



HIGHLY SENSITIVE HCHO GAS MONITOR

MODEL FP-330

INSTRUCTION MANUAL

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

This is important manual to operate the gas monitor FP-330 to keep the performance of the unit, to increase the reliability of the unit. The record of the checking result and the treatment of this should be kept and use them for next checking, planning for repair and improvement of the equipment. It is kindly requested to keep the safety enough consideration at instruction even when the work failure or accidents etc takes place by inadvertent factors and disconnection of power and signal cables.

• Identification of each cautionary marks

▲ DANGER

This mark means that it may occur serious damage on the human' s life or products if the unit is used in improper way.

▲ WARNING

This mark means that it may occur serious damage on human' s body or products if the unit is used in improper way.

▲ CAUTION

This mark means that it may occur some damage on the body or products if the unit is used in improper way.

*** NOTE**

This mark means the advice on the operation/control of the unit.

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1. PRODUCT OUTLINE

1-1 SUMMARY

This gas monitor is designed to detect PPM level gas concentration.

By this detection result, it is not to assure the warranty of life and safety.

This instruction manual is the guide book to use HCHO detector model FP-330 correctly. It is kindly requested to read this manual for the already experienced staffs as well as a beginner and operate this instrument after understanding this operation well.

For this improvement, the specifications are subject to change without notice.

All or a part of this instruction manual is prohibited to copy or transcribe without our acceptance.

In this manual, the following headlines are used to carry out the safe and effective work in this instruction manual.

- Two alarms- "WARNING" and "ALARM" -are provided.
- Easy to replace the gas detection cassette tape.
- The unit maintains required performance only replacing the cassette tape every one month.
- When the gas detection tape is exposed with gas that is sampled by the pump, depending on the gas concentration, the gas detection tape makes the color.
And the unit detects the ratio of color changed and converts it to the gas concentration.
- Almost interference-free detection for alcohol, hydrogen, etc because of its detection principle.

1-2 CAUTION ITEMS

⚠WARNING

Abnormal temperature, smoke, noise, smell

During the operation, if any unusual thing is caused, stop the operation immediately, and turn the power off. If the unit is operated continuously with this condition, it may cause the electrical shock or fire.

⚠CAUTION

Contact with the metal edge

When move the unit, and it may be needed to touch the edge of the metal case or plastic parts, take care enough not to be injured by the edge of metal of plastic.

⚠WARNING

Shock & damage by the drop

Do not drop or give the impact to the unit. This unit includes very sensible parts, so it may make the unit not to detect the gas leakage correctly.

⚠WARNING

Use at the high temperature, high humidity or dusty place

- Do not use or store the unit at the place where may be high temperature, high humidity or dusty. It may cause the unusual operation of the unit or it may be source of the fire or electric shock. Use the unit within operating temperature and humidity specified in the specifications sheet.
- When the unit is moved from high temperature area to low temperature area, it may get the water condensation inside of the unit. If the unit is operated with this condition, the correct gas detection may not be performed. And it may be source of the malfunction. When the unit is moved, use the unit after keeping the unit in the same condition for several hours to be accustomed with the condition.

⚠CAUTION

Operation at the unstable place

Do not install the unit at the bent position or there is vibration .
During the operation, the unit may drop, and it may injure the human or broken.

⚠WARNING

Connection of Earth(grounding)

To avoid electric shock, connect the earth wiring to the earth terminal .
If not, it may make the electric shock.

⚠WARNING

Treatment of power cable

Do not put any material on the power cable, or do not stretch the cable or bent.
It may cause the fire or damage of the cable.

⚠ WARNING

Power source

Before power on, check that the power source voltage is within the given voltage. If not, it may damage the unit or source of the fire/electric shock.

⚠ WARNING

Multi-wiring

To the same power input, if many power plugs are connected, it may cause the fire, and it may cause the power shut down due to over loading. And it may make the unit to be affected by the electrical noise.

⚠ WARNING

Mixing in of a foreign articles to the inside of the unit

Do not mix metallic articles or foreign articles which are easy to burned the inside of the unit.

It may cause the bad performance, electric shock or fire.

⚠ WARNING

Put the articles on the unit

Do not put the container including water such as flower vase, potted plant etc, and small metallic articles such as pin, clip etc onto the unit.

If they are entered into the unit and used as it is, it is caused to the breakage of the unit, electric shock or fire.

⚠ CAUTION

Use of gas detection tape

- Store the gas detection tape in the bag in the refrigerator. Do not cut the bag during the storage. If the bag is cut, it expedites the change of the color of the tape and it can not be used any more. And use the gas detection tape within the storage period specified.
- If the gas detection tape is stored beyond the specified storage period, we can not assure the accuracy of the gas detection. To be safety, do not use the gas detection tape which is stored beyond specified storage period.
- The gas detection tape is painted with special material, do not touch with the fingers. It does not cause any influence on the human body, but it may cause the low accuracy of the gas detection or tape cut.
- The replacement period of the gas detection tape is one month at no gas condition. When the unit detect the gas, the gas detection tape must be replaced before one month.
- The gas detection tape is designed for this unit only, so do not use this gas detection for other unit. It may be source of the trouble.
- Depending on the kinds of the tape or storage condition, the gas detection tape may get the color slightly, but it does not affect on the gas detection.

2. PRODUCT FUNCTION

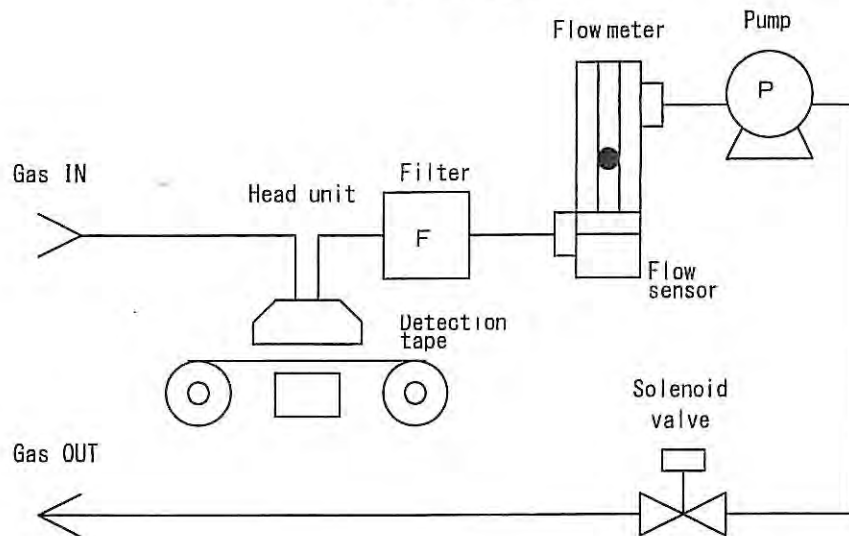
2-1 ACCESSORY LIST

This unit is accessory with the following and then check them when received.

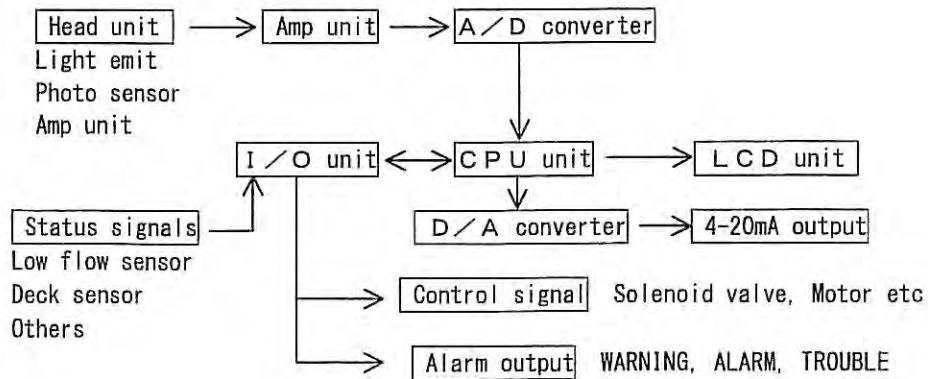
- Cassette tape : 1 pce
- Dust filter : 1 pce
- Instruction manual : 1 pce
- Fuse (Desk top type only) : 2 pcs

2-2 BLOCK DIAGRAM

Piping diagram

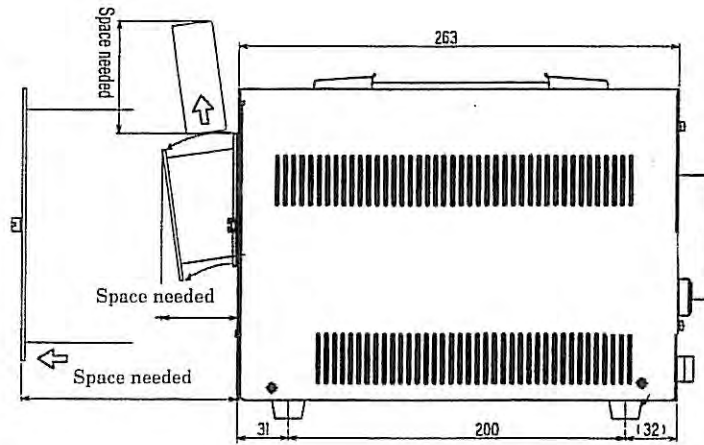
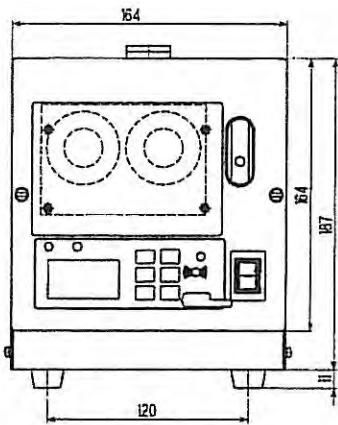


Electric block DWG



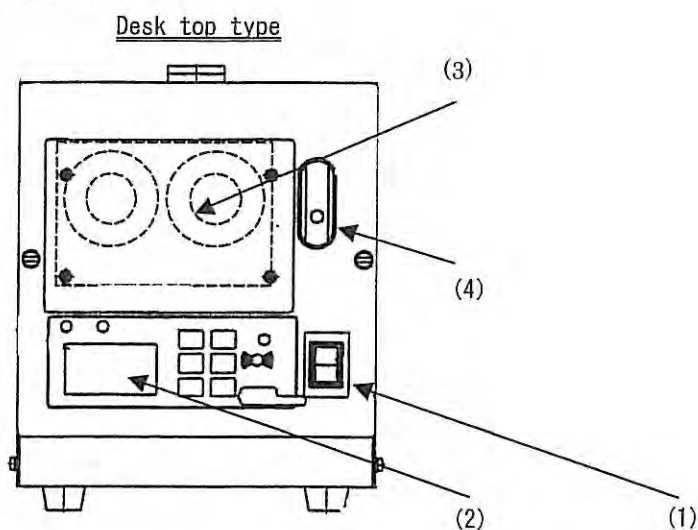
2-3 DRAWING

Desk top type



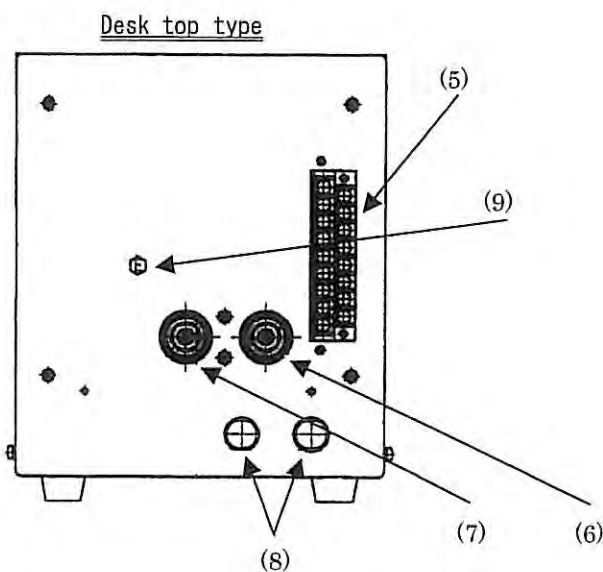
2-4 EACH NAME DESIGNATION

2-4-1 FRONT PANEL



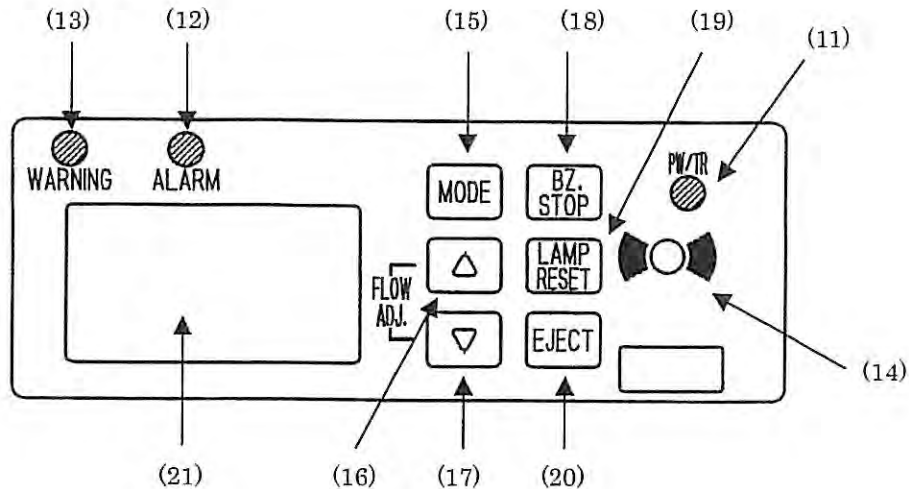
- (1) POWER switch : Power ON/OFF
- (2) Operation panel : Operate each and display. See [2-4-3 OPERATION PANEL]
- (3) Cassette tray : Set the gas detection tape.
- (4) Flow monitor : Check the flow rate of sample gas.

2-4-2 REAR PANEL



- (5) External terminal : See [3-3-2 TERMINAL DRAWING]
- (6) Gas IN half union : Connect the PTFE tube ϕ 6mm O.D
- (7) Gas OUT half union : Connect the PTFE tube ϕ 6mm O.D
- (8) Fuse : 2A * 2 pcs
- (9) Earth terminal : Connect the earth wiring

2-4-3 OPERATION PANEL



- | | |
|-----------------------------|---|
| (11) POWER/TROUBLE lamp | : Normal (Gas status) ... Green light on
Trouble Green lamp blinking |
| (12) ALARM lamp (Alarm) | : Red lamp
Light out at gas detection.
When trigger alarm, it blinks or lights on. |
| (13) WARNING lamp (Warning) | : Orange lamp
Light out at gas detection.
When trigger alarm, it blinks or lights on. |
| (14) Buzzer | : Alarm Continuous tone (Pi)
Warning Intermittent tone (Pi, Pi,)
Switch on Single tone (Pi) |
| (15) MODE switch | : When press approx 3 sec at gas detection, it gets maintenance mode and can make alarm test etc. |
| (16) Δ (UP) switch | : • When press this switch at gas detection, the flow will go up.
• When this switch is pressed, mode can be selected. |
| (17) ∇ (DOWN) switch | : • When press this switch at gas detection, the flow will go up.
• When press this switch at maintenance status, the mode can be selected. |
| (18) BZ STOP switch | : When press BZ STOP switch(18) at gas detection status, the buzzer stops sounding and alarm lamps(12), (13) shall be changed from blinking to light on. |
| (19) LAMP RESET switch | : • After press BZ STOP switch(18) at gas alarm status, press LAMP RESET switch at gas alarm. When it gets lower than alarm preset level, the alarm lamp(12), (13) will light out, the external alarm will be cancelled.
• When it gets to plural trouble status, the trouble can be checked in turn by pressing this switch.
See [7-1 SELF-DIAGNOSIS]
• When pressed at gas detection status, the alarm set value shall be displayed on LCD(21) for approx 2 sec. |
| (20) EJECT switch | : When unload the cassette tape, press and hold this switch for approx 2 sec and then, the cassette tray will open. |
| (21) LCD | : This shall show various comment such as gas reading. |

3. OPERATION

3-1 HANDLING

- ① For panel mount type, there is no handle. Then carry it with hands on to the bottom.

▲ CAUTION

Do not lift nor transport the in this unit by use of cassette tray. There are risks of breakage of cassette tray, breakage of the instrument or injury when the instrument is dropped.

- ② When install this unit, take caution to install where alarm can be checked easily, the reading is easy to see, the cassette tape is easy to replace, flow can easily be adjusted and it is easy to maintain.

▲ WARNING

Do not put the container including water such as flower vase, potted plant etc, and small metallic articles such as pin, clip etc onto this unit.

If they are entered into this unit and used as it is, it is caused to the breakage of this unit, electric shock or fire.

- ③ Do not install the following places where it will be cause for trouble and accident.
- Place where sun-drought is given.
 - Place where to be plenty of dust and full of humidity.
 - Place where direct wind is given.
 - Place where to be many of vibration.
 - Place where to be on unstable stool or slant.
 - Place where to be outdoor or plenty of water drops.

▲ WARNING

• Do not use or store in high temperature, high humidity and dusty places. It is caused to the abnormal action, electrical shock or fire.

• When this unit is moved the place from low temperature to high temperature, the surface or inner part will be condensed.

If it is used under such condition, correct detection cannot be performed.

Also it is caused to the trouble.

When this unit is moved, leave it for few hours at the place of use to equilibrate with environment temperature.

▲ CAUTION

Do not put this unit on unstable places such as slope, narrow space or vibrated places.

It is afraid that this unit may drop or face during operation which caused to injury or breakage of this unit.

- ④ As this unit is composed of precision electronics parts, do not drop and crush and install where it is safe and horizontal.

⚠ WARNING

Do not give a shock such as fall and hit to this unit.

Since this unit applies precise electronics parts, normal operation or correct gas detection cannot be performed.

- ⑤ Keep it from the noise source where to be near from high capacity transducer, high noise of motor power source and high voltage generator.
- ⑥ To prevent the error of operation by electric radio interference, keep it at over 1m away from the walky-talky and hand-phone or mobile.

3-2 PIPING

- ① The piping between both IN/OUT should be within MAX 20m.
- ② The piping material should be used with a PTFE tube of $\phi 6$ mm O.D.
- ③ For OUT side pipe, discharge to the given exhaust duct.
- ④ For GAS IN side, mount it by the accessory filter.

⚠ CAUTION

- The length of piping depends on the kind of adsorptive gas.
- Contact our nearest agent or Riken Keiki for adsorptive gases and length of piping.

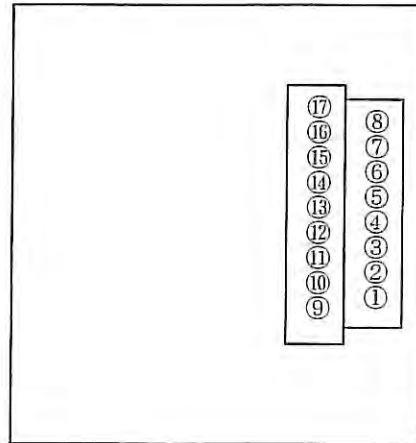
3-3 WIRING

3-3-1 CAUTION ITEMS

- ① The signal wire of current output should be used in the condition not to be affected by the noise through the shielded cable (CVVS cable etc).
- ② Wiring work should be used by switching OFF (O side) If it should be done under power charge condition, it may damage the unit by short circuit etc.

3-3-2 TERMINAL DRAWING

- | | |
|--------------------------|-------------------|
| ① AC220V (L) / DC24V (+) | } Power input |
| ② AC220V (N) / GND (-) | |
| ③ GND | |
| | |
| ④ 4-20mA (+) | } Current output |
| ⑤ 4-20mA (-) | |
| ⑥ No use | |
| ⑦ No use | |
| ⑧ No use | |
| | |
| ⑨ COM | } WARNING contact |
| ⑩ a | |
| ⑪ b | |
| ⑫ COM | } ALARM contact |
| ⑬ a | |
| ⑭ b | |
| ⑮ COM | } Trouble contact |
| ⑯ a | |
| ⑰ b | |



• Power input

Desk top : AC100-220V

Panel mount : DC24V (Check the polarity)

• Power output : 4-20mA (Take care of polarity)

Output 0~F.S at linearity

0 : 4.0 mA

F.S. : 20.0 mA

Trouble : 0.5 mA

Initial : 2.5 mA

For gas exceeding F.S, it indicates up to the output of 22mA.

The rating of alarm point each is 125V, 0.5A. It may have the case to need the protection spares such as spark killer by the connection load to keep the function.

3-4 GAS DETECTION CASSETTE TAPE

This gas detection cassette tape (FC TYPE) is for exclusive cassette tape.
Use it by understanding all the below.

3-4-1 HANDLING OF GAS DETECTION CASSETTE

▲ CAUTION

Do not touch with detection tape.

Special reagent is applied for detection tape and then, though it is not harmful to human, do not touch by hand. Because it may cause drop of detectability and the cut-out of tape.

▲ WARNING

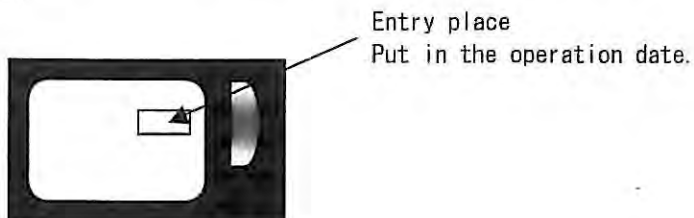
Do not use the detection cassette tape after passing its expiry date.

The operation time of cassette tape is one month and then, the tape passing over 1 month after opening cannot warrant the indication accuracy from the safety.

*** NOTE**

When start to use the detection cassette tape, specify the start of operation date.

To grasp the replacement date of the detection tape, be sure to put the date of operation on the cassette tape.



▲ CAUTION

Use the designated model for the detection cassette tape.

The cassette tape is different from the measuring gas, check the model of it first and use it.

If the different model of cassette tape is used, it is impossible to detect the gas. Then, the cassette tape model name is displayed on LCD while the cassette loading tray is open.

▲ CAUTION

Check the contents in display every day and be sure to replace the cassette tape.

- The replacement frequency of cassette tape is 31 days under the condition that sample gas is free.
If the sample gas is detected and the tape will go on faster.
Then this replacement frequency is shorter.
Then, the tape will be consumed if unloading on the way or turn on the power ON/OFF.
Use the new cassette tape as long as it can and then, use it up to the end.
- When repeatedly unload the cassette tape on the way, the accuracy of tape reminder accuracy will be in accurate.
- When the reminder date display shows 2 days, the message [CHANGE TAPE] will be shown.
POWER/TROUBLE lamp will flicker and the replacement of cassette tape will be blinking and expedite the replacement of the cassette tape.
If the cassette tape is empty completely, it will show [TAPE END] and as the gas detection is stopped to operate and replace the tape immediately.
- When load the cassette tape on the unit, see [6-4 REPLACEMENT OF CASSETTE TAPE] when replace.

⚠ CAUTION

Do not load cassette tape to the other unit than our specified gas monitor.

The gas detection cassette tape is for exclusive use (FC type) of unit.
Do not load it to the other unit and not use it by turning back the tape.

⚠ CAUTION

Do not give the force to the detection tape.

When turn the tape winding part by hand, do not give the force more than the required or strain the tape strongly. Do not wind the winding part basically.

⚠ CAUTION

Some detection tape may change its color slightly when the storage bag is opened, depending on the storage condition.

However, it does not affect to the gas sensitivity.

3-4-2 GAS DETECTION TAPE CASSETTE

⚠ CAUTION

Preserve the cassette tape in refrigerator without opening a bag.
Do not put it into freezer.

The detection tape is so delicate.

If do not handle with care, the capability of tape will be lost and then, the accurate detection will not be available.

After having understood the following, store the detection tape.

⚠ CAUTION

Do not store the cassette tape which has been opened once.

For the cassette tape which once opened, put it back into the pack and store it in the refrigerator. When one month has passed, do not use it because the given function of that tape may not maintain the original function due to the deterioration.

⚠ CAUTION

Use up the cassette tape within the storage period.

- The gas detection tape must be used up in the storage period printed in the pack. If the detection tape has passed the storage period, it will be deteriorated and cannot maintain the original function.
- If stored after opening the pack and leave it with loading the cassette tape in the unit, the discolor of tape may take place and the original function of tape could not be maintained. Then, after opening, use it up at earliest.

3-4-3 RETURN OF GAS DETECTION TAPE

For outer cassette case used up, it is kindly requested to return back for recycling the natural resources.

4. OPERATION METHOD

4-1 PREPARATION

4-1-1 CHECK ITEM

- Pipe : Check whether the given items are not wrong (Pipe material, length)
See [3-2 PIPING]
- Wire : Check whether the connection with external output is correct or not.
See [3-3 WIRING]

4-1-2 POWER INPUT

- After having understood the below, turn on the power.
- Check that the power switch is OFF side (O side) .
 - Check that the power source is adjusted with the power displayed on the unit.

⚠ WARNING

Do not supply the power source other than the specified voltage.
The unit will be broken and it may cause of electrical shock or fire.

⚠ WARNING

Make grounding the earth wire to prevent an electrical shock.
Otherwise, you may have an electrical shock.
Use the "E" terminal located at the rear of this unit.

- Use the power source by keeping it away from the high consumption of motor and high power source.
- Do not make multi-wire connection.
Arrange not to damage the power cord. Do not bend the power cord or hook or pull out forcibly.

4-1-3 POWER ON

Change over the power switch from OFF (O side) to ON side (I side).
After power on, this comes to the detection condition.

* NOTE

The unit reels out the tape after power on.
The life span of the tape will be shortened if the power ON/OFF is repeated rashly in tape loaded condition.

* NOTE

If there are high concentration gases with detection tape loaded, it may give an alarm even if it is before detection condition.
However, this is not a correct gas concentration because it is before detection condition.

4-1-4 LOADING OF DETECTION CASSETTE TAPE

Put in the detection cassette tape suited for the model to the detection gas.
Check the detection tape and tape model.
In detail, see [6-4 REPLACEMENT OF CASSETTE TAPE] . After loading it,
(after closing the cassette tray), it will be in detection condition in a minute.

* NOTE

The tape is always fed once after loading the cassette tape.
The life span of the tape will be shortened if the tape loading/unloading is repeated rashly.

* NOTE

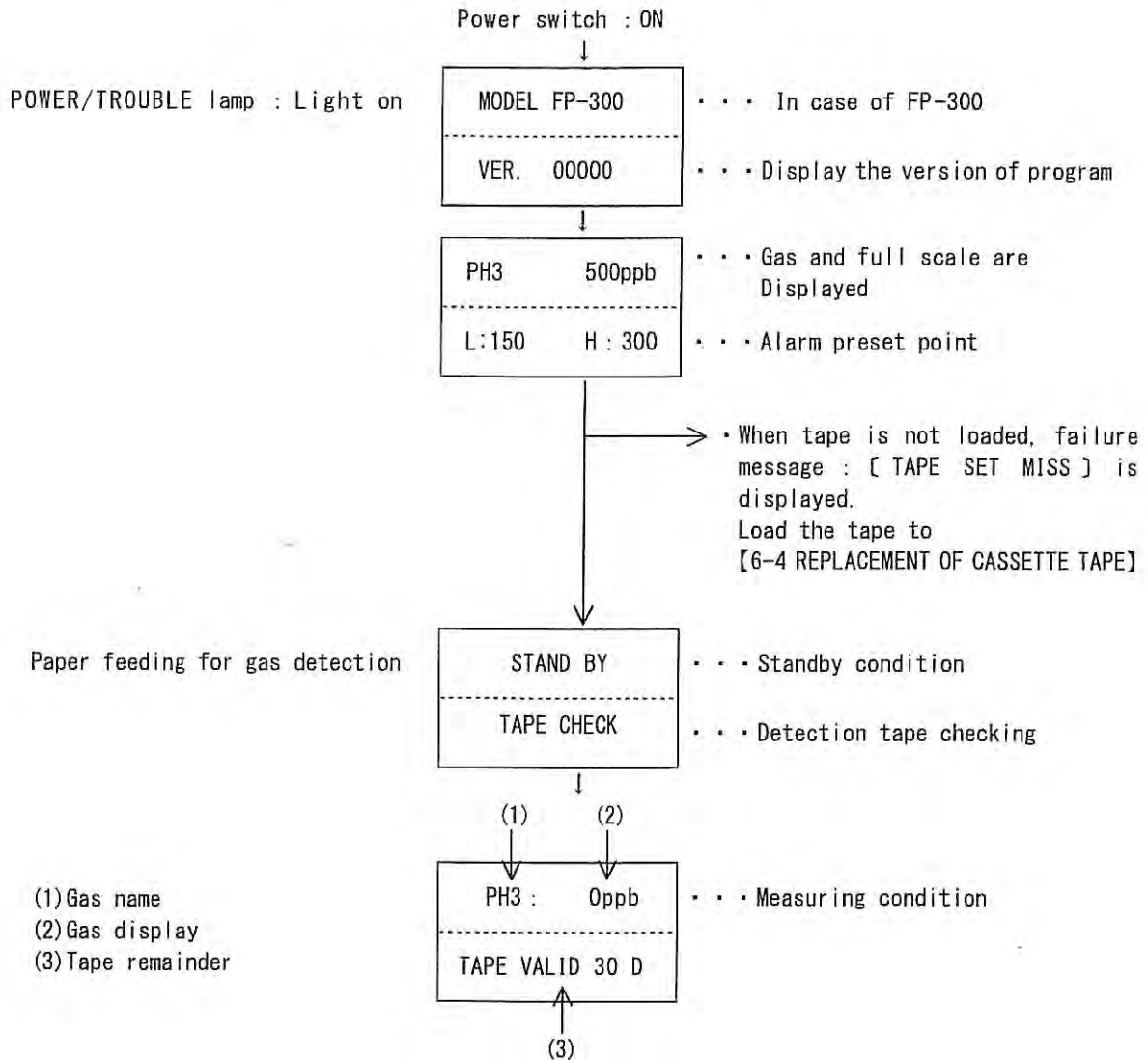
If there are high concentration gases with detection tape loaded, it may give an alarm even if it is before detection condition.
However, this is not a correct gas concentration because it is before detection condition.

4-1-5 FLOW ADJUSTMENT

Check the sample gas flow rate. If the flow meter ball is out of range,
see [6-3 FLOW ADJUSTMENT OF SAMPLE GAS] and adjust it.

4-2 OPERATION

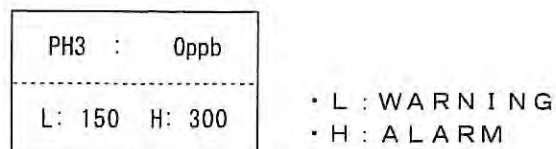
When make the power switch ON (I side) , it will proceed to the detection condition after displaying the necessary information and mechanical check.



4-3 SIMPLE CHECK FOR GAS ALARM PRESET POINT

When press "LAMP RESET" switch of the front panel on the measuring condition, the alarm point shall be displayed as follows.

However, the normal measuring condition means the condition in which gas alarm and trouble alarm do not trigger.

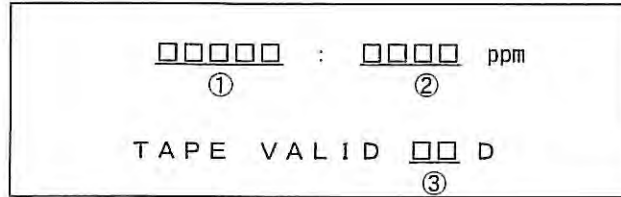


5. EACH FUNCTION

5-1 LCD DISPLAY

5-1-1 DISPLAY FORMAT

LCD The display is formatted by the following.



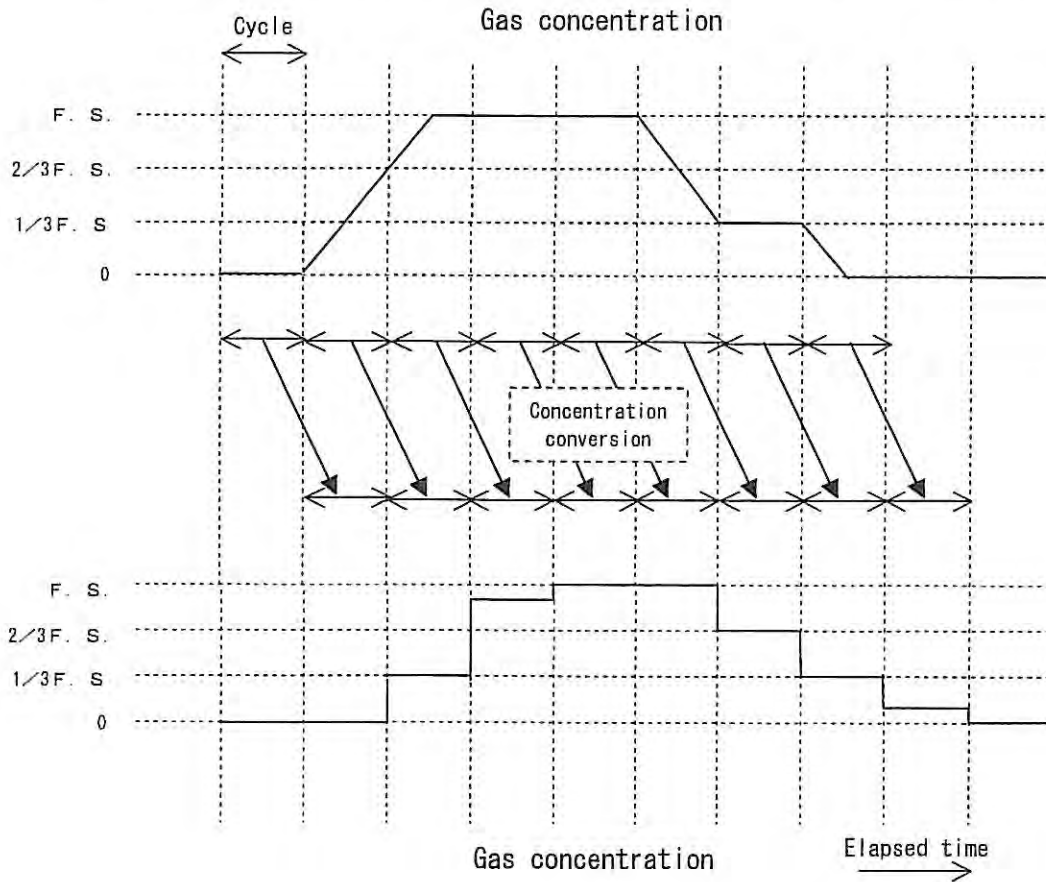
- ① Gas name is displayed.
- ② Gas density is displayed. Displayed by ppm, ppb unit
- ③ Display the remainder of detection tape.

5-1-2 GAS CONCENTRATION DISPLAY

The display of this gas concentration has the following feature.

- For gas concentration, the figure at each detection cycle is updated at each cycle.
- For gas concentration, it will be the average within the time of detection cycle.
- For gas display, the detection figure at previous detection cycle is outputted.

The following drawing is the timing chart at the case of change with elapsed time.



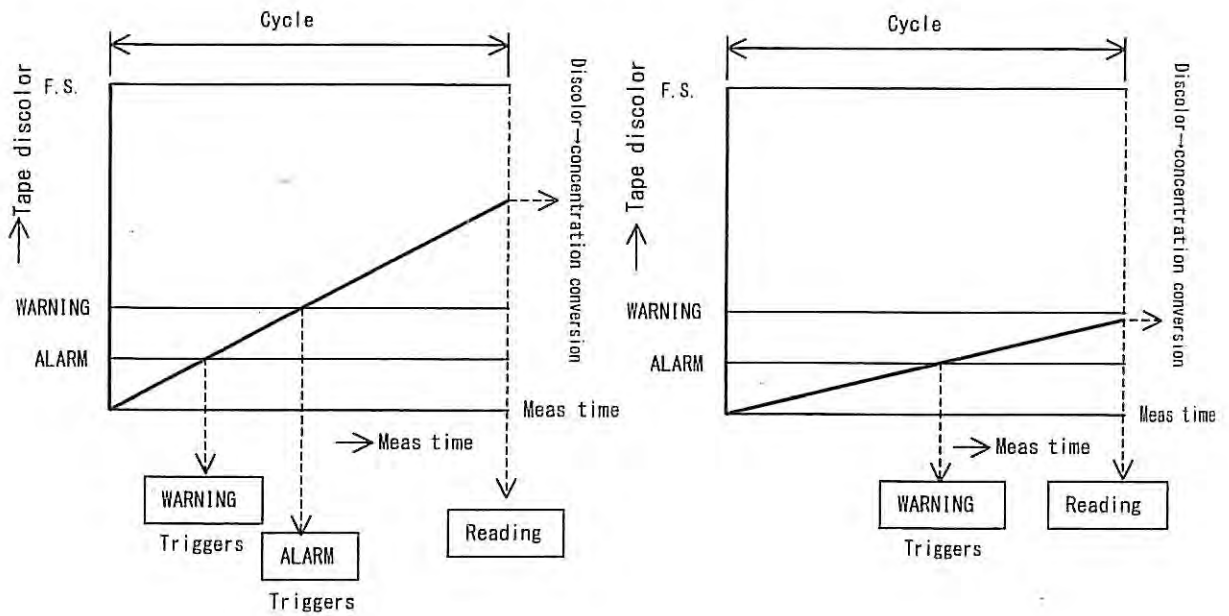
5-2 ALARM FUNCTION

5-2-1 GAS ALARM

This unit is designed to detect the level of discolor by being exposed to the detection tape containing the special reagent within a unit of time. Namely, if a unit of time (detection cycle) has not passed, the accurate gas detection is not available.

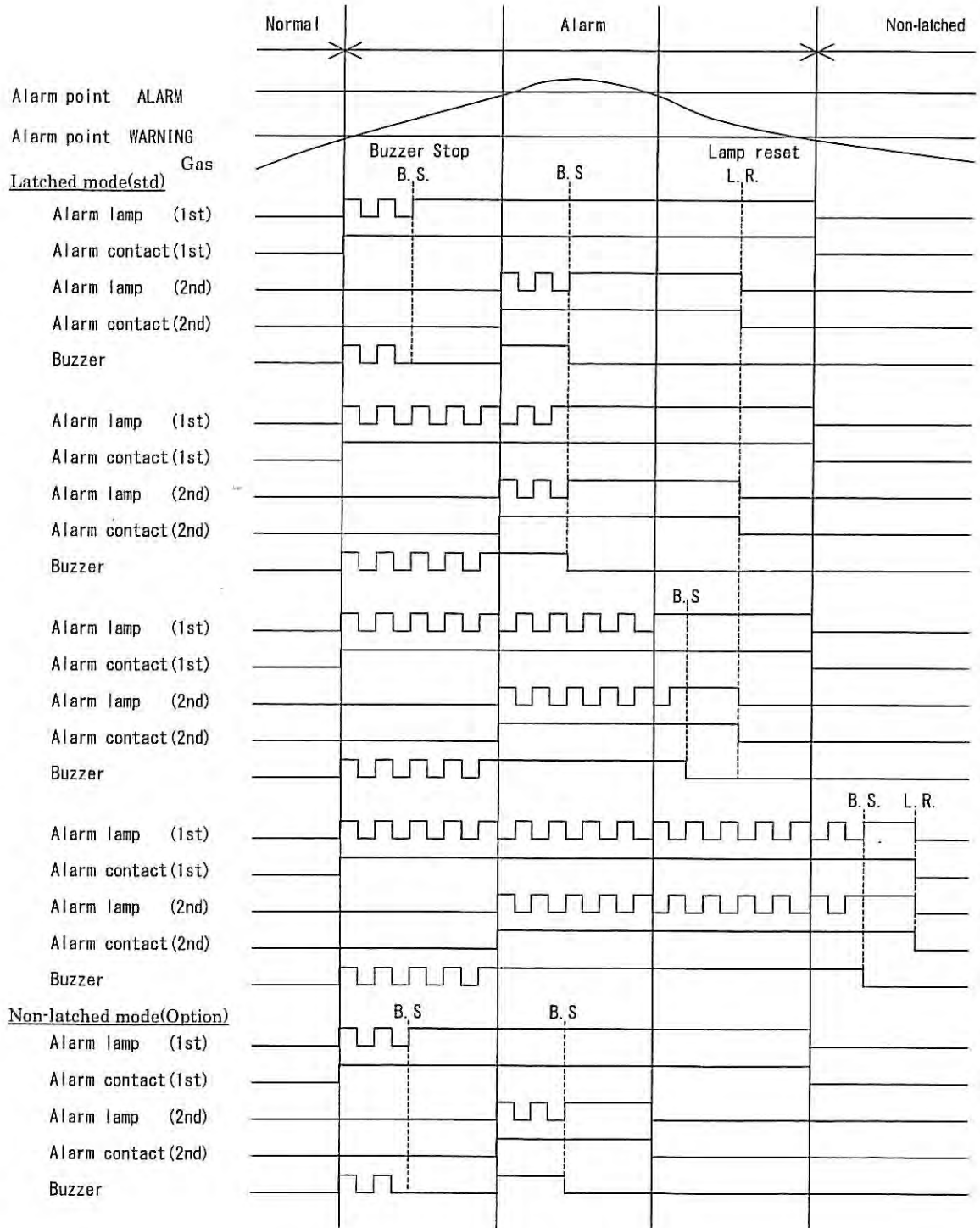
On the other hand, when high concentration gas is generated, it is required to trigger alarm at the earliest.

The alarm activation of this unit is based on the following figure, the rapid measurements are available.



5-2-2. ALARM PERFORMANCE

Timing chart



5-3. EXTERNAL OUTPUT

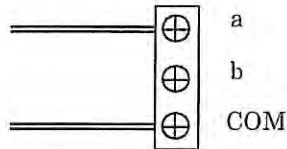
5-3-1 ALARM OUTPUT

This output will be non-latched mode after pushing the reset switch.

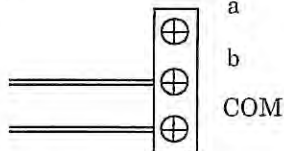
WARNING Contact : Dry "C" contact, Rating : AC 125V, 0.5A (Resistive load)
ALARM Contact : Dry "C" contact, Rating : AC 125V, 0.5A (Resistive load)
TROUBLE alarm Contact : Dry "C" contact, Rating : AC 125V, 0.5A (Resistive load)

The connection to terminal proceeds as follows.

"a" contact (N.O) case



"b" contact (N.C) case



Alarm contact is used as signal transmission media to activate the buzzer alarm rotation light. Do not use it for control purpose such as shutting off etc.

▲ CAUTION

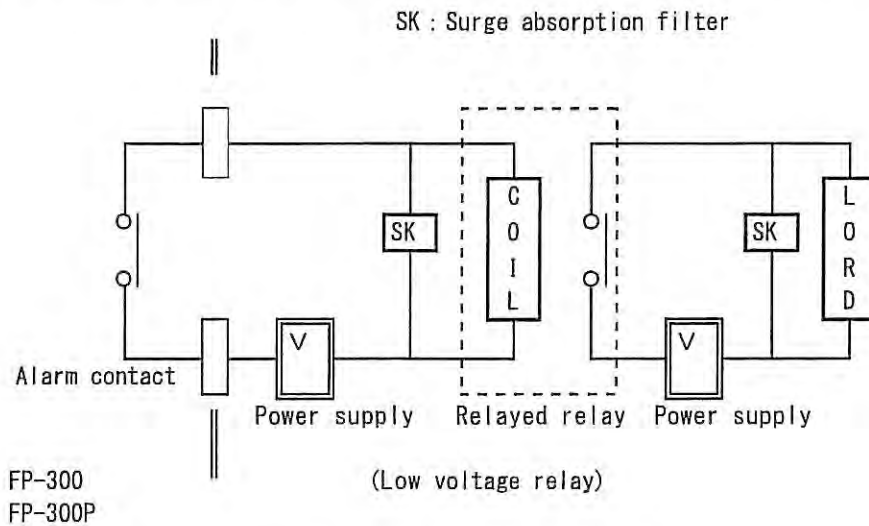
Normally-close contact (Break contact) at de-energized condition may change to open contact in a moment due to physical shock.

Whenever alarm contact is used with normally-close contact, please put delayed-circuit (for about one second) to receiver side of normally-close contact to avoid such phenomenon.

When control the external load, it may have the case to give the evil influence to the gas detector by load characteristic. In such case, let it make the performance stable and to protect the contact, it is requested to proceed to the following procedure.

- Mount and use CR circuit (Spark killer :SK) suited for relay coli by relaying via low voltage relay.
In case of DC case, use it by mounting diode etc to the relay.
- Mount CR circuit to the load side of relayed relay on request.

Reference: By the condition of load, OR circuit may be better to install in the contact side but it is required to put in by checking the action of load.



—How to think alarm contacts against inductive load —

When use the inductive load for alarm contacts, the very high reverse electromotive voltage may be generated and the following trouble tends to be produced.

- Contact part of relay is melted adhesively and the contacts can not work.
- High voltage is put inside of detector unit and then, electrical parts may be damaged.
- As it is big noise, the trouble action may be taken by the reckless drive of CPU.
- Irrespective of inductive load, there is the possibility of unforeseeable noise instruction for contact above trouble may be generated.

To prevent the above difficulties in advance, it is required to have following preventions.

- The inductive load shall not be used in principle (Do not use fluorescent lamp, motor, etc.).
- When use the inductive load, make the contact amplification outside, but the outside relay coil belong, use the relay driven by the low voltage (within AC100V) and it is protected by an appropriate surge killer.
- When control the light inductive load directly, the contact shall be always protected with appropriate surge killer.

In this case, contact rating shall be below 50% of resistive load.

Below 0.25A at 100VAC

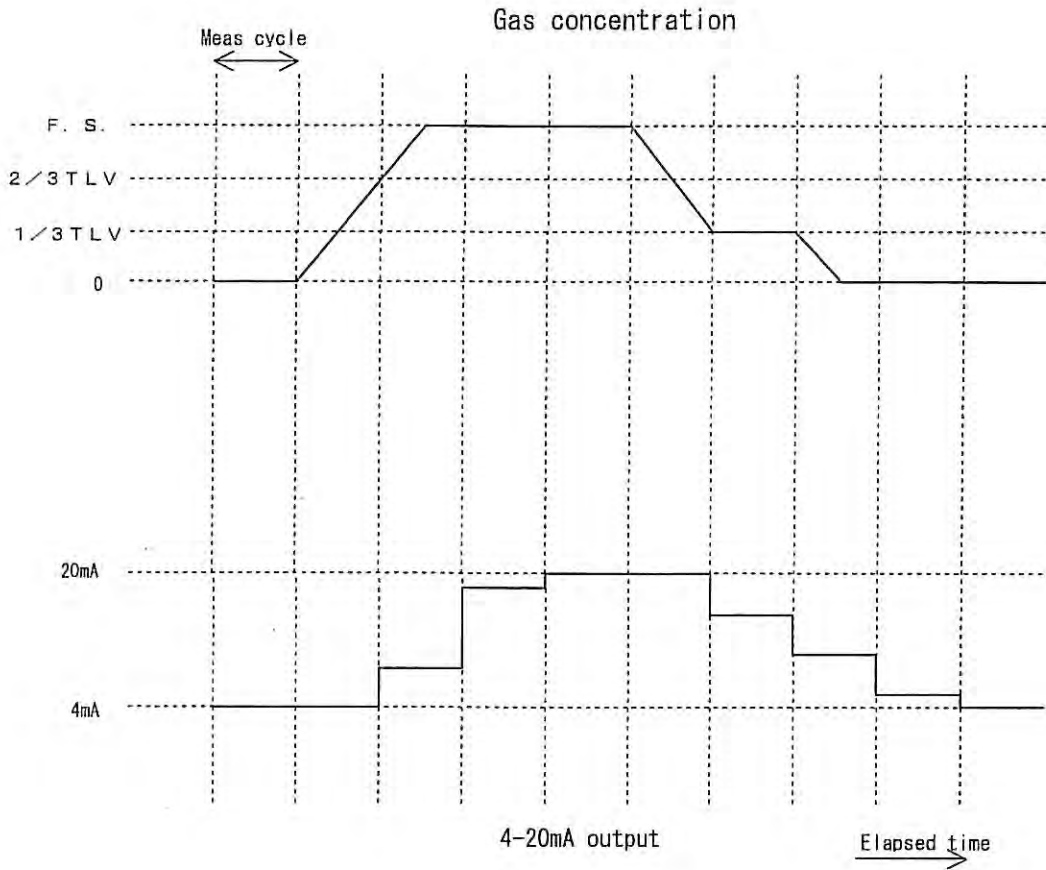
Below 0.75A at 30VDC

* As the inductive load, there are following samples.

- Patlight * External relay * Buzzer * Siren * Fan * Fluorescent lamp *Motor etc.

5-3-2 4-20mA OUTPUT

This unit is provided with 4-20mA output suited for LCD reading display.
The following is a timing chart for 4-20mA output whenever the gas concentration is changed.



5-3-3 OUTPUT PERFORMANCE

Output : 4-20mA output
Resistive load : Below 300Ω

- 4.0 mA Gas concentration reading 0.0ppm
- 20.0 mA F.S.
- 22.0 mA Gas concentration exceeding F.S.
- 0.5 mA Trouble alarm
- 2.5 mA Elapsed time up to gas detection from power on at initial and maintenance time

6. MAINTENANCE CHECK

6-1 DAILY CHECK

Proceed to the following daily check procedure to maintain the function.

- ① Check the remainder of cassette tape.
 - Check it by the remainder display [TAPE VALID ...D] on the lower of front panel.
 - When the cassette tape is at prime time of replacement, replace it to follow the [6-4 REPLACEMENT OF CASSETTE TAPE] .
- ② Check that the sample gas flow is within the red lines.
 - When require flow adjustment, see [6-3 FLOW ADJUSTMENT OF SAMPLE GAS] for adjustment.
- ③ Check that there is no trouble alarm.
 - When the trouble alarm goes out, see [7-2 TROUBLE CAUSE AND MEASURES] and make resetting work.

6-2 REGULAR MAINTENANCE CHECK

6 months maintenance contract is recommended to use this unit for longer.

6-3 FLOW ADJUSTMENT OF SAMPLE GAS

The flow adjustment of sample gas shall proceed to the following.

- ① Check that this unit is under operating condition.

* NOTE

In case of low sample flow it will show the message [FAIL = FLOW] but proceed to the next.

- ② Check that the red ball in the flow monitor is within the red lines.

The red ball may goes up/down from the center between two red lines by the pipe load and cassette tape feeding. If it is within the center, it is no problem nor influence. If it is deviated from the red line, it must be adjusted in the center by turning $\Delta \nabla$ flow adjuster.



The red ball of flow monitor shall be in the center position between two red lines.

* NOTE

The red ball does not stay between two red lines during the tape loading since the gas is not supplied.

6-4 REPLACEMENT OF CASSETTE TAPE

This cassette tape replacement shall be carried out as below.

- ① Check that this unit is under detection condition.
- ② Press and hold EJECT key for about 2~3 sec on the front panel and open the cassette tape. At this time, the buzzer sounds for 4 times.

* NOTE

- When performing other actions than detection condition, you cannot operate EJECT key.
- You cannot operate EJECT key during [TAPE CHECK] .

- ③ Remove the cassette tape used up.
- ④ Put in the new tape not to be in wrong position by checking the tape model.
If the position is wrong, it cannot be put in. Do not force to put in.
Then, the cassette model name is displayed in the LCD while tray is open.

▲ CAUTION

The model of detection tape is different from the measuring gas.
If the different model is used, it may be impossible to detect the gas.
Also, it may be impossible to detect the gas if the expired tape is used.
Uncertain loading may-cause a tape cut.
The gas detection tape shall be loaded back of the tray firmly.

- ⑤ Press the SET PUSH of cassette tray to close it.
 - This will return to an automatic detection condition by closing the cassette tray.
 - It will take about 1 minute for self-diagnosis until the detection starts.

* NOTE

Press the cassette tray firmly until it is locked.
If the cassette tray would be opened halfway, there is a possibility to cut the tape.

- ⑥ Check the sample gas flow rate. If deviated, adjust it.
When required to adjust, see [6-3 FLOW ADJUSTMENT OF SAMPLE GAS] .

▲ CAUTION

Always use the new detection tape. If the halfway tape is used, the tape will be cut (Tape end) suddenly before tape reminder display shows "0" .
It becomes the same result if eject the cassette tray once and then, set it at once.
It counts tape reminder correctly when putting power ON/OFF in tape loaded condition.
However, the tape will be expired 30days after tape loading date if the power off condition continued for a long period.
Then, replace the tape with new one.

6-5 ALARM TEST

The alarm test shall be made in the following procedure.

- ① Check that this is in the detection condition.
- ② Press and hold MODE key for about 3 sec.
 - Select Alarm test by Δ key or ∇ key and press BZ STOP key.
 - Display [ALARM TEST] on LCD and the reading will increase every 1 digit while pressing Δ key.
Whenever exceed the preset alarm level, it triggers alarm.
 - At this time, no output contact works. If let the external output work, press BZ STOP key and LAMP RESET key simultaneously and start alarm test.

* NOTE

If Δ key is released or other key is pressed during the above procedures, the reading will stop or it will decrease to 0(zero) .

⚠ CAUTION

Signals corresponding to the LCD reading are output while in alarm test.
When make alarm test, announce it to respective department beforehand.
Carry it out after making proper treatment (External signal output, alarm contact).

- ③ Release Δ key.
 - The gas concentration at display will stop.
- ④ Press ∇ key again.
 - Reading goes down every 1 digit.
 - When the display returns to 0, it will return to the set screen automatically.
- ⑤ Press and hold MODE key for about 3 minutes and it will be to the detection mode.

6-6 LCD CONTRAST ADJUSTMENT

LCD contrast adjustment shall be made with the following procedure.

- ① Check that this is under detection condition.
- ② Press and hold MODE key for about 3 sec.
- ③ Select LCD CONTRAST with Δ key or ∇ key and press BZ STOP key.
LCD CONTRAST is displayed on LCD and the contrast will be thicker by pressing Δ key and thinner by pressing ∇ key.
- ④ When press BZ STOP key at visible condition, the set is completed and returns to the set screen.
- ⑤ Press and hold MODE key for about 3 sec and it will return to the detection condition.

6-7 RECOMMENDED SPARE PARTS LIST

No.	Name	Check cycle	Replacement cycle(year)	Q'ty/set
1	Pump(except diaphragm)	6 months	1~3	1
2	Diaphragm	6 months	1~2	1
3	Pump holder	1 year	3~6	1
4	Solenoid valve	---	5~8	1
5	Head	---	3~4	1 set
6	Inner pipe (Rubber)	6 months	1~3	1 set
7	Inner pipe (PTFE)	6 months	3~8	1 set
8	Elbow(F2)	6 months	1~3	5
9	Elbow	6 months	1~3	1
10	Filter holder (With O-ring)	1 year	3~6	1
11	Gear motor (Dec drive)	---	7~9	1
12	Gear motor (Tape winding)	---	7~9	1
13	Switching regulator	---	6~8	1
14	Main PCB	---	7~8	1
15	Switching PCB(LCD)	1 year	7~8	1
16	Fuse(2A)	---	8	2
17	Flow-monitor assy.	1 year	7~8	1
18	Inner filter(Balston)	---	3~5	1
19	External dust filter	6 months	0.5~1	1

* NOTE

- The above replacement cycle will be changed depending on operating conditions and it does not mean the guarantee period.
- The flow-monitor assy. (Item 17) contains a low flow sensor and O-ring.
- Replacement of PCB (Printed Circuit Board) is required due to the deterioration of capacitor.

7. TROUBLE CASE TREATMENT

7-1 SELF-DIAGNOSIS

Each diagnosis function in this unit is provided.

If trouble was found, the following message is shown and make the recovery procedure.

Self-diagnosis	LCD message	POWER/TROUBLE lamp	Alarm contact
Sensor failure	FAIL = SENSOR	Blinking	Alarm status
Low flow	FAIL = FLOW	Blinking	Alarm status
Tape damage	FAIL = TAPE	Blinking	Alarm status
Tap cassette pre-caution	CHANGE TAPE	Blinking	Normal status
Tape ending	TAPE END	Blinking	Alarm status
Tape fails	FAIL = TAPE LEVEL	Blinking	Alarm status
Tape set fails	TAPE SET MISS	Blinking	Alarm status
System trouble	FAIL = SYSTEM	Blinking	Alarm status
Motor trouble	FAIL = MOTOR	Blinking	Alarm status

*NOTE

When encounter some troubles, [→] on the right of LCD will blink and when press [LAMP RESET] switch, another trouble content will be displayed.

7-2 TROUBLE CAUSE AND MEASURES

Trouble content	Main cause	Counter-measure
Sensor failure	Sensor disconnection or connector removal or output deterioration.	Sensor head is replaced by manufacturer.
	Measuring path(LED・sensor)part is extremely dirty.	Ditto
Low flow	Secular drop of pump or dust filth at flow path.	Adjusted by flow adjuster.
Tape breakage	Loading of tape cassette is not sure.	Make sure to set the new tape cassette.
	When load the cassette, it damaged the tape.	Ditto
Tape cassette change precaution	Nearly at tape ending.	Replace it with new tape cassette.
Tape ending	Tape ends	Replace it with new cassette.
Tape failure	It is when use the discolor tape than the regulated or the tape passing the life and that stored in the outside of refrigerator.	Replace it with new tape cassette.
Tape set failure	It is not to set the tape cassette. It may be some error of tape loading.	Load the tape cassette. Load it out and check the tape condition. If not in error, load it again.
System trouble	System trouble of instrument	Re-plug in the power. If it does not reset, contact the manufacturer.
Motor trouble	Trouble of gear motor	Contact manufacturer for repair.
Power cannot be on.	Power terminal is off.	Connect it to the terminal firmly.
	Fuse is disconnected. Or not connected.	Put in the rating fuse.
	No voltage is supplied.	Check the power voltage supply.

8. STOPPING THE OPERATION

When finish this operation, turn power switch of this unit to OFF(0) position.

▲CAUTION

Do not store the unit in following places. It will be cause for trouble or accident.

- Place where sun-drought is given.
- Place where to be plenty of dust and high humidity.
- Place where direct wind is given.
- Place where to be many of vibration.
- Place where to be on unstable stand or slant.
- Place where to be outdoor or water drop.

▲CAUTION

Do not store this unit with gas detection cassette loaded. The detection tape will be deteriorated at the time of re-use and the correct detection cannot be obtained.

9. LIST OF PRODUCT SPECIFICATIONS

HCHO 0-0.500ppm

Model name	FP-330
Detection principle	Paper tape
Detection tape type	FCL-018
Detection gas	HCHO
Measuring range	0.080 to 0.500ppm
Zero suppression	0.080ppm
Measuring cycle	1800 seconds (30 minutes)
Resolution	0.005ppm
Flow rate	450ml/min.
Max. tubing length	2m
Indication accuracy	+/-20% of indication value + 1 digit
Operating time	1 month with one tape at no alarm *with tape remaining indication (count down from 7days) *with tape end alarm
Alarms	Two alarms (adjustable from range 0.05 to 0.4ppm)
Alarm operation	Latching alarm (standard) or non-latching (option) Lamp : Caution = Yellow, Alarm = Red, with buzzer
Self-diagnosis	Low flow, tape cut, sensor failure, etc.
External output	4-20mADC (load resistance : below 300 ohm)
Operating temp & humidity	5 to 35 degrees C 20 to 60%RH (no condensing)
Gas inlet/outlet	O/D 6mm with fittings
Power source	100VAC to 220VAC auto power, +/-10%
Outer dimensions	164 (W) x 198 (H) x 268 (D) mm, 6.5kg approx.

HCHO 0-1.00ppm

Model name	FP-380
Detection principle	Paper tape
Detection tape type	FCL-018
Detection gas	HCHO
Measuring range	0.05 to 1.00ppm
Zero suppression	0.05ppm
Measuring cycle	600 seconds (10 minutes)
Resolution	0.01ppm
Flow rate	450ml/min.
Max. tubing length	2m
Indication accuracy	+/-20% of indication value + 1 digit
Operating time	1 month with one tape at no alarm *with tape remaining indication (count down from 7days) *with tape end alarm
Alarms	Two alarms (adjustable from range 0.05 to 0.4ppm)
Alarm operation	Latching alarm (standard) or non-latching (option) Lamp : Caution = Yellow, Alarm = Red, with buzzer
Self-diagnosis	Low flow, tape cut, sensor failure, etc.
External output	4-20mADC (load resistance : below 300 ohm)
Operating temp & humidity	5 to 35 degrees C 20 to 60%RH (no condensing)
Gas inlet/outlet	O/D 6mm with fittings
Power source	100VAC to 220VAC auto power, +/-10%
Outer dimensions	164 (W) x 198 (H) x 268 (D) mm, 6.5kg approx.

FP-380 HCHO 0-5.0ppm

Model name	FP-380
Detection principle	Paper tape
Detection tape type	FCL-018
Detection gas	HCHO
Measuring range	0.3 to 5.0ppm
Zero suppression	0.3ppm
Measuring cycle	180 seconds (3 minutes)
Resolution	0.1ppm
Flow rate	450ml/min.
Max. tubing length	2m
Indication accuracy	+/-20% of indication value + 1 digit
Operating time	1 month with one tape at no alarm *with tape remaining indication (count down from 7days) *with tape end alarm
Alarms	Two alarms (adjustable from range 0.05 to 0.4ppm)
Alarm operation	Latching alarm (standard) or non-latching (option) Lamp : Caution = Yellow, Alarm = Red, with buzzer
Self-diagnosis	Low flow, tape cut, sensor failure, etc.
External output	4-20mADC (load resistance : below 300 ohm)
Operating temp &	5 to 35 degrees C 20 to 60%RH (no condensing)

humidity	
Gas inlet/outlet	O/D 6mm with fittings
Power source	100VAC to 220VAC auto power, +/-10%
Outer dimensions	164 (W) x 198 (H) x 268 (D) mm, 6.5kg approx.

Tape Saver mode is available for above all three ranges;

0H: Normal operation.

1H: One measurement during one hour.

2H: One measurement during two hours.

***When HCHO is existing in the background continuously beyond 0.08ppm,**

the tape on FP-301FI is moved at every measurement, so it consumes the

tape very quickly. In such case, to save the tape, the tape saver mode is

provided on FP-301FI. Without background gas, the tape stays for 2 hours in the same position regardless of the measuring cycle.

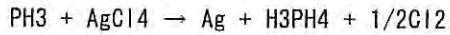
10. DETECTION PRINCIPLE

The structure of detection part applied in this unit is shown below figure.

There is a gas chamber made of shaded container to take the target gas onto the tape, and luminous element and photo-sensor are arranged in there.

When the target gas passes through the cellulose tape impregnated with coloring agent, it produces color by chemical reaction.

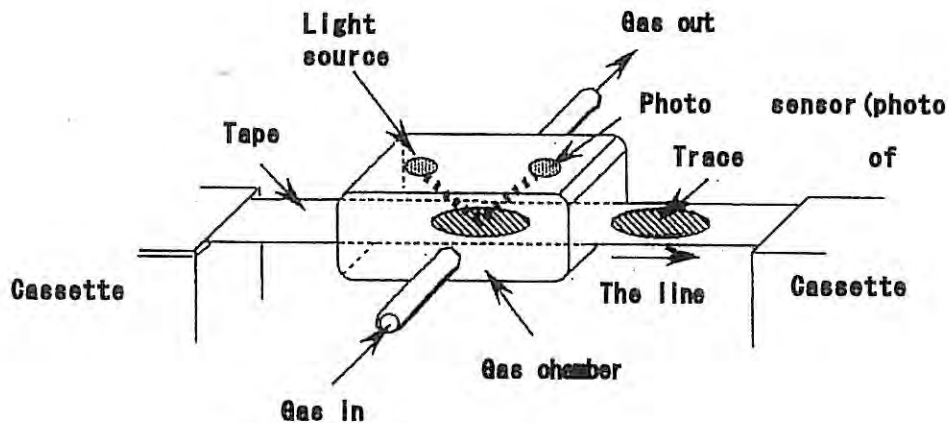
For example, when phosphine (PH₃) gas contacts the tape, it generates a silver colloid as shown below chemical equation and changes the color of the tape from white to black.



The degree of this coloring is taken as the change of light reflection amount to the tape.

The variation ratio of intensity for this reflection amount shall be called as response value to gas concentration.

By calculating the calibration curve beforehand, the gas concentration can be determined from response value.



STRUCTURE

Supplemental Instruction Sheet

Instruction for Factory Maintenance Mode and User's Maintenance Mode For Model FP-330 HCHO Monitor

1. User's Maintenance Mode

(1) To enter User's Maintenance Mode:

Press MODE key on the panel for 3 sec.

(2) To exit User's Maintenance Mode:

Press MODE key on for 3 sec. again.

(3) Select configurable item

You can configure 3 setting values. Display can be scrolled with Δ/∇ keys. Press BZ STOP key which is used as "enter" key in User's Maintenance Mode to change each setting values.

2-1. Alarm Test

2-2. LCD Contrast

2-3. Select Intermittent Measuring Time.

How to select Intermittent Measuring Time (2-3.)

*You can select 0H, 1H or 2H for intermittent measuring time.

0H means continuous measurement.

(1) Display below menu.

HCHO : 0ppm
STEP TIME?

(2) Press BZ STOP key and display shows below menu.

HCHO : 0ppm
STEP TIME : 0.0H

Select desired time with Then, select desired with Δ/∇ keys and Press BZ STOP to execute.

Specification for Intermittent Measurement

The operating time for a detection tape is up to 1 month. Operating time is 1 month with continuous measuring mode if target gas does not exist at the sampling field, however, if target gas exists, the expended time will be shorter, proportional to the gas level and frequency of exposure. If extended tape life is desirable and frequent gas exposure can occur, with selection of Intermittent Measurement Mode, you can extend the detection tape operating time even if target gas exists.

1) 0-0.5ppm (Measuring Cycle : 30min)

STEP TIME	0.0H (Preset time)	1.0H	2.0H
Operation	Continuous Measurement	Intermittent Measurement	Intermittent Measurement
Tape advance time	No target Gas : 2 hours Target Gas Exists : 30 min.	1 hour	2 hours
Operating time per tape	No Target Gas : 1 month Target Gas Exists: 1 week	Half a month	1 month

2) 0-1ppm (Measuring Cycle : 10 min)

STEP TIME	0.0H (Preset time)	1.0H	2.0H
Operation	Continuous Measurement	Intermittent Measurement	Intermittent Measurement
Tape advance time	No Target Gas : 2 hours Target Gas Exists: 10 min.	1 hour	2 hours
Operating time per tape	No Target Gas : 1 month Target Gas Exists: 2.5 days	Half a month	1 month

3) 0-5ppm (Measuring Cycle : 3 min)

STEP TIME	0.0H (Preset time)	1.0H	2.0H
Operation	Continuous Measurement	Intermittent Measurement	Intermittent Measurement
Tape advance time	No Target Gas : 2 hours Target Gas Exists: 3 min.	1 hour	2 hours
Operating time per tape	No Target Gas :1 month Target Gas Exists: 18 hours	Half a month	1 month

In case selecting Intermittent Measurement Mode, you can extend the expended time of detection tape. 2.0H Mode can be extend to 1 month and 1.0H Mode, half a month.

2. Factory Maintenance Mode

(1) To enter Factory Maintenance Mode:

Press Power ON while pressing MODE key and ▽key on the panel.

(2) To Escape from Factory Maintenance Mode:

Press MODE key for 3 sec.

(3) Select Measuring gas

Total of 21 menu items are shown in this Factory Maintenance Mode.

Do not change any setting values other than MEAS GAS CHANGE (1-15, or date and time).

Scroll the display with ▽ key. Display "MEAS GAS CHANGE" and press BZ STOP key which is used as "enter" key in Factory Maintenance Mode.

21 setting values

- 1-1. Alarm Test
- 1-2. LCD Contrast
- 1-3. Zero Suppression
- 1-4. Alarm Delay times
- 1-5. Time of Initial Clear
- 1-6. Max. Measurement Time for a point
- 1-7. D/A Test

- 1-8. Actual Gas Calibration
- 1-9. Alarm Point
- 1-10. Alarm Action
- 1-11. Alarm Delay times for High Level Gas
- 1-12. Alarm Buzzer
- 1-13. Trouble Buzzer
- 1-14. Tape Level
- 1-15. Select Measuring Gas (MEAS GAS CHANGE)
It is set at factory before delivery. (Make range change only, not gas type.)
- 1-16. Expiration Date of Detection Tape
- 1-17. Interval Time for Measurement
- 1-18. Number of Times for Intermittent Measurement
- 1-19. Delay time of Output of Intermittent Gas Concentration
- 1-20. Cycle of Intermittent Measurement
- 1-21. Date & Time

How to select measuring gas (1-15.)

1. Display "MEAS GAS CHANGE"

HCHO	:	0ppm
MEAS GAS CHANGE ?		

2. Press BZ STOP key and display shows below menu.
Then, select desired with Δ/∇ keys and
Press BZ STOP to execute.

1	:	PH3
2	:	HCHO
3	:	HCHO
4	:	HCHO

Measurable gases & full scale for Model FP-301FLW

1	:	PH3	900ppb
2	:	HCHO	0.500ppb
3	:	HCHO	1.00ppm
4	:	HCHO	5.0ppm



Product Warranty

7/1/2009

RKI Instruments, Inc. warrants gas alarm equipment sold by RKI to be free from defects in materials, workmanship, and performance for a period of one year* from the date of shipment from RKI Instruments, Inc. (some products have 2 year warranty, as listed below). Any parts found defective within that period will be repaired or replaced, at our option, free of charge. Parts must be returned to RKI Instruments, Inc. for repair or replacement. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, or which must be cleaned, repaired or replaced on a routine basis.

Examples of such items are:

- a) Pump diaphragms and valves
- b) Fuses
- c) Batteries
- d) Filter elements
- e) Scrubbers
- f) Lamps

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

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF RKI INSTRUMENTS, INC. INCLUDING BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL RKI INSTRUMENTS, INC. BE LIABLE FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL LOSS OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCTS TO FUNCTION OR OPERATE PROPERLY.

This warranty covers instruments and parts sold to users only by authorized distributors, dealers and representatives as appointed by RKI Instruments, Inc.

We do not assume indemnification for any accident or damage caused by the operation of this gas monitor and our warranty is limited to the replacement of parts or our complete goods. Warranty covers parts and labor performed at RKI Instruments, Inc. only, and does not cover field labor or shipment of parts back to RKI.

* Warranty is one year for all products and parts except as indicated below:

2 year warranty:

All Premier Portable instruments including EAGLE 1 sold after August 2009. All Premier Portable instrument sensors including replacement sensors. Sensors damaged by poisoning, contamination, overexposure, or left off bias are not warranted.

RKI Instruments, Inc. 33248 Central Avenue, Union City, CA 94544 Phone (510)441-5656 Fax (510)441-5650

World Leader In Gas Detection & Sensor Technology
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