RI-600

Indoor Carbon Dioxide Monitor

Operator's Manual

Part Number: 71-0517
Revision: 0
Released: 11/7/22

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1
Outline of the Product

Preface

Thank you for choosing our indoor carbon dioxide monitor RI-600. Please verify that the model number of the product you purchased is included in the specifications on this manual.

This manual describes the monitor's specifications and instructions on proper use. All users must read and understand the operating manual before using the detector.

Note that the contents of this manual are subject to change without notice for product improvement. It is also prohibited to copy or reproduce this manual, in whole or in part, without permission.

Regardless of warranty period, we shall not make any indemnification for accidents and damage caused by using the monitor. Make sure to read the warranty policy specified on the instrument's warranty.

Purpose of use

This carbon dioxide monitor measures carbon dioxide in the air and shows the concentration on the LCD. The detector converts the gas reading to an analog, 4-20 mA output, signal and also provides an alarm contact.

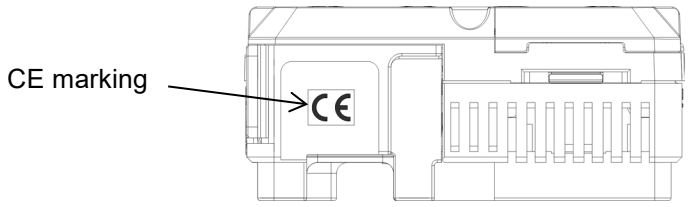
The monitor is a safety unit, not an analyzer. Check the specifications before use and properly conduct measurement in accordance with purposes.

Definition of DANGER, WARNING, CAUTION and NOTE

DANGER	This message indicates that improper handling may cause serious damage to life, health, or assets.
WARNING	This message indicates that improper handling may cause serious damage to health or assets.
CAUTION	This message indicates that improper handling may cause minor damage to health or assets.
NOTE	This message indicates advice on handling.

Method of confirmation for CE marking type (DC specification only)

The CE marking is attached to the detector, as shown below, for CE versions. Please confirm the instrument specification before using. Refer to the Declaration of Conformity that is at the end of this manual if your instrument has the CE marking label.



CE marking label (Bottom of instrument)
(DC specification, dry battery type only)

2
Important Notices on Safety

WARNING

- If an abnormality is found in the monitor, contact RKI immediately.

2-1. Danger Statements

DANGER

- This is not an explosion-proof unit. Never attempt to measure a gas in an atmosphere over the lower explosive limit.

2-2. Warning Statements

WARNING

- Before turning on the monitor, always check that the voltage is compliant with the specifications. Operating on an unstable power supply may cause malfunctions.
- Do not operate this monitor in a place where combustible/explosive gases or vapors are present. Operating the monitor in such an environment will lead to extreme dangers.
- Perform a span adjustment at fixed intervals.
- Do not run the monitor's power cable or remote sensor cable with power cables from another device or with high-frequency or high-voltage cables.
- If a high-frequency or high-voltage cable needs to intersect with the monitor's power cable, it should be orthogonally connected.
- When wiring, be careful not to apply any stresses on the cables by pulling, tightening, twisting, etc.
- Do not disassemble/modify the monitor. It may invalidate the warranty of the performance. Changing the settings without understanding them may cause alarm malfunctions. Please use the monitor properly in accordance with the operating manual.
- Do not use the monitor with it attached to a control device, equipment, etc.

2-3. Caution Statements

CAUTION

- Do not use a device, such as a transceiver, which transmits a radio wave near the monitor or its cables. It may affect the measurement. If a transceiver or other radio wave transmitting device is used, it must be used in a place away from the monitor.
- Restarting the monitor within five seconds after turning it off may cause errors.
- This is not a control unit. It is not allowed to use the external output of the monitor to control other units.
- This is a safety unit. Make sure to perform regular maintenance to ensure safety. Continuing to use the monitor without performing maintenance will compromise the sensitivity of the sensor, thus resulting in inaccurate gas readings.
- Do not pick the sensor or buzzer opening with a sharp-pointed item. The unit may cause malfunction or get damaged, possibly resulting in incorrect measurements.
- Do not also install the monitor in a place where the monitor may get wet. Ignoring this may cause the monitor to malfunction.
- This is a precision device. Do not apply strong shock or vibration to the monitor.
- When the case is opened for wiring or other operation, do not touch inner parts. When wiring, be sure that excessive pressure is not applied to the power cable or remote sensor cable.
- Do not block the vent for the sensor.

3
Product Components

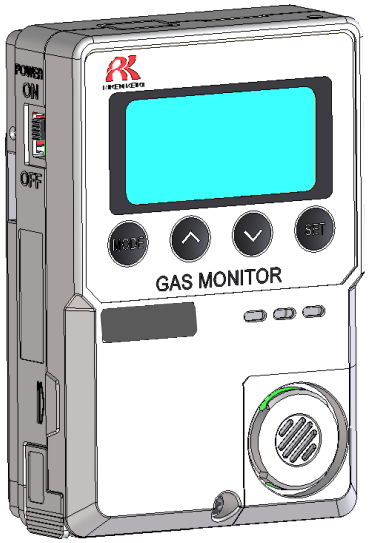
3-1. Main unit and standard accessories

After unpackaging the unit, check the monitor and accessories. If there is anything missing, contact RKI.

Main unit

For names and functions of individual parts of the monitor and LCD display, see "3-2. Names and functions for each part" (P.9).

RI-600



Standard accessories

- Cross-recessed pan head machine screw (2 pcs.)
- Cross-recessed round head wood screw (2 pcs.)
- 3.2 m AC power cable (1 pc.) *Supplied only with AC specification
- Operating manual (1 pc.)

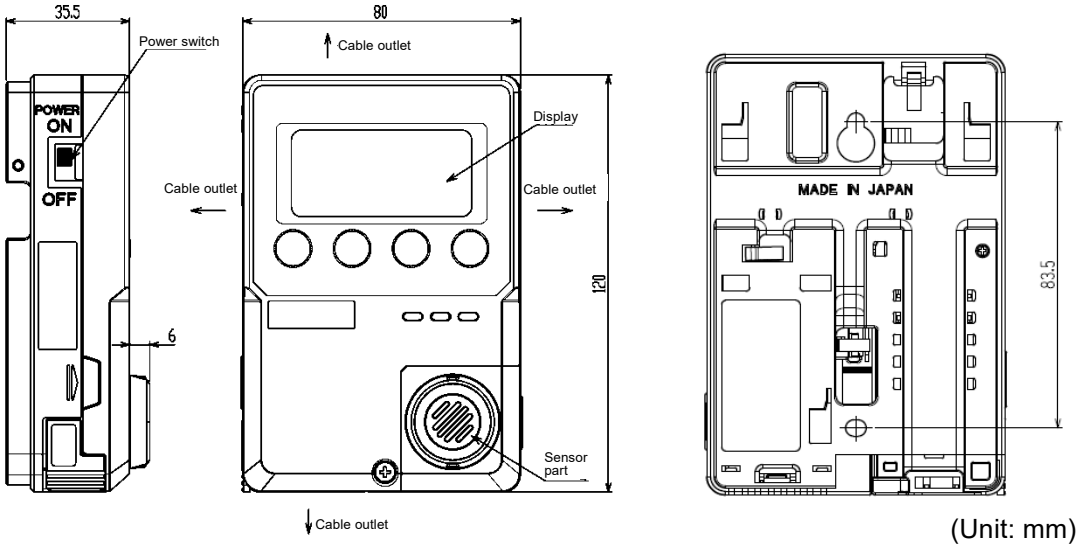
CAUTION

- The main unit and sensor unit (remote type) are precision devices. Be careful not to drop the monitor when installing or uninstalling the main unit or sensor unit. Dropping the monitor may compromise its original performance or cause malfunctions.

Optional accessories

- Installation board (1 pc.)
- Gas calibration cap (1 pc.)

Outline drawing

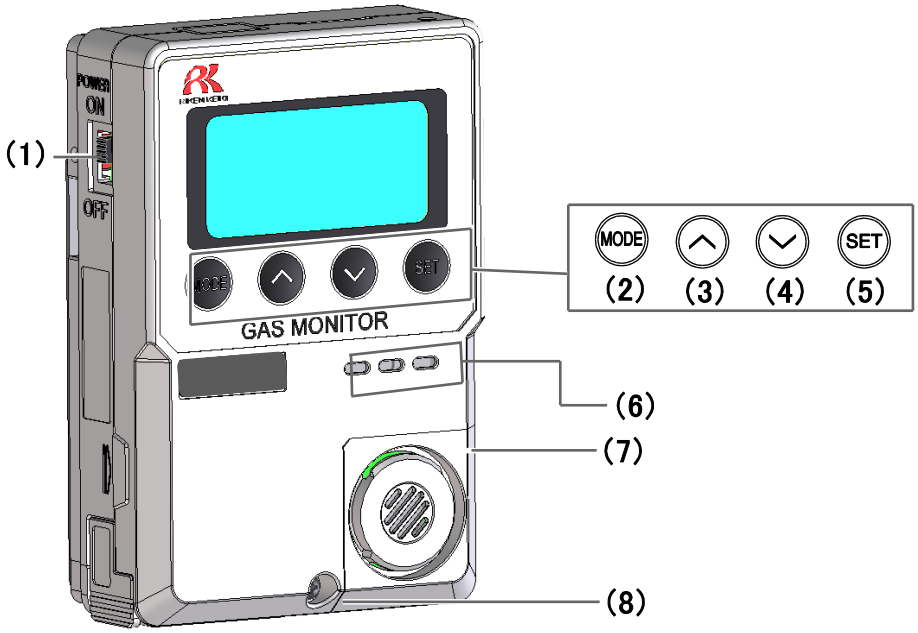


(Unit: mm)

3-2. Names and functions for each part

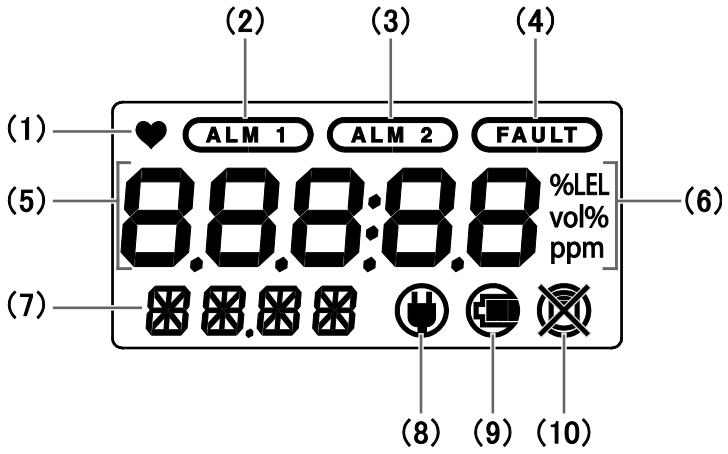
This section describes the names and functions of the individual parts and LCD display that make up the monitor.

Main unit



Name	Major function
(1) Power switch	Turns the power ON/OFF. Slide the switch up to power on and down to power off.
(2) MODE button	Hold down this button to enter the user mode. It is also used to cancel or skip during setup.
(3) ∧ button	Used to change the screen and increase numerical values during setup.
(4) ∨ button	Used to change the screen and decrease numerical values during setup.
(5) SET button	Used to confirm the setting.
(6) Buzzer sound opening	Emits operation and judgment sounds. (Do not block it.)
(7) Sensor part	Detects a gas to be detected. The sensor is inside the cover.
(8) Screw	Loosen this screw to open the case.

Display



Name		Major function
(1)	Operating state display	Displays the operating status. Blinks in normal operation.
(2)	1st alarm display	Lights up or flashes orange during a first alarm state.
(3)	2nd alarm display	Lights up or flashes red during a second alarm state.
(4)	Fault alarm display	Lights up red during a fault alarm state.
(5)	Concentration value display Maintenance indicator	Displays the gas concentration. Maintenance items and others are displayed during setup.
(6)	Unit display	Displays the unit (ppm/vol%) according to the specification.
(7)	Gas name display Maintenance display	Displays the gas name. Maintenance items and others are displayed during setup.
(8)	AC/DC power display	Lights up when the monitor is operating on AC or DC power.
(9)	This is not used for the monitor.	
(10)	This is not used for the monitor.	

4
How to Install

4-1. Precautions for installation points

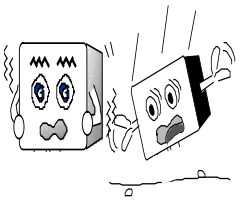
When installing the monitor, observe the following precautions. Ignoring these precautions may damage the monitor, resulting in inaccurate gas detection.

CAUTION

- This is a precision device. Because the monitor may not provide the specified performance in some places (environments), check the installation environment, then take appropriate actions if necessary. Because the monitor plays an important role for safety and disaster prevention, it should be installed appropriately.
- Do not install this product in any of the following locations:
  - Outside environments or areas exposed to direct sunlight
  - Areas exposed to water
  - Areas exposed to ventilation from an air conditioner, etc.
  - Areas exposed to soot, smoke, or steam
  - Areas where the temperature drops below 0ºC or rises over 40ºC or the temperature changes suddenly
  - Areas with high humidity like a bathroom
  - Areas with bad ventilation such as behind a curtain

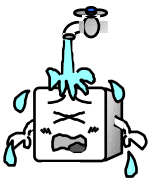
<Do not install the monitor in a place with vibrations or shocks.>

The monitor consists of sensitive electronic parts and must be installed in a stable place without vibrations or shocks, etc. and where it cannot fall.



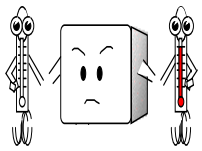
<Do not install the monitor in a place exposed to water, oil, or chemicals, etc.>

When selecting installation points, avoid a place where the monitor is exposed to liquids such as water, oil, or chemicals.



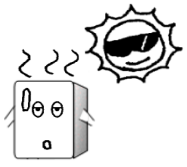
<Do not install the monitor in a place where the temperature drops below 0ºC or rises over 40ºC.>

The operating temperature of the monitor is 0 to +40ºC. Install the monitor in a stable place not exceeding the operating temperature range.



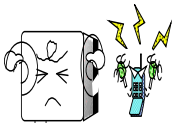
<Do not install the monitor in a place exposed to direct sunlight or sudden changes in the temperature.>

Avoid a place where the monitor is exposed to direct sunlight or radiant heat (infrared rays emitted from a high-temperature object) or where the unit temperature changes suddenly. Condensation may form inside the monitor, and the monitor cannot adjust to sudden changes in the temperature.



<Keep the monitor (and its cables) away from noise source devices.>

When selecting installation points, avoid a place where high-frequency/high-voltage devices exist.



<Do not install the monitor in a place where maintenance of the monitor cannot be performed or where handling the monitor involves dangers.>

Regular maintenance of the monitor must be performed. Do not install the monitor in a place where the machinery must be stopped when maintenance is performed, where parts of the machinery must be removed to perform maintenance, or where the monitor cannot be removed because racks or other things prevent access to it. Do not install the monitor in a place where maintenance involves dangers (for example, near a high-voltage cable).

4-2. Precautions for system designing

Note the following precautions for system designing of the monitor.

CAUTION

- An unstable power supply and noise may cause malfunctions or false alarms.

Using a stable power supply

The external output and alarm contact of the monitor may be activated when the power is turned on, when momentary blackout occurs, or when the system is being stabilized. In such cases, use a UPS (uninterruptible power system), or take appropriate actions on the receiving side.

The monitor must be provided with the following power supply.

Power supply voltage	100 - 120 VAC ±10% (50/60 Hz) or 24 VDC ±10%
Allowed time of momentary blackout	Up to 10 milliseconds (To recover from the momentary blackout for 10 milliseconds or more, restart the monitor.) **Example of actions:** To ensure continuous operation and activation, install a UPS (uninterruptible power system), etc. outside the monitor.
Others	Do not use it with a power supply that has a large power load or high-frequency noise. If necessary, use a line filter to avoid the noise source.

Proper use of alarm contact

The monitor's alarm contact is used to transmit signals to activate an air-conditioning control.

CAUTION

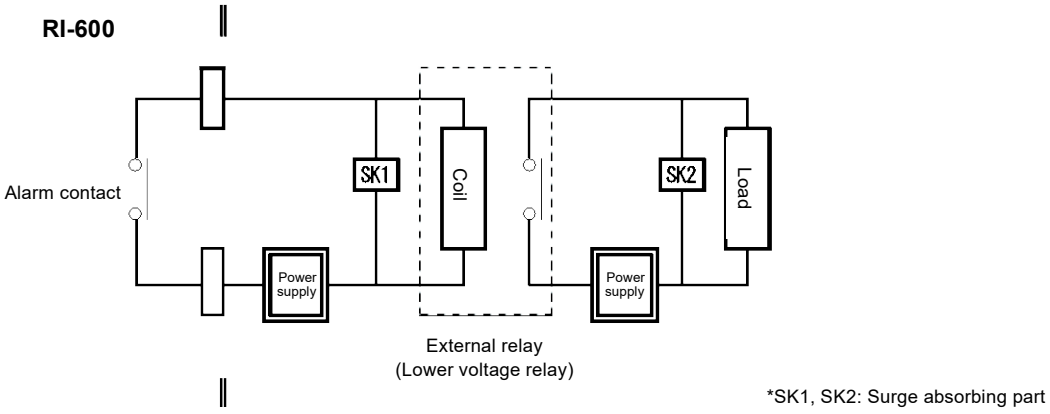
- While in a de-energized state, the b contact (break contact) may be opened momentarily by a physical shock, such as external force.
- When the b contact is selected for the alarm contact, take appropriate actions to prepare for a momentary activation, for example, add signal delay operation (approximately one second) to the receiving side of the b contact.

The specifications for the external output gas alarm contact of the monitor are based on the resistance load conditions. If inductive load is used at the alarm contact, the following errors will likely occur due to counter electromotive force generated at the contact:

- Defective insulation or defective contact at the relay contact
- Damage of any electric parts due to high-voltage generated inside the monitor
- Abnormal operations by an out-of-control CPU

If a load is activated, the following measures must be taken to stabilize the monitor's operation and to protect the alarm contact:

- Relay it with an external relay at a lower voltage of 100 VAC or below (contact amplification). At the same time, the surge absorbing part SK1 suitable for the specifications must be attached to the external relay.
- In addition, the surge absorbing part SK2 must be attached to the loaded side of the external relay if necessary.
- For certain load conditions, it is recommended that the surge absorbing part be attached to the contact. It must be attached to an appropriate location by checking how the load is activated.



CAUTION

- In principle, do not activate inductive load at the alarm contact of the monitor. In particular, never use an inductive load to activate a fluorescent lamp or motor, etc.
- If an inductive load is activated, relay it with an external relay (contact amplification). However, because the coil of an external relay also involves inductive load, select a relay at a lower voltage (100 VAC or below), and then protect the contact of the monitor with an appropriate surge absorbing part, such as a CR circuit.

4-3. Installation of main unit

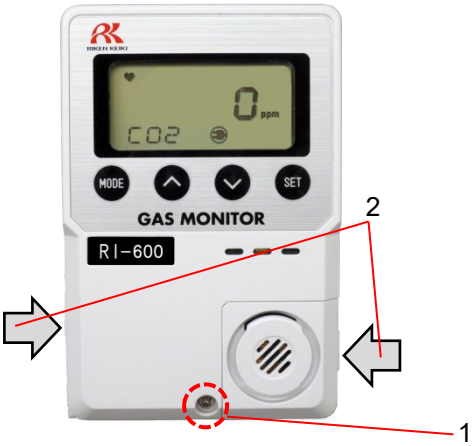
Install the main unit on the wall 50-180 cm from the floor.
If wall screws are available, remove the screw at the lower part of the main unit to open the cover and install the unit using the mounting holes on the back of the unit.

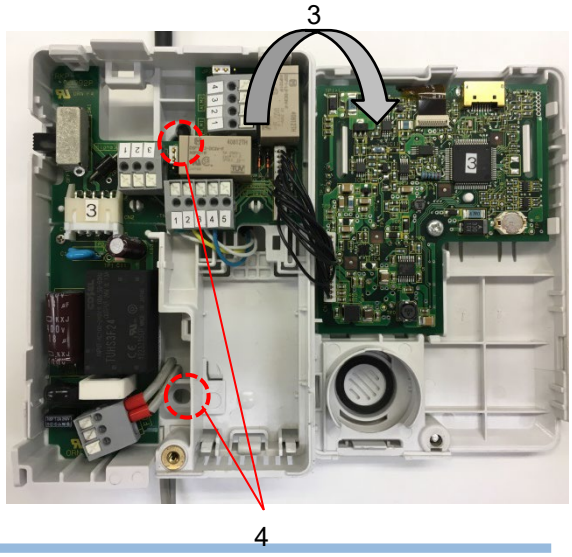
CAUTION

- Install the sensor in a place not directly exposed to ventilation from an air conditioner.
- Sudden changes in the temperature may cause the readings not to come back.

NOTE

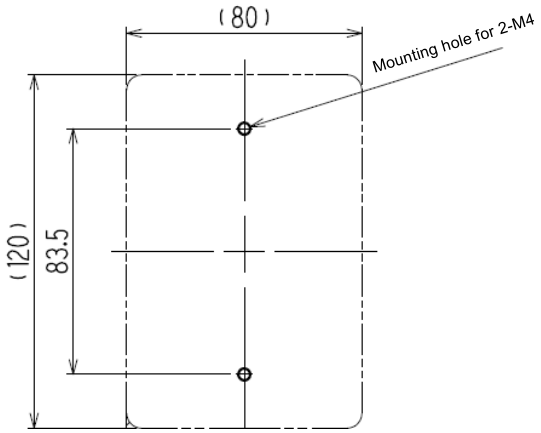
- To install the main unit to the wall with screws, use the mounting holes on the back of the unit according to the following procedure.
  (1) Loosen the screw at the lower part of the main unit and open the surface cover of the case.
  (2) Push both sides of the monitor until it clicks.
  (3) Open the surface cover.
  (4) Fix the main unit with two screws (M4) through the mounting holes.
  (5) Put the surface cover back on the case and tighten the screw at the lower part of the main unit.



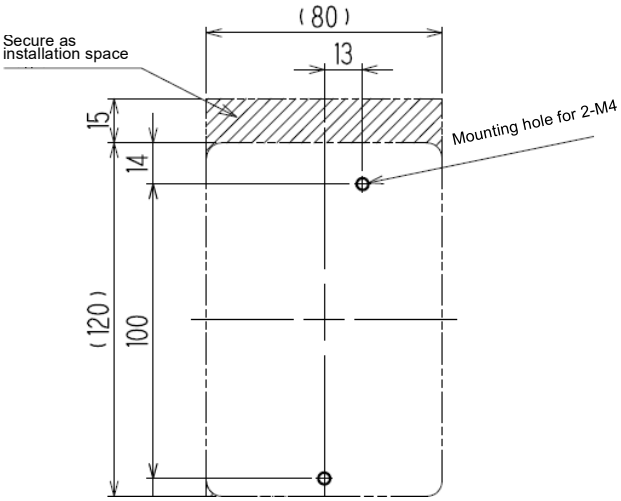


<Maintenance Space>

If the installation board (option) is used, secure an installation space above the unit so that it can be installed by sliding.



Installation dimension drawing (Installation board not used)
Compatible with JIS single switch box



Installation dimension drawing (Installation board used)

4-4. Precautions for wiring

If the monitor operates on AC or DC power, or inductive load is used at the alarm contact, wiring work is required. The following cables are recommended for wiring the monitor with the power supply, signal cable and contact.

<Recommended Cables>

For AC power	Solid wire/stranded wire: 0.2 - 1.5 mm^2
For DC power	CVVS: 0.2 - 1.5 mm^2
For signal cable (4 - 20 mA/0 - 1 V)	CVVS: 0.2 - 1.5 mm^2
For contact	Cable such as CVV (0.2 - 1.5 mm^2) Up to 4 cores

CAUTION

- Be careful not to damage the internal electronic circuit when wiring. In addition, be careful not to apply stresses on the monitor when (overweight) cables are installed.
- The power and signal cables must be wired separately from the motor power cables.
- When stranded wires are used, prevent wires from contacting each other.

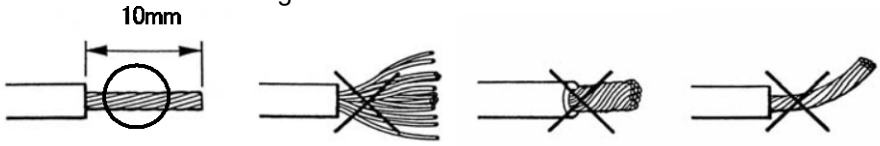
<Cable Connection Conditions>

Connectable cable, bare wire length and connection tools are as follows:
- Cable: 0.2 - 1.5 mm^2
- Bare wire length: 10 - 11 mm
- Connecting tools: Dedicated screwdrivers manufactured by WAGO and equivalent (edge width 3.0 to 4.5 mm x 0.5 mm)

CAUTION

When the wire insulation is peeled off, the bare wire length must be 10mm.

- Improper clamping of the wire due to a shorter bare wire length may cause defective electric conduction or heating.
- Catching the wire insulation due to a shorter bare wire length may cause defective electric conduction or heating.
- Exposing the wire due to a longer bare wire length may cause defective insulation or a short circuit.
- Be careful not to break up the wire. If the wire is broken up when inserted to the terminal, this may cause defective insulation or heating.



<Compatible Bar Terminal>

For a bar terminal, the following items are available.
- Bar terminal (ferrule): Model 216 Series (manufactured by WAGO)
- Crimping tool: Model VarioCrimp 4 (206-204) (manufactured by WAGO)

CAUTION

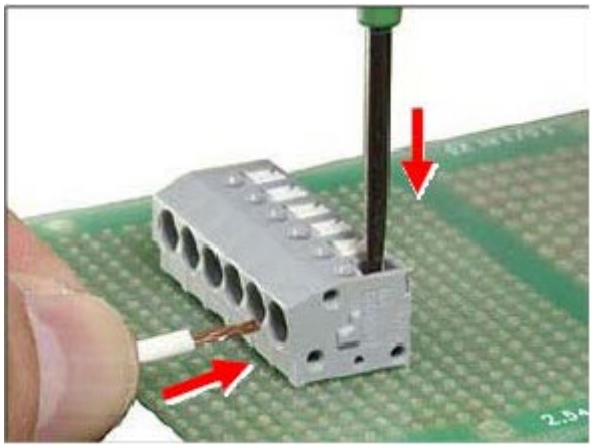
- A bar terminal of the specified model must be used. Using other bar terminals invalidates the warranty of the performance.

How to connect to terminal plate

When cables (wires) are connected to the terminal plate inside the main unit, use the dedicated screwdriver or a compatible flathead screwdriver.
When connecting a stranded wire, be sure to press the push button and open the spring while connecting the wire.

1 Push the push button straight downward using the compatible screwdriver or equivalent to open the spring.

2 Insert a wire with a specified bare wire length (10 mm) until the end of it reaches the deepest point.



3 Release the screwdriver.
The wire is connected.

CAUTION

- Always use the correct tool when wiring the instrument.
- Do not insert more than one wire into one wiring hole. If the total size (mm^2) of two or more wires is within the maximum wire connection range of the terminal plate, it may cause reduced spring clamping force, defective insulation due to clogged wire sheath, defective contact, or loose wires.

NOTE

<Compatible Screwdriver>

When opening the spring, use the compatible screwdriver manufactured by WAGO or equivalent (a screwdriver with an edge width of 3.0 to 4.5 mm x 0.5 mm which can fully open the spring: See the table below). In doing this work, be careful not to apply excessive force. Ignoring this may damage the housing/push buttons or cause the push buttons to break.

Compatible screwdriver manufactured by WAGO	
Screwdriver (M) straight type	210-120J
Screwdriver (M) straight type (short shaft & grip)	210-350/01 210-657
Screwdriver (M) straight type (insulated shaft type)	210-720

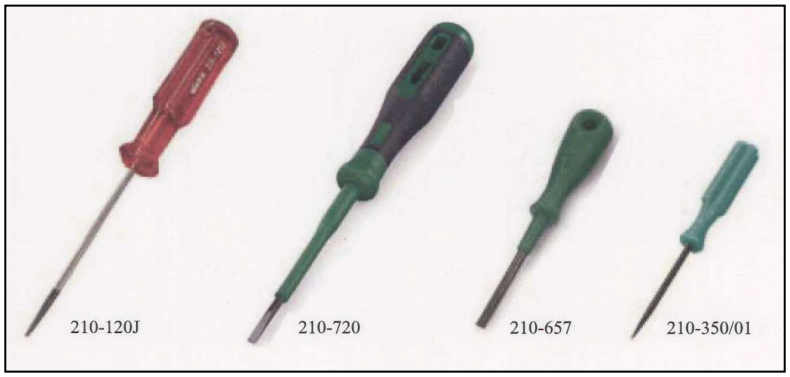
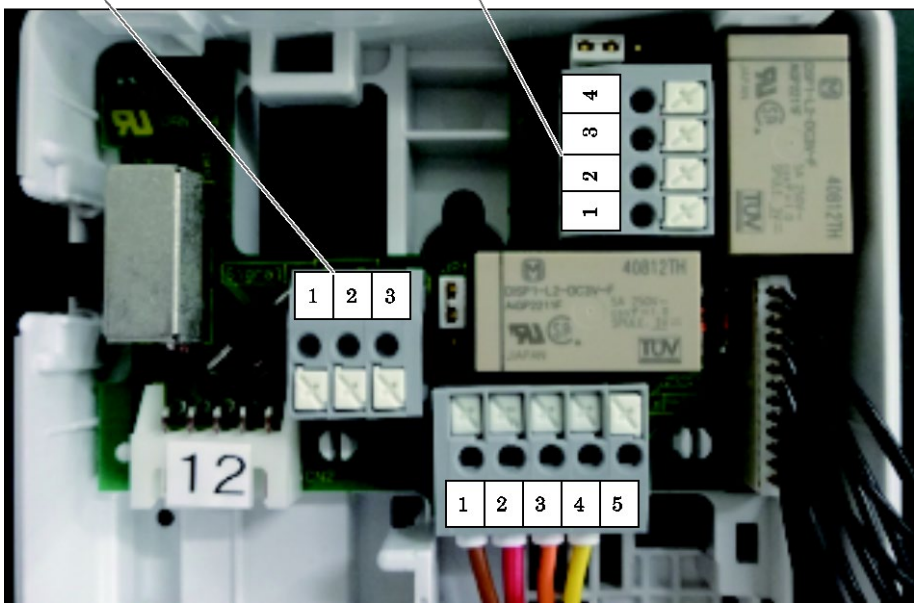


Figure of terminal plate

The overview of the terminal plate inside the main unit is as follows:

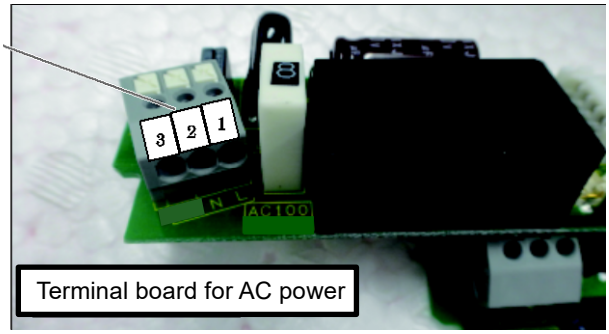
For external output signal
(4 - 20 mA/0 - 1 V) (TN2)
1: (+)
2: (-)

For contact (TN3)
1 - 2: ALM1 (First)
3 - 4: ALM2 (Second)



<For Connecting AC Power>

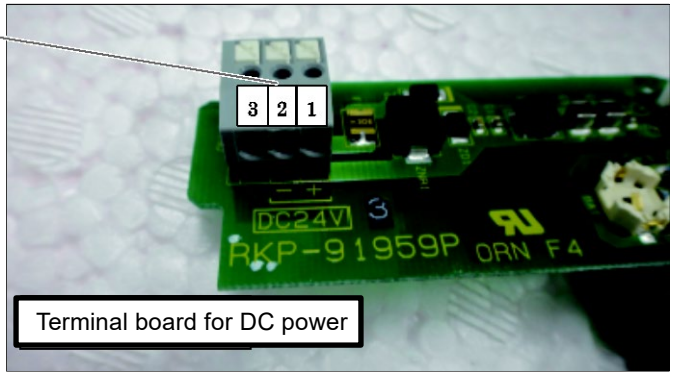
AC power (TND)
100 - 120 VAC ± 10% (50 Hz/60 Hz)
1: L
2: N
3: Not used



Terminal board for AC power

<For Connecting DC Power>

DC power (TND)
24 VDC ± 10%
1: (+)
2: (-)
3: N.C



Terminal board for DC power

5
How to Use

5-1. Before using the monitor

Users must follow the operating precautions. Ignoring the precautions may damage the monitor, resulting in inaccurate gas detection.

CAUTION

- After you have received the monitor, start using the monitor within the specified operation start limit of its sensor.

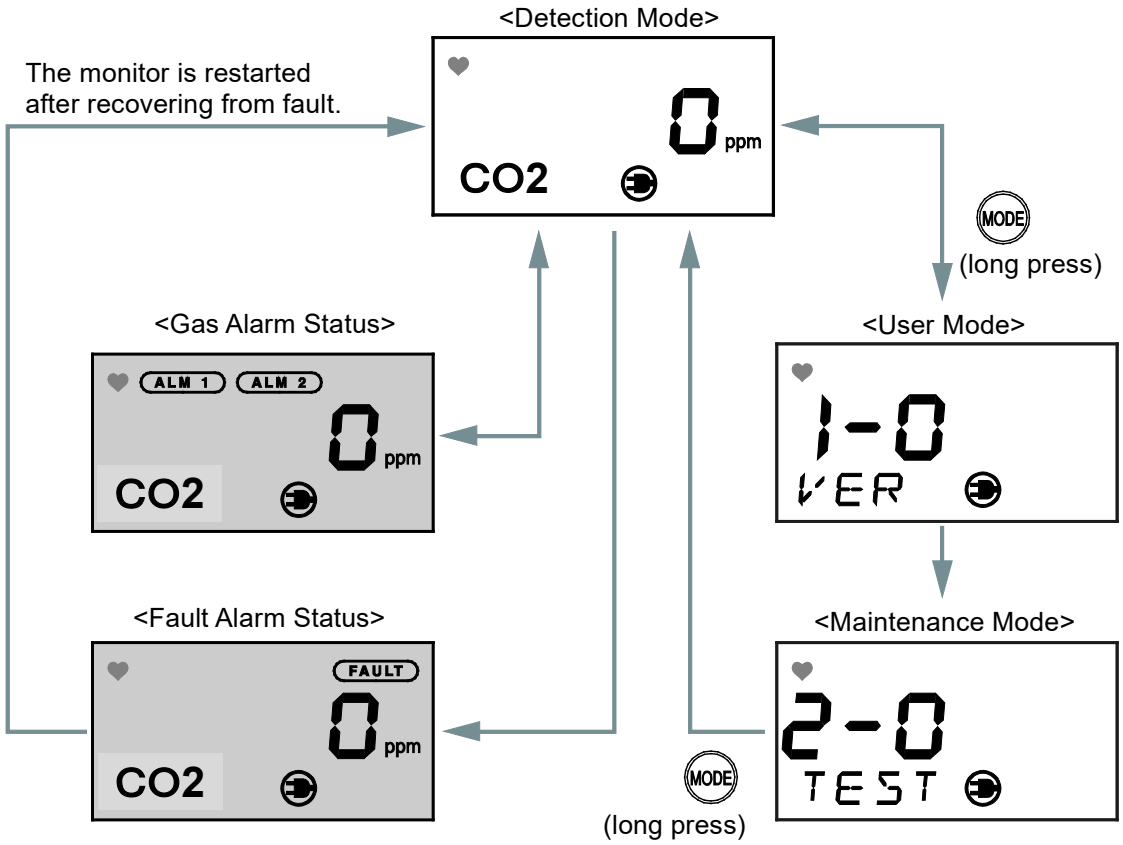
5-2. Preparation for start-up

Check the following points before monitoring for carbon dioxide.

- Before turning on the power, check that the monitor is installed properly and that the external wiring is done properly.
- Check that the power supply voltage is compliant with the specifications.
- Because the external contact may be activated during the adjustment, take measures to prevent an activated contact from affecting external circuits.

5-3. Basic operating procedures

Normally, the detection mode is activated after the power is turned on.

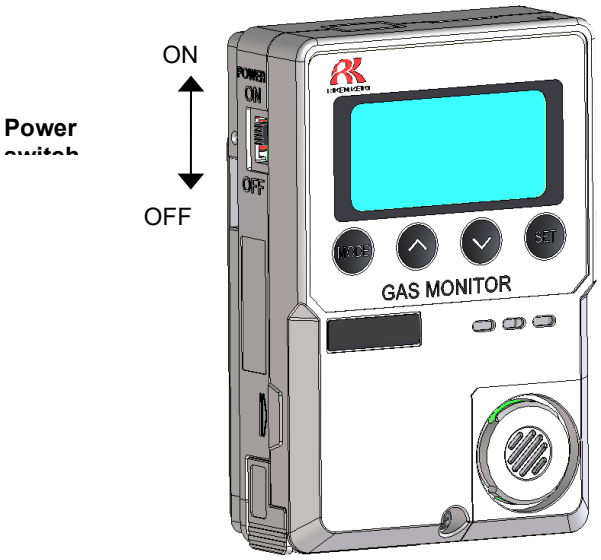


WARNING

- When the monitor enters each mode from the detection mode while an alarm is activated, the alarm contact is released.

5-4. Power-on

- Before turning on the power switch, check that the monitor is installed properly.
- Slide the power switch up to power on the monitor.
- After the monitor completes the start-up, it enters the detection mode.

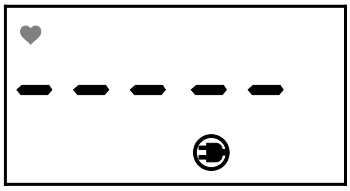


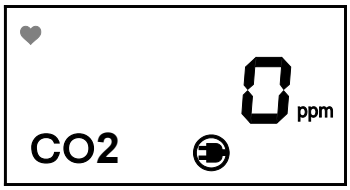
<Start-up Procedures (approximately 25 seconds for system check of the monitor and alarm deactivation)>

Power On

Initial clear
(approx. 25 seconds)

Detection mode





During initial clear
External output
4 - 20 mA: About 2.5 mA fixed
0 - 1 V: About 0 V fixed

CAUTION

- Do not turn off the monitor during the initial clear. If it is turned off during the initial clear and turned on again, abnormal operation may occur.
- After the initial clear, perform a calibration.
- In a normal air release environment, CO2 concentration is hundreds of ppm. Since the reading is not zero, even in the normal state, attention is paid.
- If there are many people and ventilation is insufficient in the area, CO_2 concentration may exceed 1000ppm (0.1 vol%).

5-5. Modes

Mode	Item	LCD display	Details
Detection mode	**—**	Gas concentration Gas name	Normal state
User Mode	**Version display**	1-0 VER	Indicate the program version.
	Fresh air adjustment	1-1 AIR	Not used.
	Setting display	1-2 CONF	Show the typical settings. 1-20: First Alarm Setpoint (ALM1) 1-21: Second Alarm Setpoint (ALM2) 1-22: Alarm Delay Time (DELY) 1-23: Zero Suppression Value (SUPP) 1-24: Not used (----) 1-26: Not used (----) 1-27: Alarm Summary (AL-S)
	Regular maintenance mode switching	1-3 MMOD	Switch to the regular maintenance mode.
Maintenance Mode	**Gas introduction display**	2-0 TEST	2-00: Gas Test (GAS) 2-01: Alarm Test (ALM) 2-02: Fault Alarm Test (FALT) 2-03: Display Test (LCD) 2-04: Not used (----)
	Zero adjustment	2-1 ZERO	Perform the zero adjustment.
	Span adjustment	2-2 SPAN	Perform the span adjustment.
	Zero/span initialization	2-3 SDEF	Not used.
	Environmental setting	2-4 SET	2-40: Not used (----) 2-41: Not used (----) 2-42: Alarm Value Setting (AL-P) 2-43: Alarm Delay Time Setting (AL-D) 2-44: Alarm Pattern Setting (AL-T) 2-45: Zero Suppression Type Setting (SP-T) 2-46: Zero Suppression Value Setting (SAPP) 2-47: Not used (----) 2-48: External Output Adjustment (MA20) 2-49: Not used (----) 2-4A: Date/Time Setting (DATE) 2-4b: Not used (----) 2-4C: Not used (----) 2-4d: Buzzer ON/OFF Setting (BZZR) 2-4E: Gas Alarm Contact ON/OFF (AL-R) 2-4F: External Output Signal ON/OFF (MA-O) 2-4H: LCD Backlight ON/OFF (LCD)
	Display	2-5 DISP	2-50: Not used (----) 2-51: Not used (----) 2-52: Calibration Curve Number Display (GSEL) 2-53: Fault Detail Display (FALT) 2-54: Not used (----)
	Factory mode switching	2-6 FMOD	Not used.
	User mode switching	2-7 UMOD	Return to the user mode.

5-6. User mode

WARNING

- After adjustment is completed, press the MODE button to return to detection mode. (The monitor automatically returns to detection mode in ten hours.)

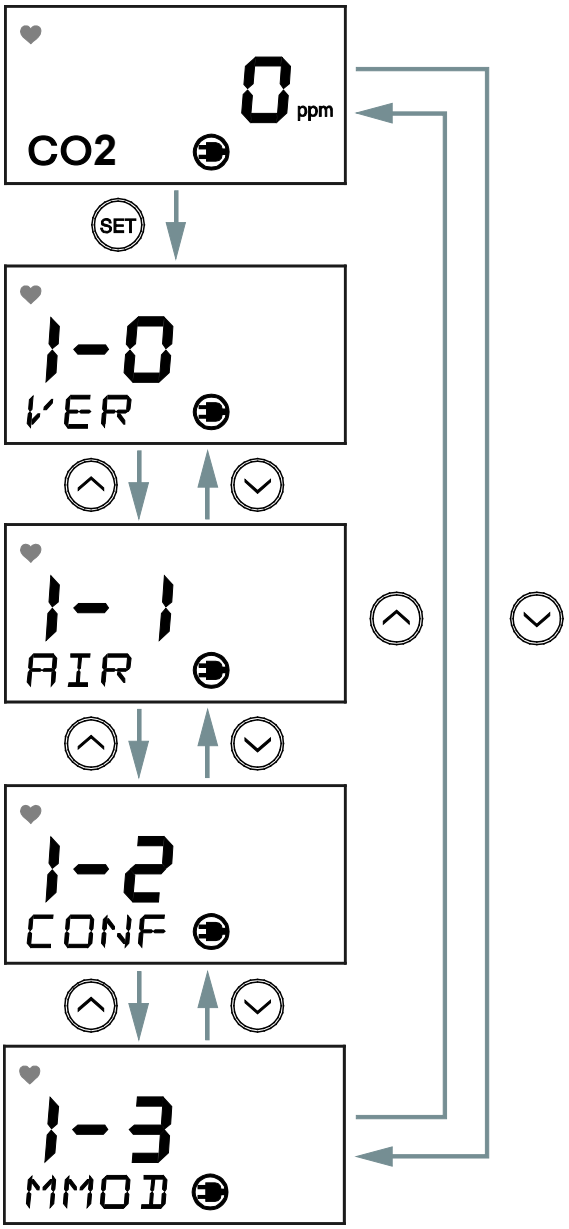
Detection mode
Press the MODE button for three seconds.

User mode
1-0. VER
Indicate the program version.

1-1. AIR
Not used.

1-2. CONF
Display various setting values.

1-3. MMOD
Switch to the regular maintenance mode.



<Setting Display "1-2">

This is used to check the setting of typical menus.

1-2. CONF
Press the SET button.

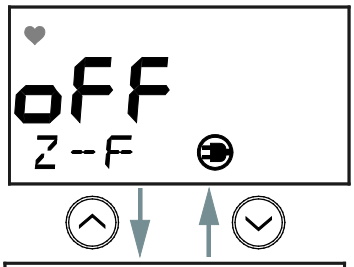
First Alarm Setpoint Display
Press the SET button to display the first alarm setpoint.

Second Alarm Setpoint Display

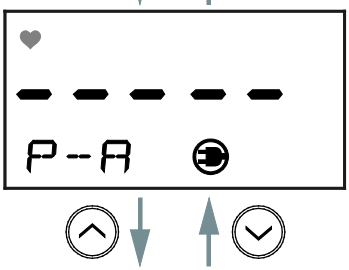
Alarm Delay Time Display (seconds)

Zero Suppression Value Display

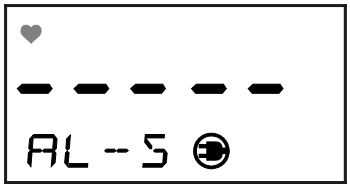
Zero Follower ON/OFF Display
Not used.



Air Pressure Correction ON/OFF Display
Not used.



Alarm Summary



5-7. Power-off

Slide the power switch down to power off.
After turning off the power switch of the monitor, turn off the power supply (100 VAC or 24 VDC) of the monitor.

CAUTION

- When the monitor is turned off, an alarm may be triggered on the upper (central) system. Before turning off the monitor, activate the inhibit (point skip) on the upper (central) system. Decide whether the power can be turned off by checking the operation of the devices connected to the external output or external contact output terminal of the monitor.

6
Alarm Activation and Functions

6-1. Gas alarm activation

A gas alarm is activated when detected gas concentration reaches the preset alarm setpoint.

NOTE

- The alarm setpoint (first alarm and second alarm) is factory-set. The setting values can be changed in the maintenance mode (P.30).
- Although the alarm delay time (standard: 2 seconds) prevents false alarm activation, the delay can be turned off in the maintenance mode (P.30).

Display operation

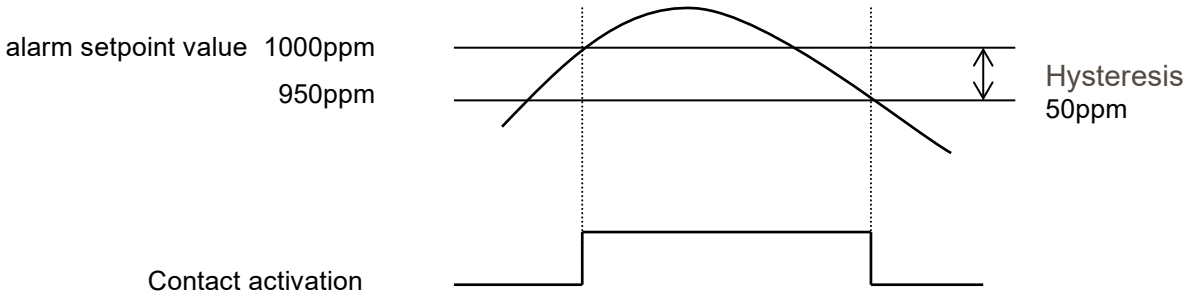
<Concentration Display>
In case of over the detection range (Over Scale), "∩∩∩∩" is displayed on the LCD.

<During Power-on>
The LCD is continuously displayed.

<Alarm Display (ALM1: Yellow Backlight), (ALM2: Red Backlight)>
The alarms have two levels. The yellow or red backlight lights up when the respective alarm setpoint value is reached to or exceeded. (Default: Backlight is off)

Contact activation

When gas concentration is at or above the alarm setpoint value, the contact is activated. After the gas concentration falls below the alarm setpoint value, the contact activation resets automatically.
Measuring ranges of 0-2000ppm / 0-5000ppm / 0-10000ppm have a 50 ppm hysteresis.



6-2. Fault alarm activation

A fault alarm is triggered when an abnormality is detected in the monitor. After a fault alarm is triggered, FAULT is displayed and the backlight (red) lights up on the LCD. An error message displays on the LCD. Determine the cause(s) and take appropriate actions.
After the monitor is successfully returned from the fault, it restarts and goes through an initial clear procedure.

If the monitor has problems and is repeatedly malfunctioning, contact RKI immediately.

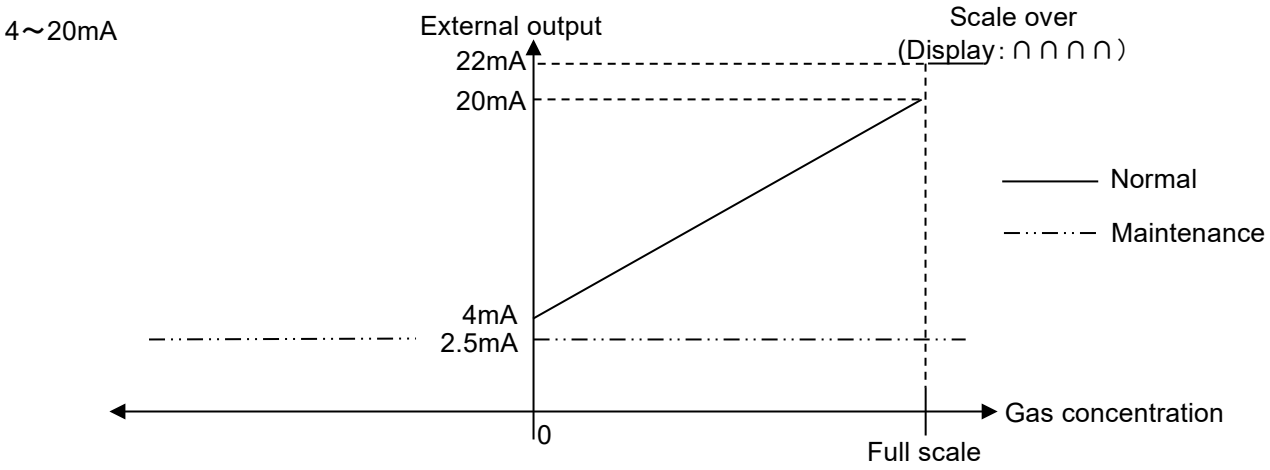
NOTE

- For information on malfunctions (error messages), see "Troubleshooting" (P.56).

6-3. External output operation

The monitor outputs an analog signal of 4 - 20 mA according to CO2 concentration display on the LCD

Gas concentration VS External output



< 4 - 20 mA Output Table>

Status	External output (4 - 20 mA)	Remarks
Initial	2.5mA	Fixed values
Normal	4.0～20.0mA	Depending on gas concentration
Scale over	22mA	Fixed values
Trouble	0.5mA	Fixed values
Maintenance mode menu	2.5mA	Fixed values
Air calibration	2.5mA	Fixed values
Alarm setpoint check	2.5mA	Fixed values
Alarm summary check	2.5mA	Fixed values
Date/time check and setting	2.5mA	Fixed values
Alarm test	4.0～20.0 mA	Depending on test value

6-4. Peak hold operation

The Peak hold function allows the user to check the highest CO2 reading since the last time the monitor was cleared.

1. While in detection mode, press the ∧ button to activate the Peak hold function.
2. Press the ∧ button to display the date and time of the Peak reading.
3. To return to detection mode, press the ∧ button.
4. To clear the last Peak value, hold the SET button for three seconds.

NOTE

- If you press MODE on either the Peak hold or date and time screen, the monitor will return to detection mode.
- The monitor will automatically switch from the Peak hold screen to the reading's date and time after 15 seconds, then return to detection mode after another 15 seconds.
- Depending on the age of the instrument, some RI-600s will not have Peak hold functionality.

7
Maintenance

The monitor is an important instrument for the purpose of safety. To maintain the performance of the monitor and improve the reliability of safety, perform a regular maintenance.

7-1. Maintenance intervals and items

This is a safety unit. Make sure to perform daily and regular maintenance before use.

- Daily maintenance: Perform maintenance before starting work each day.
- Regular maintenance: Perform maintenance once or more for every six months.

Maintenance item	Maintenance content	Daily maintenance	Regular maintenance
Power supply check	Check that the LCD display lights up.	○	○
Concentration display check	Check that the concentration display value does not become the abnormal concentration or abnormal variation. *The CO2 concentration is also present in the hundreds of ppm under the general air environment.	○	○
Alarm test	Inspect the alarm circuit by using the alarm test function.	–	○
Span Adjustment	Perform span adjustment using a calibration gas.	–	○
Gas alarm check	Check the gas alarm using a calibration gas.	–	○

WARNING

- If an abnormality is found in the monitor, contact RKI immediately.

7-2. Maintenance mode

The maintenance mode allows for checking the status of the monitor and adjusting and changing the settings.

WARNING

- When the adjustment is completed, press the MODE button to return to detection mode. The monitor automatically returns to detection mode after 10 hours.

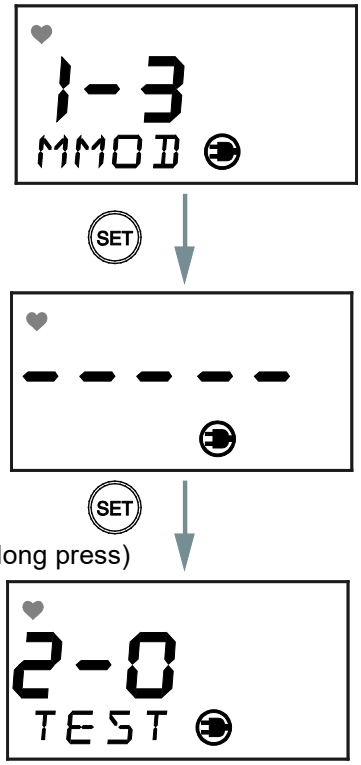
Item	LCD display	Details
Gas introduction display	2-0 GAS TEST	2-00: Gas Test 2-01: Alarm Test 2-02: Fault Alarm Test 2-03: Display test 2-04: Not used (----)
Zero adjustment	2-1 ZERO	Perform the zero adjustment.
Span adjustment	2-2 SPAN	Perform the span adjustment.
Zero/span initialization	2-3 SDEF	Not used.
Environmental setting	2-4 SET	2-40: Not used (----) 2-41: Not used (----) 2-42: Alarm Value Setting (AL-P) 2-43: Alarm Delay Time Setting (AL-D) 2-44: Not used (----) 2-45: Zero Suppression Type Setting (SP-T) 2-46: Zero Suppression Value Setting (SAPP) 2-47: Not used (----) 2-48: External Output Adjustment (MA20) 2-49: Not used (----) 2-4A: Date/Time Setting (DATE) 2-4b: Not used (----) 2-4C: Not used (----) 2-4d: Buzzer ON/OFF Setting (BZZR) 2-4E: Gas Alarm Contact ON/OFF (AL-R) 2-4F: External Output Signal ON/OFF 2-4H: LCD Backlight ON/OFF (LCD)
Display	2-5 DISP	2-50 : Not used (----) 2-51 : Not used (----) 2-52 : Calibration Curve Number Display (GSEL) 2-53 : Fault Detail Display (FALT) 2-54 : Not used (----)
Factory mode switching	2-6 F MODE	Not used.
User mode switching	2-7 U MODE	Return to the user mode.

<Entering Maintenance Mode>

From measuring mode, press and hold the MODE button for 3 seconds.

Press the ∧ button until the “1-3 MMOD” screen appears.

Press the SET button in "1-3. M MOD".

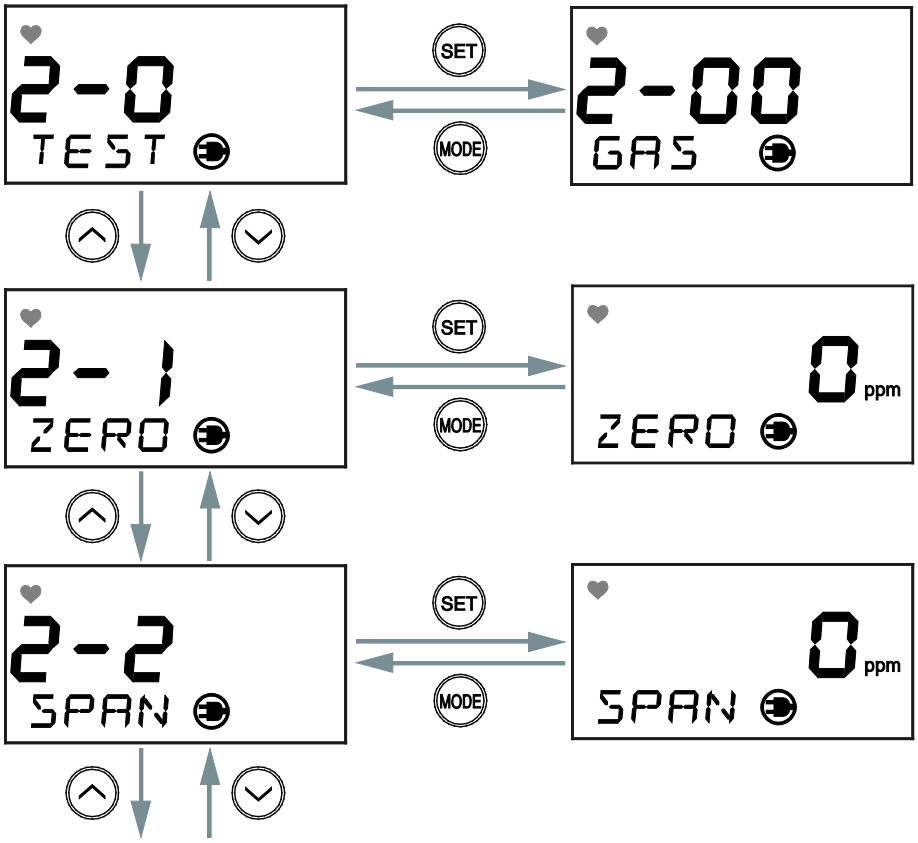


Then press the SET button again for three seconds.

2-0. GAS TEST
Perform a test with the gas.
Similar to the detection condition, the reading changes and an alarm is displayed after gas is introduced, but the “ALM1” and “ALM2” do not flash and the contact is not activated.

2-1. ZERO
Perform the zero adjustment.

2-2. SPAN
Perform the span adjustment.



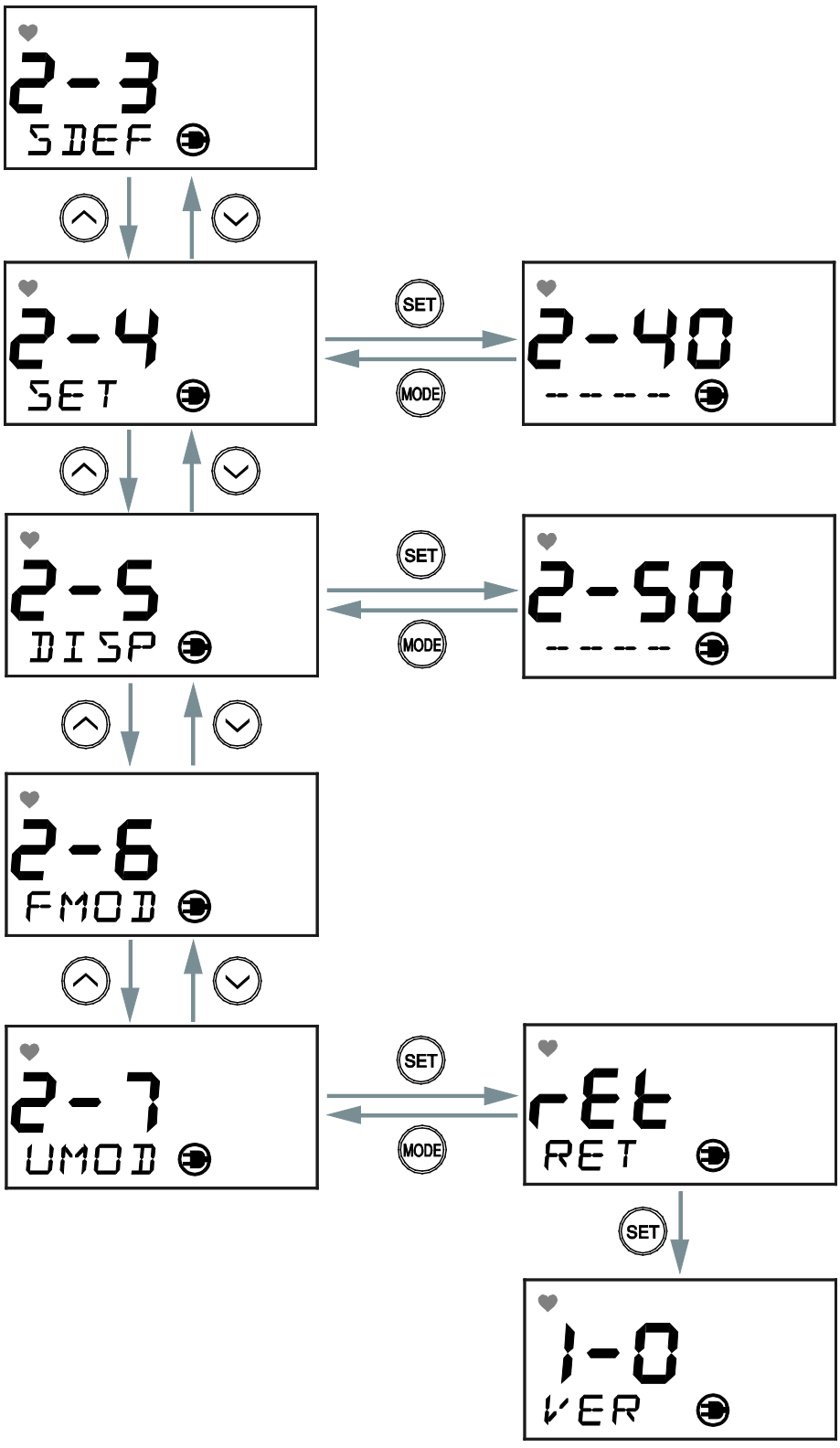
2-3. SDEF
Not used.

2-4. SET
Specify various settings.

2-5. DISP
Provide various detail displays.

2-6. F MODE
Not used.

2-7. U MODE
Return to the user mode.



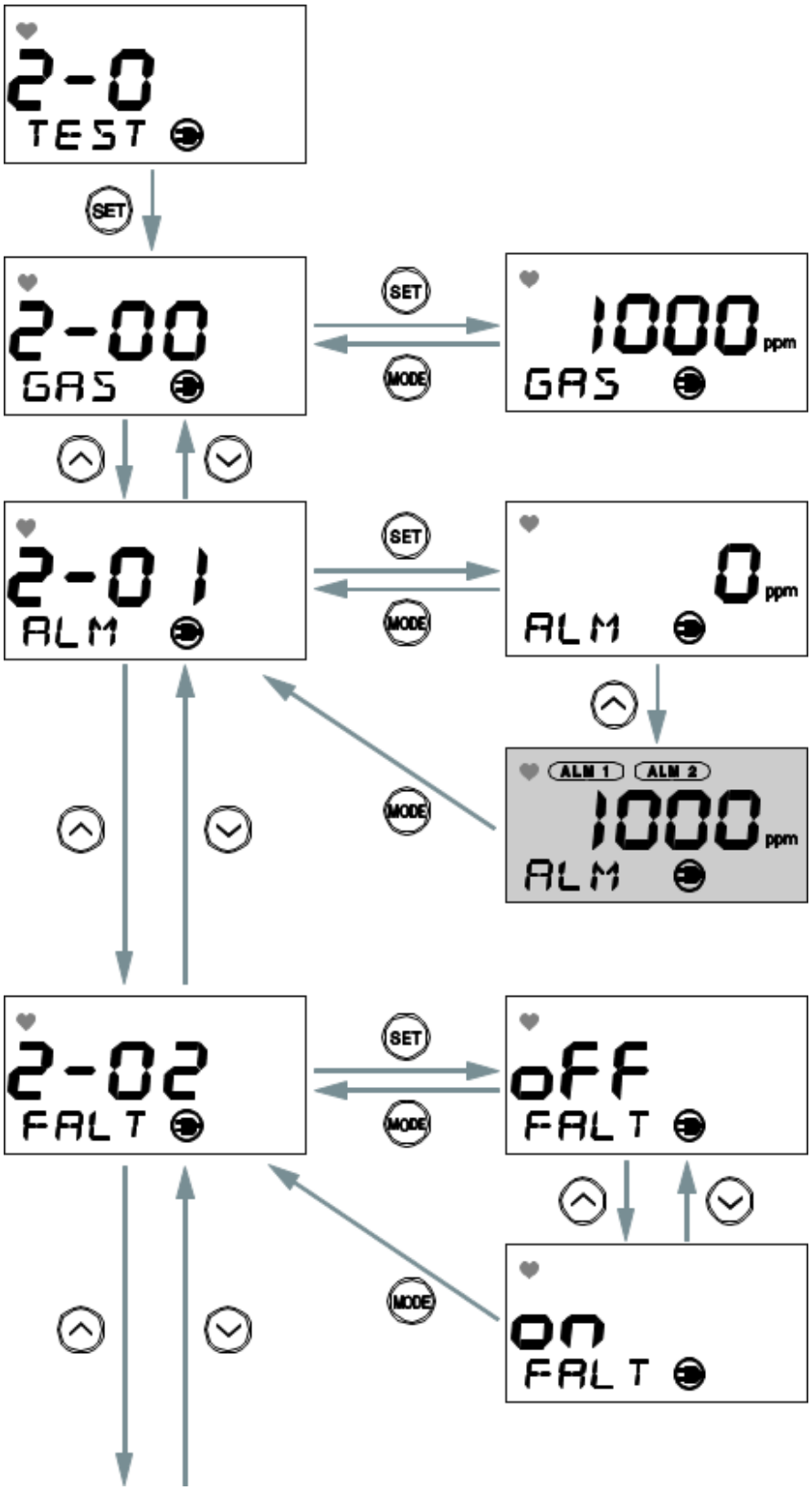
<Test Functions>

2-0. GAS TEST
Perform a test with the gas.
Similar to the detection mode, the reading changes and an alarm is displayed after the gas is introduced, but the contact is not activated.

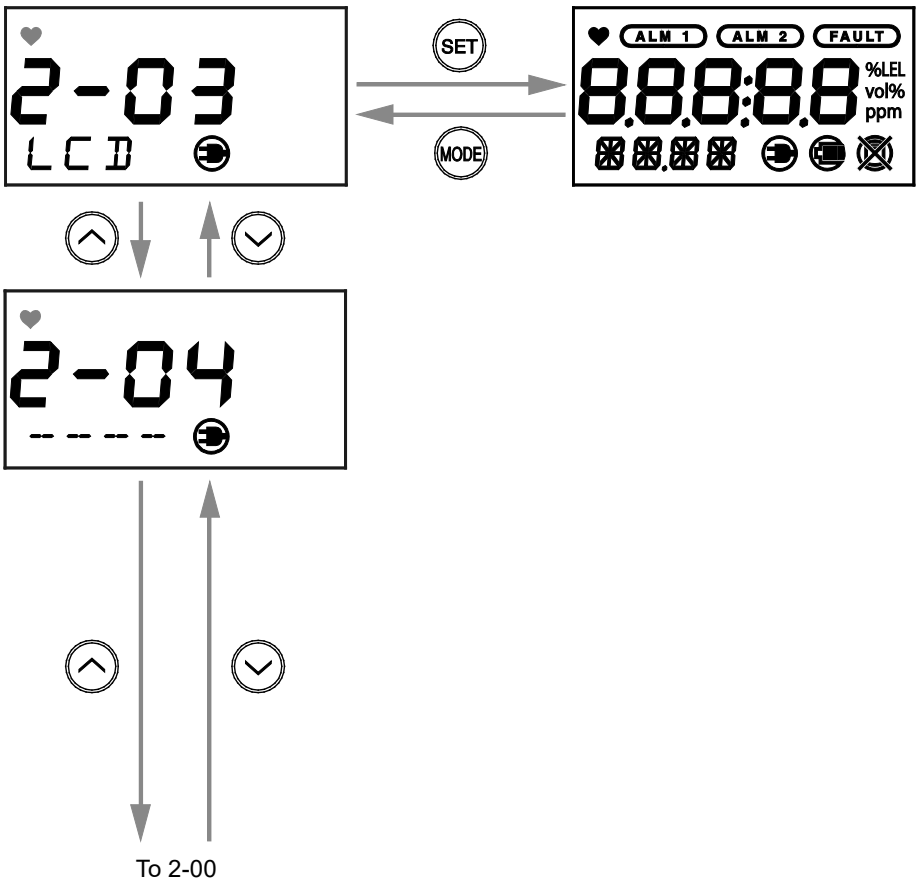
2-00. GAS
Perform the gas test.

2-01. ALM
Perform the alarm test.
Use the ∧ button to increase the display value to the alarm setpoint to trigger an alarm.

2-02. FALT
Conduct a fault alarm test.
Use the ∧ or ∨ button to enable the function to trigger an alarm.



2-03. LCD
Perform the LCD display test.



2-04.
Not used.

7-3. Preparing for a Zero and Span Adjustment

Perform a zero and span adjustment on the sensor using a calibration gas at least every 6 months. The zero and span adjustment requires dedicated equipment and calibration gas.

Materials

・Calibration cup

・0.5 LPM fixed flow regulator

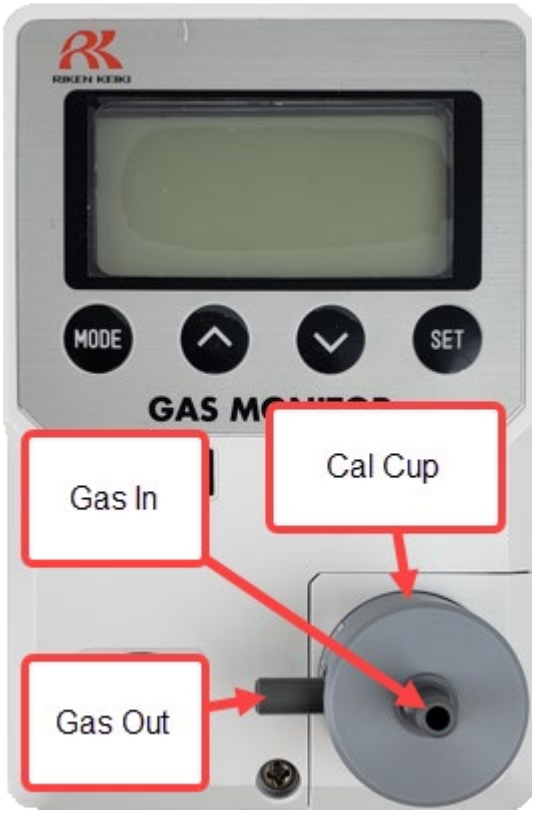
・Sample tubing

・100% N2 calibration cylinder (since there is a background of CO2 in fresh air, fresh air cannot be used to perform a zero adjustment and 100% N2 must be used instead)

・CO2 calibration cylinder with a concentration near 50% of the full scale

Procedure

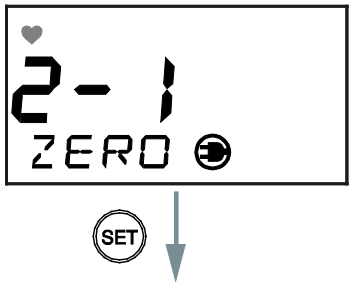
1. Screw the fixed flow regulator into the calibration cylinder.
2. Use the calibration tubing to connect the regulator to the calibration cup's inlet.
3. Attach the calibration cup to the RI-600.



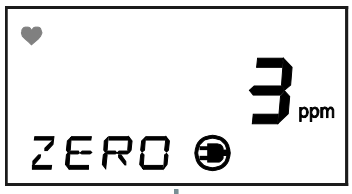
7-4. Performing a Zero Adjustment

2-1. ZERO
Navigate to the zero adjustment menu item in Maintenance Mode (see page 31).

Press the SET button.

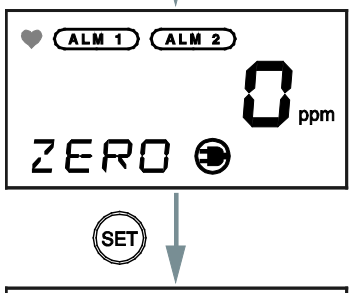


The current concentration is displayed.

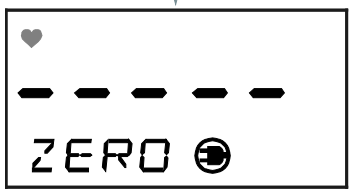


Turn the regulator's knob counterclockwise to open the regulator.

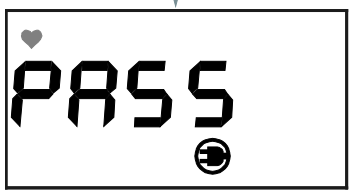
Allow the N2 gas to flow for 2 minutes.



Press the SET button.

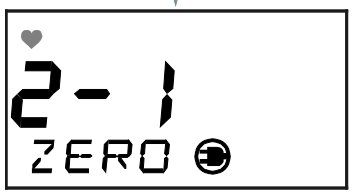


"PASS" appears when the adjustment is successful. "FAIL" appears when the adjustment fails.



Zero adjustment will end.

Turn the regulator's knob clockwise to close it.



7-5. Performing a Span Adjustment

2-2. SPAN
Navigate to the span adjustment menu item in Maintenance Mode (see page 31).

Press the SET button.

The current concentration is displayed.

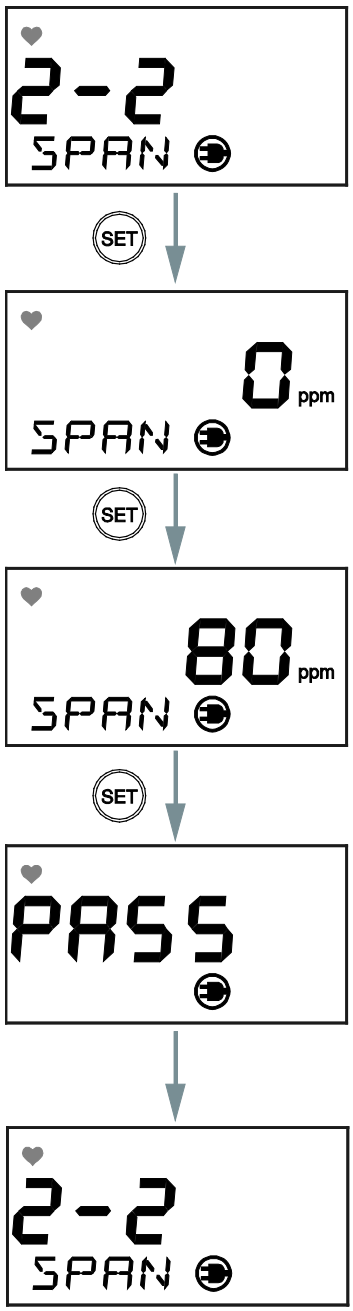
Turn the regulator's knob counterclockwise to open it. Allow gas to flow for 2 minutes.

Use the ∧ or ∨ button to adjust the reading to the span adjustment gas concentration and press the SET button.

"PASS" appears if the adjustment is successful. "FAIL" appears if the adjustment fails.

Span adjustment will end.

Turn the regulator's knob clockwise to close it.



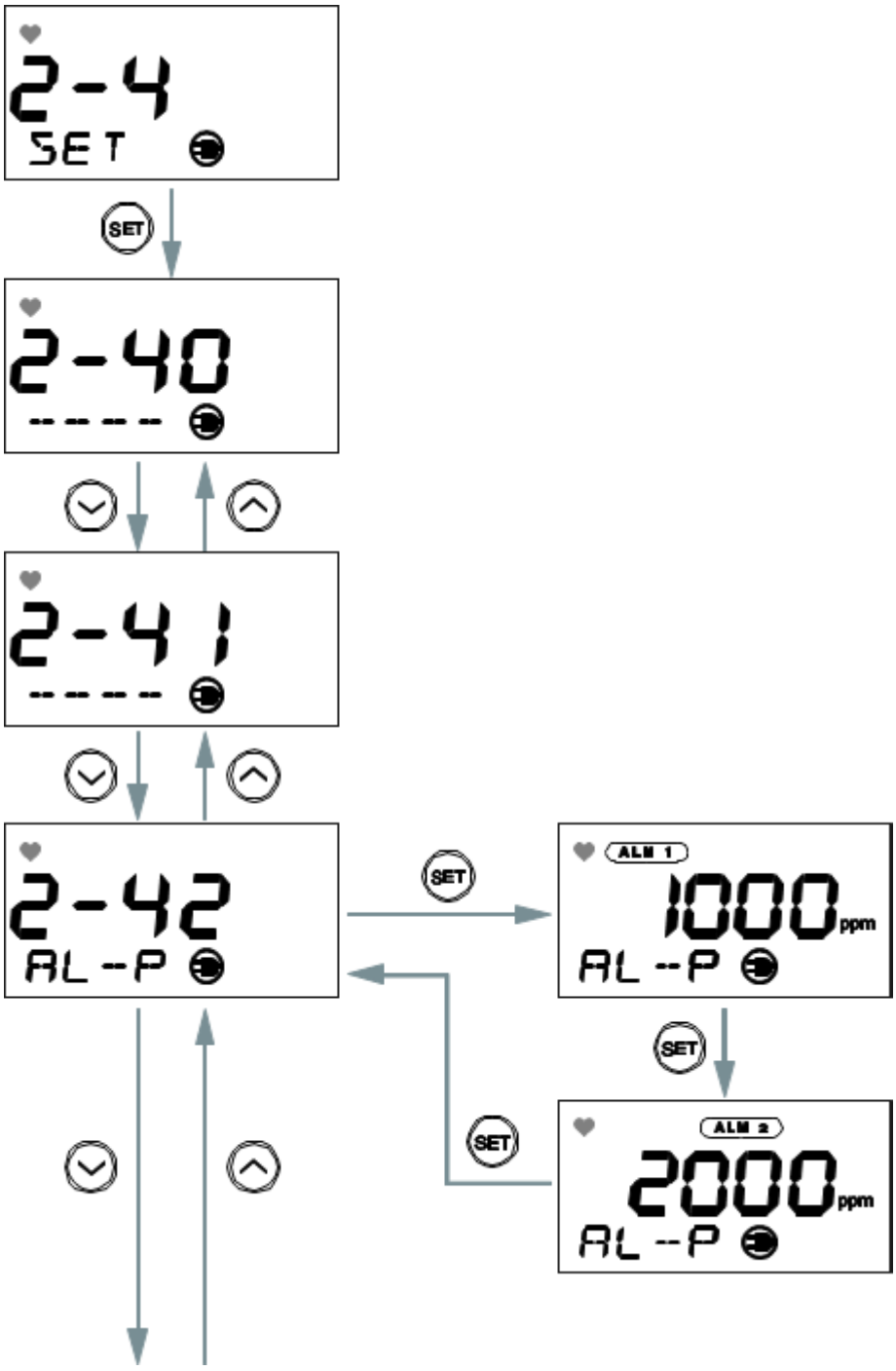
7-6. Environmental Setting

2-4. SET
Specify various settings.

2-40.
Not used.

2-41.
Not used.

2-42. AL-P
Set the alarm setpoint (first, second).
Use the ∧ or ∨ button to set the alarm setpoint and press the SET button to confirm it.

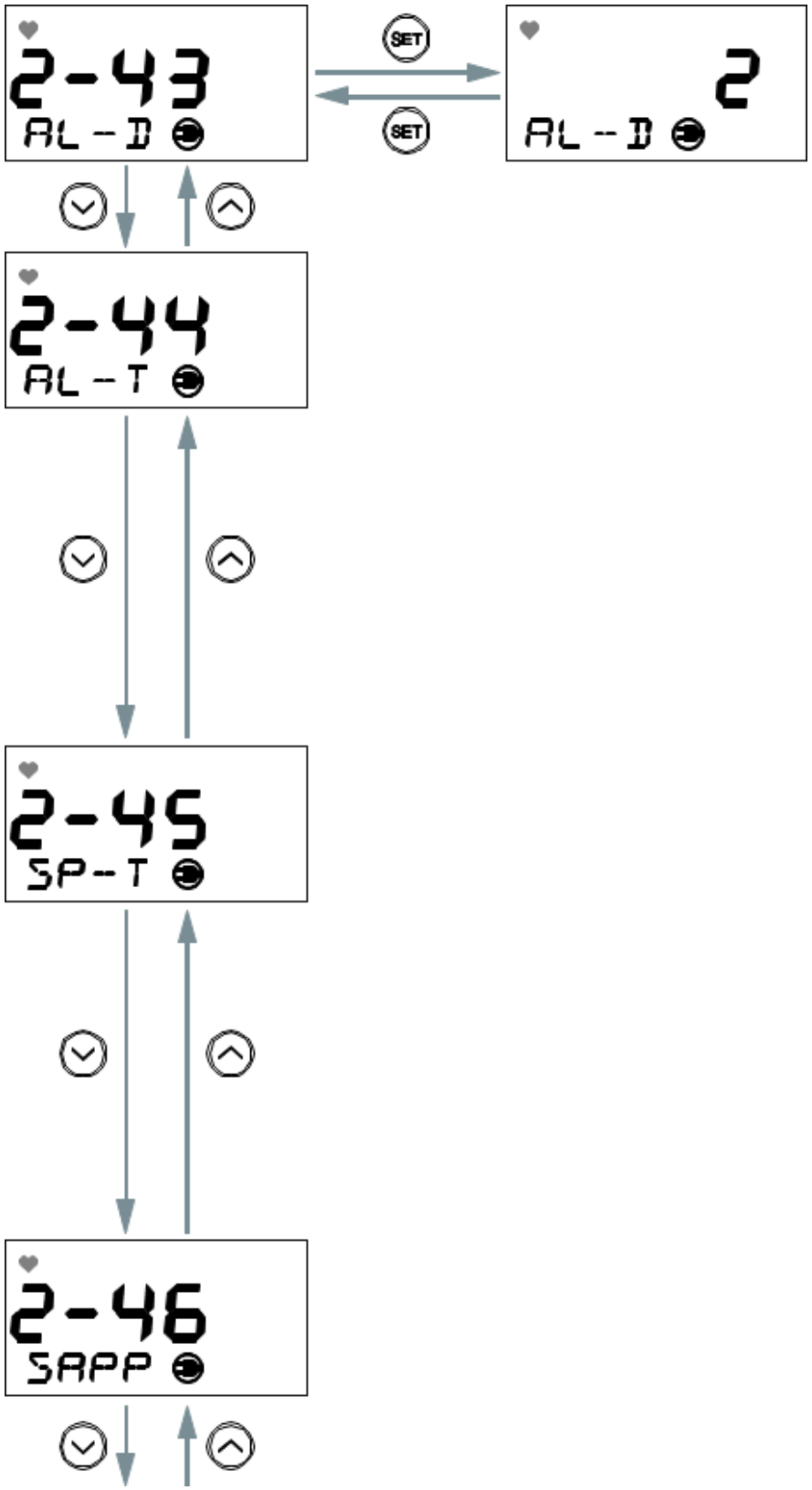


2-43. AL-D
Set the alarm delay time (seconds).
Use the ∧ or ∨ button to set the time (seconds) and press the SET button to confirm it.

2-44. AL-T
Not used.

2-45. SP-T
Not used.

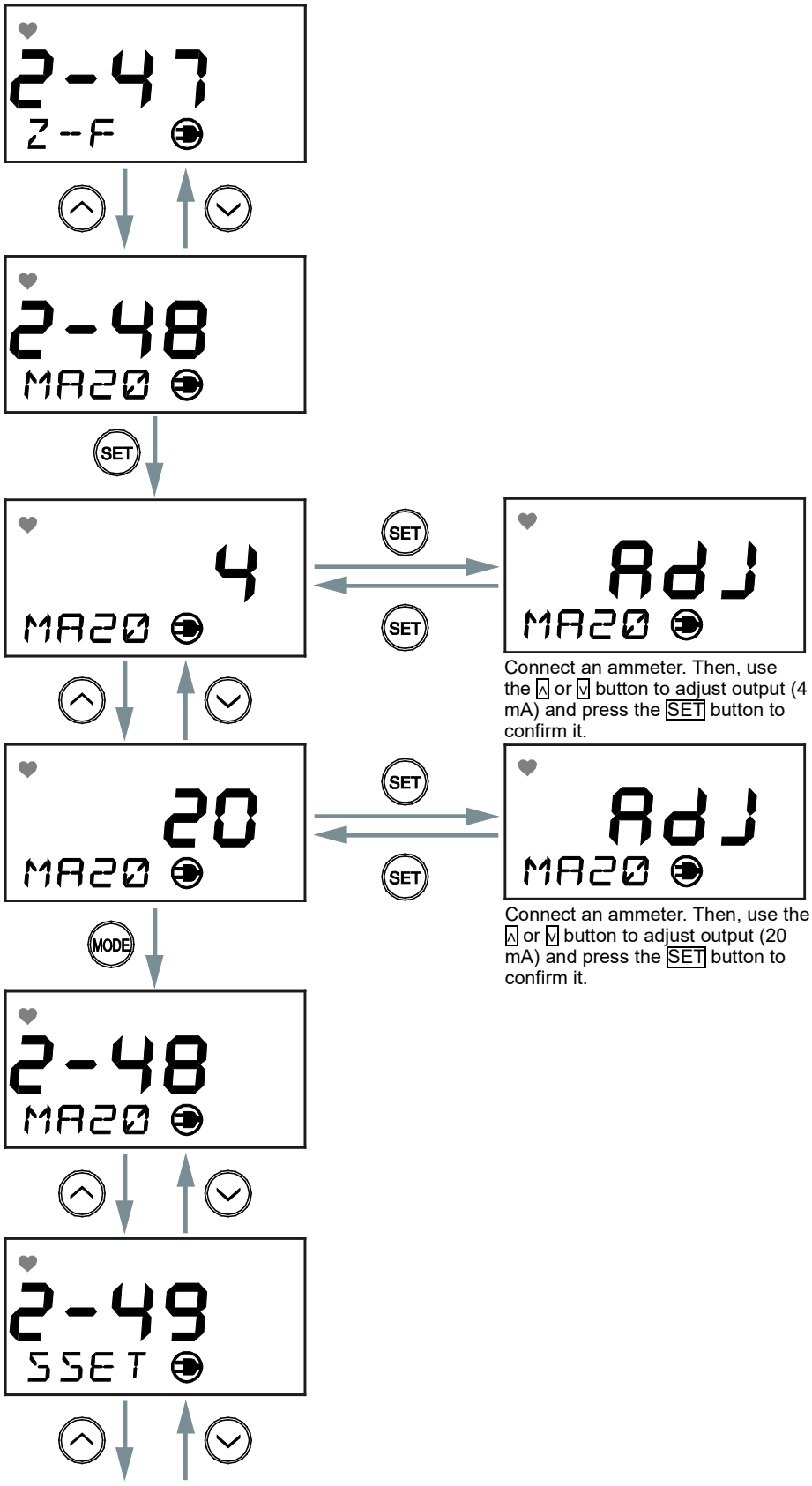
2-46. SAPP
S Not used.



2-47.
Not used.

2-48. MA20
Adjust the external output (4 mA, 20 mA). Connect an ammeter. Then, use the ∧ or ∨ button to select the value and press the SET button to confirm it.

2-48. MA20
Adjust the external output (4 mA, 20 mA). Connect an ammeter. Then, use the ∧ or ∨ button to select the value and press the SET button to confirm it.

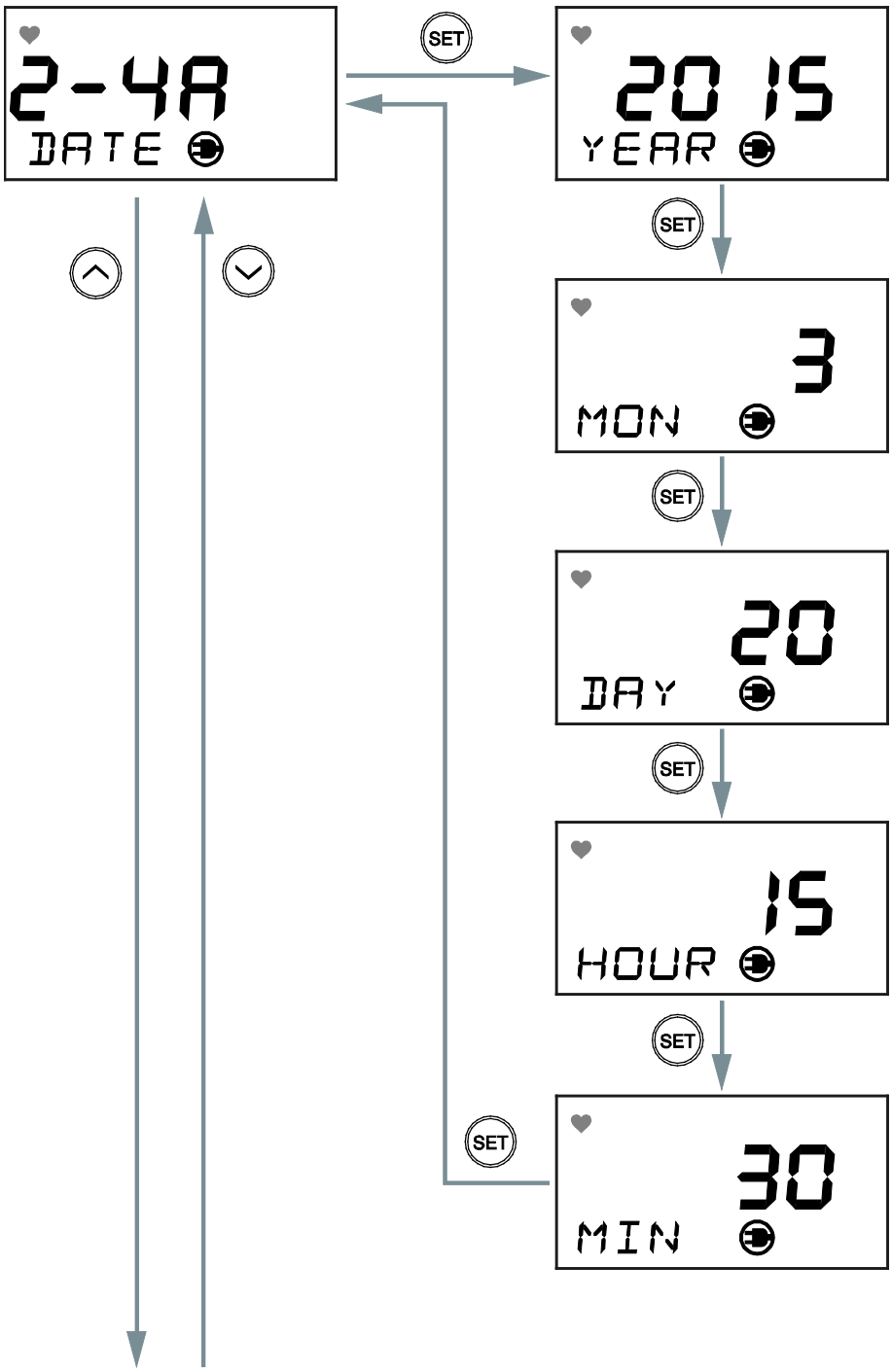


Connect an ammeter. Then, use the ∧ or ∨ button to adjust output (4 mA) and press the SET button to confirm it.

Connect an ammeter. Then, use the ∧ or ∨ button to adjust output (20 mA) and press the SET button to confirm it.

2-49. SSET
Not used.

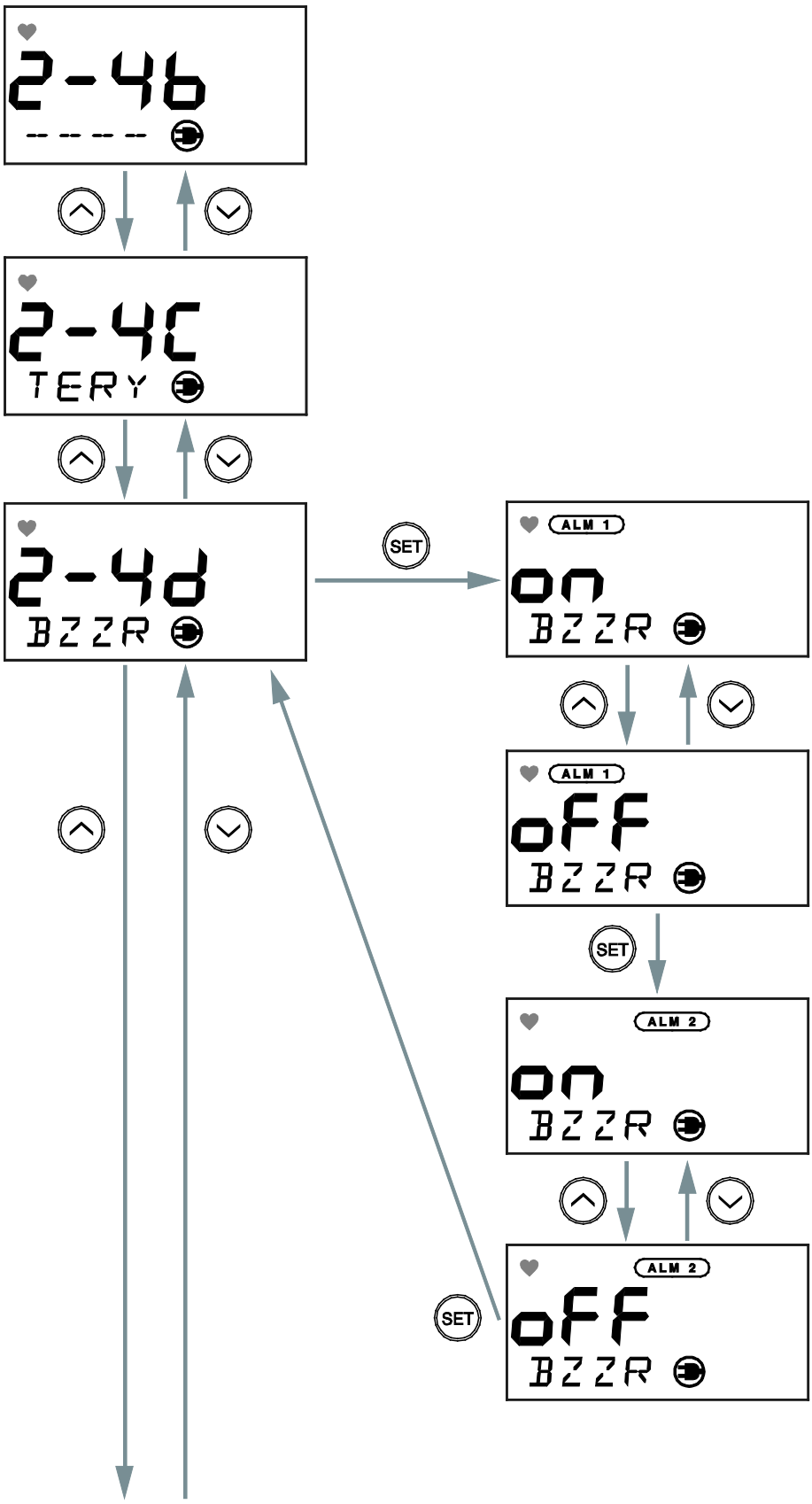
2-4A. DATE
Set the date/time.
Use the ∧ or ∨ button to select each value in the order of year, month, day, hour and minute and press the SET button to confirm it.



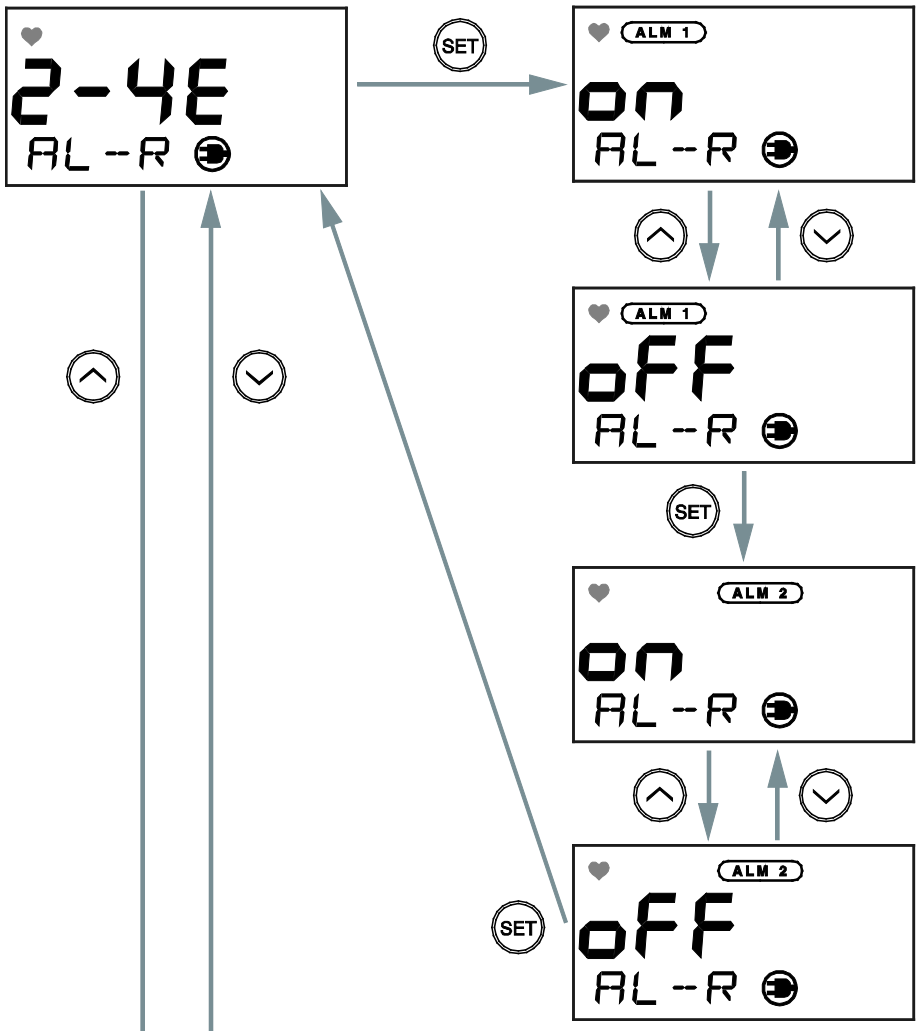
2-4b. P-A
Not used.

2-4C. ACAL
Not used.

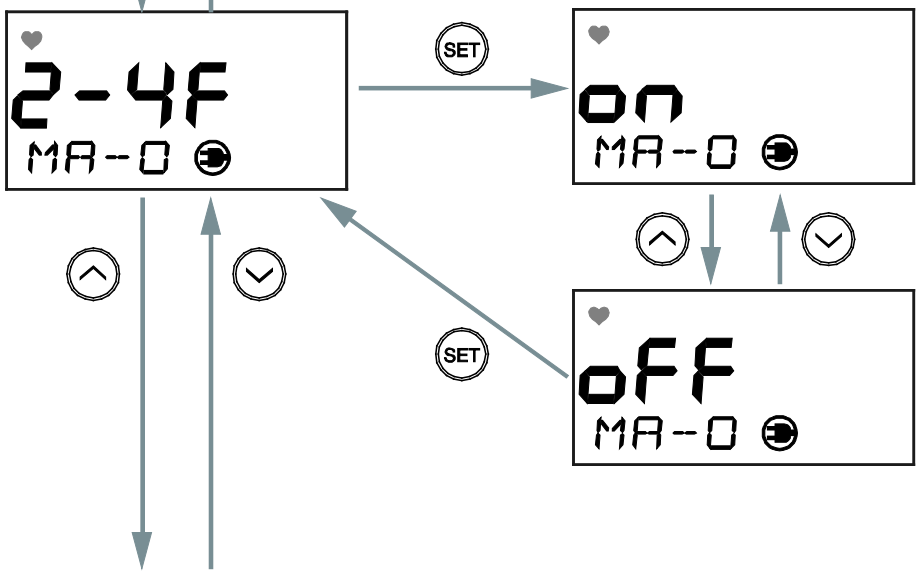
2-4d. BZZR
Set the buzzer to ON/OFF.



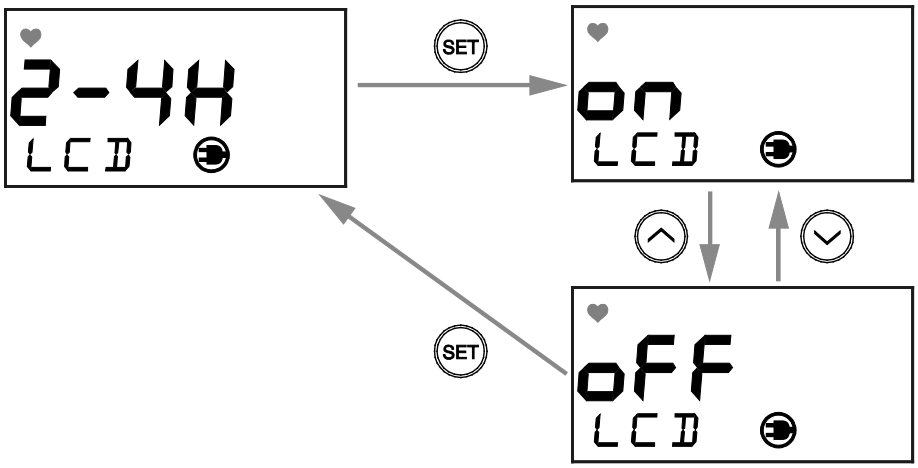
2-4E. AL-R
Set the gas alarm state contact to ON/OFF.



2-4F. MA-O
Set the external output signal to ON/OFF.



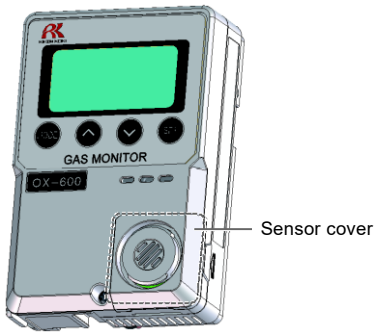
2-4H. LCD
Set the LCD backlight to ON/OFF.
*No backlight by standard setting



7-7. Component Replacement

<Replacing the Sensor (Integrated Sensor Type)>

1 **Remove the sensor cover of the sensor part.**



2 **Insert a coin straight to the recessed area at the lower right of the monitor to release the sensor cover's latch.**

3 **Remove the sensor cover.**

4 **Remove the old sensor.**

5 **Install the new sensor.**
Be sure the sensor pins are lined up with the board's sockets.

6 **Put the sensor cover back on.**

CAUTION

- When installing the sensor, be sure the pins are lined up with the sockets before pushing in the sensor. Ignoring this may bend and damage the sensor pins.
- After the sensor is installed, always perform a calibration (zero adjustment and span adjustment).
- Do not disassemble the sensor because it contains electrolyte. If contact occurs, rinse the area immediately with a large quantity of water.
- The sensor must be stored under normal temperature/humidity in a clean place away from direct sunlight.

<Replacing the Sensor (Remote Sensor Type)>

1 **Remove the sensor cover of the sensor unit.**
Push the tabs on the both sides with your fingers to release the sensor cover latch.

Remove the sensor cover to check the sensor.

2 **Remove the old sensor.**

3 **Install the new sensor.**
Be sure the sensor's pins are lined up with the board's sockets.

4 **Put the sensor cover back on.**

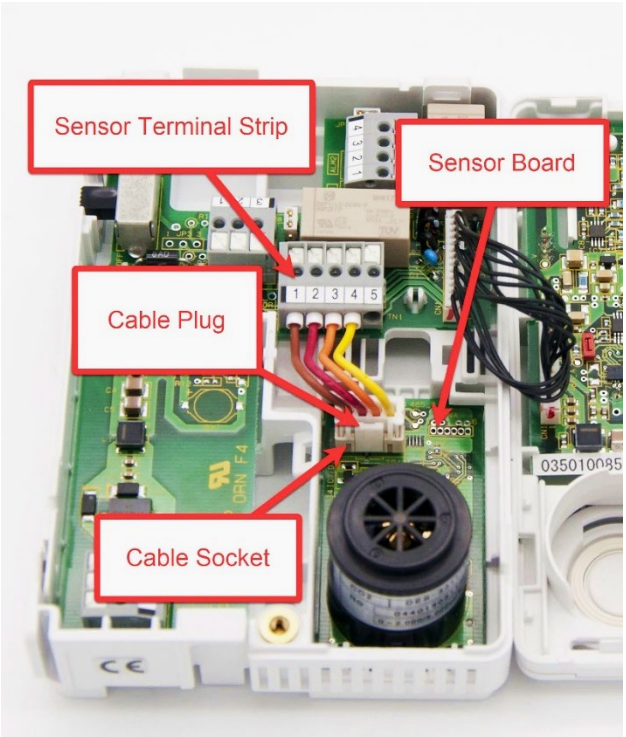
7-9. Adding a Remote Sensor Cable

NOTE

- The wire colors in the extender cable may vary depending on the type of cable used. The Type A cable has red/green/white/black wires, and the Type B cable has white/yellow/white/blue wires. The pictures in this section show the Type A cable.

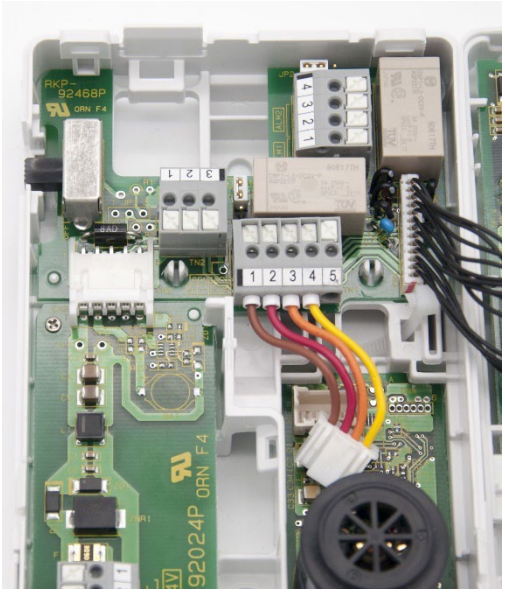
1 **Turn off or disconnect power to the RI-600.**

2 **Remove the top half of the main unit's housing.**



3 **Remove the cable plug from the cable socket on the sensor board.**

Press the tab on the plug to release it and pull it away from the socket.

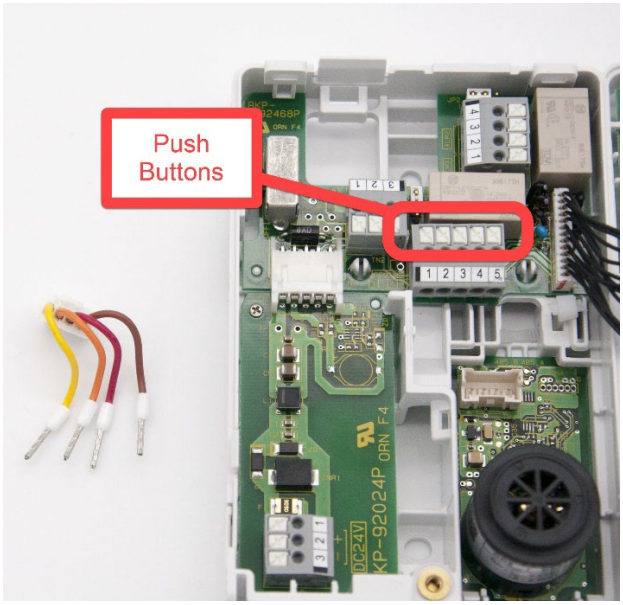


4 **Unplug the wires from the sensor terminal strip.**

For each terminal strip position:

- Push the pushbutton straight downward using the compatible screwdriver or equivalent to open the spring.
- Remove the wire.
- Release the screwdriver.

The cable connector with the short length of wires will not be needed once the cable is installed.

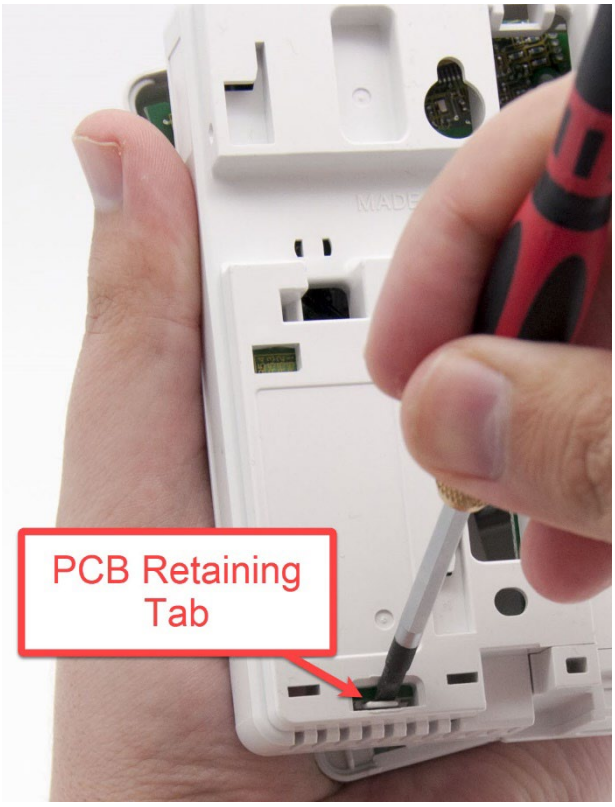


5 **Remove the sensor from the sensor board.**

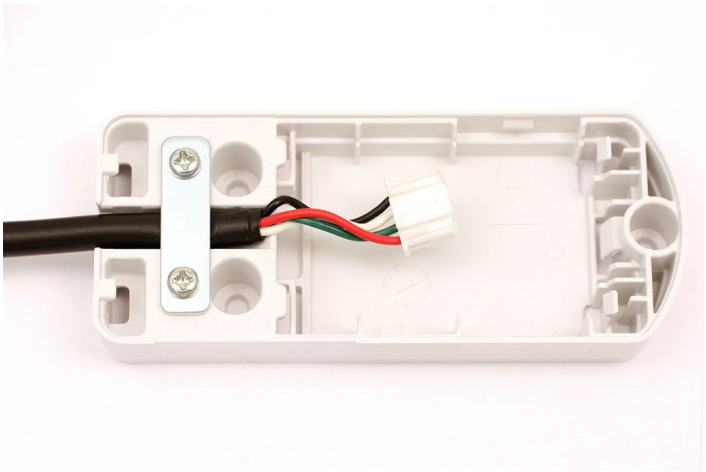
6 **To remove the sensor board, insert a compatible screwdriver into the back of the RI-600 housing as shown in the figure to the right.**

Press down on the PCB retaining tab.

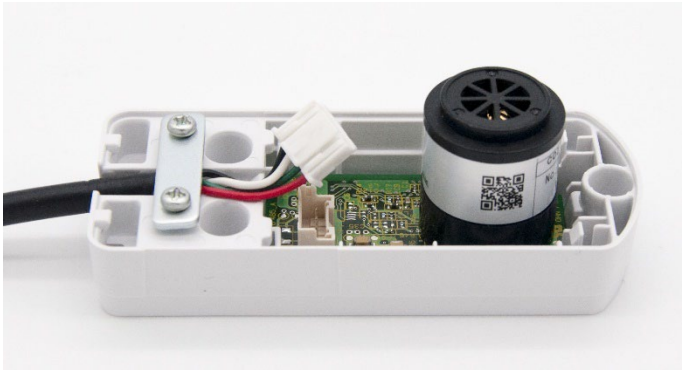
The sensor board should fall out when the retaining tab is pushed down.



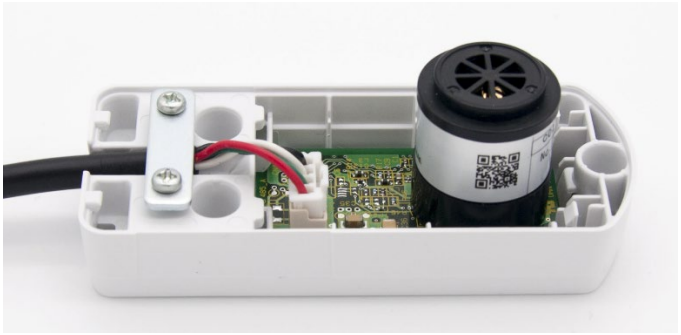
7 **Remove the sensor cover of the cable's remote sensor housing.**
Push the tabs on both sides of the sensor cover with your fingers to release the sensor cover latch.



8 **Install the sensor board. The board will click into place. Place the sensor back into the sensor board.**

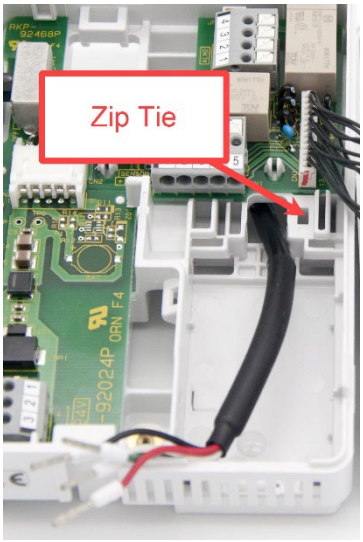


8 **Connect the cable plug into the sensor board.**



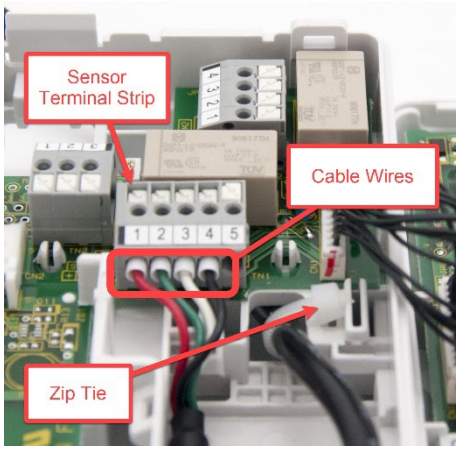
9 **Secure the sensor cover of the new cable's remote sensor housing.**

10 **Route the new remote cable's wiring through the hole in the housing to the right of the sensor terminal strip and install a zip tie in the case and around the cable as shown in the image to the right, but do not tighten it yet.**



11 **Using the terminal pushbuttons, connect the cable's wires to the sensor terminal strip. See the table below for the wire colors. Type A wire colors are shown in the figure to the right. Note that the Type B cable has two pairs of wires extending from the cable.**

Tighten the zip tie to secure the cable in place.



	Terminal 1	Terminal 2	Terminal 3	Terminal 4
Type A	Red	Green	White	Black
Type B	White wire of white/yellow pair	Yellow wire of white/yellow pair	White wire of white/blue pair	Blue wire of white/blue pair

12 **Secure the top half of the main unit's housing to the bottom half.**

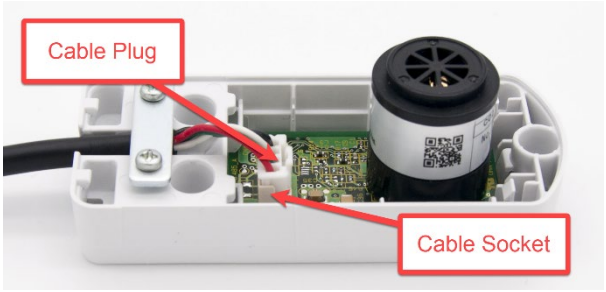
7-10. Replacing a Remote Sensor Cable

NOTE

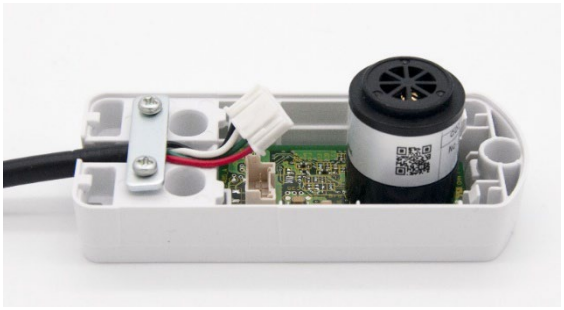
- The wire colors in the extender cable may vary depending on the type of cable used. The Type A cable has red/green/white/black wires, and the Type B cable has white/yellow/white/blue wires. The pictures in this section show the Type A cable.

1 **Turn off or disconnect power to the RI-600.**

2 **Remove the sensor cover of the old cable's remote sensor housing.**
Push the tabs on both sides of the sensor cover with your fingers to release the sensor cover latch.



3 **Remove the cable plug from the cable socket on the sensor board.**
Press the tab on the plug to release it and pull it away from the socket.



4 **Remove the sensor from the sensor board and set it aside.**

5 **To remove the sensor board, insert a flathead screwdriver into the back of the extender housing as shown in the figure to the right.**

Push on the retaining tab.

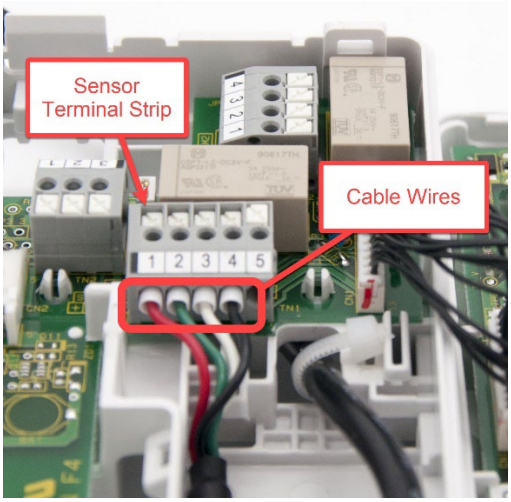
The sensor board should fall out when the retaining tab is pushed.

6 **Remove the top half of the main unit's housing to access the wiring at the other end of the cable.**

7 **Remove the old cable's wiring leads from the sensor terminal strip.**

For each terminal strip position:

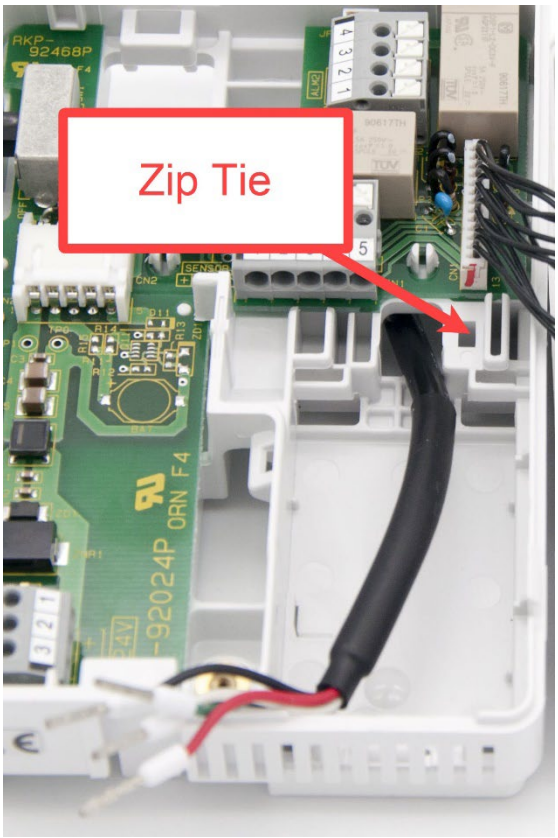
- Push the push button straight downward using the compatible screwdriver or equivalent to open the spring.
- Remove the wire.
- Release the screwdriver.



8 **Carefully cut the zip tie and pull the old cable out of the housing.**

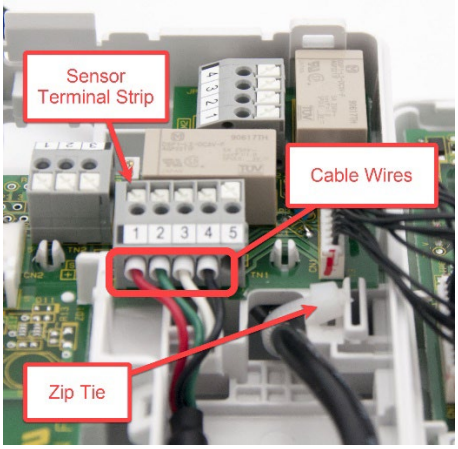
9 **Route the new cable's wires through the hole in the housing to the right of the sensor terminal strip.**

Install a zip tie in the case and around the cable as shown in the image to the right, but do not tighten the zip tie yet.



10 **Connect the cable's wires to the sensor terminal strip. See the table below for the wire colors. Type A wire colors are shown in the image to the right.**

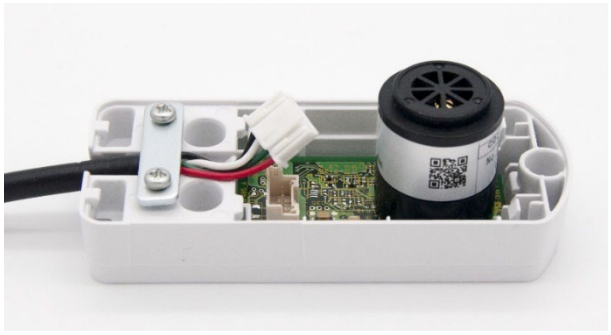
Note that the Type B cable has two pairs of wires extending from the cable. Tighten the zip tie to secure the cable in place.



	Terminal 1	Terminal 2	Terminal 3	Terminal 4
Type A	Red	Green	White	Black
Type B	White wire of white/yellow pair	Yellow wire of white/yellow pair	White wire of white/blue pair	Blue wire of white/blue pair

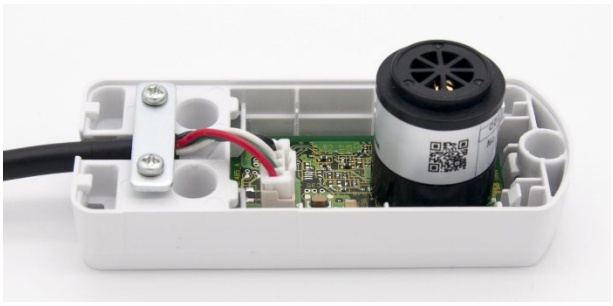
11 **Secure the top half of the main unit's housing to the bottom half.**

12 **Remove the sensor cover of the new cable's remote sensor housing and install the sensor board. The board will click into place.**



13 **Connect the new cable's plug into the sensor board.**

Secure the sensor cover of the new cable's remote sensor housing.



8
Storage and Disposal

8-1. Procedures to store the monitor or leave it for a long time

The monitor must be stored under the following environmental conditions.
• In a dark place under the normal temperature and humidity away from direct sunlight
• In a place where gases, solvents, or vapors, etc. are not present

Store the monitor in the shipping carton in which the product was delivered.

If the shipping carton is not available, store the monitor away from dust, etc.

8-2. Procedures to relocate the monitor or use it again

For monitor relocation, refer to "How to Install" for relocation sites and wiring work.
The unpowered time must be minimized when the monitor is relocated.

When the monitor is used again after a long-period storage, perform a calibration.

8-3. Disposal of products

When the monitor is disposed of, it must be treated properly as an industrial waste in accordance with the local regulations, etc.

Return all used sensors to RKI.

9
Troubleshooting

This Troubleshooting guide does not explain the causes of all malfunctions which may occur on the monitor. This simply helps to find the causes of the monitor's most frequent malfunctions.
If the monitor shows a symptom which is not explained in this manual or still has malfunctions even after remedial actions are taken, please contact RKI.

Symptom/Display	Causes	Actions
The power cannot be turned on.	The power switch is turned off.	Turn on the power switch.
	Abnormalities/momentary blackout of power supply system	Provide the rated voltage. Take measures such as checking or adding the UPS, power supply line filter and insulation transformer.
	The main unit is not installed properly.	Check whether the main unit is properly attached to the wall-mounted unit.
	Cable abnormalities (open circuit/not connected/short circuit)	Check the wiring of the monitor and related devices around it.
	Fault in AC adapter.	AC adapter replacement is necessary. Please contact RKI.
	The connector of AC adapter is not connected correctly.	Correct the AC adapter connection.
Abnormal operations	Disturbances by sudden surge noise, etc.	Turn off and restart the monitor. If a symptom like this is observed frequently, take appropriate measures to eliminate the noise.
Sensor abnormalities E-1	The sensor is not connected or is improperly connected.	Confirm that the sensor is connected and that the sensor unit board's connectors are securely fastened.
	Errors in communication with the unit	Replace the sensor unit board with a new one.
System abnormalities E-9 SYSTEM	The rated voltage is not supplied to the monitor.	Confirm that the power supply is providing the rated voltage.
	Abnormalities of ROM, RAM or EEPROM inside the monitor	Please contact RKI.
The reading drops and does not recover.	Sudden change in the temperature and CO2 concentration	Please use it in the stable environment that does not experience rapid change in temperature or CO2 concentration.
	Disturbance by noise	Turn off and restart the monitor. If a symptom like this is observed frequently, take appropriate measures to eliminate the noise.
Span adjustment impossible	Improper calibration gas concentration	Use the proper calibration gas.
	Deteriorated sensor sensitivity	Replace the sensor with new one.

10
Product Specifications

10-1. List of specifications

Detection principle	Non-Dispersive Infrared Ray
Gas to be detected	Carbon dioxide
Concentration display*1	LCD digital display (Five-digit, seven-segment/green, orange and red backlight) *No backlight by standard setting
Detection range	0 – 2000 ppm / 0 – 5000 ppm / 0 – 10000 ppm 0 – 2 vol% / 0 – 5 vol%
Display resolution	0 – 2000 ppm: 1 ppm / 2000ppm – 10000 ppm: 10 ppm 0 – 2 vol%: 0.005 vol% / 2 – 5 vol%: 0.010 vol%
Detection method	Diffusion type
Alarm setpoint value	0 – 2000 ppm 1st: 1000ppm / 2nd: 2000ppm [standard setting] 0 – 5000 ppm 1st: 1000ppm / 2nd: 5000ppm [standard setting] 0 – 10000 ppm 1st: 1000ppm / 2nd: 5000ppm [standard setting] 0 – 2 vol% 1st: 0.5vol% / 2nd: 2.0vol% [standard setting] 0 – 5 vol% 1st: 0.5vol% / 2nd: 3.0vol% [standard setting]
Accuracy Under the same test conditions	Within ±5% for full scale (to the gas concentration signal output)
Response time Under the same test conditions	90% response (T90) within 60 seconds
Gas alarm type	Two-step alarm (H-HH)
Gas alarm display	First: Lights up the concentration display and backlight (orange), buzzer Second: Lights up the concentration display and backlight (red), buzzer *No backlight and no buzzer by standard setting
Gas alarm pattern	Auto-reset
Gas alarm contact	No-voltage contact 1a or 1b and normally de-energized (energized in response to an alarm)
Fault alarm/self diagnosis	System abnormalities/sensor connection abnormalities
Fault alarm display	Alarm detail display and backlight blinking (orange), buzzer *No backlight by standard setting
Fault alarm pattern	Auto-reset
Contact capacity	125 VAC - 1 A or 30 VDC - 1 A (resistance load)
Transmission specifications	4 - 20 mA DC (no-insulation/load resistance under 300 Ω)
Power supply	100 – 120 VAC ±10% (50/60 Hz) or 24 VDC ±10%
Power consumption	AC specification: Max. 6 VA DC specification: Max. 4 W
Initial clear	Approx. 25 seconds
Warm-up time	Approx. 30 minutes
Operating temperatures	0 - 40ºC (At a constant condition)
Operating humidity	Below 90%RH (Non-condensing)
Structure	Wall mounting type
External dimensions	Approx. 80 (W) x 120 (H) x 35.5 (D) mm (projection portions excluded)
Weight	AC specification: Approx. 200 g DC specification: Approx. 180 g

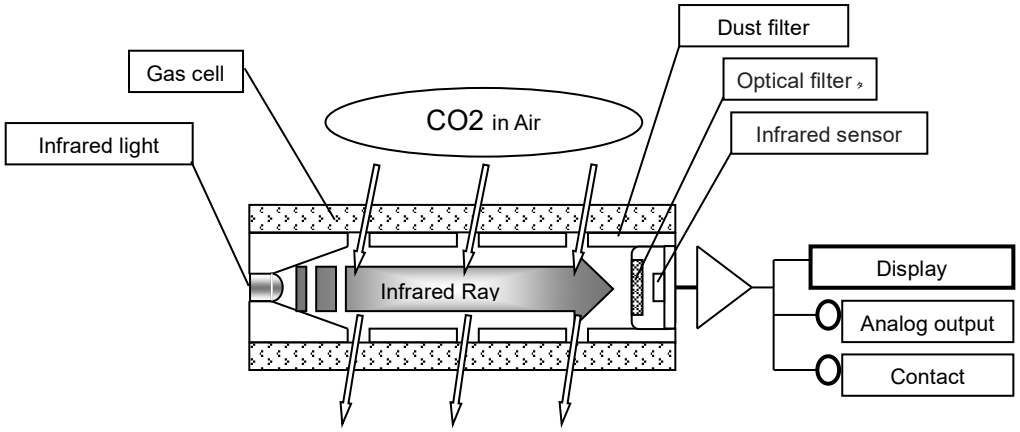
11
Spare Parts List

Part Number	Description
06-1248RK-03	Calibration tubing, 3 feet
21-1927	Mounting plate for instrument removal
45-0443RK	Bar terminal with red insulation, for 18 AWG
45-0444RK	Bar terminal with black insulation, for 16 AWG
45-0445RK	Bar terminal with blue insulation, for 14 AWG
45-0446RK	Bar terminal with gray insulation, for 12 AWG
46-5100RK	Lever, wiring tool
47-1556-03	Extender cable with remote box, 3 meters
47-1556-05	Extender cable with remote box, 5 meters
47-1556-10	Extender cable with remote box, 10 meters
47-1556-20	Extender cable with remote box, 20 meters
81-0070RK-01	Calibration cylinder, 2000 ppm CO2 in N2, 34 liter steel
81-0070RK-03	Calibration cylinder, 2000 ppm CO2 in N2, 103 liter
81-0071RK-01	Calibration cylinder, 5000 ppm CO2 in N2, 34 liter steel
81-0071RK-03	Calibration cylinder, 5000 ppm CO2 in N2, 103 liter
81-0072RK-01	Calibration cylinder, 2.5% volume CO2 in N2, 34 liter steel
81-0072RK-03	Calibration cylinder, 2.5% volume CO2 in N2, 103 liter
81-0078RK-01	Calibration cylinder, 100% N2, 34 liter steel
81-1050RK	Regulator, fixed flow, 0.5 LPM with gauge and knob, for 17 liter and 34 liter steel cylinders (cylinders with external threads)
81-1051RK	Regulator, fixed flow, 0.5 LPM with gauge and knob, for 34 liter aluminum, 58 liter, and 103 liter cylinders (cylinders with internal threads)
81-1153	Calibration cup
DES-3311-5	CO2 sensor for 0 - 2000 ppm, 0 - 5000 ppm, and 0 - 10000 ppm ranges
DES-3311-6	CO2 sensor for 0 - 2% and 0 - 5% ranges

12
Appendix

12-1. Detection principle of Non-Dispersive Infrared Ray

The Model RI-600 applies the Non-Dispersive Infrared Ray Absorption (NDIR) technique to detect target gas. The infrared beam emitted from the light source passes through the gas cell and reaches the IR sensor. The target gas enters the gas cell from the gas inlet.
When the target gas enters the gas cell, the amount of infrared ray received by the IR sensor decreases since the infrared ray emitted from IR source is absorbed by the target gas.
This decreased amount is detected by IR sensor and output as gas concentration. There is an optical band pass filter in front of IR sensor which allows the absorption wave of the target gas to pass through.
Then, there is no sensitivity for the gas which has the different absorption wave from the target gas.
Furthermore, there is no sensitivity against N_2 and H_2 etc. which cannot absorb infrared ray.



12-2. Definition of terms

ppm	Gas concentration indicated in the unit of one-millionth of the volume
vol%	Gas concentration indicated in the unit of one-hundredth of the volume
Calibration	Find relationship of the readings, display values or setpoints with the actual values by using the calibration gas, etc.
Maintenance mode	When maintenance is performed on the monitor, the alarm contact is disconnected, and a signal to indicate the maintenance mode status is sent out to the external output signal. As a result, maintenance can be performed on a single unit of the monitor.
Initial clear	The reading is unstable for a few seconds after the power is turned on. To prevent malfunctions for that period, the alarm contact is deactivated. In addition, a signal to indicate the initial clear status is sent out to the external output.
Zero suppression	A function to cut off the influences of environmental changes, interference gases, etc.
Alarm delay time	A function which temporarily suspends alarm activation to prevent a false alarm caused by outside noise.

320CE17002

Declaration of Conformity

We, RIKEN KEIKI CO., LTD.

2-7-6, Azusawa, Itabashi-ku,
Tokyo 174-8744 Japan

declare in our sole responsibility that the dollowing product conforms to all the relevant provisions.

Product Name	:	Compact Gas Monitor		
Model Name	:	RI−600 (DC model)		
Council Directives	:	EMC	:	2014/30/EU
		RoHS	:	2011/65/EU
Applicable Standards	:	EMC	:	EN 50270:2015(Type2) EN 61326-1:2013 IEC 61326-1:2012
		RoHS	:	EN50581(2012)

Year to begin affixing CE Marking : 2017

Place: TOKYO, Japan

Signature: Tetsuya Kawabe
Full name: Tetsuya Kawabe

Date: Mar 6, 2017

Title: Director,Quality control center