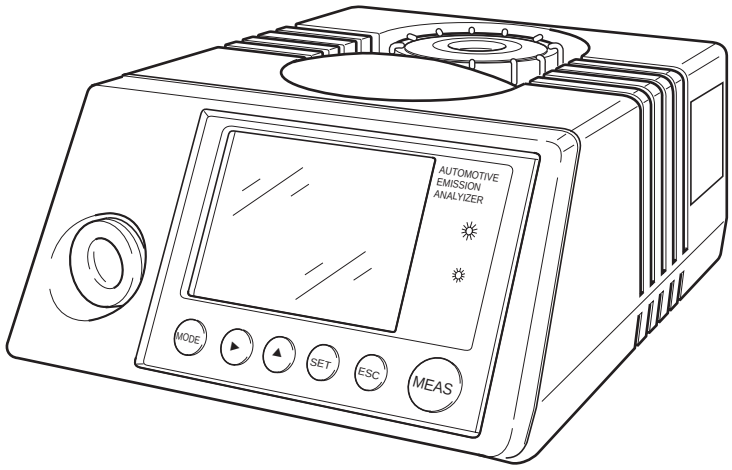
Service Manual

AUTOMOTIVE EMISSION ANALYZER

— CO, HC, CO_2, O_2 —

Multiplex Analyzer Measuring Instrument

TYPE: ZKE



Fuji Electric Co., Ltd.

INZ-TN512524d-E

CONTENTS

INTRODUCTION

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.

Manufacturer	:	Fuji Electric Instrumentation Co., Ltd.
Type	:	Described in nameplate on main frame
Date of manufacture	:	Described in nameplate on main frame
Product nationality	:	Japan

⚠ 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 description 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.

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).

2. ITEMS ON DANGER AND WARNING

2.1 General safety precautions

① Before operating this instrument, read and understand the contents of this manual.

② Do not allow any person to use this instrument unless she/he is familiarized with the operation.

③ Preparation for operation, inspection and maintenance must be performed as mentioned in this manual.

2.2 Operating precautions

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

⚠ DANGER

The span gas cotained 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 risk of death or serious injury due to electric shocks.

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

- Incorrect handing of the instrument may lead to unexpected accidents.

Do not allow any person to use the instrument unless she/he is familiarized with the operation.

- Incorrect handing of the instrument may lead to unexpected accidents.

3. DESCRIPTION OF OPERATING PARTS AND CHECK ITEMS

3.1 Sampling system

3.1.1 Outline

The sampling system is used to supply a specified amount of automotive emissions to the measuring unit, by removing a trace of dust or drain from gases exhausted through the tail pipe of automobiles.

For an analyzer to measure automotive emissions accurately, each unit of the sampling system must meet the following requirements.

1) Flow rate (monitored by pressure gauge) is as specified.
2) Air is not sucked into the units which are measuring automotive emissions.
3) It is designed not to allow dust or drain to enter the measuring unit.

If these requirements are not met, the instrument may provide different measuring readings from actual concentration of emission gases. The following chart will help you locate the probable cause of trouble or perform the routine maintenance and check for the sampling system.

3.1.2 Troubleshooting

Name of components	Phenomena	Probable cause	Remedies
Probe	Flow rate is not supplied as specified. Indicating action is slow.	Clogged	• Replace. • Check for piping joints.
	Readings are too low due to absorbed air.	Damaged	
Primary filter holder (with probe tightening screws)	Readings are too low due to absorbed air.	Damaged Tightening screws are loose	• Replace holder. • Retighten.
Sampling tube (with connecting cap)	Flow rate is not supplied as specified Indicating action is slow.	Clogged	• Replace tube. • Check for piping joints.
	Readings are too low due to absorbed air.	Damaged	
Primary filter element	Flow rate is not supplied as specified. Indicating action is slow.	Dirty, clogged	Replace periodically.
Membrane filter	Flow rate is not supplied as specified. Indicating action is slow.	Dirty	Replace periodically.

Name of components	Phenomena	Probable cause	Remedies
O-ring (large, small) for membrane	Readings are too low due to absorbed air.	Damaged or scratched	• Replace O-ring.
Primary filter, drain separator and packing	Readings are too low due to absorbed air.	Damaged or scratched Incorrect fitting	• Replace packing. • Check.
Drain separator	Readings are too low due to absorbed air.	Damaged Fitting of connecting cap	• Check.
	Flow rate is not supplied as specified Indicating action is slow.	Clogged	
Membrane filter (for cover and cylinder)	Readings are too low due to absorbed air.	Damaged Closing of door	• Replace O-ring. • Check.
Double suction pump	Gases are not suctioned. (Specified flow rate is not supplied.) Drain is not exhausted outside.	Damaged diaphragm Disconnect exciting coil or burnout	• Replace pump. • Check for pump signal (See Page 8).
Pressure sensor	Flow rate cannot be monitored.	Improper sensor Improper circuit	• Check for sensor. • Check for sensor circuit.
Span gas inlet	No readings of standard gases are not indicated since standard gases are not supplied to the measuring unit.	Clogged	• Internal piping • Check for connections.
Internal piping	Readings are too low due to absorbed air.	Damaged, or improper plugging	• Check for connections.
Charcoal filter	Response speed is too slow to return to zero point.	Excessively clogged	• Replace.

3.2 Measuring unit

3.2.1 Outline

The measuring unit flows cleaned-up exhaust gases filtered by the sampling system into the internal sampling cell. It optically analyzes CO, HC and CO_2 contained in the gases and converts them into electrical signal (voltage change). Use of solid state sensor and band pass filter makes the measuring unit compact, which is composed of infrared ray light source, cell (sampling cell only) and sensor unit. In addition, an O_2 meter (option) uses galvanic cells. This section covers troubleshooting which aids you in finding out the causes of trouble and taking its remedy when the instrument is in trouble.

3.2.2 Troubleshooting

Name of components	Phenomena	Probable cause	Remedies
Infrared ray light source unit	Readings remains unchanged.	Disconnected light source windings	• Measure winding resistance value (within 3.9Ω±30%).
	Readings are not stable due to lack of sensitivity.	Dirty window	• Clean.
	Improper accuracy (linearity) of CO_2 meter	Sealing gas released	• Replace light source unit.
Cell unit	Readings are not stabilized due to lack of sensitivity, and zero calibration or span calibration is not carried out.	Dirty sampling cell	• Clean.
	Readings are not stabilized due to leak of sampling gas.	Deteriorated O-ring	• Replace.
Cell holder	Readings are not stabilized due to lack of sensitivity, and zero calibration or span calibration is not carried out.	Dirty window	• Clean.
Sensor unit	Readings are not stabilized.	Dirty band pass filter (BPF)	• Clean.
	Readings are not stabilized.	Deteriorated or damaged sensor (head amplifier)	• Replace.
	Readings remains unchanged.	Improper motor revolutions	• Check for motor signal (See Page 8).
	Readings remains unchanged.	Sector revolution	• Reinsert sector
	Temperature is not compensated properly.	Disconnected temperature compensation resistance	
Oxygen sensor	Oxygen meter readings are improper.	Check oxygen sensor along for voltage.	Disconnect the oxygen sensor connector and check the voltage. Zero gas (N_2): 0 to 1mV Span gas (corresponding to 21%): 27mV±8mV

3.3 Electric system and PC board

3.3.1 Outline

The electric system is used to operate the double suction pump motor fan and each PC board electrically.

The PC board incorporates the first stage IC's of AC amplifier circuits of CO, HC and CO_2 in the head amplifier (sensor unit). The amplifier PC board incorporates analog circuit, pump driven circuit, solenoid valve driven circuit and motor driven circuit for CO, HC and CO_2 and O_2. CPU and memory IC are mounted on the main printed board. Since the electrical system uses switching power for power supply, it is compact and lightweight.

This section provides the troubleshooting which helps you to determine if each part is properly functioning.

3.3.2 Troubleshooting

Name of components	Phenomena	Probable cause	Remedies
Power cord	Electricity is not supplied to each unit.	Disconnected	• Replace.
Tube fuse	Electricity is not supplied to each unit.	Disconnected	• Replace.
Fuse holder	Electricity is not supplied to each unit.	Damaged or improper contact	• Replace.
Power switch	Electricity is not supplied to each unit.	Improper contact	• Replace.
Switching power	Electricity is not supplied to amplifier printed board.	Faulty circuit	• Replace.
Head amplifier	See Pages 8 and 9.	See Pages 8 and 9.	
Main printed board	See Page 9.	See Page 9.	
Amplifier printed board	See Pages 8 and 9.	See Pages 8 and 9.	

4. VOLTAGE CHECK

4.1 Voltage check of parts

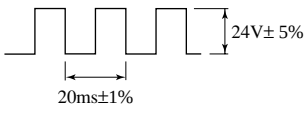
4.1.1 Check for power supply voltage of amplifier PC board

Attach a voltmeter across the check terminals of an amplifier PC board to check that the readings are within the standard range.

Item	Points to be checked	Voltage check
Power supply voltage	Across Vcc and GND	+5.000V DC±0.15V
Power supply voltage	Across P12 and SC	+12.000V DC±0.5V
Power supply voltage	Across N12 and SC	−12.000V DC±0.5V

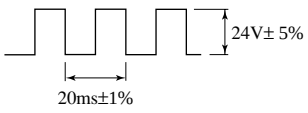
4.1.2 Check for motor driven signal

Attach an oscilloscope to the connector of the amplifier PC board to check for waveform.

Item	Points to be checked	Waveform check
Motor driven signal	Across CN2 ① – ② terminals	

4.1.3 Check for pump driven signal (with pump driven)

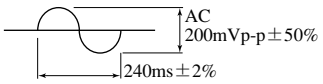
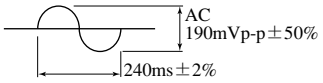
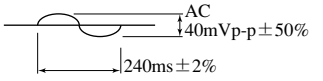
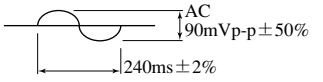
Attach an oscilloscope to the connector of an amplifier PC board. Press (MEAS) key to check for waveforms when the pump is driven.

Item	Points to be checked	Waveform check
Pump driving signal	Across CN3 ① – ② terminals	

4.1.4 Sensor signal check (Head amplifier output)

Attach an oscilloscope to the connector of an amplifier PC board.

Check for waveforms of each component by flowing zero gas (air).

Item (component)	Points to be checked	Voltage check
CO	Across amplifier PC board, CN1 ⑤ - SC (check pin)	
HC	Across amplifier PC board, CN1 ④ -SC (check pin)	
CO_2	Across amplifier PC board, CN1 ⑥ - SC (check pin)	
Ref	Across amplifier PC board, CN1 ⑦ - SC (check pin)	

4.1.5 Check for oxygen sensor signal

Remove CN8 from the PC board.

Across the ends of the PC board, attach a voltmeter to check the voltage.

Note) No power supply is required for the battery-powered oxygen sensor.

Item	Points to be checked	Voltage check
O_2	Both terminals of sensor connector	Zero gas (N_2) : 0 to 1mV DC Span gas (Air) : 27±8mV DC

4.1.6 Check and adjustment for power supply of main PC board

Attach a voltmeter across the check terminals of the main PC board to check that the readings are within the standard range.

Item	Points to be checked	Setting voltage	Adjuster
Power supply voltage	Across VD-VG	+5.000V DC±0.2V	Check only
Indication power supply voltage	Across TP6-GND	+24.000V DC±0.2V	VR1

5. ADJUSTMENT

5.1 Zero point adjustment

Attach a voltmeter to the check terminals of an amplifier PC board. Drive the pump by pressing (MEAS) key to suck clean air. Using zero point adjuster, the voltage should be adjusted as given below when the pump is in suction.

Note 1) Carry out warm-up operation (for more than 30 minutes) and then perform zero point adjustment while the pump sucks in clean air.

Note 2) Perform zero point adjustment by the reference voltage, "Ref gain".

Note 3) No gain adjustment is required for the oxygen sensor.

Components	Setting voltage	Points to be checked	Adjuster
Ref	– 2.000V DC±0.05V	Across TP4 – SC	VR4
CO	0.100V DC±0.1 V	Across TP2 – SC	VR2
HC	0.100V DC±0.1 V	Across TP1 – SC	VR1
CO_2	0.200V DC±0.1 V	Across TP3 – SC	VR3

5.2 Span point check

After zero point adjustment, flow supplied cylinder gas through the calibration gas inlet to check for span point voltage.

Note 1) Check for the span point when the pump is securely stopped.

Components	Setting voltage	Points to be checked	Span gas
Ref	–2.000V DC±0.5V	Across TP4 – SC	—
CO	+0.600V to +1.100 V DC	Across TP2 – SC	3.0 to 3.5vol % CO
HC	+0.600V to +1.100 V DC	Across TP1 – SC	3600 to 4000 volppm C_3H_8
CO_2	+1.400V to +1.900 V DC	Across TP3 – SC	18.0 to 20.0 vol % CO_2

5.3 Zero/span calibration

Carry out zero/span calibration by pressing the front key.

For calibration procedure, refer to Instruction Manual.

5.4 Adjustment of pressure sensor voltage

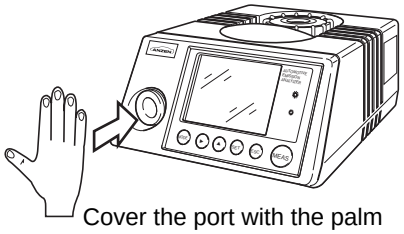
① Drive the pump by pressing (MEAS) key to suck in air through the drain port in about 15 sec.

② Attach a voltmeter across TP5 – SC of the amplifier PC board. Using VR6, adjust the voltage to 0.000V±0.1V (zero point adjustment for pressure sensor).

③ Cover the drain separator port with the palm of your hand so that airtightness can be maintained.

Note) Press your hand tightly against the port. Otherwise airtightness may be impaired.

④ Using VR5, adjust the voltage across TP5 - SC to 2.200V±0.1V.



Cover the port with the palm of your hand.

6. PARAMETER MODE

To repair this instrument, the following data may have to be changed.

6.1 Overview of each mode

Mode No.	Name	Contents
1	DATA CLEAR	Initializes internal data (present parameter mode)
2	JAPANESE/ENGLISH indication	Switches Japanese to English or vice versa.
3	COMPONENT/RANGE SET	Sets the number of display components and HC range.
4	PRINTER SET	Sets when a printer other than recommended one is connected.
5	OFFSET	Sets hardware offset values.
6	LINEARIZER table generation	Converts non-linear output into linear output.
7	INTERFERENCE COMPENSATION table generation	Compensates for mutual interference.
8	TEMPERATURE COMPENSATION table generation	Compensates for influence of ambient temperature.
9	MINUS indication	Sets "with/without" of a minus indicator.
10	P.E.F entry	Sets propane ratio coefficients at the time of HC span calibration.
—	Alive signal values of each sensor	Reads signals from sensors of CO/HC/CO_2/O_2/ temperature/pressure.

6.2 How to set parameter mode

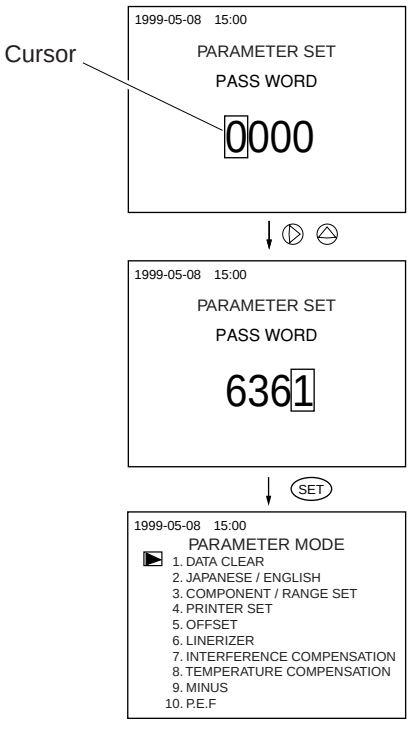
① Select "8. PARAMETER SET" from the Menu screen.

② Press the (SET) key to set this mode , and the screen will be switched to this PARAMETER SET screen.

③ Using the digit select key ▷ and value increment key △ , enter the password.

> Type 6361 in the password box.

④ Press the (SET) key to display the PARAMETER MODE screen.



6.3 Description of each mode

6.3.1 DATA CLEAR

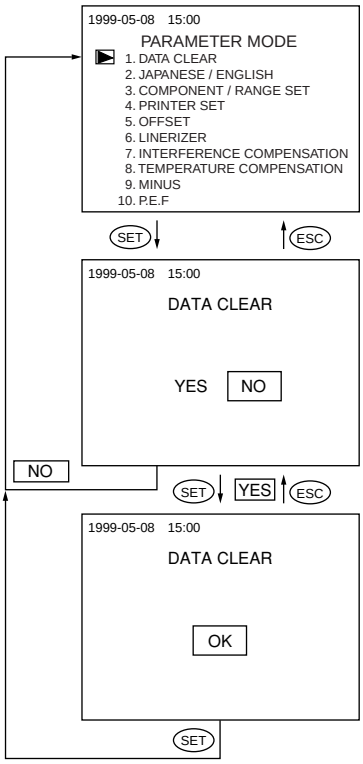
Note) Don't use this mode since it is used to clear internal data. If it must be used, keep records of information associated with all parameters.

① Point the cursor ▶ to "1. DATA CLEAR" by pressing the ▷ key.

② Press the SET key to switch the screen to this mode.

③ Select "YES" or "NO" by the ▷ key and press the SET key again.

No:	The parameter screen will return without executing "DATA CLEAR".
Yes:	A message appears, prompting you to verify that you want to execute "Data Clear".
OK:	Press the SET key.
NO:	Press the ESC key.



④ Whether pressing the "YES" or "NO" button or not, this screen will return to the "PARAMETER" screen.

6.3.2 JAPANESE/ENGLISH indication

This mode is used to switch the indication of the MENU and PARAMETER screen to Japanese or English.

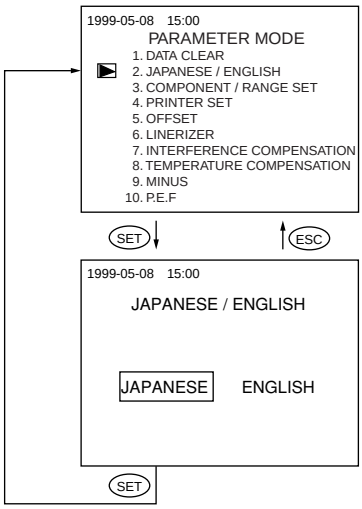
① Point the cursor ▶ to "2. JAPANESE/ENGLISH" by pressing the ▷ key.

② Press the SET key to switch the screen to this mode.

③ Select JAPANESE or ENGLISH by pressing the ▷ key, and press the SET key again.

JAPANESE:	Japanese indication mode
ENGLISH:	English indication mode

④ The display will return to the "PARAMETER MODE" screen.



6.3.3 COMPONENT / RANGE SET

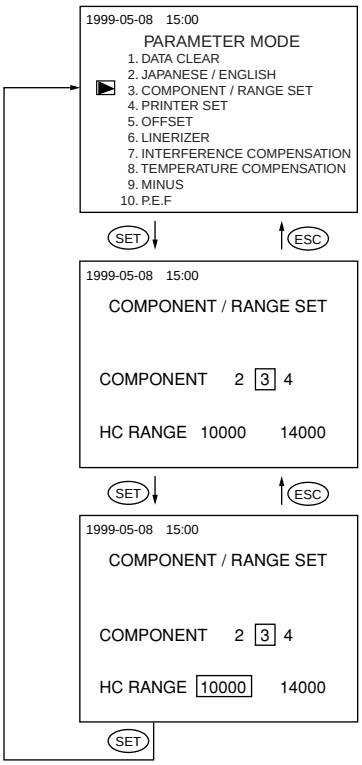
This mode is used to set the number of display components and to select the range value of the HC meter.

① Point the cursor ▶ to "3. COMPONENT/RANGE SET" by pressing the ▷ key.

② Press the SET to switch the screen to this mode.

③ Select any of "2-component", "3-component" and "4-component" by pressing the ▷ key. Press the "SET" key. The cursor moves to "HC RANGE".

④ Select "10000volppm" or "14000volppm" by the ▷ key, and press the SET key.



NO. OF COMPONENTS
- "2": 2-component display (CO/HC)
- "3": 3-component display (CO/HC/CO_2)
- "4": 4-component display (CO/HC/CO_2/O_2)

HC RANGE
- "10000": 10000volppm meter in full scale
- "14000": 14000volppm meter in full scale

⑤ The display will return to the PARAMETER screen.

6.3.4 PRINTER SET

This mode is used when selecting any printer other than recommended printer.

① Point the cursor ▶ to "4. PRINTER SET" by pressing the ▷ key.

② Press the SET key to switch the screen to this mode.

③ Select any of baud rates, "9600", "4800", and "2400" by pressing the ▷, and press the SET key. The cursor will move to the "BIT" selection.

④ Select either "8" or "7" by the ▷ key, and press the SET key again.

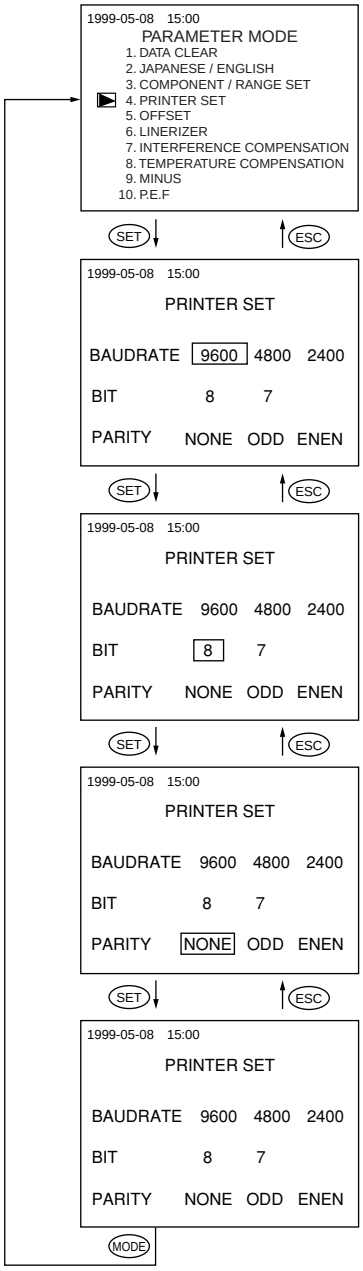
The cursor moves to the "PARITY" selection.

⑤ Select any of "None", "Even" and "Odd" from PARITY and press the SET key.

The cursor will disappear.

⑥ Pressing the MODE key will return to the "PARAMETER" screen. Pressing the ESC key will return to the "PARITY" screen.

BAUD RATE:	"9600"
	"4800"
	"2400"
BIT:	"8"
	"7"
PARITY:	"None"
	"Odd"
	"Even"



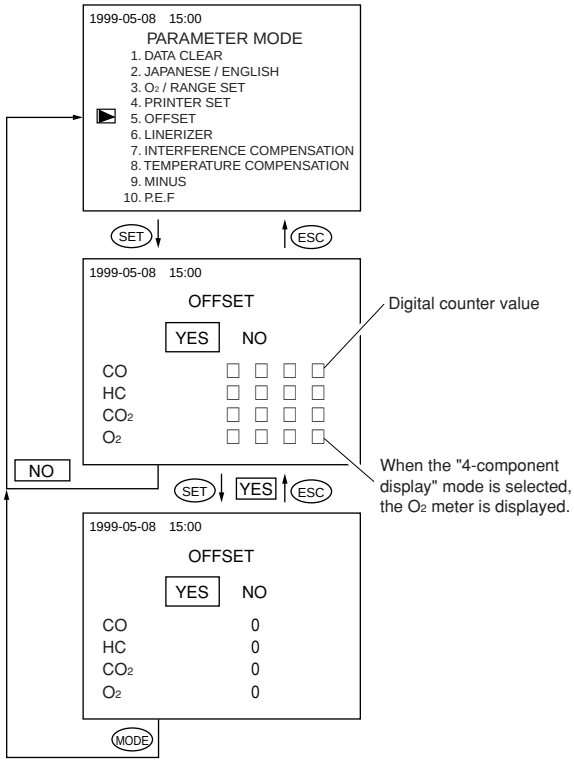
6.3.5 Zero OFFSET setting

This mode is used to offset zero electrically when replacing the main or amplifier PC board.

① Point the cursor ▶ to "5. OFFSET"" by pressing the key ▷ .

② Press the SET key to switch the screen to this mode.

③ Use an adjuster on the amplifier PC board to adjust analog values of components to 0.1V±0.1V or less when the zero gas (N_2) is supplied. (See Page 10).



Note 1) Option O_2 meter reads the counter indication, if provided.

Note 2) Zero gas is permitted in the air, if the O_2 meter is not provided.

Note 3) The CO_2 meter is used for internal compensation even when the 2-component mode is selected. This mode also is effective.

④ Select "YES" or "NO" from the OFFSET screen and press the SET key.

NO: The OFFSET screen will return to the "PARAMETER" screen without executing "OFFSET".

YES: It executes OFFSET.

⑤ Press the YES button again, and the cursor will disappear. The component counter indicates a value near 0.

⑥ Pressing the MODE key returns to the PARAMETER screen.

6.3.6 LINEARIZER table generation

This mode is used when replacing the PC board and sensor unit.

> **Note) If you have purchased sensor units for maintenance, supplied data is requested to enter.**

① Point the cursor ▶ to "6. LINEARIZER" by pressing the key ▷.

② Press the SET key to switch the screen to this mode.

③ Move the cursor ▶ to any component you want to change by using the key ▷.

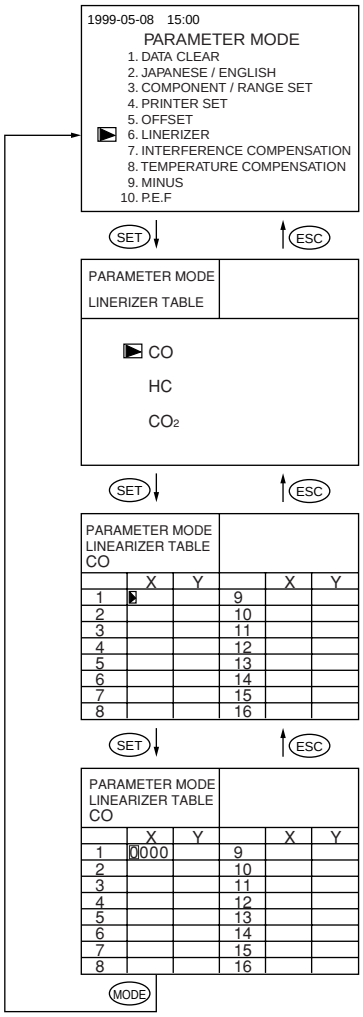
④ Press the SET key to select the crossover you want to change by the key ▷.

⑤ Press the SET key again to change each crossover data by the key ▷.

⑥ Press the SET key to save the data. The cursor will appear.

⑦ Press the MODE key to return to the PARAMETER screen.

> No. of crossover points is 16 (1 to 16).
> X axis indicates output values or equivalent.
> Y axis indicates values of concentration or equivalent.



6.3.7 INTERFERENCE COMPENSATION table generation

This mode is used when replacing the PC board or sensor.

Note) If you have purchased sensor units for maintenance, supplied data is requested to enter.

① Point the cursor ▶ to "7. INTERFERENCE COMPENSATION" by pressing the key ▷.

② Press the SET key to switch the screen to this mode.

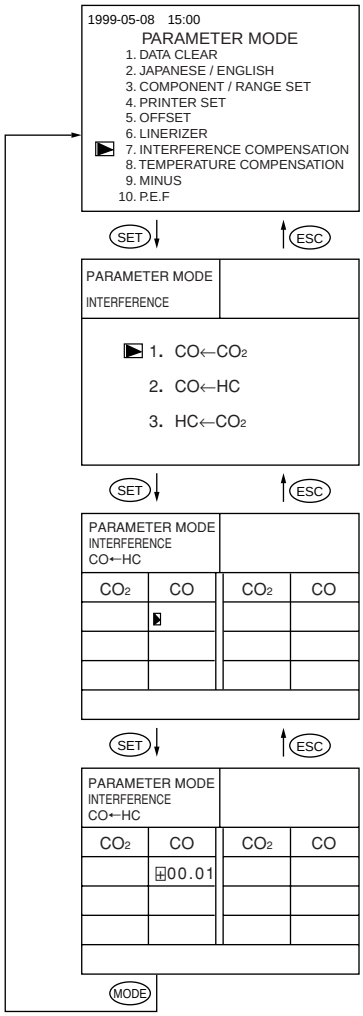
③ Move the cursor ▶ to any datat you want to change by using the key ▷.

④ Press the SET key to select the crossover you want to change by the key ▷.

⑤ Press the SET key again to change each crossover data by the key ▷.

⑥ Press the SET key to save the data. The cursor will appear.

⑦ Pressing the MODE key returns to the PARAMETER screen.



6.3.8 TEMPERATURE COMPENSATION table generation

This mode is used when replacing the PC board and sensor unit.

Note) If you have purchased sensor units for maintenance, supplied data is requested to enter.

① Point the cursor ▶ to "8. TEMPERATURE COMPENSATION" by pressing the key(▷).

② Press the (SET) key to switch the screen to this mode.

③ Select either zero or span TEMPERATURE TABLE by the key (▷).

Note "TEMPERATURE TABLE is a collection of temperature sensor data. No change must be made for routine work.

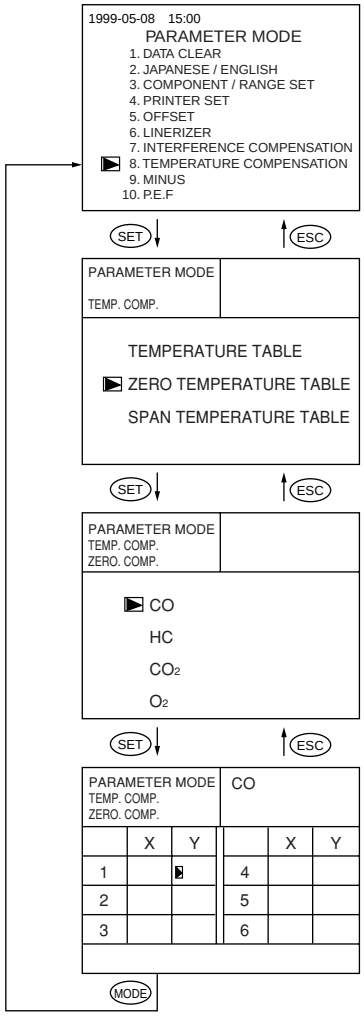
④ Press the (SET) key to select any component you want to change by using the key(▷).

⑤ Press the (SET) key again to change the Y-axis data by the key (▷).

⑥ After setting, press the (SET)key to save the data.

⑦ Pressing the (MODE) key returns to the PARAMETER screen.

X axis: Temperature value (no change can be made)
Y axis: Amount of compensation (change can be made)



6.3.9 MINUS indication

This mode is used to set the indication below zero to "0".

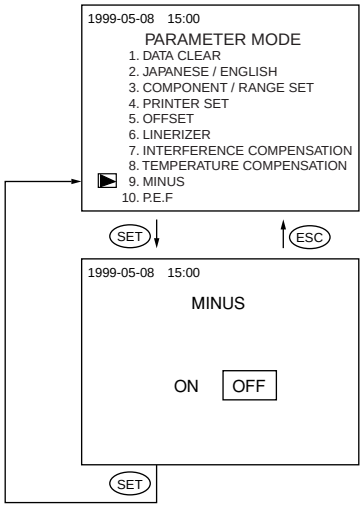
① Point the cursor ▶ to "9. MINUS" by pressing the key ▷.

② Press the SET key to switch the screen to this mode.

③ Select "ON" or "OFF" to indicate the MINUS indication by pressing the key ▷ and press the SET key.

ON: indicates a value below zero.
OFF: sets a value below zero to 0.

④ The display returns to the PARAMETER screen.



6.3.10 P.E.F

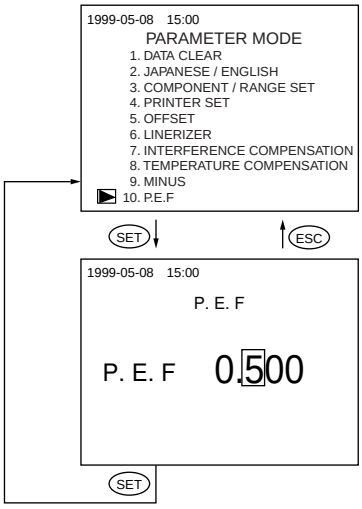
This mode is used to set the range when replacing the PC board and sensor unit.

Note)	**If you have purchased sensor units for maintenance, supplied data is requested to enter.**

① Point the cursor ▶ to "10. P.E.F" by pressing the key ▷.

② Press the SET key to switch the screen to this mode.

③ Select the digit you want to change by using the key ▷ , and set by the key △ .



The setting range is from "0.300 to 0.700".
When entering "0.000", the converted value becomes ✕ 1.000 or equivalent.
If a value is entered beyond the range, the setting becomes invalid.

④ Press the SET key to save the data, then the display returns to the PARAMETER screen.

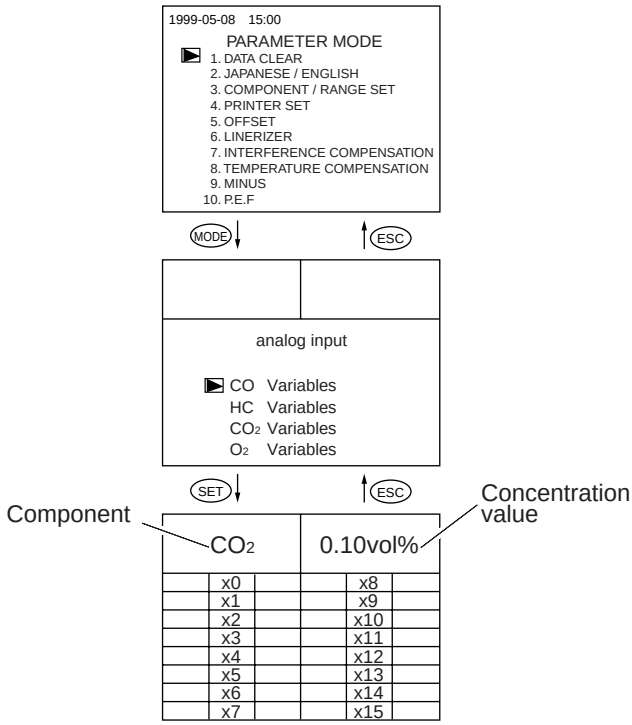
6.3.11 Check of sensor signals

The indication just after the A/D conversion of each sensor (CO/HC/CO2/O2/ temperature/pressure) can be read. It helps you in analyzing trouble.

① Press the (MODE) key on the PARAMETER screen. The pump is driven to switch to this mode.

② Move the cursor ▶ to select any of components you want to read by pressing the key (▷) and then press the (MODE) key.

③ To return to the PARAMETER screen, press the (ESC) key.



Description of analog input

AinP No.	COUNT	Sensor
0	Value just after A/D conversion	HC
1		CO
2		CO_2
12		O_2
13		Temp.
14		Pressure

* 3-11 and 15 are not used.

CO / HC / CO_2 / O_2 / variables

X	COUNT
0	Value just after A/D conversion
1	Value after offset
2	Value after zero temperature compensation
3	Value after zero calibration
4	Value after interference compensation
5	Value after span temperature compensation
6	Value after span calibration
7	Value after linearization

*X8 to X15 are not used.

7. UNIT REPLACEMENT

7.1 Infrared ray light source unit

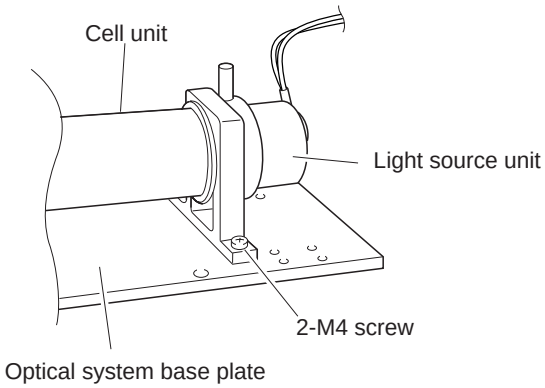
Reason for replacement: Disconnected or deteriorated infrared ray light source, leak of sealing gas, cracked window, improper readings due to contamination.

Check :

1) Visually check that the window is not dirty or the sealing pipe is not damaged.
2) Detach the connector and check the winding resistance values of the light source. The resistance values should be 3.9Ω±30%.

Procedures:

1) Detach the connector inserted into the repeating connector.
2) Remove 2-M4 screws which fix to the optical system base plate.
3) Remove the cell unit from the light source holder.
4) For assembly after repair or replacement, reverse the above procedure.



7.2 Sensor unit

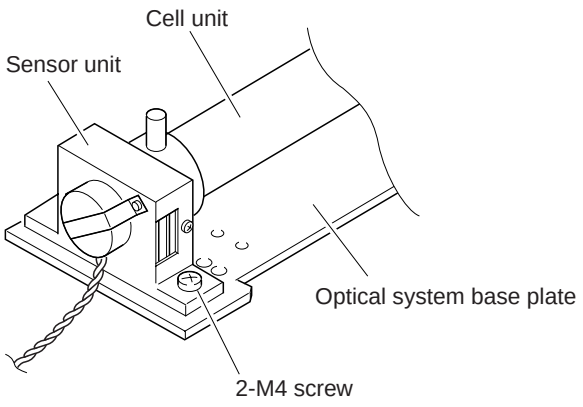
Reason for replacement: Fluctuating indication due to damaged sensor, dirty and scratched B.P.F and damaged motor.

Check:

1) Perform a visual check of window and B.P.F for stain or scratch.
2) Check that the sector rotates in a fixed cycle.
3) Check that the sensor signal is normal (See Page 9).

Procedures:

1) Detach the connector that is attached to the sensor unit.
2) Remove 2-M4 screws which secure to the optical system base plate.
3) Remove the cell unit from the light source holder.
4) For assembly after repair or replacement, reverse the above procedures after repair or replacement.



7.3 Cell unit

Reason for replacement: Improper air tightness due to deteriorated O-ring.
Poor sensitivity due to contaminated inner surface of the cell.

Check:
1) Check that O-ring is free of crack or scratch.
2) Wipe the cell interior with a soft cloth.

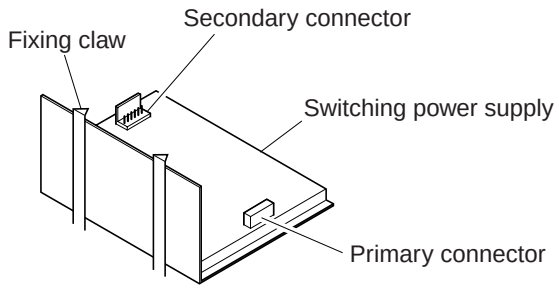
Procedure; Remove the infrared ray light source unit in Item 7.1 and sensor unit in Item 7.2 and then remove the cell unit.

7.4 Switching power source unit

Reason for replacement: Indication lamp is not lit due to improper power supply voltage.

Check: Check for power supply voltage of each unit. (See Page 8, 9.)

Procedure:
1) Detach the primary and secondary connectors of switching power supply.
2) Remove claw that secures the case using a driver and the switching power supply unit.
3) For assembly after replacement, reverse the above replacement procedures.



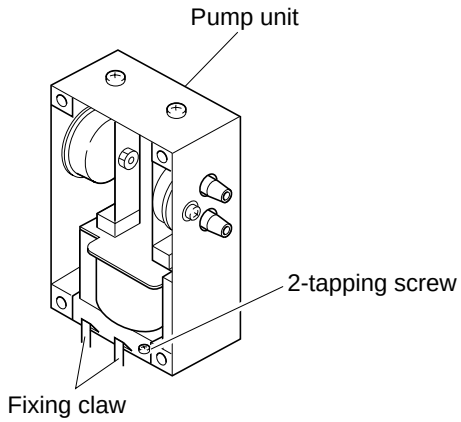
7.5 Pump unit

Reason for replacement: Response is improper due to deteriorated diaphragm.

Check: Attach a flowmeter to the drain port to check for the total flow rate (drain and sampling port). If the total flow is below 3*l*/min, replace the pump unit.

Procedures:

1) Detach the connector inserted into the amplifier PC board (CN3).
2) Remove 2-tapping screws securing to the case.
3) Remove a claw that secures the case using a driver and the switching power supply unit.
4) For assembly after replacement, reverse the above procedure.



7.6 Solenoid valve unit

Reason for replacement: Error in reading is found due to leak.
Switching of zero gas and sampling gas is improper.

Check:

1) Apply pressure (of less than 20kPa) to Ⓐ port of the solenoid valve to check for leak.

	Flow path direction
Non-conductive	A ⇔ B
Conductive	A ⇔ C

Note) Gas inlets Ⓐ and Ⓒ are provided at the main unit.

Procedures:

1) Remove 4-tapping screws from the membrane filter mounting board.
2) Remove the solenoid valve that is secured to the mounting board unit by 2-M3 screws.
3) For assembly after replacement, reverse the above replacement procedure.

7.7 PC board unit

Reason for replacement: It is damaged due to shorted power supply.

Check: Check for voltage and waveform at each part.
(For details, see Page 8 to 10.)

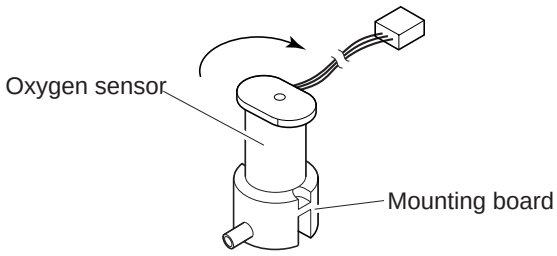
Procedures:
1) Detach the connector connected to each unit.
2) Remove 2-tapping screws that secure the PC board.
3) The amplifier is fixed to the main PC board by a single fixture (1).
4) For assembly after replacement, reverse the above procedure.

7.8 Oxygen sensor unit

Reason for replacement: This sensor unit is a consumable. Replacement should be performed every year.

Check: Measure the voltage at both ends of the sensor connector. Voltage should be more than 10mV when sucking air. If not, replace it.

Procedures:
1) Detach the connector inserted into the amplifier PC board (CN8).
2) Turn the oxygen sensor counterclockwise to remove from the mounting board.
3) Wind a seal tape on the replacement oxygen sensor and screw in clockwise.

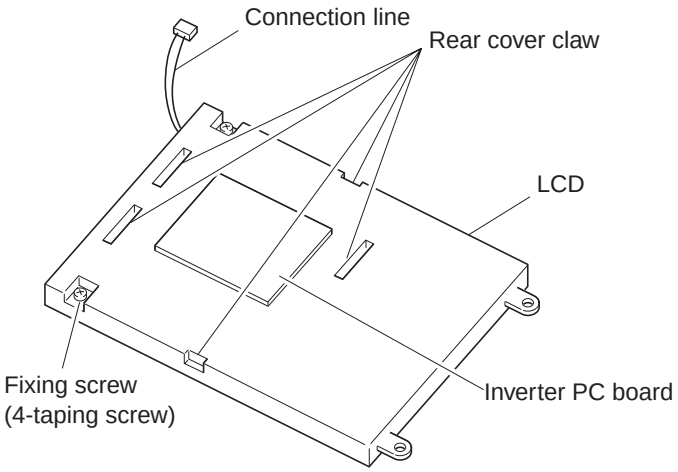


7.9 LCD fluorescent tube

Reason for replacement: The fluorescent tube is a consumable. Replacement should be per formed every 10,000 hours.

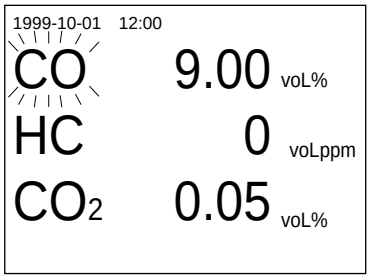
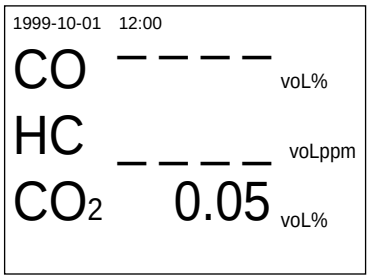
Procedures:

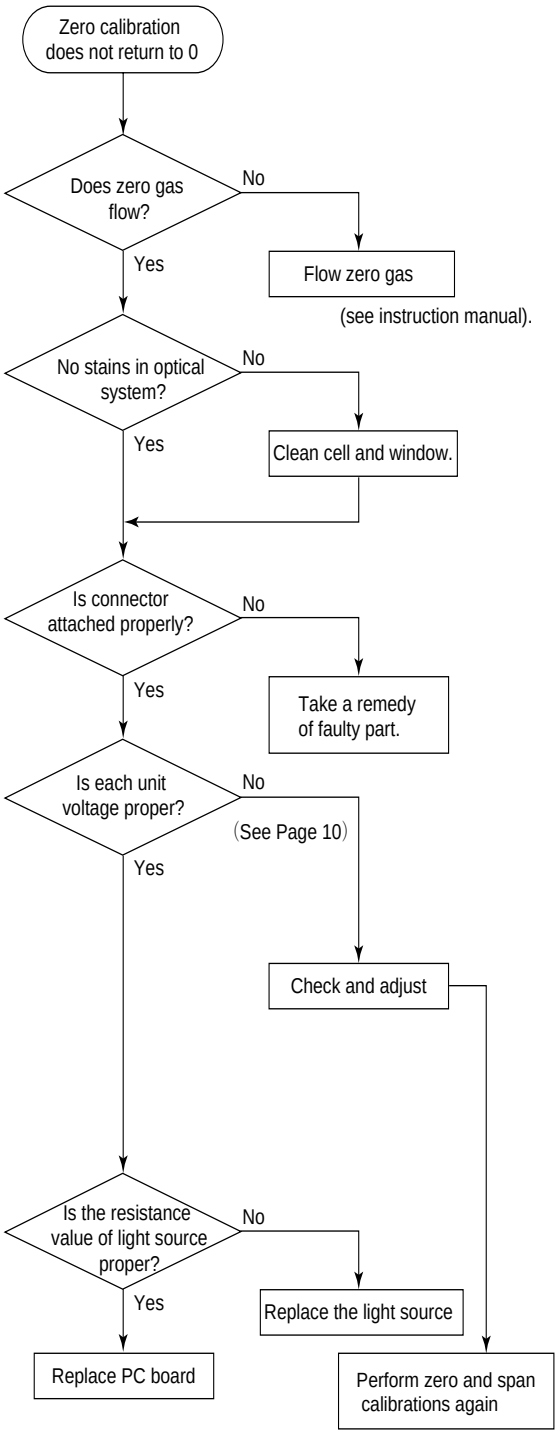
1) Remove F.P.C cable from the main PC board (CN4).
2) Remove 4-tapping screws which secure the front panel.
3) The rear cover of the LCD panel is secured by claws at 5 positions.
4) Remove the rear cover by using a driver.
5) Lift both ends of the connecting lines for replacement.
6) For assembly, reverse the replacement procedure.



8. TROUBLESHOOTING CHART

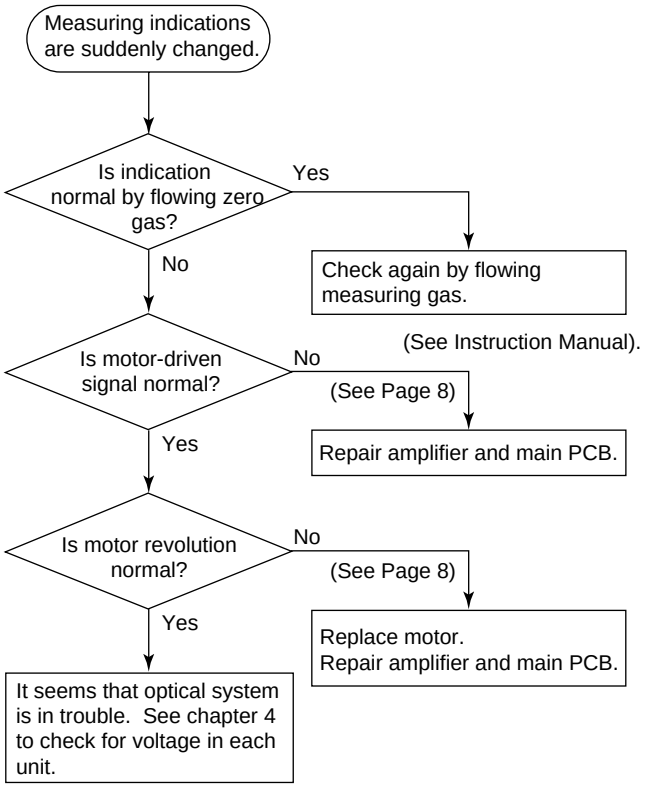
8.1 Improper zero calibration

Contents of errors
① After calibration, the “Component Display” lamp flickers. 
② Display is under bar or over bar 



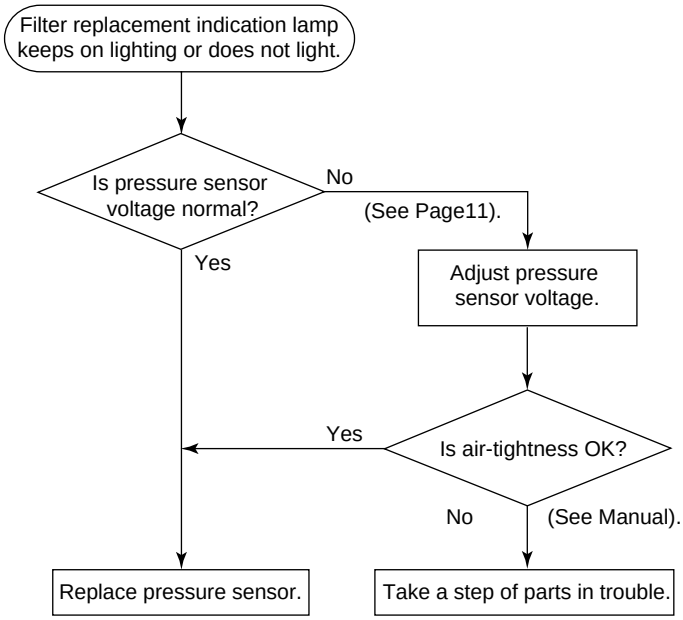
8.2 Fluctuations in indication value

Contents of trouble	
①	Concentration indication is suddenly scale-over.
②	Fluctuations are sharpened.



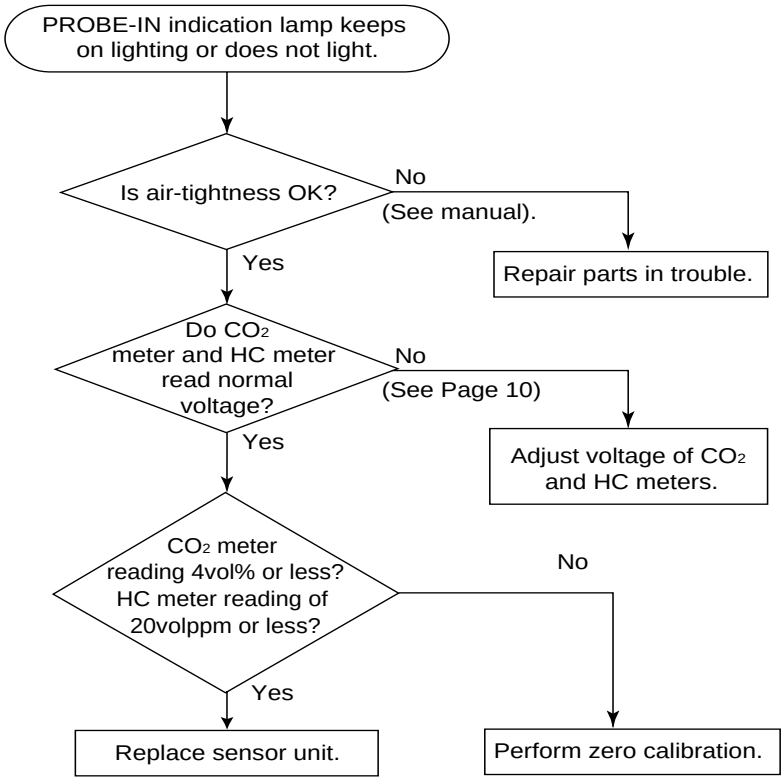
8.3 Filter replacement alarm in trouble (Ⓕ)

Contents of trouble	
①	Filter replacement indication lamp keeps lighting.
②	Filter replacement indication lamp does not light.



8.4 PROBE-IN alarm in trouble

Contents of trouble	
①	PROBE-IN indication lamp keeps on lighting.
②	PROBE-IN indication lamp does not light.



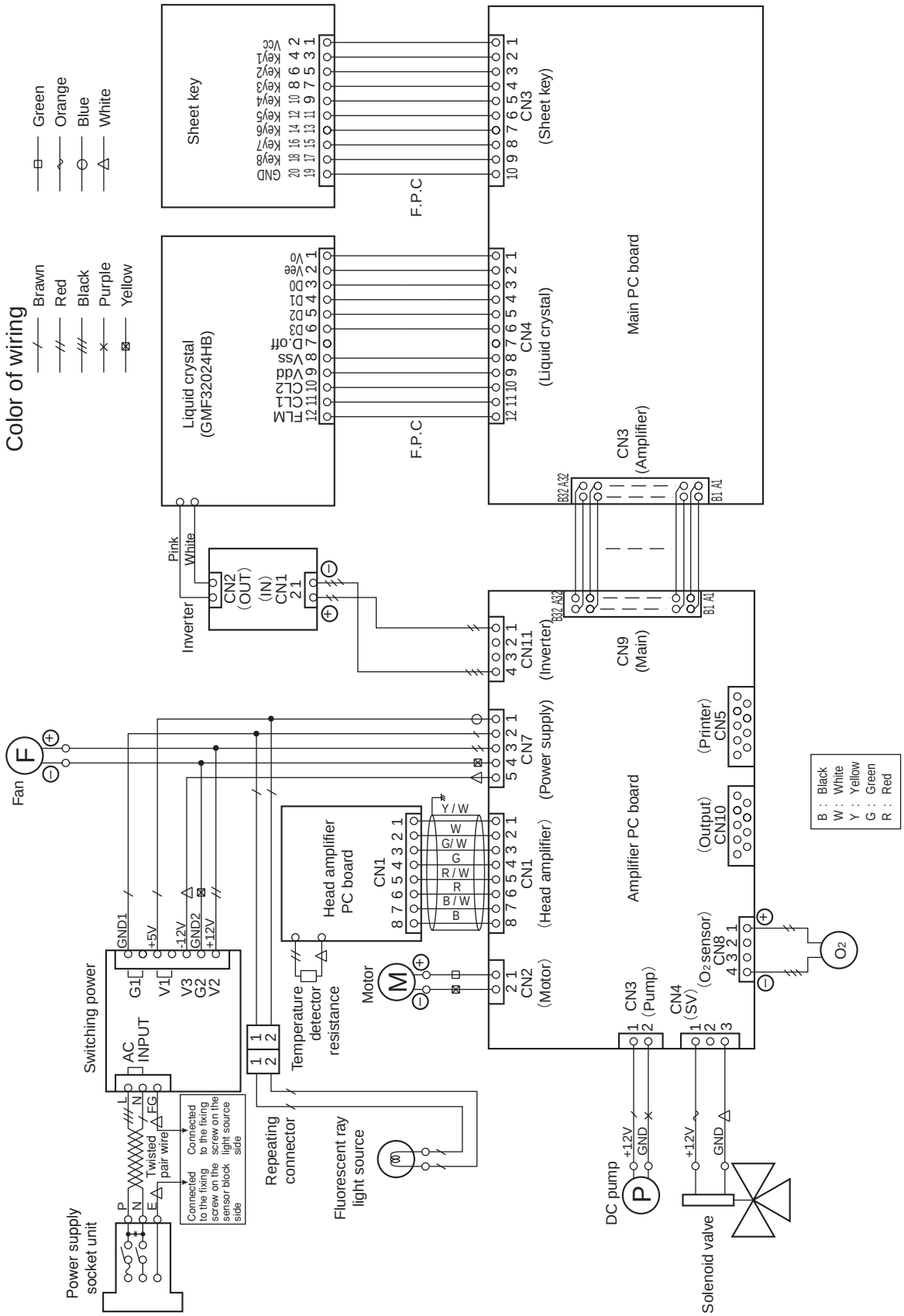
8.5 Other trouble

	Contents of touble	Reasons for replacement	Remedy	Remark
①	Fuse is burn-out by the power ON.	Wiring or PCB is shorted or other parts are in trouble.	Detach the PCB voltage supply connector (Amplifier CN7) and check faulty parts of the primary and secondary sides.	See Page 10.
②	Gas will leak even if calibration gas is supplied.	Poor air-tightness of sampling system.	Perform airtightness check of each part.	See Instruction Manual.

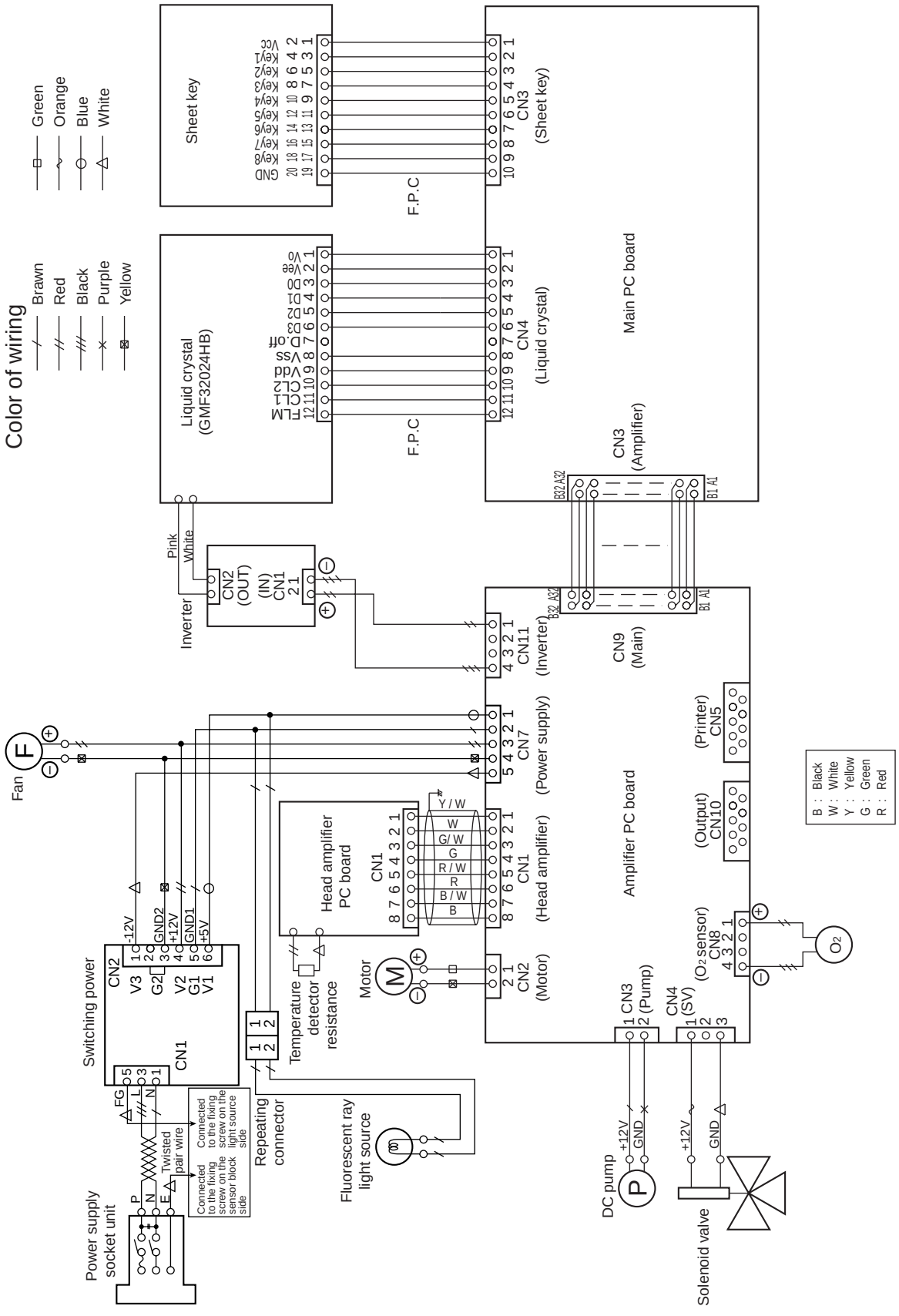
9. ATTACHED DRAWINGS

9.1 Wiring diagram

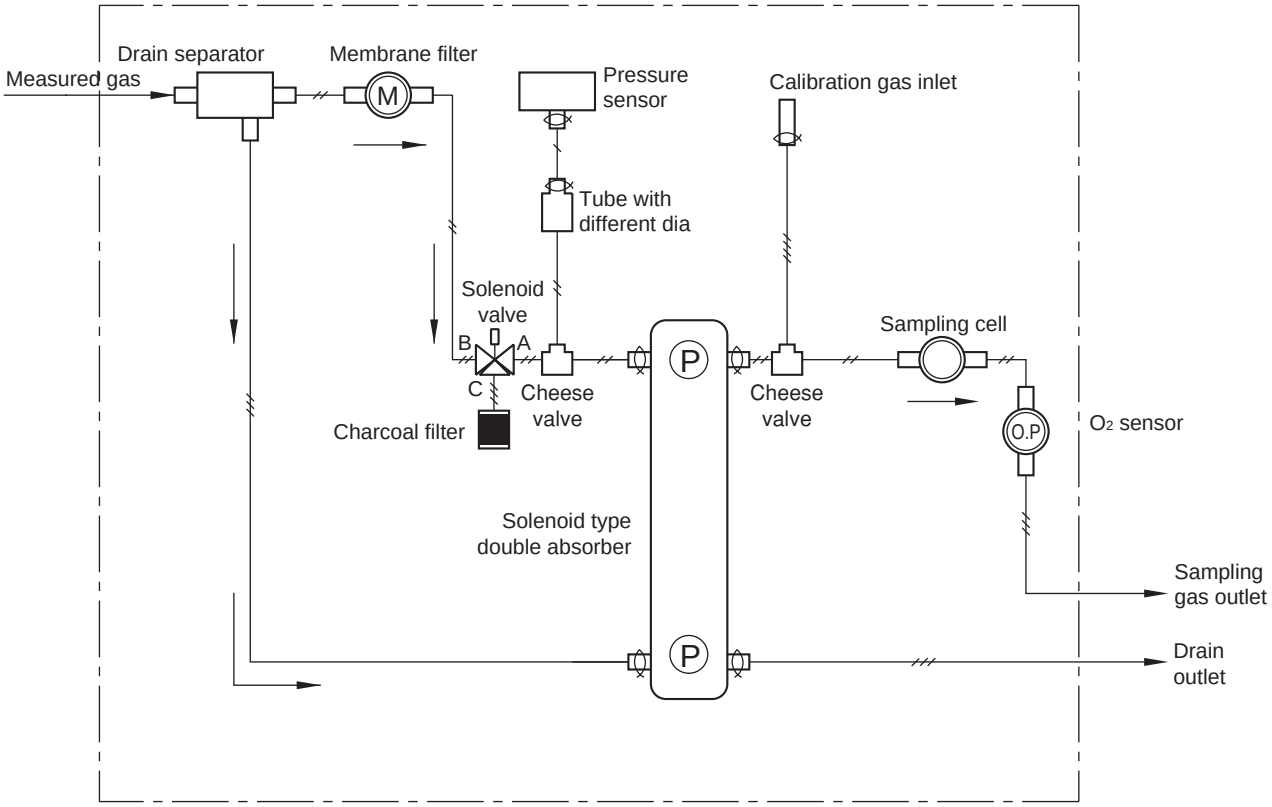
9.1.1 Wiring diagram (Manufacture before March, 2004)



9.1.2 Wiring diagram (Manufacture after April, 2004)



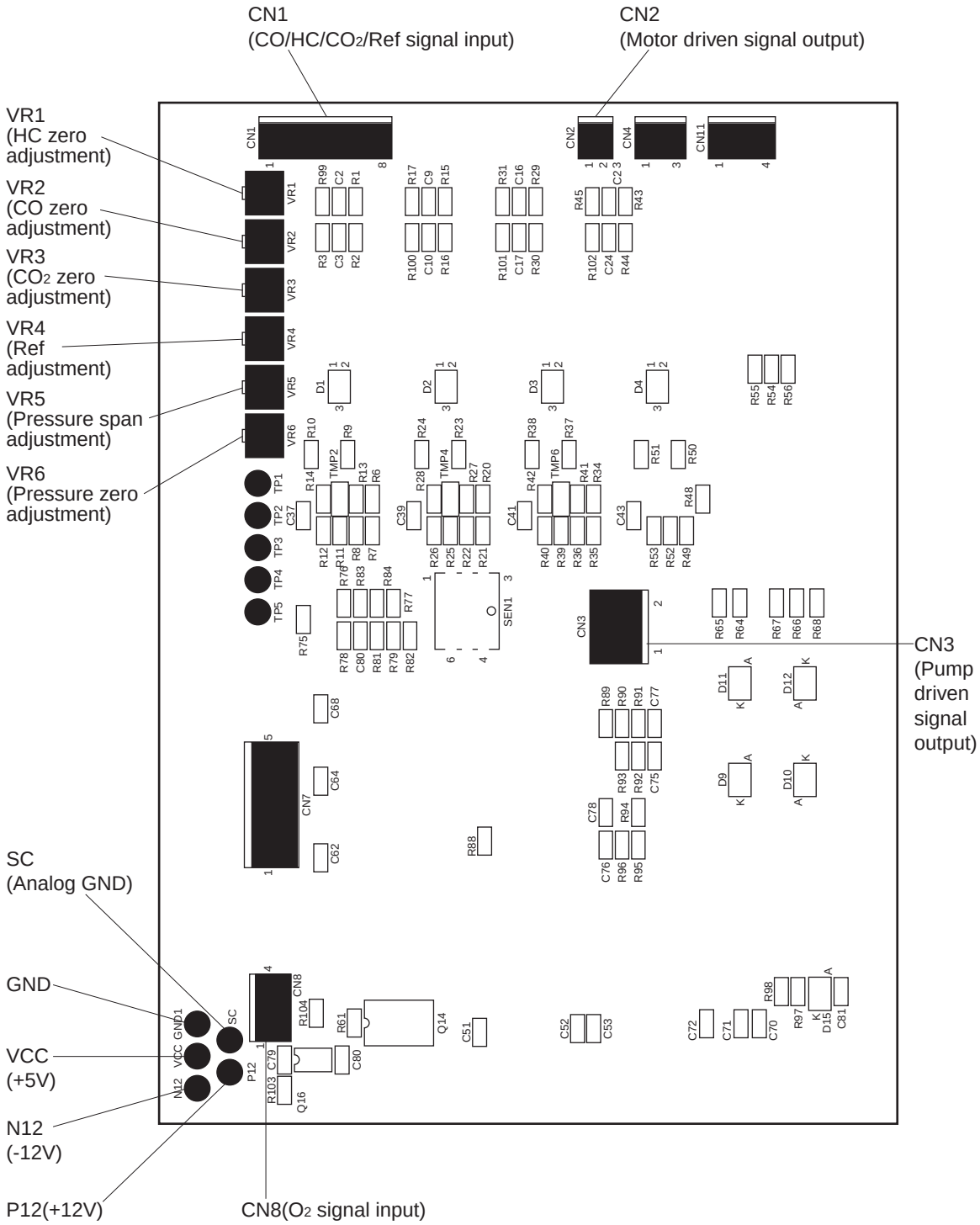
9.2 Piping diagram



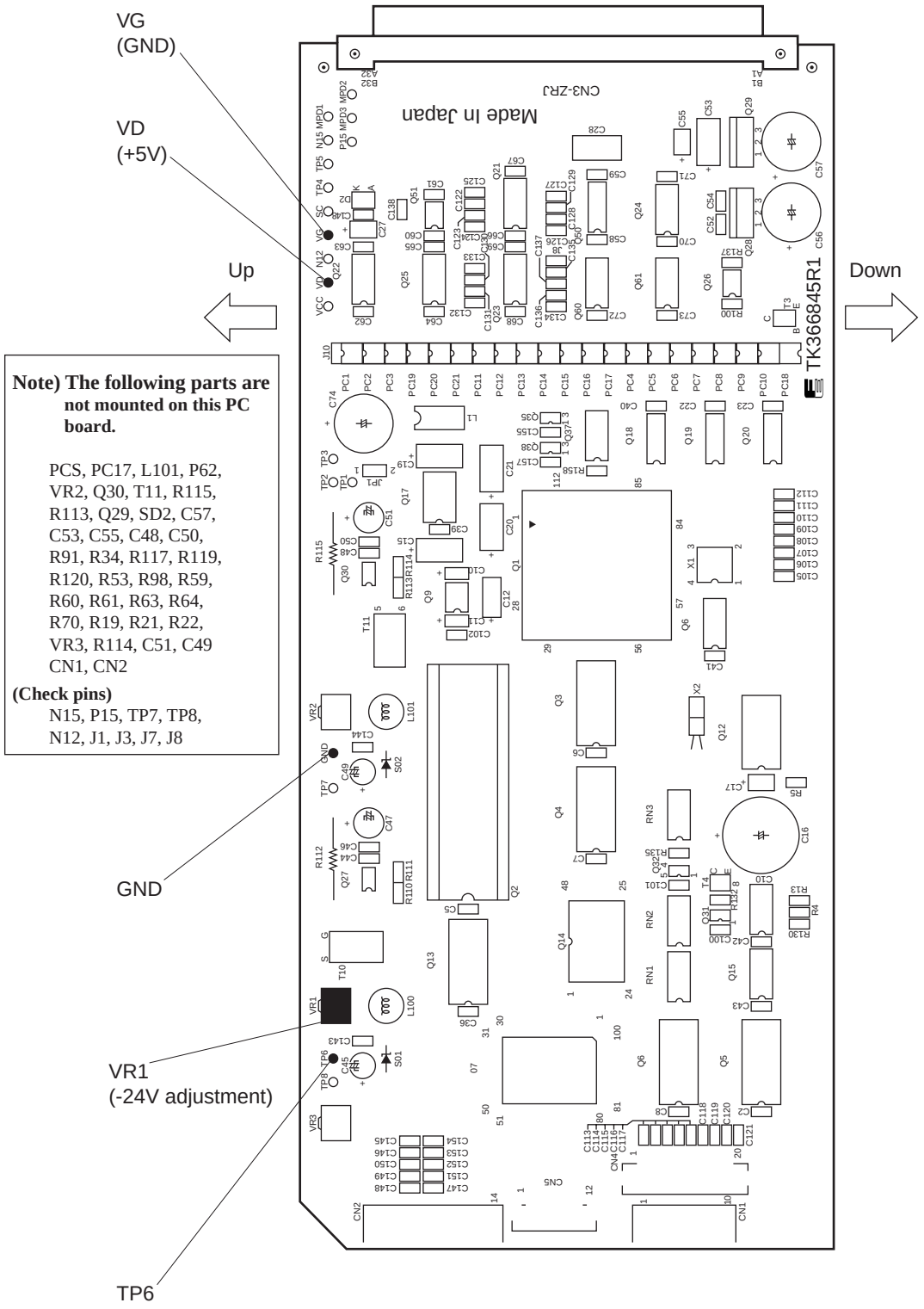
Applicable tube materials

Quality	Tube dia.	Symbol	Length of use
Soft transparent vinyl tube	ϕ 4.8／ϕ 2.8		150mm
Polyurethane tube	ϕ 9／ϕ 5.5		500mm
Toaron tube	ϕ 9／ϕ 5		500mm
Toaron tube	ϕ 7／ϕ 4		200mm
Hose band	ϕ 8		4
Hose band	ϕ 4.3		2
Hose band	ϕ 7		1

9.3 Layout of amplifier PC board check pins and controls



9.4 Layout of main PC board check pins and controls



Fuji Electric Co., Ltd.

International Sales Div
Sales Group

Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome,
Shinagawa-ku, Tokyo 141-0032, Japan
http://www.fujielectric.com
Phone: 81-3-5435-7280, 7281 Fax: 81-3-5435-7425
http://www.fujielectric.com/products/instruments/