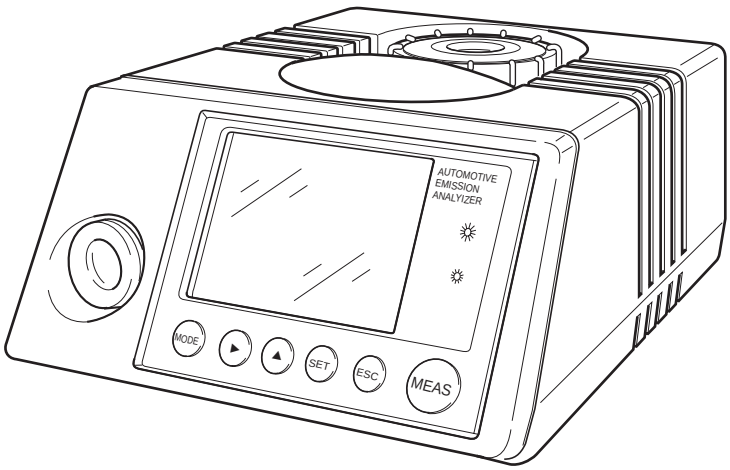
Instruction Manual

AUTOMOTIVE EMISSION ANALYZER

[CO, HC, CO_2, O_2]

MODEL: ZKE



Fuji Electric Co., Ltd.

INZ-TN1ZKEe-E

PREFACE

You are now the owner of the automotive emission (carbon monoxide, hydrocarbon, carbon dioxide, oxygen) multiplex analyzer measuring instrument.

- Before using the instrument, be sure to read and understand the contents of this manual.
- The precautions and operating instructions should be observed to ensure the full performance of the unit and to prevent unexpected trouble such as electric shocks, accidents resulting in injury or death due to absorption of harmful gases.
- If you have any problems on the unit or the contents of this instruction manual, please feel free to contact your dealer.
- Use this manual carefully. If the manual is lost or contaminated, it can be obtained from your dealer. Keep the manual on hand correctly.
- You are strictly prohibited to modify the unit without permission. We are not responsible for any trouble caused by such a modification.

Manufacturer	: Fuji Electric Co., Ltd.
Type	: Shown on nameplate of instrument
Date of manufacture	: Shown on nameplate of instrument
Product nationality	: Japan

Notice

- Transcription of a part or the whole of this manual without permission is prohibited.
- The contents of this manual are subject to change without prior notice.

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Rev. 1st edition September, 1999
Rev. 2nd edition February, 2000
Rev. 3rd edition February, 2002
Rev. 4th edition August, 2005
Rev. 5th edition April, 2011

⚠ WARNING

This instruction manual shows the following warning symbols on “danger”, “warning” and “caution” and their descriptions which are very important to ensure safe operation of the unit.

Before using the unit, be sure to read and understand the descriptions of the symbols to prevent accidents resulting in injury or death or damage to the unit.

DANGER ..... Incorrect handling of the unit may lead to death or serious injury to the operator.

⚠ WARNING ..... Incorrect handling of the unit may cause a risk of death or serious injury to the operator.

⚠ CAUTION ..... Incorrect handling of the unit may lead to injury to the operator or damage to the unit.

CONTENTS

1. INTRODUCTION

1.1 Purpose of use

This instrument is a multiplex analyzer capable of measuring 4 components in automotive emission; carbon monoxide (CO), hydrocarbon (HC), carbon dioxide (CO_2) and oxygen (O_2).

The number of components to be measured depends on the purchase specifications.

2. ITEMS ON DANGER AND WARNING

2.1 General safety precautions

1) Before operating the unit, read and understand the contents of this instruction manual.
2) Do not allow any person to use this unit unless s/he is familiarized with the operation.
3) Preparation for operation, inspection and maintenance must be performed as mentioned in this manual.
4) When unusual noise arises or the unit becomes abnormal during operation, stop the unit immediately and notify your dealer of it for inspection.
5) Do not use the unit for any purposes other than maintenance or inspection of automobiles.
6) The measuring instrument may not operate correctly due to the effects of electric waves. Be sure to keep the instrument away from other instruments.

2.2 Operating precautions

Failure to observe any of the following precautions could result not only in damage to the unit but also in accidents resulting in injury or death. Be sure to read the following items and use the unit correctly.

DANGER

The span gas contained in a can is harmful. Do not spray it to human body.

- It may lead to a risk of death or serious injury.

WARNING

Be careful with electric shocks.

- Turn OFF the power before performing wiring work to prevent a risk of death or serious injury due to electric shocks.

Before using the unit, read and understand the contents of this instruction manual.

- Incorrect handling of the unit may lead to unexpected accidents.

Do not allow any person to use the unit useless s/he is familiarized with the operation.

- Incorrect handling of the unit may lead to unexpected accidents.

2.3 Precaution on use

This analyzer is a precision device.
Special care should be taken not to apply shocks when carrying it.

Install the analyzer on a level place free from vibrations.
If it is installed on a tilted place, it does not indicate correct measurements.

Use the analyzer in a place not subjected to direct sunlight.
Ambient temperature: 0 to 40°C. Do not use in a place with high humidity.
Ambient humidity: Less than 90% RH.

Avoid using the analyzer in a place with much dust or in a place where it is exposed to exhaust gas.
Also, do not install it in a place subject to spray of water and oil.

⚠ CAUTION

CO and HC contained in automobile exhaust gas are harmful to human body.
Special care should be taken with regard to ventilation. If required, connect a vinyl tube to the exhaust port of the analyzer to discharge measured exhaust gas.

Note:
① **The sampling tube should be handled gently to avoid damage while in use.**
② **When handling the membrane filter, do not lose the O-ring.**
③ **Keep on hand the inspection report and accessories supplied with the product at the time of delivery.**

2.4 Unpacking and confirmation of delivered items

(1) Unpacking

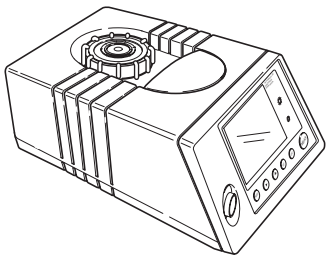
This analyzer is packed together with its accessories.

Care should be taken not to lose these accessories when unpacking

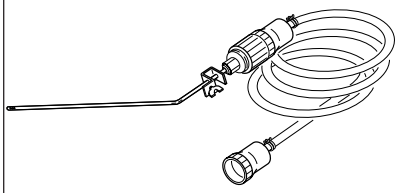
(2) Confirmation of delivered items

After unpacking, make sure that the following accessories are supplied with the analyzer.

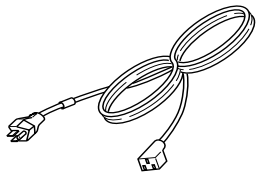
Delivery items



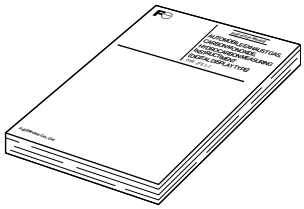
Main unit (Type:ZKE) ……1 set



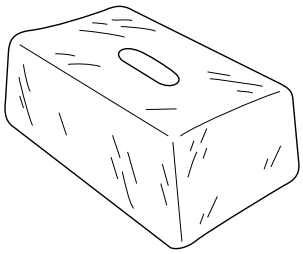
Sampling probe ……1 set



Power cord……1 pc

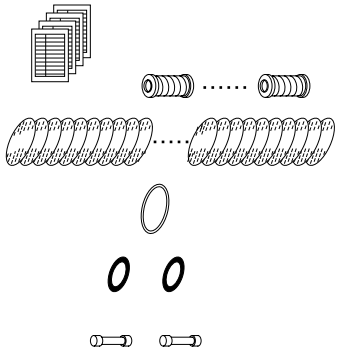


Instruction manual…1 copy



Vinyl cover for main unit ……1 pc

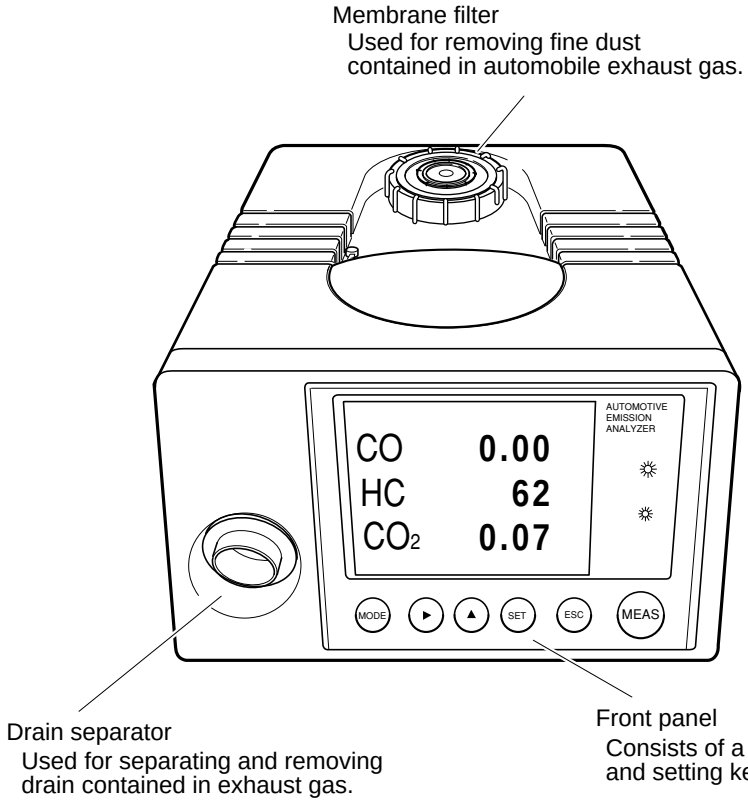
Standard gas …1 pc

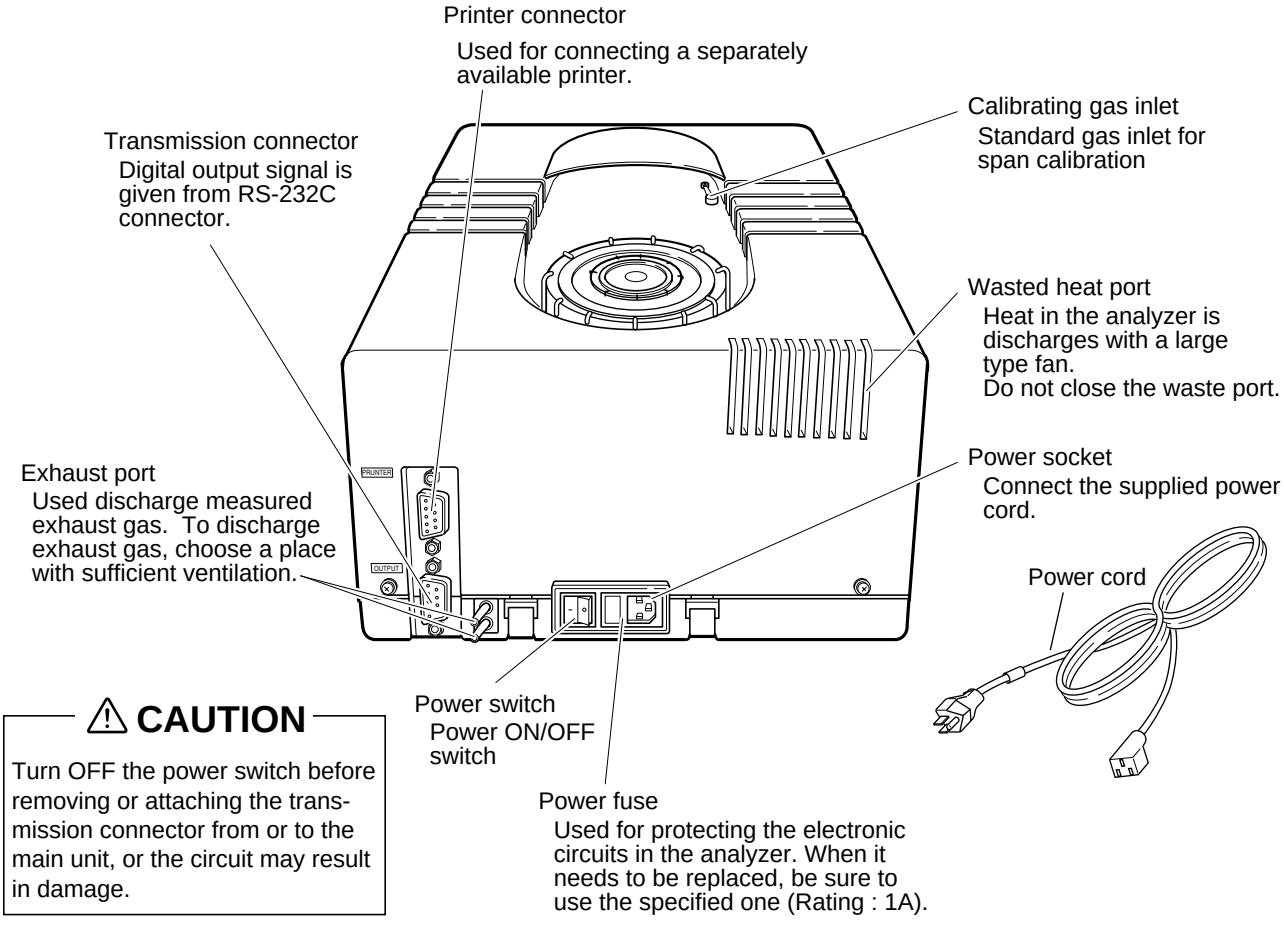


Primary filter element	16 pcs
Filter paper for membrane filter	50 pcs
Inner O-ring for membrane filter	1 pcs
Paking (for primary filter and drain separator)	2 pcs
Tube type fuse	2 pcs

3. NAME OF OPERATING PARTS AND THEIR FUNCTIONS

3.1 Name of operating parts and their functions

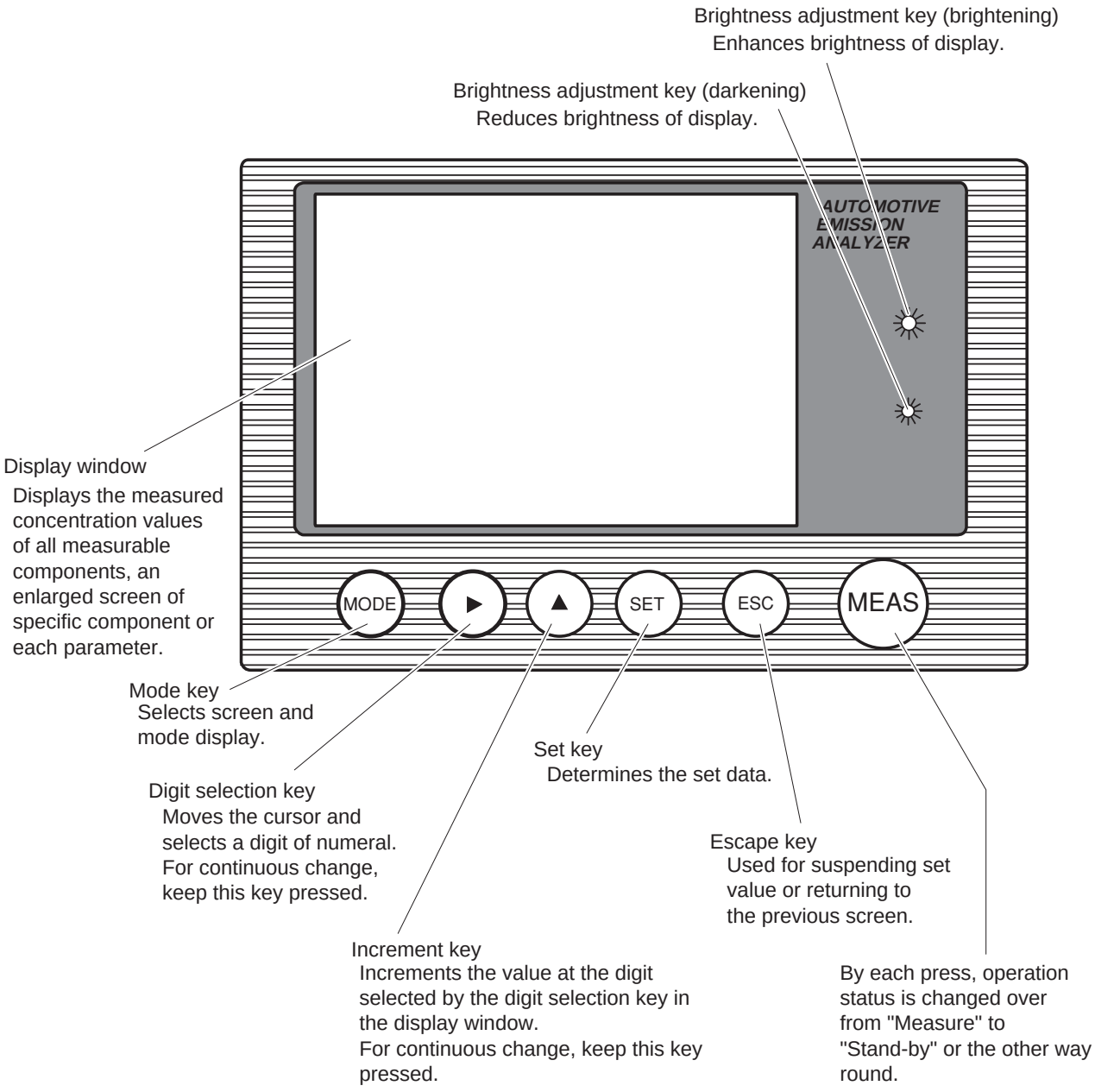




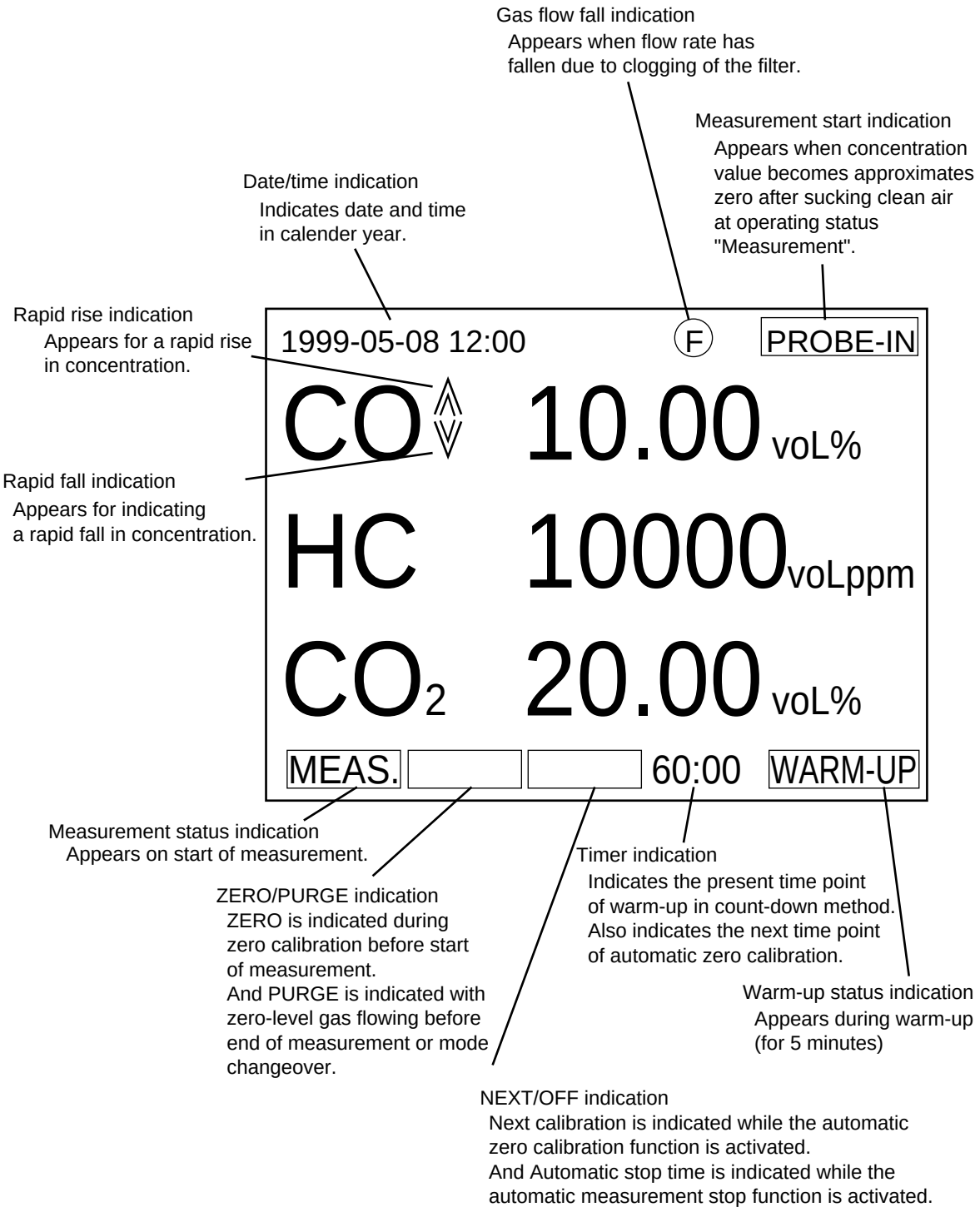
⚠ CAUTION

Turn OFF the power switch before removing or attaching the transmission connector from or to the main unit, or the circuit may result in damage.

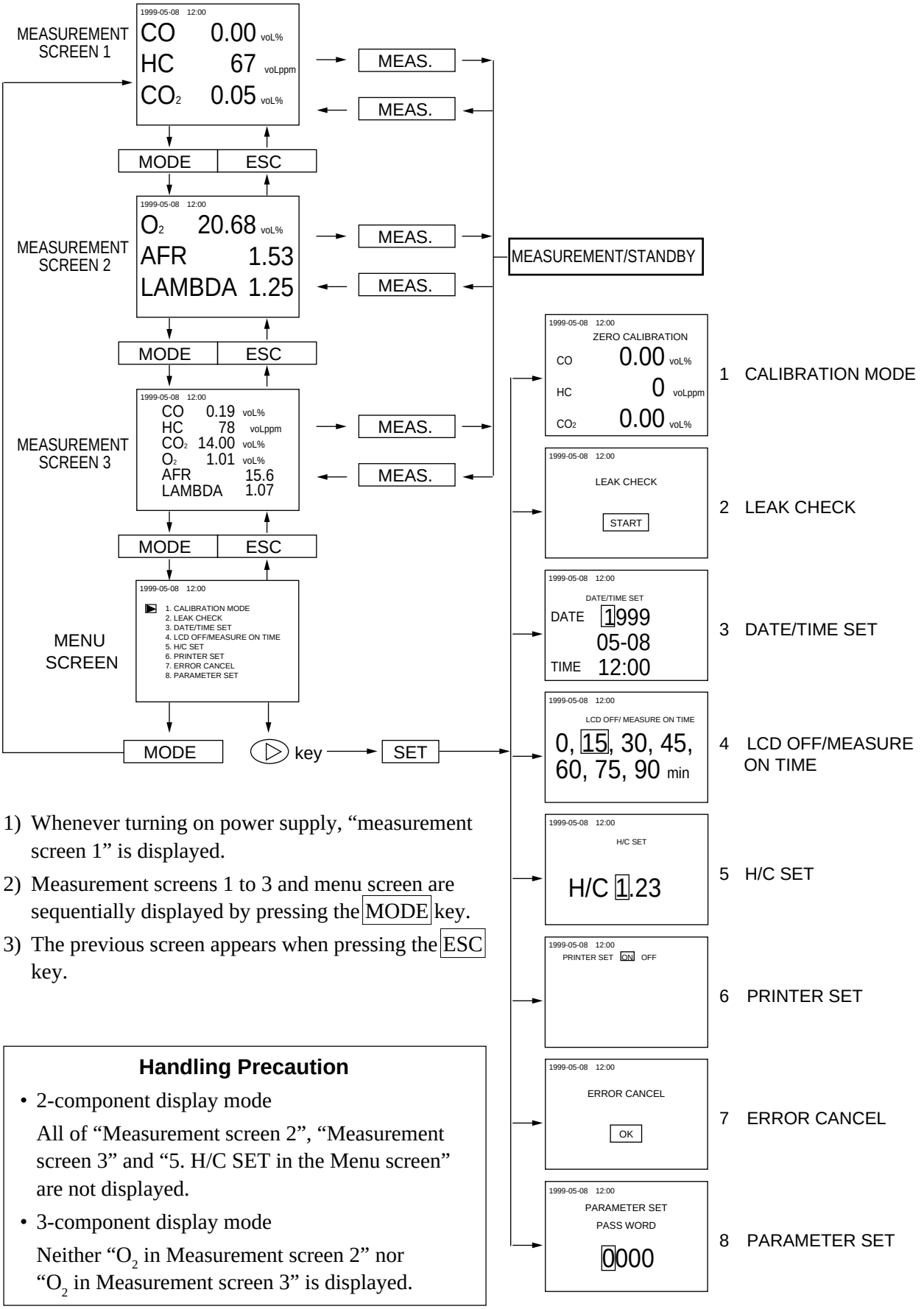
3.2 Part names and functions of front panel



3.3 Outline of display window



3.4 Screen display and outline of key operations



1) Whenever turning on power supply, “measurement screen 1” is displayed.
2) Measurement screens 1 to 3 and menu screen are sequentially displayed by pressing the MODE key.
3) The previous screen appears when pressing the ESC key.

Handling Precaution

- 2-component display mode

  All of “Measurement screen 2”, “Measurement screen 3” and “5. H/C SET in the Menu screen” are not displayed.
- 3-component display mode

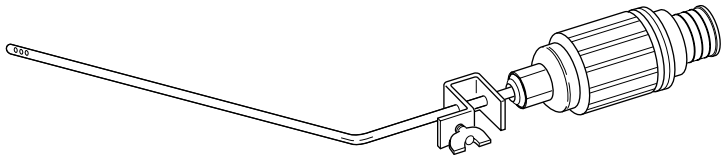
  Neither “O_2 in Measurement screen 2” nor “O_2 in Measurement screen 3” is displayed.

4. PREPARATION FOR MEASUREMENT

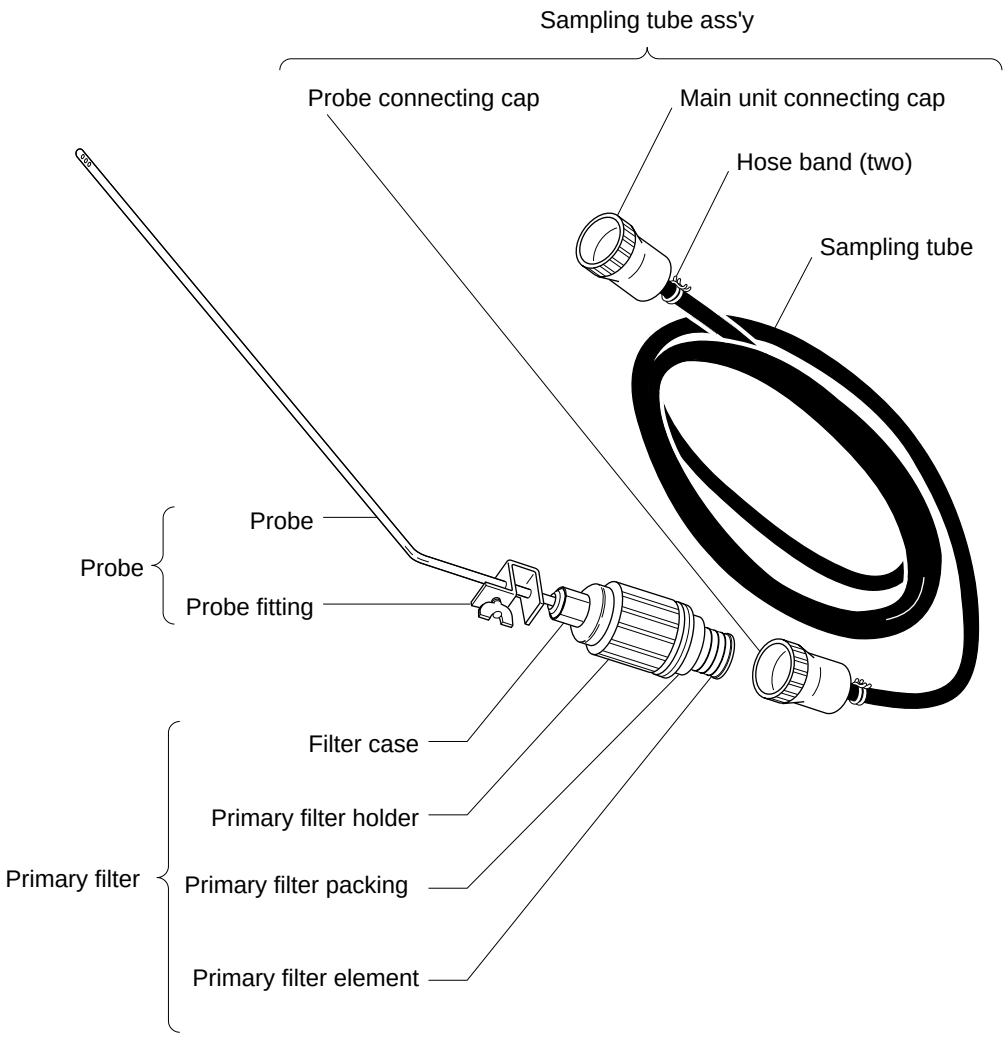
4.1 Preparation for measurement

(1) Check on sampling probe unit

① The probe is slightly bent at the tip for convenience of packing. Before using, it should be straightened



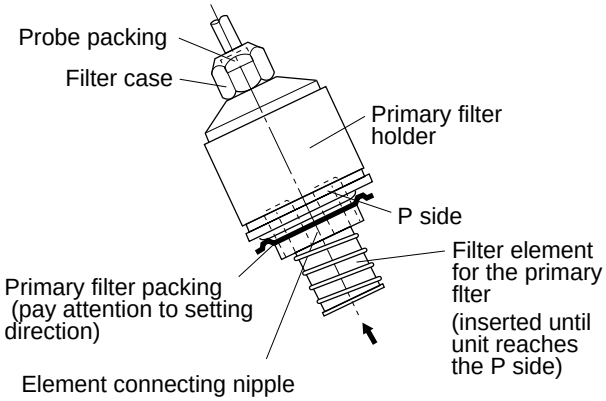
② Name of parts on the sampling probe are shown below.



(2) Assembling of primary filter

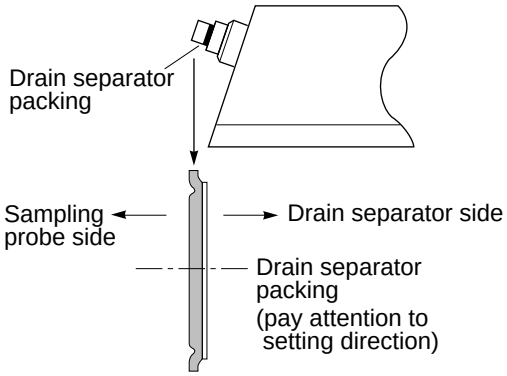
The probe, primary filter element and sampling tube are separated prior to packing. These parts should be assembled together according to the following procedures.

① Check that the primary filter packing is set correctly, and then mount the filter element for the primary filter in position.
② Turn the probe connecting cap clockwise until it is connected firmly to the primary filter holder



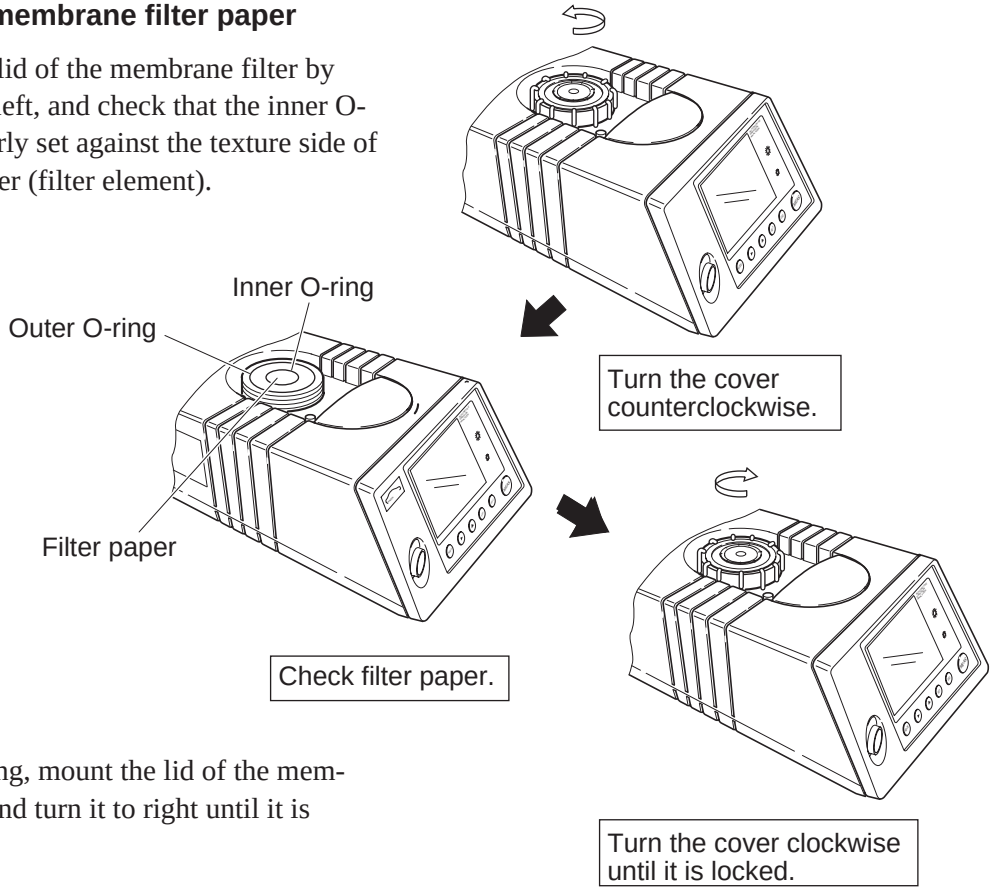
(3) Check on drain separator packing

Check that the drain separator packing is properly mounted between the drain separator and the sampling probe



(4) Check on membrane filter paper

Remove the lid of the membrane filter by turning it to left, and check that the inner O-ring is properly set against the texture side of the filter paper (filter element).



After checking, mount the lid of the membrane filter and turn it to right until it is locked

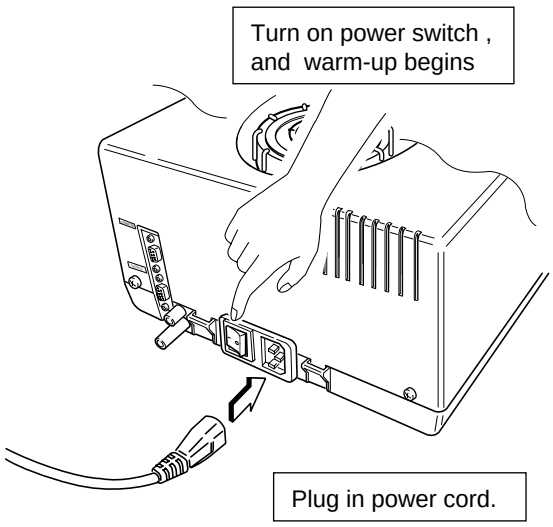
4.2 Warm-up operation

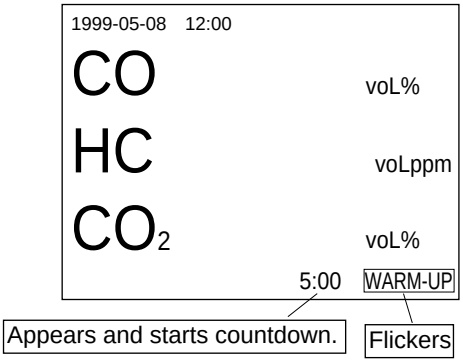
(1) Power ON

Make sure the power switch is turned off. Then, insert the power plug into the receptacle and turn on the power switch on the rear face of main unit. (The power switch is turned off with its <O> mark depressed.)

On start of warm-up, concentration indication turns off and WARM-UP indication begins flickering. At the same time, the remaining warm-up time is indicated at the bottom right of screen.

Note that warm-up needs about 5 minutes. During warm-up, measurement and calibration cannot be performed.





Handling Precaution

The clarity of liquid crystal display may be affected by ambient temperature. In this case, use the contrast and brightness controls to make a fine adjustment.

⚠ WARNING

- Wiring work should be made after all the power supplies are turned OFF, in order to prevent electric shocks.
- Make sure that the earth terminal of the power cord is connected to the earth point.

4.3 Calibration

Handling Precaution

Calibration is performed automatically by pressing the SET key. In the event of a failure of gas flow or a calibration error due to incorrect span setting input, the calibration is interrupted and the abnormal component lamp flickers. In such a case, remove the cause of failure and then perform the calibration once again.

The sign of calibration error appears continuously until the error is cancelled or the power is turned OFF.

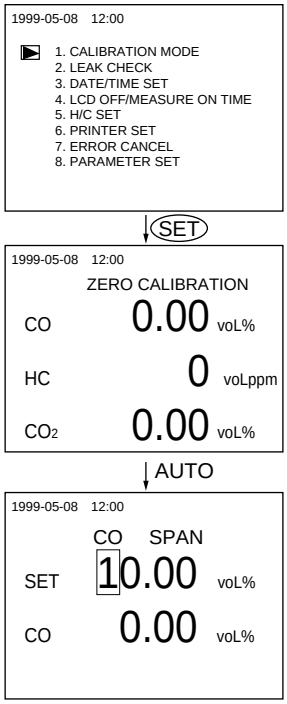
(1) Zero calibration

① After warm-up, select the menu screen by the MODE key.

Move the cursor (▶) to select "1. CALIBRATION MODE" by the ⊳ key.

② By pressing the SET key, a sign of ZERO CALIBRATION appears on the display and zero gas flows for about 15 seconds for auto-zero calibration.

③ After calibration, the display changes to CO span mode.



Handling Precaution

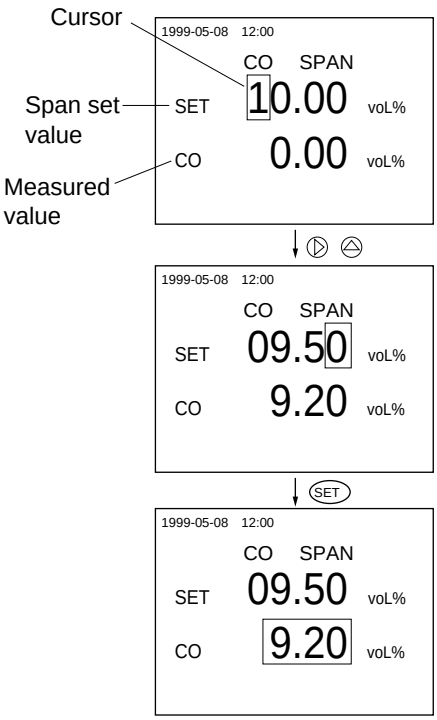
- If the ESC key is pressed during or after calibration, purge gas flows and the display returns to "Menu" screen. However, pressing this key during calibration disables zero calibration.
- During warm-up, neither zero nor span calibration can be performed. Wait until warm-up is completed.
- Zero gas/purge gas flow time can be set to 15 sec, 20 sec, 25 sec, 30 sec, and 45 sec by the internal setting.

  For details, consult with our service engineer.

(2) CO span calibration

Handling Precaution

If span calibration is not required, press the MODE key. Then, the "CALIBRATION MODE" screen will change to the next screen. If the MODE key is pressed several times, the screen will return to the "Menu" screen.



① After zero calibration, "CO SPAN" is indicated. Make sure measured value is zero at this time.

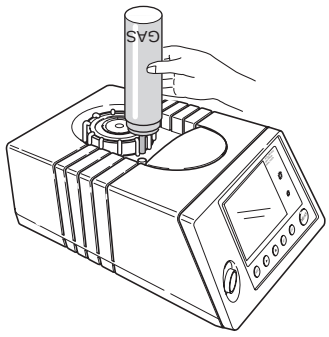
② Input the span value described on the standard gas label by ▷ and △ keys.

③ When pressing the SET key, the cursor moves to "measured value."

④ Remove the cap at the calibrating gas inlet and insert the nozzle of the standard gas cylinder straight down.
The standard gas flows into the analyzing unit when the cylinder is pressed down.
When the indication starts changing, stop pressing the cylinder and wait until the indcation is stabilized.
Next, press down the cylinder intermittently and check that the indication dose not increase any more and is stabilized. Then, remove the cylinder from the calibrating gas inlet.

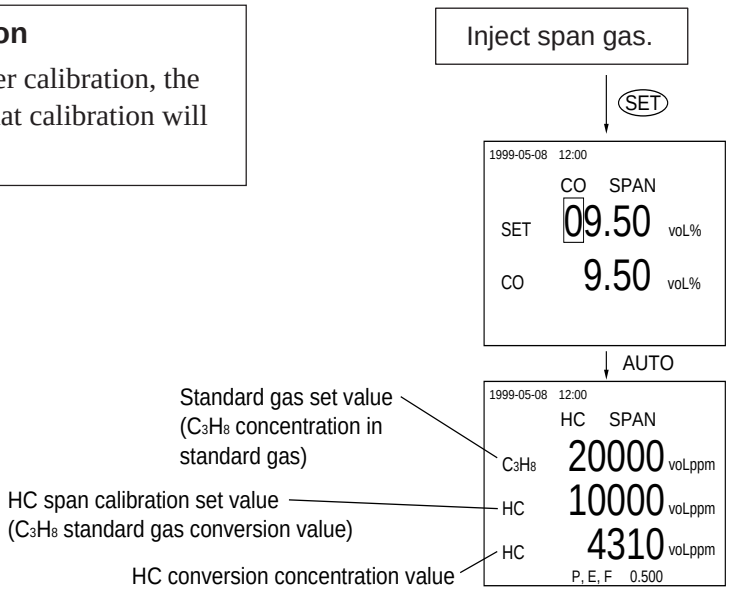
⑤ Start calibration by pressing the SET key.

⑥ After calibration, indication will change to "HC SPAN."



Handling Precaution

If the ESC key is pressed during or after calibration, the previous screen returns. Please note that calibration will not be carried out in this case.



(3) HC span calibration

Make setting and calibration in the same procedure as shown in 4-3-(2) (CO span calibration).
After calibration, purge gas flows automatically and display will change to the “Menu” screen.
The O_2 meter should be used to perform span calibration, if provided.

Handling Precaution

For HC measurement, C_3H_8 (propane gas) is used as span gas.
The value obtained by multiplying C_3H_8 gas concentration with the conversion coefficient indicated at the bottom of screen is automatically input as an HC span calibration setting value (at the center of screen).

(4) CO_2 span calibration

Make setting and calibration in the same procedure as shown in 4-3-(2)(CO span calibration).
After calibration, purge gas flows automatically and display will change to the “Menu” screen.
The O_2 meter should be used to perform span calibration, if provided.

Handling Precaution

In the 2-component display mode, the CO_2 meter signal is used for different internal compensations. This meter should be calibrated.

(5) O_2 span calibration

This mode appears only when the O_2 meter is used.

Handling Precaution

Zero calibration of the O_2 meter is automatic after any of CO/HC/CO_2 span is calibrated.

① Input the set value of span by ▷ and △ keys.
② Next, press the SET key, and the double pump runs to flow clean air (gas equivalent to 20.9%).
③ After indication has stabilized, press the SET key again to perform span calibration.
④ After calibration, purge gas flows automatically, and the menu screen will return.

Handling Precaution

Be sure that the set value of O_2 span must be 20.9% (corresponding to atmospheric air).

5. MEASUREMENT

5.1 Measurement

(1) Prior to measurement

- Before connecting the sampling probe, check to make sure that the filter is clean.
- Carry out warm-up operation and check that zero and span have been calibrated correctly.
- Before making measurement, press the measurement key and make sure that the PROBE-IN lamp is displayed.

Handling Precaution

By pressing the MEAS. key, auto-zero calibration is performed prior to measurement. After the calibration, the absorption system operates and the gas is absorbed from the probe side.

Therefore, a reading error may arise with the instrument due to the gas left in the probe, but it is not a trouble with the instrument.

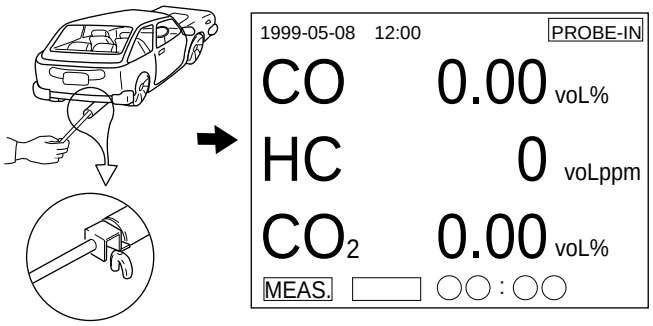
The instrument should be used after the PROBE IN sign appears.

The sign of PROBE IN should appear when the HC density is 0 to 20 volppm and CO_2 concentration is 0 to 4 vol%.

(2) Measurement

① Connect the sampling probe to the analyzer and press the MEAS. key. After automatic zero calibration, clean air is sucked through the probe.

② Make sure CO/HC/CO_2 indication has stabilized near zero and PROBE-IN is lit. Then, insert the probe into the exhaust pipe by 60 cm or more and fix the probe by the probe fixture.

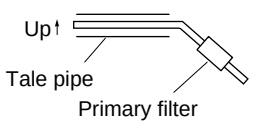


③ After the display of the sign has stabilized, read the value of concentration.

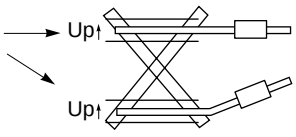
Handling Precaution

Insert the probe correctly as per Good EX. shown below to prevent entry of drain into the primary filter.

(Good)
Drain not collected in primary filter



(Not good)
Drain collected in primary filter



Handling Precaution

(1) Measured value should be read after the display has been stabilized.

(2) Do not insert the probe unnecessarily deep into the exhaust gas pipe.

(3) Do not turn OFF the power during measurement.

(3) Completion of measurement

① Do not lift up the probe when drain is collected in the primary filter. Otherwise drain enters the membrane filter or sampling cell.

② Remove the probe from the exhaust gas pipe at the completion of measuremment, then check that clean air is sucked up and the display is reset to zero point.

③ Before turning OFF the power, be sure to aspirate clean air completely from the probe and let the residual gas escape from the measuring instrument.

⚠ CAUTION

The sampling probe becomes hot just after measurement. Do not touch it directly to prevent burns.

5.2 Printer output (option)

This instrument is capable of printing concentration values on a printer.

① Turn OFF the power. Plug a specified printer into the connector of the rear panel.

② Turn ON the power again. After the printer has been warmed up sufficiently to stabilize indication values on the measurement screen, hold down the SET key for more than 1 sec. It produces output of setting conditions and concentration values to the printer.

Handling Precaution

- Printing is not performed on the Menu screen.
- In the warm-up process, concentration values are displayed as "– – – –".
- Turn OFF the power switch before removing or attaching the transmission connector, or the circuit may result in damage.

6. MENU SCREEN

6.1 CALIBRATION MODE

Perform span calibration of each component (CO, HC, CO_2 and O_2) periodically (every week).
For calibration method, refer to Item 4.3 (Calibration).

6.2 LEAK CHECK

Carry out this test whenever required.
For test method, refer to Item 7.3 (Leak check).

6.3 DATE / TIME SET

The present date and time point can be set.

Handling Precaution

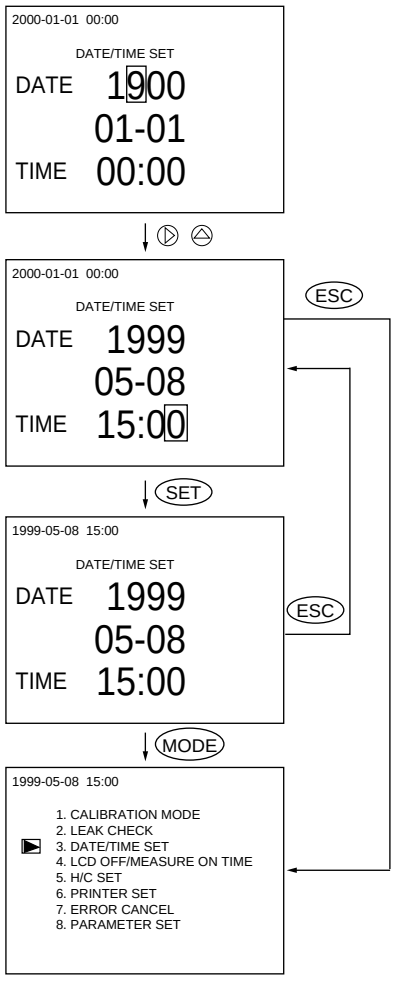
- This mode is backed up by a battery. However, if power supply is not turned on for 7 days or longer, the set contents will be reset to "✳✳✳✳-✳✳-✳✳ ✳✳:✳✳."
  In this case, reentry is required.
- This mode is interlinked with printout time of a printer.

① Press the SET key, and screen will change into this mode.

② Move the cursor to the position of year, month, day, hour or minute to be set by the ▷ key.
Then, change the numeral as desired by △ key.
To change values continuously, keep the △ key down pressed.

③ After setting, determine the new data by the SET key. The cursor will disappear and the indication at the top left of screen will be set.

④ Press the MODE key, and the menu screen will return. For reentry, press the ESC key, and the previous screen will return.



Handling Precaution

Time setting is based on 24-hour system.

6.4 LCD OFF / MEASURE ON TIME

In this mode, you can select the automatic turning-off time of display backlight and the automatic measurement (double pump) stop time.

Handling Precaution

- To turn off the LCD backlight, press any key, and the LCD will come off at the set time.
- The extinguished backlight will light again when any key is pressed.
- Time setting is common for turning off backlight and stopping measurement. However, because timer is independent, backlight alone can be turned off even in the standby mode.
- The remaining time until measurement stops and OFF indication are displayed at the bottom of the screen.

Handling Precaution

- When this time is set at "0 min," the function for turning off backlight and stopping measurement remains inactive.

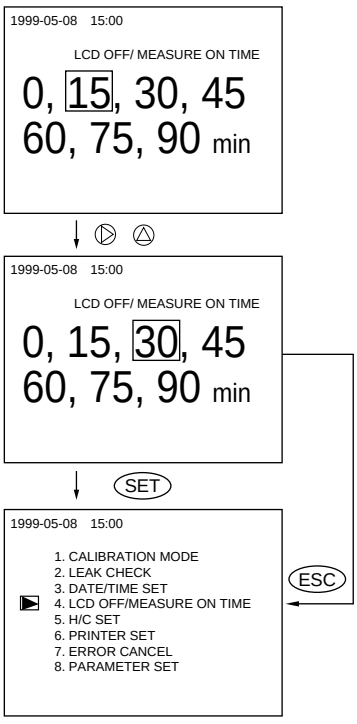
  In this case only, the automatic zero calibration function works to carry out every hour.

  And, the remaining time before the next automatic zero calibration and ZERO NEXT indications are presented at the bottom of screen.
- In case automatic zero calibration time comes during measurement, timer indicates "00:00" and calibration is withheld until measurement is completed. After measurement, timer restarts from 3 minutes ("3:00").

① Press the SET key, and screen will change into this mode.

② Move the cursor to the set time as desired by the ▷ and △ keys.
To change values continuously, keep the ▷ key down pressed.

③ After setting, determine the new data by the SET key. Display will return to the menu screen.



6.5 H/C SET

Handling Precaution

This mode is not displayed in the “2-component display” mode.

In order to obtain AFR (air/fuel ratio) and LAMBDA (excess air ratio), a coefficient based on fuel composition has to be set in this mode.

Handling Precaution

Input 1.88 when measuring a regular gasoline car.

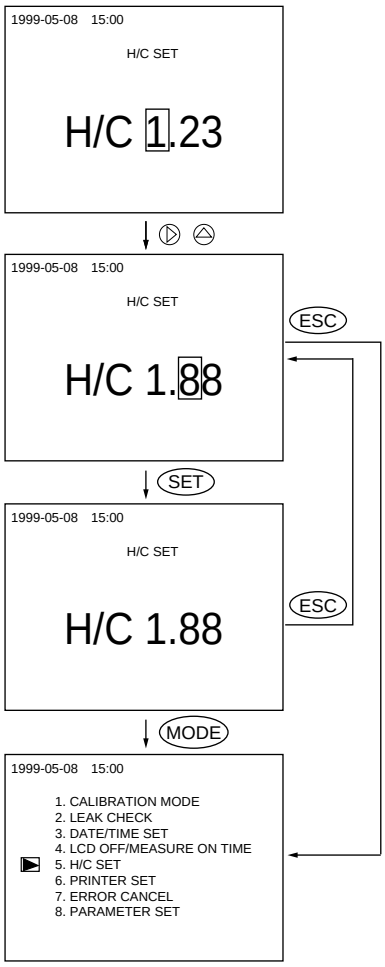
Input 1.75 when measuring a premium gasoline car.

① Press the SET key, and screen will change into this mode.

② Move the cursor to the desired digit by the ▷. Next, change the numeral as desired by △ key. To change values continuously, keep the △ key down pressed

③ After setting, determine the new data by the SET key. The cursor will disappear.

④ Press the MODE key, and the menu screen will return. For reentry, press the ESC key, and the previous screen will return.



Handling Precaution

Settable range is “0.00 to 9.99.”

6.6 PRINTER SET (option)

This setting is required for connecting a printer as an optional function.

Note that the following printer is recommended.

Model : BS-80TSD (dark gray)

① Press the SET key, and screen will change into this mode.

② Select or avoid printout of printer data by the ▷ key.

Set “ON” for selection of printout or “OFF” for its avoidance.

Handling Precaution

For printout, the print head has a service life of about 25,000 outputs.
Each heat-sensitive paper roll can be used for about 130 outputs.
In case printout (OFF) is selected, the roll lasts for about double time of the above.

③ On selection of printout (ON)

1. TEST NO, 2. STANDARD VALUE,

3. ADDRESS, and 4. NAME are displayed.

Select “1. TEST NO” by the △ key and press the SET key. The cursor moves to “2. STANDARD VALUE”. Select either of values by the ▷ and △ keys, and then press the SET key. The cursor moves to the next item number.

To change values continuously, keep the △ key down pressed.

Settable range is as follows.

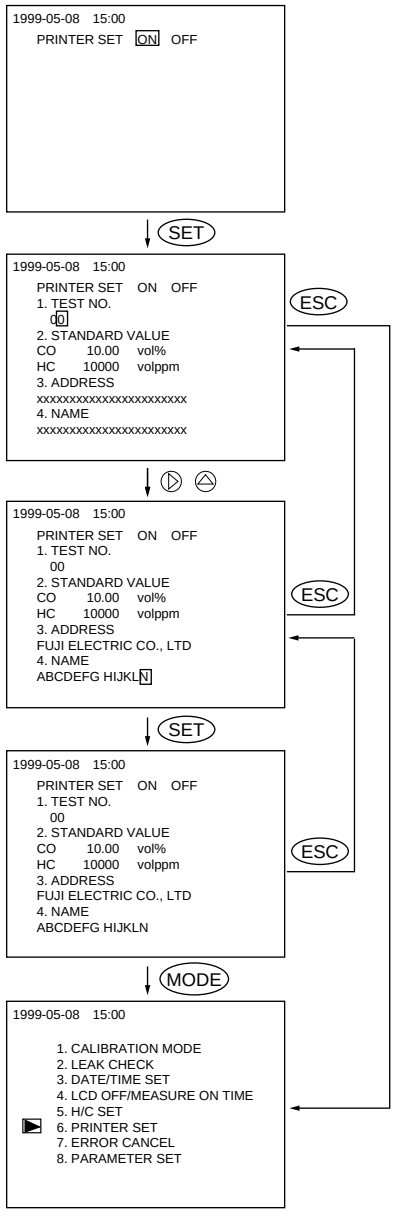
1. TEST NO. “0 to 99”
2. STANDARD VALUE
   “CO: 0 to 10.00 vol%”
   “HC: 0 to 10000 volppm”
3. ADDRESS “Max. 24 digits”
4. NAME “Max. 24 digits”

Whenever pressing the △ key for entry in parameters 3 and 4, “A to Z,” “-,” “.,” “,” and “0 to 9”are selected cyclically.

On avoidance of printout (OFF):
Only “1. TEST NO.” is displayed.
Setting method is the same as above.

④ Finally, press the SET key, and the cursor will disappear.

⑤ Press the MODE key, and the menu screen will return. For reentry, press the ESC key, and the previous screen will return.



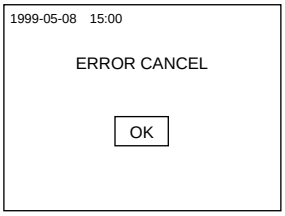
Example of print-out

```
* AUTOMOBILE EXHAUST *
* INSPECTION REPORT  *

DATE: 1999-05-08
TIME: 15:00

CO :     0.19 voL%
HC :       78 voLppm
CO2:    14.00 voL%
O2 :     1.01 voL%
AFR:     15.6
LAMBDA:  1.07

TEST NO
  0

RESULTS : OK
STANDARD VALUE:
 CO :  4.50 voL%
 HC :  1200 voLppm

ADDRESS:
 FUJI ELECTRIC CO., LTD.

NAME:
 FUJI-MACHI, HINO-CITY

Fuji Electric
      Instruments Co., Ltd.
```

6.7 ERROR CANCEL

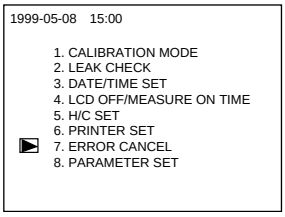
This mode is used to cancel “Display of Calibration Error” caused by zero/span calibration.

① Press the SET key. The screen displays ERROR CANCEL mode.



SET

② Press the SET key again. Error is cancelled and the error component lamp that “flickers” will change to “ON”. The display returns to the Menu screen.



Handling Precaution

This mode is used to cancel error display only. It has no means of correcting any calibration error. Check the cause of errors and make remedies.

6.8 PARAMETER SET

This mode is a factory adjustment mode (parameter mode). User adjustment and setting are not required.

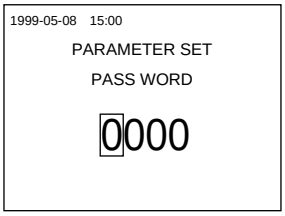
Handling Precaution

If the data in the parameter mode is changed, the instrument may not operate correctly.

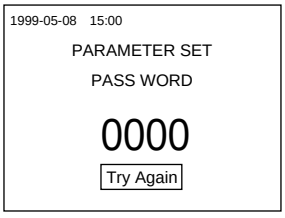
Avoid operating the instrument.

See “Service manual” for the operation method in the parameter made.

① By pressing the SET key, the display changes to the parameter mode.
Input a 4-digit secret number and it will enter the parameter mode, if it is correct.

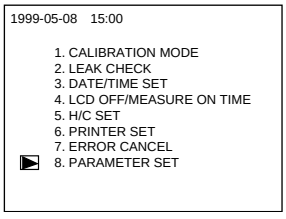


② If it is incorrect, a sign of Try Again appears.



ESC

③ The display returns to the menu mode by pressing the ESC key.



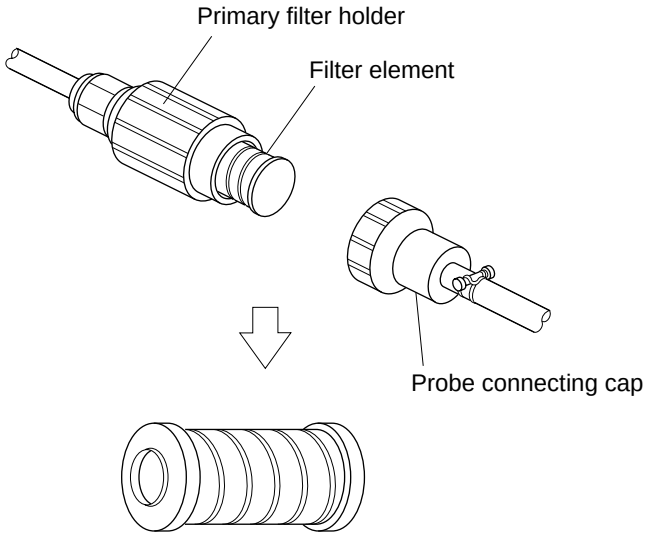
7. INSPECTION AND MAINTENANCE

7.1 Routine inspection and maintenance

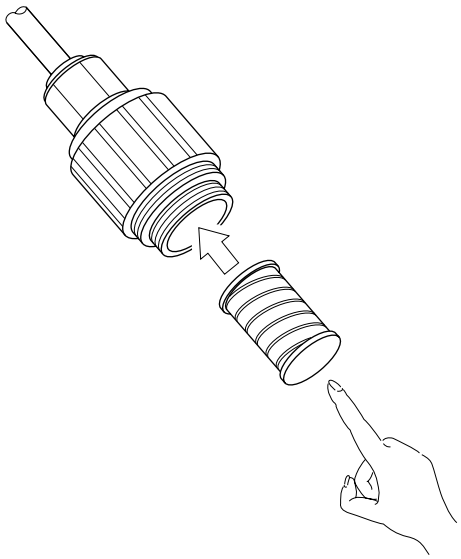
(1) Inspection of primary filter element

① Before starting the first measurement in one day, check the filter element. Remove the probe connecting cap and then remove the filter element from the primary filter holder to inspect the condition of contamination of filter.
If the filter element is considerably contaminated, it should be replaced with a new one.

Also check the sampling probe. If it is badly contaminated, remove dirt and dust referring to "Cleaning of sampling probe".

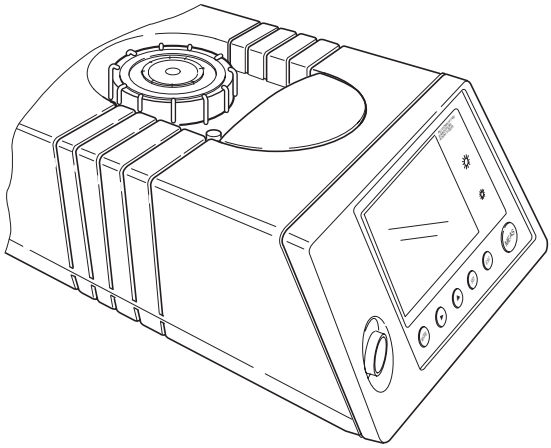


② Replacement of filter element
Insert a new filter element into the element connecting nipple on the primary filter holder. Fully insert the element and set the probe connecting cap in position.

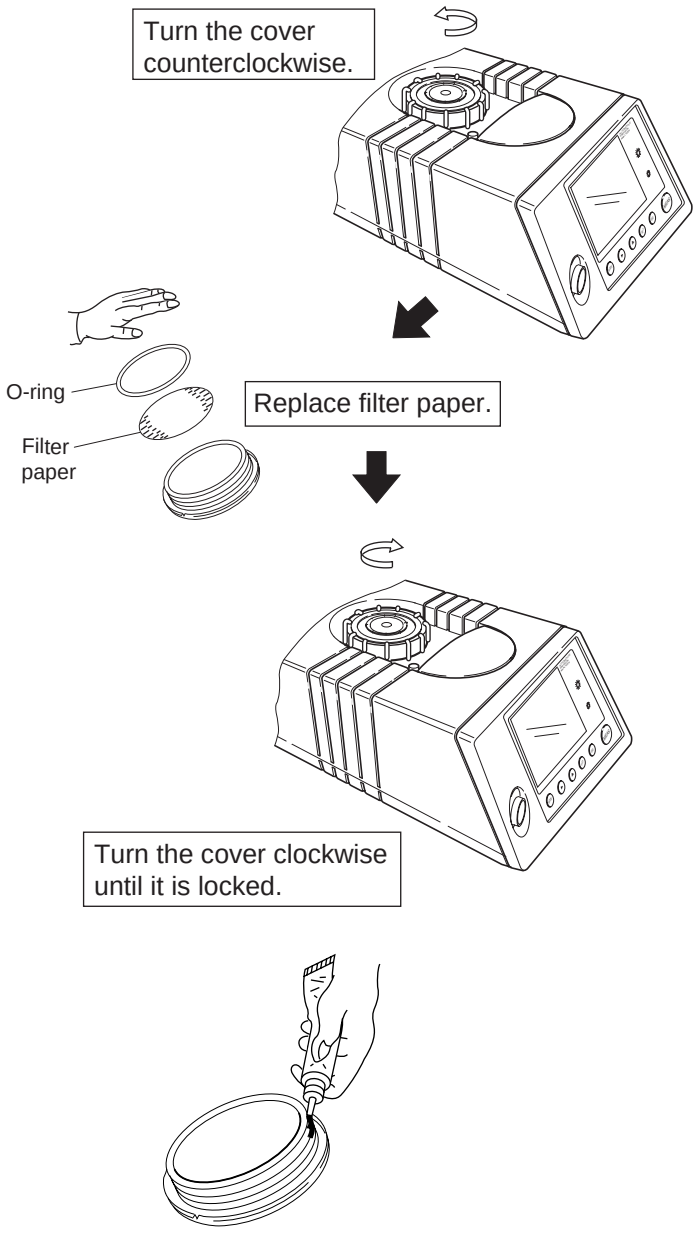


(2) Inspection of filter paper (membrane filter element)

① Inspection should be made prior to initial measurement whenever measurements are required.
At first check the filter paper visually for contamination.
If it has turned black or is wet with water or oil,replace it with a new one.
Failure to observe this inspection and maintenance can result in damage to the filter paper which causes entry of dust into the analyzing unit, whereby correct measurements are not available.
Filter paper should be replaced every 2-3 days or when actual gas suction time exceeds 1 to 2 hours in total.



② Replacement of filter paper
Make sure that the MEAS. key is OFF.
Then, turn the membrane filter cover counterclockwise and remove the filter paper from the unit.
Next, remove the inner O-ring and take out the soiled paper. At this time,check that the soiled paper or dust is not stuck on the unit. Set a new filter paper in place and hold it with the inner O-ring at the texture side.
The inner O-ring should be fitted to membrane filter while pressing it with hand or with a flat object.
Finally,attach the lid of the membrane filter to the threaded section and turn it to right until it is locked firmly.
When it is difficult to remove the lid, put a thin coat of vaccum grease or silicon grease on the outer O-ring.



③ Cleaning of membrane filter
Clean the membrane filter with a cloth moistened with water or cleaning solvent. Next, wipe it dry with a dry cloth.
When cleaning the inside of the filter case,special care should be taken to prevent entry of dust into its gas outlet.

7.2 Inspection and maintenance depending on measuring condition

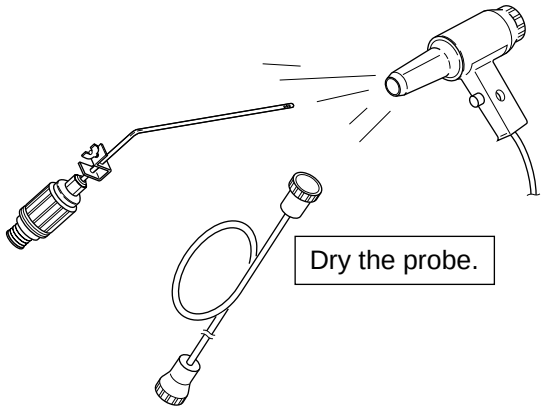
(1) Cleaning of sampling probe

The probe, primary filter holder and sampling tube should be cleaned as often as possible so that dust and drain oil are not stuck.

In this way, the service life can be extended.

First, clean the inside with cleaning solvent and dry with a blow of drying air.

Next, clean the surface with a piece of cloth moistened with water or cleaning solvent.



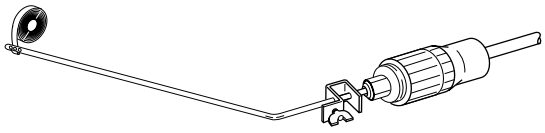
7.3 Leak check

① Connect the sampling probe to the analyzer and select "2. LEAK CHECK" on the menu screen.
Next, close the exhaust gas sampling port with vinyl tape.

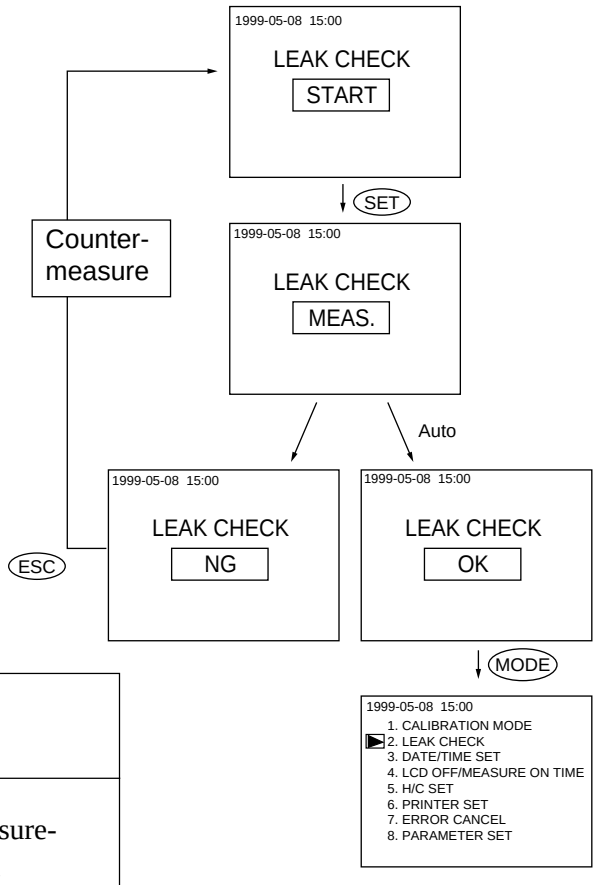
② Press the SET key. The screen will change to the CHECK mode that allows automatic measurement. The result is displayed after about 10 seconds.

③ If "OK" is displayed, the test is normal. Press the MODE key. Purge gas flows and the Menu screen is returned.

④ If "NG" is displayed, go to ⑤ shown on the next page.



Close the sampling port with tape.

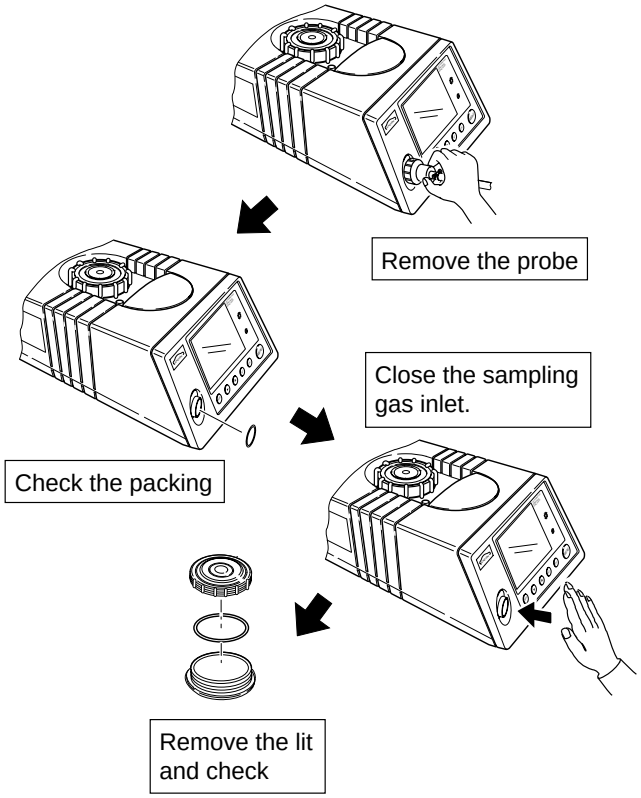


⚠ CAUTION

The sampling probe becomes hot just after measurement. Do not touch it directly to prevent burns.

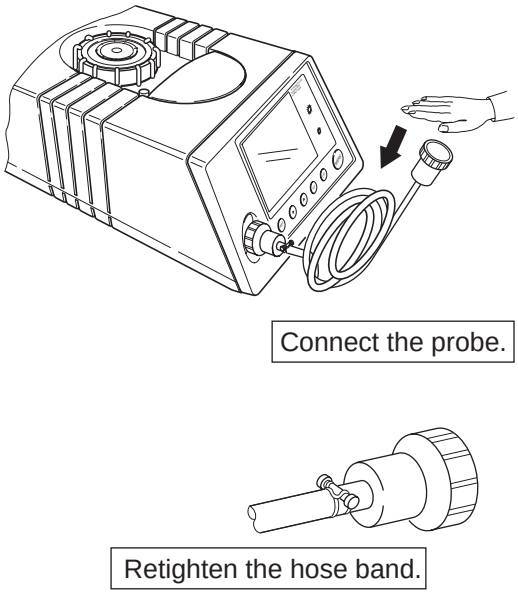
⑤ First of all, remove the sampling probe from the analyzer and check that the coupling packing is normal. If it is defective, replace it with a new one.

⑥ Block the sample gas inlet drain separator with your palm and perform leak check again.
When the result is “OK,” sealing of the sampling probe is poor.
If “NG,” remove the lid of membrane filter and make sure adequate sealing is maintained with the O-ring.



⑦ Sealing check on sampling probe
To find out improper sealing of the sampling probe, connect the probe firmly to the analyzer and remove the probe connecting cap. Close the gas inlet of this cap with finger or the cap with palm and carry out test again.

⑧ If the result is “NG,” retighten the hose band and check the connection of the tube.
Also, check the connecting cap for presence of cracks.
When the sampling tube is cracked, it should be replaced, as it results in poor sealing.
If “OK,” there is a poor sealing in the line before the primary filter. In this case, turn the filter case and retighten the probe packing with the packing, probe and filter held manually.



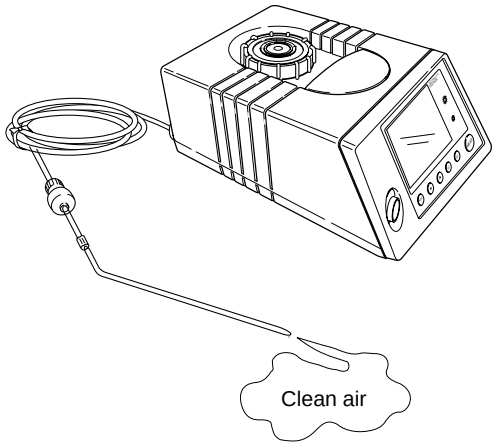
7.4 Inspection and maintenance of hang-up condition

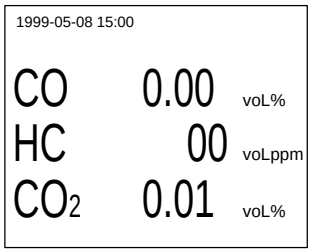
After the completion of measurement, the display indicates about zero point when clean air is sucked up for about 5 to 10 minutes through the probe exhaust gas sampling hole.

If it takes time until it reaches zero point, remove the sampling probe and suck up clean air directly from the drain separator.

If, at this time, the display does not reach zero point, clean the membrane filter and replace the filter paper. Then, connect the sampling tube to the analyzer and suck up clean air from the exhaust gas sampling hole of probe.

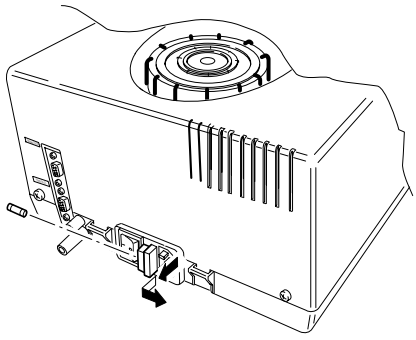
If the display does not reach zero point in a certain period of time, clean the sampling tube and replace the primary filter element, then check to see that the display reaches the zero point.





7.5 Blowout of power fuse

Check the cause of blowout, then remove the power fuse holder and replace the fuse. When replacing, use the supplied fuse or one with the same rating (1A).



Replace the fuse.

7.6 Maintenance of active carbon filter

This filter will be replaced with a new one by service personnel at the time of periodic inspection.

<<Standard gas cylinder>>

4.5 liters standard gas at atmospheric pressure is contained in the cylinder of 0.6 liters in volume by compressed at 0.7MPa. If calibrated effectively, span calibration can be done approx. 15 times.

Use the standard gas carefully. Normally it takes about 10 seconds until the display is stabilized after injecting a new standard gas. If this response time takes 30 seconds to about 1 minute, there is no residual pressure and hence a new standard gas should be used. (Please stock sufficient spare.)

7.7 Inspection and maintenance in cold area

If the drain is frozen in the sampling probe or other sampling parts, they may cause clogged pipe, and then, gas can not be suck up.

When ambient temperature is likely to drop down below 0 °C during storage in a cold season, be sure to carry out the following steps.

(1) Inspection and maintenance for storage after measurement

① If the filter paper (filter element) is wet, it should be replaced with a new one.

② Remove the sampling probe from the analyzer and then remove the primary filter element from the primary filter holder. Next, remove the drain deposited on the probe, primary filter and smapling tube by compressed dry air.

7.8 Replacement of oxygen (O_2) sensor

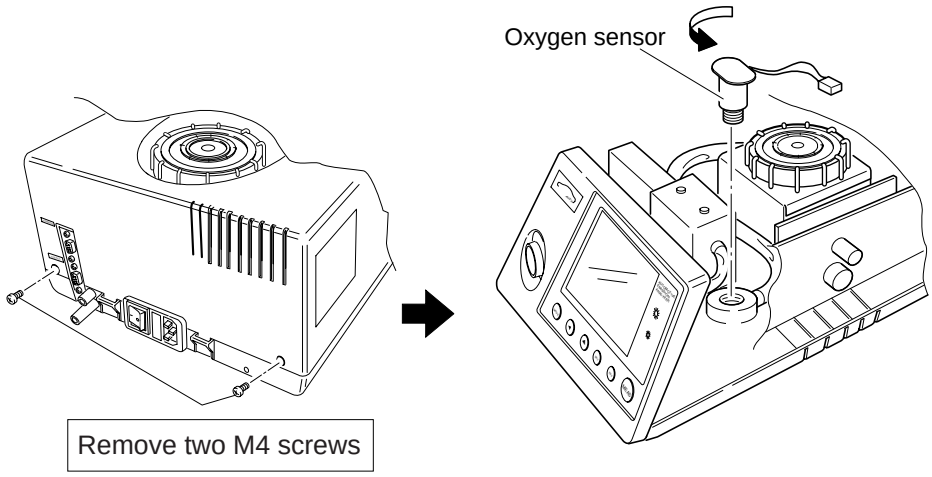
This sensor has a service life of about 1 year from the date of shipment from the factory. Replace the sensor each time periodic inspection is carried out.

Remove two M4 screws from the rear of main unit and detach the cover.

Then, unplug the oxygen sensor connector (amplifier PC board CN8).

The oxygen sensor is screwed-in type. Turn the sensor counterclockwise until it is separated.

Wind a seal tape on the replacement sensor and mount it by reversing the above procedure.

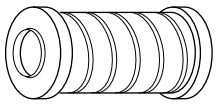
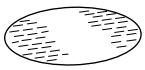
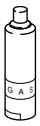
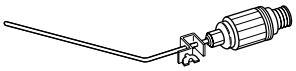
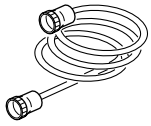
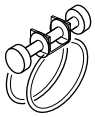
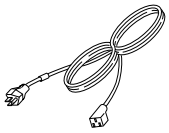
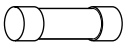
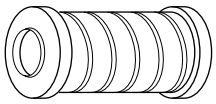
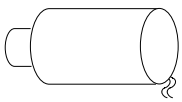


Handling Precaution

- When mounting the sensor, it should be fixed so as not to cause poor sealing.

7.9 Maintenance parts

The following maintenance parts are available from your nearlest dealer.

No.	Name of parts	Reference diagram	Remarks
(1)	Primary filter element		1 package:20 pcs Filter color: White
(2)	Filter paper (membrane filter element)		1 package : 100 pcs
(3)	Standard gas cylinder		1 package : 12 pcs
(4)	Probe		
(5)	Sampling tube		
(6)	Hose band		
(7)	Power cord		
(8)	Tube type fuse		1A
(9)	Active carbon filter		1 package : 20 pcs. Filter color:Black
(10)	Oxygen sensor		Optionnal item (Consumable)
(11)	Fluorescent tube for liquid crystal		Standard replacement time : 10,000 hour Ask service agent for replacement.

8. TROUBLESHOOTING

8.1 Troubleshooting

When the instrument seems to be in trouble, check again carefully before calling your dealer.

If something wrong occurs with this instrument, read this instruction manual carefully for check of errors. If errors are not yet remedied, consult with your dealer.

Trouble	Cause	Remedy
Indicating lamp can not be lit .	Power is OFF.	Turn ON the switch or connect the receptacle.
	Fuse is blown out.	Check the cause of trouble and replace the fuse.
Indicated value does not become lower or it is not stabilized.	Zero/span is not calibrated correctly	Perform calibration once again.
	Filter is dirty.	Replace the filter.
	Improper sealing.	Check the sealing condition and replace defective parts.
Response speed is slow.	Zero/span is not calibrated correctly.	Perform calibration once again.
	Filter is dirty.	Replace the filter.
	Improper sealing.	Check the sealing condition and replace defective parts.

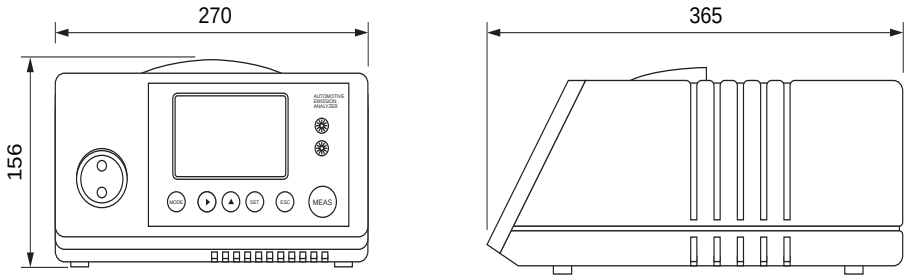
9. SPECIFICATIONS

Name of product		Automotive emission (carbon monoxide, hydrocarbon, carbon dioxide, oxygen) multiplex analyzer
Model		ZKE
Measuring range	CO	0 to 10.00 vol%
	HC	0 to 10,000 volppm or 0 to 14,000 volppm
	CO_2	0 to 20.00 vol%
	O_2	0 to 25.00 vol%
Measurable components		Carbon monoxide, hydrocarbon, carbon dioxide and (oxygen) contained in automobile exhaust gas sampled directly from tale pipe
Measuring system		Non-dispersion type infrared ray analysis (NDIR) O_2 meter : Galvanic battery type
Indication (digital system)	CO	0 to 10 vol% (Minimum indication increment 0.01 vol%)
	HC	0 to 10,000 volppm (Minimum indication increment 1 volppm)
		0 to 14.000 volppm (Minimum indication increment 1 volppm)
	CO_2	0 to 20 vol% (Minimum indication increment 0.01 vol%)
	O_2	0 to 25 vol% (Minimum indication increment 0.01 vol%)
Repeatability		CO meter; within ±5% of the true value to be indicated at about 3.5 vol%, or within ±5/3 % of data of more than 13 times out of 20.
		HC meter; within ±5% of the true value to be indicated at about 1000 volppm, or within ±5/3 % of data of more than 13 times out of 20.
		CO_2 meter; within ±5% of the true value to be indicated near full scale
		O_2 meter; within ±5% of the true value to be indicated near full scale
Accuracy		CO meter; within ±0.06vol% (within ±5% of the actual value to be indicated for 1.2 vol% or more)
		HC meter; within ±12 volppm (within ±5% of the actual value to be indicated for 240 volppm or more)
		CO_2 meter; within ±5% of the true value to be indicated.
		O_2 meter; within ±5% of the true value to be indicated.
Drift		CO meter; within ±5%/4H of the true value to be indicated at about 3.5vol%
		HC meter; within ±5%/4H of the true value to be indicated at about 1,000volppm
		CO_2 meter; within ±5%/4H of the true value to be indicated near full scale
		O_2 meter; within ±5%/4H of the true value to be indicated near full scale
Response time		Within 15 sec at 95% response
Warm-up time		Approx. 5min.
Draining		Automatic separation and draining
Operating condition		Ambient temperature; 0 to 40ºC
		Ambient humidity; 90% RH or less
External output		Corresponds to digital output RS-232C and printer output
Power source		100V, 110V, 115V, 200V, 220V, 240V AC, 50/60 Hz
Mass		Approx. 5kg
Dimensions		Main unit ; 156 x 270 x 365 mm (H x W x D) Probe ; 640mm (length) Sampling tube ; 4,000mm (length)

10. SYMBOL CODE

ZKE				1	1	
						Letters
	2					Display:English, Power Supply:115V AC 50/60Hz
	3					Display:English, Power Supply:200V AC, 220V AC 50/60Hz
						Measurable components
		2				CO/HC measurement Neither A/F nor λ is indicated.
		3				CO/HC/CO_2 measurement A/F, λ indication
		4				CO/HC/CO_2/O_2 measurement A/F, λ indication
						Measuring range
			1			CO :0 to 10% HC :0 to 10000ppm CO_2 :0 to 20%
			2			CO :0 to 10% HC :0 to 10000ppm CO_2 :0 to 20% O_2 :0 to 25%
			3			CO :0 to 10% HC :0 to 14000ppm CO_2 :0 to 20%
			4			CO :0 to 10% HC :0 to 14000ppm CO_2 :0 to 20% O_2 :0 to 25%
			5			CO :0 to 10% HC :0 to 10000ppm
			6			CO :0 to 10% HC :0 to 14000ppm

11. OUTLINE



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