Instruction Manual

NDIR TYPE INFRARED GAS ANALYZER

TYPE: ZRC6

Fuji Electric Systems Co., Ltd.

INZ-TN1ZRC6-E

PREFACE

We are grateful for your purchase of Fuji Electric's Infrared Gas Analyzer, TYPE: ZRC.

- First read this instruction manual carefully until an adequate understanding is acquired, and then proceed to installation, operation and maintenance of the analyzer. Wrong handling may cause an accident or injury.
- The specifications of this analyzer are subject to change without prior notice for further product improvement.
- Modification of this analyzer is strictly prohibited unless a written approval is obtained from the manufacturer. Fuji Electric will not bear any responsibility for a trouble caused by such a modification.
- This instruction manual shall be stored by the person who actually uses the analyzer.
- After reading the manual, be sure to store it at a place easier to access.
- This instruction manual should be delivered to the end user without fail.

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

Delivered Items

Name	Quantity	Remarks
Analyzer main frame	1	
Fuse	2	250V AC/2A
Cell window mounting tool	1	With mounting block cell
Instruction manual	1	

Request

- It is prohibited to transfer part or all of this manual without Fuji Electric's permission in written format.
- Description in this manual is subject to change without prior notice for further improvement.

Issued in May, 2003

CAUTION ON SAFETY

First of all, read this "Caution on safety" carefully, and then use the analyzer in the correct way.

- The cautionary descriptions listed here contain important information about safety, so they should always be observed. Those safety precautions are ranked in 3 levels, "DANGER", "CAUTION" and "PROHIBITION".

DANGER	Wrong handling may cause a dangerous situation, in which there is a risk of death or heavy injury.
CAUTION	Wrong handling may invite a dangerous situation, in which there is a possibility of medium-level trouble or slight injury or only physical damage is predictable.
PROHIBITION	Items which must not be done are noted.

Caution on installation and transport of gas analyzer	
DANGER	• This unit is not explosion-proof type. Do not use it in a place with explosive gases to prevent explosion, fire or other serious accidents.
CAUTION	• For installation, observe the rule on it given in the instruction manual and select a place where the weight of gas analyzer can be endured. Installation at an unsuited place may cause turnover or fall and there is a risk of injury. • For lifting the gas analyzer, be sure to wear protective gloves. Bare hands may invite an injury. • Before transport, fix the casing so that it will not open. Otherwise, the casing may be separated and fall to cause an injury. • The gas analyzer is heavy. It should be transported carefully if manually required. Otherwise, body may be damaged or injured. • During installation work, care should be taken to keep the unit free from cable chips or other foreign objects. Otherwise, it may cause fire, trouble or malfunction of the unit.

Caution on piping	
DANGER	**In piping, the following precautions should be observed. Wrong piping may cause gas leakage.** **If the leaking gas contains a toxic component, there is a risk of serious accident being induced.** **Also, if combustible gas is contained, there is a danger of explosion, fire or the like occurring.** • Connect pipes correctly referring to the instruction manual. • Exhaust should be led outdoors so that it will not remain in the locker and installation room. • Exhaust from the analyzer should be relieved in the atmospheric air in order that an unnecessary pressure will not be applied to the analyzer. Otherwise, any pipe in the analyzer may be disconnected to cause gas leakage. • For piping, use a pipe and a pressure reducing valve to which oil and grease are not adhering. If such a material is adhering, a fire or the like accident may be caused.

Caution on wiring	
CAUTION	• Wiring work must be performed with the main power set to OFF to prevent electric shocks. • Enforce construction of class-D grounding wire by all means. If the specified grounding construction is neglected, a shock hazard or fault may be caused. • Wires should be the proper one meeting the ratings of this instrument. If using a wire which cannot endure the ratings, a fire may occur. • Be sure to use a power supply of correct rating. Connection of power supply of incorrect rating may cause fire.

Caution on use	
DANGER	• For correct handling of calibration gas or other reference gases, carefully read their instruction manuals beforehand.
CAUTION	• Before leaving unused for a long time or restarting after left at such a status for an extended length of time, follow the directions of each instruction manual because they are different from normal starting or shutdown. Otherwise, the performance may be poor and accidents or injuries may be caused. • Do not operate the analyzer for a long time with its door left open. Otherwise, dust, foreign matter, etc. may stick on internal walls, thereby causing faults.

Caution on use	
PROHIBITION	• Do not allow metal, finger or others to touch the input/output terminals in the instrument. Otherwise, shock hazard or injury may occur. • Do not smoke nor use a flame near the gas analyzer. Otherwise, a fire may be caused. • Do not allow water to go into the gas analyzer. Otherwise, hazard shock or fire in the instrument may be caused.

Caution on maintenance and check	
DANGER	• When doors are open during maintenance or inspection, be sure to purge sufficiently the inside of the gas analyzer as well as the measuring gas line with nitrogen or air, in order to prevent poisoning, fire or explosion due to gas leak.
CAUTION	**Be sure to observe the following for safe operation avoiding the shock hazard and injury.** • Remove the watch and other metallic objects before work. • Do not touch the instrument wet-handed. • If the fuse is blown, eliminate the cause, and then replace it with the one of the same capacity and type as before. Otherwise, shock hazard or fault may be caused. • Do not use a replacement part other than specified by the instrument maker. Otherwise, adequate performance will not be provided. Besides, an accident or fault may be caused. • Replacement parts such as a maintenance part should be disposed of as incombustibles.

Others	
CAUTION	• If the cause of any fault cannot be determined despite reference to the instruction manual, be sure to contact your dealer or Fuji Electric's technician in charge of adjustment. If the instrument is disassembled carelessly, you may have a shock hazard or injury.

CONTENTS

1. OUTLINE

This infrared gas analyzer measures the concentration of gas by utilizing the characteristics of gas (molecule consisting of different-kind atoms) that it absorbs the infrared ray of specific wavelength.

The analyzer is capable of performing quick and highly accurate continuous measurement of sample gas by component. Since it maintains an outstanding level of safety, reliability, and maintainability, it is used in a wide range of fields including process measurement and monitoring of air pollutants.

<Features>

(1) Most suited for incorporation in equipment

The analyzer consisting of an analyzing block, signal processing circuit and power unit, all of which are accommodated in a compact case, can be readily incorporated in customer's sampling equipment.

(2) Wide dynamic range

A range ratio of max 1:20 can be secured in standard 2 ranges. Range selection follows the external selection input signals.

(3) Low interference

Interference-compensating detector substantially suppresses interference by the disturbing gases coexisting in the sample gas.

(4) High measurement accuracy and stability

A single light source/double beam system ensures highly accurate and stable measurement.

(5) Easy maintenance

Parts requiring maintenance such as the sample cell can be mounted/dismounted easily.

2. NAME AND DESCRIPTION OF EACH UNIT

2.1 Appearance

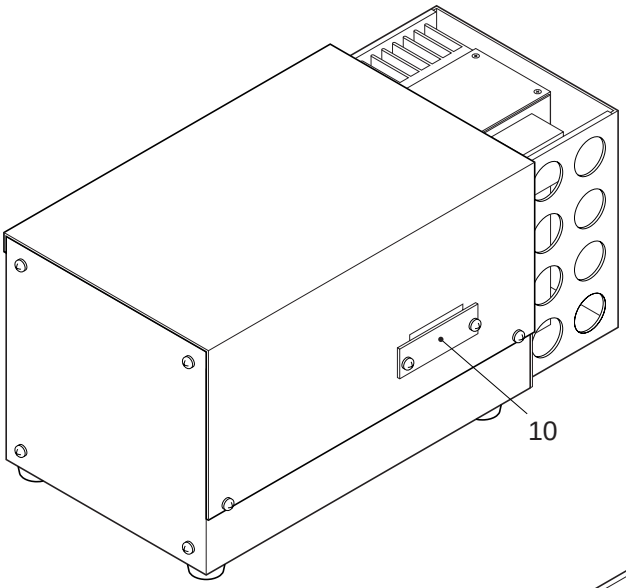


Fig. 2-1 Front view

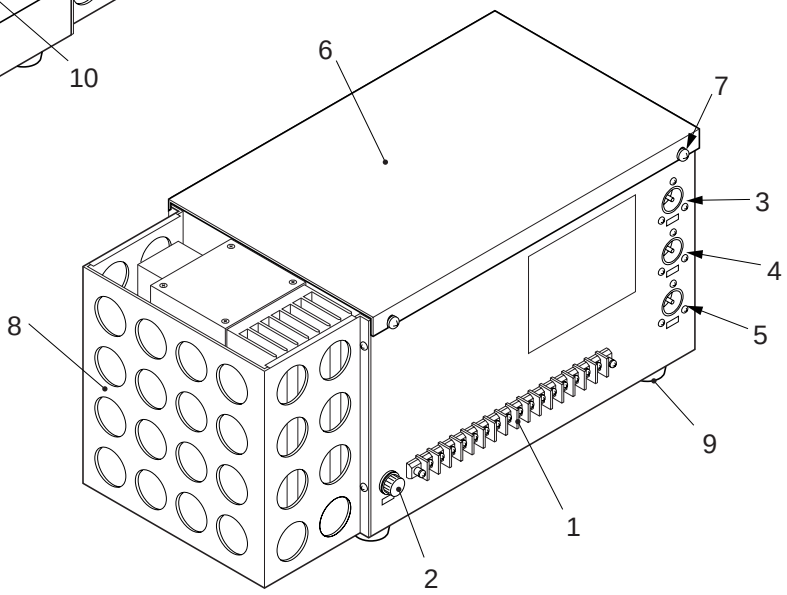


Fig. 2-2 Rear view

No.	Name	Description
1	External connection terminal block	Power supply terminal, output terminals and range switching terminals
2	Power fuse	Use 250V/2A AC time-lag fuse.
3	Sample gas inlet	Connect the sample gas line to the inlet.
4	Sample gas outlet	Connect the exhaust line to the outlet.
5	Purge gas inlet	Connect the purge gas line to the inlet.
6	Cover	
7	Cover mounting screw	Screws for fastening the cover (4×M3)
8	Light source cover	Infrared light source is housed inside the cover.
9	Rubber cushion	Cushion for desk-top-type analyzer
10	Zero and span calibration window cover	Remove the cover when performing zero and span calibration.

2.2 Internal structure, optical system

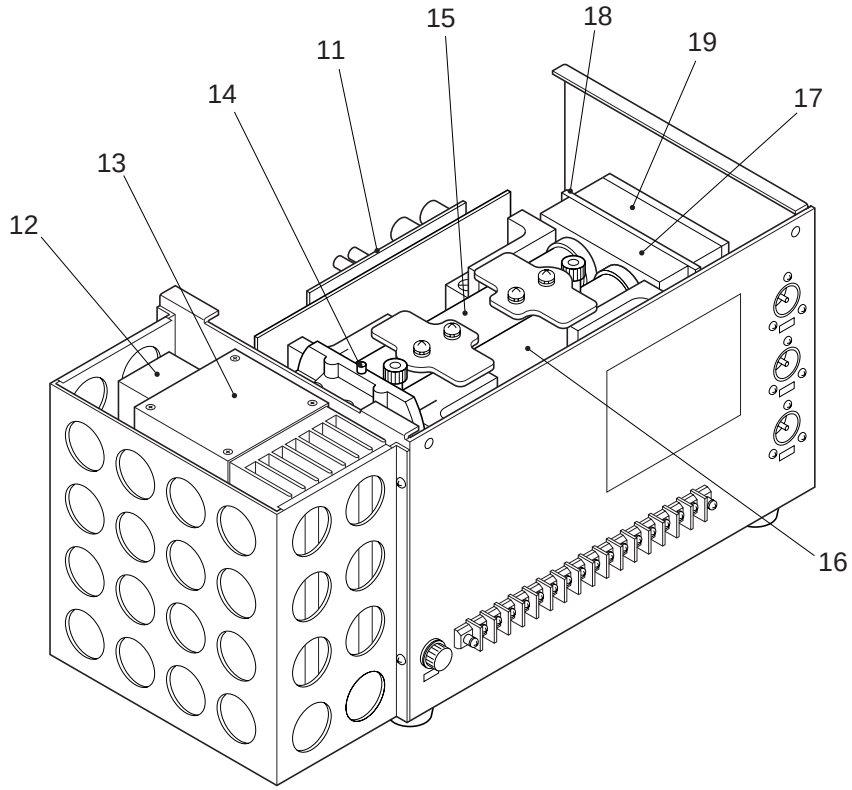


Fig. 2-3

No.	Name	Description
11	Amplifier printed board	Printed board for sensor signal processing
12	Motor	Rotates the sector at a fixed interval.
13	Infrared ray light source unit	Infrared lay light source
14	Optical zero adjustment knob	Adjusts the reference infrared ray and the infrared ray incoming to the sample.
15	Reference cell Note 1)	Reference gas is sealed in the cell.
16	Sample cell Note 1)	Sample gas is fed in the cell.
17	Measurement detector	Detects signals for the component to be measured.
18	Dimmer board Note 2)	Adjusts the infrared ray incoming to the interference-compensating detector.
19	Interference-compensating detector Note 2)	Detects signals for interfering component.

Note 1: The cell that is 32mm or shorter has a reference cell and a sample cell incorporated into one.
Note 2: If measurement disturbance (interference) by other gases can be ignored, in high concentration measurement range, for example, the interference-compensating detector may not be used.

3. INSTALLATION

⚠ DANGER

This unit is not explosion-proof type. Do not use it in a place with explosive gases to prevent explosion, fire or other serious accidents.

⚠ CAUTION

- Entrust the installation, movement or re-installation to a specialist or the supplier. A poor installation may cause accidental tipover, shock hazard, fire, injury, etc.
- The gas analyzer is heavy. It should be installed with utmost care. Otherwise, it may tip over or drop, for example, causing accident or injury.
- For lifting the gas analyzer, be sure to wear protective gloves. Bare hands may invite an injury.
- This unit should be installed in a place which conforms to the conditions noted in the instruction manual. Otherwise, it may cause electric shocks, fire or malfunction of the unit.
- During installation work, care should be taken to keep the unit free from entry of cable chips or other foreign objects. Otherwise, it may cause fire, trouble or malfunction of the unit.

3.1 Unpacking

(1) The analyzer undergoes stringent inspections at the factory to assure the function as a precision measurement device, and is packed with extreme caution in to avoid receiving a shock during transportation. Unpack carefully paying attention not to give a strong shock to the analyzer. When unpacking is completed, check the analyzer visually for flaws, cracks, or displacement of parts (refer to Figs. 2-1 and 2-2). The following accessories are attached to the analyzer. Check that no parts are missing.

(2) Standard accessories

Power fuse ..... × 2

Instruction manual ..... × 1

Cell assembling tool ..... × 1 (attached only when the length of the cell is 32mm or shorter)

3.2 Installation

(1) Installation site

- Select a place not subjected to direct sunlight or radiation from a high-temperature object.
- When mounting the analyzer outdoors, provide an appropriate case cover to protect the analyzer from being exposed to weather.
- Select a clean environment without corrosive or flammable gases.
- Avoid a place subjected to vibration.

(2) Installation procedure

- This is a desk-top-type analyzer.
  To fasten the analyzer, remove the rubber cushions and use the four M4 screws.

(3) Cautions on installation

- The cover may be removed to perform maintenance.
  Allow sufficient space around the analyzer to facilitate the maintenance work.

3.3 Wiring

⚠ CAUTION

- Wiring work must be performed with the main power set to OFF to prevent electric shocks.
- Enforce construction of class-D grounding wire by all means.
  If the specified grounding construction is neglected, a shock hazard or fault may be caused.
- Wires should be the proper one meeting the ratings of this instrument. If using a wire which cannot endure the ratings, a fire may occur.
- Be sure to use a power supply of correct rating. Connection of power supply of incorrect rating may cause fire.

Fig. 3-1 is an external wiring diagram. Remove the protective cover of the external connecting terminals, and perform external wiring.

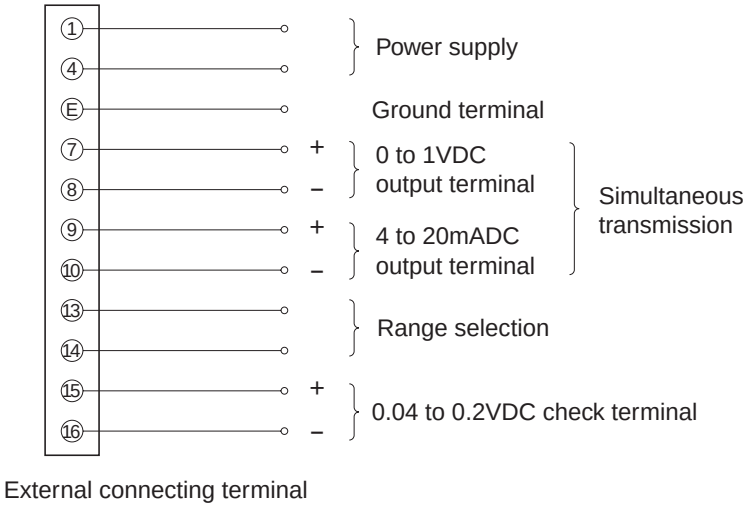


Fig. 3-1

Terminals ① to ④ are power terminals (Connect to the designated power supply).

Ⓔ is a ground terminal. Be sure to ground the analyzer. Be sure to perform class D grounding work.

⑦ and ⑧ are 0 to 1VDC output terminals.

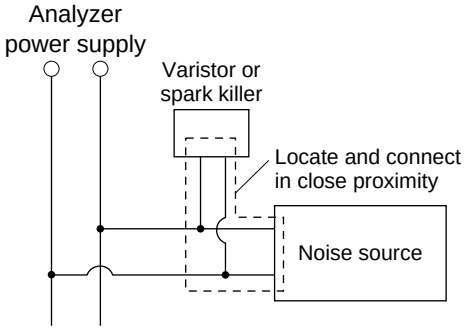
⑨ and ⑩ are 4 to 20mADC output terminals (simultaneous transmission).

⑬ and ⑭ are range selection terminals. Short-circuiting the both terminals switches to high range.

⑮ and ⑯ are 4 to 20mADC check terminals. It is satisfactory if 0.04VDC is obtained at zero point and 0.2VDC is obtained at full-scale point. Use a shielded wire for the signal line.

When noise source is in the vicinity

- Do not install the analyzer near power noise generating electric equipment (such as high frequency furnace and electric welder). If the analyzer must be used near such equipment, a separate power line should be used for avoiding noise.
- In case noise may enter from a relay, solenoid valve, etc. through power supply, connect a varistor or spark killer to the noise source as shown in the diagram. If the varistor or spark killer is located away from the noise source, no effect is obtainable. So, locate near the noise source.



3.4 Piping

Piping should be connected to the gas inlets and outlets of the rear panel of the analyzer.

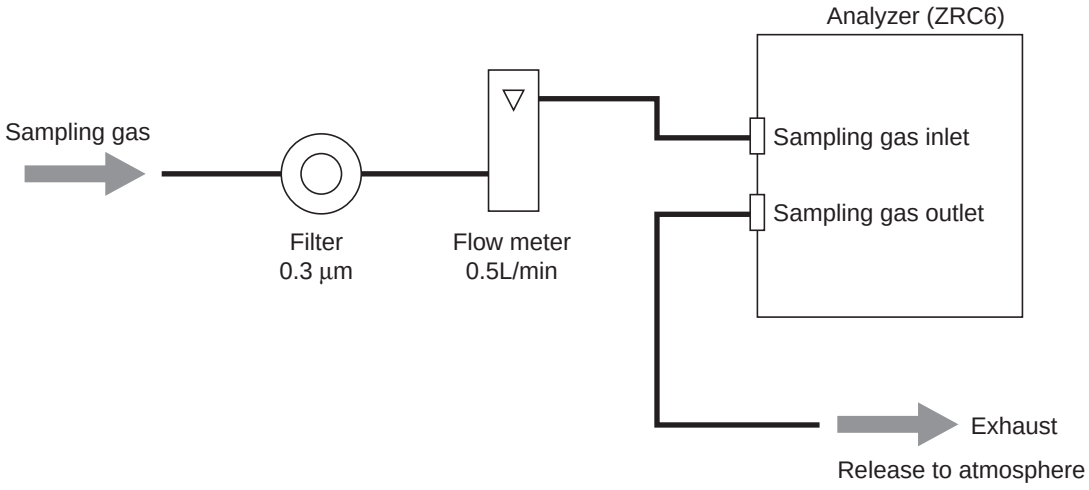
- Use a corrosion resistant tube of Teflon, stainless or polyethylene to connect the instrument to a sampling system. Even if there is a danger of corrosion, refrain from using a tube of rubber or soft vinyl. The instrument provides inaccurate indication due to gas absorption by piping materials.
- Pipe connection port is Rc1/4 female thread (or NPT1/4). Piping should be cut as short as possible for a quick response. About 4 mm inner diameter is recommended.
- Entry of dust into the instrument may result in defective operation. Use a clean piping or coupling.
- Provide a filter to keep the dust level to 0.3 μm or lower.

Sampling gas inlet: Attach the gas tube to introduce gas to be measured such as one that has completed dehumidification process and standard gases for zero and span calibration to this inlet.
Gas flow to be introduced should be constant within the range of 0.5 L/min ± 0.1 L/min.

Sampling gas outlet: Exhaust measured gas through the outlet. Attach the tube to exhaust measured gas outdoors or to the atmosphere.

Purge gas inlet: It is used for purging the inside of the total gas analyzer .
Use dry gas N_2 or instrumentation air for purge gas. Flow rate should be 1 L/min ± 0.5 L/min.
(Be sure to use dry N_2 for CO_2 gauge.)

Example of piping



3.5 Sampling

3.5.1 Conditions of sampling gas

① Dust contained in the sampling gas should be completely removed with a filter. For the final stage filter, use a filter that allows removing dust particles of 0.3μm.

② Dew point of sampling gas must be lower than the ambient temperature to avoid occurrence of drain in the gas analyzer. If vapor is contained in the sampling gas, dew point should be lowered to 0°C by using a dehumidifier.

③ If SO_3 mist is contained in the sampling gas, use a mist filter or cooler to remove SO_3 mist. Other mists should be removed by using a mist filter or cooler.

④ Corrosive gases such as Cl_2, F_2 and HCl, if they are contained in the sampling gas in considerable amounts, will shorten the life of instruments.

⑤ Temperature of sampling gas should be within 0 to 50°C. Provide a means that prevents entry of hot gas directly into the instrument.

3.5.2 Sampling gas flow

Flow of sampling gas should be 0.5L/min ± 0.1L/min.

Avoid flow fluctuation during measurement.

Observe the flow reading by a flowmeter provided as shown in the example of the sampling system configuration (Item 3.4).

3.5.3 Preparation of standard gas

Routine calibration is required by standard gas for keeping this instrument under normal operation condition (once a week). Prepare a standard gas cylinder for zero calibration and span calibration.

3.5.4 Purging of instrument inside

The inside of instrument need not be purged generally except for the following cases.

① A combustible gas component is contained in sample gas.

② Corrosive gas is contained in the atmospheric air at the installation site.

③ The same gas as the sample gas component is contained in the atmospheric air at the installation site.

④ CO_2 concentration is 100ppm or lower
In such cases as above, the inside of analyzer should be purged with the air for instrumentation or dry N_2.

Purging flow rate should be 1L/min ± 0.5 L/min.
If dust or mist is contained in purging gas, it should be eliminated completely in advance.

4. OPERATION

4.1 Preparation for operation

Check to be sure that the pipes at the gas-sampling section, exhaust section, etc. are connected correctly. Check that the wiring has been properly carried out. Use the instruction manual of the sampling device, if provided, to assure proper operation.

4.2 Warm-up and operation

① Feed the purge gas to purge the inside of the instrument at the rate of approximately 1L/min for about one hour. If purging is not performed, insert the attached cap to the purge inlet.

② The instrument is not provided with a power switch. Directly connect the rated power to the AC receptacle. After the power is turned on, the output scales out of the upper and the lower limit, which is normal.

③ Set the range selection input signal (Fig. 3-1) to low range (open the range selection terminal).

④ Checking the stability of output (zero point) of the analyzer

When approximately 4 hours elapses after the power is turned on (warm-up time), the temperature inside the instrument and the output become stable, which can be checked easily using the recorder as shown below. Feed the zero gas to the sample cell (0.5L/min.), and turn on the power. The output value is kept stable at approximately the same value before the power is turned off. Measurement can be taken even in the warm-up operation, but output deviation may result.

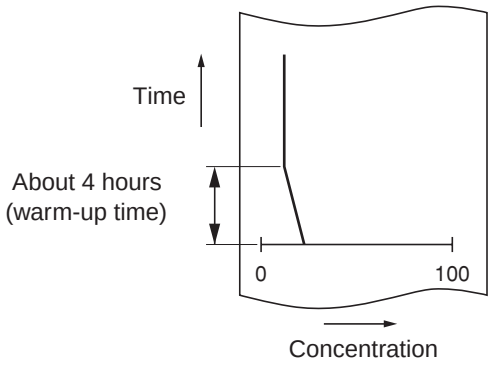


Fig. 4-1

4.3 Zero and span calibration

Perform zero and span calibration just after the operation is started (after the warm-up is completed) and periodically (approximately once/week).

(1) Low-range zero calibration

① Select low range.

② Remove the calibration window cover on the front face (see Fig. 2-1).

③ Connect a voltmeter or recorder between output terminals (7) and (8) (Fig. 3-1) (output: 0 to 1VDC).

④ Feed zero gas (dry N_2) to the sample gas inlet (at the flow rate of about 0.5L/min).

⑤ After the output stabilizes, adjust the VR7 knob (zero fine adjustment volume) on the printed board of the amplifier section (see attached drawing 1: Parts layout on the printed board). If adjustment cannot be made with the VR7 knob, set the VR7 knob to the center, and use VR6 (zero coarse adjustment volume) to make an adjustment.

(2) Low-range span calibration

① After performing zero calibration, switch the gas to low-range standard span gas (flow rate: 0.5L/min).

② After the output is stabilized, adjust the VR4 knob (low-range span adjustment volume) on the printed board of the amplifier section so that the concentration is kept at approximately the same as the standard span gas concentration.

(3) Checking high-range zero point

① Select high range.

② Switch the gas to zero gas again.

③ After the output is stabilized, check zero point. If the output value is kept within (0.8% of high-range full-scale value, adjustment is not required. If the value exceeds (0.8% of the high-range full-scale value, make an adjustment following the description of Item 5.6.

(4) High-range span calibration

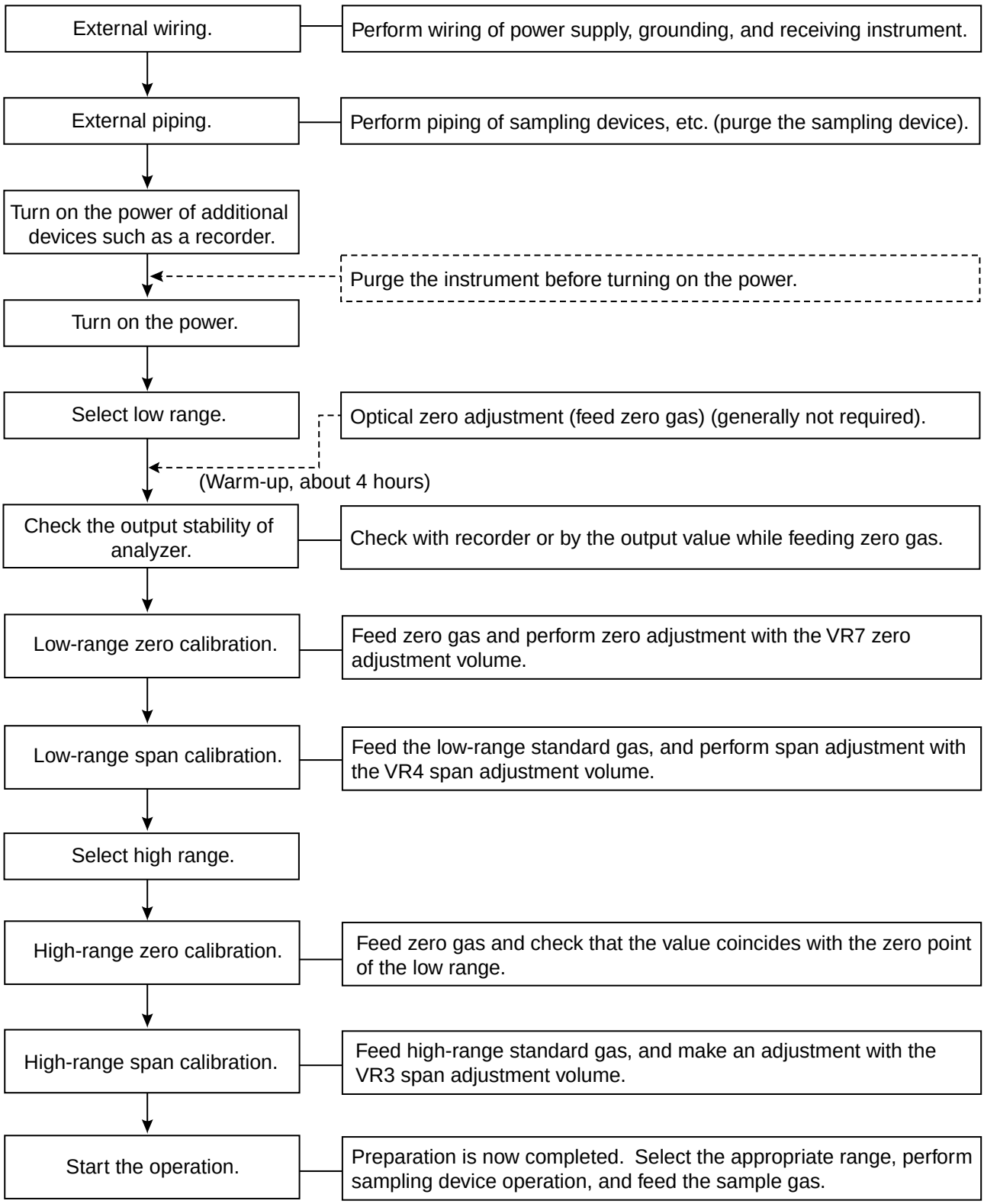
① Switch the gas to high-range standard span gas.

② After the output is stabilized, adjust the VR3 knob on the printed board of the amplifier section (high-range span adjustment volume) so that the output value is kept approximately the same as the standard span gas concentration.

Zero and span calibration is now completed.

4.4 Flow of operation

Prepare for the operation of sampling device as follows.



5. MAINTENANCE

5.1 Daily check

(1) Zero calibration and span calibration

① Perform zero calibration. For the calibration procedures, refer to “Item 4.3 Zero and span calibration”.

② Then, perform span calibration. For the calibration procedures, refer to “Item 4.3 Zero and span calibration”.

③ Zero calibration and span calibration should be carried out once a week, as required.

(2) Flow rate check

① Sampling gas flow and purge gas flow are as follows:

- Sampling gas flow: 0.5L/min±0.1L/min
- Purge gas flow: About 1L/min

② Check and maintenance should be carried out every day, as required.

5.2 Daily check and maintenance procedures

Table 7.1 Maintenance and check table

	Parts to be checked	Phenomena	Causes	Remedy
Daily check	Output value	Output fluctuation	① Dust is mixed in sampling cell.	① Clean the sampling cell. In addition, check sampling devices, especially gas filter.
			② Air is absorbed midway in the sampling pipe.	② Find out cause of leak and repair.
	Sample gas flow rate and purge gas flow rate if the instrument is purged	Standard flow is beyond the specified flow rate of 0.5L/min, 0.4 to 0.6L/min.	———	Adjust with the needle valve of the floater, etc.
Weekly check	Zero point of gas analyzer	It is deflected.	———	Adjust.
	Span point of gas analyzer	It is deflected.	———	Adjust.
Yearly check	Gas analyzer	Regardless of any phenomena	———	Overhaul.

5.3 Maintenance of analyzer unit

The analyzer is stringently adjusted before it is delivered from the factory. Be sure to handle it with due care. Contact our sales office or adjustment technician for adjustment, if needed.

5.3.1 Cleaning the sample cell

Clean the sample cell if the following phenomena are observed or the cause shown below is assumed.

(a) Phenomenon

- Zero point tends to move to the + side every time zero point adjustment is made.
- Zero point adjustment cannot be made even if the VR7 low-range zero point adjustment volume and the VR6 coarse adjustment volume are turned counterclockwise to the limit.

(b) Cause

- Foreign matter such as dust or water droplets may have entered the sample cell. Clean the sample cell.
- In addition, examine the sampling devices, filter, in particular.

(C-1) Disassembly, cleaning, and assembly (pipe cell)

① Turn off the power switch, stop the sample gas, and allow the zero gas to flow for several minutes to purge the cell interior.

② Remove the internal gas inlet tube.

③ Loosen both right and left screws for cell holding plate.

- Remove the sample cell only (see Fig. 5-1).

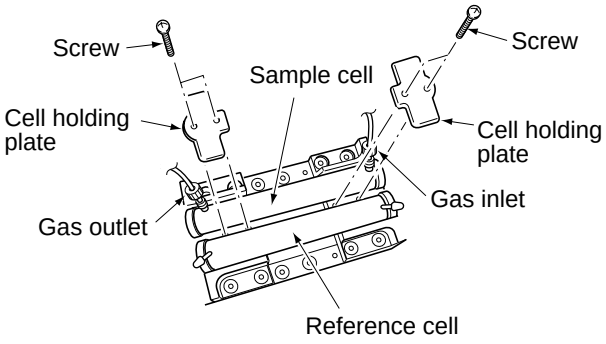


Fig. 5-1

④ Turn to the left the sample cell window and remove it from the sample cell (see Fig. 5-2).

⑤ For cleaning the window and cell inside surface, first eliminate coarse dust by soft brush or the like and then wipe them by soft rag.

The window is easy to get scratched. Pay utmost attention so as not to damage it.

⑥ After the end of sample cell cleaning, mount the cell in place and proceed to running. After cleaning sample cell, be sure to perform optical zero adjustment (see Item 5.4) and moisture interference compensation adjustment (see Item 5.4).

Cleaning is now completed.

Caution

A slightly corroded infrared transmission window or sample cell can be remedied by gently rubbing with chromium oxide powder on cleaning cloth but an excessively corroded one must be replaced.
When cleaning, do not exert an excessive stress.

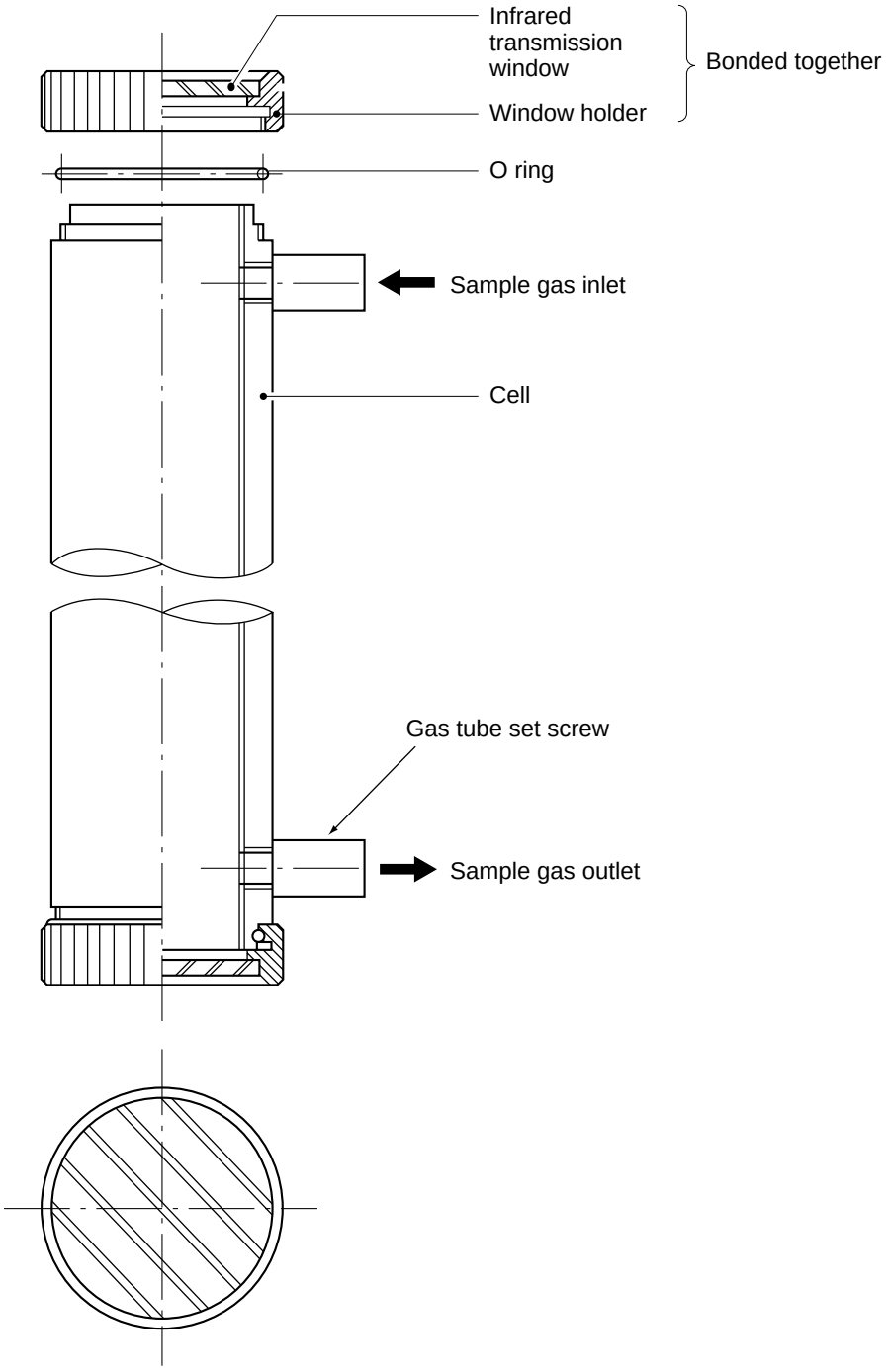


Fig. 5-2 Structure of sample cell (pipe cell)

(C-2) Cleaning method for sample cell (block cell)

① Turn off the power switch, stop the sample gas, and allow the zero gas to flow for several minutes to purge the cell interior.

② Remove the internal gas inlet tube.

③ Loosen the 2 detector set bolts.

Note) The distribution cell, block cell and detector are fastened by the same bolts.

④ Using the furnished cell mounting tool, turn the window fixture to the left and remove it from the cell. (See the structure of sample cell (block cell) in Figs. 5-3 and 5-4.)

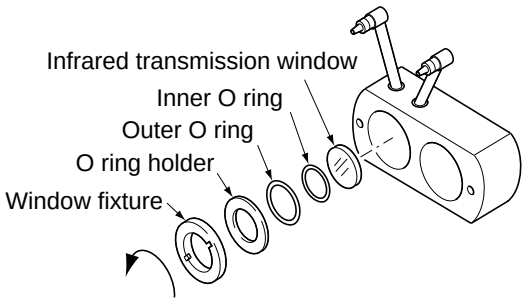


Fig. 5-3

⑤ For cleaning the infrared transmission window and cell inside surface, first eliminate coarse dust by soft brush or the like and then wipe them by soft rag.

The window is easy to get scratched. Pay utmost attention so as not to damage it.

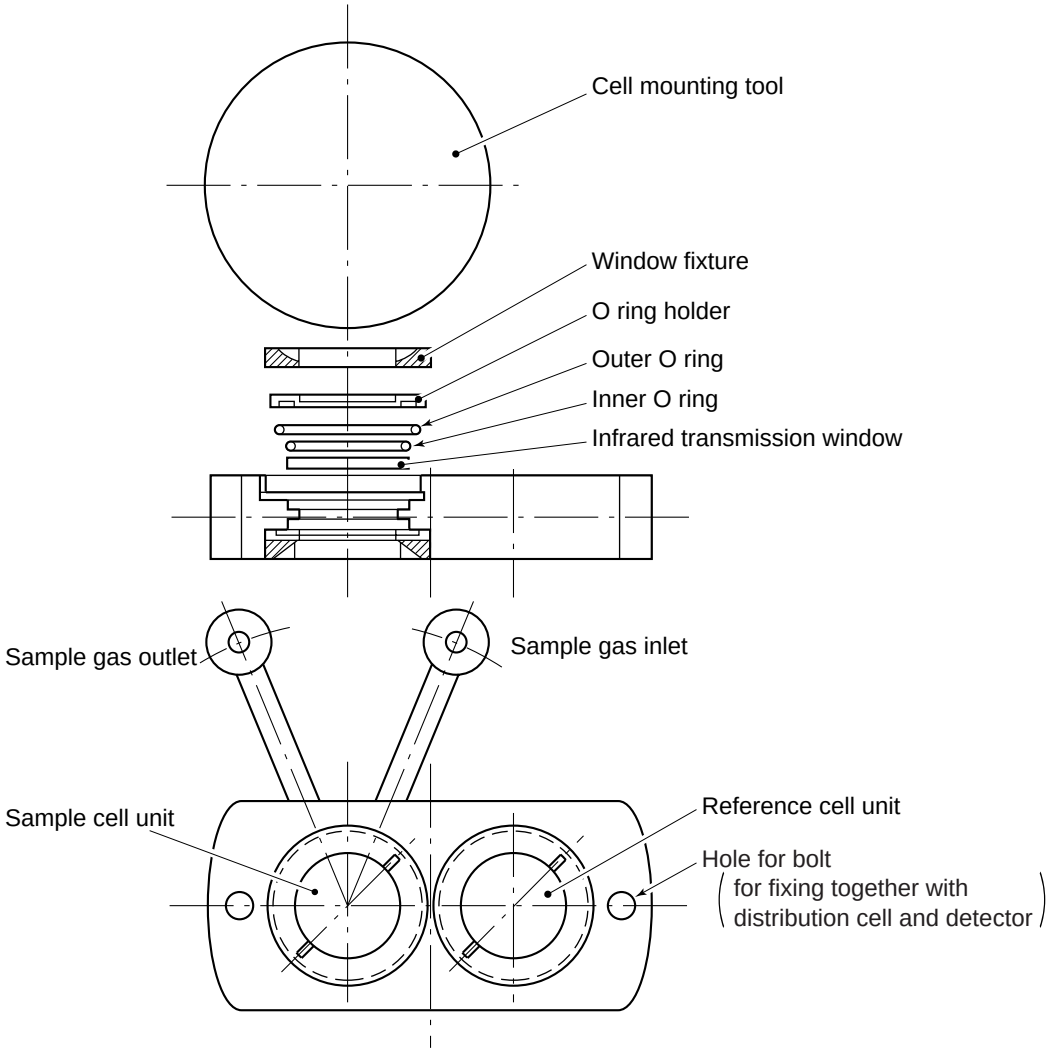
⑥ After the end of sample cell cleaning, mount the cell in place and proceed to running.

After cleaning sample cell, be sure to perform optical zero adjustment (see Item 5.4) and moisture interference compensation adjustment (see Item 5.5).

Cleaning is now completed.

Caution

A slightly corroded infrared transmission window or sample cell can be remedied by gently rubbing with chromium oxide powder on cleaning cloth but an excessively corroded one must be replaced.
When cleaning, do not exert an excessive stress.



Structure of sample cell (of 32, 16, 8, 4, 2 mm long)
(sample cell and reference cell are integrated)

Note) Use the dedicated cell mounting tool (furnished).

Fig. 5-4 Structure of sample cell (block cell)

5.4 Optical zero adjustment method (optical balance adjustment)

Caution

If the following operation is maladjusted, the measurement may adversely be affected. If you are not trained for adjustment, do not carry out this operation but contact the distributor or our serviceman.

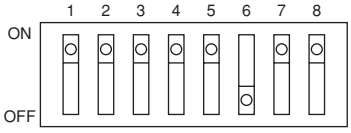
After the sample cell is cleaned and the optical section is reassembled, make optical zero adjustment. The adjustment procedure is shown below.

① Set VR7 (zero fine adjustment volume) and VR6 (zero coarse adjustment volume) to the center of the variable range.

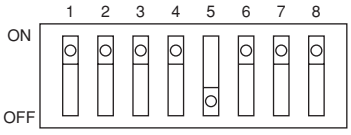
② After the warm-up is completed, feed zero gas.

③ Select low range.

④ Set the dip switch (DS1) No. 6 on the printed board of the amplifier section to OFF. Make an adjustment using the "optical zero adjustment knob (Fig. 2-3)" so that the output is kept within ± 5% of the full scale of the low range.



⑤ Then set the dip switch (DS1) No. 6 to ON and set No. 5 to OFF. Make an adjustment with the "dimmer board (Fig. 2-3)" so that the output is kept within ± 5% of the full scale of the low range. Loosen the bolts fastening the detector a little before making an adjustment. Output may fluctuate when the bolt is fastened.



⑥ Set the dip switch (DS1) No. 5 back to ON (keep No. 6 to ON).

⑦ Make an adjustment with VR6 (zero coarse adjustment volume) so that the output value becomes zero, and VR7 (zero fine adjustment volume) comes to the center of the variable range.

⑧ Stop feeding zero gas.

Optical zero adjustment is now completed.

5.5 Moisture interference compensation adjustment method

Caution

If the following operation is maladjusted, the measurement may adversely be affected. If you are not trained for adjustment, do not carry out this operation but contact the distributor or our serviceman.

Make the following adjustment if interference by moisture is large (if it exceeds ±2% of the full scale). Be sure to perform the adjustment after optical balance adjustment is made.

① Select low range after warm-up operation. Feed zero gas (dry N_2) at the flow rate of 0.5L/min.

② Make an adjustment with VR6 and VR7 so that the output value becomes zero.

③ Feed moisture interference gas (saturated H_2O at 0 or 2°C) as shown in Fig. 5-5. If the output value exceeds ±2% of the full scale, make an adjustment with VR2 on the printed board of the amplifier section (interference compensating detector gain) so that the output value becomes zero.

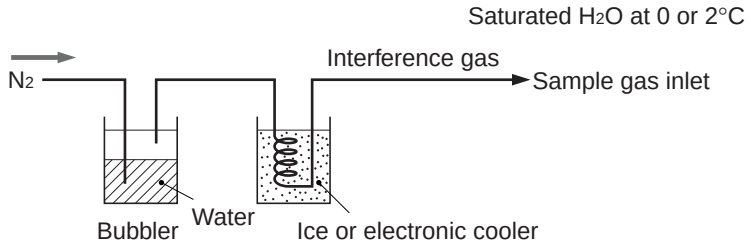


Fig. 5-5

④ Feed zero gas again and check that the output value is zero. If the deviation exceeds ±2% of the full scale, repeat the procedure from ① to ③.

The adjustment is now completed.

5.6 High-range zero point adjustment

High-range zero point adjustment is not required generally. If deviation between zero point in low range and that of high range exceeds 0.8% of the full scale, make an adjustment following the procedures shown below.

① Feed zero gas to set the output to zero (low range).

② Shield the sample cell with a piece of paper so that the output becomes approximately + 0.6V.

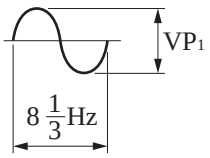
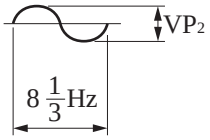
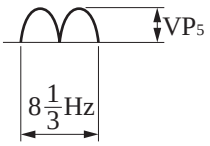
③ Make an adjustment with VR6 and VR7 in the shielded status so that the output value becomes zero.

④ Select high range, and make an adjustment with the VR5 high-range zero coarse adjustment volume so that the output value becomes zero.

⑤ Select low range, and remove the shielding piece of paper. Make an adjustment with VR6 and VR7 so that the output value becomes zero.

⑥ Select high range, and check that the deviation of output values is kept within ± 0.8%.

5.7 Inspection and maintenance of printed circuit board of the amplifier section

<table>
<tr><th colspan="2">Symptoms</th><th>Inspection</th><th>Remedy</th></tr>
<tr><td colspan="2">Power cannot be turned on.</td><td>i) Is specified voltage applied between external terminals ① and ④ (Fig. 3-1)?
ii) Is fuse blown?</td><td>Refer to section 3.3.
Replace defective parts, if any.</td></tr>
<tr><td rowspan="5">No output</td><td>Circuit power</td><td>Examine the voltage of each part of the printed board of the amplifier section
i) Between +15V and GND check terminals
The voltage is within +15V± 0.5V.
ii) –15V and GND check terminals
The voltage is within –15V± 0.5V.
iii) Between DV and DVG check terminals
+17.8V± 0.5V
iv) Between P20 and N20 check terminals
+19.8V± 0.5V</td><td>Defective power printed board for circuits (See attached drawing 1.)
Defective power printed board for light source (See attached drawing 1.)
Replace defective parts.</td></tr>
<tr><td>Sector</td><td>Remove the cover of the infrared ray light source unit and check that the sector is rotating.</td><td>If the chopper is not rotated, the motor is defective.</td></tr>
<tr><td>Infrared ray light source</td><td>Touch the light source and check that it is not cold.</td><td>If the light source is cold, the light source or the printed board is defective.</td></tr>
<tr><td>Detector</td><td>Examine the check terminals on the printed board with a synchroscope while feeding the standard gas. Check that the following sine waveforms are obtained and that the voltage is applied.
<table>
<tr><th>Check terminal</th><th>Waveform</th><th>Voltage</th></tr>
<tr><td>CP1-GND</td><td> 
</td><td>VP1 = 0.1 to 8V</td></tr>
<tr><td>CP2-GND</td><td> 
</td><td>VP2 ≒ 1/6VP2</td></tr>
<tr><td>CP5-GND</td><td> 
</td><td>VP5 = 1.5 to 6V</td></tr>
</table></td><td>If the waveforms shown at the left are not obtained, the detector or the printed board is defective.</td></tr>
</table>

6. SPECIFICATIONS

6.1 General specifications

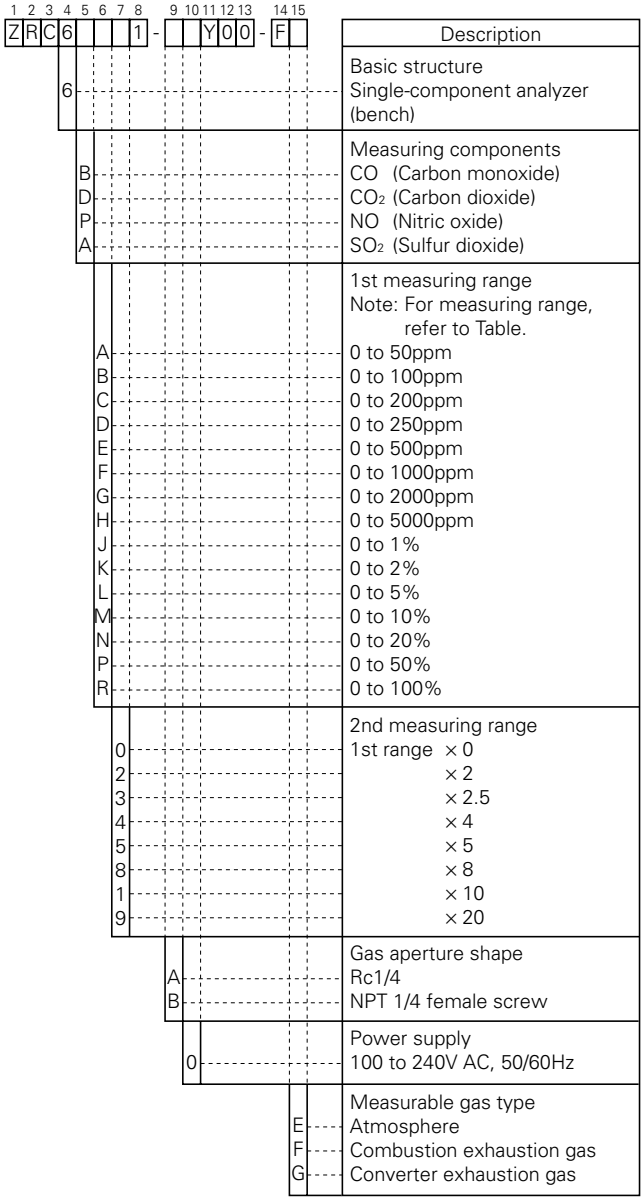
Power supply: 100V-240V AC, 50/60Hz
Power supply voltage variation in running time; within ±10%.
Power consumption: 130VA max
Ambient temperature: –5 to +45°C
Ambient humidity: 95% RH or less
Enclosure temperature: –20 to +60°C
Enclosure humidity: 95% RH or less
Casing: Zinc plated steel (Special chromate) (JIS: SECC-C equivalent) steel color
Indoor-use
Dimensions (H × W × D):
On Table-top 176 × 433 × 229 mm
Mass: Approx.9 kg
Warm-up time: About 4 hours (after power ON)
Materials of gas-contacting parts:
Sample cell; SUS304, chloroprene rubber
Infrared-ray transmitting window;
CaF_2 or sapphire
Internal tubing: fluoride ethylene resin
Gas inlet, outlet, purge gas inlet size:
Rc1/4, or NPT1/4 female screw
Purge gas flow rate:
1L/min±0.5L/min
Purging is required when combustible and corrosive gases are contained in the atmosphere or the range of CO_2 is less than 100ppm. In other cases, purging should be made as necessary.
Scope of delivery: Analyzer × 1, power fuse × 2, Instruction manual × 1
Mounting method: On table-top
Installation condition:
Install the analyzer at a place not exposed to direct sunlight or the radiation from a high temperature object. Avoid vibration, and select a clean place free from corrosive and/or combustible gasses. If installing outdoors, provide a suitable casing or cover to protect the analyzer from wind, rain, etc.
Standard requirements for measuring gases:
Temperature: 0 to 50°C
Moisture: Below a level where saturation occurs at 2°C (condensation unallowable).
Dust: 0.3μm or less (Recommended membrane filter; ZBBM6)
Pressure: 10kPa or less (Flow rate: 0.5L/min)(Gas outlet side should be open to the atmospheric air)
Standard control for sample gas:
Calibration gas: Dry gas
Interfere control gas: 2°C saturation
Measuring system:
Infrared-ray absorption method, non-dispersion, differential flow system, single light source, double-beam system.

Measurable components and measuring ranges:

Measurable components		Minimum measuring range	Maximum measuring range
CO	Carbon monoxide	0 to 100ppm	0 to 100vol %
CO_2	Carbon dioxide	0 to 50ppm	0 to 100vol %
NO	Nitric oxide	0 to 100ppm	0 to 2000ppm
SO_2	Sulfur dioxide	0 to 100ppm	0 to 10vol %

Measuring ranges: Shown on another table
Range selection: Short circuit between external terminal 13 and14 switches to high range side.
Output signal: 0 to 1V DC/4 to 20mA DC simultaneous output
Linearity: ±2% of full scale
0 to 1V DC/permissible load resistance; 100kΩ or more
4 to 20mA DC/permissible load resistance; 550Ω or less
Repeatability: ±0.5% of full scale
Zero drift: ±2% of full scale/week
Span drift: ±2% of full scale/week
Response time: Maximum within 20 seconds including gas replacement time of sample gas. (for 90% FS response) but differs from the length of sample cell.
Measured gas flow rate:
Standard 0.5L/min±0.1L/min

6.2 Code symbols



6.3 Measurable component and range – availability check table –

(1) Single component analyzer (NO, SO_2, CO_2, CO)

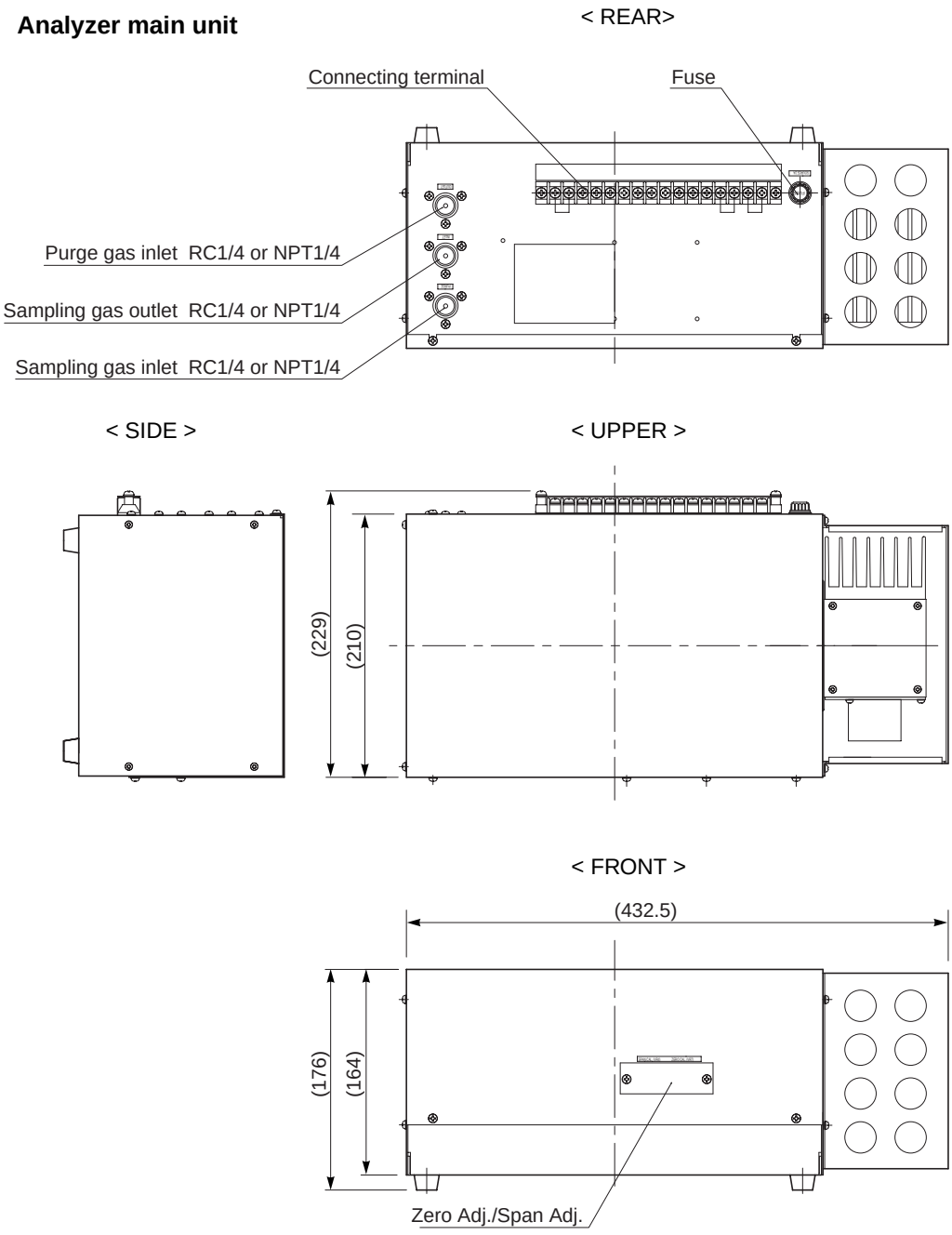
☆: NO analyzer measurable range　　□: SO_2 analyzer measurable range
◎: CO_2 analyzer measurable range　　○: CO analyzer measurable range

1st range \ 2nd range		B	C	D	E	F	G	H	J	K
		0 to 100ppm	0 to 200ppm	0 to 250ppm	0 to 500ppm	0 to 1000ppm	0 to 2000ppm	0 to 5000ppm	0 to 1%	0 to 2%
A	0 to 50ppm	◎	◎	◎	◎	◎	—	—	—	—
B	0 to 100ppm	—	☆□◎○	☆□◎○	☆□◎○	☆□◎○	☆□◎○	—	—	—
C	0 to 200ppm	—	—	☆□◎○	☆□◎○	☆□◎○	☆□◎○	—	—	—
D	0 to 250ppm	—	—	—	☆□◎○	☆□◎○	☆□◎○	□◎○	—	—
E	0 to 500ppm	—	—	—	—	☆□◎○	☆□◎○	□◎○	□◎○	—
F	0 to 1000ppm	—	—	—	—	—	☆□◎○	□◎○	□◎○	□◎○
G	0 to 2000ppm	—	—	—	—	—	—	□◎○	□◎○	□◎○
H	0 to 5000ppm	—	—	—	—	—	—	—	□◎○	□◎○
J	0 to 1%	—	—	—	—	—	—	—	—	□◎○
K	0 to 2%	—	—	—	—	—	—	—	—	—
L	0 to 5%	—	—	—	—	—	—	—	—	—
M	0 to 10%	—	—	—	—	—	—	—	—	—
N	0 to 20%	—	—	—	—	—	—	—	—	—
P	0 to 50%	—	—	—	—	—	—	—	—	—
R	0 to 100%	—	—	—	—	—	—	—	—	—

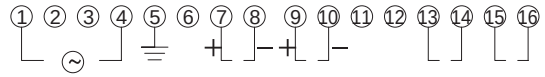
1st range \ 2nd range		L	M	N	P	R
		0 to 5%	0 to 10%	0 to 20%	0 to 50%	0 to 100%
A	0 to 50ppm	—	—	—	—	—
B	0 to 100ppm	—	—	—	—	—
C	0 to 200ppm	—	—	—	—	—
D	0 to 250ppm	—	—	—	—	—
E	0 to 500ppm	—	—	—	—	—
F	0 to 1000ppm	—	—	—	—	—
G	0 to 2000ppm	—	—	—	—	—
H	0 to 5000ppm	□◎○	□◎○	—	—	—
J	0 to 1%	□◎○	□◎○	◎○	—	—
K	0 to 2%	□◎○	□◎○	◎○	—	—
L	0 to 5%	—	□◎○	◎○	◎○	◎○
M	0 to 10%	—	—	◎○	◎○	◎○
N	0 to 20%	—	—	—	◎○	◎○
P	0 to 50%	—	—	—	—	◎○
R	0 to 100%	—	—	—	—	◎○

6.4 Output diagram (Unit:mm)

Analyzer main unit

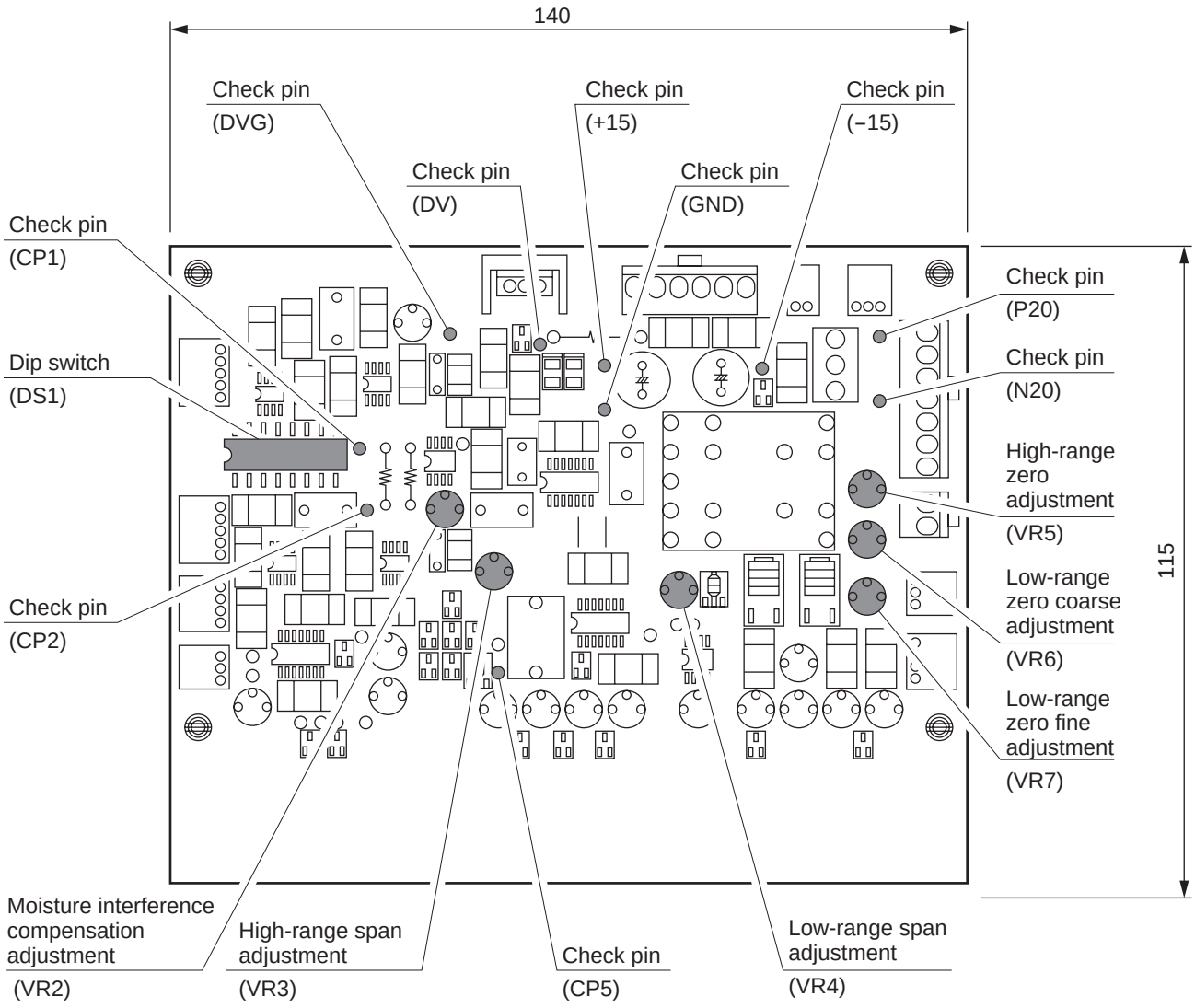


Connecting diagram

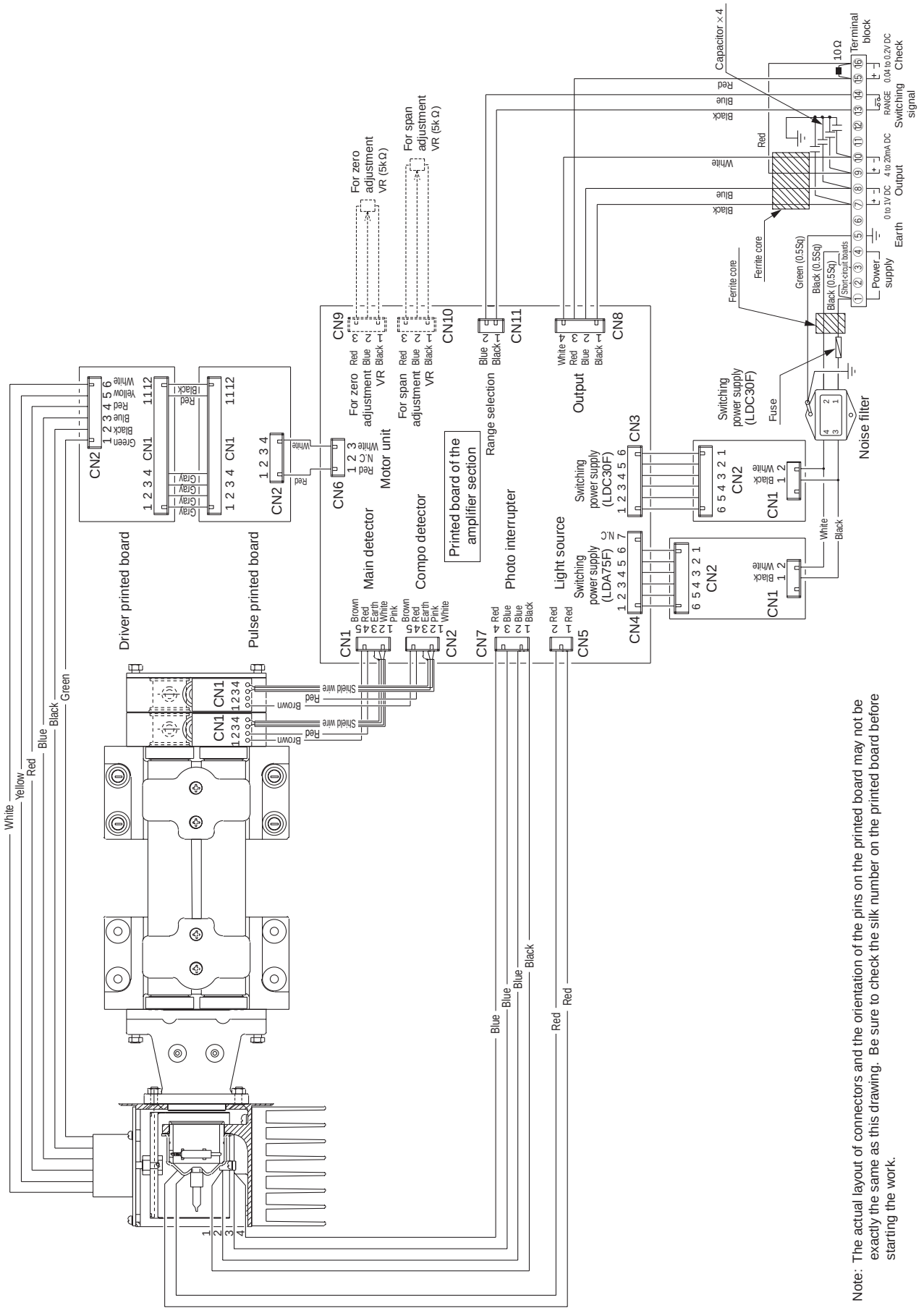


Power supply 100 to 240V AC | Output 1 (0 to 1V DC) | Output 2 (4 to 20mA DC) | Range | Check (0.04 to 0.2V DC)

Attached drawing 1 Parts layout on the printed circuit board of the amplifier section



Attached drawing 2 Connection diagram



Note: The actual layout of connectors and the orientation of the pins on the printed board may not be exactly the same as this drawing. Be sure to check the silk number on the printed board before starting the work.

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