INSTRUCTION MANUAL
FOR
RIKEN INFRARED PORTABLE HC GAS DETECTOR
MODEL RI-415
(General use)

	For HC gas use	Model RI-415 Range 0-100%LEL/0-100vol% (Dual auto range)
	For CH4 gas use	Model RI-415 Range 0-100%LEL/0-100vol% (Dual auto range)

Precaution in operation

* After reading this manual well, start to operate this instrument.
* Keep this manual where to carry out easily.
* When take out this manual by use of construction work, be sure to put it where it was.
* Do not use this instrument for no other than given purpose.
* When operate this instrument without using this manual or repair it by use of no other parts than the genuine one, the safety and quality of products could not be guaranteed. When any accident should take place by those irregular method, we cannot assume the responsibility for it.

RKI Instruments, Inc. 33248 Central Ave. Union City, CA 94544
Phone: 800-754-5165 Fax: 510-441-5650

In the beginning

It is of our great pleasure to purchase Riken portable HC gas detector model RI-415 this time. This instrument is an explosion-proof type portable gas detector which is designed to measure the presence of crude oil vapors in an inert gas or in air such as HC gas, vapors and methane gas.
This instruction manual is a guide book for operation of Riken portable HC gas detector model RI-415. It is kindly requested to read and understand this content by experienced users as well as by beginners. The following headline shall be shown to carry out the safetyand effective work in this instruction manual.

⚠ Danger

This means that it gives the serious harm to the human life, body or material directly such as touching high voltage.

⚠ Warning

This means that it gives the serious harm to the human body or material if do not perform the operation according to the instruction manual.

⚠ Caution

This means that it gives the slight harm to the human body or material if do not perform the operation according to the instruction manual.

* Note

This means the advice in the operation.

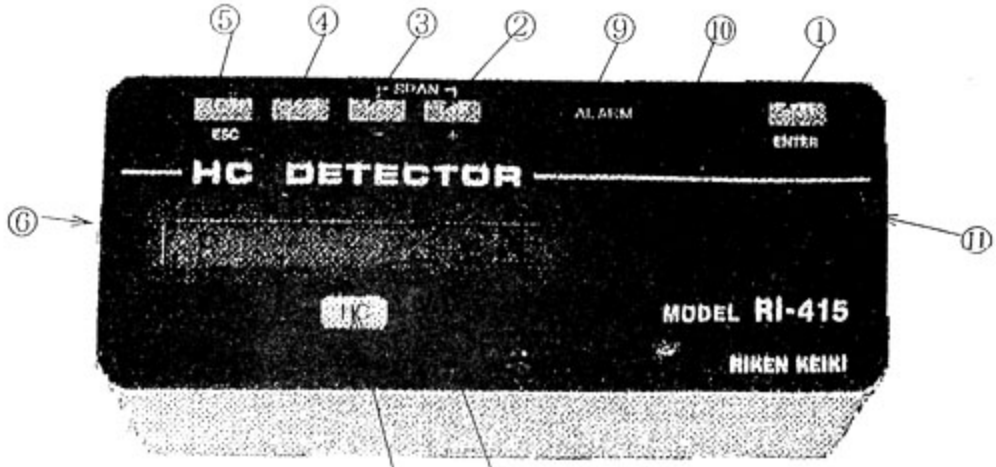
Model RI-415 consists of two types according to the kind of gases below ;

1) For HC gas use　Model RI-415
2) For CH4 gas use　Model RI-415

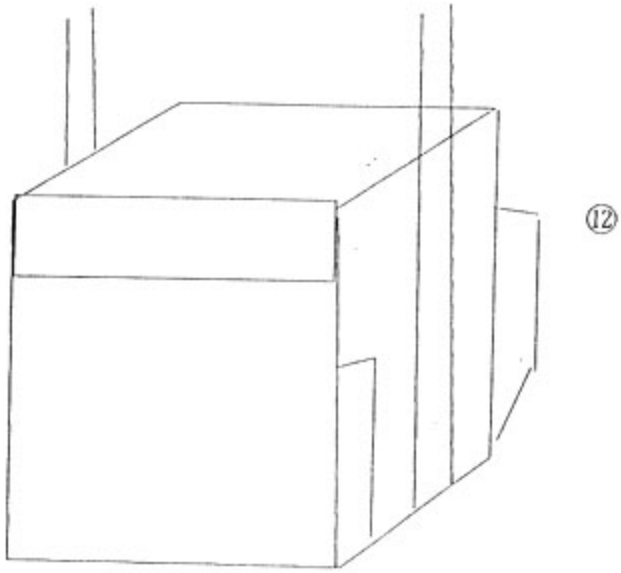
When ordering, please specify either model RI-415 for HC or Model RI-415 for CH4.

Contents

1. Name of each part

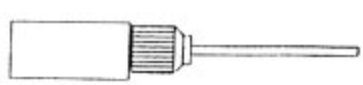


正面図



⑬

⑭



① POWER/ENTER SWITCH
This is used for the confirmation of power ON, OFF/input.

② PUMP/(+) SWITCH
This is used for pump SWITCH ON/OFF and to increase the input value.

③ ZERO/(-) SWITCH
This is used for zero adjustment and decrease the input value

④ PEAK SWITCH
This is used when desired to show the peak value.

⑤ BATT/ESC SWITCH
This is used when desired to show the battery voltage and cancel the input.

⑥ GAS OUTLET
This is the outlet to exhaust sample gas out.

⑦ CALIBRATION GAS NAME PLATE
This shows the calibration gas name.

⑧ DISPLAY UNIT (LCD display with back light)
This displays gas concentration.

⑨ ALARM LAMP
This flickers and lights on at trouble alarm time.

⑩ PHOTO SENSOR WINDOW
This back-lights automatically the display unit by detecting that it gets dark around.

⑪ GAS INLET
This is a measuring gas inlet.

⑫ CARRYING CASE

⑬ GAS SAMPLING HOSE (Spiral, 1m)

⑭ GAS SAMPLING PROBE

2. Operation

Check item before operation

Instrument :

* Check that there is no damage on the display unit.

Gas sampling probe (with filter)

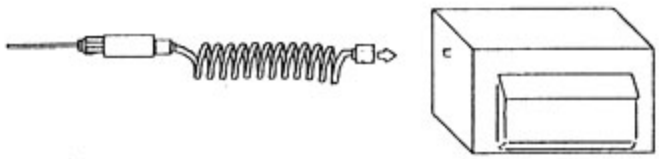
* Check the dirt of cotton and when it gets dirty, replace the cotton with new one (See 4-3)
* When the water drops are deposited, drain it out.
* Check that there is no crack or damage.

Gas sampling hose (spiral)

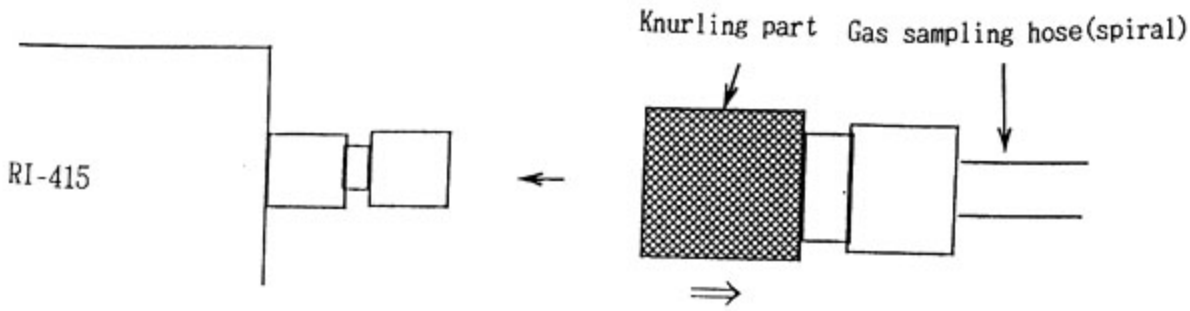
* Check that there is no break of it.
* Check that there is no looseness on the nipple mounting.

2-1. Preparation

(1) Mount the battery into instrument (See 4-1)
(2) Put the instrument into the carrying case.
(3) Connect gas sampling hose (spiral) and gas sampling probe with instrument in turn.



By holding the knurling part with fingers, pull it to the arrow mark. ⇨
Plug in to the arrow mark ← with its condition. Release the fingers holding the knurling part and press in. Then locked after ticking sound.



⚠ Warning

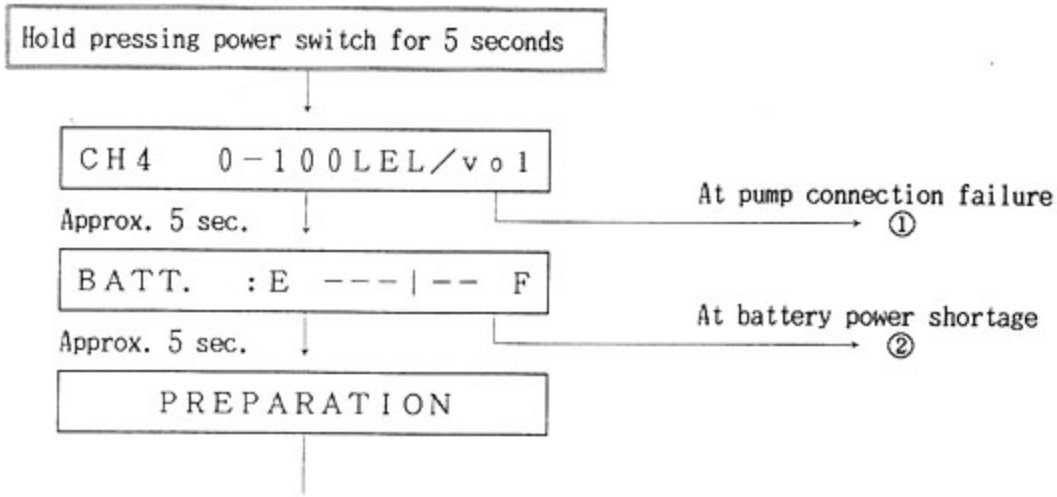
* As this is used in dangerous zone, be sure to use it with carrying case on.

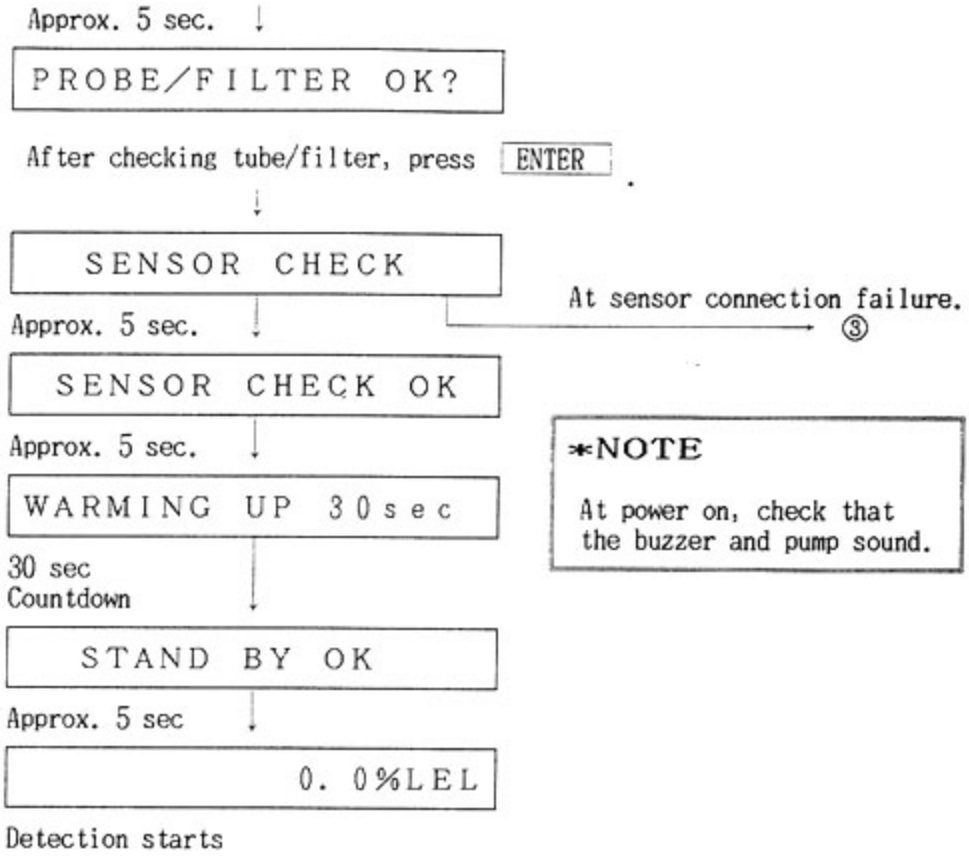
⚠ Caution

* Be sure to plug in the gas sampling hose and junction tube.
  If not surely connected, the accurate measurement cannot be carried out.
* Be sure to mount the filter tube with flowmonitor.
  If measure without filter, it will be a cause of trouble by sucking dust, water and oil etc.

2-2. Start-up procedure

Hold pressing power switch for 5 seconds and the power will turn on. Via battery check of filter probe, connection and sensor connection check, the gas detection will start. The sequence performance until the gas detection starts is as follows :





① Display, performance at pump connection failure (See 3-1)

FAIL PUMP	(Lamp : Light-on, buzzer : Continuous)

② Display, performance at power voltage shortage (See 4-1)

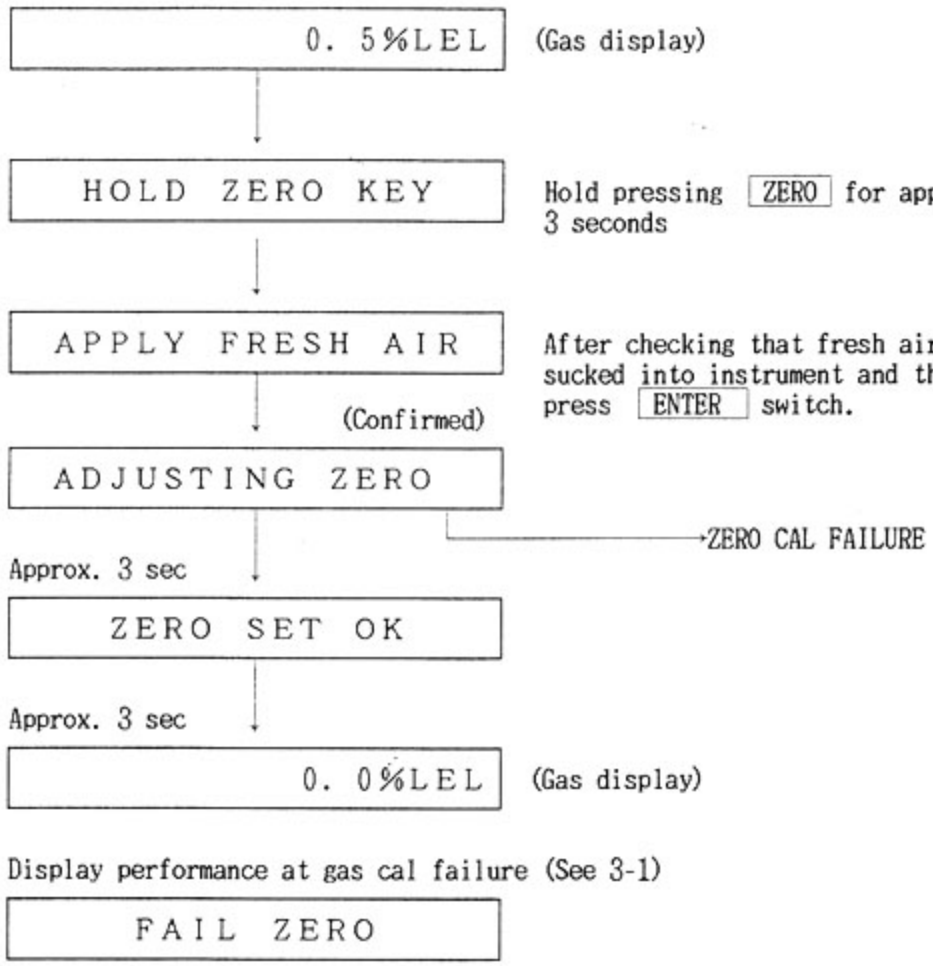
REPLACE BATTERY	(Lamp : Light-on, buzzer : Continuous)

③ Display, performance at sensor connection failure (See 3-1)

FAIL SENSOR	(Lamp : Light-on, buzzer : Continuous)

2-3. Zero adjustment

Make zero adjustment by removing the gas sampling hose. After the detection starts, see the flow monitor and check that the air is sucked properly. Then check that the reading gets stable and make zero adjustment by sucking the fresh air into instrument. The operation procedure is shown below.



Display performance at gas cal failure (See 3-1)

FAIL ZERO

⚠Caution

When make zero adjustment, do it after having fresh air sucked into instrument for over 1 minute.
If zero point is adjusted under presence of gas, the accurate detection can not be carried out.

*** NOTE**

When desired to cancel the pre-operation, press ESC switch but after confirmed, it can not be cancelled

2-4. Measurement

(1) Measurement

After stopping the sampling hose at the point where desired to measure and read out the display reading.

⚠Danger

* There may be the oxygen deficiency at gas outlet point due to the inert gas. Do not breathe at all.
* There may be the exhaust of high density gas (Above LEL). Do not approach the fire to it.

⚠Caution

* Do not let water or oil sucked into instrument. If it should be sucked, the pump or sensor shall be failed.
* When measure, check the running sound of pump and flow monitors. It cannot be measured at stop of pump operation.
* When the measuring gas is except calibration gas, the display reading will show at slightly high or slightly low side position.
* Do not block the gas outlet because the display reading may show the slightly high position.

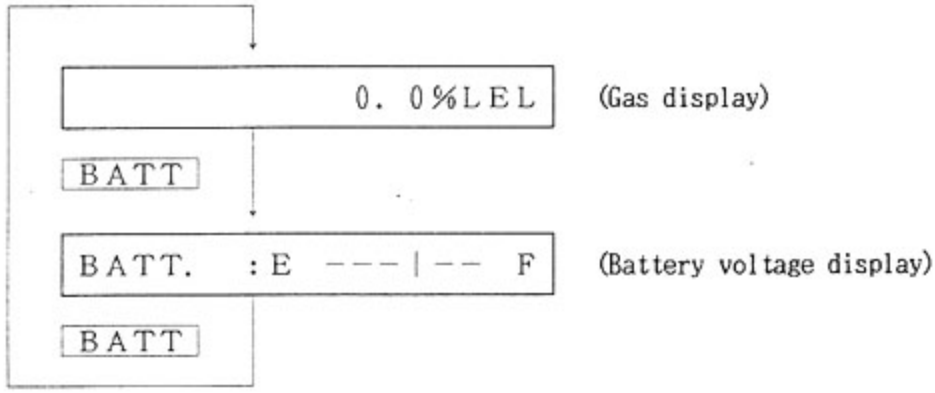
*** NOTE**

When suck high density gas above LEL, the hang-up phenomenon takes place from the adsorption of it to the gas sampling hose(spiral) and the filter of gas sampling probe.

① When use the range of vol%, use it as it is.
② When make zero adjustment, remove the gas sampling hose(spiral) and let fresh air sucked into instrument.
③ When measure by %LEL range, clean the gas sampling hose(sprial) by air and try to measure after the display reading goes down zero.

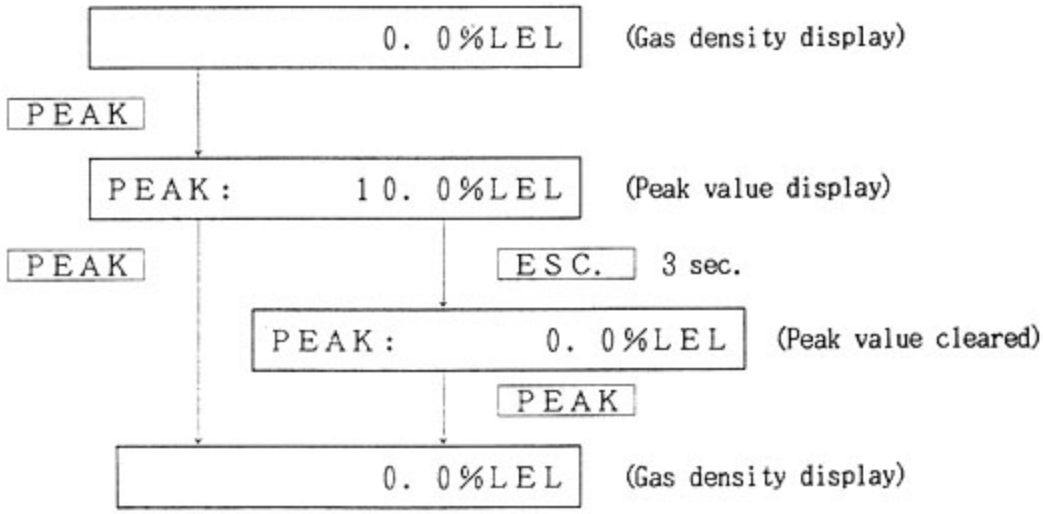
(2) Battery voltage

By pressing BATT switch while in operation, the battery voltage at present can be confirmed. The battery voltage will return to the gas concentration reading if there is no input of this switch "ON" for 20 seconds.



(3) Read-out of peak value

When press PEAK switch in operation, this shows the peak value (Max point of reading) from the power switch "ON" up to now.
Then when press PEAK switch again, the peak mode is cancelled and returns to the measurement mode. Then if there is no input of peak for about 20 seconds, this shall return to the measurement mode.
When hold pressing ESC switch for 3 seconds in the peak display, the peak value will be cleared.



2-5. Stop of pump operation

When transfer the sampling point or stop measurement temporarily, it can stop the running of pump only.
When stop pump running, the battery consumption can be cut by about 40% as compared with the pump running time. All except pump work and then, no warning-up time is required if re-operate the pump.

> * NOTE
>
> When do not measure for some time, turn off the power.
> As all except pump work, the battery will be consumed if leave the pump operation stopped.

(1) Pump running display

<Pump running on>

This displays gas reading whole in pump running.

0. 0%LEL	(Pump running)

<Pump power off>

The following message shows while in pump work stopping.

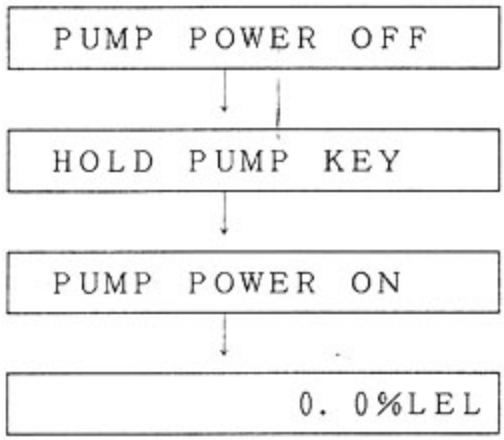
PUMP POWER OFF	(Pump stop operation)

(2) Operating procedure

Pump : Running on → stop

0. 0%LEL	(Pump running)
↓	
HOLD PUMP KEY	Press [PUMP] for about 3 sec.
↓	
PUMP POWER OFF	

Pump : Stop → operation



Pump power off display

Press [PUMP] for about 3 sec.

Display for about 3 sec.

(Pump running)

2-6. Measurement completion

(1) Treatment after measurement

Make air cleaning until the reading comes nearby to zero point under condition that the sampling hose(spiral) is connected with instrument by sucking fresh air.

(2) Power OFF

While pressing the power switch for about 5 seconds, the power will be off.
While pressing the power switch off, the buzzer will sound for about 10 times.

⚠Caution

* Do not forget to do air cleaning.
  Make air cleaning for minimum 5 seconds regardless of measuring gas condition.
  When neglect the air cleaning, the following will take place and will be a cause for trouble.

  ① If water, oil and mist are left and condensed in dust, much of water and oil shall be sucked into instrument at the next measurement time.
  ② As HC vapors may be absorbed completely, there will be a trouble for next time measurement.

3. Alarm function

3-1. Kind of alarm and alarm pattern

Trouble alarm is provided for this instrument.
Each alarm is provided with buzzer, lamp and display.

Trouble alarm and alarm pattern

		Lamp	Buzzer	Display
Power ON	System error	ON	CONTINUOUS	"SYSTEM ERROR"
	Battery power shortage	ON	CONTINUOUS	"REPLACE BATTERY"
	Sensor disconnection	ON	CONTINUOUS	"FAIL SENSOR"
	Pump disconnection	ON	CONTINUOUS	"FAIL PUMP"
Measurement	Low battery warning	Flicker	INTERMITTENT	"B" flicker at left end
	Low battery alarm	ON	CONTINUOUS	"REPLACE BATTERY"
	ZERO cal failure	OUT	NO SOUND	"FAIL ZERO"
	SPAN failure	OUT	NO SOUND	"FAIL SPAN"

3-2. Countermeasure at alarm

(1) System error ("SYSTEM ERROR")
When receive an excessive noise, this error may appear.
Consult it with the nearest agent.

(2) When the low battery alarm is given, replace 4 pcs of batteries with new ones according to the procedure of "4-1 Battery replacement".

(3) Sensor connection error ("FAIL SENSOR")
When give an excessive shock or impulse to the instrument such as dropping or throwing etc and use for a long time period, such display may appear.
Carry out the daily check or regular check (See "4. Maintenance check".)

(4) Pump connection error ("FAIL PUMP")
When give an excessive shock or impulse to the instrument such as dropping or throwing etc and use for a long time period, such display may appear.
Carry out the daily check or regular check (See "4. Maintenance check".)

(5) Zero cal error ("FAIL ZERO")
Under the condition that zero gas(air) is not sucked correctly or water and oil etc are sucked into instrument, such display may appear. Check whether there is any damage or any sign of water or oil etc suction in the sampling hose or filter tube with flowmonitor etc. If any error could not be found, let zero gas(air) sucked into instrument correctly and make zero adjustment. (See para 2-4)

(6) SPAN failure ("FAIL SPAN")
Under the condition that zero gas(air) is not sucked correctly or water and oil etc are sucked into instrument, such display may appear. Check weather there is any damage or any sign of water or oil etc suction in the sampling hose or filter tube with flowmonitor etc. If any error could not be found, let calibrtion gas sucked into instrument correctly and make span adjustment (See para 4-2)

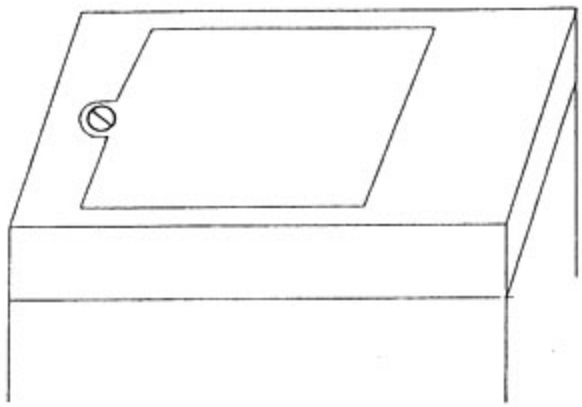
4. Maintenance check

4-1. Battery replacement

> **Warning**
>
> * Battery replacement shall be done at non-hazardous zone by all means.
> * Be sure to use the genuine batteries.

When make battery replacement, replace all 4 pcs batteries with new ones.

(1) Check that the batteries are no more available.
When the power is on, do it after power off.



(2) Remove the carrying case from the instrument.

(3) Open the battery cover by turning the cover on the bottom of instrument counterclockwise with minus screwdriver or coin etc.

(4) Remove 4 pcs batteries and put the new ones where they were by taking care of polarity.

> * **NOTE**
>
> When remove battery, remove it from the polarity of (+). When put it, it is easy to replace the battery from the polarity of (-).

(5) When finish the replacement of batteries, put the battery cover in the reverse way.

> ⚠ **Warning**
>
> * Tight up the battery cover for sure.

4-2. Gas calibration

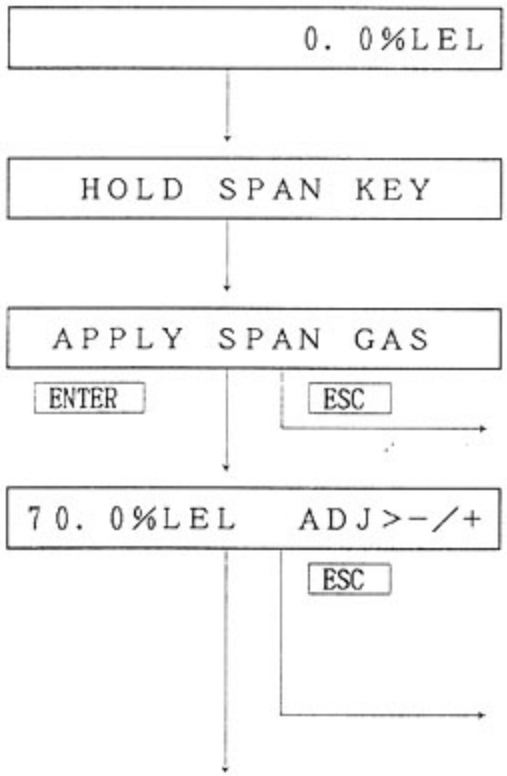
It is required to make the regular maintenance check (over once in 6 months) to assure the normal operation of instrument.
The measuring range of model RI-415 series are dual expanded scale of 0-100%LEL and 0-100vol%. Then, the gas calibration of both ranges is required.

(1) For this gas calibration gas (both for low density gas and high density gas) and sampling bags (Green & orange).

(2) Remove the gas sampling hose(spiral) from the instrument. Then, arrange to connect sampling bag from the gas inlet of instrument.

(3) Turn on the power and make zero adjustment.

(4) Put the low density gas into green sampling bag and make gas calibration in the following procedure.



(Gas density display)

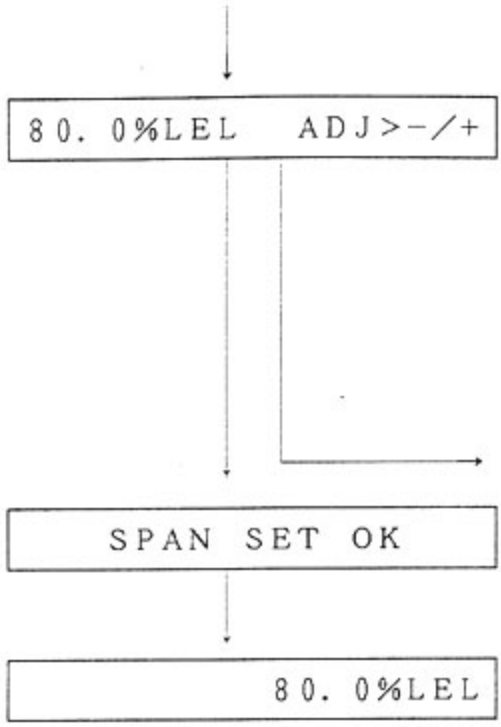
Press [PUMP] and [ZERO] switch for 3 seconds simultaneously.

Supply calibration gas from the gas inlet and press [ENTER]

Stop gas calibration
→ Return to gas density display

Wait until gas reading gets stable. When there is almost no difference between gas display and calibration gas value, it dose not need gas calibration adjustment. Then, press [ESC] switch and make it end.

Gas calibration ends
→ Return to gas density display



Adjust the gas reading to the calibration value. By pressing −, + switch, adjust the gas reading to the value of canned gas and press [ENTER] switch. But when press [ENTER] without pressing −, + switch, ① will appear. This means that calibration proceeds without setting the calibration gas value. When do not make gas calibration, press [ESC] switch.

Gas cal error

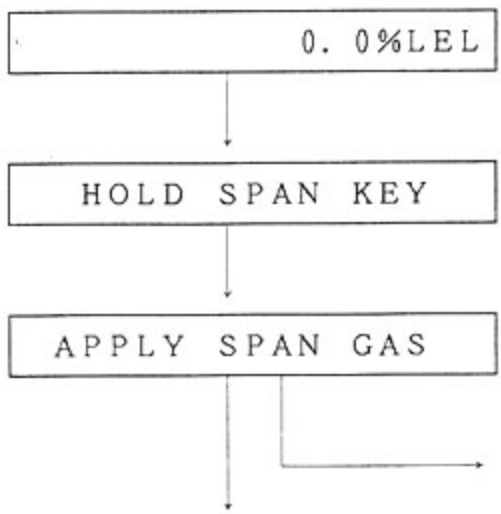
Calibration ends normally

(Gas density reading)

⚠ Danger

* Do not approach the fire at the time of gas calibration at all. For gas calibration, use the high density gas.

(5) Put the high density gas of canned gas into the orange sampling bag. Then, make gas calibration in the same procedure.

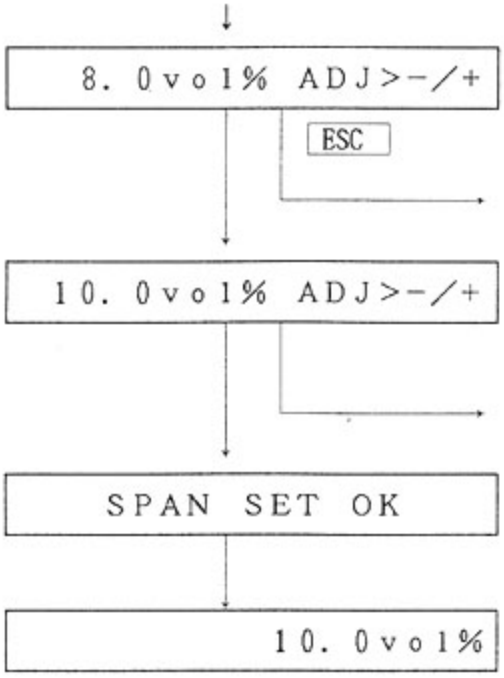


(Gas density display)

Press [PUMP] and [ZERO] switch for 3 seconds simultaneously.

Supply calibration gas from the gas inlet and press [ENTER]
When cease calibration, Press [ESC]

Stop calibration
→ Return to gas density display.



Supply calibration gas from the gas inlet and press. ENTER
When cease calibration, Press ESC

Stop calibration
→ Return to gas density display.

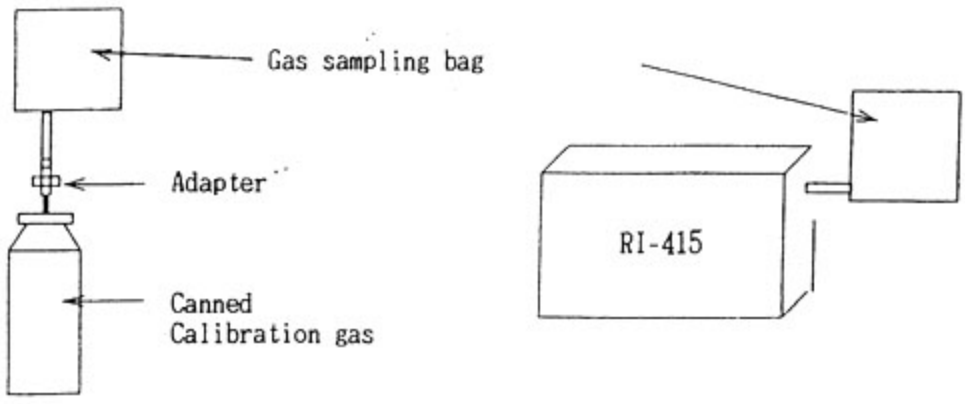
Supply calibration gas from the gas inlet and press ENTER
When cease calibration, Press ESC

①

Supply calibration gas from the gas inlet and press ENTER
When cease calibration, Press ESC

(Gas density reading)

① Display or performance at gas calibration failure (See para 3-1)



⚠ Caution

* Do not supply the calibration gas directly by plugging in the gas inlet from the canned gas. Because the inside of instrument may be damaged.
* Be sure to make calibration by both high density gas and low density gas.
* If neglect this calibration, the accurate measurement cannot be assured.

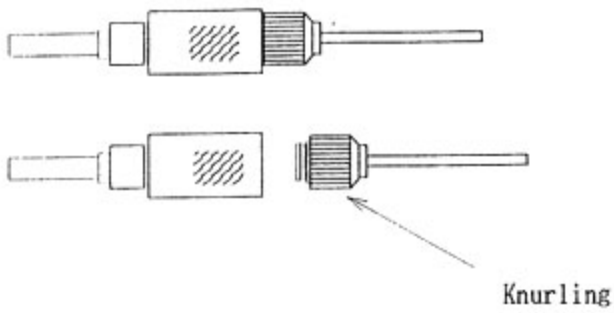
4-3. Filter replacement

Check the filter (Cotton) in the gas sampling probe before measurement and if it is dirty, replace it with new one.

(1) By turning the knurling part of the gas sampling probe, open the gas sampling probe.

(2) Take out the cotton filter in the gas sampling probe by use of tweezers etc.

(3) Put the new cotton filter so that it can be even in the gas sampling probe and close the knurling part in the reverse procedure.



⚠ Caution

* Do not put much of cotton filter.
  If put in too much, the flow rate gets down and the accurate measurement cannot be carried out.

*** Note**

* Leaving the gas sampling probe with sucking water, oil and dust will give bad influence on sensor. It is recommended to replace dust filter of gas sampling probe every time.

4-4. Daily check and regular maintenance check

(1) Daily check

* Are there any damage on switches, lamp, display and panel?
* Pump suction work check
  (Is pump suction sound normal? Can any trouble sound be heard?)
* Battery voltage check.

(2) Regular maintenance check

It is recommended to receive the maintenance check at least once in a year.
Contact the nearest agent or Riken Keiki Co., Ltd.

4-5. Replacement of parts.

As the following parts have its own life end, it must be replaced regularly.
When replace, contact the nearest agent or Riken Keiki Co., Ltd.

Dust filter (of gas sampling probe)	: Every time
Pump	: Approx. 2 years (Depends on use frequency)
Internal filters	: Approx. 1 year (Depends on use frequency)
Sensor	: Approx. 5 years

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

After replacement of dust filter(of gas sampling probe), keep the instrument from the direct sun drought and store it in a room.
When do not use for more than one month, store it by removing the batteries.

5. Scrap of instrument

When scrap the instrument after a long use, do it in the same treatment as industrial scrap goods (Non-flammable goods) because no harmful material for environment is used.

6. Trouble shooting

This trouble shooting does not mention the possible cause of all the malfunction but simply shows it to help the cause research of probable malfunction.

Trouble	Cause	Treatment
Power can not be on	* Empty batteries * Batteries are consumed up. * Wrong polarity of battery * Time shortage to press POWER switch	* Put batteries in correct way by seeing the battery replacement (See 4-1) * Hold pressing for approx. 5 seconds (Until displayed)
No pump running	* No measurement and pump stops running (Display comment)	* Make re-operation of pump (See 2-6)
No pump suction	* The pipe of IN, OUT of filter or tube etc may be removed or clogged.	* Check the clog of filter pipe or twist etc and treat it correctly. (See 4-3 and 2-5)
Zero "0.0"%LEL of gas display is flickering	* Zero point is deviated	* Check that there is gas free around and make zero adjustment.
"100.0vol%" flickering	* Zero point or gas sensitivity is deviated.	* Make zero adjustment. (See para 2-4.) * When not adjusted to reading value, make gas calibration (See para 4-2.)

7. Caution in operation

Keep the following items below to maintain the function of instrument.

⚠ Warning

* Do not modify or alter the circuit or structure etc.
  after modifying and altering the instrument, the function can not be maintained any longer
* As this is explosion-proof type instrument, make the battery replacement at non-hazardous-zone. The replacement at hazardous zone will be beyond the scope of explosion-proof concept.
* As this is explosion-proof type instrument, be sure to operate with carrying case on.

⚠ Caution

* Do not fall or crush it.
  As this is a fine instrument, the function may not be maintained if high impulse or shock is given.
* Do not splash water directly
  As this is not drip-proof structure, it will be a cause for trouble if water is splashed directly.
* Do not give the electrical noise during operation by strong walkie-talkie wave etc. When give the electrical noise to the instrument, it will be a cause to damage the instrument.
* When the temperature in air is changed drastically, it may affect the reading of instrument.
* When it is in dew or condensed, the normal measurement can not be carried out.
* For internal filter and filter tube, be sure to operate it with them on by all means.

8. Definition of words

%LEL

When define the Lower Explosion Limit of combustible gas as 100%.

Methane : 100%LEL = 5.0vol%
Iso-butane : 100%LEL = 1.8vol%

vol%

This is the unit shown by percentage for how much a special material (or gas) in a volume is occupied in that volume

Combustible gas

The lower limit of Explosive Limit (Explosive limit when mixed with air) is to be below 10%. The difference between upper and lower limits is to be above 20%.

HC gas

General name of hydrocarbon
This instrument displays it by converting through iso-butane gas density.

in Air

The atmosphere of -10～+40℃, below 90%RH in an atmospheric pressure (1013hPa)

Hang-up phenomenon

This is the phenomenon to show slightly higher reading than the actual one by the influence of residual gas for some while though fresh air is supplied after high density gas was sucked into instrument.

9. Specifications

9-1. Specifications

Model	RI-415 for HC	RI-415 for CH4
Gas	HC	CH4
Detection principle	Non dispersive infrared method	
Measurable range	0-100%LEL/0-100vol% (Dual auto range)	
Increment	0.5%LEL/0.5vol%	
Indication accuracy	Within ±5% of reading	
Response time	Within 30 seconds (T90)	
Sampling/Suction rate	Suction pump, over 300 mℓ/min	
Ambient temp/humidity	−10℃～40℃/below 90%RH (Non-condensing)	
Power source	Alkaline batteries (Size C) 4 pcs.	
Continuous operation time	Approx. 50 hours (no alarm/no light at 20℃)	
Explosion proof	Exiad II BT3	
Dimension/weight	200(W)X80(H)X142(D)mm/approx. 2kg (including batt.)	
Additional function	Low battery voltage alarm, Trouble alarm (disconnection of detection cell), Peak hold	

9-2. Accessories

(1) Standard accessories

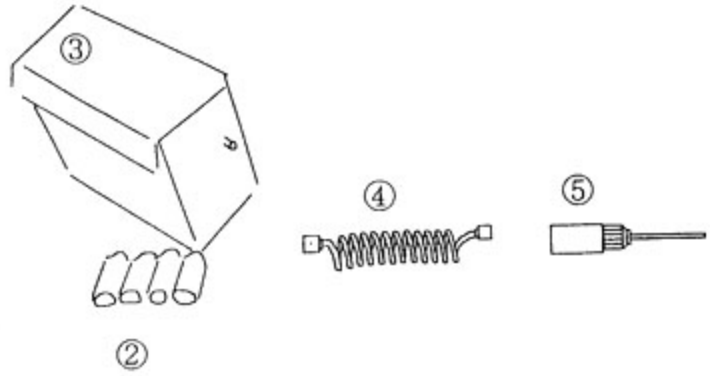
① Instruction manual

② Dry battery (4 pcs)

③ Carrying case

④ Gas sampling hose (spiral) 1m

⑤ Gas sampling probe (with filter)



(2) Optional accessories

① Gas sampling bag (for LEL)

② Gas sampling bag (for VOL)

③ Filter tube (with flow monitor)

④ Junction tube (20cm)

⑤ Gas sampling hose 30m (for LEL)

⑥ Gas sampling hose 30m (for VOL)

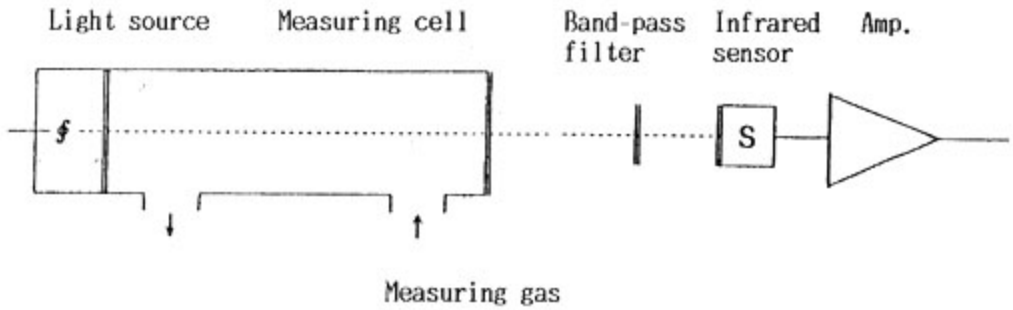
⑦ Canned CH4 gas for 70%LEL
⑧ Canned CH4 gas for 70VOL% } RI-415 for CH4 spec

⑨ Canned iso-butane for 50%LEL
⑩ Canned iso-butane for 10vol% } RI-415 for HC spec

10. Detection principle

Model RI-415 is based on NDIR method (Non-Dispersive Infrared) and this structure is shown below.

The infrared beam emitted from the light source passes through the measuring cell, and optical band pass filter which can pass the absorption wave of measuring gas and attains to the infrared sensor. The amount of infrared attaining to the infrared sensor through measuring cell is absorbed by the measuring gas when measuring gas is supplied into the measuring cell and will decrease according to its density.
The variable amount of infrared is measured by the infrared sensor and it is displayed as gas concentration.
Then, there is no sensitivity against CO2 and CO etc which have the different absorption wave from the measuring gas. Then there is no sensitivity against N2 and H2 etc which cannot absorb infrared. As compared with the conventional catalytic combustion method, there is no poisoning material to be absorbed and almost no sensitivity drop on this detection principle.



RIKEN KEIKI STANDARD WARRANTY

GAS DETECTION INSTRUMENTS

RIKEN KEIKI CO., LTD. warrants gas alarm equipment manufactured and sold by us to be free from defects in materials and workmanship for a period of one year from date of shipment from RIKEN KEIKI CO., LTD. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, F.O.B. Factory. 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. Such items may include :

a) Lamp bulbs and fuses
b) Pump diaphragms and valves
c) Absorbent cartridges
d) Filter elements
e) Batteries

Warranty is voided by abuse including rough handling, mechanical damage, operation, alteration 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 WARRNTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF RIKEN KEIKI CO., LTD. INCLUDING BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL RIKEN KEIKI CO., LTD. BE LIABLE FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL LOSS OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCT TO FUNCTION OR OPERATE PROPERLY.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers and representatives as appointed by RIKEN KEIKI CO., LTD.

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