Model ZRF

Nondispersive Infrared Gas Analyzer

Instruction Manual

California Analytical Instruments, Inc.
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CALIFORNIA ANALYTICAL
INSTRUMENTS, INC.

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CALIFORNIA ANALYTICAL
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Domestic
5/95

RECOMMENDED Spare Parts Price List

Model ZRF Infrared Gas Analyzer

Part Number	Description	Unit Price
943016	Pipe Cell Window Assembly (2/cell)	$ 90.00
943015	Pipe Cell Window O-Ring	2.00
943021	Block Cell Window (2/cell) (2 Pcs/Pkg)	50.00
943020	Block Cell O-Ring Set (2 set/cell, 1 inner & 1 outer per set)	6.00
943046	Fuse, 2A (5/Pkg)	6.00
781160	Filter Disk (5/Pkg) (Units with optional filter & flowmeter)	10.00
400017	Catalyst Preform (2/Pkg) (Models ZRF3 & ZRF4, Carbon Monoxide Analyzer with internal converter)	400.00
400010	Solenoid Valve (Models ZRF3 & ZRF4)	265.00
943043	*Stepping Motor Assembly	450.00

For units subject to severe vibration or shock, a spare infrared source is recommended

943005	Infrared Light Source (Designate measured components with order)	650.00

*The synchronous motor (MIS-4) is no longer available. The stepping motor retrofit kit (P/N 943042) is required to replace the synchronous motor. Kit price is $600 including power/driver assembly.

Overnight shipment from stock is available for most items.
Orders are subject to a $50 minimum.

PRICES & SPECIFICATIONS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

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FOLLOWING COMMERCIAL TRANSPORT OF THIS ANALYZER

THE FOLLOWING INSPECTIONS SHOULD BE PERFORMED BEFORE THE ANALYZER IS PLACED IN OPERATION

1. INSPECT THE INFRARED SOURCE
   i. ENSURE POWER DISCONNECTED. LOOSEN THE TWO ROLLET SCREWS NEAR THE ENDS OF THE FRONT PANEL.

   ii. SLIDE THE CHASSIS OUT TO PERMIT ACCESS TO THE IR SOURCE. THE SOURCE IS A SILVER BELL-SHAPED DEVICE (~ 40 mm or 1.5 inches in diameter) LOCATED ON THE LEFT SIDE OF THE CHOPPER ASSEMBLY. THE SOURCE MAY HAVE A SHORT (~ 1") PINCH TUBE WITH BLACK COVER PROTRUDING FROM THE REAR.

   iii. REMOVE THE TWO M-4 SCREWS SECURING THE IR SOURCE TO THE CHOPPER HOUSING. IT IS NOT NECESSARY TO REMOVE THE ELECTRICAL CONNECTIONS.

   iv. SLIDE THE IR SOURCE OUT OF THE CHOPPER HOUSING AND INSPECT FOR BROKEN/DETACHED SPRINGS, ETC. (THE SOURCE SHOULD APPEAR AS IN FIG. A OF THE ATTACHED DRAWING)

   v. REASSEMBLE IN REVERSE ORDER.

2. INSPECT THE TWO LARGE VERTICAL CIRCUIT CARDS TO ENSURE THEY ARE EACH SEATED IN THE PAIRS OF PLASTIC GUIDES ON THE BOTTOM OF THE CHASSIS. THE CARDS ARE EASILY RESEATED BY REMOVING THE TWO M3 SCREWS WHICH SECURE THE CARD BRACKET AT THE TOP ENDS OF THE CARD FRAME, LIFTING AND RESEATING THE CARD, AND REPLACING THE SCREWS.

3. CONFIRM GAS TUBING CONNECTIONS ARE SECURE.

******

****DO NOT OPERATE THE ANALYZER WITH A BROKEN INFRARED SOURCE**

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(714) 974-5560

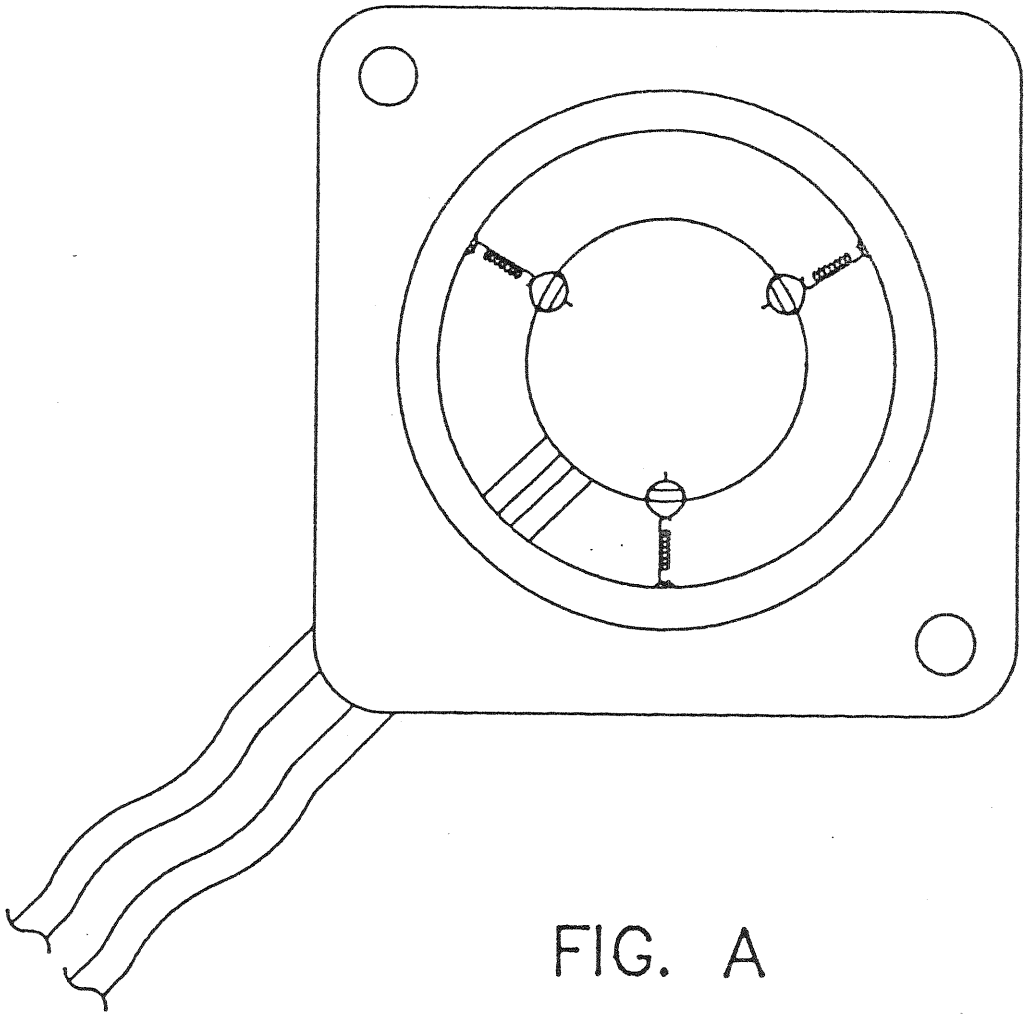


FIG. A

CONTENTS

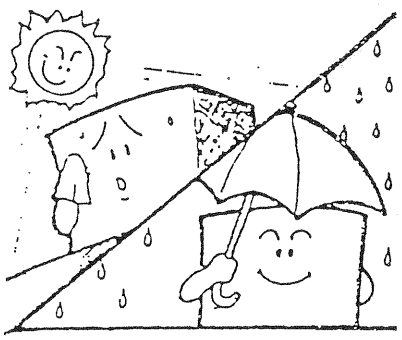
PRECAUTIONS ON USE

- Select a suitable installation site meeting the following conditions.

  Normal temperature and humidity and with a minimum of temperature variation.

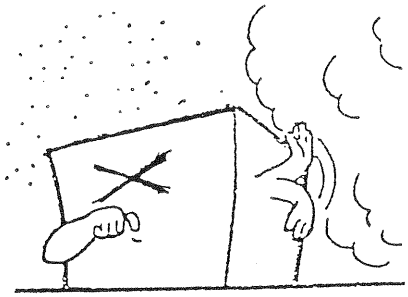
  Not exposed to intense heat radiation nor direct sunlight.

  The analyzer has an indoor structure, so if it will be installed outdoors, provide a suitable case covering to protect it from wind and rain.

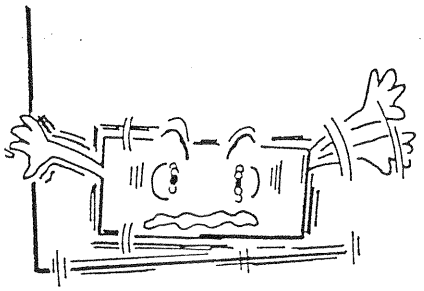


- Use in a proper environment.

  Use in a clean place with a minimum of corrosive or combustible gas.



- Avoid use at a place subject to vibrations.

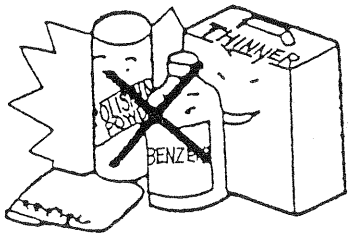


o Beware of electric shock.

Be sure to connect the grounding wire so as to avoid electric shocks.

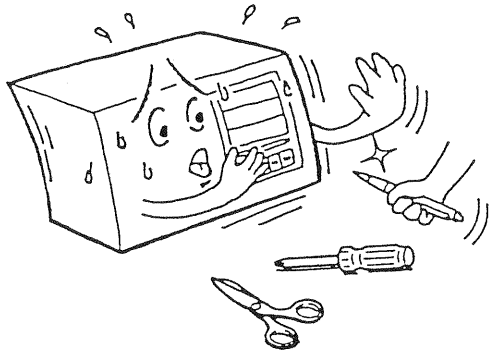
o When cleaning the analyzer

Do not use benzene, thinner or the like for cleaning since it may cause deformation or cracking.



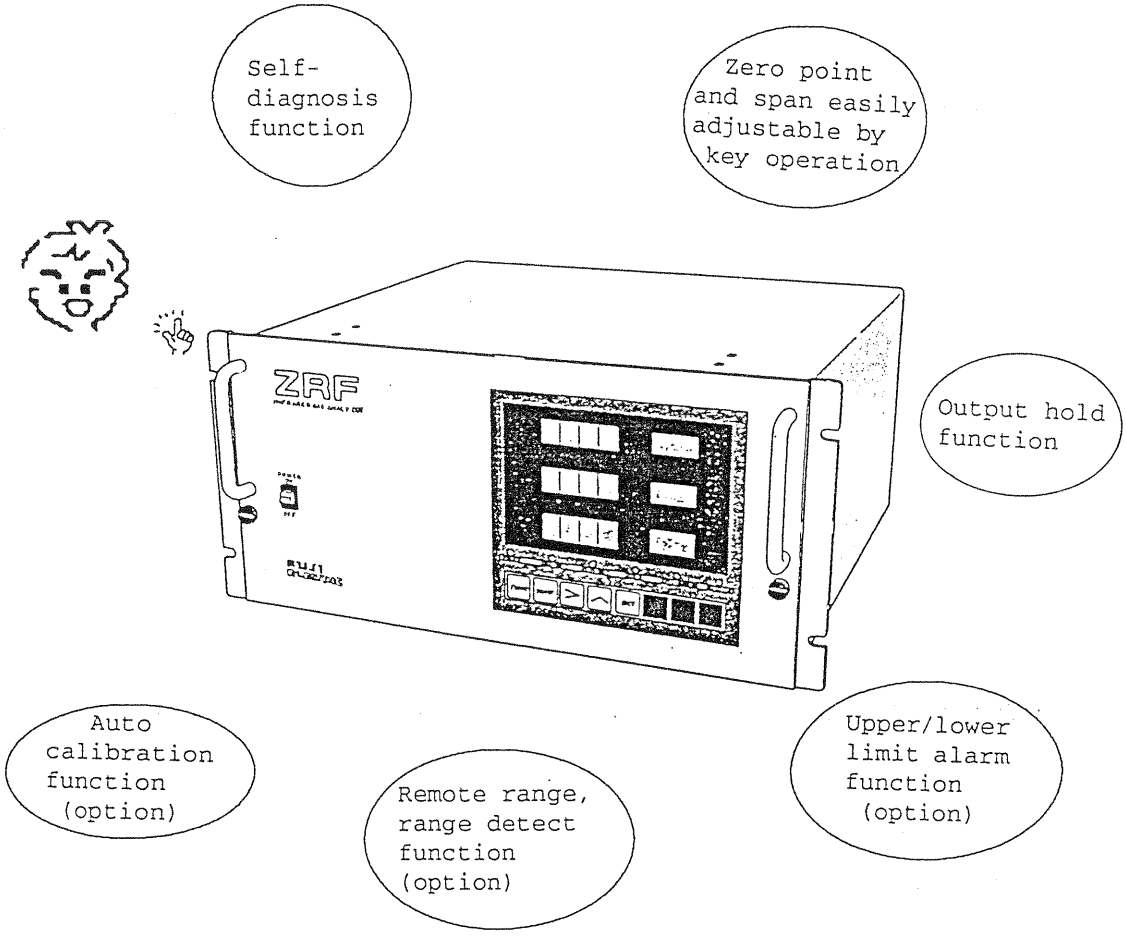
o Key operation

Avoid using a sharp pointed object for operating keys on the analyzer front.



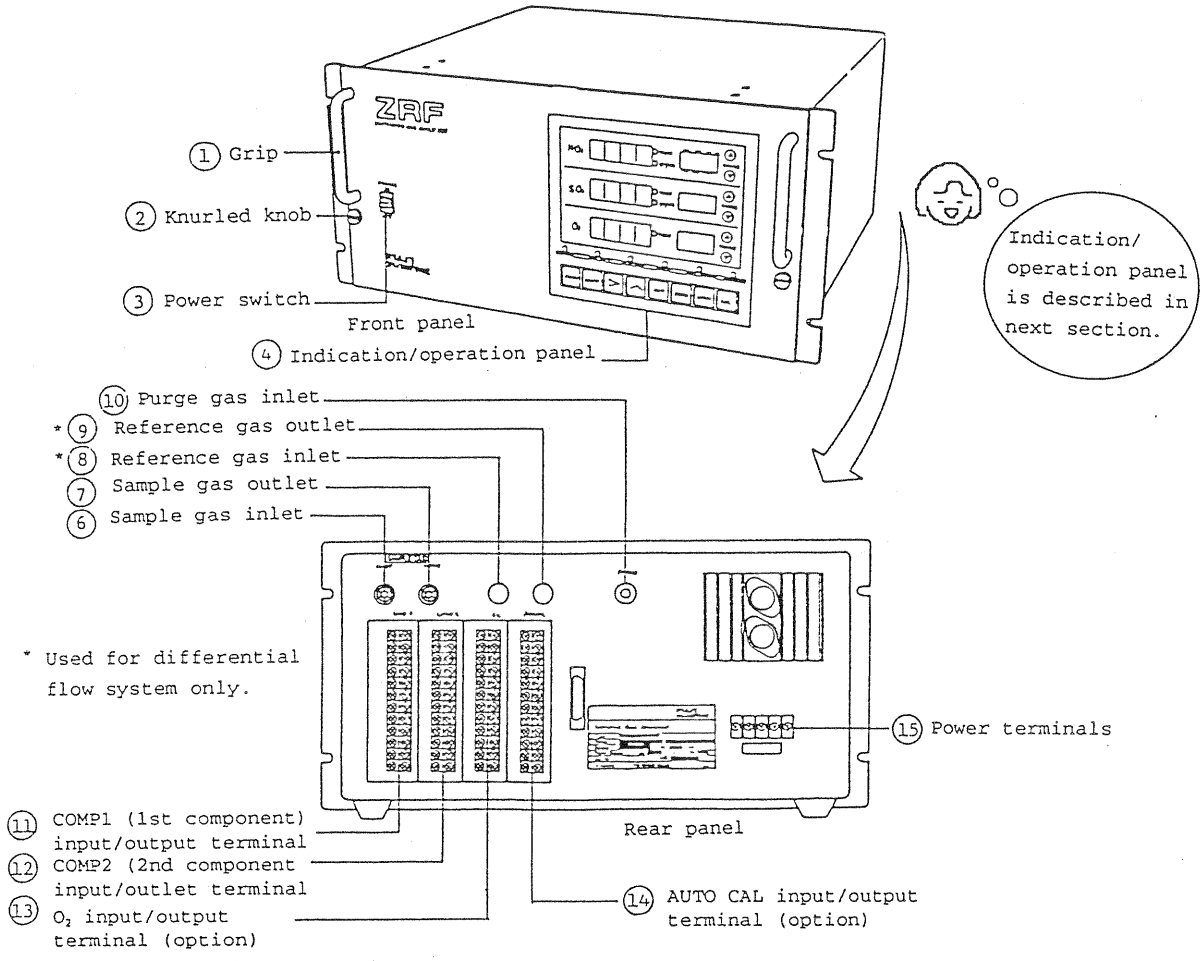
1. OUTLINE

This is a multi-function, easy-to-operate non-dispersion type infrared gas analyzer for measuring the concentration of gases such as NO, SO_2, CO_2 and CO. It utilizes a highly reputed mass flow type detector featuring high sensitivity and reliability, plus a microprocessor for easy operation.



2. NAME AND DESCRIPTION OF EACH COMPONENT

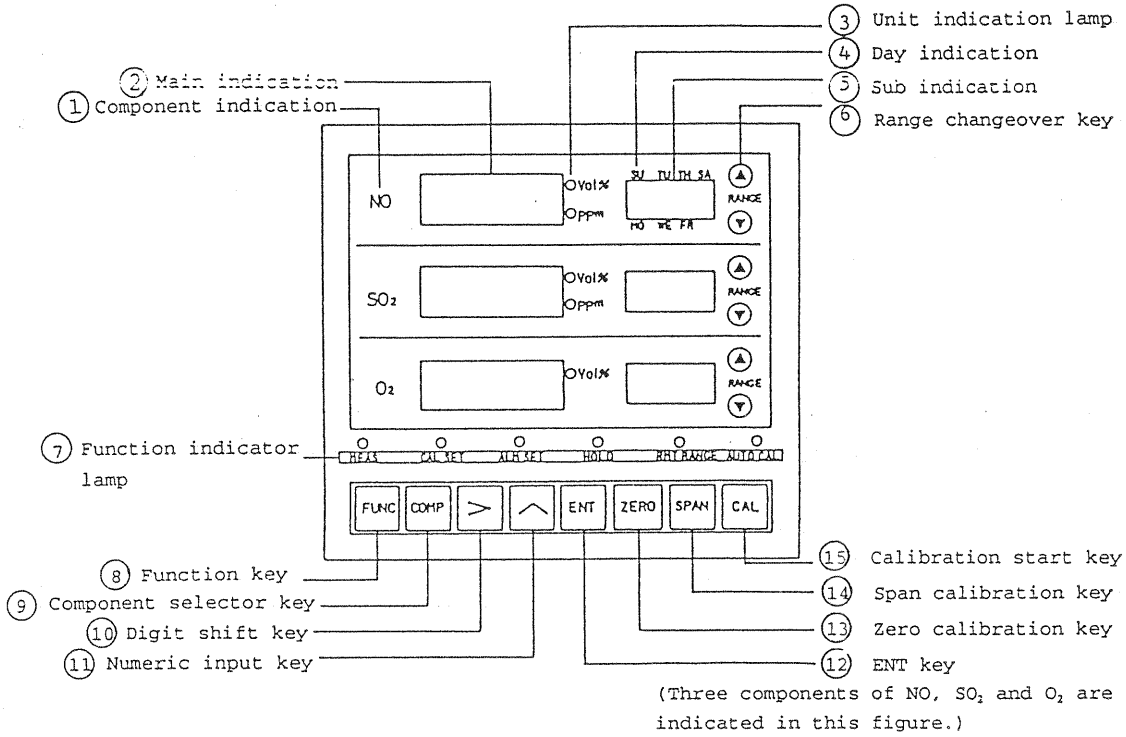
2.1 Name and description of each component on case



Part name	Description
① Grip	Used to pull out the interior (base).
② Knurled knob	Used to fasten the instrument and case.
③ Power switch	Turn ON to supply power to the internal components (excluding the pump). After 3 or 4 seconds the LED indicator lights up. (Refer to 4.2 for pump power supply.)

Part name	Description
(4) Indication/operation panel	Indicates gas concentration, measuring range, etc., and contains keys necessary for routine operation and settings. Refer to section 5 for operating method .
(5) Flowmeter (option)	Used to check sample gas flow rate. Float rises when sample gas flows.
(6) Sample gas inlet	Connect gas to be measured here.
(7) Sample gas outlet	Connect pipe for discharging measured gas here.
(8) Reference gas inlet	Connect reference gas here in case of differential flow system.
(9) Reference gas outlet	Connect pipe here for discharging reference gas.
(10) Purge gas inlet	Connect pipe for purge gas here.
(11) COMP1 (1st component) input/output terminal	Used for 1st component of standard type and sample switching type or flow differential type.
(12) COMP2 (2nd component) input/output terminal	Input/output terminal for 2nd component of two-component analyzer.
(13) O_2 input/output terminal (option)	Input/output terminal for O_2 analyzer.
(14) AUTO CAL input/output terminal (option)	Input/output terminal for auto calibration function.
(15) Power terminals	Supply power to the analyzer

2.2 Name and description of components on indication/ operation panel



Part name	Description
(1) Component indication	Indicates kind of gas measured.
(2) Main indication	Indicates measured concentration. Also indicates various setpoints for alarm function, auto calibration function (option), etc.
(3) Unit indication lamp	Indicates unit of measured gas concentration.
(4) Day indication	Indicates current day or day of starting by means of bar in auto calibration (option) setting mode. Indi- SU MO TU WE TH FR SA cation Day Sun Mon Tue Wed Thu Fri Sat

Part name	Description
⑤ Sub indication	Indicates measuring range, error code, various setpoints, etc.
⑥ Range changeover key	Used when changing the range. High range is set when pressing Ⓐ and low range is set when pressing Ⓥ.
⑦ Function indicator lamp	Relevant lamp lights up when following functions are set. MEAS : Lights up in measuring status. CAL SET : Flashes in calibration concentration setting mode. ALM SET : Flashes in alarm setting mode. HOLD : Flashes in hold setting mode or lights steadily while hold function is activated. RMT RANGE: Flashes in remote range setting mode or lights steadily while remote range function is activated. AUTO CAL : Flashes in auto calibration setting mode or lights steadily while auto calibration func-tion is activated.
⑧ Function key	Setting mode is changed at each press of this key. (Refer to section 5.)
⑨ Component selector key	Set component is changed for each setting mode or span adjustment.
⑩ Digit shift key	Shift is made from highest toward lowest digit at each press of this key.
⑪ Numeric input key	Selected digit is incremented at each press of this key.

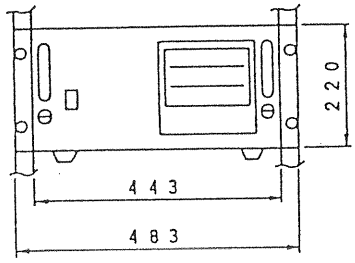
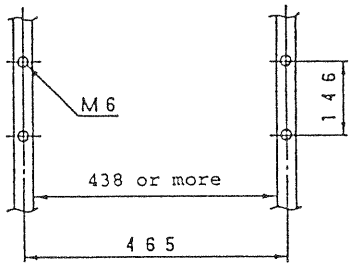
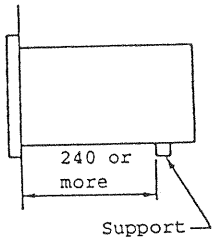
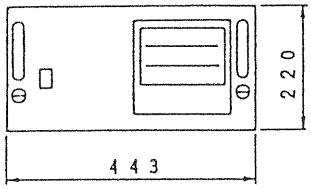
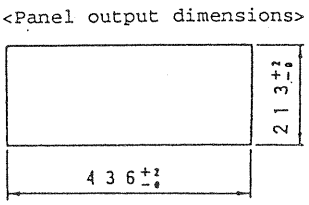
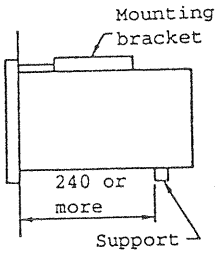
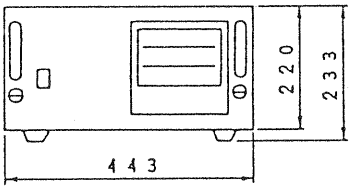
Part name	Description
⑫ ENT key	By pressing this key after setting, the set contents are memorized and become valid.
⑬ Zero calibration key	Used for zero point calibration. (Lamp flashes in zero calibration mode.)
⑭ Span calibration key	Used for span calibration. (Lamp flashes in span calibration mode.)
⑮ Calibration start key	Start key for manual calibration. Zero is calibrated by pressing [ZERO] and [CAL] keys. Span is calibrated by pressing [SPAN] and [CAL] keys. (CAL lamp lights steadily during calibration.)

3. INSTALLATION

3.1 Mounting method

The following three methods are usable for mounting the analyzer.

(Unit: mm)

Type	Outer dimensions	Mounting method	Procedure
19 inch rack mounting			
Panel mounting			
Desk top type			

(1) Mounting method

Mount so that the front panel is vertical.

(2) Caution on installation

70% or more of the instrument weight should be supported by the case bottom.
(When mounting on a panel or 19 inch rack, attach a support under the rear of the case.)

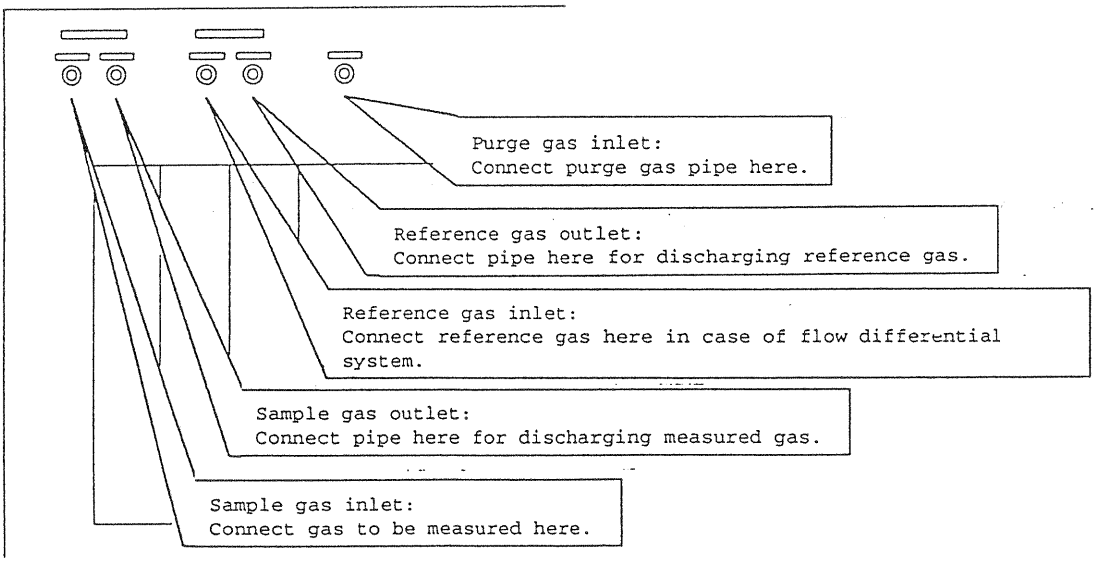
3.2 Piping method

(1) Piping procedure

Connect pipes to the gas inlets and outlets located at the top left on the analyzer rear.

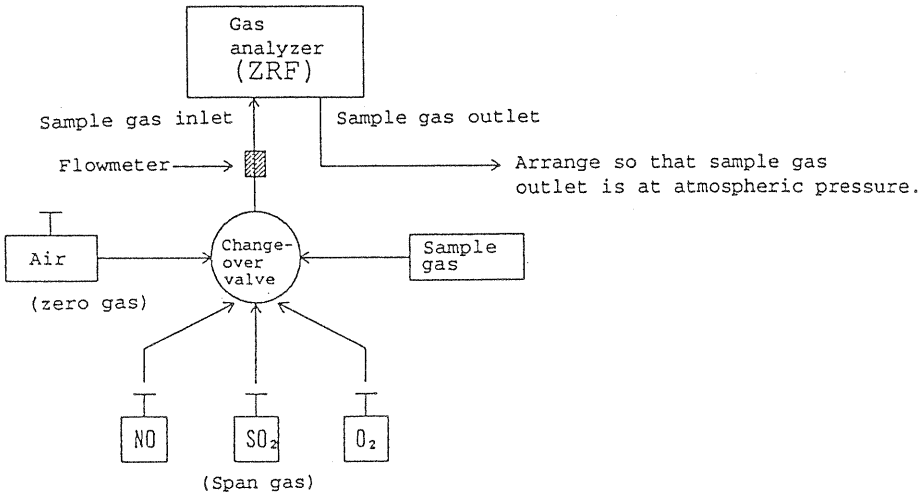
Use anticorrosive tubes made of teflon, stainless steel, polyethylene or the like for connecting the analyzer and sampling system. Avoid using rubber or soft vinyl tubes even if there is no worry about corrosion. Improper piping material may cause inaccurate indication due to adsorption of gas. The pipe connections are Rc1/4 (PT1/4) internal thread. And the pipes should be kept as short as possible to quicken the response. A suitable inner diameter is about 4 mm. Note that dust entering the analyzer may cause a malfunction, so be sure to use clean pipes and joints.

Carry out gas piping as follows.



(2) .Piping diagram

Shown next is an example of the configuration for measuring three components. (When using Zirconia O_2 analyzer)



3.3 Sampling

3.3.1 Sample gas conditions

(1) Remove all dust included in sample gas by means of a filter. Use a filter capable of eliminating dust particles of 0.3μ at the final stage.

(2) The dew point of sample gas must be lower than the ambient temperature to prevent accumulation of drain inside the analyzer. If water vapor is included in the sample gas, then feed the gas through a dehumidifier to lower the dew point to around 0°C.

(3) If SO_3 mist is included in sample gas, then use a mist filter, cooler etc. to exclude the mist. The same applies if other kinds of mist are included.

(4) Note that if strongly corrosive gas such as Cl_2, F_2 or HCl is included in sample gas in a large amount, it will shorten the service life of the analyzer.

(5) The sample gas temperature should range from 0 to 50°C. Be careful not to introduce a high temperature gas directly into the analyzer.

3.3.2 Sample gas flow rate

The sample gas flow rate should be as follows. Provide a flowmeter as shown in the preceding diagram to measure the flow rate.

Standard type	0.5±0.25 ℓ/minute
Sample switching type	(1ℓ+1ℓ)±0.1ℓ/minute (sample gas + reference gas)
Flow differential type	(0.5ℓ+0.5ℓ)±0.25ℓ/minute (sample gas + reference gas)

3.3.3 Preparation of standard gas

Prepare standard gas for zero point and span point calibration.

Zero gas	N_2 gas
Span gas	Gas with concentration of 80% or more of full scale for each component

When using a Zirconia O_2 analyzer, use air for zero gas.

Zero gas	Air
Span gas	1 to 2% O_2 Gas of 80% or more of full scale for other than Zirconia O_2 analyzer.

Note) When calibrating the low and high ranges of Zirconia type O_2 analyzer, use 9 to 10 Vol% O_2/N_2 for the low range, and air for the high range.

3.3.4 Analyzer interior purging

Although purging of the analyzer interior is normally unnecessary, it should be considered in the following cases.

(1) When combustible gas is included in the measured gas
(2) When corrosive gas is included in the atmosphere at the installation site.
(3) When the same gas as the measured component is included in the atmosphere at the installation site

In such cases, purge the analyzer interior with instrumentation air or N_2. The flow rate for purging should be about 1 ℓ/minute.

And dust or mist should be completely eliminated from the gas for purging.

3.3.5 Pressure at sample gas outlet

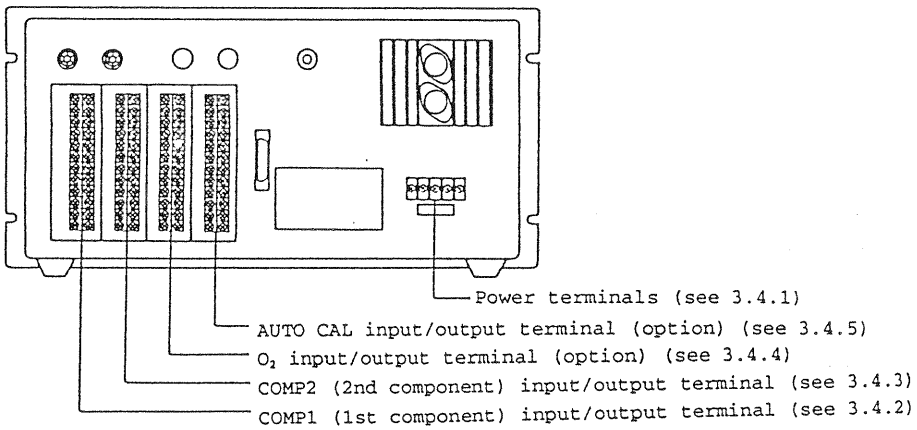
Arrange so that the sample gas outlet is at atmospheric pressure.

3.4 Wiring method

The external terminals are provided on the rear of the instrument.

Carry out wiring to each terminal according to the figure. Terminal screws are M3.5 (but power terminals are M4).

Use shielded wires for the output signals to suppress the influence of external noise.



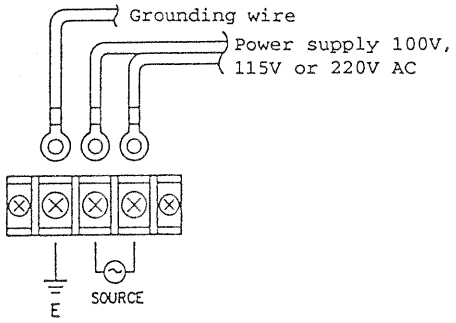
3.4.1 Power terminals

The power terminals are arranged as shown in the figure.

Connect the specified power supply to the terminals and connect a grounding wire to the ground terminal.

The grounding should be made securely.

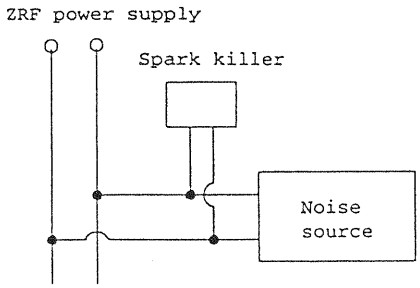
Use solderless terminals (for M4) for connection to the terminals.



When noise generating source is located nearby

Avoid installing this analyzer near an electrical apparatus which produces power source noise. (Such as high frequency furnace, electric welder, etc.) If use of the analyzer near such an apparatus is unavoidable, then keep the power lines separate to avoid noise.

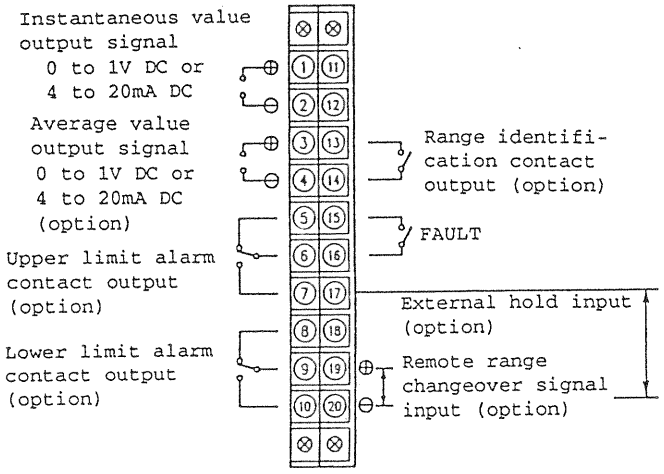
If noise from a relay, solenoid valve or the like enters the power source, then attach a varistor or a spark killer to the noise source as shown in the figure.
Note that attaching the varistor or spark killer away from the noise source will be ineffective.



3.4.2. COMP1 (1st component) input/output terminal

This output terminal is used with the standard single-component type, sample switching type or flow differential type.

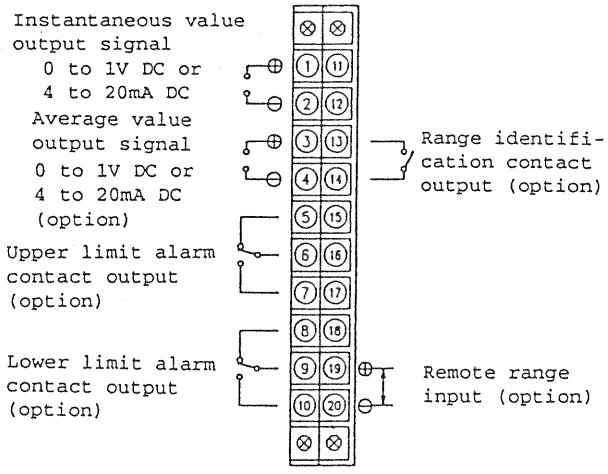
The wiring method is as follows.



3.4.3 COMP2 (2nd component) input/output terminal

This output terminal is for the 2nd component of the standard type.

The wiring method is as follows.



. COMP1, COMP2 terminal block

<Instantaneous value output>

Instantaneous value of 0 to 1V DC or 4 to 20mA DC is outputted.

<Moving average output> (option)

Moving average of 0 to 1V DC or 4 to 20mA DC is outputted.

<Upper limit alarm contact output> (option)

When signal exceeds upper limit, terminals ⑤ and ⑥ turn from on to off and ⑥ and ⑦ turn from off to on.

1c contact 250V AC, 2A (resistive load)

<Lower limit alarm contact output> (option)

When signal is below lower limit, terminals ⑧ and ⑨ turn from on to off and ⑨ and ⑩ turn from off to on.

1c contact 250V AC, 2A (resistive load)

<Range identification signal output> (option)

Terminals ⑬ and ⑭ are conductive when 1st range is selected: ⑬ and ⑭ are open when 2nd range is selected.

1a contact 250V AC, 2A (resistive load)

<Remote range input> (option)

1st range is selected when 5V DC is input to terminals ⑲ and ⑳ ; 2nd range is selected when there is no input to terminals ⑲ and ⑳ .

<External hold input> (Output to COMP1 terminal) (option)

Hold setting component is outputted and held with 5V DC inputted between (17) and (20).

<Fault> (Output to COMP1 terminal)

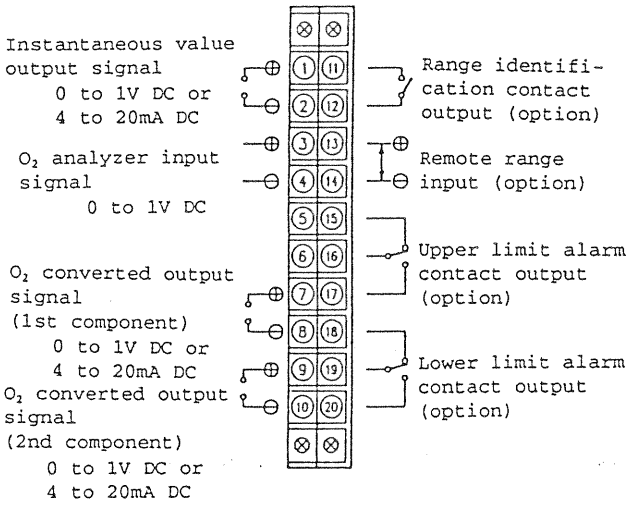
Contact output when analyzer incurs an abnormality.

1a contact 250V AC, 2A (resistive load)

3.4.4 O_2 input/output terminals (option)

This is the input/output terminal for the standard type O_2 analyzer.

The wiring method is as follows.



O_2 terminal block

<Instantaneous value output>

Instantaneous value of 0 to 1V DC or 4 to 20mA DC is outputted.

<O_2 analyzer input terminal>

O_2 analyzer signal of 0 to 1V DC is inputted.

<O_2 conversion output>

O_2 conversion instantaneous value is outputted with preset conversion reference value.

<Upper limit alarm contact output> (option)

When upper limit is exceeded, terminals (15) and (16) turn from on to off and (16) and (17) turn from off to on.

1c contact 250V AC, 2A (resistive load)

<Lower limit alarm contact output> (option)

When signal is below lower limit, terminals (18) and (19) turn from on to off and (19) and (20) turn from off to on.

1c contact 250V AC, 2A (resistive load)

<Range identification contact output> (option)

Terminals (11) and (12) are conductive when 1st range is selected: (11) and (12) are open when 2nd range is selected.

1a contact 250V AC, 2A (resistive load)

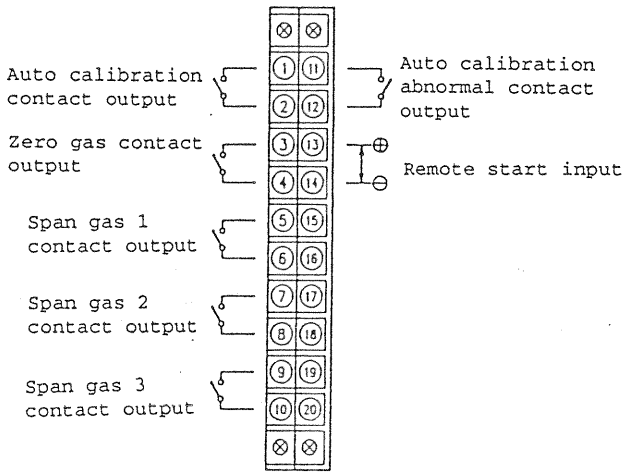
<Remote range input> (option)

1st range is selected when 5V DC is input to terminals (13) and (14) ; 2nd range is selected when there is no input to terminals (13) and (14) .

3.4.5 AUTO CAL input/output terminal (option)

This is the output terminal for the auto calibration function.

The wiring method is as follows.



AUTO CAL terminal block (option)

<Contact output during auto calibration>

Contact between (1) and (2) is ON during auto calibration.

1a contact, 250V AC, 2A (resistive load)

<Zero gas contact output>

Contact output for driving solenoid valve for flowing zero gas.

1a contact 250V AC, 2A (resistive load)

<Span gas 1 contact output>

Contact output for driving solenoid valve for flowing 1st component span gas.

1a contact 250V AC, 2A (resistive load)

<Span gas 2 contact output>

Contact output for driving solenoid valve for flowing 2nd component span gas.

1a contact 250V AC, 2A (resistive load)

<Span gas 3 contact output>

Contact output for driving solenoid valve for flowing O_2 analyzer span gas.

1a contact 250V AC, 2A (resistive load)

<Auto calibration abnormal contact output>

Contact output when abnormality occurs during auto calibration.

<Remote start input>

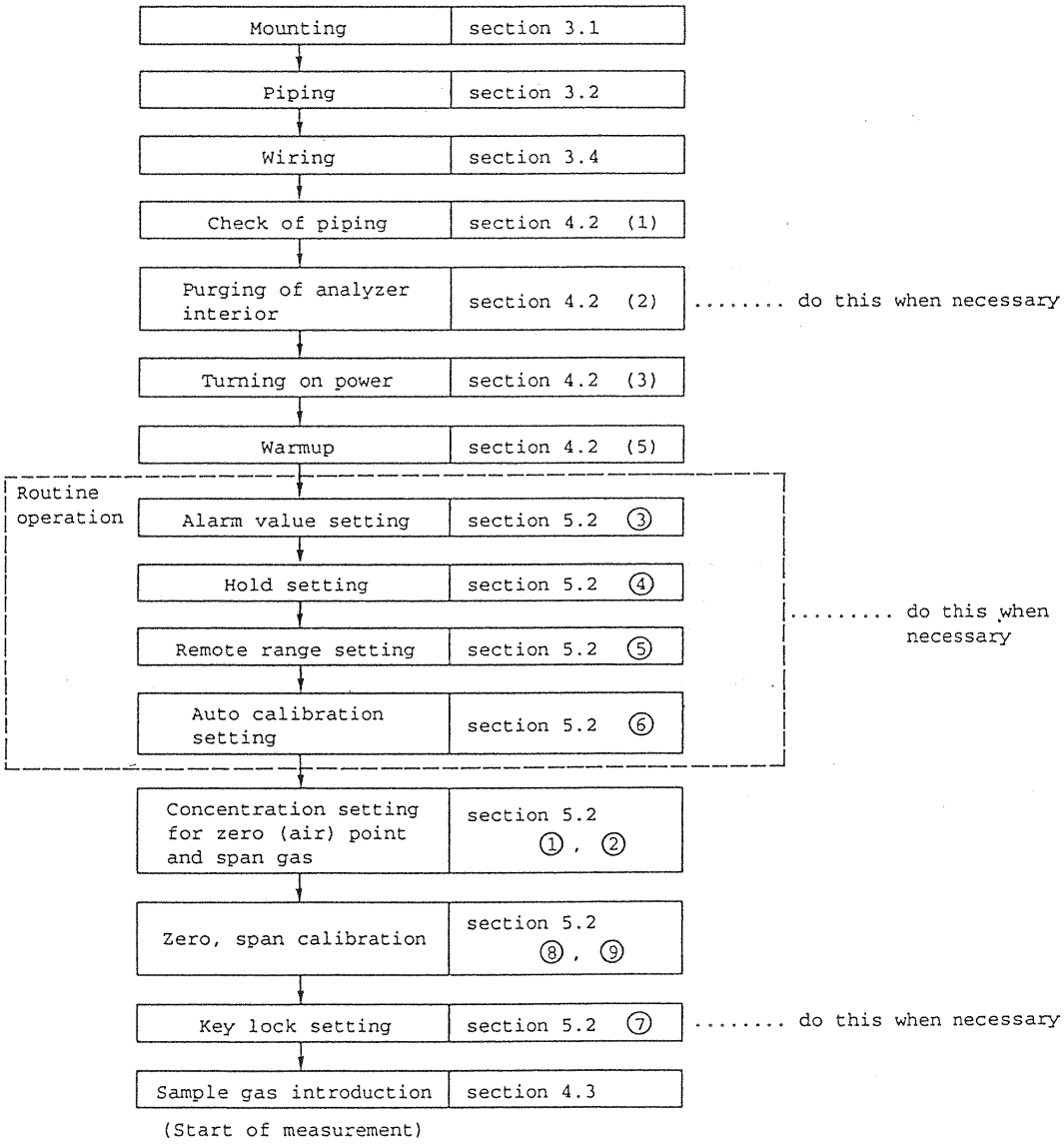
Input for starting auto calibration via external signal. Calibration started by inputting 5V DC between terminals (13) and (14).

4. OPERATION

4.1 Operation procedure

Set up the operational status by the following procedure.

Operation is started by using the keys on the front panel of the analyzer. Before use, please read through the instruction manual for the analyzer.



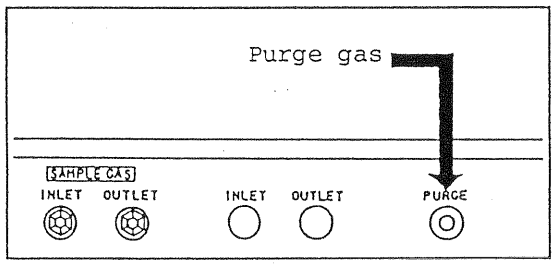
4.2 Preparation for operation

(1) Check of piping

Check that piping has been made correctly.

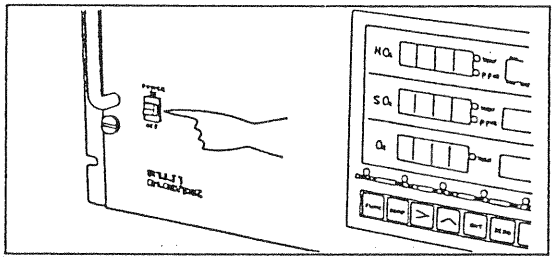
(2) Purging of analyzer interior

When purging is necessary, then flow purge gas for about 3 hours before turning on power.



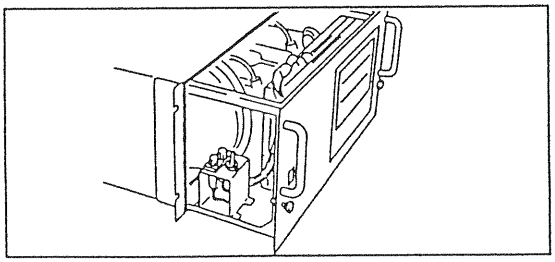
(3) Turning on power

Turn on the power switch and indication will appear in a few seconds.



(4) Turn on pump power supply

When the optional pump is provided, then pull out the base and turn on the pump power supply.



(5) Warmup

Flow the zero gas and warm up the instrument. The warmup is completed when the zero point stabilizes (about 4 hours).

(6) Concentration setting for calibration gas

Next set the concentration for the calibration gas. Refer to 5.2 ①, ② for the procedure.

(7) Zero calibration

Flow zero calibration gas and calibrate the zero point. Refer to 5.2 ⑧ for the key operation for zero calibration.

(8) Span calibration

Flow span calibration gas and calibrate the span. Refer to 5.2 ⑨ for the key operation for span calibration.

4.3 Start of measurement

Flow the sample gas to start measurement.

4.4 Shutdown

Stop the flow of sample gas, and flow zero gas for 10 minutes to purge the interior of the measuring cell.

Then turn off the power switch of the instrument.

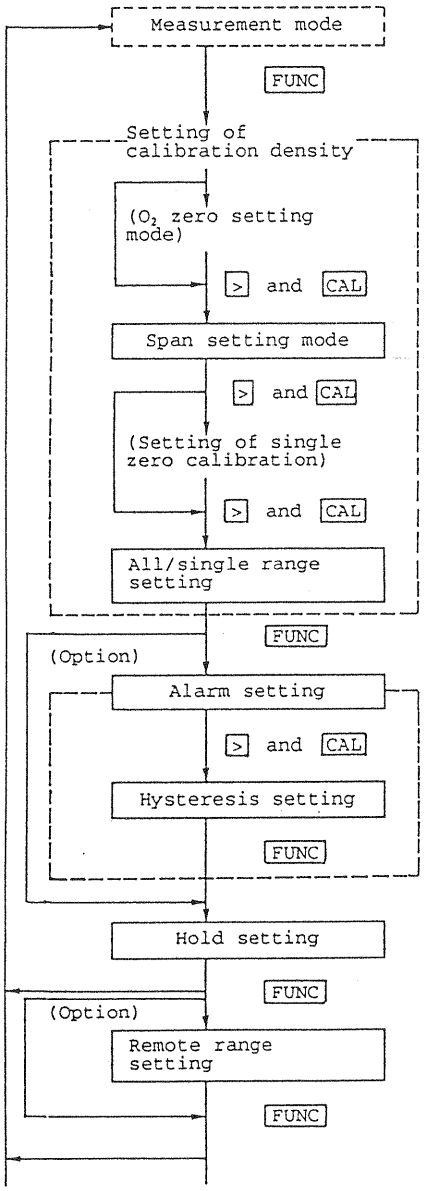
When a pump is equipped, also turn off the pump power supply.

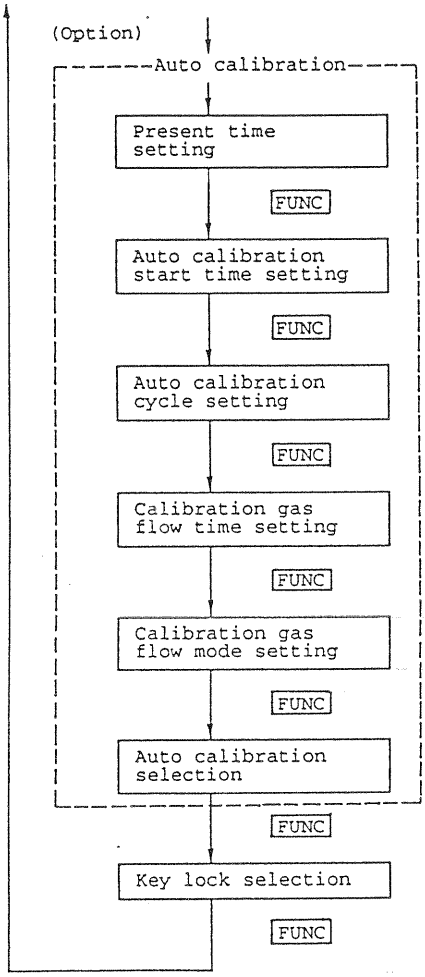
* The set values are retained in the memory even when power is turned off. But note that with the clock function of the auto calibration function, the backup fails to work after 48 hours has elapsed, so when the power is turned on again, the correct time must be re-input.

5. OPERATION OF INDICATION/OPERATION PANEL

5.1 Outline of indication/operation panel

This panel consists of the following functions.

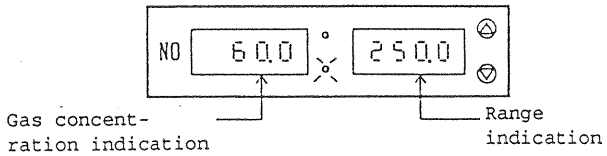
Function and key operation	Main indication	Sub indication	Function lamp	Page
	Measured value	Range	MEAS lamp ON	5-3
	Zero point calibration density (with zirconia O_2)	Range	CAL SET lamp ON	5-5
	Span point calibration density	Range	CAL SET lamp ON	5-5
	O. CAL (with O_2 meter)	Set value	CAL SET lamp ON	5-6
	S. CAL	Set value	CAL SET lamp ON	5-7
	Lo 2P Hi 2P	Alarm value	ALM SET lamp flickers.	5-12
	His	Hysteresis value	ALM SET lamp flickers.	5-14
	Hold	ON or OFF	Hold lamp flickers.	5-15
	r. rAG	ON or OFF	RMT RANGE lamp flickers.	5-18

	Hour & minute Hour & minute CYCL F.SEC FLNO. A.CAL LOC.	Day of week Day of week Time Time Mode No. ON or OFF ON or OFF	AUTO CAL flickers. AUTO CAL lamp flickers. AUTO CAL lamp flickers. AUTO CAL lamp flickers. AUTO CAL lamp flickers. AUTO CAL lamp flickers. --	5-19 5-21 5-22 5-23 5-24 5-25 5-26 5-27
Zero calibration [ZERO] [CAL] Span calibration [SPAN] [CAL]	Measured value Measured value	Range Range	ZERO/CAL key lamp flickers. SPAN/CAL key lamp flickers.	

- o When the setting mode is assumed, the analog output signal is held at the value just before entering this mode.
- o When optional functions are not provided, the contents of these functions are not indicated.

5.2 General operation

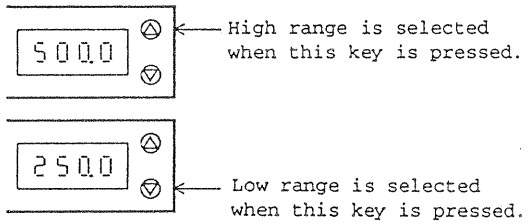
The measuring mode is assumed when power is turned ON.
The gas concentration appears on the main indication, while the range being used appears on the sub indication.



Advice on Operation

* When selecting the range

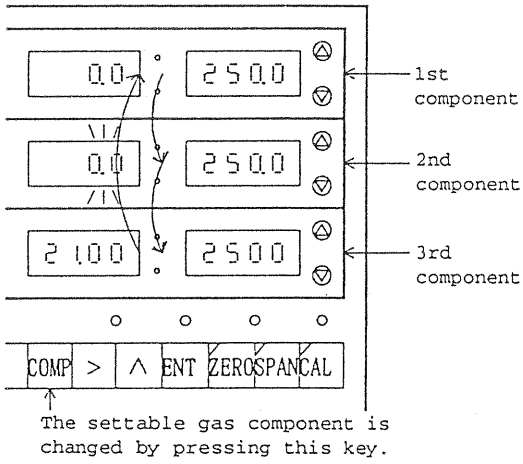
  In the setting status, as shown in the figure at the right, the high range is selected when △ key is pressed, while the low range is selected when ▽ key is pressed.



* When selecting the gas component

  In the setting status, as shown in the figure at the right, the gas component can be set by pressing [COMP] key.

  Example)
  When [COMP] key is pressed while the 1st component is flashing, the flashing moves to the 2nd component (figure at right). The setting for the 2nd component is now changeable.



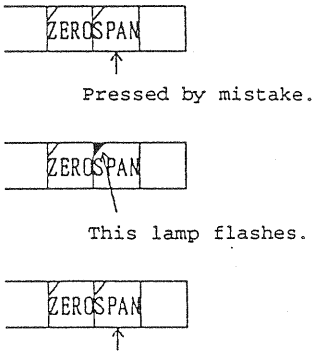
* [COMP] key is not provided for single-component analyzer.

* For releasing zero or span

If a mistake has been made in zero or span calibration, then perform a reset in the following way.

The figure at the right shows an example.

If [SPAN] key has been pressed mistakenly instead of [ZERO] key, then press [SPAN] key again. Calibration is cleared.



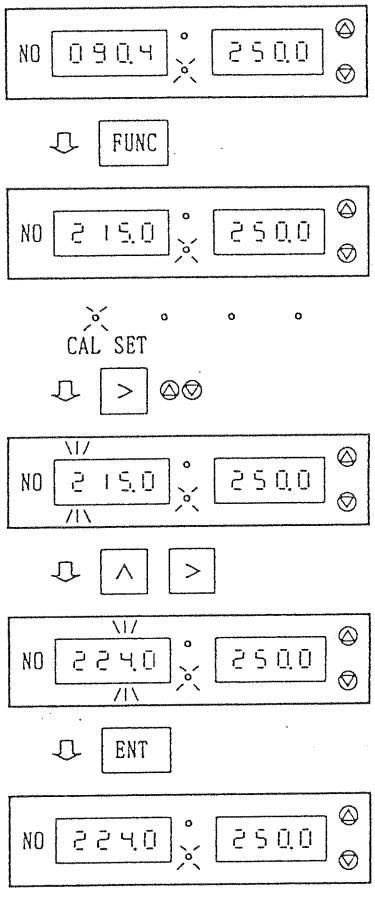
Press again and the lamp will go out. The resetting is now finished, so press the [ZERO] key.

If [ZERO] key has been pressed mistakenly instead of [SPAN] key, then press [ZERO] key again. Calibration is cleared.

* To clear moving average, press the [^] key 3 times while pressing the [>] key in measurement mode. The data of each moving average is cleared.

① Calibration concentration setting
(when not using Zirconia O_2 analyzer)

When not using a Zirconia O_2 analyzer, then set a span value for the calibration concentration setting.
(Zero point calibration concentration is fixed at zero.)
Set the calibration gas concentration (span value).
When [FUNC] key is pressed in the measuring status, the previously set span value will appear on the main indication.



The CAL SET LED of the function indicating lamps will flash.
By pressing the [>] key, the highest digit of the main indication for the 1st component will flash, and the span value can now be set.
Select a range with the △ ▽ keys.
After selecting the range, set a span value in this status.
The numeric value will be incremented by pressing [^] key.
The digit to be set can be selected by pressing [>] key.

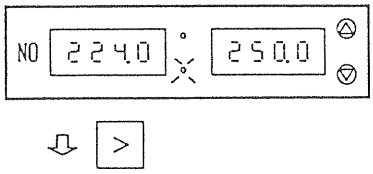
> For selecting the 2nd and subsequent components and the range, press the [>] key and while the main indication for the 1st component is flashing, press the [COMP] key and then the main indication for the component to be set will flash. Now press the △ ▽ keys to select the range to be set.

When the span value has been set, press the [ENT] key. Setting operation is now completed.

[Setting of single zero calibration]

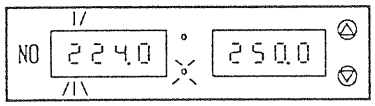
This setting operation is used to select a zero calibration component. This function is invalid when O_2 component is not included.

Press the [>] key in span setting mode. The first digit in the main indication flickers.



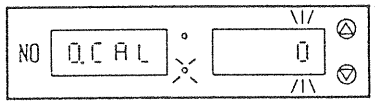
⇩ [>]

Press the [CAL] key. 0CAL appears in the main indication and " 0 " appears in the sub indication.



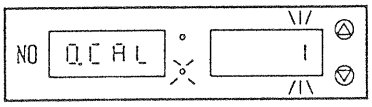
⇩ [CAL]

At each press of the [∧] key, the setting is changed in the order of 0 - 1 - 2 - 0.



⇩ [∧]

After selecting, press the [ENT] key. The data is stored in memory.



[ENT]

= Meaning of set value =

Select code	Zero calibration	
	Manual calibration	Auto calibration
0	Calibration of all components	Calibration of all components
1	Calibration of components other than O_2	Calibration of components other than O_2
2	Calibration of O_2	

Note 1) This mode is invalid when O_2 component is not included.

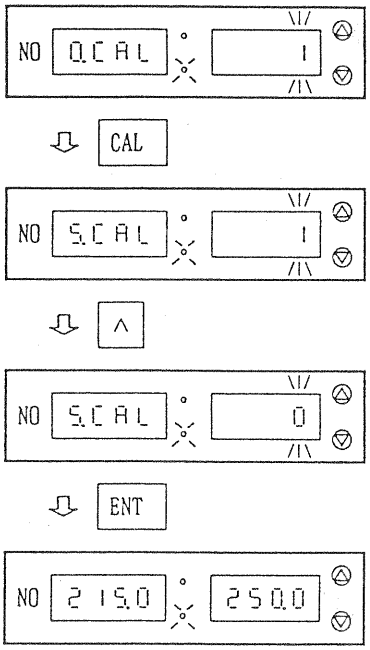
Note 2) The main indication flickers when zero calibration ([ZERO] + [CAL]) is made on selected components.

[Setting of single calibration of all or each range]

This setting operation is used for calibration of all or each range during zero/span calibration.

Perform setting in the following way.

By pressing [CAL] key while the highest digit of the main indication for the 1st component is flashing, then ' S.CAL ' will appear on the main indication and '1' will appear on the sub indication.
Press [∧] key and '1' will change to '0'.



= Meaning of set values =

0: The calibration is valid only for the selected range, and zero and span calibration can be made independently for each range.
1: By conducting zero and span calibration for one range, the calibration will be done automatically for the other ranges as well.

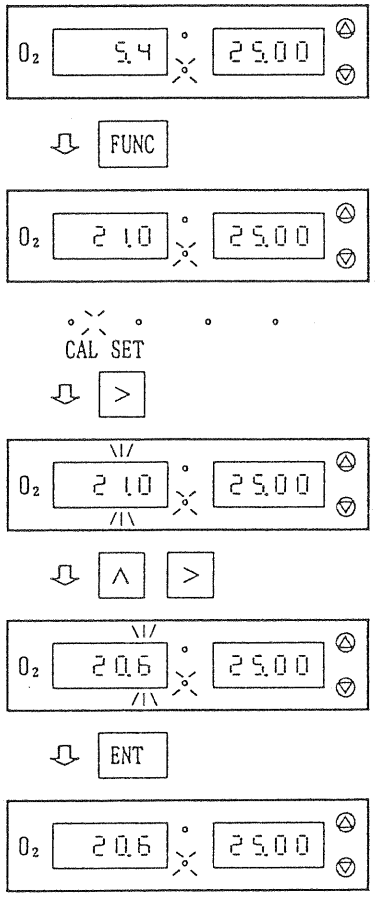
When the selection has been finished, press the [ENT] key.

② Calibration concentration setting (when using Zirconia O_2 analyzer)

When a Zirconia O_2 analyzer is provided, set the zero (air) point and the span calibration concentration for each component of the O_2 analyzer.

* Setting of calibration concentration for zero (air) point

The zero (air) point calibration concentration is settable for the O_2 analyzer alone. The zero point calibra-tion concentration for components other than for the O_2 analyzer is fixed at zero.
By pressing the [FUNC] key in the measuring status, the calibration concentration previously set for the zero (air) point will appear on the main indication.
The CAL SET LED of the function indicating lamps will flash.



Press the △ ▽ keys to select a range.

By pressing the [>] key, the 2nd highest digit of the main indication of the O_2 analyzer will flash, and zero point setting is enabled.

The numeric value will be incremented by pressing [∧] key.

The digit to be set is selected by pressing [>] key.

> Setting ranges are 20.0 to 21.9 vol% for high range and 7.0 to 21.9 vol% for low range.
>
> Set the same air concentration for both high and low range.

Press the [ENT] key after setting the zero point. Setting operation is now completed.

* Setting of span calibration concentration

Press the [CAL] key in the status where the digit of the O_2 analyzer main indication is flashing via the zero (air) point calibration concentration setting. The previously set span value will now appear on the main indication.

The CAL SET LED of the function indicating lamps will flash.

The highest digit of the 1st component main indication will flash and the span value is now settable.

Press the △ ▽ keys to select a range.

When the range has been selected, set a span value in this status.

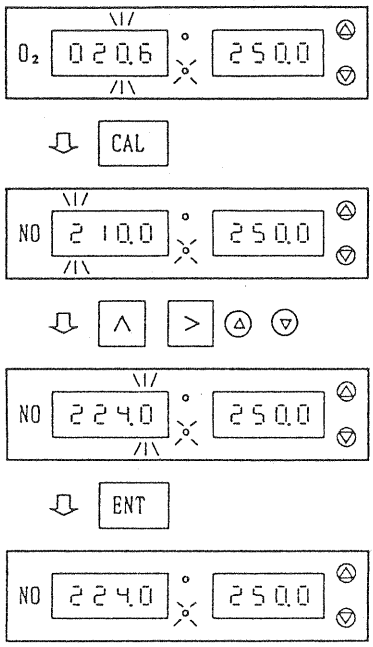
The numeric value will be incremented by pressing [∧] key.

Press the [>] key and the digit to be set can be selected.

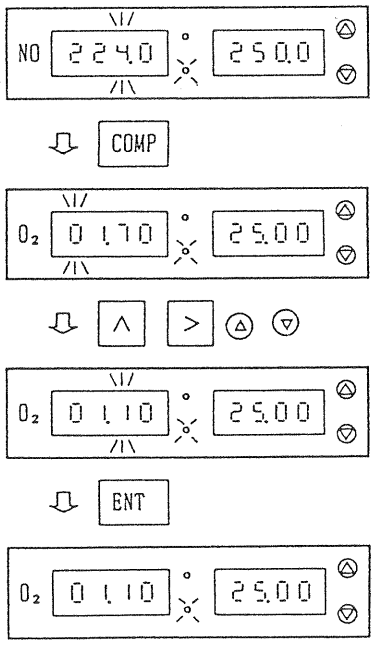
> For selecting the 2nd and subsequent components and the range, press the [>] key and in the status where the 1st component main indication is flashing, press the [COMP] key and the main indication for the component to be set will flash. Press the △ ▽ keys to select the range to be set.

Press the [ENT] key after setting the span value. Setting operation is now completed.

= Setting for each component =



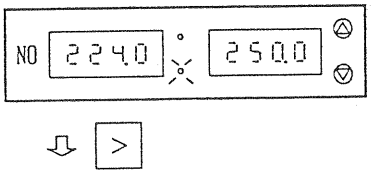
= Setting of O_2 analyzer =



[Setting of single zero calibration]

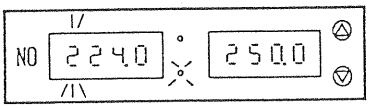
This setting operation is used to select a zero calibration component. This function is invalid when O_2 component is not included.

Press the [>] key in span setting mode. The first digit in the main indication flickers.



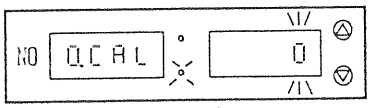
⇩ [>]

Press the [CAL] key. 0CAL appears in the main indication and " 0 " appears in the sub indication.



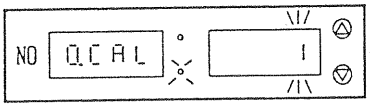
⇩ [CAL]

At each press of the [∧] key, the setting is changed in the order of 0 - 1 - 2 - 0.



⇩ [∧]

After selecting, press the [ENT] key. The data is stored in memory.



[ENT]

= Meaning of set value =

Select code	Zero calibration	
	Manual calibration	Auto calibration
0	Calibration of all components	Calibration of all components
1	Calibration of components other than O_2	Calibration of components other than O_2
2	Calibration of O_2	

Note 1) This mode is invalid when O_2 component is not included.

Note 2) The main indication flickers when zero calibration ([ZERO] + [CAL]) is made on selected components.

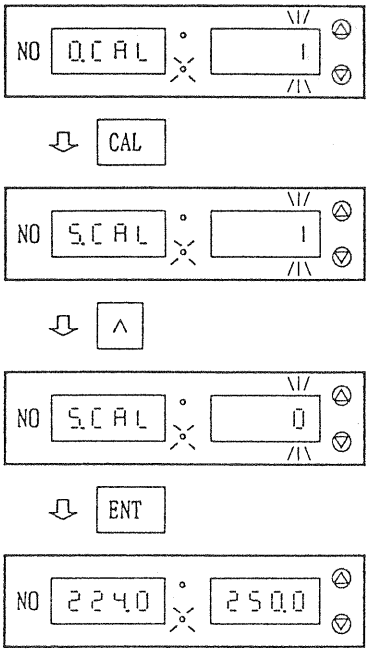
[Setting of single calibration of all or each range]

This setting operation is used for calibration of all or each range during zero/span calibration.

Carry out the setting as follows.

By pressing [CAL] key while the highest digit of the 1st component main indication is flashing, ' SCAL ' will appear on the main indication and '1' will appear on the sub indication.

Press [∧] key and '1' will change to '0'.



= Meaning of set values =

0:	The calibration is valid only for the selected range, and zero and span calibration can be made independently for each range.
1:	By conducting zero and span calibration for one range, the calibration will be done automatically for the other ranges as well.

Press the [ENT] key when the selection is finished.

③ Alarm value setting (option)

Set the upper and lower limit alarms and output an alarm. Setting can be made for each component and each range.

Press [FUNC] key in the measuring status and 'Lo■■' will be indicated.
The ALM SET LED of the function indicating lamps will flash.

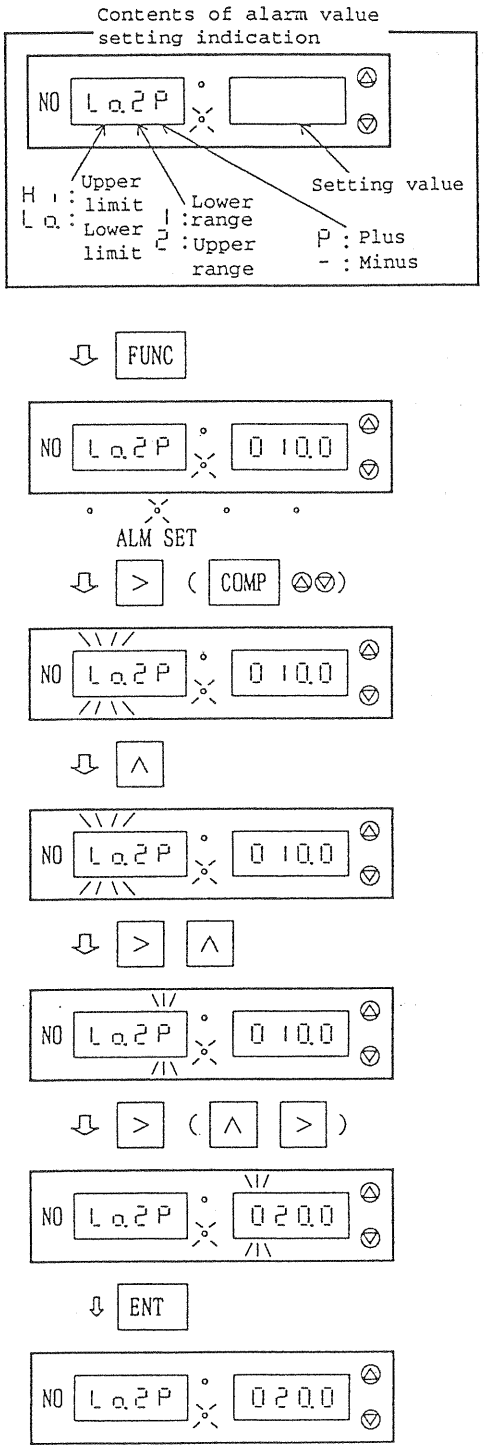
Press the [>] key and then alarm values are settable. The highest two digits of the main indication will flash.

> Press the [COMP] key and select the gas component for which alarms will be set. Press △ ▽ keys and select the range.)

Press the [∧] key and select either the upper or lower limit alarm.

> 'Lo' indication appears when lower limit alarm is to be set and 'H ,' indication appears when upper limit alarm is to be set.

Press the [>] key and the lowest digit flashes, so press the [∧] key to select either plus ('P') or minus ('-') for the set value.
Press the [>] key and the highest digit of the main indication flashes, so set an alarm value. The numeric value is incremented by pressing [∧] key.
Press the [>] key and the digit can be selected.
When the alarm setting is finished, press the [ENT] key. Setting operation is now completed.



Caution

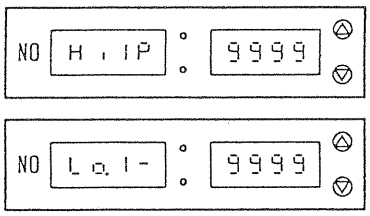
Alarm values are settable within the selected range.

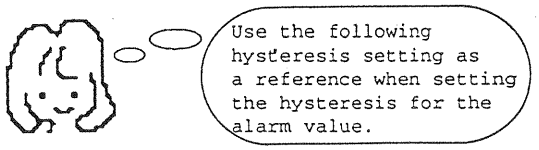
Note that the upper limit alarm cannot be set below the lower limit alarm.

And if the lower limit alarm is set above the already memorized upper limit alarm, then the upper limit alarm will become the same value as the newly set lower limit alarm.

To make the alarm function invalid

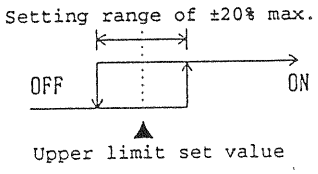
For making the alarm function invalid, then set the upper limit alarm value to ' 9999 ' and the lower limit alarm value to '-9999' for each component and each range.

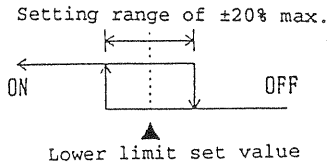




Hysteresis setting

Set a hysteresis versus the alarm value.





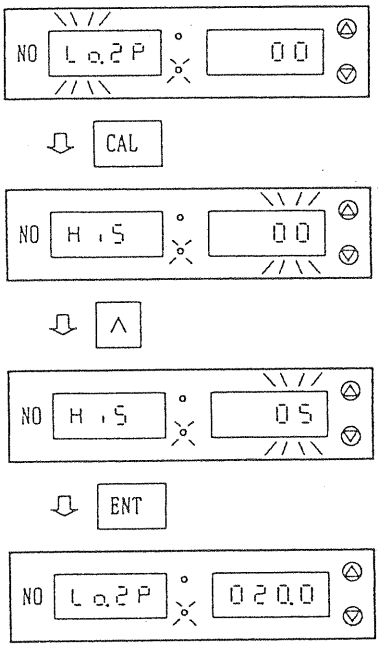
When [CAL] key is pressed in the alarm setting status, 'H.S' will appear on the main indication.

This is the mode for setting the hysteresis for the alarm value.

Change the hysteresis value on the sub indication by pressing the [∧] key.

The hysteresis is settable in 1% steps in a range of ±0 to ±20% versus the measuring range.
The indication changes from 0→1→2····· 10→20→0→····· .

Press the [ENT] key when the setting is finished.



④ Hold setting

This is used when calibrating for holding the output signal at the value just before entering calibration. (The indication is not held.)

The hold function is settable for each component.

Set to OFF when not using.

Press the [FUNC] key in the measuring status and 'Hold' will be indicated.

The HOLD LED of the function indicating lamps will flash.

Press the [>] key and the hold function will be settable.

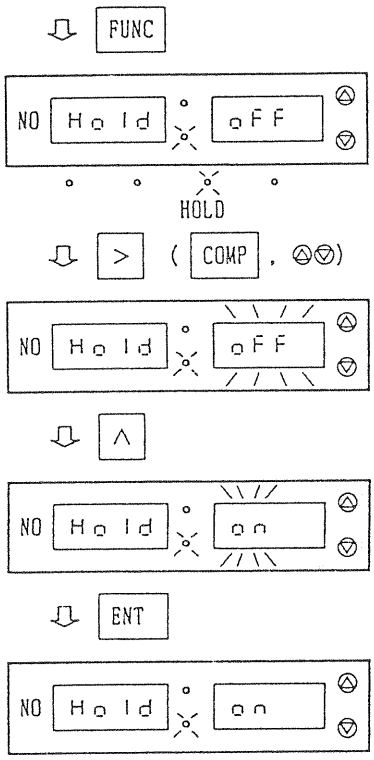
The sub indication will flash.

> Press the [COMP] keys and select a setting component.

Select hold 'on' or 'oFF' by pressing the [∧] key.

Press the [ENT] key after setting the hold function. Setting operation is now completed.

At hold ON, the HOLD of the function indicating lamp will light steadily while the hold function is activated.
The unit indicating lamp flickers only for components which have been set. This lamp goes off at hold OFF.



Only the output will be held when this function is 'on'; the indication is not held.

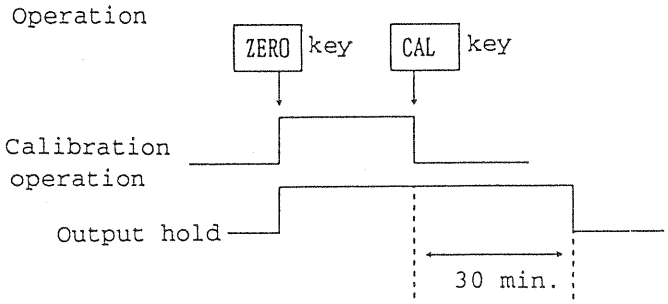
Hold function

<Output hold functions after manual calibration>

The following shows the output hold function after manual calibration (zero or span).

The hold function is cleared automatically after 30 minutes or it can be cleared by key operation (manual).

1. Operation



2. Clear operation

1) Auto clear

Press the ZERO key or SPAN key after hold setting (ON/OFF). Output hold is started and calibration is completed with CAL key. Then, the hold function is automatically cleared after 30 minutes.

2) Manual clear

The hold function is cleared manually by pressing the ENT key and CAL key at the same time.

Note 1) During auto calibration, the contact output between terminals (1) and (2) does not operate when it is under manual calibration.

Note 2) Output hold is effective only for preset components.

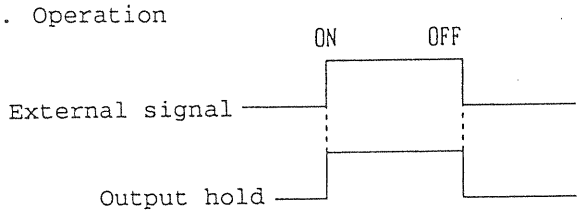
<Output hold function under auto calibration>

Output hold function under auto calibration and replacement time. For operation, refer to Item (6).

<External hold function> (option)

The following operation is used for output hold with external signals.

1. Operation



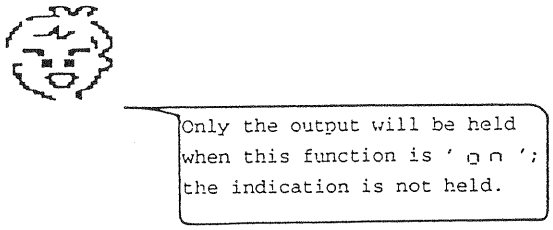
2. Operation method

By putting 5V DC between the 1st component input/output terminals (17) and (20) ("+" and "-"), only the component preset by the front key will be operated..

Note 1) The indication during operation is the same as that of hold calibration.

Note 2) This function is effective only when alarm, remote range or range detect function is used as an option.
(When using the supplied function, be sure to contact Fuji because the hardware is different.)

Note 3) This function is effective only for the standard type No.1 and 2 range analyzers and flow differential type.



⑤ Remote range setting (option)

This is used for selecting the range via an external signal.

This setting should be OFF when remote range is not used.

Press the [FUNC] key in the measuring status and 'r.rAG' will be indicated.

The RMT RANGE LED of the function indicating lamps will flash.

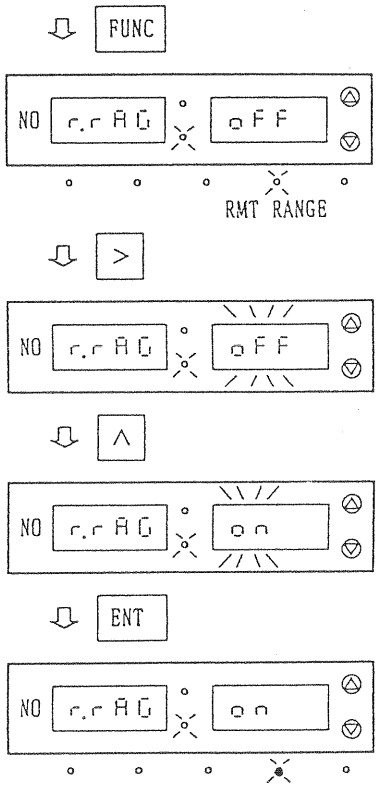
Press the [>] key and the remote range function is settable.

The sub indication will flash.

Select the remote range 'on' or 'oFF' by pressing the [∧] key.

The setting is valid for all the components.

Press the [ENT] key when the remote range setting is finished. Setting operation is now completed.



When the remote range function is set ON, the RMT RANGE LED of the function indicating lamps will remain lit, and the ⓐ ⓥ keys will be unusable for range selection.

By inputting 5V DC between the remote input terminals (13) and (14), the No. 1 range is selected.
No. 2 range is selcted when 5V DC input is not applied to the remote input terminals (13) and (14).

⑥ Auto calibration (option)

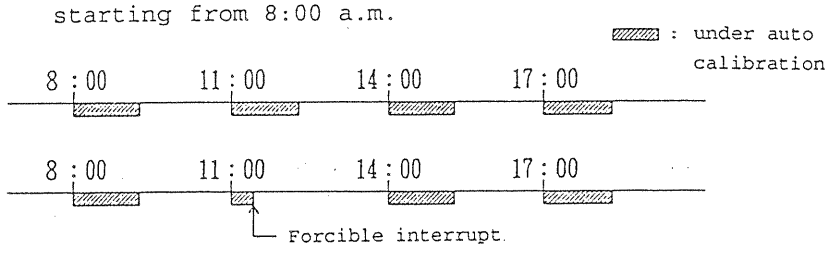
As an option with this analyzer, the signals from the input/output terminals on the rear panel can be used for driving an external solenoid valve and introducing standard gas, whereby zero point and span can be calibrated automatically.

The auto calibration is done according to (6.1) Current time setting, (6.2) Auto calibration start time, (6,3) Auto calibration cycle, (6,4) Calibration gas flow time, (6,5) Calibration gas flow mode, and (6.6) Auto calibration ON/OF setting.

Caution on operation

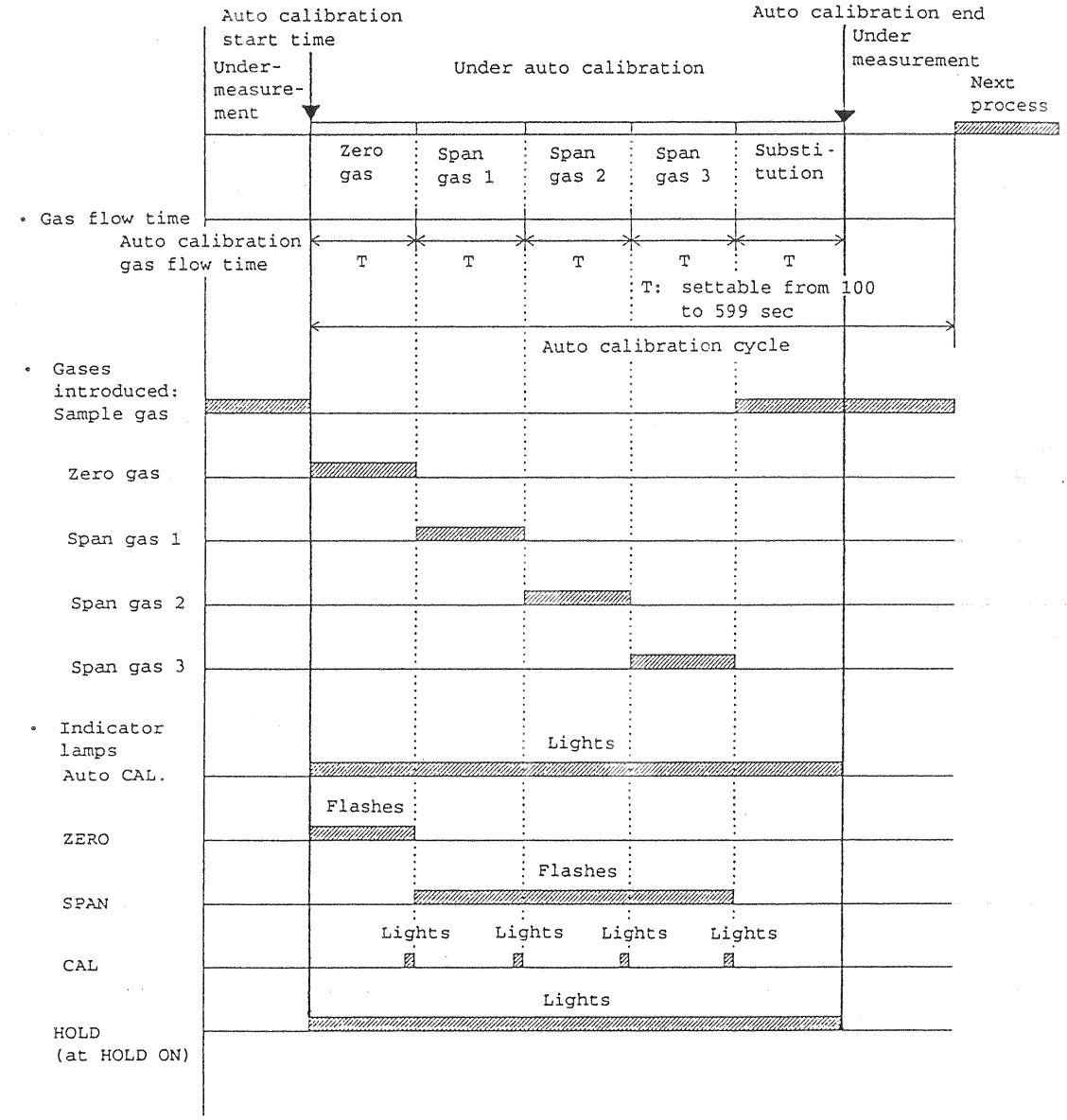
1. When the auto calibration start time is reached during key operation, the auto calibration is given priority and is started. All key operation will be invalid until the auto calibration is finished.
2. To forcibly interrupt the auto calibration in progress, press both the [ENT] and [CAL] keys simultaneously. After the forcible interrupt, the measuring mode is resumed and all the keys are operable. Although the current auto calibration will be passed over, it will be started from the initially set cycle from the next time onward.

Example: When auto calibration is set for 3 hour intervals starting from 8:00 a.m.



3. Key operation is possible while calibration is not under way with the auto calibration function set. Therefore all settings (of span, hold, remote range, time, etc.) including manual calibration can be made. But note that if the wrong time is set on the clock, the auto calibration will not be started at the correct time.
4. Auto calibration is able to start by applying remote start signal, 5V DC longer than 100msec, to remote start input terminals. In this case, auto calibration will start independent to its ON/OFF setting.

Example where auto calibration gas flow mode 5 is set



Auto calibration abnormality:

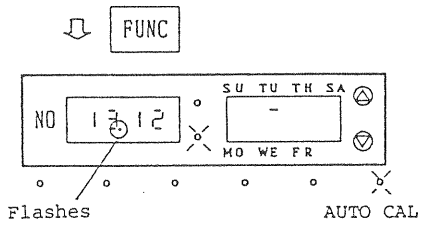
If an abnormality occurs during auto calibration, a contact signal for auto calibration abnormality will be output from the input/output terminals on the rear of the analyzer. The gas which incurred the abnormality will not be calibrated, and instead the next component will be calibrated.

6.1 Current time setting

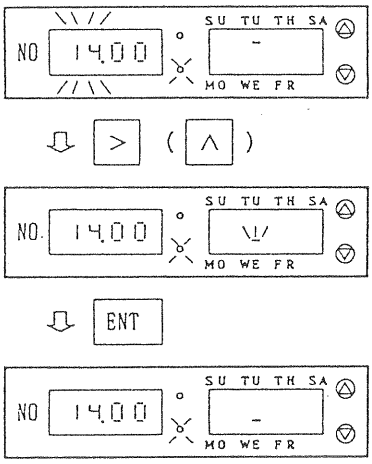
Set the current time and day of the week.

Press the [FUNC] key in the measuring status.

The AUTO CAL LED of the function indicating lamps will flash.



> The main indication shows the hour and minute via a 24-hour indication and the decimal point flashes.
> A '-' bar lights up at the relevant weekday on the sub indication.
>
> | Indication | SU | MO | TU | WE | TH | FR | SA |
> |---|---|---|---|---|---|---|---|
> | Day | Sun | Mon | Tue | Wed | Thu | Fri | Sat |



Press the [>] key and the time is now settable. The highest two digits of the main indication will flash.

The numeric value is incremented by pressing the [^] key.

Press the [>] key and the digit can be selected.

After the time setting, press [>] key and the day is settable on the sub indication.

The bar indication will flash.

Press the [^] key and the bar will shift.
Press the [ENT] key when the time and day setting is finished. The data is stored in memory.

> Time starts from the point where [ENT] key is pressed.

(6.2) Auto calibration start time setting

When [FUNC] key is pressed at the current time indication, the auto calibration start time and day will appear on the main and sub indications. The AUTO CAL LED of the function indicating lamps will flash. In the case of start time, the decimal point on the main indication will light steadily.

Press the [>] key and the auto calibration start time is settable, so set a start time on the main indication.

The numeric value is incremented by pressing the [∧] key.

Press the [>] key and the digit can be selected.

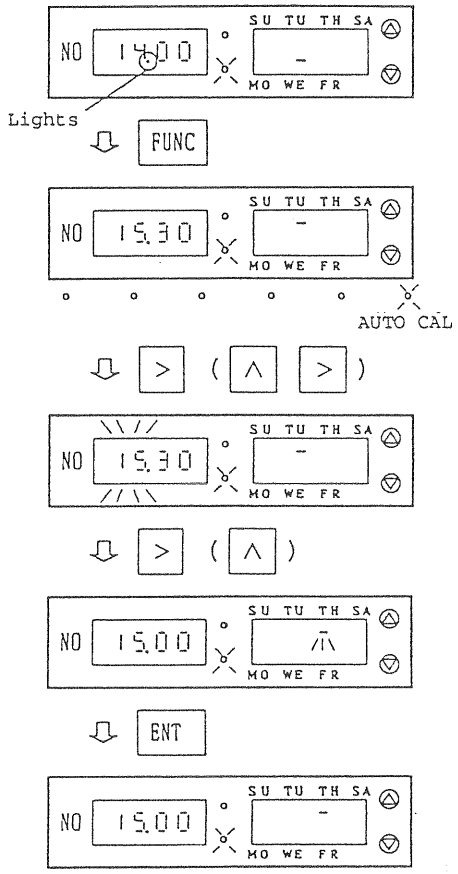
After setting the calibration start time, press the [>] key and the calibration start day can be set on the sub indication. The bar indication will flash.

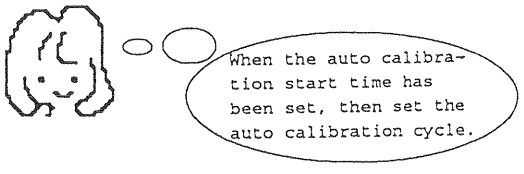
Press the [∧] key and the bar will shift.

> The auto calibration start time is settable up to one week ahead.

When the auto calibration start time and day have been set, press the [ENT] key. The data is stored in memory.

> When the auto calibration at the set time is finished, the next auto calibration start time will be set automatically.
> To confirm the next auto calibration start time, then carry out this operation and check the indication.





(6.3) Auto calibration cycle setting

The calibration cycle is settable in either 'days' or 'hours'.

Press the [FUNC] key at the calibration start time indication and ' CYCL ' will appear.

The AUTO CAL LED of the function indicating lamps will flash.

Press the [>] key and the auto calibration cycle is settable. The highest digit on the sub indication will flash.

Select either 'days' or 'hours' by pressing the [∧] key.

> ' d ' appears on the sub indication when selecting 'days' and ' H ' appears when selecting 'hours'.

Press the [>] key and the calibration cycle can be set in the lower digits of the sub indication.

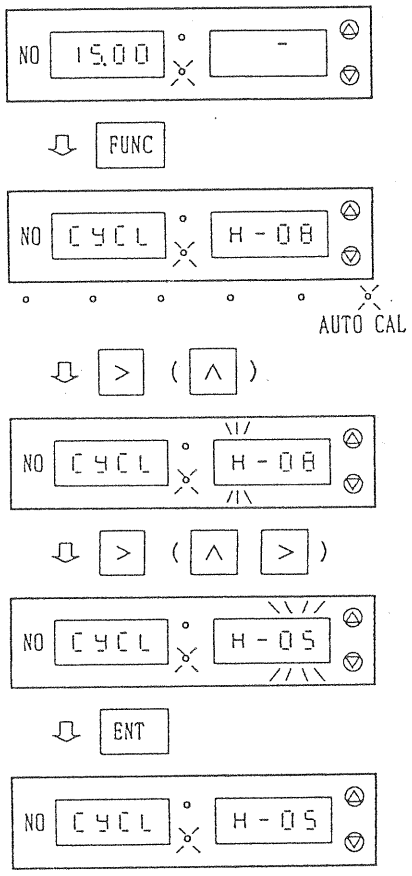
The numeric value is incremented by pressing the [∧] key.

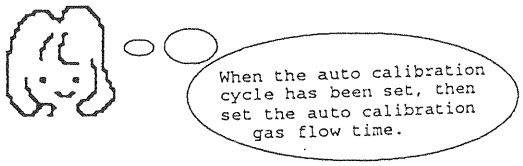
Press the [>] key and the digit can be selected.

> Day is settable in a range of 1 to 7 days. Hour is settable in a range of 1 to 99 hours.

> **Note**
>
> If ' 00 ' (hours) is set, it will be automatically set to ' 1 ' (hour).

Press the [ENT] key when the calibration cycle has been set. The data is stored in memory.





(6.4) Calibration gas flow time setting

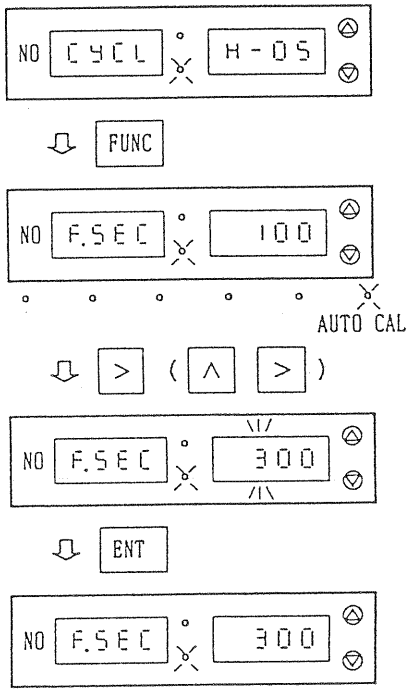
Press the [FUNC] key at the calibration cycle indication and ' F.SEC ' will appear.

The AUTO CAL LED of the function indicating lamps will flash.

Press the [>] key and the auto calibration gas flow time is settable.

Set the flow time on the sub indication. The numeric value is incremented by pressing the [∧] key.

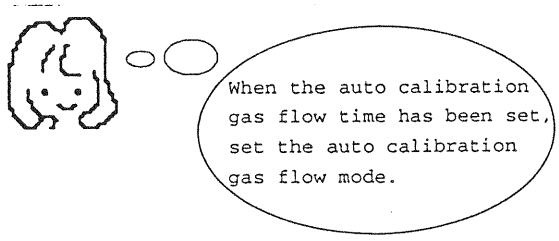
Press the [>] key and the digit can be selected.



> The setting range is 100 to 599 seconds.

Press the [ENT] key when the calibration gas flow time has been set. The data is stored in memory.

> The time set in this mode is common to all the calibration gas flow time including replacement time.



(6.5) Calibration gas flow mode setting

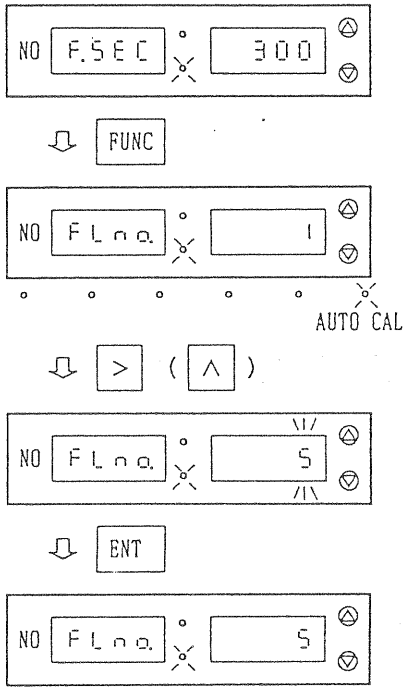
Select a calibration gas flow mode according to the number of components to be calibrated.

Press the [FUNC] key at the calibration gas flow time indication and 'FLno' will appear.

The AUTO CAL LED of the function indicating lamps will flash.

Press the [>] key and the auto calibration gas flow time is settable.
Set the flow mode no. by pressing the [∧] key.
(See the table below for the meaning of the flow mode no.)

Press the [ENT] key when the calibration gas flow mode has been set. The data is stored in memory.



Meaning of flow modes

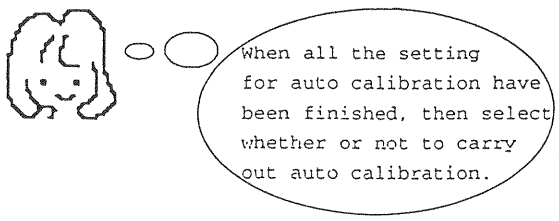
Mode no. 1: Zero gas

Mode no. 2: Zero gas - 1st component span gas

Mode no. 3: Zero gas - 1st component span gas - 2 component span gas

Mode no. 4: Zero gas - 1st component span gas - 2 component span gas (O_2)

Mode no. 5: Zero gas - 1st component span gas - 2 component span gas - 3rd component span gas (O_2)



(6.6) Auto calibration ON/OFF setting

Select whether or not to carry out auto calibration.

Set to 'oFF' when calibration will not be made.

Press the [FUNC] key at the calibration gas flow mode indication and 'ACAL' will be appear.

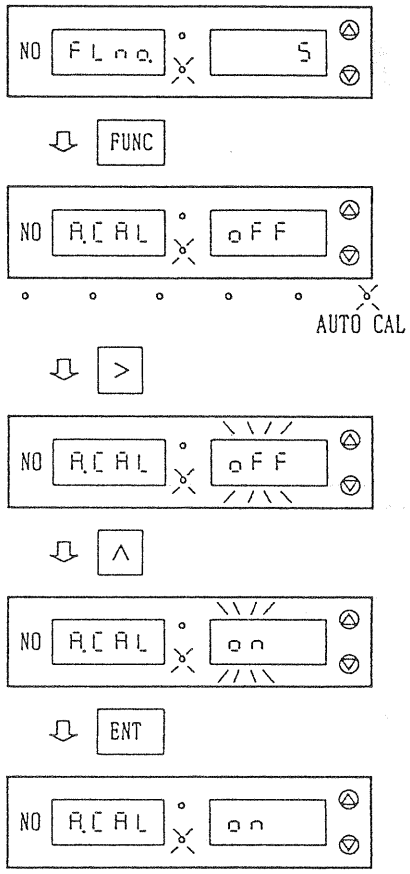
The AUTO CAL LED of the function indicating lamps will flash.

Press the [>] key and auto calibration ON or OFF can be set.

Select either 'on' or 'oFF' on the sub indication by pressing the [∧] key.

When the auto calibration ON/OFF setting is finished, pres the [ENT] key.

Setting operation is now completed.



⑦ Key lock ON/OFF setting

This function is intended to prevent erroneous key operation.

By pressing the key lock at ' on ', keys other than the [FUNC] key will be inoperable.

To release the function, set at ' oFF '.

Press the [FUNC] key in the measuring status and ' LOC. ' will be indicated.

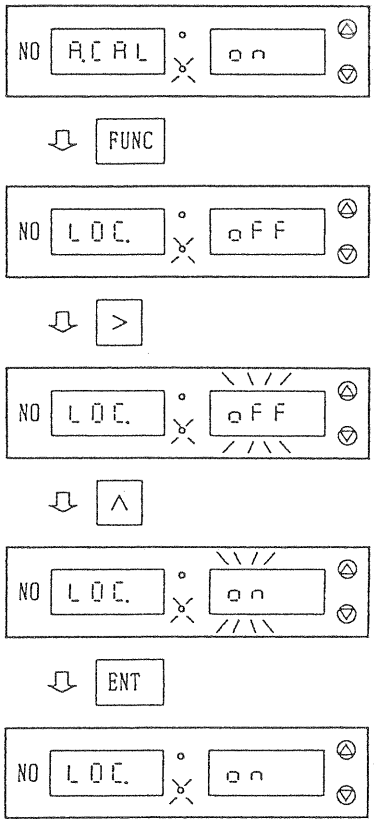
Now press the [>] key and the key lock can be set.

The sub indication will flash.

Set the key lock ON or OFF by pressing the [∧] key.

Press the [ENT] key when the key lock setting is finished.

Setting operation is now completed.



When the key lock is set at ' on ' keys other than the [FUNC] key are inoperable.

⑧ Zero calibration

This is used for adjusting the zero point.

Flow the zero gas and wait until the indication stabilizes. When the Zirconia O_2 analyzer is used, use air as the zero gas. Note 1)

When the indication has stabilized, select the measuring range to be calibrated by using the △ ▽ keys.

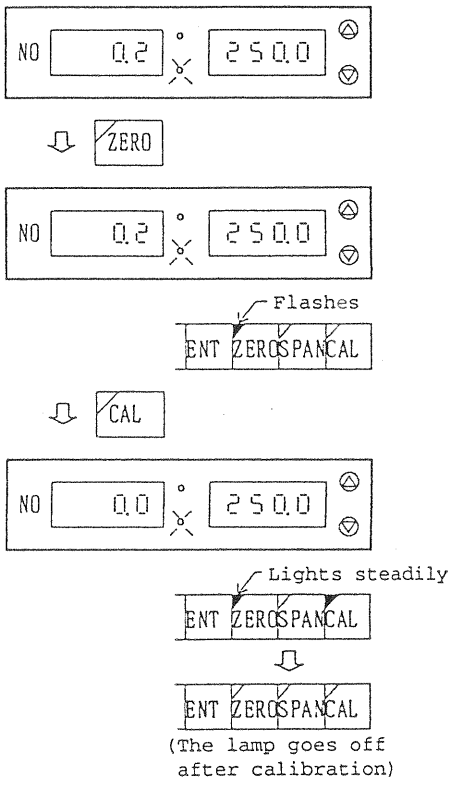
> When using a multi-component analyzer, undergo zero calibration at the selected range and component. Note 2)

Since the measuring status is resumed after the calibration, carry out the calibration for other ranges if necessary.

Press the [ZERO] key, and [ZERO] key lamp will flash.

After the indication is stabilized, press the [CAL] key and conduct zero calibration.

The [CAL] key lamp lights steadily during calibration.



The calibration is completed when the key lamp goes off. After the calibration, it is reset in measurement mode. Calibrate other ranges as necessary.

Note 1) When using gas separately for low and high ranges, apply 9 to 10 Vol% O_2/N_2 which has been set for low range.

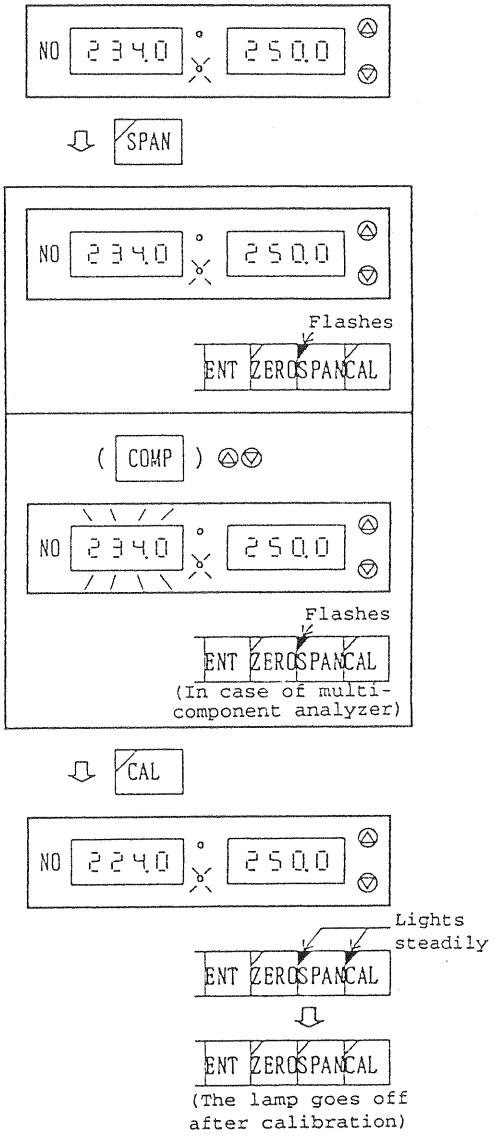
Note 2) Calibration component should be set in zero calibration select mode (see Item 5.2 ①, ②)

⑨ Span calibration

Carry out span calibration by flowing calibration gas at the concentration set as a span value.

Flow the calibration gas at 0.5 ℓ/minute. Wait until the indication stabilizes, and then conduct span calibration.

Press the [SPAN] key and the [SPAN] key lamp flashes.



> In the case of multi-component analyzer, the main indication will flash for the components which can be calibrated.
> Press the [COMP] key and the calibratable gas component will change.
> When the gas component has been determined, press the △ ▽ keys and select a range.

Note) The lamp will not flash in the case of a single-component analyzer.

After the indication is stabilized, press the [CAL] key and conduct span calibration.

The [CAL] key lamp lights steadily during calibration.

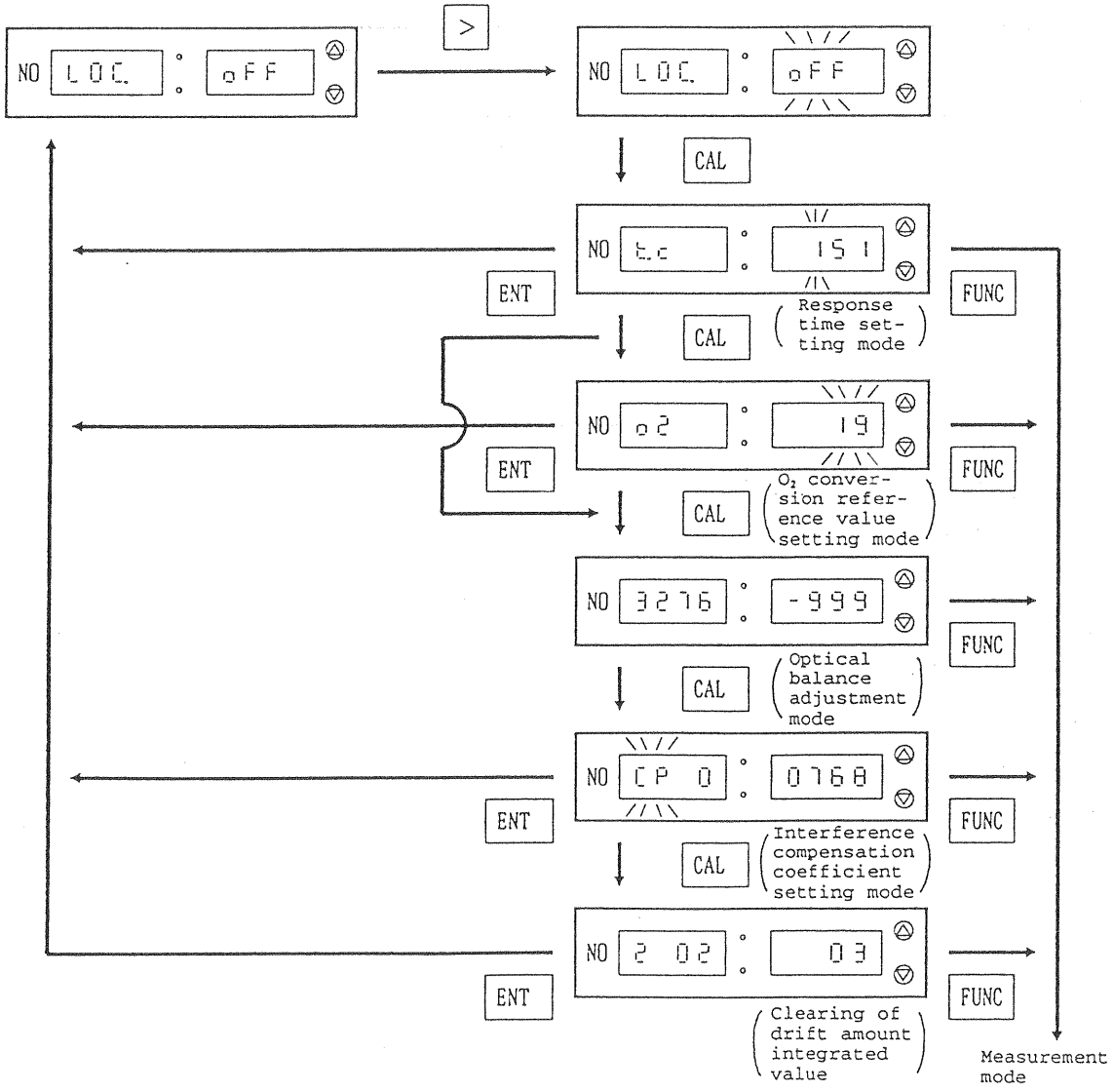
The calibration is completed when key lamp goes off.

Since the measuring status is resumed after calibration, continue the calibration for each component and each range.

6. MAINTENANCE MODE

The maintenance mode refers to setting and adjustment in the following five modes.

- Response time setting mode (Refer to ①)
- O_2 conversion reference value setting mode (option) (Refer to ②)
- Optical balance adjustment mode (Refer to ③)
- Interference compensation coefficient setting mode (Refer to ④)
- Indication and clearing of drift amount integrated value (Refer to ⑤)



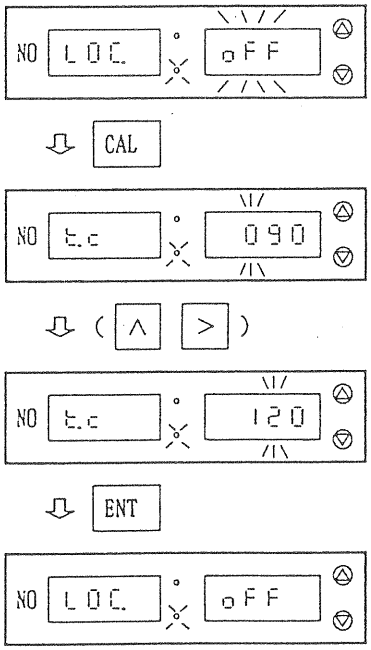
Cautions on Operation

1. Note that there is no O_2 conversion reference value setting mode when an O_2 indication and conversion function is not provided. If [CAL] key is pressed in the response time setting mode, then optical balance adjustment will be indicated.
2. Be sure to press the [ENT] key when each setting is finished. If another key is pressed without pressing [ENT], then the set numerics will not be registered.
3. After pressing [ENT] key, "LOC" indication will light up.

① Response time setting

With the " LOC " indication flashing, press the [CAL] key and " t.c " will be indicated. The sub indication will now flash.

Press [COMP] key and select the desired component.



Set the response time of the electrical system. Set numerics (1 to 199) from the highest digit which is flashing on the sub indication.
The settable range is 1 to 49 for O_2.

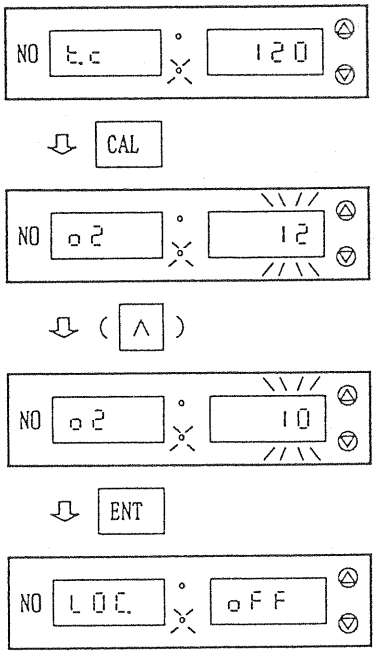
90% response time (electrical system) ≒ 0.22 x (1 to 199) sec.

Press the [∧] key and the numeric will be incremented. The digit can be selected by pressing the [>] key.
Press the [ENT] key after setting the response time.

② O_2 conversion reference value setting

With the " LOC " indication flashing, press the [CAL] key and " o2 " will be indicated.
The sub indication now flashes.
Set a reference value (1 to 19) $\%O_2$.
Press the [∧] key and the numeric will be incremented.
Press [ENT] key after setting a reference value.

$$O_2 \text{ converted concentration} = \frac{21 - \text{Set value}}{21 - O_2 \text{ concentration}} \times \text{NO} \times \text{concentration}$$

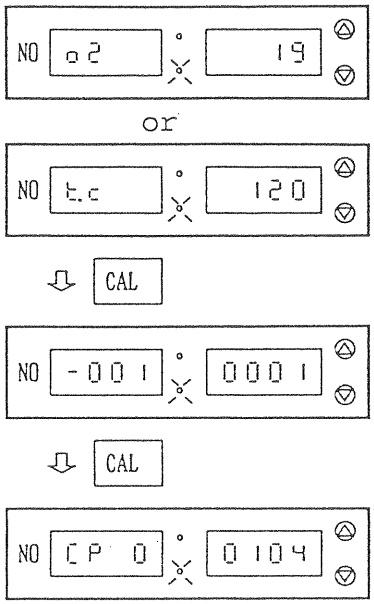


③ Optical balance adjustment

When the sample cell is reassembled after having been detached for cleaning or the like, this optical zero adjustment should be performed before use.
When this mode is assumed, the input signal from the measurement detector is displayed on the main indicator while the input signal from the interference compensating detector is displayed on the sub indicator.
The numerics vary in a range of -999 to 3200.
This adjustment is made so that the readings on both indicators approach zero. Refer to section 7 "Maintenance" for details.

With the "LOC." indication flashing, press the CAL key and the input signal from the measurement detector will appear on the main indicator while the input signal from the interference compensating detector will appear on the sub indicator.

Press the CAL key after the optical balance adjustment.



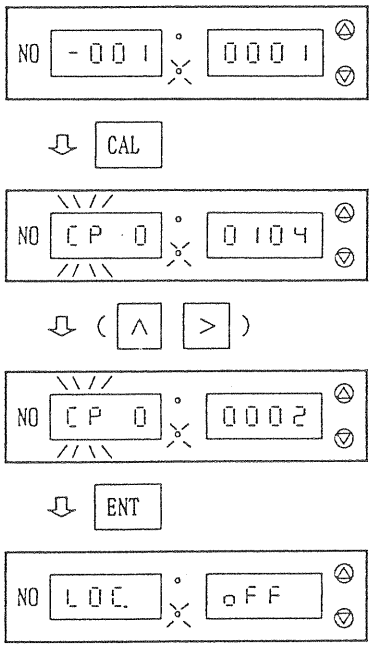
CAUTION!!

A mistake in this adjustment will cause problems in measurement.

④ Interference compensation coefficient setting

This is used for adjusting the interference compensation when there is much interference. In this mode, the indication is adjusted, while flowing interference gas (0 or 2°C saturated H_2O), so that it is nearly zero or within 2% of the value obtained by dividing 30,000 by the range ratio. Refer to section 7 "Maintenance " for details.

With the " LOC. " indication flashing, press the [CAL] key and " CP " will be indicated. Main display lamp " CP " flickers.
(The compensation coefficient is the lower two digits on the main indicator and a value within -32768 to 32768 on the sub indicator.)
(The lower 2nd digit of main display is negative symbol.)



Press the [COMP] key and select the desired component.

Set the compensation coefficient.
Press the [^] key and the numeric will be incremented.
Press the [>] key and the numeric will be decremented.
Press [ENT] key after setting the compensation coefficient.

CAUTION!!

A mistake in this adjustment will cause problems in meaurement.

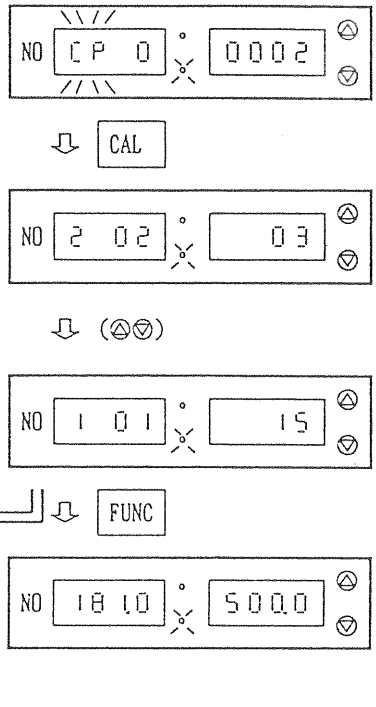
⑤ Indication and clearing of integrated drift value

When the " LOC " indication flashing, press the [CAL] key and indicate the zero point drift amount on the main indicator and the span point drift amount on the sub indicator for each component.

Select the range with the △ ▽ keys and the integrated zero point and span point drift values will be indicated for that range.

When the integrated drift value appears, press the [FUNC] key and the measurement mode will be resumed.

[ENT]



Zero clearing

Carry out zero clearing after cleaning the sample cell.when the integrated drift value appears on the indicator, press the [ENT] key and the integrated zero point and span point drift values will be cleared to zero for each component and each range. The indicator will then display " LOC ".

7. MAINTENANCE

7.1 Routine maintenance

(1) Zero and span calibration

① Carry out zero calibration with reference to the method in section 5.2.

② Nest carry out span calibration with reference to the method in section 5.2

③ Zero and span calibration should be made about once a week or when necessary.

(2) Check of flow rate.

① The flow rates for sample gas, standard gas and purge gas are as follows.

Sample gas and standard gas flow rates

Standard type analyzer	0.5±0.25 ℓ/minute (sample gas)
Sample switching type	(1ℓ+1ℓ)±0.1ℓ/minute (sample gas + reference gas)
Flow differential type	(0.5ℓ+0.5ℓ)±0.25ℓ/minute (sample gas + reference gas)

Purge gas flow rate: about 1 ℓ/minute

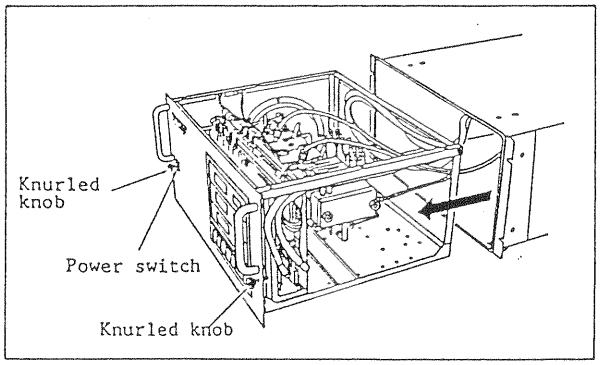
② Inspection and maintenance should be carried out about once a day or as necessary.

7.2 Periodical inspection

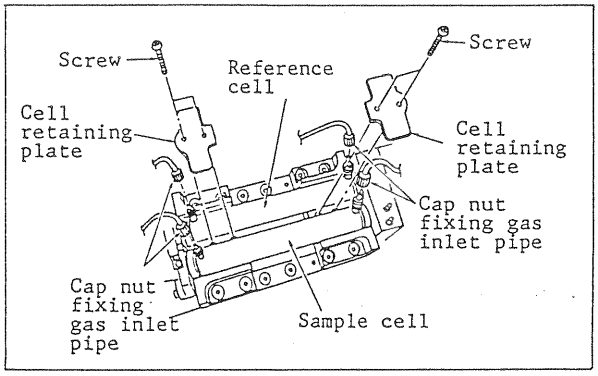
7.2.1 How to clean sample cell (pipe cell)

This instrument has been carefully adjusted before shipment from the factory. If it should require readjustment, then please contact Fuji.

(1) Turn off the power switch, stop the flow of sample gas and flow zero gas for a few minutes.
Loosen the knurled knobs on the front panel and pull out the analyzer interior by means of the grips.

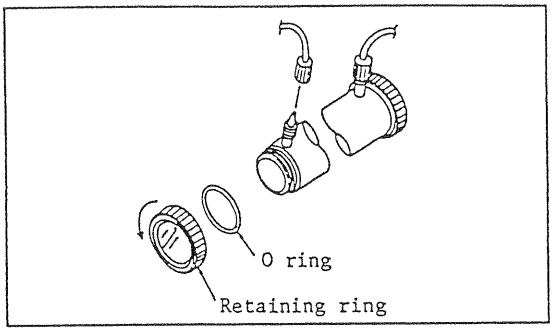


(2) Loosen the cap nuts fixing the gas inlet pipe, and detach the internal gas inlet pipe.



(3) Remove the screws from the left and right cell retaining plates.
- In the case of the sample switching type, remove both the sample and reference cells.
- With the standard type, remove only the sample cell.

(4) Turn the retaining ring (with transparent window) to the left and remove it from the cell. Refer to Fig. 3A (page 7-6.)



(5) For cleaning the infrared-ray transmitting window and cell interior, first remove heavy contamination with a soft brush or the like, then wipe lightly with the furnished cleaning cloth for sample cell. Be especially careful when cleaning the window since it is easily scratched.

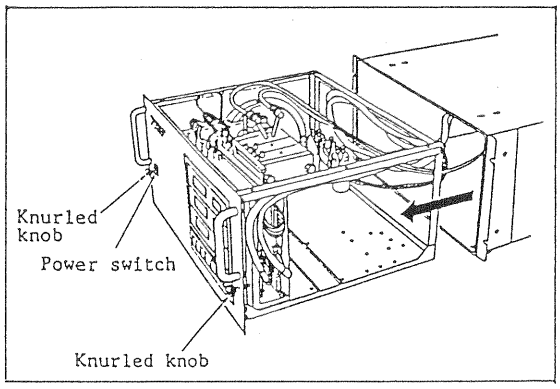
Note

If the infrared-ray transmitting window is only lightly contaminated, it can be cleaned by wiping lightly with the cleaning cloth for sample cell to which chrome oxide powder is added. But if heavily contaminated, then the window must be replaced. Be careful not to apply unreasonable force when cleaning.

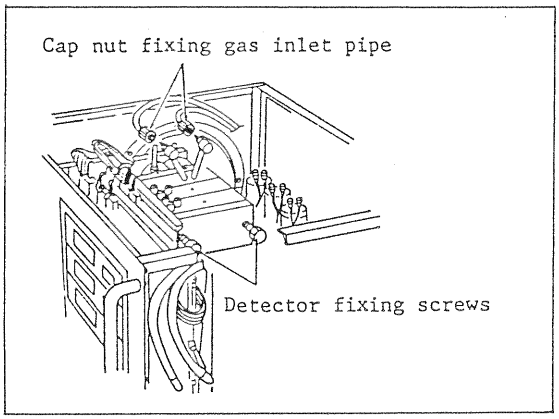
(6) When cleaning of the sample cell is finished, then reassemble the cell in its original position.
If the zero point has deviated considerably when operating again, select a low range and carry out optical zero adjustment (refer to item 7.2.3).

7.2.2 How to clean sample cell (block cell)

(1) Turn off the power switch, stop the flow of sample gas and flow zero gas for a few minutes.
Loosen the knurled knobs on the front panel and pull out the analyzer interior by means of the grips.



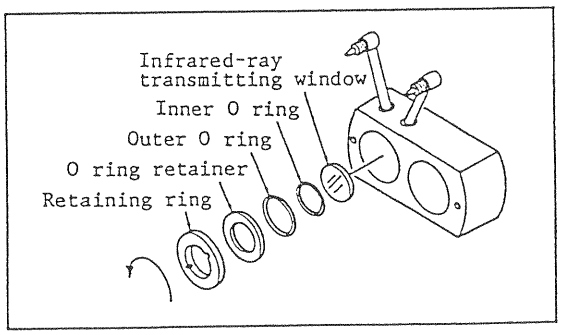
(2) Loosen the cap nuts fixing the gas inlet pipe and remove the internal gas inlet pipe.



(3) Remove two detector

Note: Be careful since the distribution and block cells are fixed together with the detector.

(4) Using the furnished cell assembly tool, turn the retaining ring leftward and detach it from the cell.
Refer to Fig. 3B (page 7-7).



(5) For cleaning the infrared-ray transmitting window and cell interior, first remove heavy contamination with a soft brush or the like, then wipe lightly with the furnished cleaning cloth for sample cell.
Be especially careful when cleaning the window since it is easily scratched.

Note

If the infrared-ray transmitting window is only lightly contami-nated, it can be cleaned by wiping lightly with the cleaning cloth for sample cell to which chrome oxide powder is added. But if heavily contaminated, then the window must be replaced. Be careful not to apply unreasonable force when cleaning.

(6) When cleaning of the sample cell is finished, then reassemble the cell in its original position.
If the zero point has deviated considerably when operating again, select a low range and carry out optical zero adjustment (refer to item 7.2.3).

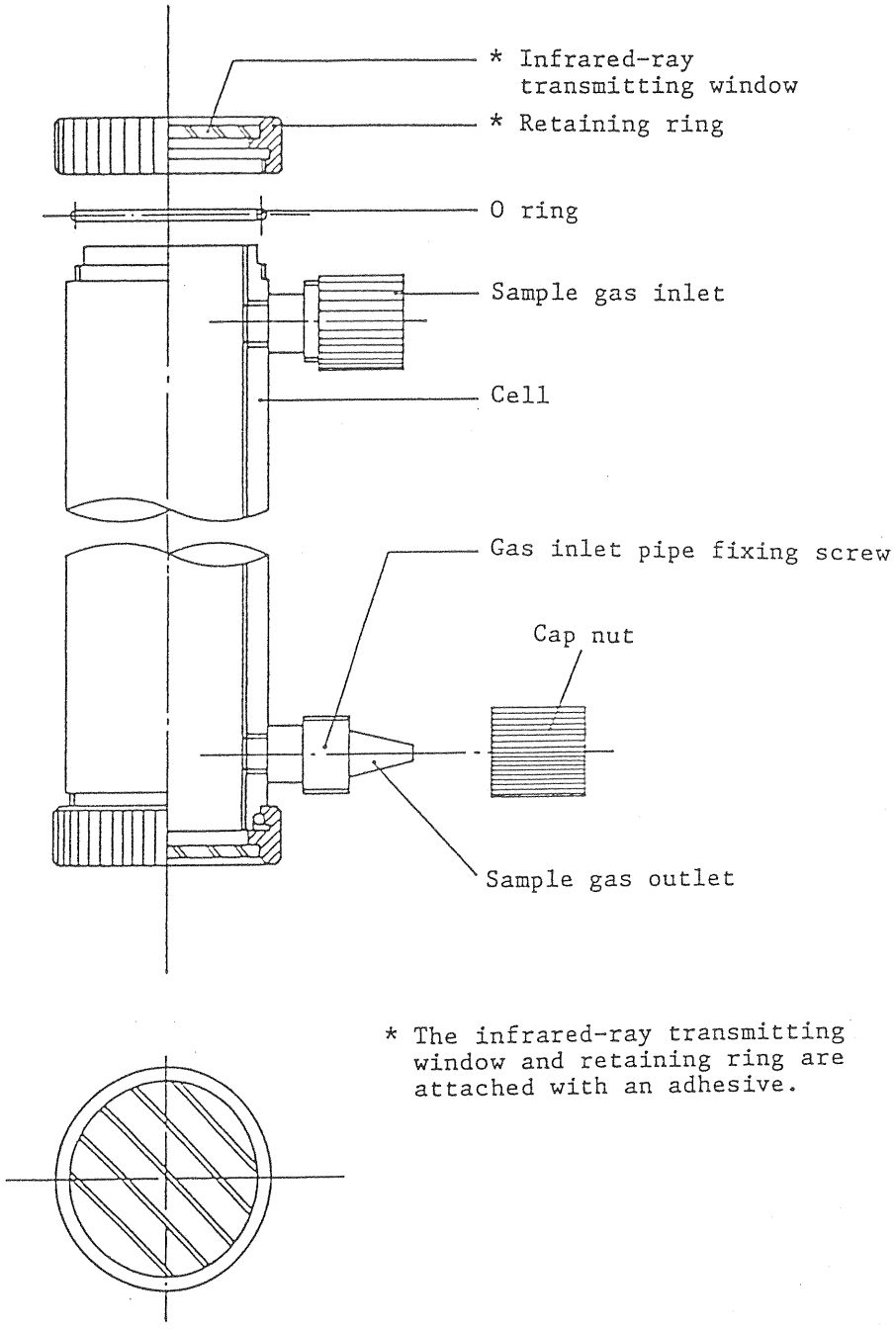
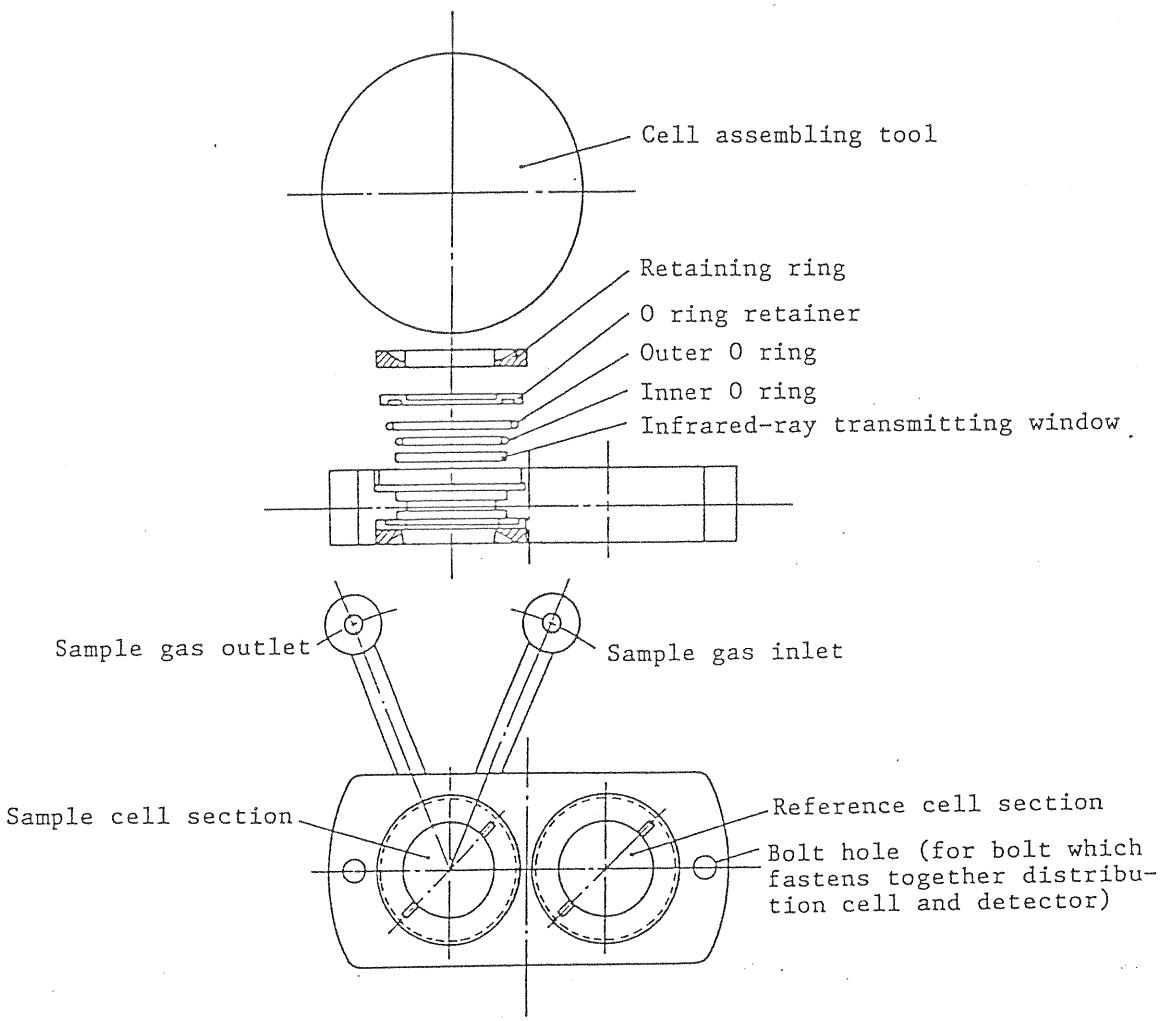


Fig. 3A Sample cell structure (pipe cell)

Use the exclusive cell assembling tool (furnished).



Sample cell structure (for cells with length of 32, 16, 8, 4, 2 mm)

(The sample cell and reference cell are integral.)

Fig. 3B Sample cell structure (block cell)

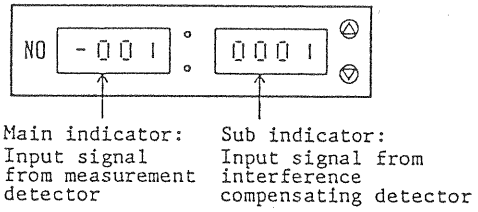
7.2.3 Optical zero adjustment method

When the sample cell is reassembled after having been removed for cleaning or the like, this adjustment should be carried out before use. Following is the adjustment procedure.

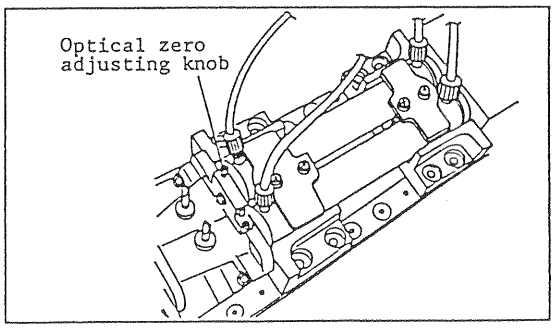
(1) First carry out electrical zero adjustment.
With the power turned off, detach the connectors CN2 and 3 (for 1st component) and CN4 and 5 (for 2nd component) leading from the detector which are connected with the main PCB (2).
Next, turn on the power and calibrate the zero point using [ZERO] and [CAL] keys.

(2) Turn off power, connect the connectors CN2 and 3 (1st component) and CN4 and 5 (2nd component), and turn on power again. Supply dry nitrogen from the sample gas inlet and wait until the indication stabilizes.

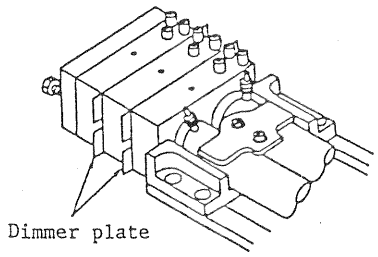
(3) Set up the optical zero adjustment mode as in 6-3. The following indications will appear on the main and sub indicators of the analyzer front panel.



(4) Operate the optical zero adjusting knob so that the numeric value on the main indicator approaches zero (within ±10).



(5) Operate the dimmer plate so that the numeric value on the sub indicator approaches zero (within ±10).



(6) Repeat steps (4) and (5) to bring the numeric values on the main and sub indicators as close to zero as possible.

CAUTION!!

A mistake in this adjustment will cause problems in meaurement.

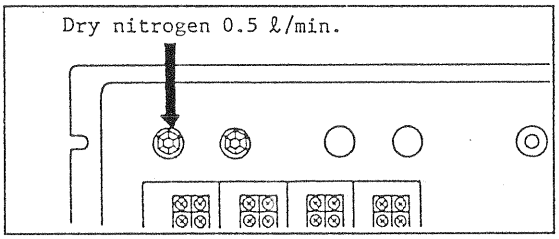
7.2.4 Interference compensation adjusting method

Since this adjustment is difficult, please contact Fuji if it becomes necessary.

Adjust the interference compensation if the effect of interference is large (more than ±2% of full scale).

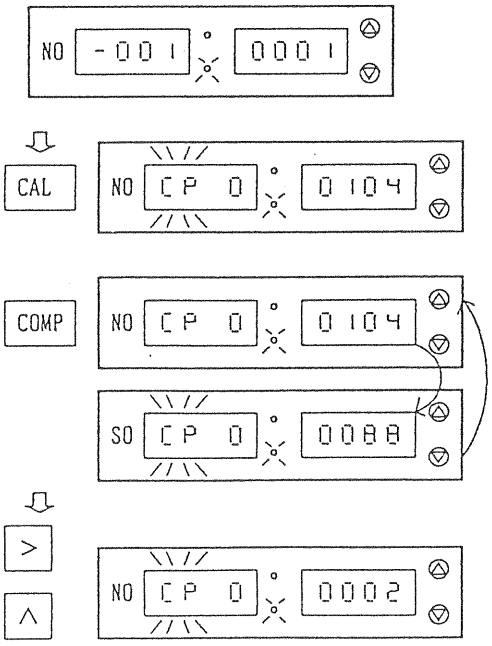
7.2.4-1 In case standard type and flow differential type systems

(1) After warming up the instrument, supply dry nitrogen at a rate of 0.5 ℓ/minute from the sample gas inlet. (With the flow differential system, supply dry nitrogen continually to the reference cell.)



(2) Carry out zero calibration using the ZERO and CAL keys.

(3) Set up the interference compensation setting mode as in section 6-4.



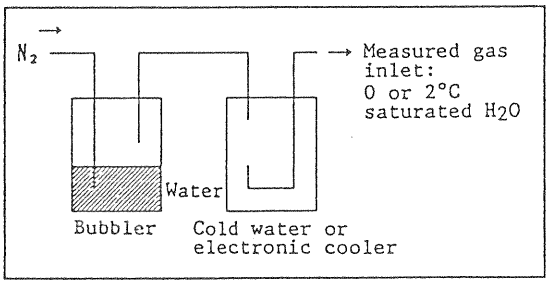
" CP " will appear in the upper two digits of the main indicator on the front panel while a total of 5 numerals will appear in the lower digit of the main indicator plus the four digits of the sub indicator. (A negative sign appears in the second lowest digit of the main indicator.).

(4) Supply interference gas (0 or 2°C saturated H_2O) as shown in the figure. When the indication has stabilized, press the [COMP] key and select the component to be adjusted, then adjust by using the [>] and [^] keys so that the indicated value approaches zero or within 2% of the value obtained by dividing 30,000 by the range ratio.

When range ratio is 1 : [5] (low range: high range)

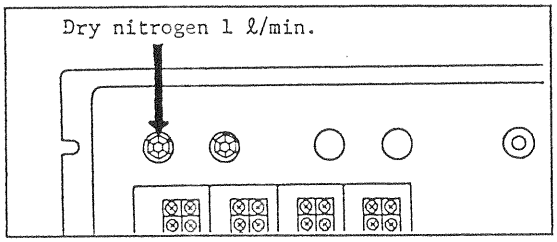
$$30{,}000 \times \frac{1}{[5]} \times 0.02 = 120$$

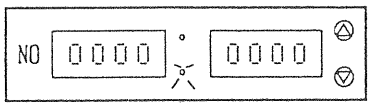
Adjust to obtain a value of nearly zero within ±120.



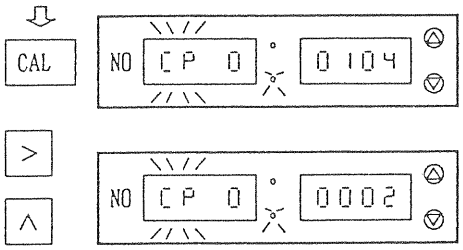
7.2.4-2 In case of sample switching system

(1) After warming up the instrument, supply dry nitrogen at a rate of 1 ℓ/minute from the measured gas inlet. Detach the pipe from the reference cell gas inlet (light source side) and flow dry nitrogen at 1 ℓ/minute via a





(Zero point adjustment)



(2) Carry out zero calibration using the [ZERO] and [CAL] keys.

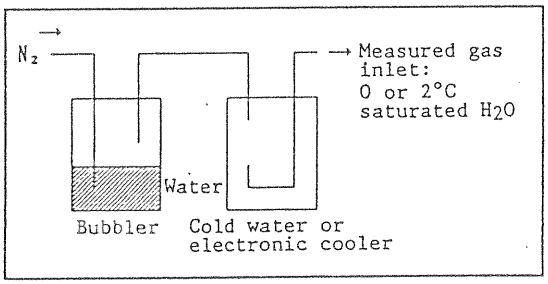
(3) Set up the interference compensation setting mode as in section 6-4. "CP" will appear in the upper two digits of the main indicator on the front panel while a total of 5 numerals will appear in the lower digit of the main indicator plus the four digits of the sub indicator.
(A negative sign appears in the second lowest digit of the main indicator.)

(4) Supply interference gas (0 or 2°C saturated H_2O) as shown in the figure. When the indication has stabilized, adjust by using the [>] and [^] keys so that the indicated value approaches zero or within 2% of the value obtained by driving 30,000 by the range ratio.

When range ratio is 1 : [5] (low range: high range)

$$30{,}000 \times \frac{1}{[5]} \times 0.02 = 120$$

Adjust to obtain a value of nearly zero within ±120.



(5) Return the reference cell pipe to its original position.

8. ERROR CODES AND REMEDIES

This analyzer is provided with self-diagnosis functions, and an error code is displayed if an abnormality occurs in the instrument.

Carry out the following remedies when an error code appears.

- When an error code appears, first check for an abnormality in the power supply or gas piping.
- The analyzer will not operate correctly unless the cause of the error is removed. But, the error indication remains as it is as a history until the [ENT] key is pressed.

Error codes and countermeasures

Error code	Contents of error code	State of analyzer	Cause	Check and countermeasure
E-0	Trouble with digital circuit (memory read/write impossible)	Not operated until trouble is removed.	• Malfunction due to noise • Digital circuit is defective.	• Turn ON the power supply. When the analyzer operates correctly, it is considered normal. • Replace the main printed circuit board.
E-1	Trouble with digital circuit (output ic read/write impossible)			
E-3	Synchronizing signal has stopped.	• Both the indicated value and output value have stopped. • LED stops flickering at each setting.	• Improper adjustment of synchronizing signal • Improper rotation of motor and chopper • Synchronizing signal process circuit is defective. • Instantaneous power failure	• Adjust synchronizing signal on main printed circuit board 2. (CP1 - CS. VR1) • Check motor and chopper for proper rotation. • Check connector for proper connection. • Replace main printed circuit board 2.
E-4	Zero point calibration is out of the calibration range.	Measurement is possible but zero calibration is impossible.	• Improper zero gas • Unbalance of optical system • Optical system parts are defective.	• Check gas components and dew point. • Check sampling system. • Check the inside of cell for contamination. • Adjust the balance of optical system. • Replace light source. • Replace sensor.
E-6	Integrated drift of zero point exceeds 50%/FS of each measurement range.			
E-8	One-time zero point calibration exceeds 50%/FS of measurement range.			

Error code	Contents of error code	State of analyzer	Cause	Check and countermeasure
E-5	Span point calibration is out of calibration range.	Measurement is possible but zero calibration is impossible.	• Improper setting of calibration set value and cylinder • Unbalance of optical system • Optical system parts are defective.	• Check calibration set value and cylinder. • Check sampling system. • Check the inside of cell for contamination. • Adjust the balance of optical system. • Replace light source. • Replace sensor.
E-7	Integrated drift of span point exceeds 50%FS of each measurement			
E-9	One-time span point calibration exceeds 50%/FS of measurement range.			
E-10	Zero calibration is impossible due to astable input.	Measurement is possible but calibration is impossible.	• Abnormal sampling system (improper gas flow) • Defective sensor • Effect of vibration	• Check piping connection and gas flow. • Replace sensor. • Check wiring and connector. • Check operating conditions and carry out vibration-proofing.
E-11	Span calibration is impossible due to astable input.	Measurement is possible but span calibration is impossible.		
E-16	O_2 input signal is low.	Measured value of O_2 analyzer is different from density.	• O_2 sensor is defective. • Input circuit is defective.	• Check O_2 sensor output voltage. • Check wiring and connector.
E-23	O_2 input signal is over.			
E-17	Temperature sensor input signal is low.	Measurement error due to ambient temperature may become large.	• Temperature sensor is defective. • Temperature circuit is defective.	• Check resistance of TMP1 on printed circuit board 2.
E-24	Temperature sensor input signal is over.			

1. Error code appears at the sub indication in the case of a single-component analyzer, and at the 2nd component sub indication in the case of a multi-component analyzer.

2. When multiple errors have occurred, the error codes appear successively starting from the lowest numbered one upon pressing [ENT] key.
   After displaying all the error codes, press [ENT] key again and the error display disappears, but they will reappear if the fault is not removed.

3. Turn ON the power supply. When the analyzer operates correctly, it is considered normal.

4. When an error occurs, the FAULT contact output is conductive.

APPENDIX

Appendix 1. Specifications

General items

Power supply : 100V ±10% AC, 50/60Hz; 115 and 220V AC also available on request.
Refer to "Code symbols".

Power consumption: : 125VA max. (220VA max. when CO/CO_2 converter equipped)

Ambient temperature: : - 5 to +45°C

Ambient humidity: : 90%RH or less

Enclosure: : Steel casing, for indoor application

Outer dimensions (H x W x D):
Rack mounting type; 220 x 483 x 463mm
Panel flush mounting type; 220 x 443 x 463mm
Table top type; 232 x 443 x 463mm

Weight : Approx. 20kg

Finish color : Munsell 5Y 8/1

Indication : 4 digit LED for concentration
4 digit LED for sub-indication

Output hold:
Output value before manual or automatic calibration is held.
Whether or not to effect hold function can be selected.

Measured gas temperature: 0 to 50°C

Material of gas-contacting parts:
Sample cell; SUS304, neoprene rubber
Infrared-ray transmitting window; CaF_2 or sapphire
Internal tubing; Teflon tube, silicone tube, Toaron tube

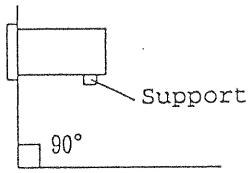
Gas inlet/outlet, purge gas inlet size:
Rc1/4 (PT1/4 internal thread) or NPT1/4 internal thread

Purge gas flow rate : 1±0.5ℓ/min (purging performed when necessary)

Scope of delivery:
Analyzer, mounting bracket, test report, power fuse, cloth for cleaning infrared-ray transmitting window

Mounting method:

Mounted on 19 inch rack, or flush on panel, or on table top



Remark: 70% or more of the analyzer weight should be supported at the bottom of the case.
(In case of mounting on panel or 19 inch rack, provide a support at the rear of casing).

Installation conditions:

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 of corrosive and/or combustible gases. If installing outdoor, provide a suitable casing or cover to protect the analyzer from wind, rain, etc.

Standard type

Measuring system:

Non-dispersion infrared-ray absorption method, single light source - double beam

Measurable components and measuring range:

Standard single-component analyzer

Measurable component		Min. measuring range [ppm]	Measuring range
CO	Carbon monoxide	0 to 100	Refer to table given in page A-8
CO_2	Carbon dioxide	0 to 50	
NO	Nitrogen monoxide	0 to 100	
SO_2	Sulfur dioxide	0 to 100	
CH_4	Methane	0 to 500	
$CC\ell_4$	Carbon tetrachloride	0 to 200	
N_2O	Nitrous oxide	0 to 200	
$CF_3CHBrC\ell$	Halothane	0 to 50	
$C_2HF_3C\ell$-$OCHF_2$	Ethlane	0 to 50	
C_2H_5OH	Ethyl alcohol	0 to 250	

Standard two-component analyzer

Measurable component		Min. measuring range [ppm]	Measuring range
NO + SO_2	Nitrogen monoxide + sulfur dioxide	0 to 250/0 to 250	Refer to "Code symbols"
CO + CO_2	Carbon monoxide + carbon dioxide	0 to 200/0 to 200	
CO_2 + CH_4	Carbon dioxide + Methane	0 to 100/0 to 1000	

Measuring range : Refer to table in page A-8 and A-9

Output signal : 0 to 1V or 4 to 20mA DC (allowable load resistance 550Ω or less), linear

Repeatability : Within ±0.5% of full scale

Linearity : Within ±1% of full scale

Zero drift : Within ±2% of full scale/week

Span drift : Within ±2% of full scale/week

Response time : 25 seconds (for 90% response) including gas substitution time; time differs with the length of sample cell

Measured gas flow rate : 0.5±0.25ℓ/min (Standard)

Sample switching type

This is an optimum sample switching type gas analyzer for measurement of low concentrations or for eliminating the effects of interfering components.

Measuring system:
Non-dispersion infrared-ray absorption method, single light source - double beam, sample switching system with integrated zero air generator.

Measurable component : CO (carbon monoxide)

Measuring range:

1st range [ppm]	2nd range [ppm]
0 to 10	None, 0 to 20, 25, 50, 100
0 to 25	None, 0 to 50, 100
0 to 50	None, 0 to 100
0 to 100	None

Output signal:
0 to 1V or 4 to 20mA DC, linear, step-like output which changes every 50 seconds

Repeatability : Within ±1% of full scale

Linearity : Within ±1% of full scale

Zero drift : Within ±0.5% of full scale/week

Span drift : Within ±1.5% of full scale/week

Response time : Within 120 seconds (for 90% response)

Measured gas flow rate : 2.0±0.2ℓ/min (reference gas + sample gas)

Differential flow type

This is an optimum gas analyzer of measurement in two modes, absolute concentration and concentration difference.

Measuring system:

Non-dispersion infrared-ray absorption method, single light source - double beam, flow differential system with integrated zero air generator for CO.

Measurable components and measuring range:

Measurable component		1st range [ppm]	2nd range [ppm]
CO_2	Carbon dioxide	-50 to +50 -100 to +100	0 to 500 0 to 1000
CO	Carbon monoxide	0 to 50 0 to 100 0 to 200 0 to 250	None, 0 to 100, 200, 250, 500 None, 0 to 200, 250, 500 None, 0 to 500 None, 0 to 500

Remark: There are restrictions on the reference gas conditions.

Output signal:

	1st range	2nd range
CO_2	-1 to +1V DC	0 to 1V DC
CO	0 to 1V or 4 to 20mA DC	0 to 1V or 4 to 20mA DC

Remark: Linear output

Repeatability : Within ±0.5% of full scale

Linearity : Within ±1% of full scale

Zero drift : Within ±2% of full scale/week (within ±2% of full scale/day for 0 to 50ppm range)

Span drift : Within ±2% of full scale/week (within ±2% of full scale/day for 0 to 50ppm range)

Response time : 25 seconds max. (for 90% response) including gas substitution time

Measured gas flow rate : 0.5±0.25ℓ/min (reference gas + sample gas)

Optical specifications

(These are added on request. Refer to the "Code symbols".)

Filter, flow checker:
Membrane filter and flow checker are built in.
Remark: The built-in membrane filter is a glass-fiber paper monitoring type. The pre-filter should be prepared separately.

Pump: A small two-throw electromagnetic pump is built in, so sample gas and reference gas can be sampled separately at the same time.

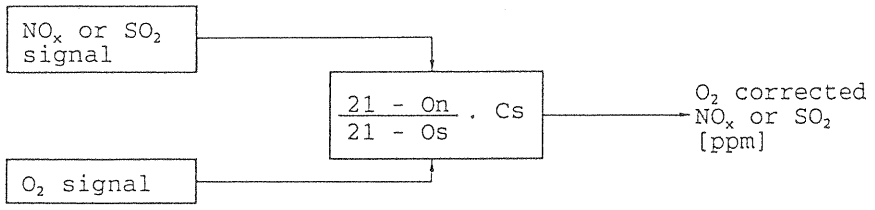
CO/CO_2 converter:
This converter uses a special catalyst for converting efficiently into CO_2 the CO contained in sample gas which is used in the sample switching type etc. The converter is built in the analyzer.

O_2 correction output:
An exclusive O_2 sensor is used for correcting the measured gas concentration into the value at standard O_2 concentration.
For obtaining the NO_x and/or SO_2 exhaust standard value, ZRF can measure the NO_x and/or SO_2 concentration and simultaneously the residual oxygen concentration in exhaust gas, and then correct according to the following equation.
(Application of this equation is mandatory for the NO_x or SO_2 exhaust standard.)

$$C = \frac{21 - On}{21 - Os} \cdot Cs$$

Where, C: Concentration after O_2 correction
Cs: NO_x or SO_2 measured concentration
Os: O_2 measured concentration
On: O_2 standard concentration

Block diagram



The O_2 measured signal is according to the exclusive O_2 sensor (type ZFK) or external O_2 meter (0 to 1V DC/0 to 25% O_2).

O_2 output signal:
0 to 1V or 4 to 20mA DC

O_2 converted output signal:
0 to 1V or 4 to 20mA DC, linearity ±2% of full scale; output can be provided for each of 1st and 2nd components

Alarm output:

Upper limit alarm;	Contact output	1c contact
	Contact capacity	250V, 2A AC (resistive load)
Lower limit alarm;	Contact output	1c contact
	Contact capacity	250V, 2A AC (resistive load)

Remote range changeover:
Range is changeable via external signal.
Range changeover input signal: 5V DC

Range identification signal output:
Contact output 1a contact
Contact capacity 250V, 2A AC (resistive load)

Average value output:
Average value is output every hour.
Output signal; 0 to 1V or 4 to 20mA DC, linear

Automatic calibration:
Zero and span are automatically calibrated at the preset cycle. Both of calibration gas and electromagnetic valve are not included.

Calibration channel:
Up to 3 components can be calibrated simultaneously.

Zero calibration point:
Fixed at 0% (Zirconia O_2 meter allows setting zero points)

Span calibration point:
0 to 100% full scale

Calibration start:
Via built-in timer or remote start signal

Output hold at calibration:
Possible

Calibration gas flow mode:
(1) Zero gas
(2) Zero gas - span gas 1
(3) Zero gas - span gas 1 - span gas 2
(4) Zero gas - span gas 1 - span gas 3(O_2)
(5) Zero gas - span gas 1 - span gas 2 - span gas 3(O_2)

Calibration gas flow time:
Settable from 100 to 599 seconds

Calibration cycle:
1 to 99 hours (1-hour units) or 1 to 7 days (1-day units)

Calibration failure alarm:
Provided when fault occurs during auto calibration.

Contact output:
During calibration; 1a contact, contact capacity 250V, 2A AC (resistive load)
Calibration failure; 1a contact, contact capacity 250V, 2A AC (resistive load)
Electromagnetic valve drive; 1a contact, contact capacity 250V, 2A AC (resistive load)

Remote start:
Remote start signal, voltage input 5V DC

Communication interface:
RS232C

NDIR TYPE INFRARED GAS ANALYZER

(Standard single-component analyzer measuring ranges)

Measurable component	2nd range	1st measuring range														
		50ppm	100ppm	200ppm	250ppm	500ppm	0.1%	0.2%	0.5%	1%	2%	5%	10%	20%	50%	100%
CO	×0	–	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	×2	–	O	O	O	O	O	O	O	O	O	O	O	O	O	–
	×2.5	–	O	O	O	O	O	O	O	O	O	O	O	O	–	–
	×4	–	O	O	O	O	O	O	O	O	O	O	O	O	–	–
	×5	–	O	O	O	O	O	O	O	O	O	O	O	O	–	–
	×8	–	O	O	O	O	O	O	O	O	O	O	O	–	–	–
	×10	–	O	O	O	O	O	O	O	O	O	O	O	–	–	–
	×20	–	O	O	O	O	O	O	O	O	O	O	–	–	–	–
CO_2	×0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	×2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	–
	×2.5	O	O	O	O	O	O	O	O	O	O	O	O	O	–	–
	×4	O	O	O	O	O	O	O	O	O	O	O	O	O	–	–
	×5	O	O	O	O	O	O	O	O	O	O	O	O	O	–	–
	×8	O	O	O	O	O	O	O	O	O	O	O	O	–	–	–
	×10	O	O	O	O	O	O	O	O	O	O	O	O	–	–	–
	×20	O	O	O	O	O	O	O	O	O	O	O	–	–	–	–
NO	×0	Δ	O	O	O	O	O	O	Δ	–	–	–	–	–	–	–
	×2	Δ	O	O	O	O	O	O	Δ	–	–	–	–	–	–	–
	×2.5	Δ	O	O	O	O	O	Δ	–	–	–	–	–	–	–	–
	×4	Δ	O	O	O	O	Δ	–	–	–	–	–	–	–	–	–
	×5	Δ	O	O	O	O	Δ	–	–	–	–	–	–	–	–	–
	×8	Δ	O	O	O	Δ	–	–	–	–	–	–	–	–	–	–
	×10	Δ	O	O	O	Δ	–	–	–	–	–	–	–	–	–	–
	×20	Δ	O	O	Δ	–	–	–	–	–	–	–	–	–	–	–
SO_2	×0	Δ	O	O	O	O	O	O	O	O	O	O	O	*	*	*
	×2	Δ	O	O	O	O	O	O	O	O	O	O	*	*	*	–
	×2.5	Δ	O	O	O	O	O	O	O	O	O	O	*	*	–	–
	×4	Δ	O	O	O	O	O	O	O	O	O	*	*	*	–	–
	×5	Δ	O	O	O	O	O	O	O	O	O	*	*	*	–	–
	×8	Δ	O	O	O	O	O	O	O	O	*	*	*	*	–	–
	×10	Δ	O	O	O	O	O	O	O	O	*	*	*	–	–	–
	×20	Δ	O	O	O	O	O	O	O	*	*	*	–	–	–	–
CH_4	×0	–	–	Δ	Δ	O	O	O	O	O	O	O	O	O	O	O
	×2	–	–	Δ	Δ	O	O	O	O	O	O	O	O	O	O	–
	×2.5	–	–	Δ	Δ	O	O	O	O	O	O	O	O	O	–	–
	×4	–	–	Δ	Δ	O	O	O	O	O	O	O	O	O	–	–
	×5	–	–	Δ	Δ	O	O	O	O	O	O	O	O	O	–	–
	×8	–	–	Δ	Δ	O	O	O	O	O	O	O	O	–	–	–
	×10	–	–	Δ	Δ	O	O	O	O	O	O	O	O	–	–	–
	×20	–	–	Δ	Δ	O	O	O	O	O	O	O	–	–	–	–
N_2O	×0	Δ	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	×2	Δ	O	O	O	O	O	O	O	O	O	O	O	O	O	–
	×2.5	Δ	O	O	O	O	O	O	O	O	O	O	O	O	–	–
	×4	Δ	O	O	O	O	O	O	O	O	O	O	O	O	–	–
	×5	Δ	O	O	O	O	O	O	O	O	O	O	O	O	–	–
	×8	Δ	O	O	O	O	O	O	O	O	O	O	O	–	–	–
	×10	Δ	O	O	O	O	O	O	O	O	O	O	O	–	–	–
	×20	Δ	O	O	O	O	O	O	O	O	O	O	–	–	–	–

Measurable component	2nd range	1st measuring range											
		50ppm	100ppm	200ppm	250ppm	500ppm	0.1%	0.2%	0.5%	1%	2%	5%	10%
CCl_4	×0	Δ	O	O	O	O	O	O	*	*	Δ	Δ	Δ
	×2	Δ	O	O	O	O	O	*	*	Δ	Δ	Δ	–
	×2.5	Δ	O	O	O	O	O	*	*	Δ	Δ	–	–
	×4	Δ	O	O	O	O	*	*	Δ	Δ	Δ	–	–
	×5	Δ	O	O	O	O	*	*	Δ	Δ	Δ	–	–
	×8	Δ	O	O	O	*	*	Δ	Δ	Δ	–	–	–
	×10	Δ	O	O	O	*	*	Δ	Δ	Δ	–	–	–
	×20	Δ	O	O	*	*	Δ	Δ	Δ	–	–	–	–
Halothane	×0	O	O	O	O	O	O	O	O	*	Δ	Δ	Δ
	×2	O	O	O	O	O	O	O	*	Δ	Δ	Δ	–
	×2.5	O	O	O	O	O	O	*	Δ	Δ	Δ	–	–
	×4	O	O	O	O	O	O	*	Δ	Δ	Δ	–	–
	×5	O	O	O	O	O	*	Δ	Δ	Δ	Δ	–	–
	×8	O	O	O	O	O	*	Δ	Δ	Δ	–	–	–
	×10	O	O	O	O	O	*	Δ	Δ	Δ	–	–	–
	×20	O	O	O	*	Δ	Δ	Δ	Δ	–	–	–	–
Ethlane	×0	O	O	O	O	O	O	O	O	*	Δ	Δ	Δ
	×2	O	O	O	O	O	O	O	*	Δ	Δ	Δ	Δ
	×2.5	O	O	O	O	O	O	*	Δ	Δ	Δ	–	–
	×4	O	O	O	O	O	O	*	Δ	Δ	Δ	–	–
	×5	O	O	O	O	O	*	Δ	Δ	Δ	Δ	–	–
	×8	O	O	O	O	O	*	Δ	Δ	Δ	–	–	–
	×10	O	O	O	O	O	*	Δ	Δ	Δ	–	–	–
	×20	O	O	O	*	Δ	Δ	Δ	Δ	–	–	–	–

Remarks: (1) O : standard measuring range
(2) * : Consult with us regarding delivery period and output characteristics in case of non-standard measuring range.
(3) Δ : Consult with us regarding capability of manufacture, price and delivery period.
(4) – : outside of manufacturing range.
(5) : 2nd range should be specified when ordering.

(Standard two-component analyzer measuring ranges)

Combination of 1st, 2nd measurable components, measuring ranges:

Manufacture is possible as non-standard specifications even for some items not given in the table, so please consult with us.

SO_2 \ NO	250 ppm	500 ppm
250ppm	○	○
500ppm	○	○

Remarks: (1) ○ : manufacturable range for 1st measuring range.
Up to 1:20 possible for 2nd range for NO and SO_2.
(2) 2nd range should be specified when ordering.

Garbage application
CO_2: 0 to 50%
CH_4: 0 to 80%

CO_2 \ CO	200 ppm	250 ppm	500 ppm	0.1 %	0.2 %	0.5 %	1 %	2 %	5 %	10 %	20 %	50 %	100 %
200ppm	○	○	○	○	⊘	⊘	–	–	–	–	–	–	–
250ppm	○	○	○	○	⊗	⊗	⊗	–	–	–	–	–	–
500ppm	○	○	○	○	○	○	⊗	⊗	–	–	–	–	–
0.1%	⊘	⊘	⊘	○	○	○	⊘	⊘	⊘	–	–	–	–
0.2%	⊗	⊘	⊘	⊘	○	○	○	⊗	⊗	⊗	–	–	–
0.5%	–	–	⊘	⊘	⊗	⊗	○	○	⊗	⊘	⊘	–	–
1%	–	–	–	⊘	⊘	⊗	○	○	○	⊘	⊗	⊘	⊗
2%	–	–	–	–	⊘	⊗	⊗	○	○	○	○	○	○
5%	–	–	–	–	–	⊗	⊗	⊗	○	○	○	○	○
10%	–	–	–	–	–	–	⊘	⊗	○	○	○	○	○
20%	–	–	–	–	–	–	–	⊘	○	○	○	○	○
50%	–	–	–	–	–	–	–	–	○	○	○	○	○
100%	–	–	–	–	–	–	–	–	○	○	○	○	○

Remarks: ○ : manufacturable range for 1st measuring range.
⊗ : manufacturable range for 2nd measuring range (max. range) for CO and CO_2.

Appendix 2. Code symbols

(Standard single-component analyzer)

Digits 1 2 3 4 5 6 7 8 - 9 10 11 12 13

Z R F 1 □ □ Y 1 - □ □ □ □ □

Code	Description
	Measuring method
1	Single-component analyzer
	Measurable components
A	SO_2
B	CO
P	NO
D	CO_2
E	CH_4
Z	Other non-standard items
	1st range
A	0 to 50ppm
B	0 to 100ppm
C	0 to 200ppm
D	0 to 250ppm
E	0 to 500ppm
F	0 to 0.1%
G	0 to 0.2%
H	0 to 0.5%
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%

Notes[1]: See separate table in page A-8 for measuring range.
[4]: 2nd range should be specified when ordering.

Code	Power supply	Piping connection
0	100V AC 50Hz	PT1/4 (Rc1/4)
1	100V AC 60Hz	PT1/4 (Rc1/4)
2	115V AC 60Hz	NPT1/4
3	220V AC 50Hz	PT1/4 (Rc1/4)

Code	Structure/output signal		
A	Table-top type	/ 0 to 1V DC	
B	19 inch rack mounting type	/ 0 to 1V DC	
C	Panel mounting type	/ 0 to 1V DC	
D	Table-top type	/ 4 to 20mA DC	
E	19 inch rack mounting type	/ 4 to 20mA DC	
F	Panel mounting type	/ 4 to 20mA DC	
G	Table top type	/ 0 to 1V DC	/ RS232C
H	19 inch rack mounting type	/ 0 to 1V DC	/ RS232C
J	Panel mounting type	/ 0 to 1V DC	/ RS232C
K	Table top type	/ 4 to 20mA DC	/ RS232C
L	19 inch rack mounting type	/ 4 to 20mA DC	/ RS232C
M	Panel mounting type	/ 4 to 20mA DC	/ RS232C

Optional components

Code	Filter, flow checker	Pump
0	–	–
1	O	–
2	O	O

Optional functions (1)

Code	Auto calibration	Average value output	Alarm output, remote range, range identification
Y	–	–	–
A	O	–	–
B	–	O	–
D	–	–	O
F	O	O	–
H	O	–	O
K	–	O	O
M	O	O	O

Optional functions (2) Note[2]

Code	O_2 indication, correction Note[3]	O_2 indication, correction (for ZFK)	Alarm output, remote range, range identification
Y	–	–	–
A	O	–	–
B	–	O	–
C	O	–	O
D	–	O	O

Note[2]: O_2 correction is available only for SO_2 and NO.
[3]: Any linearlized 0 to 1V DC signal from external analyzer calibrated 0 to 25% O_2 full scale is acceptable.

(Standard two-component analyzer)

Digits 1 2 3 4 5 6 7 8 - 9 10 11 12 13

Z R F 2 □ □ □ 1 - □ □ □ □ □

Code	Description
	Measuring method
2	Two-component analyzer
	Measurable components
F	SO_2 + NO
G	CO_2 + CO
Z	Other non-standard items
	1st range for 1st component
C	0 to 200ppm
D	0 to 250ppm
E	0 to 500ppm
F	0 to 0.1%
G	0 to 0.2%
H	0 to 0.5%
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 for 2nd component
C	0 to 200ppm
D	0 to 250ppm
E	0 to 500ppm
F	0 to 0.1%
G	0 to 0.2%
H	0 to 0.5%
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%

Notes[1]: See separate table in page A-9 for measuring range.
[5]: 2nd range should be specified when ordering

Code	Power supply	Piping connection
0	100V AC 50Hz	PT1/4 (Rc1/4)
1	100V AC 60Hz	PT1/4 (Rc1/4)
2	115V AC 60Hz	NPT1/4
3	220V AC 50Hz	PT1/4 (Rc1/4)

Code	Structure/output signal		
A	Table-top type	/ 0 to 1V DC	
B	19 inch rack mounting type	/ 0 to 1V DC	
C	Panel mounting type	/ 0 to 1V DC	
D	Table-top type	/ 4 to 20mA DC	
E	19 inch rack mounting type	/ 4 to 20mA DC	
F	Panel mounting type	/ 4 to 20mA DC	
G	Table top type	/ 0 to 1V DC	/ RS232C
H	19 inch rack mounting type	/ 0 to 1V DC	/ RS232C
J	Panel mounting type	/ 0 to 1V DC	/ RS232C
K	Table top type	/ 4 to 20mA DC	/ RS232C
L	19 inch rack mounting type	/ 4 to 20mA DC	/ RS232C
M	Panel mounting type	/ 4 to 20mA DC	/ RS232C

Optional components

Code	Filter, flow checker	Pump
0	–	–
1	O	–
2	O	O

Optional functions (1)

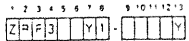
Code	Auto calibration	Average value output Note[4]	Alarm output, remote range, range identification Note[4]
Y	–	–	–
A	O	–	–
C	–	O	–
E	–	–	O
G	O	O	–
J	O	–	O
L	–	O	O
N	O	O	O

Optional functions (2) Note[2]

Code	O_2 indication, correction Note[3]	O_2 indication, correction (for ZFK)	Alarm output, remote range, range identification
Y	–	–	–
A	O	–	–
B	–	O	–
C	O	–	O
D	–	O	O

Note[2]: O_2 correction is available only for SO_2 and NO
[3]: Any linealized 0 to 1V DC signal from external analyzer calibrated 0 to 25% O_2 full scale is acceptable
[4]: Provided for each of 1st and 2nd components.

(Sample switching type)



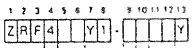
Description			
Measuring method			
3	Sample switching system		
Measurable components		1st measuring range	2nd measuring range
B V	CO (carbon monoxide)	0 to 10ppm	1st range × 0 / × 2 / × 2.5 / × 5 / × 10
B T		0 to 25ppm	1st range × 0 / × 2 / × 4
B A		0 to 50ppm	1st range × 0 / × 2
B B		0 to 100ppm	1st range × 0
Power supply		Piping connection	
0	100V AC 50Hz	PT1/4 (Rc1/4)	
1	100V AC 60Hz	PT1/4 (Rc1/4)	
2	115V AC 60Hz	NPT1/4	
3	220V AC 50Hz	PT1/4 (Rc1/4)	
Structure/output signal			
A	Table top type	/ 0 to 1V DC	
B	19 inch rack mounting type	/ 0 to 1V DC	
C	Panel mounting type	/ 0 to 1V DC	
D	Table top type	/ 4 to 20mA DC	
E	19 inch rack mounting type	/ 4 to 20mA DC	
F	Panel mounting type	/ 4 to 20mA DC	
G	Table top type	/ 0 to 1V DC	/ RS232C
H	19 inch rack mounting type	/ 0 to 1V DC	/ RS232C
J	Panel mounting type	/ 0 to 1V DC	/ RS232C
K	Table top type	/ 4 to 20mA DC	/ RS232C
L	19 inch rack mounting type	/ 4 to 20mA DC	/ RS232C
M	Panel mounting type	/ 4 to 20mA DC	/ RS232C

Optional components	Filter, flow checker	Pump	CO/CO_2 converter
3	○	–	○
4	○	○	○

Optional functions (1)	Alarm output, remote range, range identification	Auto calibration
Y	–	–
D	○	–
A	–	○
H	○	○

Note 2nd range should be specified when ordering

(Differential flow type)



Description			
Measuring method			
4	Flow differential system		
Measurable components		1st measuring range	2nd measuring range
D Q	CO_2 (carbon dioxide)	350 ± 50ppm	0 to 500ppm
D S		350 ± 100ppm	0 to 1000ppm
B A	CO (carbon monoxide)	0 to 50ppm	1st range × 0 / × 2 / × 2.5 / × 5 / × 10
B B		0 to 100ppm	1st range × 0 / × 2 / × 2.5 / × 5
B C		0 to 200ppm	1st range × 0 / × 2 / × 2.5
B D		0 to 250ppm	1st range × 0 / × 2
Power supply		Piping connection	
0	100V AC 50Hz	PT1/4 (Rc1/4)	
1	100V AC 60Hz	PT1/4 (Rc1/4)	
2	115V AC 60Hz	NPT1/4	
3	220V AC 50Hz	PT1/4 (Rc1/4)	
Structure/output signal(*1)			
A	Table top type	/ 0 to 1V DC	
B	19 inch rack mounting type	/ 0 to 1V DC	
C	Panel mounting type	/ 0 to 1V DC	
D	Table top type	/ 4 to 20mA DC	
E	19 inch rack mounting type	/ 4 to 20mA DC	
F	Panel mounting type	/ 4 to 20mA DC	
G	Table top type	/ 0 to 1V DC	/ RS232C
H	19 inch rack mounting type	/ 0 to 1V DC	/ RS232C
J	Panel mounting type	/ 0 to 1V DC	/ RS232C
K	Table top type	/ 4 to 20mA DC	/ RS232C
L	19 inch rack mounting type	/ 4 to 20mA DC	/ RS232C
M	Panel mounting type	/ 4 to 20mA DC	/ RS232C

Optional components	Applicable measured component	Filter, flow checker	Pump	CO/CO_2 converter
0	CO_2	–	–	–
3	CO	○	–	○
4		○	○	○

Optional functions (1)	Alarm output, remote range, range identification	Auto calibration
Y	–	–
D	○	–
A	–	○
H	○	○

Notes: (1) With DQ or DS in 5th and 6th digits of code, only voltage is available for output signal (1st range – 1 to + 1V, 2nd range 0 to 1V).
(2) 2nd range should be specified when ordering.

NON-DISPERSION TYPE INFRARED GAS ANALYZER (ZRG/ZRF)

Preface

This is a supplementary instruction manual issued due to the addition of functions to the analyzer.

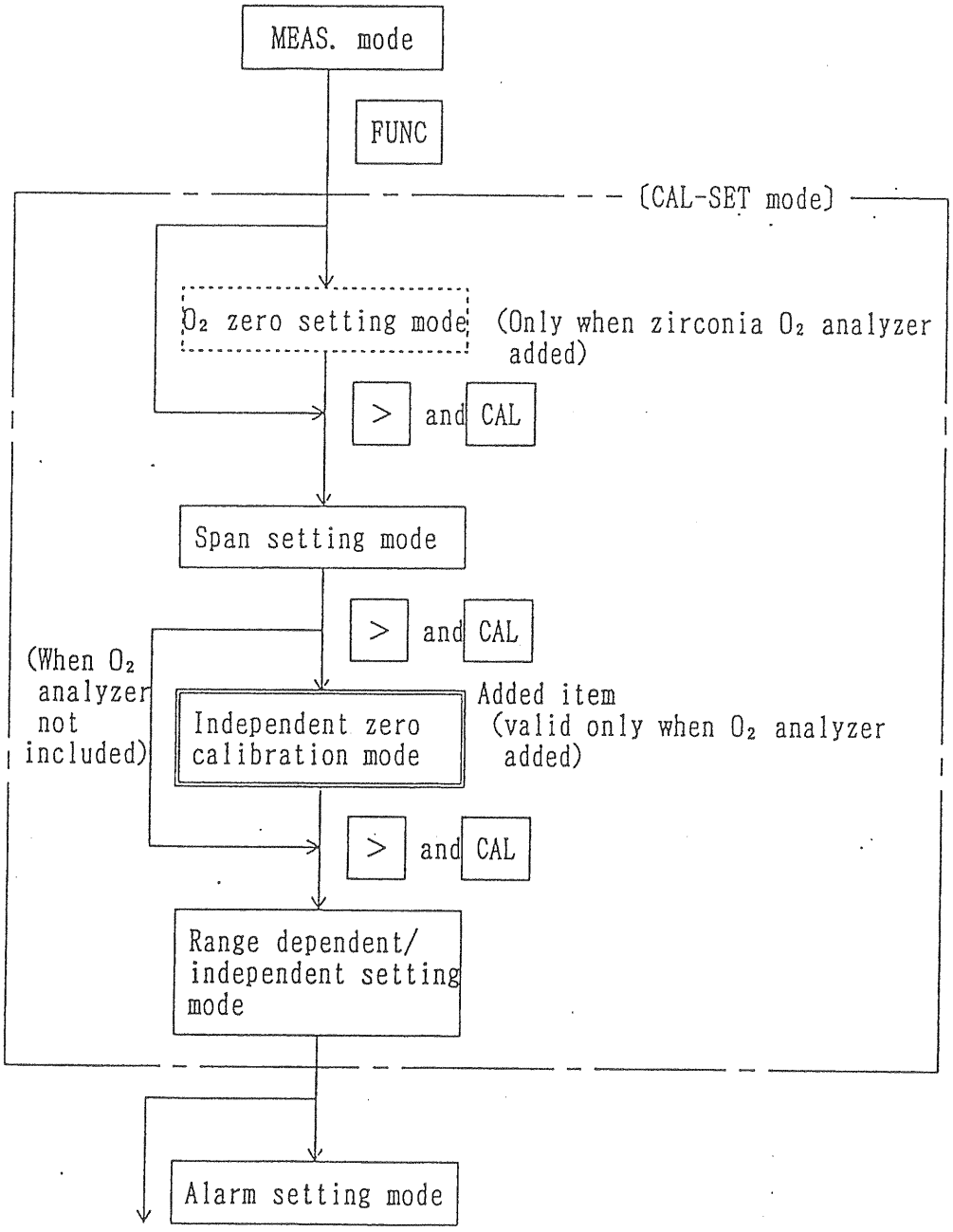
Contents

1. Setting of independent zero calibration

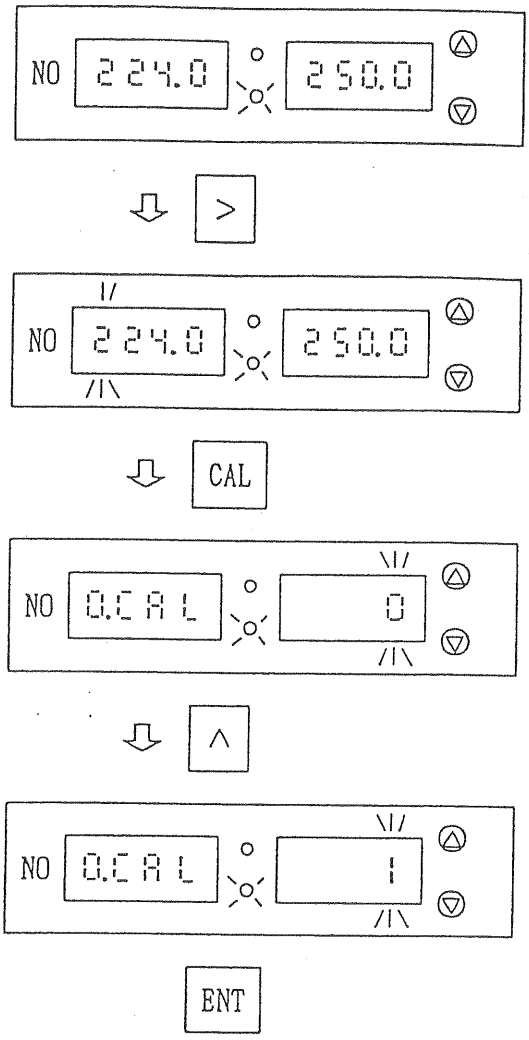
This mode is used for selecting the component for which zero calibration will be mode.

Note that this function will not be added when O_2 is not included in the measured components.

1－1 Operation



1 — 2 Key operation



In the mode of setting span calibration concentration, press the [>] key to make the highest digit of the main display flash.

Upon pressing the [CAL] key, 「0.CAL」 will appear on the main display and 「0」 on the sub display.

The setting will change in the other of 0→1→2→0 at each press of the [^] key.

When the selection is finished, press the [ENT] key to memorize the contents.

=Meanings of set values=

Selected code	When zero calibration out	
	In manual calibration	In aut calibration
0	Calibrate all components	Calibrate all components
1	Calibrate components except O_2	Calibrate components except O_2
2	Calibrate only O_2	

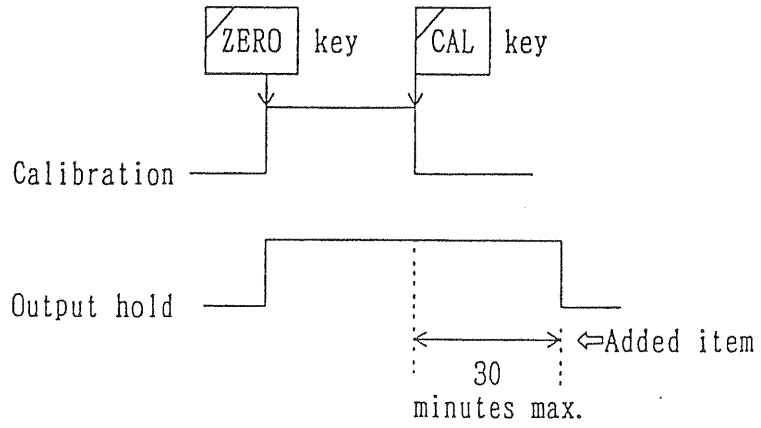
Note 1) This function will not be added when O_2 is not included in the measured components.

Note 2) The main display flashed during zero calibration ([ZERO] + [CAL]) only for the component selected in this mode.

2. Output hold function following manual calibration

Output hold function following manual calibration is added. The hold function can be released either automatically after 30 minutes or forcibly via key operation.

2－1 Operation



2－2 Release of function

1) Automatic release

After setting the hold function (ON/OFF), pressing the ZERO or SPAN key released the output hold. And after ending calibration with the CAL key, the hold function is retained for 30 minutes, after which it is automatically released.

2) Forcible release

The hold function is forcibly released by simultaneously pressing ENT and CAL keys on the front panel.

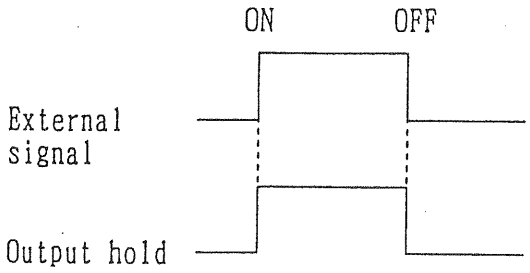
Note 1) The "under calibration contact output" between ① and ② on the auto calibration output terminal is not activated during manual calibration.

Note 2) The output hold function is valid only for the preset component, in the mode of hold setting.

3. Remote hold function (option)

This is used for holding the output via a signal from the exterior.

3－1 Operation



3－2 Procedure

During inputting 5V DC between⑰and ⑳ (⊕－⊖) on the 1st component input/output terminal, the function is activated only for the preset component.

Note 1) The indication during activation of this function is the same as for the hold function at calibration.

Note 2) This function is valid only when the alarm, remote range and range identification options are added.

Note 3) This function is valid only for the standard 1, 2 range type and differential flow type analyzers.

4. Other revised functions

1) Addition of moving average valud/average value reset function

A reset function is added for the average values obtained at 1 hour, 4 hours, etc.

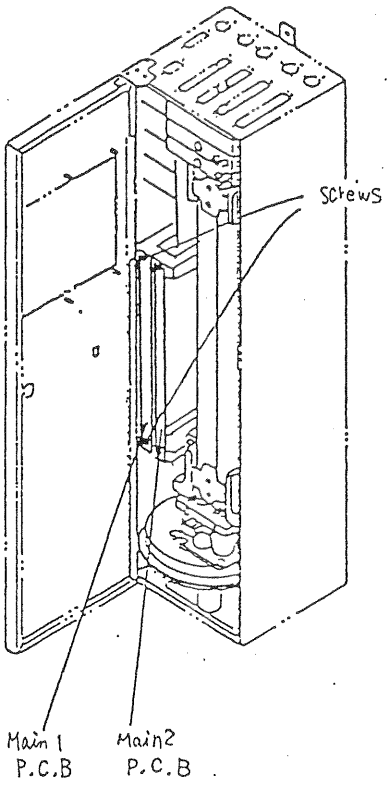
1－1) Key operation

A manual reset is made by pressing [∧] key 3 times while holding down [>] key in the measuring mode (MEAS.).

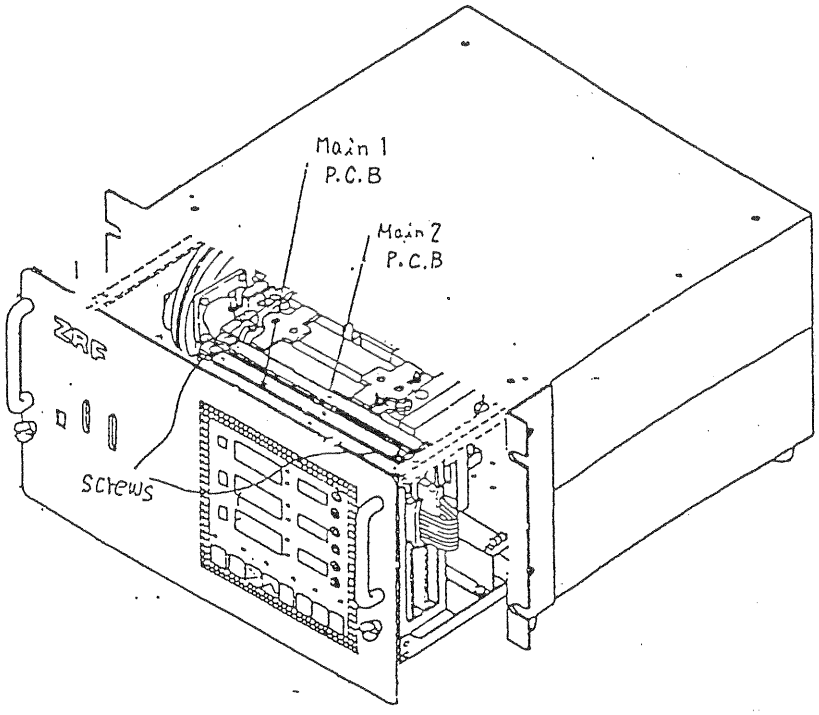
2) Change of function for contact output during calibration

The "under calibration contact output" between ①—② on the auto calibration output terminal has been changed so that it is not activated during manual calibration.

5. Procedure for ROM replacement



In case of type ZRG



In case of type ZRF

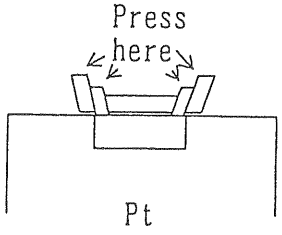
① Turn off the power, turn the lock on the front door 90° and open the door.

Loosen two knobs on the front and pull out the internal chassis.

② Main 1 and main 2 PCB's are arranged from the left side inside the unit.

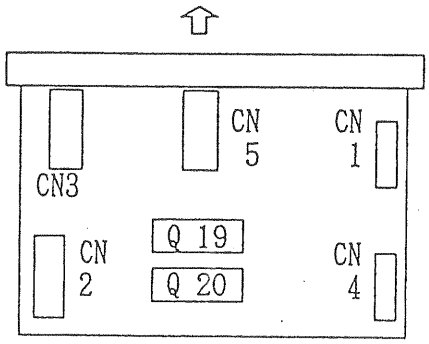
Main 1 and main 2 PCB's are arranged from the front inside the unit.

③ Disconnect connector(CN2), between main 1pt and display pt, connector CN1 between main 1pt and main 2pt, connector CN4 between main 1pt and output pt, power connector CN3 and transmission connector CN5. CN1, CN2, and CN4 are connected with flat cables. Open the locks as shown below to detach the connectors.



④ The PCB is hold with a fixture and two M3 screws, so detach the screws and pull up the PCB1 to remove it.

⑤ The arrangement on main 1 PCB is shown below.



A seal is attached on the IC.

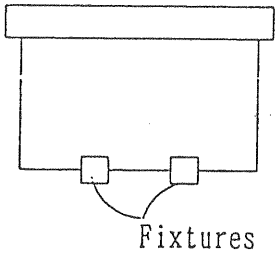
TK7××××× Code NO. 1 or 2

⑥ Both Q19 and Q20 serve as IC sockets, so detach the ROM hear. Replace No.1 ROM at Q19 and No.2 ROM at Q20.

Note 1) Be careful not to bend the IC pins when replacing the ROMs.

⑦ When the ROM replacement is finished, reverse the procedure from step ⑤ to reattach the parts.

Note 2) Be sure to insert the PCB's correctly into the case using the fixtures at the bottom of the case.



Note 3) Be careful when inserting connectors not to mistake them.