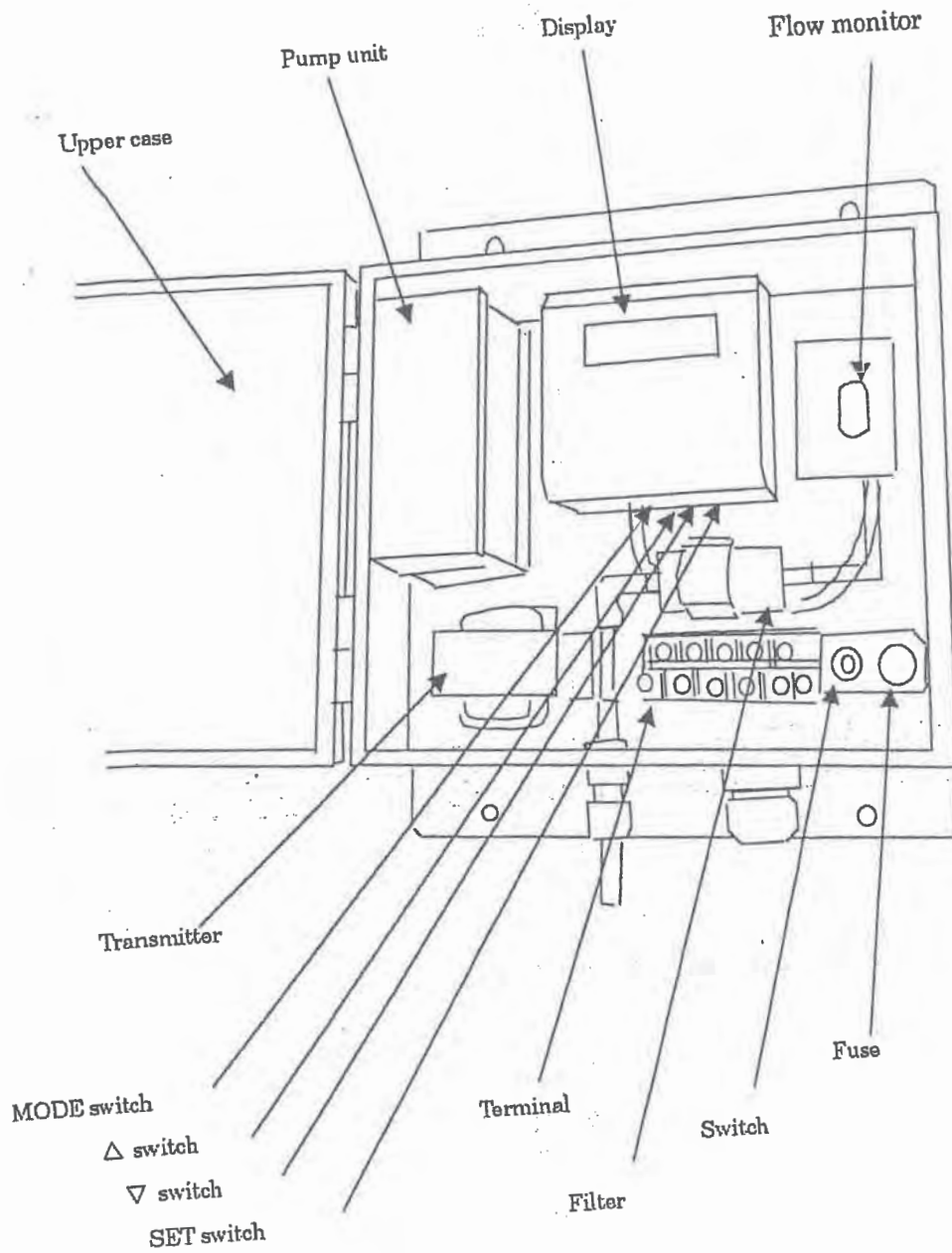
RI-215D series has 6 types as follows.

Model	Output signal	Measuring range
RI-215D	4-20mA	0-2000ppm
		0-5000ppm
		0-9990ppm
	0-10V	0-2000ppm
		0-5000ppm
		0-9990ppm

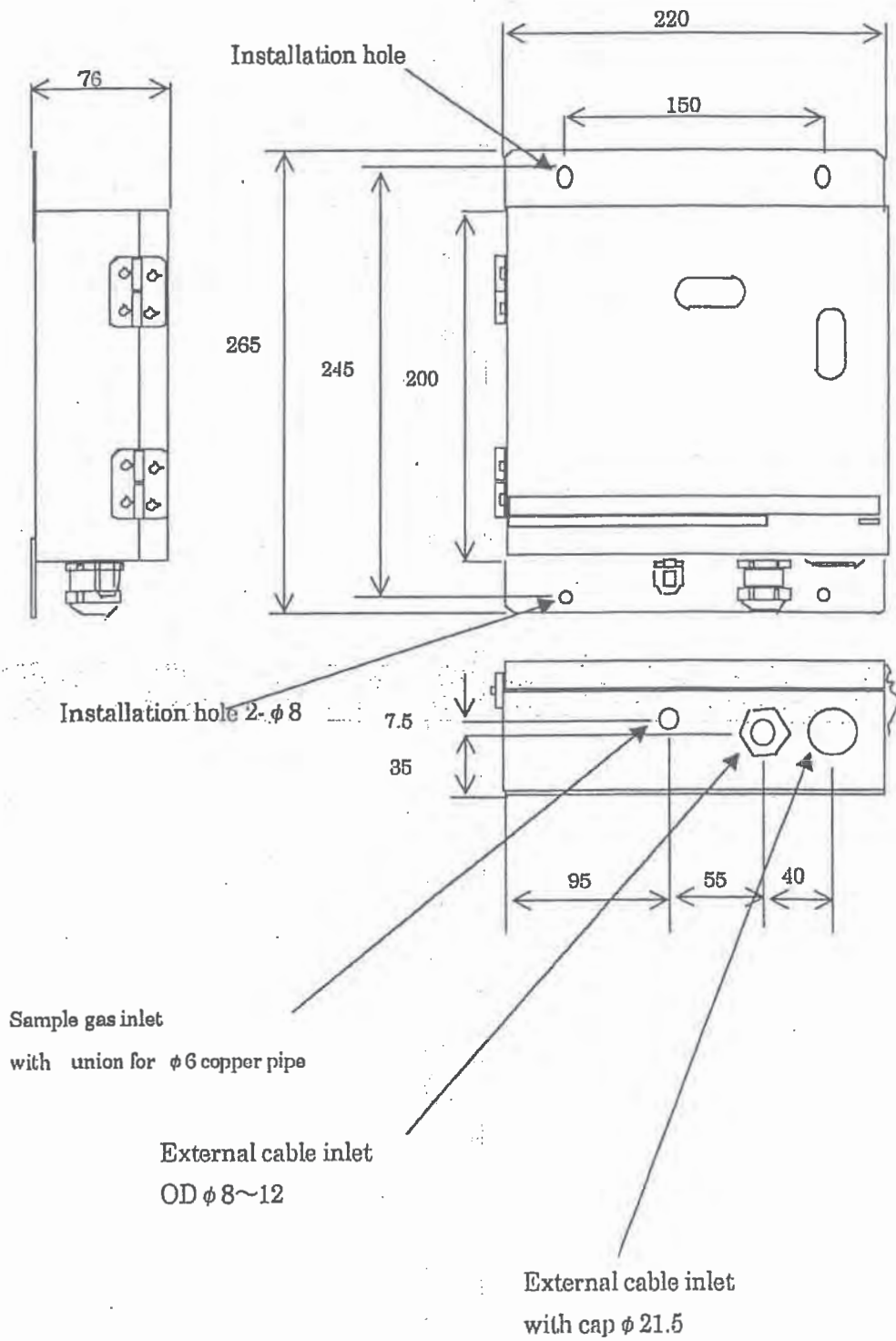


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# 1. Name of each part



## 2. How to install

### 2-1. Before use

Check the instrument has no-damage by appearance before use. Confirm the instrument is the same as ordered one by checking the model type described on name plate.

### 2-2. Caution at install

\* Don't install the instrument where high humidity is existed.

Don't install the instrument where much dust is existed.

Don't install the instrument where vibration is given

Don't install the instrument where the atmosphere has organic vapor or oil.

Don't install the instrument where the unit get wet.

Don't install the instrument near window

Don't install the instrument under direct sunshine

\*Don't install the instrument at below place, when the air conditions controlled by using the ventilation output (external output, relay output). Much CO<sub>2</sub> gas is exhausted at below place.

1) Don't install the instrument at the place lower than 1.8m from floor.

It is easy to get the human breath.

(ref. The concentration of human breath is approx. 4%vol = 40,000ppm.)

2) Don't install the instrument near burner.

3) Don't install the instrument where there is the exhaust gas of automobile.

\*Install the instrument on flat and vertical wall.

\*Install the instrument where there is space of upper part (5cm), below part (50cm), left and right part (each 10cm) in addition to front space.

### 2-3. How to install

Fix the instrument on wall with screw by using 4 pcs. of installation hole.

### 3.Piping

#### 3-1. Caution at piping

\*Shorten the length of piping as short as possible in order to shorten the measuring time.

\*When condensation may be generated in pipe by high humidity, make the treatment not to enter the water into the instrument.

(Example of treatment : Install the drain pot at lowest place of pipe.)

#### 3-2. How to make piping

Use the material of pipe is a copper pipe  $\phi$  6 or corresponded one to polyethylene tube.

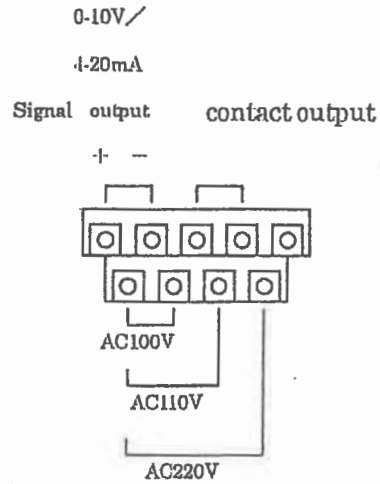
## 4. WIRING METHOD

### 4-1. Caution at wiring

- 1) Equip the power leakage breaker when necessary. Connect the power source from where voltage is stable.
- 2) Don't make common wiring with the power source of electrical noise like as motive cable.
- 3) Connect the line filter and make the treatment of surge where inductive trouble or electrical noise may occurred.
- 4) Fit the additional lightning arrester to power source cable where much thunder lightning occurred.
- 5) Use the shielded cable as output signal cable where much electrical noise occurred when necessary.
- 6) When the external contact is used, supply the suitable protective element.  
And the external contact has not enough capacity to control the device which have large load resistance. When use the contact signal, make the isolate treatment like as the amplification of power through external relay.

#### 4-2. Wiring method

Select the terminal by power voltage. And make wiring.



### WARNING

- ☆ Perform the piping and wiring work with power off.  
Otherwise, it will be caused to get electric shock.
- ☆ Use the specified power voltage.

## 5. Operation

### 5-1. Start up

- (1) In case of wiring correctly, after turning on the power switch, initial clear starts for approx. 1 minute.  
Display : CO2  
External output : 0V or 2.5mA  
Contact output : OFF
- (2) After initial clear, internal sensor detects CO2 in air. Then, the LCD display shows the concentration of CO2. And the voltage or current signal in proportion to the concentration are output. The internal relay contact is activated to open or close in accordance with alarm point. It may be that indication is higher or lower than actual concentration. But, indication will be stabilized in a minute.
- (3) Perform the warning up operation more than 30 minutes.

### 5-2. Control of air condition

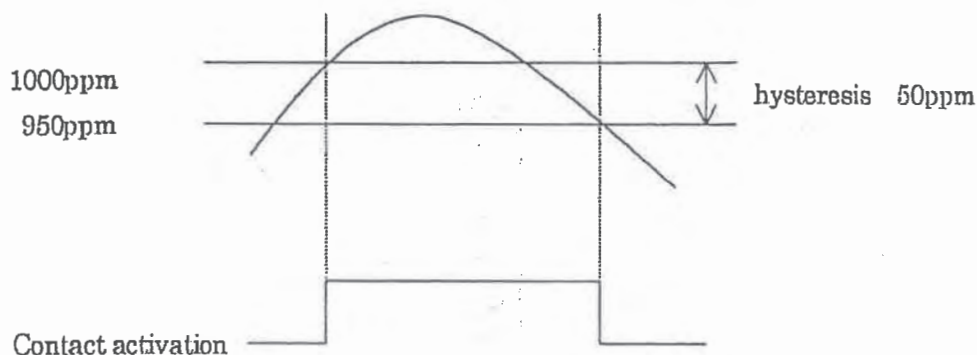
In case of controlling of air condition with this instrument, two kind of way can be selected depending on the ventilator or the control way.

One is the way which use contact output, the other is the way which use signal output.

In case of selecting the way which use contact output, when the indication is more than the value of presetting parameter (alarm point), the ventilation is performed,

And when the indication is less than the value of presetting parameter, the ventilation is stopped.

But, there is hysteresis of 50ppm for all model of full scale range ,0-2,000ppm, 0-5,000ppm and 0-10,000ppm specification.



### 5-3. Alarm point (setting, confirmation)

All model (0-2000ppm/5000ppm/10000ppm) can be set alarm point at range of 50ppm - full scale.

Factory- set is 1000ppm.

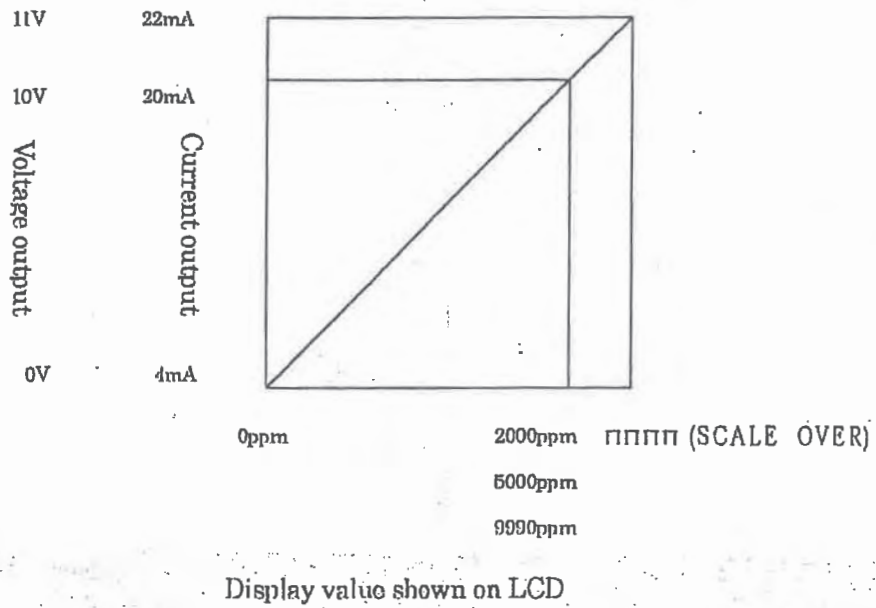
Item	Operation	LCD	Contents
Confirmation of alarm point	①Press $\Delta$ switch	788 10:00	Concentration of measuring gas. Adjustment mode of alarm point. Colon is flickering. Return to the concentration of measuring gas.
	②Release $\Delta$ switch.	788	
Change of alarm point.	①Press $\Delta$ switch.	10:00	Adjustment mode of alarm point. Colon is flickering. Alarm point and colon is flickering alternately. Decision.  Return to the concentration of measuring gas.
	②Press $\Delta$ switch more than 3 seconds.	10:00	
	②Press $\Delta$ or $\nabla$ switch, and adjust to the alarm point.	12:00	
	③Press SET switch for 3 seconds.	990	

#### \*NOTE

\*When cancel the change of alarm point, press MODE switch before the change of alarm point is decided.  
Alarm point will be returned to initial condition.

#### 5-4. External output signal

The below is the relation between CO<sub>2</sub> concentration and external output signal.



In case of the full scale over, LCD shows ΠΠΠΠ , current output is 20-22mA (Max.22mA fixed). And voltage output is 10-11V (Max.11V fixed).

## 6. Maintenance Check

This is a important instrument for security and safety. To maintain the security and enhance the reliability of safety, the regular maintenance check (at least once 6 months) shall be absolutely necessary.

For gas calibration, contact to nearest agent or Riken Keiki.

### 6-1. Daily check

Check item	Check contents	Treatment
Is it OK with LCD display?	In normal, gas concentration is shown on LCD.	
Is it enough with flow rate?	Check that the ball of flowmonitor is within the two red lines.	When the ball is below the red line, the path of pipe may be stopped up. Check and remove the stopper.
Is dust filter dirty?		When filter is dirty, replace it with new one.
Is the instrument dirty?		When the instrument is dirty, blow up it or suck it by cleaner.
Does output signal show unusual value?	When many persons are in room during daytime or when the heater is operated, indication value ranges from approx. 500 - 2,000ppm. When any person are not in room at night, indication value ranges from approx. 300 - 500ppm.	When showing unusual value, check the output by using calibration kit and make gas calibration. (refer to next page.)

## 6-2. Gas Calibration

- (1) Before calibration, warming up time is necessary for approx. 30minutes.  
If the instrument is in continuous operation, proceed to below (2).
- (2) Remove the tube laid to the detector of unit.  
(The tube can be removed by turning slowly and pulling it.)
- (3) Fit the calibration kit into detector head and supply calibration gas.  
Make calibration in accordance with the following procedure.

Item	Operation	LCD display	Contents
Calibration	①Supply span gas. After indication is stable, push SET switch for 3 seconds continuously.	CAL	Gas calibration mode is shown on LCD .
	②After pushing SET switch for 3 seconds continuously, indication flicker.	908	Concentration value flicker.
	③By pushing switch $\Delta$ or $\nabla$ , adjust the display value to the setting value.	990	
	④Push SET switch.	990	Decision

In case of checking and make calibration of indication at field, please purchase optional parts "Calibration kit". When purchasing "Calibration kit", contact to Riken Keiki or our agent.

### \* NOTICE

When make calibration, don't breathe upon the instrument. There is the case that calibration can not be made correctly.

### 6-3. Replacement of fuse

When the instrument don't operate after turning the power switch on, the fuse may be blown.  
Replace the fuse in accordance with following procedure.

- ① Cut off the power source and turn off the power switch.
- ② Remove the fuse case and replace to new fuse.
- ③ Fit the fuse case and switch on the power source.

Specification of fuse:  $\phi$  5.2 x 20    1A    250V



### CAUTION

☆ Don't touch the electric parts except the fuse.

### 6-4. Storage and treatment when not use for a long time

The instrument shall be stored in the following environment condition.

1. Temperature :  $5^{\circ}\text{C} \sim 40^{\circ}\text{C}$
2. Humidity : 30%RH  $\sim$  80%RH
3. Environment condition : To be an environment where there is no generation of gas, solvent and vapor etc.

Store the instrument in the packing box. If the packing box is missing, store the instrument in the plastic bag.

Don't store the instrument under direct sunshine.

When re-use the instrument, be sure to warm up the unit for approx. 30 minutes and to make gas calibration. (ref.5-2. Gas calibration).

## 7. Scrap of the instrument

When this instrument scrap, dispose of it with the same as the industrial scrap goods.(Non-flammable goods). Toxic substance is not used in the instrument.

## 8. Trouble shooting

Symptom	Cause	Treatment
Power does not turn ON.	Is it OK with power cable connection?  Is fuse disconnected?	Check the power cable connection.  If fuse is disconnected, replace it new one.
Indication is unstable	When many persons are in room during daytime or when the heater is operated, indication ranges from approx. 500 - 2,000ppm. When any person are not in room at night, indication ranges from approx. 300 - 500ppm.	If LCD display is diffective, repair is needed.
Indication does not change.	Is there any noise?  Are there rapid change of temperature or that of CO2 concentration?	Make treatment for the noise.  Use the instrument where change of temperature and that of CO2 concentration are stable.
Indication is over scale and does not change	Does CO2 gas stay around sampling point?	Check the cause of generating CO2 gas like heater. And ventilate a room.
Alarm. does not given at alarm point.	Is the alarm point correct?	Set the alarm point again.
「E-00」 is shown on display	System trouble	Turn on power again and check the wiring again.
「E-01」 is shown on display	Detector trouble	Turn on power again and make calibration again.

## 9. Definition of word

### **Principle of Non-Dispersive Infrared Ray**

This instrument use the principle of NDIR (Non-Dispersive Infrared Ray).  
(In detail, Refer to 11. Detecting Principle.)

### **PPM**

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

### **Full scale**

Max value of measuring range.

### **Calibration**

To adjust the indication value into the concentration of calibration gas.

### **Hysteresis**

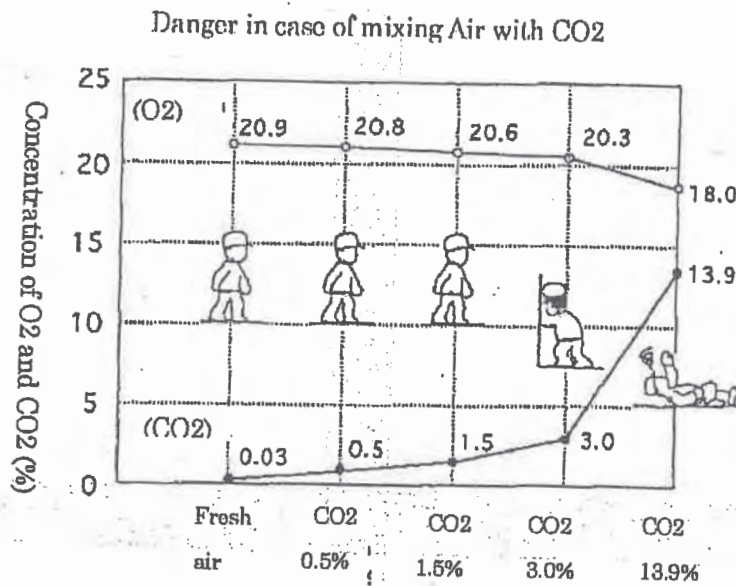
Difference between the concentration value of activating contact and the concentration value of returning.

## 10. CO2 concentration and Symptom

### CO2 concentration and Symptom

CO2 concentration in air	Symptom
0.5	No symptom by exposed for 6 hours.
1~2	Feel uncomfortable
3~4	Breathing increases due to stimulus of respiratory organs. Pulse and blood pressure increase. Eventually, headache and dizziness occur.
6	Breathing becomes difficult.
7~10	Unconscious within a few minutes.

- In case of mixing air with CO<sub>2</sub>, the composition is as below.  
It is dangerous to measure O<sub>2</sub> only. It needs to measure CO<sub>2</sub> together with O<sub>2</sub>.



## 11. Specifications

### 11-1. Specifications

Model	RI-215D
Detection principle	Non dispersive infrared absorption method (NDIR)
Measuring gas	Carbon dioxide (CO <sub>2</sub> ) in air
Measuring range	0-2,000ppm 0-5,000ppm 0-10,000ppm
Repeatability	± 5%F.S. (At constant temp., humidity, and pressure conditions)
Output signal	0 - 10V DC (Load resistance: min.500k Ω) or 4 - 20mADC (Load resistance :Max.300Ω)
Alarm range	OFF, 50~2000ppm (Adjustable in step of 10ppm) OFF, 50~5000ppm (Adjustable in step of 10ppm) OFF, 50~9990ppm (Adjustable in step of 10ppm) Factory-set : 1000ppm ± 100ppm
Alarm	1a (no-voltage contact 1 point)
Contact rating	AC250V 1A (Load resistance)
Hysteresis	Approx. 50 ppm
Display	Digital LCD
Warming up time	Approx. 30 minutes. (Display starts after 1minute.)
Operating temp.	0~+40°C
Operating humidity	10~90%RH(No-condensing)
Wiring connection	Terminal plate Power supply AC100V①-②/AC110V①-③/AC220V①-④ Output signal ⑤(+)-⑥(-) Alarm output ⑦-⑧
Power requirement	AC100V ± 10% 50/60Hz or AC110V ± 10% 50/60Hz or AC220V ± 10% 50/60Hz
Power consumption	Less than 12VA
Outer dimensions	200(H) x 220(W) x 76(D)
Weight	Approx. 3.6 kg
Painting color	Munsell 2.5Y9/2

### 11-2. Accessory

Standard accessory

Instruction manual

## 1 2. DETECTION PRINCIPLE

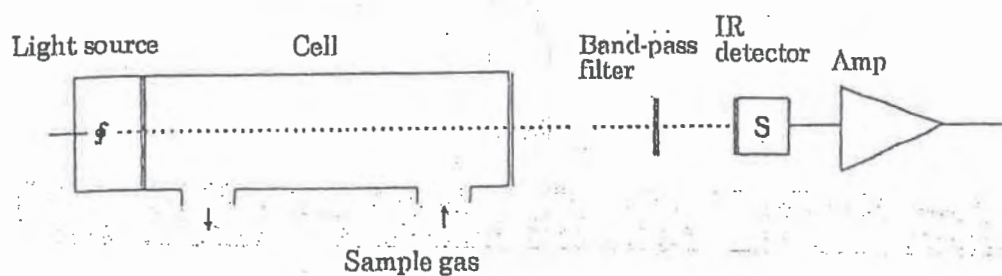
This instrument use the principle of NDIR (Non-Dispersive Infrared Ray).

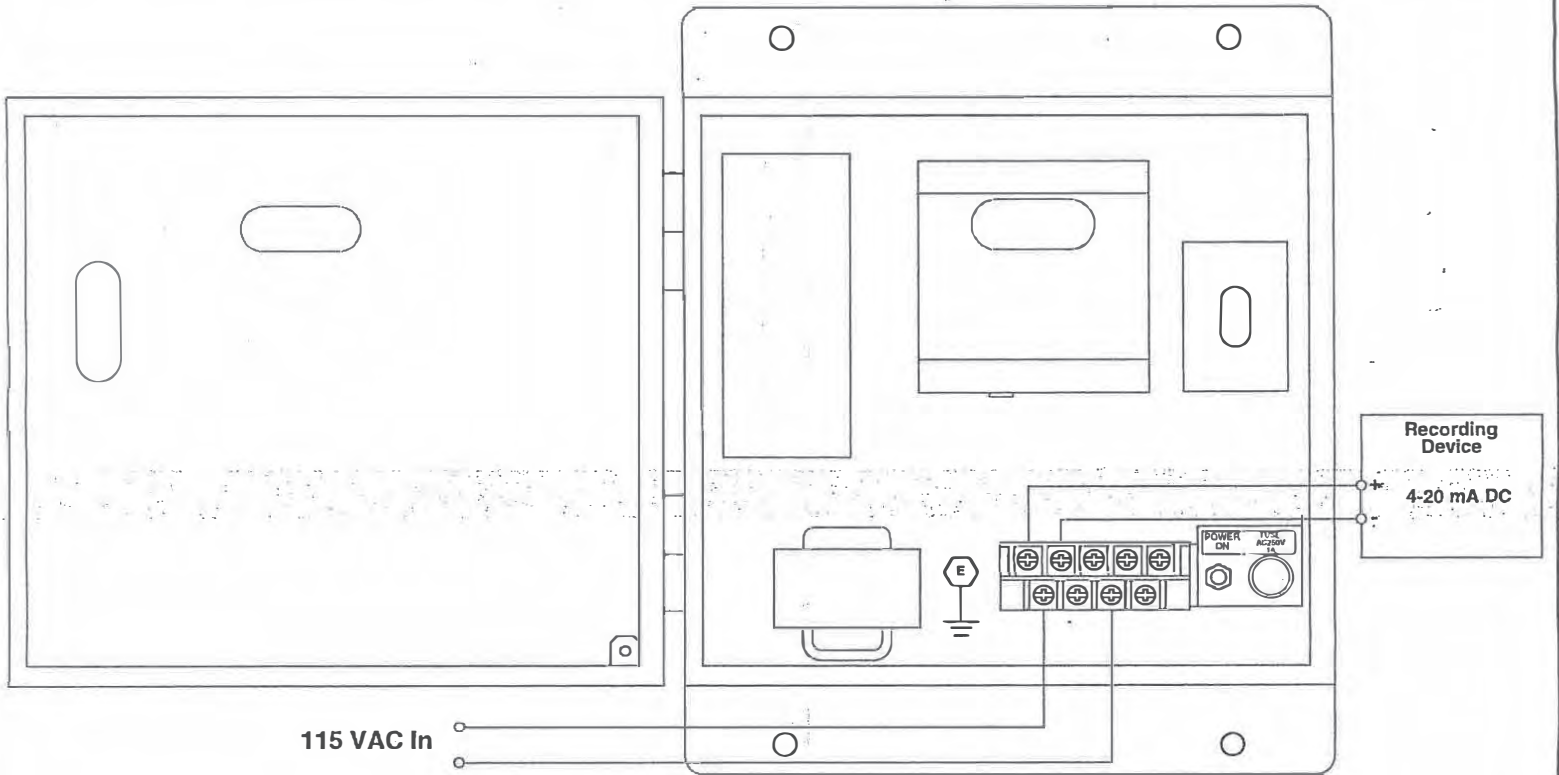
The construction of the detector cell is as following drawing.

The emitted Infrared ray go to the infrared sensor through the sampling gas and IR filter (band pass filter).


The amount of infrared ray is reduced in proportion to the gas concentration, as infrared ray is absorbed in the gas.

And the change of infrared ray amount is converted to gas concentration and displayed on LED display.





115 VAC In

DO NOT SCALE DRAWING		All Dimensions in Inches Unless Otherwise Noted.	 <b>RKI Instruments, Inc.</b>
Deburr	Break Edges .010 R		
Tolerances & Finishes Unless Otherwise Noted: .XX ± .010      Angles ± 0° 30' .XXX ± .005      Conc. .010 TIR Fractions ± .015      Finish 125 ✓		MATERIAL: N/A	<b>TITLE: Wiring Diagram, RI-215D</b>
Finish for O-ring Grooves, 3 Sides 32 ✓		FINISH: N/A	
SCALE: .5		DRAWN BY: TK APPROVED BY:	PART NUMBER: RI-215D-R01 DATE: 6/30/00
			REVISION: 0 PAGE 1 OF 1



INSTRUMENTS  
Gas Detection for Life!

## PRODUCT WARRANTY

1/1/2002

RKI Instruments, Inc. warrants gas alarm equipment sold by us to be free from defects in materials, workmanship, and performance for a period of one year\* from the date of shipment from RKI Instruments, Inc. Any parts found defective within that period will be repaired or replaced, at our option, free of charge. Parts must be returned to RKI Instruments, Inc. for repair or replacement. 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:

- |                               |                    |
|-------------------------------|--------------------|
| a) Pump diaphragms and valves | c) Batteries       |
| b) Fuses                      | d) Filter elements |

Warranty is voided by abuse including mechanical damage, alteration, rough handling, or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs, 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 RKI INSTRUMENTS, INC. INCLUDING BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL RKI INSTRUMENTS, INC. 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 RKI Instruments, Inc.

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. Warranty covers parts and labor performed at RKI Instruments, Inc. only, and does not cover field labor or shipment of parts back to RKI.

\* The Models GX-2001 and GasWatch 2 carry a two year warranty. The two year warranty applies to the instrument including original sensors. Replacement parts and sensors have a standard one year warranty.