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OPERATING INSTRUCTIONS FOR

Model 7600ZA

NDIR Infrared Gas Analyzer



P/N M7600ZA
10/28/15



DANGER



Toxic gases and or flammable liquids may be present in this monitoring system.
Personal protective equipment may be required when servicing this instrument.
Hazardous voltages exist on certain components internally which may persist
for a time even after the power is turned off and disconnected.
Only authorized personnel should conduct maintenance and/or servicing.
Before conducting any maintenance or servicing, consult with authorized
supervisor/manager.

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Warranty

This equipment is sold subject to the mutual agreement that it is warranted by us free from defects of material and of construction, and that our liability shall be limited to replacing or repairing at our factory (without charge, except for transportation), or at customer plant at our option, any material or construction in which defects become apparent within one year from the date of shipment, except in cases where quotations or acknowledgements provide for a shorter period. Components manufactured by others bear the warranty of their manufacturer. This warranty does not cover defects caused by wear, accident, misuse, neglect or repairs other than those performed by Teledyne or an authorized service center. We assume no liability for direct or indirect damages of any kind and the purchaser by the acceptance of the equipment will assume all liability for any damage which may result from its use or misuse.

We reserve the right to employ any suitable material in the manufacture of our apparatus, and to make any alterations in the dimensions, shape or weight of any parts, in so far as such alterations do not adversely affect our warranty.

Important Notice

This instrument provides measurement readings to its user, and serves as a tool by which valuable data can be gathered. The information provided by the instrument may assist the user in eliminating potential hazards caused by his process; however, it is essential that all personnel involved in the use of the instrument or its interface, with the process being measured, be properly trained in the process itself, as well as all instrumentation related to it.

The safety of personnel is ultimately the responsibility of those who control process conditions. While this instrument may be able to provide early warning of imminent danger, it has no control over process conditions, and it can be misused. In particular, any alarm or control systems installed must be tested and understood, both as to how they operate and as to how they can be defeated. Any safeguards required such as locks, labels, or redundancy, must be provided by the user or specifically requested of Teledyne at the time the order is placed.

Therefore, the purchaser must be aware of the hazardous process conditions. The purchaser is responsible for the training of personnel, for providing hazard warning methods and instrumentation per the appropriate standards, and for ensuring that hazard warning devices and instrumentation are maintained and operated properly.

Teledyne Analytical Instruments, the manufacturer of this instrument, cannot accept responsibility for conditions beyond its knowledge and control. No statement expressed or implied by this document or any information disseminated by the manufacturer or its agents, is to be construed as a warranty of adequate safety control under the user's process conditions.

Specific Model Information

It is not recommended that this instrument be used for analysis on any other gas or gas mixture than that specified at the time of purchase. The analyzer is set up and calibrated at the factory for a specific application using a known gas mixture that is representative of the customers' process. Using this instrument to analyze any other gas mixture may result in interference and possible measurement error. Consult the factory for additional information for gas analysis not specified at the time of purchase.

Instrument Serial Number: _____

Measurable Species:	NO <input type="checkbox"/>	SO2 <input type="checkbox"/>	CO2 <input type="checkbox"/>	CO <input type="checkbox"/>	O2 <input type="checkbox"/>	Built-In	External
					Fuel Cell	<input type="checkbox"/>	<input type="checkbox"/>
					ZrO2	<input type="checkbox"/>	<input type="checkbox"/>
Range 1:							
Range 2:							
Span Gas 1:							
Span Gas 2:							
Zero Gas:							
Background:							

Safety Messages

Your safety and the safety of others is very important. We have provided many important safety messages in this manual. Please read these messages carefully.

A safety message alerts you to potential hazards that could hurt you or others. Each safety message is associated with a safety alert symbol. These symbols are found in the manual and inside the instrument. The definition of these symbols is described below:



GENERAL WARNING/CAUTION: Refer to the instructions for details on the specific danger. These cautions warn of specific procedures which if not followed could cause bodily injury and/or damage the instrument.



CAUTION: HOT SURFACE WARNING: This warning is specific to heated components within the instrument. Failure to heed the warning could result in serious burns to skin and underlying tissue.



WARNING: ELECTRICAL SHOCK HAZARD: Dangerous voltages appear within this instrument. This warning is specific to an electrical hazard existing at or nearby the component or procedure under discussion. Failure to heed this warning could result in injury and/or death from electrocution.



Technician Symbol: All operations marked with this symbol are to be performed by qualified maintenance personnel only.

No
Symbol

NOTE: Additional information and comments regarding a specific component or procedure are highlighted in the form of a note.



CAUTION: THE ANALYZER SHOULD ONLY BE USED FOR THE PURPOSE AND IN THE MANNER DESCRIBED IN THIS MANUAL.

IF YOU USE THE ANALYZER IN A MANNER OTHER THAN THAT FOR WHICH IT WAS INTENDED, UNPREDICTABLE BEHAVIOR COULD RESULT POSSIBLY ACCOMPANIED WITH HAZARDOUS CONSEQUENCES.

This manual provides information designed to guide you through the installation, calibration operation and maintenance of your new analyzer. Please read this manual and keep it available.




Occasionally, some instruments are customized for a particular application or features and/or options added per customer requests. Please check the front of this manual for any additional information in the form of an Addendum which discusses specific information, procedures, cautions and warnings that may be peculiar to your instrument.



Manuals do get lost. Additional manuals can be obtained from Teledyne at the address given in the Appendix. Some of our manuals are available in electronic form via the internet. Please visit our website at: www.teledyne-ai.com.

Additional Caution on Safety

To operate the analyzer properly, be sure to read “Caution on Safety” carefully.


The descriptions listed here provide important information on safety. Be sure to observe them at all times. These safety precautions are classified into 3 levels: “DANGER,” “CAUTION” and “PROHIBITION”.


	DANGER	Improper handling may cause dangerous situations that may result in death or serious injury.
	CAUTION	Improper handling may cause dangerous situations that may result in medium-level troubles, minor injury, or property damage.
	PROHIBITION	Items which must not be done are indicated.

Caution on installation and transport of analyzer		
	DANGER	The unit is not of explosion-proof. Do not use it in an atmosphere of explosive gases. Otherwise, serious accidents including explosion or fire may result.
	CAUTION	<p>For installation, observe the rule on it given in the instruction manual, and select a place where the weight of analyzer can be supported. Installation in an inadequate place may cause turnover or falling, resulting in injury.</p> <p>Be sure to wear protective gloves when lifting the analyzer. Lifting it with bare hands may result in injury.</p> <p>Be sure to fix the cover before transporting the analyzer. Transportation in unstable state may result in injury.</p> <p>The gas analyzer is heavy. To transport the</p>




NDIR Gas Analyzer


		<p>analyzer, please use a hand cart or equivalent. Avoid carrying analyzer by hand as much as possible. Doing so may cause injury.</p> <p>Take care not to let cable chips and other foreign objects enter the unit during installation work. Otherwise, fire, failure, or malfunction may result.</p>
--	--	--

Caution on piping		
	DANGER	<p>Be sure to observe the following precautions while installing piping. Improper piping may result in gas leakage.</p> <p>If the leaking gas contains a toxic component, serious accidents may result. If it contains combustible gases, explosion or fire may result.</p> <p>Connect pipes correctly referring to the instruction manual.</p> <p>Discharge the exhaust gas outdoors to prevent it from remaining within the sampling device or indoors.</p> <p>Relieve the exhaust gas from the analyzer to the atmospheric pressure to prevent buildup of undesirable pressure to the analyzer. Otherwise, piping within the analyzer may be disconnected, resulting in gas leakage.</p> <p>Use pipes and pressure reducing valves to which no oil/grease is attached to the piping. Otherwise, fire may result.</p>


Caution on wiring		
	DANGER	<p>Be sure to turn off the power before installing wiring. Otherwise, electric shock may result.</p> <p>Be sure to perform protective earth ground connection. Otherwise, electric shock or failure may result.</p> <p>Select a proper wiring material that satisfies</p>

		<p>the ratings of the instrument. Otherwise, electric shock or fire may result.</p> <p>Be sure to connect a power supply of correct rating. Otherwise, fire may result.</p>
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Caution on use		
	DANGER	Be sure to read the instruction manual for reference gases before handling reference gases such as calibration gas to use them properly.
	CAUTION	<p>Leaving the analyzer unused for a long time or restarting it after long-term suspension requires procedures different from normal operation or suspension procedures. Be sure to follow the instructions in each instruction manual. Otherwise, intended performance may not be achieved. Also, accidents or injury may result.</p> <p>Do not operate the analyzer for a long time with its cover left open. Otherwise, dust, foreign matter, etc. may contaminate the internal walls, thereby causing faults.</p>
	PROHIBITION	<p>Do not touch the input/output terminals with metal or finger. Otherwise, electric shock or injury may result.</p> <p>Do not smoke or use flames near the analyzer. Otherwise, fire may result.</p> <p>Do not allow water to enter the analyzer. Otherwise, electric shock or internal fire may result.</p>

Caution on maintenance and check		
	DANGER	<p>Before performing work with the cover of the analyzer open for maintenance and check, be sure to purge completely not only within the analyzer but also measuring gas lines using nitrogen or air. Otherwise, poisoning, fire, or explosion may result due to gas leakage.</p>

NDIR Gas Analyzer

	CAUTION	<p>Be sure to observe the following to perform work safely, avoiding electric shock or injury.</p> <p>Remove the watch and other metallic objects before work.</p> <p>Do not touch the instrument with wet hands.</p> <p>If the fuse is blown, eliminate the cause and replace it with the one of the same capacity and type. Otherwise, electric shock or accidents may result.</p> <p>Do not use replacement parts other than those specified by the manufacturer. Otherwise, intended performance may not be achieved and accidents or failures may result.</p> <p>Dispose replacement parts such as maintenance parts as incombustibles according to the local waste disposal regulations.</p>
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This instrument is approved as an intrinsically safe gas analyzer for usage in a category (ia) Group IIC hazardous area. This approval only to the equipment specified installed in accordance with the information contained within this manual. It is the customer's responsibility to ensure safety especially when combustible gases are being analyzed since the potential of gas leaks always exist.

The customer should ensure that the principles of operating of this equipment is well understood by the user and that the instrument as well as any approved support equipment is properly installed. Misuse of this product in any manner, tampering with its components, or unauthorized substitution of any component may adversely affect the certification and the safety of this instrument.

Since the use of this instrument is beyond the control of Teledyne, no responsibility by Teledyne, its affiliates, and agents for damage or injury from misuse or neglect of this equipment is implied or assumed.

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Introduction

1.1 Overview

This instrument measures the concentration of NO, SO₂, CO₂ and CO contained in sampling gas on the principle that different atomic molecules have an absorption spectrum in the wave band of infrared rays, and the intensity of absorption is determined by the Lambert-Beer law.

In addition to the infrared analyzer, the Model 7600ZA can be fitted with a built-in compact paramagnetic O₂ sensor or use an external zirconia oxygen sensor to increase to 5 the number of simultaneous component species this unit can analyze.

Teledyne's Model 7600ZA Infrared (IR) Gas Analyzer is conveniently packaged in either a 19" rack mount or NEMA-4 wall mount enclosure. The NEMA-4 enclosure can be X or Z-purged to satisfy hazardous area installation requirements.

A high-sensitivity mass flow type twin detector is used for infrared measurements. By utilizing a single beam, double path design in conjunction with a serial dual-layer transmission detector, the Model 7600ZA delivers long term, drift-free performance.

The concentration of the desired gases is displayed on a large, easy-to-read back-lit LCD. Figure 1-1 shows the standard rack mountable Model 7600. The user interface is very intuitive and the menu / mode selection buttons, which are readily accessible, provide the operator with dynamic control and extensive diagnostic capabilities.

1.2 Main Features of the Analyzer

The Model 7600ZA Infrared Gas Analyzer is designed for accurate and reliable gas analysis and is easy to operate. The following features are standard on the 7600ZA instrument:



Figure 1-1: Model 7600A Infrared Gas Analyzer

- Simultaneous measurement of up to five components
- Excellent long-term stability
- Large, easy to read LCD display showing all simultaneous measurements and computations
- Steel case with slide-out, chassis design to facilitate any optical or maintenance adjustments required to fine tune analyzer performance
- Multiple, in-depth on-screen analyzer functions easily accessible using the front-panel user interface buttons
- Follow & Hold output signal control (during calibration)
- Remote range change control
- Low / Hi limit alarms
- Range ID signals
- Auto-calibration with user adjustable frequency and gas flow time setting programming capabilities
- Remote auto-calibration initiation
- Auto-calibration status contacts
- Instrument or calibration error contact outputs
- RS-485 MODBUS[®] RTU[™] half-duplex serial communication

- Extra functions included such as average value computation, O₂ conversion
- Pump ON/OFF contact

1.3 Options Available

- Percent O₂ detector — Paramagnetic (built-in) or ZrO₂ (externally installed), user preference
- O₂ correction (the conversion of measured CO and SO₂ readings into values at standard O₂ concentration). Consult factory for more detail for this function.

1.4 Applications

The Model 7600ZA Infrared Gas Analyzer is a versatile analytical instrument tool and is ideally suited for multi-parameter gas analysis requirements for applications such as:

- Combustion control within the power, pulp and paper, steel, and cement industries
- Heat treating / Inert gas blanketing atmosphere control
- Bulk-gas impurity analysis within the air separation industry
- Anaerobic digester / Bio-gas / Land-fill gas analysis
- Vent gas analysis of oxyhydrochlorination reactors (EDC)
- Off-gas analysis on PTA and Maleic Anhydride reactors
- Fluid Catalytic Cracker (FCC) regeneration gas analysis
- Ammonia / Fertilizer process gas stream analysis
- Continuous Emissions Monitoring Systems (CEMS)
- Biochemistry and fermentation,
- Automotive emission analysis
- Explosive and toxic gas analysis
- Chemical analysis

- Refinery operation
- Research applications

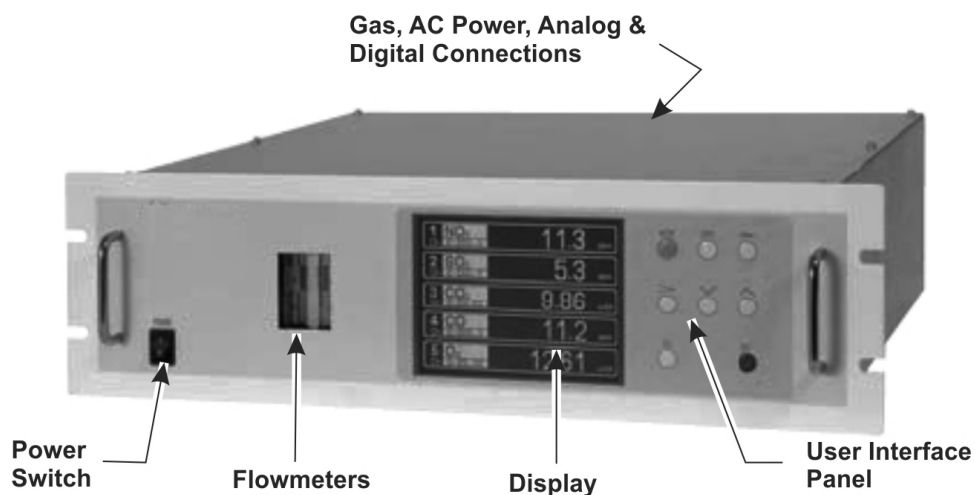


Figure 1-2 Model 7600ZA Description



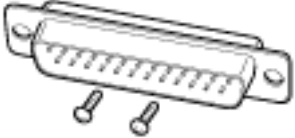



Gas connections for the 7600ZA instrument are made on the rear panel of the instrument using the installed 1/4" NPT fittings. The standard instrument has two measuring units and a pair of inlet/outlet gas connections exist for each unit. See Section 2.5 *Gas Connections*.




A power receptacle on the rear panel accepts the three-prong power cable supplied with the instrument. The analyzer operates on 100-240 VAC 50/60 Hz power. The power inlet conforms to EN60320 Protection Class 1 specifications.

Items Included with the Analyzer

2.1 Confirmation of delivered items

The following items are included with you analyzer.

<p>Analyzer</p>	
<p>Fuse (2pcs) (P/N R75796N17) Std: IEC127-2 05x20 mm 250V/2A SB</p>	
<p>Analog Output Connector (1) (P/N R77256N262) 25 pin D-sub male M2.6x4 mm</p>	
<p>Instruction Manual M7600ZAXL</p>	
<p>External Input Connector (1) (P/N R77240N35) (External O2/External Zirconia Sensor as specified)</p>	
<p>Digital Input Connector (P/N R77256N262) (3 max with the no. of DIO when digital I/O function is specified).</p>	

<p>RS-484 Connector (P/N R77256N284)</p> <p>(1) (when provided with communications function)</p> <p>9 pin D-sub connector male M2.6 x 4 mm</p>	
<p>Ferrite Core (P/N R77918N12)</p> <p>(1) for power cable (When terminal block for power supply is specified)</p>	
<p>Power Supply Cord (1) (when power input is specified)</p>	

•

2.2 Name and Description of Analyzer

The operator interface is shown in Figure 2-1A and the various connections to the instrument are shown in figure 2-1B.

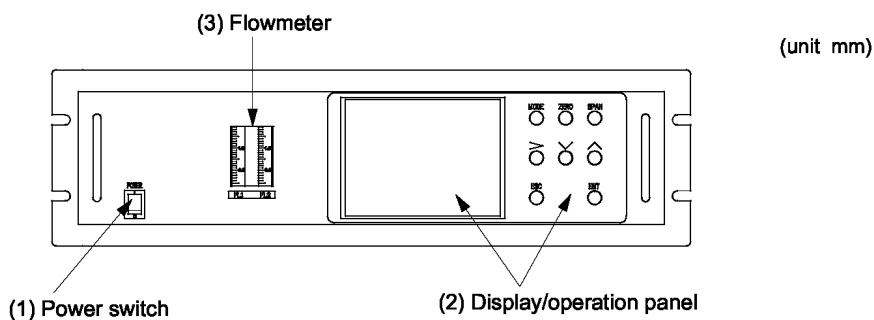


Figure 2-1: Model 7600ZA Front Panel

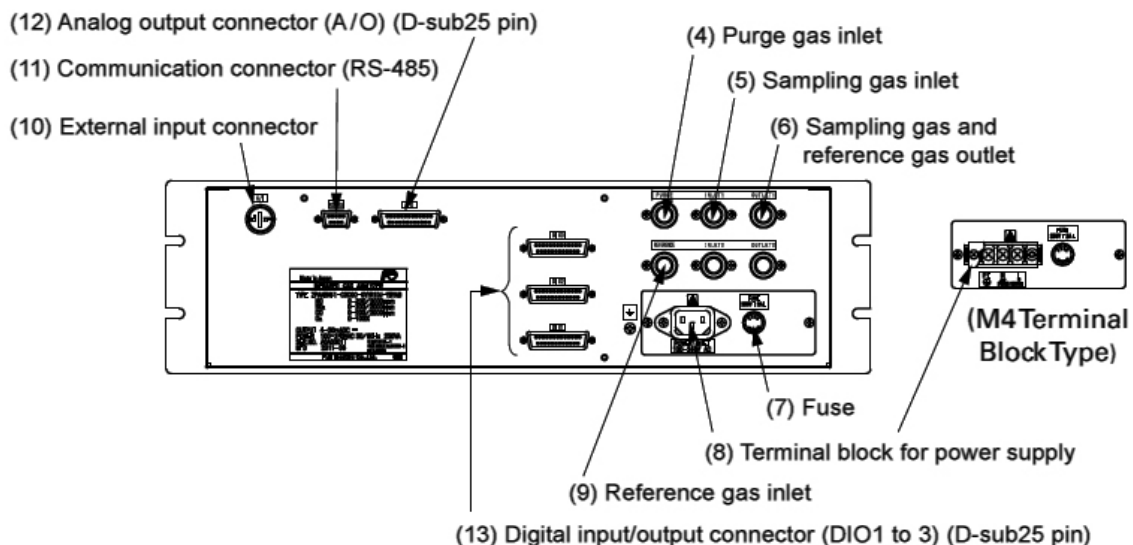


Figure 2-2: Rear Panel


Name	Description	Name	Description
(1) Power switch	Used for ON/OFF the analyzer.	(9) Reference gas inlet	For connecting to the reference gas tube.
(2) Display/operation panel	Liquid crystal display and keys for setting various functions.	(10) External input connector	For connecting to the output of externally installed O ₂ analyzer.
(3) Flow meter	For checking the flow rate of sampling gas and reference gas.	(11) Communication connector	RS-485 connector for communication.
(4) Purge gas inlet	For connecting to the purge gas tube.	(12) Analog output connector (D-sub25 pin)	Connector for the analog output
(5) Sampling gas inlet	For connecting to the measuring gas tube.	(13) Digital input/output connector (D-sub25 pin)	Connector for the digital input/output
(6) Sampling gas and reference gas outlet	For connecting to the exhaust line.		
(7) Fuse	Fuse inside		
(8) Terminal block for power supply	For connecting to the power supply line.		


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Installation

Installation of the Model 7600ZA Analyzer includes:

- Unpacking
- Mounting
- Gas connections
- Electrical connections
- Calibration

DANGER:  **THIS UNIT IS NOT AN EXPLOSION-PROOF INSTRUMENT. DO NOT USE IT IN A PLACE WITH EXPLOSIVE GASES TO PREVENT EXPLOSION, FIRE OR OTHER SERIOUS ACCIDENTS.**

CAUTION:  **ENTRUST THE INSTALLATION, MOVEMENT OR RE-INSTALLATION TO A SPECIALIST OR THE SUPPLIER. A POOR INSTALLATION MAY CAUSE ACCIDENTAL TIPOVER, ELECTRIC SHOCK, FIRE, INJURY, ETC.**

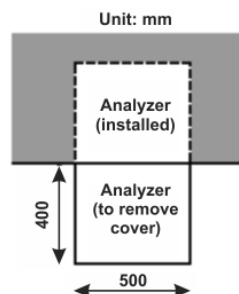
- The gas analyzer is heavy. It should be installed with utmost care. Otherwise, it may tip over or fall, causing accident or injury.
- For lifting the gas analyzer, be sure to wear protective gloves. Using bare hands may result in injury.
- This unit should be installed in an environment conforming to the conditions noted in the instruction manual. Otherwise, electric shock, fire or other malfunction of the unit may occur.
- During installation, care should be taken to keep the unit free from entry of chips, dust, and debris. Otherwise, it may cause fire, trouble or malfunction of the unit.

The analyzer is shipped with all the materials you need to install and prepare the system for operation. Carefully unpack the transmitter and inspect it for damage. Immediately report any damage to the shipping agent.

3.1 Installation Conditions

To install the analyzer for optimum performance, select a location that meets the following conditions;

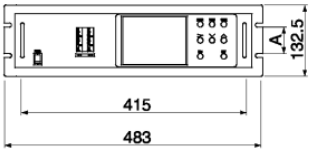
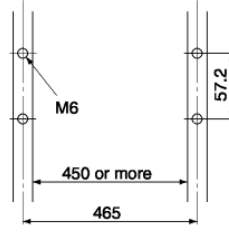
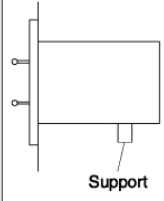
1. This instrument is designed for rack mounting in a standard 19" equipment rack.
2. Indoor use only.
3. Vibration-free.
4. Free of dust and debris and obstruction around the analyzer.
5. AC power: 100V to 240 VAC
Operating voltage: 85V to 264V AC
Rated frequency: 50/60 Hz
Power consumption: 100 VA max.
6. Operating conditions:
Ambient temperature : -5° to 45°C (max. 40°C when two optical units are used, and the power supply is more than 200V AC)
7. Maintenance space:
When analyzer is installed by itself, adhere to the diagram to make sure there is adequate space to remove the cover for maintenance.
When the analyzer is installed as an unit, See Section 3.2.1
8. A circuit breaker that meets IEC60947-1 and IEC60947-3 specifications should be installed.
9. A breaker should be installed near the analyzer where an operator can access it.
10. A label that clearly identifies the breaker should be visible.
11. The breaker rating should meet the analyzer rating max 2A and conform to all necessary approvals.



3.2 Rack Mount Installation

Refer to the diagram below for installation of the analyzer into a standard 10" equipment rack.

(Unit : mm)

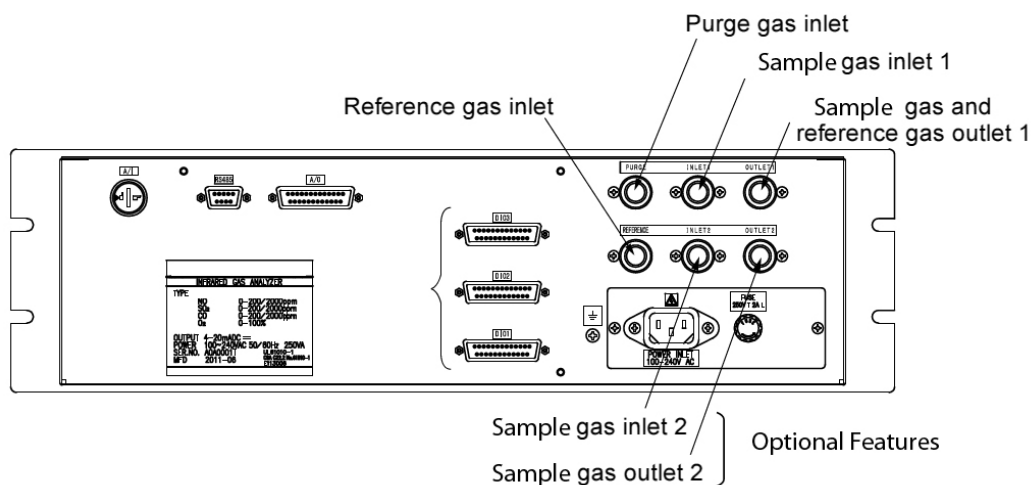
Type	External dimensions	Mounting dimensions	Mounting method
19-inch rack mounting	 <p>"A" : 57.2 (EIA)</p>		

- The analyzer weight must be supported at the bottom of the casing.
- The analyzer should be installed in a place where ambient temperature is within -5 to 45°C (max. 40°C when two optical units are used, and the power supply is more than 200V AC), and temperature fluctuation during operation is minimum.
- Where vibration is unavoidable, protect the analyzer from vibrating. If necessary, install rubber or other vibration absorbing material around the case to isolate any vibration from the support structure.

3.3 Piping

Observe the following items when making gas connections to the rear panel:

- Piping should be connected to the gas inlets and outlets at the rear panel of the analyzer.
- Use a corrosion resistant tubing comprised of Teflon, stainless steel or polyethylene to connect the instrument to a sampling system. Even if there is a danger of corrosion, refrain from using rubber or soft vinyl tubing. These materials will cause inaccurate indication due to gas absorption from the tubing.
- Pipe connection port fittings are Rc1/4 female thread (or NPT1/4). Piping should be cut as short as possible for optimum response. About 4 mm inner diameter is recommended.
- Entry of dust into the instrument may result in poor performance. Use clean tubing and couplings.



Sample inlet: Attach clean, dry sample gas to the inlet port. Note that the calibration gases (zero and span) also connect to this port.

Input gas flow should be constant within the range of 1.0 L/min \pm 0.2 L/min.

Sample outlet: Attach tubing for exhausting sample or calibration gases. The exhaust line should be directed to an appropriate safe vent depending on the nature of the sample/calibration gas used.

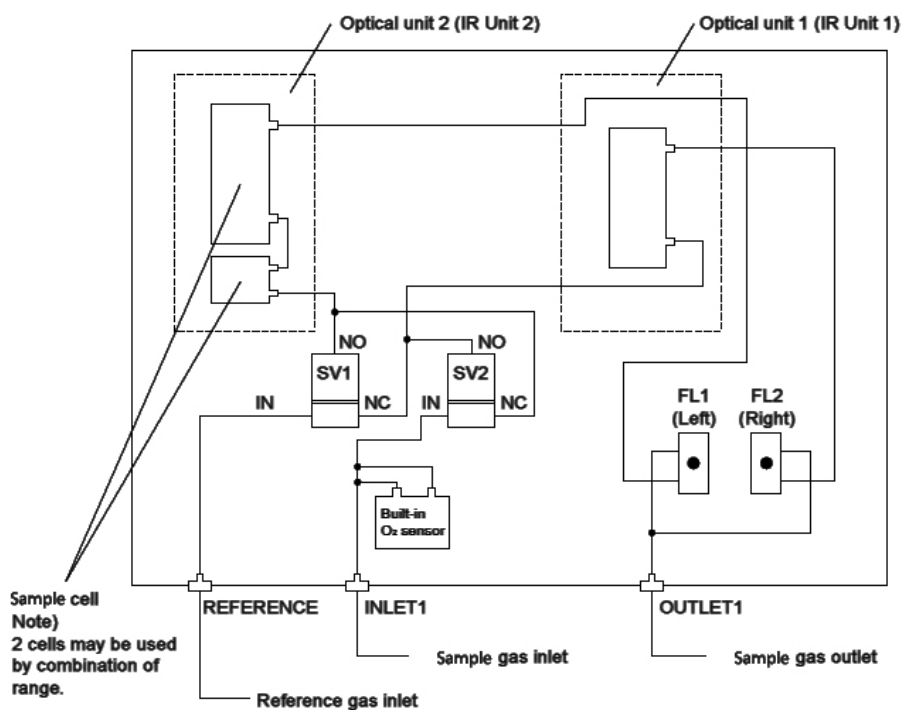
Purge gas inlet: Used to connect a purge gas for purging the internal housing of the analyzer. Use dry N₂ or instrument air for purge gas. (Flow rate is 1L/min or more. Keep dust or moisture/mist from entering the purge line.

CAUTION:



THIS INSTRUMENT IS DESIGNED TO HANDLE HAZARDOUS GASES. WHENEVER A FITTING IS OPENED, USE A NEW FERRULE AND CONE TO SECURE A GAS TIGHT SEAL. EACH FITTING MUST BE LEAK CHECKED WHENEVER A CONNECTION HAS BEEN OPENED OR DISTURBED IN ANY MANNER.

The internal piping diagram for the Model 7600ZA is shown below.



Measured Components	Optical Unit 1	Optical Unit 2
1-component for NO, CO ₂ , CO, CH ₄	Each	None
2-Components for CO ₂ / CO	CO ₂ / CO	None
2-Components for NO/CO, NO/SO ₂	NO NO	CO SO ₂
3-Components for NO/SO ₂ /CO	NO	SO ₂ / CO
4-Components for NO/SO ₂ /CO ₂ /CO	NO	SO ₂ / CO ₂ /CO

3.4 Sampling

3.4.1 Sample Gas Conditioning

1. Dust from the sampling gas should be completely removed using a filter. For the final stage filter, use a filter that removes dust particles down to 0.3 μ m.
2. Dew point must be lower than the ambient temperature. If vapor is contained in the sample, dew point should be lowered to 2°C using a dehumidifier.
3. If SO₃ mist is present in the sample gas, use a mist filter or cooler to remove the SO₃ mist. Other mists should be removed using a mist filter or gas dryer.
4. Corrosive gases such as Cl₂, F₂ and HCl, if present in considerable amounts, will shorten the life of component parts.
5. Sample gas temperature should be within 0 to 50°C. **Do not flow hot gas directly into the instrument.**

3.4.2 Sample Gas Flow

Sample flow should be 1.0L/min \pm 0.2L/min. Avoid any flow fluctuation during measurement. Observe the flow reading using the flowmeter provided as shown in the example of the sampling system configuration (see Section 3.4.6).

3.4.3 Preparation of Standard Gas

Routine calibration is required once a week using span and zero calibration gases to keep the instrument performing optimally. Prepare a standard gas cylinder for zero calibration and span calibration per the table below.

	Without O ₂ Sensor	Built-in O ₂ Sensor	External O ₂ Sensor
Zero Gas	N ₂	N ₂	Dry air
Span gas other than for O ₂ measurement.	Gas with concentration of 90 to 100% on the measuring range	Gas with concentration of 90 to 100% on the measuring range.	Gas with concentration of 90 to 100% on the measuring range.

	Without O₂ Sensor	Built-in O₂ Sensor	External O₂ Sensor
Span gas for O ₂ measurement	_____	Gas with conc. of 90 to 100% on the measuring range or atmospheric air (21% O ₂).	O ₂ gas at 1 to 2%

3.4.4 Internal Purging of the Instrument Housing

The internal housing does need not be purged except under the following conditions:

1. A combustible gas component is contained in the sample gas.
2. Corrosive gas is contained in the atmospheric air at the installation site.
3. The same gas as the sample gas component is contained in the atmospheric air at the installation site.

In such cases, the analyzer housing should be purged with instrument air or dry N₂.

The purge flow rate should be set to about 1L/min. The purge gas must be free of dust and moisture.

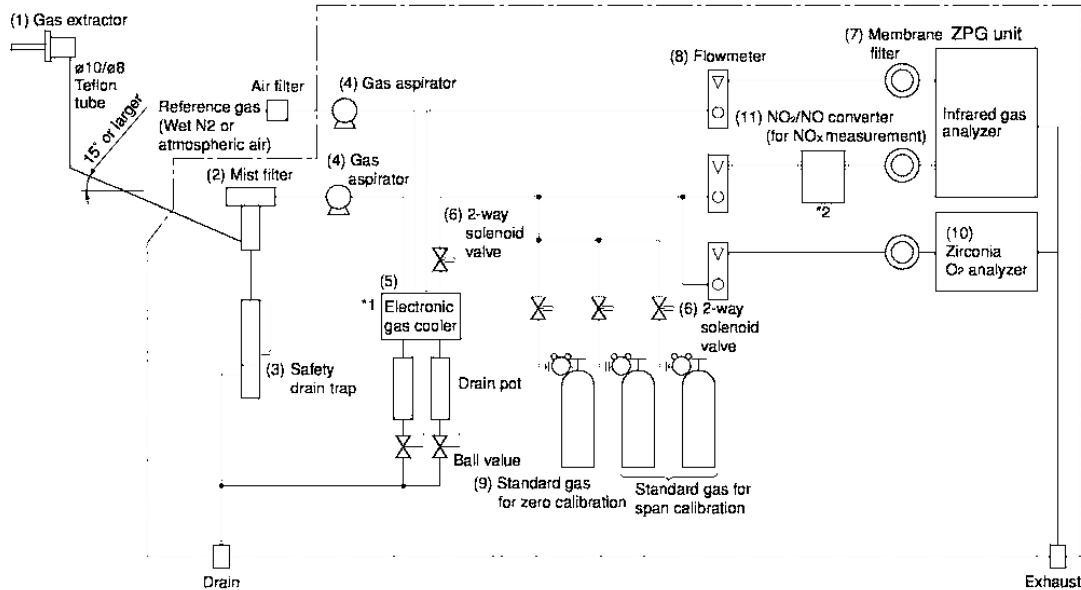
3.4.5 Pressure at Sample Outlet

Pressure at the sample gas outlet should be atmospheric pressure. Make sure there are no kinks or obstructions in the exhaust line.

3.4.6 Example Configuration of Sample System

The following illustrates a typical sample system configuration for five component gas measurement monitoring a combustion exhaust gas from boiler, refuse incinerator, etc.

Contact TAI for other system configurations to match your specific application.



- *1) Moisture must be removed from the sample using an electronic cooler. The moisture concentration should be the same for both reference and sample gas.
- *2) When measuring NOx in the sample gas, a NO₂/NO converter is required.

Name	Description	Name	Description
(1) Gas extractor	Gas extractor with a heating type stainless steel filter of standard mesh 40µm.	8) Flowmeter	Adjusts and monitors the flow rate of the sample gas.
(2) Mist filter	Removes drain, mist, and dust.	9) Reference gas	Reference gas used for calibrating zero and span of the analyzer, depending on the measured gas.
(3) Safety drain trap	The safety drain trap is divided into two spaces for positive and negative pressure. It monitors and adjusts the sample gas pressure.		
(4) Gas aspirator	For aspiration of the sample gas	10) Zirconia O ₂ analyzer	External zirconia oxygen sensor used for measuring the oxygen concentration in sample gas. (Not used when O ₂ sensor is built-in.)
(5) Electronic gas cooler	Dries the moisture in the sample gas to a dew point of approx. 2°C		

Name	Description	Name	Description
(6) Solenoid valve	Used for flowing the calibration gas.	(11) NO ₂ /NO converter	Added to NOx Analyzer. A special catalyst material is used for efficient conversion of NO ₂ to NO
(7) Membrane filter	PTFE filter used to eliminate fine dust particles.		

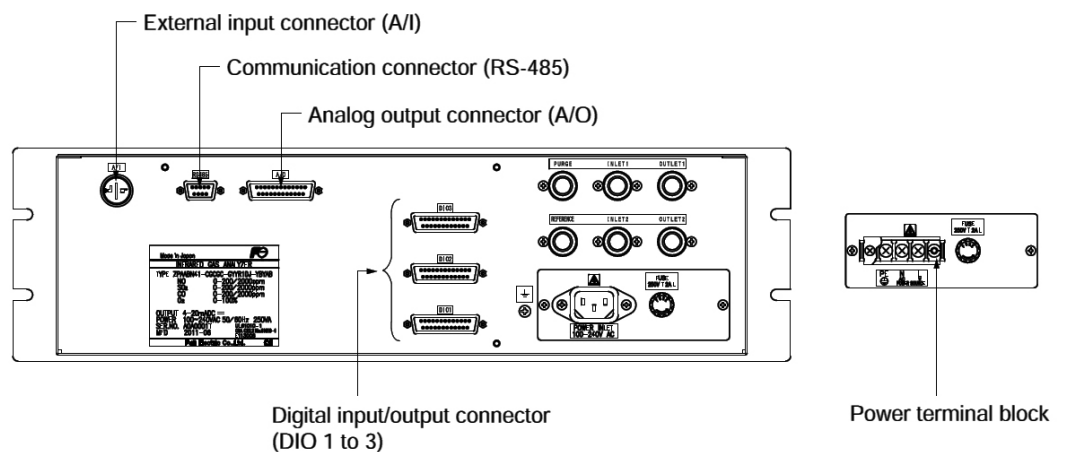
3.5 Electrical Connections

CAUTION: *To prevent electric shock or fire:*



- **Turn off the power before wiring.**
- **Always use a protective earth connection.**
- **Select a proper wiring material that satisfies the ratings of the instrument. • Be sure to connect a power supply of correct rating.**

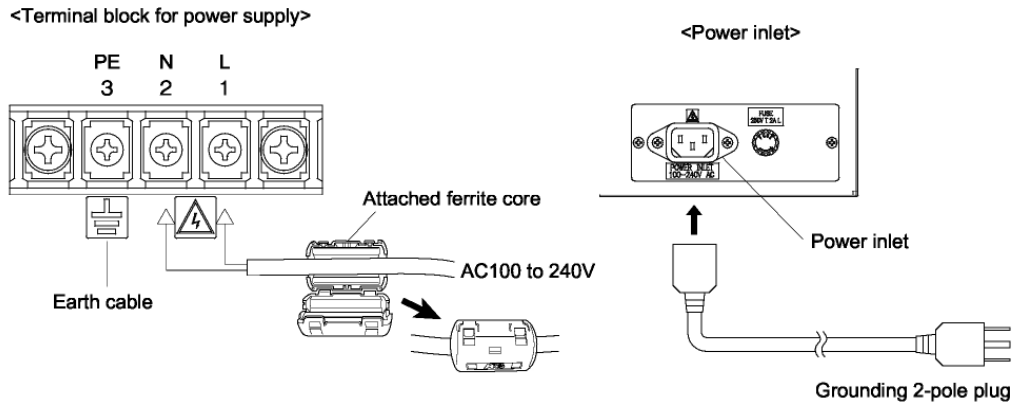
The power terminal block and external input/output connector are installed on the rear panel. Refer to the diagram below.



(1) Power Supply (Standard Terminal 1 to 2)

Connect the power supply to the power terminal, and connect the ground wire to the grounding terminal (standard terminal 3). Be sure to provide a protective earth connection. Use solderless terminals (for M4) for connection to the terminals (power and earth). See the figure below.

For the infrared gas analyzer, install an accessory ferrite core (to the power supply terminal stand side) on the AC power supply wiring line. Application line diameter $\phi 9.5$ to $\phi 10.5$. See below.



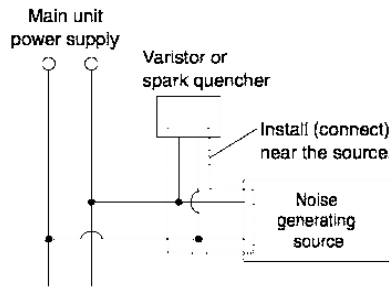
CAUTION: AFTER WIRING IS COMPLETE, BE SURE TO REPLACE THE PROTECTIVE COVER OVER THE TERMINAL BLOCKS.



Note: Avoid installing this instrument near an electrical unit (high frequency furnace or electric welder) that generates electrical noise. If using the instrument near such a noise generating unit is unavoidable, use a different power line.

Mount a noise suppressor such as varistor or spark quencher to the noise generating unit when source of noise is due to relays or solenoid valves. See accompanying figure.

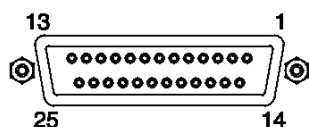
Mount the suppressor near the noise source; otherwise its effect will be diminished.



(2) Analog Output Signal: Analog Output Connector (A/O)

Output signal : 4 to 20 mA DC or 0 to 1 V DC (selected when ordering). Negative lines for the insulation and signal are common from the ground and internal circuit.

Allowable load : 4 to 20 mA DC, 550Ω or less
0 to 1 V DC, 100kΩ or more



D-sub 25-pin female

Note) Display Ch number is same as the AO number under standard specifications.

- ① ————— AO1+
- ⑭ ————— AO1-
- ② ————— AO2+
- ⑮ ————— AO2-
- ③ ————— AO3+
- ⑯ ————— AO3-
- ④ ————— AO4+
- ⑰ ————— AO4-
- ⑤ ————— AO5+
- ⑱ ————— AO5-
- ⑥ ————— AO6+
- ⑲ ————— AO6-
- ⑦ ————— AO7+
- ⑳ ————— AO7-
- ⑧ ————— AO8+
- ㉑ ————— AO8-
- ⑨ ————— AO9+
- ㉒ ————— AO9-
- ⑩ ————— AO10+
- ㉓ ————— AO10-
- ⑪ ————— AO11+
- ㉔ ————— AO11-
- ⑫ ————— AO12+
- ㉕ ————— AO12-
- ⑬ ————— NC

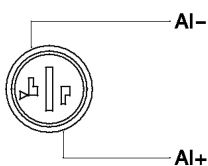
The analog output signals of the instrument are not isolated individually. It is recommended to isolate the signals individually to eliminate the interference from unwanted signals or other external interference, especially if the cable exceeds 30 meters or leads to outdoors.

(3) O₂ Sensor Input: External Input Connector (AI)

Input signal:

External zirconia O₂ sensor: Zirconia O₂ sensor signal (Fuji ZFK7 output)

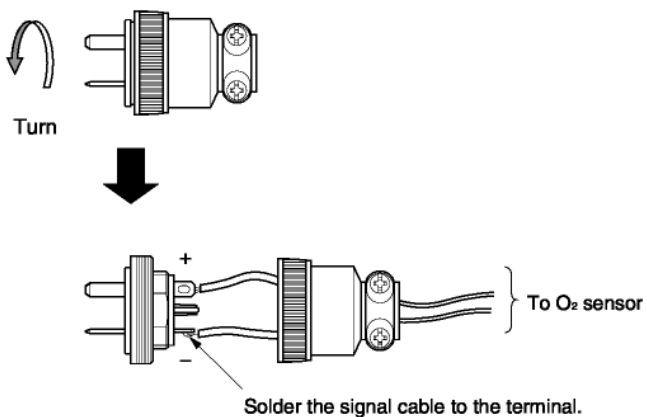
External O₂ sensor: 0 to 1 VDC (DC input resistor of 1MW or more)



- Used when the external zirconia O₂ sensor or the external O₂ sensor is ordered. It is not required or used if the analyzer has a built-in O₂ sensor.
- Connect the dedicated connector (accessory) to the output of the external zirconia sensor or the external O₂ sensor (shipped separately).
- When using an external O₂ sensor, the input signal should be 0 to 1 VDC with respect to the O₂ full scale of the analyzer. The O₂ concentration display, output, and O₂ correction can then be performed correctly.

Note: The O₂ sensor input is not isolated. TAI recommends that it be isolated when an external O₂ sensor is installed remote from the analyzer. The zirconia O₂ sensor (Fuji ZFK7) should be installed at a location that is as close to the analyzer as possible.

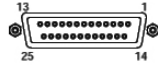
The figure below shows how to connect the O₂ signal to the dedicated connector (accessory).



(4) Contact Input/Output (DIO): Digital Input/Output Connector (DIO 1 to 2)

- Contact input signal : Voltage is applied from the external 12 to 24 V DC, max 15mA.
Photo-coupler isolation (from each DI and ground)
- Contact capacity : C contact relay output 24V/1A AC/DC resistive load

< Digital input/output > Connector for DIO 1 to 3 (option)

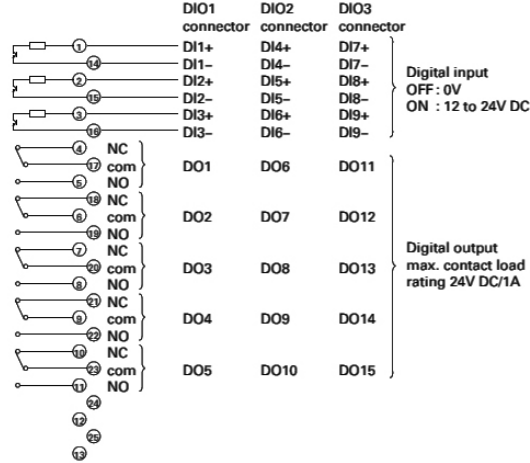


D-sub 25-pin female

Note) DIO 1 to 3 have the same internal circuit of the connector.

Contents of digital input signal

DI1	Remote hold
DI2	Average value reset
DI3	A. cal. start
DI4	A. zero. cal. start
DI5	Remote range Ch1
DI6	Remote range Ch2
DI7	Remote range Ch3
DI8	Remote range Ch4
DI9	Remote range Ch5



Digital input
OFF : 0V
ON : 12 to 24V DC

Digital output
max. contact load
rating 24V DC/1A

Allocation table of digital input signal

22th digit →	A	B	C	D	E	F	G	H	Y
DI1	○	○	○	○	○	○	○	○	
DI2	○	○	○	○	○	○	○	○	
DI3		○			○		○	○	
DI4		○			○		○	○	
DI5				○		○	○	○	
DI6			○*		○*	○*	○*	○*	
DI7				○*		○*	○*	○*	
DI8				○*		○*	○*	○*	
DI9				○*		○*	○*	○*	

○ sign shows the function is valid.

* : The function might be invalid depending on the number of measurable components.

For example: DI5 corresponds to 1st component, DI6 corresponds to 2nd components.

Contents of digital output signal

22th digit →	Independent on the number of component	1-component analyzer		2-component analyzer	3-component analyzer
	A,C	B,E	D,F,G,H	B,D,E,F,G,H	B,D,E,F,G,H
DO1	Instrument error	Instrument error	Instrument error	Instrument error	Instrument error
DO2	Calibration error	Calibration error	Calibration error	Calibration error	Calibration error
DO3		A.cal.status	(A.cal.status)	(A.cal.status)	(A.cal.status)
DO4		For zero gas	(For zero gas)	(For zero gas)	(For zero gas)
DO5		For span gas Ch1	(For span gas Ch1)	(For span gas Ch1)	(For span gas Ch1)
DO6	(Alarm1)	(Alarm1)		(For span gas Ch2)	(For span gas Ch2)
DO7	(Alarm2)	(Alarm2)			(For span gas Ch3)
DO8	(Alarm3)	(Alarm3)			(Range identification Ch1)
DO9	(Alarm4)	(Alarm4)		(Range identification Ch1)	(Range identification Ch2)
DO10	(Alarm5)	(Alarm5)	Range identification Ch1	(Range identification Ch2)	(Range identification Ch3)
DO11			(Alarm1)	(Alarm1)	(Alarm1)
DO12			(Alarm2)	(Alarm2)	(Alarm2)
DO13			(Alarm3)	(Alarm3)	(Alarm3)
DO14			(Alarm4)	(Alarm4)	(Alarm4)
DO15			(Alarm5)	(Alarm5)	(Alarm5)

The items in the parentheses may not be available depending on the selected type on 22th digit.

The normal open side (NO) of digital output is close when the function is active without range ID.

In case of range ID, normal open (NO) side is close with Lo-range. The normal close (NC) side is close with Hi-range.

	4-component analyzer				5-component analyzer		
22th digit →	B,E	D,F	G	H	B,E	D,F	G
DO1	Instrument error	Instrument error	Instrument error	Instrument error	Instrument error	Instrument error	Instrument error
DO2	Calibration error	Calibration error	Calibration error	Calibration error	Calibration error	Calibration error	Calibration error
DO3	A.cal.status		A.cal.status	A.cal.status	A.cal.status		A.cal.status
DO4	For zero gas		For zero gas	For zero gas	For zero gas		For zero gas
DO5	For span gas Ch1		For span gas Ch1	For span gas Ch1	For span gas Ch1		For span gas Ch1
DO6	For span gas Ch2		For span gas Ch2	For span gas Ch2	For span gas Ch2	Range identification Ch1	For span gas Ch2
DO7	For span gas Ch3	Range identification Ch1	For span gas Ch3	For span gas Ch3	For span gas Ch3	Range identification Ch2	For span gas Ch3
DO8	For span gas Ch4	Range identification Ch2	For span gas Ch4	For span gas Ch4	For span gas Ch4	Range identification Ch3	For span gas Ch4
DO9		Range identification Ch3		Range identification Ch1	For span gas Ch5	Range identification Ch4	For span gas Ch5
DO10		Range identification Ch4		Range identification Ch2		Range identification Ch5	
DO11	(Alarm1)	(Alarm1)		(Alarm1)	(Alarm1)	(Alarm1)	Range identification Ch1
DO12	(Alarm2)	(Alarm2)	Range identification Ch1	(Alarm2)	(Alarm2)	(Alarm2)	Range identification Ch2
DO13	(Alarm3)	(Alarm3)	Range identification Ch2	(Alarm3)	(Alarm3)	(Alarm3)	Range identification Ch3
DO14	(Alarm4)	(Alarm4)	Range identification Ch3	Range identification Ch3	(Alarm4)	(Alarm4)	Range identification Ch4
DO15	(Alarm5)	(Alarm5)	Range identification Ch4	Range identification Ch4	(Alarm5)	(Alarm5)	Range identification Ch5

- Isolated output (from each DO and ground)

To avoid external interference, the wiring from the analog output signal, O₂ sensor input and contact input should be run separately from that of power supply and contact output.

Note: Avoid excess noise generated by other nearby equipment, by grounding the analyzer and using properly shielded cables.

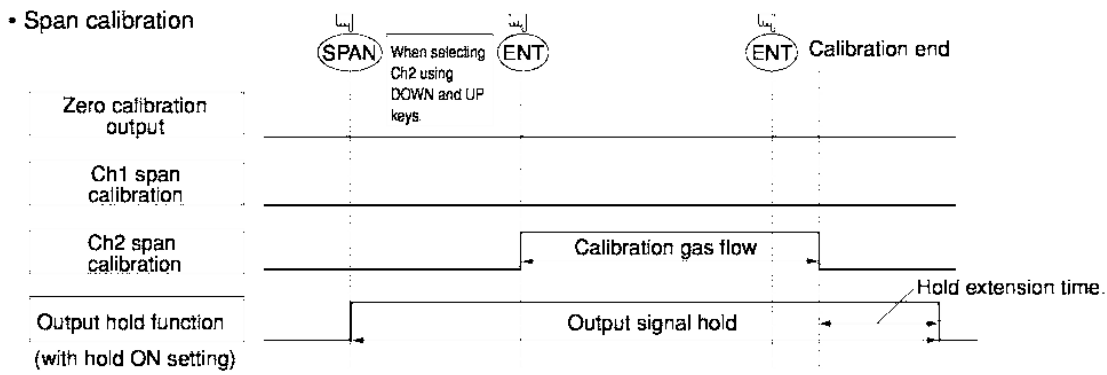
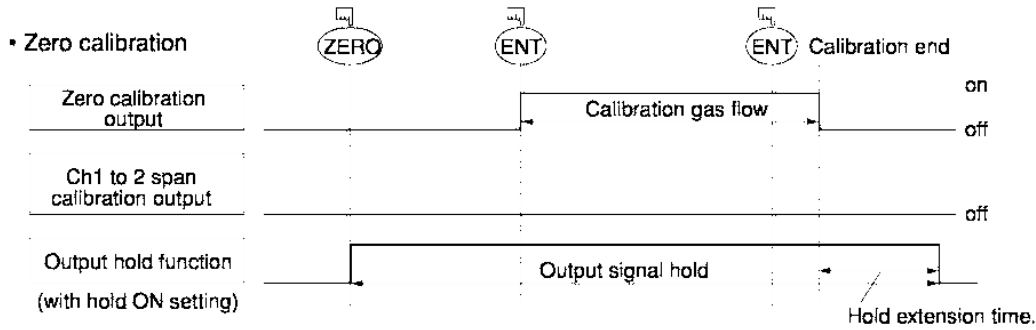
(5) Communication: RS-485 connector

< RS-485 connector >



(6) Timing of Contact Output for Calibration

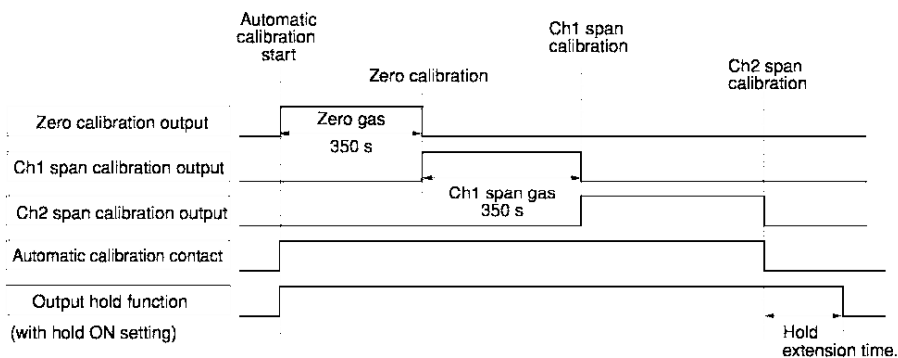
1. Manual calibration: (See “Item 6.8 Calibration” if the analyzer is equipped with the auto calibration feature).



Note) The hold extension time depends on the gas flow time of the automatic calibration settings.

2. Automatic Calibration:

(See also Section 6.4: *Automatic Calibration Settings*)



Operation

4.1 Preparation for Operation

Tube and wiring check

- Double-check if tubes of the gas sampling and exhaust ports are correctly connected.
- Double-check for proper wiring.

4.2 Warm-up Operation and Normal Operation

(1) Operation Procedure

1. Turn ON the power switch on the left side when facing the front panel of the analyzer unit. The measurement screen will appear on the front display panel in a few seconds.
2. The instrument warm-up time is about 2 hours after which the instrument will produce an accurate measurement.

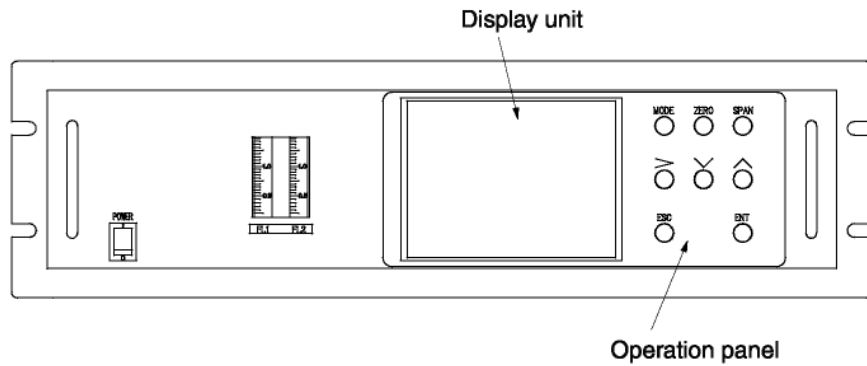
Note: During the warm-up stage, the concentration reading may be above the upper range limit. When this occurs, the indication will display as a series of four dashes. However, this is not an error.

3. During the warm up period, you can set the various instrument parameters as described in Section 6: Setting and Calibration.
4. After the warm-up period, perform the zero/span calibration as described in Section 6.8 *Calibration*.
5. After calibrating the analyzer, introduce sample gas into the analyzer and allow the lines to purge before accepting the measurement value.

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Display And Operation Panels

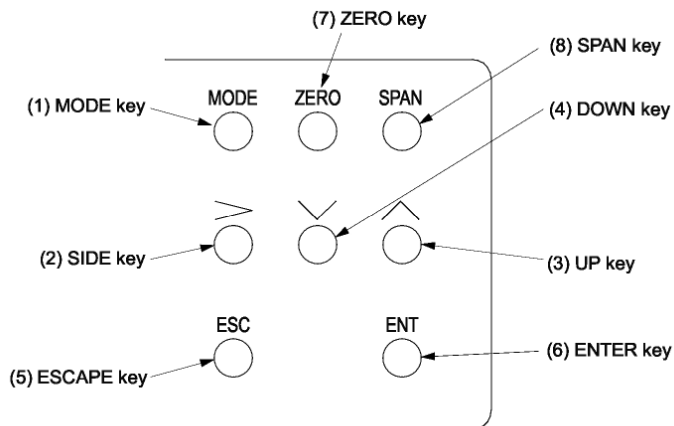
This section describes the display unit and operation panel on the Model 7600ZA as well as the various functions available to the user.



5.1 Front Panel Description

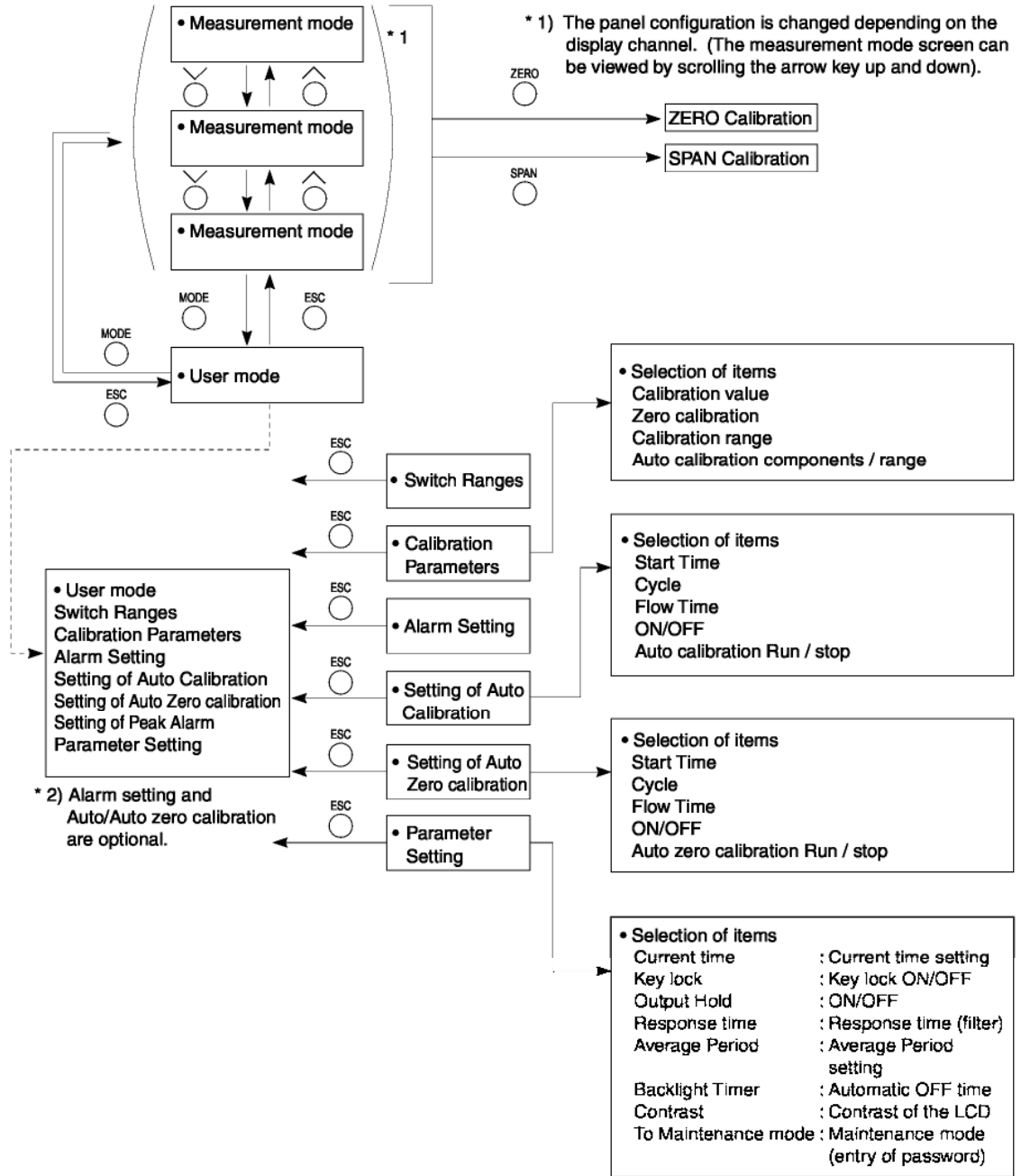
Display unit: The measurement screen and the setting items are displayed.

Operation panel: The operator interface panel is shown below.



Name	Description	Name	Description
(1) MODE key	Used to switch the mode.	(5) ESC key	Used to return to the previous screen or cancel the setting midway.
(2) SIDE key	Used to change the selected item (by moving the cursor) and the numeral digit.	(6) ENT key	Used for confirmation of selected items or values, and for execution of calibration.
(3) UP key	Used to change the selected item (by moving the cursor) and to increase the numeral value.	(7) ZERO key	Used for zero calibration
(4) DOWN key	Used to change the selected item (by moving the cursor) and to decrease the numeral value.	(8) SPAN key	Used for span calibration

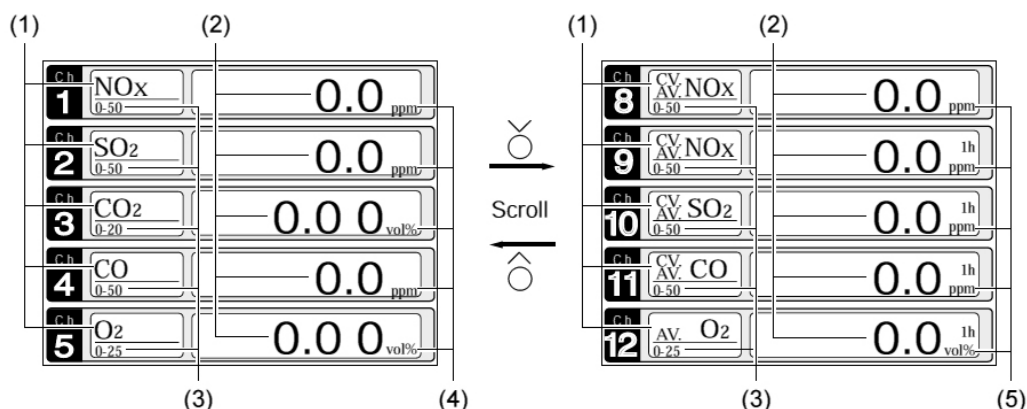
5.2 Overview of Display and Operation Panels



5.3 Outline of Display Screen

(1) Measurement mode screen (appears when the power is turned on)

The measurement screen depends on the number of components. The following screen configuration is shown as an example for NO and O₂ (output: 4 channels).



Scroll the UP and DOWN keys to display more than 5 channels.

No.	Name	Function
(1)	Component display	Displays the component of instantaneous value, corrected instantaneous value, corrected average value, etc.
(2)	Concentration display	Displays the measured value of concentration.
(3)	Range display	Displays the range values.
(4)	Unit display	Displays the unit with ppm or mg/m ³ and vol%.
(5)	Average time display	Displays the average time.

- Instantaneous value and concentration value:**

The concentration display of Ch (component) where sampling components such as “NO” and “O₂” are displayed in the component display, are the current concentration values of the measured components contained in sample gas under test.

- **O₂ corrected concentration values:**

Ch components in which “cv**” is displayed as “cv CO” in the display are calculated values derived from the following equation. Refer to Section 6.7 *Maintenance Mode - Other Parameter*.

$$C = \frac{(21 - O_n)}{(21 - O_s)} \times C_s$$

where:

O_n : The value of the O₂ correction reference value (set by application)

O_s : Oxygen concentration (Vol%)

C_s : Concentration of relevant measured component.

Note that O_s does not exceed the O₂ limit value set in Section 6.7 *Maintenance mode - Other parameter*.

C: Sample gas concentration (O₂ corrected).

The corrected sampling components are NOX , SO₂ and CO only.

- **O₂ corrected concentration average value:**

In the Ch (component) and O₂ average value where “CV/AV **” is displayed as “**CV/AV NO**” in the component display, a value obtained by averaging O₂ corrected concentration value or O₂ average value in a fixed time is output every 30 seconds.

Averaging time can be changed between 1 to 59 minutes or 1 to 4 hours according to the average time settings (See Section 6.7, *Parameter Setting*).

(The averaging set time is displayed as “1h”, for instance, in the range display).

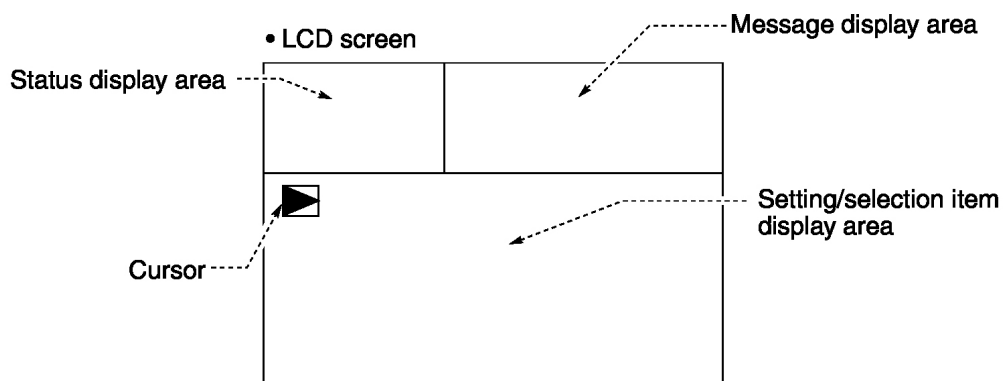
- * The measurement ranges for O₂ correction concentration value and O₂ correction concentration average value are the same as the measuring components. Also, the measurement range of the O₂ average value is the same as for O₂.

(2) Setting/Selection Screen

The setting/selection screen is configured as shown below:

- In the status display area, the current display item is displayed.

- In the message display area, messages associated with operation are displayed.
- In the setting item and selection item display area, items or values to be set are displayed, as required. To navigate through the fields, move the cursor to any item using the UP, DOWN and SIDE keys.



(3) Contents of Measured Channel (Ch)

The following table gives measurement channels and their contents according to the symbols.

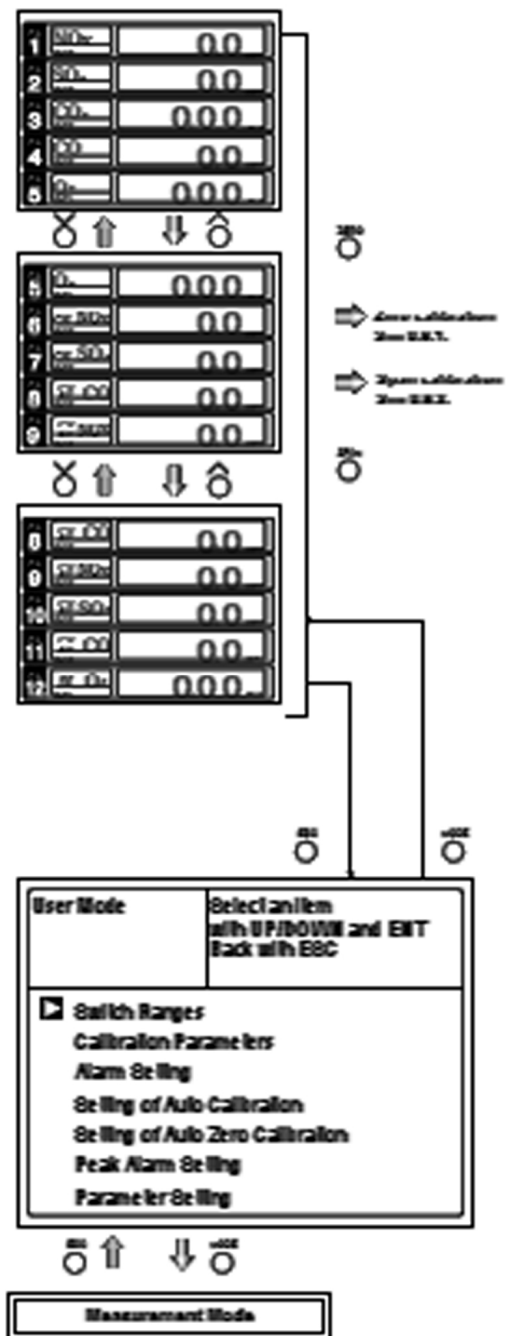
Code symbol			Display/output contents
6th digit	7th digit	21st digit	
Y	1 to 3	Y	Ch1:O ₂
P	Y	Y	Ch1:NO
A	Y	Y	Ch1:SO ₂
D	Y	Y	Ch1:CO ₂
B	Y	Y	Ch1:CO
E	Y	Y	Ch1:CH ₄
F	Y	Y	Ch1:NO, Ch2:SO ₂
G	Y	Y	Ch1:NO, Ch2:CO
J	Y	Y	Ch1:CO ₂ , Ch2:CO
K	Y	Y	Ch1:CH ₄ , Ch2:CO
L	Y	Y	Ch1:CO ₂ , Ch2:CH ₄
N	Y	Y	Ch1:NO, Ch2:SO ₂ , Ch3:CO
T	Y	Y	Ch1:CO ₂ , Ch2:CO, Ch3:CH ₄
V	Y	Y	Ch1:NO, Ch2:SO ₂ , Ch3:CO ₂ , Ch4:CO
P	1 to 3	Y	Ch1:NO, Ch2:O ₂
A	1 to 3	Y	Ch1:SO ₂ , Ch2:O ₂
D	1 to 3	Y	Ch1:CO ₂ , Ch2:O ₂
B	1 to 3	Y	Ch1:CO, Ch2:O ₂
E	1 to 3	Y	Ch1:CH ₄ , Ch2:O ₂
F	1 to 3	Y	Ch1:NO, Ch2:SO ₂ , Ch3:O ₂
G	1 to 3	Y	Ch1:NO, Ch2:CO, Ch3:O ₂
J	1 to 3	Y	Ch1:CO ₂ , Ch2:CO, Ch3:O ₂
K	1 to 3	Y	Ch1:CH ₄ , Ch2:CO, Ch3:O ₂
L	1 to 3	Y	Ch1:CO ₂ , Ch2:CH ₄ , Ch3:O ₂
N	1 to 3	Y	Ch1:NO, Ch2:SO ₂ , Ch3:CO, Ch4:O ₂
T	1 to 3	Y	Ch1:CO ₂ , Ch2:CO, Ch3:CH ₄ , Ch4:O ₂
V	1 to 3	Y	Ch1:NO, Ch2:SO ₂ , Ch3:CO ₂ , Ch4:CO, Ch5:O ₂
P	1 to 3	A *	Ch1:NO _x , Ch2:O ₂ , Ch3:corrected NO _x
A	1 to 3	A *	Ch1:SO ₂ , Ch2:O ₂ , Ch3:corrected SO ₂
B	1 to 3	A *	Ch1:CO, Ch2:O ₂ , Ch3:corrected CO
F	1 to 3	A *	Ch1:NO _x , Ch2:SO ₂ , Ch3:O ₂ , Ch4:corrected NO _x , Ch5:corrected SO ₂
G	1 to 3	A *	Ch1:NO _x , Ch2:CO, Ch3:O ₂ , Ch4:corrected NO _x , Ch5:corrected CO
J	1 to 3	A *	Ch1:CO ₂ , Ch2:CO, Ch3:O ₂ , Ch4:corrected CO
N	1 to 3	A *	Ch1:NO _x , Ch2:SO ₂ , Ch3:CO, Ch4:O ₂ , Ch5:corrected NO _x , Ch6:corrected SO ₂ , Ch7:corrected CO
V	1 to 3	A *	Ch1:NO _x , Ch2:SO ₂ , Ch3:CO ₂ , Ch4:CO, Ch5:O ₂ , Ch6:corrected NO _x , Ch7:corrected SO ₂ , Ch8:corrected CO
P	1 to 3	C *	Ch1:NO _x , Ch2:O ₂ , Ch3:corrected NO _x , Ch4:corrected NO _x average
A	1 to 3	C *	Ch1:SO ₂ , Ch2:O ₂ , Ch3:corrected SO ₂ , Ch4:corrected SO ₂ average
B	1 to 3	C *	Ch1:CO, Ch2:O ₂ , Ch3:corrected CO, Ch4:corrected CO average
F	1 to 3	C *	Ch1:NO _x , Ch2:SO ₂ , Ch3:O ₂ , Ch4:corrected NO _x , Ch5:corrected SO ₂ , Ch6:corrected NO _x average, Ch7:corrected SO ₂ average
G	1 to 3	C *	Ch1:NO _x , Ch2:CO, Ch3:O ₂ , Ch4:corrected NO _x , Ch5:corrected CO, Ch6:corrected NO _x average, Ch7:corrected CO average
J	1 to 3	C *	Ch1:CO ₂ , Ch2:CO, Ch3:O ₂ , Ch4:corrected CO, Ch5:corrected CO average
N	1 to 3	C *	Ch1:NO _x , Ch2:SO ₂ , Ch3:CO, Ch4:O ₂ , Ch5:corrected NO _x , Ch6:corrected SO ₂ , Ch7:corrected CO, Ch8:corrected NO _x average, Ch9:corrected SO ₂ average, Ch10:corrected CO average
V	1 to 3	C *	Ch1:NO _x , Ch2:SO ₂ , Ch3:CO ₂ , Ch4:CO, Ch5:O ₂ , Ch6:corrected NO _x , Ch7:corrected SO ₂ , Ch8:corrected CO, Ch9:corrected NO _x average, Ch10:corrected SO ₂ average, Ch11:corrected CO average

* When the 21st digit code is A or C, the component of the NO analyzer is displayed as NO_x.

5.4 Basic Operation

- **Measurement mode**

The measurement mode can display up to 5 channels in a single screen.



User mode displays

- Switch Ranges
- Calibration Parameters
- Alarm Setting
- Setting of Auto Calibration
- Setting of Auto Zero Calibration
- Parameter Setting.

Press the UP or DOWN key to move the cursor to the desired function.

Select the function by pressing the ENT (ENTER) key. The screen display will change to that of the selected function.

Each function is described in Chapter 6. *Settings and Calibration*.

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Settings and Calibration

6.1 Range Switch

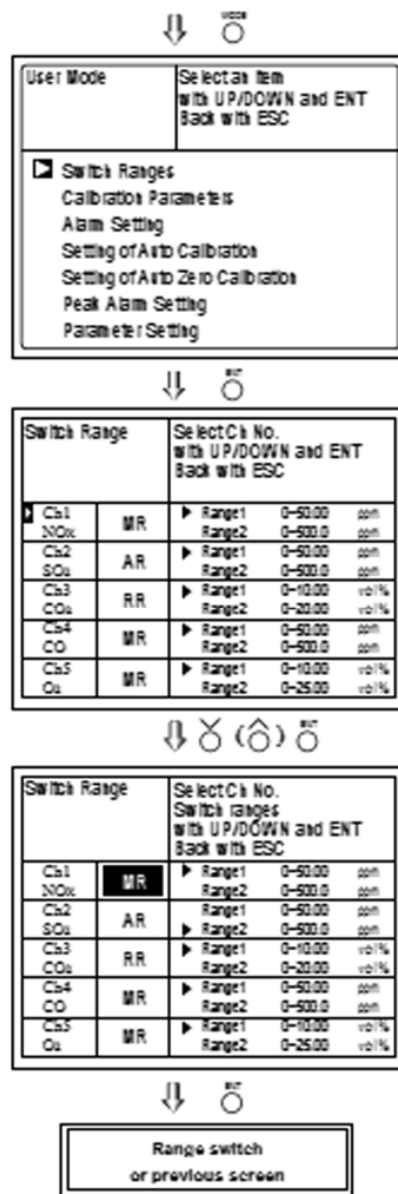
6.1.1 Setting the Range Switch Mode

The range switch has three modes:

- Manual (MR)
- Remote (RR)
- Auto Ranging (AR)

To set the range switch mode:

1. Press the MODE key while in measurement mode to display the User mode screen.
2. Move the cursor to “Switch Ranges” and press the ENT key.
3. In the “Channel Selection” screen that appears, move the cursor by pressing the UP or DOWN key, and select Ch (component).
4. Then press the ENT key.
5. The selected range switch mode will be highlighted. Press the UP or DOWN key to select the desired mode.
6. Then press the ENT key to confirm the selection.
7. If “MR” is selected, the cursor moves to “Range Switch.”



6.1.2 Manual Range Mode

The analysis range for the measured component can be switched manually as follows:

1. Select “MR” as range switch mode, and then press the ENT key.

Switch Range		Select Ch No. Switch ranges with UP/DOWN and ENT Back with ESC		
Ch1 NO _x	MR	▶ Range1	0-50.00	ppm
		▶ Range2	0-500.0	ppm
Ch2 SO ₂	AR	▶ Range1	0-50.00	ppm
		▶ Range2	0-500.0	ppm
Ch3 CO ₂	RR	▶ Range1	0-10.00	vol%
		▶ Range2	0-20.00	vol%
Ch4 CO	MR	▶ Range1	0-50.00	ppm
		▶ Range2	0-500.0	ppm
Ch5 O ₂	MR	▶ Range1	0-10.00	vol%
		▶ Range2	0-25.00	vol%

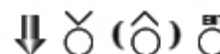


2. Using the UP/DOWN keys, move the cursor to the desired range selection. The highlighted arrow indicates the currently selectable range.
3. Select it by pressing the ENT key, and analysis will be carried out in that range.

Note: If “RR” or “AR” is selected as range switch mode, this operation cannot be performed.

The ranges for O₂ correction value, O₂ correction average value, and O₂ average value are automatically switched according to the instantaneous value range switch settings. (Same as for “RR” or “AR”.)

Switch Range		Select Ch No. with UP/DOWN and ENT Back with ESC		
Ch1 NO _x	MR	▣ Range1	0-50.00	ppm
		▶ Range2	0-500.0	ppm
Ch2 SO ₂	AR	▶ Range1	0-50.00	ppm
		▶ Range2	0-500.0	ppm
Ch3 CO ₂	RR	▶ Range1	0-10.00	vol%
		▶ Range2	0-20.00	vol%
Ch4 CO	MR	▶ Range1	0-50.00	ppm
		▶ Range2	0-500.0	ppm
Ch5 O ₂	MR	▶ Range1	0-10.00	vol%
		▶ Range2	0-25.00	vol%



End of Range Switch

To return to the previous screen, press the ESC key. If ESC is pressed in the middle of an entry or before the ENT key was pressed to accept a setting, it will reject the current selection and return you the display to the previous screen without making the changes .

6.1.3 Range Identification Contacts

The contacts for range identification on each channel are closed when Range 1 is active, and open when Range 2 is active.

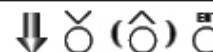
If the measurement value is held by a remote contact input or during calibration and range switch conditions are met, the contact status will change only after the hold condition is removed.

6.2 Calibration Setting

This mode is used to set calibration parameters such as span and zero gas concentration, calibration range, and auto calibration settings and range.

When <User Mode> The “Calibration Parameters” screen that appears, the data shown at right is illustrated.

Cal. Parameters	Select an item with UP/DOWN and ENT Back with ESC
<input checked="" type="checkbox"/> Calibration Value About ZERO Calibration About Calibration Range About Calibration Components / Range	



6.2.1 Setting the Span Gas Concentration

This screen allows you to set the cal gas concentrations for zero and span on each Ch used for calibration.

1. Select < User mode > → < Calibration parameters > → < Calibration value >. The “Calibration Value Settings” screen will appear.
2. Select the Ch you want to change by pressing the UP or DOWN key. Then press the ENT key and cursor moves to the first editable parameter within that field.
3. Select the concentration item you want to set (Zero or Span) by pressing the UP, DOWN or SIDE (>) key. The SIDE key only functions within the selected channel. Press the ENT key when the cursor is in the desired field. The first digit of the parameter is highlighted.
4. Enter calibration gas concentration for zero and span. Use the UP or DOWN key to increment or decrement the displayed

Cal. Settings Cal. Value	Select Ch No. for Setting calibration value		
CH	RANGE	ZERO	SPAN
Ch1	0-50.00ppm	+0000.0	50.00
NOx	0-500.0ppm	+00000	500.0
Ch2	0-50.00ppm	+0000.0	50.00
SO ₂	0-500.0ppm	+00000	500.0
Ch3	0-10.00ppm	+000.00	10.00
CO ₂	0-20.00ppm	+000.00	20.00
Ch4	0-50.00vol%	+0000.0	50.00
CO	0-500.0vol%	+00000	500.0
Ch5	0-10.00vol%	21.00	01.00
O ₂	0-25.00vol%	21.00	01.00



value one digit at a time. When the correct number is displayed for that digit, use the SIDE key to move to the next digit and repeat the increment/decrement process with the UP/DOWN keys.

5. After setting, save the entry by pressing the ENT key. The saved value becomes valid with the next calibration event.

Note: Enter calibration parameters settings for each range. If a zirconia O2 sensor is installed, select 21.00 for the Zero if air is used for calibration, and use the concentration listed on the cylinder for the span value.

After saving the calibration values entered, close the Calibration Parameter screen by pressing ESC. This will return the display to the previous screen.

Note: Pressing ESC during an entry (before pressing ENT) will abort the entry leaving the previous entry intact.

Calibration parameter range of value

NO_x, SO₂, CO₂, CO, external and built in O₂ sensor:

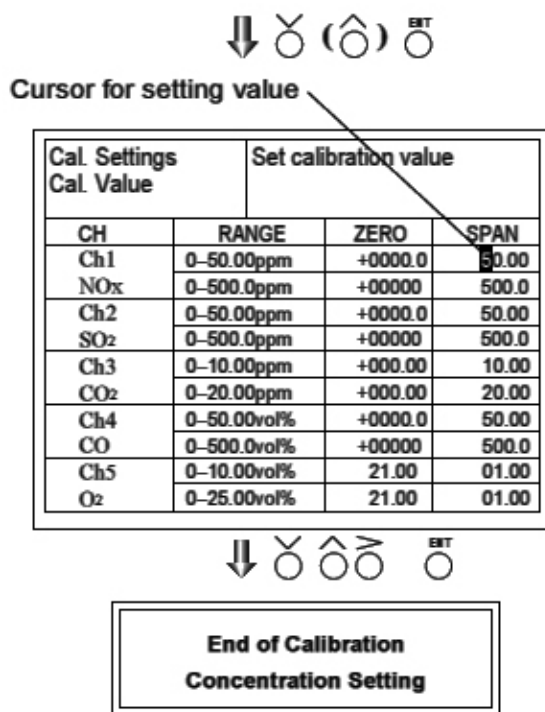
Span: 1-105% of full scale

External O₂ sensor:

Zero: 5-25%

Span: 0.01%-5% (vol.)

The settings cannot be performed beyond the range limits.

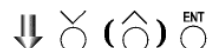


6.2.2 Manual Zero Calibration

When setting the zero calibration in manual mode, you can set all components simultaneously or one by one.

1. Select < User mode > → < Calibration parameters > → < Zero calibration >. The Zero Calibration screen will appear as shown.
2. Select the Ch you want to change using the UP or DOWN key and then press the ENT key. The setting content becomes highlighted.
3. Choose whether you want to set the zero values all together or individually by toggling “at once” or “each” with the UP or DOWN key. Each channel that is set to “at once” will be zero-calibrated at the same time.
4. When “each” is selected, the specific Ch (component) can be selected and zero-calibrated individually. Press the ENT key after making the choice and the specified calibration is performed.

Cal. Settings ZERO Cal.		Set each or both Ch at ZERO Calibration	
Ch1 NOx	Range1 Range2	0-10.00 ppm 0-100.0 ppm	at once
Ch2 O2	Range1 Range2	0-10.00 vol% 0-25.00 vol%	each



**End of
Manual Zero Calibration Setting**

To close the Manual Zero Calibration screen, press ESC. This will return the display to the previous screen.

Note: Pressing ESC during an entry (before pressing ENT) will abort the entry leaving the previous entry intact.

Example:

Set each Ch (component) to either “each” or “at once” using the steps above.

- Setting “each”
Select the Ch (component) on the manual zero calibration screen and then perform the zero calibration.
- Setting “at once”
In a manual zero calibration, Ch (components) for which “at once” are selected will simultaneously be zero-calibrated.

Manual Calibration Screen:

When setting all components to “each”:

ZERO Call.		ENT : Go on Calibration of selected Ch ESC : Not calibration	
Ch1 NOx	▶ Range1 Range2	0-50.00 ppm 0-500.0 ppm	▣ -2.1
Ch2 SO ₂	▶ Range1 Range2	0-50.00 ppm 0-500.0 ppm	-0.5
Ch3 CO ₂	▶ Range1 Range2	0-10.00 vol % 0-20.00 vol %	0.00
Ch4 CO	▶ Range1 Range2	0-50.00 ppm 0-500.0 ppm	0.0
Ch5 O ₂	▶ Range1 Range2	0-10.00 vol % 0-25.00 vol %	21.00

A single cursor will appear.

When setting all components to “at once”:

ZERO Call.		ENT : Go on Calibration of selected Ch ESC : Not calibration	
Ch1 NOx	▶ Range1 Range2	0-50.00 ppm 0-500.0 ppm	▣ 0.0
Ch2 SO ₂	▶ Range1 Range2	0-50.00 ppm 0-500.0 ppm	▣ 0.3
Ch3 CO ₂	▶ Range1 Range2	0-10.00 vol % 0-20.00 vol %	▣ 0.00
Ch4 CO	▶ Range1 Range2	0-50.00 ppm 0-500.0 ppm	▣ -0.1
Ch5 O ₂	▶ Range1 Range2	0-10.00 vol % 0-25.00 vol %	▣ 21.00

Cursors will appear at all components where “at once” is set.

6.2.3 Setting the Calibration Range

This mode is used to set whether the channels use one or both of the calibration ranges.

- From the Calibration Parameters screen, select Calibration Range. The following screen appears.
- Select the Ch you want to change by pressing the UP or DOWN key, then press the ENT key. The setting content is highlighted.
- Toggle between “both” or “current” using the UP or DOWN key.
 - If “both” is selected, zero or span calibration will be performed on both Range 1 and Range 2 on the selected Ch when the calibration is performed.

Cell. Settings Cell. Range		Set calibration range current or both range	
Ch1 NOx	Range1 Range2	0-50.00 ppm 0-500.0 ppm	both
Ch2 SO ₂	Range1 Range2	0-50.00 ppm 0-500.0 ppm	current
Ch3 CO ₂	Range1 Range2	0-10.00 vol % 0-20.00 vol %	current
Ch4 CO	Range1 Range2	0-50.00 ppm 0-500.0 ppm	both
Ch5 O ₂	Range1 Range2	0-10.00 vol % 0-25.00 vol %	current



End of Calibration Range Setting

- If “current” is selected, zero or span calibration will be performed only for the range displayed when calibration is performed.
4. Press the ENT key after the selection, and the specified calibration is performed.

To close the Calibration Range Settings screen or to abort the entry midway, press the ESC key. The previous screen will return.

Example:

Ch1 NOx	Range 1: 0 to 50 ppm Range 2: 0 to 500 ppm	both
Ch 2 SO ₂	Range 1: 0 to 50 ppm Range 2: 0 to 500 ppm	current

Ch1: Range 1 and Range 2 are calibrated together

Ch2: Only the currently displayed range is calibrated

Note: When “both” is selected, the same calibration gas concentration must be used for both ranges.

When setting NOx and CO to “both”

ZERO Call.		ENT : Go on Calibration of selected Ch ESC : Not calibration	
Ch1 NOx	▶ Range1 0-50.00 ppm Range2 0-500.0 ppm	◀	-0.6
Ch2 SO ₂	▶ Range1 0-50.00 ppm Range2 0-500.0 ppm	▶	0.4
Ch3 CO ₂	▶ Range1 0-10.00 vol% Range2 0-20.00 vol%	▶	0.00
Ch4 CO	▶ Range1 0-50.00 ppm Range2 0-500.0 ppm	◀	-0.1
Ch5 O ₂	▶ Range1 0-10.00 vol% Range2 0-25.00 vol%	▶	21.00

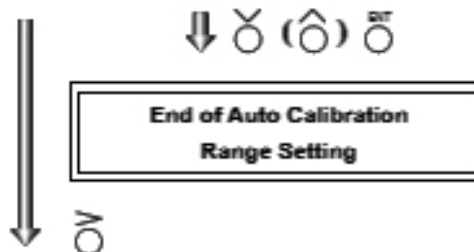
Two cursors will appear in both ranges (Ch1 and Ch4).

6.2.4 Setting the Component/Range for Auto Calibration

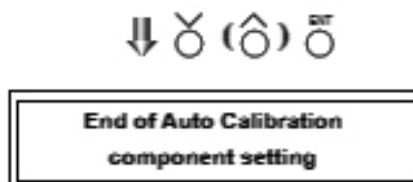
In this section you can select the Ch (component) and the range to calibrate on for those components that have the auto ranging (AR) feature enabled.

1. From the User Mode screen select < Calibration parameters > → < Auto calibration component/range >. The “Auto Calibration Component Range” screen appears as shown.
2. Select the Ch you want to change by pressing the or the key. Press the ENT key. The cursor will be highlighted in the selected channel.
3. Select the range you want to use as the main calibration range by pressing the UP or DOWN key to move to the desired range.
4. Press the ENT key, and subsequent calibrations will be performed on the selected range when either auto calibration or auto zero calibration is requested.

Cell. Settings Auto Cal.		Select a range for auto calibration	
Ch1 NO _x	Range1 Range2	0-50.00 ppm 0-500.0 ppm	enable
Ch2 SO ₂	Range1 Range2	0-50.00 ppm 0-500.0 ppm	enable
Ch3 CO ₂	Range1 Range2	0-10.00 vol% 0-20.00 vol%	enable
Ch4 CO	Range1 Range2	0-50.00 ppm 0-500.0 ppm	enable
Ch5 O ₂	Range1 Range2	0-10.00 vol% 0-25.00 vol%	enable



Cell. Settings Auto Cal.		Set enable or disable for auto calibration	
Ch1 NO _x	Range1 Range2	0-50.00 ppm 0-500.0 ppm	enable
Ch2 SO ₂	Range1 Range2	0-50.00 ppm 0-500.0 ppm	enable
Ch3 CO ₂	Range1 Range2	0-10.00 vol% 0-20.00 vol%	enable
Ch4 CO	Range1 Range2	0-50.00 ppm 0-500.0 ppm	enable
Ch5 O ₂	Range1 Range2	0-10.00 vol% 0-25.00 vol%	enable



Note regarding Auto Calibration Component/Range Selection

The auto calibration or manual calibration of the component for which auto ranging (AR) is in effect will be performed on the range that is selected here. In this case, once the calibration is started, the range is automatically switched, and on completion of the calibration, the original range is resumed.

The range identification contact is interlocked with the range after the

switch. However, if the hold setting is set to “ON,” the contact status before calibration is maintained.

5. Press the SIDE key in the state described in (3), and the highlight is toggled between “enable” and “disable” auto calibration.
6. Select “enable” or “disable” by pressing the UP or DOWN key.
7. Then press the ENT key to save your selection.

To close the Auto Calibration Settings screen or to abort the entry midway, press the ESC key. The previous screen will return.

Auto Calibration Operation

Auto calibration is performed under the following rules.

1. Zero calibration is performed at the same time, for the Ch (component) in which “enable” is selected at the time of auto calibration and auto zero calibration.
2. Span calibration is performed in the order from smallest Ch No., for the Ch (component) that have “enable” set in the Auto Calibrations Setting screen.

Note: ZERO calibrations for components which have been set to “enable” in the Auto Calibration Settings screen (above) are performed in batch irrespective of the description in “6.2.2 Manual Zero Calibration.”

6.3 Alarm Setting

6.3.1 Setting Alarm Parameters

The High/Low limit concentration alarms are user adjustable. Five different alarm contact outputs can be used. The setting range is 0-100% full scale for each range.

To change the alarm setting, set the alarm ON/OFF setting to OFF, and then change the value.

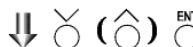
1. Enter the “Alarm Setting” screen from the user mode. The screen shown on the right will display. Use the UP or DOWN keys to move the cursor to the desired Alarm No. or hysteresis. Then press ENT.
2. After selecting the alarm the screen shown at the right will display. Use the UP or DOWN keys until the cursor is aligned with the desired item and press ENT.

Note: Set the values so that H-limit value > L-limit value and that (H-limit value - L-limit value) > hysteresis.

In the case where reverse range O₂ measurements are used set the values so that L-limit value > H-limit value.

When “0” is set, the alarm is inactive.

Alarm Setting	Select Alarm No. or Hysteresis setting
<input checked="" type="checkbox"/> Alarm-1 Alarm-2 Alarm-3 Alarm-4 Alarm-5	
Hysteresis	00 %FS



Alarm Setting Alarm-1	Select an item with UP/DOWN and ENT Back with ESC
<input checked="" type="checkbox"/> Channel	Ch1
H-Limit Range 1	10.00 ppm
Range 2	100.0 ppm
L-Limit Range 1	000.0 ppm
Range 2	0000 ppm
Kind of Alarm	High
ON / OFF	OFF



Cursor for setting value

Alarm Setting Alarm-1	Select an item with UP/DOWN and ENT Back with ESC
<input checked="" type="checkbox"/> Channel	Ch1
H-Limit Range 1	0.00 ppm
Range 2	100.0 ppm
L-Limit Range 1	000.0 ppm
Range 2	0000 ppm
Kind of Alarm	High
ON / OFF	OFF



End of Alarm Setting

3. After setting the parameters, press ENT to save the settings.

To close the Alarm Settings screen or to abort the entry midway, press the ESC key. The previous screen will return.

Alarm Setting Descriptions

The alarm contact number can be assigned to any channel. Channels can also have multiple alarms assigned to them.

Channel:	Channel setting targeted for alarm. Any channel may be selected for multiple alarms.
H-Limit value:	Sets the high limit value (concentration) for alarm.
L-Limit value:	Sets the low limit value (concentration) for alarm.
Kind of Alarm:	Select either High limit alarm, Low limit alarm, and High limit or Low limit alarm, HH limit alarm, and LL limit alarm. High, HH: Alarm contact closes when above H-limit alarm. Low, LL: Alarm contact closes when below L-limit alarm. High or Low: Alarm contact closes when above H-limit value or below lower limit value.
ON/OFF:	Enables the alarm function when set to ON, or disables it if set to OFF.

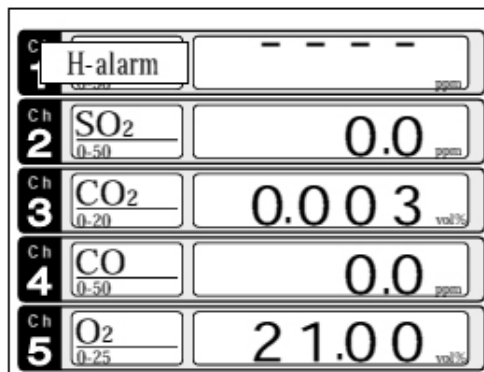
Note: The H-limit value cannot be set below the L-limit value, and the L-limit value cannot be set above the H-limit value.

If it is desired to set the H-limit value below the L-limit value already stored in the memory, reduce the L-limit value beforehand, and vice versa for setting the low limit above the high limit.

Note: After turning on power, the alarm logic trigger is inactive for 10 minutes.

When an H-limit alarm occurs, the “H-alarm” message displays in the relevant component field. Other alarm displays are:

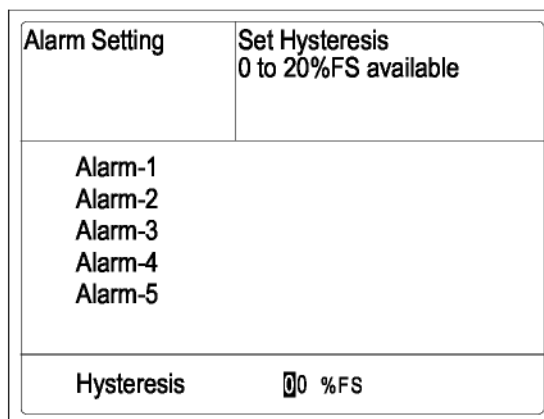
L-alarm for Low-limit alarm, HH-alarm for high limit alarm, HH-alarm for high-high alarm, and LL-alarm for low-low alarm.



6.3.2 Hysteresis Setting

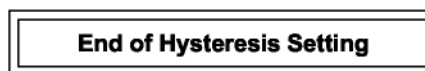
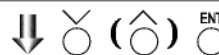
The alarm hysteresis can be set or changed to prevent chattering of an alarm output about its alarm set point. To set or change the alarm hysteresis:

1. Navigate to the “Alarm Setting” screen and then move the cursor to “Hysteresis” using the UP or DOWN key. Then press ENT to display the screen shown at the right.
2. From this screen enter the hysteresis values by increasing or decreasing the value using the UP or DOWN keys. Move the cursor to the next digit with the SIDE key. When the value is correct, press ENT to save.



The hysteresis can be set from 0-20% full scale on the selected range.

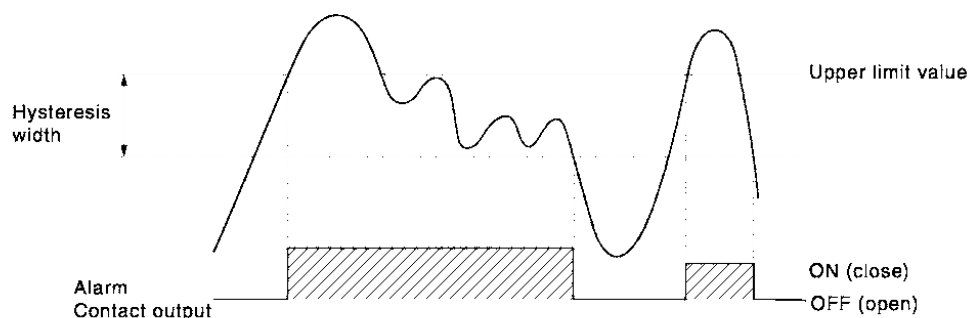
To close the Hysteresis Settings screen or to abort the entry midway, press the ESC key. The previous screen will return.



Note: The hysteresis is common to all alarms (components). Hysteresis in peak alarm setting described in Item 6.3.3 should be set separately.

Hysteresis (In case of upper limit alarm)

An alarm output is turned ON if the measured value exceeds the upper limit value as shown below. Once the alarm output has been turned ON, it is not turned OFF until the indication falls below the hysteresis width from the upper limit value.

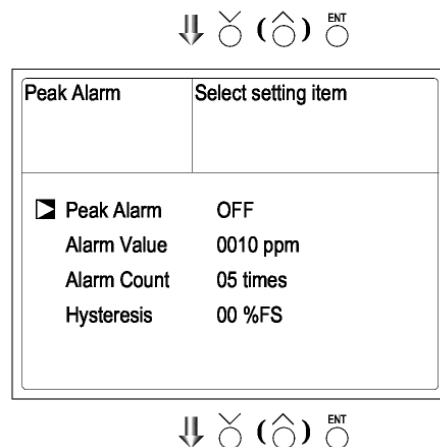
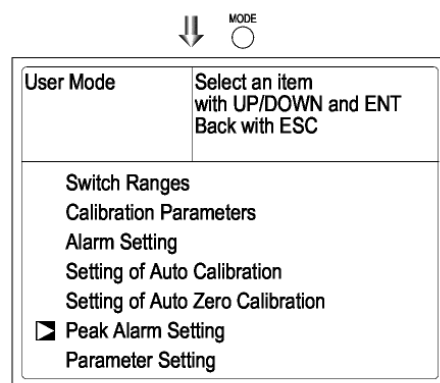


6.3.3 Peak Alarm Setting

When the peak number of times CO concentration exceeds the upper limit value during measurement reaches the set number, an alarm is provided.

The peak alarm and this setting screen appear only when an option is added.

1. Press the MODE key while in the Measurement mode, and the User mode appears.
2. Using the UP or DOWN keys move the cursor to “Setting of Peak Alarm”. Then press ENT.
3. In the “Peak Alarm Setting” selection screen that appears, point the cursor to any item you want to set using the UP or DOWN key. Then press ENT.
4. Enter numeric values using the UP or DOWN keys. The setting will be saved after pressing the ENT key.



Description of Setting Items

Peak Alarm : ON/OFF of peak alarm

Alarm Value : If measuring value exceeds the set alarm value, a peak counter increments by 1 time.

Alarm Count : When the alarm value is exceeded this many times per hour, the peak count alarm is activated (closed).

Hysteresis : To prevent possible chattering when the measuring value may exceed the set peak concentration by only 1 time, the peak count has an allowance in the hysteresis width.

↓ (Down Arrow) (Left Arrow) (Right Arrow) ENT

Peak Alarm	Set Peak Alarm ON or OFF
Peak Alarm	OFF
Alarm Value	0010 ppm
Alarm Count	05 times
Hysteresis	00 %FS

↓ (Down Arrow) (Left Arrow) (Right Arrow) ENT

End of Peak Alarm Setting

Setting Range

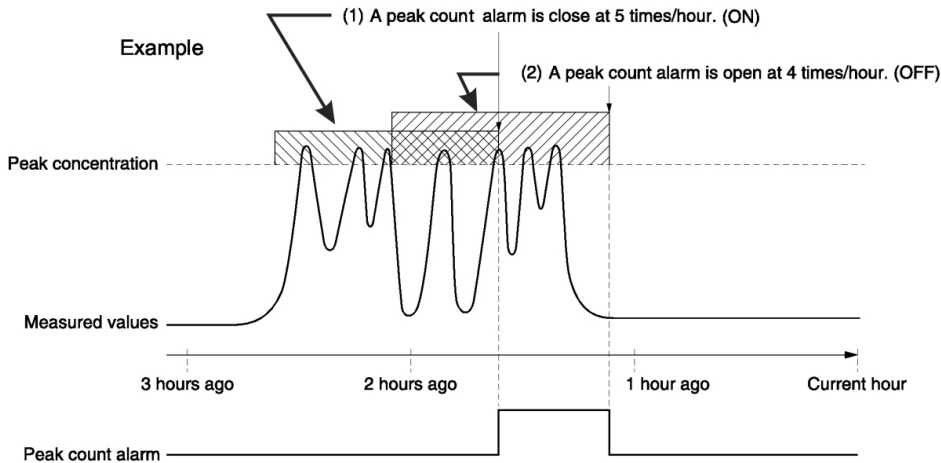
Alarm value: 10-1000 ppm → 5 ppm step (initial value: 500 ppm)

Alarm count: 1- 99 times/hr → (initial value: 5 times)

Hysteresis : 0-20 % FS → (initial value: 0% of full scale)

[% FS] represents the percentage with the CO range regarded as 100%.

Action of Peak Alarm



If the CO concentration exceeds the alarm value, counting will begin. If the number of peaks is over the set times per hour, a peak alarm contact output becomes closed (ON). If it is less than the set times per hour, it is open (OFF). Since 5 peaks /hour is exceeded in the cross-hatched area marked (1) in the above graph, the peak count alarm is turned ON. Since peaks of more than 5 per hour occur at the interval between (1) and (2), the peak count alarm remains ON whereas at (2), peaks are reduced to 4 per hour, and the alarm is turned OFF.

Like the hysteresis of the alarm setting, the hysteresis prevents possible chattering when a measured gas fluctuates about the alarm value.

- * The peak alarm counting logic is not performed during the first 10 minutes after the power is turned ON.

Releasing peak count alarm

To release the peak count alarm, set the peak alarm to OFF.

Turning on the peak alarm initiates the count at 0.

6.4 Setting Up the Auto Calibration

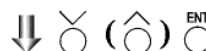
6.4.1 Auto Calibration

Auto calibration is automatically carried out at the time when zero span calibration are set. Before changing the setting of auto calibration, set the auto calibration function to OFF.

1. Enter the “Setting of Auto Calibration” screen from the user mode, and the display shown at right appears. Use the UP and DOWN keys to align the cursor with the desired item and then press the ENT key.
2. In the “Set Auto Cal” screen that appears, enter the values for the various settings. To make a value entry or change, use the UP and DOWN keys to increment or decrement the value on digit at a time. Use the SIDE key to move the cursor to the next digit.

When all the settings are correct, press the ENT key to save them. Subsequent auto calibrations will use the saved settings.

Set Auto Cal.	Select setting item
<input checked="" type="checkbox"/> Start Time Cycle Flow Time ON / OFF	SUN 12:00 07 day OFF Time : MON 12:34
Auto Calibration Run	



Set Auto Cal.	Set Start Time
Start Time Cycle Flow Time ON / OFF	SUN 12:00 07 day ← OFF Time : MON 12:34
Auto Calibration Run	

Press the or the key, and date and time are displayed alternately.



Description of Auto Cal Settings

- Start Time : Setting for the first calibration event (day of the week, hour, minute)
- Cycle : The period between the start time of one calibration and the next (unit: hour/day)

End of Auto Calibration Setting

- Flow Time : The time required for purging with calibration gas.
Time required for replacement of sample gas after the calibration is completed (Set by calibration gas. See the next page.)
- ON/OFF: Turns the auto calibration feature ON or OFF.

To close the Auto Cal Settings screen or to abort the entry midway, press the ESC key. The previous screen will return.

Gas flow time setting

1. With the cursor on “Flow Time”, press the ENT key to bring up the Flow Time screen.
2. Move the cursor to the gas you want to change by pressing the UP or DOWN key, and then press ENT.
3. The highlighted value can be changed by pressing UP or DOWN key, and then using the SIDE key move the cursor to the right to alter the next digit.
4. After changing the value, press the ENT key to save the setting.
5. Press the ENT key again to return to the Auto Cal Setting screen.

Set Auto Cal.	Set flow item of calibration gas 60 to 900 sec
ZERO	50 sec.
Ch1 Span	350 sec.
Ch2 Span	350 sec.
Ch3 Span	350 sec.
Ch4 Span	300 sec.
Ch5 Span	300 sec.
Ex. time	300 sec.



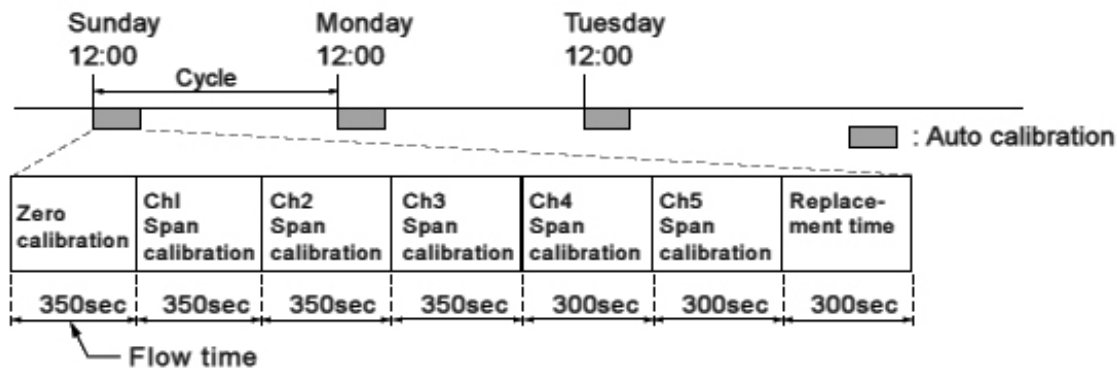
Note: Only the channels used are displayed on this screen. The Ex. time sets the output signal hold extension time that follows the completion of calibration. It is valid only when the hold setting is set to “ON.” The Ex. time set here is also the hold extension time used in a manual calibration.

Auto calibration status contact output is closed during auto calibration (NO side), and is open in other cases.

Example:

Start Time	Sun	12:00
Cycle	1	day
Flow Time	Zero	350 sec
	CH 1 Span	350 sec
	CH 2 Span	350 sec
	CH 3 Span	350 sec
	CH 4 Span	300 sec
	CH 5 Span	300 sec
	Ex. Time	300 sec
ON/OFF	ON	

Thus, with the above settings:



Setting Range:

Cycle:	1-99 hours or 1-40 days (default value—7days)
Flow Time:	60-900 sec (default value—300 sec)

Caution: *When an auto calibration starts, the measurement screen appears automatically.*



Any operation other than “Stop Auto Calibration” (see Item 6.4.2) is not permitted during auto calibration. “Stop Auto Calibration” cannot be performed with the key lock to ON.

To force a cancel of the auto calibration, set the key lock to OFF and then execute “Stop Auto Calibration”.

Turn power OFF and then ON again at the time set as the next start time in auto calibration, and then repeat it in the set cycle.

Remote Start

Whether the auto calibration is set at ON or OFF, an auto calibration is always available via a remote start input.



6.4.2 Forced Run/Stop Of Auto Calibration

Auto calibration can be performed just once or forcibly stopped while the calibration is in process

6.4.2.1 EXECUTION OF AUTO CALIBRATION (ONLY ONCE)

1. In the “Set Auto Cal screen, move the cursor to “Auto Cal Run” using the UP or DOWN key, then press ENT.
2. “Run” is highlighted, displaying a message to confirm the execution of auto

Set Auto Cal	Auto Cal Run
	ENT Run / Stop
	ESC Cancel
Start Time	SUN 12:00
Cycle	07 day
Flow Time	
ON / OFF	OFF
	Time : MON 12:34
Auto Calibration Run	

calibration. Press the ENT key to execute the auto calibration or press the ESC key to cancel.

6.4.2.2 FORCED STOP OF AUTO CALIBRATION

This mode is used to stop the auto calibration forcibly.

1. In the “Set Auto Cal” screens point the cursor to “Auto Calibration Stop” using the “UP or DOWN key. Then press ENT. (“Auto Calibration Stop” appears when this screen is selected while auto calibration is performed.)
2. “Stop” is highlighted, displaying a message to confirm the stop of auto calibration. Press the ENT key to stop the auto calibration or press the ESC key to cancel the stop auto cal action.

Set Auto Cal.	Auto Cal. Stop ENT : Run / Stop ESC : Cancel
Start Time	SUN 12:00
Cycle	07 day
Flow Time	300 sec
ON / OFF	OFF
Time : MON 12:34	
Auto Calibration Stop	

“Auto Calibration” screen

Example

When Ch 1 and Ch2 are enabled for auto calibration (see Section 6.2.4):

- Zero calibration
A message, “Zero cal.” blinks at Ch1 and Ch2.
- Ch1 span calibration
A message, “Span cal.” blinks at Ch1.
- Ch2 span calibration
A message, “Span cal.” blinks at Ch2.

1	ZERO cal.	0.5
2	ZERO cal.	0.3
3	CO ₂	0.000
4	CO	0.0
5	O ₂	21.02

1	SPAN cal.	90.8
2	SO ₂	0.0
3	CO ₂	0.00
4	CO	0.0
5	O ₂	0.00

1	NO _x	0.0
2	SPAN cal.	95.0
3	CO ₂	0.00
4	CO	0.0
5	O ₂	0.00

Caution: *During an auto calibration, all key operations are not permitted other than key lock ON/OFF and “Auto Calibration Stop.”*



When the key lock is ON, the “Auto Calibration Stop” is locked out as well.

To stop “Auto Calibration” forcedly, set the key lock to OFF and then execute “Auto Calibration Stop.”

6.5 Setting Auto Zero Calibration

6.5.1 Auto Zero Calibration

Zero calibration can be performed automatically using the settings applied in this screen.

The channels for which auto calibration is to be performed are determined by the auto calibration settings described in Section 6.2.4.

Before changing any of the auto zero calibration settings, set the auto zero calibration to OFF.

1. Enter the “Set Auto Zero Cal” screen from the user mode. The screen shown at the right will appear.
2. Use the UP or Down keys to move the cursor to the desired item and press the ENT key. In the “Set Auto Zero” screen that appears, set the desired parameter using the UP or DOWN key to increment/decrement the value and the SIDE key to move to the next digit or field.

After the setting is correct, press the ENT key to save the settings. The next auto zero calibration will use the entered values.

Description of Auto Zero Settings

- Start Time : Setting for the first calibration event (day of the week, hour, minute)

Set Auto Zero Cal.	Select setting item
▶ Start Time	SUN 12:00
Cycle	07 day
Flow Time	300 sec.
ON / OFF	OFF
Time : MON 12:34	
Auto Zero Calibration Run	



Set Auto Zero Cal.	Set Start Time
▶ Start Time	SUN 12:00
Cycle	07 day
Flow Time	300 sec.
ON / OFF	OFF
Time : MON 12:34	
Auto Zero Calibration Run	

Press the or the key, and date and time are displayed alternately.



End of Auto Zero Calibration Setting

- Cycle : The period between the start time of one calibration and the next (unit: hour/day)
- Flow Time: The time required for purging with calibration gas.
- ON/OFF: Turns the auto calibration feature ON or OFF.

To close the Auto Zero Settings screen or to abort the entry midway, press the ESC key. The previous screen will return.

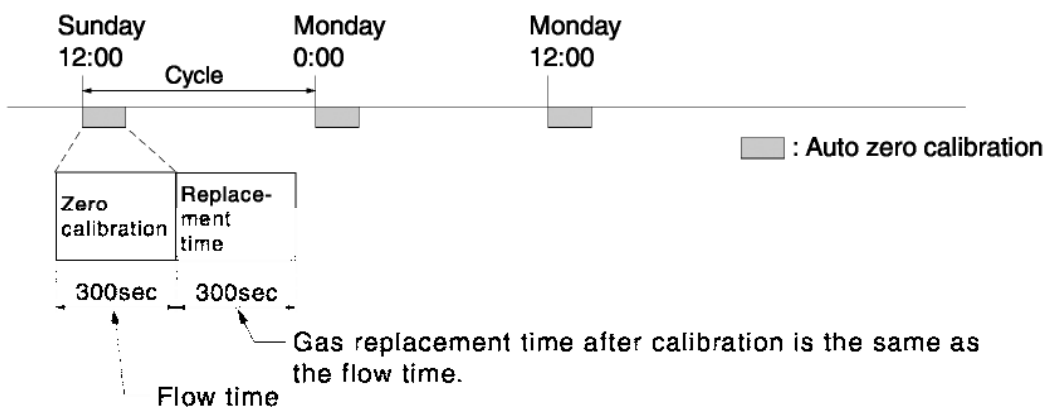
Auto Calibration Status Relay Contacts

The auto calibration status contact output is closed during auto zero calibration (NO side), and open during normal operation.

Example

Start Time	SUN	12:00
Cycle	12	hour
Flow Time	300	sec
ON/OFF	ON	

For an auto zero calibration using the above settings:



In this example, Ch1 through Ch5 are enabled, as shown in Section 6.2.4 “Setting the Component/Range for Auto Calibration.

Setting the Range

Cycle	1 to 99 hours or 1 to 40 days (default: 7 days)
Flow Time	60 to 900 sec (default: 300 sec.)

Caution: *When an auto zero calibration starts, the measurement screen automatically appears.*



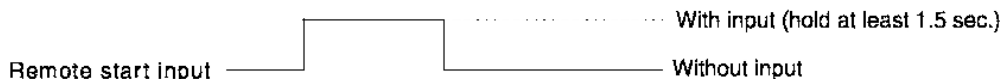
Any operation other than “Auto Zero Calibration Stop” (see Item 6.5.2) is not permitted during auto zero calibration. “Auto Zero Calibration Stop” cannot be performed with the key lock set to ON. To forcibly cancel auto zero calibration, set the key lock to OFF and then execute “Auto Zero Calibration Stop”.

If the auto calibration period and auto zero calibration period overlap, the auto calibration is retained, ignoring the auto zero calibration of that period.

When the hold setting is set to ON, the hold time for auto calibration contact and measurement value output signal is extended after calibration for gas purging.

Remote Start

A remote start input will begin a calibration event regardless of whether the auto zero calibration is set to ON or OFF.

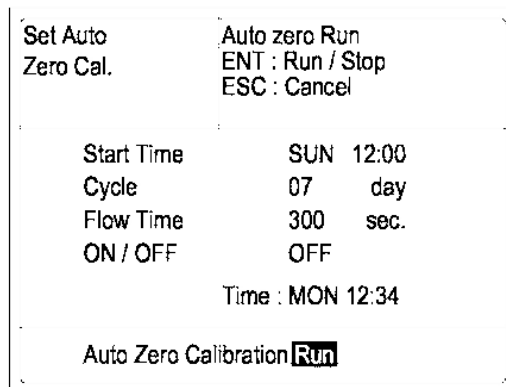


6.5.2 Forced Run/Stop of Auto Zero Calibration

Auto zero calibration can be performed just once, or auto zero calibration can be forcibly stopped during calibration.

6.5.2.1 EXECUTION OF AUTO ZERO CALIBRATION (ONLY ONCE)

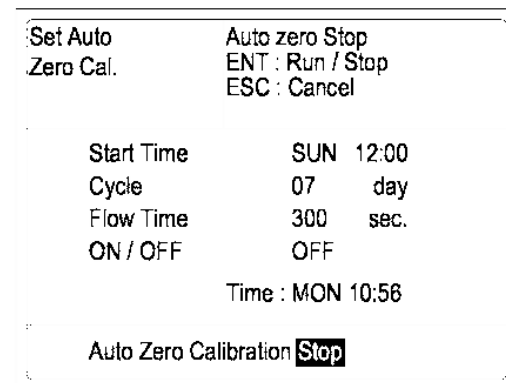
1. In the “Setting of Auto Zero Calibration” screen that appears, point the cursor to “Run” by pressing the UP or DOWN key. Then press ENT.
2. “Run” is highlighted, displaying a message to confirm execution of auto zero calibration. Press the ENT key to execute the calibration, or the ESC key to cancel.



6.5.2.2 FORCED STOP OF AUTO ZERO CALIBRATION

This mode is used to forcibly cancel an auto zero calibration event.

1. In the “Setting of Auto Zero Calibration” screen that appears, point the cursor to “Stop” by pressing the UP or DOWN key, then press ENT. (“Auto Zero Calibration Stop” appears when the screen is selected while auto zero calibration is performed.)



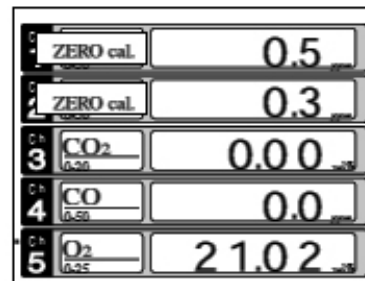
2. “Stop” is highlighted, displaying a message to confirm the stop of auto zero calibration.

Press the ENT key to stop the auto zero calibration and the ESC key to cancel (not stopped).

Auto Zero Calibration Screen

Example

With Ch1 and Ch2 set to enable for auto calibration (see Section 6.2.4):



- Zero calibration
A message, “Zero cal.” blinks at Ch1 and Ch2.

Caution: *During auto zero calibration, the only key operations allowed are key lock ON/OFF and “Auto Zero Calibration Stop.”*

When the key lock is set at ON, even the “Auto Zero Calibration Stop” cannot be used.

To forcibly stop “auto zero calibration”, set the key lock to OFF and then execute “Auto Zero Calibration Stop.”

6.6 Parameter Setting

From the Parameter Setting screen you can set or adjust various parameters of the instrument such as time, key lock, etc. Settable items are as follows:

Description of setting items

- Current Time : Current year, month, date, day of the week, hour, and minute setting. (The display appears in this order.)

Note: The clock backup time is 2 days. If power is turned on after being off for 2 days or longer, the time must be set again.

- Key Lock : Invalidates any key operation except canceling the key lock.
- Output Hold : Sets whether Calibration Output is held or not, and the holding value setting.
- Response time : Sets the response time of electrical system.
- Average Period : Sets the moving average time.
- Backlight Timer : Sets automatic OFF of the backlight of display unit and its timer.
- Contrast : Adjusts contrast of the LCD.
- Maintenance Mode : A password protected entry screen used to access the instrument’s maintenance mode.

* For the maintenance mode, see Section 6.7.

1. Enter the “Parameter Setting” screen from the user mode, and the display shown at right appears. Use the UP or DOWN key to move the cursor to the desired item and then press ENT.

Parameter	Select setting item
Current Time	12/01/11 WED 13:50
Key Lock	OFF
Output Hold	OFF Current
Response Time	
Average Period	
Backlight Timer	ON 5 min
Contrast	
To Maintenance Mode	0000



2. In the “Parameter Setting” screen that appears, perform the value entry or the setting. For the value entry or setting change, use the UP or DOWN key, and the SIDE key to move the cursor to the right.

Parameter	Set day of week
Current Time	12/01/11 WED 13:50
Key Lock	OFF
Output Hold	OFF Current
Response Time	
Average Period	
Backlight Timer	ON 5 min
Contrast	
To Maintenance Mode	0000



End of Parameter Setting

To close the Parameter Setting screen or to abort the entry midway, press the ESC key. The previous screen will return.

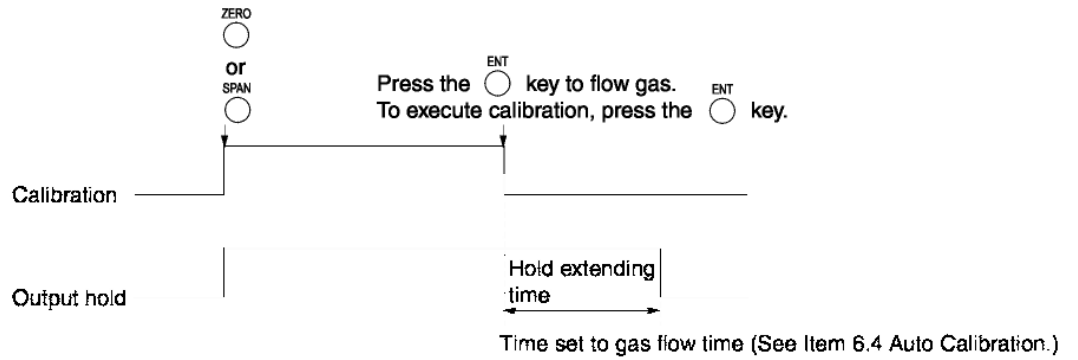
Setting Range

- Hold setting : 0 to 100% FS
- Response time : 1 - 60 sec. (default: 15 sec)
- Average period : 1 - 59 min or 1 - 4 hours (default value: 1 hour)
1 - 59 minutes when the unit is set to minute and 1 - 4 hours when is set to hour.
- Backlight Timer : 1 - 60 min (default value: 5 min)
- Maintenance mode : 0000 to 9999 (default value: 0000)

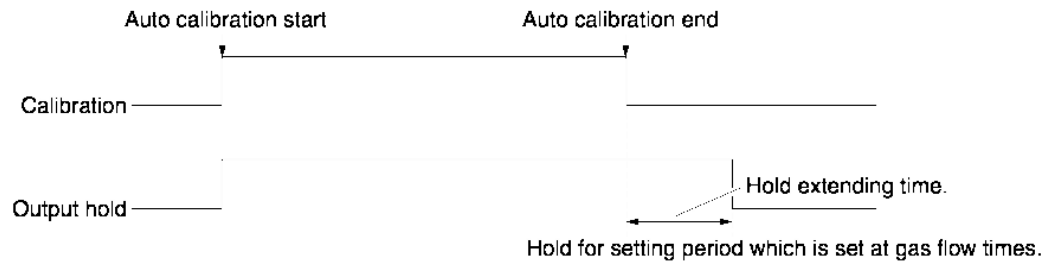
Output Hold

Setting an output hold to ON causes the output signal of each channel to be held during the manual/auto calibration plus the purge flow time (see Section 6.4, Setting of Auto Calibration). However, an output signal can be held via an external input regardless of the Hold ON/OFF setting.

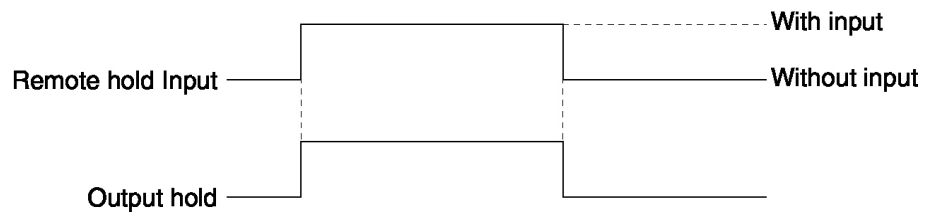
Manual Calibration



Auto Calibration



Remote Hold



Screen Display During Holding

A “Hold ON” message will blink on the measuring screen during a hold period. But during a manual calibration, the screen displays the process of calibration, therefore a “Hold ON” message will not displayed even if the output signal is held, however the screen will display the hold extending time.

If the calibration is cancelled after the calibration gas has been supplied, the holding extending time will be performed in either of manual or auto calibration operation.

You can select the hold value from the value immediately before entering output hold. The choices are “current” or an arbitrary value input using “setting”.

Use the procedures shown below for adjusting these settings.

1. From the “Parameter setting” screen that appears, select “Output Hold”. Highlight either “ON” or “OFF” using the UP or DOWN key and then press ENT to select it and return to (1).
2. When ON/OFF is highlighted, press the SIDE key. Toggle between “Current” or “Setting” using the UP/DOWN keys and then press ENT when the desired selection is highlighted.
3. Pressing ENT when “Current” is selected will hold the value immediately before the hold was initiated and return the highlight to (1).

Pressing the ENT key while “Setting” is selected

Parameter	Select Hold ON or OFF
Current Time	12/01/11 WED 13:50
Key Lock	OFF
Output Hold	ON Current
Response Time	
Average Period	
Backlight Timer	ON 5 min
Contrast	
To Maintenance Mode	0000



Parameter	Select Hold setting
Current Time	12/01/11 WED 13:50
Key Lock	OFF
<input checked="" type="checkbox"/> Output Hold	ON Setting
Response Time	
Average Period	
Backlight Timer	ON 5 min
Contrast	
To Maintenance Mode	0000





will bring up the parameter hold screen where an arbitrary hold value can be set.

- On the parameter hold screen that appears, move the cursor to the Ch (component) you want to hold using the UP or DOWN key and then press ENT.

Parameter Hold		Select Ch No.	
<input checked="" type="checkbox"/>	Ch1	NOx	010 %FS
<input type="checkbox"/>	Ch2	SO ₂	020 %FS
<input type="checkbox"/>	Ch3	CO ₂	015 %FS
<input type="checkbox"/>	Ch4	CO	012 %FS
<input type="checkbox"/>	Ch5	O ₂	022 %FS



- A highlighted value indicates that it can be changed. Adjust the highlighted value with the UP or DOWN key and then move the cursor to the right to change the next digit using the SIDE key.
- After the value is changed, press the ENT key.

Parameter Hold		Set Hold value 0 to 100%FS	
<input checked="" type="checkbox"/>	Ch1	NOx	0 10 %FS
<input type="checkbox"/>	Ch2	SO ₂	020 %FS
<input type="checkbox"/>	Ch3	CO ₂	015 %FS
<input type="checkbox"/>	Ch4	CO	012 %FS
<input type="checkbox"/>	Ch5	O ₂	022 %FS



End of Hold Setting



Parameter Setting screen

Note: The setting is expressed as 1/1 full scale range for both respective ranges.

When 0 to 1000 ppm is selected as the range, and 10% FS is selected as hold setting, the output equivalent to 100 ppm is held irrespective of the measured value at that time.

- Press the ESC key to return to the parameter setting screen.

Setting Description

- The instantaneous measurement value that is displayed cannot be held. (Output only can be held.)
- Optional modbus communications “Measurement concentration” register values are held.
- If set value is selected for hold, instantaneous O₂ correction value is calculated and held based on the set value.
- Range identification contact output cannot be switched even if the range is switched during the hold.

Response time

The response time of the electrical system can be changed. Individual settings can be made per each component.

Note: This screen does not provide an exact time setting, rather, it should be used as a guide for the response time.

The setting value can be modified by the customer.

Parameter	Select Ch No.		
Response Time			
<input checked="" type="checkbox"/> Ch1 NOx	10	Sec.	
Ch2 SO ₂	20	Sec.	
Ch3 CO ₂	15	Sec.	
Ch4 CO	12	Sec.	
Ch5 O ₂	22	Sec.	

Average Period

This screen allows you to set an averaging period for the average values of O₂ correction and O₂ average.

It enables you to set an average time of 1 to 59 minutes (1-minute step) or 1 to 4 hours (1-hour step).

Changing the setting also resets the averaging of O₂ correction and O₂ average value. (Pressing the ENT key resets averaging only for the components whose setting was changed.)

Parameter	Select Ch No.		
Average Period			
<input checked="" type="checkbox"/> Ch9 \overline{NOx}	01	hour	
Ch10 $\overline{SO_2}$	01	hour	
Ch11 $\overline{CO_2}$	01	hour	
Ch12 $\overline{O_2}$	01	hour	
Reset AV. Output		Reset	

Average Value Reset

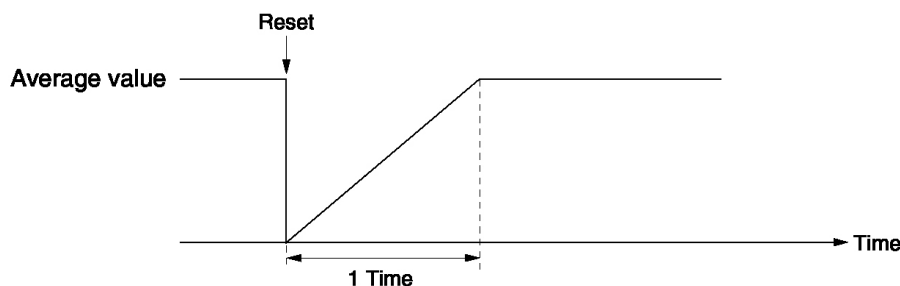
This mode is used to clear all average values, i.e. O₂ correction average and O₂ average, and restarts averaging. All average values are reset simultaneously. The indication value and output value is 0 ppm, vol% or so at the time of the reset input (based on average period settings).



So long as with input, resetting lasts.
 At the edge of changing from "with input" to "without input," the average action restarts.

Example:

If the average period was set to 1 hour:



- Sampling occurs every 30 seconds.
- Every 30 seconds, the average for the last 1 hour (time setting) is output.
- At the instant of resetting, zero is assumed for all past values. This means that the average value will not be correct for 1 hour after resetting.

Backlight Timer

Automatic OFF setting of the backlight of the LCD unit is user adjustable. When the specified time elapses during measurement screen display, the backlight automatically switches off. Pressing any key will turn the backlight back ON.

On the Parameters screen, when ON is selected for the Backlight Timer function, the time until auto OFF will also display. Press the SIDE key when ON is highlighted and the time setting can be changed. Use the UP or DOWN key to change the time value and then press ENT to save the value.

Parameter	Select ON or OFF
Current Time	12/01/11 WED 13:50
Key Lock	OFF
Output Hold	ON Previous value
Response Time	
Average Period	
Backlight Timer	<input checked="" type="checkbox"/> 5 min
Contrast	
To Maintenance Mode	0000

When OFF is selected, the backlight always remains on and does not automatically turn off.

Contrast

The LCD Contrast is user adjustable. With the contrast function highlighted, use the UP or DOWN keys to move the slider representing the contrast. When satisfied, press the ENT key to save the setting.

Parameter	Select ON or OFF
Current Time	12/01/11 WED 13:50
Key Lock	OFF
Output Hold	ON Previous value
Response Time	
Average Period	
Backlight Timer	ON 5 min
Contrast	<input type="text"/>
To Maintenance Mode	0000

Maintenance Mode

Enter the password and then press the ENT key to enter the maintenance mode. The password can be set using the password setting screen from Other Parameter/Password Set function while in the maintenance mode. The next section describes in detail the functions available in maintenance mode.

The default password is set at the factory to “0000.” You can enter the maintenance mode with this value before changing the password in maintenance mode to one of your choosing.

6.7 Maintenance Mode

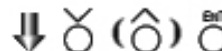
This mode is used to check sensor input values, display of error log or setting of passwords, etc. This is a password protected area. To access the maintenance mode, enter the correct password from the Parameter Setting/To Maintenance screen.

1. Select the Maintenance Mode from the Parameter Setting screen to display the Password Setting screen.
2. Enter the password, and the Maintenance Mode item selection screen will be displayed. Point the cursor to the item you want to set by pressing the UP or DOWN key and then press ENT.

Note: "To Factory Mode" is for TAI's service engineers only.

3. Press the ESC key to return to the Maintenance Mode item selection screen from each screen.

Maintenance Mode	Select operating item
<input checked="" type="checkbox"/> 1. Sensor Input Value 2. Error Log 3. Cal. Log 4. Output Adj. 5. Other Parameter 6. To Factory Mode	



Each "Maintenance" screen

Maintenance Sensor Input	
Input 1	100821
Input 2	96118
Input 3	102241
Input 4	82856
Input 5	11050
<input checked="" type="checkbox"/> GAS Sample	

6.7.1 Sensor Input Value screen

There are 5 possible inputs on the Model 7600ZA:

1. Input 1 to 4 : NDIR sensor digital value
2. Input 5 : O2 sensor digital value

6.7.2 Error Log screen

This screen displays the error history and logs the last 14 instrument errors.

See Section 8.1 Error Message for specific information regarding error number and its meaning.

To clear an error from the log, select Clear Error Log and press the ENT key. The specific entry will be removed from the list.

Maintenance Mode	Error Log					
	ENT : Clear Error Log ESC : Back					
Error No.	Y	M	D	H	M	Ch
No. 4	12	2	11	18	10	2
No. 1	12	1	10	12	2	1
No. 6	11	12	1	10	10	2
No. 9	11	12	1	10	10	2
No. 5	11	12	1	0	0	2
No. 9	11	12	1	0	0	2
Next page						Page1
<input checked="" type="checkbox"/> Clear Error Log						

6.7.3 Calibration Log screen

Calibration history can be displayed from this screen. Information available includes sensor input value, concentration value, and the date when zero/span calibration was performed for the last 10 calibration events. They are logged according to component.

To clear an event, move the cursor to Clear Calibration Log and press the ENT key, and the calibration log is cleared completely.

Other items appearing on the Calibration Log screen are:

Z1 : Zero calibration (Z) of Range 1

S1 : Span calibration (S) of Range 1

Cnt : Value of measuring detector at the time of calibration

Con : Concentration value displayed before calibration

YDMH: Time of calibration event

Maintenance Cal. Log	Select Ch No.
<input checked="" type="checkbox"/> Ch1 NOx <input type="checkbox"/> Ch2 SO2 <input type="checkbox"/> Ch3 CO2 <input type="checkbox"/> Ch4 CO <input type="checkbox"/> Ch5 O2	
Clear Error Log	



Maintenance Cal. Log	Ch1 NOx		
R	Cnt	Con	YDMH
Z1	485231	-0.27	12111810
S1	441764	51.38	12111810

6.7.4 Output Adjustment Screen

The Analog Output Adjustment screen allows the user to adjust the 0-1 V and 4-20 mA output signal.

Connect a digital multi meter to the specific output terminal requiring adjustment and adjust the value so that 4 mA or 0 V is output at zero concentration and 20mA or 1V is output at full scale or span.

1. Move the cursor using the UP or DOWN key to the output (OUT No. and zero/span) to be adjusted, and then press the ENT key. The selected value is highlighted.
2. Adjust the value, while watching the output, using the UP or DOWN key. When the correct value appears, press the SIDE key to select the next digit.
3. On completion of the adjustment, press ENT to save the adjustment.

Maintenance Mode Output Adj.			Adjust OUTPUT ZERO and SPAN		
OUT	Zero	Span	OUT	Zero	Span
1	00600	03700	7	00600	03700
2	00600	03700	8	00600	03700
3	00600	03700	9	00600	03700
4	00600	03700	10	00600	03700
5	00600	03700	11	00600	03700
6	00600	03700	12	00600	03700



Maintenance Mode Output Adj.			Zero / Span adjustment		
OUT	Zero	Span	OUT	Zero	Span
1	00600	03700	7	00600	03700
2	00600	03700	8	00600	03700
3	00600	03700	9	00600	03700
4	00600	03700	10	00600	03700
5	00600	03700	11	00600	03700
6	00600	03700	12	00600	03700

Caution: *Be sure to perform zero / span calibration when the range setting is changed. Otherwise, the measurement value may not be output properly.*



6.7.5 Other Parameter

The Other Parameter screen hosts 5 user settable functions:

- Password Setting
- O₂ Reference Value
Range: 00 to 19%
- O₂ Reference Value Limit
Range: 01 to 20%
- Station Number
Range: 00 to 32
- Instrument Range Setting
- Set Sample Switching

Maintenance Mode setting	Select an item
Password Set	2465
O ₂ ref. Value	12% O ₂ limit 20% O ₂
Station No.	01
Range setting	
Set Sample Switching	

To change any of these items:

- Press the UP or DOWN key to move the cursor to the item whose setting is to be changed.
- The values for password, oxygen correction, limit, and station No. are highlighted.
- Press the UP or DOWN key to change the value. Use the SIDE key to move to the next digit to the right. Press the ENT to save the new value.

6.7.5.1 PASSWORD SET

The Password Set screen is used to change the password that is required move from the parameter setting screen to the maintenance mode. An arbitrary 4-digit number can be set to replace the default password for this purpose.

Note: Record the password and store in a safe place. Otherwise you cannot enter the maintenance mode.

6.7.5.2 O₂ REF. VALUE AND LIMIT

This function sets the oxygen concentration reference value used in the oxygen correction calculation*. It is settable in the range from 00 to 19%. The O₂ Limit can also be set from this screen. This sets the oxygen concentration limit at the time of oxygen correction calculation. It is settable in the range from 01 to 20%.

* Refer to the O2 correction concentration value in “5.3 Outline of display screen” for oxygen correction calculation procedure.

6.7.5.3 STATION No.

This function allows the user to set the station No. for MODBUS communication. It is settable in the range from 00 to 32.

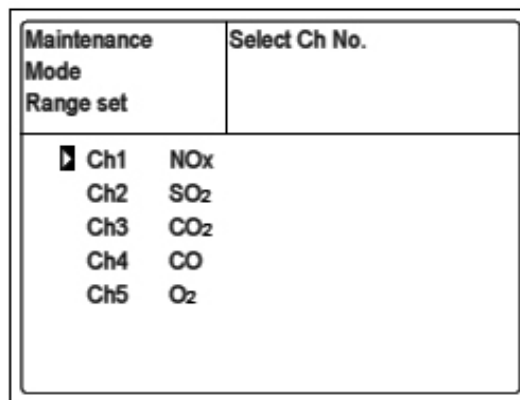
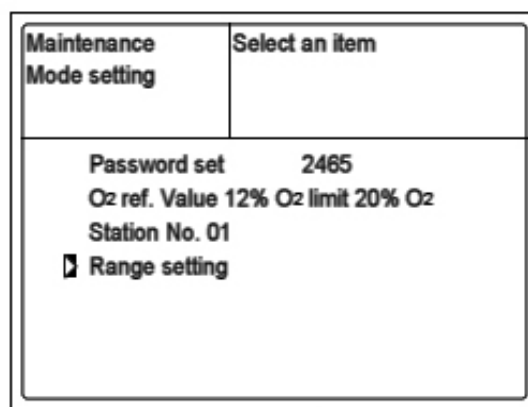
6.7.5.4 RANGE SETTING

This function brings up a screen where the user can set the range for which concentration measurements are made. There are two settable ranges for each component each with a minimum and maximum value as requested at the time of purchase. The range to be used can be selected as Range 1 or Range 2.

To set the range:

1. Move the cursor to the item to be set using the UP or DOWN key, and then press ENT.

2. Move the cursor to the Ch (component) whose setting is to be changed using the UP or DOWN key, and then press ENT.



3. Move the cursor to the item whose setting is to be changed using the UP or DOWN key, and then press ENT.

The value for range 1 and range 2 must fall within the MIN and the MAX range of the instrument (including the MIN and the MAX range), and range 1 must be less than range 2.

4. Press the UP or DOWN key to change the value. Use the SIDE key to move to the next digit to the right. Press the ENT to save the new value. The measurement unit cannot be changed.
5. The decimal point can also be changed when it is highlighted. Use the UP or DOWN key to change the placement of the decimal point.
6. After all changes have been entered, press the ENT key to save.

Maintenance Mode	Select range or range num.	
Range set		
Ch1 NOx		
MIN range	50.00	ppm
Range 1	100.0	ppm
Range 2	300.0	ppm
<input checked="" type="checkbox"/> MAX range	500.0	ppm
Range num.	2	



Maintenance Mode	Set range	
Range set		
Ch1 NOx		
MIN range	50.00	ppm
Range 1	100.0	ppm
Range 2	300.0	ppm
MAX range	500.0	ppm
Range num.	2	

6.7.5.5 SAMPLE SWITCH SETTING

The sample switch setting allows the user to define the total flow period for reference and sample gas and set where in the total flow period measuring begins, i.e. the user defines how long the gas will flow before measurement begins. The sample switch setting also allows the user to set or change the interference compensation coefficient.

Maintenance Mode	Select an item
Sample Switch Setting	
▸ Gas Flow Time Interference Compensation Coefficient	



Maintenance Mode	Select an item
Sample Switch Setting	
Gas Flow Time	
▸ Reference Gas Switching Time 05 s Reference Gas Measuring Time 05 s Reference Gas Flow Time 10 s Sample Gas Switching Time 05 s Sample Gas Measuring Time 05 s Sample Gas Flow Time 10 s	

Changing the gas flow time:

When the gas flow time is chosen from the sample switch setting screen, the user can input a switch time and measure time for both reference and sample flows. The combined interval of switch time and measure time is the total flow time which is also displayed on the screen. The switch time is the flow period established by the user for purging the line.

Use the UP/DOWN key to

Maintenance Mode	Select an item
Sample Switch Setting	
Gas Flow Time	
▸ Reference Gas Switching Time 05 s Reference Gas Measuring Time 05 s Reference Gas Flow Time 10 s Sample Gas Switching Time 05 s Sample Gas Measuring Time 05 s Sample Gas Flow Time 10 s	

select the item to be changed and then Press ENT. Use the SIDE key to increment the value (maximum 30 sec. for switching or measuring time) and when the appropriate time displays, press ENT again. This places the value into memory.

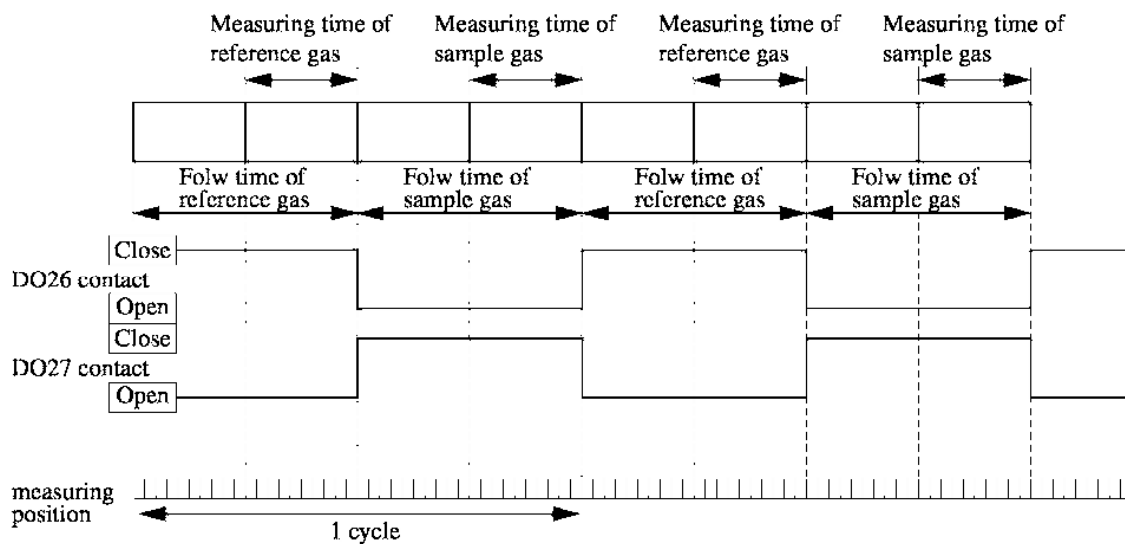
Note: This setting time is very important. Do not change the setting time unless it is required.

Note: The following constraints are placed upon flow selection:

- 1) *Switching time (sample) = switching time (reference)*
- 2) *Flow time (sample) = Flow time (reference)*
- 3) *Flow time (reference) = switching time (ref) + measuring time (ref)*
- 4) *Flow time (sample) = switching time (sample) + measuring time (sample)*

1 cycle = flow time of reference gas + flow time of sample gas

The following is an example of sample switching:



Switching time of reference gas: 1-30 sec (default = 5sec)

Measuring time of reference gas: 1-60 sec (default = 5 sec)

Interference Compensation Coefficient

When the interference compensation coefficient is chosen on sample switch setting screen, the screen as shown on the right appears.

Maintenance Mode Sample Switch Setting	Select an item
<input checked="" type="checkbox"/> Gas Flow Time Interference Compensation Coefficient	



From this screen you can select the interference compensation coefficient for each desired channel with the UP/DOWN keys.

Press the ENT key to move to the specific interference compensation value.

Use the SIDE Key to alter the value and then press ENT again to save the new value.

Maintenance Mode Sample Switch Setting Interference Adj.	Select the component to be adjusted.		
<input checked="" type="checkbox"/> Ch1	NOx	44445	1.000000
Ch2	SO ₂	0	1.000000
Ch3	CO	44445	1.000000
Ch4	CO ₂	44445	1.000000

6.8 Calibration

6.8.1 Zero Calibration

This function is used for the zero point adjustment. A proper zero gas, suitable for the application, should be used. Refer to section 3.4 “Sampling”.

1. From the Measurement screen, press the ZERO key to display the Manual Zero Calibration screen.
2. Select the Ch (component) to be calibrated using the UP or DOWN key and then press the ENT key, and zero gas will be admitted to the analyzer.

Note: For the Ch (components) where “both” is set in the calibration range setting (see section 6.2.3), zero calibration is carried out on both ranges.

3. Wait until the indication stabilizes on the zero gas then press ENT. The zero calibration will be carried out on the highlighted range(s).

Note: On Ch (components) for which “AR” is set (see Section 6.1.1 Setting Range Switch Mode), the cursor automatically moves to the next range selected in “Setting of Auto Calibration Component/ Range” (6.2.4), and calibration is carried out on that range.

To close the Zero Calibration screen or to abort the entry midway, press the ESC key. The previous screen will return.



ZERO Cal.		Select Ch No. with UP / DOWN and ENT Back with ESC	
<input checked="" type="checkbox"/> Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
<input checked="" type="checkbox"/> Ch2 SO ₂	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
<input checked="" type="checkbox"/> Ch3 CO ₂	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%		0.00
<input checked="" type="checkbox"/> Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
<input checked="" type="checkbox"/> Ch5 O ₂	▶ Range 1 0-10.00 vol% Range 2 0-25.00 vol%		20.09



ZERO Cal.		Select Ch No. with UP / DOWN and ENT Back with ESC	
<input checked="" type="checkbox"/> Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
<input checked="" type="checkbox"/> Ch2 SO ₂	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
<input checked="" type="checkbox"/> Ch3 CO ₂	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%		0.00
<input checked="" type="checkbox"/> Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
<input checked="" type="checkbox"/> Ch5 O ₂	▶ Range 1 0-10.00 vol% Range 2 0-25.00 vol%		20.09



ZERO Cal.		ENT : Go on calibration of selected Ch. ESC : Not calibration	
Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	<input checked="" type="checkbox"/>	0.0
Ch2 SO ₂	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	<input checked="" type="checkbox"/>	0.9
Ch3 CO ₂	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%	<input checked="" type="checkbox"/>	0.34
Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm	<input checked="" type="checkbox"/>	1.1
Ch5 O ₂	▶ Range 1 0-10.00 vol% Range 2 0-25.00 vol%	<input checked="" type="checkbox"/>	20.09



To Measurement screen after executing Manual Zero Calibration

6.8.2 Span Calibration

The Model 7600ZA requires periodic span calibration at or near the full scale value on the range of interest. It requires a prepared standard gas containing a known concentration of the measured species. For span calibration gas on the NOX, SO₂, CO₂, and CO channels, TAI recommends using a gas source containing 90-100% of the measured species in a background known to be compatible with the instrument.

For the oxygen channel, with units that include a built-in O₂ sensor, use a prepared standard gas with an O₂ concentration of 90 to 100% full scale on the anticipated measuring range.

If the instrument is fitted with an external zirconia sensor, use a prepared standard of 1-2% O₂.

To perform a span calibration:

1. Press the SPAN key on the Measurement screen to display the Manual Span Calibration screen.

2. Select the channel (component) to be calibrated using the UP or DOWN key and then press ENT. Calibration gas will then flow to the sensor.

Note: For the Ch (components) in which “both” is set in the calibration range setting (Refer to Section 6.2.3), span calibration is performed on both ranges.

↓ SPAN

SPAN Cal.		Select Ch No. with UP / DOWN and ENT Back with ESC	
<input checked="" type="checkbox"/> Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
Ch2 SO ₂	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
Ch3 CO ₂	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%		0.00
Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
Ch5 O ₂	▶ Range 1 0-10.00 vol% Range 2 0-25.00 vol%		20.09

↓ (O) (O) ENT

SPAN Cal.		Select Ch No. with UP / DOWN and ENT Back with ESC	
Ch1 NOx	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
<input checked="" type="checkbox"/> Ch2 SO ₂	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
Ch3 CO ₂	▶ Range 1 0-10.00 vol% Range 2 0-20.00 vol%		0.00
Ch4 CO	▶ Range 1 0-50.00 ppm Range 2 0-500.0 ppm		0.0
Ch5 O ₂	▶ Range 1 0-10.00 vol% Range 2 0-25.00 vol%		20.09

↓ ENT

- Wait until the indication is stable. After the indication has stabilized, press ENT. Span calibration on the selected range will be performed.

Note: On channels for which “AR” (auto ranging) is enabled (See Section “6.1.1) the cursor automatically moves to the range that is enabled. See Section 6.2.4 “Setting of auto calibration component/range”. Calibration is then carried out on that range.

SPAN Cal.		ENT : Go on calibration of selected Ch. ESC : Not calibration	
Ch1 NOx	▶ Range 1 0-50.00 ppm ▶ Range 2 0-500.0 ppm	▶	0.0
Ch2 SO ₂	▶ Range 1 0-50.00 ppm ▶ Range 2 0-500.0 ppm	▶	0.9
Ch3 CO ₂	▶ Range 1 0-10.00 vol% ▶ Range 2 0-20.00 vol%	▶	0.34
Ch4 CO	▶ Range 1 0-50.00 ppm ▶ Range 2 0-500.0 ppm	▶	
Ch5 O ₂	▶ Range 1 0-10.00 vol% ▶ Range 2 0-25.00 vol%	▶	20.09



To Measurement screen after executing Manual Span Calibration

To close the Span Calibration screen or to abort the entry midway, press the ESC key. The previous screen will return.

7. Maintenance

7.1 Daily Check

1. Zero calibration and span calibration

1. Perform zero calibration. For the calibration procedures, refer to Section 6.8.1 Zero calibration.
2. Following the zero calibration, perform a span calibration. For the calibration procedures, refer to Section 6.8.2 Span calibration.
3. Zero/span calibration should be carried out once a week, or as required.

2. Flow rate check

1. Sample and purge gas flow rates are as follows:
Sample gas flow : 1.0 L/min \pm 0.2L/min
Purge gas flow : About 1L/min
2. Instrument checks and maintenance should be carried out every day, as required.

7.2 Daily Check And Maintenance Procedures

Table 7.1 Maintenance and Check Table

	Parts to be checked	Phenomena		Remedy
Daily check	Indication value	Indication values are too low. Indication values are too high.	(1) Dust contamination in sampling cell.	(1) Clean the sampling cell. In addition, check sampling devices, especially gas filter.
			(2) Air is absorbed midway in the sampling piping.	(2) Find out cause of leak and repair.
	Sampling gas flow rate (Purge gas flow is included when purging).	Deviation from regulated flowing quantity (0.3L/min to 0.7L/min).	_____	Adjust by needle valve of flow rater.
Weekly check	Zero point of gas analyzer	Deviation from zero point.		Zero adjustment
	Span point of gas analyzer	Deviation from span point.		Span adjustment
Yearly check	Gas analyzer	Regardless of any phenomena	_____	Overhaul or service in accordance with proper service plan.

7.3 Long Term Maintenance

Create a long-term maintenance component procurement plan based on the “Gas analyzer annual inspection plan” indicated below.

Gas Analyzer Annual Inspection Plan

The recommended replacement period of components varies depending on the installation conditions.

1. The recommended replacement period is a recommended standard criterion and varies depending on the environment of the field, conditions of measuring gas and other factors.
2. The recommended replacement period is not the warranty period. It is provided as a preventative maintenance program baseline schedule.

Installation Conditions

1. Ambient temperature: -5°C to +40°C
2. Humidity: 90% RH or less
3. Corrosive gases: None
4. No radiated heat, direct sunlight or rain/wind
5. Dust: No more than local environmental standards permit
6. Vibration: None

Sample gas conditions

1. Temperature: +60°C to +800°C
2. Pressure: -3 to +3 kPa (-4 to +4 psi)
3. Moisture content: 30% or less
4. Dust: 0.1 g/Nm³ or less
5. Components: 0 to 500 ppm NOX, 0 to 500 ppm SO₂, 0 to 2000 ppm CO, 5% to 15% CO₂, 0% to 21% O₂, 0 to 100 ppm HCl, residue N₂

Please consult TAI Customer Service regarding gas analyzer maintenance service requirements.

Annual Inspection Plan Sheet

No.	Component name	Q'ty	Recommended replacement period (year)	Year										
				Delivered year	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
1	Fuel cell O2 analyzer (build-in)	1	2			○		○		○		○		○
2	Infrared light source	1 to 2	8									○		
3	Sector motor	1 to 2	5						○					○
4	O-ring for sampling cell	1 to 5	2			○		○		○		○		○
5	Detector	1 to 4	8									○		
6	LCD	1	3				○			○				○
7	Main power supply unit	1	5						○					○
8	Main power PCB	1	5						○					○
9	Light source power PCB	1	5						○					○

7.4 Cleaning the Sample Cell

Entry of dust or water in the sampling cell contaminates the interior of the cell resulting in drift. If dirty or contaminated, it must be cleaned. Check the sampling device, especially the filter, to prevent the cell from being dust or mist contamination.

Caution: *Maintenance should be performed only by properly trained and qualified personnel. In addition to the following steps, the user must adhere to any local and regional regulations.*



7.4.1 Sample Cell Disassembly

There are two kinds of sampling cells:

1. Block Cells: cell lengths 4 mm, 8 mm, 32 mm
2. Pipe Cells: cell lengths 64 mm, 125 mm, 250 mm

A two component analyzer may incorporate both sampling cells in one optical unit. In this case, detach the pipe cell first and then the block cell (See Fig 7-3)

7.4.1.1 PIPE CELL REMOVAL (SEE FIG. 7-1)

1. Stop all gas flow. If necessary, purge the pipe cell thoroughly with zero gas.
2. Turn OFF the power switch and disconnect the AC power cord.
3. Remove the cover (six screws).
4. Remove the tube connected to the pipe cell.
5. Loosen and remove the screw (No. 7) holding the cell retainer (No. 11) at both ends of the pipe cell.
6. Remove the cell from the assembly and unscrew the infrared transmission window (No. 14) at both ends.
7. For assembly, reverse the disassembly procedure.

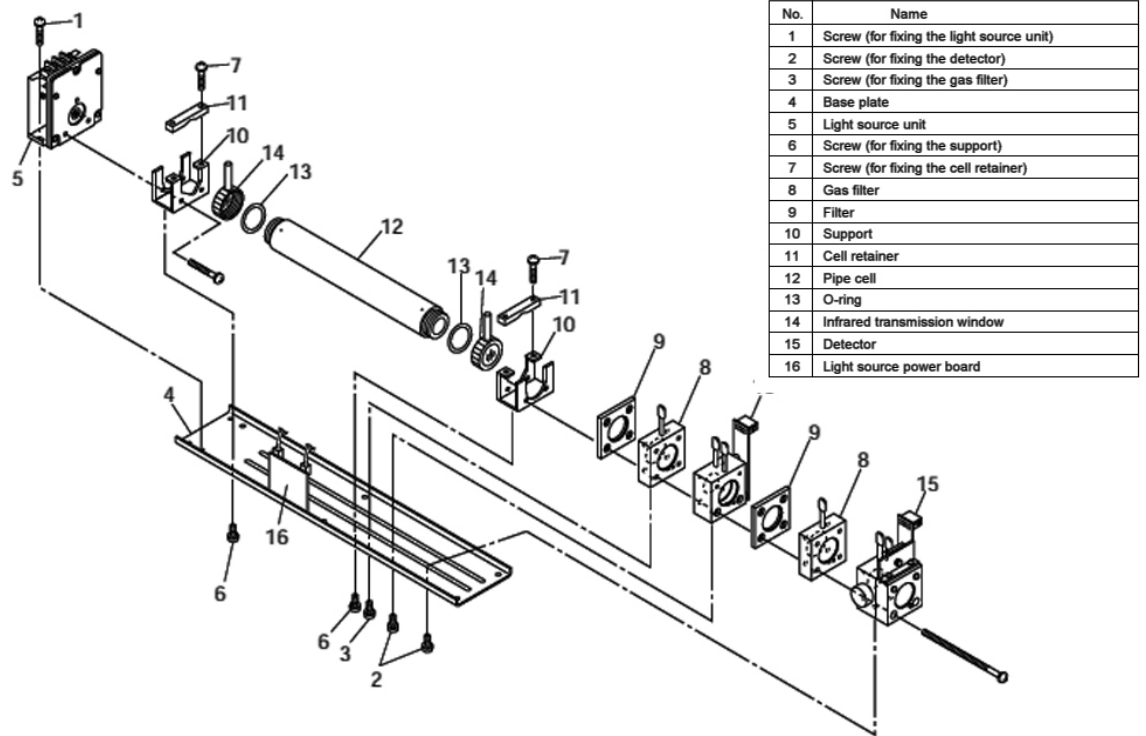
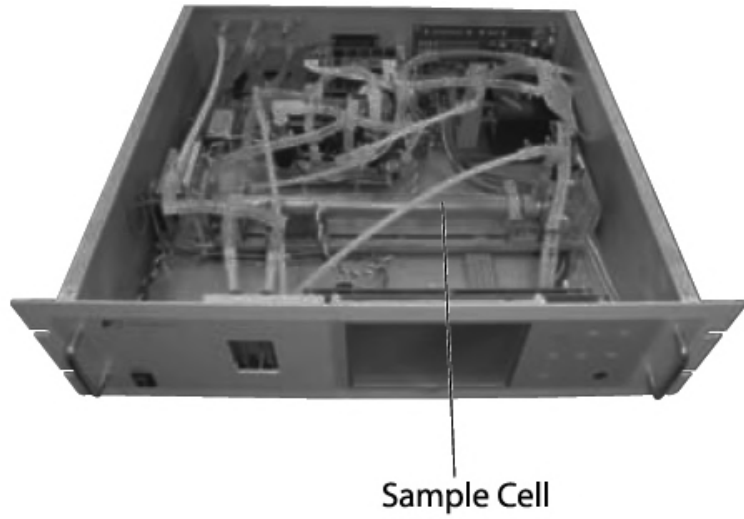


Figure 7-1: Measuring Unit Configuration (Pipe Cell)

7.4.1.2 BLOCK CELL REMOVAL (SEE FIG. 7-2)

- 1) For Steps 1) to 4), see 7.4.1. 1. *How to remove pipe cell.*
- 5) Disconnect and remove detector output cables from detector output circuit board (No.12). Applying an identification mark on top of the removed cable connector will ensure proper pin assignment later.
- 6) Unscrew the two screws (No. 10) that hold the detector to the light source unit to remove the detector from the measuring unit. The block cell and the detector can be removed together.
- 7) To remove the block cell, unscrew the two screws (No. 6) holding the block cell to the detector. The infrared transmission window (No. 8) is just sandwiched (not fixed) between the detector and block cell. Keep the detector facing up, when removing this window.
- 8) For assembly, reverse the disassembly procedures.

Note: The O-ring (No. 9) is placed between the window holder and block cell. Take care about the O-ring position. With a 2-component analyzer, install 2-component detector last. Take care that no space is left between the 1-component and 2-component detectors. When inserting the detector output cable connector into the PCB, make sure the connector is attached with the proper pin assignment (top/bottom).

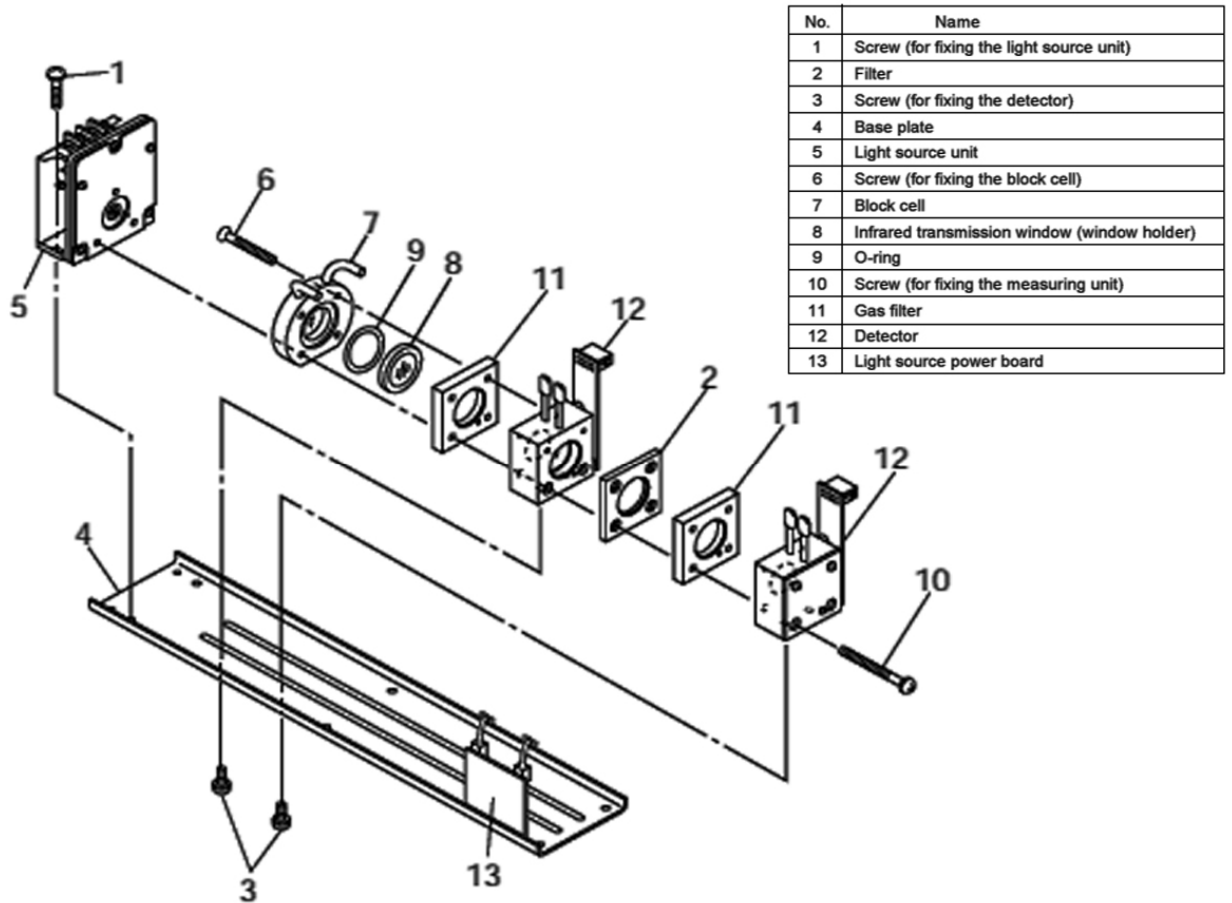


Figure 7-2: Measuring Unit Configuration (Block Cell)

7.4.1.3 MEASURING UNIT REMOVAL

Refer to Figure 7-3.

- 1) For Steps 1) to 4), see *7.4.1. 1. How to remove pipe cell.*
- 5) Disconnect and remove detector output cables from detector output circuit board (No.12). Applying identification mark on top of removed cable connector will ensure proper pin assignment later.
- 6) Disconnect wiring to the 2-pin terminals of the infrared ray light source assembly and chopper motor pin connector from the PCB (No. 17).
- 7) Detach the six screws (No. 16) fastening the base plate (No. 3) to remove the measuring unit.
- 8) For assembly, reverse the disassembly procedures.

Note) Use care when assembling or disassembling the measuring cell to avoid the application of force to the detector pipe or light source unit pipe. If the pipe is deformed or damaged by excessive force, there is the potential of creating a gas leak. This would result in erroneous measurements reported..

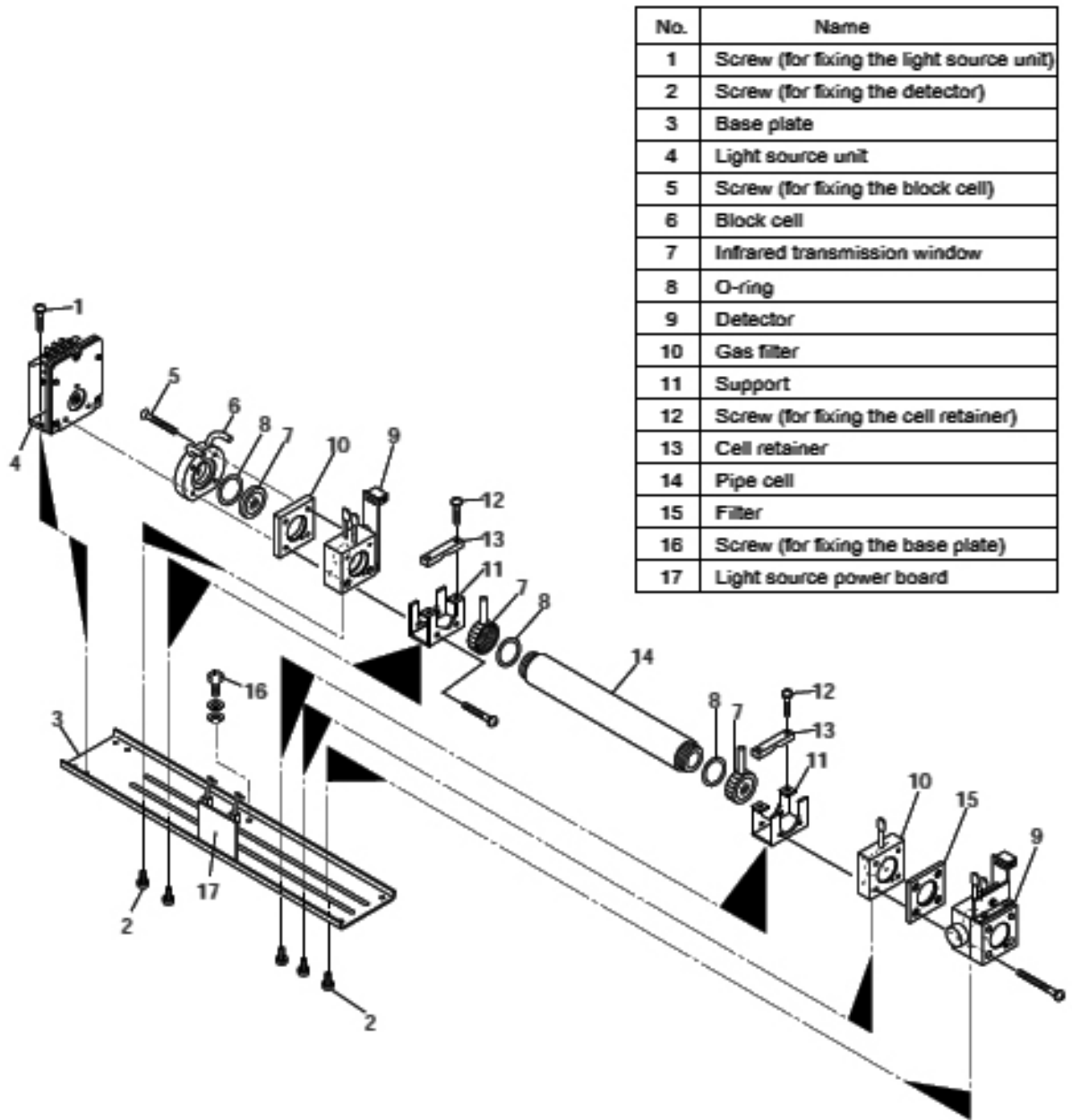


Figure 7-3: Configuration of Measurement Unit for 2 Cell Analyzers

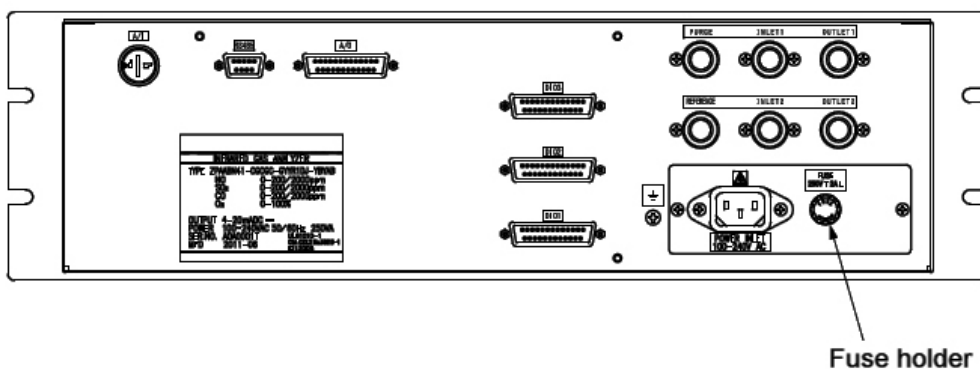
7.4.2 Cleaning the Sample Cell

1. To clean the sample cell or IR transmission window, first clear away any dirt using a soft brush and then lightly wipe using a soft cloth. Do not use abrasive or paper towels.

Note: The window is fragile. Handle with care. Avoid scratching the window. Do not rub the dirt from the window roughly.

2. If the window or the sample cell interior is very dirty, use a soft line-free cloth moistened with absolute alcohol.
3. If the window is corroded, rub off any scale from the window lightly with a soft cloth to which chrome oxide powder is applied. If it is excessively corroded, it should be replaced.
4. When the cleaning operation is complete, assemble according to the sample cell assembly/disassembly procedures. Assemble the pipe carefully. If it becomes bent or damaged, replace it with a new part.
5. **Do not wash the sample cell components with water.**

7.5 Fuse Replacement



Rear view

1. Turn “OFF” the main power supply switch to the analyzer.
2. Rotate the fuse holder cap (shown in the figure above) counterclockwise and pull it out. The cap (fuse holder) will

contain the fuse. Remove the blown fuse from the holder and replace it with a new one (250VAC/2A, Slo-Blo).

3. Reinstall the fuse holder cap, turn ON the power supply switch. The analyzer will power up normally.

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8. Error Messages

Table 8-1 lists the error messages that may occur onscreen along with the probable cause for the error.

Table 8-1: Error Messages

Error display	Error contents	Probable causes
Error No.1	Light source/motor rotation is faulty.	<ul style="list-style-type: none"> • Infrared light source is faulty. • Sector motor is not properly run or is stopped. • Amplifier circuit is faulty.
Error No.2	Detector failure	<ul style="list-style-type: none"> • Detector voltage circuit is faulty. • Detection element is broken or faulty. • Amplifier circuit is faulty.
Error No.3	A/D error	<ul style="list-style-type: none"> • A/D conversion circuit is failure.
Error No.4	Zero calibration is not within.	<ul style="list-style-type: none"> • Zero gas is not supplied.
Error No.5	Amount of zero calibration (indication value) is over 50% of full scale.	<ul style="list-style-type: none"> • Zero error due to dirty cell. • Detector is faulty.
Error No.6	Span calibration is not within the allowable range.	<ul style="list-style-type: none"> • Span gas is not supplied. • Calibrated concentration setting does not match cylinder concentration.
Error No.7	Amount of span calibration (difference between indication value and calibrated concentration) is over 50% of full scale.	<ul style="list-style-type: none"> • Zero calibration is not performed normally. • Span error due to dirty cell. • Detector sensitivity has deteriorated.
Error No.8	Measured values fluctuate too much during zero and span calibration.	<ul style="list-style-type: none"> • Calibration gas is not supplied. • Time for flowing calibration gas is short.
Error No.9	Calibration is abnormal during auto calibration.	<ul style="list-style-type: none"> • Error corresponding to No. 4 to No. 8 occurred during auto calibration.
Error No.10	Output cable connection is improper.	<ul style="list-style-type: none"> • DIO circuit is failure. • Internal wiring to the DIO circuit is broken.

When errors No. 1 to No. 3 and No. 10 occur, analyzing block error contact output closes. When errors No. 4 to No. 9 occur, the calibration error contact output closes.

8.1 Troubleshooting

When error No. 1 occurs, remove the top cover of the analyzer and check the LED on the light source PCB. If the LED is off, then the error is caused by a light source disconnection.

Errors 1-3 and 10 indicate an analyzer failure or fault. Contact TAI for assistance.

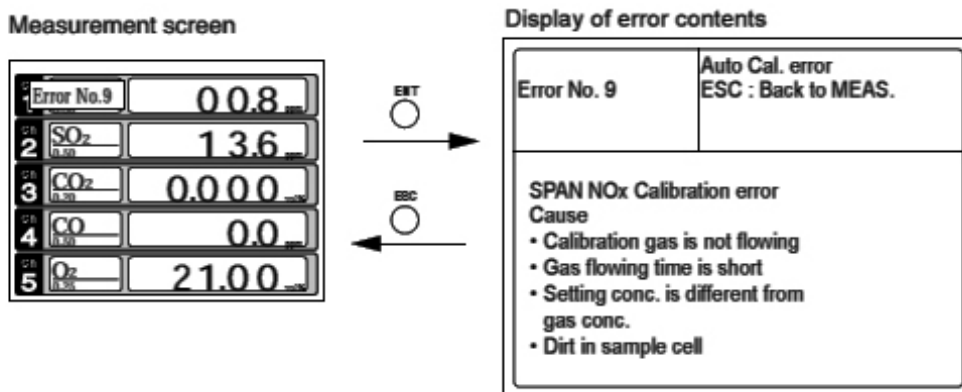
Errors 4-8 indicate that the calibration procedure may be incorrect. Check the following items, and if the error still occurs, contact TAI.

1. Is the calibration gas flowing to the analyzer?
2. Does the calibration operation match the supplied gas? (For example, zero calibration is performed while flowing the span gas.)
3. Does the supplied gas concentration match the gas concentration set in the calibration concentration setting?

Also, if errors 5 and 7 occur, you can perform calibration forcibly, following the procedure. This is used as a fault recovery when calibration fails and calibration contents are invalid or wrong.

Typical Error Screen Display

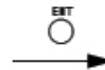
For Errors 1-4, 6, and 8-10:



- Press the ECS key to delete the error display.
- If the ESC key is pressed without removing the cause of an error, the error will be displayed again.
- When more than one error occurs, use the SIDE key to move to the next error display.

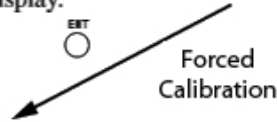
For errors 5 and 7:

ZERO Cal.		ENT : Go on calibration of selected CH. ESC : Not calibration	
Ch1 NOx	▶ Error No. 5	ppm ppm	3083
Ch2 SO ₂	▶ Range 1 0-50.00 Range 2 0-500.0	ppm ppm	-13.6
Ch3 CO ₂	▶ Range 1 0-10.00 Range 2 0-20.00	vol% vol%	-0.09
Ch4 CO	▶ Range 1 0-50.00 Range 2 0-500.0	ppm ppm	-0.09
Ch5 O ₂	▶ Range 1 0-10.00 Range 2 0-25.00	vol% vol%	-0.09



Error No. 5	SPAN cal. error ENT : Force Cal. ESC : Stop cal. and back to MEAS.
NOx Calibration error Cause <ul style="list-style-type: none"> • Span gas is not flowing • Deviation of zero point due to contamination • Low sensitivity of detector 	

- Pressing ^{ESC} ○ deletes the error display.



Calibration is continued. Unless another calibration error occurs, calibration is carried out to the end, the Measurement screen returns.



1	NO ₂ <small>(n.50)</small>	90.8
2	SO ₂ <small>(n.50)</small>	13.6
3	CO ₂ <small>(n.50)</small>	0.000
4	CO <small>(n.50)</small>	0.0
5	O ₂ <small>(n.50)</small>	0.09

8.2 Error Log File

When an error occurs, the history is saved in an error log file. The error log file is accessible in the maintenance mode.

Error Log Screen

Error No.	Y	M	D	H	M	Ch
No. 4	12	2	11	18	10	2
No. 1	12	1	10	12	2	1
No. 6	11	12	1	10	10	2
No. 9	11	12	1	10	10	2
No. 5	11	12	1	0	0	2
No. 9	11	12	1	0	0	2

Annotations:

- Date and time when an error occurred. (points to Y, M, D, H, M columns)
- Component for which the error occurred. (points to Ch column)
- Errors that occurred (points to Error No. column)
- New (points to top of list)
- Old (points to bottom of list)

- * Up to 14 errors can be saved in the error history; the oldest error will be deleted one by one every time a new error occurs.
- * If the power supply is turned OFF, the contents in the error log file will not be lost or damaged.

Deleting Error History

Press the ENT key on the above screen, and the “Clear Error Log” will be highlighted. Pressing ENT again will clear the error history.

9. Specifications

9.1 General Specifications

9.1.1 Standard Specifications

Measurement Method:

NO, SO₂, CO₂, CO:

Non-dispersion infrared-ray absorption method

Single light source and single beams (single beam system)

O₂: Fuel cell O₂ analyzer (built-in) or paramagnetic O₂ analyzer (built-in) or zirconia O₂ analyzer (external)

Measured Gas/Range:

	Min Range	Max Range
NO	0-50 ppm	0-5000 ppm
SO ₂	0-50 ppm	0-5000 ppm
CO ₂	0-50 ppm	0-25%
CO	0-50 ppm	0-5000 ppm
O ₂ (built in) Fuel Cell	0-10 vol.%	0-25 vol.%
O ₂ (built in) Paramag.	0-5 vol.%	0-100 vol.%
O ₂ External Zirconia	0-5 vol.%	0-25 vol.%

Max. 5 components measurement including O₂.

Measuring range ratio max. 1:10 (except O₂)

User adjustable ranges between the specified minimum and maximum range.

Settable one range or two ranges, low range (Range 1) and high range (Range 2).

See Table 1 for possible combinations of components and ranges.

Display Indication:

Digital indication in 4 digits (LCD panel with LED back light)

Instantaneous value of each component

Instantaneous value after O₂ correction (only in NO, SO₂, CO measurement with O₂)

Average value after O₂ correction (only in NO, SO₂, CO measurement with O₂)

O₂ average value

Analog Output Signals:

4 to 20mA DC or 0 to 1VDC, isolated internally from circuit and ground. Output lines are non-isolated; 12 outputs max.

Allowable load 550Ω for 4 to 20mA DC

Allowable load 100KΩ for 0 to 1V DC

- Refer to Table1 for the channel No. of displayed values and analog output signals.

Analog Input Signal:

For signal input from externally installed O₂ sensor.

Signal requirement:

- (1) Signal from Zirconia O₂ sensor
(TYPE: ZFK7)
- (2) 0 to 1V DC from an O₂ sensor. Input section is not isolated. This feature is present when an O₂ sensor is not built in.
- * Externally installed O₂ sensor must be purchased separately.

Digital Output: (option)

1C contact (24V DC/1A, resistive load)
max.15 outputs

Instrument error, calibration error, range identification, auto calibration status, solenoid valve drive for auto calibration, High/Low limit alarm contact output

All relay contacts are isolated mutually and from the internal circuit.

Digital Input: (option)

Voltage contact (supply 12-24VDC (15mA Max.)) Max. 9 inputs

Remote range change over, auto calibration remote start, remote hold, average value reset, isolated from the internal circuit with photocoupler.

Power Supply:

Voltage rating: 100V to 240V AC
Allowable range: 85V to 264V AC
Frequency: 50Hz/60Hz
Power consumption: 100VA max.

Operating Conditions:

Ambient temperature: -5°C to 45°C
Ambient humidity: 90% RH max., non-condensing

Storage Conditions:

Ambient temperature: -20°C to 60°C
Ambient humidity: 100% RH max.,
non-condensing

Dimensions (H x W x D): 133 x 483 x 382mm

Mass: 13 kg max.(approx.)

Finish Color: Front panel; Cool gray (PANTON 1C-F)

Enclosure: Steel casing, for indoor use

Material for Wetted Parts:

Gas inlet/outlet; SUS304
Sample cell; SUS304, chloroprene rubber
Infrared-ray transmitting window: CaF₂
Internal piping: Toaron, Teflon,
Polypropylene
Paramagnetic O₂ sensor cell : SUS316
Fuel cell O₂ sensor cell: ABS resin

Gas inlet/outlet: Rc1/4 or NPT 1/4 internal thread

Purge gas flow rate: 1L/min (when required)

Life time of Fuel Cell O₂ Sensor: 2 years

9.1.2 Standard Functions

Output Signal Hold: Output signals are held unchanged during manual and auto calibrations when HOLD function is ON.
The values held are those just before start of calibration mode or setting value.
User selectable.
Indication of instantaneous values will not be held.

Range Switching: Range switch function is available in manual, auto, and remote modes. Only preset switch method is effective.

Manual: Allows range to switch by key operation.

Auto: Automatically switched from first range to second range when the measured value exceeds 90% FS of first range.

Automatically switched from second range to first range when the measured value drops to 80% or less first range.

Remote: (Option) Voltage contact input allows the range to switch via an external signal when a remote range switch input is received.

When the contact input terminals for each component are input voltage, the first range is selected, and it is switched to the second range when the terminals are open.

* The switch range values are settable between the first range and second range values (low/high range values).

Digital Communication: RS-485 (9-pin D-sub connector)
Half-duplex bit serial
Start/Stop synchronization
MODBUS RTU™ protocol

Contents: Read/Write parameters
Read measurement
concentration and instrument
status

Remark: When connecting via RS232C
interface, an RS-232C to RS-
485 converter should be used.

9.1.3 Optional Functions

Remote Output Holding: Output signal is held at the last value or preset value by a voltage input to the remote output holding input terminals. Holding is maintained while the voltage is input to the terminals. Indication of instantaneous values are not held.

Range ID Signal: The present measuring range is identified by a contact position. The contact output terminals close for each component when the first range is selected, and open when the second range is selected.

Auto Calibration: Auto calibration is carried out periodically on a user defined schedule. When a standard calibration gas cylinder and a solenoid valve for opening/closing the gas flow line are installed externally by the customer, calibration will be carried out using the solenoid valve drive contacts for zero and span calibration and will be cycled on/off sequentially at the set auto calibration timing.

Auto Cal Cycle Setting: Auto calibration cycle is user defined. Setting is variable within 1 to 99 hours (in increments of 1 hour) or 1 to 40 days (in increments of 1 day).

Gas Flow Time Setting: The time for flowing each calibration gas in auto calibration is user

defined and settable between 60 to 900 seconds (in increments of 1 second).

Auto Cal Remote Start: Auto calibration starts by opening the auto cal remote start input terminal after short circuiting for 1.5 sec or longer. Auto calibration initiates when contacts open.

Auto Zero Calibration: Auto zero calibration is carried out periodically at the preset cycle. This cycle is independent from “Auto Calibration” cycle.

When zero calibration gas and solenoid valve for opening/closing the calibration gas flow line are installed by the customer, zero calibration will be carried out at the set auto zero calibration timing.

Auto Zero Cal Cycle Setting:

Auto zero calibration cycle is user settable. Setting is variable within 1 to 99 hours (in increments of 1 hour) or 1 to 40 days (in increments of 1 day).

Gas Flow Time Setting: The timing for flowing zero gas in an auto zero calibration is user settable from 60 to 900 seconds (in increments of 1 second)

High/Low Limit Alarm: Alarm contact output turns on when measurement value reaches the preset high or low limit alarm value. Contacts close when the instantaneous value of each channel exceeds the high alarm limit value or falls below the low alarm limit value.

Instrument Error Contact Output: Contacts turn on when analyzer error No. 1, 2, 3 or 10 occurs.

Calibration Error Contact Output: Contacts turn on if a manual or auto calibration error occurs. (Err # 4-9).

Auto Cal Status Contact Outputs: Contacts turn on during auto calibration.

O₂ Correction: Correction for measured NO, SO₂ and CO gas concentrations with reference O₂ concentration is given by:

$$C = \frac{21 - O_n}{21 - O_s} \times C_s$$

Correction formula:

- C : Sample gas concentration after O₂ correction.
- C_s : Measured concentration of sample gas.
- O_s : Measured O₂ concentration (Limit setting: 1 to 20% O₂)
- O_n : Reference O₂ concentration (value changeable by setting 0 - 19% O₂).

Average value after O₂ correction and O₂ average value calculation:

The result of O₂ correction or instantaneous O₂ value can be output as an average value over the preset period of time.

Moving average method is used. Sampling interval is 30 seconds (Output is updated every 30 seconds).

Update is the averaged value of the most recent elapsed averaging time period.)

Averaging time period is settable from 1-59 minutes (in increments of 1 minute) or 1-4 hours (in increments of 1 hour).

Average Value Resetting: The above-mentioned output of average value is started from the initial state by opening the average value resetting input terminals after short circuiting for 1.5 sec or longer.
Output is reset by input voltage and the terminal circuit.

Communication Function:

RS-485 (9 pin D-sub connector)

Half-duplex bit serial

Start-stop synchronization

Modbus™ protocol

Contents : Read/Write parameters

Read measurement conc. and
instrument status

Remark : When connecting via RS-232C
interface, an RS-232C ↔
RS485 converter should be
used.

Atmospheric Pressure Correction:

Measure atmospheric pressure and
calculate compensation (for use, exhaust
port of analyzer must be at atmospheric
pressure.

After atmospheric pressure correction:

Zero point: Not affected.

Span point: Change is 0.5% measured
value or less relative to a 1%
change in atmospheric
pressure.

Correction range: 700kPa-1050kPa

9.1.4 Performance

Repeatability:	±0.5% of full scale
Linearity:	±1% of full scale prior to atmospheric pressure correction (option)
Zero drift:	±0.5% of full scale/week. ±2.0% of full scale/week (O ₂ sensor)
Span drift:	±2.0% of full scale/week
Response time (for 90% FS response):	30 seconds or better. Response depends on timing of the switching gas operation (T _d =5-20 seconds).

Interference from other gases:

Sample switching design effectively minimizes interference. However interference is still possible depending on the component gas and its concentration.

Preprocessing can further decrease the possibility of interference.

Contact TAI if you suspect possible interference in your application.

9.1.5 EC Directive Compliance

This product conforms to the requirements of the Low Voltage Directive 2006/95/EC and EMC directive 89/336/EEC (as amended by Directive 92/31/EEC), both as amended by Directive 93/68/EEC.

It conforms to following standards for product safety and Electromagnetic Compatibility ;

- EN61010-1 : 2010
 Safety requirements for electrical equipment for measurement, control and laboratory use.
 “Installation Category II”
 “Pollution Degree 2”
- EN61326-1 : 2006
 Electrical equipment for measurement, control and laboratory use — EMC requirements.
 CE

9.1.6 Requirements for Sample Gas

- Flow rate: 1.0 L / min ±0.2L / min
- Temperature: 0 to 50°C
- Pressure: 10 kPa or less (Gas outlet side should be at atmospheric pressure).
- Dust: 100 µg/Nm³ or less in particle size of 0.3 µm or less.
- Mist: Not allowed
- Moisture: For sample gases NO, SO₂, CO: less than 2°C saturation point.
 For CO₂ measurement: less than -30°C saturation point with comparable moisture levels in sample and reference gases).
- Corrosive component: 1 ppm or less
- Standard gas for calibration:
- Zero gas: Dry N₂
- Span gas ; Each sample gas having concentration 90 to 100% of its measuring range recommended).
- For external zirconia O₂ sensor use the same calibration gas line:

Zero gas ; Dry air or atmospheric air (Do not use with CO₂ measurement)

Span gas ; For other than O₂ measurement, each sample gas having concentration 90 to 100% of its measuring range.

For O₂ measurement, O₂ gas of 1 to 2 vol% /remainder N₂ gas

Reference Gas for Sample Switching:

NO, SO₂, CO measurement:
For sample gas dew point >2°C, use wet N₂ for sample switching reference gas.

For sample gas dew point <2°C, use dry N₂ for sample switching reference gas.

CO₂ measurement:
N₂ w/o CO₂ and moisture (99.999999% pure).

Purge Gas: N₂

9.1.7 Installation Requirements

- Indoor use (Select a place where the equipment does not receive direct sunlight, draft/rain or radiation from hot substances. If such a place cannot be found, a roof or cover should be prepared for protection).
- Avoid sites where unit receives heavy vibration.
- Select a site where atmospheric air is clean



9.2 Measured Components and Range

Procedure for range selection:

1-Component Analyzer:

First determine the 1st range, then select 2nd range from the corresponding right column.

Greater than 2 Coponents:

The 2nd range in the tables below for 2 or more components is the maximum available range. Select the 2nd range to be less than or equal to the 2nd range(max).

Table 1: Availablitiy Check Table

1-component analyzer:NO

1st range	2nd range					
0-50ppm	None	0-100ppm	0-200ppm	0-250ppm	0-300ppm	0-500ppm
0-100ppm	None	0-200ppm	0-250ppm	0-300ppm	0-500ppm	0-1000ppm
0-200ppm	None	0-250ppm	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm
0-250ppm	None	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm	
0-300ppm	None	0-500ppm	0-1000ppm	0-2000ppm		
0-500ppm	None	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm
0-1000ppm	None	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm	
0-2000ppm	None	0-2500ppm	0-3000ppm	0-5000ppm		
0-2500ppm	None	0-3000ppm	0-5000ppm			
0-3000ppm	None	0-5000ppm				
0-5000ppm	None					

1-component analyzer:SO₂

1st range	2nd range					
0-50ppm	None	0-100ppm	0-200ppm	0-250ppm	0-300ppm	0-500ppm
0-100ppm	None	0-200ppm	0-250ppm	0-300ppm	0-500ppm	0-1000ppm
0-200ppm	None	0-250ppm	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm
0-250ppm	None	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm
0-300ppm	None	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm
0-500ppm	None	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm
0-1000ppm	None	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm	0-1%
0-2000ppm	None	0-2500ppm	0-3000ppm	0-5000ppm		
0-2500ppm	None	0-3000ppm	0-5000ppm			
0-3000ppm	None	0-5000ppm				
0-5000ppm	None					

1-component analyzer:CO

1st range	2nd range					
0-50ppm	None	0-100ppm	0-200ppm	0-250ppm	0-300ppm	0-500ppm
0-100ppm	None	0-200ppm	0-250ppm	0-300ppm	0-500ppm	0-1000ppm
0-200ppm	None	0-250ppm	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm
0-250ppm	None	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm
0-300ppm	None	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm
0-500ppm	None	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm
0-1000ppm	None	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm	0-1%
0-2000ppm	None	0-2500ppm	0-3000ppm	0-5000ppm		
0-2500ppm	None	0-3000ppm	0-5000ppm			
0-3000ppm	None	0-5000ppm				
0-5000ppm	None					

1-component analyzer:CO₂

1st range	2nd range					
0-50ppm	None	0-100ppm	0-200ppm	0-250ppm	0-300ppm	0-500ppm
0-100ppm	None	0-200ppm	0-250ppm	0-300ppm	0-500ppm	0-1000ppm
0-200ppm	None	0-250ppm	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm
0-250ppm	None	0-300ppm	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm
0-300ppm	None	0-500ppm	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm
0-500ppm	None	0-1000ppm	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm
0-1000ppm	None	0-2000ppm	0-2500ppm	0-3000ppm	0-5000ppm	0-1%
0-2000ppm	None	0-2500ppm	0-3000ppm	0-5000ppm		
0-2500ppm	None	0-3000ppm	0-5000ppm			
0-3000ppm	None	0-5000ppm				
0-5000ppm	None					

2 component analyzer:NO/SO₂

1 component:NO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

2 component:SO ₂	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

2 component analyzer:NO/CO

1 component:NO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

2 component:CO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

The second component should be selected as shown in the right table.

The second component should be selected as shown in the right table.

2 component analyzer:CO₂/CO

1 component:CO ₂		2 component:CO
1st range	2nd range (max)	1st range/2nd range (max)
0-50ppm	0-500ppm	
0-100ppm		
0-200ppm		0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2000ppm, 0-300/2000ppm, 0-500/5000ppm, 0-1000/5000ppm,
0-250ppm	0-1000ppm	0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-300ppm		
0-500ppm		
0-200ppm	0-2000ppm	
0-250ppm	0-2500ppm	
0-300ppm		
0-500ppm		
0-1000ppm		
0-2000ppm	0-5000ppm	0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-2500ppm		
0-3000ppm		
0-3000ppm		
0-5000ppm		
0-5%	0-25%	
0-10%	0-25%	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2000ppm, 0-300/2000ppm, 0-500/5000ppm, 0-1000/5000ppm,
0-20%	0-25%	0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-25%	0-25%	

3 component analyzer: NO/SO₂/CO >>> Combination of 1st component NO and 2nd component SO₂/3rd component CO

1 component: NO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

+

2 component: SO ₂		3 component: CO
1st range	2nd range (max)	1st range/2nd range (max)
0-50ppm	0-500ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2000ppm, 0-300/2000ppm, 0-500/2000ppm, 0-1000/2000ppm, 0-2000ppm
0-100ppm	0-1000ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/3000ppm, 0-1000/3000ppm, 0-2000/3000ppm, 0-2500/3000ppm, 0-3000ppm
0-200ppm	0-2000ppm	
0-250ppm	0-2500ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-300ppm		
0-500ppm	0-3000ppm	0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-1000ppm		
0-2000ppm		
0-2500ppm		
0-500ppm	0-5000ppm	0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-1000ppm		
0-2000ppm		
0-2500ppm	0-5000ppm	0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-3000ppm		
0-5000ppm	None	

4 component analyzer: NO/SO₂/CO₂/CO >>> 1st NO/4th CO and 2nd SO₂/3rd CO₂

1 component: NO	
1st range	2nd range (max)
0-50ppm	0-500ppm
0-100ppm	0-1000ppm
0-200ppm	0-2000ppm
0-250ppm	0-2500ppm
0-300ppm	0-2500ppm
0-500ppm	0-5000ppm
0-1000ppm	0-5000ppm
0-2000ppm	0-5000ppm
0-2500ppm	0-5000ppm
0-3000ppm	0-5000ppm
0-5000ppm	None

+

2 component: SO ₂		4 component: CO
1st range	2nd range (max)	1st range/2nd range (max)
0-50ppm	0-500ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2000ppm, 0-300/2000ppm, 0-500/2000ppm, 0-1000/2000ppm, 0-2000ppm
0-100ppm	0-1000ppm	
0-200ppm	0-2000ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/3000ppm, 0-1000/3000ppm, 0-2000/3000ppm, 0-2500/3000ppm, 0-3000ppm
0-250ppm	0-2500ppm	
0-300ppm		
0-500ppm		
0-1000ppm	0-3000ppm	0-50/500ppm, 0-100/1000ppm, 0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-2000ppm		
0-2500ppm		
0-500ppm	0-5000ppm	0-200/2000ppm, 0-250/2500ppm, 0-300/2500ppm, 0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-1000ppm		
0-2000ppm		
0-2500ppm		
0-3000ppm	0-5000ppm	0-500/5000ppm, 0-1000/5000ppm, 0-2000/5000ppm, 0-2500/5000ppm, 0-3000/5000ppm, 0-5000ppm
0-5000ppm	None	

+

CO₂ component analyzer

3 component: CO ₂	
1st range	2nd range (max)
0-5vol%	0-25vol%

Table 2: Channel No. and Display/Outputs Comparison

Code symbol			
6th digit	7th digit	21st digit	Display/output contents
P	Y	Y	Ch1:NO
A	Y	Y	Ch1:SO ₂
U	Y	Y	Ch1:CO ₂
B	Y	Y	Ch1:CO
F	Y	Y	Ch1:NO, Ch2:SO ₂
G	Y	Y	Ch1:NO, Ch2:CO
J	Y	Y	Ch1:CO ₂ , Ch2:CO
N	Y	Y	Ch1:NO, Ch2:SO ₂ , Ch3:CO
V	Y	Y	Ch1:NO, Ch2:SO ₂ , Ch3:CO ₂ , Ch4:CO
P	1to 3	Y	Ch1:NO, Ch2:O ₂
A	1to 3	Y	Ch1:SO ₂ , Ch2:O ₂
U	1to 3	Y	Ch1:CO ₂ , Ch2:O ₂
B	1to 3	Y	Ch1:CO, Ch2:O ₂
F	1to 3	Y	Ch1:NO, Ch2:SO ₂ , Ch3:O ₂
G	1to 3	Y	Ch1:NO, Ch2:CO, Ch3:O ₂
J	1to 3	Y	Ch1:CO ₂ , Ch2:CO, Ch3:O ₂
N	1to 3	Y	Ch1:NO, Ch2:SO ₂ , Ch3:CO, Ch4:O ₂
V	1to 3	Y	Ch1:NO, Ch2:SO ₂ , Ch3:CO ₂ , Ch4:CO, Ch5:O ₂
P	1to 3	A*	Ch1:NO _x , Ch2:O ₂ , Ch3:corrected NO _x
A	1to 3	A*	Ch1:SO ₂ , Ch2:O ₂ , Ch3:corrected SO ₂
B	1to 3	A*	Ch1:CO, Ch2:O ₂ , Ch3:corrected CO
F	1to 3	A*	Ch1:NO _x , Ch2:SO ₂ , Ch3:O ₂ , Ch4:corrected NO _x , Ch5:corrected SO ₂
G	1to 3	A*	Ch1:NO _x , Ch2:CO, Ch3:O ₂ , Ch4:corrected NO _x , Ch5:corrected CO
J	1to 3	A*	Ch1:CO ₂ , Ch2:CO, Ch3:O ₂ , Ch4:corrected CO
N	1to 3	A*	Ch1:NO _x , Ch2:SO ₂ , Ch3:CO, Ch4:O ₂ , Ch5:corrected NO _x , Ch6:corrected SO ₂ , Ch7:corrected CO
V	1to 3	A*	Ch1:NO _x , Ch2:SO ₂ , Ch3:CO ₂ , Ch4:CO, Ch5:O ₂ , Ch6:corrected NO _x , Ch7:corrected SO ₂ , Ch8:corrected CO
P	1to 3	C*	Ch1:NO _x , Ch2:O ₂ , Ch3:corrected NO _x , Ch4:corrected NO _x average
A	1to 3	C*	Ch1:SO ₂ , Ch2:O ₂ , Ch3:corrected SO ₂ , Ch4:corrected SO ₂ average
B	1to 3	C*	Ch1:CO, Ch2:O ₂ , Ch3:corrected CO, Ch4:corrected CO average
F	1to 3	C*	Ch1:NO _x , Ch2:SO ₂ , Ch3:O ₂ , Ch4:corrected NO _x , Ch5:corrected SO ₂ , Ch6:corrected NO _x average, Ch7:corrected SO ₂ average
G	1to 3	C*	Ch1:NO _x , Ch2:CO, Ch3:O ₂ , Ch4:corrected NO _x , Ch5:corrected CO, Ch6:corrected NO _x average, Ch7:corrected CO average
J	1to 3	C*	Ch1:CO ₂ , Ch2:CO, Ch3:O ₂ , Ch4:corrected CO, Ch5:corrected CO average
N	1to 3	C*	Ch1:NO _x , Ch2:SO ₂ , Ch3:CO, Ch4:O ₂ , Ch5:corrected NO _x , Ch6:corrected SO ₂ , Ch7:corrected CO, Ch8:corrected NO _x average, Ch9:corrected SO ₂ average, Ch10:corrected CO average
V	1to 3	C*	Ch1:NO _x , Ch2:SO ₂ , Ch3:CO ₂ , Ch4:CO, Ch5:O ₂ , Ch6:corrected NO _x , Ch7:corrected SO ₂ , Ch8:corrected CO, Ch9:corrected NO _x average, Ch10:corrected SO ₂ average, Ch11:corrected CO average

* When the 21st digit code is A or C, the component of the NO analyzer is displayed as NO_x.

9.3 Code Symbols

Digit	Description	note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
4	<Specification/structure> Horizontal type(Terminal block for power supply) Horizontal type(Power inlet,with lock)	note1	Z	P	B	B				1																	
5	<Mounting> 19 inch rack mounting type EIA conformity(horizontal type)					A																					
6	<Measurable component (NDIR)> 1st component 2nd component 3rd component 4th component																										
	NO	-																									
	SO ₂	-																									
	CO ₂	-																									
	CO	-																									
	NO	SO ₂																									
	NO	CO																									
	CO ₂	CO																									
	NO	SO ₂	CO																								
	NO	SO ₂	CO ₂	CO																							
	Others																										
7	<Measurable component (O ₂)> None External O ₂ analyzer External zirconia O ₂ analyzer (ZPK7) Built-in fuel cell O ₂ analyzer Built-in paramagnetic O ₂ analyzer	note2																									
8	<Revision code>																										
9	<Measuring range (NDIR)>1st component, 1st range	note3																									
10	<Measuring range (NDIR)>1st component, 2nd range	note3																									
11	<Measuring range (NDIR)>2nd component, 1st range	note3																									
12	<Measuring range (NDIR)>2nd component, 2nd range	note3																									
13	<Measuring range (NDIR)>3rd component, 1st range	note3																									
14	<Measuring range (NDIR)>3rd component, 2nd range	note3																									
15	<Measuring range (NDIR)>4th component, 1st range	note3																									
16	<Measuring range (NDIR)>4th component, 2nd range	note3																									
17	<Measuring range (O ₂)> None 0-5/10vol% 0-5/25vol% 0-10/25vol% 0-5vol% 0-10vol% 0-25vol% 0-50vol% 0-100vol% Others																										
18	<Gas connection> Rc1/4 NPT1/4																										
19	<Output> DC0-1V DC4-20mA DC0-1V+Communication function DC4-20mA+Communication function																										
20	<Indication/power supply cord> In Japanese, cord rated 125V (PSE) In English, cord rated 125V (UL) In English, cord rated 250V (CEE) In Chinese, cord rated 250V (CCC)	note4																									
21	<O ₂ correction and O ₂ correction average output> None O ₂ correction O ₂ correction average O ₂ correction and O ₂ correction average	note5																									
22	<Optional function (DIO)> FAULT A. Cal. H/L Alarm Range/D/Remote range																										
	None																										
	○																										
	○	○																									
	○																										
	○																										
	○	○																									
	○	○																									
	○	○																									
	○	○																									
	○	○																									

NDIR Gas Analyzer

Specifications

Digit	Description	note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	← Digit
23	<Pressure compensation> None Pressure compensation		Z	P	B	B	1																	Y	Y			
24	<Unit> ppm, Vol% mg/m ³ , g/m ³	note6																							A	B		
25	<Adjustment> For standard(combustion exhaust) Others	note7																								A	Z	

RANGE CODE

Range	Code	Range	Code
0-50ppm	A	0-5000ppm	H
0-100ppm	B	0-1vol%	J
0-200ppm	C	0-2vol%	K
0-250ppm	D	0-3vol%	Q
0-300ppm	S	0-5vol%	L
0-500ppm	E	0-10vol%	M
0-1000ppm	F	0-20vol%	N
0-2000ppm	G	0-25vol%	V
0-2500ppm	U	Others	Z
0-3000ppm	T		

O₂ measurement range

Measurement range	Range code	Fuel cell O ₂ sensor (built - in)	Paramagnetic O ₂ sensor (built - in)	Zirconia O ₂ sensor (external)
0-5/10 vol%	A		○	○
0-5/25 vol%	B		○	○
0-10/25 vol%	C	○	○	○
0-5 vol%	L		○	○
0-10 vol%	M	○	○	○
0-25 vol%	V	○	○	○
0-50 vol%	P		○	
0-100 vol%	R		○	

note1)When "D" is specified at 4th digit, Power supply cord is supplied in the scope of supply. Cord specification should be specified at the 20th digit.

note2)When "1" is specified at 7th digit, O₂ pt analyzer signal has to be set as 0-1V DC linear corresponding to full scale. External zirconia O₂ analyzer and external O₂ analyzer are not included in the scope of supply, and has to be separately ordered.

note3)Select the range code for each range from the range code table shown above. Range of fuel cell O₂ analyzer is 0-10vol% or more.

note4)Select the type of voltage rating, plug type and applicable standard of the power supply cord by 20th digit. Select a power supply cord for using at the location of end-user.

note5)O₂ correction is calculated only for NO, SO₂ and CO.

note6)When 5 components measurement is specified, "H" must not be specified at 22nd digit. When 4 components measurement is specified and "H" is specified at 22nd digit, 3 points is maximum for alarm output function.

note7)When "B" is specified at 24th digit, measuring range should be specified by ppm range code. In this case NO,SO₂ and CO measuring range are corresponding range in mg/m³. Please refer to the table shown below for the corresponding range code based on "mg/m³".

note8)When "A" is specified at 25th digit ,the analyzer will be adjusted and delivered with the balance gas N₂. When other adjustment is required, please specify "Z". When "Z" is specified, please attach a list of gas composition contained in the measuring gas.

Corresponding mg/m³

Corresponding range in mg/m ³				
Range code	Unit : ppm	NO	SO ₂	CO
A	0-50ppm	0-65.0mg/m ³	0-140mg/m ³	0-60.0mg/m ³
B	0-100ppm	0-130mg/m ³	0-280mg/m ³	0-125mg/m ³
C	0-200ppm	0-260mg/m ³	0-570mg/m ³	0-250mg/m ³
D	0-250ppm	0-325mg/m ³	0-700mg/m ³	0-300mg/m ³
S	0-300ppm	0-400mg/m ³	0-850mg/m ³	0-375mg/m ³
E	0-500ppm	0-650mg/m ³	0-1,400mg/m ³	0-600mg/m ³
F	0-1,000ppm	0-1,300mg/m ³	0-2,800mg/m ³	0-1,250mg/m ³
G	0-2,000ppm	0-2,600mg/m ³	0-5,600mg/m ³	0-2,500mg/m ³
U	0-2,500ppm	0-3,300mg/m ³	0-7,100mg/m ³	0-3,000mg/m ³
T	0-3,000ppm	0-4,000mg/m ³	0-8,500mg/m ³	0-3,750mg/m ³
H	0-5,000ppm	0-6,600mg/m ³	0-14,00q/m ³	0-6,250mg/m ³

The conversion formula "ppm" unit into "mg/m³" unit.

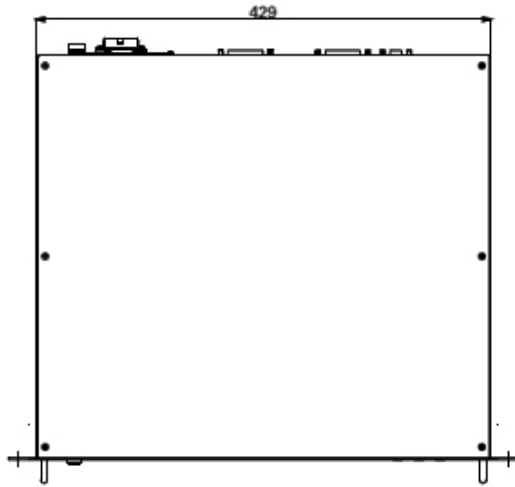
NO (mg/m³) = 1.34 × NO (ppm)

SO₂ (mg/m³) = 2.86 × SO₂ (ppm)

CO (mg/m³) = 1.25 × CO (ppm)

9.4 Outline Diagram

<TOP VIEW>

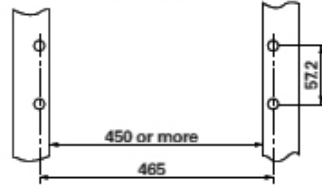


Mounting method

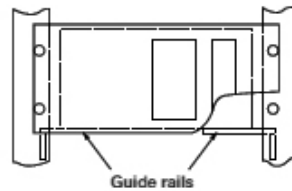
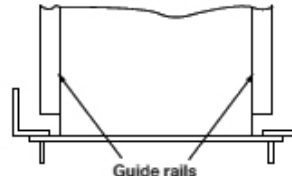
The analyzer weight should be supported at the bottom of the case.

19-inch rack mounting type

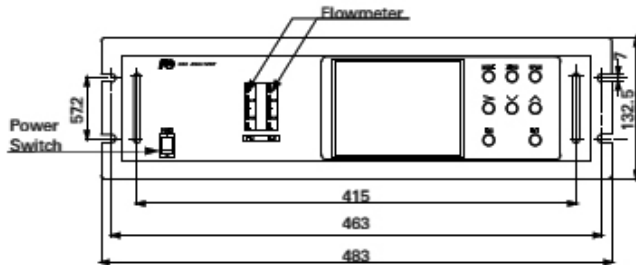
<Rack dimensions>



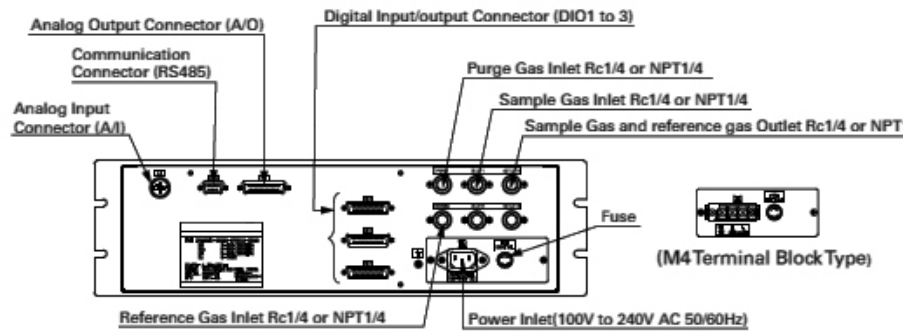
Mounting diagram



<FRONT VIEW>



<REAR VIEW>



<SIDE VIEW>

