INSTRUMENTS

Gas Detection For Life

RKI Instruments, Inc.
Instruction Manual

For
Portable Halocarbon Indicator

Model RI-413A

Ranges:

R-12	0-4,975 ppm
R-22	0-4,975 ppm
R-114	0-2,475 ppm
R-134a	0-4,975 ppm
R-502	0-4,975 ppm
R-404	0-4,975 ppm
R-236FA	0-4,975 ppm

The accompanying instrument is sold and serviced in North America by RKI Instruments, Inc. Please contact RKI Instruments for any follow up service needs, including questions, warranty issues, repairs, and spare parts and sensors. Thank you for selecting this fine instrument for your use. With proper care and maintenance, it will provide you with many years of reliable service. Please note this range selection uses program number 02281.

C O N T E N T S

1. Introduction

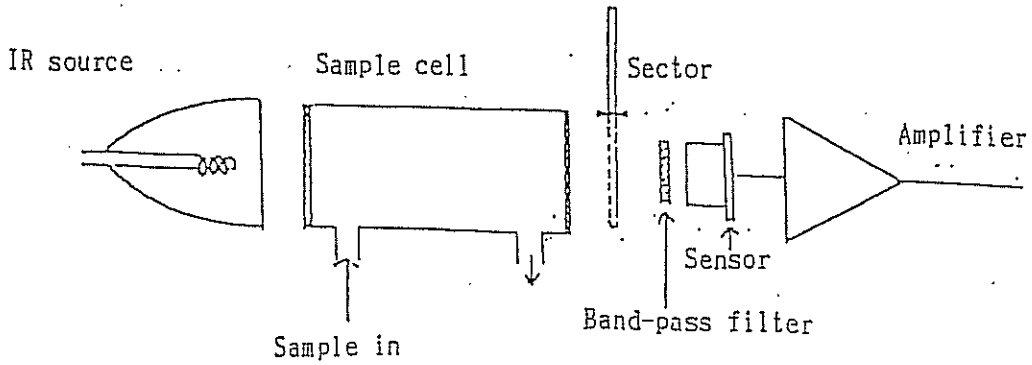
The Model RI-413A represents a new approach to the problem of measuring FREON in ppm range.
The versatility of the microprocessor coupled to the selectivity of the nondispersive infrared analyzer makes possible a portable gas analyzer small enough and inexpensive enough for daily use in industrial safety and atmospheric control applications.

2. Features

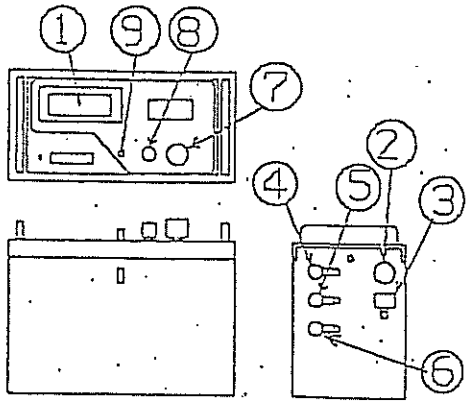
* Digital display
* Microprocessor controlled
* Measurement of instant concentration for 7 kinds of freon gas
* Measurement of average concentration for 1, 3 or 15 minutes
* Adjustable alarm point at 0 - full scale
  Available to stop the alarm
* Illuminated display
* Battery powered
* Lightweight
* Fully portable

3. Detection principle

The infrared analyzer uses the fact that each gas absorbs infrared energy of a characteristic frequency. In the gas analyzer an infrared source (an electrically heated wire) emits a broad band of energy which is focused on a solidstate detector through a narrow band filter selected to transmit only a certain range of frequencies which are selectively absorbed by halogenated carbon gas. A sample of the gas to be detected flows through an enclosed chamber interposed between the infrared source and the detector. The infrared ray is alternately transmitted through this chamber. If the measuring chamber contains halogenated carbon gas, the amount of energy passing through the chamber is smaller than that of without halogenated carbon gas.
A comparison of the two levels of energy is an indication of the concentration of halogenated carbon gas in the sample.



4. Part indentifications



① LCD display
② Sample inlet (and CAL gas inlet)
③ Charger conn
④ Calibration adj
⑤ External output
⑥ Continuous operation AC adapter Conn
⑦ Selector switch
⑧ Zero knob
⑨ Selection switch for measuring gas

5. Specifications

Detection principle	Non-dispersive infrared absorption (NDIR)
Measurable gas & range	R-11 (CCl_3F) 0~4,975 ppm (25 ppm/digit) R-12 (CCl_2F_2) 0~4,975 ppm (25 ppm/digit) R-22 ($CHClF_2$) 0~4,975 ppm (25 ppm/digit) R-502 (R115 + R22) 0~4,975 ppm (25 ppm/digit) R-113 ($CClF_2$-CCl_2F) 0~3,975 ppm (25 ppm/digit) R-114 ($CClF_2$-$CClF_2$) 0~2,475 ppm (25 ppm/digit) R-134a (CH_2FCF_3) 0~4,975 ppm (25 ppm/digit) Remarks : Reading on any one of these to gases can be selected by use of the selection switch on the top panel
Indication method	Continuous ..... Digital LCD display instantaneous concentration Average ..... Digital LCD display of average concentration over 1, 3 or 15 minutes
Repeatability	Less than ± 3% of full scale at R-12
Response time	Approx. 10 seconds to 90% indication
Sampling method	Motor-driven diaphragm pump
Alarms	Audible for -Alarm may be set at any level 0~full scale for any selected gas (short pulse) -End of averaging perid (long tone) -Low battery (continuous tone)
Ambient temperature & humidity	-10° C ~ +40° C, 10%~95% RH
Operating hours	Approx. 4 hours (based on use of alkaline dry cells at 25 ° C)
Recorder output	DC 0~100mV (linear)
Power supply	A) Alkaline dry cell ..... 6 pcs. (standard) B) Dry cell (carbon-zinc) ..... 6 pcs. C) Ni-Cd rechargeable battery (3 pcs./set) ... 2 sets Auxiliary charger available for charging or continuous operation on AC100V, AC117V, AC220V, AC240V
Dimensions & weight	230 (W) x 190 (H) x 113 (D)mm, Approx. 2.6kg (instrument only)

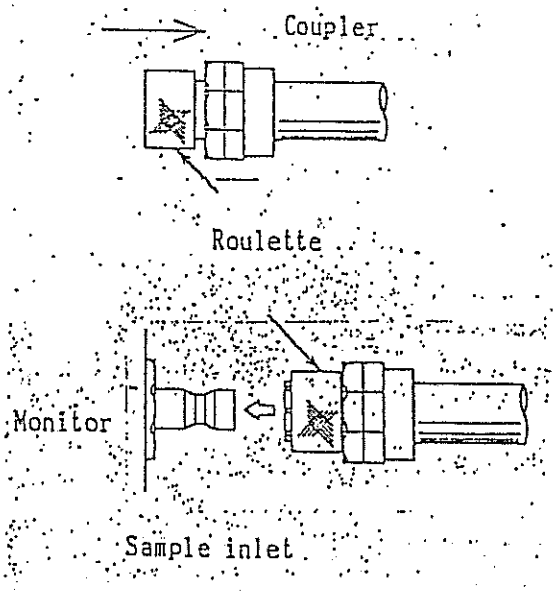
Specifications subject to change without notice.

6. Normal operation

6-1. Preparation

1) After connection of gas sampling probe and sampling tube, connect the other end of sampling tube to the gas inlet (2) (described as "INLET") on the right side of monitor.

2) As the knurling part on the end of sampling tube is coupler-quick fit type, connect it according to the following drawings.

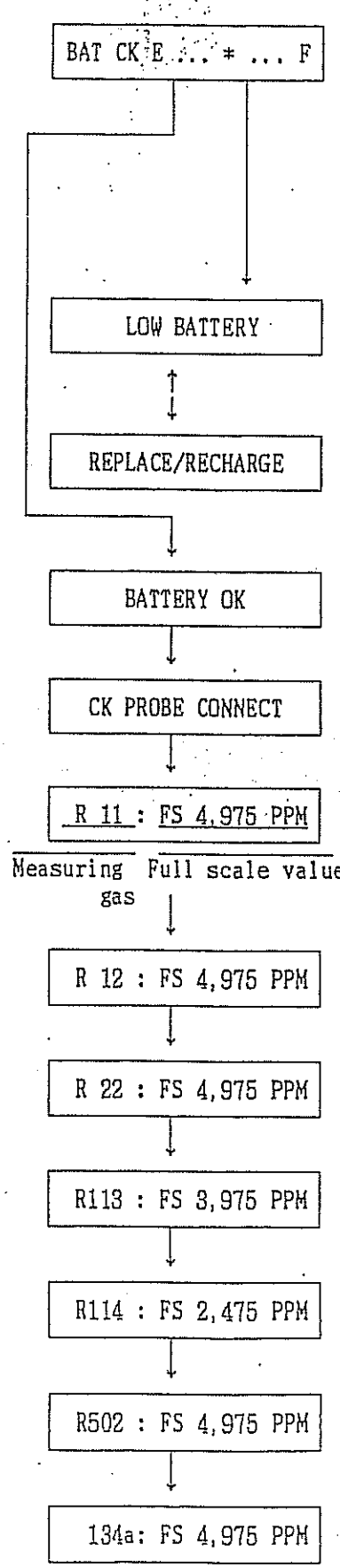


① Pull the knurling part on the end of gas sampling tube toward arrow mark by holding it with fingers.

② When it is pushed into the depth of gas inlet with the knurling part pulled, it will click. Then when release the fingers holding it, it will be locked to the monitor.

③ When gas sampling tube should be taken off from minitor gas sampling tube will be taken off from monitor easily by making reverse procedure of above.

6-2-1. Battery check



After the connection of sampling tube, turn the selector switch (7) to "BAT CK".
The indication decribed in left side will appear on the display. Now ready to measure.
After a few seconds, the indication on display will change as left fig, the suction pump will operate.
Battery capacity is indicated with " * " mark.
This mark will move from F to E depending upon operation hours.

When " * " mark is moved until E position (When battery capacity is dropped), the indication will appear as left fig and the buzzer will sound.

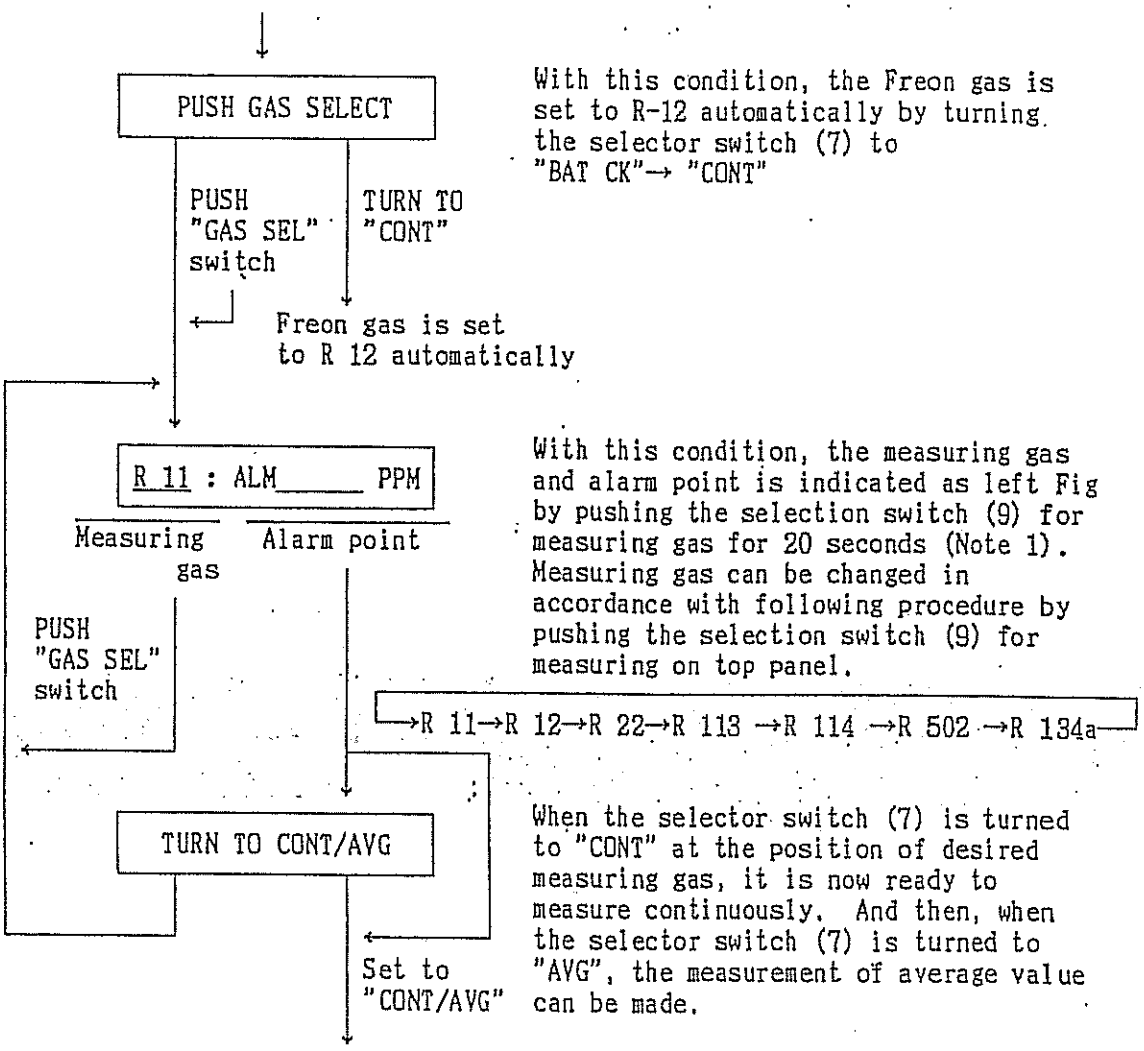
In this case, replace the battery with new one (in case of usage of dry battery) or charge (in case of usage of Ni-Cd battery)

When the battery capacity is OK, confirm the connection of sampling tube

Measuring gas and full scale value is indicated as follows in order.
R 11 → R 12 → R 22 → R 113 → R 114 → R 502 → R 134a

6-2-2. Selection of measuring gas

As standard, model RI-413A is calibrated with R-12. With this condition, the model RI-413A can select the measuring gas and can set the alarm point for each gases.



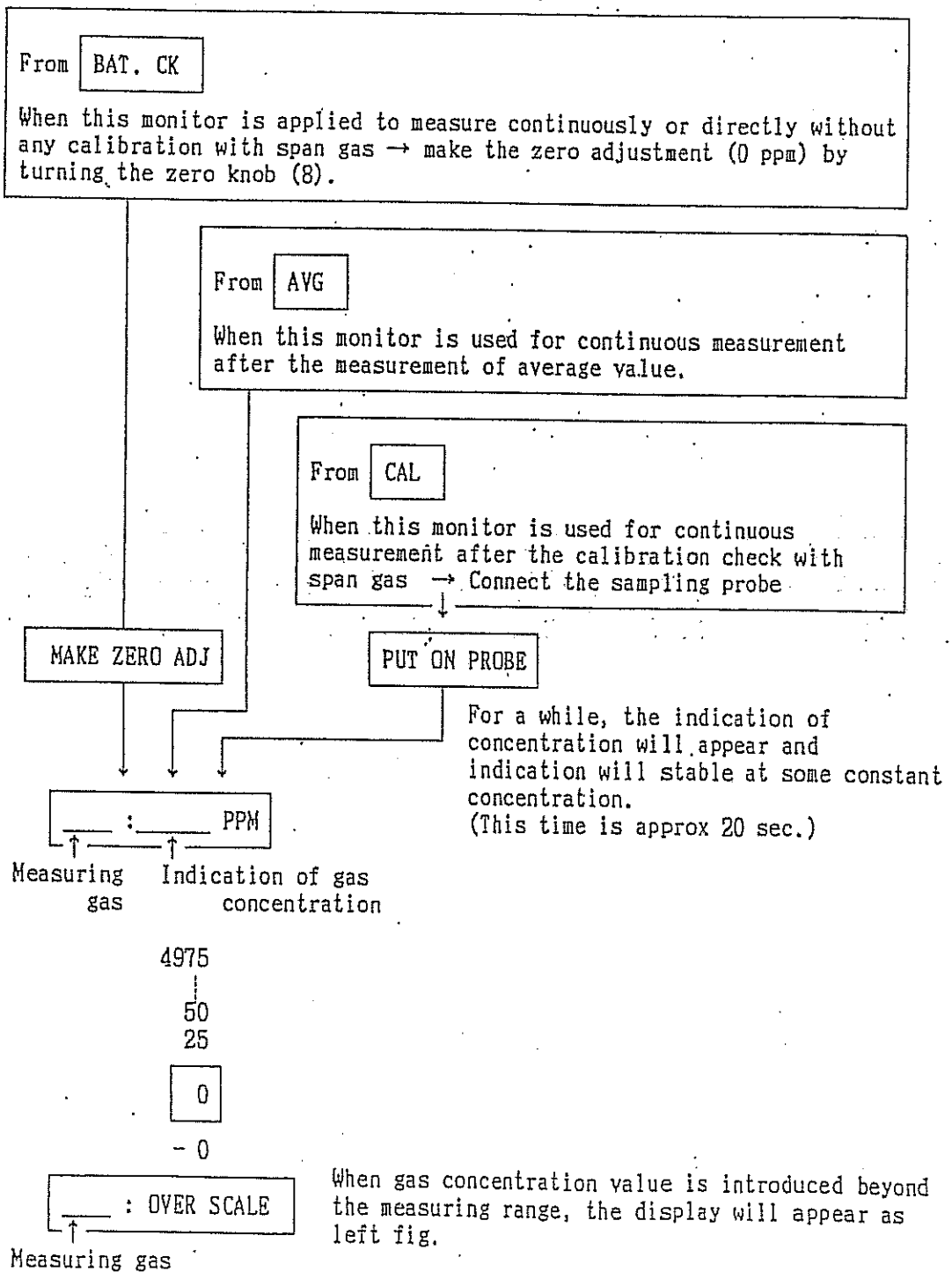
Note 1) When it needs to change the alarm point, refer to item 8-2 "Setting of alarm point". It should be done within 20 seconds.

Note 2) After the finishment of battery check, make the warming up for approx 15 minutes.

6-3. Normal measurement (Continuous measurement)

6-3-1. When this monitor is used firstly or when this monitor is not used for a long period, it is necessary to make the zero and span calibration before the measurement. Carry out the zero and span calibration in accordance with item 7 "Calibration method".

6-3-2. How to use



6-4. Measurement of average value

This monitor can be measured the average value for 1 minute, 3 minutes and 15 minutes in addition to continuous measurement.
Carry out the setting of average time in accordance with following procedure.

6-4-1. Setting method of measuring time for average value

(1) Confirm that the selection switch (7) is "OFF".

(2) Take out the sampling tube from the monitor.

(3) Remove the monitor from carrying case.

(4) Remove the front panel.

(5) When the front panel is removed, the printed circuit board is fixed. Set the desired average time by turning SW2 with minus driver.

Note) SW2 is set to "5" position at Riken factory.

Average time

1 minute	Set the arrow position to "5"
3 minute	Set the arrow position to "6"
15 minute	Set the arrow position to "7"

After the finishment of time setting, close the panel.

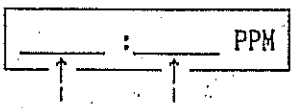
6-4-2. Measuring method of average value

(1) Carry out the adjustment in accordance with item 6-1 "Preparation", 6-2 "Battery check" and 6-3 "Normal measurement (continuous measurement)".

(2) Turn the selector switch (7) to "AVG"

The indication will appear on the display as left fig.
When switch is turned, the remaining time is indicated as following.

	Count indication of remaining time
Average value for 1 minute	Remaining time is indicated at 1 sec. interval.
Average value for 3 minutes	Remaining time is indicated at 5 sec. interval.
Average value for 15 minutes	Remaining time is indicated at 5 sec. interval.



After the finishment of measurement for average value, the buzzer will sound with intermittent. The average value is indicated as left fig.

Note 1) After the finishment of measurement for average value, the buzzer will sound with intermittent. Then, when the reading of gas concentration is finished, turn the selector switch (7) to "CONT" position immediately. The buzzer will stop.

Note 2) When the average value is measured again, turn the selector switch (7) to "AVG" position.

Note 3) Don't set SW(2) to other position except 5, 6, 7.
When SW(2) is set to other position except 5, 6, 7, normal measurement can't make.

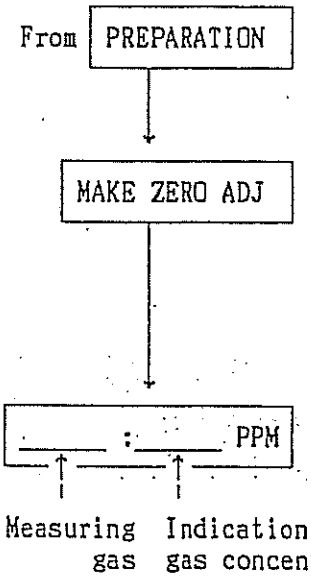
7. Calibration method

When this monitor is used firstly or when this monitor is not used for a long time and also, when calibration check is made with regular check, carry out the calibration in accordance with following procedure.

This monitor is calibrated with R-12. But, if it is necessary to measure individual gas (such as R-502) accurately, make the calibration with individual gas (such as R-502).

7-1. Calibration procedure

(1) Carry out the battery check in accordance with item 6-2 "Battery check".
(2) Make warming up for approx. 15 minutes.
(3) Zero calibration



Turn the selector switch (7) to "CONT" position. The indication is indicated on display as left fig.

When the indication is stabilized, adjust to 0 PPM by turning the ZERO knob.

Note 1) The zero calibration is fresh air. Then, confirm whether the interference gas such as Freon gas etc is existed around the monitor or not.

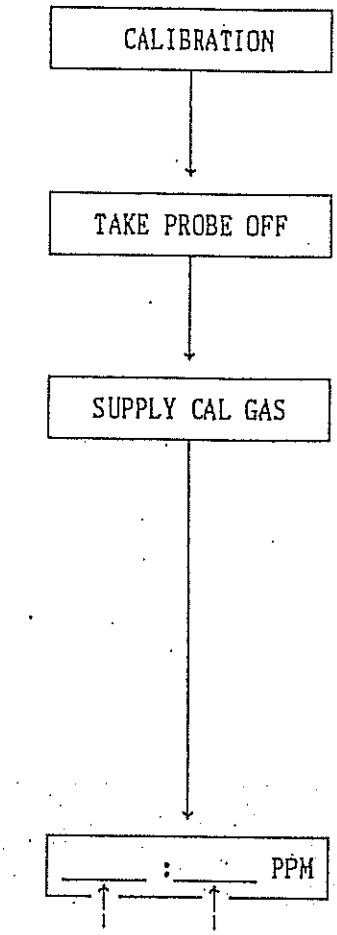
Note 2) How to use the ZERO knob ..... Lift and turn

Note 3) When it is not make the zero adjustment by turning the ZERO knob on the panel, make the zero adjustment (0 ppm) with VR-8 for zero coarse on printed circuit board in accordance with following procedure.

a Set the zero knob (8) to the center of rotation angle on front panel (Turn 2.5 times to counterclockwise after turning to the clockwise fully.

b Adjust to 0 ppm with VR-8 for zero coarse on printed circuit board.

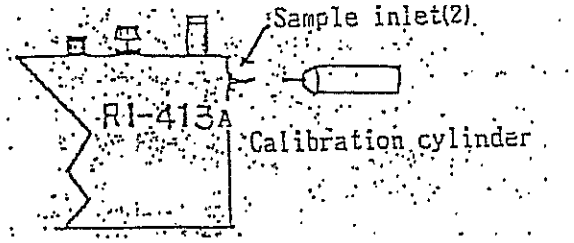
(3) Span calibration



Turn the selector switch (7) to "CAL" position. The indication is indicated on display as left fig.

Remove the sampling tube and sampling probe from the monitor (Refer to item 6-1 "Preparation").

Put calibration cylinder for span adjustment to sample inlet (2) as following fig and insert the nozzle of calibration cylinder to sample inlet and then, push the calibration cylinder for 2 - 3 times in a moment.



Gas concentration value on display will close to gas concentration value described on label of calibration.
After the introduction of calibration gas, when the indication value is stabilized. Put the minus driver into the hole of calibration adj(4) and adjust the indication to gas concentration value described on label of calibration.

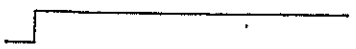
Note 1) When the calibration gas is introduced into gas inlet (2), don't continute to push the calibration gas cylinder for a long time. (Within 1 time/1 sec.)

Note 2) After the finishment of calibration, turn the selector switch (7) from "CAL" position to "CONT" position. Draw out the gas from the detector.

8. Alarm

8-1. Alarm function and alarm pattern

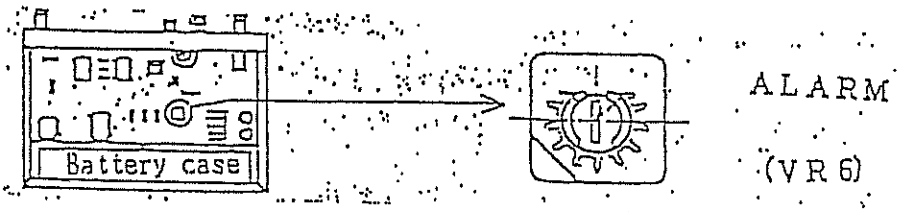
It is possible to judge the following alarm function depending to the alarm buzzer pattern.

Alarm function	Alarm pattern
Alarm of gas concentration	
Low battery	
Finishment of calculation (Finishment of measurement for average value)	

8-2. Setting of alarm point

Alarm setting method

(1) Confirm that the selector switch (7) is "OFF" position.
(2) Take out the sampling tube from the monitor.
(3) Remove the monitor from carrying case.
(4) Remove the front panel.
(5) Turn the selector switch (7) to "BAT. CK".
(6) Select an necessary desired gas by pushing "GAS SEL" switch.
(7) When the front panel is removed, the printed circuit board is fixed. Set the desired alarm point with minus driver by turning the ALARM (VR6) on printed circuit board.



After the setting of alarm point, turn the selector switch (7) to "OFF" and after that, close the front panel.

(8) The indication of measuring gas and alarm point is appeared for approx 20 sec. When the alarm point can not set during this time, push the selector switch for measuring gas (9) again and adjust the alarm point after the indication of desired measuring gas.

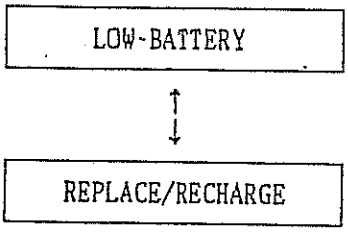
Note 1) When the alarm point is set, take care so that the minus driver is not touched to any parts except ALARM (VR6).

Note 2) The alarm point is set with 1000ppm (R-12) at Riken factory. The alarm point is adjustable at any point in 0-full scale value with VR6.
If it is necessary to make "OFF" of alarm buzzer, turn the VR6 to clockwise until the indication will be appeared to "ALARM OFF".

9. Power supply

This monitor is available to use the dry battery, Ni-Cd battery (Option) and AC adaptor (Option).

9-1. Replacement of battery (in case of usage of dry battery)



When the dry battery is used, the indication will appear on display as above fig. And also, when the alarm for low battery is sounded, replace the battery with new one in accordance with following procedure.

(1) Confirm that the power supply is "OFF".

(2) Take out the monitor from carrying case.

(3) Remove the battery cover.

(4) Remove the older battery and put new battery into the battery holder. (Don't mistake the polarity of battery)

(5) After the finishment of battery replacement, close the battery cover.

Note 1) When the dry battery is replaced with new one, don't mix new battery and used battery.

Note 2) When the dry battery is used, apply the dry battery of same type and same manufacturer.

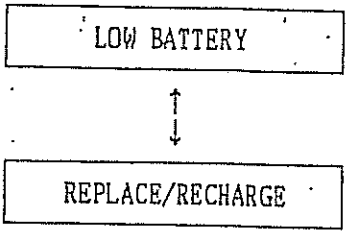
Note 3) When the dry battery is used, don't connect it to the charger absolutely.

Note 4) The operation hours for dry battery is approx 4 hours. But, the character for dry battery is confirmed depending upon the surrounding temperature as following.

Surrounding temperature	Operating hours
40° C	5 hours
25° C	4 hours
−10° C	30 minutes

Note) This data of table is Alkaline battery type AM-1 made by National.

9-2. Charging (In case of usage of Ni-Cd battery)
(The Ni-Cd battery and charger is option)

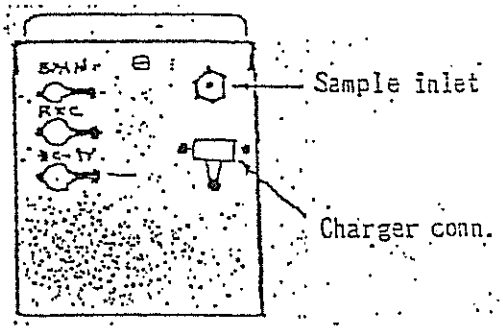


When the Ni-Cd battery is used, the indication is appeared on the display as above fig. And also, when the alarm for low battery is sounded, make the charging as following procedure.

① Confirm that the selector switch (7) is "OFF" position.

② Connect the charger to "CHG" position and make the charging.

③ The charging time is approx 15 hours.



Note 1) Don't use the monitor during charging.

Note 2) When the Ni-Cd battery is used, apply an exclusive battery and charger (this is option).

Note 3) When the battery capacity is dropped, carry out the charging with charger. When it is necessary to use the monitor during charging, it is possible to use the monitor even if during charging by connecting the AC adaptor.

9-3. How to use the AC adaptor (option)

The monitor can be measured continuously by using the AC adaptor. In this case, put the jack of AC adaptor to the socket of "DC-8V". When this monitor is used with continuous measurement, take care the following points.

(1) When this monitor is used with continuous measurement for a long period (from a few days to a few week), make the zero and span calibration once a day.

(2) When the variation of environmental temperature is remarkable large during operation for a long time, the monitor might be not covered from the accuracy.

(3) The continuous operating hours as guarantee for suction pump is approx. 500 hours. When this monitor is used continuously for a long period, replace the pump with new one regularly.

(4) When the AC adaptor is used for monitor use the AC adaptor which is not influenced from the noise.

10. Notice of handling

To maintain the function of this monitor, take care the following points on handling.

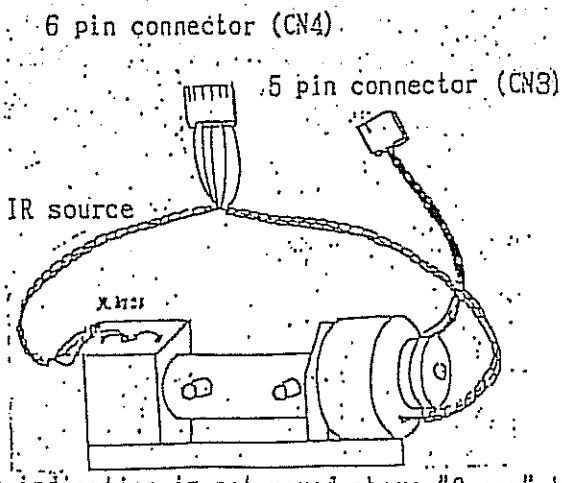
(1) Don't drop or shock
(2) Protect the monitor from a waterdrop
(3) When the monitor is given with excessive electric noise from outside and strong shock during operation,

the indication is appeared | SWITCH OFF ⟶ ON | on the display.

And also, abnormal indication is appeared on display.
In this case, turn the selector switch (7) to "OFF" and again, turn the selection switch to "ON".
(4) When the selector switch (7) is turned to "OFF", turn the selector switch (7) to "ON" after more than 3 seconds.
(5) When this monitor is used at higher humidity, moisture and dust places, confirm whether filter of sampling probe is dirt or not at regular. If this filter is dirty, replace with new one.

11. Check of monitor in abnormal condition

When the monitor is abnormal during operation, check the monitor as following procedure.



11-1.

Phenomenon * When the indication is not moved above "0 ppm" by turning the zero knob to clockwise fully.

Check point * Check whether connector (6 pin/CN4) of detector is removed or not.

* Check whether contact point of connector (6 pin/CN4) of detector is normal or not.
* Check whether the IR source of detector is cold by touching with hand or not.

Treatment * Check the connector (CN4)

* When the IR source of detector is cold, it is necessary to replace the detector with new one (This is disconnection of IR source).

11-2.

Phenomenon * The indication is adjustable by turning the zero knob. However, even though the calibration gas is introduced to the monitor, the indicator is not changed.

Check point * Check whether the connector (5 pin/CN3) of detector is removed.

* Check whether the contact of the connector (5 pin/CN3) of detector is stable.
* Check whether the light source of detector is cold.

* Check whether the installation of gas sampling probe and gas sampling tube is normal (Leakage check).

* Check whether the inside sampling tube is removed or cracked.

Treatment * Check the CN3 connector.

* Check the CN5 connector.

* When the light source of detector is cold, the light source of detector is disconnected. It is necessary to replace with new detector head complete.
* Check the gas sampling probe, gas sampling tube and inside sampling tube.

11-3.

Phenomenon * The display is not appeared after the power switch to "ON" and is appeared with abnormal indication.

Check point * Check whether the battery is installed in normal.

* Check whether the battery is defective contact with the leakage of battery electrolyte.

* Check whether the connector of printed circuit board is loosen.

Treatment * Replace the batteries with new one.

* Polish the battery socket with a alcohol.

11-4. When the water is absorbed into the detector through sampling probe and sampling tube, turn the setector switch ⑦ to "OFF" immediately and replace the filter with new one. Make the operation for approx 10 minutes by turning the setector switch ⑦ to "BAT. CK" position. After that, make the ZERO adjustment and calibration certainly.

12. Function of some parts

This monitor has following functions.

12-1. Output for recorder

When this monitor is used with connection of recorder, connect the recorder to external outlet of "REC 0-100mV".
Please use an exclusive plug for connection (cable with 1m).

12-2. Automatic illumination in dark place

This monitor will illuminate automatically when the surrounding is dark. This monitor can be read the indication value at dark place. The illumination will vanish auatomatically when the surroundings will bright.

13. Accessories

Standard accessories

1. Carrying case with shoulderstrap ..... 1 pce
2. Span gas ..... 1 pce
3. Gas sampling probe ..... 1 pce
4. Gas sampling hose (1m) ..... 1 pce
5. Alkaline dry cell ..... 6 pcs.
6. Instruction manual ..... 1 sheet