



Instruction Manual

PAPERLESS RECORDER

TYPE: PHR



PREFACE

Congratulations on your purchase of Fuji Paperless Recorder (Type: PHR).

- Read this instruction manual carefully to ensure correct installation, operation and preparation.
Incorrect handling may lead to accident or injury.
- Specifications of this unit is subject to change without prior notice for improvement.
- Modification of this unit without permission is strictly prohibited.
Fuji will not be bear any responsibility for a trouble caused by such a modification.
- This instruction manual should be kept by the person who is actually using the unit.
- After reading the manual, be sure to keep it at a place easy to access.
- This instruction manual should be delivered to the end user without fail.

Manufacturer : Fuji Electric Co., Ltd.
Type : Shown on nameplate of Paperless Recorder
Date of manufacture : Shown on nameplate of Paperless Recorder
Product nationality : Japan

(Note) Windows 2000/XP/7, Excel, WORD PAD are registered trademarks of Microsoft Corporation.

(Note) Compact Flash is a trademark of Sandisk Corporation.

Request

- It is prohibited to transfer part or all of the manual without Fuji's permission.
- Description in this manual will be changed without prior notice.

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CAUTION ON SAFETY

Read this “Caution on Safety” carefully before using the instrument.

- Be sure to observe the instructions shown below, because they describe important information on safety. The degree of danger is classified into the following two levels: “DANGER” and “CAUTION.”

The signs and their meanings are as follows:

 DANGER	Improper handling may cause dangerous situations that may result in death or severe injury.
 CAUTION	Improper handling may cause dangerous situations that may result in moderate or light injuries or property damage.

 **DANGER**

- When there is a possibility that the abnormality of this instrument may cause a major accident or damage to other instruments, externally install an adequate emergency stop circuit or a protection circuit to prevent accidents.
- This product is provided with a built-in fuse that cannot be replaced by the customer. Therefore, we recommend you to separately provide adequate fuses externally. (Rating: 250V, 1A)
The details of the built-in fuse are as follows.
Type: TR-5 19372, 3.15A (Manufactured by Wickmann-Werke GmbH)
Rating: 250V, 3.25A, Type: T (Slow-blow type)
- Feed the power-supply voltage to specifications to prevent damages to and breakdown of the instrument.
- Never turn on the power before all the mounting and wiring work are finished to prevent electric shock, malfunction or failure of the instrument.
- Never use this instrument in an environment where flammable or explosive gases exist, since this is not of intrinsically safe construction.
- Never disassemble, remodel, modify, or repair this instrument. Otherwise malfunction, electric shock, or failure may result.
- Never touch the terminal while the instrument is being energized. Otherwise electric shock or malfunction may result.
- Turn off the power before attaching/detaching the module/unit. Otherwise electric shock, malfunction or failure may result.
- We recommend you to perform periodic maintenance for the safe and continuous use of this instrument, because consumable parts or those which deteriorate with time are mounted in this instrument.
- Do not block the ventilation holes at the top and the bottom of this instrument. Otherwise a failure, malfunction, shortened service life, or fire may result.

CAUTION

- Never use the instrument if it is found damaged or deformed when unpacked. Otherwise a fire, malfunction, or failure may result.
- Check that the instrument is to the proper specifications. Otherwise damage or failure may result.
- Do not give a shock to the instrument by falling or toppling it. Otherwise damage or failure may result.
- Operate the instrument paying attention to prevent foreign matters such as scraps, electric wire chips, and iron powder from entering in the instrument.
- Check every six months that the terminal screws and mounting screws are securely fastened. Loose screws may cause fire or malfunction.
- When changing the setting during the operation or forcibly outputting, starting or stopping the instrument, be sure to check that safety is ensured. Improper operation may result in damage or failure of the instrument.
- Be sure to keep the attached terminal cover mounted on the terminal block during the operation. Otherwise electric shock or fire may result.
- Never install this instrument in the following environments.

A place where the ambient temperature goes beyond the range from 0 to 50°C (0 to 40°C when the instrument is mounted with its side face closely contacted, or in the case of portable type, or provided with Ethernet function)

A place where the ambient humidity goes beyond the range from 20 to 80% RH

A place where condensation occurs

A place where corrosive gases (sulfuric gases or ammonia, etc., in particular) or flammable gases exist

A place where vibration or impact may be applied to the instrument (permissible continuous vibration condition: 2.45 m/s² or lower)

A place subjected to water, oil, chemicals, vapor, or steam

A place subjected to dust and high in salt or iron content

A place where inductive interference may have a great effect, thus causing static electricity, magnetism, or noises

A place subjected to heat accumulation by radiant heat or the like

If the instrument is installed near other electronics instruments, such as TV in particular, noises may be caused. Take the following measures in these cases.

- Place the instrument as far from the TV or the radio as possible (1m or more)
 - Change the orientation of the antenna of the TV or the radio.
 - Use separate receptacles.
- When mounting this instrument against the panel, pay attention not to apply stress to the case. Otherwise the case may be damaged.
 - Stop using the instrument if it is immersed in water. Otherwise electric leak, electric shock, or fire may result.
 - Do not use the wires other than the specified compensation conducting wires for the thermocouple input connection. Otherwise improper indication or malfunction may result.



CAUTION

- Use a wire material with low wire resistance and with small resistance difference among the three wires for the resistance bulb input connection. Otherwise improper indication or malfunction may result.
- If a large noise is generated from the power supply, provide an isolating transformer and use a noise filter.
- Never use organic solvents such as alcohol or benzene when cleaning this instrument. Do not directly water the main unit. Otherwise deterioration, failure, electric leak, electric shock, or fire may result. When cleaning the main unit, wipe with a dry cloth.
- Dispose the instrument as an industrial waste.
- Be sure to ground the instrument. Otherwise electric shock or malfunction may result.
- Only authorized workers should perform wiring. Improper wiring may cause fire, failure, or electric shock.
- At this equipment, the electrostatic discharge is evaluated as performance criteria B in EN61326.

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CAUTION

Refer to chapters 3 and 4 only when installing this instrument. Only qualified workers should carry out mounting and wiring of this instrument.

1. INTRODUCTION

We thank you for purchasing Fuji Paperless Recorder PHR.

The instruction manual describes installation, operation, and maintenance of Paperless Recorder. Read this manual carefully before use.

1.1 Paperless recorder

- (1) This recorder displays measured data in real time on the liquid crystal display. It is a paperless type that is also capable of saving the measured data to a compact flash card.
- (2) It can set up to 18 channels for the input types such as thermocouple, resistance bulb, and DC voltage (or current).
- (3) It allows the measured data saved to the compact flash card to be displayed on the display unit. Use of the support software attached to the recorder allows the saved data to be displayed on a personal computer.

1.2 Product check

Upon receiving the recorder unit, check the appearance for damage, and if the correct quantity of the accessories are supplied.

Check on accessories

This recorder comes with the accessories shown in Fig. 1-1. Check that they are all present.

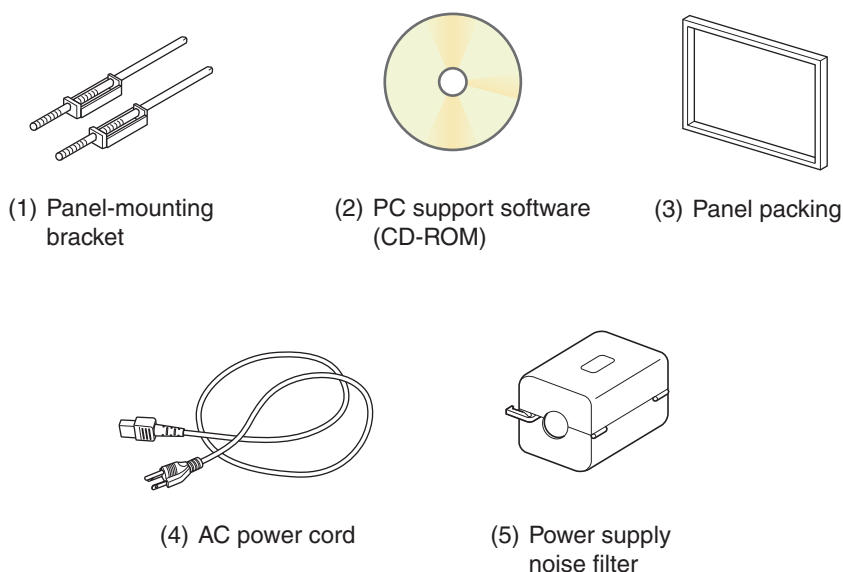


Fig. 1-1 Accessories

Product name			Quantity	
			Panel-mounted	Portable
(1)	Panel-mounting bracket		2	—
(2)	CD-ROM	PC support software instruction manual (both in Japanese and English)	1	1
(3)	Panel packing for front face		1	—
(4)	AC power cord (2m)		1	1
(5)	Power supply noise filter		1	1

1.3 Check on type and specification

Code symbols are marked on specification nameplates. Check the type as ordered. (The specification nameplates are attached to the right of the case and at the rear of the display unit).

PHR			4	5	6	7	8	9	10	11	12	13
					B	1	4	-		1		Y
Digit	Specifications	Note										
4	<Number of input points> 9 18		↓ 1 2									
5	<Mounting> Panel mounted Portable (desktop)	(Note 3)	↓ 1 2									
7	<Compact flash> Without				↓ 1							
8	<Improvement No. (Fixed)>					↓ 4						
9	<Display (instruction manual)> Japanese English						↓ N E					
11	<Alarm relay output/DI input> Without With	(Note 1)							↓ 0 1			
12	Communication/alarm (open collector) output/ DI input/Ethernet	Without RS485+DI+DO (Note 2) Ethernet (Note 3) Ethernet+RS485 +DI+DO (Note 2, 3)								↓ Y R E W		

Note 1: If you select 2 (18-point input) for the 4th digit of the code symbol, you cannot select 1 for the 11th digit (alarm output/DI input board).

Note 2: If alarm output/DI input for 18-point input is required, select R or W for the 12th digit (communication/alarm output/DI input/Ethernet).

Note 3: Portable type is not approved by UL and CE marking.
Portable type cannot be selected with Ethernet.

1.4 Handling memory card (Compact Flash) – Cautions on handling

- (1) Use a Compact Flash (sold separately) that we warrant its performance.

Use of a commercially available Compact Flash may cause failure.

CAUTION

- 1) Be sure to format the memory card with the PC you use.
Format it as FAT32, FAT16 or FAT. If it is formatted as NTFS, for example, it cannot be used because the PHR does not recognize it.
- 2) The memory card should be inserted in the proper direction and fixed securely to the slot.
- 3) Don't turn OFF the power or remove the card from the slot while data is being written in or read from the card, or recorded data may be damaged or lost.
- 4) Measured data saved to the memory card should be backed up, if necessary.
If the CF card should be broken, important record data will be lost. Be sure to backup the data.
Before using a CF card adaptor, check the capacity of the adaptor. If the capacity of the memory card to be formatted is larger than that of the adaptor, do no format the card. Otherwise the PHR does not recognize it even if it could be formatted on Windows.
- 5) If you insert a large-capacity Compact Flash, the recorder's screen may stop about 3 seconds. Recording is still performed normally during this period.

- (2) Compact flash in the capacity range from 8MB to 2GB can be used.

Refer to the following tables for the storage capacity in the case of 9-channel recording (on condition that no events such as alarms or messages are occurring, and that integration is stopped).

(The number of days required for 18-channel recording is approximately one half of those shown in the table.)

(The number of days required for average value recording and instantaneous value recording is approximately twice of those shown in the table.)

Compact flash size		64MB				
Display refresh cycle		1 sec	10 sec	30 sec	1 min	10 min
Recordable capacity (about)	ASCII format	112 hours	46 days	140 days	280 days	7.7 years
	Binary format	448 hours	184 days	560 days	1,120 days	30.8 years

Compact flash size		128MB			
Display refresh cycle		1 sec	10 sec	30 sec	1 min
Recordable capacity (about)	ASCII format	226 hours	94 days	282 days	565 days
	Binary format	932 hours	388 days	3.2 years	6.4 years

Compact flash size		256MB			
Display refresh cycle		1 sec	10 sec	30 sec	1 min
Recordable capacity (about)	ASCII format	18 days	187 days	1.5 years	3 years
	Binary format	72 days	748 days	6 years	12 years

Note: Refer to Item 8.19 "Setting method of record data format" for the selection of ASCII or binary format for data recording.

- (3) Data write to the memory card is performed according to the following timing. If the power is OFF in the writing cycle, note that the data will not be recorded.

Display refresh cycle	1 sec to 1min	2 min	3 min	5 min	10 min	20 min	30 min
Write cycle	1 min	2 min	3 min	5 min	10 min	20 min	30 min

Display refresh cycle	1 hour	2 hours	3 hours	4 hours	6 hours	12 hours
Write cycle	1 hour	2 hours	3 hours	4 hours	6 hours	12 hours

- (4) The data recorded in the compact flash can be regenerated on the PC by using the data viewer (contained in the attached CD-ROM).

If the data is recorded in ASCII format, it can be directly opened in a spreadsheet such as EXCEL. However, large-amount data cannot be opened (about 10MB or larger in the case of 9-point input, and about 5MB or larger in the case of 18-point input).

In those cases, read in data with the data viewer (contained in the attached CD-ROM), and perform CSV conversion to divide the file, which allows the data to be read in.

The data recorded in binary format cannot be directly opened in a spreadsheet such as EXCEL. See "8.20 Setting for record data format" for details.

Note: 1) Be careful not to make the size of a file too large even if a large-capacity CF card is used. (Keep it to less than 10MB if possible.)

2) If the size of recording file becomes 256MB or more, a new file is created automatically to continue recording.

(5) Removing memory card

By prohibiting the writing on the memory card, the card can be taken out even if the recording or integration is not stopped. Refer to Item 8.28 “Removing memory card (compact flash)” for the procedure.

CAUTION

Make sure to prohibit writing before removing the memory card, when using FTP server function.

1.5 Ethernet communication function

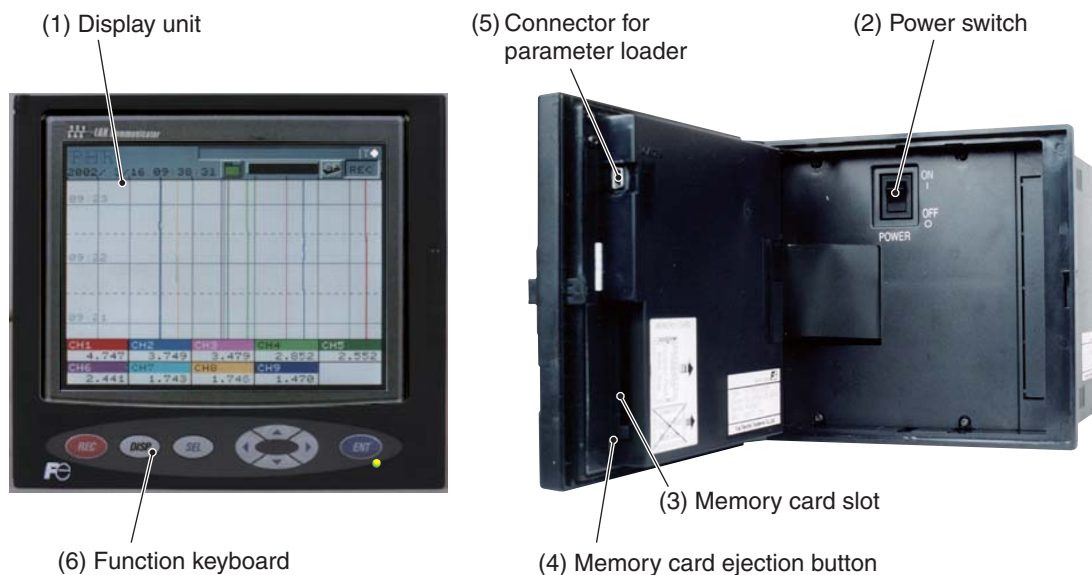
By connecting the paperless recorder to Ethernet, the following function can be used (when E or W is selected for the 12th digit of the code symbols).

- FTP server function: Record files stored in the compact flash of the recorder can be downloaded from the PC on the network using Web browser (Microsoft Internet Explorer) or DOS prompt.
- Web server function: Measurements of the recorder or event log on the network can be displayed using Web browser (Microsoft Internet Explorer).
- E-mail function: E-mails can be sent to specified addresses with the measurement of the recorder attached.
- MODBUS TCP/IP function: Settings of the recorder can be read or written from the PC on the network using MODBUS TCP/IP function.



2. NAMES AND FUNCTIONS OF PARTS

2.1 Names and functions of parts



(1) Display unit

Allows the Real time trend screen, Bar Graph Display screen, Analog Meter Display screen, Digital Display screen, Totalized Value Display screen, Historical trend screen and other various Parameter Set screens to be displayed.

(2) Power switch

Used to turn the power ON or OFF.

(3) Memory card slot

Used for inserting the memory card

(4) Memory card ejection button

To remove the memory card from the slot, press this button.

CAUTION

- 1) Do not remove the memory card while recording is in progress (while **REC** in the display unit is highlighted) or during totalizing. Otherwise, the data cannot be recorded correctly, or the past data may be damaged. Be sure to stop recording and totalizing before removing the memory card. (If the memory card is removed and inserted again while recording or totalizing is in progress, it is recorded as a new file.)
- 2) While the compact flash of the paperless recorder is accessed by FTP communication, do not take out the compact flash.
Furthermore, when the FTP server function is used, inhibit access to the compact flash in the "Memory card abstract" screen, before taking out the compact flash.






(5) Connector to parameter loader

When changing parameters by using a loader, connect the exclusive cable (optional cable: PHZP1801) to the connector.

(6) Function keyboard

Used for operation, or setting and verifying each parameter.



Key name	Function
 (Record)	<p>Used to start or stop recording.</p> <p>Pressing once starts recording, and pressing once again stops recording.</p>
 (Display)	<p>Used to switch displayed contents. Every time it is pressed, the display is switched in the following order: (1) → (2) → (3) → (4) → (5) → (6) → (7) and back to (1).</p> <p>(1) Real time trend display Displays the measurement data of an arbitrary channel</p> <p>(2) Key guidance display Displays the guide for key operation.</p> <p>(3) Bar graph/analog meter display Displays the measured data of the channel in a bar graph (or analog meter)</p> <p>(4) Digital display. Displays the measured data of the channel in numerical values.</p> <p>(5) Totalizing data display Displays the totalizing data of an arbitrary channel in numerical values.</p> <p>(6) Event summary display Displays the alarm summary or message summary.</p> <p>(7) Ethernet log display Displays the FTP communication and E-mail sending log.</p> <p>Used to switch the parameter setting screen to the data display screen.</p> <p>Pressing the key on the historical trend screen, historical jump window appears.</p>
 (Select)	<p>Used to switch from the data display screen to the parameter setting screen.</p> <p>Pressing the key on the parameter setting screen switches to the screen one step up.</p> <p>Pressing the key on the historical trend screen switches to the real time trend screen.</p> <p>Note, however, that pressing the key on the menu screen does not change screens.</p>
 (Entry)	<p>(1) Used for selection on the setting screen or registration of the set data.</p> <p>(2) If the key is pressed while the scales are displayed on the real time trend display screen, historical trend display screen (*1), or recorded data display screen, the channels for which scales are to be displayed can be switched. (Scale of ch1 → scale of ch2 → → scale of ch9 → scale of ch1 → scale of ch2.....)</p> <p style="text-align: right;">*1: The screen in the past of the data currently recorded</p>
 (Cursor)	<p>(1) Used to select setting items.</p> <p>(2) Used to increase or decrease numerical values.</p> <p>(3) Pressing the ▼ key on the real time trend displays the historical trend screen (*1). At this time, the window can be scrolled using the cursor key.</p> <p>(4) Pressing the ◀ or the ▶ key on the real time trend display, bar graph/analog meter display, digital display, or totalized value display screen switches group screens as follows.</p> <p>▶ key: Group 1 → 2 → 3 → 4 → 1 → ...</p> <p>◀ key: Group ... ← 1 ← 4 ← 3 ← 2 ← 1</p> <p style="text-align: right;">*1: The screen in the past of the data currently recorded</p>

2.2 Inserting and removing the memory card

The memory card is used for saving measured data. Before attempting to use the recorder, set it in the recorder slot securely.

This section explains how to insert the memory card into or remove it from the slot.

(1) To insert memory card

Step 1) Open the panel unit.

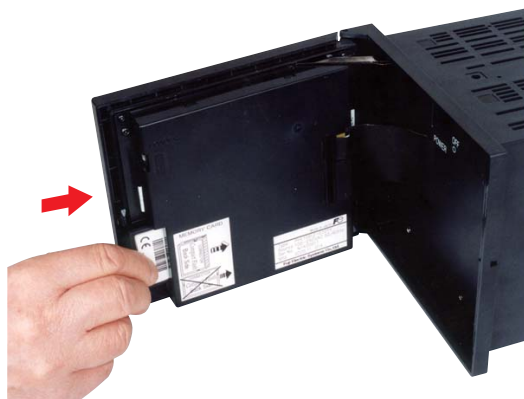


Step 2) Insert the memory card into the slot at the right side of the panel unit as shown in Photo.

CAUTION

Insert the card straight into the slot as shown by the photo at right.

Be careful not to forcibly press the card if it is inserted obliquely. Otherwise the pin on the PHR may be damaged.

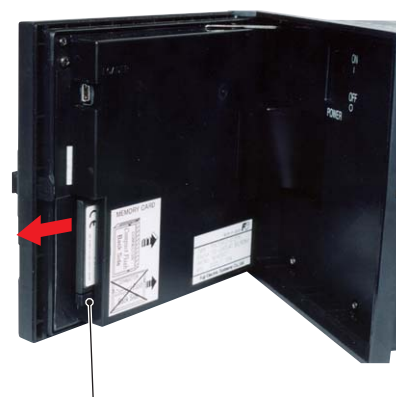


(2) To remove memory card

Step 1) Press the memory card ejection button to remove the memory card from the slot.

CAUTION

- (1) Do not remove the memory card while data is written in it (while the lamp indicating writing status is kept on). Refer to Item 8.28 “Removing memory card (compact flash)” for the removal of the memory card while recording is in progress.
- (2) After inserting the memory card into the slot, don't remove the card until the recorder can acknowledge it.
- (3) Be careful with static electricity when removing the memory card.

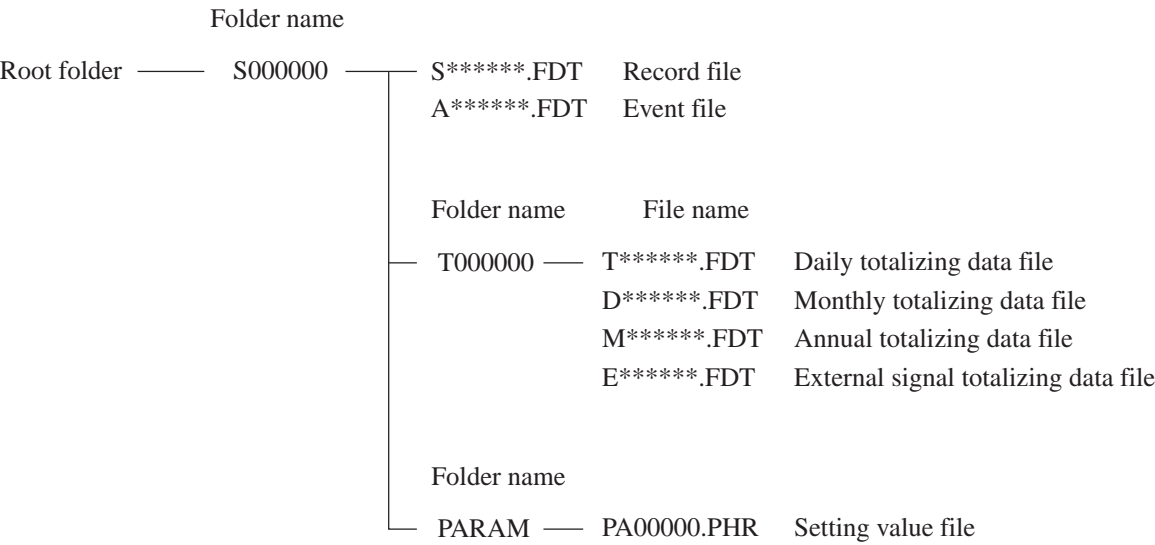


Memory card ejection button

2.3 Recording data to memory card

(1) Folder configuration of the memory card:

The following folders are created in the memory card.



(2) Recorded data:

Data can be recorded in the following four formats. Either ASCII or binary format can be selected for recording. Refer to Item 8.20 “Setting for record data format.”

- Trend data : Records the maximum and the minimum values of the measured value sampled at display update cycles.
- Trend data file name to be created: S00****.FDT (**** is substituted by four-digit numerical value.)
- Refer to “Appendix 1 (1) Trend data file” for recording format.
- Event data : Records the information on occurrence or release of alarms and message issuing information.
- Event data file name to be created: A00****.FDT (**** is substituted by four-digit numerical value.)
- Refer to “Appendix 1 (2) Event data file” for recording format.
- Totalizing data : Records the totalizing data every totalize recording cycle.
- The name of the totalizing data file created is as follows.
- Daily report: T000000.FDT
 - Monthly report: D000000.FDT
 - Annual report: M000000.FDT
 - External input: E000000.FDT
- Setting value file : The setting value of the recorder can be stored in a memory card.
- Name of the configuration file to be created: *****.PHR (Substitute arbitrary capital letters or numerical value for *****.)

(3) Recording capacity:

It depends on the capacity of the memory card.

Refer to the following tables for the storage capacity in the case of 9-channel recording (on condition that no events such as alarms or messages are occurring, and that integration is stopped).

(The number of days required for 18-channel recording is approximately one half of those shown in the table.)

(The number of days required for average value recording and instantaneous value recording is approximately twice of those shown in the table.)

Compact flash size		64MB				
Display refresh cycle		1 sec	10 sec	30 sec	1 min	10 min
Recordable capacity (about)	ASCII format	112 hours	46 days	140 days	280 days	7.7 years
	Binary format	448 hours	184 days	560 days	1,120 days	30.8 years

Compact flash size		128MB			
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Recordable capacity (about)	ASCII format	226 hours	94 days	282 days	565 days
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Compact flash size		256MB			
Display refresh cycle		1 sec	10 sec	30 sec	1 min
Recordable capacity (about)	ASCII format	18 days	187 days	1.5 years	3 years
	Binary format	72 days	748 days	6 years	12 years

Note: Refer to Item 8.20 "Setting for record data format" for the selection of ASCII or binary format for data recording.

(4) Recording cycle:

The following tables show the timing of writing the trend data to the compact flash.

The event data is written in the compact flash by the minute.

Display refresh cycle	1 sec to 1min	2 min	3 min	5 min	10 min	20 min	30 min
Writing cycle	1 min	2 min	3 min	5 min	10 min	20 min	30 min

Display refresh cycle	1 hour	2 hours	3 hours	4 hours	6 hours	12 hours
Writing cycle	1 hour	2 hours	3 hours	4 hours	6 hours	12 hours

(5) Timing to start recording:

The event data cannot be written in the compact flash before the initial display update cycle.

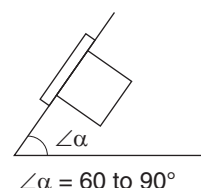
3. MOUNTING METHOD

This unit is designed to be panel mounted.

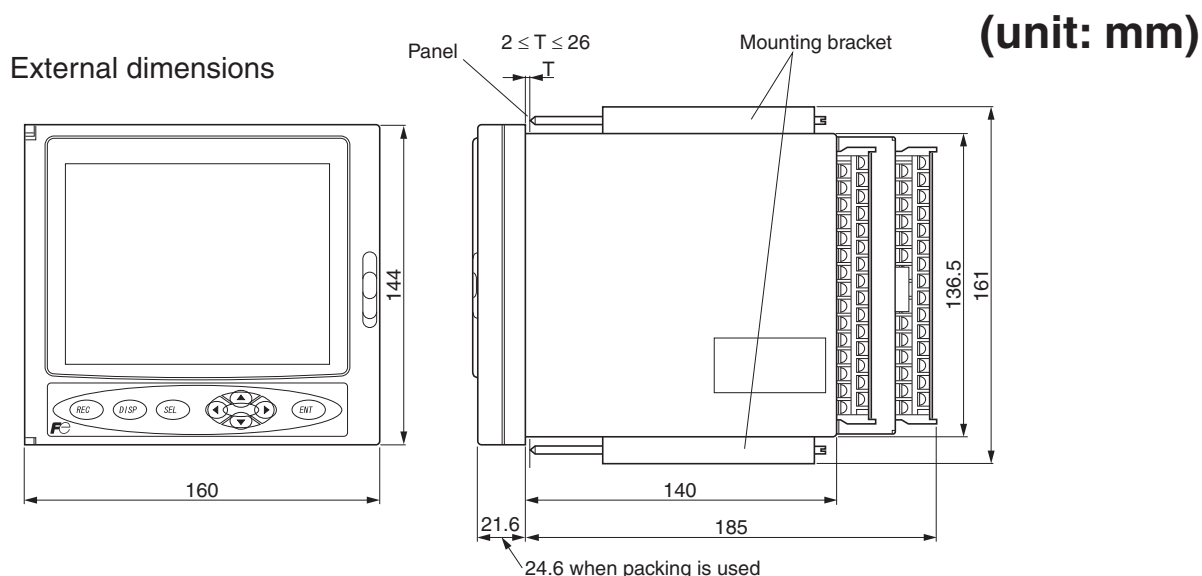
3.1 Mounting location

Select the following location for mounting the unit.

- (1) A place that is not subject to vibration or shock.
- (2) A place where there is no dust, dirt or corrosive gas.
- (3) A place where ambient temperature falls within 0 to 50°C range with minimum temperature fluctuation (Recorder provided with Ethernet function: 0 to 40°C).
- (4) A place that is not struck directly by strong radiant heat.
- (5) A place that is free from water drip or dew condensation in the range of 20 to 80%RH.
- (6) A place that is well ventilated for the dispersion of heat generated from other devices.
- (7) A space that is accessible for wiring, and maintenance and check.
- (8) A place that is not affected by electromagnetic wave from wireless machine or portable telephones.
- (9) Mount the unit horizontally, with no tilt to the left or right (The forward tilt should be 0° but the unit may be inclined 0 to 30° rearwards.

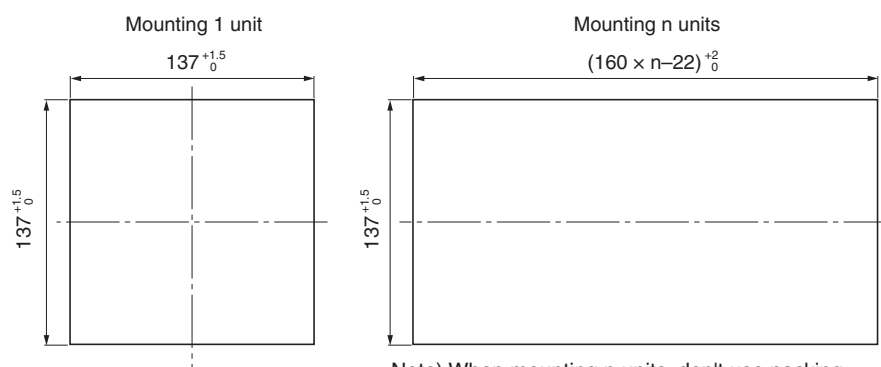


3.2 External dimensions and panel cutout dimensions



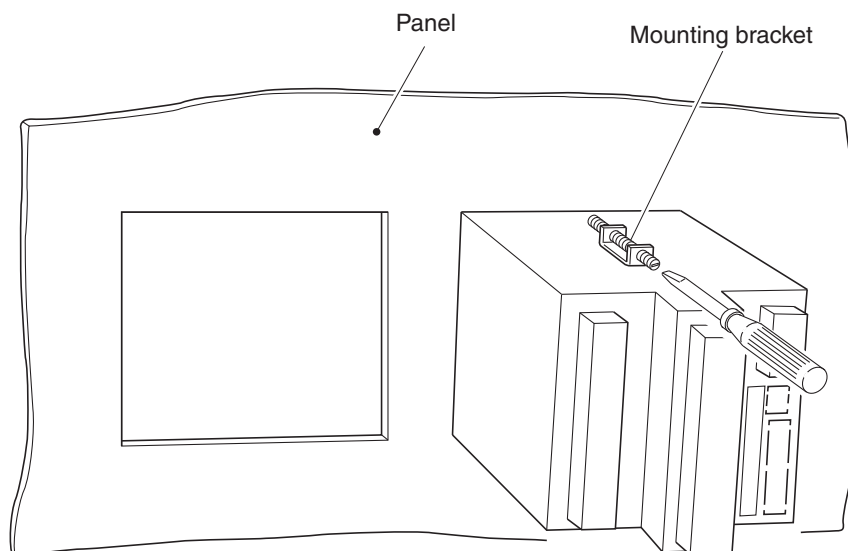
Note) If other instruments are placed under the recorder unit, provide a space of 100 mm or more from the instrument or floor.

Panel cutout dimensions



Note) When mounting n units, don't use packing.

3.3 Method of mounting onto panel



- Using the supplied mounting bracket, tighten the upper and lower screws until the panel is fixed.
- The panel to be used should be more than 2 mm thick.

CAUTION

Excessive torque will cause damage to front panel frame or result in case deformation.

Torque: 0.2 N·m

- If the panel front is subject to water splashes, use panel packing between the unit and panel.

4. WIRING

4.1 Before wiring

(Note) When cables are connected to terminals of the recorder unit, don't apply pulling force to them excessively. Excessive force to the terminal may result in damage to the terminal or cable.

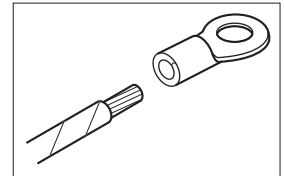
- (1) Use the power cable that has the performance equivalent to or higher than 600-V vinyl insulated power cable (IEC227-3). Install the attached noise filter within approximately 20cm from the power terminal of this instrument. (Wind the power cable 1 to 2 turns.)
- (2) For the thermocouple input, be sure to use a compensated lead wire.
- (3) Input signal cables should be wired separately as far as possible (30 cm or more) from power lines and high-voltage lines to minimize the effect of inductive noise. Shielded cables should preferably be used. In this case, the shield braids should be earthed at one point.
- (4) Up to 2 solderless terminals should be used when connecting cables to terminals. Be sure to use an insulation cap.

(Note)

- 1) At the completion of wiring of the input terminals, be sure to close the rear cover to ensure the compensation of reference contact when thermocouple input is used.
In case of thermocouple input, follow the steps to stabilize temperature at the terminal.
 - Be sure to attach input terminal cover.
 - Don't use a thick cable to prevent the effect of radiation. It is recommended that the cable with a diameter of 0.5 mm or less should be used.
 - Don't mount other instruments near a fan to keep temperature stable.
- 2) For connection of lead wires to terminals, use of sleeve-insulated clamping terminals is recommended.
- 3) This unit has no power fuse. Mount a power fuse outside the unit as needed.

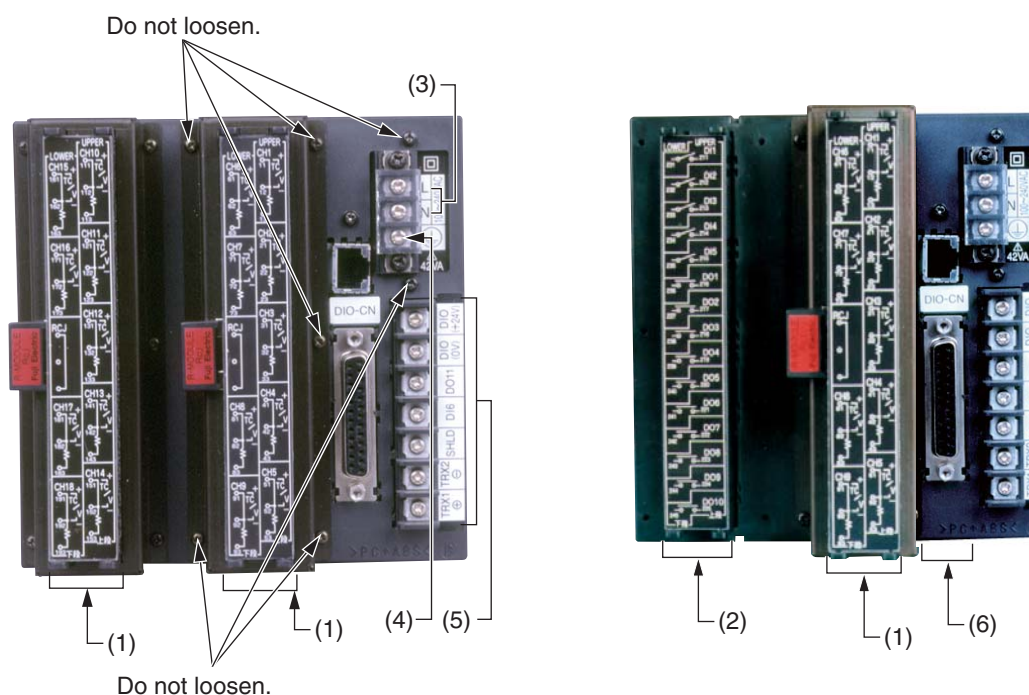
Recommended fuse rating: 250V AC, 1A

- 4) Don't loosen screws that are secured to the terminal case and power terminal.



4.2 Connection to terminals

- (1) Input terminal:
Connect signal cable for each channel.
- (2) Alarm (DO)/DI (External control unit):
Connect the output of alarm signals and the input of DI (external control) signals (for alarm [DO] 1 to 10 and DI [external control] 1 to 5)
- (3) Power terminal:
Connect power cable to L/N terminals. Power source to be connected should be free from noise.
- (4) Earth terminal:
Connect to “G” terminal (Class-D, 100Ω or less).
- (5) Communication, alarm (open collector) output and DI terminal:
Connect the input of alarm output (DO11) and DI (external control: D16) signals.
Connect communication signal cable to TRX (+) and TRX (-).
- (6) Alarm (open collector) output and DI input:
Connect the input of alarm output (DO12 to 28) and DI (external control: DI7 to 10) signals.



Note: Do not loosen the screws. Otherwise accurate measurement may not be carried out with thermo-couple input.

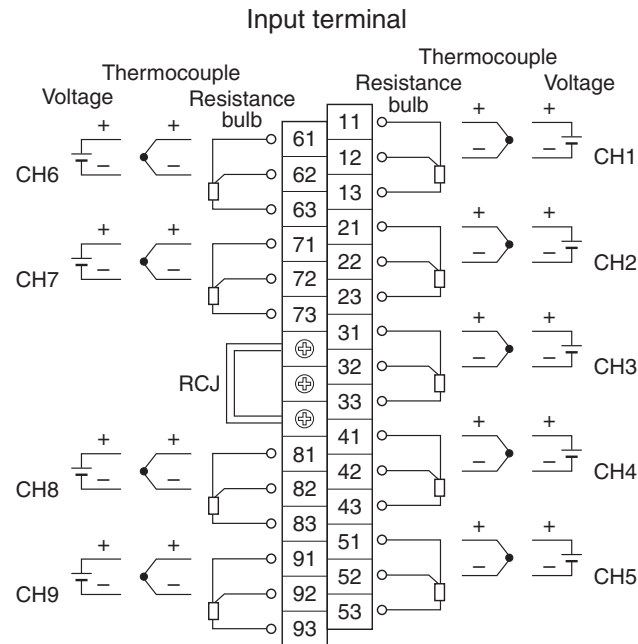
(1) Wiring of input terminal

- 1) Input terminal No. is determined for each channel.
- 2) When changing the type of input signal (see Item 8.4) after purchasing the unit, connect input terminals according to the relation between terminal No. and channel No.

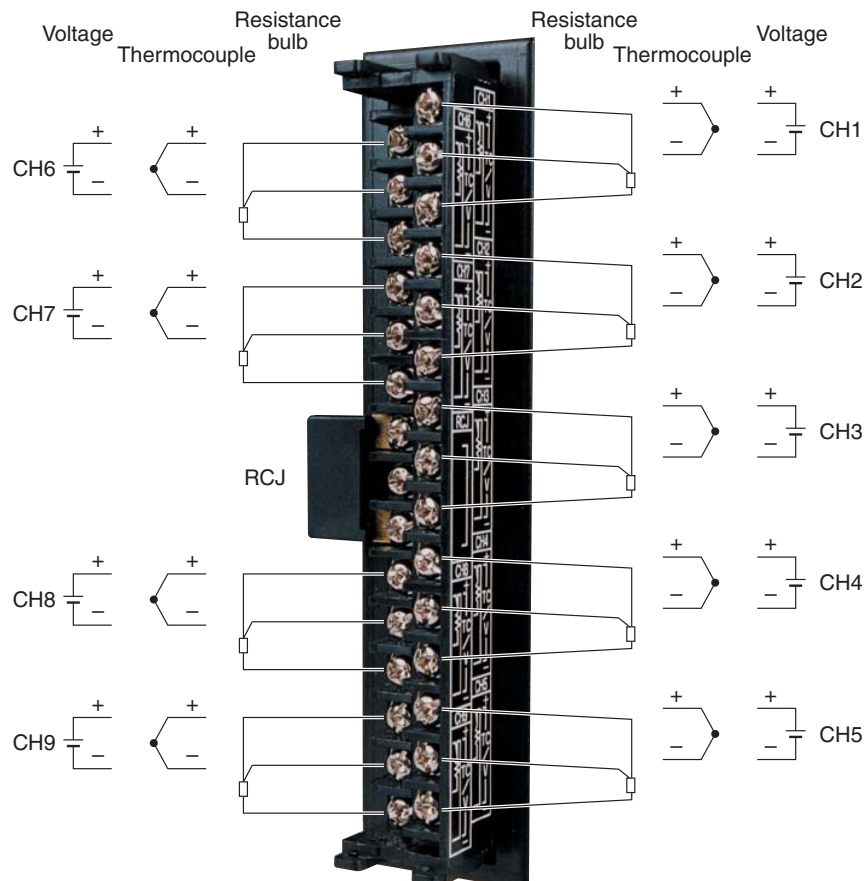
CAUTION

Do not apply excessive voltage. Otherwise the PHR circuit may be damaged, and proper operation may not be performed.

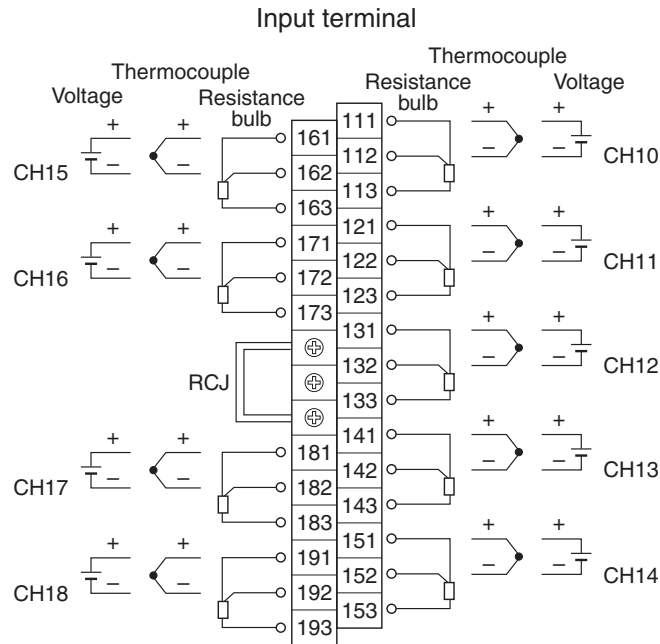
Channel 1 to 9



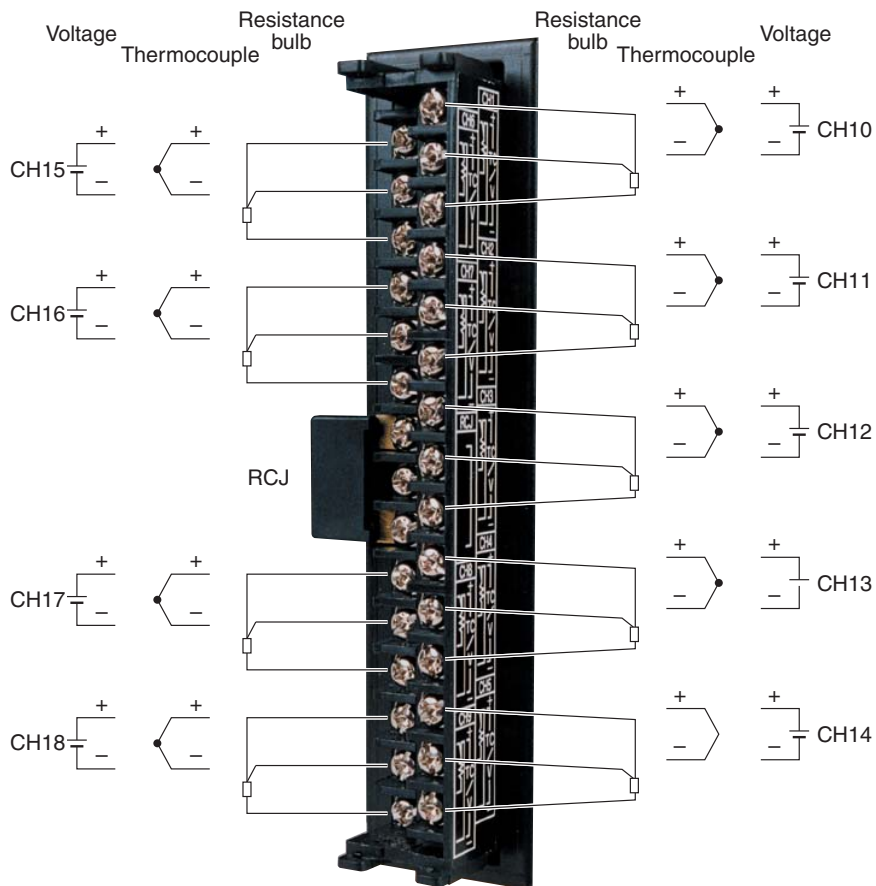
Note) For current input, connect optional shunt resistors to the voltage input terminals.



Channel 10 to 18

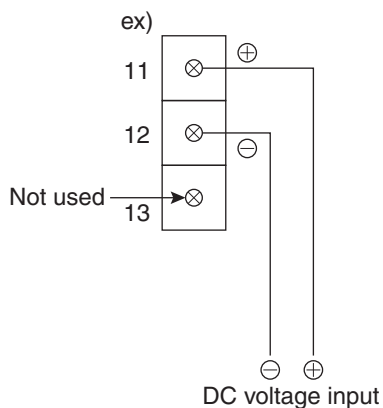


Note) For current input, connect optional shunt resistors to the voltage input terminals.

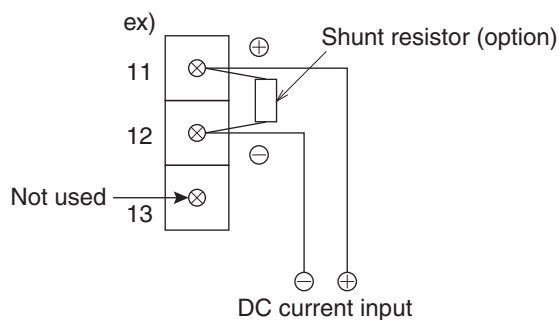


Wiring of input terminals

(1) DC voltage input



(2) DC current input

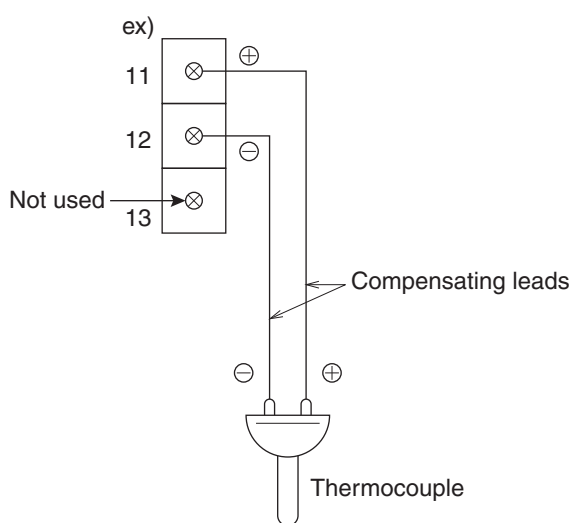


Example 1) For 4 to 20mA and 10 to 50mA input, $10\Omega \pm 0.1\%$ shunt resistance is used.

[In this case, set the input range to $\pm 500\text{mV}$ (see Item 8.4).]

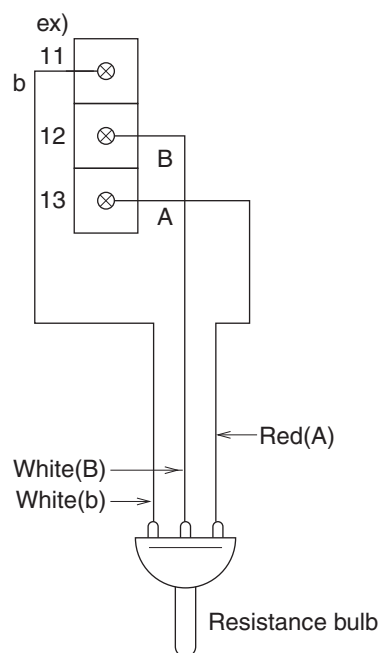
Voltage conversion by shunt resistance of 10Ω
 4 to 20mA DC : 40 to 200mV DC
 10 to 50mA DC : 100 to 500mV DC

(3) Thermocouple input



Note) Avoid using thermocouple input with wiring parallel to other instruments.

(4) Resistance input



Note)

- 1) Input signals should be the same for every 2 channels.

Example) ch1: thermocouple
 ch2: thermocouple } Any type of thermocouple can be set.
 ch3: 5V
 ch4: 5V } 1 to 5V or 0 to 5V can be set.

For the setting method, see Item 8.4.

- 2) Don't remove RCJ module.

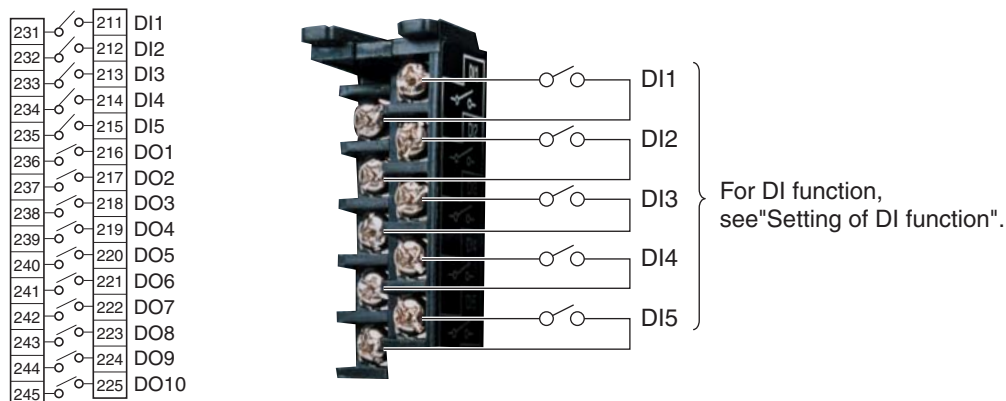
(2) Wiring of alarm output (DO)/DI (external control unit) (Option)

Note: This option cannot be mounted if the number of input points is 18.

About external control unit (DI)

- 1) This instrument is provided with the function of performing “start/stop of recording operation,” “F-value computation resetting,” “Start/stop of totalizing,” and “Message display” in response to the contact signals (DI) received from outside the instrument.

Alarm output/DI input terminal




Note 1) DI (external control) unit is not insulated and should be used with a relay connected to the outside.

External contact capacity: 20V/0.05A DC, 1a contact

Note 2) DI (external control) unit is operated as follows when the front switch is pressed.

(1) Recording start/stop

	External control		Front key
	Recording start/stop by DI		
	ON	OFF	
Recording suspended	Starts recording	——	Starts recording
Recording in progress	——	Stops recording	Stops recording

(2) F value calculation reset

	External control	
	ON	OFF
F value calculation in progress	Resets F value.	Continues calculation.

(3) Totalizing reset

	External control	
	ON	OFF
Totalizing in progress	Resets totalized value.	Continuous totalizing.

(4) Totalizing start/stop

	External control	
	ON	OFF
Totalizing suspended	Starts totalizing	——
Totalizing in progress	——	Stops totalizing

(5) LCD

	External control	
	ON	OFF
LCD OFF	LCD ON	——

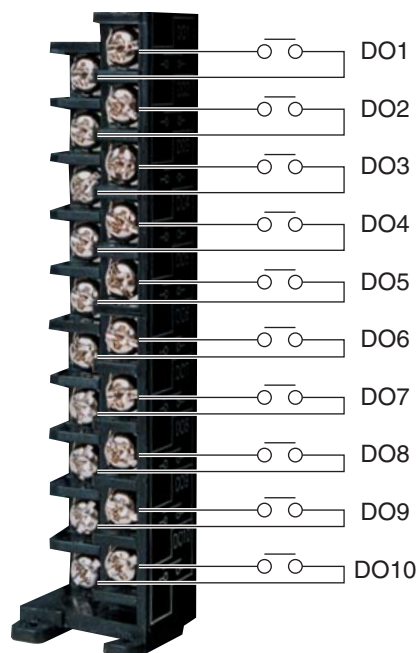
About alarm output (DO)

- 1) Alarm setting is provided at 4 points for each input channel. Up to 10 points for alarm output can be set as an option.
- 2) When an alarm occurs, the relevant terminals are shorted (ON).

1a contact output: Relay contact capacity : 150V AC/3A, 30V DC/3A (resistive load : DO1)
: 240V AC/3A, 30V DC/3A (resistive load : DO2 to DO10)

Alarm output/DI input terminal

231	211	DI1
232	212	DI2
233	213	DI3
234	214	DI4
235	215	DI5
236	216	DO1
237	217	DO2
238	218	DO3
239	219	DO4
240	220	DO5
241	221	DO6
242	222	DO7
243	223	DO8
244	224	DO9
245	225	DO10



Note: If lamps are provided on the outside, set a resistor to prevent rush current. When relays or solenoids are used, set elements for contact protection (diodes or surge killers, etc).

(3) Wiring of communication, alarm output (DO)/DI input

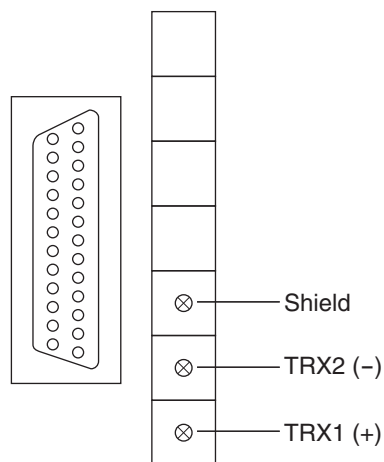
Note: Select R or W for the 12th digit of the code symbols to use this option.

About communication

This is digital communication function with other devices. Specifications are as follows.

Item	Specifications	
Electrical specifications	Conforms to EIA RS-485	
Communication mode	Two-wire half-duplex	
Synchronous system	Start-stop synchronization	
Topology	1 : N	
Number of connected units	Up to 31	
Communication distance	Up to 500m (Total distance)	
Communication speed	9600, 19200 bps	
Data format	Data length	8 bits
	Stop bit	1 bit
	Parity	None, Even, Odd (selectable)
Transmission code	HEX value (MODBUS RTU mode)	
Error detection	CRC-16	
Insulation	The communication section and the ground terminal are functionally separated. (Withstand voltage: 500V AC)	

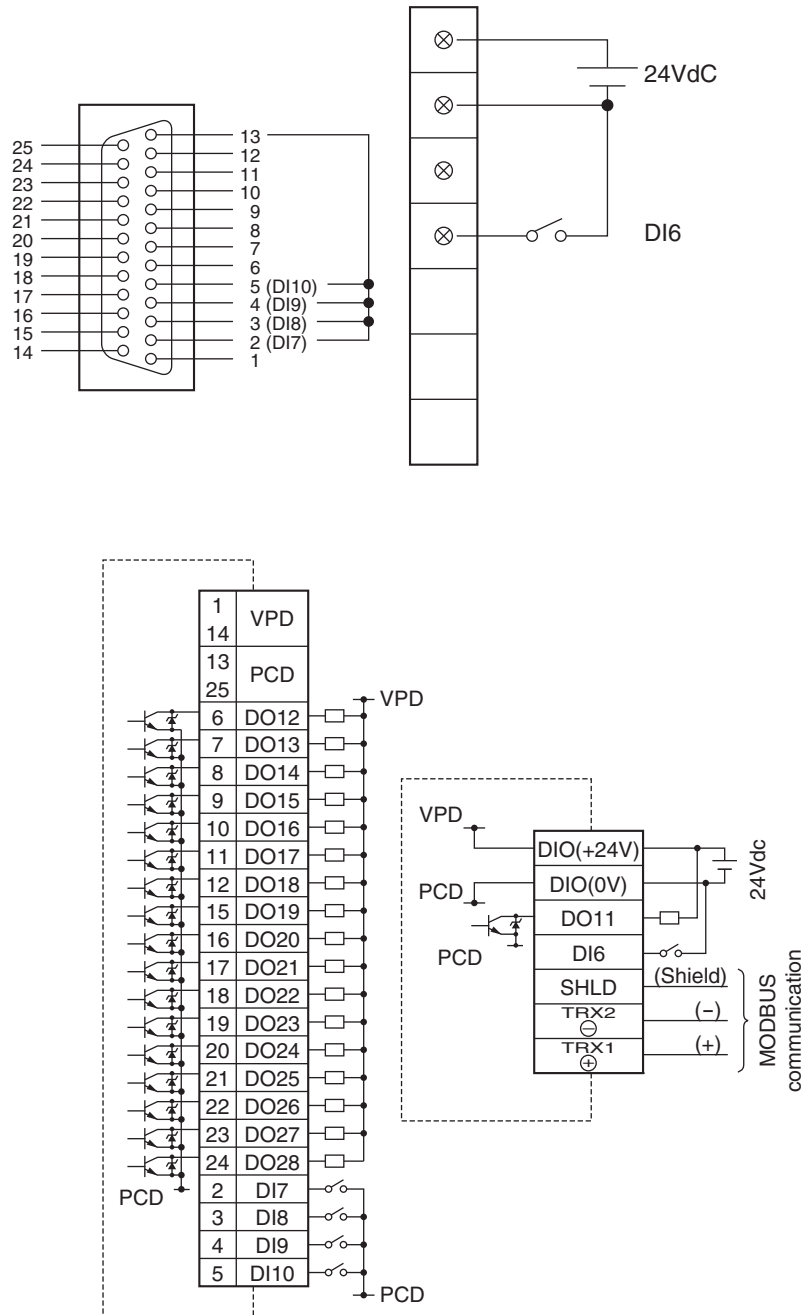
Communication terminal



About external control unit (DI)

This function is the same as that described on page 4-6.

Alarm output/DI input terminal



Note 1: The DI (external control unit) is not insulated. Connect a relay externally to use the unit.

Capacity required for external contact: 20V/0.05A DC, 1a contact, or larger

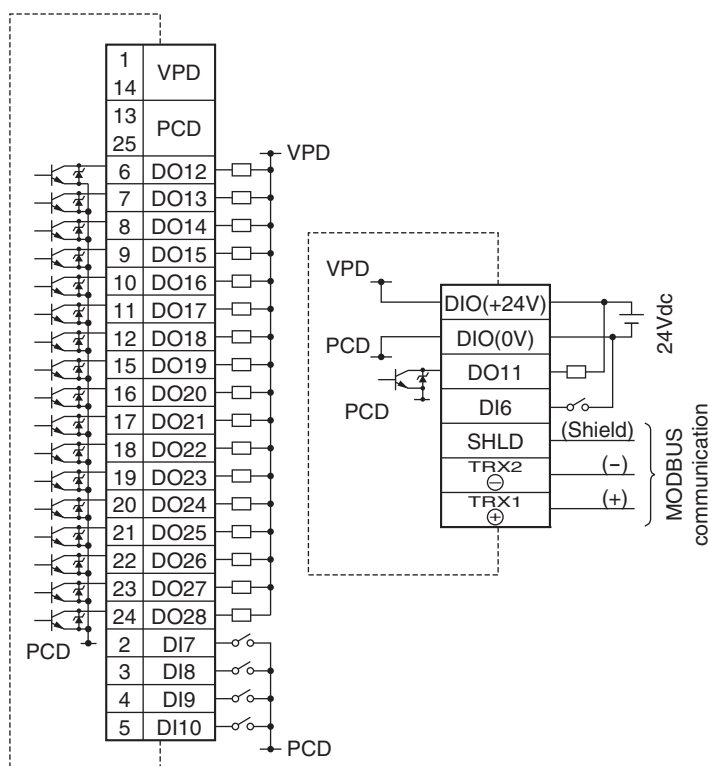
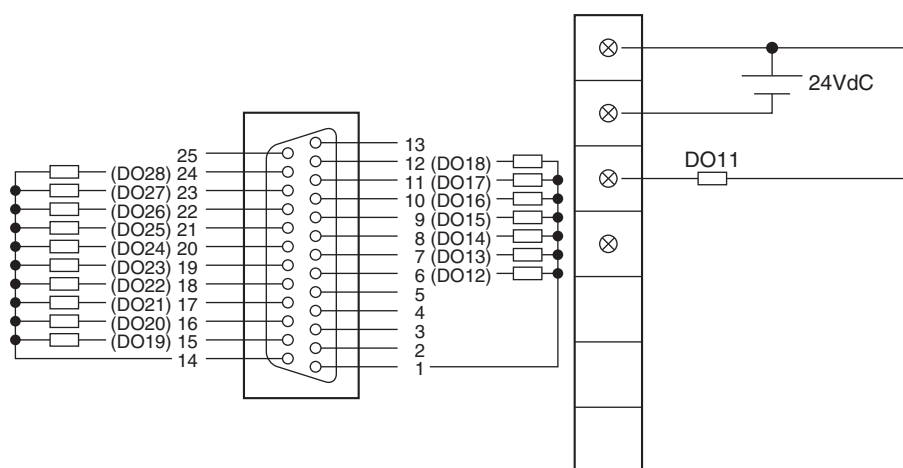
Note 2: The operation by DI (external control unit) and the switch on the front face is as shown in (1) to (5) of Note 2 on page 4-6.

About alarm output (DO)

- 1) Alarm setting can be made for 4 points per input channel. Alarm output (DO) can be mounted up to 18 points.
- 2) On occurrence of an alarm, the internal transistor is turned ON.

Output : Open collector

Rating : 30V/100mA DC (resistance load)



Note: This is not relay output.

Do not apply voltage or feed current larger than the rating.

Otherwise the internal circuit may be damaged, and the instrument stops operating.

(4) Ethernet (option)

Note: Select E or W for the 12th digit of code signals to use this option.

Ethernet communication specifications are as follows.

Note: Install the LAN cable far away from the power supply line or strong electric line as possible to avoid the influence of induction noise.

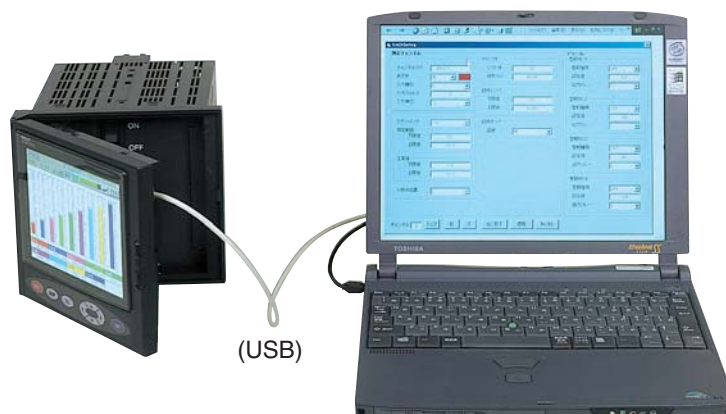
Item	Specifications 10BASE-T
Communication speed	10 Mbps
Communication mode	Base band
Maximum network length or maximum node spacing	Up to 500 m (4-stage cascade)
Maximum segment length	Up to 100 m (between node and hub)
Connection cable	UTP (Unshielded twisted pair cable) 22-26AWG
Communication protocol	TCP/IP

(5) Cautions on connection of input signals via barrier

- 1) When thermocouple or resistance bulb is used for input
Measurement value error is generated because resistance value within the barrier is added.
Calibrate the measurement value in a state where the input, barrier, and the recorder are connected.
See section 10.1 for details of calibration.
- 2) Use our Zener barrier (PWZ) with 100V AC series power supply (85 to 150V AC) according the restrictions placed to maintain safety ratings.

4.3 Connection the recorder to loader

- (1) When connecting the recorder to a loader, use optional PC loader communication cable (PHZP1801) as shown below.



The loader cable should be connected to the USB port of PC.

CAUTION

Be sure to display the data display screen (refer to Item 7.4) instead of the parameter setting screen before using the loader. Otherwise, the set value may not be written.

5. PORTABLE

5.1 Portable

- The instrument can be carried about easily holding the handle.
(The portable type is not UL or CE certified.)

External view



5.2 Handling

Observe the following in handling the instrument.

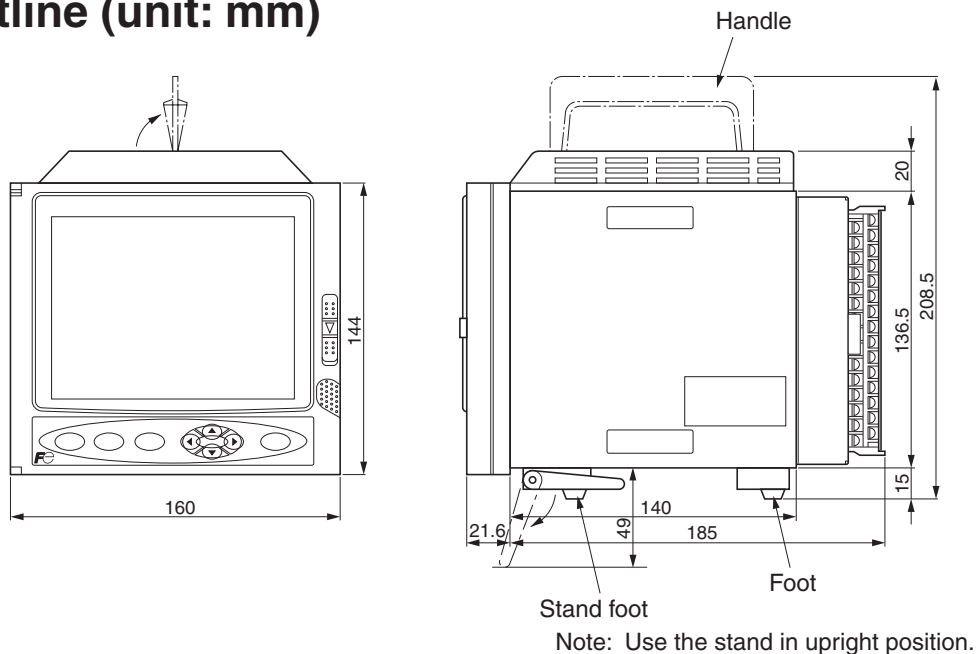
(1) Preferable use environment

- A place not subjected to vibration or impact
- A place not subjected to dust or corrosive gases
- A place of ambient temperature of 0 to 40°C with minimum temperature change
- A place where the humidity is kept within the range from 20 to 80%RH and not subjected to drops of water.
- A place provided with sufficient ventilation allowing the heat from the instrument to be discharged
- A place not subjected to the interference from electromagnetic waves by radio devices or mobile phones
- A place where the instrument is not exposed to the risk of falling.

(2) Notes

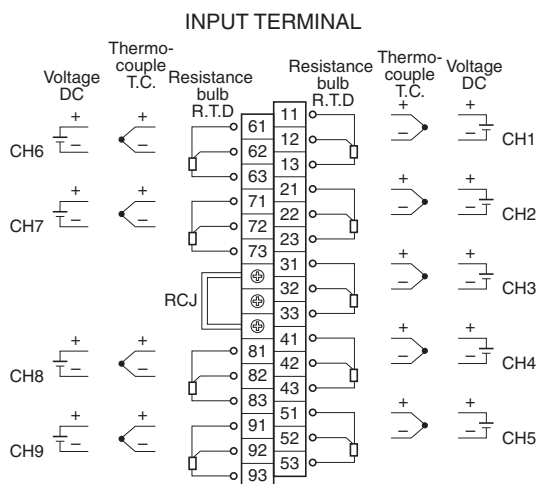
- Use the stand in upright position.
- Be sure to return the rear cover to the original position after performing the wiring of the input or the alarm (DO)/DI terminal.
- Be sure to turn off the power before performing wiring and inspection to avoid receiving electric shock.

5.3 Outline (unit: mm)

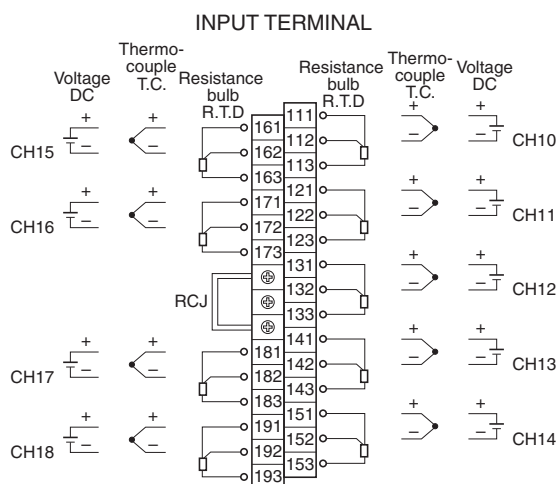


5.4 Wiring

When the number of input points = 9: M3 screw

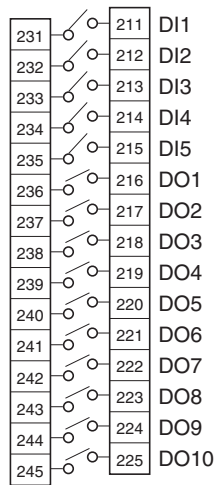


When the number of inputs = 18: M3 screw

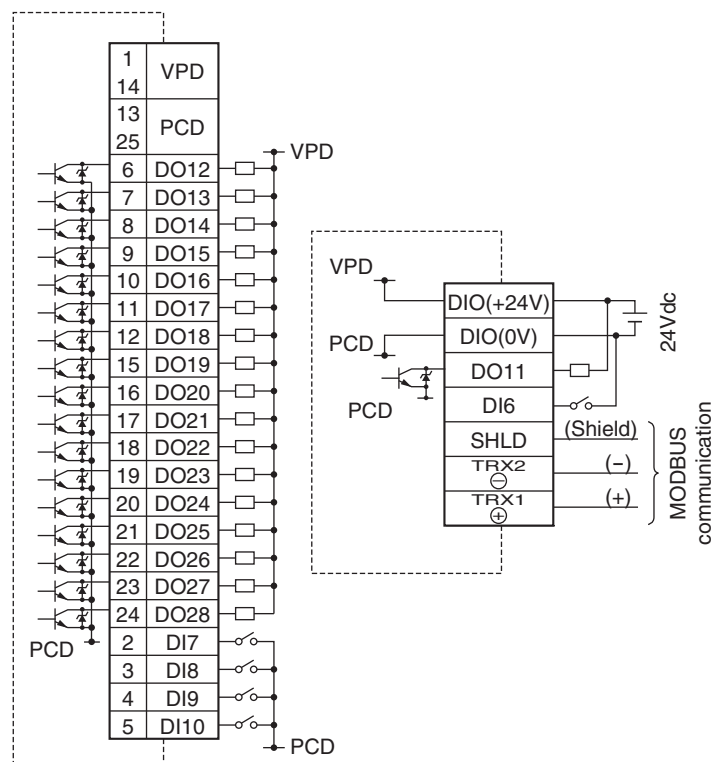
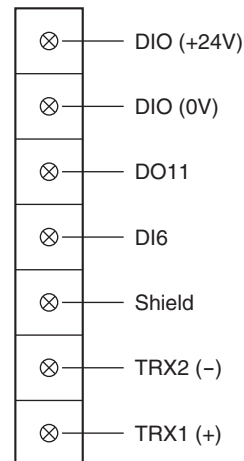
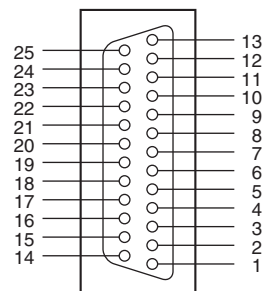


When the 11th digit of the code symbols is 1 (With alarm output/DI input)

Alarm output (DO)/DI input terminal

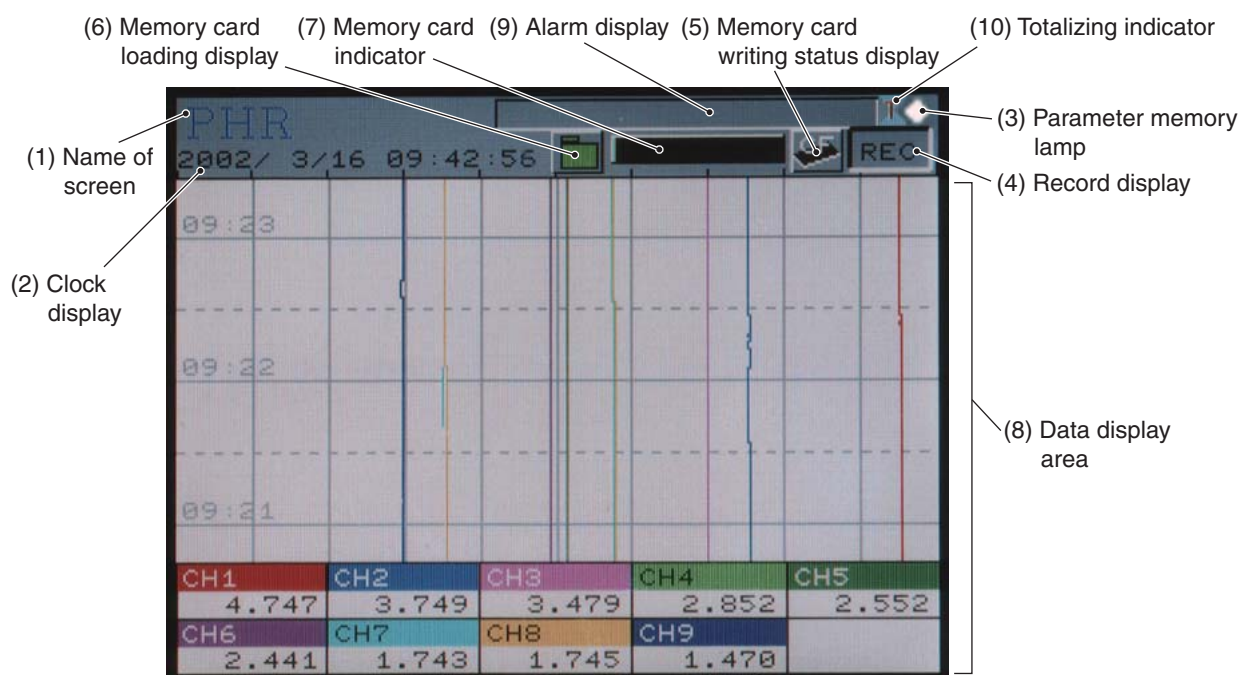


When the 12th digit of the code symbols is R (With communication, alarm output/DI input)



6. DISPLAY FUNCTION

6.1 Basic composition of Data Display screen



(1) Group screen name

Displays the screen name (“Display Name”) that was set arbitrarily.

(2) Clock display

Displays date and time

(3) Parameter memory lamp

If the lamp blinks in red, it means that parameters are not saved to the flash memory. Save the set value by selecting “Main unit” → “Register data” screen.

(4) Record display

“REC” is lit when the measured data is being recorded. On the “Real Time Trend” screen, data will be displayed only when the recorder is in recording.

(5) Memory card writing status display

It is lit when measured data is being written in a memory card.

(6) Memory card loading display

It indicates the loading state of the memory card.

Blinks : shows the state where the memory card is not loaded in the slot.

Green display: shows the state where the memory card is loaded and can be pulled out.

Red display : shows the state where the memory card is loaded but must not be pulled out.

(7) Memory card indicator

It indicates how much of the memory card has been used in graphs. At 90%, it turns red. At 100%, the recorder stops recording. Replace the memory card before it is used up.

(8) Data display area

It displays measured data in real time trend, bar graph, or digital display on the screen. (See item 6.2 to 6.4.)

The measured data of the channels 1 to 9 are displayed at the factory setting. To display the measured data of the channels of 10 and larger numbers, perform the setting for them at the screen structure setting in Section 8.12.1 “Screen setting 1.”

(9) Alarm display

It displays alarm information that occurs at present (channel No. and alarm No.).

If more than 1 alarm occurs, it displays one alarm after another in every 3 seconds.

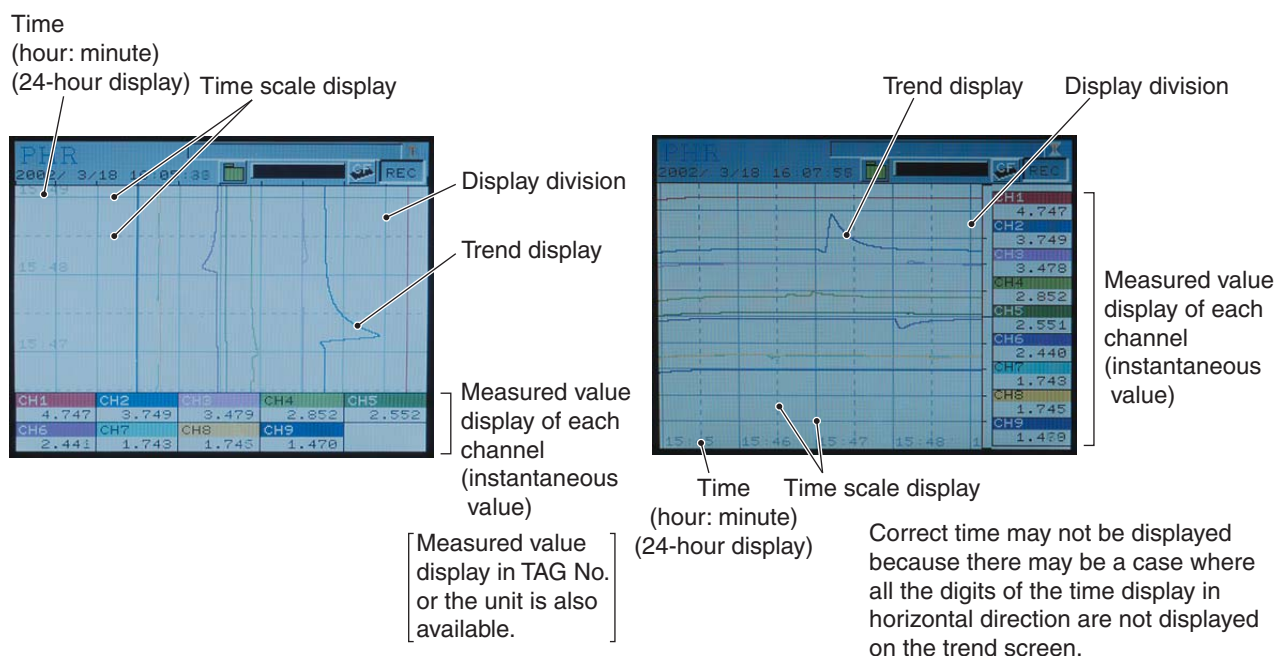
(10) Totalizing indicator

While totalizing is in progress, the totalizing mark () appears at the bottom of the letter T.

When totalizing is not in progress, only the letter T is displayed. Refer to 6.5 for details of totalizing screen.

6.2 Real time trend display of measured data

Measured data can be displayed in waveforms. The vertical or horizontal directions can be selected by setting. By pressing ◀ or ▶ key, four screens with different display contents (scale display and screen structure contents [group configuration], Tag No. unit display, etc.) can be selected one after another.



*) The screens consist of those selected in "Display record setting" → "Screen setting 1, 2."

- 1) The display unit allows measured data to be displayed in waveforms only when recording. If the recorded values exceed the limits of 0 % and 100%, they will be displayed at 0% and 100% positions, respectively. If waveforms of more than 1 channel are displayed at the same position, the trend lines overlap each other. In this case, color of the channel with the largest number is given priority over those of other channels. (Example: In the case of ch2 and ch8, the color of ch8 is displayed.)
- 2) Display refreshment cycles are selectable from parameters of 1 sec to 12 hours. Relations between the parameter and chart speed are shown in tables below. After the start of the recording, the initial refreshment cycles will start at the time of 00: 00: 00 when the recording is continued.

(Example) When display refreshment cycles are set to 1 minute, it will start at the next cycle of m hour: n minute: 0 second.

Display refresh cycle (sec)	1	2	3	5	10	20	30
Chart speed (mm/h) as converted	1296	648	432	260	130	65	43

Display refresh cycle (min)	1	2	3	5	10	20	30
Chart speed (mm/h) as converted	22	11	7.2	4.3	2.2	1.1	0.7

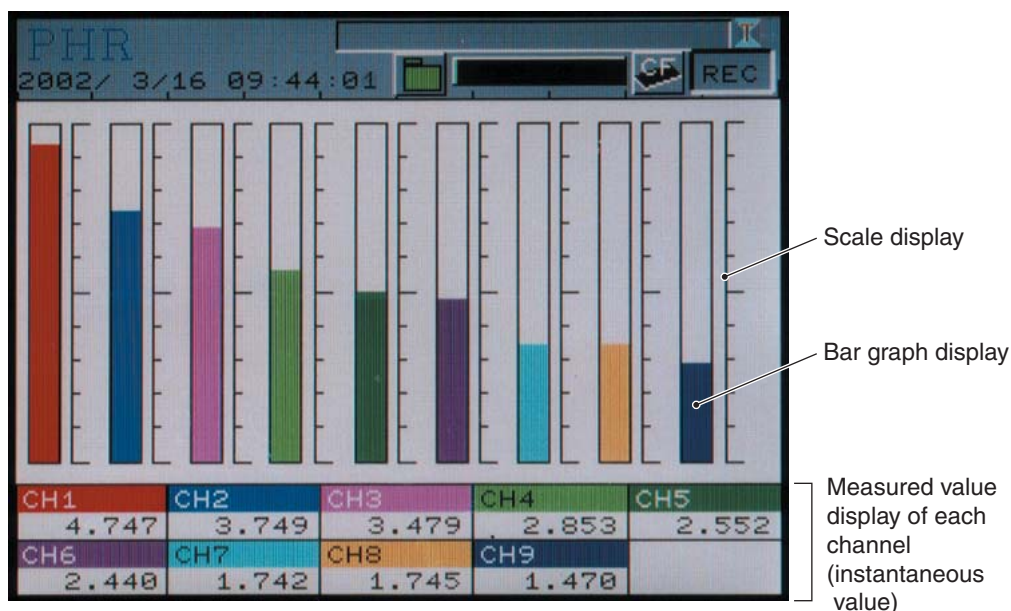
Display refresh cycle (hour)	1	2	3	4	6	12
Chart speed (mm/h) as converted	0.36	0.18	0.12	0.09	0.06	0.03

-
- 3) The Historical Trend screen is displayed by pressing the cursor key (▼) when the Real Time Trend is displayed. This screen allows currently recorded waveform data to be read from the memory card, tracing back to the past. To return to the Real Time Trend screen, press the (SEL) key.
 - 4) The recorder performs the recording by pressing the (REC) key, and it displays waveforms without inserting the memory card into the slot. In this case, about 400 data can be displayed in historical trend. To display the data exceeding 400 items, insert the memory card into the slot before starting the recording.
 - 5) If the power is turned OFF while recording, data written in the memory card will be destroyed. Be sure to press the (REC) key to stop the recording, and then turn OFF the power.
 - 6) If the input signal is burnt out, or over/under range is displayed, the recording line is displayed at 0% or 100% position (at 100% position if the signal is burnt out). Note, however, the line is displayed at the position equivalent to 0.26V for 0-5V input with the input kept open, and at the position equivalent to 260mV for 0-500mV input with the input kept open.

6.3 Display of measured data in bar graphs or analog meters

The measured data can be displayed either in bar graphs or analog meters. The display type can be selected by referring to Item 8.12.2 “Data display screen selecting procedure-2 (screen setting 2).”

1. The measured data is displayed in a bar graph.



2. The measured data is displayed in analog meters.

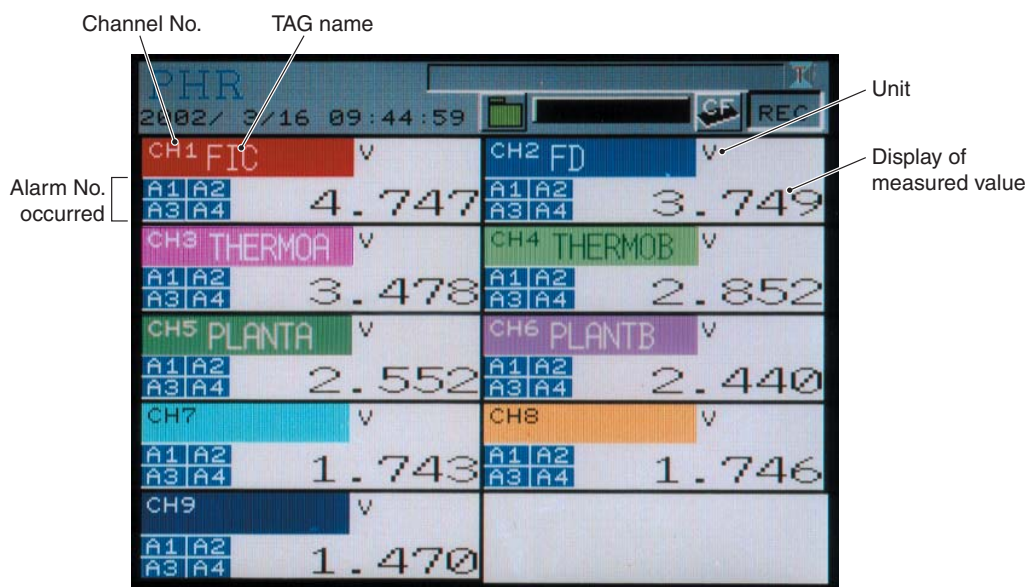
Note that the analog meter display is allowed only for the first 4 channels of the group screens selected for the analog meter by screen setting. For example, if No.1=ch5, No.2=None, No.3=None, and No.4=ch1 are selected, the analog meter display will be as follows: upper left: ch5, upper right: ---, lower left: ---, and lower right: ch1. Meter scale only is displayed for the part ---.



- (1) Setting of display ranging from 0 to 100% is displayed in bar graphs.
- (2) Display refreshment cycles are fixed to 1 sec.
- (3) The recorder displays measured data even when it stops recording.

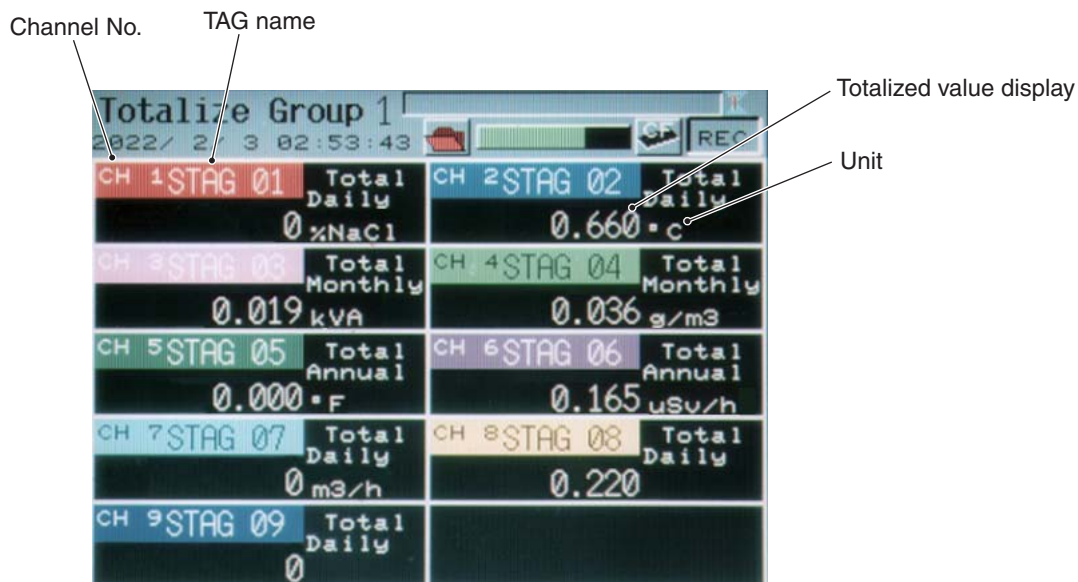
6.4 Digital display of measured data

Measured data is displayed in numerical values.



- (1) Measured values of each channel are displayed in digital value.
- (2) Display refreshment cycles are fixed to 1 sec.
- (3) When an alarm occurs, Alarm No. at the channel is displayed in red.

6.5 Totalizing data display



- (1) The value displayed depends on the setting of parameter “totalize reset operation.”
If ON is selected, the totalized value by totalize base time is displayed.
If OFF is selected, the total value from the start of totalizing is displayed.
- (2) Display update cycle is fixed to 1 second.

-
- (3) The value of totalizing data recorded also depends on “totalize reset operation.”

If ON is selected, the totalized value by totalize base time is recorded.

If OFF is selected, the total value from the start of totalizing is displayed.

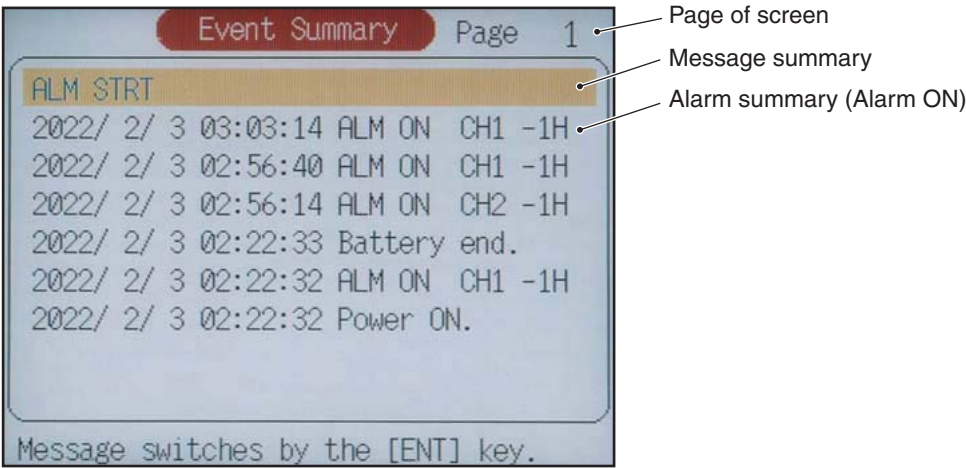
Example: When flow rate of 100L/h is recorded, the totalized value appears as follows.

Elapsed time	Totalize reset	
	OFF	ON
1 hour	100	100
2 hours	200	100
3 hours	300	100

- (4) Even if the power is turned off during totalize calculation because of power failure, the totalized value is not reset. On restoration of power, the instrument resumes totalizing beginning from the data before the power failure.
(Note that if the file used before power failure is lost in the CF card when the power is restored, a new file is created. The data during power failure is not totalized.
[Example] The data in the CF card used was taken in to the PC, and another CF card was inserted.
- (5) While totalize calculation is suspended, totalized data is not displayed. When totalize calculation is suspended while “External input” is selected as totalizing type, totalized data is not displayed, either.
- (6) Depending on the setting of “totalizing operation,” the instrument can be used not only as a totalizer but also as a timer or a counter.
- When “input value” is selected, normal totalizing function is performed.
 - When “counter” is selected, the number of times of DI set to ON during totalizing period or the number of times of alarm occurrence (ON) is displayed and recorded.
Decimal point does not appear in counter display.
 - When “time measurement” is selected, the time when DI is kept ON or alarm is kept ON during totalizing period is displayed and recorded.
The time is displayed in the unit selected in parameter “totalize base time.”
The value is displayed with the fractional portion discarded.
- (7) Totalize start/stop time and the previous totalized value are displayed on the totalizing 4-channel display screen.
- (8) Totalizing is performed until the maximum value 999,999,999 is reached. Totalizing is not performed exceeding that value.

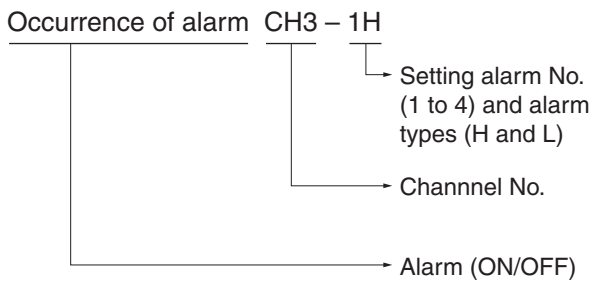
6.6 Event summary display

Alarm information and message information history can be displayed.
The contents of messages can be displayed as message information.

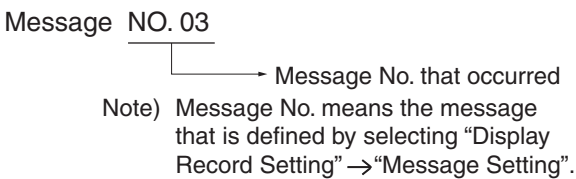


- (1) A maximum of 180 events can be displayed on the screen.
- (2) Page scrolling can be performed by pressing ◀ or ▶ key.
- (3) When events occur, they are displayed on the screen despite in the recording state. If the recorder is not in the recording state, events are not recorded in the memory card.
- (4) Once displayed, the event is kept displayed until the power is turned off (turning off the power clears the event buffer).
- (5) Press the (ENT) key to switch between message contents display and message start time display.
The message contents are initially displayed.
- (6) How to view the event summary and message summary is as follows:

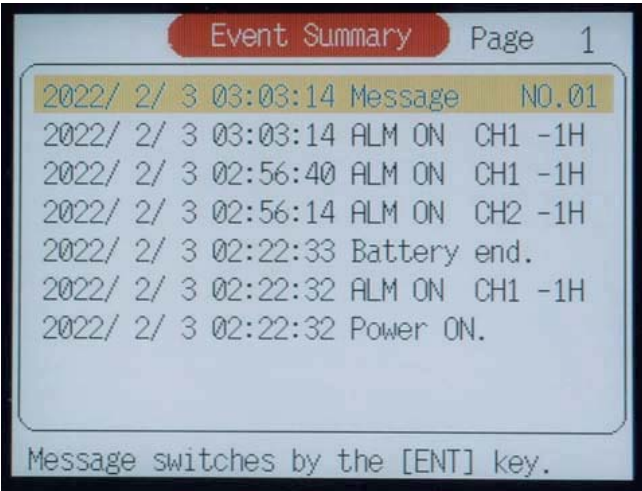
Example of alarm summary



Example of message summary



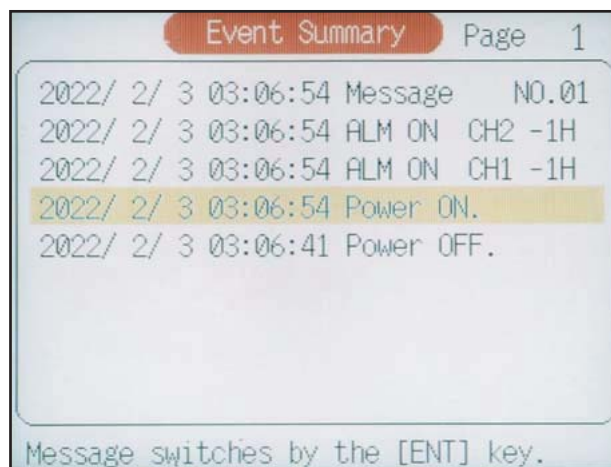
Example of message display



(7) Turn OFF/ON the power, and event summary is displayed.

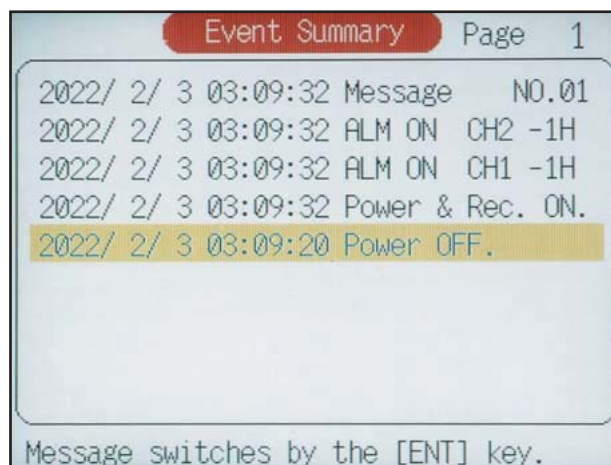
Message is changed according to recording status.

1) When power is turned OFF/ON while recording is suspended



(Not recorded in the event file.)

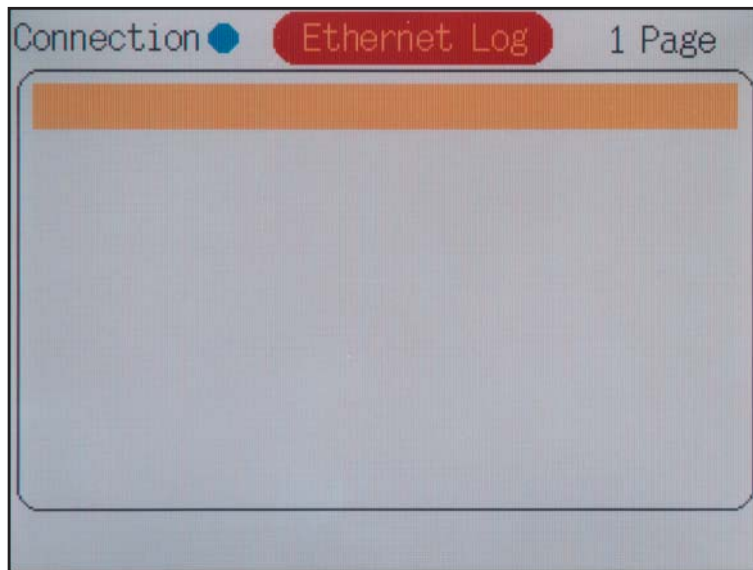
2) When power is turned OFF/ON while recording is in progress



(Recorded in the event file.)

6.7 Ethernet log display

The use information of FTP, Web, E-mail, and MODBUS TCP/IP functions can be displayed.



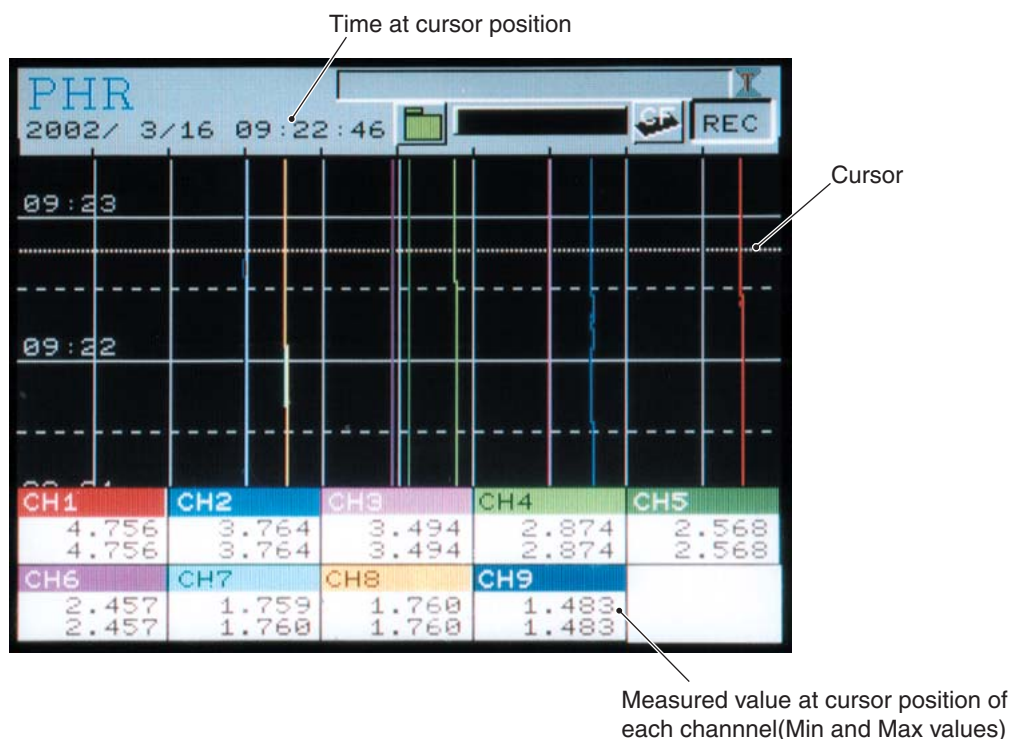
- (1) Up to 180 communication items can be displayed.
- (2) Pages can be turned using horizontal cursor key.
- (3) The log appears every time communication is carried out irrespective of the state of recording.
- (4) Once displayed, the contents of communication are kept displayed until the power is set to OFF.
(Communication buffer is cleared when the power is set to OFF.)
- (5) Details of the display are as follows.

Communication contents display

- E-mail transmission display (E-mail No. is E-mail trigger No.)
 - E-mail sent : "E-mail No.1"
 - E-mail send error : "E-mail No.1 NG"
- FTP communication display
 - FTP server log in : "FTP LOGON USER1"
 - FTP server log off : "FTP LOGOFF USER1"
- MODBUS TCP/IP communication display
 - Communication start : "MODBUS Start"
 - Communication stop : "MODBUS Stop"

6.8 Historical trend display

Pressing the ▼ key in the real time trend screen displays the screen shown below, which indicates the history of data currently recorded.



- (1) It allows the data recorded in the memory card to be displayed. The display can be scrolled by using the cursor expressed in a white dotted line. The cursor can move vertically the (▲ or ▼) key or horizontally the (◀ or ▶) key. Min. value or Max. value at the position of the cursor are displayed at the lower part of the screen.
- (2) Recording start/stop cannot be performed on the screen. To do this, switch the “Historical Trend” screen to “Real Time Trend” screen. However, this “Historical Trend” screen cannot be shifted to the “Parameter Set” screen. To shift the “Real Time Trend” screen, be sure to press the **(SEL)** key.
- (3) The data that can be displayed on the historical trend screen is the one currently recorded or the data held immediately before the recording is stopped. The data that was recorded in the past and whose recording was then stopped must be displayed on the record data display screen, or reproduced on the PC using the data viewer.

The following items are displayed on the historical trend screen based not on the setting of the past recording but on the currently selected values.

- Trend direction
- Number of screen partition
- Trend scale display
- Color bar display selection

-
- (4) Press the **DISP** key on the historical trend screen, and the following display appears.



Enter the time you want to view on the screen and press the **ENT** key, and the data at the selected time is displayed.

When time before the current time is entered, the specified time appears at the bottom of the screen.

When time after the current time is entered, the specified time appears at the top of the screen.

If the entered time falls within the range of the time currently displayed, the screen remains the same.

6.9 Message that appears when main unit failure occurs

(1) Message that appears when the CF card memory is full

When the CF card memory becomes full, the following message appears on the trend screen, etc., and recording is stopped. (Totalize calculation is not stopped.) If the message appears, immediately replace the CF card.



6.10 Cautions about power ON/OFF

(1) Recording state and record file

If the power is turned OFF when the recorder is in the recording, data written in the memory card may be damaged. Be sure to stop recording by pressing (REC) key, and then turn OFF the power. In addition, if the power is OFF with the recorder in the recording, the recorder will start recording when the power is turned ON again. In this case, data will be recorded as a new file.

(2) Recording set values

After parameters have been set, register the set values by selecting "Main Unit" → "Register data", or they will return to the former values when power is turned OFF.

(3) Clock function

The clock is backed up by an internal lithium battery. The battery life is expected to be about 10 years at normal temperature. Although there is no need to set the clock when the power is turned ON, an error may occur every time the power is turned ON/OFF (about 1 sec per ON/OFF operation).

(4) Message that appears when the battery is dead

When battery voltage becomes low, the following message appears on the trend screen, etc. If the message appears, stop recording and totalize calculation, and ask your dealer for repair.



(5) When power is turned OFF because of power failure during recording

When the power is turned ON again, messages "Power OFF" and "Power & Record ON" appear at the top of the event file and the event display. (See 6.6 "Event summary display.")

(6) When power is turned OFF during totalize calculation

When the power is turned ON again, the instrument resumes totalizing beginning from the value before the power was turned OFF.

Data is recorded in the totalizing file using the file before the power is turned OFF. (Note that if the file used previously is lost, recording is started using a file newly created.)

7. OPERATION AND ACTIONS

7.1 Before running the recorder

Check the following points before starting operation.

Loading the memory card

- (1) Inserting and removing the memory card..... See Item 2.2.



Wiring

- (1) Input terminals..... See Item 4.2.
- (2) Alarm terminals (option)..... See Item 4.2.
- (3) Power and ground terminals..... See Item 4.2.



Conformity of input connection to recording channel

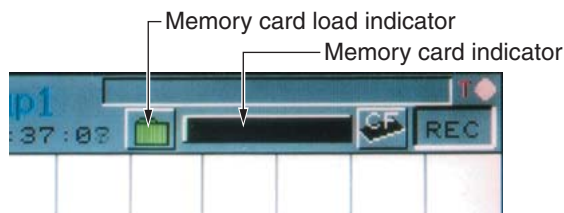
- (1) Channel settings..... See Item 8.4.

7.2 Power ON and state

- (1) Open the panel unit. Turn “ON” the power switch at the upper center of the panel unit.
- (2) After power ON, the self-check function starts up.



- (3) Insert a memory card, and then check with the memory card load indicator that the card can be used. (It can be used if the memory card load indicator is kept ON in green or red, and it cannot be used if it is kept flickering.) If the memory card load indicator is kept flickering in red even if the CF card is inserted, remove the CF card, check the direction of insertion (see 2.2) and insert it securely. If the indicator is still flickering, the CF card may not have been formatted, or some parts may be defective.



- (4) Measured data are displayed for each channel.

CH1	CH2	CH3	CH4	CH5
3.862	0.911	3.762	1.262	1.761
CH6	CH7	CH8	CH9	
2.861	3.761	0.761	1.262	

Measured data for each channel

* TAG. No. or the unit display is also available according to screen configuration setting.

TAG 01	TAG 02	TAG 03	TAG 04	TAG 05
2.815	2.816	119.6	84.7	284.3
TAG 06	TAG 07	TAG 08		
314.1	4.432	3.428		

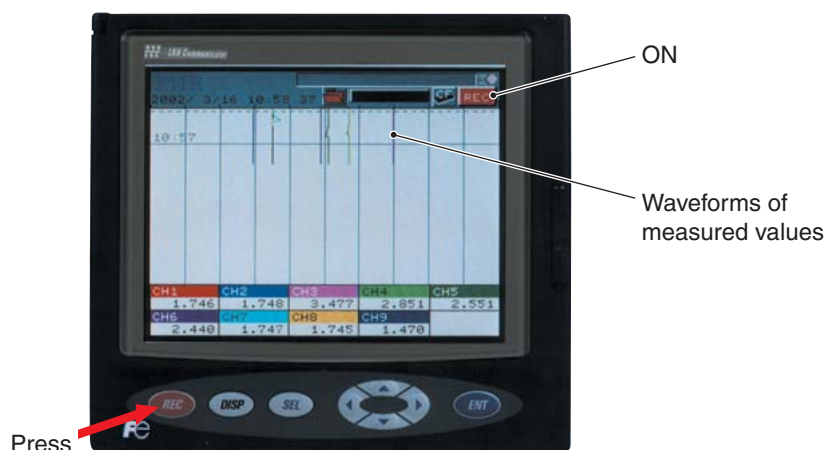
V	V	°C	°C	mV
2.815	2.816	119.6	84.7	284.3
mV	V	V		
314.1	4.431	3.428		

7.3 Stopping and starting the recording operation

(1) Recording start

- 1) To start the recording, press the **(REC)** key. The **[REC]** lamp is lighted and measured values are displayed in waveforms on the data display unit. Also, it starts saving the measured values to the memory card.

* Recording is performed at the timing described in “Appendix 6 Timing for recording.”

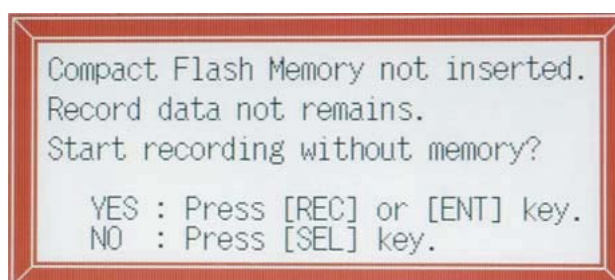


- 2) When the password for stopping and starting the record operation is set, the password setting screen is displayed as follows. Therefore, make a setting of the password. When the password is correct, the recording is started.



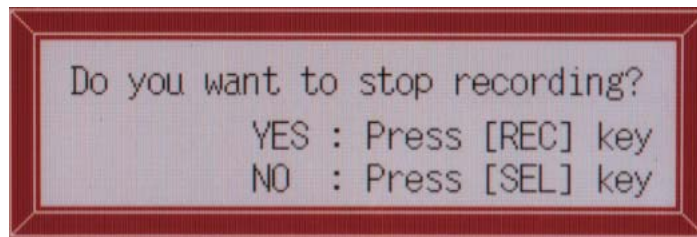
- 3) If the CF card is not inserted, the following message appears. Press the **(REC)** or the **(ENT)** key to start recording. Press the **(SEL)** key not to start recording.

Note: If recording is carried out with the CF card not inserted, data cannot be recorded.

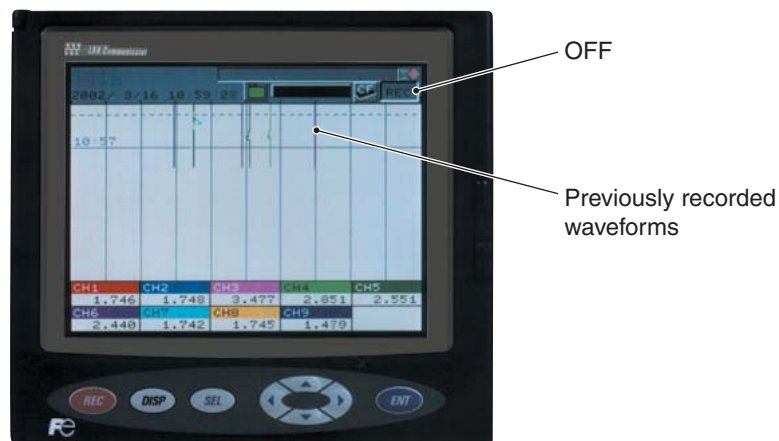


(2) Recording stop

- 1) To stop recording, press the **REC** key. The following message appears. To stop the recording, press the **REC** key, and press the **SEL** key to continue recording.



- 2) After the stop of the recording, the **REC** lamp comes off. The trend display on the data display unit stops. In this case, even if there is some data that are not yet written in the memory card, the unit writes them in the card until the recording is finished.



- 3) When the password for stopping and starting the record operation is set, the password setting screen is displayed as follows. Therefore, make a setting of the password. When the password is correct, the recording stop confirmation screen is displayed.



7.4 Switching data display screens

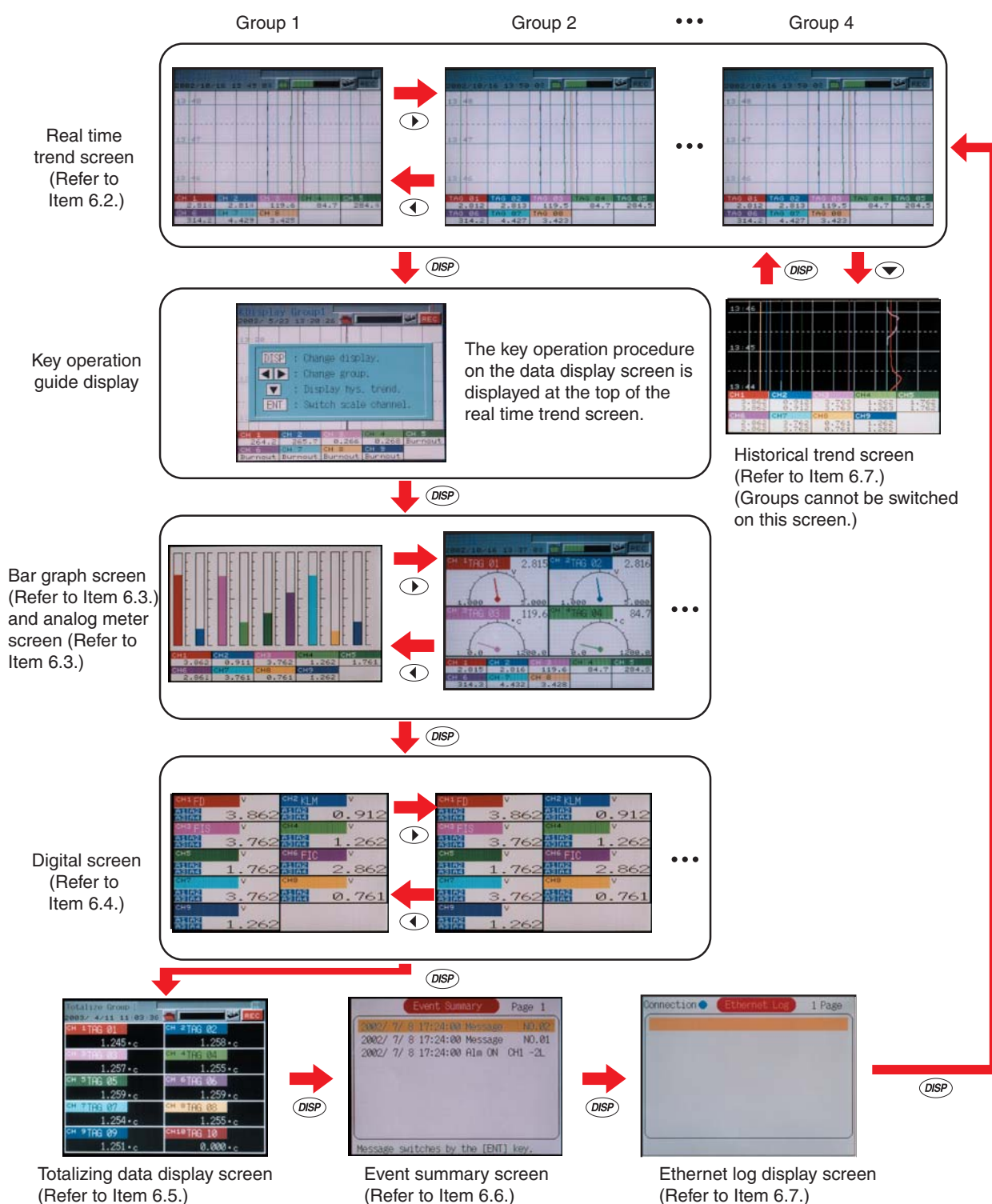
Data display screens include real time trend screen, bar graph (analog meter) screen, digital screen and totalizing screen. Every time the **DISP** key is pressed, the screen switches to another one. To display the historical trend screen, press the **▼** key in the real time trend screen.

Press the **◀** or **▶** key in the real time trend screen to switch to each group screen.

* If group screens are switched in high speed, the color on the color bar may not be displayed correctly. Display the screen once again in such cases to restore proper color display.

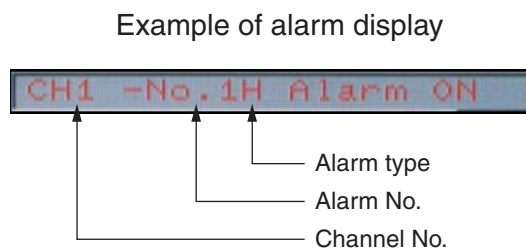
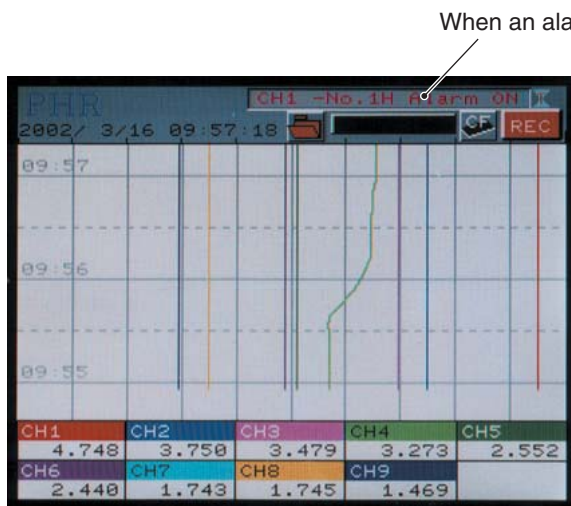
Refer to Item 8.12.2 for selection of bar graph/analog meter display.

The structure of the data display screen is as follows.



7.5 Display of alarm

(1) Alarms that occurred on the Trend Display, Bar Graph and Digital Display screens:



It is indicated that an alarm of alarm No.1 and alarm type H occurs at channel 4.

* If an alarm occurs on the “Digital Display” screen, Alarm No. at left of “Measured value display” comes on in red.



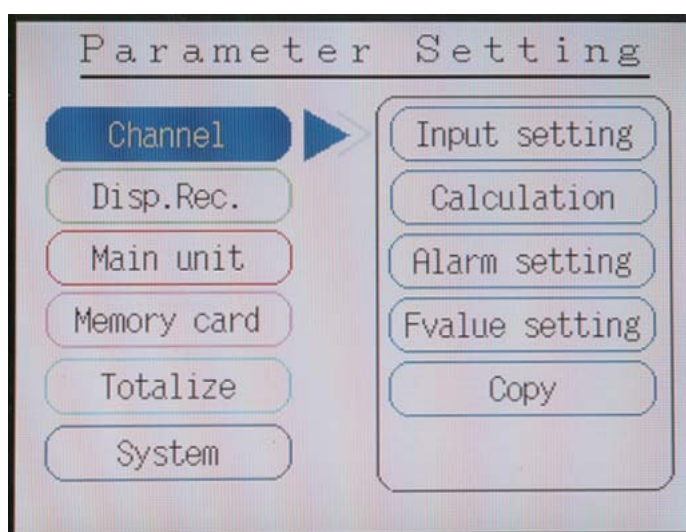
* If an alarm occurs against the current input, the alarm contents (and not the past alarm record) are displayed on the historical screen and the record data display screen of the memory card.

8. SETTING AND CHECKING PARAMETERS

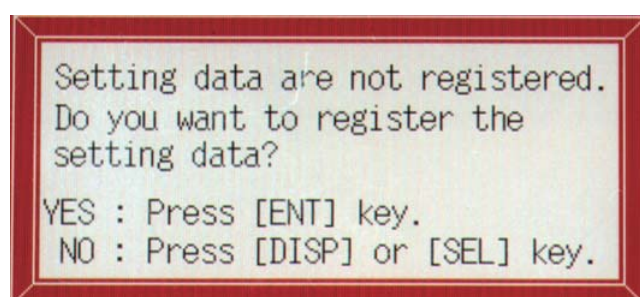
8.1 Setting and checking

Follow the description of Item 8.2 “Outline of parameter setting procedure” to enter into each screen, and then follow the description of Item 8.3 “Basic operation of setting screens” to make parameter setting.

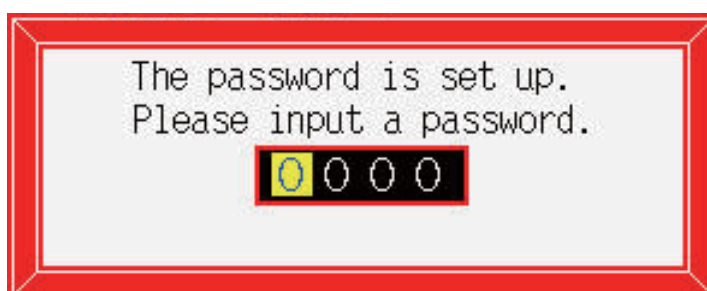
- (1) Parameters are factory-set as given in the table on the next page. Turning on power as they are initiates operation (indication and recording). Change the parameter setting as required.
- (2) Display range consists of multi-ranges. Set the range as desired. The input types are the same for every 2 channels.
- (3) Alarms, TAG No. and messages are not set. Set them as needed. An input filter is set at 3 seconds.
- (4) Press the **(SEL)** key in the data display screen to display the parameter setting screen. Refer to Item 8.2 for the contents and the operation of the parameter setting screen.



Note: After setting the parameters, click “Main Unit” → “Register data” in order to save the set information to a flash memory. To refresh parameter set values, press **(DISP)** key. So, the following message appears, prompting you to select the option. Press the **(ENT)** key twice. Now, the parameter has been refreshed.



- (5) When the password for parameter setting or compact flash operation is set, the following password setting screen may be displayed for displaying each parameter setting screen. Therefore, make a setting of the password. When the password is correct, the setting screen is displayed.



(1) Parameters as set by factory (initial values)

	Parameter names	Factory setting contents (initial value)	Setting range	Copy setting	Remarks
Channel settings	Input setting	Input type : K thermocouple	Skip, K, E, J, T, R, S, B, N, W, L, U, PN thermocouple, Pt100, JPt100, 50mV, 500mV, 1 to 5V, 0 to 5V range, Other channels	○	Set the same input types for every 2 channels.
		Unit : °C	°C, °F, and engineering unit for voltage input	○	
	Calculation setting	Input filter : 3 s	0 to 900 sec (1 sec step)	○	
		Subtraction channel : 0	0 to 30 (0: No subtraction)	○	
		PV shift : 0	Engineering unit	△	
		PV Gain : 100%	0.00 to 327.67%	△	
		F value calculation function : OFF	OFF, ON	○	
	F value calculation setting	Reference temperature : 0.0°C	-230.0 to 3276.7°C		Setting is common to all channels.
		Z value : 0.0°C	-230.0 to 3276.7°C		
		Decimal point : 1	0 to 4		
		Reset temperature : 0.0°C	-230.0 to 3276.7°C		
	Alarm setting	Alarm No : 1	1 to 4	○	
		Alarm type : OFF	OFF, H, L	○	
		DO relay No. : None	None, 1 to 28	○	
		Alarm set value : 0.0°C	Engineering unit	○	
Display record settings	Display recording mode setting	Display refresh cycle : 1 sec	1 sec to 12 hours		
		File division cycle : No division	No division, 1 hour, 1 day, 1 week, 1 month		
		File overwrite function : OFF	OFF, ON		
		Trend display compression : 1/1	1/1, 1/10, 1/30, 1/60		
	Range setting	Tag (upper) : TAG01 to TAG36	Up to 8 characters	○	
		Tag (lower) : Blank	Up to 8 characters	○	
		Display color : depends on channel No.	14 colors		
		Display range : 0.0 to 1200.0°C	Varies depending on input type.	○	
		Recording type : Max/Min recording	Max/Min recording, Instantaneous value recording, Average value recording	○	
		Recording mode : With Record	With Record/ Display Only	○	
	Message setting	Message : Blank	Up to 32 characters		Message data is only recorded inevent file.
		Timing : None	No, DI ON, DI OFF, Alarm ON, Alarm OFF		
	Display setting	Display Name : Display group 1 to 4	Up to 16 characters		
		Screen structure : No.1-9=ch1-9	From ch1 to 30 for each of No.1 to 10		
		Trend direction : Vertical	Horizontal, Vertical		
		Display divided to : 10	1 to 20		
		Trend scale display : OFF	OFF, ON		
		Bar graph/Analog meter selection : Bar graph	Bar graph, Analog meter		
		Color bar display selection : Channel No. display	Channel No., Tag No., Unit		
	Background color setting	Trend screen background color : white	White, black		
		Historical screen background color : black	White, black		
Main Unit settings	Clock adjustment	Current time			
	LCD OFF time	LCD OFF time : 0 min (Kept lit at all times.)	0 to 60 min (0 : Kept lit at all times.)		
	Unit define	Blank	Up to 7 characters × 12		
	DI setting	Function Invalid	Function Invalid, Recording Start/Stop, F value calculation reset, Totalize start/stop, Totalize reset, LCD ON		
	Alarm Setting	Alarm hysteresis : 0.20%	0.00 to 100.00%		
		Alarm latch : OFF	OFF, ON		
		Memory FULL alarm : None	None, 1 to 28		
		Battery alarm : None	None, 1 to 28		
	Record data format	Recorded data format : ASCII	ASCII, Binary		
	RS-485 communication setting	MODBUS station No. : 1	0 to 255 (0 : No communication)		
		MODBUS communication speed : 19200bps	19200bps, 9600bps		
		MODBUS parity : Odd	None, Odd, Even		
		Front communication function : ON	OFF, ON		

* When parameter copy (section 8.8) is selected, the items marked with ○ are copied.
Initial value is restored with the items marked with △ .

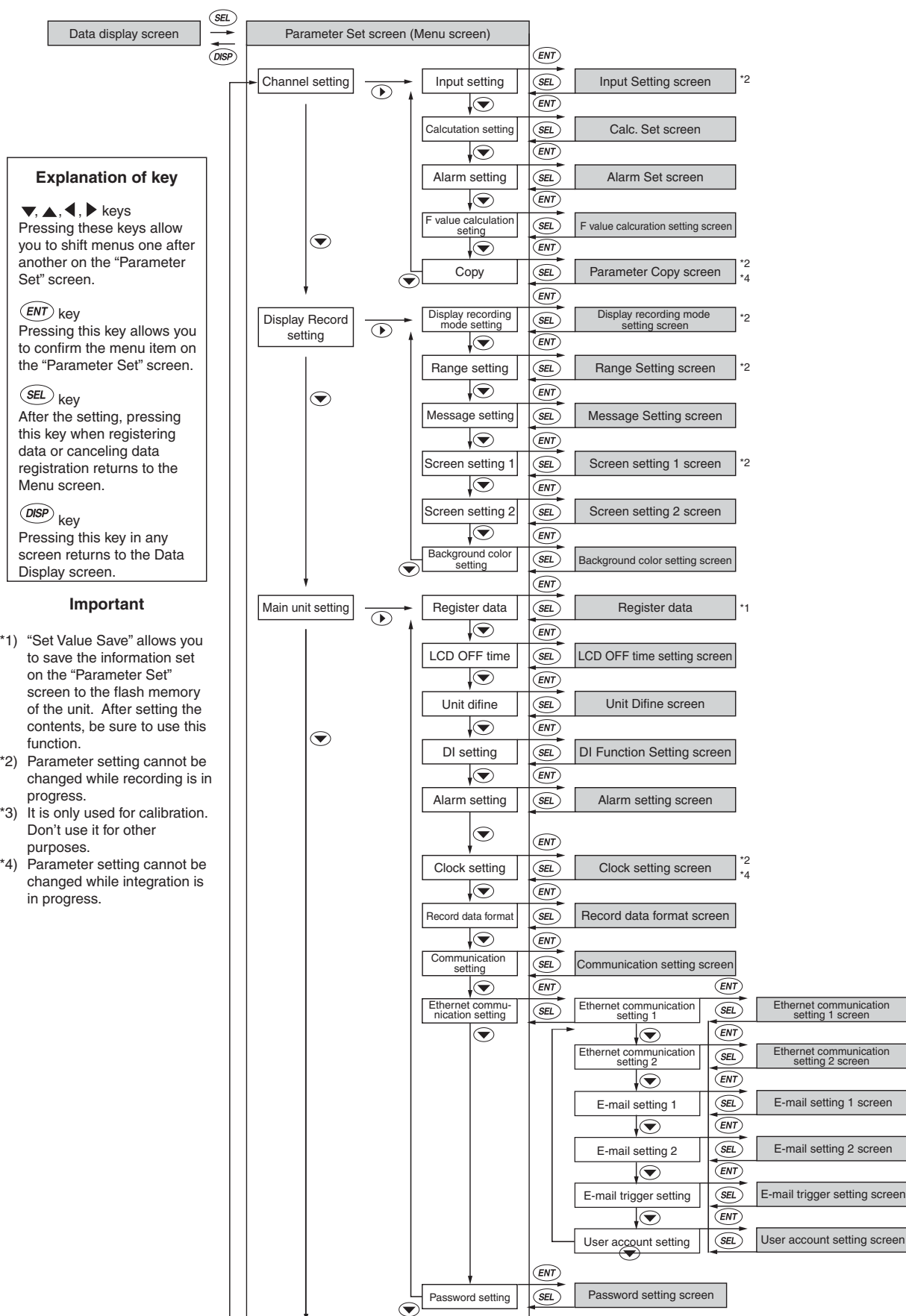
	Parameter names	Factory setting contents (initial value)	Setting range	Copy setting	Remarks
Main Unit settings	Ethernet setting 1	IP address : 192.168.1.1	0 to 255 (each digit)		
		Subnet mask : 255.255.255.0	0 to 255 (each digit)		
		Default gateway : 0.0.0.0	0 to 255 (each digit)		
	Ethernet setting 2	FTP server function : OFF	OFF, ON		
		FTP access control : OFF	OFF, ON		
		Web server function : OFF	OFF, ON		
		E-mail function : OFF	OFF, ON		
		MODBUS TCP/IP function : OFF	OFF, ON		
	E-mail setting 1	SMTP IP address : 0.0.0.0	0 to 255 (each digit)		
		Sender's mail address : Blank	Up to 64 characters		
		Sender's name : Blank	Up to 32 characters		
	E-mail setting 2	Receiver's mail address 1 to 8 : 0.0.0.0	Up to 64 characters		
	E-mail trigger setting	Title : Blank	Up to 32 characters		
		Triiigger timing : None	None, DI ON, DI OFF, Alarm ON, Alarm OFF, Warning, Timer cycle		
		Text 1 : Blank	Up to 32 characters		
		Text 2 : Blank	Up to 32 characters		
		PV value affixation : OFF	OFF, ON		
		Receiver's address No. : None	1 to 8 (selectable)		
		Mail send test :			
	User account setting	User name : Blank	Up to 16 characters		
		Password : Blank	Up to 8 characters		
		User Level : Guest	Guest, Administrator		
	Password setting	Record start/stop : 0000	0000 to 9999 (no password at 0000)		
		Parameter setting : 0000	0000 to 9999 (no password at 0000)		
		CF manager : 0000	0000 to 9999 (no password at 0000)		
Totalized setting	Daily report	Totalize cycle : 1 hour	10, 20, and 30 min., 1, 2, 3, 4, 6, 12, and 24 hours		
	Annual report	Base date : 1	1 to 31		
	External input	External input : DI1	DI1 to 10, Channel 1 to 30, Alarm No. 1 to 4		
	Channel setting 1	Totalize calculation : Input value totalizer	Input value totalizer, Counter, Time measurement		
		External input : DI1	DI1 to 10, Channel 1 to 30, Alarm No. 1 to 4		
		Totalize base time : /h	/s., /min, /h., /day		
		Totalize reset operation : ON	OFF, ON		
		Totalize reset input : None	None, DI ON, Alarm ON		
	Channel setting 2	Totalize TAG : STAG01 to STAG72	Up to 8 characters		
		Totalize unit : Blank	Can be selected arbitrarily.		
		Totalize lower limit cut value : 0.0°C	Engineering unit		
		Totalize scaling value : 1	1 to 32767		
Math Channel setting	Arithmetic operation setting	Arithmetic operation : No setting		○	
	Input setting	Unit : °C	Engineering unit	○	
		Measurement range : 0.0 to 500.0	-3276.7 to 3276.7	○	
		Engineering value : 0.0 to 500.0	-3276.7 to 3276.7	○	
		Square rooter : OFF	OFF, ON	○	
		Logarithmic calculation : OFF	OFF, ON	○	
	Math setting	Input filter : 3 sec	0 to 900 sec (1 sec step)	○	
		Subtraction channel : 0	0 to 30 (0: no subtraction)	○	
		PV shift : 0	Engineering value	△	
		PV gain : 100%	0.00 to 327.67	△	
		F value calculation function : OFF	OFF, ON	○	

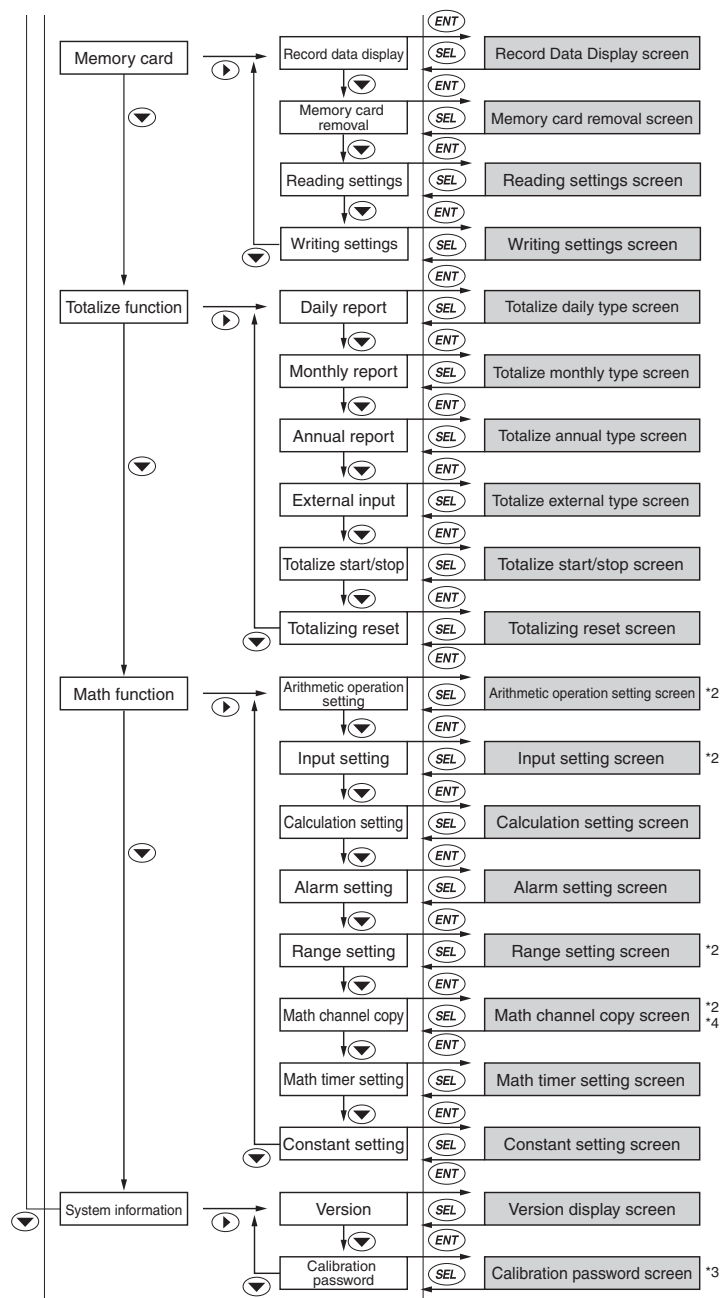
* When parameter copy (section 8.8) is selected, the items marked with ○ are copied.
Initial value is restored with the items marked with △ .

	Parameter names	Factory setting contents (initial value)	Setting range	Copy setting	Remarks
Math Channel setting	Alarm setting	Alarm No. : 1	1 to 4	○	
		Alarm operation : OFF	OFF, H, L	○	
		DO relay No. : None	None, 1 to 28	○	
		Alarm set value : 0	Engineering value	○	
	Range setting	Tag (upper) : TAG37 to TAG72	Up to 8 characters	○	
		Tag (lower) : Blank	Up to 8 characters	○	
		Display color	14 colors		
		Display range : 0.0 to 1200.0°C	Engineering value	○	
		Recording type : Max/Min recording	Max/Min recording, Instantaneous value recording, Average value recording	○	
		Recording mode : yes	With record/ display only	○	
	Math timer setting	H-P, L-P timer cycle setting : 1	1 to 32767 min		
		Average value timer cycle setting : 1	1 to 32767 min		
		Total value timer cycle setting : 1	1 to 32767 min		
	Constant setting	Constant : 0	-32767 to 32767		

* When parameter copy (section 8.8) is selected, the items marked with ○ are copied.
Initial value is restored with the items marked with △ .

8.2 Outline of parameter setting procedure

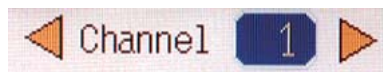




8.3 Basic operation of setting screens

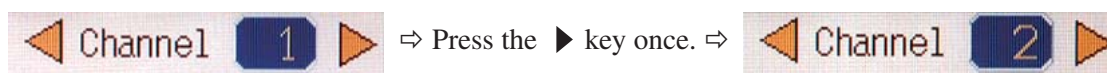
The basic operation of the setting screens is classified in the following 4 methods. In this case, use the up and down arrow keys (▲ and ▼) to move setting items.

- (1) When selecting contents to set by using the ◀ and ▶ keys



In this case, the contents that blink are changed by these arrow keys (◀, ▶).

Example: When changing the channel from 1 to 2;

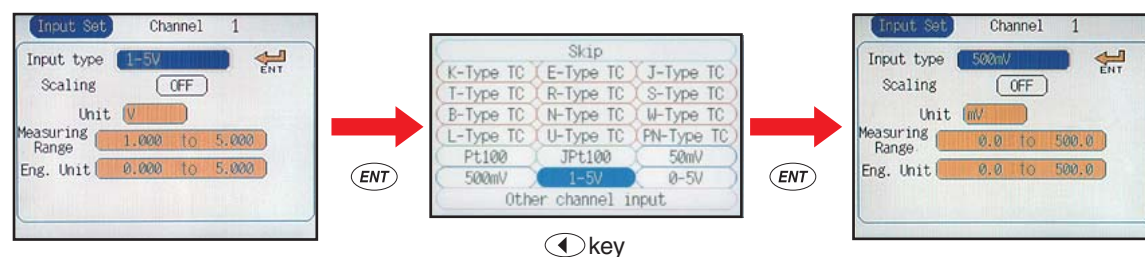


- (2) When selecting contents to set from menu;

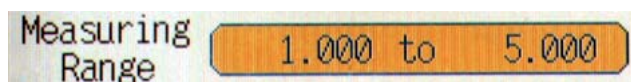


In this case, press the (ENT) key to display the Menu screen. Select an item from the Menu screen by using the ▲, ▼, ◀, and ▶ keys, and press the (ENT) key. So, the blinking contents are changed.

Example: Input type: When changing DC voltage from 5V to 500mV;

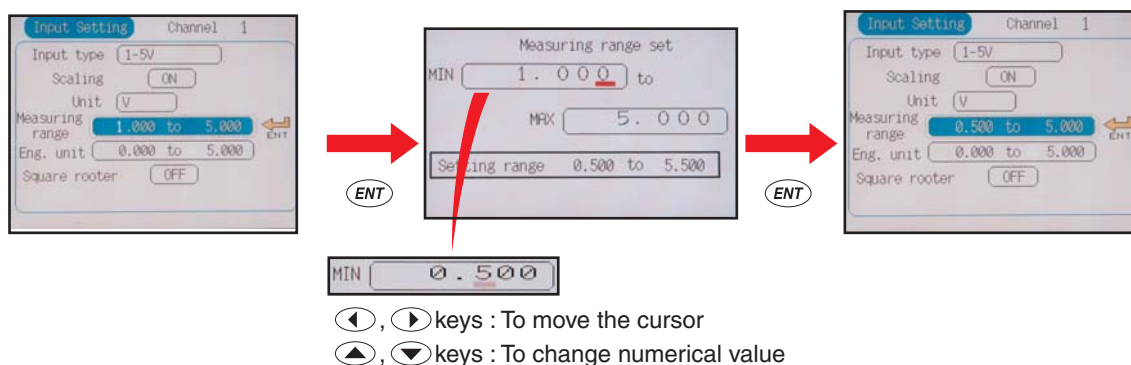


- (3) When setting contents by entering numerical value;

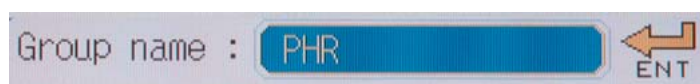


In this case, press the (ENT) key to display the “Numeric Value Entry” screen. Use the ▲, ▼, ◀, and ▶ keys to enter numeric values. The blinking contents are changed by pressing the (ENT) key.

Example: When changing the setting range from “1 to 5V” to “0.5 to 5V”;



(4) When setting the contents by entering characters;



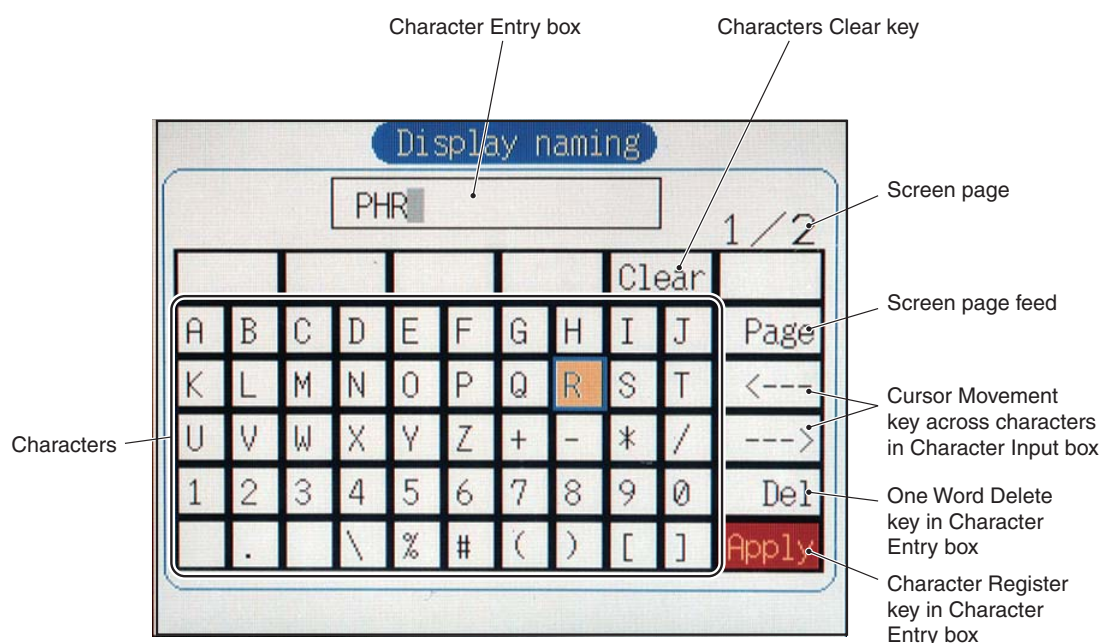
In this case, press the (ENT) key to display the “Character Entry” screen. Use the ▲, ▼, ◀, and ▶ keys to enter a character one by one, and press the (ENT) key. Characters are entered in the “Character Entry” box. After entry, select “Apply”. The blinking contents are changed by pressing the (SEL) key.

Example: When entering PHR in the group screen name box;



[Reference]

Description of Character Entry screen



Note: To make the set characters valid, select the “Apply” key and press the (ENT) key. The set characters will not be valid without pressing the (ENT) key.

Note: In case where the character string is filled with blank, delete the blank and then enter characters. You can't enter characters without deleting the blank.

8.4 Setting for input types, skip, scaling, units, square rooter, logarithmic display and unit code table

[Explanation]

For the input types for each channel (resistance bulb, thermocouple, and DC voltage input), unit (°C, V), and DC voltage input, it is necessary to set scaling, measuring range, engineering unit, square rooter and logarithmic display.

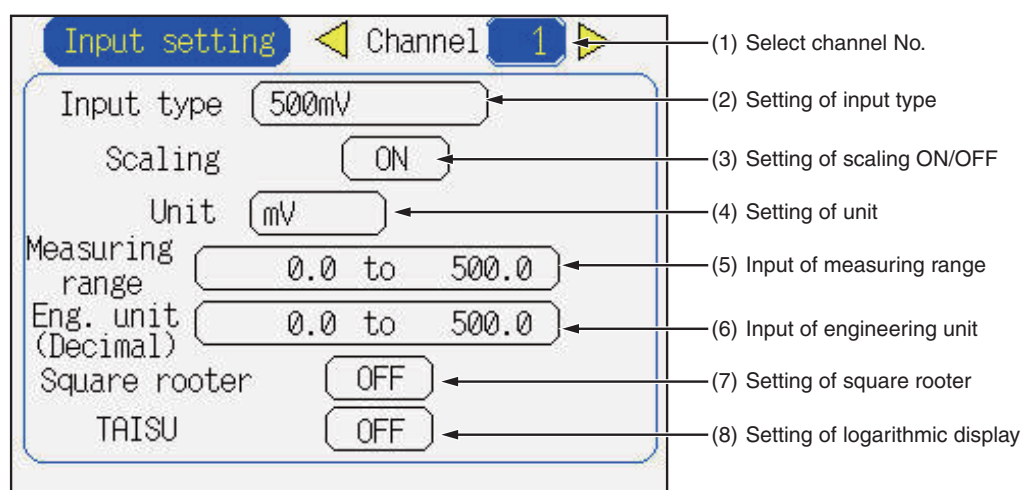
Note 1: When the “Input type” is set to “Skip”, indication, recording and alarm for the channel are not carried out.

Note 2: After the change of the “Input type”, wait for a while until the measured value stabilizes.

Note 3: When the recorder is in recording, the “Input type” cannot be changed.

[Operation]

Select “Channel” → “Input Setting” from the “Parameter Setting” screen, and the “Input Setting” screen appears.

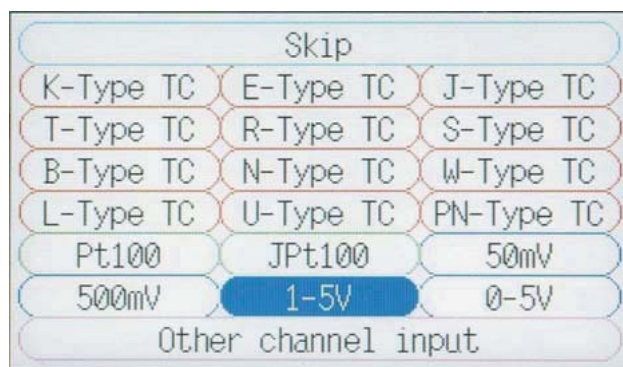


- (1) To select channel No.

Select the channel No. by using the cursor key.

- (2) To set input type

Move the cursor to the box next to “Input type” and press the **(ENT)** key, and the following input type selection screen appears. Select any input signal by using the cursor key and press the **(ENT)** key. If you don’t want to perform “indication”, “recording”, and “alarm” operation, select “Skip”.



Note: About input type setting

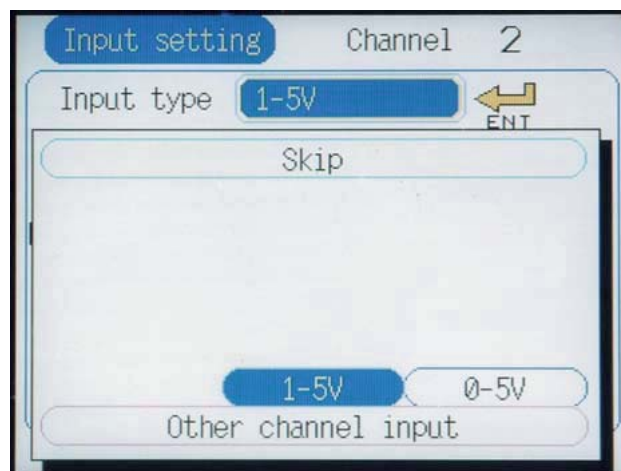
The same input type is basically allocated to 2 channels.

Channels 2, 4, 6, 8, 11, 13, 15, and 17 can only be allocated the input type that is the same as the one allocated to the channel immediately before them.

The following input types are available

Input type	Details
Thermocouple, 50mV	K, E, J, T, R, S, B, N, W, L, U, and PN thermocouples, 50mV
Resistance bulb	Pt100, JPt100
500mV	500mV
5V	1 to 5V, 0 to 5V
Other channels	Either one of the input channel If "Other channels" is selected for input type, operation/recording can be performed for signals connected to other channels without connecting the wire to 2 positions. (The data for other channels at this time is the one before operation such as filtering is performed.)

Note, however, that arbitrary input type can be selected only for channels 9 and 18 irrespective of the type allocated to other channels. For example, if the input type 1 to 5V is selected for channel 1, the following screen appears as the input type selection screen for channel 2, which allows only 1 to 5V, 0 to 5V, Other channel or Skip to be selected.



Input type setting example of each channel

	Input type	Input type	Description
Channel 1	K thermocouple	Thermocouple, 50mV	The type of thermocouple can be arbitrarily selected for each channel.
Channel 2	T thermocouple		
Channel 3	1 to 5V	5V	
Channel 4	0 to 5V		
Channel 5	Pt100	Resistance bulb	The type of resistance bulb can be arbitrarily selected for each channel.
Channel 6	JPt100		
Channel 7	500mV	500mV	
Channel 8	500mV		
Channel 9	J thermocouple	Thermocouple, 50mV	Input type can be arbitrarily selected for channel 9.
Channel 10	K thermocouple	Thermocouple, 50mV	The input type of the thermocouple and 50mV is the same.
Channel 11	50mV		
Channel 12	Skip	5V	Skip can arbitrarily selected irrespective of the input type.
Channel 13	1 to 5V		
Channel 14	Pt100	Resistance bulb	
Channel 15	Skip		
Channel 16	Skip	500mV	
Channel 17	500mV		
Channel 18	50mV	Thermocouple, 50mV	Input type can be arbitrarily selected for channel 18.

(3) To set scaling

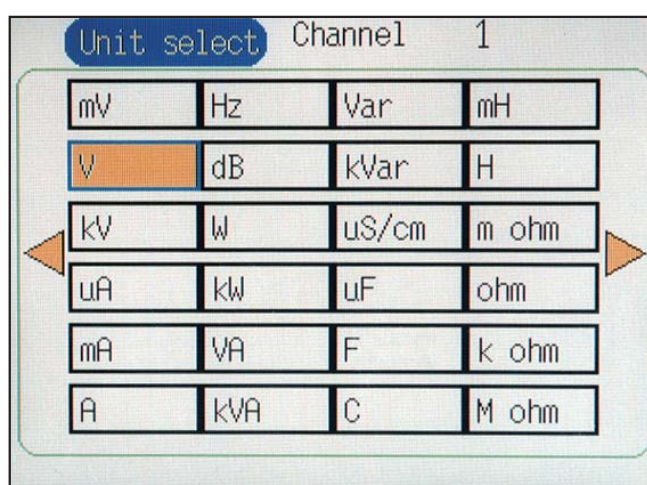
With DC voltage input, set Scaling “ON” “OFF” with the cursor key.

Note: When the scaling is set to “ON,” the display range is initialized. For details, refer to Item 8.10 “Setting for TAG. No., display range, and record mode”.

(4) Setting units

Units can only be set when the scaling is set to “ON”.

Move the cursor key to any of units and press the **(ENT)**. The “Unit Select” Menu screen (see the following figure: when input type is voltage input) appears. Select any unit on the screen by using the cursor key, and then press the **(ENT)** key.



Note: If “Other channels” is selected for input type, engineering value/measurement range is kept constant irrespective of the type of the channel to be referenced. Be careful when performing scaling.

Unit code

Temperature · humidity	Flow rate				Pressure		Level- Height	Capacity · Weight · Area	
°C	t/d	t/h	t/min	t/s	mbar	mPa	mm	ml	mm2
°F	kg/d	kg/h	kg/min	kg/s	bar	Pa	cm	l	cm2
%RH	g/d	g/h	g/min	g/s	N/mm2	kPa	m	kl	m2
vol%	m3/d	m3/h	m3/min	m3/s	N/m2	MPa		mm3	g
	l/d	l/h	l/min	l/s				cm3	kg
								m3	t

Density		Analysis			Power · Energy	Velocity · Acceleration		Time	Electro- magnetism
g/cm3	g/l	ppm	ppmNOx	%CO2	mN	mm/s	rps	µs	mV
kg/cm3	kg/l	ppmNH3	ppb	%He	N	mm/min	rpm	ms	V
g/m3	g/ml	ppmSO2	pH	%Ar	N · m	mm/h	rph	s	kV
kg/m3		ppmH2S	mol	%O2	J	m/s	m/s2	min	µA
		ppmCO	%	%NaCl	kJ	m/min	rad/s	h	mA
		ppmO2	%H2	%CO		m/h	km/h		A

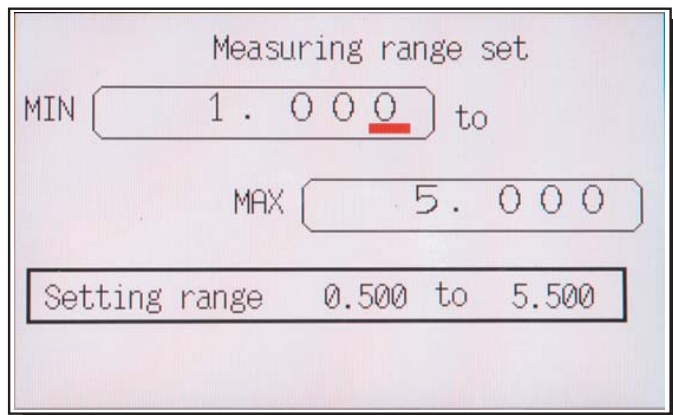
Electromagnetism			Heat · Light	Radiation	Other	Customer-made (Note 2)	
Hz	Var	mH	lx	Sv/h	Pa · s	(Unit 1)	(Unit 7)
dB	kVar	H	cd	mSv/h	mPa · s	(Unit 2)	(Unit 8)
W	µS/cm	m ohm	lm	nGy/h		(Unit 3)	(Unit 9)
kW	F	ohm	cd/m2	µGy/h		(Unit 4)	(Unit 10)
VA	F	k ohm		m		(Unit 5)	(Unit 11)
kVA	C	M ohm				(Unit 6)	(Unit 12)

Note 1: Blank consists of some spaces

Note 2: Units can be made by the customer (See 8.16).

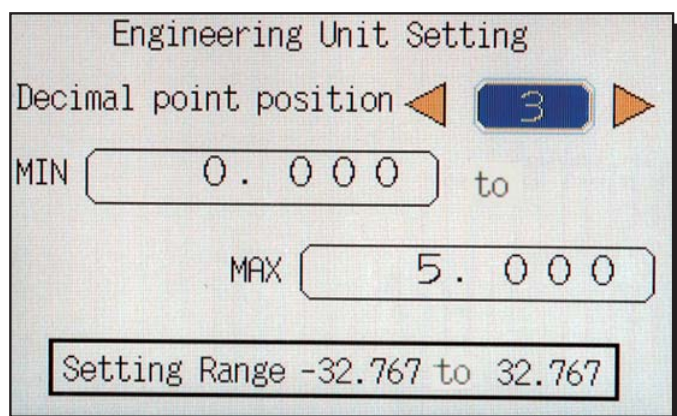
(5) Entering the measuring range

The measuring range can be set only when the scaling is set to ON. To display the “Measuring Range Set” screen, move the cursor to “Measuring Range” and press the **ENT** key. Enter the measuring range by using the cursor key and press the **ENT** key for confirmation. MIN means low limit, while MAX means high limit.



(6) Entering the engineering unit

The engineering unit can be set only when the scaling is set to ON. To display the “Engineering Unit Setting” screen, move the cursor to “Engineering Unit” and press the **ENT** key. Set “Decimal Point Position” by using the cursor key and press the **ENT** key for confirmation, and then enter “Engineering Unit” according to the “Setting Range”. (MIN: low limit, MAX: high limit)



- Decimal point is settable arbitrarily.
- Engineering unit should be within the range from -32767 to 32767.

(7) Entering square rooter (rooter)

Square rooter “ON” and “OFF” can be set using the cursor key in the case of DC voltage input.

Description of square rooter

The measuring range is set to 0 to 100%, and square rooter is performed against the input value converted to percentage value.

If the input value converted to percentage is minus, the result of square rooter should be 0%.

The data after the square rooter (0 to 100%) is converted to industrial value with the obtained data regarded as 0 to 100% of the engineering unit.

Example: In the case of the following input setting, the readings for the input values are as follows.

Input type: 1 to 5V
Measuring range: 1 to 5V
Industrial value: 0 to 1000 (t/h)

	Reading
When input is 1V (0%)	$(1000-0) \times \sqrt{0} = 0$ (t/h)
When input is 3V (50%)	$(1000-0) \times \sqrt{0.5} = 707$ (t/h)
When input is 5V (100%)	$(1000-0) \times \sqrt{1} = 1000$ (t/h)

(8) Entering logarithmic display

Logarithmic display can be set only when the scaling is set to ON.

Select logarithmic display “ON”, “OFF” by the cursor key.

(Note)

When the logarithmic calculation is set to ON, the operation is carried out as follows.

- Only exponent part can be set for engineering value and display range. The setting range is -9 to 9 (10^{-9} to 10^9).
- Subtraction, F value calculation and measurement value cannot be totalized.
- PV shift value is set by the voltage value.
- Record data is recorded by the voltage value.

Description of logarithmic calculation

The measurement voltage can be displayed in exponential form in the range of $1.00\text{E}-9$ to $1.00\text{E}+9$. Only exponent part can be set for engineering value and display range.

Example) In the case of the following setting, the indication values for the input values are as follows.

Input types: 1 - 5V

Measurement range: 1 to 5V

Engineering value: 1 to 5 (means $1.00\text{E}+1$ to $1.00\text{E}+5$).

	Indication value
When input value is 1V	$1.00\text{E}+1$
When input value is 3V	$1.00\text{E}+3$
When input value is 5V	$1.00\text{E}+5$

8.5 Setting for input filter (time constant), PV shift, and subtraction

[Explanation]

Set input filter (time constant), PV shift, and PV gain for each channel.

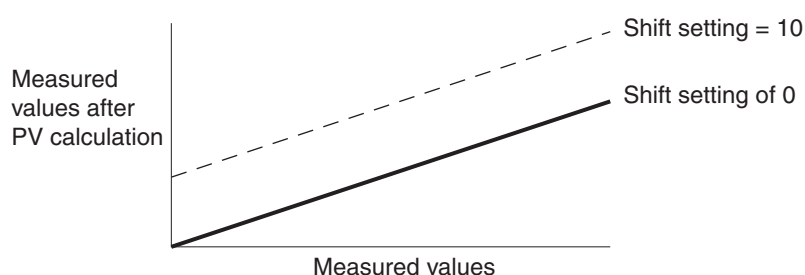
Select the channel to which subtraction and F value calculation is to be performed.

[PV shift function]

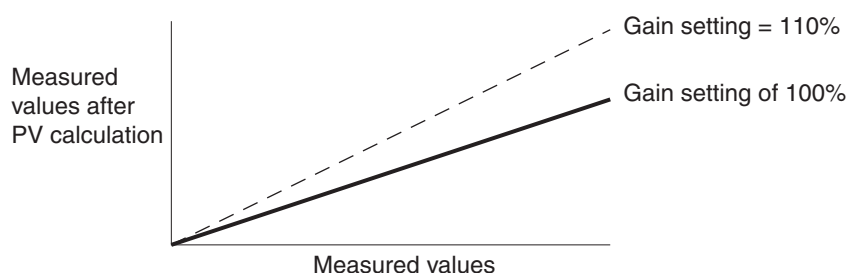
- Measured values can be calculated, recorded, and displayed with the PV shift constant.
- PV shift calculation can be achieved with the gain and shift values.

Conversion graphs relating to shift calculation and gain calculation are shown below.

- Shift calculation



- Gain calculation



- PV shift is calculated as follows;

$$P' = AP + B$$

Where,

P': Measured value after calculation of PV shift

P : Measured value

A : Gain (0.00 to 327.67%)

B : Shift values (engineering unit: -32767 to 32767, decimal point depends on input type)

* The measured value after PV shift calculation is limited so that it falls within the settable display range by input type set for each channel. The judgment of input error (such as Burnout, Error, and Over) is performed against the input and not for the result of shift or gain calculation.

- If input type is changed or the scaling function is turned ON/OFF, the PV shift set value for the channel is cleared. (If the scaling function is turned ON/OFF by the setting copying function, the PV shift set value for the channel is not cleared.)
- The Copy function allows you to copy set values, but it is not provided with a means of making copy of PV shift set values.

[Subtraction function]

- The result of subtraction of the values for 2 channels is recorded to the channel to be set.

Example: When the result of ch1-ch2 is recorded to ch1

$$\text{ch1}=\text{ch1}-\text{ch2}$$

- Be sure to perform subtraction between the channels having the same unit and decimal point position. Otherwise the record cannot be guaranteed.
- Subtraction is not performed for ch0.
- Limit is not set to the result of subtraction.

[F value calculation function]

From the measured temperature, the extinction value of bacteria by sterilization by heating can be calculated.

F value calculation formula

$$F \text{ value} = \sum \frac{10^{\left(\frac{(T - T_0)}{Z}\right)}}{60}$$

T: Measured temperature

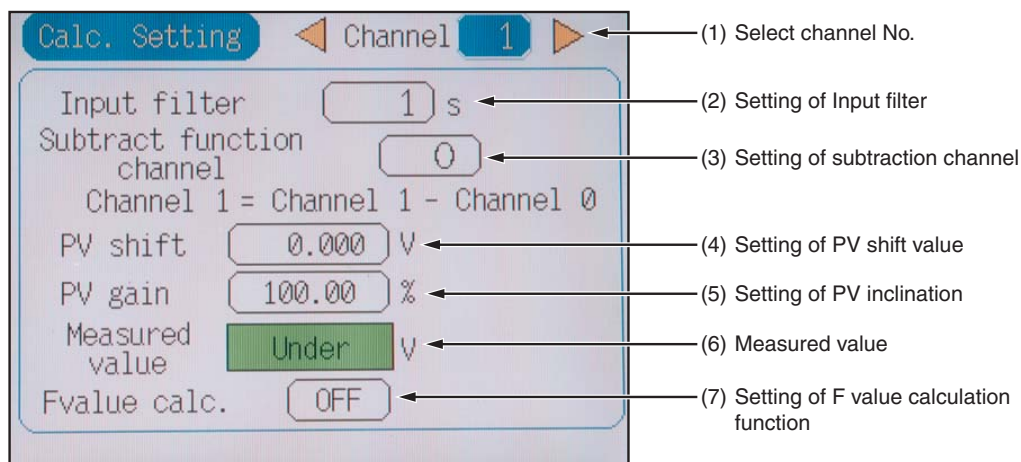
T0: Reference temperature

Z: Z value

- F value calculation is performed by the second.
- The measured temperature of the channel for which F value calculation is performed cannot be recorded.
- The unit field of the channel for which F value calculation is to be performed is kept blank, and the decimal place is set to the one designated in F value calculation setting screen that is common to all channels.
- The constants to be used for F value calculation (reference temperature, Z value, and decimal point position) are common to all channels.
- F value calculation can be reset manually or by DI.
- If input is abnormal, an error (such as Over, Under, Burnout, Error) is displayed, but 0 is recorded.
- F value calculation can be performed only with a decimal temperature value expressed to the tenth decimal place.

[Operation]

Select “Channel” → “Calculation” from the Parameter Set screen, so the “Calc. Setting” screen appears.



- (1) To select channel No.

Select the channel No. by using the cursor key.

- (2) To set input filter (primary delay filter)

Move the cursor to “Input Filter” and select numerical values by the cursor key.

Input filter range: 0 to 900 sec (step of 1 sec)

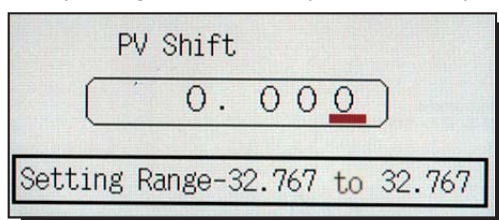
- (3) To select subtraction channel

Move the cursor to the box next to “Subtraction function channel” and select the channel No. for which subtraction is to be performed using the cursor.

- (4) To set PV shift value

Move the cursor to “PV Shift” and press the **ENT** key. So, the “PV Shift” screen appears as shown below.

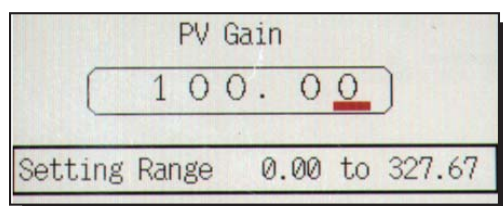
Enter PV shift value by using the cursor key and **ENT** key.



- (5) To set PV gain

Move the cursor to “PV Gain” and press the **ENT** key. So the “PV Gain” screen appears as shown below.

Enter PV inclination by using the cursor key and **ENT** key.



- (6) Measured value

The measured value will vary with a change in the set value such as PV shift set value and PV gain set value.

- (7) F value calculation function

Select F value calculation “ON” or “OFF” using the cursor.

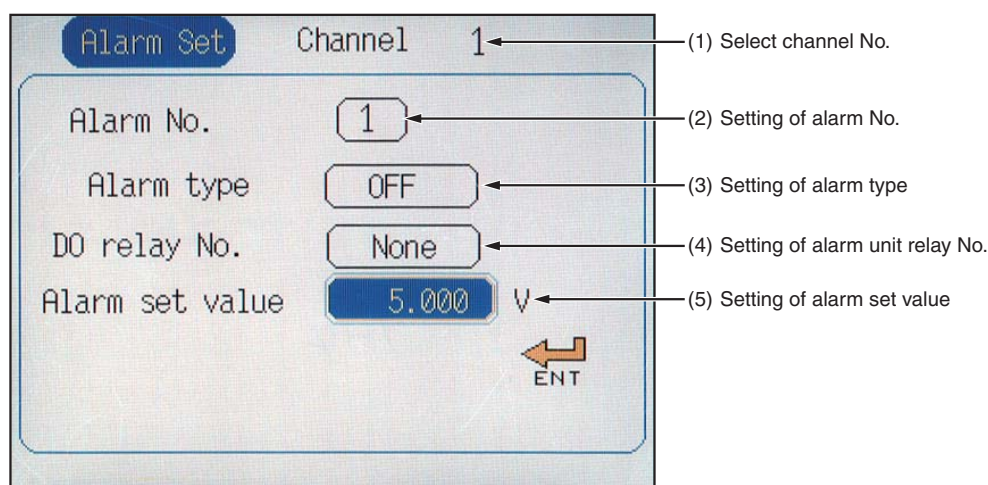
8.6 Alarm setting

[Explanation]

- Channel : Set the channel No. for the alarm
- Set alarm No. : Up to 4 alarms can be set for a single channel.
- Alarm type : Set in both “H” and “L” (for a single alarm)
When it is set to “OFF”, an alarm type stops.
- DO relay No. : Set the optional alarm unit relay number (1 to 28, No output for “Without”)
- Alarm set value: Set in terms of engineering unit (alarm for absolute value)

[Operation]

Select “Channel” → “Alarm Setting” from the “Parameter Setting” screen, and the “Alarm Set” screen appears.



- (1) To select channel No.

Select the “Channel No.” by using the cursor key.

- (2) To set alarm No.

Select “Alarm No.” by the cursor key.

- (3) To set alarm type

Select Yes/No from the Alarm type (H and L) by the cursor key.

- (4) To set alarm unit relay No.

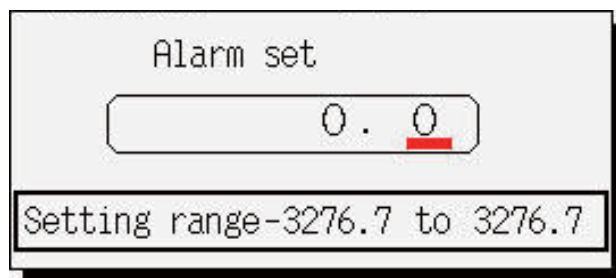
Select the alarm unit relay number using the cursor key. (Option)

- (5) To set alarm set value

Move the cursor to “Alarm set value” and press the **ENT** key. So, the “Alarm Set” screen appears as shown below.

Enter Alarm set value by the cursor key and then press the **ENT** key for confirmation.

- Note:**
- With logarithmic display setting ON, alarm set value may be different from the value set in the alarm setting screen.
 - With logarithmic display setting ON, alarm set value changes if the measurement range setting and the engineering value setting are changed.
 - If a relay is not provided, the alarm is displayed in the event summary, but relay output is not produced.



8.7 Setting for F value calculation (Setting common to all channels)

[Explanation]

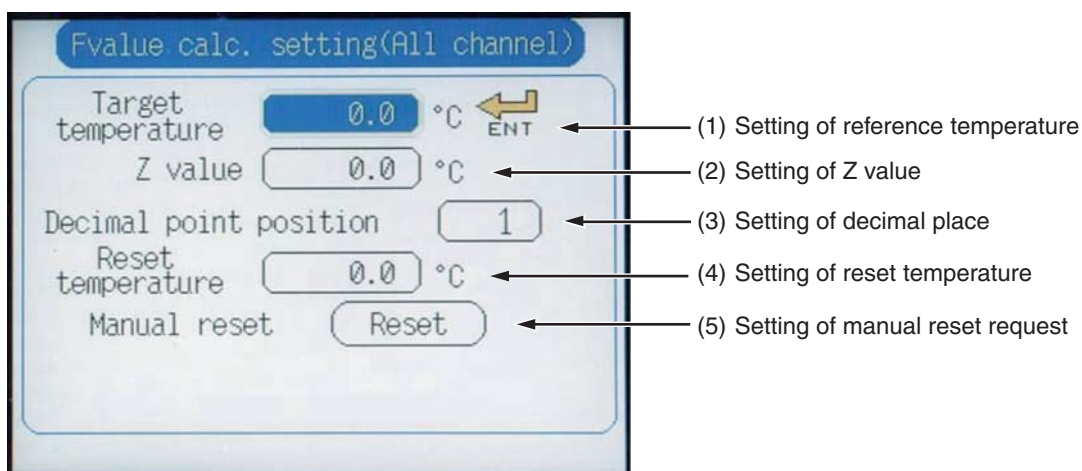
- Select the calculation constants to be used for F value calculation (Extinction value calculation of bacteria by sterilization by heating) that are common to all channels.

F value calculation constants: Reference temperature, Z value, Decimal point position

- F value calculation can be manually reset.

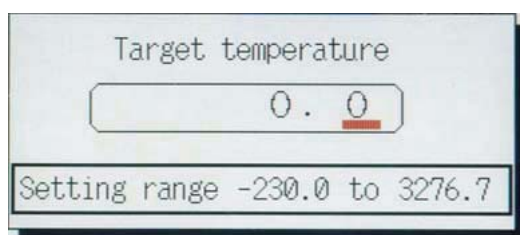
[Operation]

Select “Channel” and then “F value setting” on the “Parameter Setting” screen to display the F value calculation setting screen shown below.



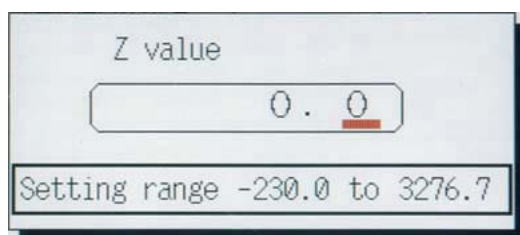
- (1) To set target temperature

Move the cursor to the box next to “Target temperature” and press the **(ENT)** key, and the following target temperature setting screen appears. Enter the target temperature using the cursor and the **(ENT)** key.



(2) To set Z value

Move the cursor to the box next to “Z value” and press the **ENT** key, and the following Z value setting screen appears. Enter Z value using the cursor and the **ENT** key.



(3) To set decimal point position

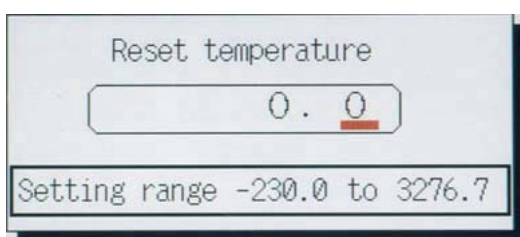
Move the cursor to the box next to “Decimal point position” and enter decimal point position using the cursor.

(4) To set reset temperature

If input temperature is lower than the set temperature, F value operation is not performed.

Move the cursor to reset temperature and press the **ENT** key, and the reset temperature setting screen (below) appears

Enter reset temperature using the cursor key and the **ENT** key.



(5) Manual reset request

To reset the F value manually, move the cursor to the box next to “Manual reset” and press the **ENT** key.

Note: If F value calculation is performed, F value for the ch is displayed.

Simultaneous display and recording of F value and temperature is performed as follows.

(Example)



ch	Input type	Calculation	Display/recording
ch1	K thermocouple	—	Temperature is displayed and recorded.
ch2	Other channel input (ch1)	F value calculation	F value is displayed and recorded.

8.8 Parameter copy

[Explanation]

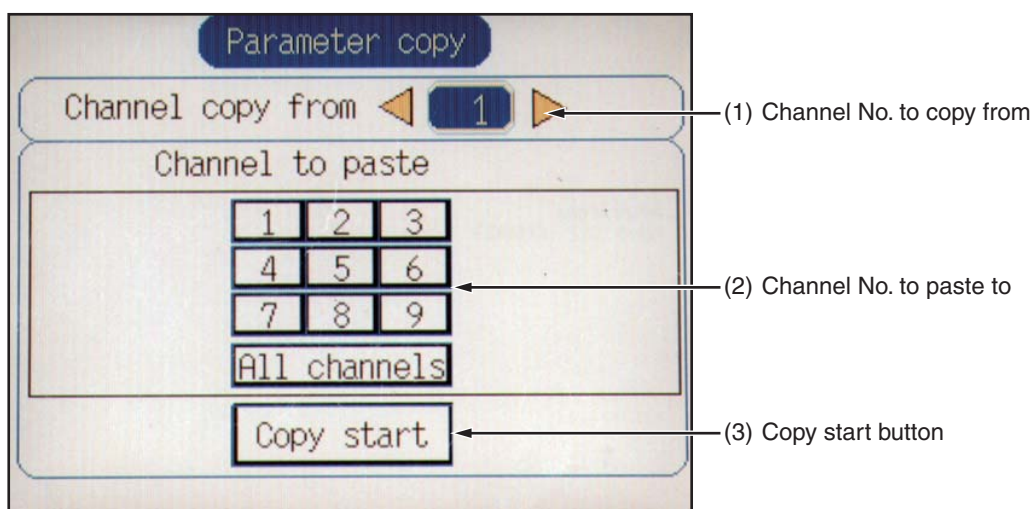
This screen allows you to copy parameters at one channel to other channels.

The set data that can be copied includes input type, input filter, scaling, display range, unit, TAG No., alarm set value, and subtraction channel.

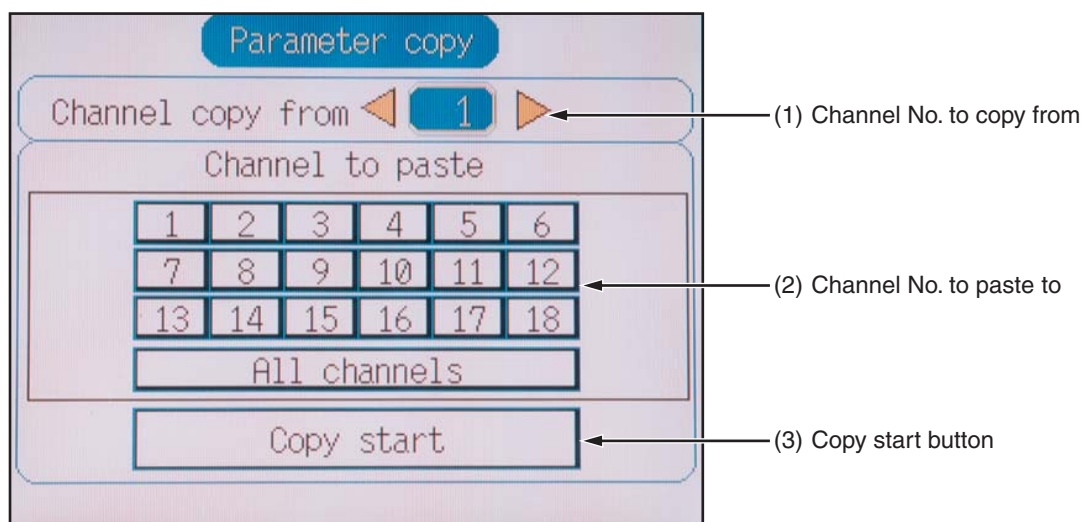
[Operation]

Select “Channel” → “Copy” from the “Parameter Set” screen, and the “Parameter Copy” screen appears.

Copy screen for the number of input points of 9



Copy screen for the number of input points of 18



(1) Channel No. to copy from

Select “Channel copy from” using the cursor key.

(2) Channel No. to paste to

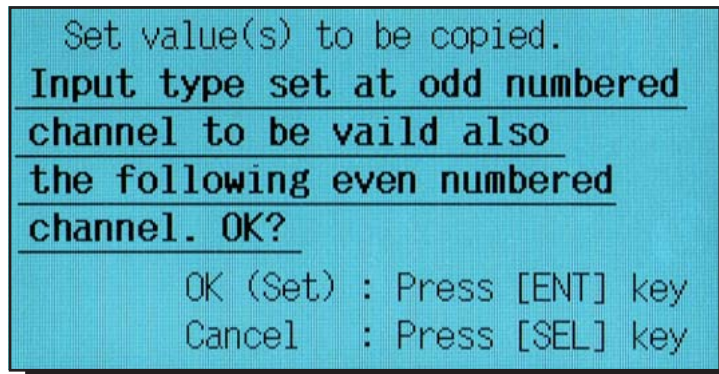
Select “Channel to paste” using the cursor key and the **ENT** key. (Select “All channels” to paste to all channels.)

(3) Copy start button

Press the **ENT** key, and the “Guidance” screen appears as shown in the next page.

Press the **ENT** key to copy, and select the **ENT** key to cancel.

Guidance screen for the number of input points of 9

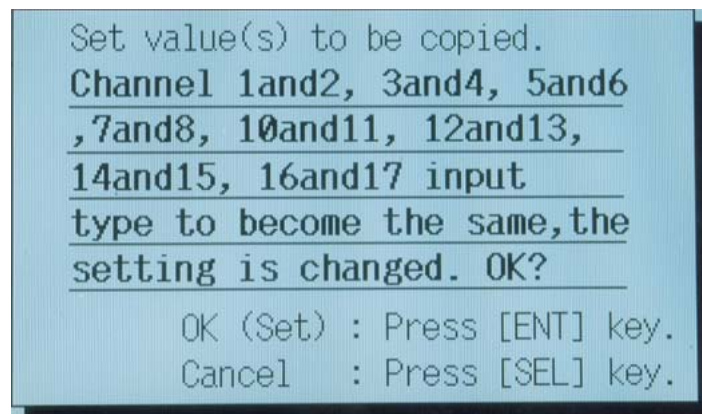
A screenshot of a guidance screen with a blue background and black text. The text is as follows:

Set value(s) to be copied.
Input type set at odd numbered
channel to be valid also
the following even numbered
channel. OK?

OK (Set) : Press [ENT] key
Cancel : Press [SEL] key

This screen provides instructions for copying input types between odd and even numbered channels. It asks for confirmation to proceed with the copy operation.

Guidance screen for the number of input points of 18

A screenshot of a guidance screen with a blue background and black text. The text is as follows:

Set value(s) to be copied.
Channel 1and2, 3and4, 5and6
,7and8, 10and11, 12and13,
14and15, 16and17 input
type to become the same,the
setting is changed. OK?

OK (Set) : Press [ENT] key.
Cancel : Press [SEL] key.

This screen provides instructions for copying input types between specific channel pairs (1&2, 3&4, 5&6, 7&8, 10&11, 12&13, 14&15, 16&17) to make them the same. It asks for confirmation to proceed with the copy operation.

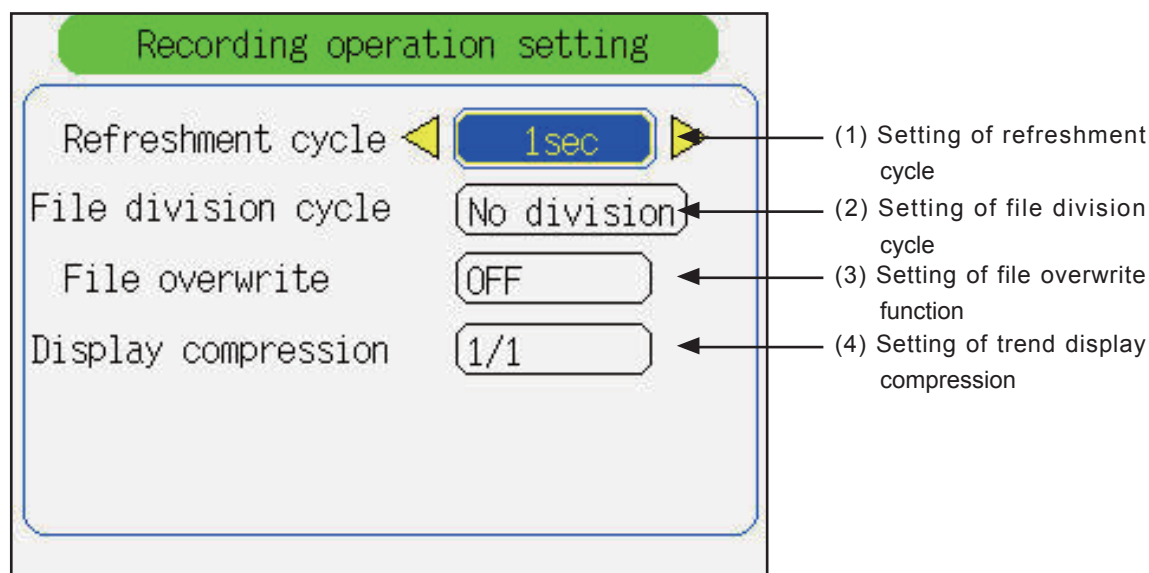
8.9 Setting for display refreshment cycles

[Explanation]

This screen allows you to set trend refreshment cycles, and recording file division cycle.

[Operation]

Select “Display Record” → “Disp. Cycle” from the “Parameter Set” screen, and the “Display Refreshment Cycle Setting” screen appears.



(1) To set “Display refreshment cycle”

Select the cycle time (1 sec, 2 sec, 3 sec, 5 sec, 10 sec, 20 sec, 30 sec, 1 min, 2 min, 3 min, 5 min, 10 min, 20 min, 30 min, 1 h, 2 h, 3 h, 4 h, 6 h, 12 h) by the cursor key.

Relationship between “Refreshment Cycle” and “Chart Speed” (on screen) is given below.

Refresh cycle	1 sec	2 sec	3 sec	5 sec	10 sec	20 sec	30 sec
Chart speed (as converted)	1296mm/h	648mm/h	432mm/h	260mm/h	130mm/h	65mm/h	43mm/h

Refresh cycle	1 min	2 min	3 min	5 min	10 min	20 min	30 min
Chart speed (as converted)	22mm/h	11mm/h	7.2mm/h	4.3mm/h	2.2mm/h	1.1mm/h	0.7mm/h

Refresh cycle	1 hour	2 hours	3 hours	4 hours	6 hours	12 hours
Chart speed (as converted)	0.36mm/h	0.18mm/h	0.12mm/h	0.09mm/h	0.06mm/h	0.03mm/h

When the initial refreshment cycle will start at 00: 00: 00 when the refreshment continues after the start of the recording

(Example)

When refreshment cycles are set to 1 min, the next cycle begins at m hour: n minute: 0 sec.

(2) To set “File division cycle”

Move the cursor to “File division cycle” and then press the **(ENT)** key to display the File division cycle setting screen.

If “No division” is selected, the recorded file is not divided automatically.

If “1 hour,” “1 day” or “1 week” is selected, the archived file is divided hourly, daily or weekly from the start of recording.

If “1 month” is selected, the recorded file is divided at 0:00 on the first day of every month.

Note 1) If the “File division cycle” setting is shorter than the “Display refreshment cycle” setting, the recorded file without data is created.

Note 2) If “1 hour,” “1 day” or “1 week” is selected as the file division cycle, the number of data of the first file is one larger than that of the second and the subsequent files.

Note 3) When file divide function is used, it is impossible to display the previous recorded file which is divided on the historical trend screen. The divided previous recorded file can be displayed on the record data display screen.

Note 4) Even if you select “No division” for the file division cycle setting, when the size of recording file becomes 256MB or more, a new file is created automatically to continue recording.

If you select “1 week” or “1 month” for the file division cycle setting, when the size of recording file becomes 256MB or more before the pre-set file division cycle, a new file is created automatically to continue recording.

(3) To set File overwrite function

Select ON/OFF of File overwrite function with the cursor key.

If “ON” is selected, the oldest data is deleted and the newest data is adopted when the compact flash becomes full during recording. File overwrite function is operated as follows.

- If the free space of the compact flash reduces to 1M byte or less, the oldest data is deleted.
- The maximum number of recording files that can be saved in the compact flash is 1350. If the number of files is more than 1350, the oldest data is deleted regardless of the free space of compact flash.
- If the possible capacity of compact flash (including deletable recording file) is less than 10MB, File overwrite function does not operate.

(Note)

When the division function is not operated or when there is only 1 file in the compact flash which becomes full, file overwrite function is suspended even if the division function is operated.

(4) To set Trend display compression

Select compression rate of the trend display (1/1, 1/10, 1/30, 1/60) with the cursor. For example, when refresh cycle is set to 1 sec, trend display is updated as follows.

Compression rate	1/1	1/10	1/30	1/60
Display time	1 sec	10 sec	30 sec	60 sec

(Note)

- Historical display screen cannot be compressed.
- The compression rate cannot be changed during recording.

8.10 Setting for TAG. No., display range, and record mode

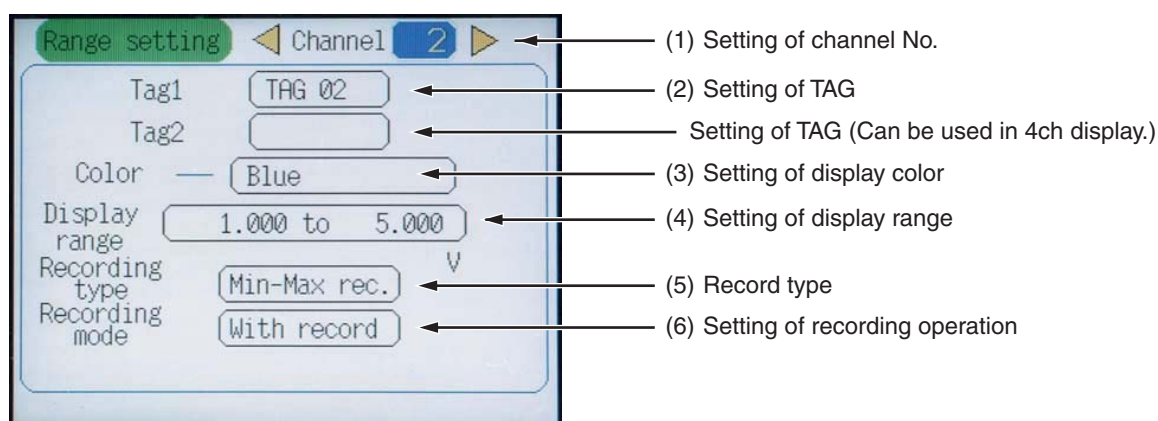
[Explanation]

This “Range Setting” screen allows you to set “TAG”, “Display Range”, and “Recording Mode” for each channel.

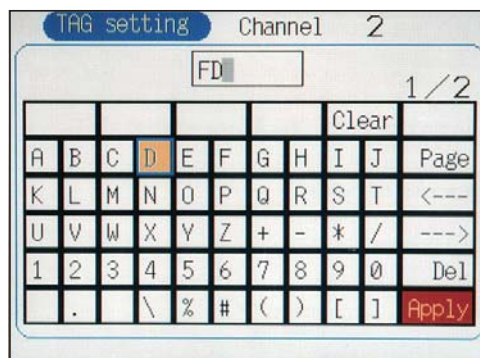
- TAG : Set TAG (TAG name) using alphanumeric characters consisting of up to 8 digits.
Up to 8 characters (half-size) can be entered. Note, however, that on some screens such as trend screen, only 7 characters can be displayed.
- Display color : Set the color to be displayed.
- Display Range: Set the “Display Range” (engineering unit).
It means scales of 0% and 100% within the display range.
When using DC voltage input scaling set, set the display range after setting the scaling. When setting the scaling, the decimal point of the display range is the same as decimal position set in terms of engineering unit.
- Recording Mode : Set either display and record or display.

[Operation]

Select “Disp.Rec.” → “Range Setting” from the Parameter Set screen. So, the “Range Setting” screen is displayed.



- (1) To select Channel No.
Select channel No. by using the cursor key.
- (2) TAG. 1 setting
Move the cursor to “TAG” and press the **ENT** key. So, the “TAG Setting” screen appears as shown below. Enter the TAG name by the cursor key and press the **ENT** key for confirmation.
After entry of the TAG name, press the “Apply”, and then press the **ENT** key.
On 4ch display screen, TAG can be displayed in 2 stages. The second stage TAG is provided for that purpose.



(3) To set display color

Move the cursor to the box next to the display color and press the **ENT** key, and the following color selection window appears. Select the display color using the cursor and the **ENT** key.



(4) To set "Display Range"

Move the cursor to "Display Range" and press the **ENT** key. So, the "Range Set" screen appears as shown below. Enter "Range" by the cursor key, and press the **ENT** key for confirmation.

For the setting range, refer to Table 1, "Display Range Set Range".

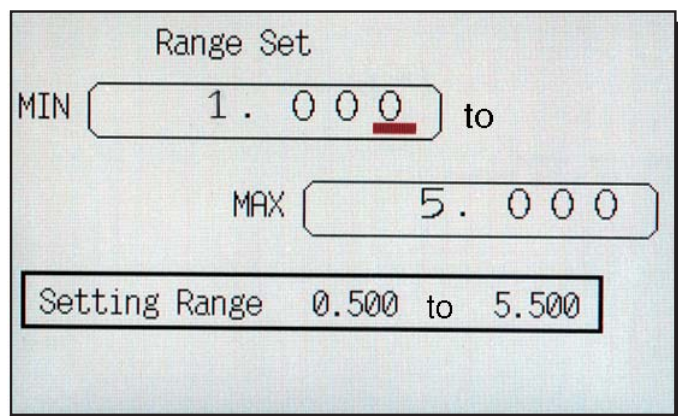


Table 1 Display Range Set Range

Type		Input range	Display range set range
Thermocouple	B	400 to 1760°C	370.0 to 1790.0°C
	R	0 to 1760°C	– 30.0 to 1790.0°C
	S	0 to 1760°C	– 30.0 to 1790.0°C
	K	–200 to 1370°C	–230.0 to 1400.0°C
	E	–200 to 800°C	–230.0 to 830.0°C
	J	–200 to 1100°C	–230.0 to 1130.0°C
	T	–200 to 400°C	–230.0 to 430.0°C
	N	0 to 1300°C	– 30.0 to 1330.0°C
	W	0 to 1760°C	– 30.0 to 1790.0°C
	L	–200 to 900°C	–230.0 to 930.0°C
	U	–200 to 400°C	–230.0 to 430.0°C
	PN	0 to 1300°C	– 30.0 to 1330.0°C
Resistance bulb	JPt100	–200 to 600°C	–230.0 to 630.0°C
	Pt100	–200 to 600°C	–230.0 to 630.0°C
DC voltage		0 to + 50mV	– 10.00 to + 55.00mV
		0 to +500mV	– 10.0 to + 550.0mV
		+ 1 to + 5V	+ 0.500 to + 5.500V
		0 to + 5V	– 0.100 to + 5.500V

(5) Type of recording

Type of recording can be selected from the following three.

- **Max/Min recording:**

The maximum and the minimum values in recording cycle are recorded. For example, assume that the input is changed as shown below when recording cycle is set to 1 minute (recording is made in 1 minute cycle). The recorded values at this time appear as follows.

Example:

Input value	
15:12:01	150.2
	↓ (No change)
15:12:14	150.2
15:12:15	135.3 (Sudden temperature change)
15:12:16	135.3
15:12:17	150.2 (Reset)
	↓ (No change)
15:12:47	150.2
15:12:48	152.4 (Temperature change)
	↓ (No change)
15:12:51	152.4
15:12:52	150.2 (Reset)
15:13:00	150.2 ← Recorded here

Record data			
	CH01MIN	CH01MAX	
2004/7/7	15:13	135.3	152.4

- **Instantaneous value recording:**

The instantaneous value in recording cycle is recorded.

Compared with Max/Min recording, longer recording time in CF card is allowed because the data recorded in recording cycle is reduced from 2 to 1.

Recording is made as follows in the above example.

	CH02PV
2004/7/7 15:13	150.2

- **Average value recording:**

The average value in recording cycle is recorded.

Compared with Max/Min recording, longer recording time in CF card is allowed because the data recorded in recording cycle is reduced from 2 to 1.

Recording is made as follows in the above example.

	CH03AVG
2004/7/7 15:13	144.8

(6) Setting “Record mode”

Select either “With Record” or “Display Only” by the cursor.

When setting “Display Only”, trend display on the Trend screen and history display on the Historical screen are not carried out. Further, nothing is recorded except for display of measured values.

CAUTION

Recording at input error

If the input signal is “Burnout,” “Error,” “Over” or “Under,” recording is made as follows.

Recording type	Burnout	Error	Over	Under
Max/Min value recording	–32768	–32768	32767	–32767
Instantaneous value recording	–32768	–32768	32767	–32767
Average value recording	0	0	0	0

8.11 Setting for messages

[Explanation]

- When various events occur, messages can be displayed.
- Up to 10 messages of 32 characters each can be registered.
- The message can be set with alphanumeric characters.
- Message timing to be displayed can be set at “ON/OFF of Alarm”, and ON/OFF of DI input.
- Message data can be recorded only in an event file of the memory card.
- You can add the time and the measured data of the channels to the messages by performing the setting of the following special comments for the messages.
 - (1) “@Y”: replaced with the year (3 words) when the message is created. Example: ‘08
 - (2) “@D”: replaced with the month and day (5 words) when the message is created. Example: 06/09
 - (3) “@T”: replaced with the time (5 words) when the message is created. Example: 12:00
 - (4) “@C01” to “@C30”: replaced with the measured data of the specified channel (7 words) when the message is created. Enter the desired channel number after “C.” Example: – 0.005

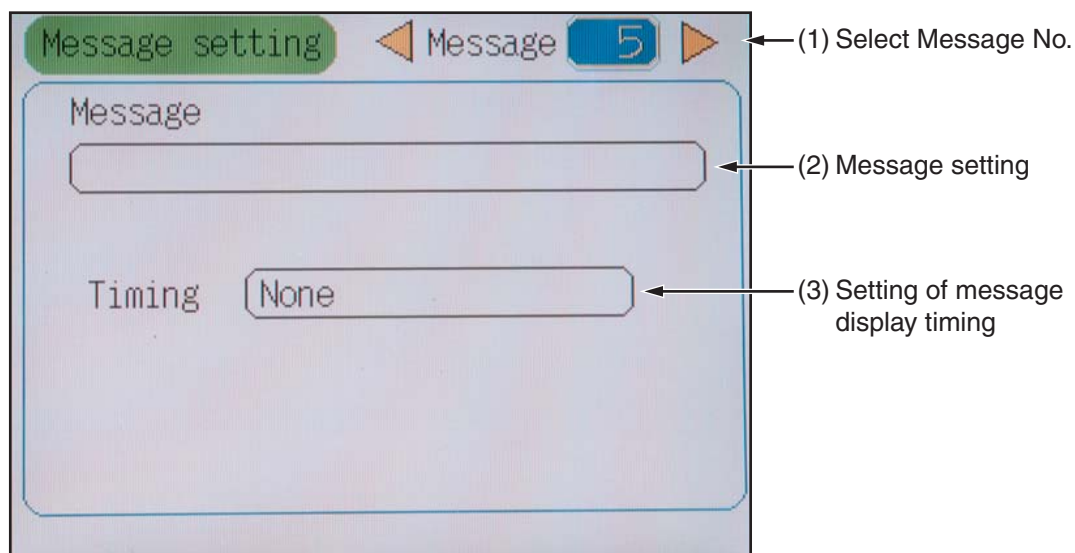
The following is an example of message recorded by the comment settings mentioned above.

Example: Message setting : @Y_@D_@T__CH1_@C01__mV

Created message: ‘08_06/08_12:00_CH1__ – 0.005_mV

[Operation]

Select “Disp.Rec.” → “Message Setting” from the “Parameter Setting” screen. So, the “Message Setting” screen appears.



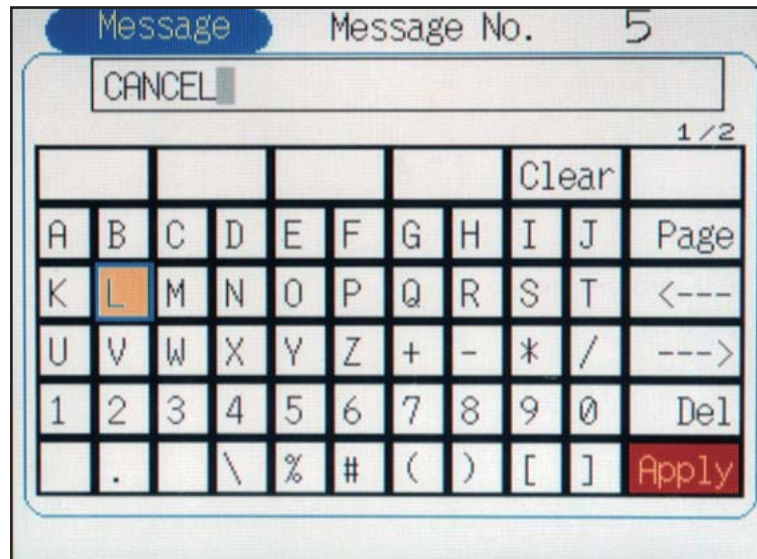
- (1) To select Message No.

Select “Message No.” by the cursor key.

(2) To set messages

Move the cursor to “Message” and press the **ENT** key. So, the Message screen appears as shown below. Enter message by the cursor and press the **ENT** key for confirmation.

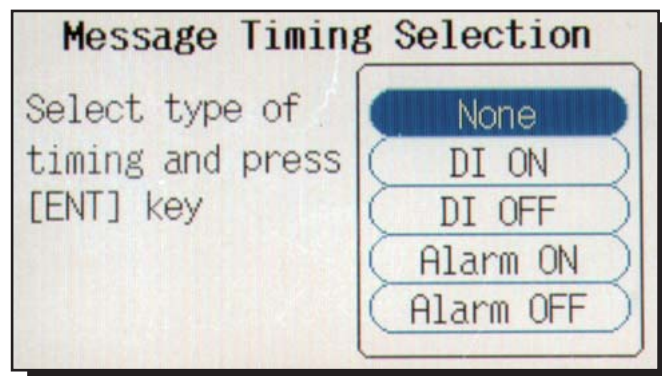
After entry of the message, press “Apply” to register the message, and then the **ENT** key.



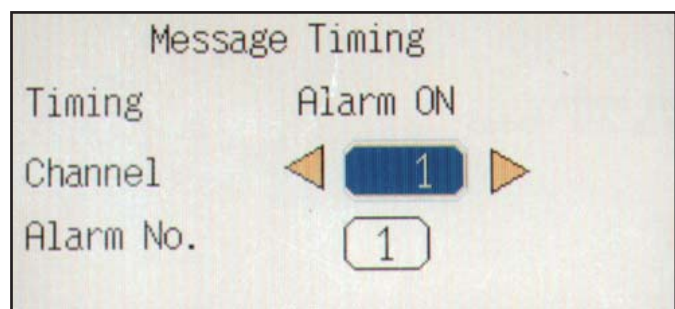
(3) To set the message display timing

Move the cursor to “Timing” and press the **ENT** key. So, the “Message Timing Selection” screen appears as shown below.

For “Alarm OFF” and “Alarm ON”, refer to Item 8.6.



Select any item by the cursor key and press the **ENT** key. After selection, the “Message Timing” screen appears as shown below. Set the “Channel” and “Alarm No.” by the cursor key. After setting them, press the **ENT** key for confirmation.



8.12 Setting for data display screen

Four combinations of the input channels you want to display (called screen structure or group screen) can be set on the data display screen.

8.12.1 Screen setting 1

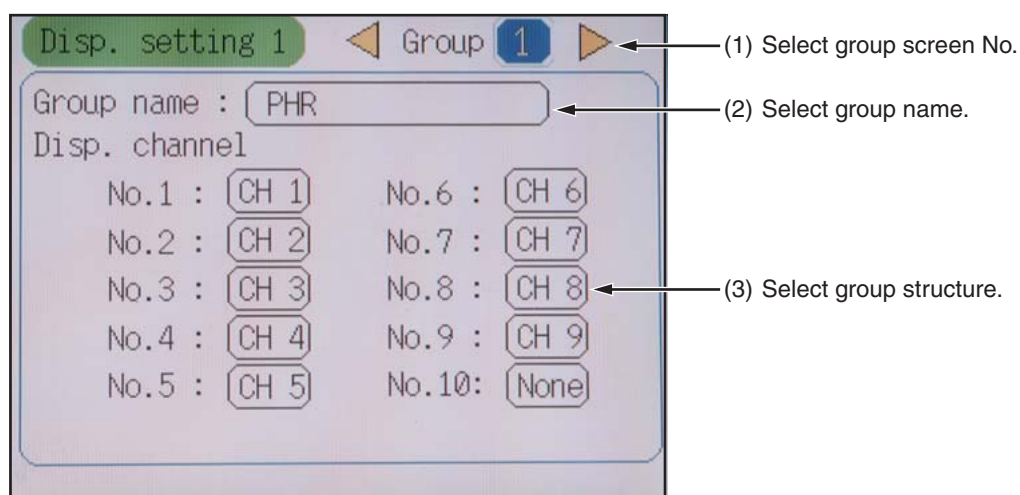
[Explanation]

Screen setting 1

- Set the name of group screen using alphanumerical characters. Up to 16 characters can be entered.
- Set the screen structure (group screen) on the data display screen.

[Operation]

Select “Disp.Rec.” and then “Disp. setting 1” on the parameter setting screen to display the setting screen.



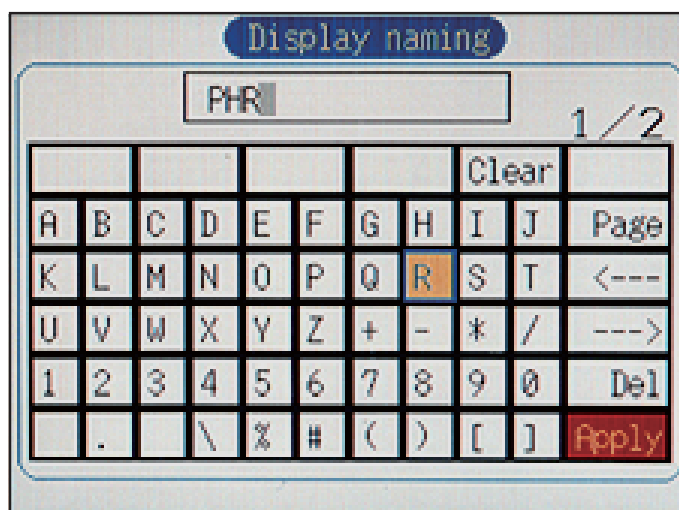
- (1) To select group screen No.

Select the group screen No. you want to make setting change using the cursor key.

- (2) To set group name

Move the cursor to “Group name” and press the **ENT** key, and the following character entering screen appears. Enter the screen name using the cursor and the **ENT** key.

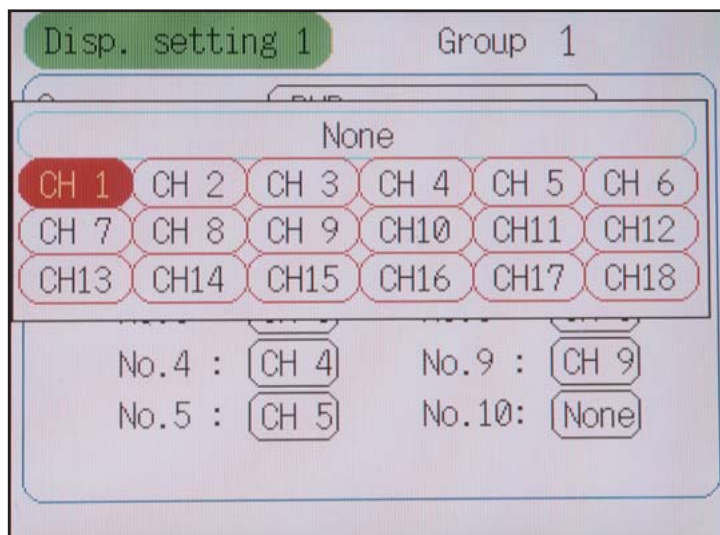
When the name is entered, press the **ENT** key in “Apply” position to register the screen name.



(3) To set group structure

Move the cursor to the channel No. you want to make setting change on the screen structure screen and press the **(ENT)** key, and the following channel setting screen appears.

Note: The following figure is a channel setting screen for the number of inputs of 18.



Select channel No. using the cursor and the **(ENT)** key.

Selecting "None" does not make recording at that position on the data display screen.

The following is the relation between the No. of the screen structure and the data display screen.

No.1	No.2	No.3	No.4	No.5
CH 1	CH 2	CH 3	CH 4	CH 5
2.812	1.406	69.6	34.7	284.5
2.812	1.406	69.6	34.7	284.5
CH 6	CH 7	CH 8	CH 9	CH10
314.2	2.427	1.212	0.000	0.000
314.3	2.428	1.212	0.000	0.000
No.6	No.7	No.8	No.9	No.10

8.12.2 Screen setting 2

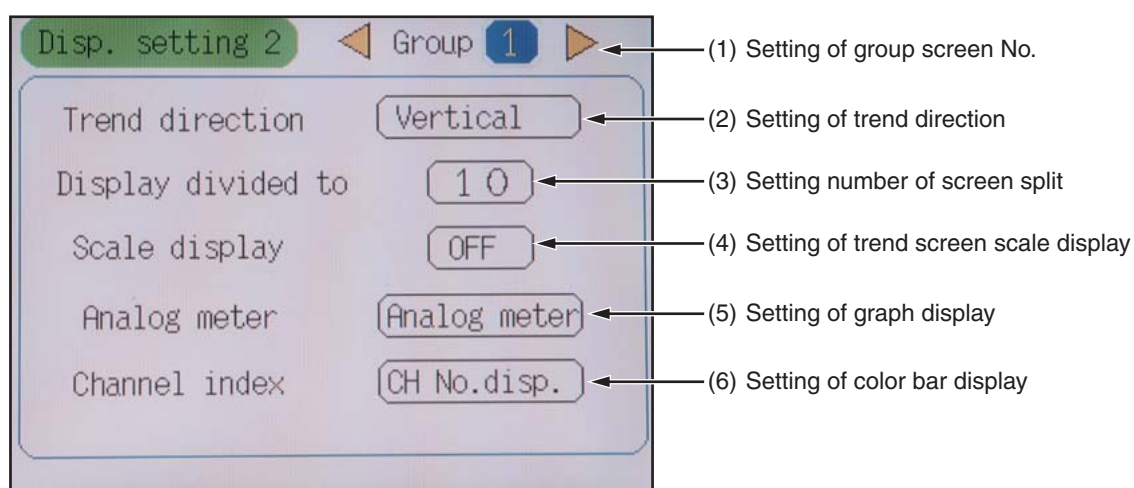
[Explanation]

Screen setting 2

- Set the direction (vertical or horizontal) of the trend screen (real time trend screen or historical trend screen).
- Set the number of screen split.
- Set the display/non-display of the scales on the trend screen.
- Select either Bar graph or analog meter display as a display method of the measured value.
- Select one from TAG No. display, unit display, and channel No. display.

[Operation]

Select “Disp.Rec.” and then “Disp. setting 2” on the parameter setting screen to display the setting screen.



- (1) To set group screen No.

Select the group screen No. for which you want to make setting change using the cursor.

- (2) To set trend direction

Select either “vertical” or “horizontal” for trend display direction using the cursor key.

- (3) To set the number of screen split

Move the cursor to the item of number of screen split, and select using the ◀ or the ▶ key. Setting the scale display of the trend to ON allows the screen to be split according to the scale irrespective of the screen split setting.

- (4) To set trend screen scale display

Move the cursor to the item of trend scale display, and select “OFF” or “ON.” The scale of the displayed ch can be arbitrarily changed using the (ENT) key.

Note: If the input type is changed with a chart remaining on the trend data screen, correct display cannot be obtained.



- (5) To set graph display

Select either “Bar graph” or “Analog meter” for graph display using the cursor key.

* Analog meters are displayed only for four channels from No.1 to No.4 in the screen structure.

- (6) To select color bar display

Select one from “Channel No. display,” “TAG No. display,” and “Unit display” using the cursor key.

* Seven characters only can be displayed as TAG No. on the color bar.

In the case of 4 channel display

The following 2 types are displayed out of Channel No., TAG 1, TAG 2, and Unit according to the color bar display selection setting.

Color bar display selection	Channel No. display	TAG No. display	Unit display
Color bar display selection	Channel No. TAG 1	TAG 1 TAG 2	TAG 1 Unit

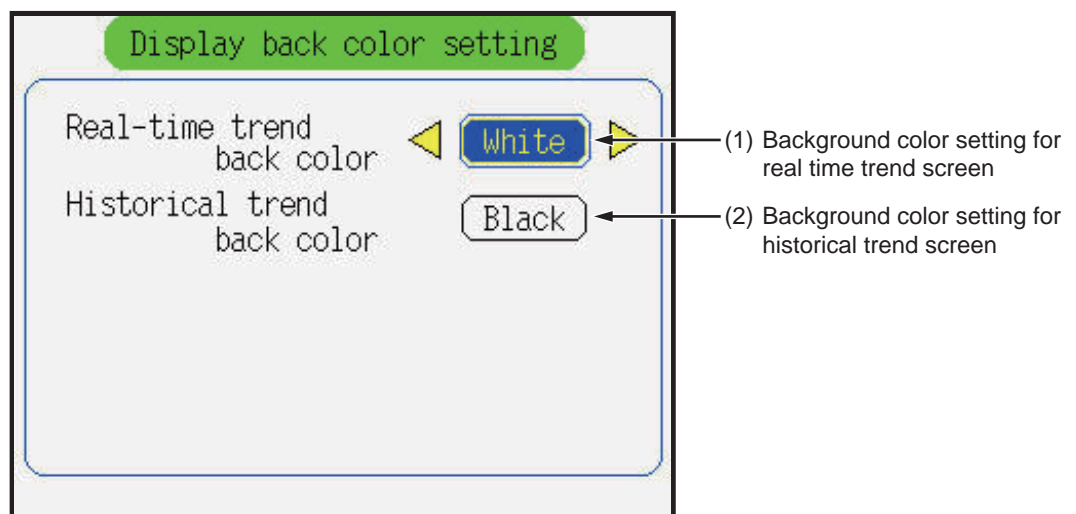
8.13 Background color setting for the real time trend screen and historical trend screen

[Description]

Set background color for the real time trend screen and the historical trend screen.

[Operation]

Select “Display Record” → “Background color” from the “Parameter Set” screen, and the “Background color” of the trend screen appears.



(1) Background color setting for real time trend screen

Select background color for the real time trend screen with the cursor.
“White” or “Black” can be selected.

(2) Background color setting for historical trend screen

Select background color for the historical trend screen with the cursor.
“White” or “Black” can be selected.

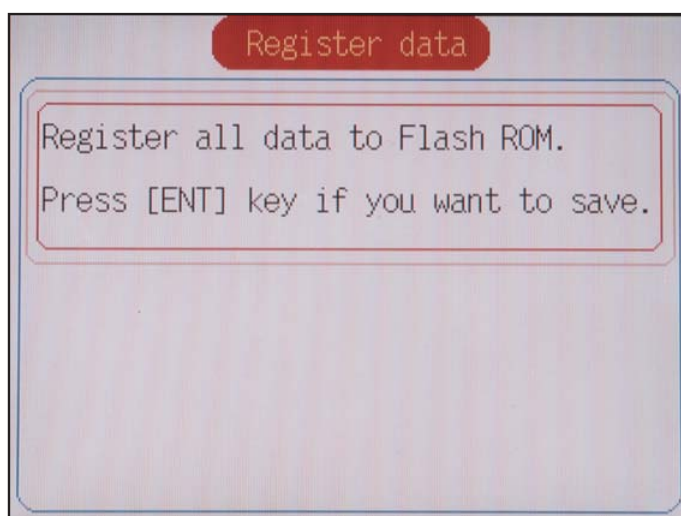
8.14 Registering method of set values (saving to flash memory)

[Explanation]

To return the set values such as “Channel” and “Disp.Rec.” to the original ones when the power is turned ON, the set value can be saved to the internal memory of the recorder.

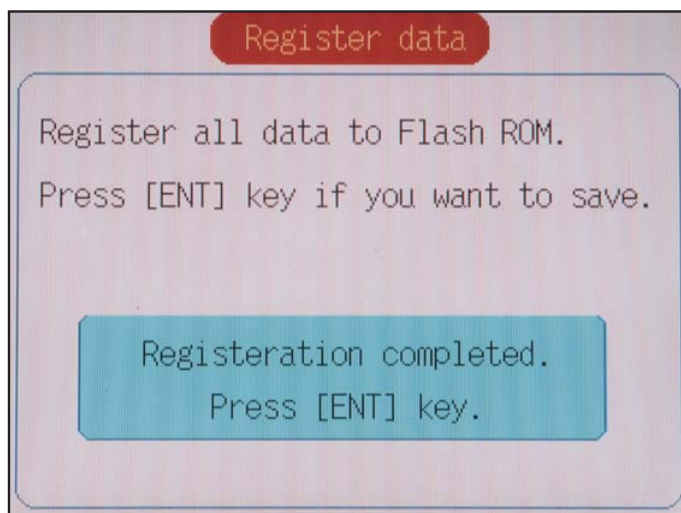
[Operation]

Select “Main Unit” → “Register data” from the “Parameter Setting” screen. So, the “Register data” screen appears.



To save set values to the internal memory, press the **[ENT]** key.

When pressing the **[ENT]** key, the currently displayed screen returns to the “Parameter Setting” screen without saving the set values. To return to the “Parameter Setting” screen after the set value has been saved, press the **[ENT]** key.



Note 1: When the parameter memory lamp blinks in red, it indicates that set parameters are not registered to the flash memory. Click “Register data” from the “Main Unit”.

Note 2: After parameters have been set, be sure to register the set value by selecting “Main Unit” → “Register data”. Otherwise, the set values returns to original values when turning OFF power.

8.15 Setting for LCD OFF time

[Explanation]

Move the cursor to LCD OFF time, and set LCD OFF time using the key (setting range: 0 to 60 min.)

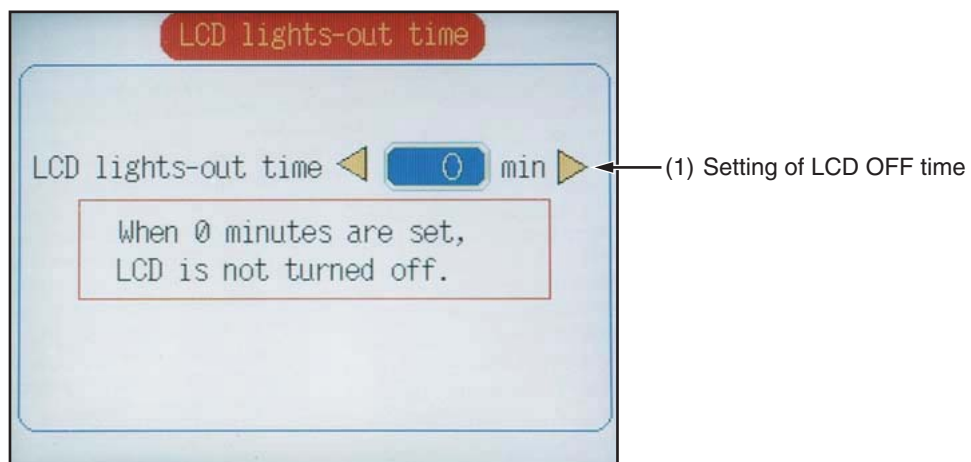
If key operation is not performed, the backlight of the LCD (screen) goes off automatically.

If key operation is performed while the backlight is kept off, it comes on. The backlight can also be turned on by DI setting.

If 0 min. is selected for OFF time, the light is kept ON.

[Operation]

Select “Main Unit” → “LCD OFF time” on the parameter setting screen, and the LCD OFF time screen appears.



(1) To set LCD OFF time

Change the setting using the cursor key on both sides. Then press the **DISP** key, and the trend screen appears again.

[Explanation]

The “Unit Define” screen allows you to make units with up to 7 alphanumeric characters. Up to 12 types of units can be registered. The unit can be verified by the unit selection given in Item 8.4.

[Operation]

Select “Main Unit” → “Unit Define” from the “Parameter Setting” screen. So, the “Original Unit Definition” screen appears.

Original Unit Definition

Move the cursor to the unit box that remains blank by the cursor key. By pressing the **ENT** key, the “Unit Naming” screen appears.

Enter a unit by the cursor key and then press the ENT key for confirmation.

After entry of the unit, select the “Apply” to register the unit code, and press the **ENT**.

Unit naming Unit No. 1

N/cm2 2/2

										Clear	
a	b	c	d	e	f	g	h	i	j	Page	
k	l	m	n	o	p	q	r	s	t	<---	
u	v	w	x	y	z	+	-	*	/	--->	
1	2	3	4	5	6	7	8	9	0	Del	
	{	}	@	°	_	<	>			Apply	

Note: Blank is counted as a character. If the space for all the 7 characters is blank, further setting cannot be made.

8.17 Setting for DI (external control unit) function

[Explanation]

Up to 10 DI points can be optionally selected. The following operation can be performed with every DI.

(1) Start/stop of record

Using DI, start/stop of the record can be switched.

- The record can also be started/stopped from the keypad on the front face.
- Start/stop switching function of the record is judged according to rise/fall edge of DI.
OFF → ON (Rise): Recording start (No change if the recording is made from the start.)
ON → OFF (Fall): Recording stop (No change if the recording is stopped from the start.)

(2) F value calculation reset

F value calculation can be reset using DI.

- F value calculation reset is judged based on Rise/Fall edge of DI.
OFF → ON (Rise): F value calculation is reset.
ON → OFF (Fall): No change

(3) Start/Stop of totalizing

Totalizing can be started/stopped using DI.

- Start/stop switching function of totalizing is judged according to rise/fall edge of DI.
OFF → ON (Rise): Starts totalizing.
ON → OFF (Fall): Stops totalizing.

(4) Totalize reset

Totalized value can be reset using DI.

- Determine whether totalizing should be reset based on DI rise/fall edge.
OFF → ON (Rise): Reset totalizing.
ON → OFF (Fall): No change

(5) Screen ON

The screen (backlight) can be turned ON using DI.

(This function is valid only when the screen (backlight) is kept OFF by screen OFF function.)

The operation is carried out as follows.

Status	DI	
	OFF → ON	ON → OFF
Screen OFF	Screen OFF → ON	No change
Screen ON	No change	No change

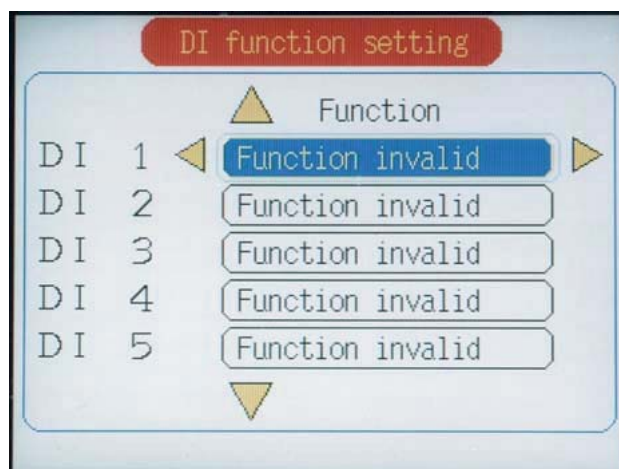
(6) Message set

Message can be set using DI.

- In distinct from the function described in (1) to (5) above, message set can be set on the message setting screen.
- Message set function also works if the functions described in (1) to (5) shown above are allocated to DI. (Both the function allocated to DI and the message set function are operated.)

[Operation]

Select “Main unit” then “DI setting” on the parameter setting screen to display the DI function setting screen.



Move the cursor to DI No. to which DI function is to be set.

Select one from “Function Invalid,” “Record start/stop switching,” “F value calculation reset,” “Totalize start/stop switching,” “Totalize reset,” and “Screen ON” using the cursor key.

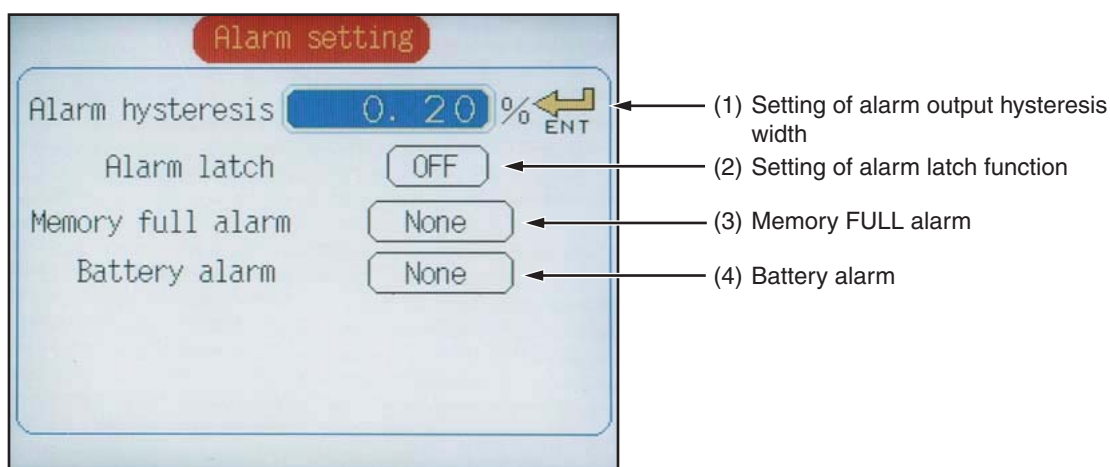
8.18 Alarm setting (whole, memory FULL, battery)

[Explanation]

- Alarm hysteresis width can be set at the low limit and high limit of an alarm (settable within the display range of 0 to 100%).
- Alarm latch function can be performed with ON/OFF. Even if an alarm starts or is cancelled, alarm display and output are held).

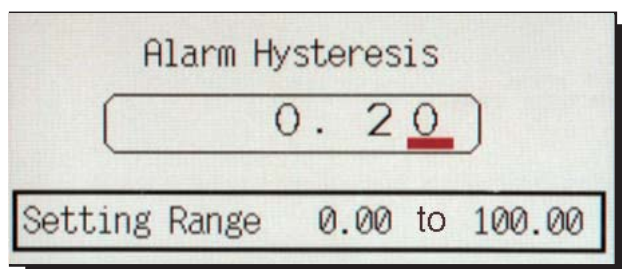
[Operation]

Select “Main Unit” → “Alarm setting” on the parameter setting screen, and the alarm setting screen appears.



(1) To set the alarm output hysteresis width

Move the cursor to “Alarm Hysteresis” and press the **(ENT)** key. The “Alarm Hysteresis” screen appears (as shown below). Enter hysteresis width (0 to 100%) by the cursor key and then press the **(ENT)** key for confirmation. It is applicable to all types of alarms. The numeric value is expressed as a percentage of the display range for each channel.



(2) To set alarm latch

The alarm function is protected by setting the alarm latch even after the cause of the alarm has been removed. To cancel the alarm latch, select it to OFF.

(3) Memory FULL alarm

Move the cursor to Memory FULL alarm, and make the setting using the key.

If the free space of the memory reduces to about 10%, the alarm is output to outside. Select the destination of the alarm output. (If the alarm is output to outside with 90% free space, it is not recorded in the event summary.)

(External output is optional. DO1 to DO10 are relay contact output, DO11 to DO28 are open collector (transistor) output.)

If None is selected, the alarm is not output.

If the memory becomes full, a display appears indicating the situation, irrespective of the setting of the item.

If the memory is replaced, external output is set to OFF, but the display on the screen does not disappear.

Press the **DISP** or the **SEL** key after replacement to make the display disappear.

(4) Battery alarm

Move the cursor to Battery Alarm, and make the setting using the key.

When the voltage of backup battery becomes low, the alarm is output to outside. Select the destination of the alarm output.

(External output is optional. DO1 to DO10 are relay contact output, DO11 to DO28 are open collector (transistor) output.)

If None is selected, the alarm is not output.

If the battery voltage becomes low, a display appears indicating the situation, irrespective of the setting of the item.

If the battery is dead, the clock setting or the data being totalized may be cleared when the power is turned OFF during totalize calculation. Replace the battery before it is dead.

Contact us or your nearest dealer for replacement.

(The period from the time when the battery alarm is issued to the time when the backup is made completely invalid cannot be guaranteed because of the characteristics of batteries. Therefore, if the alarm is issued, immediately upload the settings using parameter loader software attached to the main unit to store them on the PC. Otherwise the set data may be lost.)

Note: Alarm latch cannot be selected for memory FULL alarm and battery alarm.

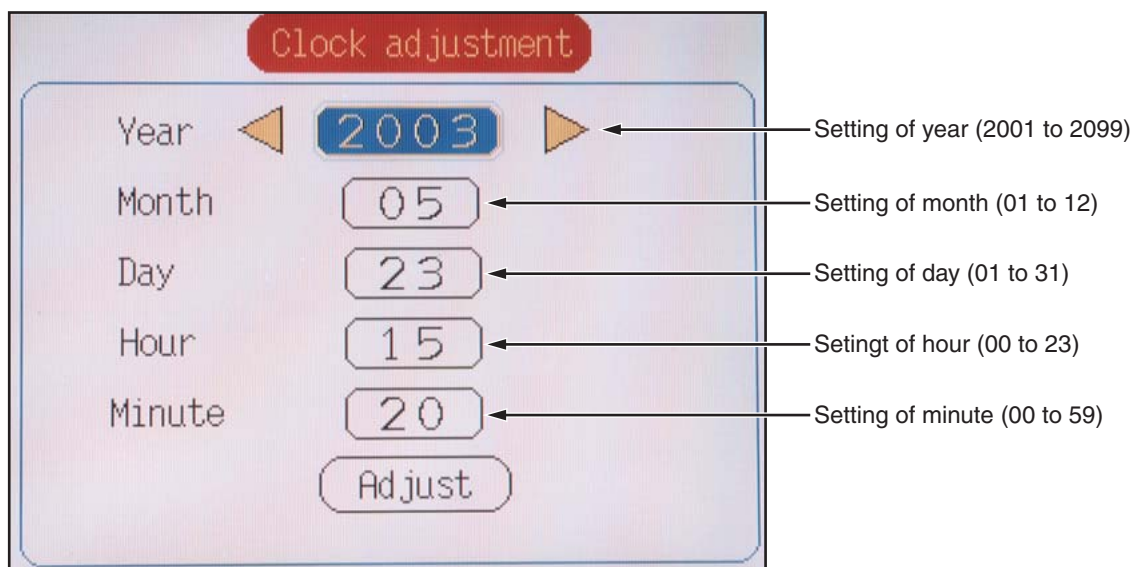
8.19 Adjustment method of clock

[Explanation]

This screen allows you to adjust the time (year, month, day, hour, and minute) according to the time signal. After adjusting the time, press the **(ENT)** key.

[Operation]

Select “Main Unit” → “Clock Adj.” from the “Parameter Setting” screen. So, the “Clock Adjustment” screen appears.



Move the cursor to each item (year, month, day, hour, and minute) by using the cursor key.

Use the cursor key to change values.

After the clock has been adjusted, move the cursor to “Adjust” at the lower of the screen and press the **(ENT)** key. So, the following message appears. Pressing the **(ENT)** key again returns to the Parameter Set screen.

Clock adjustment completed.
Press [ENT] key

- Reference 1:** The clock is factory-set to the current time before delivery. Since it is backed-up by a lithium-ion battery, it is always running with power interruption or power OFF. The lithium battery has a service life of about 10 years at normal temperature of 25°C.
- Reference 2:** The time scale is divided into 24 hours. The range is set from 00: 00 to 23: 59
- Reference 3:** A “second” is not settable. But, the inside of the clock is treated as follows. After setting the “minute”, press the **(ENT)** key at the “Adjust” position. Then, the clock runs with the second counter set to 0.

8.20 Setting for record data format

[Explanation]

Select record data format from ASCII or binary format.

Each format has the following characteristics.

ASCII format

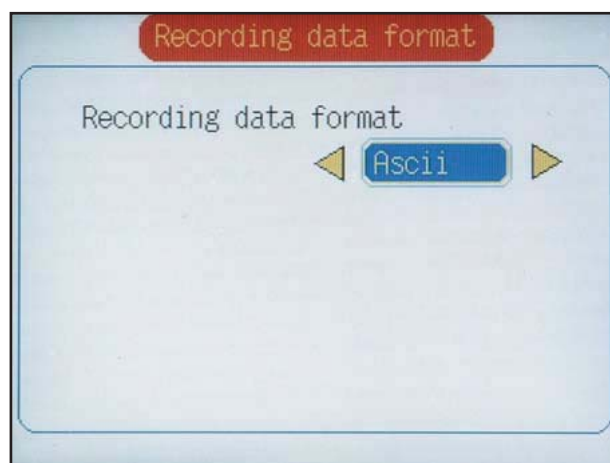
- Record data can be directly opened on Excel or with text editor.
- The number of data that can be recorded is about 1/4 that of binary format.

Binary format

- Record data cannot be directly opened on Excel or with text editor.
Open the record data with supplied data viewer software and convert it in CSV file, and the data can be opened on Excel or with text editor.
- The number of data that can be recorded is about 4 times that of ASCII format.

[Operation]

- 1) Select “Main Unit” → “Record Data Format” on the parameter setting screen, and the record data format screen appears.



- 2) Setting record data format

Change the setting using the cursor key on both sides.

Then press the **DISP** key, and the trend display screen appears again.

8.21 Setting for RS485 communication function

[Explanation]

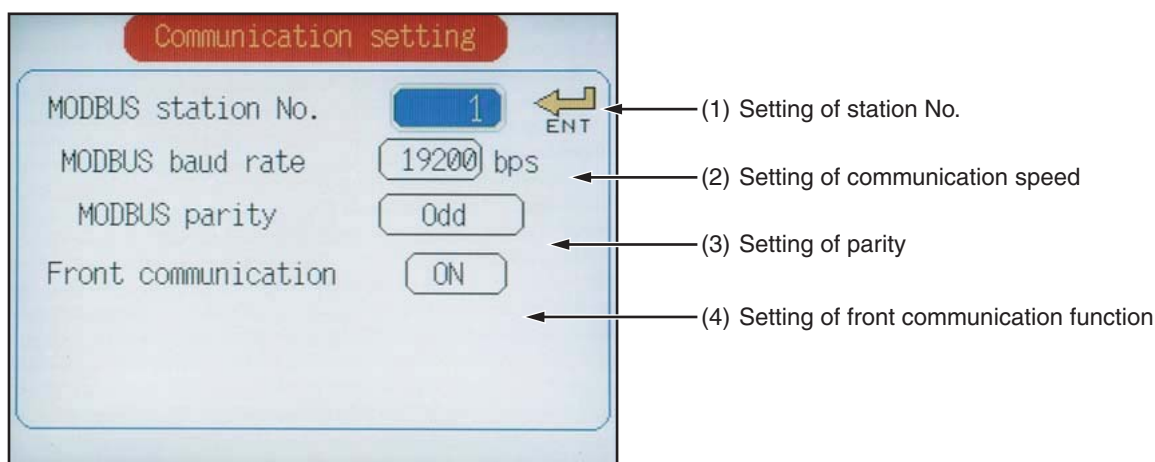
Communication is allowed with RS485 (conforming to MODBUS RTU protocol).

Make the setting on this screen.

To make the parameter setting valid, be sure to save the set parameter and then turn off the power and turn it on again.

[Operation]

- Select “Main Unit” → “Communication Setting” on the subsequent page and then press the **ENT** key, and the communication setting screen appears.



- (1) To set station No.

Move the cursor to Station No. and press the **ENT** key, and the station No. On the station No. setting screen that appears, set MODBUS station No. in the range from 0 to 255. If 0 is selected, communication is not carried out. Be careful not to select the station No. of other slave devices in the same communication line. Otherwise proper communication cannot be carried out on the communication line.

When the setting of this parameter is changed, save the setting and then turn off the power and turn it on again. Otherwise the changed setting cannot be made valid.

- (2) To set communication speed

Move the cursor to Communication Speed, and set the communication speed (baud rate [bps]) (9600 or 19200 [bps]) using the cursor keys on both sides.

- (3) To set parity

Move the cursor to Parity, and select the parity of communication from Odd, Even, and None using the cursor keys on both sides.

- (4) To set front communication function

Keep it set to ON.

(If OFF is selected, communication error occurs to loader software. If communication error should occur, set it to ON, save the setting, turn off the power and turn it on again.)

8.22 Setting the Ethernet function

[Explanation]

The paperless recorder can have the Ethernet function as an option.

The following are allowed with the Ethernet function.

- (1) FTP server function: The record file stored in the memory card can be fetched via the Ethernet.
- (2) Web server function: Measured value, integrated value, and event data stored in the recorder can be checked via the Ethernet
- (3) E-mail function: E-mails can be transmitted on occurrence of an alarm or at certain intervals.
- (4) MODBUS TCP/IP function: Setting can be read or written via the Ethernet using the parameter loader supplied with the recorder.

To connect the recorder to the Ethernet, select IP address, subnet mask, and default gateway, and make ON/OFF setting of each function.

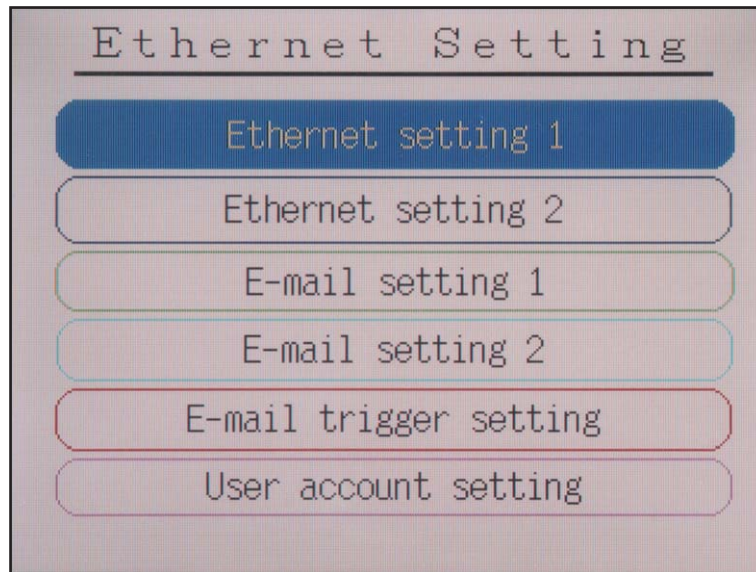
* Refer to the “Instruction Manual for Paperless Recorder Communication Function” for details of the setting.

Note:

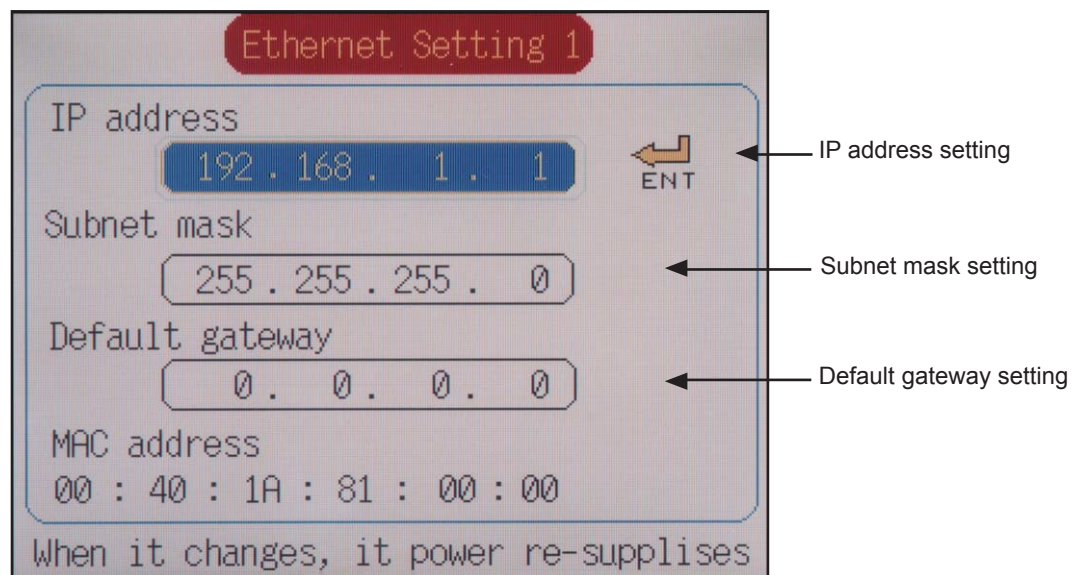
- Consult the system administrator to connect the recorder to the intra-company LAN.
- To enable this parameter after it is selected, store the set values, turn off the power, and turn it on again.
- Pay attention to the following when using the FTP server function.
 - (1) If FTP communication request is not issued for 10 minutes, the communication is automatically disconnected.
 - (2) The display operation of the paperless recorder may be slowed down when a large file is fetched.
 - (3) Do not remove the memory card of the main unit while it is accessed via the FTP communication. When the FTP server function is used, inhibit the access to the memory card on the “Removing memory card” screen before removing the memory card.
 - (4) Do not delete or change the name of the file with which recording or integration is being performed.

[Operation]

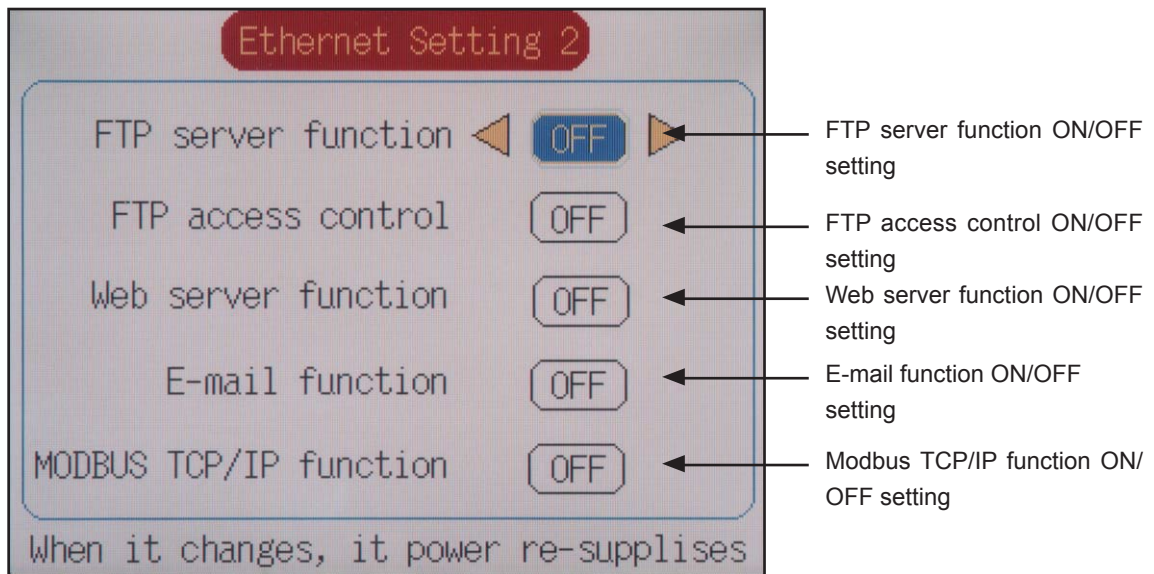
- (1) Select [Main unit setting] → [Ethernet communication setting] on the parameter setting screen, and the “Ethernet communication setting” screen appears.



- (2) Select “Ethernet communication setting 1,” and the following screen appears.



- (3) Then display the “Ethernet communication setting” screen again, and select “Ethernet communication setting 2,” and the following screen appears.



8.23 Setting E-mail function

[Explanation]

To use the E-mail function, set E-mail server address, address of the E-mail sender, E-mail sender, and the address of the destination of the E-mail.

Up to 8 addresses can be selected as the destination of the E-mail.

Refer to the “Instruction Manual for Paperless Recorder Communication Function” for details of the setting.

Note:

- To use the E-mail function, set the E-mail function to ON on the “Ethernet setting 2” screen.

[Operation]

- (1) Select [Main unit setting] → [Ethernet communication setting] → [E-mail setting 1] on the parameter setting screen, and the following screen appears.

E-mail setting 1

SMTP IP address
0 . 0 . 0 . 0

Sender's mail address

Sender's name

Mail server address

Sender's mail address setting

Sender's name setting

- (2) Then display the “Ethernet communication setting” screen again and select “E-mail setting 2,” and the following screen appears.

E-mail Setting 2 Page 1/2

Receiver's mail address
Address 1

Address 2

Address 3

Address 4

Receiver's mail address setting

8.24 Setting E-mail trigger function

[Explanation]

When using the E-mail function, make E-mail transmission trigger setting.

Up to 10 E-mail triggers can be registered.

Refer to the “Instruction Manual for Paperless Recorder Communication Function” for details of the setting.

Note:

- To use the E-mail function, set the E-mail function to ON on the “Ethernet setting 2” screen.

[Operation]

Select [Main unit setting] → [Ethernet communication setting] → [E-mail trigger setting] on the parameter setting screen, and the following screen appears.

E-mail trigger setting ◀ No. 1 ▶

Title ← E-mail title setting

Trigger timing ← E-mail trigger timing

Text1 ← E-mail send text setting

Text2 ← E-mail send text setting

PV value affixation ← PV value affixation ON/OFF setting

Receiver's add No. ← Receiver's address No. ON/OFF setting

Mail send test ← Mail send test

8.25 Setting the user account

[Explanation]

Set the user name, password, and the access level for connecting the recorder to the FTP server.

Up to 8 persons can be registered as users.

The access level of the user can be selected from “Administrator” and “Guest.”

The FTP server function is limited as shown below according to the access level selected.

	Administrator	Guest
FTP server function	Authorized to delete files	Not authorized to delete files
	Authorized to change file names	Not authorized to change file names

Refer to the “Instruction Manual for Paperless Recorder Communication Function” for details of the setting.

Note:

- Do not use a space character for password.

[Operation]

Select [Main unit setting] → [Ethernet communication setting] → [E-mail trigger setting] on the parameter setting screen, and the following screen appears.

The screenshot shows a screen titled "User account setting" with a sub-header "No. 1". The screen contains three input fields: "User name" (empty), "Password" (empty), and "User level" (set to "administrator").

8.26 Password setting

[Explanation]

Set the password to prohibit password to be changed, or recording start/stop. Entering passwords is required right after the following procedure is executed.

- When starting/stopping recording
- When entering the “Parameter Setting” screen.
- When entering the memory card-related setting screen

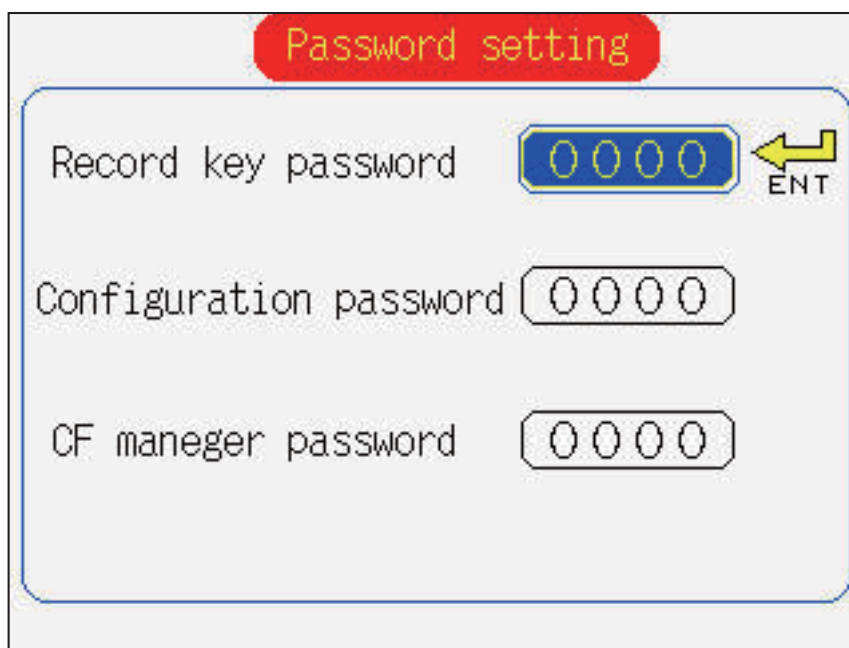
After parameter is set and doesn't need to be changed, password setting is recommended. It is due to prevent settings from being changed mistakenly by password.

(Note) If you forget the password, parameter cannot be changed. Be sure to print the following table after the password is set."

	Password
When starting/stopping recording	
Parameter setting display	
Memory card related setting display	

[Operation]

Select “Main Unit” → “Password Setting” from the “Parameter Setting” screen, and then press the **(ENT)** key. The password setting screen appears.



Move the cursor to the parameter to be changed. Pressing the **(ENT)** key displays the “Parameter Setting” screen. Set the password using the cursor, and press the **(ENT)** key. Set “0000” to reset the password setting.


8.27 Displaying record data of memory card

[Explanation]

The recorded data (trend data file) contained in the memory card set to the main unit can be displayed on the historical trend screen.

- The meaning of file name is as follows.
 - S00****.FDT: File name of the trend data file (A00****.FDT, which is an event data file, is not displayed.)

The part **** is substituted by 4-digit numerical value, and every time a new file is created, the value increases sequentially beginning from 0000.

- Every time a recording is started using the  key or by DI input, a new file is created.
A trend file and an event file are created as a set as a new file without fail.
- The date indicates the last time when the writing was conducted on the file.
- The file name cannot be changed on this screen. Read the data on the memory card with the PC, and change the file name on the PC.

Observe the following when changing the file name.

- 1) Change both the trend data file (Sxx.FDT) and the event data file (Axx.FDT)
- 2) Be sure to give the trend data file a name beginning with S, and give the event data file a name beginning with A.
- 3) Give the same name to the xxxx portion of Sxxxx.FDT and Axxxx.FDT. Otherwise the file cannot be opened.
- 4) The file cannot be opened with S.FDT or A.FDT.
- 5) Keep the length of the file name to 7 characters or less including S or A. The file with the name of 8 characters or longer cannot be opened.
- 6) Do not give the same file name to the part xxxx of Sxxxx.FDT and Axxxx.FDT in separate pairs.

Otherwise the program may not be properly operated and forced termination etc. may occur.

[Example]

Avoid giving the same file name, 88, to S88 in the upper stage and A88 in the lower stage as in the example shown below.

Before change

S01. FDT/A01.FDT	2002-11-19	10:00
S02. FDT/A02.FDT	2002-11-19	15:38

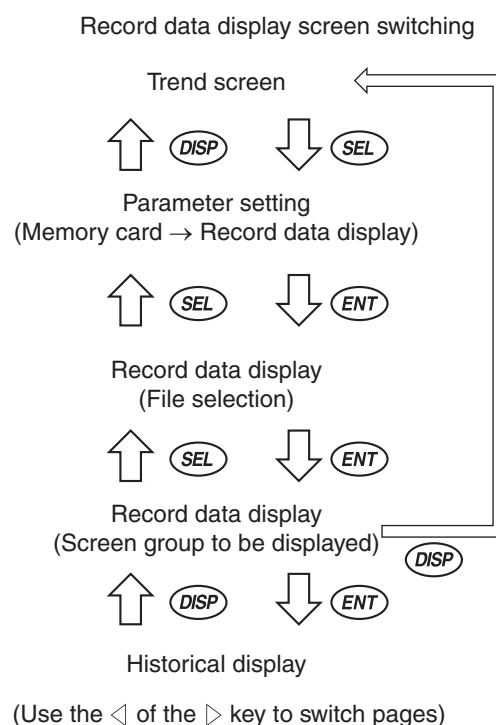
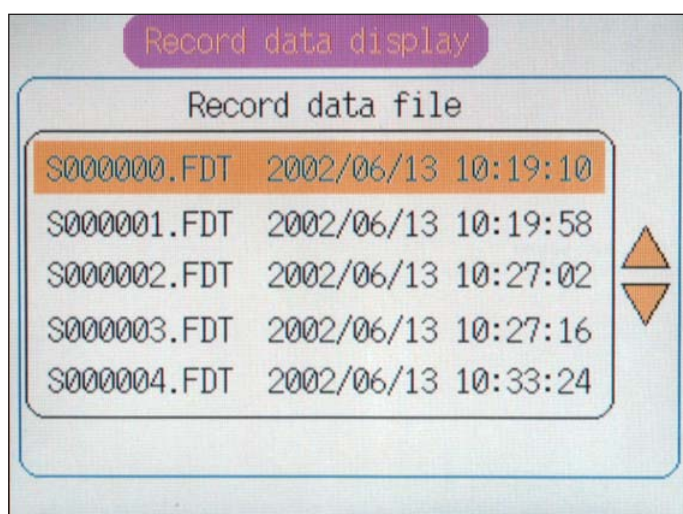
After change

<u>S88</u> . FDT/A01.FDT	2002-11-19	10:00
S02. FDT/ <u>A88</u> .FDT	2002-11-19	15:38

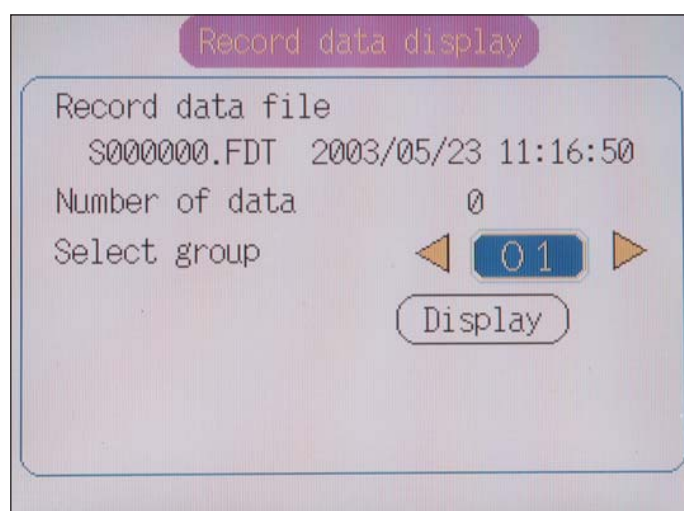
- 7) Be sure to enter the file name with one-byte characters. The instrument does not recognize two-byte characters.

[Operation]

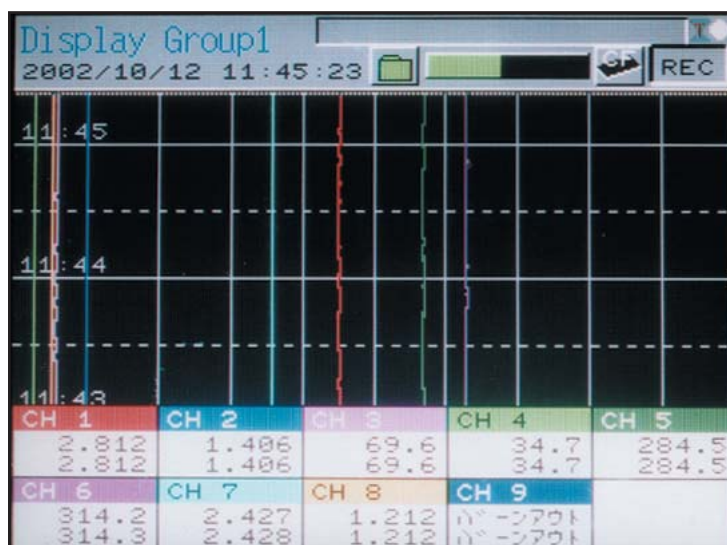
Select “Memory card” and then “Rec. data disp.” on the “Parameter Setting” screen to display the record data display screen.



- (1) Select the file to be opened using the cursor key, and then press the **ENT** key to display the following record data display screen.



- (2) Select the screen group No. to be displayed using the cursor key and press the **(ENT)** key, and the cursor moves to the “Display.” Then press the **(ENT)** key to display the historical trend screen of the group No. selected.



Refer to Item 6.7 “Historical trend display” for the method of seeing the historical trend screen.

Of the data read in from the memory card, the following settings are displayed not based on the setting made at the time of past recording but on the currently set value.

- Trend direction
- Number of screen split
- Trend scale display
- Color bar display selection

- (3) Press the **(DISP)** key on the historical trend screen, and the following display appears.



Enter the time you want to view on the display and press the **(ENT)** key, and the data at the specified time is displayed.

When time before the current time is entered, the specified time appears at the bottom of the screen.

When time after the current time is entered, the specified time appears at the top of the screen.

If the entered time falls within the range of the time currently displayed, the screen remains the same.

8.28 Removing memory card (compact flash)

[Explanation]

By prohibiting the writing to the memory card, the memory card can be removed without stopping the recording while recording or totalizing is in progress. Refer to [Operation] shown below for the removing procedure.

- If the internal buffer (memory) of PHR becomes full while the memory card is being removed, the record data is cut off.
- The internal buffer (memory) of PHR can store the data up to the following capacity.

(1) Record data and event data: Approximately 600k bytes

In case of MAX-MIN recording, 4 bytes is required for 1 record data.

In case of instantaneous value and average value recording, 2 bytes is required for 1 record data.
38 bytes is required for 1 event data.

When recording 9-channel in MAX-MIN recording, approximately 15300 data can be stored.

When the display refresh cycle is 1 second, data equivalent to 4 hours can be stored. The number of the save data varies depending on the number of the event data.

(2) Totalize data: 5k bytes

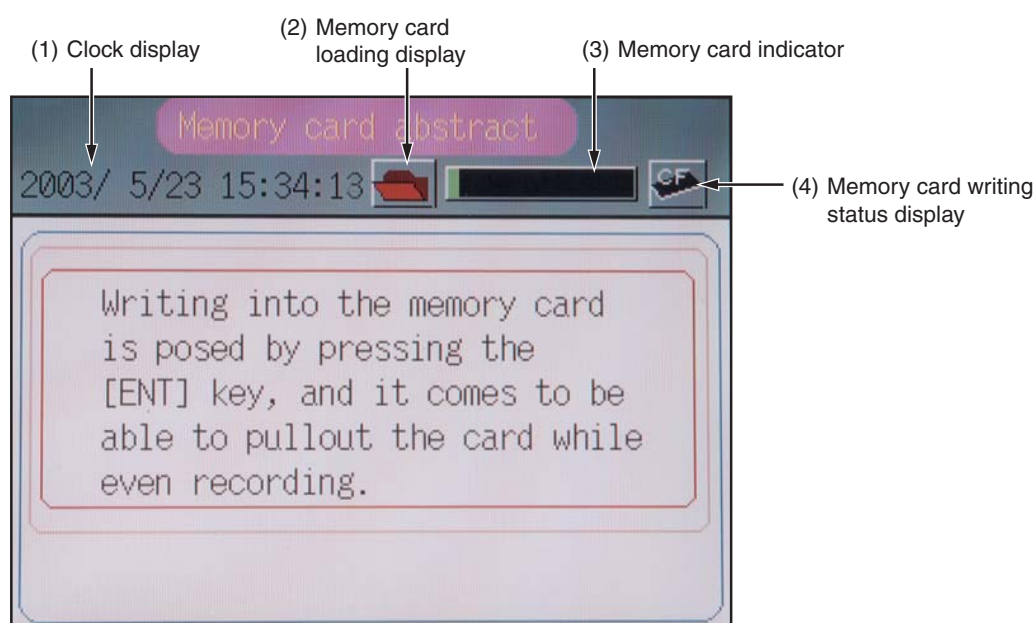
4 bytes are required for 1 totalize data.

When totalizing 9-channel, approximately 128 data can be stored. When totalizing once every 1 hour in daily report, data equivalent to 128 hours can be stored.

- When the memory card is reinserted after it is removed, a new record file (trend file, event file, or an totalizing file) is created.

[Operation]

Select “Memory card” and then “Card abstract” on the parameter setting screen to display the memory card removal screen.



(1) Clock display

Displays the date and the time.

(2) Memory card loading display

Displays the memory card loading status.

Flashing: Indicates the state where a memory card is not inserted.

Lit in green: Indicates the state where the memory card can be removed.

Lit in red: Indicates the state where the memory card cannot be removed.

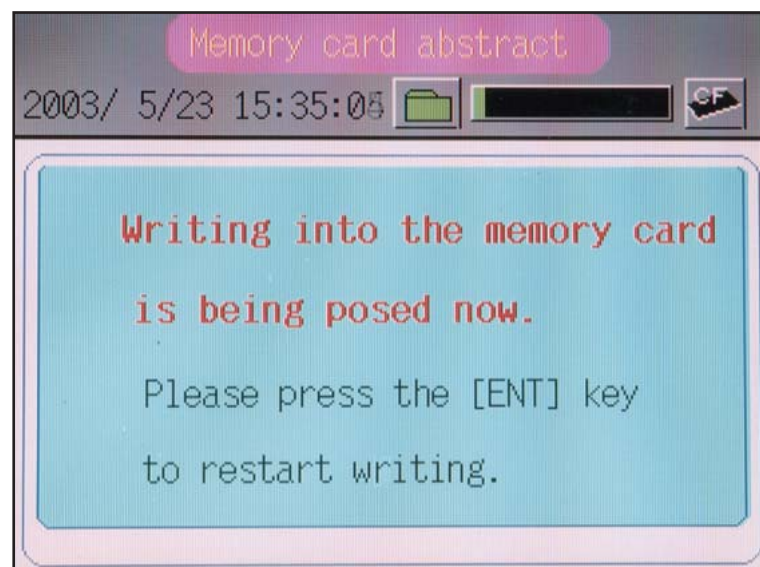
(3) Memory card indicator

Displays the usage of the memory card in a bar graph. Lit in red when 90% of the whole capacity has been used up.

(4) Memory card writing status display

Kept lit while the measured data is being written into the memory card.

Pressing the **(ENT)** key displays the following screen, and the writing into the memory card is prohibited. Check that the memory card loading display is lit in green, and then remove the memory card and back up the recorded data. Then insert the memory card once again and press the **(ENT)** key. The parameter display screen is displayed and the prohibition of writing into the memory card is released.



8.29 Reading settings

[Explanation]

The setting file within the memory card that is set in the main unit can be read.

The setting file of the recorder (*****.PHR) can be created on the recorder main unit and the parameter loader supplied with the recorder.

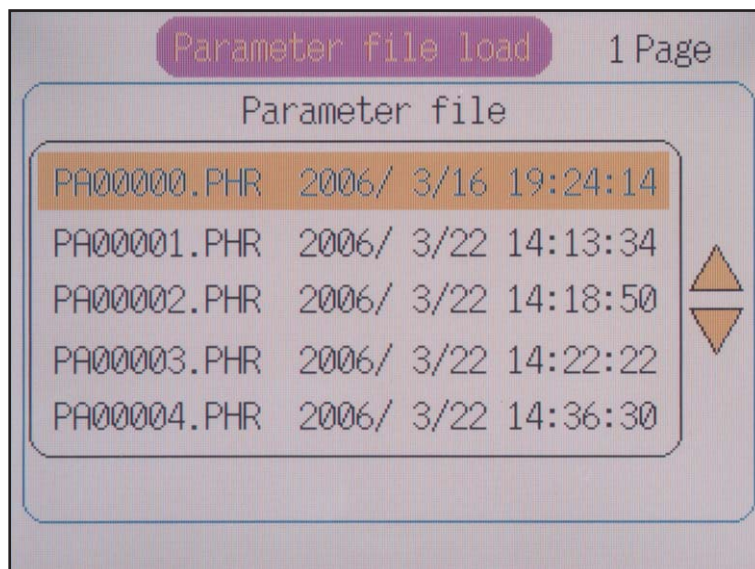
Store the setting file in the “PARAMET” folder within the memory card.

Note:

- Settings cannot be read while recording or totalizing is being performed.
- If the password appears, or the measurement on the math channel is recorded, after the setting file is read from the memory card with a recorder of version V39A or earlier, initialize the setting and then make the setting manually once again. Do not use a recorder of version V39A or earlier to read the setting file read from a memory card.

[Operation]

- (1) Select [Memory card] → [Reading settings] on the parameter setting screen to display the setting reading screen.
- (2) A list of setting files appears. Move the cursor to the file to be read and then press the **ENT** key, and the settings of the selected file are read.



8.30 Writing settings

[Explanation]

The settings of the recorder can be written into a memory card.

The setting file of the recorder (*****.PHR) can be read on the recorder main unit and the parameter loader supplied with the recorder.

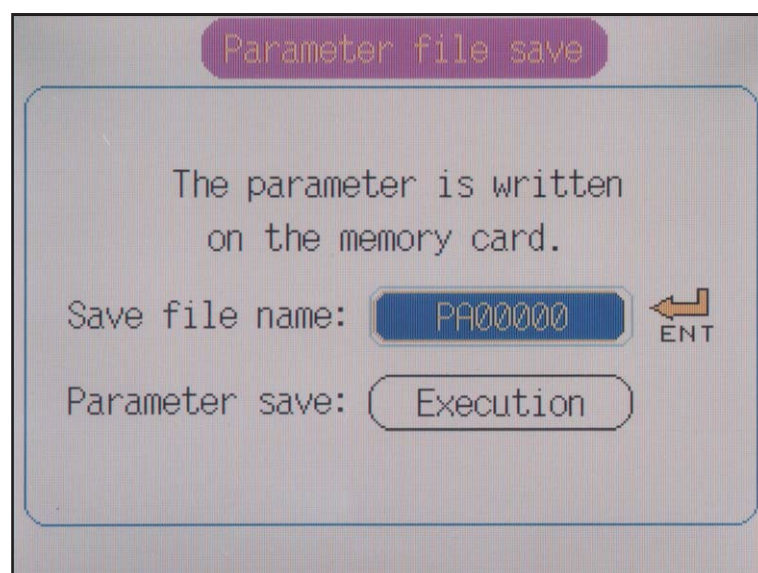
The setting file is stored in the “PARAMET” folder within the memory card.

Note:

- A file cannot be created with the same name as the setting file stored in the memory card. (The setting file cannot be overwritten.)
- Follow the instructions shown below to read a setting file, which has been created in a memory card with a recorder of version 40A or later, in a recorder of version V39A or earlier:
 - (1) Select “0000” as the password for starting/stopping recording. If a password other than “0000” is selected, a password setting screen appears when the recording is started/stopped.
 - (2) Select “Display only” as the recording operation setting for all the calculation channels. If an item other than “Display only” is selected, the measurement of the math channel appears when recording is started.

[Operation]

- (1) Select [Memory card] → [Writing settings] on the parameter setting screen to display the setting writing screen.
- (2) Move the cursor to “file name setting” and select the setting file name to be created.
- (3) Move the cursor to “Execute write” and then press the **ENT** key, and a setting file is created within the memory card.



8.31 Totalize calculation setting

[Outline of totalize start method]

- To start totalizing, set totalize operation in channel setting 1 of daily, monthly, and annual totalizing of parameter setting to analog, and follow one of the procedures shown below.
- (1) Set totalize start/stop of parameter setting/totalize/start, stop, reset to ON.
 - (2) If the recorder is provided with DI, set DI1 function to totalize start/stop switching in parameter setting/main unit setting/DI setting, for example, and then set DI1 to ON.

CAUTION

- 1) When totalize start/stop switching is performed with DI signal, be careful not to set the DI signal to ON while totalize parameters are being set. Otherwise the screen may fluctuate.
- 2) To count DI or measure ON time of DI during totalizing operation, do not select “Skip” as the type of input of the channel targeted for totalization.

8.32 Setting for daily totalizing

[Example]

Make the setting on daily totalizing on this screen.

Select daily totalizing, and the totalized value is recorded in a file at specified totalize cycle.

If totalize cycle is set to 1 hour, for example, the value is recorded at every hour on the hour.

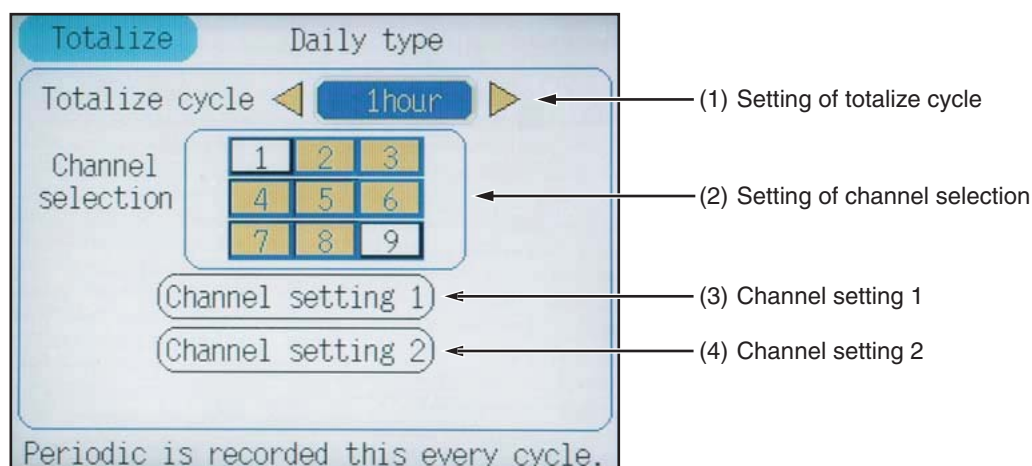
[Example] Recording start: 8:32:21
 First recording: 09:00:00
 Second recording: 10:00:00
 Recording is thus continued at every hour on the hour.

The file name of the record is T*****.FDT.

The file cannot be viewed on the PHR. View it on the PC using a viewer, etc.

[Operation]

- Select “Totalize setting” → “Daily” on the parameter setting screen, and the daily type screen appears.



(1) To set totalize cycle

Move the cursor to Totalize cycle, and select the time interval of totalize recording using the cursor key on both sides from 10, 20, 30 minutes, 1, 2, 3, 4, 6, 12, and 24 hours.

Selecting 24 hours is equivalent to selecting monthly totalizing (described later).

(2) To set channel selection

Move the cursor to the channel (square with numerical value in it) with which you want to carry out daily totalizing and press the **ENT** key, and the channel (square) turns to yellow, indicating that daily totalizing has been selected. Return the cursor to the channel and press the **ENT** key again, and the color returns back to white, indicating that the daily totalize setting has been reset.

If the channel selected has already been specified as monthly, annual, or as external input, a confirmation message appears.

(3) Channel setting 1

See section 8.33.

(4) Channel setting 2

See section 8.34.

About totalize calculation

Totalize calculation can be selected from “Totalizer,” “Counter,” or “Time measurement.”

- a) Select “Totalizer,” and normal daily or monthly totalizing function is made available.
- b) Select “Counter,” and the number of times of DI set to ON or alarm occurrence (on) during totalizing period is recorded. Decimal point does not appear in counter display.
- c) Select “Time measurement,” and the time when DI or alarm is kept ON during totalizing period is recorded, with fractional portion of the value discarded.

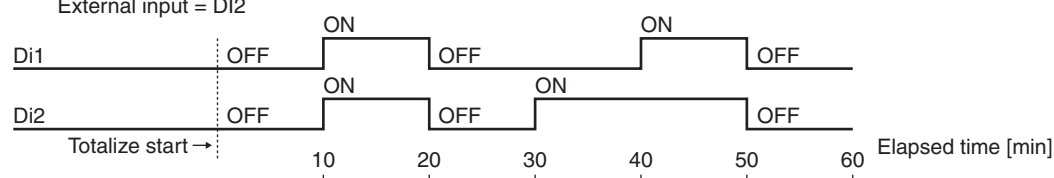
The time is displayed in the unit specified in parameter “Totalize base time.”

CAUTION

Set the ON/OFF pulse width of DI input to 200 msec or longer. The DI function and “Counter” or “Time measurement” can be used at the same time.

Example: The record data appears as shown below when selected parameters are as follows.

Totalize base time = /min
Totalize type = Daily
External input = DI2



Totalizing = Counter
= Time measurement

Record data					
1	1	2	2	2	2
0	10	10	20	30	30

[min]

* Since external input = DI2 in this example, the operation has nothing to do with ON/OFF operation of DI1.

8.33 Setting for channel setting 1 (Daily)

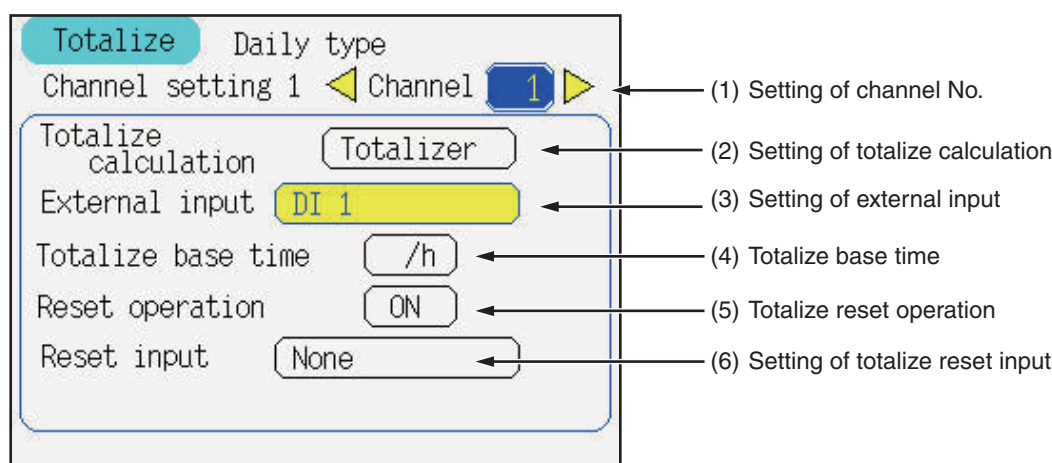
[Explanation]

Make the setting on daily totalizing by channel on this screen.

[Operation]

- Move the cursor to “Channel setting 1” on the daily type screen and press the **(ENT)** key, and the channel setting 1 screen appears.

Channel setting 1



- (1) To set channel No

Select the target channel No. using the cursor key.

- (2) To set totalize operation

Move the cursor to Totalize calculation, and select one from Totalizer, Counter, or Time measurement.

See the previous page for the meaning of those.

Depending on the setting, the items not require setting, which are described on the subsequent pages, are changed.

The color of the items not requiring setting changes to yellow, indicating that setting cannot be made.

(Note) When the logarithmic display is set to ON, do not use “Totalizer”.

- (3) To set external input

- Move the cursor to External Input, and make the setting using the cursor key on both sides. Set either DI or Alarm to Trigger.
- Use external input when totalize calculation is set to Counter or Timer.

- (4) Totalize base time

- Move the cursor to Totalize base time, and make the setting using the cursor key on both sides.
- Select totalize base time from /s, /min, /h, or /day.

Example: When the flow rate of 120L/min. is recorded, the totalized value appears as follows depending on totalize base time selected.

Base time	/s	/min	/h	/day
Totalized value	2	120	7,200	172,800

* 120L/min. equals to 2L/sec. ($120/60 = 2$) and 7200L/h ($120 \times 60 = 7200$)

(5) To reset totalizing

Displays the date and the time.

- Move the cursor to Reset operation, and make the setting using the cursor key on both sides.
- If ON is selected, totalized data is recorded in a totalize file in totalize cycles.
If OFF is selected, the totalized data from the start of totalizing is recorded in a totalize file.

Elapsed time	Reset operation	
	OFF	ON
1 hour	100	100
2 hours	200	100
3 hours	300	100

Example: When the flow rate of 100L/h is recorded, the record data appears as shown in the table at right.

(6) Totalize reset input

Move the cursor to the totalize reset input and press the **ENT** key, and the totalize reset input screen appears. Select either DI or alarm as the trigger to reset the totalized value.

8.34 Setting for channel setting 2 (Daily)

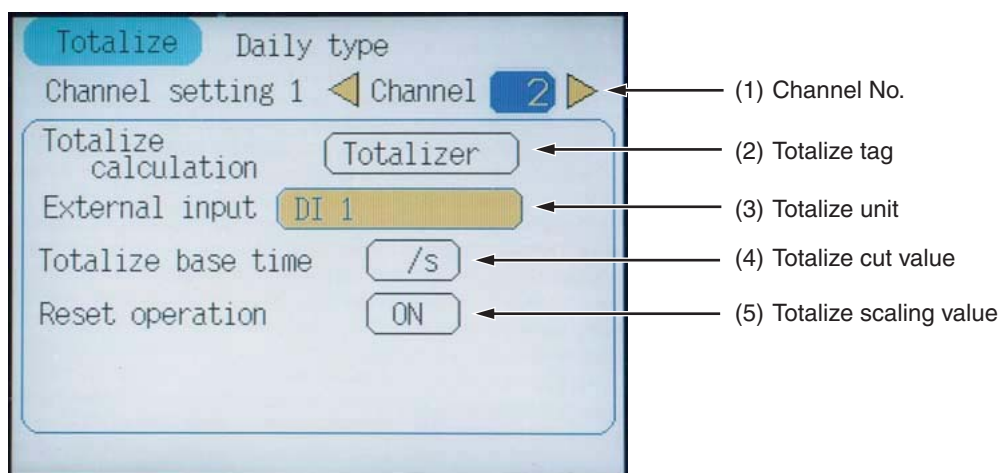
[Explanation]

Make the following setting related to daily totalizing by channel on this screen.

- TAG, unit, lower limit cut value, cut value (scaling)

[Operation]

- Move the cursor to “Channel setting 2” on the daily type screen and press the **(ENT)** key, and the channel setting 2 screen appears.

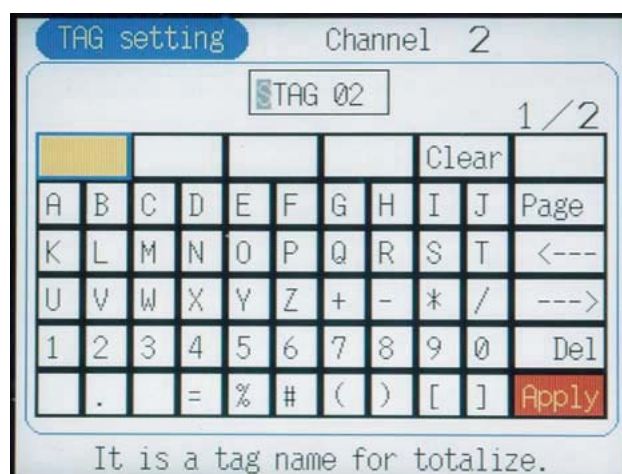


- (1) To set channel No.

Select target channel No. using the cursor key.

- (2) Totalize tag

- Move the cursor to Totalize tag and press the **(ENT)** key, and the TAG setting screen (shown below) appears. Enter totalize TAG using the cursor key and the **(ENT)** key. Then press the **(ENT)** key at “Apply” position, and the totalize tag is registered.
- Totalize TAG is recorded in the totalize file and displayed on the totaled value display screen.

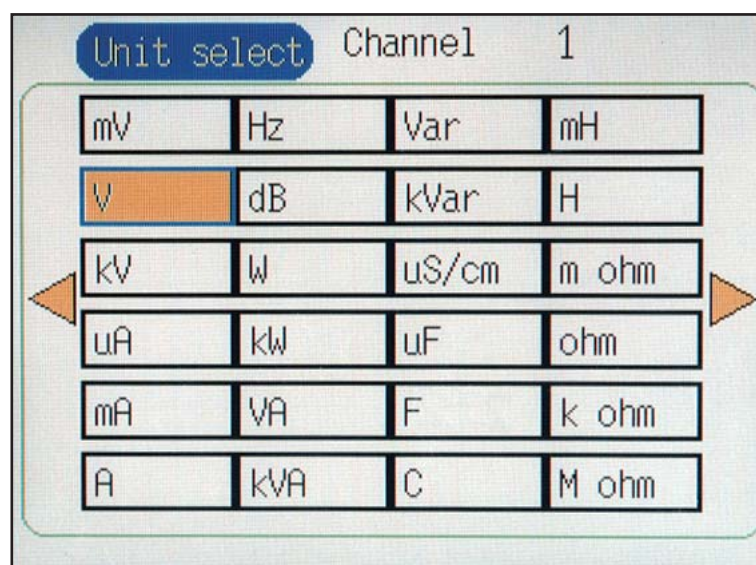


CAUTION

Do not start/stop totalizing with DI while the Totalize TAG setting screen is displayed. Otherwise the screen may fluctuate.

- (3) To set totalizing data unit for each channel

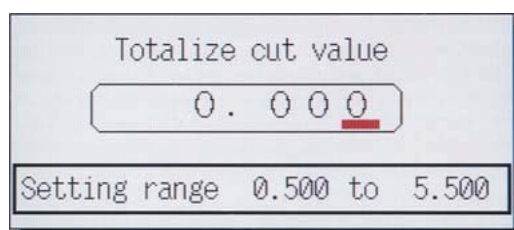
Move the cursor to the Totalize unit field and press the **(ENT)** key to display the following unit select screen. Select the desired unit using the cursor key and then press the **(ENT)** key.



- (4) To set totalize cut value for each channel

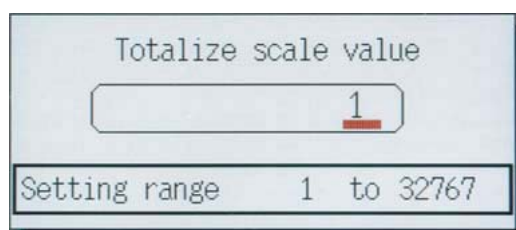
Move the cursor to the field of totalize cut value and press the **(ENT)** key to display the following totalize cut value setting screen. Enter totalizing cut value using the cursor and the **(ENT)** key.

- If the measured value is smaller than the totalizing cut value, the measured value is regarded as 0 in the totalizing (totalizing value does not increase).



- (5) Totalize scale value (totalize scaling)

- Move the cursor to Totalize scale value and press the **(ENT)** key, and the Totalize scale value input screen shown below appears. Enter desired value using the cursor key and press the **(ENT)** key, and the entered totalize scale value is registered.



Totalize scale value is used for scale conversion between the measurement value and the totalized value. The following calculation is performed.

$$\text{Totalized value} = \frac{\text{Measurement value}}{\text{Totalize scale value}}$$

(Division only. Multiplication cannot be performed.)

[Example] To convert 1/h to m³/h, totalize cut value = 1000 because 1[1/h] = 1/1000 [m³/h].

8.35 Setting for monthly totalizing

[Explanation]

Make the setting on monthly totalizing on this screen.

Specify monthly totalizing and start totalize calculation, and totalized value from 0:00 to

24:00:00 is recorded in a file at 0:00 a.m. (start time of a new date).

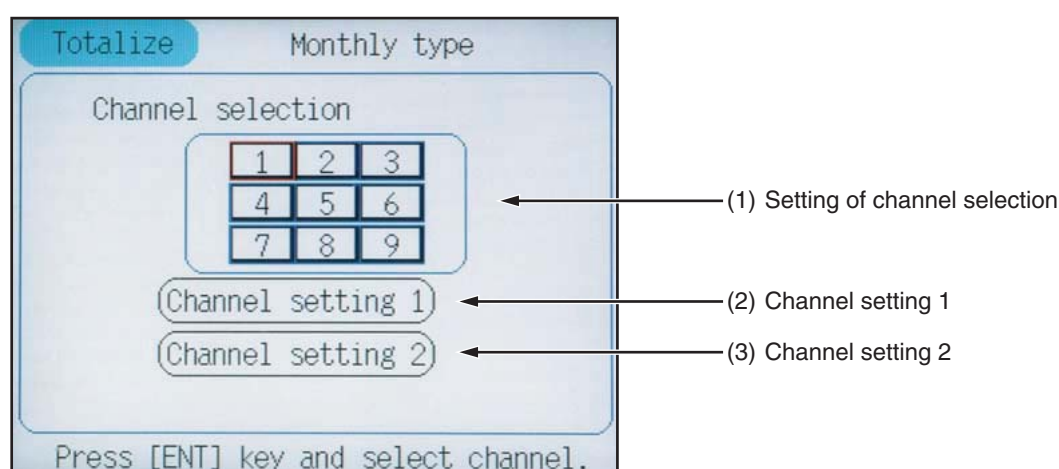
The time when totalizing is started (0:00) is fixed and cannot be changed.

The record file name is D*****.FDT.

The file cannot be viewed with the PHR. View the file on a PC using a viewer, etc.

[Operation]

- Select “Totalize setting” → “Monthly” on the parameter setting screen, and the monthly type screen appears.



(1) To set channel selection

Move the cursor to the channel (square containing numeric value) with which monthly totalizing is to be performed and press the **[ENT]** key, and the channel (square) turns to yellow, indicating that monthly totalizing has been selected. Return the cursor to the channel, and press the **[ENT]** key again, and the color of the channel returns back to white, indicating that monthly totalizing setting has been reset.

If the channel has already been specified for daily, annual, or external input, a confirmation message appears.

(2) Channel setting 1

See section 8.33 (meaning of each item is the same as daily report).

(3) Channel setting 2

See section 8.34 (meaning of each item is the same as daily report).

8.36 Setting for annual totalizing

[Explanation]

Make the setting on annual totalizing on this screen.

Specify annual totalizing and start totalize calculation, and the totalized value from 0:00:00 on the base date of the month to 24:00:00 on the previous date of the base date of the next month is recorded in a file. The time is fixed and cannot be changed.

Recording is performed at 0:00:00 (start of the base date). If the first day of the month is specified as the base date, for example, recording is performed at 0:00:00 of the first date of the month.

[Example]

Recording start: 2004-07-07 23:56:04

First recording: 2004-08-01 0:00:00

Second recording: 2004-09-01 0:00:00

Recording for coming months is continued like this.

The record file name is M*****.FDT.

When the 31st is selected as the base date, the recording for February (not of leap year) and April is carried out as follows.

Recording in February: the instant when time changes from 23:59:59 of the 27th to 0:00:00 of the 28th of February

Recording in April: The instant when time changes from 23:59:59 of the 29th to 0:00:00 of the 30th of April

When the 30th is selected as the base date:

Recording in February: the instant when time changes from 23:59:59 of the 27th to 0:00:00 of the 28th of February

Recording in April: the instant when time changes from 23:59:59 of the 29th to 0:00:00 of the 30th of April

When the 29th is selected as the base date:

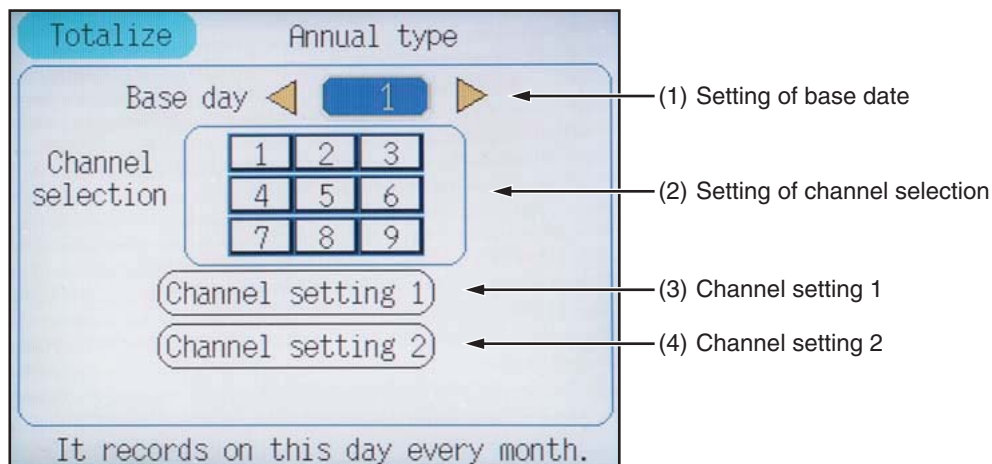
Recording in February: the instant when time changes from 23:59:59 of the 27th to 0:00:00 of the 28th of February

Recording in April: the instant when time changes from 23:59:59 of the 28th to 0:00:00 of the 29th of April

The file cannot be viewed with the PHR. View the file on a PC using a viewer, etc.

[Operation]

- Select “Totalize setting” → “Annual” on the parameter setting screen, and the Annual type screen appears.



(1) To set base date

Move the cursor to Base date, and select the base date when totaled value is recorded.
Time cannot be specified.

(2) To set channel selection

Move the cursor to the channel (square containing numeric value) with which annual totalizing is to be performed and press the **ENT** key, and the channel (square) turns to yellow, indicating that annual totalizing has been selected. Return the cursor to the channel, and press the **ENT** key again, and the color of the channel returns back to white, indicating that annual totalizing setting has been reset.

If the channel has already been specified for daily, annual t, or external input, a confirmation message appears.

(3) Channel setting 1

See section 8.33 (meaning of each item is the same as daily report).

(4) Channel setting 2

See section 8.34 (meaning of each item is the same as daily report).

8.37 Setting for external input totalizing

[Explanation]

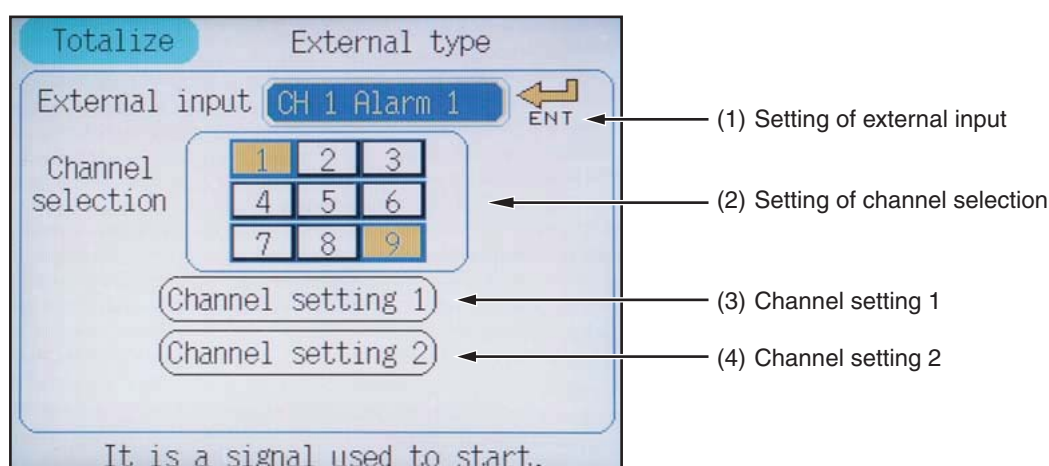
- Make the setting on external input totalizing, which starts/stops totalizing with external input used as a trigger, on this screen.

Select a signal that controls totalize start/stop from DI or alarm of each channel. Set it to ON (alarm occurrence) to start totalizing. Set it to OFF (alarm reset) to stop totalizing and recording in a file at the same time. The value is recorded in a file only when totalizing is stopped. It is not recorded while totalize calculation is in progress.

- The record file name is E*****.FDT.
- The file cannot be viewed with the PHR. View the file on a PC using a viewer, etc.

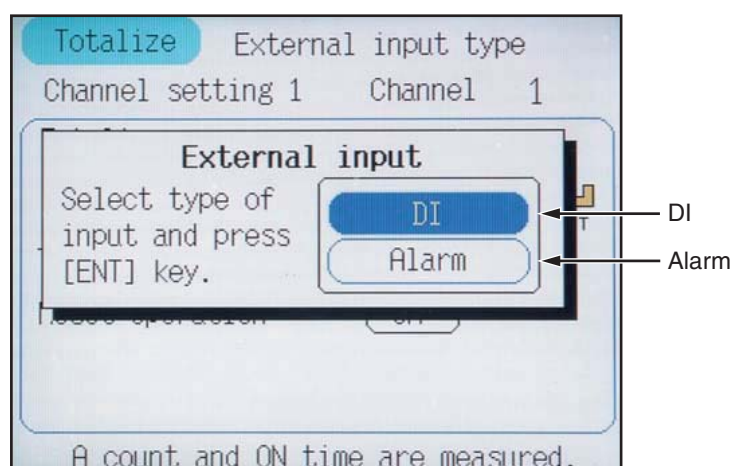
[Operation]

- Select “Totalize setting” → “External type” on the parameter setting screen, and the External type screen appears.



- (1) To set external input

Move the cursor to External Input and press the **ENT** key, and the External type selection screen appears.



Move the cursor to DI and press the **ENT** key. On the External type screen that appears, select DI No. with which totalize start/stop is controlled using the cursors on both sides.

Move the cursor to Alarm and press the **ENT** key. On the External type screen that appears, select the alarm No. with which totalize start/stop is controlled using the cursors on both sides.

(2) To set channel selection

Move the cursor to the channel (square containing numeric value) with which external input totalizing is to be performed and press the **ENT** key, and the channel (square) turns to yellow, indicating that external input totalizing has been selected. Move the cursor back the channel and press the **ENT** key again, and the color of the channel returns back to white, indicating that external input totalizing setting has been reset.

If the channel has already been specified for daily, monthly, or annual, a confirmation message appears.

(3) Channel setting 1

See section 8.33 (meaning of each item is the same as daily report).

(4) Channel setting 2

See section 8.34 (meaning of each item is the same as daily report).

8.38 Setting for totalize start/stop

[Explanation]

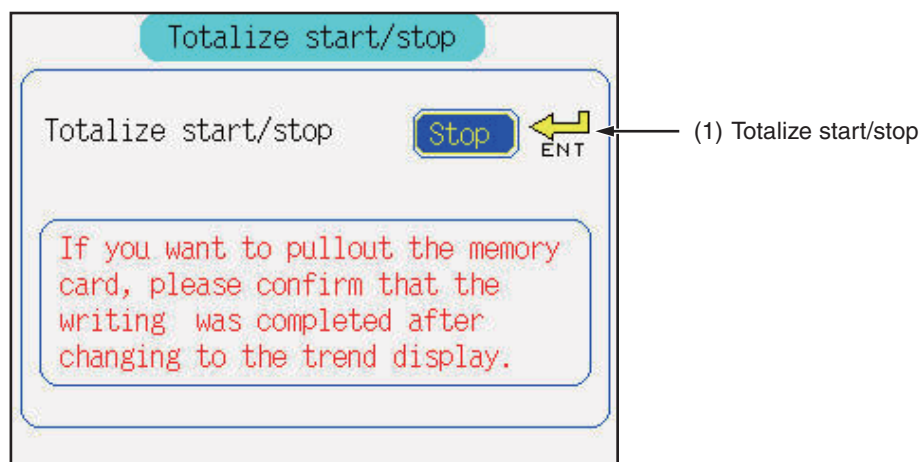
Make totalize start/stop setting on this screen. Selected monthly or annual totalizing and external input can be started only when totalizing is started on this screen.

Totalize calculation can also be stopped only when the totalizing is stopped on this screen.

Totalizing can also be started/stopped with DI (option) or communication (option).

[Operation]

- Select “Totalize setting” → “Totalize start/stop” on the parameter setting screen, and the totalize start/stop setting screen appears.



(1) Totalize start/stop

Press the **ENT** key on this item, select ON or OFF using the cursor on both sides, and press the **ENT** key to make totalize calculation start/stop setting. If a channel has not been selected for daily, monthly, annual or external input, a totalize file cannot be created even if totalize calculation is started.

8.39 Setting for totaled value reset

[Explanation]

You can reset a totaled value for a desired channel.

The totaled value is set to 0 when it is reset while totalizing.

[Operation]

- On the parameter setting screen, select “Totalize Setting” → “Totalize Reset.”

The Totalize Reset screen appears.

Totalize Reset

Select channel No.

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	26	27	28	29	30

All channels

Reset start

(1) Selection of a channel No.

(2) Start of the totaled value reset.

- (1) Selection of a channel No.

Select a channel No. for which the totalize value reset is to be performed.

- (2) Start of the totaled value reset.

If you press the **ENT** key for this item while totalizing, it is reset to be 0.

8.40 Setting of calculation channel

[Explanation]

- 12 channels from channel 19 to 30 can be used as the calculation channel.
- Formula (3 calculations × 4 expressions) can be set per each channel.
- The result of formula 4 is entered for calculation channel. Note that, when the result of formula 4 which is not including the decimal point is outside the range of ± 32767 , enter a value limited to ± 32767 .

Note 1) Calculation is always executed from left to right. There is no priority in for four arithmetic operations.

Example: The following formula (A) is calculated as (B).

Formula (A) $B01 = C01 + C02 \times C03$

Formula (B) $B01 = (C01 + C02) \times C03$

Note 2) Either Average value calculation; AVG (A), or totalize calculation; SUM (A, B) can be used only once at each channel.

Note 3) When formula increases in number, calculation will take a long time in the recorder. Therefore the display cycle of measurement value may take a longer time.

- For arithmetic operation, see the following table.

Available items	Display	Contents
Four arithmetic operation (addition)	A+B	Adds input A and input B.
Four arithmetic operation (subtraction)	A-B	Subtracts input B from input A.
Four arithmetic operation (multiplication)	A*B	Multiplies input A and input B.
Four arithmetic operation (division)	A/B	Divides input A by input B Note: $0/0 = 0$
Absolute value	ABS(A)	Calculates absolute value of input A
Exponential	POW(A, B)	Calculates exponential in “input B” of input A. (A^B)
Square root	SQR(A)	Calculates square root of input A
LOG	LOG(A)	Calculates common logarithm of input A
LN	LN(A)	Calculate natural logarithm of input A.
EXP	EXP(A)	Calculates exponential in “e” of input A.
Humidity	RH(A, B)	Calculates the relative humidity when the input A is dry-bulb temperature and the input B is wet-bulb temperature.
Max. (between channels)	MAX(A, B)	Compares input A and input B, and calculates whichever larger.
Min. (between channels)	MIN(A,B)	Compares input A and input B, and calculates whichever smaller.
Maximum value (time)	H-P(A)	Calculates maximum value of input A. Initializes maximum value by timer input.
Minimum value (time)	L-P(A)	Calculates minimum value of input A. Initializes minimum value by timer input.
Average	AVG(A)	Calculates average value of input A. Updates average value by timer input.
Totalize	SUM(A, B)	Calculates totalize value of input A/B. Resets totalize value by timer input.
Clearing formula	End/delete	Arithmetic operation is deleted without confirmation. Care should be taken when deleting.
Input data	Input data	For arithmetic operation, “Channel input”, “Channel totalize value”, “DI input”, “Communication input”, “Constant” and “Previous formula result” can be used as input data.

- The contents in the following table can be used for arithmetic operation.

Input data	Display	Settable range
Channel input	C01 to C30	Measurement value of channel 1 to 30
Channel totalize value	T01 to T30	Totalize value of channel 1 to 30 (using totalize value with no decimal point that is limited to ± 32767).
DI input	D01 to D10	DI 1 to 10 (OFF : 0, ON : 1)
Communication input	M01 to M12	1 to 12 (no decimal point)
Constant	K01 to K20	1 to 20
Result of the last formula	B01 to B03	1 to 3

- For detailed description of each calculation function is as follows.

ABS(A): Calculates absolute value of input A.

Examples of ABS (A) output is described below. (Decimal point is set to 1.)

Input A	Output ABS(A)	Memo
10.0	10.0	
-10.0	10.0	

POW(A, B): Raises the input A to the power of input B. (A^B)

When the negative number with decimal point is raised to the power of numeric values with decimal point, output becomes 0.

0 raised to the 0-th power is 1.00.

Examples of POW (A, B) output is described below. (Decimal point is set to 1.)

Input A	Input B	Output POW(A,B)	Memo
50.0	2.0	2500.0	
-5.5	2.5	0.0	Input error
0.0	0.0	1.0	0 raised to the 0-th power is 1.

SQR(A): Calculates square root of input A.

When input data is negative number, 0 is outputted.

Examples of SQR(A) output is described below. (Decimal point is set to 1.)

Input A	Output SQR(A)	Memo
100.0	10.0	
-10.0	0.0	When input data is negative number, 0 is output.

LOG(A): Calculates common logarithm of input A.

When input data is negative number, 0 is output.

Examples of LOG (A) output is described below. (Decimal point is set to 1.)

Input A	Output LOG(A)	Memo
100.0	2.0	
-10.0	0.0	When input data is negative number, 0 is output.

LN(A): Calculates natural logarithm of input A.

When input data is negative number, 0 is output.

Examples of LN (A) output is described below. (Decimal point is set to 1.)

Input A	Output LN(A)	Memo
100.0	4.6	
-10.0	0.0	When input data is negative number, 0 is output.

EXP(A): Calculates exponential in “e” of input A.

Examples of EXP (A) output is described below. (Decimal point is set to 1.)

Input A	Output EXP(A)	Memo
1.2	3.3	

RH(A, B): Calculates the relative humidity when the input A is dry-bulb temperature and the input B is wet-bulb temperature.

When the temperature span is -40 to 150°C, humidity can be calculated.

In case of wet-bulb temperature \geq dry-bulb temperature, 100%RH is output.

When the measured temperature is out of range, the following table is output.

		Wet-bulb temperature (input B)		
		Less than -40°C	Range	More than 150°C
Dry-bulb temperature (input A)	Less than -40°C	0%RH	0%RH	0%RH
	Range	0%RH	Calculation value	100%RH
	More than 150°C	0%RH	100%RH	100%RH

Examples of RH (A) output is described below. (Decimal point is set to 1.)

Input A Dry-bulb temperature	Input B Wet-bulb temperature	Output RH(A, B)	Memo
70.0	65.0	79.2	
70.0	70.0	100.0	Input A = when input value is B, 100%RH is output
50.0	-41.0	0.0	Input B < -40°C
151.0	10.0	100.0	Input A > 150°C

MAX(A, B): Compares input A and input B and calculates whichever larger.

Examples of MAX (A, B) output is described below. (Decimal point is set to 1.)

Input A	Input B	Output MAX(A, B)	Memo
50.0	49.0	50.0	Input A > input B
49.0	50.0	50.0	Input A < input B

MIN(A, B): Compares input A and input B and calculates whichever smaller.

Examples of MIN (A, B) output is described below. (Decimal point is set to 1.)

Input A	Input B	Output MIN(A, B)	Memo
50.0	49.0	49.0	Input A > input B
49.0	50.0	49.0	Input A < input B

H-P(A): Calculates the maximum value of input A according to H-P, L-P timer cycle.
 Output is initialized at a cycle.

Examples of H-P (A) output is described below. (Decimal point is set to 1 and the value of SUM timer cycle is set to 2 minutes.)

Input A	Output H-P(A) (Output value at a cycle)	Memo
Sine wave 1 minute cycle Amplitude 50.0 Bias 0.0	50.0	Maximum value of Sine wave

L-P(A): Calculates the minimum value of input A according to H-P, L-P timer cycle.
 Output is initialized at a cycle.

Examples of L-P (A) output is described below. (Decimal point is set to 1 and the value of SUM timer cycle is set to 2 minutes.)

Input A	Output L-P(A) (Output value at a cycle)	Memo
Sine wave 1 minute cycle Amplitude 50.0 Bias 0.0	-50.0	Minimum value of Sine wave

AVG(A): Calculates average value of input A according to AGV timer cycle.
 Output varies at a cycle. (The indication does not change during a cycle.)

Examples of AVG (A) output is described below. (Decimal point is set to 1, and the value of AVG timer cycle is set to 2 minutes.)

Input A	Output AVG(A) (Output value at a cycle)	Memo
Sine wave 1 minute cycle Amplitude 50.0 Bias 0.0	0.0	Average value of Sine wave

SUM(A, B): Calculates totalize value of input A/B according to SUM timer cycle.
 Resets totalize value at a cycle. Also, negative numbers can be totalized.

Examples of SUM (A) output is described below. (Decimal point is set to 1, and the value of SUM timer cycle is set to 2 minutes.)

Input A (Fixed value)	Input B (Fixed value)	Output SUM(A, B)	Memo
50.0	120.0	50.0	
50.0	60.0	100.0	
-50.0	120.0	-50.0	

8.41 Setting arithmetic operation for math channel

[Explanation]

Set arithmetic operation for each channel.

Note) Averaging calculation (AVG) and totalize calculation (SUM) can be used just once per each channel.

[Operation]

Select “Calculation setting” → “Formula setting” from the “Parameter Setting” screen to display the “Formula setting” screen.

- (1) Setting channel No.

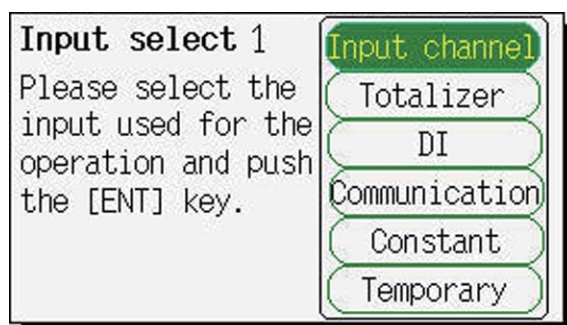
Select the “Channel No.” by using the cursor key.

- (2) To set arithmetic operation

Move the cursor to the input field and press the **ENT** key, and the formula setting screen (shown below) appears.

Press the **ENT** key on the formula setting screen to display the Menu screen. Move the cursor to the target formula and press the **ENT** key.

Select the desired input type on the input type selection screen, and press the **ENT** key. Enter each input No..



- Channel input : Enter the channel No. to be used.
- Channel totalized value : Enter the totalize No. to be used (channel No. of which totalize calculation is set). (See “8.31” to “8.39”)
- DI : Enter the DI No. to be used for calculation. (See 8.17.)
- Communication input : Enter the communication input No. to be used.
- Constant : Enter the constant No. to be used for calculation (channel No. of which constant is set). (See 8.48.)
- Formula result : When the result of formula 1 to 3 is used, enter the formula No.

Example) Formula = Constant 5 × (Input 3 + Constant 2) + Input 1: Enter as shown below.

Formula 1
B01 = C03 + K02
Formula 4
Result = K05 × B01 + C01

(C03 = Input 3, K02 = Constant 2, B01 = Result of formula 1)

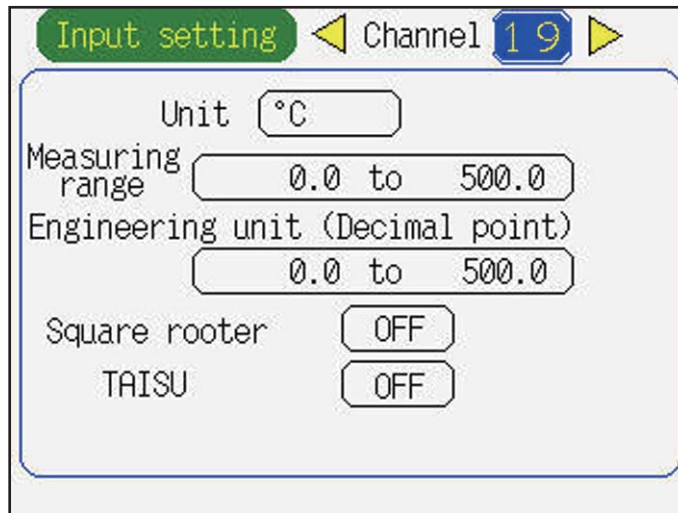
8.42 Input setting for math channel

[Explanation]

Make the settings of units, measurement value, engineering value, and square rooter per each math channel.

[Operation]

Select “Calculation setting” → “Input setting” from the “Parameter Setting” screen to display the “Input setting” screen.



The screenshot displays the 'Input setting' screen for Channel 19. The screen has a green header bar with 'Input setting' in yellow text and 'Channel 19' in white text. Below the header, there are five settings, each with a label and a value field:

- Unit: °C
- Measuring range: 0.0 to 500.0
- Engineering unit (Decimal point): 0.0 to 500.0
- Square rooter: OFF
- TAISU: OFF

For operation procedure, refer to “8.4 Setting for input types, skip, scaling, units and square rooter”.

8.43 Calculation setting for math channel

[Explanation]

Make the settings of input filter (time constant), subtraction, PV shift, PV gain, and F value calculation per each math channel.

[Operation]

Select “Calculation setting” → “Calculation setting” from the “Parameter Setting” screen to display the “Calculation setting” screen.

Calc. setting ◀ Channel 19 ▶

Input filter 3 s

Subtract function channel 0

Channel19 = Channel19 - Channel 0

PV shift 0.0 °C

PV gain 100.00 %

Measured value 0.0 °C

Fvalue calc. OFF

For operation procedure, refer to “8.5 Setting for input filter (time constant), PV shift and subtraction”.

8.44 Alarm setting for math channel

[Explanation]

Make the alarm setting per each math channel.

[Operation]

Select “Calculation setting” → “Alarm Setting” from the “Parameter Setting” screen to display the alarm setting screen.

The screenshot shows a screen titled "Alarm setting" in a green box at the top left. To its right is a yellow left arrow, the text "Channel", and a blue box containing "19" with a yellow right arrow. Below this header is a light gray rounded rectangle containing four settings, each with a label and a value in a box:

Alarm No.	1
Alarm type	OFF
DO relay No.	None
Alarm set value	0.0 °C

For operation procedure, refer to “8.6 Alarm setting”.

8.45 Setting for TAG No., display range and record mode for math channel

[Explanation]

Make the settings of TAG, display color, display range, recording type, and recording mode per each math channel.

[Operation]

Select “Calculation setting” → “Range setting” from the “Parameter Setting” screen to display the range setting screen.

Range setting ◀ Channel 19 ▶

Tag1	TAG 19
Tag2	
Color	— Indigo
Display range	0.0 to 1200.0 °C
Recording type	Min-Max rec.
Recording mode	Display only

For operation procedure, refer to “8.10 Setting for TAG.NO., display range, and record mode”.

8.46 Math channel parameter copy

[Explanation]

This screen allows you to copy parameters at one channel to other channels. To set the data that can be copied includes formula, input setting, calculation setting, and alarm setting.

[Operation]

Select “Calculation setting” → “Calculation channel copy” from the “Parameter Setting” screen to display the Math channel parameter copy screen.

Math channel parameter copy

Channel copy from ◀ 19 ▶

Channel to paste

19	20	21	22
23	24	25	26
27	28	29	30

All channels

Copy start

For operation procedures, refer to “8.8 Parameter copy”.

8.47 Math timer setting


[Explanation]

When maximum value (H-P), minimum value (L-P), average value calculation (AVG), and totalize value calculation (SUM) are set at formula setting, make the setting of calculation cycle.

[Operation]

Select “Calculation setting” → “Math timer setting” from the “Parameter Setting” screen to display the Math timer setting screen.

Math timer setting

H-P,L-P timer cycle min  ENT

AVG timer cycle min

SUM timer cycle min

Move the cursor to the desired formula and press the **ENT** key.

In each setting screen that appears, set the time using the cursor key and the **ENT** key.

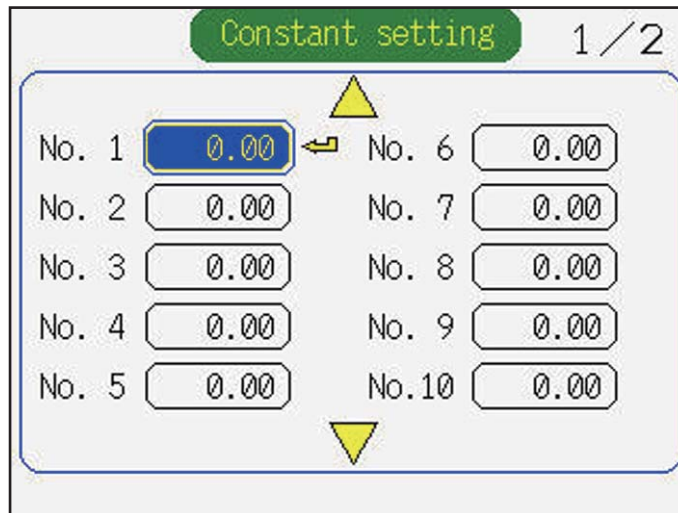
8.48 Constant setting

[Explanation]

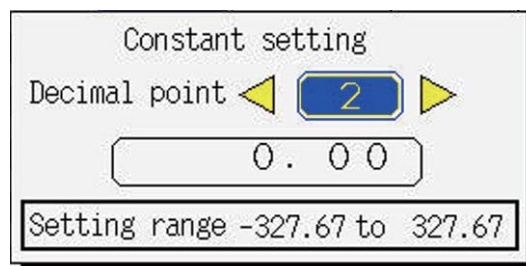
When constant is set at “8.38 Setting for formula”, execute the following procedure. Make constant setting.

[Operation]

Select “Calculation setting” from the “Parameter Setting” screen → “Constant setting” to display the constant setting screen.



Move the cursor to the relevant constant No. and press the **ENT** key to display the following constant setting screen. Enter the decimal point position and constant using the cursor key and the **ENT** key.



9. MAINTENANCE AND INSPECTION

9.1 Recommended replacement cycle of parts

(When used at 25°C)

Names of parts	Cycle	Remarks
LCD (front panel)	5 years	LCD backlight cannot be replaced as a single unit. Return to factory for repair.
Panel packing	5 years	
Fuse (external use)	2 years	When external fuses are used, replace them every 2 years for preventive maintenance. Fuse rating: 250V AC, 1A
Memory card	6 months	<ul style="list-style-type: none">• To prevent data from being lost, back up the recorded data once every 6 months.• If writing error occurs in the memory card, data may be lost. If data has been written in the memory card to some extent, check if data writing has been normally performed.• Be sure to replace the memory card as needed with a new one.
Lithium battery	5 years	It cannot be replaced as a single unit. Return to factory for repair.

9.2 Calibration

To assure measuring accuracy, perform calibration every year.

For calibration procedure, refer to Chapter 10. Contact our Sales Representative for details.

9.3 Formatting the memory card

The memory card should be formatted by a personal computer (the recorder is not provided with a means of formatting the memory card).

Select a PC drive for the memory card and press the right-mouse button. The menu appears, prompting you to select the option. Select “Format”. On the screen that appears, select the “Start” button to initiate the formatting.

Select FAT32, FAT16 or FAT for the file system. The recorder does not recognize the memory card formatted with other systems.

10. CALIBRATION

The following operation can be carried out.

- (1) Calibration of the measured value
- (2) Setting method of date format
- (3) Initialization of the set value

10.1 Calibration method of measured values

[Explanation]

Adjustment is not required in an ordinary status. However, to maintain the desired accuracy of the measured value display, we recommend you to perform calibration periodically by adding calibration input signals. Add calibration input signals to the channel to be calibrated. To calibrate the input of the resistance bulb, be sure to perform 500mV calibration beforehand, and then perform the calibration.

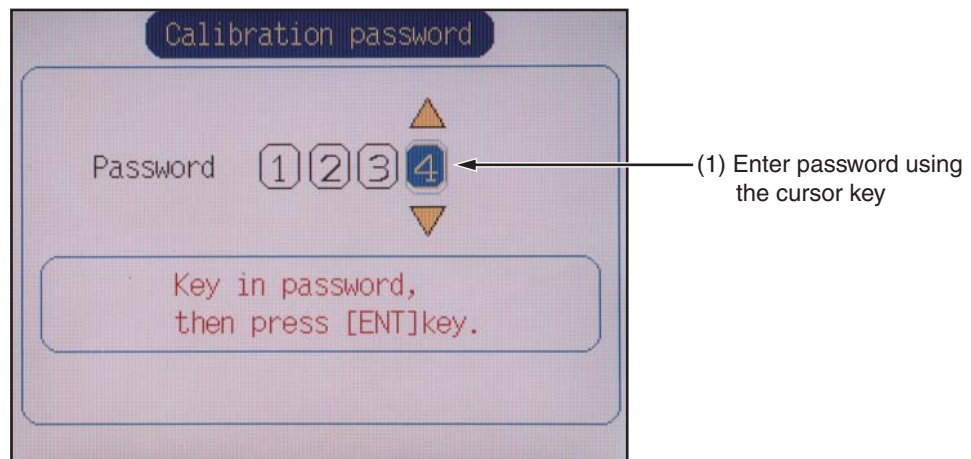
Note: 1) If improper calibration input signals are added, the instrument operates improperly. Be sure to follow the procedure shown above to perform calibration. Otherwise the instrument may operate improperly. The devices listed in the table on page 10-2, [Required device], are required for calibration.

- 2) If reading error is not large, adjust the value to the reading of the [PV shift function] described in section 8.5.

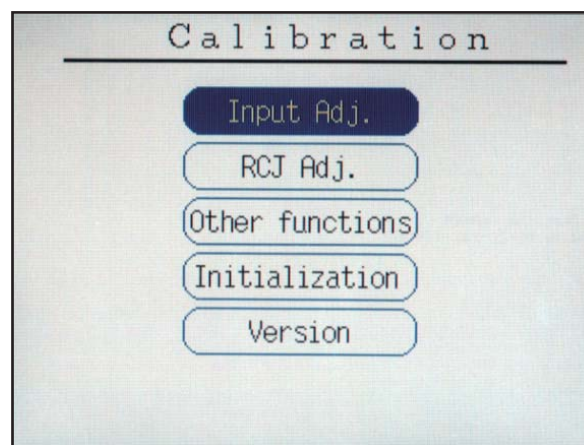
[Operation]

- (1) Select "System" and then "Calib. password" on the "Parameter Setting" screen to display the calibration password screen. Enter the password using the cursor key. (The password is 1234.)

Note: The entered password is kept valid until the power is turned off. Turning off the power clears the password.



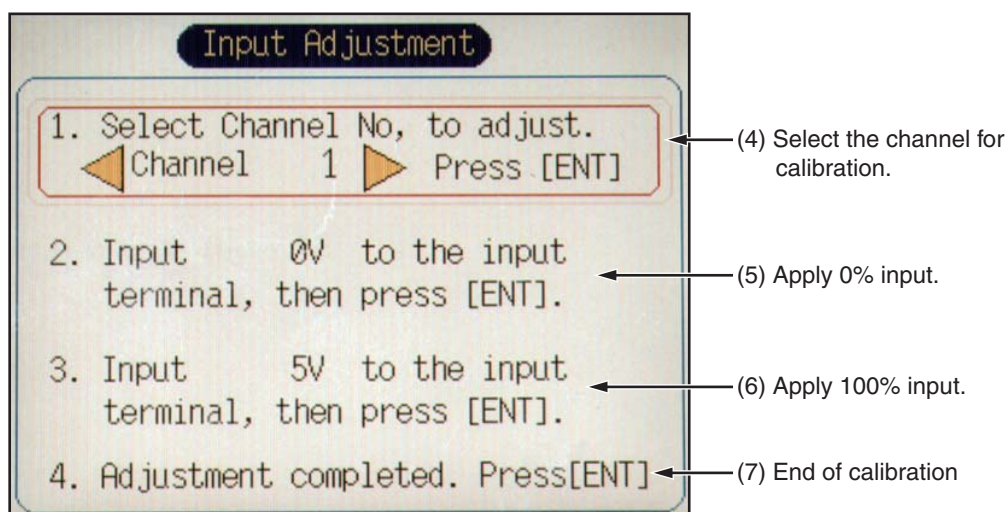
- (2) Press the **ENT** key to display the menu screen on the application operation screen.



CAUTION

Do not perform [Other functions] and [Initialization], which are for calibration by the manufacturer. Otherwise, proper operation of the recorder may not be assured. For example, proper input reading may not be displayed, or parameters selected may return to the initial values before delivery.

- (3) Move the cursor to “Input Adj.” and press the **ENT** key, and the “Input Adjustment” screen appears.
- (4) Select the channel for calibration.



Select the channel for calibration by using the cursor key and press the **ENT** key.

- (5) Apply 0% input

In the case of resistance bulb input, be sure to perform 500mV input calibration before performing calibration.

The following are input signals for 0% point calibration.

- Voltage input: 0 mV or 0 V
- Thermocouple input: 0 mV
- Resistance bulb (Pt, JPt): 100Ω

After input of the input signal for 0% calibration, press the **ENT** key. Zero calibration will start automatically. After calibration, the “End of Calibration” message appears. Pressing **ENT** moves to the next span calibration.

- (6) Apply 100% input

The input signal for 100% calibration is shown below;

- Voltage input: 50 mV or 500 mV, and 5V
- Thermocouple input: 50 mV
- Resistance bulb: 300Ω

After input of 100% calibration input signal, press the **ENT** key. Span calibration will start automatically. After calibration, the “End of Calibration” message appears. Pressing **ENT** moves it to the next span calibration.

- (7) End of calibration

After the message has appeared, press the **ENT** key.

[Required device]

Device	Specifications
AC power supply	0 to 300Vac/5A
mV generator	0 to 50Vdc Resolution: 10V (in mV range) Output impedance: 2 or lower
Dial resistor	0.01 to 400.00 Resolution: 0.01
Digital multimeter	5 + 1/2 digit display Resolution: 1V (in mV range)

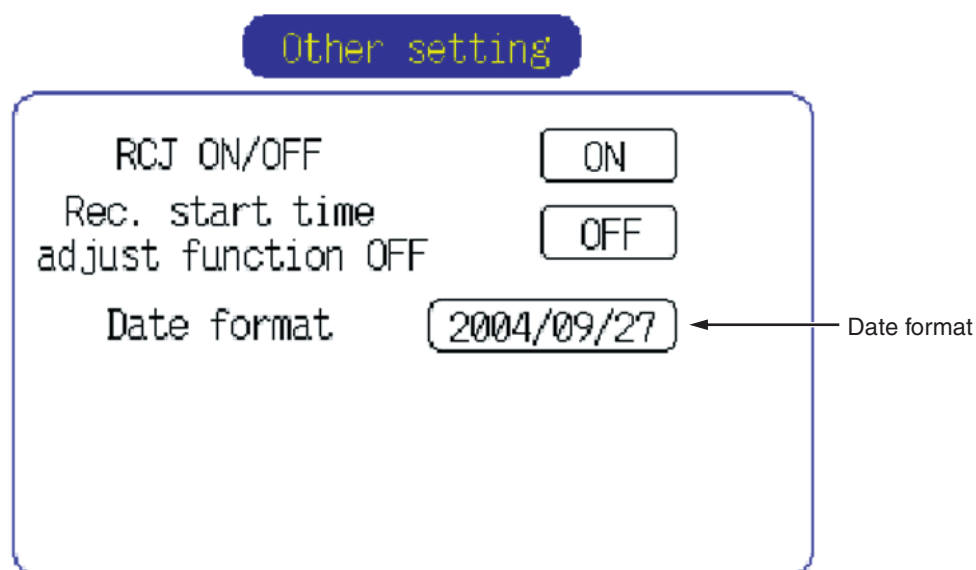
10.2 Setting for date format

[Explanation]

Date format can be selected.

[Operation]

- (1) Perform (1) and (2) in [Operation] of “Calibration method of measured values” to display the application operation screen menu.
- (2) Select “Other setting” and press the **ENT** key, and the date format setting screen appears.



- Setting date format

Move the cursor to the field next to “Date format,” and select a desired date format from those listed in the following table using the < or the > key .

Date format selection item	Format	Example of screen display	
2004/09/27	yyyy/mm/dd	2004/09/27	17:00:00
27/09/2004	dd/mm/yyyy	27/09/2004	17:00:00
27-Nov-04	dd-MMM-yy	27-Nov-04	17:00:00
09/27/2004	mm/dd/yyyy	09/27/2004	17:00:00
Nov-27-04	MMM-dd-yy	Nov-27-04	17:00:00

Note: The date displayed on the date format selection item is fixed to September 27, 2004.

10.3 Initializing the set value

[Explanation]

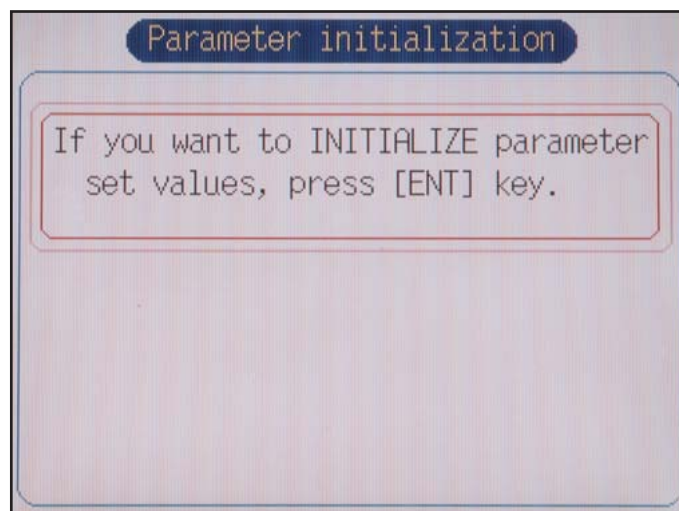
Parameters can be returned to the value set at the time of delivery from the factory.

- After initializing the set value, be sure to store the initialized parameters in a nonvolatile memory. Otherwise they return to the values before the initialization when the power is turned off.

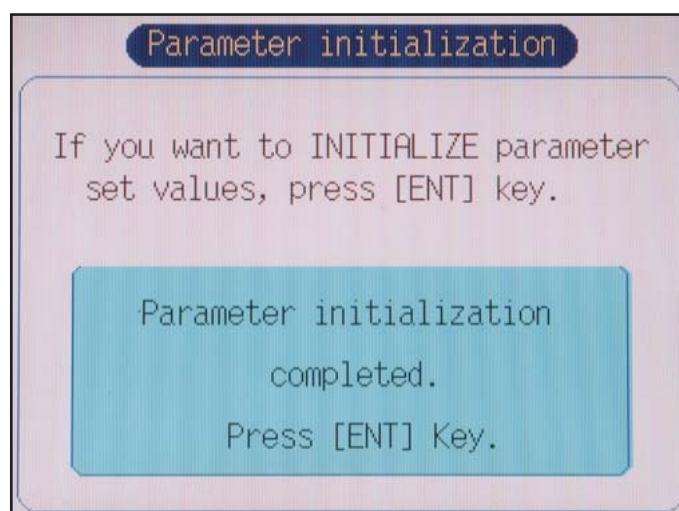
Note: If parameters are initialized, the adjusted values are not initialized.

[Operation]

- (1) Follow the procedure (1) and (2) in [Operation] of Item 10.1 “Calibration method of measured values” to display the menu screen of the application operation screen.
- (2) Select “Initialization” and press the **ENT** key to display the parameter initialization screen.



- (3) Press the **ENT** key to return the parameters to the values set at the time of delivery from the factory.



11. TROUBLESHOOTING

If the recorder does not operate normally, take a remedy according to the table given below. For a complicated trouble, contact our Sales Representatives.

Situation	Check	Remedy
Does not work at all.	1) Is the power supply terminal connection correct?	Connect correctly.
	2) Is power being supplied properly?	Supply correctly.
Keys do not work.	1) Does the screen display correctly? If keys only do not work, key switch may be faulty.	Contact our Service Center
	2) There are some parameters that cannot be set during recording. Check if setting has been attempted during recording.	Stop recording at once.
“System Error” is displayed when power is ON.	It is displayed when a fault occurs in CPU. Turn the power ON again. If it does not return to normal condition, CPU may be faulty.	Contact our Service Center.
The record swings over to the 0% side or the 100% side.	1) Is digital indication displayed correctly? If the input is not connected correctly, burnout may occur or over- or under-indication may occur	Connect correctly.
	2) The record swings over the indication range if the indication range is not set correctly.	Set the indication range correctly.
The indication changes too much.	To match the indication to that of the field indicator, use PV shift given in Item 8.5.	
The data indicator indicates “Over”, “Under” or “Error”.	If the input is not connected correctly or a signal that is different from the input type is connected, the indication becomes faulty.	<ul style="list-style-type: none"> • Connect correctly. • Set the input type according to the input signal.
Memory card is not recognized.	1) Is the format of compact flash FAT16?	Format to FAT16.
	2) Is compact flash made by SanDisk used?	Use compact flash made by SanDisk.
Recording data is not written in compact flash	1) Is the compact flash connected properly?	Fix the compact flash according to Item 2.2.
	2) Is the compact flash full?	
	3) If the measuring channel is set as “Indication only” or “Skip”, data is not recorded.	
“Recording has been stopped because the compact flash has run out of capacity. Replace the compact flash.” is kept displayed.	1) The compact flash has run out of capacity.	1) Replace the compact flash with the one with sufficient capacity, and then press the DISP key. 2) Press the DISP key.
	2) Was the DISP key pressed after the compact flash is replaced with the one with sufficient capacity?	

Situation	Check	Remedy
Record trend is not displayed.	1) Recording has not been started.	1) Press the REC key.
	2) No ch has been registered for the group displayed.	2) Make group registration by referring to section 8.12.
	3) “Skip” has been selected as the input type of the ch registered for the group displayed.	3) Select an input type by referring to section 8.4.
	4) Long time (30 sec or 1 hour, for example) has been selected and displayed as an update interval.	4) Select a shorter refreshment cycle by referring to section 8.9.
	5) “Display Only” has been selected as the recording operation of the ch registered for the group displayed.	5) Select “With Record” by referring to section 8.10.
Display disappeared during operation.	Press any key.	1) Change the LCD OFF time according to the description in section 8.14..
	1) Not faulty if image appears.	
	2) May be faulty if image does not appear even if a key is pressed.	2) Contact our service center.

12. SPECIFICATIONS

1. Input system

- Number of input points : 9 or 18 points (Can be selected at the time of purchase)
- Input circuit : Input mutual isolation (See “Others” on Item 12.10 for the withstand voltage.)
Resistance bulb measured current: about 1 mA
- Measuring cycles : 9 or 18 points....100ms cycles
- Recording cycles : 1 sec to 12 hours
- Writing cycles : 1 min to 12 hours
- Input types : Thermocouple, resistance bulb, DC voltage, and DC current (Shunt resistors are fitted in input terminals).

Note: Provide a shunt resistor (type PHZP0101) separately.

- Measuring range

Input types		Measuring range
Thermocouple	B	400.0 to 1760.0°C
	R	0.0 to 1760.0°C
	S	0.0 to 1760.0°C
	K	–200.0 to 1370.0°C
	E	–200.0 to 800.0°C
	J	–200.0 to 1100.0°C
	T	–200.0 to 400.0°C
	N	0.0 to 1300.0°C
	W	0.0 to 1760.0°C
	L	–200.0 to 900.0°C
	U	–200.0 to 400.0°C
	PN	0.0 to 1300.0°C
Resistance bulb	JPt100	–200.0 to 600.0°C
	Pt100	–200.0 to 600.0°C
DC voltage	50mV	0.00 to 50.00mV
	500mV	0.0 to 500.0mV
	1 to 5V	1.000 to 5.000V
	0 to 5V	0.000 to 5.000V

Note) B, R, S, K, E, J, T, N : JIS C 1602, DIN IEC 584-1
W : 5%Re-26%Re · W (Hoskins Mfg. Co. USA)
L : Fe-Cu · Ni (DIN 43710)
U : Cu-Cu · Ni (DIN 43710)
PN: Platinel
JPt100 : JIS C 1604-1989 (Old JIS Pt 100)
Pt100 : JIS 1604, DIN IEC 751

- Selection of input types : By key operation on the front panel.
Note that the same input type (thermocouple, resistance bulb, voltage) should be set every 2 channels. Refer to “Setting for input types” for details.
- Burn-out function : Provided as standard for thermocouple and resistance bulb inputs. If the input has been open-circuited, the recording level swings over 100%.
Thermocouple burn-out current: about 0.2 μ A
- Input filter function : Settable for each channel (primary delay filter)
Time constants are settable in the range from 0 to 900 sec.
- Scaling function : Possible by DC voltage (current) input
Scaling range: –32767 to 32767
Decimal position: settable at any point
Unit symbol: Selectable out of 125 different units or 12 user units of up to 7 characters.

-
- Subtraction function : Subtraction between each channel is allowed.
 - Totalizing function : The measured value of each channel can be totalized. Applicable to daily, monthly, annual or external input totalizing.
 - F value calculation function : F value (extinction value of bacteria by sterilization by heating) can be calculated from the measured temperature by each channel. F value and measured temperature can be displayed and recorded using 2 channels.
 - Square rooter function : Square rooter can be performed against the input value per each channel
 - Logarithmic calculation function :
The measured value of each channel can be displayed in exponent form.
 - Mathematics function : The following calculation is available with the math function.
 - 1) Calculation function
Addition, subtraction, multiplication, division, absolute value, exponential, square-root extraction, LOG, LN, EXP, humidity, maximum, minimum, average, and totalizing.
 - 2) Calculation input enable
Channel input (CH1 to CH30), Total input (CH1 to CH30), DI (DI1 to DI10), Communication input (No.1 to No.12), Constant (No.1 to No.20).

2. Indication system

- Indicator : 5.7" TFT color LCD (320 x 240 dots) with backlight, no contrast adjustment
On the LCD, certain picture elements may remain lit or extinguished. On account of the nature inherent to LCD, the brightness may be non-uniform, which produces no problems.
 - Color of indication : 14 colors
 - Applicable language : English
 - Life of backlight : 50,000 hours in terms of total lighting time. (Replace the backlight as a set of display unit. If the LCD extinguishing function is resorted to, the LCD can be used longer as much.)
 - Trend display : Direction: vertical and horizontal
Number of channels: 10 or 4 channels per screen group. (Input: 30 points at the maximum)
Display refreshment cycles: select from 1 sec to 12 hours.
Scale display or no-display can be selected.
 - Bar graph display : Number of channels: 10 or 4 channels per screen group. (Input: 30 points at the maximum)
Display refreshment cycles: 1 second.
 - Analog meter display : For 4 inputs per screen group (input from 1 to 4). Display in bar graphs or in analog meters can be selected.
Display refreshment cycle: 1 second
 - Digital display : Number of channels: 10 or 4 channels per screen group. (Input: 30 points at the maximum)
Display refreshment cycle: 1 second
-

- Totalizing data display : Number of channels: 10 or 4 channels per screen group. (Input: 30 points at the maximum)
Display refreshment cycle: 1 second
- Event summary display : Alarm summary and message summary can be displayed.
The message occurrence information and message display can be switched.
- Ethernet log display : E-mail sending, FTP server log in/off and MODBUS TCP/IP communication start/stop can be displayed.
- Parameter display/setting : Already-set Data Display and Set Change Display screen
- TAG display : Number of characters to be displayed:
Up to 8 characters
Up to 8 characters (Note 1) at 10-channel display.
Up to 16 characters at 4-channel display.
Note 1: Up to 7 characters only can be displayed on certain screens.
Characters to be displayed:
Alphanumerics
Tag, unit and channel No. display:
Which can be displayed depends on the particular screen. Refer to the table below.
(Keywords only are extracted.)

Screen	Channels per screen	Item			
		Tag 1	Tag 2	Unit	ch Np.
Trend	4 or less	+	+	+	+
	5 or more	x	—	x	x
Bar graph	4 or less	+	+	+	+
	5 or more	x	—	x	x
Analog meter	4 or less	All			
	5 or more	No. 1 to 4	All except tag 2		
		Others	x	—	x
Instantaneous value	4 or less	All			
	5 or more	All except tag 2			

x: 1 item only can be displayed +: 2 items only can be displayed —: Nothing can be displayed

- Historical trend display : Displays past recording data read from compact flash, currently recording data or just recorded data. The recording chart can be scrolled or, via time designation, the control can jump to an arbitrary recording chart.
- Number of screen groups : Four groups (Up to 10 channels per 1 group can be registered.)

3. Keyboard

- No. of keys : 8
- Function : Used to select various screens and set various parameters.

4. Recording function

- External memory media : Compact Flash card
Format according to FAT32, FAT16 or FAT. Otherwise, reading and saving are impossible.
- Recording capacity : 2GB maximum (compact flash). Limiting the recording file to 64 MB is recommended (for 112 hours if display refreshment cycle is 1 second). Refer to Chapter 12.18 "Table 1 Recording capacity." If the capacity becomes 256MB or more, a new file is created automatically to continue recording.

-
- Recording method : Turning ON the REC key allows measured data to be written at fixed cycles.
Recorded as a new file whenever the recording starts
 - Data save cycles : Linked to the display refreshment cycles on the “Real Time Trend” screen. However, they are automatically set to about 1 minute if the refreshment cycles are set to less than 1 minute.
 - Trend data : Measurement data sampled at measurement cycle is saved in terms of mean value, instantaneous value or maximum/minimum value.
 - Event data : Saves alarm data and message data.
Further saves power ON and OFF, if any, after starting recording.
 - Totalizing value data : Records the totalized data according to the totalizing type selected by channels. Values by totalizing types or total from the beginning of totalizing, whichever selected, can be recorded. For each channel, the input value totalizing, number of DI inputs or measurement at times when DI inputs have occurred can be selected. Input values to be totalized are selected from daily report, monthly report, annual report and external input.
If power has been turned off and on while totalizing, the totalizing is resumed at last value. (Last value remains saved, but data during power OFF is not totalized.)
 - Configuration data : Configuration data can be saved. And this data can also download to recorder.
 - Storage capacity : Approximately 1.5 years when the display refresh cycle is 30 seconds (in the case of 9-channel recording in ASCII data format, and 256MB compact flash used). Refer to Chapter 12.18 “Table 1 Recording capacity.”
 - Residual capacity of memory: Indicates how much of the memory card has been used on the screen. If the residual capacity is none, the recording stops.
 - Compact flash : Type: PHZP1301-512
(If you use a CF card other than the above, we can not guarantee the proper operation. In addition, please check our web site for other CF cards which we conducted performance tests on. We will keep information updated.)
 - Data format : Either of ASCII or binary format can be selected. (Switching cannot be made while the recording is in progress. In the case of ASCII format, the data can be directly read on Excel, etc.)
Note: The data recorded in binary format cannot be read directly.
Approximately 166 bytes per sampling for maximum/minimum recording of 9-channel input in ASCII format, or approximately 40 bytes for maximum/minimum recording of 9-channel input in binary format.

5. Alarm function

- No. of settings : Up to 4 alarms for each channel are settable.
- Type of alarm : High/Low limits

-
- Indication : Status (alarm types) is displayed on digital display unit when an alarm occurs.
Historical display on alarm summary (Alarm start/cancel time and alarm types)
 - Hysteresis : Set within the display range of 0 to 100%.
Acts on high or low limit alarm, and does not affect the battery alarm nor memory full alarm.
 - Relay output : Number of points; 10 (option: Cannot be selected if the number of input points is 18.)
 - Transistor output (open collector output):
18 points (option)
 - Alarm latch function : Holds alarm indication and alarm output even after measurement value has left the alarm range.
ON/OFF operation is performed according to key setting.

6. Power supply

- Rated power voltage : 100V to 240V AC
- Range of operating voltage : 90 to 264V AC
- Supply frequency : 50/60Hz $\pm 2\%$ (both employable)
- Power consumption

Power voltage	Consumption
100V AC	About 36VA
240V AC	About 47VA

7. Structure

- Mounting method : Panel-mounted (vertical panel) or portable (desktop type)
- Thickness of panel : 2 to 26 mm
- Materials : PC-ABS for case and bezel
- Color : Black
- External dimensions : Panel-mounted: 160 (W) \times 144 (H) \times 185 (D) mm
Portable: 160 (W) \times 179 (H) \times 206.6 (D) mm
- Mass : About 1.5 kg (9-point input, without option)
- External terminal board : M3 screw terminals

8. Normal operating condition

- Power voltage : 90 to 264V AC
- Supply frequency : 50/60 Hz $\pm 2\%$ (both employable)
- Ambient temperature : Panel-mounted
0 to 50°C (without Ethernet function) *1
0 to 40°C (with Ethernet function) *2
Portable
0 to 40°C
- Ambient humidity : 20 to 80% RH
- Vibration : 10 to 60Hz 0.2m/s² or less

- Shock : None
- Magnetic field : 400 A/m or less
- Signal source resistance : Thermocouple input 1k Ω or less
Resistance bulb input... 10 Ω /wire or less (resistance of each wire of 3-wire system should be balanced).
Voltage input... 0.1% or less of input resistance
- Mounting posture : Forward tilt 0°, backward tilt within 30°, horizontal 0°
- Warm-up time : One hour or more after power ON

*1: When “Y” or “R” is selected for the 12th digit of the code symbols

*2: When “E” or “W” is selected for the 12th digit of the code symbols

9. Reference standard

- Accuracy/resolution : Measuring conditions (23 \pm 2°C, 65 \pm 10% RH, power voltage, frequency fluctuation within \pm 1%, no external noise, warm-up time of 1 hour or more, vertical mounting, standard values of signal source resistance and wiring resistance... within 1%)

Input types		Digital indication accuracy Note 1	Digital indication resolution
Thermocouple	B R S K E J T N W L U PN	$\pm(0.15\%+1 \text{ digit})$ $\pm(0.3\%+1 \text{ digit})$ for the range shown below. Thermocouple B : 400 to 600°C Thermocouples R and S : 0 to 300°C Thermocouples K, E, J, T, L, and U : -200 to -100°C	0.1°C
Resistance bulb	JPt100 Pt100	$\pm(0.15\%+1 \text{ digit})$	0.1°C
DC voltage	50mV	$\pm(0.15\%+1 \text{ digit})$	10 μ V
	500mV		100 μ V
	5V		1mV

Note 1) Digital indication accuracy is a percentage (%) of the value in the measuring range. (Refer to section 12.1 “Input system.”)

Note 2) No error of reference contact compensation of thermocouple is included.

- Error of reference contact compensation:
K, E, J, T, N, L, U, PN: \pm 0.5°C
R, S, B, W: \pm 1.0°C
(when measured at 0°C or more)
- Max. input voltage : Thermocouple, resistance bulb, DC voltage: \pm 10V DC (continuous)
- Input resistance : Thermocouple, DC voltage: About 1M Ω (Approximately 100 k Ω when the power is set to OFF)

10. Others

- Clock : With calendar function (Christian era)
Accuracy: ± 100 ppm or less (monthly error: about 4 minutes)
However, time error at ambient temperature $23 \pm 2^\circ\text{C}$ and power ON/OFF is not included.
- Memory backup : Parameters are saved to the internal non-volatile flash memory.
The clock is backed up with built-in lithium battery.
Trend data is not backed up.
- Insulation resistance : $100\text{ M}\Omega$ (when measured between each terminal and ground by using a 500V DC megger)
- Withstand voltage : Input terminal – input terminal: 500 V AC, 1 min
Power terminal – ground: 2000V AC, 1 min
Input terminal – ground: 500V AC, 1 min
Alarm terminal (contact output) – ground: 2000 V AC, 1 min
Alarm terminal (contact output) – alarm terminal (contact output):
750 V AC, 1 min
Communication terminal – ground: 500 V AC, 1 min
Alarm terminal (open collector) – ground: 500 V AC, 1 min
Power terminal – input terminal: 500 V AC, 1 min

11. Effect on operation conditions

- Effect of power supply fluctuation:
For the fluctuation in the range from 90 to 264VAC (frequency: 50/60Hz)
Reading change: $\pm(0.2\%+1\text{ digit})$ or lower
For the fluctuation in the range from 47 to 63Hz (power voltage: 100VAC)
Reading change: $\pm(0.2\%+1\text{ digit})$ or lower
- Effect of input signal resistance:
Thermocouple input: $50\mu\text{V} \pm 1\text{ digit}$ per 100Ω
DC voltage: Fluctuation for the resistance value equivalent to 0.1% of the input resistance: $\pm(0.2\%+1\text{ digit})$ or lower
Resistance bulb (for wiring resistance of 10Ω for 1 line (the same for 3 lines))
Reading change: $\pm(0.2\%+1\text{ digit})$ or lower
- Effect of ambient temperature: Reading change: $\pm(0.3\%+1\text{ digit})/10^\circ\text{C}$ or lower
- Effect of mounting position : For the backward 30° slant
Reading change: $\pm(0.2\%+1\text{ digit})$ or lower
- Effect of vibration : When sine wave of 10 to 60Hz with the acceleration of 0.2m/s^2 is applied in each direction for 2 hours
Reading change: $\pm(0.2\%+1\text{ digit})$ or lower

12. Safety and EMC standard

- Safety standard : Based on IEC61010-1
- EMC standard : Based on EN61326

13. Transportation/storage conditions

- Temperature : -10 to 60°C
- Humidity : 5 to 90%RH
- Vibration : 10 to 60Hz, 2.45m/s² or lower
- Shock : 294m/s² or lower (packed state)

14. Additional function (Option)

■ Alarm relay output/DI (11th digit of code symbol: "1")

The card with 10-point relay output and 5-point DI input can be mounted.

Cannot be mounted if the number of input points is 18.

- Terminal structure : M3 screw terminal
- Alarm relay output : 1a contact output (10 points), Individual channel or common output (OR output) allowed.

DO1 : Contact capacity; 150V/3A AC, 30V/3A DC (resistance load)

DO2 to 10 : Contact capacity; 240V/3A AC, 30V/3A DC (resistance load)

- DI input : No voltage contact input (5 points)
The following control is allowed by contact input.
 - (1) Recording start/stop
 - (2) Message set
 - (3) F value calculation reset
 - (4) Totalizing start/stop
 - (5) Totalized value reset
 - (6) LCD (backlight) lighting
 - (7) E-mail sending

ON pulse width: 200 msec or more

OFF pulse width: 200 msec or more

■ Communication, alarm (open collector output), DI input (12th digit of code symbols is "R" or "W".)

Card having RS485 communication and 18 alarm points (open collector output) and 5 DI input points can be installed.

- Terminal structure : M3 screw terminal (DO11 (alarm open collector output), DI6, DIO source terminal and communication terminal)
D-Sub 25 pin female terminal (DO12 to DO28 (alarm open collector output)) and DI7 to DI10

-
- Communication function : Electrical specifications: Conform to EIA RS-485
Communication protocol: MODBUS (RTU)
Communication method:
2-wire, half-duplex type, start-stop synchronization
Data format: Data length: 8 data bits
Stop bit: 1 stop bit
Parity: Even, odd, None
Communication rate: 9600, 19200 bps
Maximum number of connectable units:
32 including master (multi drop)
Communication distance (total extension): 500 m max.
RS232C/RS485 converter (recommended):
Model K3SC-10 (isolated type manufactured by Omron)
 - Alarm output : Open collector transistor output (18 points), 30 V DC, 0.1 A, resistance load
 - DI input : No-voltage contact input (5 points).
Contact input allows following controls.
(1) Recording start/stop
(2) Message set
(3) F value calculation reset
(4) Totalizing start/stop
(5) Totalized value reset
(6) LCD (backlight) lighting
(7) E-mail sending
ON pulse width: 200 msec or more
OFF pulse width: 200 msec or more

15. Ethernet (Option)

The following can be performed through the Ethernet function.

■ HTTP server (Internet Explorer 6 is available) ^{Note 1}

- Measurement display : Digitally displays the measurement of each channel of the recorder and alarm occurrence status.
- Event summary display : Displays event summary including alarm ON/OFF and issuance of messages.
- Main unit information display : Displays memory use conditions and information on the main unit such as the battery end warning.
- Totalized value display : Digitally displays the totalized value of each channel of the recorder.

■ FTP server (Internet Explorer 6 available.) ^{Note 1}

- File download : Record files stored in compact flash (CF) can be downloaded from the browser.
- File delete : Record files stored in CF can be deleted from the browser.
- Access authentication : Authenticates access authority to FTP server.

■ SMTP (e-mail client)

Transmits e-mails to specified address under the following conditions.

- (1) When an alarm turns on or off
- (2) When DI is set to ON or OFF
- (3) When an error occurs to the main unit (such as low battery or no memory space)
- (4) At specified intervals

■ MODBUS TC/IP

- Data read : Settings can be read through MODBUS TCP/IP communication.
- Data write : Settings can be written through MODBUS TCP/IP communication.

Note 1: Netscape isn't available.

16. Support software

Note:

- Applicable PC: PC/AT-compatible machine.
- Operation on PC98-series machines by NEC is not guaranteed.
- Operation on self-made or shop-brand PCs is not guaranteed.

The following software is provided as standard.

■ Loader software for PC

- Major function : Performs various parameter setting/change of the main unit.
- O/S : Windows 2000/XP, Windows 7 (Home Premium, Professional (Not applicable for 64 bit version))
- Required memory : 64MB or larger
- Disk drive : Windows 2000/XP/7-capable CD-ROM
- Hard disk capacity : Free capacity of 30MB or larger required
- Printer : Windows 2000/XP/7-capable printer and printer driver

Note: PC loader communication cable (type PHZP0201) is separately required.

■ Data viewer software

- Major function : Regenerates the past trend record on the PC from the data in the compact flash. Provided with historical trend display and event display functions.
Data can be changed to CSV file.
- O/S : Windows 2000/XP, Windows 7 (Home Premium, Professional)
- Required memory : 64MB or larger
- Disk drive : Windows 2000/XP/7-capable CD-ROM drive
- Hard disk drive : Free capacity of 30MB or larger required
- Printer : Windows 2000/XP/7-capable printer and printer driver

17. Standard function

Function	Description
Display range voluntary setting	Display range can be set by channel.
Input type setting	Input type can be set by channel. (key operation on the front face) Set the same input type for every 2 channels.
Skip function	Skips arbitrary channel display/recording
Trend display	Time display: Time is displayed at the top of the trend display screen. Alarm display: On occurrence of an alarm and the restoration, alarm is displayed in the alarm display field. The compact flash usage is displayed at the top of the bar graph.
TAG name display	By channel, Maximum of 8 characters
Screen name display	Displays the screen name (maximum of 16 characters).
Unit creation	Industrial units can be arbitrarily created, Maximum of 7 digits, 12 types
Scaling function	Arbitrary scaling is allowed in the case of DC voltage input. Decimal point position can also be arbitrarily set in the range from -32767 to 32767.
PV shift	Shifts the zero point and slant of the reading.
Input filter	Prevents sudden fluctuation of input for each channel (primary delay filter) Time constant: 0 to 900 seconds
Burnout function	Displays the break of thermocouple/resistance bulb input by scaling out to 100% side.
Historical trend display	Regenerates and displays the data stored in the compact flash by scrolling the screen. Displays data of a designated time.

18. Table 1. Recording capacity

The recording can be made for the period of time listed in the tables shown below under the following conditions.

- 9 input points
- Recording data format: ASCII
- Recording type: Maximum/minimum recording
- No alarm, nor message, nor other events.

CompactFlash size	64MB				
Display refreshment cycle	1 sec	10 sec	30 sec	1 min	10 min
Recordable capacity (about)	112 hours	46 days	140 days	280 days	7.7 years

CompactFlash size	256MB			
Display refreshment cycle	1 sec	10 sec	30 sec	1 min
Recordable capacity (about)	18 days	187 days	1.5 years	3 years

- When the number of input points is 18, the period is approximately one half of those listed in the table.
- In binary format, the period is approximately 4 times as long as those listed in the table.
- For recording type of mean or instantaneous value, the number of days is approximately 2 times as long.

While compact flash is not in use, recorded date and event date can be stored approximately 600kB in the main unit.

When recording 9-channel in MAX-MIN recording, approximately 15300 data can be stored.

For 4 hours at the display refresh cycle of 1 second.

The number of the save data varies depending on the number of the event data.

Also, the number of the recording data allowing the historical display is fixed to 400 data.

(2) Event data file

A000001.FDT

PHR11B11-N11YY

SNo.A2M0262T Ver.V12A

2002/ 4/18 23:32:00,A,01,2,02,1

2002/ 4/18 23:32:00,M,Low temperature attention ,01

2002/ 4/18 23:45:22,A,03,3,01,1

2002/ 4/18 23:45:22,M,Humidity is abnormal. ,01

Message data

2002/ 4/18 23:47:21,A,03,3,01,0

2002/ 4/18 23:47:28,A,03,4,02,1

2002/ 4/18 23:47:28,M,Humidity is abnormal. ,01

2002/ 4/19 00:39:46,A,03,4,02,0

2002/ 4/19 00:41:26,A,01,2,02,0

"Occurrence of alarm" data

Year, month, day, time, type (A), channel No., alarm No.

Alarm types (1: H, 2: L)

Alarm start (1) and alarm cancel (0)

2002/ 4/19 00:41:26,M,Low temperature attention off ,01

2002/ 4/19 00:42:27,A,03,4,02,1

2002/ 4/19 00:42:27,M,Humidity is abnormal. ,01

2002/ 4/19 00:43:12,A,03,4,02,0

2002/ 4/19 00:52:37,A,01,1,01,1

2002/ 4/19 00:52:37,M,High temperature attention ,01

2002/ 4/19 02:05:58,A,01,1,01,0

2002/ 4/19 02:05:58,M,High temperature attention off ,01

2002/ 4/19 02:42:38,A,01,2,02,1

2002/ 4/19 02:42:38,M,Low temperature attention ,01

2002/ 4/19 02:55:48,A,03,3,01,1

2002/ 4/19 02:55:48,M,Humidity is abnormal. ,01

2002/ 4/19 02:57:51,A,03,3,01,0

2002/ 4/19 02:57:57,A,03,4,02,1

2002/ 4/19 02:57:57,M,Humidity is abnormal. ,01

2002/ 4/19 03:50:02,A,03,4,02,0

2002/ 4/19 03:51:40,A,01,2,02,0

2002/ 4/19 03:51:40,M,Low temperature attention off ,01

2002/ 4/19 04:02:53,A,01,1,01,1

2002/ 4/19 04:02:53,M,High temperature attention ,01

2002/ 4/19 05:16:14,A,01,1,01,0

2002/ 4/19 05:16:14,M,High temperature attention off ,01

Appendix 2 Difference between Micro Jet Recorder (PHC) and PHR

Item	PHC	PHR
Display	Fluorescent display tube 20 characters × 2 stages	TFT color LCD 320 × 240 dots, 16 colors
Trend recording	Printed in Recorder	Viewed on the display unit of the recorder. Play back by inserting the memory card in PC
Chart speed	5 to 1500mm/h (400mm/h or over: unstable)	“Display Refresh Cycle” are settable within the range of 1 sec to 12 hours.(See 6.2)
Effective chart width	100mm ±0.5mm	About 115 mm (Trend direction: vertical) About 74 mm (Trend direction: horizontal) No over-scale
Scale line	Scale lines are printed at intervals of about 40 mm.	No scale lines are indicated.
Fixed-time printing	Time, chart speed, PV values are printed at fixed cycles linked to the chart speed	Time and time line are indicated at intervals of about 22mm.
List print	Instantaneous value list, daily report and total list, scale line, and message	None
Alarm print	When an alarm occurs, it starts on chart paper 100% side. When it is cancelled, printing can be performed.	Messages are displayed on the Alarm Display unit when the alarm is ON/OFF.
Daily report / Total	Provided / Provided	Not provided / Provided
Message	16 characters × 10 types Recording start/stop, DI on/off, alarm ON/OFF	32 characters × 10 types Recorded in Event Data file
Recording cycles	Links to chart speed 400/chart speed (mm/h)	Linked to Display Refreshment Cycles (See 1.4)
Input		
No. of input points	6 points	9, 18 points
Input types	TC × 12, Pt × 2, 50mV, 500mV, 5V, 50V	No 50V range
Change of input signal	Pin selection + setting on front display	Front display. However, the same type are set on every 2 channels.
Burn-out	TC and Pt are provided as standard.	TC and Pt are provided as standard.
Input range	—	Minus range of voltage input is scaled down (0 to 50mV, 0 to 500mV, 1 to 5V, 0 to 5V)
Input sampling cycles	320ms: 6 points	100ms: 9, 18 points
Parameter set	It is changed from the front panel unit.	It is changed from the front panel unit, loader, or compact flash. Some parameters that cannot be set during recording (See Appendix 3).
Performance and characteristic		
Input resistance	10MΩ(50mV, TC), 1M(5V), 100kΩ(500mV)	1MΩ (All input types)
Accuracy of clock	±50 ppm (monthly error: 2 min)	±100 ppm (monthly error: 4 min)
Alarm types	High/Lower limit, high limit/ lower limit of change rate	High/Lower limit
No. of settings	4 points/ch	4 points/ch
Hysteresis width	0.5% of recording span	Hysteresis width is selectable.
Alarm latch	Yes, it can be cancelled by DI or on front panel unit.	Yes, it can be cancelled on front panel unit.
Construction		
External terminal	Screw terminal (M4)	Screw terminal (M3)
Case material	Steel	Plastic with openings
Mass	2.1 kg	About 1.5 kg
Dimensions	144 × 144 × 199 mm	160 × 144 × 185 mm

Item	PHC	PHR
DIO unit	DI: 3 points Alarm relay: 6 points	9-point input: DI: 5 points, Alarm relay: 10 points + DI: 5 points, Alarm (open collector): 18 points 18-point input: DI: 5 points, Alarm (open collector): 18 points
Communication unit	RS485	RS485/Ethernet
Function		
Arbitrary setting of input types	Pin setting + from front panel unit	Settable from the front panel unit
Subtraction	Possible between channels	Possible between channels
Logarithm calculation	Possible	None
Rooter calculation	Possible	Possible
Zoom/zone/auto-range	Possible	None
PV shift	Possible	Possible
Parameter copy	Possible (for one channel)	Possible (for one channel or all channels)
Memory backup	Clock	Clock: Battery backup
	All parameters	Parameters: Parameters can be stored in internal nonvolatile memory and compact flash.
	Data in recording (daily report and total report)	Data in recording: No back up before data is written in compact flash memory.
Parts that need periodical maintenance	Recorder head (every 6 months) Chart (every month) Motor (every 5 years) Display tube (every 30,000 hours)	LCD display unit: replace every 50,000 hours (replace together with control panel) Panel packing: every 5 years Memory card: every 6 months
Effect of common mode noise	CMRR 120dB	CMRR 120dB (between earth terminal and minus input terminal) In case of Pt, cable A should not be affected by common mode noise when wiring.
Effect of wiring resistance	Thermocouple: 25 μ V/100 Ω	Thermocouple: 0.5 μ V/ Ω Minimize the wiring resistance.

Appendix 3 Parameters that cannot be set during recording

Channel parameter	Input types Units Scaling (measuring range, engineering value) Square rooter Logarithmic calculation TAG Display color Display range Recording types Recording mode F value calculation function F value calculation decimal position
Recording parameters	Display refreshment cycles File division cycle File overwrite function Trend display compression function Display naming Display structure
Unit parameters	Clock Recorder data format
Functions that cannot be used during recording	Channel parameter copying function Parameter initialization Loading setting value from compact flash Math channel parameter copying function
Math channel parameter	Arithmetic operation Unit Scaling (measuring range, engineering value) Square rooter Logarithmic calculation TAG Display color Display range Recording types Recording mode F value calculation function

Appendix 4 Parameters that cannot be set during totalizing

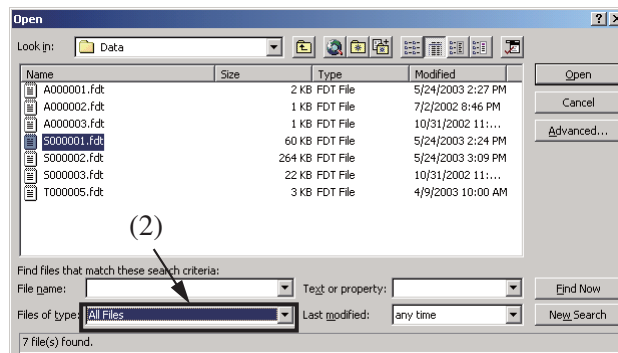
Channel parameter	Totalizing type Totalizing calculation mode External input Totalizing unit time Totalizing reset mode Totalize reset input Totalizing TAG Totalize unit Totalizing lower limit cut value Totalizing divisor
Totalizing parameters	Totalized time for daily report Base date for annual report External input signal
Unit parameters	Clock Recorder data format
Functions that cannot be used during totalizing	Initializing setting value Loading setting value from compact flash
Math channel parameter	Totalizing type Totalizing calculation mode External input Totalizing unit time Totalizing reset mode Totalize reset input Totalizing TAG Totalize unit Totalizing lower limit cut value Totalizing divisor

Appendix 5 Opening the PHR record data in ASCII format on Excel

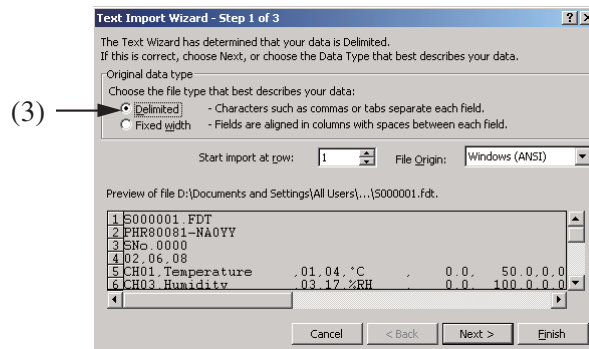
Note 1: Binary format record data cannot be opened with the method shown below. (See section 8.20 Setting for record data format for details.)

Note 2: The record data of 10MB or larger in case of 9-point input, and 5MB or larger in case of 18-point input cannot be opened on Excel. In these cases, read the data using the data viewer (contained in the attached CD-ROM) and perform CSV conversion to divide the file, which allows the data to be read.

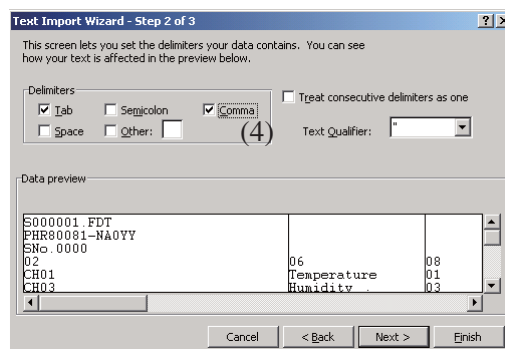
- (1) Start up Excel, select “File(F)” and the “Open (O)” on the menu to display the following screen.



- (2) Select “All” for the file type, and select PHR record data (S****.FDT).
- (3) Selecting the file displays the following data format setting screen. Select “Dividing characters such as a comma or a tab....” for the original data format, and then press the “Next” button.



- (4) Pressing the “Next” button displays the following screen.
Check “Comma (C)” in the dividing character setting.



- (5) Pressing the “Exit (E)” button displays the record data of PHR.

Appendix 6 Timing of recording

The timing of recording varies depending on display refresh cycle and integration record cycle.

Example: When the recording is started at 08:45 at the display refresh cycle of 20 minutes, the data is recorded next when the clock indicates 0, that is, at 09:00. The recording will thus be performed at 09:20, 09:40, 10:00etc.

Display refresh cycle	Data is recorded when the PHR clock indicates the following time.
1 second	Every second
2 seconds	Every even-numbered second
3 seconds	At 0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57 seconds
5 seconds	At 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55 seconds
10 seconds	At 0, 10, 20, 30, 40, 50 seconds
20 seconds	At 0, 20, 40 seconds
30 seconds	At 0, 30 seconds
1 minute	Every minute (When 0 is displayed. The same for the following)
2 minutes	Every even-numbered minute
3 minutes	At 0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57 minutes
5 minutes	At 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55 minutes
10 minutes	At 0, 10, 20, 30, 40, 50 minutes
20 minutes	At 0, 20, 40 minutes
30 minutes	At 0, 30 minutes
1 hour	Every hour (When "0 m :0 s" is displayed. The same for the following)
2 hours	Every even-numbered hour
3 hours	At 0, 3, 6, 9, 12, 15, 18, 21 hours
4 hours	At 0, 4, 8, 12, 16, 20 hours
6 hours	At 0, 6, 12, 18 hours
12 hours	At 0, 12 hours

Appendix 7 Screen configuration

Measurement value display screen	Parameter setting screen		Setting item
Trend screen	Channel setting	○ Input setting screen (8.4)	Input type, scaling, unit, measurement range, engineering value, square root extraction, logarithmic calculation
Bar graph screen		○ Calculation setting screen (8.5)	Input filter, subtraction, PV shift, PV inclination, F value calculation function
Analog meter screen		○ Alarm setting screen (8.6)	Alarm operation, DO relay No., alarm measurement value
Instantaneous value display screen		○ F value calculation setting screen (8.7)	Reference temperature, Z value, decimal point position, reset temperature, manual reset
Totalized value display screen		○ Copy screen (8.8)	(Selected channels or all channels can be copied.)
Event display screen	Display record setting	○ Display update cycle screen (8.9)	Display update cycle, file division cycle, file overwrite, trend display compression
Ethernet log display screen		○ Range setting screen (8.10)	Tag No., Tag No.2, display color, display range, recording type, recording operation
Historical display screen		○ Message setting screen (8.11)	Message, message timing
		○ Screen setting 1 (8.12)	Screen name, screen configuration channel
		○ Screen setting 2 (8.12)	Trend direction, number of screen division, scale display, bar graph/meter selection, color bar display selection
		○ Background color setting (8.13)	Background color for real time trend screen and historical trend screen
	Main unit setting	○ Register data screen (8.14)	Register data
		○ LCD OFF time screen (8.15)	LCD OFF time
		○ Unit defining screen (8.16)	Unit
		○ DI setting screen (8.17)	DI function
		○ Alarm setting screen (8.18)	Alarm hysteresis, alarm latch, memory full alarm, battery alarm
		○ Clock adjustment screen (8.19)	
		○ Record data format screen (8.20)	Record data format
		○ RS-485 communication setting screen (8.21)	Station No., baud rate, parity, front communication
		○ Ethernet communication setting screen (8.22)	IP address, subnet mask, default gateway
		○ Ethernet setting 1 screen (8.22)	FTP server function, FTP access control, Web server function, E-mail function, MODBUS TCP/IP
		○ Ethernet setting 2 screen (8.22)	SMTP address, sender's address, sender's name
		○ E-mail setting 1 screen (8.23)	Receiver's address
		○ E-mail setting 2 screen (8.23)	
		○ E-mail trigger setting screen (8.24)	Title, trigger timing, text 1, text 2, measured value affixation, receiver's address No., E-mail send test
		○ User account setting screen (8.25)	User name, password, user level
		○ Password setting (8.26)	○ Parameter setting △ Memory card operation/recording start/stop

Measurement value display screen	Parameter setting screen		Setting item
	Memory card	△- Record data display screen (8.27)	Record data display
		△- Memory card removing screen (8.28)	Memory card removing
		△- Reading settings screen (8.29)	Reading settings
		△- Writing settings screen (8.30)	Writing settings
	Totalize function	○- Daily type screen (8.32)	Totalize cycle, base day, external input, totalize calculation operation, totalize type, digital type, totalize base time, totalize reset operation, totalize TAG, totalize unit, totalize cut value, totalize scaling value
		○- Monthly type screen (8.35)	
		○- Annual type screen (8.36)	
		○- External type screen (8.37)	Totalize start/stop
		○- Totalize start/stop screen (8.38)	
		○- Totalize reset screen (8.39)	Totalize reset
	Math channel function	○- Formula setting screen (8.41)	Arithmetic operation
		○- Input setting screen (8.42)	Unit, measurement range, engineering value, square rooter
		○- Calculation setting screen (8.43)	Input filter, subtraction, PV shift, PV gain, F value calculation function
		○- Alarm setting screen (8.44)	Alarm operation, DO relay No., alarm measurement value
		○- Range setting screen (8.45)	TAG No., TAG No.2, display color, display range, recording type, recording operation
		○- Math channel copy screen (8.46)	(Selected math channels or all math channels) can be copied.
		○- Math timer setting screen (8.47)	Math timer
		○- Constant setting screen (8.48)	Constant
	System information	Version screen (9.1)	Input adjustment, special setting (*1), set value initialization, adjusted value initialization (*1), version
		Calibration password screen (9.1) (1234)	

*1: Do not manipulate.

○ : Setting can be locked by parameter setting password.

△ : Setting can be locked by compact flash operation password.

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