ST13-00087-A

Maintenance Manual

Shodex® CD-200

Electric Conductivity Detector

SHOKO SCIENTIFIC

Before starting

This maintenance manual is provided for the technical support staff in Shodex official distributors to repair Shodex CD-200 Electric Conductivity Detector (hereinafter called "Shodex CD-200").

When a trouble happens, this manual helps you to find the cause and solve it.

For using this manual, please note the following.

1) When you repair Shodex CD-200, please take the thinkable safest countermeasure against the damage of your health by the contact with harmful substances and the electric shock.
2) Please read this manual before you repair Shodex CD-200, and treat the instrument correctly in accordance with this manual.
3) There is a case that the information contained in this manual is changed without notice.
4) It is the policy of SHOKO SCIENTIFIC to provide maintenance spare parts for a period of seven (7) years after the final production of the instrument. Spare parts may be available after seven (7) year period but only on an "as available" basis.

Limited Warranty Policy

SHOKO SCIENTIFIC warrants Shodex CD-200 in the range of which is mentioned in "About the guarantee for the product" on the back side of "Certificate of Analysis" and repairs it free in such cases.

Except the cases of the free-repair above, it will be charged for the repair in accordance with SHOKO SCIENTIFIC's maintenance service rule.

Precautions

Thank you for your continued patronage. Observe the following precautions in order to make safe and stable use of the detector.

[Important!]

Precautions are divided into three groups in this operation manual, depending on the degree of danger. The three groups are

⚠ **Warning** : This sign is used where failure to follow strictly the instructions and procedures indicated by this sign may cause injury or damage to health.

Caution : This sign is used where failure to follow strictly the instructions and procedures indicated by this sign may cause this detector and the peripheral apparatus to deteriorate or break down.

Note : This sign is used wherever information is given to ensure optimal performance of the detector.

Precautions listed below are those of particular importance extracted from this operation manual :

⚠ **Warning** Do not use the detector in places where combustible gas or any source of fire or spark exists or might exist.

⚠ **Warning** Prior to connection, make sure that the voltage of the power socket into which the detector power cable is plugged is the same as the power supply voltage indicated on the detector.

⚠ **Warning** The power socket into which the detector power cable is plugged should be of a 3P type with a grounding terminal. Other types of power sockets should not be used.

⚠ **Warning** When using organic solvent, wear safety goggles. It is recommended that a sink or equipment for washing the eyes be installed nearby in case the organic solvent in use comes into contact with the eye(s) or skin.

⚠ **Warning** When any abnormality, such as liquid leakage, is observed, immediately turn off the power and unplug the detector from the main power source.

⚠ **Warning** Do not use the detector with the cover open; always unplug the detector from the main power source before opening the cover.

⚠ **Warning** If the detector is used in a manner not specified by this operation manual, the protection provided by the detector may be impaired.

⚠ **Warning** When using flammable organic solvent as mobile phase, be sure to make necessary arrangement to prevent accidental ignition (fire) by static electricity.

⚠ **Warning** If the fuse blows after being replaced, power off the detector immediately and disconnect the power cord. Please consult our local representative in your area or SHOKO SCIENTIFIC.

Caution As this detector is readily affected by the ambient temperature, use it in places where there is little wind or change in the ambient temperature. Do not use the detector near any source of vibration, electrical noise, or in places where corrosive gas and a lot of dust are present.

Caution External input/output terminals are for contact closure. Never apply voltage to them.

Caution Do not connect any tube other than the provided "OUT tube" to the eluent outlet joint of the detector. Put the exit end of the "OUT tube" in the waste liquid bottle and do not apply back pressure.

Caution When connecting this detector to other detectors in series, put it at the end.

Caution Make sure that no back pressure is applied to the outlet of the detector. Connect the tip of the Teflon tube on the cell outlet of the detector to a receptacle for waste liquid.

Caution If eluent freezes inside the detector, the flow line might break, damaging the detector. If there is any chance of eluent freezing during stoppage or storage of the detector, withdraw the eluent completely from the flow line of the detector.

Caution When using any eluent containing a salt at high concentration, make sure that the flow line is washed with water thoroughly after use. Failure to do so may result in plugging of the line, causing the detector to cease operation.

Caution If the detector is not to be used for more than one week, prior to storage, wash the flow line with pure water or acetone, and dry the line by allowing nitrogen gas to flow through it.

Caution Do not use any eluent which might corrode the material, such as stainless steel, that it comes into contact with. Use of such eluent might cause a base line drift and damage the detector.

Note Use a thoroughly degassed eluent. It is recommended that a degassing device be used to degas the eluent, as it is easy to use and permits continuous degassing.

Note If an eluent is replaced with another eluent, replace all channels of the ion chromatograph with new eluent. When eluent replacement is not sufficient, it may become the cause of an unstabilized baseline.

Note When high voltage caused by static electricity is applied to the instrument, some incorrect actions may be observed. Please take note of static electricity.

Note Please do not set other equipment on this detector, in order to avoid enlarging the baseline drift and losing control of the temperature.

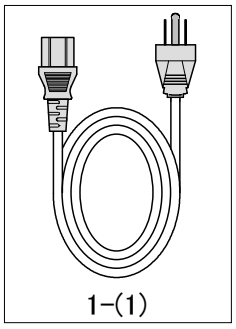
Contents

1. Standard accessories

When unpacking, please verify that all the following accessories are included:

【 **Details of Accessories** 】

No.	*Name*	*Specification*	*Quantity*
1	Power cable	3-core cord with a grounding electrode (100V) (1) For voltage of 100 or 120 VAC Power supply cable set (125 V) (2) For voltage of 220 or 240 VAC Power supply cable set (250 V)	1*
2	Signal cable	2-core shield cable (approx. 2 m)	1
3	Fuse	Time-lag type 500 mA (T500 mA L/250 V)	
4	IN tube set	Teflon tube of 1.6 mm outer dia. x 0.25 mm inner dia. x 1000 mm length (PEEK setscrew with ferrule attached)	1
5	OUT tube set	Teflon tube of 2.5 mm outer dia. x 1.5 mm inner dia. x 2000 mm length (connecting tube, setscrew, and ferrule attached)	1
6	Discharge tube set	Silicone rubber tube of 10 mm outer dia. x 7 mm inner dia. x 2000 mm length (connection joint attached)	1
7	Operation manual		1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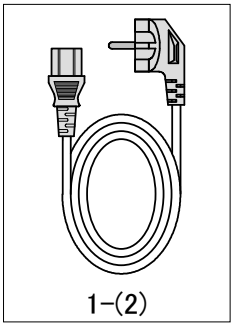
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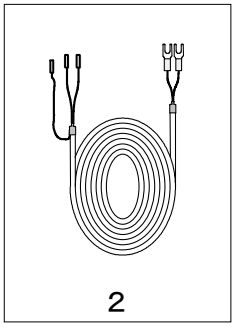
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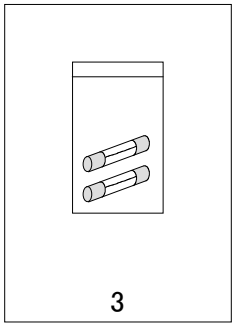
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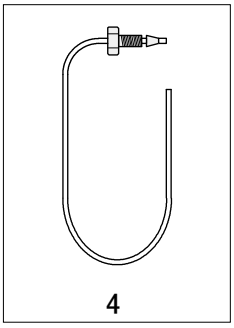
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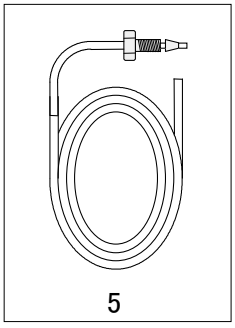
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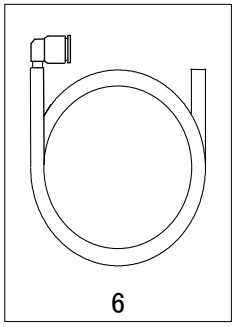
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＊: Either 1-(1) or 1-(2) is attached according to the power supply voltage at the first destination.
When unpacking, please verify that all the following accessories are included:

2. Features

Shodex CD-200 is an Electric Conductivity Detector for HPLC and has the following features:

1) Stability

The double temperature control system provides for a very fast start up time and excellent stable baseline performance.

2) Safety

Solvent leak sensor generates an output signal that stops pump flow in case of an eluent leak within the detector.

3) Integration

Well-organized Output signal terminals and USB communication port guarantee high-level integration and automation in conjunction with your HPLC system.

3. Specifications

1)	Measuring method	:	Two-electrode system
2)	Measuring limits	:	0-600 mS/m
3)	Measuring range	:	0.0025-5.12/0.025-51.2/0.25-512 mS/m (12 steps)
4)	Linearity range	:	0-600 mS/m
5)	Noise	:	< 0.0005 mS/m (response; 1 sec) or less (2.5 mM phthalic acid ; pH 4.0 ; 1.5 ml/min.)
6)	Response	:	0.1, 0.25, 0.5, 1.0, 1.5, 2, 3, 6 seconds
7)	Zero adjustment	:	Automatic zeroing
8)	Base line shift	:	Limit; 0-2 mS/m, Resolution; 0.01mS/m
9)	Integrator output	:	0-1 V (Sensitivity; 2/20/200 mV/mS/m)
10)	Recorder output	:	0-10 mV (for each range)
11)	External contact input	:	ZERO IN/MARKER IN
12)	External contact output	:	・READY (Temperature control stabilized)/LEAK/ ・ERROR (ROM/RAM/PARAMETER/LEAKAGE/ SENSOR ERROR/OVER HEAT/ZERO OVER/ COMUNICATION)/ ・MARKER OUT (Contact capacity : 24 VDC, 0.1 A)
13)	Temperature control	:	OFF, 30-50℃ in increments of 1℃ (with a 77℃ thermal fuse) (Note) External cylinder is adjusted to a temperature that is 5℃ lower than setting temperature.
14)	External communication	:	USB
15)	Cell volume	:	approx. 2.5 μl
16)	Pressure rating	:	1 MPa
17)	Wetted part material		SUS316, PTFE, PEEK
18)	Dead volume	:	Inlet → Cell ; approx. 75 μl Cell → Outlet ; approx. 25 μl Total dead volume ; approx. 103 μl
19)	Power supply	:	100-240 VAC ± 10% , 50/60 Hz
20)	Demand	:	approx. 50 VA
21)	Outside dimensions	:	approx. 260^{W} x 400^{D} x 150^{H} mm (excluding rubber footing)
22)	Weight	:	8 kg

4. Measuring mechanism

4-1 Detecting system

This detector has adopted a two-electrode system, and the detection cell and flow line are as shown in Fig. 4-1.
In Fig. 4-1, a current proportional to the electrical conductivity of eluent is output from electrode I when an ac voltage is applied to electrode II. This current signal is output as the electrical conductivity signal through an I/V converter, a synchronous rectifier, and a signal processing circuit.
In addition, the temperature dependence of eluent is large, and in order for the electric conductivity of eluent to minimize this effect, the detection cell is contained in an inner cylinder which is adjusted to the setting temperature, and the inner cylinder is contained in an outer cylinder which is adjusted to a temperature that is 5℃ lower than the setting temperature.
In addition, two heat exchangers are prepared in the inner cylinder and the outer cylinder, respectively, so that the temperature of eluent may attain the setting temperature.

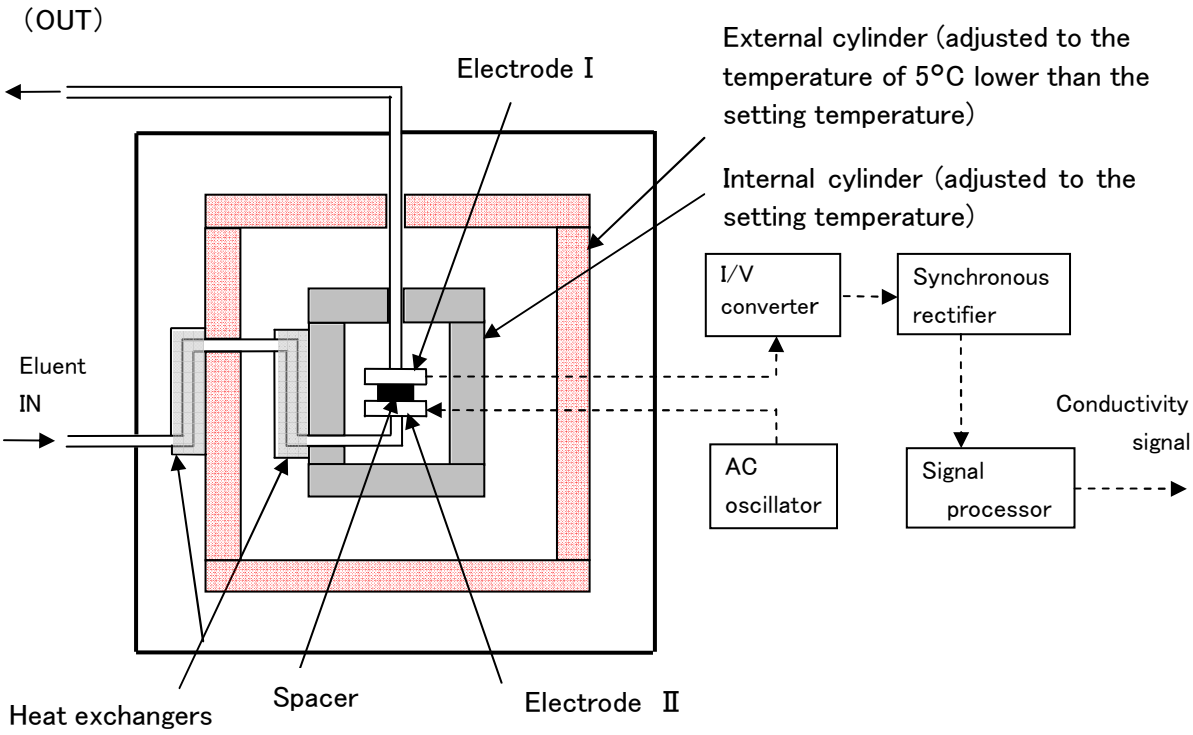


Fig. 4-1 Measuring system

4-2 Electric system

The electric system of **Shodex** CD-200 consists of an oscillator (generating AC voltage), a signal processing circuit, a display/keyboard circuit, and two temperature control circuits. Fig 4-2 shows a block diagram of the electric system.
The oscillator applies AC voltage to the cell, generating an electric AC current proportional to the electrical conductivity of the eluent, in the cell electrode. The current is converted into a voltage signal by the I/V converter. Then the voltage signals are converted by the synchronous rectifier into DC voltage signals which depend on electrical conductivity of the eluent.
This DC voltage signal is displayed as electrical conductivity of eluent, and converted to a precision digital signal after passing through the coarse zeroing circuit and the integrator range setting circuit. This precision digital signal is transferred to the digital signal processing circuit.
This precision digital signal is processed for response setting, automatic zeroing, polarity setting, base line shift, marker summation, and output for Integrator output, recorder output, and communication port output as a differential electrical conductivity voltage signal.
The temperature control circuit for the internal cylinder is kept at a private temperature, and the temperature control circuit for external cylinder is kept at a temperature which is 5 degrees lower than private temperature.

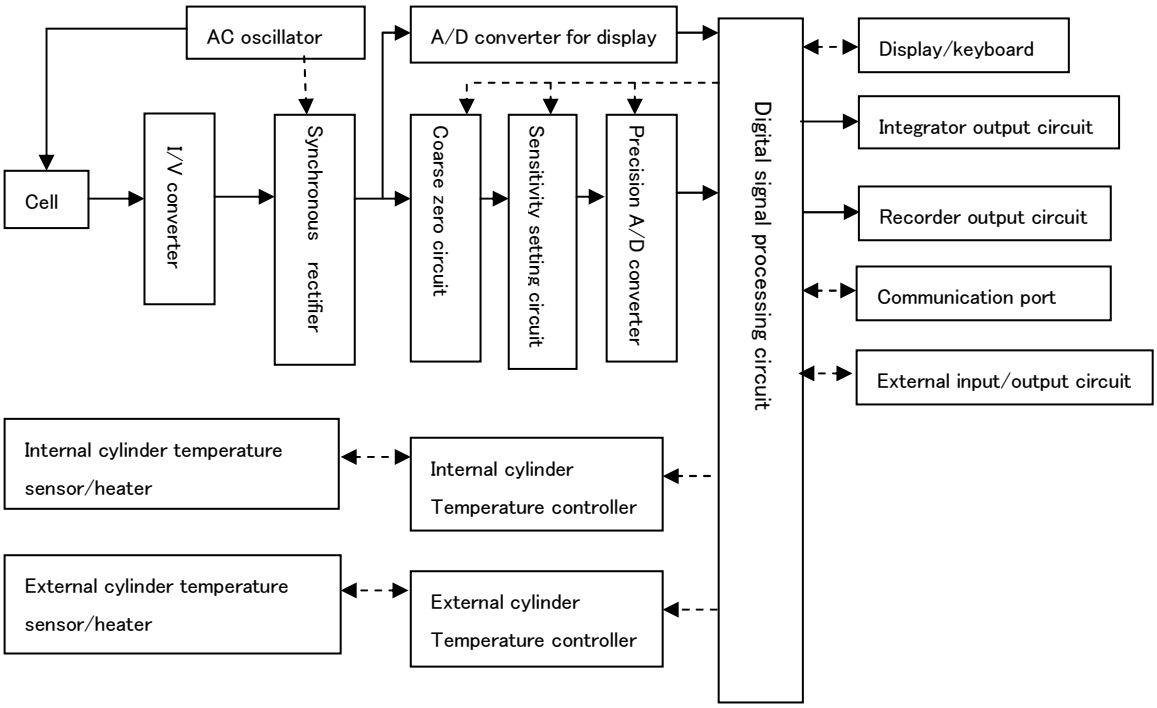


Fig. 4-2 Electrical System

5. Names and functions of parts

5-1 Front Panel

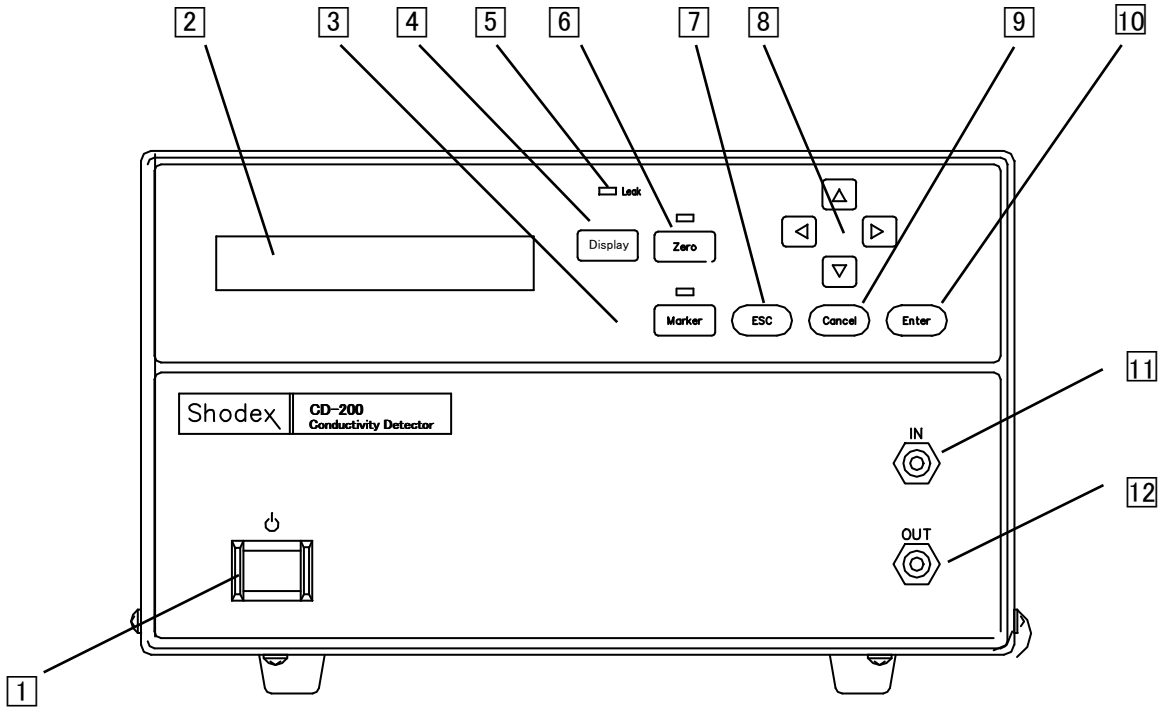


Fig. 5-1 Front Panel of **Shodex** CD-200

No.	Name of part	Function
1	Power Switch	Press this key once to turn the unit on or off.
2	LCD Display	A 24-digit 2-row character display panel. This is used for displaying or setting various parameters.
3	Marker key [Marker]	Press the Marker key to generate an event marker signal and add it to the recorder output. While this function is active, the LED above the key will be lit.
4	Display change key [Display]	Press the Display key to toggle between S display and ΔS.
5	Leak LED [Leak]	Illuminated when solvent leak is detected.
6	Auto Zero Key [Zero]	Press the Zero key to activate "Auto-Zero". While this Function is active , the LED above the key will be lit.
7	ESC Key [ESC]	Press the ESC key to cancel an operation and return to the normal screen.
8	Arrow Keys [▲▼◀ ▶]	Press the Arrow keys to move cursor or to edit values.

No.	Name of part	Function
9	Cancel Key [Cancel]	Press the Cancel key to cancel change and to stop beeping.
10	Enter Key [Enter]	Press the Enter key to finalize operations or settings.
11	Inlet Port [IN]	Connects tubing from separation column outlet.
12	Outlet Port [OUT]	Eluent passing through the flow path is discharged from this port.

5-2 Side Panel

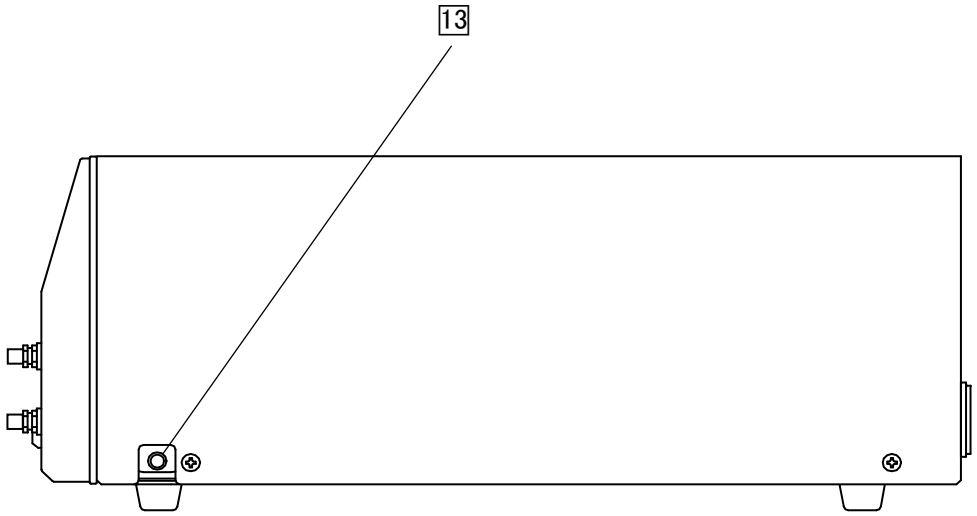


Fig. 5.2 Side panel of **Shodex** CD-200

No.	Name of part	Function
13	Drain Port	In case of internal eluent leak, the eluent will be discharged from this port. Connect the attached tubing as necessary.

5-3 Back Panel

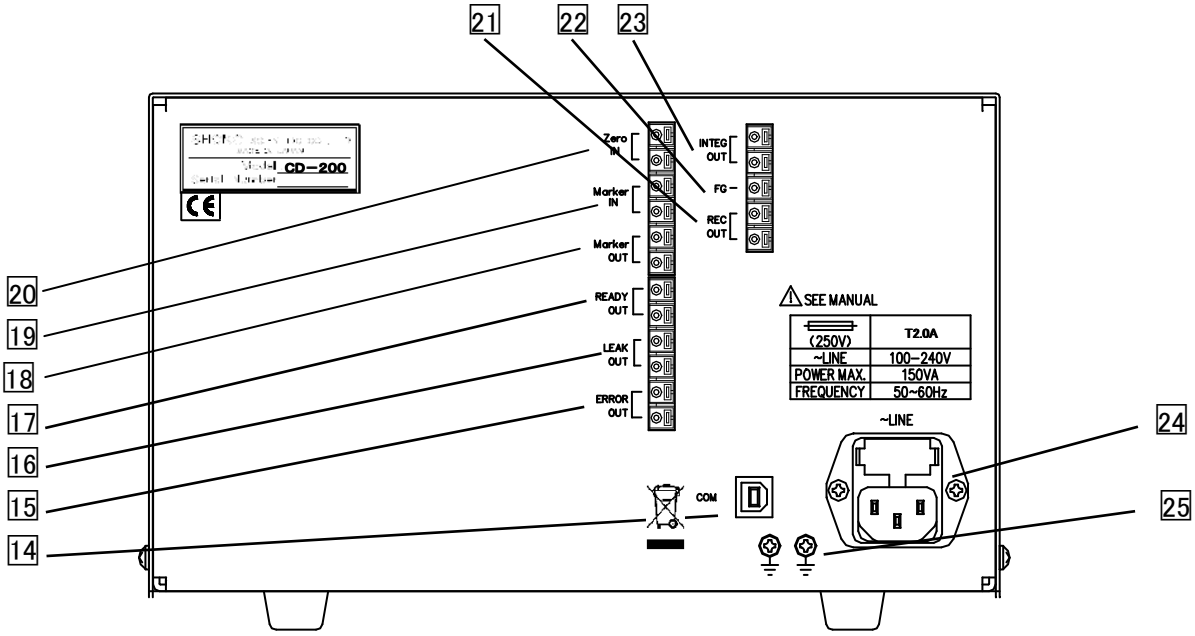


Fig. 5.3 Back panel of **Shodex** CD-200

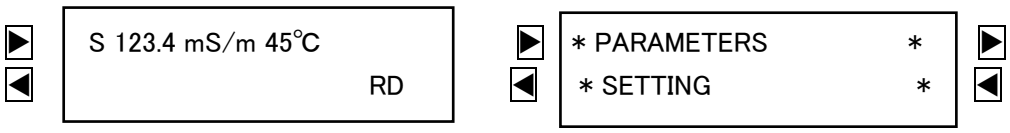
No.	Name of part	Function
14	Communication port [COM]	USB communication port
15	Error out terminals [ERROR OUT]	A contact signal is sent out through these terminals when an error occurs.
16	Leak out terminals [LEAK OUT]	A contact signal is sent out through these terminals when an eluent leak is detected.
17	Ready out terminals [READY OUT]	A contact signal is sent out through these terminals when 10 minutes have passed since the temperature of the cell has reached the designated value.
18	Marker output terminals (MARKER OUT)	A contact signal (approx. a quarter second in duration) is sent out through these terminals when marker is in operation.
19	Marker input terminals (MARKER IN)	Shortcircuiting these terminals gives the same effect as pushing the marker switch (3).
20	Zero terminals (ZERO)	Shortcircuiting these terminals gives the same effect as pushing the zero switch (6).
21	Recorder terminals [REC. OUT]	Signals to the recorder are sent out through these terminals. The sensitivity of the output signal is 10 mV/FS.
22	Ground terminal for the signal cable [FG]	The shield terminal of the signal cable should be connected to this terminal.

No.	Name of part	Function
23	Integrator terminals [INTEG. OUT]	Signals to the data processing unit are sent out through these terminals. The sensitivity of the output signal is 200, 20, or 2 mV/(mS/m) with the integrator range of 5.12, 51.2, or 512 mS/m/FS .
24	Power connector [～LINE]	The included power cable should be plugged into this connector.
25	Ground terminals [⏚]	These are the terminals to ground the main body of the detector.

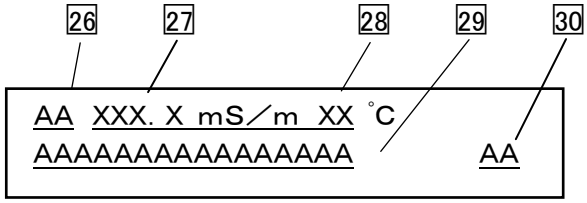
5-4 Display

The display shows a "Monitor screen" when the detector is started and can be switched to a "Parameter setting screen" when the ◀ key or the ▶ key is pressed.

<Monitor screen> <Parameter setting screen>



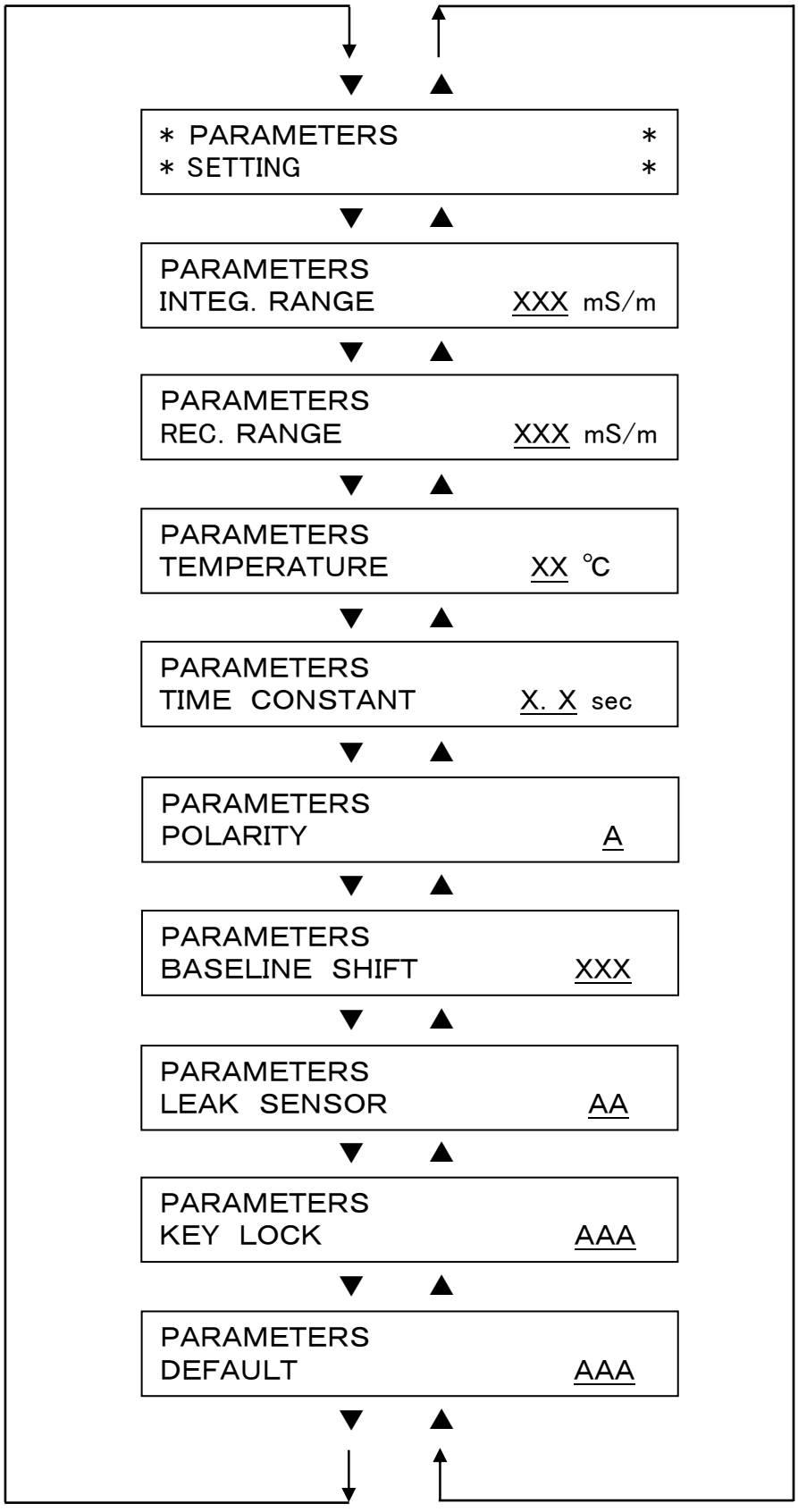
<Monitor screen>



No.	Function
26	When the nominal value of conductivity displayed in 27 is the electrical conductivity of a background, "S" is displayed, and when the displayed value is differential conductivity, "ΔS" is displayed.
27	This indicates whether the displayed value is electrical conductivity of a background or differential conductivity.
28	This indicates the temperature of the cell.
29	This indicates error or operation status. If there are multiple messages to be displayed, the priority message is displayed. (1) ROM: Is displayed when a ROM error has occurred. (2) RAM: Is displayed when a RAM error has occurred. (3) PARAMETER: Is displayed when a parameter memory error has occurred. (4) LEAKAGE: Is displayed when eluent leakage has occurred. (5) SENSOR ERROR: Is displayed when the temperature sensor has a problem. (6) OVER HEAT: Is displayed when the temperature is excessively high. (7) ZERO OVER: Is displayed when Auto Zero does not function correctly. (8) COMMUNICATION : Is displayed when a communication error has occurred. (9) TEMP. UNSTABLE: After the detector is started, this remains displayed until the temperature remains within ± 1°C of the set temperature for 10 minutes.
30	One of the following is displayed in response to the detector status. (1) LK: Key Lock status (2) ER: Error status (3) RD: Stable temperature status

<Parameter setting screen>

To show the currently set parameters in order, press the ▼ key or the ▲ key while the parameter setting screen is displayed.



To change parameters, perform the following procedures:

(1) Display the relevant parameter.

(2) Press the Enter key. The underlined digits will flash and the parameter can be changed.

(3) Press the ▼ key or the ▲ key to change the parameter with reference to Table 5-1.

(4) Press the ENTER key to finalize the parameter.

(5) Press the ESC key to return to the monitor screen.

Table 5-1 Settable parameters

N	Parameter	Selectable value	Unit	Default
1	INTEG. RANGE	5.12, 51.2, 512	mS/m/1024mV	512
2	REC. RANGE	**(INTEG. RANGE;5.12)** 0.0025, 0.005, 0.01, 0.02, 0.04, 0.08, 0.16, 0.32, 0.64, 1.28, 2.56, 5.12 (12 Steps) **(INTEG. RANGE;51.2)** 0.025, 0.05, 0.1, 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, 12.8, 25.6, 51.2 (12 Steps) **(INTEG. RANGE;512)** 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512 (12 Steps)	mS/m/10mV	512
3	TEMPERATURE	OFF, 30-50 (1 Step)	℃	45
4	TIME CONSTANT	0.1, 0.25, 0.5, 1, 1.5, 2, 3, 6 (8 Steps)	sec	1
5	POLARITY	+, −	−	+
6	BASELINE SHIFT	0-200 (50 nRIU increment)	−	0
7	LEAK SENSOR	ON, OFF	−	ON
8	KEY LOCK	YES, NO	−	NO
9	DEFAULT DATA	YES, NO	−	NO

6. Installation and connections

6-1 Power Connection and Grounding

Connect the detector to the power source according to the following procedure:

1) Confirm that the power socket into which the detector power cable is plugged is of a 3P type with a grounding terminal.
2) Confirm that the voltage of the power socket into which the detector power cable is plugged is the same as the voltage indicated on the rear panel of the detector.
3) Turn off the power switch [1] of the detector.
4) Connect the Power connector [24] of the detector rear panel to the power source using the accessory power cable.

Warning *Prior to connection, make sure that the voltage of the power socket into which the detector power cable is plugged is the same as the power supply voltage indicated on the detector.*

Warning *The power socket into which the detector power cable is plugged should be of a 3P type with a grounding terminal. Other types of power sockets should not be used.*

Warning *The accessory power cable should be used to connect the detector to the power socket. Other cables should not be used.*

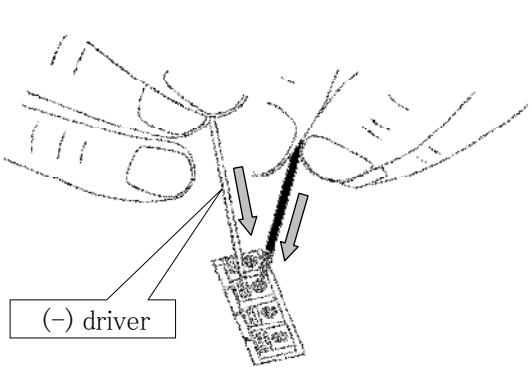
Warning *Do not use the detector in places where combustible gas or any source of fire or spark exists or might exist.*

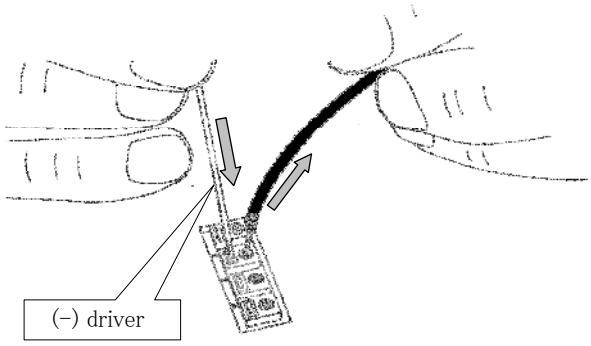
Caution *As the detector is readily affected by the ambient temperature, use it in places where there is little wind or change in ambient temperature.*
Do not use the detector near any source of vibration or electrical noise or in places where corrosive gas and a lot of dust are present.

Notice Please do not set other equipment on this detector, in order to avoid enlarging the baseline drift and losing control of the temperature.

6-2 Signal cable Connections

Make correct connections using the provided signal cables in accordance with the figures below.
Connect the red wire to the "+" terminal, the white wire to the "−" terminal, and the clear wire to "FG."





Inserts the end of the lead wire while pressing button with a flat-tip screwdriver.

<connect the wire>

Then, remove the flat-tip screwdriver to the lock the wire.
Make sure the wire is firmly connected.

<disconnect the wire>

For the contact signal out (Ready, Solvent Leak, and Error) cable connection, please use duplex lead wire.

Caution *External input/output (Auto Zero-In, Marker-In, Ready-Out, Leak-Out, and Error-Out) are for contact closure. Never apply voltage to these terminals.*

6-3 Tube Connections

When connecting this detector to a high performance liquid chromatograph through tubes, wash the chromatograph and columns thoroughly with the eluent in use and make sure that the eluent is clean before connecting the tube.
Connect the tubes in accordance with the following procedures:

1) Connect the eluent inlet joint 11 to the outlet of the column to be used through the provided IN TUBE. When fastening the stainless steel set screw of the IN TUBE, grip the eluent inlet joint 11 with a spanner.
2) Connect the supplied OUT TUBE to the eluent outlet joint 12.

Caution *Do not connect any tube other than the provided OUT TUBE to the eluent outlet joint 12 of the detector. Put the exit end of the OUT TUBE in a waste liquid receptacle and do not apply back pressure.*

Caution *When connecting this detector to other detectors in series, connect this detector at the end.*

6-4 Operation Procedures

Use the detector in accordance with the following procedures:

1) Set the parameter on operating parameter-setting screen (Refer to 5-4).
2) Start pumping eluent at the flow rate of analytical condition.
3) Confirm that the detector status is "RD."
4) Wait until the baseline is stabilized.
5) Verify that the baseline is stable, and then press the Zero key to perform Auto Zero before starting the analyses.

⚠ **Warning** *When using organic solvent, wear safety goggles. It is recommended that a sink or equipment for washing eyes be installed nearby in case the organic solvent in use comes into contact with the eye(s) or skin.*

⚠ **Warning** *When any abnormality, such as liquid leakage, is observed, immediately turn off the power.*
Unplug the detector from the main power source before opening the cover.

⚠ **Warning** *When using flammable organic solvent as mobile phase, be sure to make necessary arrangement to prevent accidental ignition (firing) by static electricity.*

Caution *If any eluent freezes inside the detector, the flow line might break, damaging the detector. If there is any chance of the eluent freezing during stoppage or storage of the detector, remove the eluent completely from the flow line of the detector.*

Caution *When using any eluent containing a salt at high concentration, make sure that the flow line is washed with water thoroughly after use. Failure to do so may result in plugging of the line, causing the detector to cease operation.*

Caution *If the detector is not to be used for more than one week, prior to storage, wash the flow line with pure water and acetone, and dry the line by allowing nitrogen gas to flow through.*

Caution *Do not use any eluent, including hydrochloric acid, which might corrode the material, such as stainless steel, that it comes into contact with.*
Use of such eluent might cause a base line drift and damage the detector.

Note *Use a thoroughly degassed eluent. It is recommended that a degassing device be used to degas the eluent, as it is easy to use and permits continuous degassing.*

Note *If an eluent is replaced with another eluent, replace all channels of the ion chromatograph with new eluent. When eluent replacement is not sufficient, it may become the cause of a unstabilized baseline.*

《 alarm 》

When an error occurs, while an alarm is displayed on lower figures of monitors, a beep sounds. The beeping stops by pressing the ″CANCEL″ key.
In addition, when two or more errors occur, only the alarm of highest priority is displayed.

7. Maintenance

7-1 Flow Line Cleaning

If cell and tube fittings become dirty, base line noise and drifts may become large.
In such a case, please wash the channel by the following procedures.

1) Please let eluent flow at 1 ml/min for 5 hours or more.
2) When an improvement is not found, let pure water flow at 1 ml/min for 5 hours or more.
3) When, despite the washing procedures of said 1) or 2) having been performed, normal operation does not return, repeat said 2) once or twice.

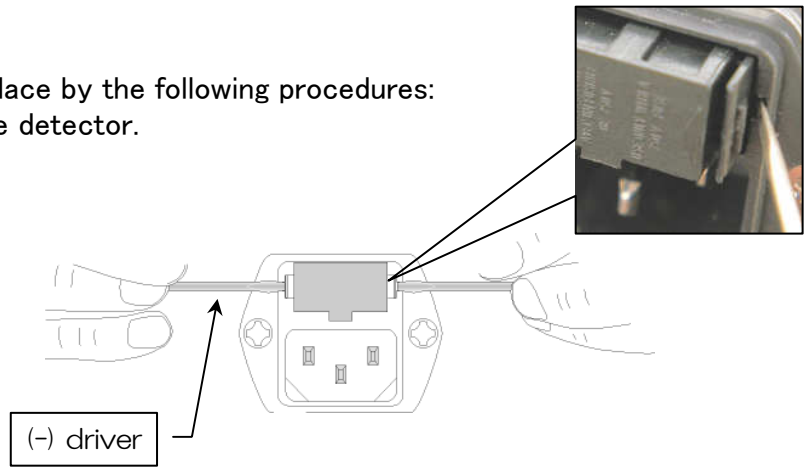
In addition, even if the above cleaning is performed, when an improvement is not found, please perform the following.

- Please perform check repair (repair request) of the detector.
- A pump etc. should be used to wash upstream side equipment.

7-2 Replacing Fuse

When the fuse is blown, replace by the following procedures:

1) Turn off the power of the detector.
2) Unplug the power cord.
3) Remove the blown fuse.
4) Replace new fuse.



Warning *Replace only with fuses of the same type and rating.*

Warning *If the fuse blows again after being replaced, immediately power off the detector and disconnect the power cord.*
Please consult our local representative in your area or SHOKO SCIENTIFIC CO.,LTD.

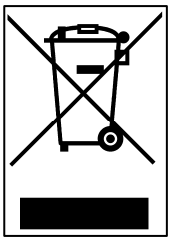
7-3 Cleaning of detector exterior

When the exterior such as the top cover of the front panel is stained or gets wet for whatever reason, please keep the detector clean and dry by wiping it off with a soft cloth or tissue paper. If stains are hard to remove, try soft cloths with a weak water solution of kitchen detergent.

Caution *Use a dry cloth to wipe the detector. Do not use water or alcohol.*
Use of such liquids may damage the detector or erase characters or color on the panel.

8. WEEE Instructions

WEEE Mark



An instrument marked with this mark indicates that it was sold on or after August 13th 2005, and it is covered by Waste Electrical and Electronic Equipment (WEEE) Directive.
This WEEE mark means that the instrument must be collected separately from general household waste, according to the regulatory guideline in your area.
Please note that our instrument is for industrial / professional use only.

Please contact your Shodex office or Shodex distributor when the instrument has reached the end of its life. They will advise you regarding disposal of the instrument.

The objective of this WEEE program is to preserve, protect, and improve the quality of the environment, protect human health, and utilize natural resources prudently and rationally.
With your co-operation we are aiming to reduce contamination from waste instruments and preserve natural resources through re-use and recycling.

Please contact Shodex at the web site listed below.

http://www.shodex.com/WEEE/

9. Troubleshooting

9-1 Troubleshooting for using

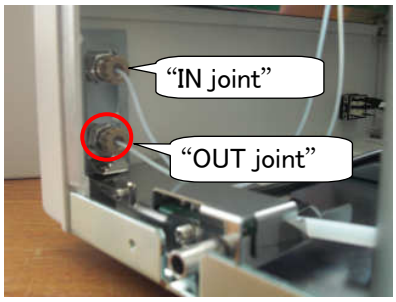
No.	Problem	Possible cause	Solution
1	No power (Lamps and displays do not go on when the power button is turned on.)	1. Power cable is not connected. 2. Fuse is blown.	1. Connect power cable to power socket. 2. Replace fuse. (If new fuse blows soon after replacement, contact agent for repair.)
2	The detector cell temperature does not reach the preset value.	The detector temperature setting is not suitable.	Preset the detector cell temperature 15℃ higher than the room temperature.
3	Baseline becomes jagged.	Bubbles are present in flow cell.	Please pass thoroughly degassed eluent through at a flow rate of about 1 ml/min. If an aqueous eluent is in use and the baseline does not stabilize even after passing the degassed eluent for more than one hour, performing one passage of methanol will be effective.
4	Periodic noises are generated.	1. Pulsation by pump is large. 2. Existence of bubbles in the flow cell amplifies the pulsation by pump.	1. Install a device, such as a damper or resistance pipe, to eliminate pulsation, close to the delivery side of the pump. 2. Pass thoroughly degassed eluent through at a flow rate of about 1 ml/min. If an aqueous eluent is in use and the baseline does not stabilize even after passing the degassed eluent for more than one hour, performing one passage of methanol will be effective.
5	No periodic noises are generated.	1. Insufficient degassing 2. Flow cell is contaminated. 3. Salts separated in the tubing or flow cell. 4. Column is contaminated.	1. Pass thoroughly degassed eluent. 2. Refer to " 7-1 flow line cleaning ." 3. Refer to " 7-1 flow line cleaning ." 4. Wash the column or use a new column.
6	Large baseline drift	1. Insufficient solvent replacement. 2. Room temperature fluctuates greatly. 3. Bubbles are present in the flow cell.	1. Replace the solvent thoroughly. (Refer to the notes in 6-4.) 2. Use the detector only in places where changes in room temperature are small. 3. Pass thoroughly degassed eluent through to purge bubbles.

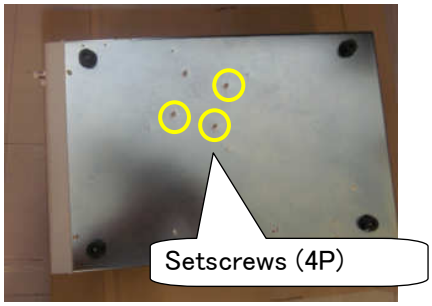
9-2 Troubleshooting for device malfunction

No	Problem	Cause	Corrective action
1	All display on front panel OFF.	1) Blown fuse.	Replace fuse.
		2) A inner Connector is not connected.	Remove the cover and confirm proper connection.
		3)Malfunction of measurement board.	Replace the measurement board in accordance with 9-4.
		4) Malfunction of the display unit.	Replace display unit in accordance with 9-5.
2	The detector cell temperature does not reach the preset value.	1) Malfunction of the detector cell unit.	Replace the detector cell unit in accordance with 9-3.
		2) Malfunction of the measurement board.	Replace the measurement board in accordance with 9-4.
3	Indication of both electrical conductivity(S) remain at "0" and do not change.	1) Malfunction of the detector cell unit.	Replace the detector cell unit in accordance with 9-3.
		2) Malfunction of the measurement board.	Replace the measurement board in accordance with 9-4.
4	Excessive noise appear at baseline.	1) Pulsation by the pump is large.	Maintain the pump.
		2) Insufficient degassing of eluent.	Use thoroughly degassed eluent.
		3) Malfunction of detector cell.	Replace the measurement board in accordance with 9-4.
5	Excessive drift appear at baseline.	1) Contamination or damage to cell unit.	Wash by thoroughly degassed eluent.
		2) Malfunction of detector cell unit	Replace the detector cell unit in accordance with 9-3.
6	Front panel does not work.	1) Malfunction of measurement board.	Replace the measurement board in accordance with 9-4.
		2) Malfunction of display unit.	Replace the display unit in accordance with 9-5.
7	"OVER HEAT" alarm	1) Malfunction of the detector cell unit.	Replace the detector cell unit in accordance with 9-3.
		2) Measure board malfunction	Replace the measurement board in accordance with paragraph 9-4.
8	"LEAKAGE" alarm	1) Broken leak sensor board	Replace the leak sensor board in accordance with paragraph 9-7.
		2) Measure board malfunction	Replace the measurement board in accordance with paragraph 9-4.
9	"ROM" alarm	1) Measure board malfunction	Replace the measurement board in accordance with paragraph 9-4.
10	"RAM" alarm		
11	"PARAMETER" alarm		

9－3 Replacement of the cell unit

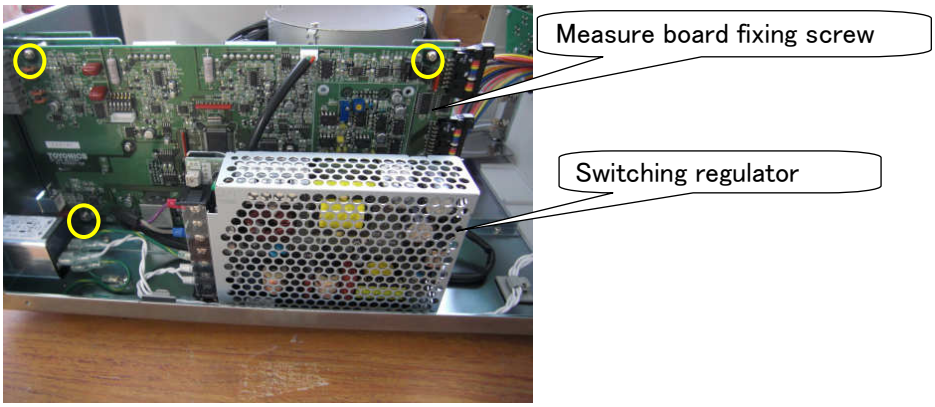
1) Turn OFF the “power” switch, and remove power cable.
2) Remove the four setscrews on each side of detector and lift off the cabinet cover.
3) Disconnect the “IN tubing of Teflon” from the “IN joint”, and disconnect the “OUT tubing of Teflon” from the “OUT joint”.
4) Disconnect all connectors(CN2,CN3,CN5) from measure board.
5) Lay the detector, and remove four screws.
6) Restore the detector, and remove four setscrews for the cell unit.
7) Fix a new cell unit and reassemble the detector in the reverse order of its disassembly.
8) Connect a pressure gauge to “OUT joint”, and enclose 1.0MPa nitrogen gas or 1.0MPa Oil free air from “IN joint” for 5 minutes, and confirm no pressure drop.
9) Practice the Span adjustment in accordance with 9-6.





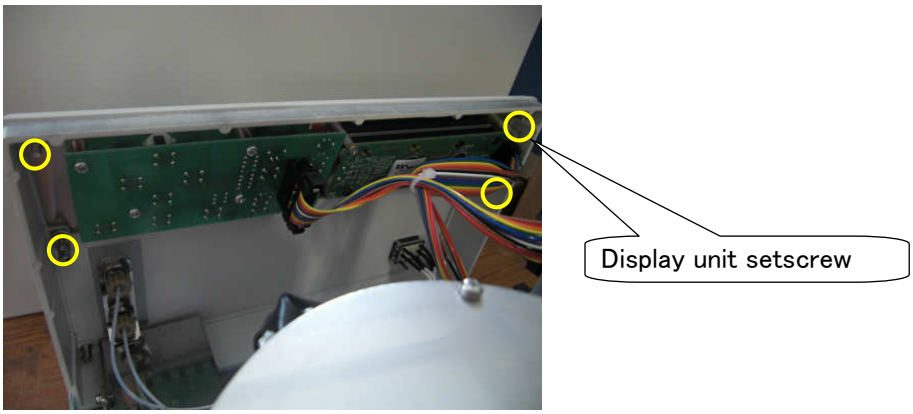
9－4 Replacement of Measure Board

1) Turn OFF the detector and disconnect the power cable from power connector of the detector.
2) Remove the four setscrews on each side of detector and lift off the cabinet cover.
3) In order for accessing to four screws which fix the measure board, remove two setscrews that fix the switching regulator, and disconnect all cables which are connecting to the measure board.
4) Loosen four screws that fix the measure board, and pull out the measure board.
5) Mount a new measure board, and reassemble the detector in the reverse order of its disassembly.
6) Input the serial number (6-digit) , in accordance with 9-7 (“SERIAL No INPUT”).
7) Practice the span adjustment in accordance with 9-6..



9－5 Replacement of display unit

1) Turn OFF the detector and disconnect the power cable from the power connector of the detector.
2) Remove the four setscrews on each side of the detector and lift off the cabinet cover.
3) Disconnect two cable connectors which are connected to the display unit.
4) Loosen four screws that fix the display unit.
5) Install the new display unit by the reversal procedure.

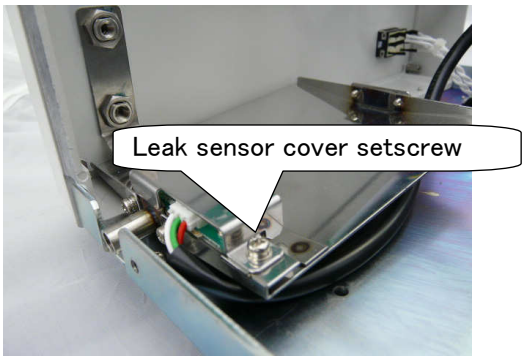


9－6 Span adjustment

1) Set the temperature to 45℃, and confirm that status is “RD”.
2) Practice “SPAN ADJUSTMENT” , in accordance with 9-8 4).

9－7 Replacement and adjustment of the Leak sensor board

1) Turn OFF the detector and disconnect the power cable from the power connector of the detector.



2) Remove the four setscrews on each side of the detector and lift off the cabinet cover.
3) Disconnect the leak sensor connector (CN7) from the measure board.
4) Loosen the setscrews of the leak sensor cover and the leak sensor board, and remove leak sensor board.
5) Install the new leak sensor board by the reversal procedure.
6) Turn on “POWER” switch with pressing “▲” key.
7) After 10 minutes from POWER on, read leak sensor level data (hexadecimal) which display at left side of LCD.
8) Read out threshold data (hexadecimal) which correspond with leak sensor level data from next table.
9) Input the threshold data at right side of LCD.
10) Turn off “POWER” switch.

[leak sensor threshold data table]

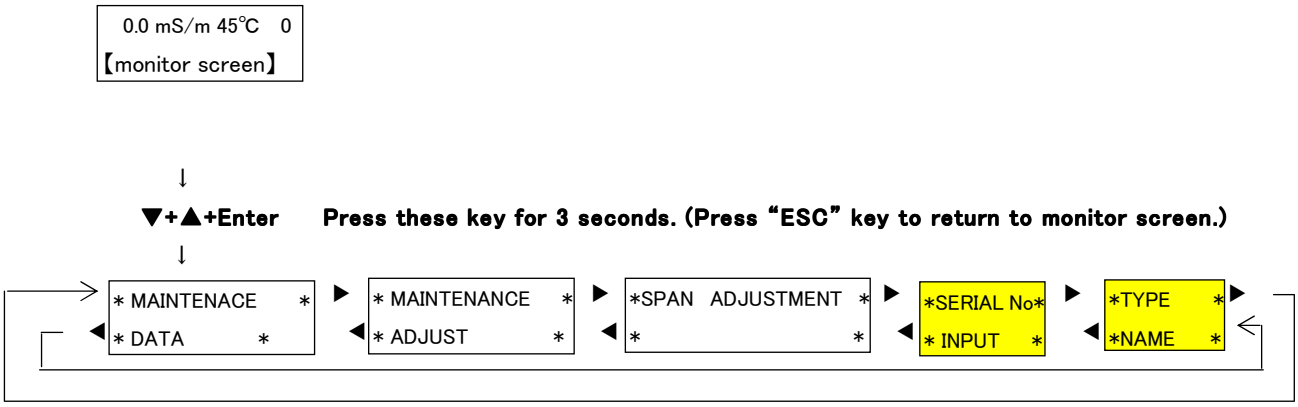
: default

level data	threshold data	level data	threshold data	level data	threshold data	level data	threshold data	level data	threshold data
192	1B0	1B2	1D0	1D2	1F0	1F2	210	212	230
193	1B1	1B3	1D1	1D3	1F1	1F3	211	213	231
194	1B2	1B4	1D2	1D4	1F2	1F4	212	214	232
195	1B3	1B5	1D3	1D5	1F3	1F5	213	215	233
196	1B4	1B6	1D4	1D6	1F4	1F6	214	216	234
197	1B5	1B7	1D5	1D7	1F5	1F7	215	217	235
198	1B6	1B8	1D6	1D8	1F6	1F8	216	218	236
199	1B7	1B9	1D7	1D9	1F7	1F9	217	219	237
19A	1B8	1BA	1D8	1DA	1F8	1FA	218	21A	238
19B	1B9	1BB	1D9	1DB	1F9	1FB	219	21B	239
19C	1BA	1BC	1DA	1DC	1FA	1FC	21A	21C	23A
19D	1BB	1BD	1DB	1DD	1FB	1FD	21B	21D	23B
19E	1BC	1BE	1DC	1DE	1FC	1FE	21C	21E	23C
19F	1BD	1BF	1DD	1DF	1FD	1FF	21D	21F	23D
1A0	1BE	1C0	1DE	1E0	1FE	200	21E	220	23E
1A1	1BF	1C1	1DF	1E1	1FF	201	21F	221	23F
1A2	1C0	1C2	1E0	1E2	200	202	220	222	240
1A3	1C1	1C3	1E1	1E3	201	203	221	223	241
1A4	1C2	1C4	1E2	1E4	202	204	222	224	242
1A5	1C3	1C5	1E3	1E5	203	205	223	225	243
1A6	1C4	1C6	1E4	1E6	204	206	224	226	244
1A7	1C5	1C7	1E5	1E7	205	207	225	227	245
1A8	1C6	1C8	1E6	1E8	206	208	226	228	246
1A9	1C7	1C9	1E7	1E9	207	209	227	229	247
1AA	1C8	1CA	1E8	1EA	208	20A	228	22A	248
1AB	1C9	1CB	1E9	1EB	209	20B	229	22B	249
1AC	1CA	1CC	1EA	1EC	20A	20C	22A	22C	24A
1AD	1CB	1CD	1EB	1ED	20B	20D	22B	22D	24B
1AE	1CC	1CE	1EC	1EE	20C	20E	22C	22E	24C
1AF	1CD	1CF	1ED	1EF	20D	20F	22D	22F	24D
1B0	1CE	1C0	1EE	1F0	20E	210	22E	230	24E
1B1	1CF	1C1	1EF	1F1	20F	211	22F	231	24F

9－8 Instruction of maintenance screen

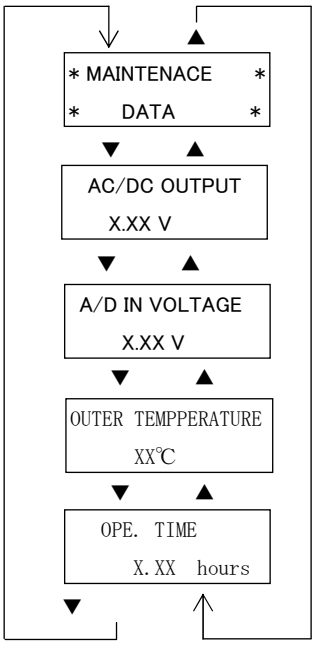
1) Procedure for opening of maintenance screen

[Note] Do not access to the "SERIAL No. INPUT" screen and "TYPE NAME" screen without Measure board replacement(paragraph 9-4).



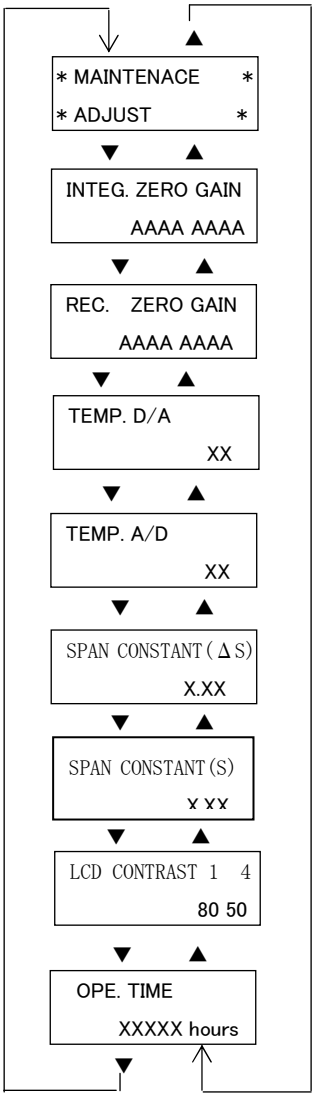
【MAINTENANCE DATA screen】【MAINTENANCE ADJUST screen】【SPAN ADJUSTMENT screen】【SERIAL INPUT/TYPE NAME screen】

2) Instruction for "MAINTENANCE DATA" screen



1) Press "ESC" key to monitor screen.
2) "AC/DC" value is a voltage at synchronous rectifier output.
3) "A/D IN" value is a voltage at A/D input.
4) "OUTER TEMPERATURE" value is a temperature of the external heater plate.
5) "OPE.TIME" value is a operating time.

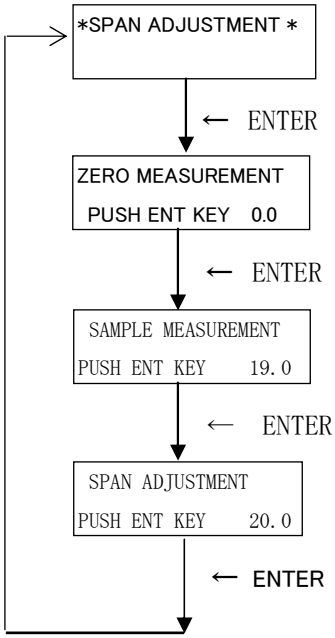
3) Instruction for “MAINTENANCE ADJUST” screen



1) Press the “ESC” key to return monitor screen.
2) On confirming of parameter change, press the “▼”、”▲” key to change a parameter.
3) Press the “ENTER” key confirm a parameter change or to save changes in set values.
4) “INTEG. ZERO and GAIN” and “REC. ZERO and GAIN” should change each column.
5) On “TEMP D/A” screen, you can perform a fine tuning of temperature set.
6) On ”TEMP. A/D” screen, you can perform a fine tuning of actual temperature display.
7) Do not change the ”SPAN CONSTANT(S/ΔS)”, because a change of “SPAN ONSTANT” bring forced span change without “SPAN ADJUSTMENT”.
8) Do not change “LCD CONTRAST” parameters.
9) On ” OPE. TIME” screen, you can clear the turn on time..

No.	パラメータ	設定範囲	初期値
1	INTEG. ZERO GAIN	ZERO : 70000h～8FFFFh	7FFFFh
		GAIN : D0000h～FFFFFh	E8DB7h
2	REC. ZERO GAIN	ZERO : 70000h～8FFFFh	7FFFFh
		GAIN : D0000h～FFFFFh	E8DAh
3	TEMP. D/A	−20～20(1 STEP 0.3℃)	0
4	TEMP. A/D	−5.0～5.0	0
5	SPAN CONSTANT(ΔS)	0～9.99	1.50
6	SPAN CONSTANT(S)	0～9.99	1.50
7	LCD CONTRAST	1:60-FF,4:00-FF([1]>[4])	80/50
8	OPE. TIME	(CL)	−

4) Instruction for “SPAN ADJUSTMENT” screen



1) Press “ESC” key to monitor screen.
2) Press “ENTER” key to next screen.
3) Press cancel key to return “SPAN ADJUSTMENT” screen without “SPAN ADJUSTMENT”.

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